TCF

Aberdeen School District – Harbor Learning Center

Study Survey

TCF Architecture
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SEPTEMBER 2025



CONSTRUCTION SERVICES GROUP

Degenkolb

METRIX ENGINEERS

Table of Contents

CHAPTER 01

1 Executive Summary

2 Architect's Letter of Certification

3 Building Area Analysis & Building Condition Assessment by Recognized Site

3.2 A.J. West Elementary

- 3.2.1 Site Plan
- 3.2.2 Building Plan & Summary
- 3.2.3 Area Analysis
- 3.2.4 Site & Building Condition Assessment

3.3 Central Park Elementary

- 3.3.1 Site Plan
- 3.3.2 Building Plan & Summary
- 3.3.3 Area Analysis
- 3.3.4 Site & Building Condition Assessment

3.4 McDermoth Elementary

- 3.4.1 Site Plan
- 3.4.2 Building Plan & Summary
- 3.4.3 Area Analysis
- 3.4.4 Site & Building Condition Assessment

3.5 Robert Gray Elementary

- 3.2.1 Site Plan
- 3.2.2 Building Plan & Summary
- 3.2.3 Area Analysis
- 3.2.4 Site & Building Condition Assessment

3.6 Stevens Elementary

- 3.2.1 Site Plan
- 3.2.2 Building Plan & Summary
- 3.2.3 Area Analysis
- 3.2.4 Site & Building Condition Assessment

3.7 Miller Junior High School

- 3.2.1 Site Plan
- 3.2.2 Building Plan & Summary
- 3.2.3 Area Analysis
- 3.2.4 Site & Building Condition Assessment

3.8 Hopkins Building (Harbor High School)

3.2.1 Site Plan
3.2.2 Building Plan & Summary
3.2.3 Area Analysis
3.2.4 Site & Building Condition Assessment

3.9 J.M. Weatherwax High School

3.2.1 Site Plan
3.2.2 Building Plan & Summary
3.2.3 Area Analysis
3.2.4 Site & Building Condition Assessment

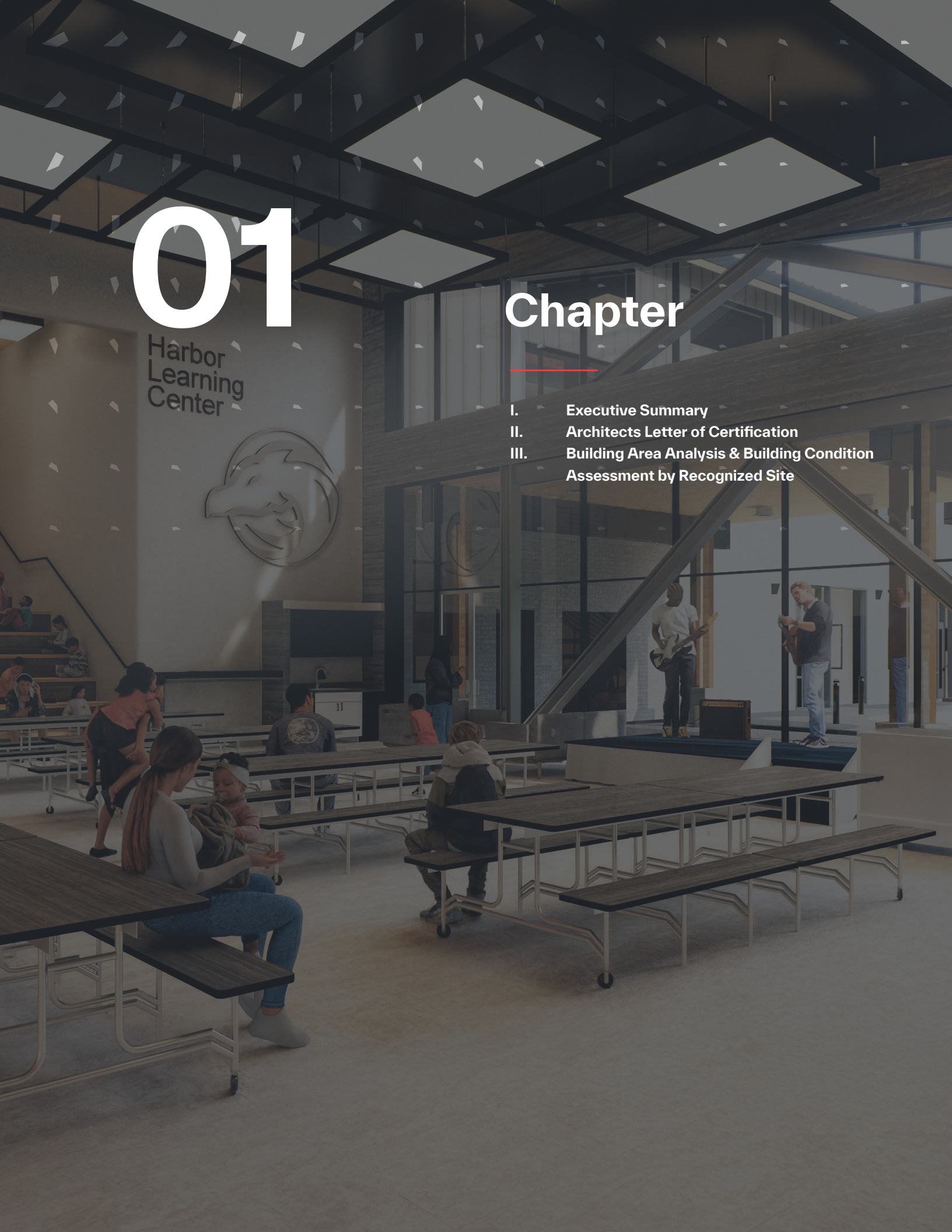
CHAPTER 02

1 6 Year Capital Facilities Plan
2 Report 1049 Cohort Survival Enrollment Projection
3 Form 1066 Count of District Disabled Students
4 “Tab2” Financial Status
5 “Tab4” School Housing Emergency by District

5.2 Aberdeen School District
5.3 Elma School District
5.4 Hoquiam School District
5.5 Montesano School District
5.6 Ocosta School District
5.7 Wishkah School District

CHAPTER 03

1 Pre-Disaster Mitigation & Seismic Study by Building



01 Chapter

I. Executive Summary
II. Architects Letter of Certification
III. Building Area Analysis & Building Condition Assessment by Recognized Site

Executive Summary

This Study and Survey report was prepared by *TCF Architecture for the Aberdeen School District* in compliance with the *Office of Superintendent of Public Instruction (OSPI)* requirements. The report incorporates contributions from *Metrix Engineers,* who evaluated mechanical and electrical systems, and *Degenkolb Engineers,* who completed structural and seismic assessments in alignment with Pre-Disaster Mitigation planning. The District's *Maintenance and Operations staff, led by Michael Pauley*, also provided critical support in identifying facility needs, documenting system performance, and ensuring the accuracy of on-site evaluations.

The study focused on the *physical condition and environmental resiliency of school facilities*, providing a clear understanding of building systems, seismic performance, and long-term durability.

CONDITION FINDINGS:

The most recent Building Condition Assessments (BCA) and Detailed Condition Assessments (2025–2026) indicate that most Aberdeen facilities perform in the *Fair range (mid-60s to mid-70s),* with only selected components scoring in the Good range. For example, A.J. West Elementary's original 1952 building scored 67.7%, its annex scored 65.7%, and Central Park's 1966 annex scored 76.8%. Common deficiencies include outdated electrical distribution, plumbing beyond service life, roof and envelope deterioration, seismic vulnerabilities, and aging interior finishes. Several facilities remain overdue for APP annual reviews, with the next certified BCA required in 2028.

SEISMIC & TSUNAMI SAFETY:

Aberdeen is uniquely exposed to coastal hazards. The District is actively coordinating with the *OSPI Seismic Safety Committee*, which is engaged in seismic safety and tsunami mitigation planning for *A.J. West Elementary, Harbor High (Hopkins Building), Miller Junior High, Stevens Elementary, Central Park Elementary, and Robert Gray Elementary*. In several cases, *proposals are under consideration to relocate schools outside of the tsunami inundation zone*, reflecting a long-term strategy to reduce seismic risk and remove facilities from high-hazard areas.

HISTORICAL INVESTMENT:

Since the 1990s, Aberdeen has leveraged the *School Construction Assistance Program (SCAP)* to modernize or replace approximately *345,000 square feet* of facilities. Major projects include McDermoth Elementary (1999 modernization), Robert Gray Elementary (2002 replacement), and J.M. Weatherwax High School (2006 new-in-lieu replacement). These schools represent the District's most reliable facilities; however, much of the remaining inventory dates from the 1950s and is increasingly costly to maintain.

STRATEGIC PRIORITIES (2025–2031):

Looking ahead, the District's foremost priority is addressing the *tsunami hazard* by planning for the relocation of schools currently situated in inundation zones to higher ground. In addition, Aberdeen is committed to improving the overall *seismic resilience* of its facilities so that buildings can better withstand earthquake events and protect students and staff. The plan also emphasizes continued investment in *core building systems*—including heating, ventilation, plumbing, electrical distribution, and roofing—to ensure reliable daily operations. Over time, the District aims to modernize older schools, reduce reliance on portable classrooms, and maintain compliance with the Asset Preservation Program. Achieving these goals will require a balanced *funding strategy* that combines state assistance, seismic safety grants, and local support to guide capital improvements through the next six years.

Executive Summary

I

CONCLUSION:

This report provides a clear snapshot of facility needs across the Aberdeen School District and establishes a six-year roadmap to prioritize capital investments. It balances sustaining recently modernized facilities with addressing mid-century buildings at the end of their useful life. With state and local support, Aberdeen can advance toward safer, more resilient, and more sustainable schools for its students and community.

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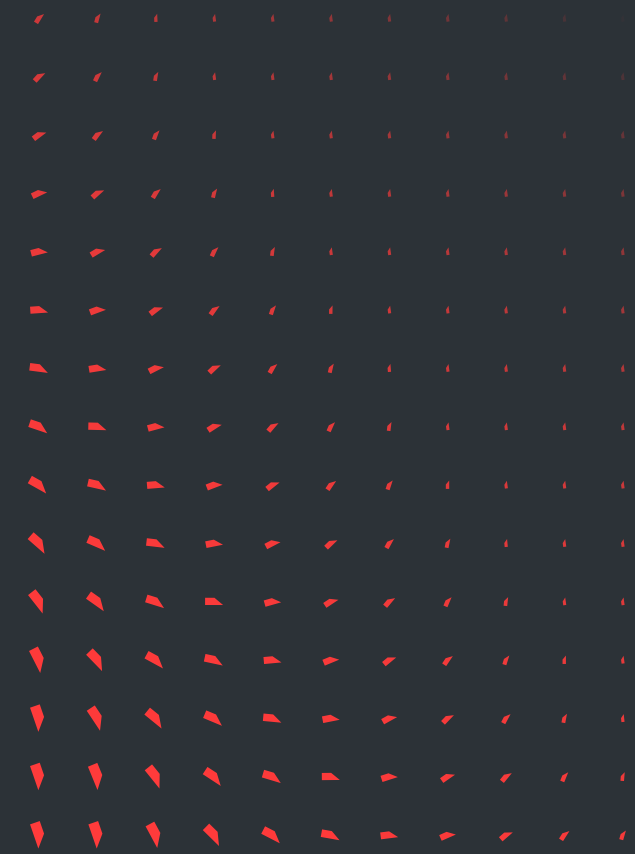
Chapter 1.2

Architect's Letter of Certification



TCF

September 29, 2025

Aberdeen School District
216 North G Street
Aberdeen, WA 98520

Re: Certification of Area Analysis and Facility Inventory Data for Study and Survey

To Whom It May Concern:
As the architect of record for the Aberdeen School District Study Survey conducted for Aberdeen School District, I hereby certify that, to the best of my knowledge and professional ability, the facility inventory data provided as part of this study is current and accurate.
This certification includes confirmation that the following information has been reviewed, verified, and updated where necessary:

- Identification and count of all SCAP-recognized permanent buildings
- Identification and count of all portable classrooms
- Gross square footages for all buildings (measured from exterior wall to exterior wall. Covered playsheds, as well as covered, open outdoor learning classrooms, are measured to the extent of their roof overhangs)
- Accurate site acreage for each school property
- Appropriate space identification in accordance with OSPI guidance

This certification is based on available records, on-site observations, and measurements conducted as part of this Study and Survey effort.
Please feel free to contact me at **(253) 572-3993** or **JR@TCFArchitecture.com** should you require any further information.

Sincerely,



James (J.R.) Mill
Architect
TCF Architecture
(253) 572-3993
JR@TCFArchitecture.com

TCF

1.3.2 // A.J. West Elementary

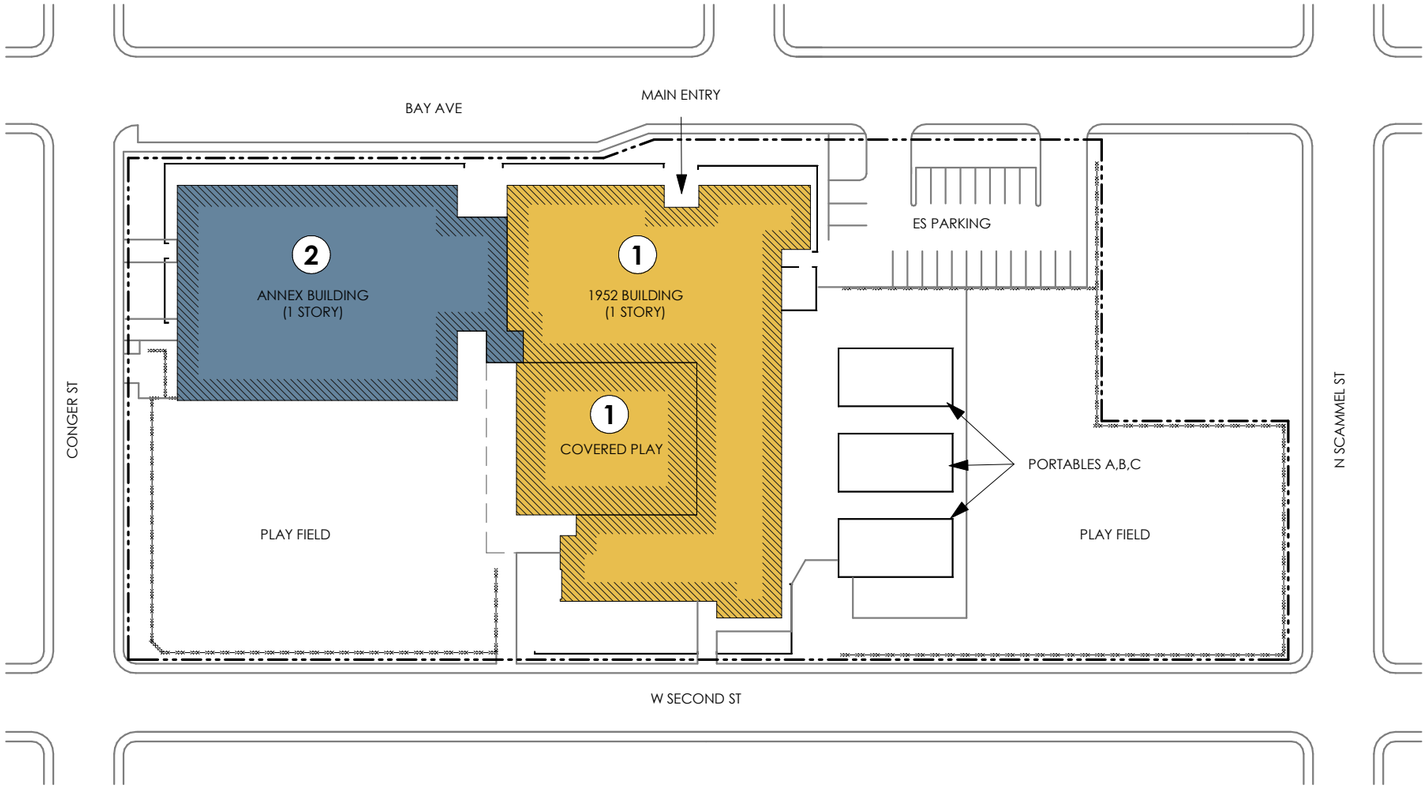
- Site Plan
- Building Plan and Area Summary
- Area Analysis
- Site & Building Condition Assessment

AJ WEST ELEMENTARY SCHOOL

Gross Area & Site Plan

BUILDING NUMBER	BUILDING NAME	GROSS* SQUARE FOOT (SF) TOTALS
1	1952 BUILDING	22630
2	ANNEX BUILDING	16400
1	COVERED PLAY	7650
		46680

*Gross sqft totals for recognized buildings only



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NORTH

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Client
ABERDEEN SCHOOL DISTRICT

Project
ASD-STUDY SURVEY

2025-008
AJ WEST ES

ABERDEEN WA, US

Issue & Revision Dates
10 SEPTEMBER 2025
Not for Construction

SITE INFORMATION PER AS-BUILTS PROVIDED BY OWNER DATED 10/21/2005

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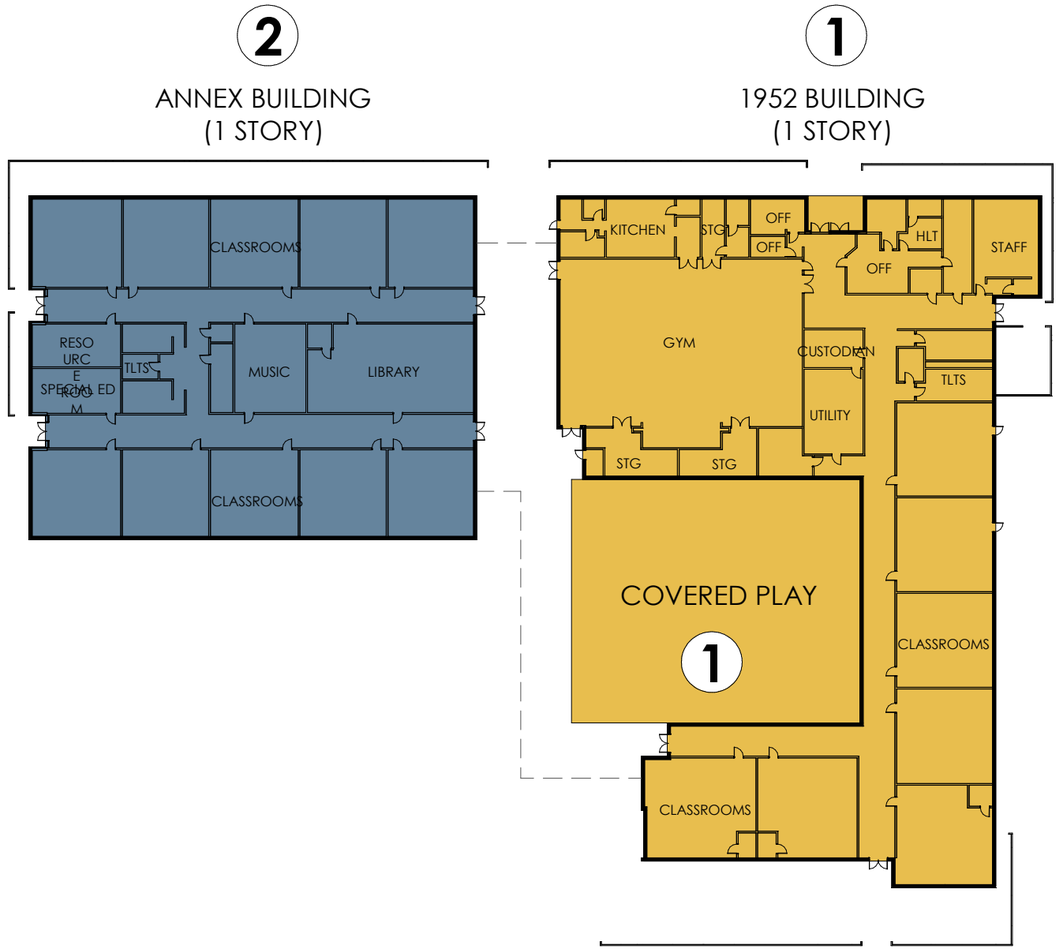
AJ WEST ELEMENTARY SCHOOL

First Floor Plan

BUILDING NUMBER	BUILDING NAME	GROSS* SQUARE FOOT (SF) TOTALS
1	1952 BUILDING	22630
2	ANNEX BUILDING	16400
1	COVERED PLAY	7650
		46680

*Gross sqft totals for recognized buildings only





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AJ West Elmentary School
Aberdeen School District - Area Analysis District Summary

Campus/Site	Building Name	Building Area Description (and Area Number/Letter, if applicable)	Year Built (Original Facility)	If Project Final Board Acceptance was within 30 years							Gross SF	SCAP-Recognized SF
				ALL New Construction (SCAP or locally funded)			APP (OSPI Only)	SCAP-funded Modernizations ONLY				
				If SCAP-funded or locally funded New Construction, Include SCAP Project Number if applicable (see Report 1 in ICOS)	If SCAP-funded include Final Board Acceptance Date on Resolution or If locally funded New Construction, Board discussion of completion (per Notes 1 & 2 below	Copy of Board Resolution uploaded in ICOS? (See Note 3 Below)	New or N/L SCAP Funded Construction after 1/1/1994	If SCAP funded Modernization, Include SCAP Project Number per Report 1 (found in ICOS)	If SCAP-funded Modernization, include Final Board Acceptance Date (see Report 1 in ICOS)	Copy of Board Resolution uploaded in ICOS? (See Notes 1 & 2 Below)		
AJ West Elementary	1952 Building	1	1952					13064	4/15/1997	Yes	22,630	22,630
AJ West Elementary	Covered Play	1	1952					13064	4/15/1997	Yes	16,400	16,400
AJ West Elementary	Annex Building	2	1966					13064	4/15/1997	Yes	7,650	3,825
										Subtotal	46,680	42,855
										District Totals	46,680	42,855

Notes

1 - The final board acceptance date is required for all SCAP-funded projects (new buildings, additions, and modernizations) completed in the last 30 years (see Report 1 in ICOS)

2 - For locally funded buildings and additions constructed in the past 30 years, the final board acceptance date must be provided. If the district does not have a final board resolution, then a copy of board meeting minutes stating completion of project is acceptable.

3 - A copy of the Final Acceptance Board Resolution for all buildings or building areas constructed or modernized, SCAP Funded or Locally, must be uploaded into ICOS.

4 - All square footage calculations must be measured to the exterior walls, exluding overhangs.

5 - Area calculations are in accordance AIA Document D-101 and WAC 392-343-019.

6 - All covered play areas and covered outdoor learning areas are calculated to the eave line, and counted at 1/2 the square footage.

7 - All building and area names, dates, and square footage figures are exactly equal to data shown on area analysis plans/diagram and data entered in ICOS.

STATE OF WASHINGTON - SUPERINTENDENT OF PUBLIC INSTRUCTION
SITE CONDITION RATING SUMMARY
ABERDEEN SCHOOL DISTRICT (14005)

A.J. WEST ELEMENTARY SCHOOL

Profile Name: Elementary School - Rural **Last Review:** 8/19/2025

Inventory Status: Recognized

Condition Rating: 73.12 %

		Condition Rating						Component	Priority		
Sub-Assembly	**Component**	**E**	**G**	**F**	**P**	**U**	**N/A**	**Score**	**L**	**M**	**H**
Site Improvement											
G2010	Roadways	☐	☐	☑	☐	☐	☐	62 %	☐	☐	☐
G2020	Parking Lots	☐	☐	☑	☐	☐	☐	62 %	☐	☐	☐
G2030	Pedestrian Plazas and Walkways	☐	☐	☑	☐	☐	☐	62 %	☐	☐	☐
G2050	Athletic, Recreational and Playfields Areas	☐	☐	☑	☐	☐	☐	62 %	☐	☐	☐
G2060	Site Development	☐	☐	☑	☐	☐	☐	62 %	☐	☐	☐
G2080	Landscaping	☐	☑	☐	☐	☐	☐	90 %	☐	☐	☐
Liquid and Gas Site Utilities											
G3010	Water Utilities	☐	☑	☐	☐	☐	☐	90 %	☐	☐	☐
G3020	Sanitary Sewerage Utilities	☐	☑	☐	☐	☐	☐	90 %	☐	☐	☐
G3030	Storm Drainage Utilities	☐	☑	☐	☐	☐	☐	90 %	☐	☐	☐
G3060	Site Fuel Distribution	☐	☑	☐	☐	☐	☐	90 %	☐	☐	☐
Electrical Site Improvements											
G4010	Site Electric Distribution Systems	☐	☑	☐	☐	☐	☐	90 %	☐	☐	☐
G4050	Site Lighting	☐	☐	☑	☐	☐	☐	62 %	☐	☐	☐

School Facilities and Organization

INFORMATION AND CONDITION OF SCHOOLS

Detailed Condition Assessment by Building

Reporting Year 2025-2026

Aberdeen

67.73

A.J. West Elementary School - 1952 Building

Building Details

PROFILE TYPE	Elementary School - Single Story
NUMBER OF FLOORS	1
CHARACTERISTICS	Occupied

Building Inventory

AREA YEAR BUILT	DISTRICT ASSIGNED AREA	GROSS BUILDING SQ FT	GROSS INSTRUCTIONAL SQ FT	SCAP RECOGNIZED SQ FT	ORIGINAL OCCUPANCY DATE	ORIGINAL BOARD ACCEPTANCE DATE
1952	1952 Building	22,630	22,630	22,630		
	Building Totals	**22,630**	**22,630**	**22,630**		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Foundations	Standard Foundation	A1010	Low	62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Deficiency: Greater than 50 years old. Reaching end of life; Industry standard for useful life: 50 years Note: Previously rated as poor. No significant deficiencies were observed during site visit. Some minor settlement in floor slab was observed, but not at structurally impactful areas and is very minor.		
Slabs on Grade	Standard Slabs on Grade	A4010		62.00% Fair
	Deficiencies:	Settlement		
	Causes:	Other		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Slabs on Grade	*Comments:*	Some very minor settlement issues were observed in classrooms at the center of slabs. This was minor and did not create other significant issues.		
Water and Gas Mitigation	Building Subdrainage	A6010		90.00% Good
Superstructure	Roof Construction	B1020		90.00% Good
Exterior Vertical Enclosures	Exterior Walls	B2010		62.00% Fair
	Deficiencies:	Cracking, Peeling, Flaking, Efflorescence and Staining, Not Seismically Compliant		
	Causes:	Excessive Heat Exposure, Loose, Cracked, Warped or Broken Boards/Panels, Moisture Intrusion, Moisture Penetration, Surface Damage		
	Comments:	Deficiency: Greater than 40 years old. Reaching end of life; Industry standard for useful life: 40 years. Fiber cement panels at main entry have failed possibly due to water ingress issues. Pitting of mortar at brick veneer was observed, also efflorescent staining at downspout areas. Fiber cement lap siding has degraded due movement and poor thermal spacing, cracking was observed at window joints. Sealant at thermal joints has exceed the service life.		
	Exterior Windows	B2020		62.00% Fair
	Deficiencies:	Deficient Hardware/Operating Parts, Excessive Heat Loss, Peeling Paint		
	Causes:	Material Condition, U-Value		
	Comments:	Deficiency: Building contains some single pane windows. Majority of windows were replaced with vinyl windows around 1994 with insulated glazing. These windows appear functional without significant deficiencies, but probably have reached their service lift. South facing vinyl windows have some warping at trims due to long-term UV exposure.		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Exterior Vertical Enclosures	Exterior Doors and Grilles	B2050		30.00% Poor
	Deficiencies:	Other, Rot or Corrosion		
	Causes:	Other		
	Comments:	Wire glazing is present in door lites. Hollow metal door finish has faded due to excessive UV exposure. Some oxidation/rust due to exposure to marine air with faded paint.		
	Exterior Louvers and Vents	B2070		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Some existing original vents still contain expanded wire mesh that is rusted and corroded. Louvers replaced in the mid-90's are in good serviceable condition.		
Exterior Horizontal Enclosures	Roofing	B3010		90.00% Good
	Roof Appurtenances	B3020		62.00% Fair
	Deficiencies:	Gutters/Downspouts Not Draining, Other		
	Causes:	Cracks, Tears, Holes, and Breaks, Surface Weathering		
	Comments:	Condition commensurate with advanced age. Downspouts show signs of ongoing leaking issues, efflorescent staining on the brick veneer around the downspouts. Also some mortar degradation around brick that looks like it is advancing due to ongoing water issues.		
	Horizontal Openings	B3060		90.00% Good
	Overhead Exterior Enclosures	B3080		90.00% Good
Interior Construction	Interior Partitions	C1010		90.00% Good
	Interior Windows	C1020		90.00% Good
	Interior Doors	C1030		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Interior Construction	*Comments:*	These doors appear to be 25-30 years old. Wire glazing is present in the glazing at some doors.		
	Interior Grilles and Gates	C1040		90.00% Good
	Suspended Ceiling Construction	C1070		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Ceiling construction is aged and dates to update in the mid-90's.		
Interior Finishes	Wall Finishes	C2010		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Wall finishes are aged and date back to mid-90's modernization. Some dirty locations and locations where some wear and tear was present from repeated use of tape and wall mounted items.		
	Interior Fabrications	C2020		90.00% Good
	Flooring	C2030		30.00% Poor
	Deficiencies:	Stains, Discoloration		
	Causes:	Moisture		
	Comments:	Carpet has exceeded its life span. Carpet was dull and loft has compressed. Some staining was present. Some portions of resilient flooring (VCT/Sheet vinyl) have stains and have collected dirt in the seams over time.		
	Ceiling Finishes	C2050		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Ceiling finishes have exceeded industry standard of 30 years for useful life. ACT tile in classrooms was dirty and some minor staining. Glue-on tile in corridors was stained in some locations.		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Plumbing	Domestic Water Distribution	D2010		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Deficiency: Supply piping and some fixtures have exceeded industry standard of 50 years foruseful life. Water heater is 20 years old and drinking fountains are new in 2016.		
	Sanitary Drainage	D2020		30.00% Poor
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Deficiency: Exceeded industry standard of 50 years for useful life.		
	Building Support Plumbing Systems	D2030		90.00% Good
HVAC	Heating Systems	D3020		90.00% Good
	Facility HVAC Distribution Systems	D3050		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Fan coil units are nearing the end of service life.		
	Ventilation	D3060		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Fan coil units nearing the end of their service life.		
Fire Protection	Fire Suppression	D4010		90.00% Good
	Fire Protection Specialties	D4030		90.00% Good
Electrical	Electrical Services and Distribution	D5020		62.00% Fair
	Deficiencies:	Other		
	Causes:	Equipment Obsolescence		
	Comments:	Equipment has reached the end of its typical lifespan (30 years).		
	General Purpose Electrical Power	D5030		62.00% Fair
	Deficiencies:	Other		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Electrical	*Causes:*	Equipment Obsolescence		
	Comments:	Equipment has reached the end of its typical lifespan (30 years).		
	Lighting	D5040		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other, T-12 Fluorescent Fixtures		
	Comments:	Deficiency: Not all fixtures and controls updated for energy efficiency.		
Communications	Data Communications	D6010		62.00% Fair
	Deficiencies:	Other		
	Causes:	Equipment Obsolescence		
	Comments:	Existing data standard is Cat-5. Current standard is Cat-6 or better.		
	Voice Communications	D6020		62.00% Fair
	Deficiencies:	Other		
	Causes:	Equipment Obsolescence		
	Comments:	Existing data standard is Cat-5. Current standard is Cat-6 or better.		
	Audio-Video Communications	D6030		90.00% Good
	Distributed Communications and Monitoring	D6060		62.00% Fair
	Deficiencies:	Other		
	Causes:	Equipment Obsolescence		
	Comments:	Deficiency: Industry standard for usefule life is 30years; system is greater than 20 years old.		
Electronic Safety and Security	Access Control and Intrusion Detection	D7010		90.00% Good
	Electronic Surveillance	D7030		62.00% Fair
	Deficiencies:	Blind Zones , Other		
	Causes:	Insufficient Equipment, Other		
	Comments:	Deficiency: System functional; reliable but of marginal capacity		
	Detection and Alarm	D7050		90.00% Good
	Comments:			
Integrated Automation	Integrated Automation Facility Controls	D8010		62.00% Fair

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Integrated Automation	*Deficiencies:*	Other		
	Causes:	Other		
	Comments:	Controls are are nearing the end of their service life.		
Equipment	Commercial Equipment	E1030		90.00% Good
	Institutional Equipment	E1040		90.00% Good
	Entertainment and Recreational Equipment	E1070		90.00% Good
	Comments:	Deficiency: Custodian noted that he thought that there might be an issue with the scoreboard in the Gym.		
	Other Equipment	E1090		90.00% Good
Furnishings	Fixed Furnishings	E2010		30.00% Poor
	Deficiencies:	Other, Unsightly		
	Causes:	Deterioration		
	Comments:	Classroom casework looks to be original from the 1950s construction. Hardware was mismatched and PLAM surfaces appear to have delaminated.		
	Movable Furnishings	E2050		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Student furnishings were new, but teacher and staff furnishings were aged and past service life.		

A.J. West Elementary School - Annex Building

Building Details

PROFILE TYPE	Elementary School - Single Story
NUMBER OF FLOORS	1
CHARACTERISTICS	Occupied

Building Inventory

AREA YEAR BUILT	DISTRICT ASSIGNED AREA	GROSS BUILDING SQ FT	GROSS INSTRUCTIONAL SQ FT	SCAP RECOGNIZED SQ FT	ORIGINAL OCCUPANCY DATE	ORIGINAL BOARD ACCEPTANCE DATE
1966	Annex Building	16,400	16,400	16,400		
	Building Totals	**16,400**	**16,400**	**16,400**		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Foundations	Standard Foundation	A1010		90.00% Good
Slabs on Grade	Standard Slabs on Grade	A4010		90.00% Good
Water and Gas Mitigation	Building Subdrainage	A6010		90.00% Good
Superstructure	Roof Construction	B1020		90.00% Good
Exterior Vertical Enclosures	Exterior Walls	B2010		62.00% Fair
	Deficiencies:	Cracking, Peeling, Flaking		
	Causes:	Surface Damage		
	Comments:	Component is nearing the end of useful life Staining at brick veneer, evidence of long term water leaks at downspouts and gutters.		
	Exterior Windows	B2020		30.00% Poor

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Exterior Vertical Enclosures	*Deficiencies:*	Excessive Heat Loss		
	Causes:	Material Condition, U-Value		
	Comments:	Some original windows reaching end of useful life. Aluminum window frame finish has faded at southern exposure. Sealant trims have warped at the southern exposures. Some IGU units have failed and have permanent water vapor staining inside the IGU.		
	Exterior Doors and Grilles	B2050		62.00% Fair
	Deficiencies:	Rot or Corrosion		
	Causes:	Material Condition, Other		
	Comments:	Finish has faded. Where paint finish has degraded the metal has begun to corrode and rust due to the nearby marine environment.		
	Exterior Louvers and Vents	B2070		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Some louvers at the play yard side appear to have been "kicked" by students.		
Exterior Horizontal Enclosures	Roofing	B3010		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Asphalt shingles appear to be from the 1994 modernization and may have exceeded their service life.		
	Roof Appurtenances	B3020		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other, Surface Weathering		
	Comments:	Component is nearing the end of useful life Downspouts and gutters appear to have leaks at joint locations and are distributing water onto the building facade.		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Exterior Horizontal Enclosures	Horizontal Openings	B3060		90.00% Good
	Overhead Exterior Enclosures	B3080		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Component is nearing the end of useful life Some staining due to ongoing gutter leaks.		
Interior Construction	Interior Partitions	C1010		90.00% Good
	Interior Windows	C1020		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Wire glazing is present.		
	Interior Doors	C1030		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Doors are in good condition but their is wire glazing present in some glazing lites.		
	Interior Grilles and Gates	C1040		90.00% Good
	Suspended Ceiling Construction	C1070		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	No deficiencies were observed. Only downgraded due to the age of the assembly.		
Interior Finishes	Wall Finishes	C2010		62.00% Fair
	Deficiencies:	Surface Appearance		
	Causes:	Other		
	Comments:	Minor scuffs, dings, and dents present from typical wear and tear from using wall mounted items.		
	Interior Fabrications	C2020		90.00% Good
	Flooring	C2030		62.00% Fair
	Deficiencies:	Stains, Discoloration		
	Causes:	Deterioration		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Interior Finishes	*Comments:*	Classroom carpet has exceeded its service life. Carpet is worn and has some minor staining.		
	Ceiling Finishes	C2050		62.00% Fair
	Deficiencies:	Surface Appearance		
	Causes:	Surface Damage		
	Comments:	Ceiling finishes have exceeded industry standard of 30 years for useful life. Some minor staining is present in sporadic locations, consistent with the age of the assembly.		
Plumbing	Domestic Water Distribution	D2010		30.00% Poor
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Deficiency: Component has exceeded useful life		
	Sanitary Drainage	D2020		30.00% Poor
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Deficiency: Component has exceeded useful life		
	Building Support Plumbing Systems	D2030		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Deficiency: Some components has exceeded industry standard useful life expectancy.		
HVAC	Facility Fuel Systems	D3010		90.00% Good
	Heating Systems	D3020		90.00% Good
	Comments:			
	Facility HVAC Distribution Systems	D3050		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Unit ventilators and fan coil units nearing end of service life.		
	Ventilation	D3060		62.00% Fair

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
HVAC	*Deficiencies:*	Other		
	Causes:	Other		
	Comments:	Unit ventilators and fan coil units nearing end of service life.		
Fire Protection	Fire Suppression	D4010		90.00% Good
	Fire Protection Specialties	D4030		90.00% Good
Electrical	Electrical Services and Distribution	D5020		30.00% Poor
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Deficiency: Components have exceeded industry standard useful life expectancy.		
	General Purpose Electrical Power	D5030		62.00% Fair
	Deficiencies:	Other		
	Causes:	Equipment Obsolescence		
	Comments:	Devices have reached the end of their typical lifespan (30 years).		
	Lighting	D5040		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other, T-12 Fluorescent Fixtures		
	Comments:	Fixtures and controls are not energy efficient. Occupancy sensors were noted in some areas. No daylight sensors or dimming was observed.		
Communications	Data Communications	D6010		62.00% Fair
	Deficiencies:	Other		
	Causes:	Equipment Obsolescence		
	Comments:	Existing data standard is Cat-5. Current standard is Cat-6 or better.		
	Voice Communications	D6020		62.00% Fair
	Deficiencies:	Other		
	Causes:	Equipment Obsolescence		
	Comments:	Existing data standard is Cat-5. Current standard is Cat-6 or better.		
	Audio-Video Communications	D6030		90.00% Good

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Communications	Distributed Communications and Monitoring	D6060		90.00% Good
Electronic Safety and Security	Access Control and Intrusion Detection	D7010		90.00% Good
	Electronic Surveillance	D7030		62.00% Fair
	Deficiencies:	Blind Zones		
	Causes:	Insufficient Equipment		
	Comments:	Deficiency: Some blind spots		
	Detection and Alarm	D7050		90.00% Good
	Comments:			
Integrated Automation	Integrated Automation Facility Controls	D8010		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Controls are nearing the end of their service life.		
Equipment	Commercial Equipment	E1030		90.00% Good
	Institutional Equipment	E1040		90.00% Good
Furnishings	Fixed Furnishings	E2010		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Casework is old and has some minor delaminations at locations near the floor. Some locations where wall base has delaminated from the casework.		
	Movable Furnishings	E2050		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Some staff furnishings are aged and have exceeded their serviceable life.		

A.J. West Elementary School - Covered Play

Building Details

PROFILE TYPE	Covered Play
NUMBER OF FLOORS	1
CHARACTERISTICS	Occupied

Building Inventory

AREA YEAR BUILT	DISTRICT ASSIGNED AREA	GROSS BUILDING SQ FT	GROSS INSTRUCTIONAL SQ FT	SCAP RECOGNIZED SQ FT	ORIGINAL OCCUPANCY DATE	ORIGINAL BOARD ACCEPTANCE DATE
1952	1952 Covered Play	7,650	7,650	0		
	Building Totals	**7,650**	**7,650**	**0**		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Foundations	Standard Foundation	A1010		90.00% Good
Slabs on Grade	Standard Slabs on Grade	A4010		62.00% Fair
	Deficiencies:	Surface Deterioration		
	Causes:	Other		
	Comments:	Play surface is ageing with settlement visible.		
Superstructure	Roof Construction	B1020		90.00% Good
Exterior Horizontal Enclosures	Roofing	B3010		90.00% Good
	Roof Appurtenances	B3020		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Some leaking at joints and connections		
	Overhead Exterior Enclosures	B3080		90.00% Good

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Fire Protection	Fire Suppression	D4010		90.00% Good
Electrical	General Purpose Electrical Power	D5030		62.00% Fair
	Deficiencies:	Other		
	Causes:	Equipment Obsolescence		
	Comments:	Equipment has reached the end of its typical lifespan (30 years).		
	Lighting	D5040		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Deficiency: Not all fixtures and controls updated for energy efficiency.		
Communications	Distributed Communications and Monitoring	D6060		62.00% Fair
	Deficiencies:	Other		
	Causes:	Equipment Obsolescence		
	Comments:	Deficiency: Industry standard for usefule life is 30years; system is greater than 20 years old.		
Electronic Safety and Security	Electronic Surveillance	D7030		62.00% Fair
	Deficiencies:	Blind Zones , Other		
	Causes:	Equipment Obsolescence, Other		
	Comments:	Deficiency: System functional; reliable but of marginal capacity		
Equipment	Institutional Equipment	E1040		90.00% Good
	Entertainment and Recreational Equipment	E1070		62.00% Fair
	Deficiencies:	Other		
	Causes:	Equipment Obsolescence		
	Comments:	Equipment is ageing.		

COPY

ABERDEEN SCHOOL DISTRICT NO. 5

Minutes of the Meeting of the Board of Directors Held April 15, 1997

WORK STUDY

A work-study session was held from 6:00 to 7:10 p.m. Board members present were Jim Brown, Jim Mason, Rhonda Hutchings, Sandra Bielski, and Frank Moses. Karen Koschak and Ken Hoover were also present. A presentation regarding the new Commission on Student Learning Assessments was made by Julie Nidick, Rhonda Manspeaker, Bill Carter and Shawn Dickson. Also present were Jennifer Rhoden and Brian King.

CALL TO ORDER

The regular meeting was called to order at 7:10 p.m. by President Jim Brown. Members present were Sandra Bielski, Jim Mason, Rhonda Hutchings, and Frank Moses. Also present were Superintendent Karen Koschak, Assistant Superintendent Ken Hoover, Director of Personnel Anna Shanks, Business Manager Greg Young and 40 patrons and staff.

MINUTES APPROVED

On motion by Sandra Bielski, seconded by Frank Moses, the minutes of the March 26 and April 1 meetings were approved as presented.

ACCOUNTS PAYABLE APPROVED

After review by Jim Brown and Frank Moses and on a motion by Frank Moses, seconded by Rhonda Hutchings, the accounts payable was approved.

THANKS FOR TRIP

David Bruncke, science teacher at Aberdeen High School, thanked the Board for approving the trip to the outdoor school.

TECHNOLOGY CONFERENCE

Mike Williams, Technology Coordinator, reminded Board members of a Technology Conference at the ESD on Saturday, April 19. Mike announced that high school student, Brandon Kahler, was selected to participate in an on-line chat with Superintendent of Public Instruction, Terry Bergeson and in on-going technology conferences throughout the year.

COMPLIANCE

Karen Koschak, Superintendent, reported the District has been found in compliance with state regulations as a result of the

District's M808 Report filed last October.

MILLER JR. HIGH FIVE YEAR PLAN

Karen Koschak reported that there will be a celebration of the District's five year plan at Miller Jr. High School on Friday, April 18, 1997 from 7:00-8:00 p.m. Everyone is welcome to attend and the District will be asking for help to set new goals for the next five years.

CLERK OF THE WORKS POSITION ADVERTISED

Superintendent Koschak reported that the District has advertised for a Contract Manager/Clerk of the Works for the McDermoth Elementary School renovation project. This position would be responsible to monitor the project and assure compliance.

MILLER JR. HIGH S.L.I.G. ACTIVITIES

Jerry Salstrom, Principal, reported on S.L.I.G. activities at Miller Jr. High School. The staff has participated in on-going training on the new assessments. Stacy Bozich attended the CSL conference in February. Math teachers will be attending conferences in May and staff members that have not received training will be attending several workshops in May.

U. S. WEST TECHNOLOGY GRANT

Bill O'Donnell, Principal at A. J. West Elementary School (also one of the team members), reported that Kelly Stewart, Helen Cullinan, Rich Van Volkinburg, were recently awarded one of four U.S. West grants to use technology to prepare students for work settings. U.S. West will provide four laptop computers, $8,000 and one week of training for team members. Their successful proposal was to add technology to the school-to-work activities already underway at A. J. West Elementary School. A parent and community advisory board will assist to oversee implementation of the grant.

SENIOR PROJECT

Derek Cook, teacher at Aberdeen High School, reported on the progress of the Senior Project. The committee has met once and their main concern is the legal ramifications of requiring a senior project in the next year. A proposal will be presented to the Board prior to the end of the school year.

DEREK COOK COMMENDED

On behalf of the Grays Harbor Buccaneer Swim team members and parents, Jim Brown presented Derek Cook a banner recognizing their AAA District championship and the Black Hills league championship. Jim Brown commended Derek Cook on the successful season and his outstanding contribution as a coach.

PUD/CARES PILOT PROGRAM

Representatives from the PUD/CARES and Microgrid presented a pilot program for energy conservation that they have proposed for the Aberdeen School District. The Board gave their consent to continue developing the program.

APRIL ENROLLMENT

Greg Young, Business Manager, reported the April enrollment figures came in as projected.

A. J. WEST PROJECT ACCEPTED AS COMPLETE

Greg Young, Business Manager, presented letters from Lumpkin, Erickson McGovern, and Reliance stating that the Panel 15 siding issue at A. J. West Elementary School is covered by a warranty. Karen Koschak stated that the District's attorney has reviewed the documents and advised that the retainage could be released. Rhonda Hutchings made a motion to accept the A. J. West project as complete. The motion was seconded by Sandra Bielski and approved unanimously by the Board members. (See attachments.)

SPRING BREAK MAINTENANCE

Greg Young reported on the projects completed by the maintenance staff during spring break. (See attachments.)

PERSONNEL (CERTIFICATED--RESIGNATION, RETIREMENT, LEAVE OF ABSENCE, SUPPLEMENTAL CONTRACTS) (CLASSIFIED—HIRE, RESIGNATION, LEAVE OF ABSENCE, EXTRA-CURRICULAR CONTRACTS)

After a review by the Personnel Director, Anna Shanks, on a motion by Sandra Bielski, seconded by Frank Moses, the Board approved the personnel matters: accepted the resignation of Miriam Campbell, teacher, effective 3-25-97; the retirement of vocational teacher Steve Lorenz effective 6-13-97; approved a leave of absence for teacher, Mary Rightmire; and approved supplemental contracts for Mike Altman, Speech Language Pathologist; Michelle Brown, Psychologist; Scott Dunn, teacher; Joe Gretsch, Psychologist; Ramona Jones, Psychologist; Carol Krueger, Speech Language Pathologist; Cindy Mitby, Occupational Therapist; Lynda Sherry, Speech Language Pathologist; and Mary Cay Slane, teacher. Classified personnel matters approved were hiring of Ralph Curry, Occupational Therapist Intern; resignation of David Knobel, Psychologist Intern; leave of absence for Kathy Ziegler, Cook's Assistant; and approved extra-curricular contracts for Kelly Carper, Miller Jr. High School assistant track coach and Shayne Reynvaan, Aberdeen High School assistant track coach.

INDIAN ED. TRIP

On a motion by Sandra Bielski, seconded by Frank Moses, the Board approved the trip to the Indian Education Youth

Conference on May 5, 1997.

APPROVED

The next regular meeting is scheduled at the Phillips Lecture Hall on Tuesday, May 6, 1997 at 7:00 p.m.

NEXT MEETING

There being no further business the meeting was adjourned at 8:30 p.m.

ADJOURNED

James M. Brown

James Brown, President

Karen Koschak

Karen Koschak, Secretary

TCF

1.3.3 // Central Park Elementary

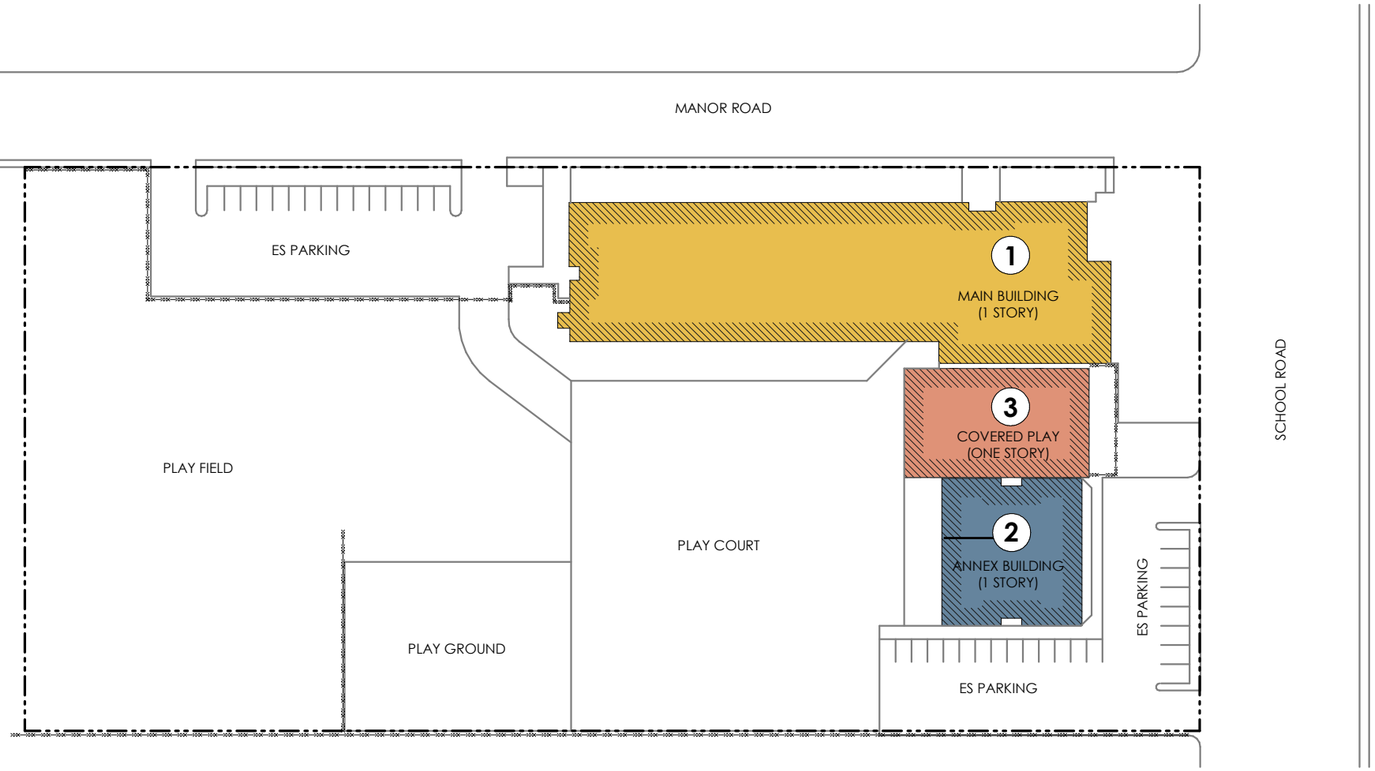
- Site Plan
- Building Plan and Area Summary
- Area Analysis
- Site & Building Condition Assessment

CENTRAL PARK ELEMENTARY SCHOOL

Gross Area & Site Plan

BUILDING NUMBER	BUILDING NAME	GROSS* SQUARE FOOT (SF) TOTALS
1	MAIN BUILDING	21446
2	ANNEX BUILDING	5895
3	COVERED PLAY 1	5704
		33045

*Gross sqft totals for recognized buildings only



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NORTH

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www.tcfarchitecture.com
P.253.572.3993

Client
ABERDEEN SCHOOL DISTRICT

Project
ASD-STUDY SURVEY

2025-008
CENTRAL PARK ES

ABERDEEN WA, US

Issue & Revision Dates
10 SEPTEMBER 2025
Not for Construction

SITE INFORMATION PER AS-BUILTS PROVIDED BY OWNER DATED 10/21/2005

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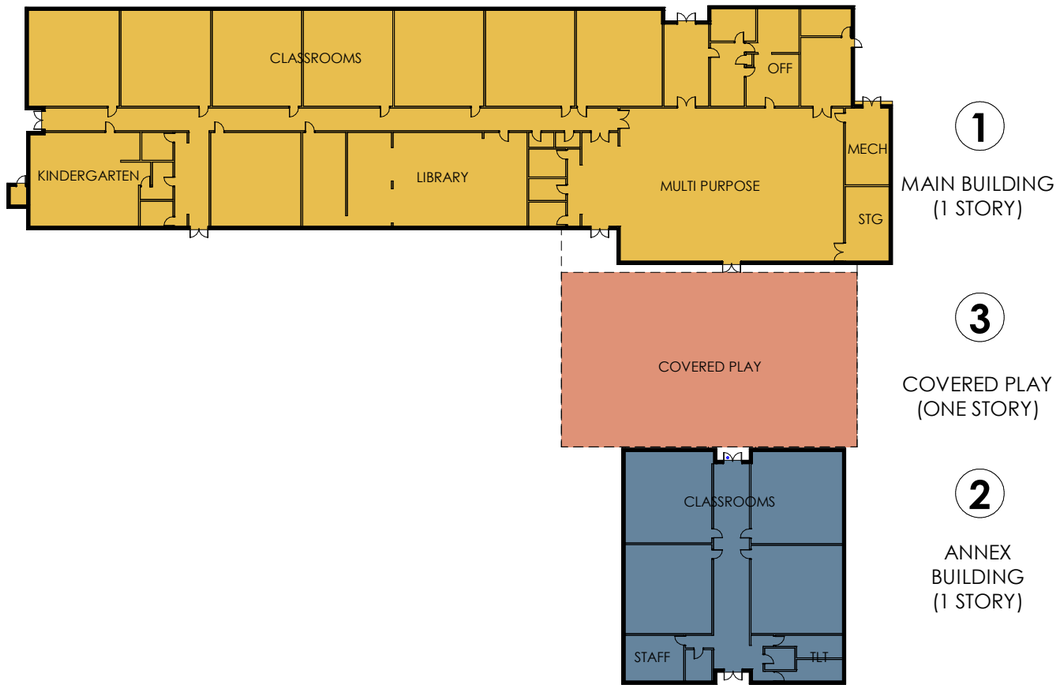
CENTRAL PARK ELEMENTARY SCHOOL

First Floor Plan

BUILDING NUMBER	BUILDING NAME	GROSS* SQUARE FOOT (SF) TOTALS
1	MAIN BUILDING	21446
2	ANNEX BUILDING	5895
3	COVERED PLAY 1	5704
		33045

*Gross sqft totals for recognized buildings only





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ABERDEEN SCHOOL DISTRICT

Project

ASD-STUDY SURVEY

2025-008

CENTRAL PARK ES

ABERDEEN WA, US

Issue & Revision Dates

10 SEPTEMBER 2025

Not for Construction

SITE INFORMATION PER AS-BUILTS PROVIDED BY OWNER DATED 10/21/2005

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Central Park Elementary School
Aberdeen School District - Area Analysis District Summary

Campus/Site	Building Name	Building Area Description (and Area Number/Letter, if applicable)	Year Built (Original Facility)	If Project Final Board Acceptance was within 30 years							Gross SF	SCAP-Recognized SF
				ALL New Construction (SCAP or locally funded)			APP (OSPI Only)	SCAP-funded Modernizations ONLY				
				If SCAP-funded or locally funded New Construction, Include SCAP Project Number if applicable (see Report 1 in ICOS)	If SCAP-funded include Final Board Acceptance Date on Resolution or If locally funded New Construction, Board discussion of completion (per Notes 1 & 2 below	Copy of Board Resolution uploaded in ICOS? (See Note 3 Below)	New or N/L SCAP Funded Construction after 1/1/1994	If SCAP funded Modernization, Include SCAP Project Number per Report 1 (found in ICOS)	If SCAP-funded Modernization, include Final Board Acceptance Date (see Report 1 in ICOS)	Copy of Board Resolution uploaded in ICOS? (See Notes 1 & 2 Below)		
Central Park Elementary School	Main Building	1	1956					15947	1/23/1995	Yes	21,446	21,446
Central Park Elementary School	Annex Building	2	1966					15947	1/23/1995	Yes	5,895	5,895
Central Park Elementary School	Covered Play	3	1956					15947	1/23/1995	Yes	5,704	2,852
										Subtotal	33,045	30,193
										District Totals	33,045	30,193

Notes

1 - The final board acceptance date is required for all SCAP-funded projects (new buildings, additions, and modernizations) completed in the last 30 years (see Report 1 in ICOS)
2 - For locally funded buildings and additions constructed in the past 30 years, the final board acceptance date must be provided. If the district does not have a final board resolution, then a copy of board meeting minutes stating completion of project is acceptable.
3 - A copy of the Final Acceptance Board Resolution for all buildings or building areas constructed or modernized, SCAP Funded or Locally, must be uploaded into ICOS.
4 - All square footage calculations must be measured to the exterior walls, exluding overhangs.
5 - Area calculations are in accordance AIA Document D-101 and WAC 392-343-019.
6 - All covered play areas and covered outdoor learning areas are calculated to the eave line, and counted at 1/2 the square footage.
7 - All building and area names, dates, and square footage figures are exactly equal to data shown on area analysis plans/diagram and data entered in ICOS.

STATE OF WASHINGTON - SUPERINTENDENT OF PUBLIC INSTRUCTION
SITE CONDITION RATING SUMMARY
ABERDEEN SCHOOL DISTRICT (14005)

CENTRAL PARK ELEMENTARY SCHOOL

Profile Name: Elementary School - Rural **Last Review:** 7/29/2025

Inventory Status: Recognized

Condition Rating: 73.95 %

Sub-Assembly	Component	Condition Rating E	G	F	P	U	N/A	Component Score	Priority L	M	H
Site Improvement											
G2020	Parking Lots	☐	☐	☑	☐	☐	☐	62 %	☐	☐	☐
G2030	Pedestrian Plazas and Walkways	☐	☐	☑	☐	☐	☐	62 %	☐	☐	☐
G2050	Athletic, Recreational and Playfields Areas	☐	☐	☑	☐	☐	☐	62 %	☐	☐	☐
G2060	Site Development	☐	☐	☑	☐	☐	☐	62 %	☐	☐	☐
G2080	Landscaping	☐	☑	☐	☐	☐	☐	90 %	☐	☐	☐
Liquid and Gas Site Utilities											
G3010	Water Utilities	☐	☑	☐	☐	☐	☐	90 %	☐	☐	☐
G3020	Sanitary Sewerage Utilities	☐	☐	☑	☐	☐	☐	62 %	☐	☐	☐
G3030	Storm Drainage Utilities	☐	☑	☐	☐	☐	☐	90 %	☐	☐	☐
Electrical Site Improvements											
G4010	Site Electric Distribution Systems	☐	☑	☐	☐	☐	☐	90 %	☐	☐	☐
G4050	Site Lighting	☐	☐	☑	☐	☐	☐	62 %	☐	☐	☐
Site Communications											
G5010	Site Communications Systems	☐	☑	☐	☐	☐	☐	90 %	☐	☐	☐

Central Park Elementary School - Annex Building

Building Details

PROFILE TYPE	Elementary School - Single Story
NUMBER OF FLOORS	1
CHARACTERISTICS	Occupied

Building Inventory

AREA YEAR BUILT	DISTRICT ASSIGNED AREA	GROSS BUILDING SQ FT	GROSS INSTRUCTIONAL SQ FT	SCAP RECOGNIZED SQ FT	ORIGINAL OCCUPANCY DATE	ORIGINAL BOARD ACCEPTANCE DATE
1966	Annex Building	5,895	5,895	5,895		
	Building Totals	**5,895**	**5,895**	**5,895**		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Foundations	Standard Foundation	A1010		90.00% Good
Slabs on Grade	Standard Slabs on Grade	A4010		90.00% Good
Water and Gas Mitigation	Building Subdrainage	A6010		90.00% Good
Superstructure	Roof Construction	B1020		90.00% Good
Exterior Vertical Enclosures	Exterior Walls	B2010		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Brick veneer appears to be wethered and chipped at wall corners. Some mildew staining and damage from previous graffitti attempts is present.		
	Exterior Windows	B2020		30.00% Poor
	Deficiencies:	Excessive Heat Loss, Other		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Exterior Vertical Enclosures	*Causes:*	Other, U-Value		
	Comments:	IGU's have failed at a few sealant locations triggering moisture staining on the interior of the glazing unit. Aluminum frames have aged and may also have some issues due to ageing connections and sealant joints. Broken window present.		
	Exterior Doors and Grilles	B2050		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	rating commensurate with age		
	Exterior Louvers and Vents	B2070		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Paint finish has begun to degrade and the louvers are beginning to show their age. What appears to be a dryer vent is blocked by extruded wire covering making it difficult to clean easily.		
Exterior Horizontal Enclosures	Roofing	B3010		90.00% Good
	Roof Appurtenances	B3020		30.00% Poor
	Deficiencies:	Other		
	Causes:	Other, Surface Weathering		
	Comments:	Gutters are corroded due to marine environmend. Downspouts daylight to adjacent storm catch basins. This configuration will wear paving prematurely. Downspout on the west side daylights into a grassy area without a drain nearby.		
	Overhead Exterior Enclosures	B3080		90.00% Good
Interior Construction	Interior Partitions	C1010		90.00% Good
	Interior Windows	C1020		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Interior Construction	*Comments:*	Deficiency: Wired glazing used. Would not be allowed by todays code.		
	Interior Doors	C1030		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Wired glazing used. Would not be allowed by todays code. Some interior doors that were retrofitted are not using heavy duty hardware.		
	Interior Grilles and Gates	C1040		90.00% Good
	Suspended Ceiling Construction	C1070		90.00% Good
Interior Finishes	Wall Finishes	C2010		90.00% Good
	Flooring	C2030		90.00% Good
	Ceiling Finishes	C2050		90.00% Good
Plumbing	Domestic Water Distribution	D2010		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Deficiency: Fixtures dated. Don't meet ADA requirements. Probably not low-flow fixtures.		
	Sanitary Drainage	D2020		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Aged system. Maintenance staff noted previous issues.		
	Building Support Plumbing Systems	D2030		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Support systems were aged and support systems lacked seismic connections.		
HVAC	Facility Fuel Systems	D3010		90.00% Good
	Heating Systems	D3020		90.00% Good

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
HVAC	*Comments:*	Deficiency: Individual packaged units at classrooms are a little noisy.		
	Facility HVAC Distribution Systems	D3050		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Unit ventilators nearing the end of service life.		
	Ventilation	D3060		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Unit ventilators nearing the end of service life.		
Fire Protection	Fire Suppression	D4010		90.00% Good
	Fire Protection Specialties	D4030		90.00% Good
Electrical	Electrical Services and Distribution	D5020		62.00% Fair
	Deficiencies:	Other		
	Causes:	Equipment Obsolescence		
	Comments:	Equipment is reaching typical end of life (~30 years).		
	General Purpose Electrical Power	D5030		90.00% Good
	Lighting	D5040		62.00% Fair
	Deficiencies:	Other, Uneven or Low light Levels		
	Causes:	Bad Ballasts, Emergency Lighting Not Working, T-12 Fluorescent Fixtures		
	Comments:	Emergency exit signs are dim or not lit. Lighting is not energy efficient, low light levels in certain areas, and lighting controls are not compliant with current codes. Ballasts in areas were noted to be non-functional.		
Communications	Data Communications	D6010		62.00% Fair
	Deficiencies:	Other		
	Causes:	Equipment Obsolescence		
	Comments:	Existing data standards are Cat-5. Current data standards are Cat-6 or better.		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Communications	Voice Communications	D6020		62.00% Fair
	Deficiencies:	Other		
	Causes:	Equipment Obsolescence		
	Comments:	Existing data standards are Cat-5. Current data standards are Cat-6 or better.		
	Audio-Video Communications	D6030		62.00% Fair
	Deficiencies:	Other		
	Causes:	Equipment Obsolescence, Other		
	Comments:	rating commensurate with age		
	Distributed Communications and Monitoring	D6060		90.00% Good
Electronic Safety and Security	Access Control and Intrusion Detection	D7010		90.00% Good
	Electronic Surveillance	D7030		90.00% Good
	Detection and Alarm	D7050		30.00% Poor
	Deficiencies:	Devices Not Working		
	Causes:	Equipment Obsolescence, Other		
	Comments:	Motion detectors did not appear to be functioning properly. Intercom system is non-functional.		
Integrated Automation	Integrated Automation Facility Controls	D8010		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Controls nearing the end of service life.		
Equipment	Commercial Equipment	E1030		90.00% Good
	Institutional Equipment	E1040		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	What appears to be a SPED room has an assembled composting toilet with plywood partition. This option is only functional for a short term and will require ongoing maintenance.		
	Entertainment and Recreational Equipment	E1070		90.00% Good

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Equipment	Other Equipment	E1090		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	No dumpster enclosure. Dumpsters are not secured from access by others.		
Furnishings	Fixed Furnishings	E2010		90.00% Good
	Movable Furnishings	E2050		90.00% Good

Central Park Elementary School - Covered Play 1

Building Details

PROFILE TYPE	Covered Play
NUMBER OF FLOORS	1
CHARACTERISTICS	Occupied

Building Inventory

AREA YEAR BUILT	DISTRICT ASSIGNED AREA	GROSS BUILDING SQ FT	GROSS INSTRUCTIONAL SQ FT	SCAP RECOGNIZED SQ FT	ORIGINAL OCCUPANCY DATE	ORIGINAL BOARD ACCEPTANCE DATE
1956	Covered Play 1	5,704	5,704	2,852		
	Building Totals	**5,704**	**5,704**	**2,852**		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Foundations	Standard Foundation	A1010		90.00% Good
Slabs on Grade	Standard Slabs on Grade	A4010		62.00% Fair
	Deficiencies:	Minor Cracking, Other		
	Causes:	Other		
	Comments:	Asphalt paved play is cracked in locations and uneven. Game lines are faded. Weeds are growing through cracks at some locations.		
Superstructure	Roof Construction	B1020		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Superstructure	*Comments:*	Appears to be a lack of lateral bracing consistent with current seismic standards. Beams and columns required refinishing. Surface rust corrosion forming on connection plates.		
Exterior Horizontal Enclosures	Roofing	B3010		90.00% Good
	Roof Appurtenances	B3020		90.00% Good
	Overhead Exterior Enclosures	B3080		90.00% Good
Interior Finishes	Ceiling Finishes	C2050		62.00% Fair
	Deficiencies:	Other, Surface Appearance		
	Causes:	Other		
	Comments:	Surface is stained and will need to be refinished.		
Fire Protection	Fire Suppression	D4010		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	some corrosion on exterior of pipes Pipes require being refinished to prevent ongoing corrosion.		
Electrical	Lighting	D5040		30.00% Poor
	Deficiencies:	Other, Uneven or Low light Levels		
	Causes:	T-12 Fluorescent Fixtures		
	Comments:	Inadequate lighting is present. Lights are using older style fluorescent fixtures.		
Electronic Safety and Security	Electronic Surveillance	D7030		90.00% Good

Central Park Elementary School - Main Building

Building Details

PROFILE TYPE	Elementary School - Single Story
NUMBER OF FLOORS	1
CHARACTERISTICS	Occupied

Building Inventory

AREA YEAR BUILT	DISTRICT ASSIGNED AREA	GROSS BUILDING SQ FT	GROSS INSTRUCTIONAL SQ FT	SCAP RECOGNIZED SQ FT	ORIGINAL OCCUPANCY DATE	ORIGINAL BOARD ACCEPTANCE DATE
1956	Main Building	21,446	21,446	21,446		
	Building Totals	**21,446**	**21,446**	**21,446**		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Foundations	Standard Foundation	A1010		90.00% Good
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	No deficiencies were observed.		
Slabs on Grade	Standard Slabs on Grade	A4010		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Graded fair due to age. Some very minor slight settlement observed.		
Water and Gas Mitigation	Building Subdrainage	A6010		90.00% Good
Superstructure	Roof Construction	B1020		90.00% Good
Exterior Vertical Enclosures	Exterior Walls	B2010		30.00% Poor
	Deficiencies:	Other		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Exterior Vertical Enclosures	*Causes:*	Other		
	Comments:	Paint finish at concrete gym walls appears to have failed in some locations (bubbling paint) White metal composite siding has degraded along the joints and has likely exceeded its service life. Joints at the metal composite siding are wavy and may have "warped"		
	Exterior Windows	B2020		30.00% Poor
	Deficiencies:	Excessive Heat Loss, Other		
	Causes:	Other, U-Value		
	Comments:	Windows have exceeded their service life. Most glazing units have failed at the sealant joint and are collecting moisture inside the pane.		
	Exterior Doors and Grilles	B2050		62.00% Fair
	Deficiencies:	Rot or Corrosion		
	Causes:	Other		
	Comments:	West facing doors show signs of corrosion due to salt and marine air.		
	Exterior Louvers and Vents	B2070		90.00% Good
Exterior Horizontal Enclosures	Roofing	B3010		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other, Surface Weathering		
	Comments:	Roofing term bar is exposed without drip flashing at fascia. The fascias made of wood. A lack of drip flashing on the rake ends of the roof is accelerating the wear on the painted wood fascias.		
	Roof Appurtenances	B3020		62.00% Fair
	Deficiencies:	Leaking		
	Causes:	Other, Surface Weathering		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Exterior Horizontal Enclosures	*Comments:*	Gutters are corroded and have small rust holes starting up. There was evidence of leaking at the joints. Prefinished gutters were not treated when they were cut in a marine environment so joints have become corroded due to salt air.		
	Overhead Exterior Enclosures	B3080		90.00% Good
Interior Construction	Interior Partitions	C1010		90.00% Good
	Interior Windows	C1020		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Wired glazing present.		
	Interior Doors	C1030		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Wired glazing is present. Some paint scratching at astragal and lower frames from typical wear and tear.		
	Suspended Ceiling Construction	C1070		90.00% Good
Interior Finishes	Wall Finishes	C2010		90.00% Good
	Flooring	C2030		90.00% Good
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Carpet and resilient flooring at the corridors and classrooms appears to have been replaced recently since the last BCA survey. New resilient flooring at the kitchne.		
	Ceiling Finishes	C2050		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Some water staining to the underside of acoustical ceiling tiles. Tectum paneling at Gym is dirty with long term staining.		
Plumbing	Domestic Water Distribution	D2010		62.00% Fair

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Plumbing	*Deficiencies:*	Other		
	Causes:	Other		
	Comments:	Deficiency: Fixtures are dated and are not low-flow. Fixtures don't meet ADA requirements.		
	Sanitary Drainage	D2020		62.00% Fair
	Deficiencies:	Sewer Gas Odors		
	Causes:	Other		
	Comments:	Cause not observed.		
	Building Support Plumbing Systems	D2030		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Graded fair due to age of systems.		
HVAC	Facility Fuel Systems	D3010		90.00% Good
	Heating Systems	D3020		90.00% Good
	Cooling Systems	D3030		90.00% Good
	Facility HVAC Distribution Systems	D3050		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Unit ventilators nearing the end of service life. Custodian said they sometimes leak.		
	Ventilation	D3060		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Unit ventilators nearing the end of using life. Gym unit VFD has failed, unit runs at full speed.		
Fire Protection	Fire Suppression	D4010		90.00% Good
	Fire Protection Specialties	D4030		90.00% Good
Electrical	Electrical Services and Distribution	D5020		62.00% Fair
	Deficiencies:	Other		
	Causes:	Equipment Obsolescence		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Electrical	*Comments:*	Equipment is reaching typical end of life (~30 years).		
	General Purpose Electrical Power	D5030		90.00% Good
	Lighting	D5040		62.00% Fair
	Deficiencies:	Other, Uneven or Low light Levels		
	Causes:	Bad Ballasts, Emergency Lighting Not Working, T-12 Fluorescent Fixtures		
	Comments:	Emergency exit signs are dim or not lit. Lighting is not energy efficient, low light levels in certain areas, and lighting controls are not compliant with current codes. Ballasts in areas were noted to be non-functional.		
Communications	Data Communications	D6010		62.00% Fair
	Deficiencies:	Other		
	Causes:	Equipment Obsolescence		
	Comments:	Existing data standards are Cat-5. Current data standards are Cat-6 or better.		
	Voice Communications	D6020		62.00% Fair
	Deficiencies:	Other		
	Causes:	Equipment Obsolescence		
	Comments:	Existing data standards are Cat-5. Current data standards are Cat-6 or better.		
	Audio-Video Communications	D6030		90.00% Good
	Distributed Communications and Monitoring	D6060		90.00% Good
Electronic Safety and Security	Detection and Alarm	D7050		30.00% Poor
	Deficiencies:	Other		
	Causes:	Equipment Obsolescence		
	Comments:	Fire alarm equipment is near the end of life (30 years). Motion detectors did not appear to be functional. Intercom system is non-functional.		
Integrated Automation	Integrated Automation Facility Controls	D8010		62.00% Fair
	Deficiencies:	Other		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Integrated Automation	*Causes:*	Other		
	Comments:	Controls nearing the end of service life.		
Equipment	Institutional Equipment	E1040		90.00% Good
	Other Equipment	E1090		62.00% Fair
	Deficiencies:	Faulty Materials		
	Causes:	Deterioration		
	Comments:	No trash enclosure present.		
Furnishings	Fixed Furnishings	E2010		90.00% Good
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Existing PLAM finished casework is aged but functional.		
	Movable Furnishings	E2050		90.00% Good

ABERDEEN SCHOOL DISTRICT NO. 5
ABERDEEN, WASHINGTON

Minutes of the Regular Meeting of the
Board of Directors Held January 23, 1995

EXECUTIVE SESSION

The regular meeting of the board was called to order by President Jane Goldberg at 7:36 p.m. Members present were Sandra Bielski, Jim Brown, Peter Czerniski, and Jim Mason along with Superintendent Karen Koschak. Also present were Executive Director of Business and Operations Keith Bigelow, Director of Personnel Lee Rhoden, Daily World reporter Stefano Esposito and eighteen patrons and staff.

MINUTES APPROVED

On motion by Peter Czerniski, seconded by James Brown, the minutes of the meeting held on January 9, 1995 were approved as presented.

ACCOUNTS PAYABLE

On motion by Sandra Bielski, seconded by Jim Mason, the board approved the payroll for the month of December in the amount of $1,185,621.69 to be paid by warrants numbered 50962 through 51280; the accounts payable from the General Fund in the amount of $150,157.20 to be paid by warrant numbered 01420, $206,072.40 to be paid by warrants numbered 01421 through 01423; from the General Fund in the amount of $362,827.23 to be paid by warrants numbered 01424 through 01774; from the Capital Projects Fund in the amount of $1,347.54 to be paid by warrants numbered 0077 through 0080; from the ASB Fund in the amount of $26,395.05 to be paid by warrants numbered 6128 through 6184; and from the Transportation Vehicle Fund in the amount of $127,420.77 to be paid by warrants numbered 0002 through 0003.

COMMENTS FROM AUDIENCE

Jeff Carlovsky, high school principal, informed board members that the high school was studying the possibility of an off-campus racquet ball class at the YMCA in conjunction with p.e. classes.

CENTRAL PARK MODERNIZATION PROJECT ACCEPTED

Keith Bigelow informed the board that a final inspection of the Central Park modernization project had been completed. The architects were recommending acceptance of the project. Bill Johnson, an architect from Erickson McGovern, explained that there were a few items to be completed, but was confident they were not major issues and would be resolved to the satisfaction of the district. On motion by Peter Czerniski, seconded by Sandra Bielski, the board accepted the project as substantially complete.

AHS BAND TRIP

Aberdeen High School band director Scott Pierson gave a report of the progress of fund raisers for the band's trip to San Francisco which is planned for May. A proclamation from Governor Lowry has been received designating the Aberdeen Gold Band as the official representative of Washington. Sixty-three students are expected to make the trip.

SCHOOL BOARD MEMBERS RECOGNIZED

Superintendent Koschak presented certificates to board members in recognition of School Board Appreciation Month. Members also received letters of appreciation from staff at Alexander Young and Central Park Elementary schools.

PUBLIC DISCLOSURE FORMS

Board members were reminded to file Public Disclosure Statements by April 15.

LETTERS OF APPRECIATION

Robert Gray Principal Lenda Emerson presented letters of appreciation from students to board members, recognizing them for their work on behalf of students in Aberdeen.

ROBERT GRAY SLIG REPORT

Lenda Emerson introduced Sue Keltner and Bill Davis who represented the Student Learning Improvement Grant teams at Robert Gray. Sue Keltner discussed the teaming concept implemented this year and Bill Davis explained what is being done to enhance the volunteer program.

MCDERMOTH SLIG REPORT

McDermoth Principal Jim Sawin summarized the Student Learning Improvement Grant Activities which center around math manipulatives; improved written communication skills through use of writing; the study of multiple intelligences; and ongoing technology training. All staff members have participated in one or more of the activities.

PERSONNEL MATTERS
CO-CURRICULAR
ADDENDUM
RESIGNATION
HIRING
SUBSTITUTES

After a review by Lee Rhoden, on motion by Peter Czerniski, seconded by Sandra Bielski, the board approved the personnel matters: approved co-curricular contracts; approved an addendum to the Transition Agreement for Sonja Martin; accepted the resignation of Shirley Redifer effective January 31; hired Trina M. Benson as a Russian interpreter on an on-call basis; and hired certificated substitutes Keturah Thayer and Rebekah Randich, and classified substitute Gary Morgan.

GIFT TO DISTRICT

On motion by Jim Mason, seconded by Jim Brown, the board accepted a donation of $600 from the 1944 Graduating Class to purchase World War II related materials for the high school library.

President Goldberg reminded board members the next meeting will be February 6. By general consent the board will hold a work study session at 7:00 p.m. prior to the meeting for policy review.	NEXT MEETING
At 8:30 p.m. President Goldberg recessed the meeting and called an executive session to discuss a personnel issue.	RECESS FOR EXECUTIVE SESSION
At 10:15 p.m. the regular meeting reconvened. There being no further business the meeting adjourned.	ADJOURN

Jane Goldberg, President

Karen Koschak, Secretary

TCF

1.3.4 // McDermoth Elementary

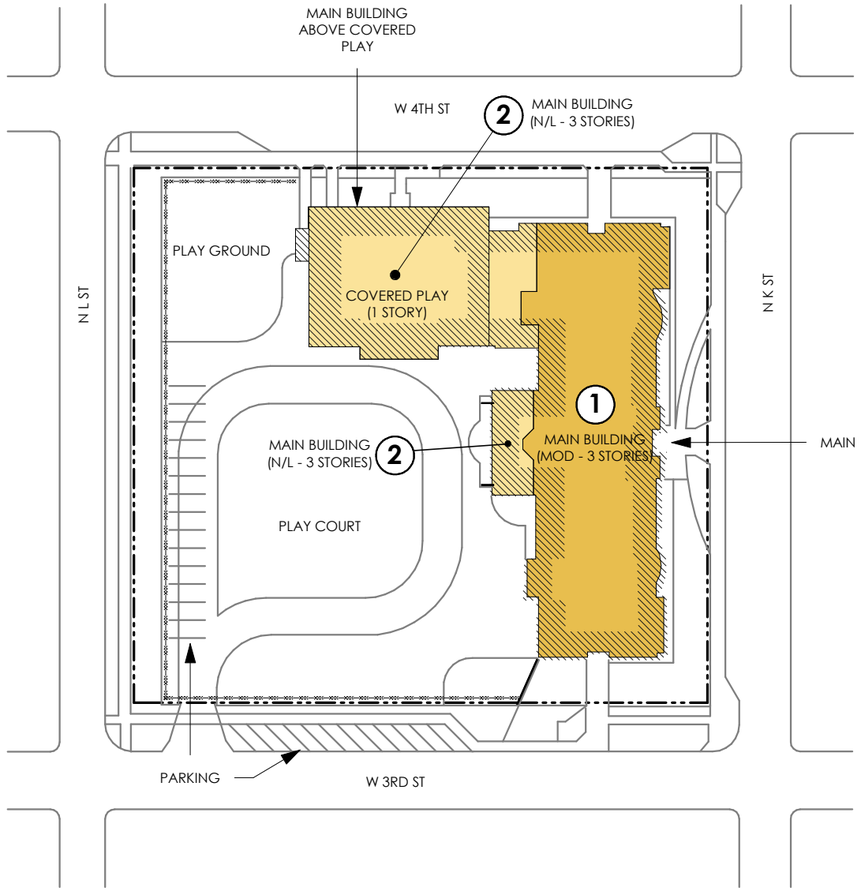
- Site Plan
- Building Plan and Area Summary
- Area Analysis
- Site & Building Condition Assessment

MCDERMOTH ELEMENTARY SCHOOL

Gross Area & Site Plan

BUILDING NUMBER	BUILDING NAME	GROSS* SQUARE FOOT (SF) TOTALS
1	MAIN BUILDING (MOD)	40265
2	MAIN BUILDING (N/L)	14167
3	COVERED PLAY (N/L)	7435
		61867

*Gross sqft totals for recognized buildings only



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www.tcfarchitecture.com
P.253.572.3993

Client

ABERDEEN SCHOOL DISTRICT

Project

ASD-STUDY SURVEY

2025-008

MCDERMOTH ES

ABERDEEN WA, US

Issue & Revision Dates

10 SEPTEMBER 2025

Not for Construction

SITE INFORMATION PER AS-BUILTS PROVIDED BY OWNER DATED 10/21/2005

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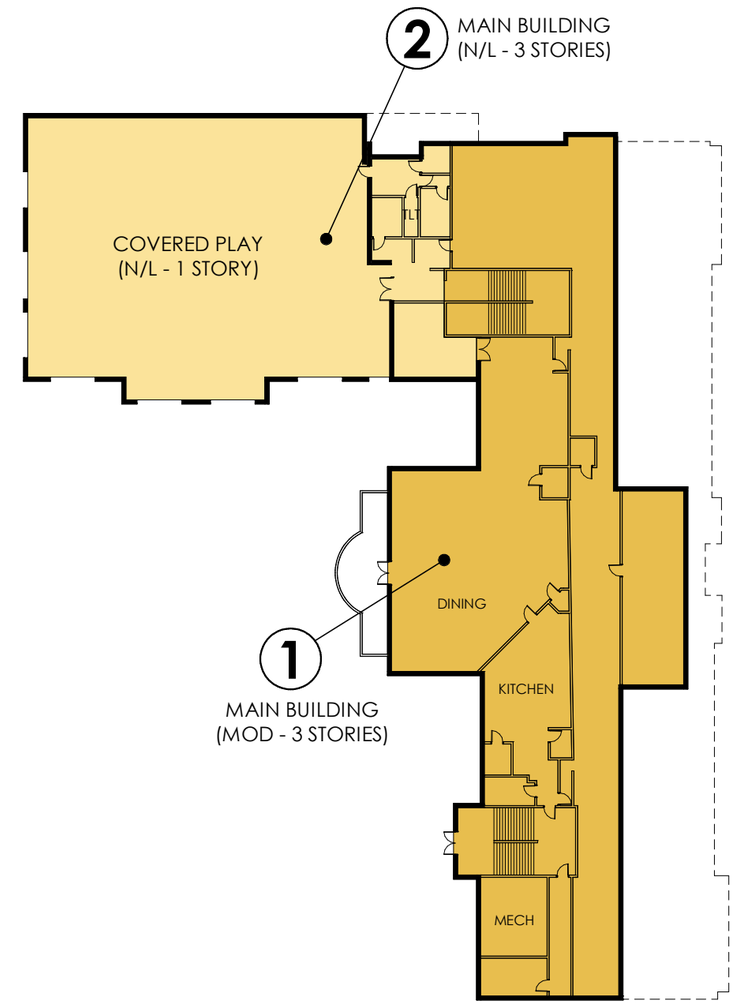
MCDERMOTH ELEMENTARY SCHOOL

Ground Floor Plan

BUILDING NUMBER	BUILDING NAME	GROSS* SQUARE FOOT (SF) TOTALS
1	MAIN BUILDING (MOD)	40265
2	MAIN BUILDING (N/L)	14167
3	COVERED PLAY (N/L)	7435
		61867

*Gross sqft totals for recognized buildings only



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ABERDEEN SCHOOL DISTRICT

Project

ASD-STUDY SURVEY

2025-008

MCDERMOTH ES

ABERDEEN WA, US

Issue & Revision Dates

10 SEPTEMBER 2025

Not for Construction

SITE INFORMATION PER AS-BUILTS PROVIDED BY OWNER DATED 10/21/2005

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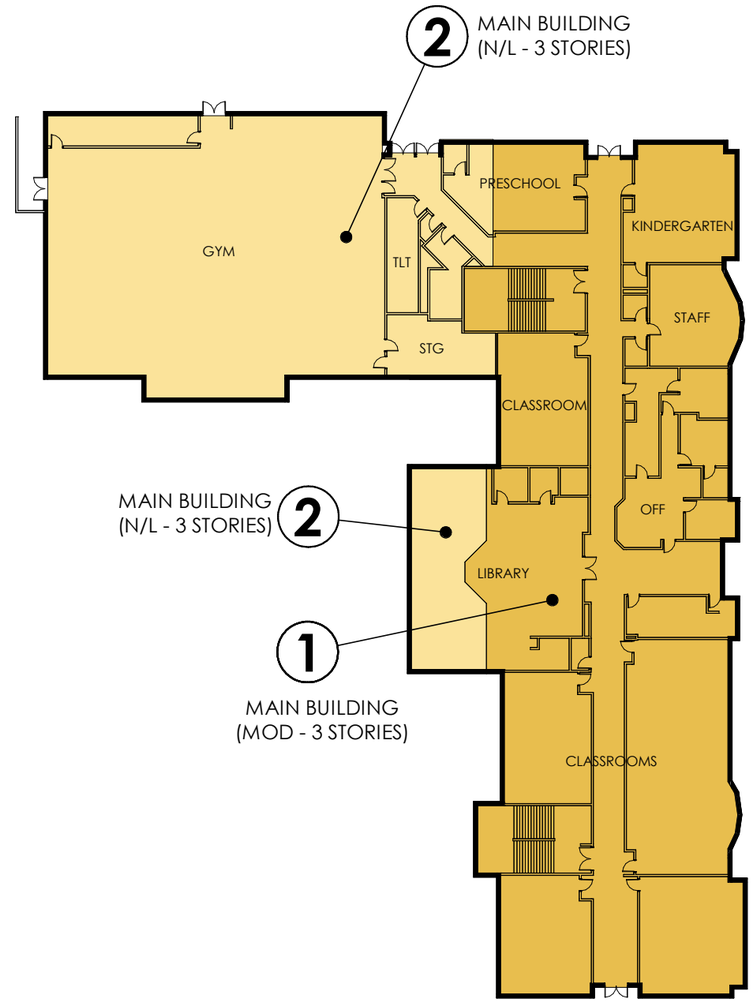
MCDERMOTH ELEMENTARY SCHOOL

First Floor Plan

BUILDING NUMBER	BUILDING NAME	GROSS* SQUARE FOOT (SF) TOTALS
1	MAIN BUILDING (MOD)	40265
2	MAIN BUILDING (N/L)	14167
3	COVERED PLAY (N/L)	7435
		61867

*Gross sqft totals for recognized buildings only



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2025-008

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ABERDEEN WA, US

Issue & Revision Dates

10 SEPTEMBER 2025

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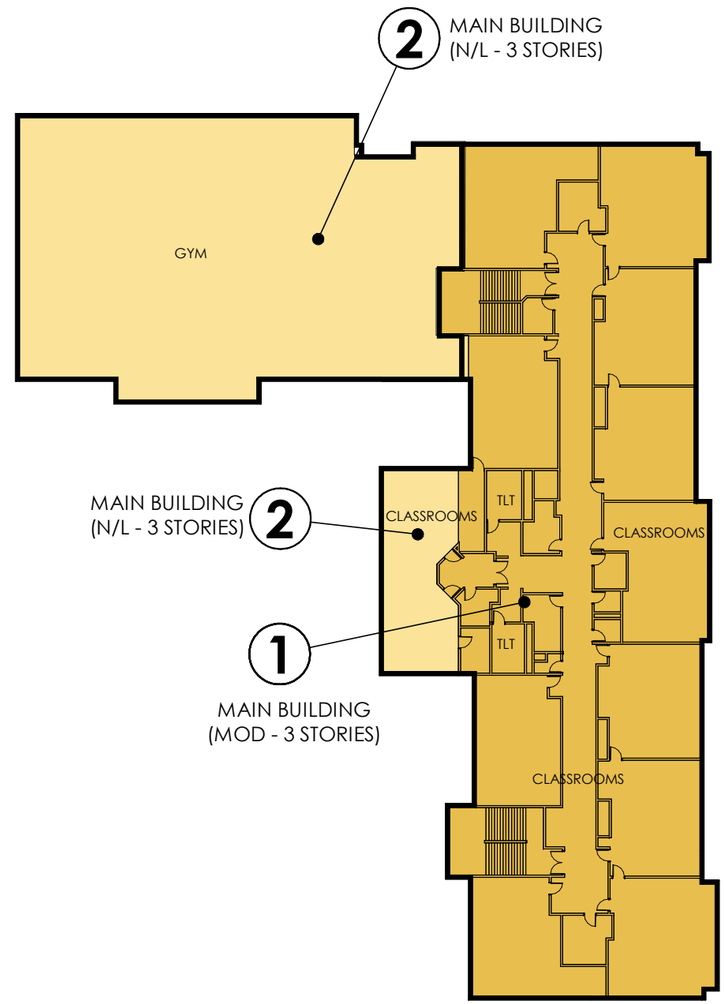
MCDERMOTH ELEMENTARY SCHOOL

Second Floor Plan

BUILDING NUMBER	BUILDING NAME	GROSS* SQUARE FOOT (SF) TOTALS
1	MAIN BUILDING (MOD)	40265
2	MAIN BUILDING (N/L)	14167
3	COVERED PLAY (N/L)	7435
		61867

*Gross sqft totals for recognized buildings only





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ABERDEEN SCHOOL DISTRICT

Project

ASD-STUDY SURVEY

2025-008

MCDERMOTH ES

ABERDEEN WA, US

Issue & Revision Dates

10 SEPTEMBER 2025

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McDermoth Elementary School
Aberdeen School District - Area Analysis District Summary

Campus/Site	Building Name	Building Area Description (and Area Number/Letter, if applicable)	Year Built (Original Facility)	If Project Final Board Acceptance was within 30 years							Gross SF	SCAP-Recognized SF
				ALL New Construction (SCAP or locally funded)			APP (OSPI Only)	SCAP-funded Modernizations ONLY				
				If SCAP-funded or locally funded New Construction, Include SCAP Project Number if applicable (see Report 1 in ICOS)	If SCAP-funded include Final Board Acceptance Date on Resolution or If locally funded New Construction, Board discussion of completion (per Notes 1 & 2 below	Copy of Board Resolution uploaded in ICOS? (See Note 3 Below)	New or N/L SCAP Funded Construction after 1/1/1994	If SCAP funded Modernization, Include SCAP Project Number per Report 1 (found in ICOS)	If SCAP-funded Modernization, include Final Board Acceptance Date (see Report 1 in ICOS)	Copy of Board Resolution uploaded in ICOS? (See Notes 1 & 2 Below)		
McDermoth Elementary School	Main Building - Modernization	1	1926					18008	10/5/1999	Yes	40,265	40,265
McDermoth Elementary School	Main Building - New in Lieu	2	1998	18008	10/5/1999	Yes					14,167	14,167
McDermoth Elementary School	Covered Play	3	1998	18008	10/5/1999	Yes					7,435	3,718
										Subtotal	61,867	58,150
										District Totals	61,867	58,150

Notes

1 - The final board acceptance date is required for all SCAP-funded projects (new buildings, additions, and modernizations) completed in the last 30 years (see Report 1 in ICOS)
2 - For locally funded buildings and additions constructed in the past 30 years, the final board acceptance date must be provided. If the district does not have a final board resolution, then a copy of board meeting minutes stating completion of project is acceptable.
3 - A copy of the Final Acceptance Board Resolution for all buildings or building areas constructed or modernized, SCAP Funded or Locally, must be uploaded into ICOS.
4 - All square footage calculations must be measured to the exterior walls, exluding overhangs.
5 - Area calculations are in accordance AIA Document D-101 and WAC 392-343-019.
6 - All covered play areas and covered outdoor learning areas are calculated to the eave line, and counted at 1/2 the square footage.
7 - All building and area names, dates, and square footage figures are exactly equal to data shown on area analysis plans/diagram and data entered in ICOS.

STATE OF WASHINGTON - SUPERINTENDENT OF PUBLIC INSTRUCTION
SITE CONDITION RATING SUMMARY
ABERDEEN SCHOOL DISTRICT (14005)

MCDERMOTH ELEMENTARY SCHOOL

Profile Name: Elementary School - Rural **Last Review:** 8/19/2025

Inventory Status: Recognized

Condition Rating: 69.59 %

Sub-Assembly	Component	Condition Rating E	G	F	P	U	N/A	Component Score	Priority L	M	H
Site Improvement											
G2010	Roadways	☐	☐	☑	☐	☐	☐	62 %	☐	☐	☐
G2020	Parking Lots	☐	☐	☑	☐	☐	☐	62 %	☐	☐	☐
G2030	Pedestrian Plazas and Walkways	☐	☐	☑	☐	☐	☐	62 %	☐	☐	☐
G2050	Athletic, Recreational and Playfields Areas	☐	☐	☑	☐	☐	☐	62 %	☐	☐	☐
G2060	Site Development	☐	☐	☑	☐	☐	☐	62 %	☐	☐	☐
G2080	Landscaping	☐	☐	☑	☐	☐	☐	62 %	☐	☐	☐
Liquid and Gas Site Utilities											
G3010	Water Utilities	☐	☑	☐	☐	☐	☐	90 %	☐	☐	☐
G3020	Sanitary Sewerage Utilities	☐	☑	☐	☐	☐	☐	90 %	☐	☐	☐
G3030	Storm Drainage Utilities	☐	☑	☐	☐	☐	☐	90 %	☐	☐	☐
Electrical Site Improvements											
G4010	Site Electric Distribution Systems	☐	☑	☐	☐	☐	☐	90 %	☐	☐	☐
G4050	Site Lighting	☐	☐	☑	☐	☐	☐	62 %	☐	☐	☐
Site Communications											
G5010	Site Communications Systems	☐	☑	☐	☐	☐	☐	90 %	☐	☐	☐

School Facilities and Organization
INFORMATION AND CONDITION OF SCHOOLS
Detailed Condition Assessment by Building
Reporting Year 2025-2026

Aberdeen
85.50

McDermoth Elementary School - Main Building

Building Details

PROFILE TYPE	Elementary School - Multi-Story
NUMBER OF FLOORS	3
CHARACTERISTICS	Occupied

Building Inventory

AREA YEAR BUILT	DISTRICT ASSIGNED AREA	GROSS BUILDING SQ FT	GROSS INSTRUCTIONAL SQ FT	SCAP RECOGNIZED SQ FT	ORIGINAL OCCUPANCY DATE	ORIGINAL BOARD ACCEPTANCE DATE
1926	upper level original	15,492	15,492	15,492		
1926	main level original	15,433	15,433	15,433		
1926	Lower level original	9,340	9,340	9,340		
1998	main level addition	10,178	10,178	10,178		9/27/1999
1998	lower covered play	7,435	7,435	3,718		9/27/1999
1998	Lower level addition	2,718	2,718	2,718		9/27/1999
1998	upper level addition	1,271	1,271	1,271		9/27/1999
	Building Totals	**61,867**	**61,867**	**58,150**		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Foundations	Standard Foundation	A1010		62.00% Fair
	Deficiencies:	Cracking		
	Causes:	Other		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Foundations	*Comments:*	Deficiency: There appears to be some cracking in the exterior concrete walls at the basement boiler room and a couple of the retaining walls at exterior stairs.		
Slabs on Grade	Standard Slabs on Grade	A4010		90.00% Good
	Pits and Bases	A4040		90.00% Good
Water and Gas Mitigation	Building Subdrainage	A6010		90.00% Good
	Comments:	Deficiency: There has been some issues with water intrusion into the building at the pipe tunnel in the original building. It has just developed over the last few years.		
Superstructure	Floor Construction	B1010		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Deficiency: Some of the wood floors are "squeaky" and have noticeable deflection when large groups of people are moving around. There has been some settlement of the new wood framing at the Cafeteria that has caused damage to the flooring.		
	Roof Construction	B1020		90.00% Good
	Stairs	B1080		90.00% Good
Exterior Vertical Enclosures	Exterior Walls	B2010		90.00% Good
	Deficiencies:	Efflorescence and Staining		
	Comments:	Deficiency: The seismic compliance of the original masonry walls is not known. There have been some water intrusion issues on the south facing walls. Exterior finishes have been removed at the Cafeteria addition and reworked. Currently is under a one-year performance review.		
	Exterior Windows	B2020		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Exterior Vertical Enclosures	*Comments:*	Deficiency: Custodian noted that the windows throughout the facility leak, particularly on the weather side of the building. He also noted that there were a number of insulated glass panes that have broken seals and are "sweating". He noted that they are being replaced over time.		
	Exterior Doors and Grilles	B2050		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	rusty steeel door jams		
	Exterior Louvers and Vents	B2070		90.00% Good
Exterior Horizontal Enclosures	Roofing	B3010		90.00% Good
	Roof Appurtenances	B3020		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Deficiency: There have been some issues with the attic vents during wind driven rain and/or snow. Allows water/moisture to be blown into vents and down onto attic floor.		
	Horizontal Openings	B3060		90.00% Good
	Overhead Exterior Enclosures	B3080		90.00% Good
Interior Construction	Interior Partitions	C1010		90.00% Good
	Interior Windows	C1020		90.00% Good
	Interior Doors	C1030		90.00% Good
	Suspended Ceiling Construction	C1070		90.00% Good
Interior Finishes	Wall Finishes	C2010		90.00% Good
	Interior Fabrications	C2020		90.00% Good
	Flooring	C2030		90.00% Good

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Interior Finishes	*Comments:*	Deficiency: There are some issues with resilient flooring between the original and new building areas. Flooring is damaged due to settlement of new wood construction. Flooring outside of the Kitchen is also cracked and needs replacement.		
	Stair Finishes	C2040		90.00% Good
	Ceiling Finishes	C2050		90.00% Good
	Comments:	Deficiency: Some damage from past leaks is still in need of repair.		
Conveying	Vertical Conveying Systems	D1010		90.00% Good
Plumbing	Domestic Water Distribution	D2010		90.00% Good
	Sanitary Drainage	D2020		90.00% Good
	Building Support Plumbing Systems	D2030		90.00% Good
HVAC	Facility Fuel Systems	D3010		90.00% Good
	Heating Systems	D3020		90.00% Good
	Cooling Systems	D3030		90.00% Good
	Facility HVAC Distribution Systems	D3050		90.00% Good
	Ventilation	D3060		90.00% Good
Fire Protection	Fire Suppression	D4010		90.00% Good
	Fire Protection Specialties	D4030		90.00% Good
Electrical	Electrical Services and Distribution	D5020		90.00% Good
	General Purpose Electrical Power	D5030		90.00% Good
	Lighting	D5040		90.00% Good
Communications	Data Communications	D6010		90.00% Good
	Voice Communications	D6020		90.00% Good
	Audio-Video Communications	D6030		90.00% Good
	Distributed Communications and Monitoring	D6060		90.00% Good
Electronic Safety and Security	Access Control and Intrusion Detection	D7010		90.00% Good

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Electronic Safety and Security	Electronic Surveillance	D7030		90.00% Good
	Detection and Alarm	D7050		90.00% Good
Integrated Automation	Integrated Automation Facility Controls	D8010		90.00% Good
Equipment	Commercial Equipment	E1030		90.00% Good
	Institutional Equipment	E1040		90.00% Good
	Entertainment and Recreational Equipment	E1070		90.00% Good
	Other Equipment	E1090		90.00% Good
Furnishings	Fixed Furnishings	E2010		90.00% Good
	Movable Furnishings	E2050		90.00% Good

ABERDEEN SCHOOL DISTRICT NO. 5

Minutes of the Meeting of the
Board of Directors Held October 5, 1999

WORK STUDY SESSION

A work-study session was held in the Phillips Lecture Hall from 6:30 to 6:55 p.m. Board members present were Sandra Bielski, Jim Brown, Rhonda Hutchings, Jim Mason, and Frank Moses.

CALL TO ORDER

President Jim Mason called the regular meeting to order at 7:02 p.m. Members present were Sandra Bielski, Jim Brown, Rhonda Hutchings, and Frank Moses. Also present were Superintendent Karen Koschak, Assistant Superintendent Ken Hoover, Administrative Assistant Grace Kite Roumell, Daily World reporter Dee Anne Shaw and approximately twenty patrons and staff.

MINUTES APPROVED

Rhonda Hutchings moved the minutes of the September 19, 1999 meeting be approved as presented. Jim Brown asked that the minutes be corrected regarding the combined swim teams. Mr. Brown stated his remarks were that "both Hoquiam and Montesano share in providing transportation to swim meets and Hoquiam make available time in their pool". Rhonda amended her motion to include the correction. The motion was seconded by Jim Brown and approved as amended.

SUPERINTENDENT REPORT

Superintendent Koschak reported enrollment is up 15 students for the month of October.

A J WEST REPORT

Principal Bill O'Donnell reported on the activities at A. J. West. West is providing an all day kindergarten program with an emphasis on reading in the morning and writing in the afternoon. Helen King and Rich VanVolkinburg had written a grant to purchase more books for the school library to meet the demands of the Accelerated Reader Program. Mr. O'Donnell then introduced Linda Gruber, Manager of Washington Mutual Savings Bank in Aberdeen. Ms Gruber presented a check for the grant in the amount of $10,000 to Mr. VanVolkinburg and Mrs. King. Mr. O'Donnnell also invited board members to visit the school-to-work activities from 11:30 to 12:00 each morning.

LEGISLATIVE REPORT

Board member Rhonda Hutchings reported on the WSSDA Legislative Conference she recently attended in Spokane. She reported that WSSDA will change the focus for their lobbying in the hopes of being more successful with the legislature on education issues.

POLICY REVISIONS

Superintendent Koschak reviewed policy revisions for the board's first reading. Included were Financial Management policies 7140 Budget: Adoption and Filing; 7310 Budget Implementation; 7330 Payroll: Authorization and Control; 7421 Monthly Financial Reports, that now includes annual reporting information previously contained in policy 7422, (policy 7422 will be deleted) and 7251 Sale of Surplus Equipment and/or Materials included a provision allowing students to purchase surplus texts. In Personnel policy 5258 Drug-Free Schools, Community and Workplace the language that pertains to use of medication by employees was simplified; and 5410 Substitute Employment now includes procedures for hiring substitute principals or administrators and reflects the change in the number of hours a retired teacher can work without adversely affecting retirement payments. Jim Brown suggested changing "shall" to "may" in several places in policy 5410.

GOVERNOR'S VISIT

Superintendent Koschak reminded board members of Governor Locke's visit to Aberdeen on October 12.

ACCOUNTABILITY GOALS

Superintendent Koschak presented for the board's first reading a new Instruction policy 2004 Accountability Goals. The policy reflects the law that requires school districts to report twice each year to parents the district's progress in meeting goals for student performance for students in the fourth and seventh grades. The policy will be presented for adoption at the next meeting.

AHS EXTENDED PERIOD DAY

High school principal Kathy Barner reported that staff were informed that they cannot fail a child without notifying the parents. She also reported that she had surveyed staff regarding their satisfaction with the extended period day. Most of the comments had been positive, but more training is needed. She is encouraging staff to participate in training. The high school staff is looking at a different manner of providing snacks during the nutrition breaks.

MCDERMOTH FINAL PAYMENT

Assistant Superintendent Ken Hoover informed board members the final payment for McDermoth Phase III project is $11,622.42.

ACCOUNTS PAYABLE

On motion by Rhonda Hutchings, seconded by Sandra Bielski, the board approved the accounts payable from the ASB Fund in the amount of $6,000 to be paid by warrant number 8872; from the Capital Projects Fund in the amount of $17,580.21 to be paid by warrants numbered 577 to 579; and from the General Fund in the amount of $4,366.25 to be paid by warrant numbered 21166.

STATE BOARD OF EDUCATION SURVEY

On motion by Jim Brown, seconded by Rhonda Hutchings, the board voted to answer "no" to both questions on a survey by the State Board of Education relating to state matching funds. Mr. Brown asked the district to send an accompanying letter stating the answer would be different if it did not further delay funds for projects.

PERSONNEL MATTERS

After a review by Superintendent Koschak, on motion by Sandra Bielski, seconded by Frank Moses, the board approved the personnel matters. The board approved supplemental contracts and contractual services agreements for certificated employees and hired substitutes Wofgang Benson, Keira Earhart, Kelly Eichhorn, Sean Ekerson, and Kristin Scroggs. The board also hired para educators Janet Thompson at Stevens school effective September 23, Sherrie Green and Sharon Rynders at the junior high effective September 27 and Sandra Heiny as food service worker at the high school effective September 24; approved extra-curricular contracts and hired substitutes Wendy Dean, C. Ray Haynes, and Chhunly Vorng.

GIFTS TO DISTRICT

Linda Gruber, from Washington Mutual, presented checks in the amount of $217.00 each to Al Kelling for Stevens school and Rick Bates for Robert Gray school. The donations were made from the Dollar-for-Education program that returns $1 to local schools for each checking account opened at Washington Mutual. On motion by Jim Brown, seconded by Sandra Bielski, the board accepted the checks for Stevens and Robert Gray schools and the $10,000 grant presented earlier to A. J. West and asked that a letter of thanks be sent congratulating Washington Mutual on their commitment to education and our community and the state.

NEXT MEETING

President Mason announced the next meeting will be at Robert Gray School on October 19. By general consent Jim Brown and Rhonda Hutchings will audit the bills.

ADJOURN

There being no further business the meeting adjourned at 8:49 p.m.

Jim Mason, President

Karen Koschak, Secretary

ANGE ORDER
CONSTRUCTION MANAGER-ADVISER EDITION

AIA Document G701/Cma

OWNER
CONSTRUCTION MANAGER
ARCHITECT
CONTRACTOR
FIELD

PROJECT: *(Name, address)*	Phase 3 McDermoth Elem. School 409 N 'K' Street Aberdeen, WA 98520	CHANGE ORDER NO.:	**TWENTY-ONE**
		INITIATION DATE:	13-Sep-99
		PROJECT NO.:	961413
TO CONTRACTOR: *(Name, address)*	Berschauer Phillips P O Box 6264 Olympia, WA 98502 Attn.: Jace Munson	CONTRACT FOR:	Phase 3 Construction
		CONTRACT DATE:	Dec. 2, 1997

The Contract is changed as follows:

The contract amount shall be reduced by $4,637.35 as compensation to the Owner for the following items as described in the attached memo from the Aberdeen School District:

1. Electrical power	**Deduct**	($2,276.37)
2. Lift rental	**Deduct**	($1,455.30)
3. 48 hours of oversee time	**Deduct**	($841.00)
4. Caulk	**Deduct**	($64.68)

Total Change Order # TWENTY-ONE DEDUCTION = **($4,637.35)**

This change order provides for all compensation arising directly or indirectly for this work including money, time and impact compensation

Not valid until signed by the Owner, Construction Manager, Architect and Contractor.

The original (Contract Sum) ~~(Guaranteed Maximum Price)~~ was	$6,231,637.00
Net change by previously authorized Change Orders	$233,824.92
The (Contract Sum) ~~(Guaranteed maximum Price)~~ prior to this Change Order was	$6,465,461.92
The (Contract Sum) ~~(Guaranteed Maximum Price)~~ will be (increased) ~~(decreased) (unchanged)~~ by this Change Order in the amount of	($4,637.35)
The new (Contract Sum) ~~(Guaranteed Maximum Price)~~ including this Change Order will be	$6,460,824.57
The Contract Time will be ~~(increased) (decreased)~~ (unchanged) by zero calendar	(0) days.
The date of Substantial Completion as of the date of this Change Order therefore is: **November 10, 1998**	

NOTE: This summary does not reflect changes in the Contract sum, or Contract Time which have been authorized by Construction Change Directive.

Olympic Associates
CONSTRUCTION MANAGER
P O Box 187 Ocean Shores, WA 98569
ADDRESS

BY DATE

The BJSS Group
ARCHITECT
724 Columbia Street NW, Suite 400 Olympia WA 9850
ADDRESS

CURTIS CLARKE 9/6/99
BY DATE

Berschauer Phillips
CONTRACTOR
P O Box 6264 Olympia, WA 98502
ADDRESS

BY DATE

Aberdeen School District
OWNER
216 North 'G' Street Aberdeen, WA 98520
ADDRESS

BY DATE

APPLICATION AND CERTIFICATE FOR PAYMENT

AIA DOCUMENT G702/CMa (Instructions on reverse side) PAGE ONE of 5 PAGES

TO OWNER:
ABERDEEN SCHOOL DISTRICT #5
216 NORTH "G" STREET
ABERDEEN, WA 98520
FROM CONTRACTOR:
BERSCHAUER PHILLIPS CONSTRUCTION CO.
P.O. BOX 11489
OLYMPIA, WA 98508-11489
CONTRACT FOR:

PROJECT:
McDERMOTH ELEM SCHOOL
MODERNIZATION

VIA ARCHITECT:
THE BJSS GROUP
724 COLUMBIA ST NW, STE 400, OLYMPIA, WA 98501
VIA CONSTRUCTION MANAGER:
OLYMPIC ASSOCIATES CO.

APPLICATION NO.: 15-REVISED
PERIOD TO: 8 31 99
PROJECT NOS.:
CONTRACT DATE:

Distribution to:
- [ ] OWNER
- [ ] ARCHITECT
- [ ] CONSTRUCTION MGR
- [ ] CONTRACTOR
- [ ]

CONTRACTOR'S APPLICATION FOR PAYMENT

Application is made for payment, as shown below, in connection with the Contract.
Continuation Sheet, AIA Document G703, is attached.

1 ORIGINAL CONTRACT SUM			$ 6,231,637.00
2 Net change by Change Order			$ 229,187.54
3 CONTRACT SUM TO DATE (Line 1 -/+ 2)			$ 6,460,824.54
4 TOTAL COMPLETED & STORED TO DATE			$ 6,460,824.54
Washington State Sales Tax 7.9%			510,405.14
5 RETAINAGE:			
a. 5.0% of Completed Work (Columns D + E on G703)	$ 323,041.23		
b. ____ of Stored Material (Column F on G703)	$		
Total Retainage (Line 5a + 5b or Total in Column I of G703)			$ 323,041.23
6 TOTAL EARNED LESS RETAINAGE (Line 4 less Line 5 Total)			$ 6,648,188.45
7 LESS PREVIOUS CERTIFICATES FOR PAYMENT (Line 6 from prior Certificate)			$ 6,636,566.03
8 CURRENT PAYMENT DUE			$ 11,622.42
9 BALANCE TO FINISH, INCLUDING RETAINAGE (Line 3 less Line 6)			$

CHANGE ORDER SUMMARY	ADDITIONS	DEDUCTIONS
Total changes approved in previous months by Owner	$ 232,067.67	
Total approved this Month	1,757.22	4,637.35
TOTALS	233,824.89	4,637.35
NET CHANGES by Change Order	229,187.54	

The undersigned Contractor certifies that to the best of the Contractor's knowledge, information and belief the Work covered by this application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the Contractor for Work for which previous Certificates for Payment were issued and now payments received from the Owner, and that current payment shown herein is now due

CONTRACTOR: **BERSCHAUER PHILLIPS CONSTRUCTION CO.**

By: M. Nagel Date: 9/15/99
Matt Nagel, Proj. Eng., for Jace Munson, Vice-Pres.

State of: WASHINGTON
County of: THURSTON
Subscribed and sworn to before me this 15TH day of September, 1999

Notary Public: Katherine I. Lefurgey
My Commission expires: 5/[illegible]/02

KATHERINE I. LEFURGEY NOTARY PUBLIC STATE OF WASHINGTON APPOINTMENT EXPIRES MAY 24, 2002

CERTIFICATE FOR PAYMENT

In accordance with the Contract Documents, based on on-site observations and the data comprising this application, the Construction Manager and Architect certify to the Owner that to be best of their knowledge, information and belief the Work has progressed as indicated, the quality of the Work is in accordance with the Contract Documents, and the Contractor is entitled to payment of the AMOUNT CERTIFIED.

AMOUNT CERTIFIED $ 11,622.42
(Attach explanation if amount certified differs from the amount applied for. Initial all figures on this Application and on the Continuation Sheet that are changed to conform to the amount certified.)

CONSTRUCTION MANAGER:
By: _____ Date:

ARCHITECT:
By: Curtis Clarke Date: 9/16/99

This Certificate is not negotiable. The AMOUNT CERTIFIED is payable only to the Contractor named herein. Issuance, payment and acceptance of payment are without prejudice to any rights of the Owner or Contractor under this Contract

ABERDEEN SCHOOL DISTRICT NO. 5

Minutes of the Meeting of the
Board of Directors Held September 21, 1999

WORK STUDY SESSION

A work-study session was held in the Phillips staff room from 6:00 to 6:45 p.m. Board members present were Sandra Bielski, Jim Brown, Rhonda Hutchings, Jim Mason, and Frank Moses.

CALL TO ORDER

President Jim Mason called the regular meeting to order at 7:00 p.m. Members present were Sandra Bielski, Jim Brown, Rhonda Hutchings, and Frank Moses. Also present were Superintendent Karen Koschak, Assistant Superintendent Ken Hoover, Director of Personnel Anna Shanks, Administrative Assistant Grace Kite Roumell, Daily World reporter Dee Anne Shaw and approximately twenty-three patrons and staff.

MINUTES APPROVED

On motion by Jim Brown, seconded by Rhonda Hutchings, the board approved the minutes of the meeting held on September 7, 1999 as presented.

ACCOUNTS PAYABLE

On motion by Sandra Bielski, seconded by Frank Moses, the board approved the August payroll in the amount of $1,263,396.98 to be paid by warrants numbered 68337 through 68452; the accounts payable from the ASB Fund in the amount of $39,052.60 to be paid by warrants numbered 8827 through 8871; from the Capital Projects Fund in the amount of $77,390.53 to be paid by warrants numbered 567 to 576; from the Expendable Trust Fund in the amount of $7,250.00 to be paid by warrants numbered 27 through 36; from the Non-Expendable Trust Fund in the amount of $1,000 to be paid by warrant number 9; and from the General Fund in the amount of $843,661.26 to be paid by warrants numbered 20880 to 21162.

COMMENTS FROM AUDIENCE

Brad Shamber, an Alexander Young parent, and other parents and staff members expressed their unhappiness over a quote in the Daily World regarding the closing of Alexander Young School. Superintendent Koschak and board members assured those present that there was no intent to close any school at this time. District enrollment is above projection and kindergarten and preschool enrollment is higher than in previous years. In addition approximately $225,000 was spent on repairs and upgrades at Alexander Young School during the past year. Jim Mason assured them that the community would be involved in the process before any consideration was given to closing any school.

Superintendent Koschak presented the schedule of fees for students for 1999-2000. Board policy 3520 requires that the board be informed annually of student fees. In response to the question by Jim Mason, high school principal Kathy Barner informed the board that each principal has a fund to pay for ASB cards or the cost of activities for students who are unable to pay their own. On motion by Sandra Bielski, seconded by Frank Moses, the board approved the fee schedule for the current school year.	STUDENT FEES APPROVED
After a review by Superintendent Koschak, on motion by Frank Moses, seconded by Jim Brown, the board approved the grant application for Title VI Innovative Education Program. The funds will be used to purchase supplemental curriculum materials for students at all grade levels.	TITLE VI GRANT APPROVED
After a review by Karen Koschak, on motion by Jim Brown, seconded by Rhonda Hutchings, the board approved the Title VI Class Size Reduction grant application. The funding will provide enhancement opportunities aimed at improving student reading. Staff in each building determine how the funds will be used in their building.	TITLE VI CLASS SIZE REDUCTION GRANT APPROVED
Assistant Superintendent Ken Hoover reviewed the monthly fiscal report. He reported that the August cash balance was approximately the same as the balance a year ago and that enrollment is slightly above projection at each level.	FISCAL REPORT
Ken Hoover reviewed Berschauer Phillips' request for approval of Change Order #21 and final payment on the McDermoth Phase III project. The board approved the change order based on an approximate amount of $11,757 with the final amount to be negotiated by the district.	FINAL CHANGE ORDER FOR MCDERMOTH
On motion by Rhonda Hutchings, seconded by Sandra Bielski, the board approved releasing the retainage for the McDermoth project when the contractor has satisfied all the conditions outlined in the September 15 letter from Ken Hoover.	AUTHORIZATION TO RELEASE RETAINAGE FOR MCDERMOTH
After a review by Personnel Director Anna Shanks, on motion by Sandra Bielski, seconded by Frank Moses the board approved the personnel matters: approved hiring Kathryn Schmidt for 4th grade at McDermoth effective September 13 and Stanley Finley for high school English effective September 21; approved the resignation of Sue Miller effective September 9; approved a maternity leave for Kirsten Tageant effective January 27 to March 16, 2000; approved supplemental and co-curricular contracts; and hired substitutes Phil Braaten, Pat Edmondson, Ron Langhans, Kirsten Long, Maria Marquette-Hawley, Wilma Miller and Phyllis Sidwell.	PERSONNEL MATTERS (CERTIFICATED)

The board also approved hiring Pamela Casey as bus driver effective September 7, para-educators Carol Coyle at Miller effective September 13, Sabrina Johnson and James Philamalee at Stevens effective September 13, Denice Walczyk at A. J. West effective September 16; Jan Kilwien at Robert Gray effective September 20, and Rhiannon Green as student helper effective September 16; approved the retirement of Kathy Catterson effective October 1; approved the termination Aimee Czerniski effective August 31 and Shannon Walsh effective September 21; approved extra-curricular contracts and resignations; and hired substitute Kristine Aschim.	PERSONNEL MATTERS (CLASSIFIED)
On motion by Jim Brown, seconded by Rhonda Hutchings the board approved a request by Hoquiam for a combined WIAA boys' swim team with Aberdeen and Montesano. Mr. Brown asked that both Hoquiam and Montesano share in providing transportation to swim meets and Hoquiam make available time in their pool.	COMBINED BOYS SWIM TEAM
High school cross country coach Steve Reed requested permission for the cross country team to travel to Seaside, Oregon on September 24 and 25. After assuring the board that ample chaperones will be supervising the students, on motion by Rhonda Hutchings, seconded by Frank Moses, the board approved the trip.	OUT-OF-STATE TRIP
President Mason reminded board members the next regular meeting is scheduled for October 5 at the Phillips Lecture Hall.	NEXT MEETING
There being no further business the meeting adjourned at 7:45 p.m.	ADJOURN

Jim Mason, President

Karen Koschak, Secretary

Aberdeen School District

216 North G Street
Aberdeen, WA 98520
Phone (360) 538-2000, FAX (360) 538-2014

Karen Koschak, *Superintendent*

September 15, 1999

Matt Nagel
Berschauer Phillips Construction Company
P.O. Box 11489
Olympia, WA 98508

Dear Matt:

Thank you for accommodating our request to adjust the final payment on the project. Listed below are the items we would like you to address before we can release the retainage on the McDermoth project. As I indicated on the phone, I am willing to request our School Board approve the release of the retainage on September 21 with the proviso that I not send the release to the financial institution until the listed items are addressed.

1. Affidavits of Wages Paid from several subcontractors (see attached list).

2. Supporting documents identified as an attachment to the Contractor's Affidavit of Release of Liens listing releases or waivers of liens from subcontractors and material and equipment suppliers. In particular please address how a reported nonpayment issue has been appropriately resolved with West Coast Design & Construction (sub to Northwest School Equipment re: installation of lockers).

3. Notice of Completion of Public Works Contract Certificate. We are currently awaiting this Certificate from the Department of Revenue.

4. Complete Punch List Items (see attached list).

5. A schedule for completing currently outstanding Warranty items (see attached list). In the case of the VCT flooring, we would like your assurance that all problems with "nail pops", excess spacing between tiles, cracked tiles and water damaged tiles will be repaired early in July, 2000.

6. Replace VCT flooring used from Owner's reserve stock.

Sincerely,

Ken Hoover

Ken Hoover, Ph.D.
Assistant Superintendent

Cc: Curtis Clarke, BJSS
Paul Anderson

This District is an Equal Opportunity Employer

Outstanding Punch List Items

1. Repair or replace recessed electrical floor boxes in the gym.
2. The Kitchen freezer door has condensation occurring on the exterior. **The repair on 9-11-99 reportedly did not fix the problem.**
3. The Kitchen pass-through roll down coiling door needs adjustment to allow the electric operation to function correctly..
4. Paint sheet-rock repaired areas near Library Bay Window area and several second floor classrooms.
5. Door 207 and exterior doors 120D, 010 and 005 need repair.
6. Install end cap on panic bar at Door 118.

Outstanding Warranty Items

1. Repair "hump" in floor at seismic joint at preschool classroom, Room 126.
2. Repair ceramic floor tile delamination in Room 125 and Room 122.
3. Repair of VCT flooring where nails are raising.
4. Leakage correction (identify and correct when rainy season starts).
5. Wall laminate is buckling in some areas.

TCF

1.3.5 // Robert Gray Elementary

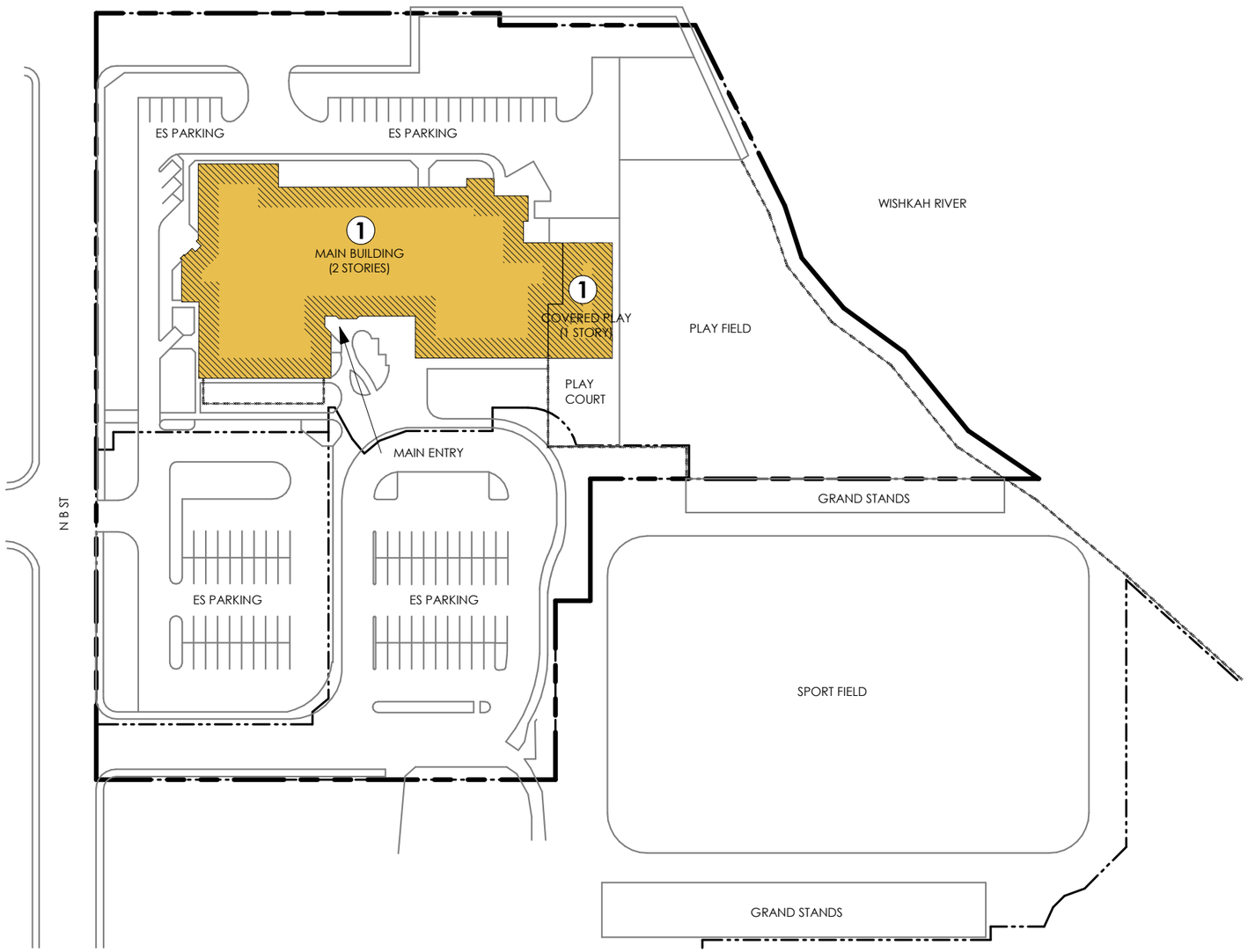
- Site Plan
- Building Plan and Area Summary
- Area Analysis
- Site & Building Condition Assessment

ROBERT GRAY ELEMENTARY SCHOOL

Gross Area & Site Plan

BUILDING NUMBER	BUILDING NAME	GROSS* SQUARE FOOT (SF) TOTALS
1	MAIN BUILDING	41907
1	COVERED PLAY	4908
		46815

*Gross sqft totals for recognized buildings only



TCF
124 North 'I' St. Tacoma, WA
www.tcfarchitecture.com
P.253.572.3993

Client

ABERDEEN SCHOOL DISTRICT

Project

ASD-STUDY SURVEY

2025-008

ROBERT GRAY ES

ABERDEEN WA, US

Issue & Revision Dates

10 SEPTEMBER 2025

Not for Construction

SITE INFORMATION PER AS-BUILTS PROVIDED BY OWNER DATED 10/21/2005

C:\Revit2025\ROBERT GRAY ES-ASD-SS_J.R.Mill.rvt

9/22/2025 12:25:50 PM

ROBERT GRAY ELEMENTARY SCHOOL

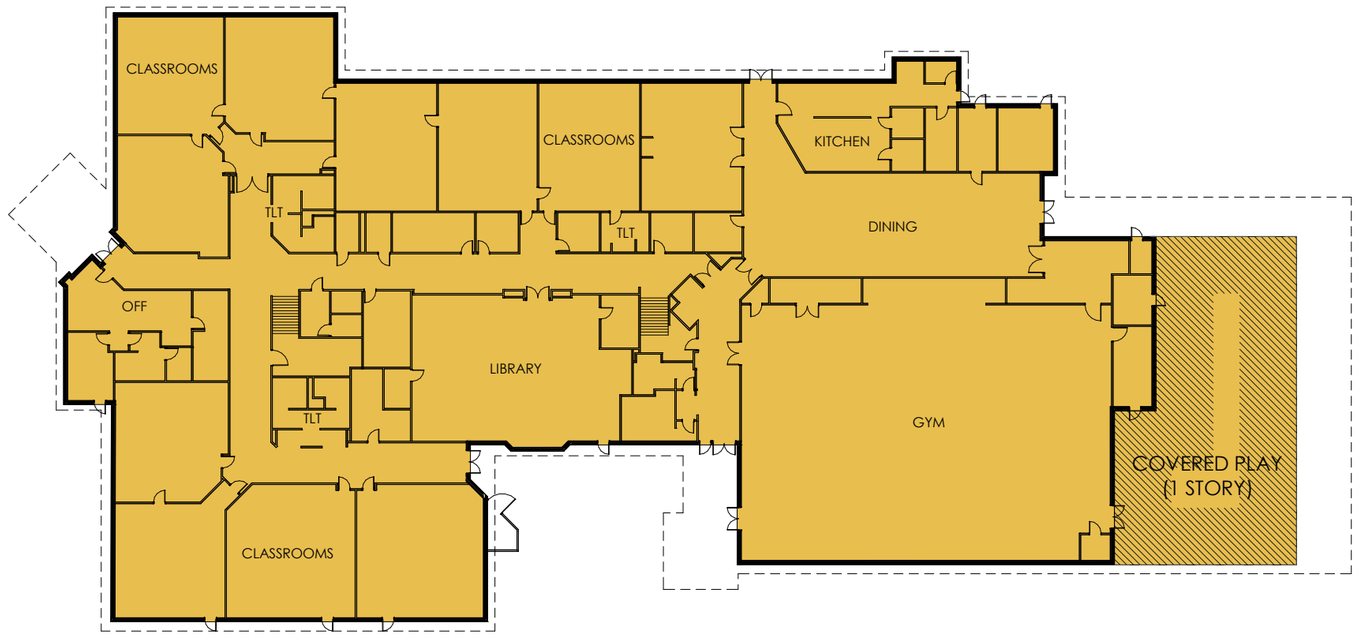
First Floor Plan

BUILDING NUMBER	BUILDING NAME	GROSS* SQUARE FOOT (SF) TOTALS
1	MAIN BUILDING	41907
1	COVERED PLAY	4908
		46815

*Gross sqft totals for recognized buildings only

1

MAIN BUILDING
(2 STORIES)



0 20' 40' 80'

NORTH

TCF
124 North 'I' St. Tacoma, WA
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Client
ABERDEEN SCHOOL DISTRICT

Project
ASD-STUDY SURVEY

2025-008
ROBERT GRAY ES

ABERDEEN WA, US

Issue & Revision Dates
10 SEPTEMBER 2025
Not for Construction

SITE INFORMATION PER AS-BUILTS PROVIDED BY OWNER DATED 10/21/2005

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ROBERT GRAY ELEMENTARY SCHOOL

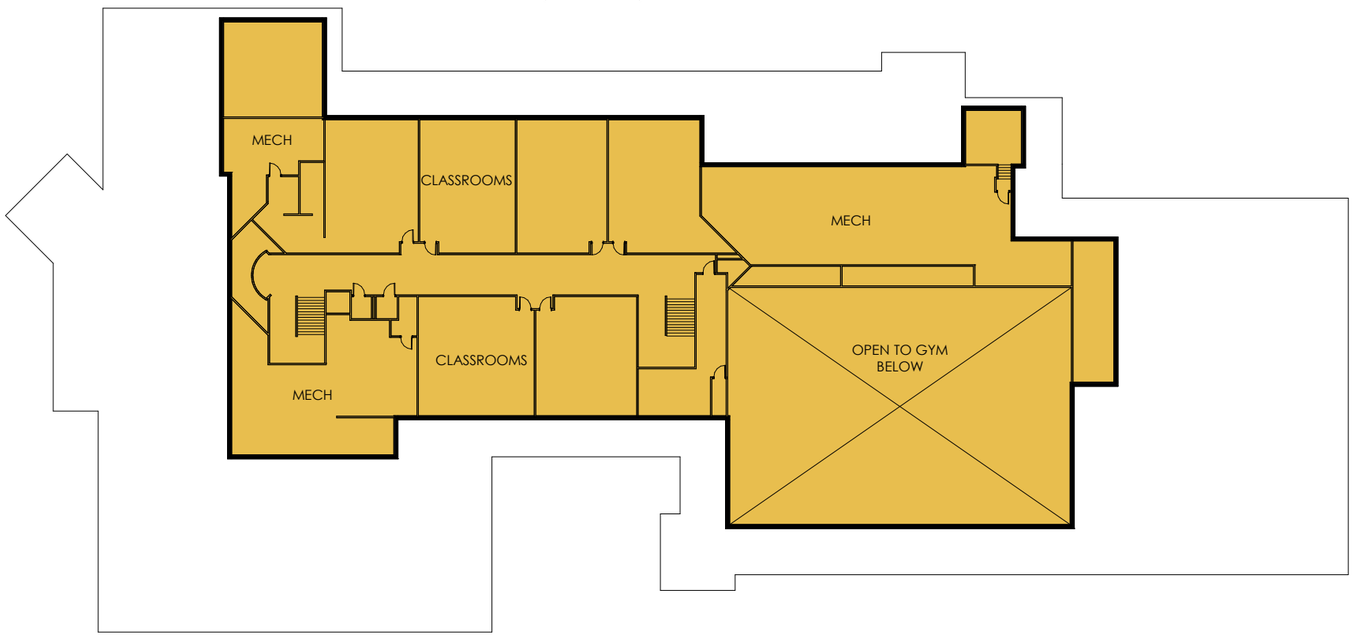
Second Floor Plan

BUILDING NUMBER	BUILDING NAME	GROSS* SQUARE FOOT (SF) TOTALS
1	MAIN BUILDING	41907
1	COVERED PLAY	4908
		46815

*Gross sqft totals for recognized buildings only

1

MAIN BUILDING
(2 STORIES)



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ABERDEEN WA, US

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Robert Gray Elementary School
Aberdeen School District - Area Analysis District Summary

Campus/Site	Building Name	Building Area Description (and Area Number/Letter, if applicable)	Year Built (Original Facility)	If Project Final Board Acceptance was within 30 years							Gross SF	SCAP-Recognized SF
				ALL New Construction (SCAP or locally funded)			APP (OSPI Only)	SCAP-funded Modernizations ONLY				
				If SCAP-funded or locally funded New Construction, Include SCAP Project Number if applicable (see Report 1 in ICOS)	If SCAP-funded include Final Board Acceptance Date on Resolution or If locally funded New Construction, Board discussion of completion (per Notes 1 & 2 below	Copy of Board Resolution uploaded in ICOS? (See Note 3 Below)	New or N/L SCAP Funded Construction after 1/1/1994	If SCAP funded Modernization, Include SCAP Project Number per Report 1 (found in ICOS)	If SCAP-funded Modernization, include Final Board Acceptance Date (see Report 1 in ICOS)	Copy of Board Resolution uploaded in ICOS? (See Notes 1 & 2 Below)		
Robert Gray ES	**Main Building**	1	2002	34011	11/18/2003	Yes					**41,907**	**41,907**
Robert Gray ES	**Covered Play**	1	2002	34011	11/18/2003	Yes					**4,908**	**2,454**
										Subtotal	**46,815**	**44,361**
										District Totals	**46,815**	**44,361**

Notes

1 - The final board acceptance date is required for all SCAP-funded projects (new buildings, additions, and modernizations) completed in the last 30 years (see Report 1 in ICOS)
2 - For locally funded buildings and additions constructed in the past 30 years, the final board acceptance date must be provided. If the district does not have a final board resolution, then a copy of board meeting minutes stating completion of project is acceptable.
3 - A copy of the Final Acceptance Board Resolution for all buildings or building areas constructed or modernized, SCAP Funded or Locally, must be uploaded into ICOS.
4 - All square footage calculations must be measured to the exterior walls, exluding overhangs.
5 - Area calculations are in accordance AIA Document D-101 and WAC 392-343-019.
6 - All covered play areas and covered outdoor learning areas are calculated to the eave line, and counted at 1/2 the square footage.
7 - All building and area names, dates, and square footage figures are exactly equal to data shown on area analysis plans/diagram and data entered in ICOS.

STATE OF WASHINGTON - SUPERINTENDENT OF PUBLIC INSTRUCTION
SITE CONDITION RATING SUMMARY
ABERDEEN SCHOOL DISTRICT (14005)

ROBERT GRAY ELEMENTARY SCHOOL

Profile Name: Elementary School - Rural **Last Review:** 8/19/2025

Inventory Status: Recognized

Condition Rating: 63.90 %

Sub-Assembly	Component	Condition Rating E	G	F	P	U	N/A	Component Score	Priority L	M	H
Site Improvement											
G2010	Roadways	☐	☐	☑	☐	☐	☐	62 %	☑	☐	☐
G2020	Parking Lots	☐	☐	☐	☑	☐	☐	30 %	☐	☑	☐
G2030	Pedestrian Plazas and Walkways	☐	☐	☑	☐	☐	☐	62 %	☐	☑	☐
G2050	Athletic, Recreational and Playfields Areas	☐	☑	☐	☐	☐	☐	90 %	☐	☑	☐
G2060	Site Development	☐	☐	☑	☐	☐	☐	62 %	☐	☑	☐
G2080	Landscaping	☐	☐	☑	☐	☐	☐	62 %	☑	☐	☐
Liquid and Gas Site Utilities											
G3010	Water Utilities	☐	☐	☑	☐	☐	☐	62 %	☐	☑	☐
G3020	Sanitary Sewerage Utilities	☐	☑	☐	☐	☐	☐	90 %	☐	☑	☐
G3030	Storm Drainage Utilities	☐	☐	☑	☐	☐	☐	62 %	☐	☑	☐
Electrical Site Improvements											
G4010	Site Electric Distribution Systems	☐	☑	☐	☐	☐	☐	90 %	☐	☑	☐
G4050	Site Lighting	☐	☐	☑	☐	☐	☐	62 %	☐	☑	☐
Site Communications											
G5010	Site Communications Systems	☐	☑	☐	☐	☐	☐	90 %	☐	☑	☐

Robert Gray Elementary School - Covered Play

Building Details

PROFILE TYPE	Covered Play
NUMBER OF FLOORS	1
CHARACTERISTICS	Occupied

Building Inventory

AREA YEAR BUILT	DISTRICT ASSIGNED AREA	GROSS BUILDING SQ FT	GROSS INSTRUCTIONAL SQ FT	SCAP RECOGNIZED SQ FT	ORIGINAL OCCUPANCY DATE	ORIGINAL BOARD ACCEPTANCE DATE
2002	Covered Play	4,908	4,908	0		11/18/2002
	Building Totals	**4,908**	**4,908**	**0**		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Foundations	Standard Foundation	A1010		90.00% Good
Slabs on Grade	Standard Slabs on Grade	A4010		90.00% Good
Superstructure	Roof Construction	B1020		90.00% Good
Exterior Vertical Enclosures	Exterior Walls	B2010		90.00% Good
Exterior Horizontal Enclosures	Roofing	B3010		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Graded fair due to ongoing roofing issues at the main building.		
	Roof Appurtenances	B3020	Medium	62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Exterior Horizontal Enclosures	*Comments:*	Downgraded due to age. Some minor downspouts over paved areas daylight to nearby storm drains. This method is out of date and causes excessive wear to paving.		
	Overhead Exterior Enclosures	B3080		90.00% Good
Fire Protection	Fire Suppression	D4010		90.00% Good
Electrical	General Purpose Electrical Power	D5030		90.00% Good
	Lighting	D5040	Medium	62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Lighting is not energy efficient. Lighting controls are not up to current code standards for daylighting and dimming. Occupancy sensors are present.		
Communications	Distributed Communications and Monitoring	D6060		62.00% Fair
	Deficiencies:	Other		
	Causes:	Equipment Obsolescence, Other		
	Comments:	Intercom system is not functioning. Clock system functional.		
Electronic Safety and Security	Electronic Surveillance	D7030		90.00% Good
Equipment	Institutional Equipment	E1040		90.00% Good
	Entertainment and Recreational Equipment	E1070		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Downgraded due to aging covered play equipment and play surface at covered play.		

Robert Gray Elementary School - Main Building

Building Details

PROFILE TYPE	Elementary School - Multi-Story
NUMBER OF FLOORS	2
BOARD ACCEPTANCE DATE	9/25/2002
CHARACTERISTICS	Occupied
ANNUAL REVIEW COMPLETED BY	District
COMMENTS	Has elevator loacted by adminstration office

This building is required to comply with the Asset Preservation Program

REPORTING YEAR	APP YEAR	BUILDING CONDITION ASSESSMENT	ANNUAL REVIEW COMPLETED BY	BOARD REPORT PRESENT DATE
2025-2026	23	80.01	District	Not Reported
2024-2025	22	84.00	District	3/4/2025
2023-2024	21	88.39	District	3/19/2024
2022-2023	20	85.96	District	3/7/2023
2021-2022	19	85.96	Consultant	3/22/2022
2020-2021	18	89.47	District	3/2/2021

The next certified BCA is due: 2031

Building Inventory

AREA YEAR BUILT	DISTRICT ASSIGNED AREA	GROSS BUILDING SQ FT	GROSS INSTRUCTIONAL SQ FT	SCAP RECOGNIZED SQ FT	ORIGINAL OCCUPANCY DATE	ORIGINAL BOARD ACCEPTANCE DATE
2002	Main Bldg Floor 1&2	41,907	41,907	41,907		11/18/2003
	Building Totals	**41,907**	**41,907**	**41,907**		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Foundations	Standard Foundation	A1010		90.00% Good
Slabs on Grade	Standard Slabs on Grade	A4010		90.00% Good
Water and Gas Mitigation	Building Subdrainage	A6010		90.00% Good
Superstructure	Floor Construction	B1010		90.00% Good
	Roof Construction	B1020		90.00% Good

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Superstructure	Stairs	B1080		90.00% Good
Exterior Vertical Enclosures	Exterior Walls	B2010		90.00% Good
	Comments:	Exterior siding appears to be weathering and in need of new paint		
	Exterior Windows	B2020		90.00% Good
	Exterior Doors and Grilles	B2050		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Downgraded due to the age of the finishes, some fading is present at doors. Exterior door contain wired glazing.		
	Exterior Louvers and Vents	B2070		90.00% Good
Exterior Horizontal Enclosures	Roofing	B3010		30.00% Poor
	Deficiencies:	Leaking		
	Causes:	Surface Weathering		
	Comments:	Appears to be a history of leaking and known issues. Roof has exceeded its useful life, asphalt shingles appear to have lost aggregate over the age of the shingle.		
	Roof Appurtenances	B3020		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Downgraded due to age. Some minor downspouts over paved areas daylight to nearby storm drains. This method is out of date and causes excessive wear to paving.		
	Horizontal Openings	B3060		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Skylights are dirty and require cleaning.		
	Overhead Exterior Enclosures	B3080		90.00% Good
Interior Construction	Interior Partitions	C1010		62.00% Fair
	Deficiencies:	Other		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Interior Construction	*Causes:*	Other		
	Comments:	Rated due to age of the facility and presence of typical mounting holes at classrooms etc.		
	Interior Windows	C1020		30.00% Poor
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Downgraded due to the presence of wired gazing.		
	Interior Doors	C1030		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Doors rated lower due to wired glazing present in door lites.		
	Interior Grilles and Gates	C1040		90.00% Good
	Raised Floor Construction	C1060		90.00% Good
	Suspended Ceiling Construction	C1070		90.00% Good
Interior Finishes	Wall Finishes	C2010		90.00% Good
	Deficiencies:	Cracking, Peeling, Flaking		
	Causes:	Other		
	Comments:	General dings at typical corners and where wall mounted items have been removed, nothing inconsistent with age and typical fair use.		
	Interior Fabrications	C2020		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Rating commensurate with age		
	Flooring	C2030	Low	62.00% Fair
	Deficiencies:	Broken or Loose Tiles, Stains, Discoloration		
	Causes:	Other, Settlement		
	Comments:	Floor cracking observed in classroom 217 across multiple tiles Carpet showing wear Commiserate with age		
	Stair Finishes	C2040		90.00% Good

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Interior Finishes	Ceiling Finishes	C2050		90.00% Good
	Deficiencies:	Efflorescence and Staining		
	Causes:	Moisture		
	Comments:	A few stained ceiling tiles observed in 2nd floor classroom corridor		
Conveying	Vertical Conveying Systems	D1010		90.00% Good
Plumbing	Domestic Water Distribution	D2010		90.00% Good
	Sanitary Drainage	D2020		90.00% Good
	Building Support Plumbing Systems	D2030		90.00% Good
HVAC	Heating Systems	D3020		90.00% Good
	Year Installed/Replaced:	2018		
	Cooling Systems	D3030		90.00% Good
	Facility HVAC Distribution Systems	D3050		90.00% Good
	Comments:			
	Ventilation	D3060		90.00% Good
Fire Protection	Fire Suppression	D4010		90.00% Good
	Fire Protection Specialties	D4030		90.00% Good
Electrical	Electrical Services and Distribution	D5020		90.00% Good
	General Purpose Electrical Power	D5030		90.00% Good
	Lighting	D5040		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other, T-12 Fluorescent Fixtures		
	Comments:	Lighting is not energy efficient. Lighting controls are not up to current code standards for daylighting and dimming. Occupancy sensors are present.		
Communications	Data Communications	D6010		62.00% Fair
	Deficiencies:	Other		
	Causes:	Equipment Obsolescence		
	Comments:	Existing data standard is Cat-5. Current standards are Cat-6 or better.		
	Voice Communications	D6020		62.00% Fair

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Communications	*Deficiencies:*	Other		
	Causes:	Equipment Obsolescence		
	Comments:	Existing data standard is Cat-5. Current standards are Cat-6 or better.		
	Audio-Video Communications	D6030		90.00% Good
	Distributed Communications and Monitoring	D6060		30.00% Poor
	Deficiencies:	Other		
	Causes:	Equipment Obsolescence, Other		
	Comments:	Intercom system is not functioning. Clock system functional.		
Electronic Safety and Security	Access Control and Intrusion Detection	D7010		90.00% Good
	Electronic Surveillance	D7030		90.00% Good
	Detection and Alarm	D7050		90.00% Good
Integrated Automation	Integrated Automation Facility Controls	D8010		90.00% Good
Equipment	Commercial Equipment	E1030		90.00% Good
	Institutional Equipment	E1040		90.00% Good
	Entertainment and Recreational Equipment	E1070	High	62.00% Fair
	Quantity:	1.00 Lot		
	Year Installed/Replaced:	2024		
	Life Span:	15		
	Deficiencies:	Other, Unsightly		
	Causes:	Equipment Obsolescence, Other		
	Comments:	Play structure replaced in 2024 with new equipment. Downgraded due to aging covered play equipment and play surface at covered play.		
	Other Equipment	E1090		90.00% Good
Furnishings	Fixed Furnishings	E2010		62.00% Fair
	Deficiencies:	Surface Deterioration		
	Causes:	Deterioration		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Furnishings	*Comments:*	Casework laminate is stained in some locations, but is in good condition considering age.		
	Movable Furnishings	E2050		90.00% Good

ABERDEEN SCHOOL DISTRICT NO. 5

Minutes of the Regular Meeting of the
Board of Directors Held November 18, 2003

WORK STUDY

At 6:00 p.m. President Rhonda Hutchings called to order a work-study session in the Board Room. Members present were Sandra Bielski and Doug Smith.

CALL TO ORDER

At 7:03 p.m. President Hutchings called to order the regular meeting of the Board of Directors. Members present were Sandra Bielski and Doug Smith along with Superintendent Martin Kay and twenty-four patrons and staff.

FLAG SALUTE

The meeting began with the flag salute. President Hutchings excused Frank Moses and Brian Shea from the meeting.

MINUTES APPROVED

On motion by Sandra Bielski, seconded by Doug Smith, the Board approved the minutes of the regular meeting held November 4, 2003 as presented.

ACCOUNTS PAYABLE

On motion by Sandra Bielski, seconded by Doug Smith, the Board approved the payroll for the month of October 2003 in the amount of $1,692,065.87 to be paid by warrants numbered 7487 through 74624; the accounts payable from the Capital Projects Fund in the amount of $9,348.99 to be paid by warrants numbered 938 through 940; from the ASB Fund in the amount of $82,175.19 to be paid by warrants numbered 11355 through 11410; from the General Fund in the amount of $892,889.14 to be paid by warrants numbered 34897 through 35182; from the Private Purpose Trust in the amount of $195 to be paid by warrant number 28; and from the Transportation Vehicle Fund in the amount of $134.69 to be paid by warrant number 03.

COMMENTS

Rhonda Hutchings reminded the Board and the audience that "Hello Dolly", the high school musical is being presented this week.

COMMENTS FROM AUDIENCE

Tim Alstrom thanked Frank Moses, Brian Shea, and Rhonda Hutchings for all of the time they spent while directors and told them their efforts did make a diference. Frank Cundari also congratulated the new members and gave credit to the past board members for their efforts.

Robert Christiansen thanked the board for their courage and commitment. Mr. Christiansen introduced his daughter Emma who read a letter to the board about the affect bullying and harassment has had on her.

Stanley Trohimovich asked for full disclosure of the bonds being sold.

WRITTEN COMMUNICATIONS

Superintendent Kay noted that the concerns expressed by Mr. Trohimovich in his written communication had been forwarded to school district legal counsel.

RESOLUTION 2003-15 APPROVE SALE OF BONDS

Dick Schober and Isaac Signe from USBancorp Piper Jaffray reported on the sale of the bonds. He described it as very successful, receiving five bids for each of the two series sold. The overall sale resulted in approximately 4.21% interest rate. Bids were awarded to Citigroup a firm with local offices in the state of Washington. One sale will close in December and the second in early January. He reported that the District was able to maintain its A3 rating for the bond sale. Dick Schober stressed the importance of maintaining a 4% cash reserve in order to keep the A3 bond rating. By breaking the sale into two series - 2003 and 2004 the district will see a savings of $624,000.

On motion by Doug Smith, seconded by Sandra Bielski, the Board approved Resolution 2003-15 approving the sale of bonds.

REVIEW AHS CONSTRUCTION TIMELINE

Superintendent Kay reminded the Board of the general timeline for selecting an architect. Architect proposals are due November 19. He reported that thirty-five people attended the pre-proposal conference. Superintendent Kay also reviewed the timeline for approving a resolution in order to submit a Maintenance and Operation Levy to the voters in February.

STEVENS SELECTED SPI SCHOOL OF THE MONTH

Scot Embrey reported he had received a call from Governor Locke's office that afternoon informing him that the governor wanted to recognize Stevens Elementary School as the school of the month for December. Governor Locke and Terry Bergeson will visit Stevens on December 11th. The selection is in recognition of their achievement in reading and the WASL.

WSSDA REPORT

Sandra Bielski reported that this school director's conference was the best conference she had attended in sixteen years. She was impressed with the information she received on effective teaching strategies. Doug Smith commented on the number of presentation available with a sprinkling of NCLB through out. Jim Fett also attended and was especially interested in accelerated achievement information he received. Superintendent Kay commented on the diversity of people serving on boards across the state. He announced that the Miller World Rhythms Band would entertain at a WSSDA conference this spring.

CONSTRUCTION CONTRACT MANAGER

Superintendent Kay recommended Heery International, a firm that focuses primarily on school construction as the district's selection for a Construction Contract Manager. The firm has assured the district they will have a full time construction manager on site during the construction phase. The firm also employs architects and engineers that serve as consultants to the construction manager. They have

completed a number of high school projects in Washington state and are highly recommended, especially Steve Nicholas, who will be our on site consultant.

The Board also reviewed the contract of services under negotiation with Heery and discussed the advantages of paying a lump sum for services, opposed to an hourly rate.

TEXTBOOKS PRESENTED

Heather Shay, a teacher from the high school, presented 7 Habits of Highly Effective Teens and DigiTools for use in informational processing classes. The books were presented for the first reading and will be presented for adoption at the next meeting.

NOVEL PRESENTED

Angie Durr, from Miller Junior High, presented for the first reading the novel Walk Two Moons. This novel will be used as supplemental reading early in the year for 7th grade students.

FINAL COMPLETION ROBERT GRAY

Tom Laufmann informed the Board that the District had received notification from BJSS Duarte Bryant that John Korsmo Construction, the contractor for Robert Gray, had completed the contracted work with a few exceptions. He assured the Board that we would continue to withhold funds from the retainage for any items not completed. On motion by Sandra Bielski, seconded by Doug Smith, the Board approved Resolution 2003-16 accepting Robert Gray Phase II as complete.

FISCAL REPORT

Tom Laufmann presented the fiscal report and discussed the low cash balance forecast for this spring. He is working with schools to control expenditures. Enrollment at elementary and junior high levels remains above projected levels. However, the high school enrollment continues to be an area of concern. He described a ramp installed for handicap access at 5th Street Gym that can be used later at another location when necessary. He reported the district had received a new piece of equipment to help stack cases of food and a lift used for maintenance. He also noted that a payment to bond holders is due December 1st. A letter from the Transportation Director Bob Svoboda was presented requesting the purchase of a new bus, which is a better bus than the bus specified on the state contract. The transportation director will attend a meeting to discuss the proposed purchase.

OUT-OF-STATE STUDENT TRAVEL

On motion by Doug Smith, seconded by Sandra Bielski, the Board approved a trip by the AHS Jazz Ensemble to the University of Oregon Jazz Celebration in Eugene, Oregon on January 16 to 18, 2004.

On motion by Doug Smith, seconded by Sandra Bielski, the Board approved a trip by the AHS Jazz Ensemble to the Lionel Hampton Jazz Festival in Moscow, Idaho on February 26 to 29, 2004.

On motion by Sandra Bielski, seconded by Doug Smith, the Board approved a trip by the Goldenaires /All That Jazz to the Lionel Hampton Jazz Festival in Moscow, Idaho on February 26 to 29.	STUDENT TRAVEL
On motion by Sandra Bielski, seconded by Doug Smith, the Board approved the trip by the AHS Bands and Orchestra to Victoria Days in Victoria, BC on May 21 to 25.	
President Hutchings reminded board members the next regular meeting is planned for December 2 and work-study meetings are scheduled for December 5 from 1:00 to 4:30p.m. and December 6 from 8:00 to 11:30 a.m.	NEXT MEETING
8:44 p.m. President Hutchings recessed the regular meeting for an executive session expected to last approximately one hour, for a discussion that may include litigation, collective bargaining, acquisition or sale of real estate, and personnel issues.	EXECUTIVE SESSION
The regular meeting reconvened at 9:49 p.m.	RECONVENE
On motion by Doug Smith, seconded by Sandra Bielski, the Board approved the personnel matters. The Board approved hiring Craig Pablo as Indian Education tutor effective November 10, a medical leave of absence for Tammy Veloni effective December 1 to January 20, approved extra-curricular matters, and hired substitute Shirley South.	PERSONNEL (CLASSIFIED) HIRE LEAVE SUBSTITUTE
There being no further business, the meeting adjourned at 9:50 p.m.	ADJOURN

Sandra Bielski, Vice-President

Martin W. Kay, Secretary

Aberdeen School District No. 5
Resolution No. 2003-16

A Resolution Authorizing Final Completion of Robert Gray Phase II

WHEREAS, the Board of Directors of the Aberdeen School District have received notification from BJSS Duarte Bryant that the construction specified in the project advertised as Robert Gray Phase II are complete in accordance with contract specifications and documents; and

WHEREAS, the Architect, General Contractor, Construction Manager, Business Manager, and Maintenance Supervisor have walked through the project and concur; and

WHEREAS, the Aberdeen School District has received a release from the State Department of Revenue, the State Department of Employment Security, and has notified the Department of Labor and Industries; now

THEREFORE BE IT RESOLVED, that the Board of Directors of Aberdeen School District No. 5 does hereby accept the work of John S. Korsmo Construction, Inc. as complete.

The undersigned certifies that the foregoing resolution was adopted at a duly convened meeting of the Board of Directors of Aberdeen School District No. 5 on the 18th day of November, 2003 of which due notice was given in the manner provided by law with the following directors being present and voting.

Aberdeen School District No. 5
Grays Harbor County, Washington

Sandra Bielski

Rhonda Hutchings

Frank Moses

Brian Shea

Doug Smith

Attest:

Martin W. Secretary to the Board

TCF

1.3.6 // Stevens Elementary

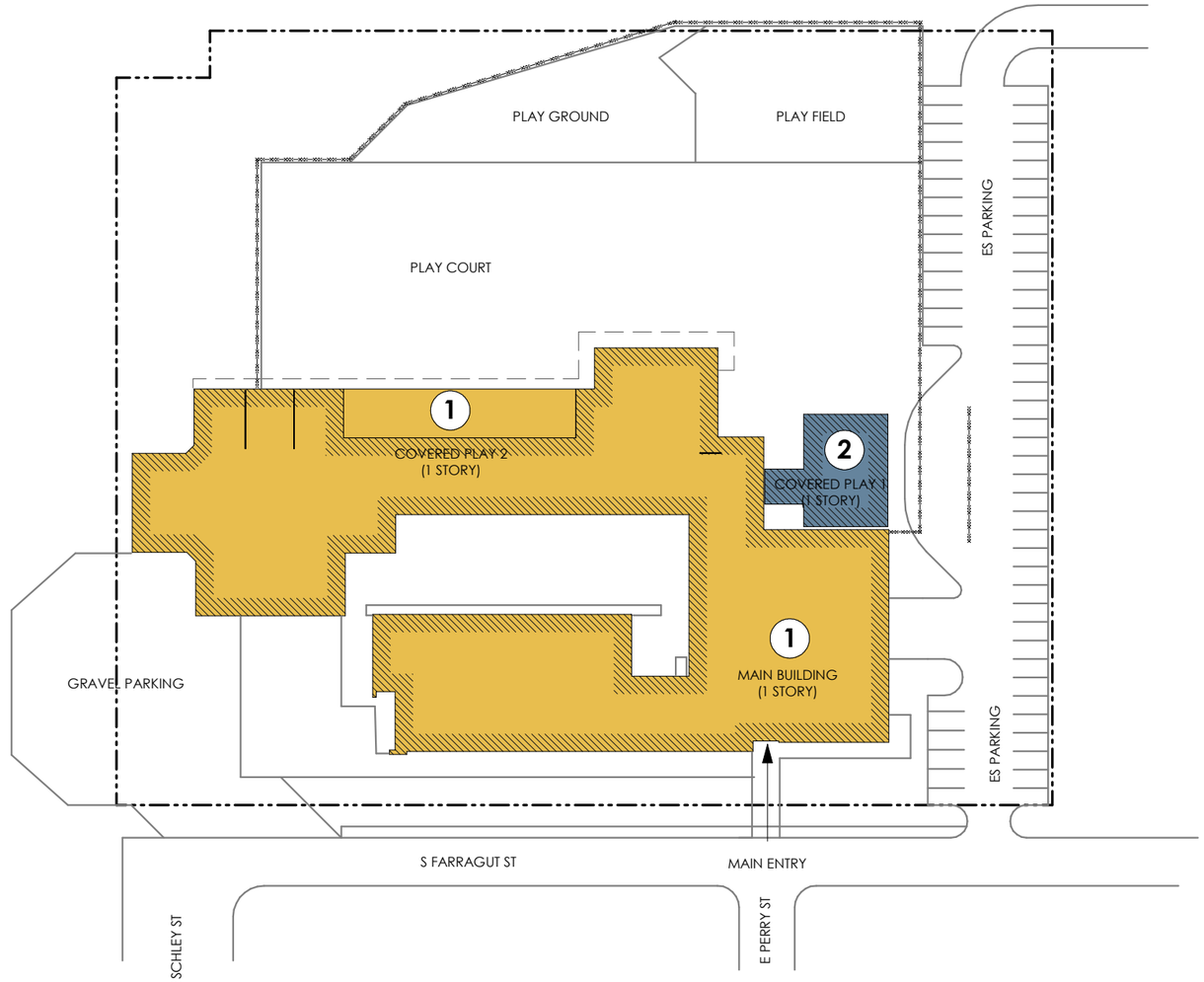
- Site Plan
- Building Plan and Area Summary
- Area Analysis
- Site & Building Condition Assessment

STEVENS ELEMENTARY SCHOOL

Gross Area & Site Plan

BUILDING NUMBER	BUILDING NAME	GROSS* SQUARE FOOT (SF) TOTALS
1	MAIN BUILDING	51110
2	COVERED PLAY 1	2352
1	COVERED PLAY 2	3531
		56993

*Gross sqft totals for recognized buildings only



0 40' 80' 160'

NORTH

TCF
124 North 'I' St. Tacoma, WA
www.tcfarchitecture.com
P.253.572.3993

Client

ABERDEEN SCHOOL DISTRICT

Project

ASD-STUDY SURVEY

2025-008

STEVENS ES

ABERDEEN WA, US

Issue & Revision Dates

10 SEPTEMBER 2025

Not for Construction

SITE INFORMATION PER AS-BUILTS PROVIDED BY OWNER DATED 10/21/2005

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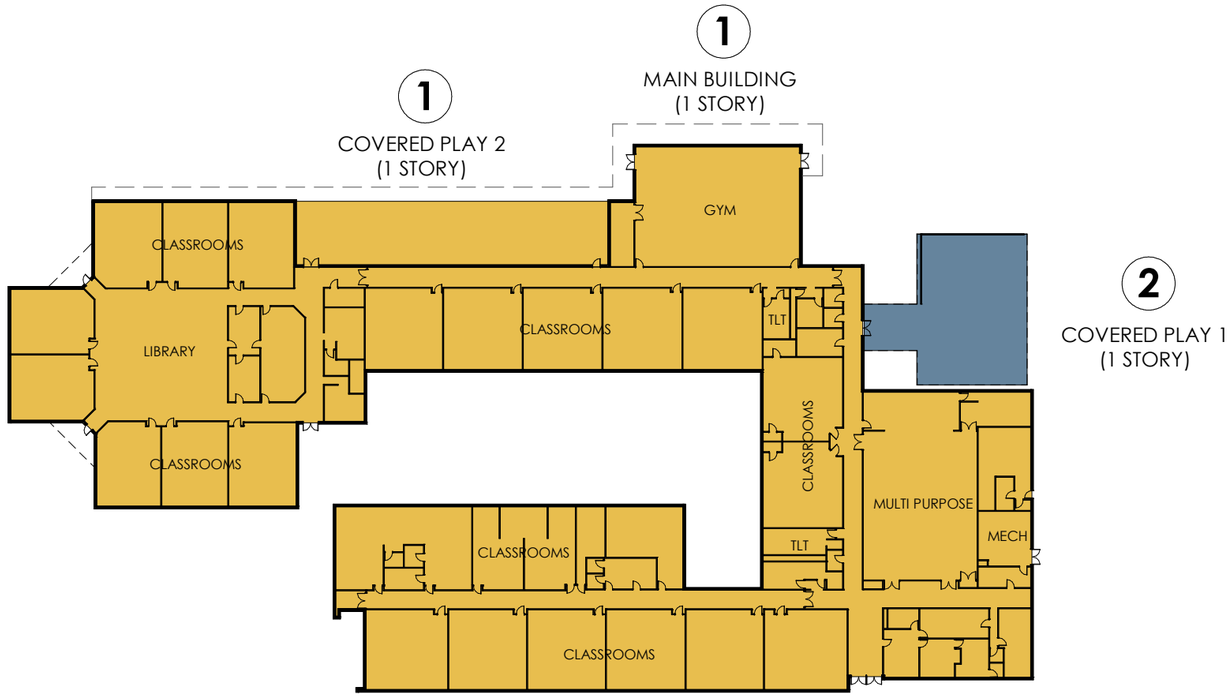
STEVENS ELEMENTARY SCHOOL

First Floor Plan

BUILDING NUMBER	BUILDING NAME	GROSS* SQUARE FOOT (SF) TOTALS
1	MAIN BUILDING	51110
2	COVERED PLAY 1	2352
1	COVERED PLAY 2	3531
		56993

*Gross sqft totals for recognized buildings only



0 30' 60' 120'

NORTH

TCF
124 North 'I' St. Tacoma, WA
www.tcfarchitecture.com
P.253.572.3993

Client

ABERDEEN SCHOOL DISTRICT

Project

ASD-STUDY SURVEY

2025-008

STEVENS ES

ABERDEEN WA, US

Issue & Revision Dates

10 SEPTEMBER 2025

Not for Construction

SITE INFORMATION PER AS-BUILTS PROVIDED BY OWNER DATED 10/21/2005

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Stevens Elementary School
Aberdeen School District - Area Analysis District Summary

Campus/Site	Building Name	Building Area Description (and Area Number/Letter, if applicable)	Year Built (Original Facility)	If Project Final Board Acceptance was within 30 years							Gross SF	SCAP-Recognized SF
				ALL New Construction (SCAP or locally funded)			APP (OSPI Only)	SCAP-funded Modernizations ONLY				
				If SCAP-funded or locally funded New Construction, Include SCAP Project Number if applicable (see Report 1 in ICOS)	**If SCAP-funded include Final Board Acceptance Date on Resolution** or **If locally funded New Construction, Board discussion of completion** (per Notes 1 & 2 below	**Copy of Board Resolution uploaded in ICOS?** (See Note 3 Below)	New or N/L SCAP Funded Construction after 1/1/1994	**If SCAP funded Modernization**, Include SCAP Project Number per Report 1 (found in ICOS)	**If SCAP-funded Modernization,** include Final Board Acceptance Date (see Report 1 in ICOS)	**Copy of Board Resolution uploaded in ICOS?** (See Notes 1 & 2 Below)		
Stevens Elementary School	**Main Building**	1	1955								51,110	51,110
Stevens Elementary School	**Covereed Play 2**	1	1976								3,531	1,766
Stevens Elementary School	**Covered Play 1**	2	1955								2,352	1,176
										Subtotal	**56,993**	**54,052**
										District Totals	**56,993**	**54,052**

Notes

1 - The final board acceptance date is required for all SCAP-funded projects (new buildings, additions, and modernizations) completed in the last 30 years (see Report 1 in ICOS)
2 - For locally funded buildings and additions constructed in the past 30 years, the final board acceptance date must be provided. If the district does not have a final board resolution, then a copy of board meeting minutes stating completion of project is acceptable.
3 - A copy of the Final Acceptance Board Resolution for all buildings or building areas constructed or modernized, SCAP Funded or Locally, must be uploaded into ICOS.
4 - All square footage calculations must be measured to the exterior walls, exluding overhangs.
5 - Area calculations are in accordance AIA Document D-101 and WAC 392-343-019.
6 - All covered play areas and covered outdoor learning areas are calculated to the eave line, and counted at 1/2 the square footage.
7 - All building and area names, dates, and square footage figures are exactly equal to data shown on area analysis plans/diagram and data entered in ICOS.

STATE OF WASHINGTON - SUPERINTENDENT OF PUBLIC INSTRUCTION
SITE CONDITION RATING SUMMARY
ABERDEEN SCHOOL DISTRICT (14005)

STEVENS ELEMENTARY SCHOOL

Profile Name: Elementary School - Rural **Last Review:** 7/29/2025

Inventory Status: Recognized

Condition Rating: 61.17 %

Sub-Assembly	Component	Condition Rating E	G	F	P	U	N/A	Component Score	Priority L	M	H
Site Improvement											
G2020	Parking Lots	☐	☐	☑	☐	☐	☐	62 %	☐	☐	☐
G2030	Pedestrian Plazas and Walkways	☐	☐	☐	☑	☐	☐	30 %	☐	☐	☐
G2050	Athletic, Recreational and Playfields Areas	☐	☐	☐	☑	☐	☐	30 %	☐	☐	☐
G2060	Site Development	☐	☐	☑	☐	☐	☐	62 %	☐	☐	☐
G2080	Landscaping	☐	☐	☑	☐	☐	☐	62 %	☐	☐	☐
Liquid and Gas Site Utilities											
G3010	Water Utilities	☐	☑	☐	☐	☐	☐	90 %	☐	☐	☐
G3020	Sanitary Sewerage Utilities	☐	☑	☐	☐	☐	☐	90 %	☐	☐	☐
G3030	Storm Drainage Utilities	☐	☑	☐	☐	☐	☐	90 %	☐	☐	☐
Electrical Site Improvements											
G4010	Site Electric Distribution Systems	☐	☑	☐	☐	☐	☐	90 %	☐	☐	☐
G4050	Site Lighting	☐	☐	☑	☐	☐	☐	62 %	☐	☐	☐

Stevens Elementary School - Covered Play 1

Building Details

PROFILE TYPE	Covered Play
NUMBER OF FLOORS	1
CHARACTERISTICS	Occupied

Building Inventory

AREA YEAR BUILT	DISTRICT ASSIGNED AREA	GROSS BUILDING SQ FT	GROSS INSTRUCTIONAL SQ FT	SCAP RECOGNIZED SQ FT	ORIGINAL OCCUPANCY DATE	ORIGINAL BOARD ACCEPTANCE DATE
1955	Covered Play 1	2,352	2,352	1,176		
	Building Totals	**2,352**	**2,352**	**1,176**		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Foundations	Standard Foundation	A1010		90.00% Good
Superstructure	Roof Construction	B1020		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Bolted connections were probably sufficient for the time built, but lack adequate shear connections. No signs of damage.		
Exterior Horizontal Enclosures	Roofing	B3010		62.00% Fair
	Deficiencies:	Faulty Material		
	Causes:	Surface Weathering		
	Comments:	Built up roofing appears aged but is serviceable. No visible signs of leaking.		
	Overhead Exterior Enclosures	B3080		62.00% Fair

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Exterior Horizontal Enclosures	*Deficiencies:*	Warped/Delaminating Finishes		
	Causes:	Moisture Penetration		
Interior Finishes	Ceiling Finishes	C2050		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Deficiency: Painted finish on exposed structure. Could use painting. Rust on steel support structure.		
Equipment	Entertainment and Recreational Equipment	E1070		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Lack of recreation or play equipment at covered areas. Basketball hoops appear to be added at overhang areas.		

Stevens Elementary School - Covered Play 2

Building Details

PROFILE TYPE	Covered Play
NUMBER OF FLOORS	1
CHARACTERISTICS	Occupied

Building Inventory

AREA YEAR BUILT	DISTRICT ASSIGNED AREA	GROSS BUILDING SQ FT	GROSS INSTRUCTIONAL SQ FT	SCAP RECOGNIZED SQ FT	ORIGINAL OCCUPANCY DATE	ORIGINAL BOARD ACCEPTANCE DATE
1976	Covered Play 2	3,531	3,531	0		
	Building Totals	**3,531**	**3,531**	**0**		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Foundations	Standard Foundation	A1010		90.00% Good
Slabs on Grade	Standard Slabs on Grade	A4010		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Graded due to age - Note grading is similar to outdoor asphalt play area.		
Superstructure	Roof Construction	B1020		90.00% Good
Exterior Horizontal Enclosures	Roofing	B3010		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Graded similar to main building - Roofing is aged past service life.		
	Roof Appurtenances	B3020		62.00% Fair

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Exterior Horizontal Enclosures	*Deficiencies:*	Other		
	Causes:	Other		
	Comments:	Graded due to age, some connections have leaking joints.		
	Overhead Exterior Enclosures	B3080		90.00% Good
Fire Protection	Fire Suppression	D4010		0.00% Unsatisfactory
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Missing fire suppression.		
Electrical	General Purpose Electrical Power	D5030		90.00% Good
	Lighting	D5040		30.00% Poor
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Lighting is inadequate at the covered area.		
Communications	Distributed Communications and Monitoring	D6060		30.00% Poor
	Deficiencies:	Other		
	Causes:	Equipment Obsolescence, Other		
	Comments:	Intercom is non-functional.		
Electronic Safety and Security	Electronic Surveillance	D7030		30.00% Poor
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Graded similar to main building.		
Equipment	Entertainment and Recreational Equipment	E1070		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Graded lower due to age.		

Stevens Elementary School - Main Building

Building Details

PROFILE TYPE	Elementary School - Single Story
NUMBER OF FLOORS	1
CHARACTERISTICS	Occupied

Building Inventory

AREA YEAR BUILT	DISTRICT ASSIGNED AREA	GROSS BUILDING SQ FT	GROSS INSTRUCTIONAL SQ FT	SCAP RECOGNIZED SQ FT	ORIGINAL OCCUPANCY DATE	ORIGINAL BOARD ACCEPTANCE DATE
1955	Area 1	28,739	28,739	28,739		
1974	Area 2	4,912	4,912	4,912		
1976	Area 3	17,459	17,459	17,459		
	Building Totals	**51,110**	**51,110**	**51,110**		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Foundations	Standard Foundation	A1010		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Graded lower due to age of oldest portion of building: Oldest building wing appears to be from the 1950's and will have some age deficiencies present.		
Slabs on Grade	Standard Slabs on Grade	A4010		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Slabs on Grade	*Comments:*	Graded lower due to age of oldest portion of building: Oldest building wing appears to be from the 1950's and will have some age deficiencies present.		
Water and Gas Mitigation	Building Subdrainage	A6010		90.00% Good
Superstructure	Roof Construction	B1020		90.00% Good
Exterior Vertical Enclosures	Exterior Walls	B2010		62.00% Fair
	Deficiencies:	Cracking, Peeling, Flaking, Other, Warped/Delaminating Finishes		
	Causes:	Moisture Intrusion, Other, Surface Damage		
	Comments:	Plywood sheathing at oldest portion of the building is delaminating and peeling. Portions of plywood but to grade at opening landings and have begun to chip and degrade. Clerestory infill panels appear to be dented and degraded. Some appearance of water ingress at corners of clerestory infill panels. Older roman brick veneer walls appear to have degraded mortar or stained mortar at shaded portions, and will require repointing.		
	Exterior Windows	B2020		62.00% Fair
	Deficiencies:	Excessive Heat Loss, Other		
	Causes:	Caulking/Weather Stripping, Flashing Failure		
	Comments:	Aluminum framed windows appear to be single pane in some locations. Aluminum finishes have worn and are stained and oxidized. Sealant joints appear to be degraded at aluminum windows. Vinyl window infills appear to have some exterior sealant joints hardening and cracking.		
	Exterior Doors and Grilles	B2050		30.00% Poor
	Deficiencies:	Deficient Hardware/Operating Parts, Not ADA Compliant, Other		
	Causes:	Material Condition, Other		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Exterior Vertical Enclosures	*Comments:*	Number of exterior doors lack accessible hardware. Some single pane wired glazing is present in doors. Exterior egress hardware at primary entries appears to be well past serviceable lifespan. Some hard inserts in previous lites at doors are not thermally efficient.		
	Exterior Louvers and Vents	B2070		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other, Screens		
	Comments:	Appears to be sheet metal hoods added to classroom ventilators. The hoods appear to be showing signs of rust and degradation from the underside where bird screen is present.		
Exterior Horizontal Enclosures	Roofing	B3010		30.00% Poor
	Deficiencies:	Leaking, Other		
	Causes:	Other		
	Comments:	Asphalt shingles: Moss growth at north slopes of difficult to access areas. Shingles appear to be aged past life span with visible cupping between shingles. Visible signs of leaking at attic area at slope transition. Built up Roofing: Appears to be an SBS built up assembly on other building wings. This roof appears aged but serviceable condition. Some flashings have signs of corrosion.		
	Roof Appurtenances	B3020		62.00% Fair
	Deficiencies:	Gutters/Downspouts Not Draining, Other		
	Causes:	Missing Drainage Components, Other		
	Comments:	Some downspouts have lost tightline connections to drain. Older sheet metal vent stacks are rusted.		
	Horizontal Openings	B3060		62.00% Fair
	Deficiencies:	Other		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Exterior Horizontal Enclosures	*Causes:*	Other		
	Comments:	Rating commensurate with age		
	Overhead Exterior Enclosures	B3080		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Deficiency: Wood-framed overhangs exceeding 4' would be required to be sprinklered by todays standards. Some damage to soffits and surfaces could use paint.		
Interior Construction	Interior Partitions	C1010		90.00% Good
	Interior Windows	C1020		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Deficiency: Windows onto hallways are typically provided with wired glass. This is no longer allowed by code.		
	Interior Doors	C1030		30.00% Poor
	Deficiencies:	Not ADA Compliant, Other		
	Causes:	Other		
	Comments:	Hardware not ADA compliant. Glazing in doors is wired glass. Fiber board inserts in some older doors.		
	Interior Grilles and Gates	C1040		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	rating commensurate with age		
	Raised Floor Construction	C1060		90.00% Good
Interior Finishes	Wall Finishes	C2010		62.00% Fair
	Deficiencies:	Other, Surface Appearance		
	Causes:	Other		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Interior Finishes	*Comments:*	Signs of wall repair where wall mounted items have been removed. The oldest 1950 portion of the building appears to have some original wall finishes present, possible hazardous materials could be present at wall plasters. Library and added wing with library appears to have aged and original finishes. Surface mounted conduit at many classroom locations due to ongoing technology upgrades and limited routing and access locations.		
	Flooring	C2030		30.00% Poor
	Deficiencies:	Broken or Loose Tiles, Other		
	Causes:	Other		
	Comments:	Many floors look to be very old. Older resilient floors (VCT, etc) appear stained and cracked due to age and use. Broadloom carpet requires replacement and is stained at many locations Some carpet replaced with carpet squares. Older terrazzo type flooring at corridor is in good condition.		
	Ceiling Finishes	C2050		30.00% Poor
	Deficiencies:	Other, Surface Appearance		
	Causes:	Other, Surface Damage		
	Comments:	Glue-on ceiling tiles at 1950's vintage classroom wing. The tiles appear to be stained and cracked in locations. Due to the vintage it is assumed that hazardous materials is present in the tiles or the tile adhesives. Specialty wood ceilings at the library and gymnasium are in good condition.		
Plumbing	Domestic Water Distribution	D2010		30.00% Poor
	Deficiencies:	Other		
	Causes:	Other		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Plumbing	*Comments:*	Deficiency: Most of the system is dated and some of the components have probably served their useful life. Fixtures are not water efficient and are not ADA compliant.		
	Sanitary Drainage	D2020		30.00% Poor
	Deficiencies:	Clogged Drains		
	Causes:	Other		
	Comments:	Drains clogging		
	Building Support Plumbing Systems	D2030		90.00% Good
HVAC	Facility Fuel Systems	D3010		90.00% Good
	Heating Systems	D3020		62.00% Fair
	Deficiencies:	Other, System Inefficient		
	Causes:	Equipment Obsolescence		
	Comments:	Deficiency: System is dated and is probably not energy efficient. Components have served their useful life. One boiler is nearing the end of its service life and one boiler is newer and in good condition.		
	Cooling Systems	D3030		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Equipment nearing the end of service life.		
	Facility HVAC Distribution Systems	D3050		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Equipment nearing the end of its service life.		
	Ventilation	D3060		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Ventilation equipment is nearing the end of service life.		
Fire Protection	Fire Suppression	D4010		0.00% Unsatisfactory

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Fire Protection	*Deficiencies:*	Code Violations, Other		
	Causes:	Other		
	Comments:	Deficiency: Building is not fire sprinklered. Would be required to be by todays standards.		
	Fire Protection Specialties	D4030		90.00% Good
Electrical	Electrical Services and Distribution	D5020		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other, System Undersized		
	Comments:	maxed out		
	General Purpose Electrical Power	D5030		62.00% Fair
	Deficiencies:	Access Hazards		
	Causes:	Other		
	Comments:	Some classrooms have a breaker box controlling lights and outlets. This is not compliant per current codes.		
	Lighting	D5040		62.00% Fair
	Deficiencies:	Other		
	Causes:	Bad Ballasts, Other		
	Comments:	Deficiency: Dated system. Does not have daylight or occupancy sensor controls.		
Communications	Data Communications	D6010		62.00% Fair
	Deficiencies:	Other		
	Causes:	Equipment Obsolescence		
	Comments:	Existing data standard is Cat-5. Current standards are Cat-6 or better.		
	Voice Communications	D6020		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Deficiency: Staff noted some coverage issues with the existing system. Existing data standard is Cat-5. Current standards are Cat-6 or better.		
	Audio-Video Communications	D6030		90.00% Good

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Communications	Distributed Communications and Monitoring	D6060		30.00% Poor
	Deficiencies:	Weak or Intermittent Com		
	Causes:	Equipment Obsolescence, Other		
	Comments:	Intercom system is no longer fully functional.		
Electronic Safety and Security	Detection and Alarm	D7050		30.00% Poor
	Deficiencies:	Other		
	Causes:	Equipment Obsolescence, Other		
	Comments:	Fire alarm system is past its useful life (30 years). Fire alarm system appears to have been upgraded, but existing devices that are no longer in use are still located throughout the facility. Fire alarm system is functioning but is not compliant with today's standards.		
Integrated Automation	Integrated Automation Facility Controls	D8010		30.00% Poor
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Controls system nearing the end of service life.		
Equipment	Commercial Equipment	E1030		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Equipment is functional, but dated. Appears to be a lack of exhaust ventilation at kitchen area.		
	Institutional Equipment	E1040		62.00% Fair
	Deficiencies:	Other		
	Causes:	Equipment Obsolescence, Other		
	Comments:	Deficiency: Equipment is functional, but dated.		
	Entertainment and Recreational Equipment	E1070		62.00% Fair
	Deficiencies:	Faulty Materials		
	Causes:	Equipment Obsolescence		
	Other Equipment	E1090		62.00% Fair

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Equipment	*Deficiencies:*	Other		
	Causes:	Other		
	Comments:	Rating commensurate with age		
Furnishings	Fixed Furnishings	E2010		30.00% Poor
	Deficiencies:	Surface Deterioration		
	Causes:	Deterioration		
	Comments:	Wall mounted casework and shelving is aged past useful life and shows some minor signs of delamination at edges.		
	Movable Furnishings	E2050		30.00% Poor
	Deficiencies:	Surface Deterioration		
	Causes:	Deterioration		
	Comments:	Existing furnishings are old and not up to modern standards. Older student fixtures and amenities require update and replacement.		

TCF

1.3.7 // Miller Junior High School

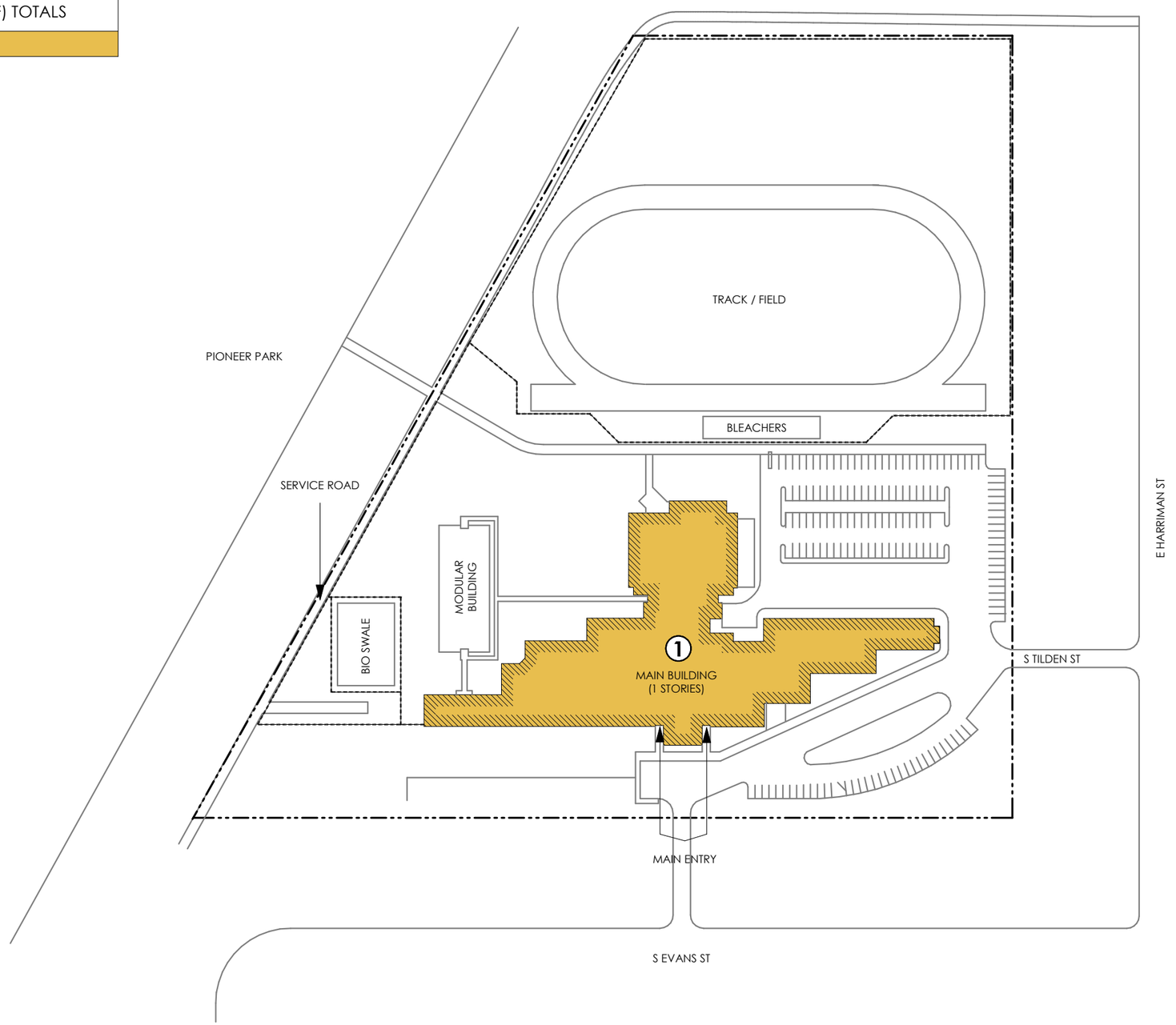
- Site Plan
- Building Plan and Area Summary
- Area Analysis
- Site & Building Condition Assessment

MILLER JR HIGH SCHOOL

Gross Area & Site Plan

BUILDING NUMBER	BUILDING NAME	GROSS* SQUARE FOOT (SF) TOTALS
1	MAIN BUILDING	88890

*Gross sqft totals for recognized buildings only



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www.tcfarchitecture.com
P.253.572.3993

Client

ABERDEEN SCHOOL DISTRICT

Project

ASD-STUDY SURVEY

2025-008

MILLER JR HS

ABERDEEN WA, US

Issue & Revision Dates

10 SEPTEMBER 2025

Not for Construction

SITE INFORMATION PER AS-BUILTS PROVIDED BY OWNER DATED 10/21/2005

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9/11/2025 11:41:35 AM

MILLER JR HIGH SCHOOL

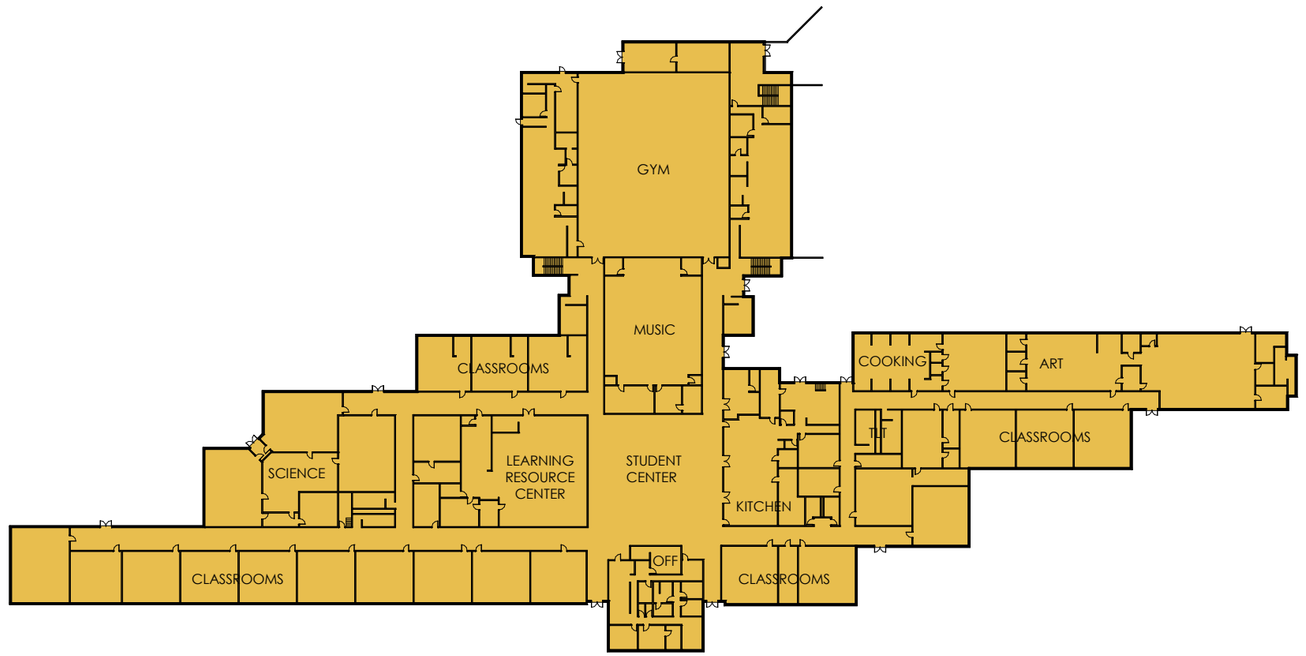
First Floor Plan

BUILDING NUMBER	BUILDING NAME	GROSS* SQUARE FOOT (SF) TOTALS
1	MAIN BUILDING	88890

*Gross sqft totals for recognized buildings only

1

MAIN BUILDING
(1 STORIES)



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NORTH

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Client

ABERDEEN SCHOOL DISTRICT

Project

ASD-STUDY SURVEY

2025-008

MILLER JR HS

ABERDEEN WA, US

Issue & Revision Dates

10 SEPTEMBER 2025

Not for Construction

SITE INFORMATION PER AS-BUILTS PROVIDED BY OWNER DATED 10/21/2005

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Miller Junior High School
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STATE OF WASHINGTON - SUPERINTENDENT OF PUBLIC INSTRUCTION
SITE CONDITION RATING SUMMARY
ABERDEEN SCHOOL DISTRICT (14005)

MILLER JUNIOR HIGH SCHOOL

Profile Name: Middle/Junior High School - Rural **Last Review:** 8/20/2025

Inventory Status: Recognized

Condition Rating: 51.18 %

		Condition Rating						Component	Priority		
Sub-Assembly	**Component**	**E**	**G**	**F**	**P**	**U**	**N/A**	**Score**	**L**	**M**	**H**
Site Improvement											
G2010	Roadways	☐	☐	☑	☐	☐	☐	62 %	☐	☐	☐
G2020	Parking Lots	☐	☐	☐	☑	☐	☐	30 %	☐	☐	☐
G2030	Pedestrian Plazas and Walkways	☐	☐	☐	☑	☐	☐	30 %	☐	☐	☐
G2050	Athletic, Recreational and Playfields Areas	☐	☑	☐	☐	☐	☐	90 %	☐	☐	☐
G2060	Site Development	☐	☐	☐	☑	☐	☐	30 %	☐	☐	☐
G2080	Landscaping	☐	☐	☐	☑	☐	☐	30 %	☐	☐	☐
Liquid and Gas Site Utilities											
G3010	Water Utilities	☐	☑	☐	☐	☐	☐	90 %	☐	☐	☐
G3020	Sanitary Sewerage Utilities	☐	☑	☐	☐	☐	☐	90 %	☐	☐	☐
G3030	Storm Drainage Utilities	☐	☐	☐	☑	☐	☐	30 %	☐	☐	☐
Electrical Site Improvements											
G4010	Site Electric Distribution Systems	☐	☑	☐	☐	☐	☐	90 %	☐	☐	☐
G4050	Site Lighting	☐	☐	☑	☐	☐	☐	62 %	☐	☐	☐
Site Communications											
G5010	Site Communications Systems	☐	☑	☐	☐	☐	☐	90 %	☐	☐	☐

Miller Junior High School - Main Building

Building Details

PROFILE TYPE	Middle/Junior High School - Multi-Story
NUMBER OF FLOORS	2
CHARACTERISTICS	Occupied

Building Inventory

AREA YEAR BUILT	DISTRICT ASSIGNED AREA	GROSS BUILDING SQ FT	GROSS INSTRUCTIONAL SQ FT	SCAP RECOGNIZED SQ FT	ORIGINAL OCCUPANCY DATE	ORIGINAL BOARD ACCEPTANCE DATE
1979	Main Floors 1 and 2	88,890	88,890	88,890		
	Building Totals	**88,890**	**88,890**	**88,890**		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Foundations	Standard Foundation	A1010		62.00% Fair
	Deficiencies:	Cracking, Other, Settlement		
	Causes:	Other		
	Comments:	Appears to be evidence of settlement around the building. Some cracking at outside brick corners. Walkways into building have cracked and are separating.		
Slabs on Grade	Standard Slabs on Grade	A4010		90.00% Good
	Pits and Bases	A4040		90.00% Good
Water and Gas Mitigation	Building Subdrainage	A6010		62.00% Fair
	Deficiencies:	Other		
	Causes:	Building Settlement		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Water and Gas Mitigation	*Comments:*	Appearance of soil settlement around the perimeter of the building. It is assumed that the drainage along the perimeter is affected due to this evidence.		
Superstructure	Floor Construction	B1010		90.00% Good
	Roof Construction	B1020		90.00% Good
	Stairs	B1080		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Access stairs only to upper attic - Downgraded due to age.		
Exterior Vertical Enclosures	Exterior Walls	B2010		30.00% Poor
	Deficiencies:	Cracking, Peeling, Flaking, Damaged Masonry, Excessive Heat Loss, Rot or Corrosion		
	Causes:	Inadequate Insulation, Moisture Penetration, Other, Structural and Frame Movement		
	Comments:	Wood siding shows evidence of excessive moisture staining especially at gym areas. This may be due to moisture build up or lack of insulation or vapor barriers. Brick veneer is cracking at locations of settlement, mortar appears to be ageing and older in some locations. Brick is stained in specific locations. Brick is broken at some door jamb locations.		
	Exterior Windows	B2020		30.00% Poor
	Deficiencies:	Excessive Heat Loss, Rot or Corrosion		
	Causes:	Material Condition, Other, U-Value		
	Comments:	Single pane glazing. Windows show excessive corrosion at some locations and will need replacement. Hollow metal frames are rusted and show signs of failure. Aluminum frames are showing age and show some open joints.		
	Exterior Doors and Grilles	B2050		30.00% Poor

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Exterior Vertical Enclosures	*Deficiencies:*	Not ADA Compliant, Other		
	Causes:	Frame/Molding Condition, Material Condition, Other		
	Comments:	Single pane or wired glazing in exterior door lites Due to settlement many door locations are not accessible as paving has settled below 1/2" of thresholds. Hardware and age of door is at service life.		
	Exterior Louvers and Vents	B2070		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Exterior louvers are aged and show signs of corrosion		
Exterior Horizontal Enclosures	Roofing	B3010		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Moss growth was present at roof shading areas. Shingles appear to be "mid-life" with some minor cupping issues. Evidence of roof run-off issues with bulk water (see appurtenances), this may be what is contributing to building settlement issues around the perimeter of the building. Some drip flashings appear to be missing over entry ways.		
	Roof Appurtenances	B3020		30.00% Poor
	Deficiencies:	Gutters/Downspouts Not Draining, Roof Drains Not Draining		
	Causes:	Faulty Design		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Exterior Horizontal Enclosures	*Comments:*	Gutters appear to be inadequately sized and located to deal with water run-off, assumption is that water is overshooting gutters and causing excessive soil degradation around the building. Open daylight draining downspouts appear to be splashing water out and possibly accelerating grade wear around the building. Roof mounted hoods and vents are corroded.		
	Horizontal Openings	B3060		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Rated fair due to age.		
	Overhead Exterior Enclosures	B3080		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Sained wood at soffit areas. Appears to be bird nuisance issue with evidence of birds roosting in rafter areas.		
Interior Construction	Interior Partitions	C1010		62.00% Fair
	Deficiencies:	Cracks, Tears, Holes, Looseness, Damaged or Missing Materials		
	Causes:	Other		
	Comments:	There are some cracks in gwb and CMU walls. Staff noted that they are from the Nisqually quake and have been checked out by engineers and deemed to be structurally sound. Graded due to age of walls and facility, wear and tear is normal for the age of the facility.		
	Interior Windows	C1020		30.00% Poor
	Deficiencies:	Other		
	Causes:	Other		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Interior Construction	*Comments:*	Most all interior glazing was noted to be wired glass. Wired glass is no longer allowed by code. It appears to have been used in rated conditions and conditions where safety glass is required.		
	Interior Doors	C1030		30.00% Poor
	Deficiencies:	Not ADA Compliant, Other		
	Causes:	Other		
	Comments:	Interior door handles are a combination of lever and knob type hardware. They are being replaced with lever type hardware as they fail. All should knobs should be changed out to lever type hardware to meet ADA. Door lites had wired glazing.		
	Interior Grilles and Gates	C1040		90.00% Good
	Suspended Ceiling Construction	C1070		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Deficiency: There were a few damaged/stained tiles noted. Most suspended ceiling appears to be from original construction and probably does not meet current code for seismic.		
Interior Finishes	Wall Finishes	C2010		62.00% Fair
	Deficiencies:	Cracking, Peeling, Flaking, Other		
	Causes:	Other		
	Comments:	Deficiency: See C1010 above. Wall carpet has been applied to the walls in the corridors. It is stained and the adhesive seems to be failing ins some areas. Staff noted that it is hard to clean. HOwever, they noted that it has made the hallways much quieter than the original plam wainscot.		
	Interior Fabrications	C2020		62.00% Fair
	Deficiencies:	Surface Appearance		
	Causes:	Other		
	Comments:	rating commensurate with age		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Interior Finishes	Flooring	C2030		62.00% Fair
	Deficiencies:	Stains, Discoloration		
	Causes:	Other		
	Comments:	Deficiency: Carpet flooring is showing signs of wear and age.		
	Stair Finishes	C2040		90.00% Good
	Ceiling Finishes	C2050		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Miscellaneous areas of damaged/stained ceiling finishes were noted throughout the facility. Mismatched ceiling tiles due to replacement over time.		
Plumbing	Domestic Water Distribution	D2010		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Deficiency: Most of the system is functional and has not posed problems. Fixtures are from original construction and are near the end of their life expectancy. They are not ADA compliant and are presumably not water efficient.		
	Sanitary Drainage	D2020		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	System is nearing the end of service life.		
	Building Support Plumbing Systems	D2030		90.00% Good
	General Service Compressed-Air	D2050		90.00% Good
HVAC	Facility Fuel Systems	D3010		90.00% Good
	Comments:	Deficiency: Gas meter assembly is located off of the back parking lot. It is not secured/protected. Should consider providing a chainlink enclosure.		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
HVAC	Heating Systems	D3020		90.00% Good
	Comments:			
	Facility HVAC Distribution Systems	D3050		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Air handling equipment is nearing the end of service life. Some units were observed to be out of balance and noisy.		
	Ventilation	D3060		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Air handling equipment is nearing the end of service life.		
Fire Protection	Fire Suppression	D4010		90.00% Good
	Fire Protection Specialties	D4030		62.00% Fair
	Deficiencies:	Extinguishers Missing		
	Causes:	Other		
	Comments:	Deficiency: At least one cabinet was noted to have a missing extinguisher. Staff noted that, because the building is sprinkled, extinguishers had been removed from some locations where cabinets couldn't be secured to avoid tampering by students. The school should review extinguisher locations with the Fire Marshal to confirm whether they are in compliance.		
Electrical	Facility Power Generation	D5010		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Deficiency: Staff noted that there is a generator, but that they believed that it was only to power the refrigerators/freezers at the Kitchen. They noted that the generator doesn't support lighting and other building necessities.		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Electrical	Electrical Services and Distribution	D5020		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other, System Undersized		
	Comments:	Deficiency: Equipment is vintage to the original construction. Building is 34 years old and equipment is nearing the end of its expected useful life. Current technology requires a lot more power than when the building was originally constructed. This presents a challenge.		
	General Purpose Electrical Power	D5030		62.00% Fair
	Deficiencies:	Other		
	Causes:	Loose Connections, Other, System Undersized		
	Comments:	Electrical system and location/quantity of outlets doesn't support the needs of new technology. Many outlets have pieces broken off of them, especially near the ground.		
	Lighting	D5040		62.00% Fair
	Deficiencies:	Other		
	Causes:	Emergency Lighting Not Working, Other		
	Comments:	The only lights that are sensor controlled are the Gymnasium. Occupancy sensors were added at the Gym a while back. None of the other spaces have occupancy or daylight sensors. Lighting system should be updated to meet current code for energy efficiency. Exit signs are underlit.		
Communications	Data Communications	D6010		62.00% Fair
	Deficiencies:	Other		
	Causes:	Equipment Obsolescence		
	Comments:	Existing data standard is Cat-5. Current standards are Cat-6 or better.		
	Voice Communications	D6020		62.00% Fair
	Deficiencies:	Other		
	Causes:	Equipment Obsolescence		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Communications	*Comments:*	Existing data standard is Cat-5. Current standards are Cat-6 or better.		
	Audio-Video Communications	D6030		90.00% Good
	Distributed Communications and Monitoring	D6060		30.00% Poor
	Deficiencies:	Other, Weak or Intermittent Com		
	Causes:	Equipment Obsolescence, Other		
	Comments:	Existing system is Visiplex, which is a radio based intercom system. This system does not adequately transmit through this building, causing communication issues.		
Electronic Safety and Security	Access Control and Intrusion Detection	D7010		90.00% Good
	Electronic Surveillance	D7030		90.00% Good
	Deficiencies:	Blind Zones , Other		
	Causes:	Equipment Obsolescence, Insufficient Equipment, Other		
	Comments:	Deficiency: Staff noted that the cameras that are in the building are basically not functioning. The system does not operate or function. A new system is needed. New system installed - SK		
	Detection and Alarm	D7050		90.00% Good
Integrated Automation	Integrated Automation Facility Controls	D8010		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Controls nearing the end of service life.		
Equipment	Commercial Equipment	E1030		90.00% Good
	Deficiencies:	Other		
	Causes:	Age Deterioration, Other		
	Comments:	Food service equipment is dated but still functions.		
	Institutional Equipment	E1040		90.00% Good
	Deficiencies:	Other		
	Causes:	Equipment Obsolescence, Other		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Equipment	*Comments:*	A/V equipment does not appear to match district standards at some classrooms.		
	Entertainment and Recreational Equipment	E1070		62.00% Fair
	Deficiencies:	Other		
	Causes:	Equipment Deterioration, Equipment Obsolescence, Other		
	Comments:	Gym equipment appears to be serviceable. Gym lockers are dented and appear to be mis-matched due to ongoing repairs or replacement. Showering facilities are obsolete. Weight room lacks adequate flooring. Upper gym loft area looks to be partially used.		
	Other Equipment	E1090		62.00% Fair
	Deficiencies:	Other, Unsightly		
	Causes:	Other		
	Comments:	No dumpster enclosure currently being used.		
Furnishings	Fixed Furnishings	E2010		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Casework is dated and original but in useable condition. Program areas have changed and casework no longer matches needs.		
	Movable Furnishings	E2050		62.00% Fair
	Deficiencies:	Surface Deterioration		
	Causes:	Deterioration, Other		
	Comments:	Deficiency: Furnishings are functional but dated.		

TCF

1.3.8 // Hopkins Building (Harbor High Scool)

- Site Plan
- Building Plan and Area Summary
- Area Analysis
- Site & Building Condition Assessment

HOPKINS BUILDING

Gross Area & Site Plan

BUILDING NUMBER	BUILDING NAME	GROSS* SQUARE FOOT (SF) TOTALS
1	HOPKINS BUILDING	53604

*Gross sqft totals for recognized buildings only



0 50' 100' 200'

NORTH

TCF
124 North 'I' St. Tacoma, WA
www.tcfarchitecture.com
P.253.572.3993

Client

ABERDEEN SCHOOL DISTRICT

Project

ASD-STUDY SURVEY

2025-008

HOPKINS BUILDING

ABERDEEN WA, US

Issue & Revision Dates

10 SEPTEMBER 2025

Not for Construction

SITE INFORMATION PER AS-BUILTS PROVIDED BY OWNER DATED 10/21/2005

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HOPKINS BUILDING

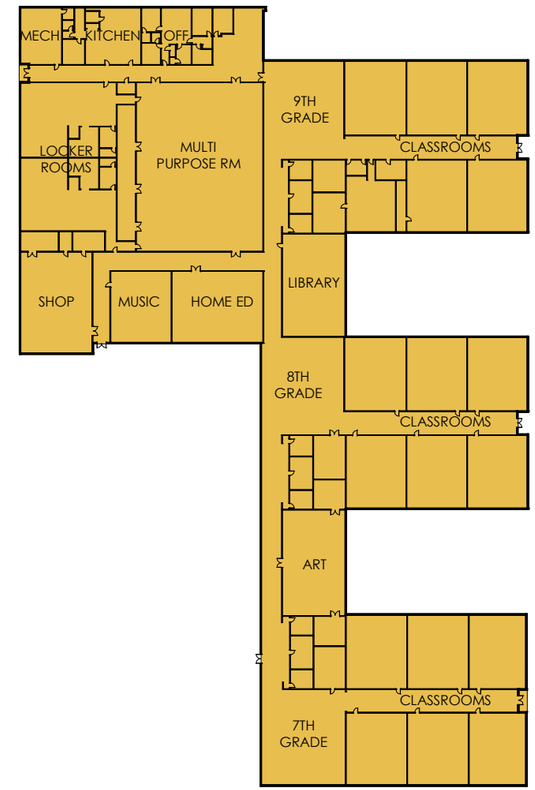
First Floor Plan

BUILDING NUMBER	BUILDING NAME	GROSS* SQUARE FOOT (SF) TOTALS
1	HOPKINS BUILDING	53604

*Gross sqft totals for recognized buildings only

1

HOPKINS BUILDING
(1 STORY)



0 50' 100' 200'

NORTH

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ABERDEEN SCHOOL DISTRICT

Project

ASD-STUDY SURVEY

2025-008

HOPKINS BUILDING

ABERDEEN WA, US

Issue & Revision Dates

10 SEPTEMBER 2025

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Hopkins Building / Harbor Learning Center
Aberdeen School District - Area Analysis District Summary

Campus/Site	Building Name	Building Area Description (and Area Number/Letter, if applicable)	Year Built (Original Facility)	If Project Final Board Acceptance was within 30 years							Gross SF	SCAP-Recognized SF
				ALL New Construction (SCAP or locally funded)			APP (OSPI Only)	SCAP-funded Modernizations ONLY				
				If SCAP-funded or locally funded New Construction, Include SCAP Project Number if applicable (see Report 1 in ICOS)	**If SCAP-funded include Final Board Acceptance Date on Resolution** or **If locally funded New Construction, Board discussion of completion** (per Notes 1 & 2 below	**Copy of Board Resolution uploaded in ICOS?** (See Note 3 Below)	New or N/L SCAP Funded Construction after 1/1/1994	**If SCAP funded Modernization**, Include SCAP Project Number per Report 1 (found in ICOS)	**If SCAP-funded Modernization,** include Final Board Acceptance Date (see Report 1 in ICOS)	**Copy of Board Resolution uploaded in ICOS?** (See Notes 1 & 2 Below)		
Hopkins Building	**Hopkins Building**	**Hopkins Building**	1956								**53,604**	**53,604**
										Subtotal	**53,604**	**53,604**
										District Totals	**53,604**	**53,604**

Notes

1 - The final board acceptance date is required for all SCAP-funded projects (new buildings, additions, and modernizations) completed in the last 30 years (see Report 1 in ICOS)
2 - For locally funded buildings and additions constructed in the past 30 years, the final board acceptance date must be provided. If the district does not have a final board resolution, then a copy of board meeting minutes stating completion of project is acceptable.
3 - A copy of the Final Acceptance Board Resolution for all buildings or building areas constructed or modernized, SCAP Funded or Locally, must be uploaded into ICOS.
4 - All square footage calculations must be measured to the exterior walls, exluding overhangs.
5 - Area calculations are in accordance AIA Document D-101 and WAC 392-343-019.
6 - All covered play areas and covered outdoor learning areas are calculated to the eave line, and counted at 1/2 the square footage.
7 - All building and area names, dates, and square footage figures are exactly equal to data shown on area analysis plans/diagram and data entered in ICOS.

STATE OF WASHINGTON - SUPERINTENDENT OF PUBLIC INSTRUCTION
SITE CONDITION RATING SUMMARY
ABERDEEN SCHOOL DISTRICT (14005)

HOPKINS BUILDING (HARBOR HIGH SCHOOL)

Profile Name: High School - Rural **Last Review:** 8/19/2025

Inventory Status: Recognized

Condition Rating: 45.08 %

Sub-Assembly	Component	Condition Rating E	G	F	P	U	N/A	Component Score	Priority L	M	H
Site Improvement											
G2010	Roadways	☐	☐	☐	☑	☐	☐	30 %	☐	☐	☐
G2020	Parking Lots	☐	☐	☐	☑	☐	☐	30 %	☐	☐	☐
G2030	Pedestrian Plazas and Walkways	☐	☐	☐	☑	☐	☐	30 %	☐	☐	☐
G2060	Site Development	☐	☐	☐	☑	☐	☐	30 %	☐	☐	☐
G2080	Landscaping	☐	☐	☑	☐	☐	☐	62 %	☐	☐	☐
Liquid and Gas Site Utilities											
G3010	Water Utilities	☐	☑	☐	☐	☐	☐	90 %	☐	☐	☐
G3020	Sanitary Sewerage Utilities	☐	☐	☑	☐	☐	☐	62 %	☐	☐	☐
G3030	Storm Drainage Utilities	☐	☐	☐	☑	☐	☐	30 %	☐	☐	☐
Electrical Site Improvements											
G4010	Site Electric Distribution Systems	☐	☐	☑	☐	☐	☐	62 %	☐	☐	☐
G4050	Site Lighting	☐	☐	☑	☐	☐	☐	62 %	☐	☐	☐
Site Communications											
G5010	Site Communications Systems	☐	☑	☐	☐	☐	☐	90 %	☐	☐	☐

Hopkins Building (Harbor High School) - Hopkins Building

Building Details

PROFILE TYPE	High School - Single Story
NUMBER OF FLOORS	1
CHARACTERISTICS	Occupied
COMMENTS	Harbor High School is the alternative High School for the Aberdeen School District. It shares its building with the Hopkins Preschool Center. Building area has been divided between the two programs.

Building Inventory

AREA YEAR BUILT	DISTRICT ASSIGNED AREA	GROSS BUILDING SQ FT	GROSS INSTRUCTIONAL SQ FT	SCAP RECOGNIZED SQ FT	ORIGINAL OCCUPANCY DATE	ORIGINAL BOARD ACCEPTANCE DATE
1956	High School	40,809	40,809	40,809		
1956	Gymnasium	6,542	6,542	6,542		
1956	Daycare	4,752	4,752	0		
1956	Pre School	1,501	1,501	0		
	Building Totals	**53,604**	**53,604**	**47,351**		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Foundations	Standard Foundation	A1010		0.00% Unsatisfactory
	Deficiencies:	Other, Settlement		
	Causes:	Design Loads, Other		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Foundations	*Comments:*	This building has signs of excessive settlement some walls and structural elements (columns) have lost contact with the foundations due to settlement, this should be considered a failed condition requiring correction.		
Slabs on Grade	Standard Slabs on Grade	A4010		0.00% Unsatisfactory
	Deficiencies:	Major Cracking/Buckling, Settlement		
	Causes:	Other		
	Comments:	Considerable settlement of floor slabs in the corridor, could be difficult to navigate for people with disabilities. This settlement level would grade this floor slab as unacceptable and would required correction.		
Water and Gas Mitigation	Building Subdrainage	A6010		30.00% Poor
	Deficiencies:	Other		
	Causes:	Building Settlement		
	Comments:	Obvious signs of issues with downspouts being rerouted and severe settlement issues.		
Superstructure	Roof Construction	B1020		62.00% Fair
	Deficiencies:	Leaking, Other		
	Causes:	Heaving, Moisture Intrusion, Other		
	Comments:	Settlement of the foundation could have effected and limited roof bearing capacity.		
Exterior Vertical Enclosures	Exterior Walls	B2010		30.00% Poor
	Deficiencies:	Cracking, Peeling, Flaking, Efflorescence and Staining, Excessive Heat Loss, Other		
	Causes:	Inadequate Insulation, Moisture Intrusion, Other, Structural and Frame Movement		
	Comments:	Concrete wainscotting walls are severally cracked in locations, evidence of "stop-gap" sealing of the cracks and water-intrusion of the concrete.		
	Exterior Windows	B2020		0.00% Unsatisfactory
	Deficiencies:	Broken Glass, Excessive Heat Loss, Other, Rot or Corrosion		
	Causes:	Flashing Failure, Frame/Molding Condition, Other, U-Value		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Exterior Vertical Enclosures	*Comments:*	Windows are in a state of effective failure. Single pane stopped in glazing. Glazing puddy has hardened and cracked in multiple locations. Evidence of extreme water ingress at window areas. Severed condensation issues at east facing exposures where the staff place towels to collect condensation.		
	Exterior Doors and Grilles	B2050		62.00% Fair
	Deficiencies:	Deficient Hardware/Operating Parts		
	Causes:	Material Condition		
	Comments:	Door hardware is not accessible in some limited secondary locations.		
	Exterior Louvers and Vents	B2070		62.00% Fair
	Deficiencies:	Faulty Material		
	Causes:	Material Condition		
	Comments:	Exterior louvers require cleaning.		
Exterior Horizontal Enclosures	Roofing	B3010		0.00% Unsatisfactory
	Deficiencies:	Leaking, Other		
	Causes:	Flashing Failure, Other, Surface Weathering		
	Comments:	Roof has evidence of extensive leaking. Lack of perimeter flashing at eaves has caused premature rot at wood fascia boards.		
	Horizontal Openings	B3060		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other, Surface Weathering		
	Comments:	rating commensurate with age		
Interior Construction	Interior Partitions	C1010		30.00% Poor
	Deficiencies:	Cracks, Tears, Holes, Looseness		
	Causes:	Defective Material, Settlement		
	Comments:	Extensive surface mounted conduits. Wall base has separated at areas where the flooring has settled. Some partitions are no longer in contact with the flooring.		
	Interior Windows	C1020		62.00% Fair
	Deficiencies:	Other		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Interior Construction	*Causes:*	Other		
	Comments:	Deficiency: Most of the interior glazing is wired glass which is no longer allowed by the code.		
	Interior Doors	C1030		30.00% Poor
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Many hardware locksets are not ADA compliant at public areas. Wire glazing is present in doors.		
	Interior Grilles and Gates	C1040		30.00% Poor
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Manually operating gates present, not ideal to be used.		
	Suspended Ceiling Construction	C1070		30.00% Poor
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Limited suspended ceiilngs: Majority of ceiling is surface mounted tectum. Some limited cloud areas look to lack seismic bracing.		
Interior Finishes	Wall Finishes	C2010		30.00% Poor
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Deficiency: Wall finishes are fairly basic and are showing their age and wear.		
	Flooring	C2030		30.00% Poor
	Deficiencies:	Irregular Surface, Other		
	Causes:	Other		
	Comments:	Deficiency: Settlement has created some flooring challenges. There are sharp breaks in the floor slope that wouldn't meet ADA. Flooring materials are worn and showing age. Gym floor has issues due to differential settlement of floor beneath and walls at perimeter.		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Interior Finishes	Ceiling Finishes	C2050		62.00% Fair
	Deficiencies:	Other, Surface Appearance		
	Causes:	Defective Material, Other, Surface Damage		
	Comments:	Older Tectum type ceiling, stained in many locations. ACT is mismatched due to various damage replacements. Glue on acoustical ceilings at some locations with stains open edges.		
Plumbing	Domestic Water Distribution	D2010		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Deficiency: Much of the system is old and dated. Fixtures are not ADA or energy efficient. Piping is galvanized steel and presumed to have issues due to age and possibly due to building settlement.		
	Sanitary Drainage	D2020		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Deficiency: Similar to domestic water systems, sanitary drainage is also old/dated and may have some issues related to building settlement.		
	Building Support Plumbing Systems	D2030		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	System nearing the end of service life.		
HVAC	Facility Fuel Systems	D3010		90.00% Good
	Heating Systems	D3020		62.00% Fair
	Deficiencies:	Excessive Heat Fluctuation, Insufficient Heat, Other		
	Causes:	Equipment Obsolescence, Other		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
HVAC	*Comments:*	Deficiency: Staff noted that there are issues due to the age of the components in the HVAC system. Appears boiler has been replaced sometime within the last 15 year.		
	Facility HVAC Distribution Systems	D3050		62.00% Fair
	Deficiencies:	System Inefficient		
	Causes:	Equipment Obsolescence		
	Comments:	Some units are noisy. Equipment nearing the end of service life.		
	Ventilation	D3060		62.00% Fair
	Deficiencies:	Incomplete Coverage, Stuffy Areas		
	Causes:	Equipment Obsolescence		
	Comments:	Equipment nearing the end of its service life. Some occupied spaces do not have mechanical ventilation and require opening operable windows.		
Fire Protection	Fire Protection Specialties	D4030		90.00% Good
Electrical	Electrical Services and Distribution	D5020		30.00% Poor
	Deficiencies:	Access Hazards, Other		
	Causes:	Equipment Obsolescence, Other		
	Comments:	Electrical distribution equipment is beyond its typical lifespan (30 years). Many rooms are equipped with circuit breakers as the means to switch outlets and lights on and off. This is no longer code compliant.		
	General Purpose Electrical Power	D5030		62.00% Fair
	Deficiencies:	Other		
	Causes:	Equipment Obsolescence		
	Comments:	Electrical equipment is beyond its typical lifespan (30 years).		
	Lighting	D5040		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Electrical	*Comments:*	Deficiency: No occupancy or daylight sensors, except at the Gym where lighting was upgraded and sensors were added. Lighting is not energy efficient.		
Communications	Data Communications	D6010		62.00% Fair
	Deficiencies:	Other		
	Causes:	Equipment Obsolescence		
	Comments:	Building data standard is Cat-5. Current standards are Cat-6 or above.		
	Voice Communications	D6020		62.00% Fair
	Deficiencies:	Other		
	Causes:	Equipment Obsolescence		
	Comments:	Building data standard is Cat-5. Current standards are Cat-6 or above.		
	Audio-Video Communications	D6030		90.00% Good
	Distributed Communications and Monitoring	D6060		30.00% Poor
	Deficiencies:	Other		
	Causes:	Equipment Obsolescence		
	Comments:	Deficiency: Systems are old and devices are outdated.		
Electronic Safety and Security	Electronic Surveillance	D7030		90.00% Good
	Detection and Alarm	D7050		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Building only has secure access control and alarm on the main door. Equipment on this door was non-functional at the time of the site visit.		
Integrated Automation	Integrated Automation Facility Controls	D8010		62.00% Fair
	Deficiencies:	Other		
	Causes:	Equipment Obsolescence		
	Comments:	Controls nearing the end of service life.		
Equipment	Commercial Equipment	E1030		62.00% Fair
	Deficiencies:	Other		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Equipment	*Causes:*	Other		
	Comments:	Deficiency: Oven at the Kitchen has hot/cold spots and requires attention. Need additional refrigeration space. Current refrigerator doesn't hold adequate temperature.		
	Entertainment and Recreational Equipment	E1070		62.00% Fair
	Deficiencies:	Unsightly		
	Causes:	Equipment Deterioration		
	Other Equipment	E1090		90.00% Good
Furnishings	Fixed Furnishings	E2010		62.00% Fair
	Deficiencies:	Surface Deterioration		
	Causes:	Deterioration		
	Movable Furnishings	E2050		62.00% Fair
	Deficiencies:	Surface Deterioration		
	Causes:	Deterioration		
	Comments:	Student furnishings appear to have some new pieces mixed with older chairs and tables. Staff equipment is aged and requires replacement.		

TCF

1.3.9 // J.M. Weatherwax High School

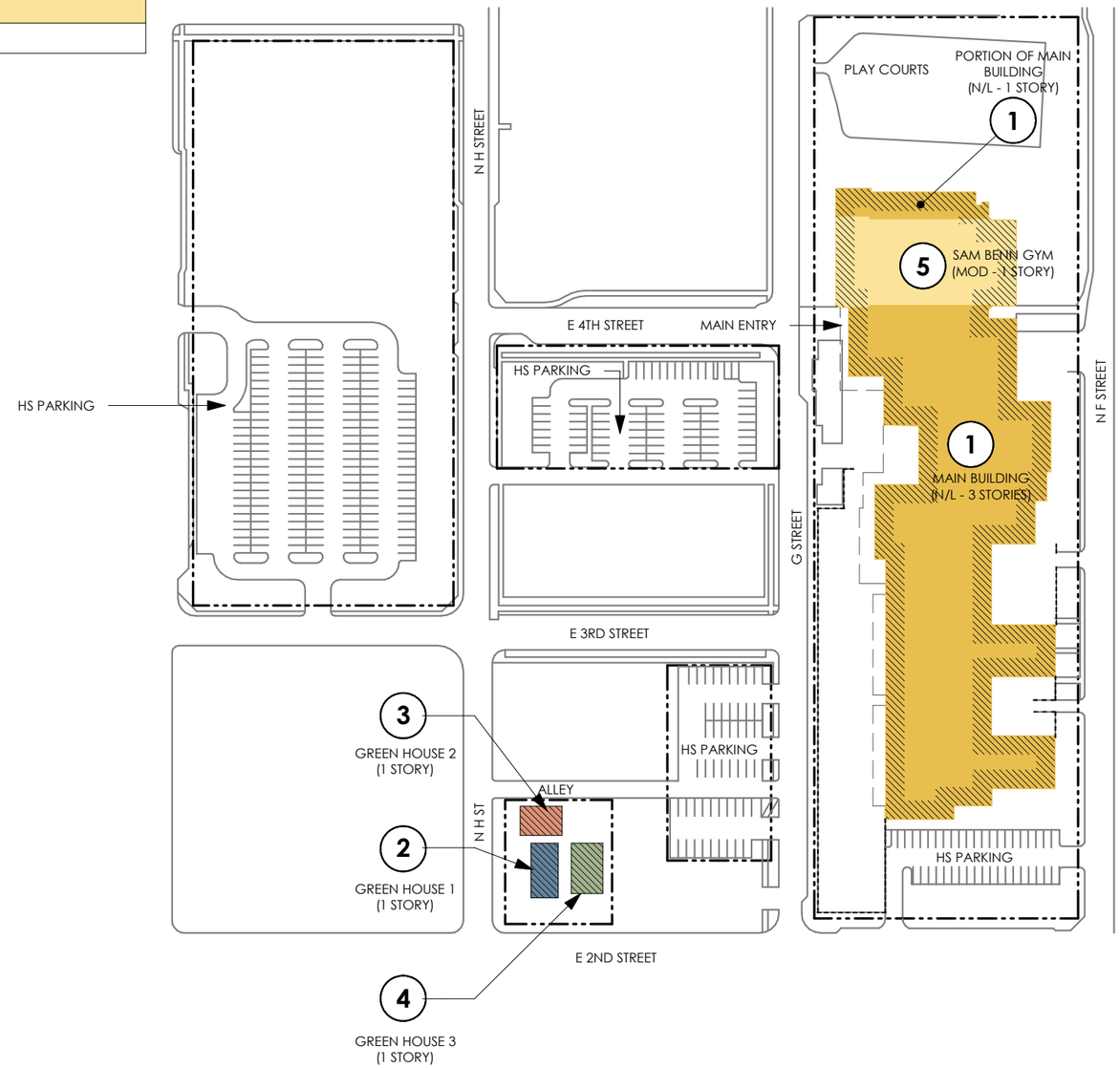
- Site Plan
- Building Plan and Area Summary
- Area Analysis
- Site & Building Condition Assessment

JM WEATHERWAX HIGHSCOOL

Gross Area & Site Plan

BUILDING NUMBER	BUILDING NAME	GROSS* SQUARE FOOT (SF) TOTALS
1	MAIN BUILDING (N/L)	173011
2	GREEN HOUSE 1	1800
3	GREEN HOUSE 2	1080
4	GREEN HOUSE 3	1200
5	SAM BENN GYM (MOD)	27409
		204500

*Gross sqft totals for recognized buildings only



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Client
ABERDEEN SCHOOL DISTRICT

Project
ASD-STUDY SURVEY

2025-008
JM WEATHERWAX HS

ABERDEEN WA, US

Issue & Revision Dates
10 SEPTEMBER 2025
Not for Construction

SITE INFORMATION PER AS-BUILTS PROVIDED BY OWNER DATED 10/21/2005

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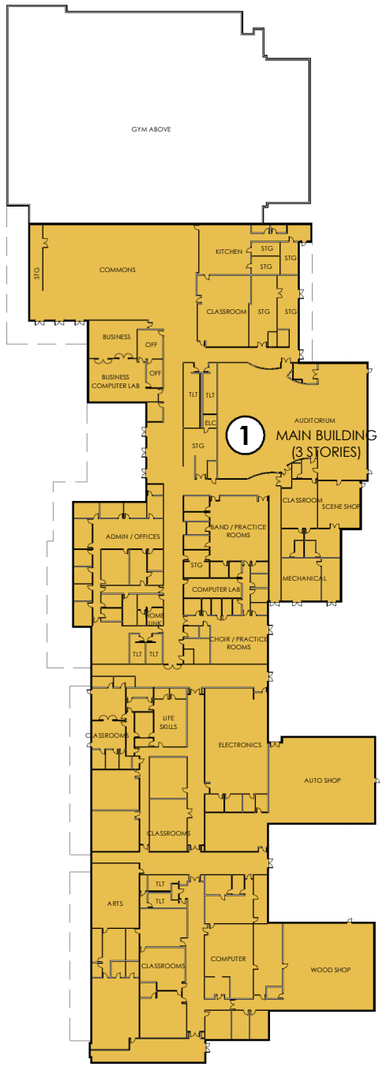
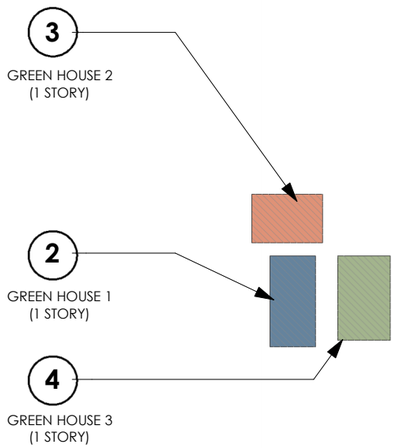
JM WEATHERWAX HIGHSCHOOL

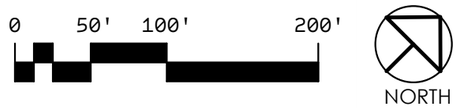
First Floor Plan

BUILDING NUMBER	BUILDING NAME	GROSS* SQUARE FOOT (SF) TOTALS
1	MAIN BUILDING (N/L)	173011
2	GREEN HOUSE 1	1800
3	GREEN HOUSE 2	1080
4	GREEN HOUSE 3	1200
5	SAM BENN GYM (MOD)	27409
		204500

*Gross sqft totals for recognized buildings only







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2025-008

JM WEATHERWAX HS

ABERDEEN WA, US

Issue & Revision Dates

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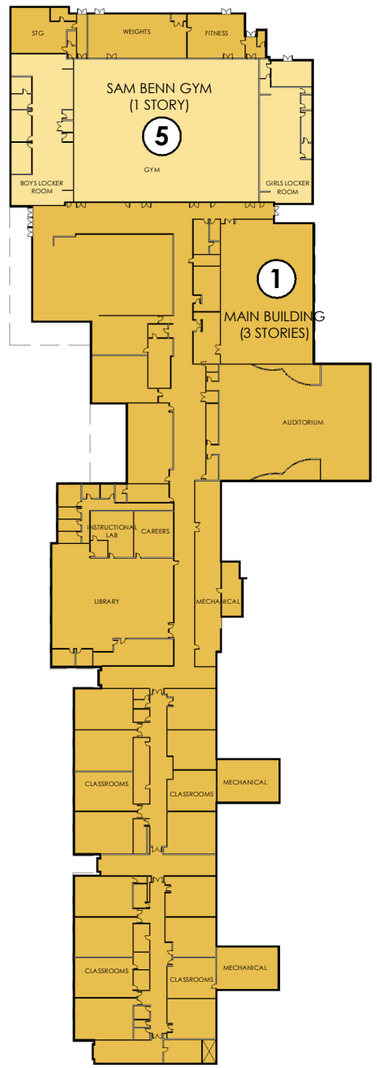
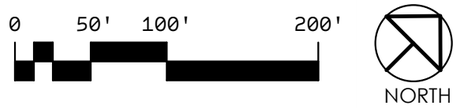
JM WEATHERWAX HIGHSCHOOL

Second Floor Plan

BUILDING NUMBER	BUILDING NAME	GROSS* SQUARE FOOT (SF) TOTALS
1	MAIN BUILDING (N/L)	173011
2	GREEN HOUSE 1	1800
3	GREEN HOUSE 2	1080
4	GREEN HOUSE 3	1200
5	SAM BENN GYM (MOD)	27409
		204500

*Gross sqft totals for recognized buildings only





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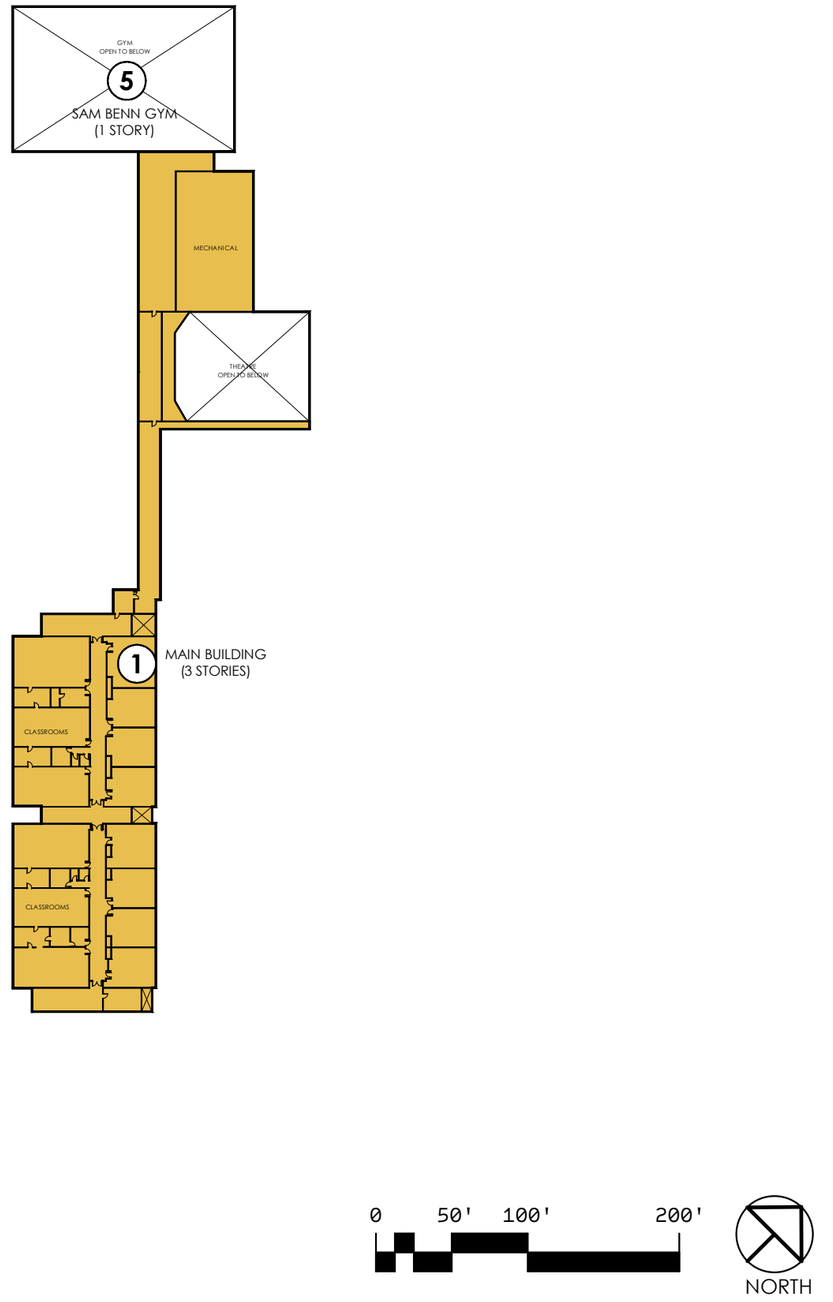
JM WEATHERWAX HIGHSCHOOL

Third Floor Plan

BUILDING NUMBER	BUILDING NAME	GROSS* SQUARE FOOT (SF) TOTALS
1	MAIN BUILDING (N/L)	173011
2	GREEN HOUSE 1	1800
3	GREEN HOUSE 2	1080
4	GREEN HOUSE 3	1200
5	SAM BENN GYM (MOD)	27409
		204500

*Gross sqft totals for recognized buildings only



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JM WEATHERWAX HS

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JM Weatherwax HS
School District - Area Analysis District Summary

Campus/Site	Building Name	Building Area Description (and Area Number/Letter, if applicable)	Year Built (Original Facility)	If Project Final Board Acceptance was within 30 years							Gross SF	SCAP-Recognized SF
				ALL New Construction (SCAP or locally funded)			APP (OSPI Only)	SCAP-funded Modernizations ONLY				
				If SCAP-funded or locally funded New Construction, Include SCAP Project Number if applicable (see Report 1 in ICOS)	**If SCAP-funded include Final Board Acceptance Date on Resolution** or **If locally funded New Construction, Board discussion of completion** (per Notes 1 & 2 below	**Copy of Board Resolution uploaded in ICOS?** (See Note 3 Below)	New or N/L SCAP Funded Construction after 1/1/1994	**If SCAP funded Modernization**, Include SCAP Project Number per Report 1 (found in ICOS)	**If SCAP-funded Modernization,** include Final Board Acceptance Date (see Report 1 in ICOS)	**Copy of Board Resolution uploaded in ICOS?** (See Notes 1 & 2 Below)		
JM Weatherwax HS	**Main Building - New in Lieu**	**1**	2007	38033	8/19/2008	Yes					173011	173011
Green House	**Green House 1**	**2**	2014	No record of SCAP funds used	1/29/2014	Yes					1,800	1,800
Green House	**Green House 2**	**3**	1999	No record of SCAP funds used	6/8/1999	Yes					1,080	1,080
Green House	**Green House 3**	**4**	1999	No record of SCAP funds used	6/8/1999	Yes					1,200	1,200
JM Weatherwax HS	**Sam Benn Gym - Modernization**	**5**	1964					No record of SCAP funds used		Yes	27409	27409
										District Totals	**204,500**	**204,500**

Notes

1 - The final board acceptance date is required for all SCAP-funded projects (new buildings, additions, and modernizations) completed in the last 30 years (see Report 1 in ICOS)
2 - For locally funded buildings and additions constructed in the past 30 years, the final board acceptance date must be provided. If the district does not have a final board resolution, then a copy of board meeting minutes stating completion of project is acceptable.
3 - A copy of the Final Acceptance Board Resolution for all buildings or building areas constructed or modernized, SCAP Funded or Locally, must be uploaded into ICOS.
4 - All square footage calculations must be measured to the exterior walls, exluding overhangs.
5 - Area calculations are in accordance AIA Document D-101 and WAC 392-343-019.
6 - All covered play areas and covered outdoor learning areas are calculated to the eave line, and counted at 1/2 the square footage.
7 - All building and area names, dates, and square footage figures are exactly equal to data shown on area analysis plans/diagram and data entered in ICOS.

STATE OF WASHINGTON - SUPERINTENDENT OF PUBLIC INSTRUCTION
SITE CONDITION RATING SUMMARY
ABERDEEN SCHOOL DISTRICT (14005)

J. M. WEATHERWAX HIGH SCHOOL

Profile Name: High School - Rural **Last Review:** 8/19/2025

Inventory Status: Recognized

Condition Rating: 78.88 %

Sub-Assembly	Component	Condition Rating E	G	F	P	U	N/A	Component Score	Priority L	M	H
Site Improvement											
G2010	Roadways	☐	☑	☐	☐	☐	☐	90 %	☐	☐	☐
G2020	Parking Lots	☐	☐	☑	☐	☐	☐	62 %	☐	☐	☐
G2030	Pedestrian Plazas and Walkways	☐	☐	☑	☐	☐	☐	62 %	☐	☐	☐
G2050	Athletic, Recreational and Playfields Areas	☐	☑	☐	☐	☐	☐	90 %	☐	☐	☐
G2060	Site Development	☐	☐	☑	☐	☐	☐	62 %	☐	☐	☐
G2080	Landscaping	☐	☐	☑	☐	☐	☐	62 %	☐	☐	☐
Liquid and Gas Site Utilities											
G3010	Water Utilities	☐	☑	☐	☐	☐	☐	90 %	☐	☐	☐
G3020	Sanitary Sewerage Utilities	☐	☑	☐	☐	☐	☐	90 %	☐	☐	☐
G3030	Storm Drainage Utilities	☐	☑	☐	☐	☐	☐	90 %	☐	☐	☐
Electrical Site Improvements											
G4010	Site Electric Distribution Systems	☐	☑	☐	☐	☐	☐	90 %	☐	☐	☐
G4050	Site Lighting	☐	☑	☐	☐	☐	☐	90 %	☐	☐	☐
Site Communications											
G5010	Site Communications Systems	☐	☑	☐	☐	☐	☐	90 %	☐	☐	☐

J. M. Weatherwax High School - Greenhouse #1

Building Details

PROFILE TYPE	Greenhouse
NUMBER OF FLOORS	1
CHARACTERISTICS	Occupied
COMMENTS	Note that this building is located on a separate site, but is part of the High School use. The address for this building is 306 North H Street, Aberdeen, WA.

Building Inventory

AREA YEAR BUILT	DISTRICT ASSIGNED AREA	GROSS BUILDING SQ FT	GROSS INSTRUCTIONAL SQ FT	SCAP RECOGNIZED SQ FT	ORIGINAL OCCUPANCY DATE	ORIGINAL BOARD ACCEPTANCE DATE
1999	Greenhouse 1	1,800	1,800	1,800		
	Building Totals	**1,800**	**1,800**	**1,800**		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Foundations	Standard Foundation	A1010		90.00% Good
Slabs on Grade	Standard Slabs on Grade	A4010		90.00% Good
Superstructure	Roof Construction	B1020		90.00% Good
Exterior Vertical Enclosures	Exterior Walls	B2010		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Deficiency: discoloring due to age Corrective Actions: replace wall panels		
	Exterior Doors and Grilles	B2050		62.00% Fair
	Deficiencies:	Other		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Exterior Vertical Enclosures	*Causes:*	Material Condition, Other		
	Comments:	Deficiency: doors are showing signs of age Corrective Actions: treat failure or replace doors		
	Exterior Louvers and Vents	B2070		62.00% Fair
	Deficiencies:	Other		
	Causes:	Material Condition		
	Comments:	Deficiency: showing signs of age Corrective Actions: treat failures or replace		
Exterior Horizontal Enclosures	Roofing	B3010		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other, Surface Weathering		
	Comments:	Deficiency: discoloring due to age Corrective Actions: replace wall panels		
Plumbing	Domestic Water Distribution	D2010		90.00% Good
	Building Support Plumbing Systems	D2030		90.00% Good
HVAC	Heating Systems	D3020		90.00% Good
	Ventilation	D3060		90.00% Good
Fire Protection	Fire Protection Specialties	D4030		90.00% Good
Electrical	General Purpose Electrical Power	D5030		90.00% Good
Equipment	Institutional Equipment	E1040		90.00% Good
Furnishings	Fixed Furnishings	E2010		90.00% Good
	Movable Furnishings	E2050		90.00% Good

J. M. Weatherwax High School - Greenhouse #2

Building Details

PROFILE TYPE	Greenhouse
NUMBER OF FLOORS	1
CHARACTERISTICS	Occupied

Building Inventory

AREA YEAR BUILT	DISTRICT ASSIGNED AREA	GROSS BUILDING SQ FT	GROSS INSTRUCTIONAL SQ FT	SCAP RECOGNIZED SQ FT	ORIGINAL OCCUPANCY DATE	ORIGINAL BOARD ACCEPTANCE DATE
1999	Greenhouse 2	1,080	1,080	0	1/1/1999	
	Building Totals	**1,080**	**1,080**	**0**		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Foundations	Standard Foundation	A1010		90.00% Good
Slabs on Grade	Standard Slabs on Grade	A4010		90.00% Good
Superstructure	Roof Construction	B1020		90.00% Good
Exterior Vertical Enclosures	Exterior Walls	B2010		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Deficiency: discoloring due to age Corrective Actions: replace wall panels		
	Exterior Doors and Grilles	B2050		62.00% Fair
	Deficiencies:	Other		
	Causes:	Material Condition, Other		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Exterior Vertical Enclosures	*Comments:*	Deficiency: doors are showing signs of age Corrective Actions: treat failure or replace doors		
	Exterior Louvers and Vents	B2070		62.00% Fair
	Deficiencies:	Other		
	Causes:	Material Condition		
	Comments:	Deficiency: showing signs of age Corrective Actions: treat failures or replace		
Exterior Horizontal Enclosures	Roofing	B3010		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other, Surface Weathering		
	Comments:	Deficiency: discoloring due to age Corrective Actions: replace roof paneles		
Plumbing	Domestic Water Distribution	D2010		90.00% Good
	Building Support Plumbing Systems	D2030		90.00% Good
HVAC	Heating Systems	D3020		90.00% Good
	Ventilation	D3060		90.00% Good
Fire Protection	Fire Protection Specialties	D4030		90.00% Good
Electrical	General Purpose Electrical Power	D5030		90.00% Good
Equipment	Institutional Equipment	E1040		90.00% Good
Furnishings	Fixed Furnishings	E2010		90.00% Good
	Movable Furnishings	E2050		90.00% Good

J. M. Weatherwax High School - Greenhouse #3

Building Details

PROFILE TYPE	Greenhouse
NUMBER OF FLOORS	1
CHARACTERISTICS	Occupied

Building Inventory

AREA YEAR BUILT	DISTRICT ASSIGNED AREA	GROSS BUILDING SQ FT	GROSS INSTRUCTIONAL SQ FT	SCAP RECOGNIZED SQ FT	ORIGINAL OCCUPANCY DATE	ORIGINAL BOARD ACCEPTANCE DATE
1999	Greenhouse 3	1,200	1,200	0	1/1/1999	
	Building Totals	**1,200**	**1,200**	**0**		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Foundations	Standard Foundation	A1010		90.00% Good
Slabs on Grade	Standard Slabs on Grade	A4010		90.00% Good
Superstructure	Roof Construction	B1020		90.00% Good
Exterior Vertical Enclosures	Exterior Walls	B2010		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Deficiency: discoloring due to age Corrective Actions: replace wall panels		
	Exterior Doors and Grilles	B2050		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Deficiency: discoloring due to age Corrective Actions: replace wall panels		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Exterior Vertical Enclosures	Exterior Louvers and Vents	B2070		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Deficiency: discoloring due to age Corrective Actions: replace wall panels		
Exterior Horizontal Enclosures	Roofing	B3010		90.00% Good
Plumbing	Domestic Water Distribution	D2010		90.00% Good
Fire Protection	Fire Protection Specialties	D4030		90.00% Good
Electrical	General Purpose Electrical Power	D5030		90.00% Good
Equipment	Institutional Equipment	E1040		90.00% Good
Furnishings	Fixed Furnishings	E2010		90.00% Good
	Movable Furnishings	E2050		90.00% Good

J. M. Weatherwax High School - Main Building

Building Details

PROFILE TYPE	High School - Multi-Story
NUMBER OF FLOORS	3
BOARD ACCEPTANCE DATE	8/19/2008
CHARACTERISTICS	Occupied
ANNUAL REVIEW COMPLETED BY	District
COMMENTS	Main Building

This building is required to comply with the Asset Preservation Program

REPORTING YEAR	APP YEAR	BUILDING CONDITION ASSESSMENT	ANNUAL REVIEW COMPLETED BY	BOARD REPORT PRESENT DATE
2025-2026	17	79.73	District	Not Reported
2024-2025	16	85.57	District	3/4/2025
2023-2024	15	88.57	District	3/19/2024
2022-2023	14	88.56	District	3/7/2023
2021-2022	13	88.56	Consultant	3/22/2022
2020-2021	12	89.85	District	3/2/2021

The next certified BCA is due: 2031

Building Inventory

AREA YEAR BUILT	DISTRICT ASSIGNED AREA	GROSS BUILDING SQ FT	GROSS INSTRUCTIONAL SQ FT	SCAP RECOGNIZED SQ FT	ORIGINAL OCCUPANCY DATE	ORIGINAL BOARD ACCEPTANCE DATE
1964	Sam Benn Gym	27,409	27,409	27,409	9/1/1964	12/15/1964
2007	JM Weatherwax	173,011	173,011	173,011	9/4/2007	8/19/2008
	Building Totals	**200,420**	**200,420**	**200,420**		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Foundations	Standard Foundation	A1010		90.00% Good
Slabs on Grade	Standard Slabs on Grade	A4010		90.00% Good
	Pits and Bases	A4040		90.00% Good
Water and Gas Mitigation	Building Subdrainage	A6010		90.00% Good

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Superstructure	Floor Construction	B1010		90.00% Good
	Roof Construction	B1020		62.00% Fair
	Deficiencies:	Other		
	Causes:	Moisture Intrusion, Shrinkage		
	Comments:	Previous comments of roof movement and inadequate seismic joints or detailing at seismic joints, no evidence seen during 2025 inspections.		
	Stairs	B1080	Low	62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Issues with current guardrailing heights. Heights meet codes, but there have been safety issues related to student behavior.		
Exterior Vertical Enclosures	Exterior Walls	B2010		90.00% Good
	Exterior Windows	B2020	Medium	62.00% Fair
	Deficiencies:	Deficient Hardware/Operating Parts		
	Causes:	Caulking/Weather Stripping, Frame/Molding Condition		
	Comments:	Minor sealant issues were observed on some selected window panes at the south end of the building.		
	Exterior Doors and Grilles	B2050		90.00% Good
	Deficiencies:	Deficient Hardware/Operating Parts		
	Causes:	Wind Pressure		
	Comments:	Previous notes regarding adjustment issues with closure arms in overcoming building overpressure.		
	Exterior Louvers and Vents	B2070	Medium	90.00% Good
	Deficiencies:	Other		
	Causes:	Material Condition		
	Comments:	Previous survey noted rusty soffit vents, these appear to have been replaced. Some dirt is present on louvers.		
Exterior Horizontal Enclosures	Roofing	B3010		62.00% Fair
	Deficiencies:	Leaking		

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Exterior Horizontal Enclosures	*Causes:*	Cracks, Tears, Holes, and Breaks, Flashing Failure		
	Comments:	Previous not regarding leaking at seismic joints. The joint installed is a sealant/gasket joint that is dependant on the gasket condition, if replacement is made consider a sheet-metal shroud for UV protection and bulk water protection. Flashings are rusted and not marine environment rated.		
	Roof Appurtenances	B3020		62.00% Fair
	Deficiencies:	Blisters/Wrinkles		
	Causes:	Other		
	Comments:	2024 - 2025 Additional areas are blistering leaving large bubbles/pocket to have repaired. Appearing more frequently and in more areas.		
	Horizontal Openings	B3060		90.00% Good
	Overhead Exterior Enclosures	B3080		90.00% Good
Interior Construction	Interior Partitions	C1010		90.00% Good
	Interior Windows	C1020		90.00% Good
	Interior Doors	C1030		90.00% Good
	Interior Grilles and Gates	C1040		90.00% Good
	Suspended Ceiling Construction	C1070		90.00% Good
Interior Finishes	Wall Finishes	C2010		90.00% Good
	Interior Fabrications	C2020		90.00% Good
	Flooring	C2030		90.00% Good
	Stair Finishes	C2040		90.00% Good
	Ceiling Finishes	C2050	Low	90.00% Good
	Comments:	Previous survey noted stained tiles, these appear to have been replaced.		
Conveying	Vertical Conveying Systems	D1010		90.00% Good
Plumbing	Domestic Water Distribution	D2010		90.00% Good
	Sanitary Drainage	D2020		90.00% Good

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Plumbing	Building Support Plumbing Systems	D2030		90.00% Good
	General Service Compressed-Air	D2050		90.00% Good
HVAC	Heating Systems	D3020		90.00% Good
	Cooling Systems	D3030		62.00% Fair
	Deficiencies:	Other		
	Causes:	Corrosion, Mineral Deposits, Electrolysis		
	Comments:	Rust developing on chiller. May require repairs/replacement sooner than typical due to marine environment.		
	Facility HVAC Distribution Systems	D3050		90.00% Good
	Ventilation	D3060		90.00% Good
Fire Protection	Fire Suppression	D4010		90.00% Good
	Fire Protection Specialties	D4030		90.00% Good
Electrical	Facility Power Generation	D5010		90.00% Good
	Electrical Services and Distribution	D5020		90.00% Good
	General Purpose Electrical Power	D5030		90.00% Good
	Lighting	D5040		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Lighting controls do not meet current code requirements for daylighting and dimming. Occupancy sensors are located throughout.		
Communications	Data Communications	D6010		90.00% Good
	Voice Communications	D6020		90.00% Good
	Audio-Video Communications	D6030		90.00% Good
	Distributed Communications and Monitoring	D6060		90.00% Good
Electronic Safety and Security	Access Control and Intrusion Detection	D7010		90.00% Good
	Electronic Surveillance	D7030		90.00% Good
	Detection and Alarm	D7050		90.00% Good

Building Components

SUB-ASSEMBLY	COMPONENT	COMPONENT CODE	MAINTENANCE PRIORITY	CONDITION RATING
Integrated Automation	Integrated Automation Facility Controls	D8010		90.00% Good
Equipment	Commercial Equipment	E1030		90.00% Good
	Institutional Equipment	E1040		90.00% Good
	Entertainment and Recreational Equipment	E1070		90.00% Good
	Other Equipment	E1090		62.00% Fair
	Deficiencies:	Other		
	Causes:	Other		
	Comments:	Locker room lockers are ageing, as is locker rooms in general. Shower facilities are obsolete.		
Furnishings	Fixed Furnishings	E2010		90.00% Good
	Movable Furnishings	E2050		90.00% Good

ABERDEEN SCHOOL DISTRICT NO. 5
RESOLUTION NO. 2008-07

A Resolution Accepting Final Completion of Aberdeen High School

WHEREAS, the Board of Directors of the Aberdeen School District have received notification from Northwest Architecture (NAC) that the construction specified in the project advertised as Aberdeen High School are complete in accordance with contract specifications and documents; and

WHEREAS, the Architect, General Contractor, Construction Manager, Business Manager, and Maintenance Supervisor have walked through the project and concur; and

WHEREAS, the Aberdeen School District has received a release from the State Department of Revenue, the State Department of Employment Security, and has notified the Department of Labor and Industries; now

THEREFORE BE IT RESOLVED, that the Board of Directors of Aberdeen School District No. 5 does hereby accept the work of Rognlin's, Inc. as complete.

The undersigned certifies that the foregoing resolution was adopted at a duly convened meeting of the Board of Directors of Aberdeen School District No. 5 on the 19th day of August, 2008 of which due notice was given in the manner provided by law with the following directors being present and voting.

Aberdeen School District No. 5
Grays Harbor County, Washington

Doug Smith, President

Sandra Bielski

Jennifer Hagen

Jeremy Hawkins

Jeff Snell

Attest:

Martin W. Kay Secretary to the Board

ABERDEEN SCHOOL DISTRICT NO. 5

Minutes of the Regular Meeting of the
Board of Directors – August 19, 2008

CALL TO ORDER

At 7:00 p.m. President Doug Smith called to order the regular meeting of the Board of Directors in the Community Room at Aberdeen High School. Members present were Doug Smith, Jennifer Hagen, Jeremy Hawkins, Sandra Bielski and Jeff Snell along with Superintendent Martin Kay and nine patrons and staff. The meeting began with the flag salute.

CONSENT AGENDA

On motion by Jennifer Hawkins, seconded by Sandra Bielski, the Board approved the consent agenda including the minutes of the meeting held on July 15, 2008; the minutes of the budget hearing held on August 12, 2008; the payroll for July 2008 in the amount of $735,933.09 to be paid by warrants numbered 100412 through 100454; the accounts payable from the Capital Projects Fund in the amount of $48,232.85 to be paid by warrants numbered 200007 through 200014. The ASB Fund in the amount of $1,650.15 to be paid by warrants numbered 400052 through 400054; the General Fund in the amount of $1,164,184.48 to be paid by warrants numbered 100411 through 100411 and $119,955.27 to be paid by warrants numbered 100456 through 100459 and $30,415.35 to be paid by warrants numbered 100460 through 100460 and $332,076.46 to be paid by warrants numbered 10455 through 10455 and $273,616.93 to be paid by warrants numbered 10461 through 100603 and $3,006.01 to be paid by warrants numbered 100604 through 100604; and a donation of $2500 from Grays Harbor Community Foundation for the Education Outcomes of Children in Foster Care Project; and a donation to the music department for a drum set and snare drum gifted from Jim and Taylor Sawin.

BOARD COMMENTS

The board did not make comment at this time.

COMMENTS FROM AUDIENCE

Comment was received from Tammy Celich regarding Booster Club fund raiser plans. Ms. Celich presented new sweatshirts and stadium seats that will be offered for sale.

HEALTH, FAMILY LIFE AND SEX EDUCATION POLICY

Superintendent Kay recommended approval of the revision to Health, Family Life and Sex Education Policy No. 2125. The 2007 Legislature passed ESSB 5297 relating to medically and scientifically accurate sexual health education in schools. This law is also known as the Healthy Youth Act (HYA). Schools will be required to comply with the HYS by September, 2008. On motion by Jeremy Hawkins, seconded

by Sandra Bielski, the Board approved the revision to **Health, Family Life and Sex Education Policy No. 2125.**

SUPERINTENDENT REPORT

Superintendent Kay expressed appreciation to the School Board members for providing one and one-half days to attend additional meetings. Information regarding 10th grade WASL test results and scores was provided. Informational packets providing state averages will be available in September. A two-day leadership retreat was completed last week and was productive.

Superintendent Kay reported that approximately $10,000 has been raised by the Music Booster Club for a Guest Artist Workshop program to provide students the opportunity to participate in an evening concert with a professional group.

Superintendent Kay provided enrollment updates for AJ West Elementary. 341 students were budgeted and actual student enrollment today was 383.

Superintendent Kay provided a reminder that August 28th is the annual welcome back event with Alvin Law as the guest speaker.

It was announced that there is an addition to the agenda and the Coaches Agreement will be presented under executive session.

CONTRACT, SAINT MARTIN'S UNIVERSITY

Superintendent Kay recommended approval of a contract agreement between Aberdeen School District and Saint Martin's University. The contract allows the placement of students for practical and student teaching experiences between the school district and Saint Martin's University. On motion by Jeff Snell, seconded by Jeremy Hawkins, the Board approved the **Contract Agreement between Aberdeen School District and Saint Martin's University.**

REVISION TO POLICY NO. 5610, PERSONNEL

Superintendent Kay presented the first reading for a revision to Policy 5610, Personnel/Substitute Employment. The revision pertains to a classified substitute employee's eligibility to purchase retirement service credit to be determined according to RCW 41.35 and retirement system rules. Substitute classified employee means a classified employee who is employed by the district exclusively as a substitute for an absent employee.

INSTRUCTIONAL SERVICES

AGREEMENT, NEW MARKET SKILLS CENTER

Curriculum Director Tita Mallory presented the Agreement for Inter-district Cooperative Educational Services between the New Market Skills Center, Tumwater School District No. 33 and Aberdeen School District. On motion by Jennifer Hagen, seconded by Sandra Bielski, the Board approved the **Agreement for Inter-district Cooperative Education Services between the New Market Skills Center and Aberdeen School District.**

COOPERATIVE AGREEMENT

Special Services Director Shawn Dickson presented the Cooperative Agreement for Provision of Special Services between the Aberdeen School Distict and Cosmopolis School District No. 99. On motion by Sandra Bielski, seconded by Jeremy Hawkins, the Board approved the **Cooperative Agreement for Provision of Special Services between the Aberdeen School District and Cosmopolis School District for 2008-2009.**

FINANCIAL SERVICES

RESOLUTION EXTENDING 2007-2008 GENERAL FUND BUDGET

At approximately 7:20 p.m. Doug Smith announced this portion of the meeting is an open public hearing and public comment will be received. Tom Laufmann presented the proposed Resolution Extending the 2007-2008 General Fund Budget. There is a need to extend the 2007-2008 General Fund Budget by $810,000 to accommodate expenditures that were not listed in the budget. The revenue in the adopted 2007-2008 Budget is adequate to cover these anticipated expenditures. Mr. Laufmann clarified the increase to the 2007-2008 General Fund Budget is from $34,054,702 to $34,864,702 and the funds are included in the adopted 2007-2008 budget. The basic expenditures include curriculum materials; food service additions; CTE carry-over and new phone system expenses to allow phones in all classrooms. Doug Smith asked for public comment regarding the budget extension. Hearing no comments, the public hearing was closed at approximately 7:30 p.m. On motion by Jeff Snell, seconded by Sandra Bielski, the Board approved **Aberdeen School District No. 5 Resolution No. 2008-05 – A Resolution Extending the 2007-2008 General Fund Budget.**

RESOLUTION ADOPTING 2008-2009 BUDGET

Tom Laufmann presented the proposed resolution adopting the 2008-2009 budget and reported the proposed budget maintains a fund balance. Preliminary enrollment in kindergarten is positive and an increase in enrollment could result in an extension in the budget next year. On motion by Jeremy Hawkins, seconded by Jeff Snell, the Board approved **Aberdeen School District No. 5 Resolution No. 2008-06 – A Resolution Adopting the 2008-2009 Budget.**

FISCAL REPORT

Tom Laufmann reviewed the monthly fiscal reports. Based on the County Treasurer's report, the amount of cash and investments on hand at the end of July was $1,782,948. For the month, revenue was above budget, mainly due to a reimbursement for ECEAP expenditures. Expenditures were below budget, with A/P below budget and payroll below due to the medical insurance payment appearing in June's payroll instead of July. At the end of July, the County Treasurer reported that there is $718,094 in cash and investments. There are plans to submit $18,000 to the state for district reimbursement for expenses for the High School project. As of the end of July, the County Treasurer reported that there is $115,790 in cash and $1,247,403 invested for the debt service fund. At the end of July, the transportation vehicle fund had a balance of $480,941 and it was invested. This fund is limited to the purchase or major repair of buses. The associated student body fund had a balance of $90,837 as of the end of July.

RESOLUTION ACCEPTING BUILDING COMMISSION REPORT FOR AHS

Tom Laufmann presented the Aberdeen High School Project Final Commissioning Report prepared by Engineering Economics Inc. The commissioning process is intended to help assure the building systems operate efficiently, effectively and according to the design intent. At the completion of construction, the commissioning consultant performed installation verification and performance tests on each piece of commissioned equipment. Issues discovered during installation verification and functional tests were logged and a list of issues communicated to the contractor. After receiving notification from the contractor that these issues were resolved, the consultant performed back-checks to verify completion. A full list of commissioning related issues has been presented to the District. Doug Smith requested this item be tabled to the September 2nd meeting to allow time for a corrected report.

RESOLUTION ACCEPTING FINAL COMPLETION OF AHS

Tom Laufmann presented a proposed resolution accepting final completion of Aberdeen High School. Notification has been received from Northwest Architecture (NAC) that the construction specified in the project advertised as Aberdeen High School are complete in accordance with contract specifications and documents. Rognlin's Inc. has completed their work and provided final close out information as required by their contract with the Aberdeen School District for construction of the new Aberdeen High School. NAC recommended this project for Final Acceptance to the School Board. This completed work is 173,011 sq. ft. of new construction and 24,010 sq. ft. of non-matchable construction for the new high school. On motion by Jeremy

Hawkins, seconded by Jeff Snell, the Board approved **Aberdeen School District No. 5 Resolution No. 2008-07 – A Resolution Accepting Final Completion of Aberdeen High School.**

CONTRACT WITH ESD 113 FOR TRAFFIC SAFETY EDUCATION

Tom Laufmann presented an Educational Service District 113 Traffic Safety Education Agreement (N). This agreement is effective from September 1, 2009 through August 31, 2009. On motion by Jennifer Hagen, seconded by Jeff Snell, the Board approved **Educational Service District 113 Traffic Safety Education Agreement (N).**

NEXT MEETING

President Smith reminded board members that the next meeting is scheduled for September 2 in the Community Room and work study will begin at 6:00 p.m. Jeremy Hawkins and Sandra Bielski will audit the bills.

EXECUTIVE SESSION

At 8:05 p.m. the meeting recessed for an executive session expected to last approximately one hour regarding personnel matters. The regular meeting reconvened at 9:30p.m.

PERSONNEL CERTIFICATED

Following a review by Personnel Director Anna Shanks, on motion by Jeff Snell, seconded by Jeremy Hawkins, the Board approved the following personnel matters: hiring Nicole Krupa as counselor at Robert Gray Elementary effective August 27, 2008; Erik Peterson as Elementary Music Teacher effective August 27, 2008; Marnie Ranheim as counselor at Central Park Elementary for current year only leave replacement and effective August 27, 2008 and Deborah Running as Business Ed/Computer Application Teacher .4 FTE effective August 27, 2008; accepted the resignation of Randy Connelly as Special Education Teacher at Aberdeen High School effective July 28, 2008; approved a leave of absence for Jenah Jump as Math Teacher at Miller Junior High effective September 2, 2008 through January 1, 2009.

The Board approved co-curriculum contracts and supplemental contracts and hired substitute teacher David Anderson.

CLASSIFIED

The Board also approved a leave of absence for Kris Taylor, a para-educator at Stevens, effective September 2, 2008 through October 1, 2008, and approved extra-curriculum classified contracts and resignations.

COLLECTIVE BARGAINING AGREEMENT

On motion by Sandra Bielski, seconded by Jennifer Hagen, the Board approved the Collective Bargaining Agreement with Aberdeen Athletic Activities Association for 2008-2009.

There being no further business, the meeting adjourned at 9:30 p.m. | ADJOURN

Doug Smith, President

Martin W. Kay, Secretary

Aberdeen
School District

216 North G Street
Aberdeen, WA 98520
360-538-2000
Fax 360-538-2014
www.asd5.org

Office of the Superintendent
360-538-2002

Traci Sandstrom
Co-Superintendent
Teaching and Learning
Technology
360-538-2123

Lynn Green
Co-Superintendent
Career & Technical Education
360-538-2038

Elyssa Louderback
Business & Operations
360-538-2007

Christi Clinkingbeard
Human Resources
360-538-2003

Stefanie Lamont
Special Education
360-538-2017

Date: September 10, 2025

Office of Superintendent of Public Instruction
School Facilities and Organization
P.O. Box 47200
Olympia, WA 98504-7200

RE: **Verification of Construction Date – Green Houses 1 & 2, JM Weatherwax High School, ICOS Building ID's 57377, and 57375**

To Whom It May Concern:

This letter is to verify that the Aberdeen School District No. 5 approved and authorized the construction of **Green Houses 1 and 2** at **JM Weatherwax High School**. The construction was completed on **June 8, 1999**.

This verification is provided to OSPI for documentation and record-keeping purposes.

Sincerely,

ABERDEEN SCHOOL DISTRICT NO. 5

Lynn Green

Lynn Green
Superintendent

This District is an Equal Opportunity Employer

Aberdeen
School District

216 North G Street
Aberdeen, WA 98520
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Elyssa Louderback
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360-538-2007

Christi Clinkingbeard
Human Resources
360-538-2003

Stefanie Lamont
Special Education
360-538-2017

Date: September 10, 2025

Office of Superintendent of Public Instruction
School Facilities and Organization
P.O. Box 47200
Olympia, WA 98504-7200

RE: **Verification of Construction Date – Green House 3, JM Weatherwax High School, ICOS Building ID 57376**

To Whom It May Concern:

This letter is to verify that the Aberdeen School District No. 5 approved and authorized the construction of **Green House 3** at **JM Weatherwax High School**. The construction was completed on **October 22, 2013**.

This verification is provided to OSPI for documentation and record-keeping purposes.

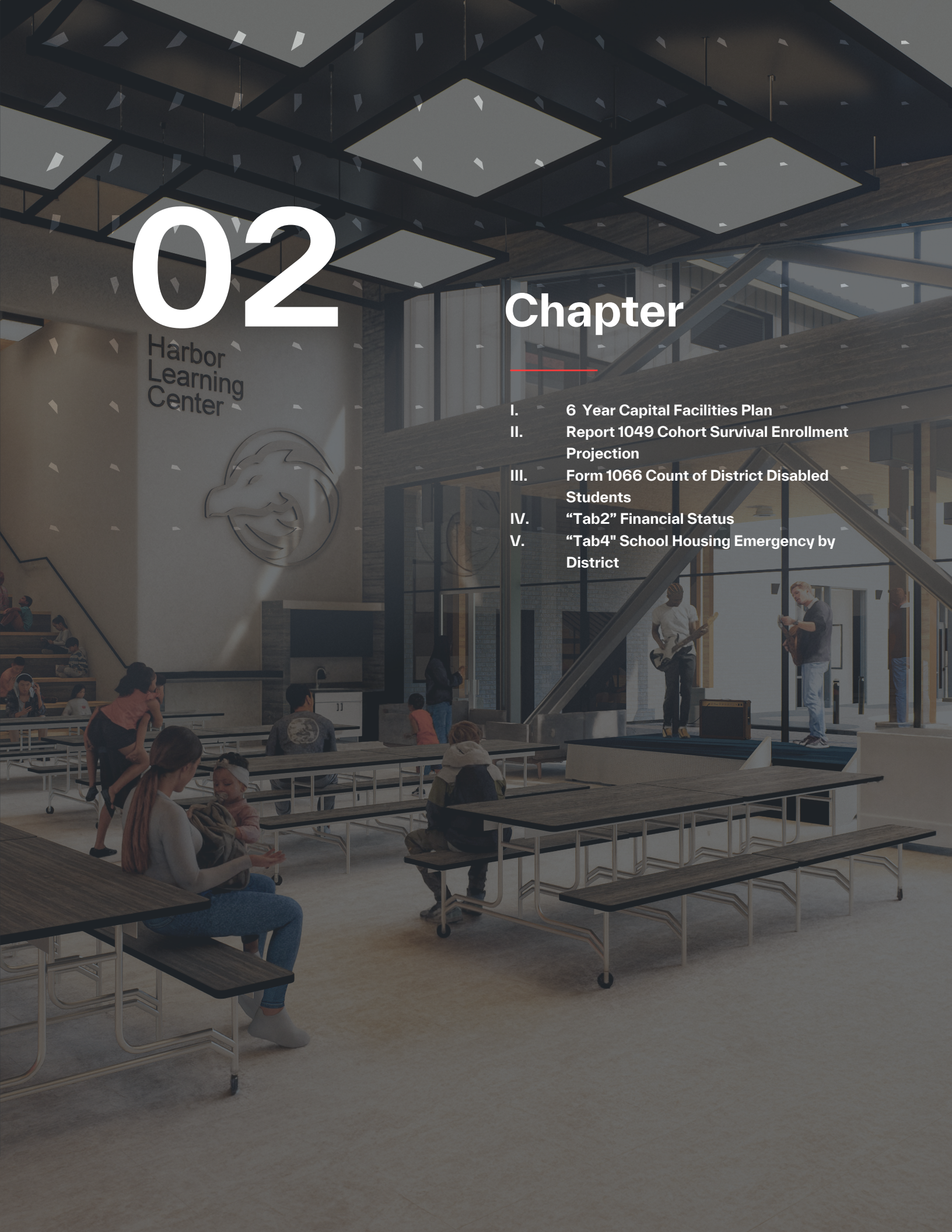
Sincerely,

ABERDEEN SCHOOL DISTRICT NO. 5

Lynn Green

Lynn Green
Superintendent

This District is an Equal Opportunity Employer

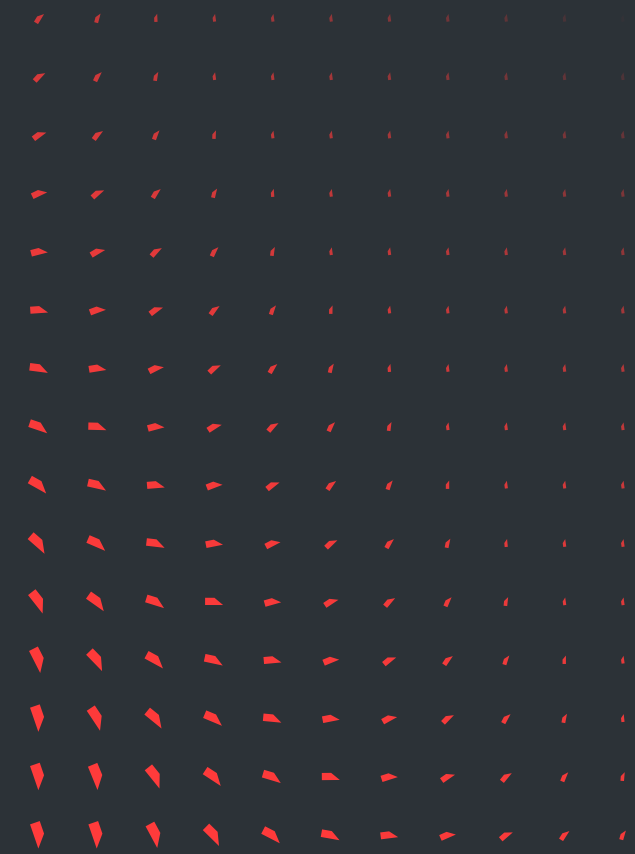


02 Chapter

I. 6 Year Capital Facilities Plan
II. Report 1049 Cohort Survival Enrollment Projection
III. Form 1066 Count of District Disabled Students
IV. “Tab2” Financial Status
V. “Tab4" School Housing Emergency by District

TCF

I. Capital Facillities Plan



Aberdeen School District

Long-Range Plan — 2024 through 2036

September 29, 2025

Introduction: This brief narrative explains that the submitted **Seismic Safety Program Master Plan** and the **Capital Levy Master Plan** together function as the District's single long-term facilities planning document. Read together, the two plans form one coherent roadmap—defining campus replacement/retrofit priorities, near-term capital work, funding coordination, and a shared schedule—so stakeholders can rely on them as a unified plan.

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1) What the Two Master Plans Do

Seismic Safety Program (SSSP) Master Plan.
This plan establishes a districtwide life-safety and resilience roadmap for facilities exposed to seismic and tsunami hazards. It identifies which campuses are replacement candidates and which will be **retrofitted or modernized**, lays out a phased pathway conforming to OSPI's Seismic Safety Grant funding, and coordinates with site selection where relocation out of the tsunami inundation zone is warranted. It is the District's framework for pursuing state seismic grant funding over multiple biennia while minimizing disruption to instruction.

Capital Levy Master Plan (2026–2029).
The levy plan directs near-term, voter-approved investments to the most urgent building needs that preserve safety and continuity of operations while leveraging work at sites scheduled for seismic-program replacement. Priority categories include secure entries and access control, communications/intercoms, roofing and envelope repairs (including a phased Aberdeen High School re-roof), site/ADA improvements, and targeted food-service equipment.

Early levy actions have included **property acquisition outside the tsunami zone**, **emergency intercom replacements at two elementary schools**, and **program planning at Aberdeen High School** for projects beginning Summer 2026.

How they work together.
The SSSP plan determines the long-horizon **replace vs. retrofit** path by campus; the levy plan focuses on **short-horizon** life-safety and operational work that

does not conflict with those long-horizon decisions. Annual coordination aligns levy cashflow with SSSP milestones to make efficient use of local and state funding.

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2) Updated School Replacement/Retrofit Schedule

OSPI Seismic/Tsunami Master Project Schedule 2024 to 2036

The District's master schedule, updated **September 26, 2025**, organizes projects by campus using a Phase structure. These phases can best be understood by viewing the attached table illustrating the timelines of the Seismic Grant work. Each phase must be approved by OSPI's Seismic Safety Grant Committee.

Work for each of these projects follow OSPI enrollment projections which show a stable enrollment.

The program window runs **Winter 2024 through Winter 2036**. In summary:

- **Harbor Learning Center (HLC/Hopkins replacement):** Construction starting Summer of 2027
- **AJ West Elementary (North Site – Replacement):** Construction starting Summer of 2031
- **Stevens Elementary (South Site – Replacement):** Construction starting Summer of 2029
- **Miller Junior High (Replacement):** Construction starting Summer of 2029
- **Central Park Elementary (Retrofit or Replacement; outside inundation zone):** Construction starting Summer of 2033.
- **Robert Gray Elementary (Retrofit/Modernize with ground improvements east of school)**: Summer of 2033.
- **McDermoth Elementary:** Swing school use to be used for Central Park and Robert Gray construction, later to be the home of Aberdeen School District offices.
- **JM Weatherwax High School & District Office:** Future work and phases to be pending.

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3) Additional Small Works Planned for the Levy

The **five-year Capital Levy (~$10M total)** funds near-term projects prioritized by a 2024 study, **updated from that levy study**, and synchronized with SSSP to avoid investing in buildings slated for replacement.

- **Early actions (2024–2025).** Property acquisition outside the tsunami design zone; replacement of failed intercom systems at two elementary schools (life-safety); and program assessments at Aberdeen High School to launch Summer 2026 work.
- **Targeted categories (2026–2029).**
  • **Safety & Security:** secure vestibules, access control, districtwide intercom upgrades.
  • **Roofs & Envelopes:** phased AHS re-roof (quarters 2027–2029) and selective districtwide repairs.
  • **Site & Accessibility:** parking, ramps, sidewalks, and priority play equipment.
  • **Food Service:** small equipment packages to support reliable meal service.

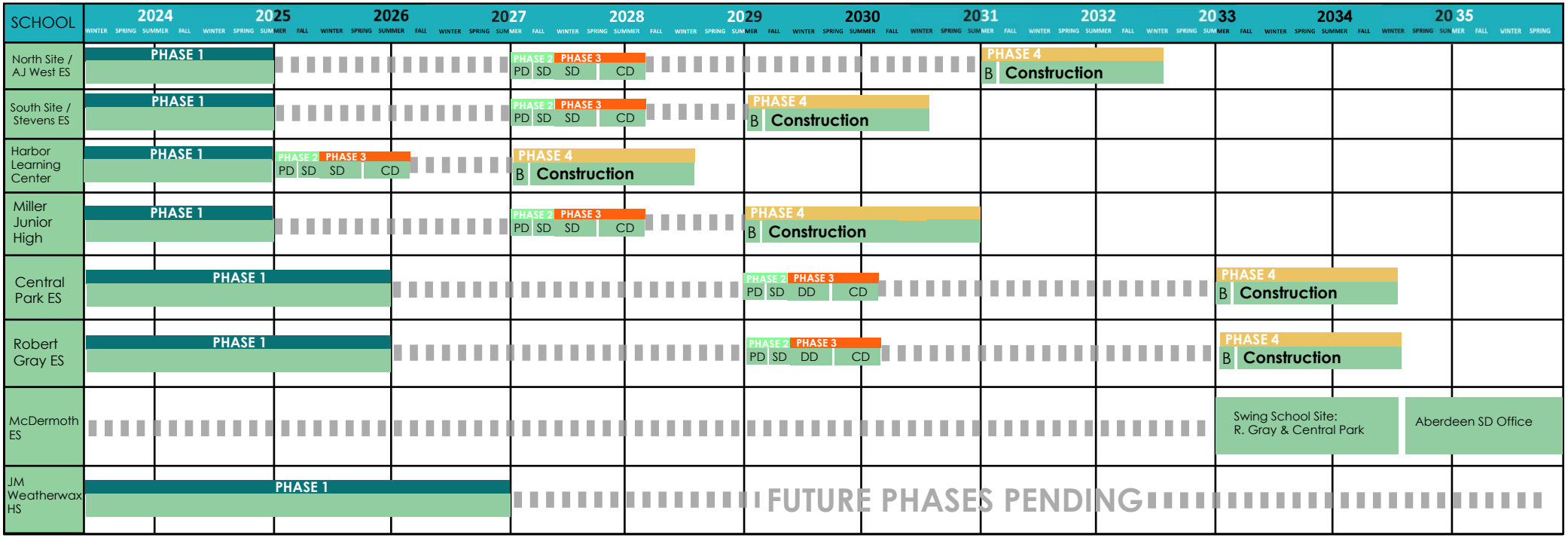
Because identified needs across seven schools exceed available levy funds by about **2.5×**, lower-priority items are **deferred** to future funding or bundled with SSSP projects as appropriate. The District will publish an annual levy/SSSP coordination update to keep scope, budget, and schedule synchronized.

Prioritization is identified in the Levy Long Term Planning Document.

Implementation and Finance

- **Implementation.** The plan highlights **2026–2031** as a practical near-term delivery window while maintaining the full **Winter 2024–Winter 2036** program horizon. Annual updates will fix specific years/quarters as state funding, permits, and property actions are confirmed.
- **Finance.** The levy provides near-term local funds; state seismic grants provide support for retrofits, vertical-evacuation solutions where needed, and replacements driven by life-safety. The District coordinates these sources so levy dollars are not expended on facilities scheduled for replacement.

OSPI SEISMIC/TSUNAMI MASTER PROJECT SCHEDULE 2024 TO 2036



Legend / Phases of the Washington State School Seismic Safety Program

PHASE 1
includes initial assessment of the site and property acquisition if required.

PHASE 2
PD SD
includes "Pre-Design" & "Schematic" Design phases, required for project scoping.

PHASE 3
DD CD
includes "Design Development" & "Construction Documents" phases, required to establish bidding for construction.

PHASE 4
B Construction
includes "Bidding" & "Construction" phases.

OSPI School Seismic Safety Grant

Aberdeen School District 5

PHASE 1 PLANNING



9 December 2024

TCF Project No. 2024-002

Table of Contents

Cover Page

Executive Summary Section 1

Scope & Process Section 2

A. Introduction
B. Seismic Study Process
C. Tsunami Study Process
D. Decision making Roadmap

Findings & Recommendations Section 3

A. Miller Junior High School
B. Stevens Elementary School
C. AJ West Elementary School
D. Harbor Learning Center (Hopkins Building)
E. McDermoth Elementary School
F. Robert Gray Elementary School
G. Central Park Elementary School
H. Summary
I. Next Steps

Seismic Retrofit Cost Estimates Section 4

A. Miller Junior High School
B. Stevens Elementary School
C. AJ West Elementary School
D. Harbor Learning Center (Hopkins Building)
E. McDermoth Elementary School
F. Robert Gray Elementary School
G. Central Park Elementary School

Appendix

A. Geotechnical
B. Seismic Study Evaluation Reports
C. Seismic Study Preliminary Drawings
D. Tsunami Hazard Assessment Report
E. Tsunami Tower Infographics

1 | EXECUTIVE SUMMARY

Introduction

This OSPI School Seismic Safety Grant - Planning effort includes initial facility assessments to evaluate the potential viability for seismic retrofit or school replacement, and/or construction of tsunami vertical evacuation towers at each school.

Findings include geotechnical exploration and analysis; existing building structural deficiencies identification; review of building systems and envelope condition and other factors which will impact decision-making along with preliminary estimated costs for seismic retrofits and vertical evacuation towers where appropriate. Costs included are total project cost (construction & soft costs). Detailed information including escalation, delivery and inclusions can be referenced in the detailed cost estimate section of this report.

Recommendations for each school based on the findings address the viability of seismic retrofitting, potential replacement and tsunami evacuation strategies.

Note that the scope of grants for seismic retrofits funded by the Washington State Office of Superintendent of Public Instruction (OSPI) are limited to improving the structural systems of the building to increase the likelihood of safer egress from the school in a significant seismic event and associated non-structural costs to accommodate those improvements. The program does not fund upgrades to bring the school up to current code or to improve buildings to a level that would allow immediate re-use following a significant seismic event.

Miller Junior High School, Stevens Elementary School, AJ West Elementary School and Harbor Learning Center are located in the tsunami inundation zone as defined by the State of Washington Department of Natural Resources (WA-DNR) and both horizontal evacuation routes and potential vertical evacuation towers have been studied along with potential hazards associated with each approach. Costs estimated for vertical evacuation towers are very preliminary and are based on $20,000 per occupant. Funding from the State of Washington only covers the students and staff at each school studied. Note that if a school were to be re-built at its current location the vertical evacuation solution could be integrated into the school design.

Recommendations

The fact sheets to the right contain data on each of the schools. The primary reason for the Replacement recommendation at the first four schools is the poor soils which drive the high seismic retrofit costs. Additional detail below:

- **Miller Junior High School** – Although the school building appears to be in good condition for its age, the soil condition under the building is very poor and even retrofitting the existing school appears to be cost prohibitive.

- **Stevens Elementary School** – The original portion of the existing school is in poor condition and the structural condition is fair. With the same poor soils as the nearby Miller Junior High School the work to complete the seismic retrofit would be better spent on replacing the school.

- **AJ West Elementary School** – The school has been significantly upgraded inside from its original construction and the structural condition is fair but the soils are not good and the school is located in a potential debris path from the port of Aberdeen in the event of a tsunami.

- **Harbor Learning Center (Hopkins Building)** – While the existing concrete walls are in better structural condition than the balance of the building, the slab on grade has settled and is extremely uneven throughout and the roof structure is laterally deficient while the roofing itself is in very poor condition. The building does not appear to have been significantly improved since it was constructed nearly seventy years ago and is not energy efficient from a systems or an envelope perspective. The soils are not good and the school is located in a potential debris path from the port of Aberdeen in the event of a tsunami.

- **McDermoth Elementary School** – The school was modernized in the mid-1990s including some structural improvements and building additions. Due to its central location outside of the tsunami inundation zone (except for a small portion of the play area), its historical character and generally very good condition, it would be a fine candidate for seismic retrofit along with another modernization to further improve the building structure, systems and finishes.

- **Robert Gray Elementary School** – Robert Gray was constructed in the early 2000s and will likely become eligible for state funding for seismic improvements and modernizations in the next 5 years. It is located outside the inundation zone but the soils east of the school would need to be addressed due to potential lateral movement in a seismic event. Like McDermoth the school would be a good candidate for seismic retrofit, structural, systems and general improvements as part of a major modernization.

- **Central Park Elementary School** – Central Park serves a neighborhood east of the city of Aberdeen and is a smaller elementary school. Since it is outside of the inundation zone it would be a candidate for either a seismic retrofit with modernization or a replacement school on the same site.

Follow Up

Upon completion of this Planning report decisions can be taken regarding additional efforts for each of the schools including:

- Determine phasing and scheduling of retrofit and/or replacement concepts including potential alternate school sites.

- Coordinate with local agencies on initial land use, code compliance and utility coordination.

- Prepare and present to OSPI School Seismic Grant Committee.

- Present information on study to stakeholders for input and buy-in on planned improvements.

MILLER JR HIGH SCHOOL

fact sheet

Stats:

706
students & staff

94,577 SF
total area
permanent construction only
(includes 2020 addition)

1978 main building
2020 addition

Tsunami Analysis:

Tsunami Arrival ***70 min***

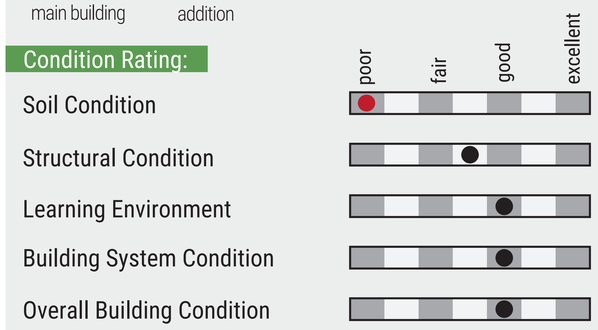


30 min
0.6 miles

Yes
Inundation Zone

Horizontal Evacuation

Condition Rating:



Findings:

To meet seismic retrofit at Building & Site:

- Extensive work at and below grade due to poor soil
- Improve shear walls and connections on western portion of school
- Replace floor finishes, most casework and some doors, match existing per OSPI requirements
- Site work demolition and restoration at building perimeter needed to accommodate pile and slab installation as well as heavy equipment on site

Seismic Retrofit Cost (including Evac. Tower):

(2027 dollars)

$60,500,000

Modernization Cost:

$22,685,904

Total Retrofit Cost:

$83,185,904

Recommendation:
REPLACE

STEVENS ELEMENTARY

fact sheet

Stats:

330
students & staff

45,900 SF
total area
permanent construction only
(includes additions)

1954 main building
1974 & **1976** addition

Tsunami Analysis:

Tsunami Arrival ***70 min***

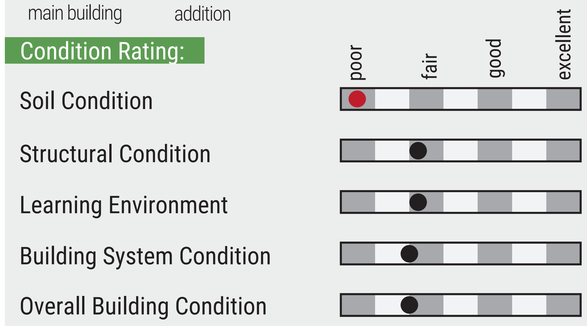


40 min
1.02 miles

Yes
Inundation Zone

Horizontal Evacuation

Condition Rating:



Findings:

To meet seismic retrofit at Building & Site:

- Extensive work at and below grade due to poor soil
- Improve shear walls and connections
- Upgrade roof systems and add seismic separation at covered play areas
- Replace floor finishes, most casework and some doors, match existing per OSPI requirements
- Site work demolition and restoration at building perimeter needed to accommodate pile and slab installation as well as heavy equipment on site

Seismic Retrofit Cost (including Evac. Tower):

(2027 dollars)

$40,000,000

Modernization Cost:

$10,503,560

Total Retrofit Cost:

$50,503,560

Recommendation:
REPLACE

AJ WEST ELEMENTARY

fact sheet

Stats:

354
students & staff

40,248 SF
total area
permanent construction only
(includes 1966 addition)

1952 main building
1966 addition

Tsunami Analysis:

Tsunami Arrival ***60 min***

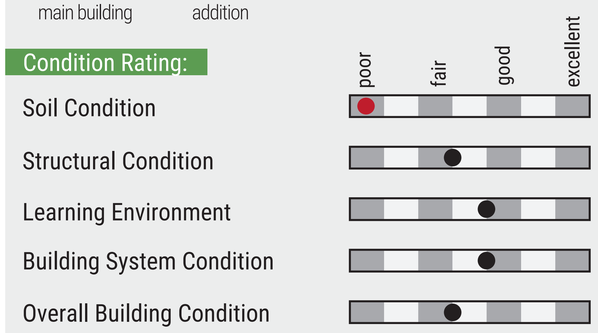


25 min
0.51 miles

Yes
Inundation Zone

Horizontal Evacuation

Condition Rating:



Findings:

To meet seismic retrofit at Building & Site:

- Extensive work at and below grade due to poor soil
- Improve shear walls and connections on western portion of school
- Replace floor finishes, most casework and some doors, match existing per OSPI requirements
- Site work demolition and restoration at building perimeter needed to accommodate pile and slab installation as well as heavy equipment on site

Seismic Retrofit Cost (including Evac. Tower):

(2027 dollars)

$28,000,000

Modernization Cost:

$12,672,060

Total Retrofit Cost:

$40,672,060

Recommendation:
REPLACE

HARBOR LEARNING CENTER (HOPKINS BUILDING)

fact sheet

Stats:

264
students & staff

25,303 SF
total area
permanent construction only
(excludes SF used by pre-k and 3rd party)

1956
main building

Tsunami Analysis:

Tsunami Arrival ***60 min***

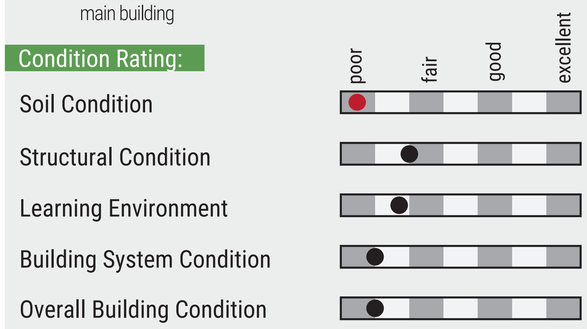


25 min
0.52 miles

Yes
Inundation Zone

Horizontal Evacuation

Condition Rating:



Findings:

To meet seismic retrofit at Building & Site:

- Extensive work at and below grade due to poor soil
- Improve shear walls and connections
- Replace roof and underlying structure
- Removal of play equipment needed, may no longer be compliant with Washington Health Code
- Replace floor finishes, most casework and some doors, match existing per OSPI requirements
- Site work demolition and restoration at building perimeter needed to accommodate pile and slab installation as well as heavy equipment on site

Seismic Retrofit Cost (including Evac. Tower):

(2027 dollars)

$38,500,000

Modernization Cost:

$11,102,400

Total Retrofit Cost:

$49,602,400

Recommendation:
REPLACE

CENTRAL PARK ELEMENTARY

fact sheet

Stats:

144
students & staff

27,706 SF
total area
permanent construction only
(includes 1966 addition)

1958 main building
1966 addition

Tsunami Analysis:

Tsunami Arrival ***n/a***

No
Inundation Zone

3 min
100 feet
Horizontal Evacuation

Condition Rating:

	poor	fair	good	excellent
Soil Condition			●	
Structural Condition		●		
Learning Environment			●	
Building System Condition			●	
Overall Building Condition			●	

Findings:

To meet seismic retrofit at Building & Site:

- Improved connections from wall to roof are needed
- Roof structure at gym needs to be upgraded
- Roof diaphragm requires improvements

Seismic Retrofit Cost (including Evac. Tower):

(2027 dollars)

$4,100,000
Modernization Cost/budget:
$8,729,551
Total Retrofit Cost/budget:
$12,829,551

Recommendation:
SEISMIC RETROFIT/ MODERNIZE

MCDERMOTH ELEMENTARY

fact sheet

Stats:

340
students & staff

42,338 SF
total area
permanent construction only
(includes additions)

1997
main building

Tsunami Analysis:

Tsunami Arrival ***60 min***

site **Yes**
building **No**
Inundation Zone
(only part of site)

10 min
0.30 miles
Horizontal Evacuation

Condition Rating:

	poor	fair	good	excellent
Soil Condition	●			
Structural Condition			●	
Learning Environment			●	
Building System Condition			●	
Overall Building Condition			●	

Findings:

To meet seismic retrofit at Building & Site:

1930 Building

- At exterior and tunnel walls, provide micropiles beneath existing concrete with new pile caps
- For interior shear walls in attic, provide new glulam beams beneath each wall with holdowns at each wall end
- Fully sheath floor of attic; at steps, provide A35 clips between upper and lower diaphrams

Adjacent Buildings

- Provide new 6" seismic joint, and re-support existing structure with new gravity elements at joints

Seismic Retrofit Cost (including Evac. Tower):

(2027 dollars)

$7,200,000
Modernization Cost/budget:
$16,916,704
Total Retrofit Cost/budget:
$24,116,704

Recommendation:
SEISMIC RETROFIT/ MODERNIZE

ROBERT GRAY ELEMENTARY

fact sheet

Stats:

354
students & staff

45,393 SF
total area
permanent construction only
(includes 1966 addition)

2002
main building

Tsunami Analysis:

Tsunami Arrival ***70 min***

site **Yes**
building **No**
Inundation Zone
(only part of site)

15 min
0.50 miles
Horizontal Evacuation

Condition Rating:

	poor	fair	good	excellent
Soil Condition	●			
Structural Condition				●
Learning Environment			●	
Building System Condition			●	
Overall Building Condition			●	

Findings:

To meet seismic retrofit at Building & Site:

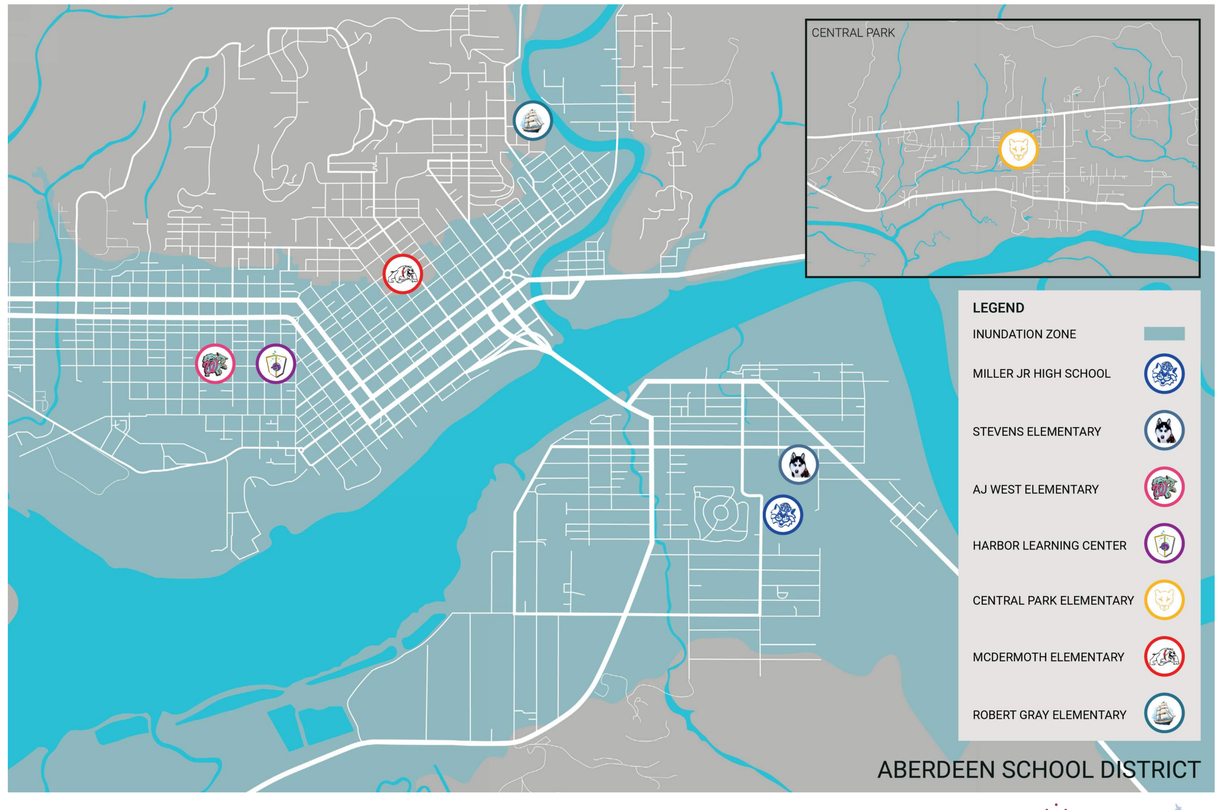
- Improved connections at existing plywood shear walls are needed
- Geotechnical testing recommends that ground improvements be made east of the school

Seismic Retrofit Cost (including Evac. Tower):

(2027 dollars)

$31,515,000
Modernization Cost/budget:
$12,825,874
Total Retrofit Cost/budget:
$44,340,874

Recommendation:
SEISMIC RETROFIT/ MODERNIZE



SEISMIC STUDY

Aberdeen School District Seismic Safety Grant & Master Planning

TCF A · Degenkolb · Construction Services Group · Aberdeen School District

Map Sheet 5
Detailed tsunami inundation of southwest Washington—Grays Harbor to northern Willapa Bay

Daniel W. Eungard, Corina Forson, Timothy J. Walsh, Edison Gica, and Diego Arcas

WASHINGTON GEOLOGICAL SURVEY
MAP SERIES 2018-01
MAP SHEET 5 of 6

Tsunami hazard maps of southwest Washington—Model results from a ~2,500-year Cascadia subduction zone earthquake scenario
March 2018 [revised May 2018]

WASHINGTON STATE DEPT OF NATURAL RESOURCES
WASHINGTON GEOLOGICAL SURVEY

NOAA Center for Tsunami Research
Pacific Marine Environmental Laboratory

N

STUDY AREA BOUNDARY

Ocean City
Screamin Eagle Campground ~45 feet
Oyhut
Point Brown Ave at E Chance A La Mer NE ~27 feet
Elks Lodge ~21 feet
OCEAN SHORES SIMULATED TIDE GAUGE
Ocean Shores
Bill's Spit ~5 feet
Shoreline beyond Driftwood St ~52 feet
WAVE ARRIVAL ~15 minutes
Spinnaker Park ~29 feet
Damon Point ~61 feet
Point Brown
Damon Point
Armstrong Bay
North Bay
Point Chehalis
Westport Viewing Tower ~13 feet
Westhaven
Westport City Park ~7 feet
West Ocean Ave Roundabout ~18 feet
Westport
Surf St @ Newell Ave W ~53 feet
Cohasset
Ocosta School vertical evacuation structure
Bay City
Shoreline beyond W Bonge Ave ~51 feet
WAVE ARRIVAL ~15 minutes
Beachcomber Grocery and Deli ~26 feet
Grayland
Heather
Warrenton Cannery Rd at SR 105 ~13 feet
Cape Shoalwater
Pacific Ocean
WAVE ARRIVAL ~40 minutes
Ocosta
South Bay
Point Newa
Neds Rock
Bowerman Basin
Grays Harbor City
Hoquiam
WAVE ARRIVAL ~50 minutes
Moon Island
East Hoquiam
Aberdeen
AJ West Elementary School ~9 feet
WAVE ARRIVAL ~70 minutes
Rennie Island
WAVE ARRIVAL ~60 minutes
South Aberdeen
Stevens Elementary School ~8 feet
Junction City
Cosmopolis
Grays Harbor
Stearns Bluff
Forest roads not shown—this is not an evacuation map
Seastrand Ridge
South Creek
Elk River
Chehalis River
Wishkah River
Wynoochee River
Humptulips River
Hoquiam River
Moon Slough
Bowerman Slough
Gordon Slough
Bay City Slough
Aberdeen Lake
10-METER DEM LIDAR
LIDAR 10-METER DEM
TOKELETH DEM LIDAR
OCEAN BEACH RD
SR 105
SR 109
US 101
STUDY AREA BOUNDARY

MAP SYMBOLS

Modeled inundation depth (feet): 60, 50, 40, 30, 20, 10, 0

Pre-earthquake open water

- Point elevation
- Shoreline where inundation is inferred but not quantified
- US or state highway
- Road
- Non-motorized route
- Lidar extent
- Study area boundary
- Arrow indicates actual tsunami inundation may extend farther than modeled inundation outside of high-resolution lidar coverage or study extent

WASHINGTON

map area

GRAYS HARBOR COUNTY
PACIFIC COUNTY
WAHKIAKUM COUNTY

Shaded relief generated from 10-meter digital elevation model and composite lidar 3-foot digital elevation model, NAD83 State Plane coordinate system, Washington South FIPS 4602 North American Datum of 1983
Digital cartography by Daniel E. Coe
Editing and production by Jessica L. Czajkowski and Susan R. Schmir

Disclaimer: This product is provided 'as is' without warranty of any kind, either expressed or implied, including, but not limited to, the implied warranties of merchantability and fitness for a particular use. The Washington Department of Natural Resources and the authors of this product will not be liable to the user of this product for any activity involving the product with respect to the following: (a) lost profits, lost savings, or any other consequential damages; (b) fitness of the product for a particular purpose; or (c) use of the product or results obtained from use of the product.

http://www.dnr.wa.gov/geology

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Tsunami terminology diagram

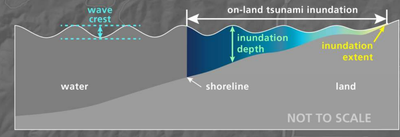


Diagram defining tsunami terminology: (1) the wave crest is the peak height of the wave, referenced offshore, where the wave is influenced only by local bathymetry; (2) inundation depth is the height of water above the ground surface for any on-land location (Map Sheets 5 and 6 show the maximum inundation depth); (3) inundation extent is the farthest inland point that the tsunami will reach. This diagram does not reflect the proportions of an actual tsunami and shows only a single snapshot in time at maximum inundation.

Daniel W Eungard
March 2018

Map Sheet 2

SCALE 1:48,000

0 3 6 miles

TSUNAMI INUNDATION HAZARD

Aberdeen School District Seismic Safety Grant & Master Planning

Aberdeen, Hoquiam, and Cosmopolis
Tsunami Evacuation Walk Times

Washington State Department of Natural Resources, Washington Geological Survey
Washington Military Department, Emergency Management Division
NOAA
Grays Harbor County, 1854
National Tsunami Hazard Mitigation Program

CITY OF HOQUIAM CITY OF ABERDEEN CITY OF COSMOPOLIS

tsunami inundation may extend farther upstream

Map Symbols

- OUTSIDE OF MODELED TSUNAMI INUNDATION ZONE
- Approximate tsunami evacuation slow-walk times (~24 minute/mile)
- TSUNAMI INUNDATION ZONE
- 10 — 0–10 minutes
- 20 — 11–20 minutes
- 30 — 21–30 minutes
- 40 — 31–40 min.
- 50 — 41–50 min. area beyond safe slow-walk times
- 60 — must walk fast 51–60 min.
- 60+ — above 60 min.
- Ocean
- trail, staircase, or bike path
- road
- tsunami evacuation route
- edge of inundation zone
- pedestrian evacuation not possible in model
- lake or pond
- impassable wetland
- impassable slope
- bridge inaccessible in model
- tsunami siren
- A — post-tsunami assembly area

This item was funded by Award #NA17NWS4670017 by a National Tsunami Hazard Mitigation Program grant to the Washington Geological Survey from the Department of Commerce/National Oceanic and Atmospheric Administration. This does not constitute an endorsement by NOAA.

Bowerman Basin

Moon Island

Beyond safe slow-walk time—must walk fast (~18 minute/mile) to exit inundation zone before tsunami arrival

Bowerman Airport

ESTIMATED WAVE ARRIVAL TIME: 50 MIN

ESTIMATED WAVE ARRIVAL TIME: 60 MIN

ESTIMATED WAVE ARRIVAL TIME: 70 MIN

Hoquiam

Aberdeen

Cosmopolis

Grays Harbor

Chehalis River

Old Landfill (A)
Hoquiam High School (A)
Sunset Memorial Cemetary (A)
Beacon Hill (A)
Basich Blvd (A)
Sam Benn Park (A)
Grays Harbor College (A)
Makarenko Park (A)
Highland Golf Course (A)

Grays Harbor County Juvenile Facility
Sierra Pacific Industries

US101 · SR109 · SR105 · US12

STUDY BOUNDARY

This map is a planning and preparation tool. Learn the evacuation routes for you and your family where you live, work, and play—evacuation maps may not be on hand during an actual emergency.

This evacuation walk time map for the cities of Aberdeen, Hoquiam, and Cosmopolis, provides an estimate of the amount of time it would take to evacuate from within the modeled inundation zone of a Cascadia-sourced subduction zone earthquake. This map provides inundation extent for the L1 scenario, defined as the 2,500-year event from which seismic and tsunami codes are locally derived. Time estimates on this map are modeled assuming a slow walking pace of 2.46 mph (~24 minute/mile), equivalent to the pace used for the timing of cross walks. Estimated wave arrival times shown on the map indicate the time between the beginning of the earthquake and modeled wave arrival at that location.

- Evacuation should begin as soon as earthquake shaking stops and it is safe to move from your drop, cover, and hold position or as directed by a tsunami warning siren, NOAA weather radio, or other official announcements.
- You should make your way uphill and follow the designated evacuation routes shown on this map. These routes were selected for pedestrian evacuation, but may be affected by post-earthquake hazards, such as collapsed bridges, landslides, and downed power lines. Use situational awareness when evacuating and be prepared to take alternate paths if necessary.
- Assembly areas are places of high ground for displaced people. These rally points are typically in open outdoor spaces or in large structures just beyond the tsunami inundation zones and likely will not have immediate services or shelter.
- Do not re-enter or cross back into the inundation zone until instructed to do so by local officials. Tsunamis are multi-wave events. The first wave may not be the highest, and danger of tsunami inundation may persist for many hours after the initial wave has subsided.

Tsunami inundation data from:
Eungard, D. W., Forson, Corina, Walsh, T. J.; Gica, Edison; Arcas, Diego, 2018, Tsunami hazard maps of southwest Washington—Model results from a ~2,500-year Cascadia subduction zone earthquake scenario: Washington Geological Survey Map Series 2018-01, originally published March 2018, 8 sheets, scale 1:48,000, 11 p. text. [http://www.dnr.wa.gov/publications/ger_ms2018-01_tsunami_hazard_southwest_washington.zip]

SCALE 1:16,000
0 1 2 3 4 miles

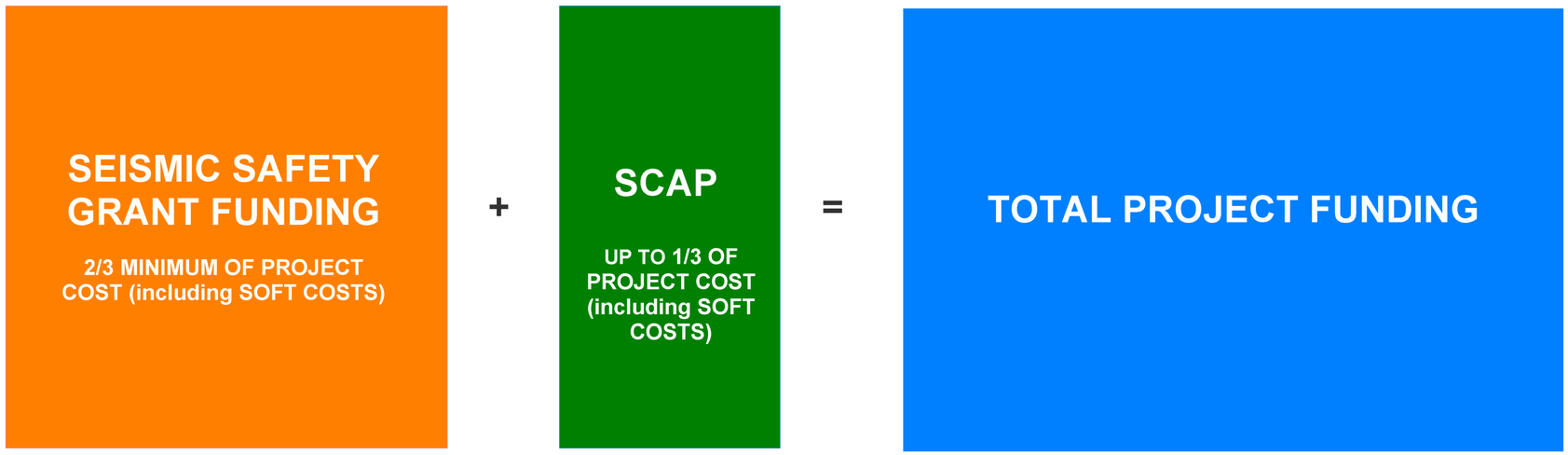
2019 Washington Geological Survey

TSUNAMI EVACUATION TIMES

Aberdeen School District Seismic Safety Grant & Master Planning

TCF A · Degenkolb · Construction Services Group · Aberdeen School District

OSPI SCHOOL SEISMIC SAFETY GRANT PROGRAM - FUNDING (PER PROJECT)



SENATE BILL 5933

In the 2022 Legislative Session, the Legislature enacted Substitute Senate Bill 5933, creating the School Seismic Safety program. This program provides grants to school districts and state-tribal education compact (STEC) schools to cover the costs of retrofitting or relocating schools located in high seismic areas or tsunami zones.

BIENNIUM FUNDING COMMITTMENT

Grant funding for the SSSGP is provided by OSPI through legislative appropriations each biennium and is subject to the availability of funding as well as any legislative or executive directive or restrictions on such funds

$13.24M appropriated in 2020
$100M appropriated in 2023/2025
$100M planned for 2025/2027
$100M planned for 2027/2029
$100M planned for 2029/2031
$100M planned for 2031/2033

OSPI SCHOOL SEISMIC SAFETY GRANT PROGRAM

GRANT AWARD FUNDING TO DISTRICTS (PER PROJECT)

Phase I - Geotech + Planning
Phase II - Conceptual Design
Phase III - Design
Phase IV - Construction

SCHOOL CONSTRUCTION ASSISTANCE PROGRAM (SCAP)

The School Construction Assistance Program (SCAP) provides funding assistance to school districts that are undertaking a major new construction or modernization project. Projects must meet eligibility requirements.

School districts are responsible to secure local funding (Grants, Levy, Bond, Capital Funds, Land, Etc) for construction projects. If eligible, the State provides partial funding based on formulas, allowances, and costs related to certain aspects of a construction project called recognized project costs.

LOCAL SHARE

If required, Local Share may include grants, levy, bond, land contribution, or other capital funding available.

Scope & Process

A. Introduction

This OSPI School Seismic Safety Grant - Phase I Planning effort includes initial Geotechnical sampling and analysis, Structural review of existing building conditions, and overall facility assessment to evaluate the potential viability for seismic retrofit, relocation, and/or construction of vertical evacuation towers.

Following investigation and assessment findings and recommendations are summarized for each of the seven studied Schools:

- Miller Junior High School
- Stevens Elementary School
- AJ West Elementary School
- Harbor Learning Center (Hopkins Building)
- McDermoth Elementary School
- Robert Gray Elementary School
- Central Park Elementary School

Findings include data and analysis of subsurface conditions, existing building structural deficiencies, condition of building systems, overview of other factors which could impact decisions and cost analysis of potential retrofit based on identified opportunities.

Cost estimating was produced assuming Design – Bid – Build approach as the basis for construction delivery to assist the Owner in making decisions.

Recommendations for each school are included alongside the findings to address viability of seismic retrofitting, potential relocation and horizontal or vertical evacuation strategies.

Follow up efforts based on the findings and recommendations will be conducted to:

- Facilitate high level phasing and scheduling of retrofit and/or replacement concepts including potential alternate school sites.
- Coordinate with agencies on initial land use, code compliance and utility coordination.
- Prepare and present to OSPI School Seismic Grant Committee
- Present information on study to stakeholders

The Project Team includes the following firms / agencies:

- Aberdeen School District 5 - Owner
- CSG | ESD 112 – Owner's Project Manager
- TCF Architecture – Architect
- Haley & Aldrich – Geotechnical Engineer
- Degenkolb Engineers – Structural Engineer
- LDC – Civil Engineer
- RC Cost Group – Cost Control Consultant
- HyperNumerics – Site Specific Tsunami Inundation Modeling

- **B. Seismic Study Process**

- Geotechnical Analysis

  Geotechnical engineer performed preliminarily characterization of subsurface conditions at each school site and provided geotechnical engineering guidance and recommendations for the proposed retrofits. These geotechnical services included conducting geologic research, subsurface explorations, laboratory testing, preliminary seismic ground motion assessments, seismic hazard evaluation, and preliminary engineering analysis. Specifically: Reviewed readily available geologic maps, water well logs, and Washington State Department of Natural Resources reports in the area, as well as other geotechnical reports and plans provided by others for general information regarding subsurface soil and groundwater conditions and geologic hazards. They conducted subsurface explorations in which they logged the subsurface conditions, collected representative soil samples, and transported the samples to a soils laboratory for further visual review and testing. Laboratory testing was performed on select soil samples to evaluate soil engineering properties. These tests included moisture content, Atterberg Limits, grain size distribution determinations, and corrosion suite tests in accordance with current American Society for Testing and Materials (ASTM) or other applicable standards. Using the data from field explorations and laboratory testing, code-based seismic design values were developed in conformance with applicable American Society of Civil Engineers guidance documents. Finally, this data was used to perform limited seismic hazard analysis, including assessment of liquefaction and lateral spread potential, and to estimate the magnitude of vertical and lateral displacements that may occur as a result of design-level seismic shaking at each school site.

- Structural Analysis

  The objective of this study was to complete a seismic evaluation and provide preliminary retrofit recommendations. The seismic evaluation and retrofit feasibility study was performed to characterize the expected seismic performance of the building in its existing condition.

  Throughout this report, the following reference codes and standards are used:

  - ASCE 41-17: Seismic Evaluation and Retrofit of Existing Buildings. American Society of Civil Engineers, 2017.
  - ASCE 7-16: Minimum Design Loads for Buildings and Other Structures. American Society of Civil Engineers, 2016.
  - 2021 International Existing Building Code as amended by the Washington State Building Code. International Code Council 2021.

  An ASCE 41-17 Tier 1 evaluation was performed with a Limited Safety structural performance objective. The following Tier 1 checklists were completed as part of this evaluation:

  - Basic Collapse Prevention Configuration Checklist modified for Limited Safety
  - Building System-Specific Collapse Prevention Structural Checklists modified for Limited Safety for each building or building type at each school campus.

  The Collapse Prevention checklists were used with modified m-factors for the Limited Safety performance objective as required by ASCE 41-17 Table 2-2 footnote c. These checklists are intended to screen for common building deficiencies with limited structural calculations. These deficiencies have been identified as potential collapse hazards when buildings of similar age and construction are subjected to large ground motions.

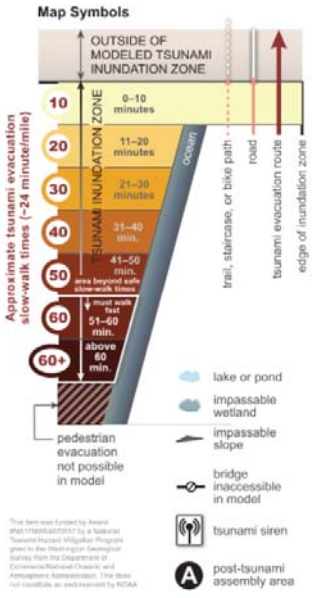
C. Tsunami Study Process

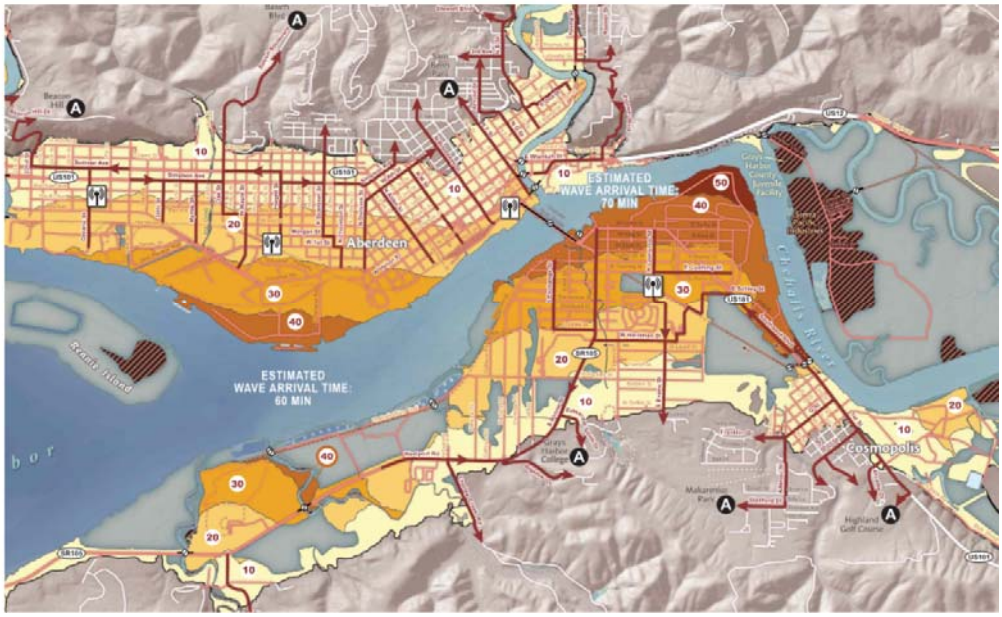
Based on hazard maps available from the Washington Department of Natural Resources (WA DNR), several school campuses are within or adjacent to the Washington Tsunami Design Zone (WA-TDZ). These maps are now incorporated into the building code and lead to additional design requirements for new construction within the inundation zone. To understand current evacuation plans, horizontal evacuation routes were mapped out for each school campus. These are illustrated in Section 3. The viability of these evacuation routes was evaluated for each campus. It was noted that some evacuation routes cross busy highways, some are aligned with power transmission lines directly along the path and others require longer travel distances. Due to the easterly location of Aberdeen in Grays Harbor, the available time to evacuate is approximately 60 minutes.

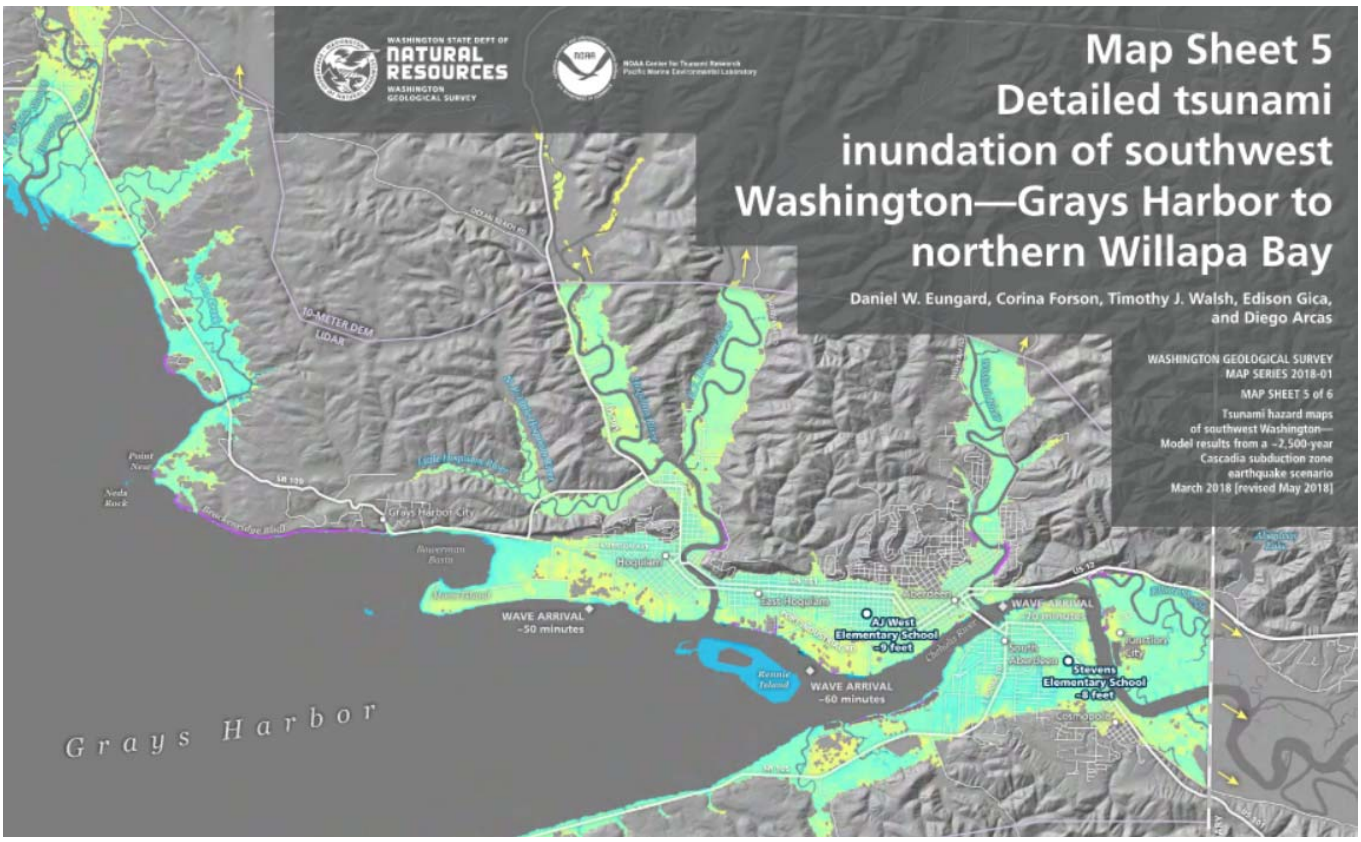
To better understand the tsunami hazard, verify evacuation assumptions, and inform the planning process, site-specific tsunami inundation modeling was completed. This modeling was completed by HyperNumerics and encompasses the Aberdeen community to allow for evaluation of tsunami hazard at each school campus. The modeling meets current building code requirements and can be used to select sites for new school buildings. It can also be used to confirm design requirements such as tsunami flow depth and velocity. Any future construction within the WA-TDZ can utilize this information for preliminary design purposes and may elect to complete further studies, for example in the case where site elevations are modified to elevate the finished floor of a building.

Phase 1 Tsunami Evacuation Planning utilized resources from:

- WA Department of Natural Resources (WA DNR) – Aberdeen, Hoquiam and Cosmopolis Tsunami Evacuation Walk Times & Detailed Tsunami Inundation of Southwest Washington
- FEMA - Guidelines for Design of Structures for Vertical Evacuation from Tsunamis






WASHINGTON STATE DEPT OF
NATURAL RESOURCES
WASHINGTON GEOLOGICAL SURVEY
Map Sheet 5
Detailed tsunami inundation of southwest Washington—Grays Harbor to northern Willapa Bay
Daniel W. Eungard, Corina Forson, Timothy J. Walsh, Edison Gica, and Diego Arcas
WASHINGTON GEOLOGICAL SURVEY
MAP SERIES 2018-01
MAP SHEET 5 of 6
Tsunami hazard maps of southwest Washington—Model results from a ~2,500-year Cascadia subduction zone earthquake scenario
March 2018 [revised May 2018]
10-METER DEM LIDAR
WAVE ARRIVAL ~50 minutes
WAVE ARRIVAL ~60 minutes
AJ West Elementary School ~9 feet
Stevens Elementary School ~8 feet
Grays Harbor

Findings and Recommendations

Conditions Ratings

The Condition Ratings shown on the school fact sheets and the executive summary are subjective ratings of each school based on design team site visits, detailed analysis and review of information provided by Aberdeen School District, FEMA, State of Washington and construction drawings.

The ratings are listed as:

- Poor (unacceptable condition)
- Fair (usable, functional for intended purpose)
- Good (better than average condition)
- Excellent (equivalent to new construction)

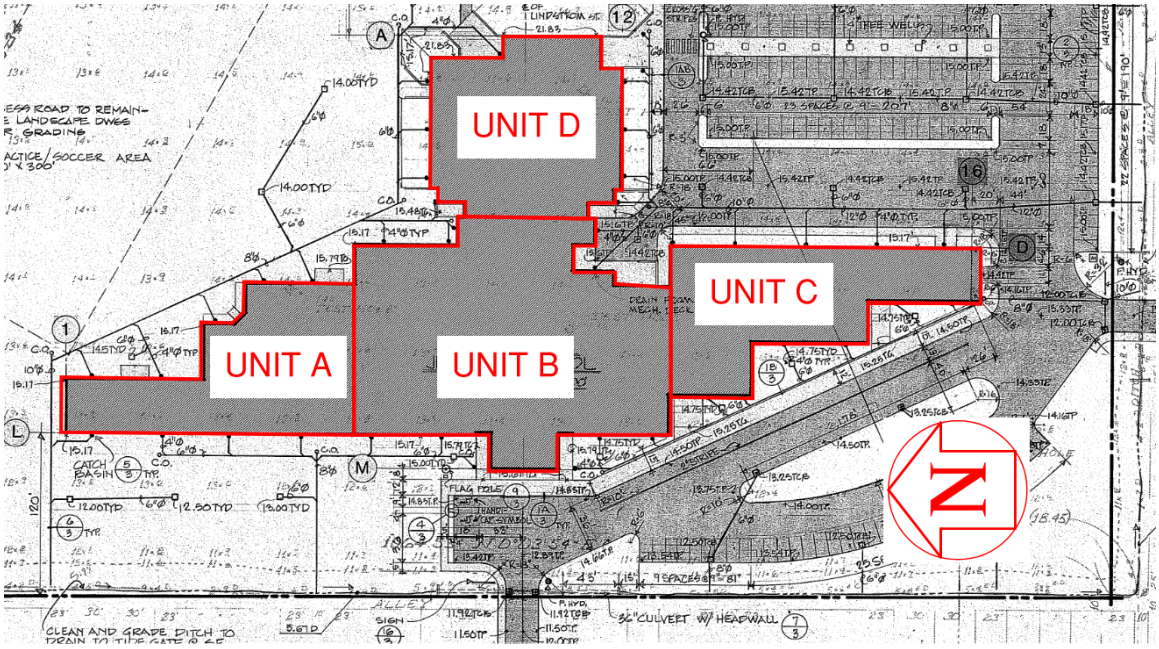
The five categories are:

- Soil Condition – Ratings for soil condition are based entirely on the geotechnical analysis and findings.
- Structural Condition – Ratings for the building structure are generated from construction drawings review, ASCE checklists and visual inspection of current conditions. The rating is balanced by the likely work required to improve the building.
- Learning Environment – The learning environment is judged based on daylighting, building lighting, acoustics, finishes and built-in equipment along with usability of spaces for intended purpose and ability to utilize spaces for varying methods of teaching / learning.
- Building System Condition – Plumbing, HVAC & Electrical systems were reviewed in determining ratings for each school based on system age, condition, suitability for purpose and sizing. Additionally, the building envelope (roof, walls, windows & doors) is assessed based on current condition, energy efficiency, remaining lifespan before replacement or significant repairs are needed.
- Overall Building Condition – The overall building condition takes the three categories above (excluding soil condition) and assigns a rating for the school relative to other similar schools in Washington.

The recommendation for each school takes all five Condition Ratings into account with significant weight given to the Soil Condition which cannot be altered, it can only be addressed to varying degrees through remediation actions as noted. In the findings and recommendations.

Miller Junior High School

Miller Junior High School is a one-story structure (with mezzanines) originally constructed in 1977. The building has four parts (denoted units A through D in the drawings), with outside-to-outside dimensions of approximately 290 feet by 650 feet. The west wing (units A-C) is a parallelogram zigzag shaped structure that houses the reading lab, science labs, learning resource center, student center, administrative offices, kitchen, music room, cooking room, sewing room, art rooms, and classrooms. The east part of the building (unit D) is rectangular and houses the gymnasium and locker rooms.



Findings:

- Geotechnical Exploration & Analysis
  - Subsurface soil and groundwater conditions at the site were explored on 8 through 11 of April 2024 by drilling one boring to a depth of approximately 121.5 feet bgs (below ground surface) using the mud-rotary drilling method and advancing one cone penetration test to a depth of approximately 112 feet bgs.
  - Subsurface profile consisted of:
    - Very soft elastic silt
    - Variable depths to weathered bedrock ranging from 87 to over 124 feet below ground surface
  - Groundwater was shallow at about 7 feet below ground surface
  - Liquefaction potential is lower at this site due to the lack of sands and high volume of fine-grained elastic silts
  - Cyclic softening is expected to occur instead of liquefaction, where the very soft silts will lose strength and will fail to properly support the existing structure foundations, causing differential settlements across the structure footprint.
  - Lateral spread could be on the order of 1½ to 3 feet under the mildest seismic design case (BSE-1E) and in the tens of feet under larger seismic scenarios (BSE-2N, BSE-2E)
  - Tsunami hazard is present, which could result in inundation with 5 to 10 feet of water following a nearby magnitude 9.0 event on the Cascadia Subduction Zone.

- Soil is classified as Site Class F due to the cyclic softening hazard. The site is in a region of high seismicity, with the Cascadia Subduction Zone contributing significantly to the overall seismic hazard at the site.

- Structural Building Review

  West Wing (Units A/B/C):

  - Foundation System:
    - Exterior wall lines: Wood or wood/concrete composite pile foundation with pile caps and grade beams.
    - Interior: Wood or wood/concrete composite pile foundation supporting reinforced concrete slab on grade and grade beams in select locations.
  - Floor System: Reinforced concrete slab on grade.
  - Wall System: 2x wood stud walls with plywood sheathing at shear walls.
  - Roof System: Plywood diaphragm supported by glulam beams and girders spanning to tube steel columns and exterior walls.

  East Wing (Unit D):

  - Foundation System:
    - Wood or wood/concrete composite pile foundation supporting reinforced concrete slab on grade.
    - Grade beams at interior and exterior wall lines.
  - Floor System: Mezzanine floors: Precast, prestressed, hollow concrete planks with a concrete topping slab.
  - Wall System:
    - Concrete walls below mezzanines.
    - 2x wood stud walls with plywood sheathing above mezzanines.
  - Roof System: Plywood diaphragm supported by glulam beams spanning to tube steel columns to the north and a steel truss to the south (over auxiliary gymnasium mezzanine).

  Site Visit and Investigation:

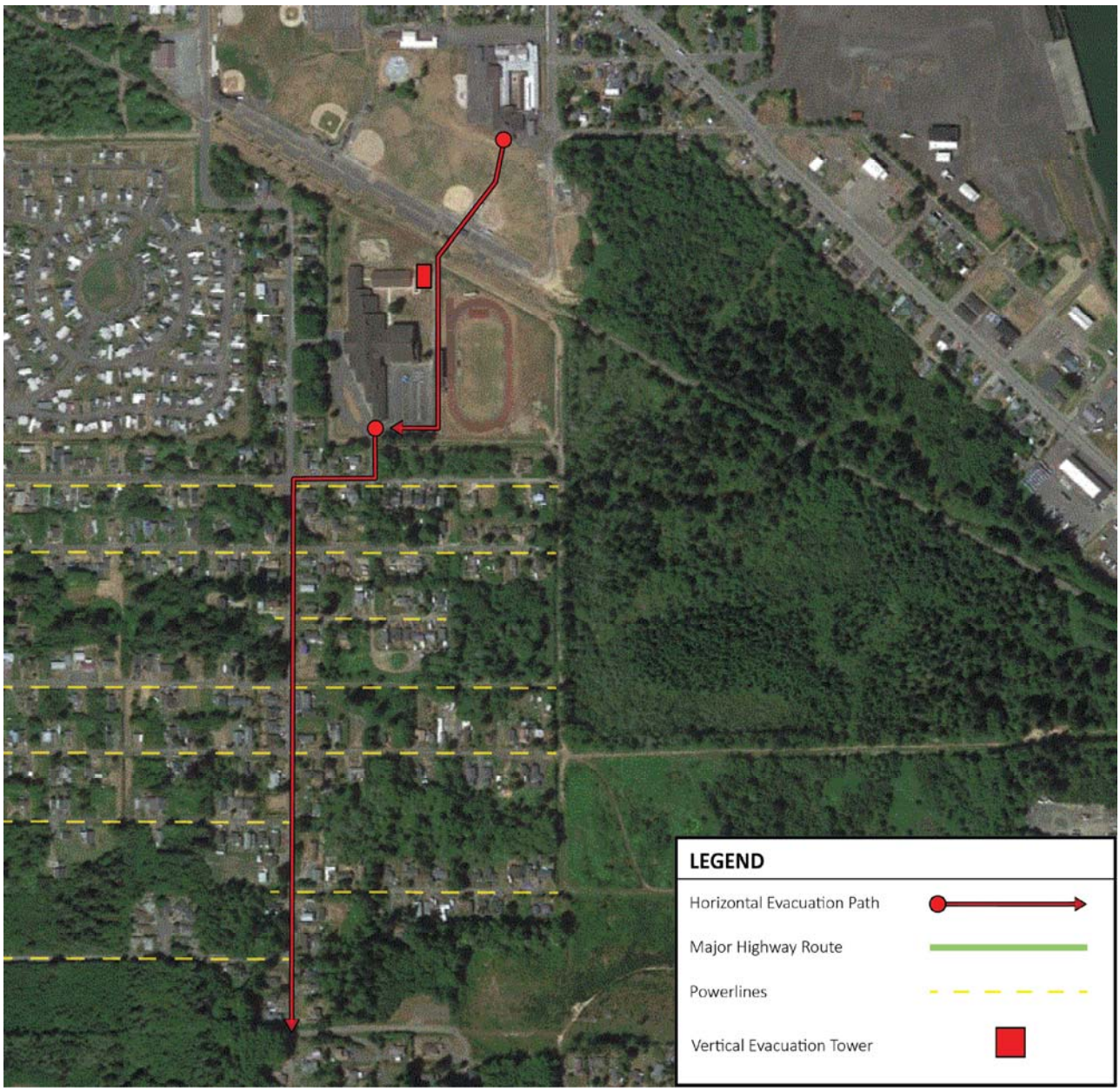
  - The buildings were in good condition with no noticeable signs of deterioration. Significant soil settlement was observed surrounding the building.
  - Typical construction observed generally matches existing drawings.

- Structural Deficiency Summary:

Category	Deficiency	Description*
Lateral Seismic-Force-Resisting System	Load Path	NC – (1) Split level diaphragms do not have a clear load path to transfer shear force from the upper diaphragm, through the wall, and into the lower diaphragm. (2) There are no clips or nailing present to deliver shear forces from the diaphragm into the shear wall.
	Adjacent Buildings	NC – There is no seismic gap between the gym and main building. This prevents independent movement of the two structures.
	Shear Stress Check	NC – The shear stress in the plywood shear walls is greater than 1000 plf in units A/B/C.
	Narrow Wood Shear Walls	NC – In units A/B/C, there are several 3' long exterior shear walls between window openings. During an earthquake, these walls would be highly stressed and subject to severe deformations that reduce their capacity.
	Walls Connected Through Floors	NC – Shear walls continue up through attic to roof but have discontinuous studs with no connection to transfer overturning uplift forces through the interface.
Diaphragms	Diaphragm Continuity	NC – There are multiple split-level diaphragms across units A/B/C. In addition, the hallway between the gym and music room is a split level with no line of resistance on the north side due to full length window openings. Also, the entry foyer splits off the main gym building and creates a diaphragm offset. These discontinuities may lead to instabilities due to lack of diaphragm support.
	Roof Chord Continuity	NC – Glulam beams at edges of diaphragms are not spliced to transfer chord forces.
Connections	Uplift at Pile Caps	U – It is unknown if composite or treated wood piles were used. If treated wood piles were used, there is likely no uplift resistance.
Foundation Configuration	Ties Between Foundation Elements	U – The wood pile foundation is tied together by the slab on grade and grade beams. However, a significant settlement was observed at the site. It is unknown if the soils below the slab on grade have settled similarly. If they have, the shear wall forces cannot be resisted substantially by the soil; the piles will likely act as lateral resisting elements.

* NC = Non-Compliant; U = Unknown

- Tsunami Egress Analysis: The school is located within the Washington Tsunami Design Zone (WA-TDZ) with inundation depths of five to ten feet. The expected tsunami arrival time is estimated at seventy minutes.
  - Horizontal evacuation time to higher ground is estimated at approximately thirty minutes based on a ten minute building evacuation and a walk speed of two miles per hour heading directly south from the school for about 0.6 miles.
  - Vertical evacuation, if constructed, should place the lowest of two levels of refuge at approximately twenty-five feet above ground level. This will need to be confirmed through future site-specific inundation modeling.



- Learning Environment: The learning environment would be rated as 'Good' with larger classroom sizes than are typically constructed in new schools as well as well sized specialty classrooms, labs, library and CTE spaces. There are also offices / pull-out spaces throughout the school to support learning and the facilities for physical education and athletics are well sized and outfitted.

- Building Systems: Existing natural gas and power to the school are below grade with meter for gas and a pad mounted transformer east of the school. HVAC relies on a pair of newer natural gas hot water boilers feeding air handling units in the unheated attic mezzanine. The building is fully fire sprinklered.

- Overall Building Condition: Although there have not been significant remodels or upgrades since original construction the building has been well maintained and appears to generally be in good condition. School layout is logical and primary educational, support and specialty spaces are well sized and equipped.

Recommendations:

Structural Next Steps and Recommendations:

The Tier 1 Procedure in ASCE 41-17 is not intended to be used for the retrofit of structures; rather, it provides a quick screening evaluation to identify areas for further study. Designing retrofit measures because of a Tier 1 screening alone is likely to result in an overly conservative and costly retrofit. ASCE 41 lists Tier 2 and Tier 3 as the two procedures available for the retrofit design of an existing building. A Tier 2 evaluation and retrofit is deficiency-based and is used in conjunction with the results of a Tier 1 evaluation. A Tier 3 evaluation and retrofit is a systematic study of the building and all its components.

As a next step, we recommend that each of the checklist items marked Noncompliant or Unknown should be evaluated using the Tier 2 procedure if the school is to be seismically retrofitted. The Tier 2 evaluation will resolve which items need to be retrofitted to define the retrofit scope.

Although a nonstructural evaluation was not performed in this phase, it is common for buildings of this type and age to require bracing of various nonstructural elements (e.g., pipes and conduits). We recommend that these items be evaluated as part of the Tier 2 analysis.

Proposed Structural Improvements: (sizes noted are preliminary)

- Replace existing concrete slab on grade w/ 24” thick mat foundation doweled through existing grade beams and extending minimum 5’-0” beyond exterior walls at building perimeter.
- Install 24” diameter drilled shafts 95 to 130 feet deep at approximately 12’-0” o.c.
- Create additional plywood shear walls at existing wall locations by adding ½” plywood sheathing and extending framing to underside of roof and adding sill bolts and hold downs at each end of wall.
- Improve existing shear wall top plate to roof connections and add hold downs at each end of wall.
- Improve connection between roof diaphragm at interior elevation changes with added nails and clips.

Tsunami Egress Recommendations:

The horizontal evacuation route is not long and does not cross busy arterial roads. There are power transmission and distribution lines overhead along the identified evacuation route along South Evans Street. Should the building be seismically retrofitted or rebuilt at its current location, a vertical evacuation tower would be the recommended approach. If the adjacent Stevens Elementary School were to be seismically retrofitted or rebuilt at its current location the tower size could be increased to accommodate the occupants of both schools. There is an existing concrete play area east of the 2020 classroom addition that could be the site for a tower.

Preliminary Estimated Tsunami Evacuation Tower cost for Miller Junior High School only would be approximately $15 million based on an estimate of $20,000/occupant.

Tsunami Tower Construction: A tsunami vertical evacuation structure must first resist a significant earthquake and then subsequent tsunami inundation. Therefore, the structure would consist of a robust steel and/or concrete framed structure with the following general features:

- Drilled piles and pile caps.
- Slab on grade below structure.
- Structural Steel Superstructure with stairs and ramp for access.

Overall recommendation:

Based on the identified structural improvements it appears that the school could be seismically retrofitted and remain in service. The preliminary estimated cost for this work, including soft costs at 35% is about $57,500,000. However, there are additional factors to consider prior to opting for retrofitting the existing school as noted below.

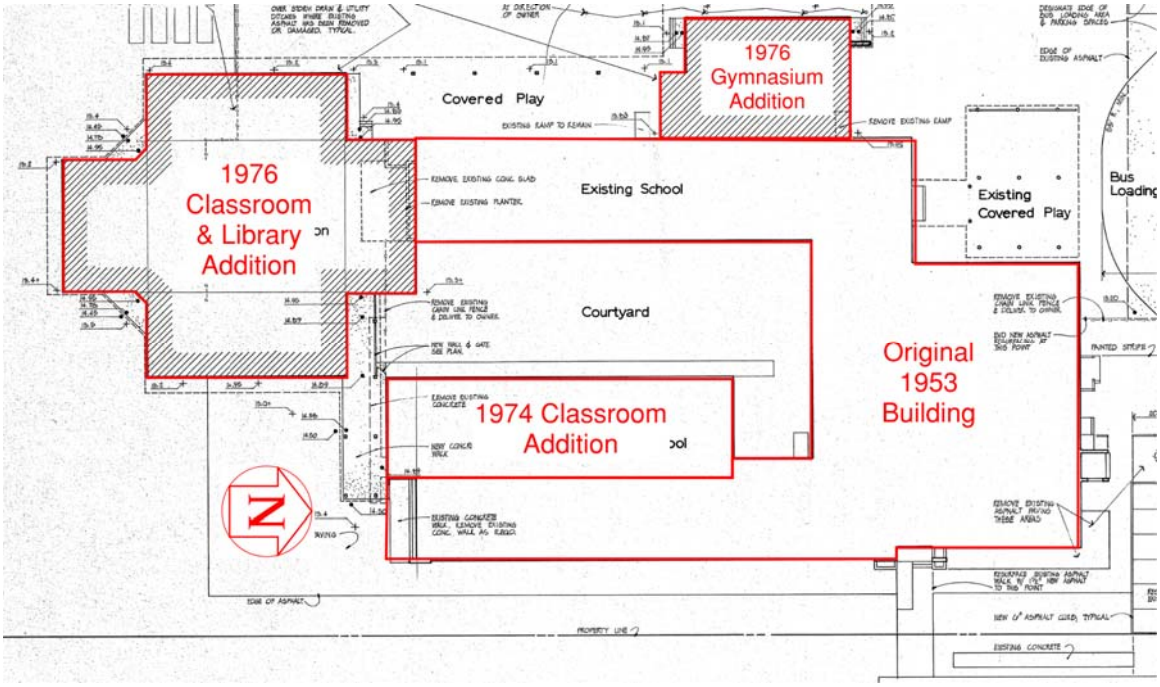
Should the school be seismically retrofitted, only building components and systems directly impacted by the structural work are eligible to be replaced in kind. With this in mind the resultant condition at the school following the retrofit will not be readily noticeable except for new flooring, casework and perhaps a portion of doors / frames.

The work included in an OSPI seismic retrofit of the school is limited to improving the building to provide a safer environment in the event of a significant seismic event for exiting the building and seeking safety. The funding is not designed to improve the school to a level that it would be able to serve as a community safe area following a significant seismic event, nor is it designed to allow immediate re-occupancy of the school without additional structural analysis and potentially more repair to the building to ensure the safety of users.

Based on the above, the costs identified for this work could potentially be put to better use by constructing a replacement school at either the same location, or preferably, a different site with more suitable soil for building construction and outside of the tsunami inundation zone.

Stevens Elementary School

Stevens Elementary School is a one-story structure of varying construction types and dates. The multipurpose room, office area, and east/west classroom wings were constructed in 1953; a classroom addition (connecting to the east classroom wing of the 1953 building) was constructed in 1974; the gymnasium, library, and additional classrooms (connecting to the south and west sides of the 1953 building) were added in 1976. The complete building footprint has outside-to-outside dimensions of approximately 215 feet by 405 feet.



Findings:

- Geotechnical Exploration & Analysis
  - Subsurface soil and groundwater conditions at the site were explored on 8 through 11 of April 2024 by drilling one boring to a depth of approximately 101.5 feet bgs (below ground surface) using the mud-rotary drilling method and advancing one cone penetration test to a depth of approximately 89 feet bgs.
  - Subsurface profile consisted of:
    - Very soft silt
    - Very loose to loose silty sand
    - Loose to medium dense sand
    - Weathered bedrock at 89 feet below ground surface
  - Groundwater was shallow at about 4.5 feet below ground surface
  - Liquefaction is certain to occur under all design seismic scenarios, resulting in an estimated 11 to 13 inches of settlement
  - Lateral spread could be on the order of 1½ to 3 feet under the mildest seismic design case (BSE-1E) and in the tens of feet under larger seismic scenarios (BSE-2N, BSE-2E)
  - Tsunami hazard is present, which could result in inundation with 5 to 10 feet of water following a nearby magnitude 9.0 event on the Cascadia Subduction Zone

- Soil is classified as Site Class F due to the severe liquefaction hazard. The site is in a region of high seismicity, with the Cascadia Subduction Zone contributing significantly to the overall seismic hazard at the site

- Structural Building Review

  Original Building (1953): The building is a one-story structure over a crawlspace with wood-framed floors and roofs. It houses the school's offices, multi-purpose room, kitchen, boiler room and classrooms. The building is h-shaped in plan with dimensions of approximately 170 feet by 270 feet, and its long dimension is oriented north-south. The west classroom wing has a 2.5:12 sloped roof with an eave height of approximately 9 feet on the exterior corridor side and 11 feet on the exterior classroom side. The east classroom wing is similar but has a double pitched roof due to the 1974 addition. The multi-purpose room sloped roof has an eave height of approximately 17'-6".

  - Foundation System:
    - Grade beams on wood piles supporting a concrete masonry block wall grid below the floor system.
    - Precast concrete posts supported by the grade beams and supporting the floor system, placed intermittently between the concrete masonry block walls.
  - Floor System: Elevated concrete floor slab supported by precast I joists, spanning to the concrete masonry block walls.
  - Wall System: 2x stud walls with diagonal sheathing.
  - Roof System: Tongue & groove wood diaphragms supported by timber joists spanning to bearing walls.

  Classroom Addition (1974): The building is a one-story wood framed structure, housing classrooms. The building has a rectangular plan with dimensions of approximately 32 feet by 140 feet, and its long dimension is oriented north-south. The original 1953 exterior corridor wall was retrofitted – a new 2x stud wall was added on top of the original wall to support the new roof trusses, and doors were added into the new classrooms. At this location, the existing skylights in the hallways were covered with plywood, and piping was added as part of a mechanical and heating upgrade. The building has a 2.5:12 sloped roof with an approximate eave height of 9 feet.

  - Foundation System: Untreated wood pile foundation with concrete pedestals and grade beams.
  - Floor System: Reinforced concrete slab on grade over compacted fill.
  - Wall System: 2x gypsum sheathed stud walls with wood posts.
  - Roof System: Plywood diaphragm supported by roof trusses spanning from the original exterior wall to the new exterior wall.

  Classroom Addition (1976): The gymnasium and library/classroom additions are both one-story buildings. The gymnasium is rectangular in plan with dimensions of approximately 50 feet by 75 feet and has a 4:12 sloped roof. The east wall of the gymnasium was originally an exterior wall in the 1953 building – in 1976, exterior finishes were replaced with gypsum board. The library/classroom building is cruciform shaped in plan with dimensions of approximately 120 feet by 140 feet and has a 4:12 sloped roof. To accommodate the addition, the original 1953 building entryway was removed, and the existing corridor was extended.

  - Foundation System: Treated wood pile foundation with concrete grade beams and pile caps.
  - Floor System: Reinforced concrete slab on grade.
  - Wall System: 2x stud walls sheathed with plywood; exterior walls have brick veneer.

- Roof System:
  - Gymnasium: Plywood diaphragm supported by glulam beams and purlins spanning to the new exterior walls on the north, south, and west sides and to the original exterior wall on the east side.
  - Library: Plywood diaphragm supported by glulam beams and glulam columns spanning to the exterior walls.

Site Visit and Investigation:

- The 1974 & 1976 buildings were in good condition with no noticeable signs of deterioration; the 1953 building was in fair condition, with noticeable deterioration at the roof.
- Typical construction observed generally matches existing drawings.

- Structural Deficiency Summary:

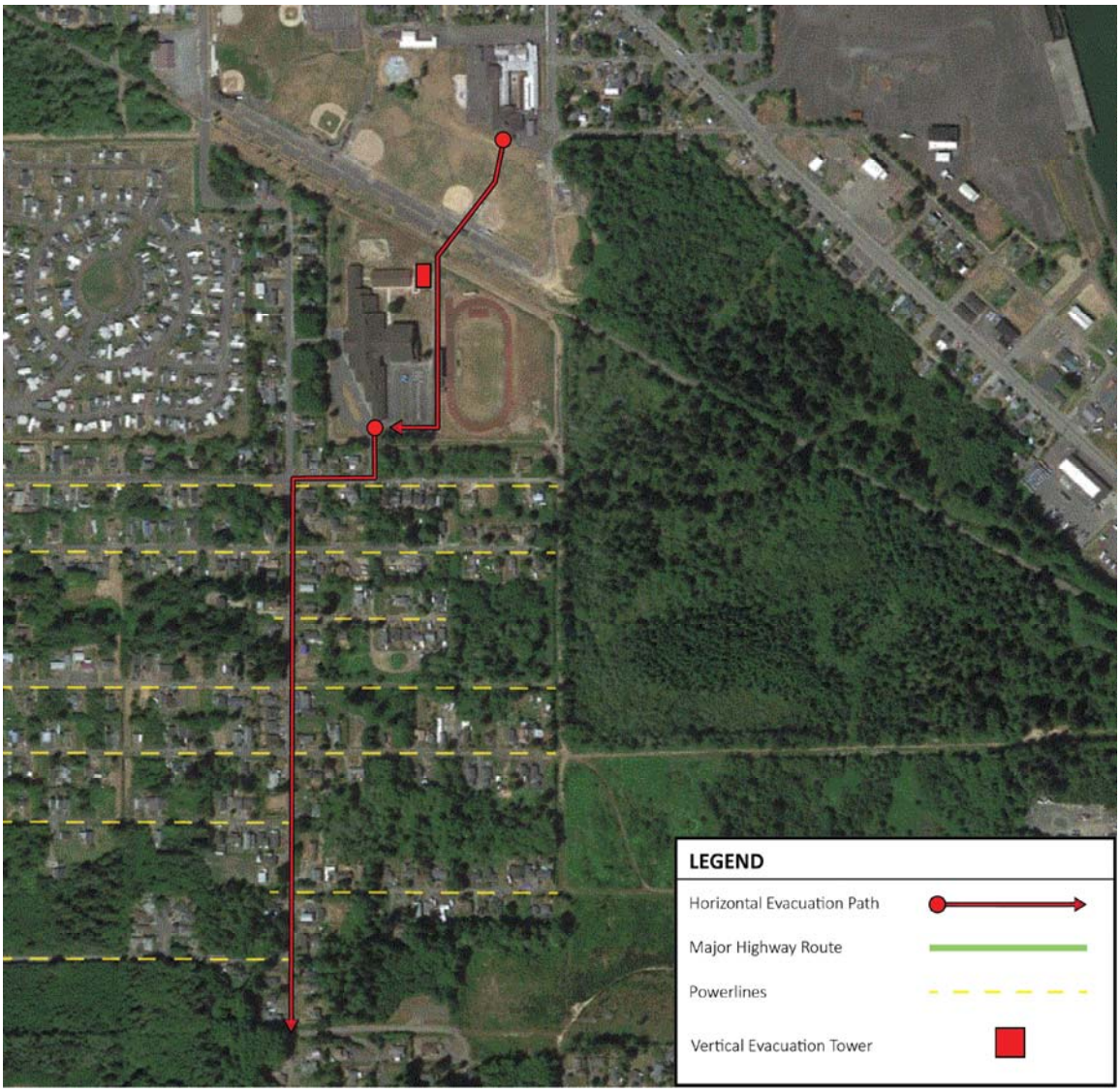
<table>
<tr><th>Category</th><th>Deficiency</th><th>Description*</th></tr>
<tr><td rowspan="3">Building System:
General</td><td>Redundancy</td><td>NC – The 1953 building has no shear walls on east & west elevations (no line of resistance in N-S direction). The 1974 drawings show three shear walls in the E-W direction and no shear walls in the N-S direction; however, the sheathing for these walls could not be verified.</td></tr>
<tr><td>Load Path</td><td>(1) There is no shear connection between the roof and exterior wall in 1953 building.
(2) There are no clips to transfer shear force across the roof joint at the valley where the 1953 and 1974 roofs meet.</td></tr>
<tr><td>Mezzanines</td><td>NC – The mechanical mezzanines above the classrooms in the 1976 building are hanging from roof glulam beams with 4x4 posts, but there is no bracing for lateral movement in the transverse direction.</td></tr>
<tr><td>Geologic Site Hazard</td><td>Liquefaction</td><td>NC – There is very high potential for liquefaction to occur during an earthquake. This would result in a significant strength loss in the soil, resulting in reduced support for foundations and large ground settlements.</td></tr>
<tr><td>Lateral Seismic-Force-Resisting System</td><td>Shear Stress Check</td><td>
<table>
<tr><th>Area</th><th>Controlling Direction</th><th>Wall Type (Capacity)</th><th>Shear Demand</th><th>Result</th></tr>
<tr><td>1953 Multipurpose Room</td><td>N-S</td><td>Diag. sheathing (700 plf)</td><td>3569 plf</td><td>NC</td></tr>
<tr><td>1953 West Classrooms</td><td>N-S</td><td>Diag. sheathing (700 plf)</td><td>1360 plf</td><td>NC</td></tr>
<tr><td>1953 & 1974 East Classrooms</td><td>N-S</td><td>Diag. sheathing (700 plf)</td><td>4115 plf</td><td>NC</td></tr>
</table>
</td></tr>
</table>

		1976 Library & Classrooms	E-W	Plywood (1000 plf)	1085 plf	NC
		1976 Gymnasium	N-S	Plywood (1000 plf)	1009 plf	NC
	Narrow Wood Shear Walls	NC – There are 4 ft long by 11 ft tall shear walls along the interior corridor wall on the east side of the building. During an earthquake, these walls would be highly stressed and subject to severe deformations that reduce their capacity.				
	Walls Connected Through Floors	NC – In the 1953 building, the shear walls have no connection to transfer uplift forces through the slab into the concrete masonry block walls below.				
	Openings	NC – In the 1953 building, the east elevation walls have many windows. These walls may have little to no resistance to shear and overturning forces.				
Connections	Wood Sill Bolts	U – The 1953 & 1974 drawings do not show sill bolts. The absence of a connection limits the ability of the shear walls to resist seismic forces.				
Diaphragms	Diaphragm Continuity	NC – There are split level diaphragms at the 1953 multi-purpose room and the 1976 gymnasium. This is a type of discontinuity which may lead to instability due to lack of support.				
	Diaphragm Reinforcement at Openings	NC – There is no reinforcement at the infilled skylights in the 1953 building corridor. These openings could substantially reduce the stiffness of the diaphragm, and large forces around them could be induced.				
	Straight Sheathing	NC – The 1953 building has a straight sheathed tongue & groove diaphragm that spans two classrooms (64 feet), which results in an aspect ratio greater than 2:1. Straight sheathed diaphragms are flexible and weak relative to other types of wood diaphragms and are not suitable for large aspect ratios.				
	Spans	NC – The 1953 building has a straight sheathed tongue & groove diaphragm that spans two classrooms (64 feet). A span this large has the potential to cause large deflections in the diaphragm which can cause increased damage.				
	Diagonally Sheathed and Unblocked Diaphragms	NC – The plywood diaphragm in the 1974 building is unblocked and spans greater than 40 feet. Without blocking, the diaphragm is subject to premature failure.				

* NC = Non-Compliant; U = Unknown

Tsunami Egress Analysis: The school is located within the WA-TDZ with inundation depths of five to ten feet. The expected tsunami arrival time is estimated at seventy minutes.

- Horizontal evacuation time to higher ground is estimated at approximately forty minutes based on a ten minute building evacuation and a walk speed of two miles per hour heading south from the school towards Miller Junior High for about 1.1 miles.
- Vertical evacuation, if constructed, should place the lowest of two levels of refuge at approximately twenty-five feet above ground level. This will need to be confirmed through future site-specific inundation modeling.



- Learning Environment: The learning environment would be rated as 'Fair' with some classroom still served by the original unit ventilators which are louder than would be allowed in new construction by the Washington State Health Department. There are also limited pull out and specialty spaces in the school to address varying approaches to learning.
- Building Systems: Existing natural gas and power to the school are below grade with meter for gas near the boiler room and a pad mounted transformer east of the school. HVAC relies on a single natural gas boiler feeding air handling units, unit ventilators and fin-tube radiators in portions of the building. Classrooms in the newer addition are served by newer split system units. The building is not fire sprinklered. Electrical service appears to be undersized for the size of the school.

- Overall Building Condition: The building was constructed in three parts – original, classroom addition, gym / library / classroom addition and the newer portion is in better condition than the older portions. With the roof system failing, the mechanical system for much of the building utilizing an older, less efficient boiler and with the building not protected by fire sprinklers the school is in 'Fair' condition at best.

Recommendations:

Structural Next Steps and Recommendations:

The Tier 1 Procedure in ASCE 41-17 is not intended to be used for the retrofit of structures; rather, it provides a quick screening evaluation to identify areas for further study. Designing retrofit measures because of a Tier 1 screening alone is likely to result in an overly conservative and costly retrofit. ASCE 41 lists Tier 2 and Tier 3 as the two procedures available for the retrofit design of an existing building. A Tier 2 evaluation and retrofit is deficiency-based and is used in conjunction with the results of a Tier 1 evaluation. A Tier 3 evaluation and retrofit is a systematic study of the building and all its components.

As a next step, we recommend that each of the checklist items marked Noncompliant or Unknown should be evaluated using the Tier 2 procedure if the school is to be seismically retrofitted. The Tier 2 evaluation will resolve which items need to be retrofitted to define the retrofit scope.

Although a nonstructural evaluation was not performed in this phase, it is common for buildings of this type and age to require bracing of various nonstructural elements (e.g., pipes and conduits). We recommend that these items be evaluated as part of the Tier 2 analysis.

Proposed Structural Improvements: (sizes noted are preliminary)

- Replace existing concrete slab on grade and add 24" thick mat foundation at areas of school with elevated concrete slabs over crawl space. Dowel through existing CMU walls and extending minimum 5'-0" beyond exterior walls at building perimeter. Note that a portion of the existing breezeway at the south side of the school will need to be removed and reconstructed to accommodate drilling and work in the courtyard.
- Install 24" diameter drilled shafts 95 to 130 feet deep at approximately 12'-0" o.c.
- Create additional plywood shear walls at existing wall locations by infilling windows and adding ½" plywood sheathing and extending framing to underside of roof and adding sill bolts and hold downs at each end of wall.
- Improve existing shear connections and add sill bolts and hold downs at each end of wall.
- Install bracing and blocking at top of walls into roof sheathing.
- Add roof sheathing over existing tongue and groove roof deck.
- Seismically separate playshed roofs from balance of building, brace existing steel posts and re-support roof edge with new columns and footings.

Tsunami Egress Recommendations:

The horizontal evacuation route is not long and does not cross busy arterial roads. There are power transmission and distribution lines overhead along the identified evacuation route along South Evans Street after passing Miller Junior High School. Should the building be seismically retrofitted or rebuilt at its current location, a vertical evacuation tower would be the recommended approach with the tower located east of the 2020 classroom addition at nearby Miller Junior High School sized to accommodate the occupants of both schools.

Preliminary Estimated Tsunami Evacuation Tower cost for Stevens Elementary School would be approximately $7 million based on an estimate of $20,000/occupant.

Tsunami Tower Construction: A tsunami vertical evacuation structure must first resist a significant earthquake and then subsequent tsunami inundation. Therefore, the structure would consist of a robust steel and/or concrete framed structure with the following general features:

- Drilled Piles and pile caps.
- Slab on grade below structure.
- Structural Steel Superstructure with Stairs and Ramp for access.

Overall recommendation:

Based on the identified structural improvements it appears that the school may be able to be seismically retrofitted and remain in service. The preliminary estimated cost for this work, including soft costs at 35% is about $40,000,000. However, there are additional factors to consider prior to opting for retrofitting the existing school as noted below.

Should the school be seismically retrofitted only building components and systems directly impacted by the structural work are eligible to be replaced in kind. With this in mind the resultant condition at the school following the retrofit will not be readily noticeable except for new roofing, flooring, casework and perhaps a portion of doors / frames.

The work included in an OSPI seismic retrofit of the school is limited to improving the building to provide a safer environment in the event of a significant seismic event for exiting the building and seeking safety. The funding is not designed to improve the school to a level that it would be able to serve as a community safe area following a significant seismic event, nor is it designed to allow immediate re-occupancy of the school without additional structural analysis and potentially more repair to the building to ensure the safety of users.

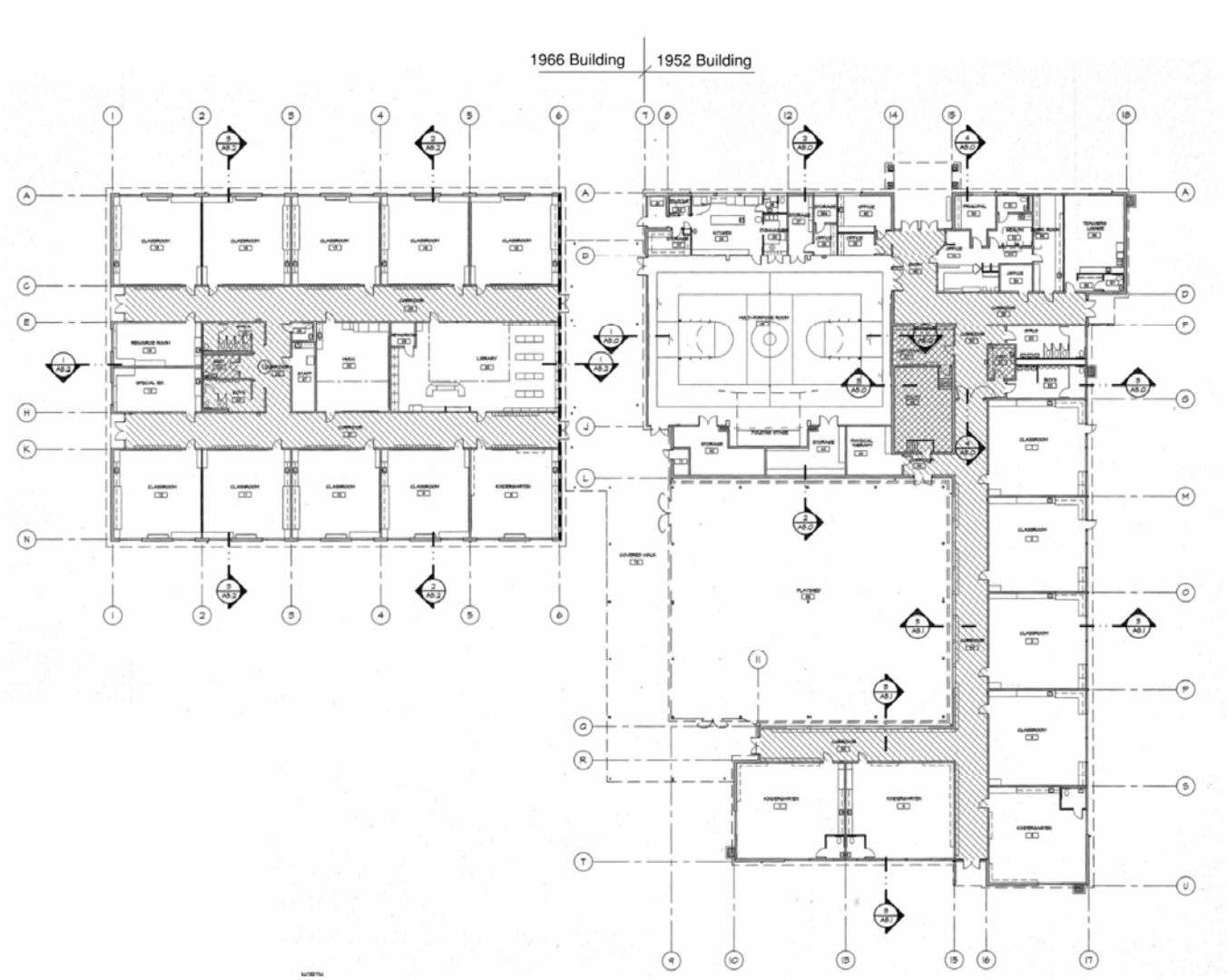
Based on the above, the costs identified for this work could potentially be put to better use by constructing a replacement school at either the same location, or preferably, a different site with more suitable soil for building construction and outside of the tsunami inundation zone.

AJ West Elementary School

AJ West Elementary School is a one-story structure of varying construction types and dates. The original building was constructed in 1952. In 1966, an annex building with additional classrooms was added to the West side of the original building.

The campus underwent a modernization in 1994. Areas with flat roofs on the 1952 and 1966 buildings were overbuilt with sloping roofs. Also, clerestory windows were added to the interior spaces of the 1966 building and windows and siding were replaced in the 1952 building.

The complete building footprint is L-shaped in plan, with outside-to-outside dimensions of approximately 230 feet by 305 feet. The 1994 drawings indicate a partial seismic upgrade of the original and annex buildings.



Findings:

- Geotechnical Exploration & Analysis

  Subsurface soil and groundwater conditions at the site were explored on 10 through 16 of April 2024 by drilling one boring to a depth of approximately 125.5 feet bgs (below ground surface) using the mud-rotary drilling method and advancing one cone penetration test to a depth of approximately 121 feet bgs.

Subsurface profile consisted of:

- Very loose silty sand
- Very soft elastic silt
- Very loose to medium dense sand and silt
- Weathered bedrock at 115 feet below ground surface

- Groundwater was shallow at about 4.5 feet below ground surface
- Liquefaction is certain to occur under all design seismic scenarios, resulting in an estimated 14 to 17 inches of settlement.
- Lateral spread could be on the order of 1½ to 3 feet under the mildest seismic design case (BSE-1E) and in the tens of feet under larger seismic scenarios (BSE-2N, BSE-2E)
- Tsunami hazard is present, which could result in inundation with 5 to 10 feet of water following a nearby magnitude 9.0 event on the Cascadia Subduction Zone.
- Soil is classified as Site Class F due to the severe liquefaction hazard. The site is in a region of high seismicity, with the Cascadia Subduction Zone contributing significantly to the overall seismic hazard at the site.

- Structural Building Review

  Original Building (1952): The building is a one-story structure with wood-framed floors and roofs. It houses the school offices, staff lounge, workroom, gymnasium, kitchen, and seven classrooms. The building is C-shaped in plan with dimensions of approximately 160 feet by 230 feet, and its long dimension is oriented north-south. The low-sloped roof has an eave height of approximately 10 feet. The gymnasium sloped roof has an eave height of approximately 15 feet.

  - Wall System:
    - Corridor walls: 2x stud walls with diagonal sheathing (plywood sheathing at infilled clerestory)
    - Exterior classroom walls: 2x stud walls with diagonal sheathing; combination of aluminum and brick veneer siding.
  - Floor System: Slab on grade
  - Foundation System: Shallow foundations with concrete strip footings at exterior and interior wall lines
  - Roof System:
    - Classroom roof: diagonal sheathing over 2x10 roof joists and 2x4 ceiling joists
    - Corridor roof: unblocked plywood over 2x8 framing (overbuilt over 1952 flat roof)
    - Gymnasium roof: Plywood sheathing (added in 1994) over original diagonal sheathing over 2x12 purlins spanning to shaped glulam beam arches (original 1952)

  Annex Building (1966): The building is a one-story structure with wood-framed floors and roofs. It houses 10 classrooms, the music room, and library. The building has a rectangular plan with dimensions of approximately 145 feet by 115 feet, with its long dimension oriented east-west. The building has a 3:12 sloped roof with an approximate eave height of 9 feet.

- Wall System:
  - 2x stud walls with plywood sheathing
  - Several walls were converted to shear walls in 1994 modernization.
- Foundation System: Reinforced concrete slab on grade and grade beams supported by driven wood piles.
- Roof System:
  - Plywood sheathing
  - Roof trusses at 32" on center over original trussed joist roof

Site Visit and Investigation:

- The buildings were in good condition with no noticeable signs of deterioration.
- Typical construction observed generally matches existing drawings.

- Structural Deficiency Summary – 1952 Building:

Category	**Deficiency**	**Description***
Building System: General	Load Path	NC – (1) Due to infilled clerestory, wall studs at interior & exterior corridor walls are not continuous through upper and lower portions. This causes a weak point in the wall. (2) The roof-to-wall connection at the exterior classroom walls has a gap currently filled with insulation. There is no load path for seismic forces to get from the roof into the wall in this configuration
Building System: General	Adjacent Buildings	NC – The gap between the play shed and 1952 building is enclosed with sheet metal in many locations but is framed into the classroom building at some locations. This prevents independent movement of the two structures.
Geologic Site Hazard	Liquefaction	NC – There is very high potential for liquefaction to occur during an earthquake. This would result in a significant strength loss in the soil, resulting in reduced support for foundations and large ground settlements.
	Shear Stress Check	NC – The average shear stress in the shear walls is greater than the limit in the E-W direction.
	Narrow Wood Shear Walls	NC – The exterior classroom walls at the East elevation have several 3 ft long shear walls. During an earthquake, these walls would be highly stressed and subject to severe deformations that reduce their capacity.

Diaphragms	Diaphragm Continuity	NC – The gymnasium diaphragm is offset from the main building on the South, West, and East sides. This is a type of discontinuity which may lead to instability due to lack of support.
	Diagonally Sheathed and Unblocked Diaphragms	NC – The diaphragm above the original construction is diagonally sheathed and spans multiple classrooms; the overframed roof diaphragm is plywood sheathed, unblocked, and spans up to 160 ft. These diaphragms have large spans that would result in large shear demands.

* NC = Non-Compliant; U = Unknown

- Structural Deficiency Summary – 1966 Building:

Category	**Deficiency**	**Description***
Building System: General	Load Path	NC – (1) Inner corridor walls are used as shear walls; however, the wall is discontinuous at the original roof trussed joists and does not have a load path. (2) N-S shear walls between classrooms added during the 1994 modernization stop at the ceiling; cripple walls were added in the truss space, but there is no shear connection from the cripple wall to the lower wall.
Building Systems – Building Configuration	Vertical Irregularities	NC – The library clerestory does not have any solid wall due to clerestory windows and mechanical openings. With little support on this side, the diaphragm may become unstable.
Lateral Seismic-Force-Resisting System	Narrow Wood Shear Walls	NC – At the exterior classroom walls, there are 4 ft walls used to resist shear. During an earthquake, these walls would be highly stressed and subject to severe deformations that reduce their capacity.
	Openings	NC – The library clerestory wall is nearly 100% openings. These walls may have little to no resistance to shear and overturning forces.
Diaphragms	Diaphragm Continuity	NC – The library clerestory is a split level. This is a type of discontinuity which may lead to instability due to lack of support.
	Diagonally Sheathed and Unblocked Diaphragms	NC – The diaphragm is sheathed with plywood but appears to be unblocked. For the N-S loading direction, the diaphragm spans 88 ft (3 classrooms). This large span would result in high shear demands.

* NC = Non-Compliant; U = Unknown

- Tsunami Egress Analysis: The school is located within the WA-TDZ with inundation depths of five to ten feet. The expected tsunami arrival time is estimated at sixty minutes.
    - Horizontal evacuation time to higher ground is estimated at approximately twenty-five minutes based on a ten minute building evacuation and a walk speed of two miles per hour heading north.
    - Vertical evacuation, if constructed, should place the lowest of two levels of refuge at approximately twenty-five feet above ground level. This will need to be confirmed through future site-specific inundation modeling.



- Learning Environment: The learning environment would be rated as 'Good' as the building was remodeled and upgraded in the 1990s. There are limited pull out and specialty spaces in the school to address varying approaches to learning since the building was constructed over fifty years ago.
- Building Systems: Existing natural gas and power to the school are served from below grade with a pad mounted electrical transformer. HVAC in the original building is served by two newer boilers feeding air handling units while the annex has several spaces with split system heat pumps. Electrical switchgear appears to have been upgraded.
- Overall Building Condition: The building was constructed in two parts and the annex is in better overall condition than the original building although both are in good condition since they were remodeled. The original building exterior and roofing are not in as good condition as the annex and the roofing should be replaced.

Recommendations:

Structural Next Steps and Recommendations:

The Tier 1 Procedure in ASCE 41-17 is not intended to be used for the retrofit of structures; rather, it provides a quick screening evaluation to identify areas for further study. Designing retrofit measures because of a Tier 1 screening alone is likely to result in an overly conservative and costly retrofit. ASCE 41 lists Tier 2 and Tier 3 as the two procedures available for the retrofit design of an existing building. A Tier 2 evaluation and retrofit is deficiency-based and is used in conjunction with the results of a Tier 1 evaluation. A Tier 3 evaluation and retrofit is a systematic study of the building and all its components.

As a next step, we recommend that each of the checklist items marked Noncompliant or Unknown should be evaluated using the Tier 2 procedure if the school is to be seismically retrofitted. The Tier 2 evaluation will resolve which items need to be retrofitted to define the retrofit scope.

Although a nonstructural evaluation was not performed in this phase, it is common for buildings of this type and age to require bracing of various nonstructural elements (e.g., pipes and conduits). We recommend that these items be evaluated as part of the Tier 2 analysis.

Proposed Structural Improvements: (sizes noted are preliminary)

- Replace existing concrete slab on grade w/ 24” thick mat foundation doweled through existing grade beams and extending minimum 5’-0” beyond exterior walls at building perimeter.
- Install 24” diameter drilled shafts 95 to 130 feet deep at approximately 12’-0” o.c.
- Create additional plywood shear walls at existing wall locations by adding ½” plywood sheathing and extending framing to underside of roof and adding sill bolts and hold downs at each end of wall.
- Improve existing shear connections adding strapping and blocking.
- At existing clerestory infills, replace existing sheathing with plywood and clips.
- Seismically separate playshed roofs from balance of building, brace existing steel posts and re-support roof edge with new columns and footings.

Tsunami Egress Recommendations:

The horizontal evacuation route is not long but does cross busy arterial roads (US Route 101) and there are power transmission and distribution lines overhead along and crossing the identified evacuation route. Should the building be seismically retrofitted or rebuilt at its current location, a vertical evacuation tower would be the recommended approach with the tower located east of the portables at the playfield to accommodate the occupants of both AJ West Elementary School & Harbor Learning Center.

Preliminary Estimated Tsunami Evacuation Tower cost would be approximately $7 million based on an estimate of $20,000/occupant.

Tsunami Tower Construction: A tsunami vertical evacuation structure must first resist a significant earthquake and then subsequent tsunami inundation. Therefore, the structure would consist of a robust steel and/or concrete framed structure with the following general features:

- Drilled piles and pile caps.
- Slab on grade below structure.
- Structural Steel Superstructure with stairs and ramp for access.

Overall recommendation:

Based on the identified structural improvements it appears that the school may be able to be seismically retrofitted and remain in service. The preliminary estimated cost for this work, including soft costs at 35% is about $28,000,000. However, there are additional factors to consider prior to opting for retrofitting the existing school as noted below.

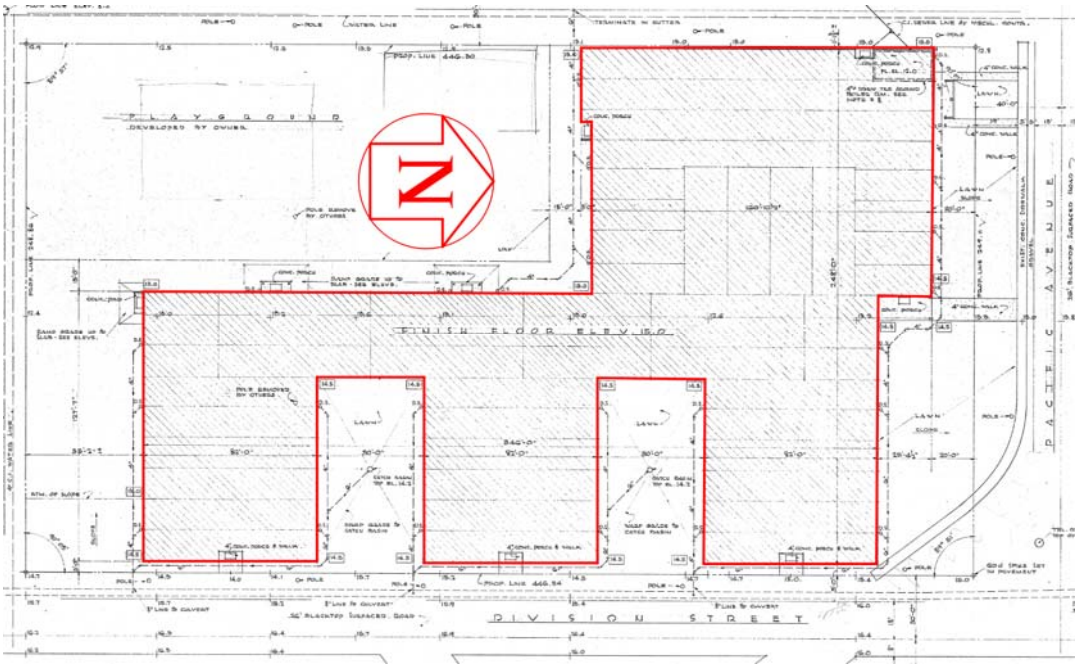
Should the school be seismically retrofitted only building components and systems directly impacted by the structural work are eligible to be replaced in kind. With this in mind the resultant condition at the school following the retrofit will not be readily noticeable except for new roofing, flooring, casework and perhaps a portion of doors / frames.

The work included in an OSPI seismic retrofit of the school, based on the research and findings, is limited to improving the building to provide a safer environment in the event of a significant seismic event for exiting the building and seeking safety. The funding is not designed to improve the school to a level that it would be able to serve as a community safe area following a significant seismic event, nor is it designed to allow immediate re-occupancy of the school without additional structural analysis and potentially more repair to the building to ensure the safety of users.

Based on the above, the costs identified for this work would likely be put to better use by constructing a replacement school at either the same location, or preferably, a different site with more suitable soil for building construction and outside of the tsunami inundation zone.

Harbor Learning Center (Hopkins Building)

Harbor Learning Center is a one-story structure originally constructed in 1956. The building has two parts, with outside-to-outside dimensions of approximately 240 feet by 370 feet. The west E-shaped structure has a low-sloped roof with eave height of approximately 10 feet and houses classrooms, activity rooms, and the library. The east part of the building is rectangular and houses the multipurpose room, locker rooms, shop, music room, kitchen, boiler room, and administrative offices. The multipurpose room has an eave height of approximately 25 feet due to its clerestory. Figure 2-1 shows a plan view of the building, taken from the 1956 drawings.



Findings:

- Geotechnical Exploration & Analysis
  - Subsurface soil and groundwater conditions at the site were explored on 8 through 11 of April 2024 by drilling one boring to a depth of approximately 121.5 feet bgs (below ground surface) using the mud-rotary drilling method and advancing one cone penetration test to a depth of approximately 109 feet bgs.
  - Subsurface profile consisted of:
    - Very soft silt
    - Very loose to loose sands with interbedded silt layers
    - Weathered bedrock at 108 feet below ground surface
  - Groundwater was shallow at about 4 feet below ground surface
  - Liquefaction is certain to occur under all design seismic scenarios, resulting in an estimated 11 to 25 inches of settlement.
  - Lateral spread could be on the order of 1½ to 3 feet under the mildest seismic design case (BSE-1E) and in the tens of feet under larger seismic scenarios (BSE-2N, BSE-2E)
  - Tsunami hazard is present, which could result in inundation with 5 to 10 feet of water following a nearby magnitude 9.0 event on the Cascadia Subduction Zone.

- Soil is classified as Site Class F due to the severe liquefaction hazard. The site is in a region of high seismicity, with the Cascadia Subduction Zone contributing significantly to the overall seismic hazard at the site.

- Structural Building Review

  Classroom Wing: The classroom wing is E-shaped in plan, with dimensions of approximately 345 feet by 130 feet. Its long dimension is oriented north-south.

  - Foundation System: Exterior wall lines: Untreated wood pile foundation with pile caps and grade beams.
  - Floor System: Reinforced concrete slab on grade.
  - Wall System: Reinforced concrete walls.
  - Roof System: Built-up roof with 2" thick tectum panels supported by wood purlins and glulam girders.

  Multipurpose Room Wing: The multipurpose room wing is rectangular in plan, with dimensions of approximately 115 feet by 160 feet. Its long dimension is oriented north-south.

  - Foundation System: Untreated wood pile foundation with pile caps and grade beams.
  - Floor System: Reinforced concrete slab on grade.
  - Wall System:
    - West multipurpose room wall: 2x plywood sheathed stud wall with wood posts.
    - North and south multipurpose room walls: Upper corrugated fiberglass walls with wood posts supported by a 2x plywood sheathed stud wall below.
    - East multipurpose room wall: Concrete wall with concrete pilasters.
  - Roof System: Built-up roof with 2" thick tectum panels supported by steel purlins and glulam girders, spanning to each wall.

  Site Visit and Investigation:

  - The buildings were in poor condition. There were noticeable signs of deterioration at the roof, and the slab on grade has settled significantly.
  - Typical construction observed generally matches existing drawings.

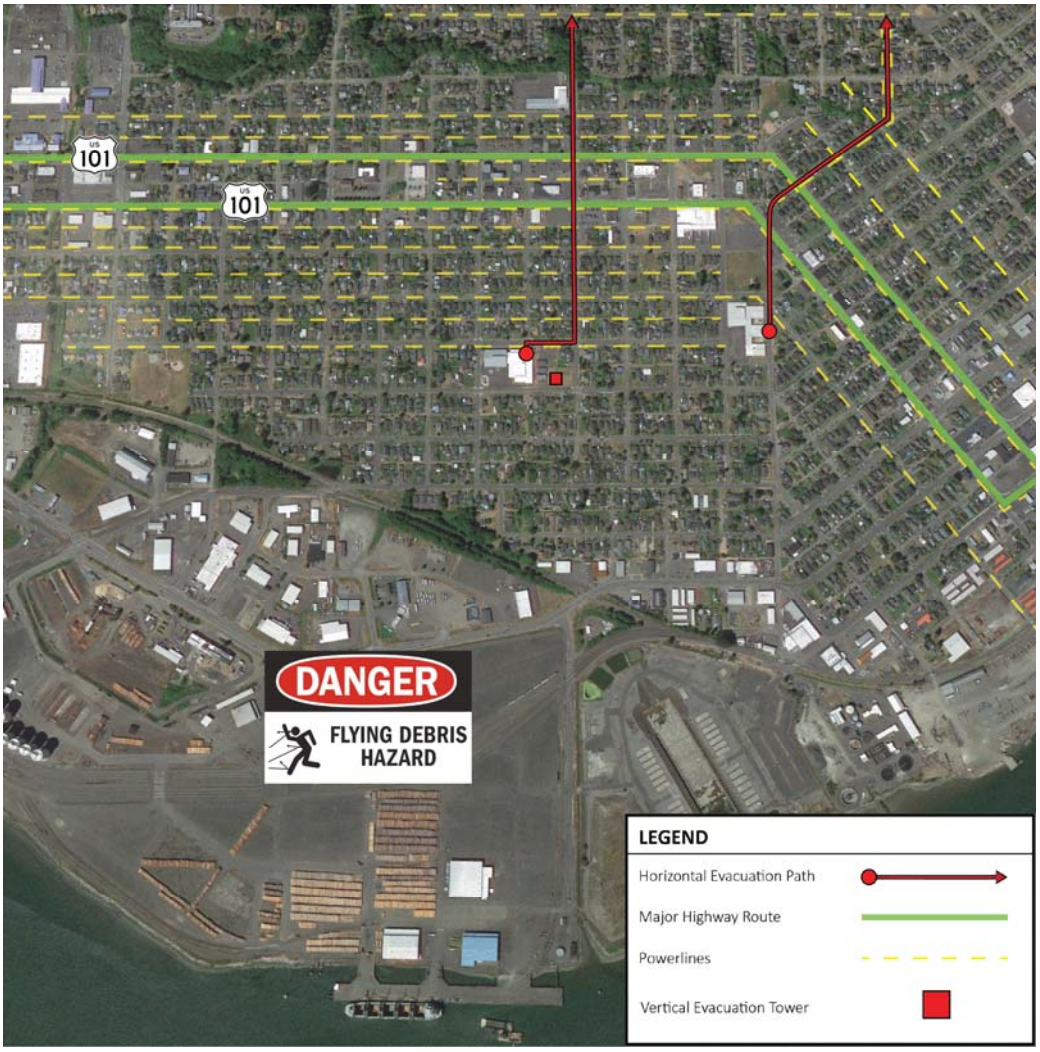
- Structural Deficiency Summary:

Category	**Deficiency**	**Description***
Lateral Seismic-Force-Resisting System	Load Path	NC – The north & south multipurpose room clerestory consists of 4x6 posts @ 7.5 feet on center, sheathed with corrugated fiberglass. There is not a shear load path through the fiberglass into the 2x6 plywood sheathed stud wall below the clerestory due to the wall discontinuity.
	Shear Stress Check	NC – While the building's concrete shear walls pass the quick check, the average shear stress through the north & south multipurpose room upper clerestory walls is 850 plf, which is greater than the assumed 100 plf strength.

Connections	Wall Anchorage at Flexible Diaphragms	NC – There are no steel anchors or straps that develop the Tectum roofing into the concrete walls, increasing the likelihood that the walls separate from the roof during an earthquake.
	Transfer to Shear Walls	NC – There are no shear connections or collectors present to transfer the diaphragm force into the concrete shear walls.
	Uplift at Pile Caps	NC – The wood piles are not anchored into pile caps or the slab on grade. The absence of anchorage means that the pile cap or slab on grade cannot deliver the uplift forces (induced during an earthquake) to the piles.
Diaphragms	Diaphragm Continuity	NC – The multipurpose room roof diaphragm is offset from the classroom diaphragm. This is a type of discontinuity which may lead to instability due to lack of support.
	Openings at Shear Walls	NC – The wire glass skylights over the corridors are diaphragm openings that are greater than 25% of the wall length. These openings significantly limit the ability of the diaphragm to transfer shear force to the walls.
	Cross Ties	NC – There are no connections anchoring any of the concrete walls to the diaphragm for out of plane forces. Due to this, the walls will tend to separate from the roof when subject to earthquake forces.
	Spans	NC – The multipurpose room tectum panel diaphragm spans 81 feet in the E-W direction and 61 feet in the N-S direction. Also, the tectum panel diaphragms over the 3 classroom wings span to the exterior concrete walls (the support provided by the corridor walls is neglected since these walls are not shear walls). Long span diaphragms such as these often experience large lateral deflections and diaphragm shear demands, resulting in increased damage during an earthquake.
	Other Diaphragms	NC – The diaphragm consists of tectum panels; however, it is understood that these may have the ability to resist shear force – further investigation is recommended.

* NC = Non-Compliant; U = Unknown

- Tsunami Egress Analysis: The school is located within the WA-TDZ with inundation depths of five to ten feet. The expected tsunami arrival time is estimated at sixty minutes.
  - Horizontal evacuation time to higher ground is estimated at approximately twenty-five minutes based on a ten minute building evacuation and a walk speed of two miles per hour heading north.
  - Vertical evacuation, if constructed, should place the lowest of two levels of refuge at approximately twenty-five feet above ground level. This will need to be confirmed through future site-specific inundation modeling.



- Learning Environment: The learning environment would be rated as 'Poor' as the building does not appear to have been remodeled or upgraded since it was constructed. Spaces have been re-partitioned, skylights have been covered over reducing daylight. There are limited pull out and specialty spaces in the school to address varying approaches to learning since the building was constructed as a middle school over fifty years ago and is currently used as an alternative secondary school.

- Building Systems: Existing natural gas is served at the northwest corner of the school along with overhead three-phase power from pole mounted transformers. HVAC is served by a newer boiler feeding units and fin tube heating that appear to be original to the building. Electrical switchgear appears to also be from the original building construction.

- Overall Building Condition: The building was constructed with concrete walls on timber piles, uninsulated aluminum windows, wood framed walls, post and beam timber and tectum roof framing. The walls appear to be in good condition but the floor slab has settled significantly at multiple locations in the building (over 6"). The glazing is single pane and the walls are uninsulated creating an inefficient use of energy for heating. The roof is in poor condition as is the wood siding at the gym.

- Recommendations:

Structural Next Steps and Recommendations:

The Tier 1 Procedure in ASCE 41-17 is not intended to be used for the retrofit of structures; rather, it provides a quick screening evaluation to identify areas for further study. Designing retrofit measures because of a Tier 1 screening alone is likely to result in an overly conservative and costly retrofit. ASCE 41 lists Tier 2 and Tier 3 as the two procedures available for the retrofit design of an existing building. A Tier 2 evaluation and retrofit is deficiency-based and is used in conjunction with the results of a Tier 1 evaluation. A Tier 3 evaluation and retrofit is a systematic study of the building and all its components.

As a next step, we recommend that each of the checklist items marked Noncompliant or Unknown should be evaluated using the Tier 2 procedure if the school is to be seismically retrofitted. The Tier 2 evaluation will resolve which items need to be retrofitted to define the retrofit scope.

Although a nonstructural evaluation was not performed in this phase, it is common for buildings of this type and age to require bracing of various nonstructural elements (e.g., pipes and conduits). We recommend that these items be evaluated as part of the Tier 2 analysis.

Proposed Structural Improvements: (sizes noted are preliminary)

- Replace existing concrete slab on grade w/ 24” thick mat foundation doweled through existing grade beams and extending minimum 5’-0” beyond exterior walls at building perimeter. Note that work at existing courtyards will require removal of play equipment to accommodate drilling.
- Install 24” diameter drilled shafts 95 to 130 feet deep at approximately 12’-0” o.c.
- Improve existing shear wall connections at roof.
- Install new collector beams at exterior classroom walls.
- Replace roof structure and replace with plywood and wood framing.

Tsunami Egress Recommendations:

The horizontal evacuation route is not long but does cross busy arterial roads (US Route 101) and there are power transmission and distribution lines overhead along and crossing the identified evacuation route. Should the building be seismically retrofitted or rebuilt at its current location, a vertical evacuation tower would be the recommended approach with the tower located east of the nearby AJ West Elementary School.

Preliminary Estimated Tsunami Evacuation Tower cost would be approximately $5.3 million based on an estimate of $20,000/occupant.

Tsunami Tower Construction: A tsunami vertical evacuation structure must first resist a significant earthquake and then subsequent tsunami inundation. Therefore, the structure would consist of a robust steel and/or concrete framed structure with the following general features: Drilled Piles and pile caps, Slab on grade below structure, Structural Steel Superstructure with Stairs and Ramp for access.

- Drilled piles and pile caps.
- Slab on grade below structure.
- Structural Steel Superstructure with stairs and ramp for access.

Overall recommendation:

Based on the identified structural improvements it appears that the school may be able to be seismically retrofitted and remain in service. The preliminary estimated cost for this work, including soft costs at 35% is about $40,000,000. However, there are additional factors to consider prior to opting for retrofitting the existing school as noted below.

Should the school be seismically retrofitted, only building components and systems directly impacted by the structural work are eligible to be replaced in kind. With this in mind the resultant condition at the school following the retrofit will not be readily noticeable except for new roofing, flooring, casework and perhaps a portion of doors / frames.

The work included in an OSPI seismic retrofit of the school is limited to improving the building to provide a safer environment in the event of a significant seismic event for exiting the building and seeking safety. The funding is not designed to improve the school to a level that it would be able to serve as a community safe area following a significant seismic event, nor is it designed to allow immediate re-occupancy of the school without additional structural analysis and potentially more repair to the building to ensure the safety of users.

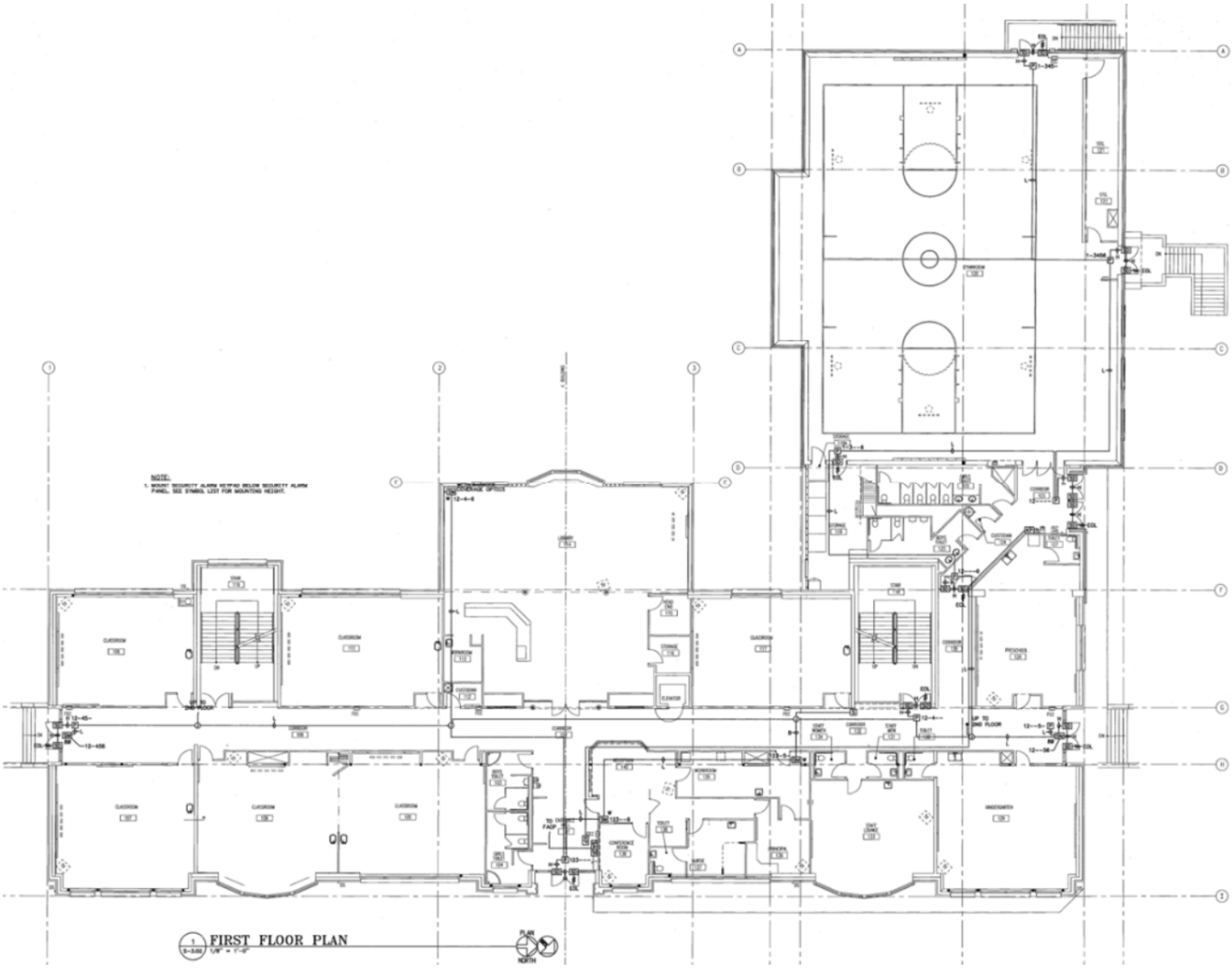
Based on the above, the costs identified for this work could potentially be put to better use by constructing a replacement school at either the same location, or preferably, a different site with more suitable soil for building construction and outside of the tsunami inundation zone.

McDermoth Elementary School

McDermoth Elementary School is a multi-story structure of varying construction types, stories, and dates. The original building was constructed in 1930 and is three stories tall. In 1997, a two-story annex building with a gymnasium was added to the Northeast corner of the original building, and the north side of the building expanded to enlarge the library and second story classrooms.

The campus underwent a partial seismic upgrade in 1997 as well. Masonry walls were backed by shotcrete or new wood framed walls, with anchors to the existing masonry walls. The attic was sheathed with plywood and straps were added running East-West along the length of the building. Interior tile partitions were demolished and replaced with wood framed partition walls, steel gravity elements, and shotcrete walls.

The complete building footprint is L-shaped in plan, with outside-to-outside dimensions of approximately 230 feet by 189 feet.



Findings:

- Geotechnical Exploration & Analysis
    - Subsurface soil and groundwater conditions at the site were explored on 7 and 8 June 2024 by drilling three borings to depths of approximately 31 to 36 feet bgs using the mud-rotary drilling method. Geophysical testing was performed along two survey lines to develop estimated shear wave velocity profiles.

- Subsurface profile consists of:
  - Artificial fill, typically loose to medium dense
  - Liquefiable alluvial soils
  - Weathered bedrock beginning around Elevation -3 to -10 in our borings (bedrock is understood to slope downward towards the south/southwest).
- Liquefaction hazard is variable across the school footprint. The northeastern portion of the school bears on non-liquefiable soil over weathered bedrock. Newer parts of the school bear on piles embedded in bedrock, which will not be susceptible to liquefaction settlement; however, the southernmost portion of the school bears on shallow foundations that may sit atop liquefiable soils with a potential for up to 9 inches of seismic-induced settlement. Underpinning of these foundations may be necessary.
- Lateral spread hazard has a low probability of occurring due to distance from free face and onsite stiff soil / weathered bedrock contours at relatively shallow depths compared to distance from free face.
- Tsunami hazard is present just in the southwestern portion of the site. Tsunami mapping seems to indicate that inundation may approach the base of the structure at its lowest point. Inundation in this case is expected to be minor.
- Soil is classified as Site Class D. The site is in a region of high seismicity, with the Cascadia Subduction Zone contributing significantly to the overall seismic hazard at the site. Assume that Site Class F is avoided due to <0.5 second fundamental period of structure.

- Structural Building Review

  Original Building (1930): The building is a three-story structure with wood-framed floors and roofs. It houses the school offices, staff lounge, workroom, gymnasium, kitchen, library, and twenty-one classrooms. The building is rectangular in plan with dimensions of approximately 231 feet by 68 feet, and its long dimension is oriented east-west. The roof has a 7:12 sloped roof with an eave height of approximately 47 feet.

  - Foundation System: Shallow foundations with concrete strip footings at exterior and interior wall lines
  - Floor System:
    - Ground Floor: Concrete slab on grade, plywood on TJI Joists at expansion of (E) Building.
    - First Floor: 3 ½" concrete slab spanning to concrete beams. ½" concrete over plywood supported by TJL on expansion of (E) building at Library.
    - Second Floor: ½" Plywood over 2x wood joists and TJI joists, spanning to interior steel beams and exterior walls.
    - Attic Floor: Partially-sheathed with plywood, supported by 2x wood joists spanning to interior steel beams and exterior walls.
  - Wall System:
    - Corridor walls: 2x wood stud walls with diagonal sheathing (plywood sheathing at infilled clerestory) or metal stud framed walls.
    - Exterior walls: Shotcrete over masonry walls, or wood framed walls anchored to masonry.
  - Roof System: Plywood over straight sheathing, spanning to 2x roof joists.

  Gymnasium Building (1997): The building is a two-story structure with pre-tensioned floors and a metal deck over steel trussed roof. It houses a gymnasium which covers an open-air play area on the first story. The building is rectangular in plan with dimensions of approximately 120 feet by 90 feet, with its long

dimension oriented north-south. The building has a 6:12 sloped roof with an approximate eave height of 32 feet.

- Foundation System: Grade beams supported by concrete piles
- Floor System: Precast hollow-core concrete panels
- Wall System:
  - First Story: 16" Concrete walls
  - Second Story: CMU Walls
- Roof System:
  - Un-topped metal decking
  - Roof trusses at 8 feet on center

Site Visit and Investigation:

- The buildings were in good condition with no noticeable signs of deterioration.
  - Typical construction observed generally matches the available existing drawings.

- Structural Deficiency Summary:

Category	**Deficiency**	**Description***
Building System: General	Load Path	NC – (1) Shear walls in the attic do not have a continuous load path, as there is no wall below to transfer shear or overturning demands. (2) The diaphragm at the attic floor has many discontinuities and is not fully sheathed.
	Adjacent Buildings	NC – The gap between the gymnasium and original building is not large enough to accommodate the building drift.
Building System: Building Configuration	Vertical Irregularities	NC – Shear walls in the attic are not continuous to the foundation.
Geologic Site Hazard	Liquefaction	NC – There is high potential for liquefaction to occur during an earthquake. This would result in a significant strength loss in the soil, resulting in reduced support for foundations and large ground settlements.
Diaphragms	Diaphragm Continuity	NC – The attic floor has many steps in it and is not fully sheathed.
	Roof Chord Continuity	NC – The roof chord at the Southwest side of the building is discontinuous in the attic, where the expansion occurred.

* NC = Non-Compliant; U = Unknown

- Tsunami Egress Analysis: The school is not located within the Washington Tsunami Design Zone (WA-TDZ) although a small portion of the play yard is located in the zone.
    - Horizontal evacuation time to higher ground is estimated at approximately fifteen minutes based on a ten minute building evacuation and a walk speed of two miles per hour heading north to Sam Benn Park.

- Learning Environment: The learning environment would be rated as 'Good' with the building having been modernized in the mid-1990s with expanded library, new gym and cafeteria / kitchen along with many upgrades.

- Building Systems: The school has existing natural gas and power service. HVAC relies on a pair of newer natural gas hot water boilers feeding air handling units in the attic. The building is fully fire sprinklered.

- Overall Building Condition: With the improvements and modernization in the mid 1990s the building has been well maintained and appears to generally be in good condition. School layout is logical and primary educational, support and specialty spaces are well sized and equipped.

Recommendations:

Structural Next Steps and Recommendations:

The Tier 1 Procedure in ASCE 41-17 is not intended to be used for the retrofit of structures; rather, it provides a quick screening evaluation to identify areas for further study. Designing retrofit measures based on a Tier 1 screening alone may result in an overly conservative and costly retrofit. We have provided retrofit concepts in Appendix A; however, they are preliminary and additional analysis should be performed if the building retrofit moves forward.

Several of the major deficiencies and their corresponding retrofits are described below. These retrofit measures are not intended to provide significant resistance to tsunami loading, but to provide safe evacuation after an earthquake.

Proposed Structural Improvements: (sizes noted are preliminary)

- Deficiency – Site Geologic Hazards
    - As discussed in Section 5, liquefaction will cause significant settlement and strength loss in soils.
    - At exterior and tunnel walls of 1930 structure, provide micropiles beneath existing concrete with new pile caps.
- Deficiency – Adjacent Buildings: Provide new 6" seismic joint, and re-support existing structure with new gravity elements where joint occurs.
- Deficiency – Load Path (1930 Building)
    - For interior shear walls in the attic, provide new glulam beams beneath each wall with holdowns at each end of wall.
    - Fully sheath the floor of the attic. Where steps occur, provide A35 clips between upper and lower diaphragms.
- Deficiency – Roof Chord Continuity (1930 Building): At the Southern side of the building, provide a strap across the diaphragm where the library expansion occurred. Where steps occur, nail ripped 2x boards to sheathing and secure strap to the 2x.

Overall recommendation:

Based on the identified structural improvements it appears that the school could be seismically retrofitted and remain in service. The preliminary estimated cost for this work, including soft costs at 35% is about $7,200,000. However, there are additional factors to consider prior to opting for retrofitting the existing school as noted below.

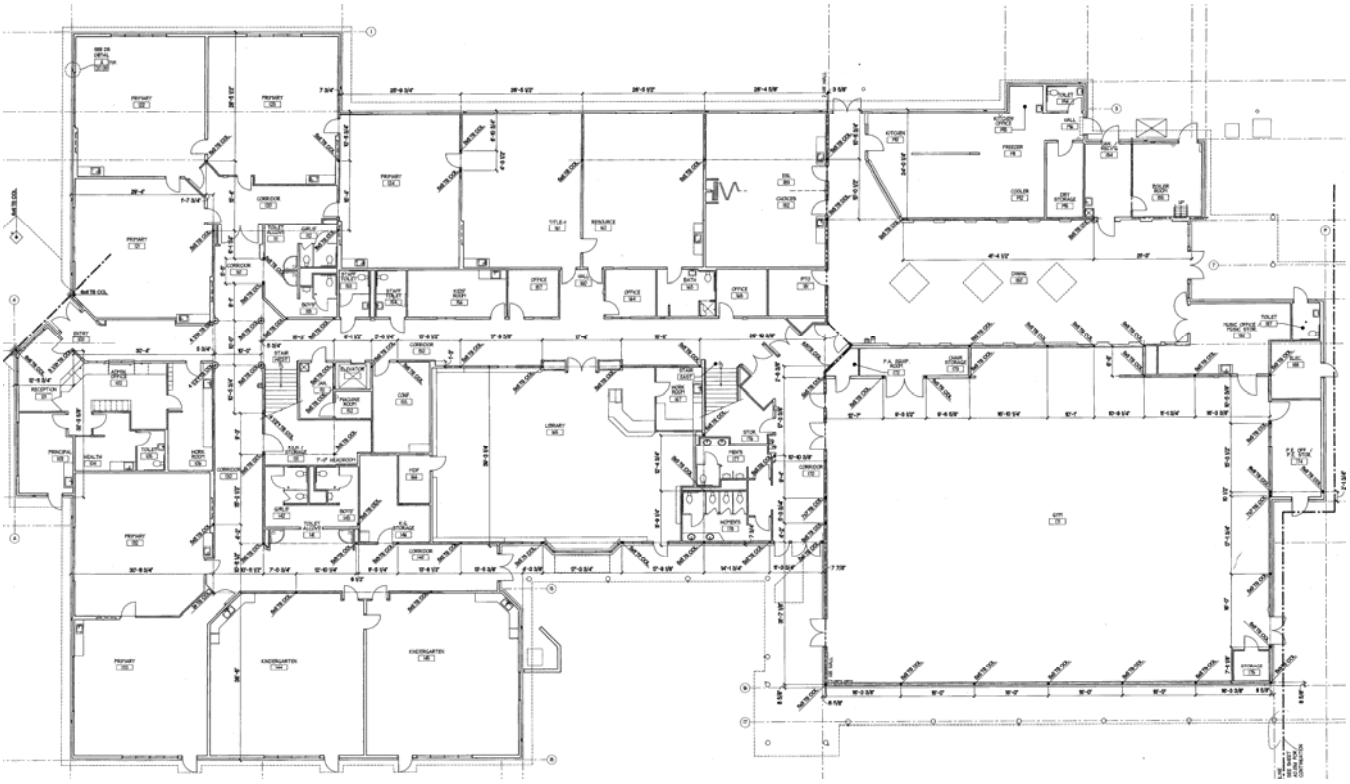
Should the school be seismically retrofitted, only building components and systems directly impacted by the structural work are eligible to be replaced in kind. With this in mind the resultant condition at the school following the retrofit will not be readily noticeable except for new flooring, casework and perhaps a portion of doors / frames.

The work included in an OSPI seismic retrofit of the school is limited to improving the building to provide a safer environment in the event of a significant seismic event for exiting the building and seeking safety. The funding is not designed to improve the school to a level that it would be able to serve as a community safe area following a significant seismic event, nor is it designed to allow immediate re-occupancy of the school without additional structural analysis and potentially more repair to the building to ensure the safety of users.

Based on the above, the costs identified for the seismic retrofit work could be used in conjunction with available OSPI SCAP funding to modernize and improve the existing building structure, systems, envelope and learning environment in a combined project unless a replacement facility utilizing the funding is a preferred approach based on district projections and goals.

Robert Gray Elementary School

Robert Gray Elementary School is a two-story structure with wood-framed walls, floors, and roofs, and was built in 2002. The first story houses the school offices, library, gymnasium, kitchen, and eleven classrooms, and the second story houses six classrooms and a staff lounge. The building is rectangular in plan with dimensions of approximately 273 feet by 160 feet, and its long dimension is oriented east-west. The first-story roof has an eave height of approximately 9 feet. The upper sloped roof has an eave height of approximately 32 feet. At the outdoor play area, the wood-framed roof spans to concrete columns. CMU walls infill between some of the columns on each elevation to provide lateral bracing to the play area.



Findings:

- Geotechnical Exploration & Analysis
    - Subsurface soil and groundwater conditions at the site were explored on 5 and 6 June 2024 by drilling two borings to depths of approximately 30 to 76 feet bgs using the mud-rotary drilling method. Geophysical testing was performed along two survey lines to develop estimated shear wave velocity profiles.
    - Subsurface profile consists of:
        - Artificial fill (relatively thin layer, 2 to 4 feet thick).
        - Very soft to medium stiff silts and liquefiable alluvial soils that increase in thickness to the east, towards the Wishkah River.
        - Weathered bedrock beginning around Elevation 18 in the western part of the site, and as deep as Elevation -34 feet in the eastern part in our borings (bedrock is understood to slope downward towards east).
    - Liquefaction hazard is variable across the school footprint. We estimate 3 to 9 inches of settlement is possible under the design earthquake.

- Lateral spread hazard has a high probability of occurring under design seismic conditions. Ground improvement will be needed outside of the structure footprint to mitigate this hazard, between the structure and the Wishkah River.
- Tsunami inundation may rise up the Wishkah River to the east of the site, but inundation of the school building is not expected.
- The report classifies the soil as Site Class D. The site is in a region of high seismicity, with the Cascadia Subduction Zone contributing significantly to the overall seismic hazard at the site. The Cascadia Subduction Zone is capable of generating large tsunamis with the potential to inundate the Washington coastline; however, the site is not within the Washington Tsunami Design Zone.

- Structural Building Review
  - Foundation System: Pile foundations with concrete grade beams at exterior and interior wall lines.
  - Floor System:
    - First floor: Slab on grade
    - Second floor: 1 ½" concrete on plywood sheathing over TJI roof joists framing to either wood-framed bearing walls or glulam and wide flange beams.
  - Wall System:
    - Corridor walls: 2x stud walls with plywood sheathing
    - Exterior walls: 2x stud walls with plywood sheathing; hardi-panel lap siding
  - Roof System:
    - First story roof: plywood sheathing over TJI roof joists
    - Second story roof: plywood sheathing over TJI roof joists
    - Gymnasium roof: 22 gauge steel roof deck spanning to open web steel joists supported by steel joist girder trusses and wide flange beams

- Structural Deficiency Summary:

Category	Deficiency	Description*
Geologic Site Hazard	Liquefaction	U – There is very high potential for liquefaction to occur during an earthquake. This would result in a significant strength loss in the soil, resulting in reduced support for foundations and large ground settlements. Lateral spread due to liquefaction may also result in large lateral movements. It is unclear if these hazards were fully mitigated in the design and construction of the school.
Lateral Seismic-Force-Resisting System	Walls Connected Through Floors	NC – Shear walls do not have interconnection between the first and second stories to transfer overturning and shear forces through the floor.

* NC = Non-Compliant; U = Unknown

- Tsunami Egress Analysis: The school is not located within the Washington Tsunami Design Zone (WA-TDZ).

- Learning Environment: The learning environment would be rated as 'Good' as the school is less than 25 years old and generally employs design elements and spaces in line with current standards.

- Building Systems: The school has existing natural gas and power service and is fully fire sprinklered. Systems were installed at the time of building construction in the early 2000s.

- Overall Building Condition: The building is relatively new, has been well maintained and appears to generally be in good condition. School layout is logical and primary educational, support and specialty spaces are well sized and equipped.

Recommendations:

Structural Next Steps and Recommendations:

The Tier 1 Procedure in ASCE 41-17 is not intended to be used for the retrofit of structures; rather, it provides a quick screening evaluation to identify areas for further study. Designing retrofit measures based on a Tier 1 screening alone may result in an overly conservative and costly retrofit. We have provided retrofit concepts in Appendix A; however, they are preliminary and additional analysis should be performed if the building retrofit moves forward.

Several of the major deficiencies and their corresponding retrofits are described below. These retrofit measures are not intended to provide significant resistance to tsunami loading, but to provide safe evacuation after an earthquake.

Proposed Structural Improvements: (sizes noted are preliminary)

- Deficiency – Site Geologic Hazards
    - As discussed above, liquefaction and lateral spread may cause significant settlement and lateral displacement.
    - Pile foundations already exist beneath the floor plan of this structure. Ground improvements outside of the building footprint would likely prevent lateral spreading and increase the stability of the soils. No additional foundation work within the building footprint is required.
- Deficiency – Wall Connection Through Floors
    - For shear walls on the second story, straps or holdowns should be used to connect the walls to beams or shear walls at the first story.

Overall recommendation:

Based on the identified structural improvements it appears that the school could be seismically retrofitted and remain in service. The preliminary estimated cost for this work, including soft costs at 35% is about $31,500,000, but the projected cost is skewed by the site costs which are estimated conservatively at this stage of the project. It is likely, but not certain, that the site costs to stabilize soil would be less than estimated once additional testing, calculations and design occur and these costs represent over 80% of estimated costs. However, there are additional factors to consider prior to opting for retrofitting the existing school as noted below.

Should the school be seismically retrofitted, only building components and systems directly impacted by the structural work are eligible to be replaced in kind. With this in mind the resultant condition at the school following the retrofit will not be readily noticeable except for new flooring, casework and perhaps a portion of doors / frames.

The work included in an OSPI seismic retrofit of the school is limited to improving the building to provide a safer environment in the event of a significant seismic event for exiting the building and seeking safety. The funding is not designed to improve the school to a level that it would be able to serve as a community safe area following a significant seismic event, nor is it designed to allow immediate re-occupancy of the school without additional structural analysis and potentially more repair to the building to ensure the safety of users.

This school is not yet eligible for Seismic Retrofit or OSPI SCAP funding due to its age, but based on the above, the costs identified for the seismic retrofit work may be able to be used in conjunction with available OSPI SCAP funding to modernize and improve the existing building structure, systems, envelope and learning environment in a combined project unless a replacement facility utilizing the funding is a preferred approach based on district projections and goals.

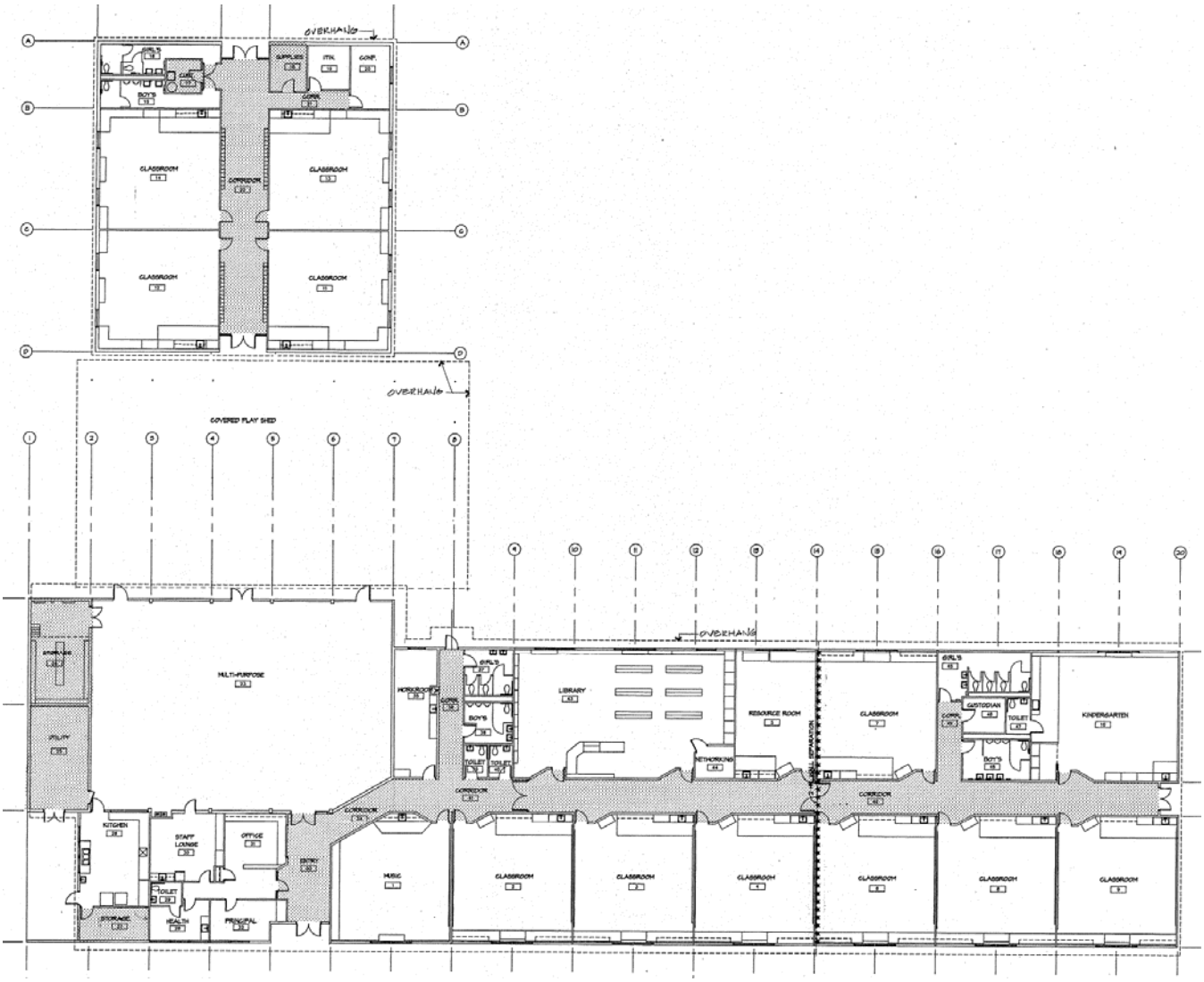
In order to better propose direction for this school, additional geotechnical exploration as well as subsurface engineering utilizing information from civil and structural engineers east of the existing school building would allow the seismic retrofit site cost budget to be further refined and assist the school district in opting how to proceed with work.

Central Park Elementary School

Central Park Elementary School is a one-story structure of varying construction types and dates. The original building was constructed in 1957. In 1966, an annex building with additional classrooms was added to the North side of the original building.

The campus underwent a modernization in 1994. Roof areas with skylights on the 1957 buildings were infilled with plywood framing. Also, a mezzanine was added to the West side of the interior space of the 1957 building gymnasium.

The complete building footprint is L-shaped in plan, with outside-to-outside dimensions of approximately 290 feet by 200 feet.



Findings:

- Geotechnical Exploration & Analysis
  - Subsurface soil and groundwater conditions at the site were explored on 4 and 5 June 2024 by drilling two borings to a depth of approximately 51 feet bgs using the mud-rotary drilling method. Geophysical testing was performed along two survey lines to develop estimated shear wave velocity profiles.
  - Subsurface profile consists of:
    - Artificial fill (relatively thin layer, 2 to 3 feet thick)

    - Alluvial soils consisting of fine-grained and coarse-grained layers
    - Localized lacustrine deposits consisting of soft elastic silt
    - Dense glacial outwash beginning near Elevation 67 feet
  - Liquefaction hazard is variable across the school footprint. We estimate up to 1½ inches of settlement is possible under the design earthquake. Additional settlement from surface manifestations of liquefaction is possible.
  - Lateral spread hazard is very low.
  - The report classifies the soil as Site Class D due to the moderate liquefaction hazard. The site is in a region of high seismicity, with the Cascadia Subduction Zone contributing significantly to the overall seismic hazard at the site.
  - The Cascadia Subduction Zone is capable of generating large tsunamis with the potential to inundate the Washington coastline; however, the site is not within the Washington Tsunami Design Zone.

- Structural Building Review

  Original Building (1957): The building is a one-story structure with wood-framed floors and roofs. It houses the school offices, library, staff lounge, workroom, gymnasium, kitchen, and ten classrooms. The building is L-shaped in plan with dimensions of approximately 290 feet by 123 feet, and its long dimension is oriented east-west. The low-sloped roof has an eave height of approximately 10 feet. The gymnasium sloped roof has an eave height of approximately 15 feet. At the north-west corner of the building there is a covered play area which attaches into the north gymnasium wall. The covered play area is approximately 34 ft deep by 98 ft wide.

    - Foundation System: Shallow foundations with concrete strip footings at exterior and interior wall lines
  - Floor System: Slab on grade
  - Wall System:
    - Corridor walls: 2x stud walls with plywood sheathing
    - Exterior classroom walls: 2x stud walls with plywood sheathing; combination of aluminum and brick veneer siding
    - Gymnasium storage room: combination of reinforced concrete and CMU walls.
  - Roof System:
    - Classroom roof: stress skin panel roofing over glulam beams
    - Corridor roof: unblocked plywood over 2x8 framing to glulam beams (reframed from removal of skylights)
    - Gymnasium roof: tectum roofing spanning to glulam beams

Annex Building (1966): The building is a one-story structure with wood-framed floors and roofs. It houses four classrooms and a teachers' lounge. The building has a rectangular plan with dimensions of approximately 73 feet by 77 feet, with its long dimension oriented north-south. The building has an approximate eave height of 9 feet.

- Foundation System: Shallow foundations with concrete strip footings at exterior and interior wall lines
- Floor System: Slab on grade
- Wall System:
  - 2x stud walls with plywood sheathing
  - Brick veneer at exterior walls
- Roof System:
  - Plywood sheathing
  - Roof trusses at 48" on center spanning to glulam beams and exterior walls

- Structural Deficiency Summary:

Category	Deficiency	Description*
Structural Components	Load Path	U – (1) Connection between tectum panels is unclear at the gymnasium. This may limit the load path for seismic forces to transfer along the roof diaphragm. NC - (2) The roof-to-wall connection at the exterior walls is unclear and appears not to have a positive connection. There is no load path for seismic forces to get from the roof into the wall in this configuration (see Figure 4-4) NC - (3) No lateral system exists at the north side of the covered play area.
	Wall Anchorage	NC – No anchorage exists from the roof diaphragm to the walls at the gymnasium
Building System: General	Mezzanines	NC – The mezzanine at the gymnasium does not have independent bracing or anchorage to the main structure in the north-south direction, which prevents transfer of the lateral forces from the mezzanine floor.
Diaphragms	Diaphragm Continuity	NC – The gymnasium diaphragm is offset from the main building on the South, and East sides This is a type of discontinuity which may lead to instability due to lack of support.
	Roof Chord Continuity	NC – Chord elements are discontinuous at the stepped gymnasium diaphragm.
	Spans	NC – Diaphragms at the gymnasium roof span greater than 24 feet and do not consist of wood structural panels.
	Other Diaphragms	NC – Gymnasium diaphragm consists of a material (Tectum) other than wood, metal deck, concrete, or horizontal bracing. The tectum roof has unknown capacity and connections.

	Diagonally Sheathed and Unblocked Diaphragms	NC – The diaphragm the gymnasium is composed of tectum roofing.
Connections	Wall Anchorage at Flexible Diaphragms	NC - No out of plane connections exist for force transfer from the gymnasium diaphragm to the exterior concrete wall. This may allow the roof to pull away from the wall in a seismic event.
	Transfer to Shear Walls	NC – No out of plane connections exist for force transfer from the gymnasium diaphragm to the exterior concrete wall. This may allow the roof to pull away from the wall in a seismic event.

* NC = Non-Compliant; U = Unknown

- Tsunami Egress Analysis: The school is not located within the Washington Tsunami Design Zone (WA-TDZ).

- Learning Environment: The learning environment would be rated between 'Good' and 'Fair' with the building having been modernized in the 1990s.

- Building Systems: The school has existing natural gas and power service. HVAC relies on a pair of newer natural gas hot water boilers feeding air handling units for the gym and unit ventilators in the classrooms. The building is fire sprinklered.

- Overall Building Condition: With the improvements and modernization in the 1990s the building appears to generally be in 'Good' to 'Fair' condition. School layout is logical but support and specialty spaces are lacking.

Recommendations:

Structural Next Steps and Recommendations:

The Tier 1 Procedure in ASCE 41-17 is not intended to be used for the retrofit of structures; rather, it provides a quick screening evaluation to identify areas for further study. Designing retrofit measures based on a Tier 1 screening alone may result in an overly conservative and costly retrofit. We have provided retrofit concepts in Appendix A; however, they are preliminary and additional analysis should be performed if the building retrofit moves forward.

Several of the major deficiencies and their corresponding retrofits are described below.

- Deficiency – Load Path (1957 Building) and Connections
    - Braced frames or tension-only bracing should infill columns at the northern end of the play area, creating a lateral force resisting system for the area.
    - At roof-to-wall connections in the gymnasium, straps should be installed at 8 ft on center on east and west walls.
    - At the main building, connections should be installed where panel edges connect to shear walls.
    - Provide inter-panel connections at all stress skin panels.

- At the gymnasium, tectum roofing should be removed. See below for re-roofing recommendations.

- Deficiency – Mezzanines
  - The northernmost mezzanine wall should be sheathed with plywood, and clips should be installed from diaphragm to wall. At the southernmost mezzanine wall, provide clips from diaphragm to wall with anchors to CMU.

- Deficiency – Diaphragms
  - Remove all tectum roofing from the gymnasium. Re-roof with plywood sheathing and provide connections to all exterior walls for transfer of in-plane shear. At East and West walls, provide straps back into the diaphragm for out of plane loads.

Overall recommendation:

Based on the identified structural improvements it appears that the school could be seismically retrofitted and remain in service. The preliminary estimated cost for this work, including soft costs at 35% is about $4,100,000. However, there are additional factors to consider prior to opting for retrofitting the existing school as noted below.

Should the school be seismically retrofitted, only building components and systems directly impacted by the structural work are eligible to be replaced in kind. With this in mind the resultant condition at the school following the retrofit will not be readily noticeable except for new flooring, casework and perhaps a portion of doors / frames.

The work included in an OSPI seismic retrofit of the school is limited to improving the building to provide a safer environment in the event of a significant seismic event for exiting the building and seeking safety. The funding is not designed to improve the school to a level that it would be able to serve as a community safe area following a significant seismic event, nor is it designed to allow immediate re-occupancy of the school without additional structural analysis and potentially more repair to the building to ensure the safety of users.

Based on the above, the costs identified for the seismic retrofit work may be able to be used in conjunction with available OSPI SCAP funding to modernize and improve the existing building structure, systems, envelope and learning environment in a combined project unless a replacement facility utilizing the funding is a preferred approach based on district projections and goals.

Summary

- Geotechnical

  Each of the first four schools studied bears on a subsurface profile that is subject to significant deformation and/or strength loss under design earthquake conditions. It is very unlikely that the existing structure would be able to withstand the expected movements in their current conditions and will likely undergo severe distress or collapse during or following a major earthquake. Seismic retrofit of any of these schools would be costly and invasive, likely requiring extensive underpinning with deep foundations and ground improvement to limit lateral displacements. At some campuses, such as AJ West Elementary and Harbor Learning Center, it is doubtful that the required ground improvement could be performed without encroaching into non-school rights-of-way (e.g., adjacent City streets). The main factor limiting the geotechnical feasibility of performing seismic retrofits at these campuses is the substantial thickness of very soft / very loose soils overlying a bedrock contact that is typically on the order of 100 feet deep.

  McDermoth Elementary and Robert Gray Elementary each face challenges due to the presence of liquefiable soils underlying portions of the school footprints. At McDermoth, much of the original school structure is understood to bear on non-liquefiable native soils, whereas the 1997 building additions were designed to bear on augercast piles embedded in weathered bedrock. Geotechnical retrofits at McDermoth Elementary will likely need to include underpinning of shallow foundations on the southern and southwestern sides of the original structure, in areas where shallow foundations are likely underlain by soft or liquefiable soils. At Robert Gray Elementary School, the school is supported on timber pile foundations driven to bedrock, and these foundations may be adequate for maintaining vertical support of the school through design seismic events (pending structural evaluation). However, these piles will not be able to tolerate lateral movements due to lateral spread hazard. The amount of lateral movement that could occur is difficult to quantify without further study, but movement on the order of feet is probable. Ground improvement will be required to mitigate this hazard.

  Central Park Elementary School may be subject to relatively small liquefaction-induced settlements, surface effects from liquefaction, and seismic strength loss in the near-surface layers. The structure may be able to tolerate these movements and reductions in bearing capacity in its current state (pending structural evaluation), or the structure may require a degree of retrofit, possibly consisting of widening existing footings or constructing grade beams to interconnect existing footings.

- Retrofit versus Replacement / Modernization

  As noted in the narratives above, state funded seismic retrofits, only address building components and systems directly impacted by the structural work and the goal of a retrofit project is limited to improving the building to provide a safer environment in the event of a significant seismic event for exiting the building and seeking safety, not to improve the school to a level that would allow immediate re-occupancy without additional structural analysis and potentially repair. With this understanding, the recommendations are to replace schools at new sites outside the tsunami inundation zone, replace schools at their current sites or to modernize the schools utilizing additional state funding in addition to the seismic retrofit work. The recommendations for modernization are limited to the school buildings outside of the tsunami inundation zone.

  The first four schools – Miller Junior High School, Stevens Elementary, AJ West Elementary & Harbor Learning Center are all located on poor soil substructure and are located within the tsunami zone as defined by the state of Washington. For this reason, it is recommended that the schools be replaced at alternate locations outside of the tsunami zone, or at their current sites should alternate locations not be available with design of the replacement facilities addressing the soil deficiencies as well as tsunami mitigation.

McDermoth Elementary, Robert Gray Elementary and Central Park Elementary buildings are not located in the tsunamic inundation zone (except for limited portions at McDermoth Elementary and Robert Gray Elementary – as shown on the detailed tsunami study conducted on those sites and included in the appendix). This opens the possibility of making decisions on whether to modernize the schools as they are seismically improved or to replace the schools either at their current sites or at alternate locations. Each school should be studied independently while the district wide elementary school capacity, location and enrollment projections are concurrently considered.

Next Steps

- Replacement Site Options

  For schools recommended to be replaced at locations outside of the tsunami inundation zone efforts are underway to identify suitable, available property and perform initial geotechnical and surveying information to determine the feasibility for use as a school while also looking at potential locations relative to neighborhoods served, potential site challenges, environmental regulations and administrative (zoning, etc.) policies.

- Sizing & Distribution of Schools

  Because this study addresses most of Aberdeen's schools (5 elementary schools, 1 Junior High School and Harbor Learning Center) with the exception of the more recently constructed Weatherwax (Aberdeen) High School, it provides an opportunity for the school district to look at capacities, siting and educational programs offered at the studied schools. These studies of enrollment trends, demographics of potential students throughout the school district along with educational goals and operational efficiencies can help to shape the design capacities and distribution throughout the district of replacement schools.

Seismic Retrofit Cost Estimates

Total Project Cost (including 35% soft costs) for Seismic Retrofit & Vertical Evacuation Tower

	June 2025	June 2026	June 2027	June 2028	June 2029
Miller Jr. High	$53,200,000	$55,300,000	$57,500,000	$59,800,000	$62,200,000
Stevens Elementary	$37,000,000	$38,500,000	$40,000,000	$41,600,000	$43,300,000
AJ West Elementary	$25,900,000	$27,000,000	$28,000,000	$29,200,000	$30,300,000
Harbor Learning Center (Hopkins)	$37,000,000	$38,500,000	$40,000,000	$41,600,000	$43,300,000
McDermoth Elementary School	$6,600,000	$6,900,000	$7,200,000	$7,400,000	$7,700,000
Robert Gray Elementary School	$29,100,000	$30,300,000	$31,500,000	$32,800,000	$34,100,000
Central Park Elementary School	$3,800,000	$3,900,000	$4,100,000	$4,300,000	$4,400,000

Escalation calculated at 4% per year

Appendix

- Preliminary Geotechnical Reports
- Seismic Study Evaluation Reports
- Seismic Study Preliminary Drawings
- Tsunami Hazard Assessment Report
- Tsunami Tower Infographics

Preliminary Geotechnical Reports

HALEY ALDRICH

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REPORT OF PRELIMINARY GEOTECHNICAL ENGINEERING FINDINGS
ABERDEEN SCHOOL DISTRICT NO. 5 SEISMIC SAFETY RETROFITS
MILLER JUNIOR HIGH SCHOOL
ABERDEEN, WASHINGTON



by
Haley & Aldrich, Inc.
Vancouver, Washington

for
TCF Architecture PLLC
Tacoma, Washington

File No. 0210368-000
July 2024

HALEY & ALDRICH, INC.
300 W 15th S
Vancouver, WA 98660
360.448.4189

5 July 2024
File No. 0210368-000

TCF Architecture PLLC
902 N 2nd Street
Tacoma, Washington 98403

Attention: Steve Wachtler, AIA, Principal

Subject: Report of Preliminary Geotechnical Engineering Findings
Aberdeen School District No. 5 Seismic Safety Retrofits
Miller Junior High School
100 East Lindstrom Street
Aberdeen, Washington 98520

Dear Steve Wachtler:

Haley & Aldrich, Inc. (Haley & Aldrich) is pleased to submit this report to TCF Architecture PLLC and Aberdeen School District No. 5 (District) summarizing our preliminary geotechnical engineering services for the seismic retrofit of Miller Junior High School in Aberdeen, Washington. Our work was completed in general accordance with our agreement executed 3 April 2024. In completing our services, we collaborated with Degenkolb Engineers, Inc. and Educational Service District 112 - Construction Services Group.

The project involves preliminary evaluation of the Miller Junior High School in Aberdeen, Washington per *American Society of Civil Engineers/Structural Engineering Institute (ASCE/SEI) 41-17 - Seismic Evaluation and Retrofit of Existing Buildings* (ASCE, 2017b). The study was funded by the Office of Superintendent of Public Instruction's (OPSI's) School Seismic Grant Program. The findings from this preliminary evaluation will inform the District's and OPSI's decision-making to either advance design efforts for seismic retrofit improvements at the existing campus or to explore re-siting the school to a new location.

This preliminary report provides a discussion of the site setting, surface and subsurface conditions, the seismic basis of design, and a preliminary geotechnical analysis of seismicity and seismic hazards that may impact plans for retrofit of the subject school. Our current scope of services does not include providing recommendations for design and construction of retrofit improvements, such as modification of existing foundations or installation of ground improvement elements. Preliminary recommendations for retrofit improvements may be provided using currently available subsurface data under a supplemental authorization.

Scope of Services

The purpose of our services was to preliminarily characterize subsurface conditions at the site and to provide geotechnical engineering guidance and recommendations that conform in a preliminary sense to the geotechnical requirements of ASCE 41-17. These services included conducting geologic research, subsurface explorations, laboratory testing, preliminary seismic ground motion assessments, seismic hazard evaluation, and preliminary engineering analyses.

We completed the following tasks in general accordance with *Part 1 – Geotechnical Field Services and Limited Seismic Hazard Evaluation* included in our proposal for Geotechnical Engineering Services dated 21 February 2024 and executed 3 April 2024.

- Reviewed readily available geologic and geologic hazard maps, water well logs, and other geotechnical reports and plans provided by others for general information regarding subsurface soil and groundwater conditions and geologic hazards.
- Drilled one boring to a depth of approximately 121.5 feet below ground surface (bgs) and advanced one seismic cone penetration test (CPT) sounding to a depth of approximately 112 feet bgs to characterize subsurface conditions.
- Observed the exploration, logged the subsurface conditions, collected representative soil samples, and transported the samples to our laboratory for further visual review and testing.
- Completed laboratory tests on select soil samples to evaluate soil engineering properties. Our specific tests included moisture content, Atterberg Limits, grain size distribution determinations, organic content, triaxial strength testing, and a suite of corrosion potential tests in accordance with current ASTM International or other applicable standards.
- Developed code-based seismic design values in conformance with ASCE 41 Section 2.4 and ASCE 7 Section 11.4, not including site-specific seismic or ground response analyses per ASCE 7 Chapter 21.
- Conducted limited seismic hazard analysis including:
  - Assessing liquefaction potential analysis per the method presented by Idriss & Boulanger (2008); and
  - Assessing lateral spreading at the site, including an evaluation of local and regional topography and nearby bathymetry.
- Prepared this report summarizing our preliminary findings.

Site Conditions

SURFACE CONDITIONS

The Miller Junior High School campus encompasses an approximately 19-acre site located at 100 East Lindstrom Street in Aberdeen, Washington. The site is bounded by residences and South Evans Street on the west, single family residences, wooded green space, and West Harriman Street to the south,

woodlands to the east, and a green space and multi-use trail to the northeast. The main school structure on site was constructed in the 1970s and is composed of several interconnected wings. A smaller modular classroom building located north of the original structure was constructed in 2019. The areas southeast and southwest of the original structure are occupied by asphalt-paved parking structures. A track and field area is present east of the school structures, and a bleacher structure is present on the west side of the track. The remainder of the site is largely unimproved and grass-covered.

The school campus is located on the south side of Aberdeen in the flats area. As such, the site topography is generally flat with an average surface elevation at approximately Elevation 11 feet (World Geodetic System 84).

The Chehalis River is located approximately 0.5 miles to the east of the school and about 0.75 miles north of the school. The bay of Grays Harbor begins approximately 1 mile west of the site at the mouth of the river. The Pacific Ocean is about 18 miles to the west of the school, beyond the northern peninsula of Grays Harbor.

Our understanding of the existing original structure foundations is based on our review of a 68-sheet set of construction plans titled, "Miller Junior High School", prepared by Street & Lundgren Architects, and dated 12 April 1977, and on the 1976 project geotechnical report prepared by Hart Crowser & Associates, Inc.[1] (Hart Crowser, 1976). The entire building is founded on an array of 20-ton capacity timber piles. The piles appear to be isolated or in groups of two and generally do not appear to be structurally interconnected to one another with grade beams. The depth and diameter of the piles was not indicated on the plans, though based on scaling of the drawings appear to have a minimum top diameter of 8 inches. The school floors consist of concrete slabs-on-grade with thickened sections under partition walls. According to the historical geotechnical report, we expect the piles to extend approximately 75 feet bgs to achieve the 20-ton capacity, and the report specifies a minimum tip depth of 50 feet bgs. Excerpts from the historical plans are included in Appendix C.

GEOLOGIC AND SOIL MAPPING

The site is mapped as Quaternary alluvium described as "silt, sand, and gravel deposited in streambeds and fans," the surface of which is "relatively undissected" (Logan, 1987). The mapping also indicates that at depth, the alluvium is likely underlain by marine sedimentary rocks assigned to the Miocene Montesano Formation. This formation is described as predominantly silty sandstone with "local to widespread conglomerate, siltstone, and mudstone" that is generally blue gray where fresh and orange-brown where weathered (Logan, 1987). Our explorations encountered fill and alluvium over dense materials at approximately 87.5 feet bgs, which are likely part of this sedimentary rock formation.

The near-surface soils at the site are mapped by the U.S. Department of Agriculture (USDA) in the *Soil Survey of Grays Harbor County Area, Pacific County, and Wahkiakum County* (Pringle, 1986), as compiled in the Web Soil Survey (USDA, 2024), as "Ocosta silty clay loam". Ocosta soils are described as very deep, poorly drained soils derived from alluvium along floodplains and deltas that are protected from tidal

[1] Hart Crowser was acquired by Haley & Aldrich in 2020.

overflow by dikes and flood control structures (Pringle, 1986). The typical soil profile generally comprises 12 inches of silty clay loam (United Soil Classification System [USCS] CL) overlying clay and silty clay (USCS MH, CH) to 20 inches that grades to clay (USCS CH) to 60 inches. Depth to water in this soil type is typically 12 to 35 inches and the soil is assigned to hydrologic soil group D, which are soils that generally have very slow infiltration and water transmission rates.

Based on our explorations, the native soils underlying some near surface imported fills are generally similar to those described in the geologic and soil mapping.

SUBSURFACE CONDITIONS

Subsurface conditions interpreted from the explorations advanced at the site as part of our current study and the historical Hart Crowser report, in conjunction with soil properties inferred from field and laboratory tests, formed the basis for the conclusions and recommendations in this report. The locations and depths of our explorations were selected considering the site features, under the constraints of surface access, time, and budget.

We explored subsurface soil and groundwater conditions at the site on 8 through 11 of April 2024 by drilling one boring (B-MJH01) to a depth of approximately 121.5 feet bgs using the mud-rotary drilling method and advancing one CPT sounding (CPT-MJH01) to a depth of approximately 112 feet bgs. The boring was located in the central-western portion of the site and the CPT was performed in the southwestern portion of the site. Historical explorations performed at the site by Hart Crowser consisted of two borings advanced to depths of 70 and 104 feet bgs, and five CPTs advanced to 95 to 124 feet bgs. The current and historical exploration locations are shown on Figure 2.

Our field exploration procedures and exploration logs are in Appendix A. Laboratory soil testing procedures and results are in Appendix B. Excerpts from the historical report are presented in Appendix C.

The explorations indicate the site is blanketed by approximately 6 to 10 feet of fill consisting of poorly graded sand with gravel overlying organic elastic silt with abundant wood debris. In the case of historical explorations, the fill was described as being composed of silty sand, sandy silt, or clayey silt, containing abundant wood waste fill or in some cases being described as wood waste without a significant soil component. The wood debris is wood waste from historical timber processing activities in the area. The fill is underlain by very soft elastic silt that generally extends to a depth of about 87 feet bgs at B-MJH01 and about 99 feet bgs at CPT-MJH01. The elastic silt identified in historical borings and CPTs and generally extends to depths of about 89 to 109 feet bgs; however, at historical CPT P-3, push refusal was not encountered even at a depth of 124 feet bgs, where the exploration was terminated. The elastic silts are typically underlain by completely decomposed marine bedrock.

Groundwater was identified in boring B-MJH01 at an approximate depth of 7 feet bgs. Pore pressure dissipation testing at CPT-MJH01 indicated that the piezometric head at the site was about 6.5 feet bgs at the time of testing. For our engineering analyses, we conservatively assumed groundwater to be present at the ground surface.

Seismic Basis of Design

SEISMIC SETTING

The site is in a seismically active area. In this section, we describe the seismic setting, identify the seismic basis of design, provide code-based design values, and discuss the seismic hazards at the site. Geologic hazards mapped near the project site are all related to seismicity and include tsunami inundation, very strong earthquake shaking, and a moderate to high liquefaction hazard (Washington Department of Natural Resources [WADNR], 2023).

Regional Seismicity

Western Washington sits at the contact between two large crustal tectonic plates. The Juan de Fuca Plate forms the floor of the Pacific Ocean off the coast of the northwestern United States and moves northeastward from its spreading ridge boundary with the Pacific Plate at an average rate of approximately 1.5 inches per year. As it converges with the continental North American Plate, the Juan de Fuca Plate dips below (or "subducts") beneath the North American Plate forming a shallow, eastward-dipping contact interface. This boundary is known as the Cascadia Subduction Zone (CSZ) and is responsible for the seismicity in the western Washington regions, producing earthquakes associated with three types of source zones: subduction interface, subduction intraslab, and crustal. The CSZ is located offshore approximately 101 miles west of the site.

Subduction Interface Sources. The displacement caused by the subduction of the Juan de Fuca Plate below the North American Plate does not generally manifest as slip between the two plates; rather, it is absorbed by compression of the North American Plate at the interface at relatively shallow depths. This compression, based on geologic and historical evidence, is released every 300 to 600 years, on average, in the form of magnitude 8 to 9 or larger earthquakes, the last such event occurring in 1700. Characteristics of this type of earthquake may include very large ground accelerations, shaking durations in excess of 2 minutes, and particularly strong long-period ground motions that may affect tall or long-period structures.

Subduction Intraslab Sources. A deeper zone of seismicity is associated with a steeper bending of the Juan de Fuca Plate and the breaking of the plate under its own weight below the Pacific Northwest region. This region, termed the Benioff Zone, produces intraslab earthquakes at depths of 40 to 70 kilometers. Such past events in western Washington include the 1949 Puget Sound, 1965 Olympia, and 2001 Nisqually earthquakes. Deep, intraslab earthquakes tend to be felt over larger areas than shallower crustal events, and generally lack significant aftershocks.

Crustal Sources. Shallow crustal faults are caused by cracking of the continental crust, resulting from the stress that builds as the subduction zone plates remain locked together. Many small crustal faults are mapped near the site that are a part of the greater Cascadia Fold and Thrust Belt (U.S. Geologic Survey [USGS], 2024). However, due to the size of these faults, their contribution to the site seismic hazard is relatively small.

SEISMIC BASIS OF DESIGN AND ANALYSIS METHODOLOGY

Preliminary site-specific seismic hazard analysis was conducted for the project site following the guidelines in ASCE 41-17 Section 2.4.1 *General Procedure for Hazard Caused by Ground Shaking*. The seismic hazard levels evaluated per this approach are as follows:

- **BSE-1E:** Basic Safety Earthquake-1 for use with the Basic Performance Objective for Existing Buildings, taken as a seismic hazard with a 20 percent probability of exceedance in 50 years (225-year return period), but not greater than the BSE-1N, at a site.
- **BSE-1N:** Basic Safety Earthquake-1 for use with the Basic Performance Objective Equivalent to New Building Standards taken as two-thirds of the BSE-2N at a site.
- **BSE-2E:** Basic Safety Earthquake-2 for use with the Basic Performance Objective for Existing Buildings, taken as a seismic hazard with a 5 percent probability of exceedance in 50 years (975-year return period), but not greater than the BSE-2N, at a site.
- **BSE-2N:** Basic Safety Earthquake-2 for use with the Basic Performance Objective Equivalent to New Building Standards, taken as the ground shaking based on the Risk-Targeted Maximum Considered Earthquake (MCE_R) per ASCE 7 at a site.

The BSE-2N hazard level is analogous to the maximum considered earthquake hazard level (MCE) in ASCE 7-16 (with a 2 percent probability of exceedance in 50 years or a 2,475-year return period), and the BSE-1N hazard level is consistent with a design-level event in ASCE 7-16 (ASCE, 2017a).

Seismic Site Class

Thick sequences of unconsolidated, soft sediments typically amplify the shaking of long-period ground motions, such as those associated with subduction zone earthquakes; whereas areas underlain by shallow soil profiles are not likely to amplify seismic waves.

The “Site Class” is a designation used by ASCE 7-16, as referenced by ASCE 41-17, to quantify ground motion amplification. The classification is based on the stiffness in the upper 100 feet (roughly 30 meters) of soil and bedrock materials at a site. We used site-specific data collected during our investigation to estimate the stiffness profile at this site:

- Seismic CPT shear wave velocity testing was performed at CPT-MJH01. The test resulted in a weighted-average shear wave velocity of 291 feet per second for a profile extending to 100 feet bgs. This weighted-average V_s profile falls within the limits of Site Class E, as defined in ASCE 7-16, as referenced by ASCE 41-17.
- Boring B-MJH01 was evaluated for site class considering Standard Penetration Test (SPT) N-values and the stratigraphy encountered. Boring B-MJH01 encountered a profile generally consisting of very soft elastic silt extending to about 87 feet bgs. Based on the N-value approach for determination of site class, conditions are consistent with Site Class E, as defined in ASCE 7-16, as referenced by ASCE 41-17.

We find that without respect to seismic hazards, Site Class E is appropriate for this site. However, due to potential for cyclic softening at this project site, which could lead to loss of foundation bearing support, the site is classified as Site Class F.

Per ASCE 41-17, a Site Class F designation requires a site-specific analysis including a seismic hazard analysis and a site response analysis; however, buildings with structural periods of less than 0.5 seconds may be designed using seismic parameters developed considering Site Class E conditions.

Preliminary Spectral Design Parameters

Acceleration response spectra for use in preliminary design have been developed following the procedures in ASCE 41-17 Section 2.4.1 *General Procedure for Hazard Caused by Ground Shaking*. These values are presented in Table 1.

Table 1. General Procedure Spectral Design Parameters

Design Parameters	Hazard Level			
	BSE-2N	BSE-1N	BSE-2E	BSE-1E
Site Class	E			
S_s	1.51	-	1.09	0.41
F_a (Site Class E)[1]	1.3	-	1.3	1.94
S_{xs}	1.96	1.31	1.41	0.80
S_1	0.69	-	0.46	0.13
F_v (Site Class E)[1]	4.2	-	4.2	4.2
S_{x1}	2.88	1.92	1.93	0.53
T_L	16 s	16 s	16 s	16 s

Notes:

1) *F_a and F_V are the ASCE 7-16 Chapter 21 site factors for Site Class E.*
2) *Site coordinates are Latitude/Longitude 46.963606°N / 123.792163°W.*
3) *Values presented in this table are for Site Class E conditions. This site falls under Site Class F categorization; however, these values are provided assuming that the structures have a fundamental period of less than 0.5 seconds, in which case Site Class E may be used for design.*

LIQUEFACTION

General

When cyclic loading occurs during an earthquake, the shaking can increase the pore pressure in loose to medium dense saturated sand and cause liquefaction. The rapid increase in pore water pressure reduces the effective normal stress between soil particles, resulting in the sudden loss of shear strength in the soil. Granular soils, which rely on interparticle friction for strength, are susceptible to liquefaction until the excess pore pressures can dissipate. Sand boils and flows observed at the ground surface after an earthquake are the result of excess pore pressures dissipating upward, carrying soil particles with the

draining water. In general, loose, saturated sand soils with low silt and clay contents are the most susceptible to liquefaction. Silty soils with low plasticity are moderately susceptible to liquefaction under relatively higher levels of ground shaking. For any soil type, the soil must be saturated for liquefaction to occur.

We performed liquefaction potential analysis on soils logged at the site using the procedures outlined in Idriss and Boulanger (2008) and updated Magnitude Scaling Factor as outlined in Boulanger and Idriss (2014).

We note the term liquefaction is defined very specifically by the simplified method that we used to evaluate the liquefaction hazard. Liquefaction is defined as when a soil under repeated cyclic loading exhibits the generation of increasing excess pore pressures until the pore pressure equals the total overburden stress. When this condition is reached, the normal stress acting between adjacent soil particles is effectively lost, and the soil, which derives its shear strength from interparticle friction, can lose much of its available shear strength. However, it is well documented that not all soils exhibit the same behavior after the initiation of liquefaction.

Loose sandy soils that achieve the condition of liquefaction during earthquake shaking can subsequently collapse and exhibit large shear strains under continued cyclic or static loading. This type of behavior is a well-documented result of numerous earthquakes, where structures underlain by shallow, liquefiable hydraulically placed fills have been observed to experience bearing capacity failures and collapse. Conversely, medium dense to dense sandy soils that achieve the condition of liquefaction will typically not collapse and can exhibit strain hardening behavior due to dilation effects. Therefore, despite the soil achieving the condition of liquefaction, there is little to no shear strength loss and only moderate shear strains under continued cyclic and static loading. This condition is termed “cyclic mobility.”

Analysis

In accordance with ASCE 7-16, as referenced by ASCE 41-17, we completed the liquefaction hazard analysis using the site class adjusted acceleration coefficient PGA_M for Site Class E. We performed our liquefaction analysis for three different hazard levels, including events with 225-year (corresponding to BSE-1E), 975-year (corresponding to BSE-2E), and 2475-year (corresponding to BSE-2N) return periods. We performed liquefaction analysis using PGA_M values of 0.44g and 0.80g and associated earthquake magnitudes of 7.6 and 8.5 for BSE-1E and BSE-2E, respectively. We used a PGA_M of 1.30g and associated earthquake magnitude of 8.8 in our analysis for the BSE-2N event. We assumed a design groundwater depth at the ground surface for our liquefaction analyses.

We performed screening for liquefiable soil layers using criteria established by Boulanger and Idriss (2014) and Bray and Sancio (2006). The Boulanger and Idriss (2014) criteria state that fine-grained soils with a plasticity index of 7 or greater are not susceptible to liquefaction. Bray and Sancio (2006) found that soils with plasticity indexes of up to 12 with moisture contents greater than 85 percent of the liquid limit should be considered susceptible to liquefaction, and soils with plasticity indexes between 12 and 18 should be considered moderately susceptible to liquefaction if the moisture content is greater than 80 percent of the liquid limit. Based on this screening analysis, the elastic silt soils at the site have

plasticity indexes that exceed the criteria presented by both Boulanger and Idriss (2014) and Bray and Sancio (2006), meaning that the elastic silt is not considered susceptible to liquefaction.

Based on these findings, our analyses conclude that potential for liquefaction (and secondary effects including lateral spreading, seismic-induced settlement, and surface manifestations) to occur at the site is low.

Seismic Strength Loss

Some strength loss due to cyclic shear stresses are expected to occur in the elastic silt soils present throughout the site subsurface. Full cyclic softening and development of lowered residual strengths within these materials are likely to occur. Supplemental exploration including performance of cyclic direct simple shear testing would be required to accurately estimate residual strength ratios for these soils. Using CPT-based strength loss correlations, the estimated residual strength ratio for the fine-grained soils is approximately 0.07, which indicates a high degree of seismic strength loss.

Based on currently available information, we conclude that the potential for cyclic softening to occur at the site is high.

As a result of the high expected soil strength loss, the pile foundation system at the site may experience bearing shear failure and cause foundation settlement.

SEISMIC DISPLACEMENT

We performed seismic displacement analyses using the commercial code Slide2 by RocScience to evaluate the stability of the site under seismic loading using a generalized subsurface soil profile extrapolating site conditions outwards to the Chehalis River. The Slide program performs two-dimensional limit equilibrium analysis to analyze slope stability and to determine a factor of safety against global failure. Our preliminary analyses indicate that the site and surrounding area are susceptible to seismic displacement under all considered seismic events, but predominantly under BSE-2E and BSE-2N conditions. To quantify an estimate of the amount of ground displacement that could occur under the design seismic scenarios, we performed displacement analyses using the simplified procedure for estimating seismic slope displacements in subduction zones by Bray, Macedo, and Liu (2023). The factor of safety against movement under BSE-1E conditions is near 1.0, indicating that lateral displacement should be minor and on the order of less than 4 inches. The mean level of expected lateral displacement at the building footprint under the BSE-2E and BSE-2N seismic events is estimated to be in tens of feet.

FAULT SURFACE RUPTURE

We used the USGS U.S. Quaternary faults web application (USGS, 2024) to identify earthquake-producing faults near the project site. No mapped earthquake-producing crustal faults are present at the site. The closest mapped fault is a strand of the Cascadia Fold and Fault Belt located more

than 12 miles to the west of the site. The USGS has mapped the "Cascadia Megathrust" portion of the Cascadia Subduction Zone approximately 101 miles west of the site.

Based on known fault locations, we consider the potential for fault rupture to occur at the site to be low unless occurring on an unmapped or otherwise unknown fault.

TSUNAMI HAZARD

The tsunami hazard at the site is mapped in the *Tsunami Hazard Maps of Southwest Washington - Model Results from a ~2,500-Year Cascadia Subduction Zone Earthquake Scenario* by the WADNR (Eungard et al., 2018). Based on this reference, the site is located within an area expected to be inundated from a CSZ-induced tsunami, with an expected inundation depth in excess of 6 feet. Similarly, tsunami wave simulation for Grays Harbor, Washington, performed by WADNR shows that the site will be inundated by 5 to 10 feet in the event of a hypothetical magnitude 9.0 earthquake on the CSZ (WADNR, 2020).

The ASCE Tsunami Hazard Tool (https://asce7tsunami.online/) maps probabilistic inundation hazards for all potential tsunami sources, not just a CSZ-related event. The school is not within the study area mapped by ASCE for tsunami inundation zone, with mapping ending at S Lewis Street, approximately 1,600 feet west of the site; however, extrapolation of tsunami inundation zone mapping suggests the school site could potentially be inundated (ASCE, 2022). The degree of inundation is unknown, but based on nearby run-up elevations presented by ASCE, it is estimated that inundation would be limited to several feet at most.

Based on the findings presented by Washington DNR, we consider the potential for tsunami inundation to occur at the site to be high.

Corrosivity

One soil sample was collected and tested for corrosivity characteristics by CERCO of Concord, California. The tested sample consisted of near-surface soils and was tested for resistivity, redox potential, sulfate and chloride ion concentrations, and pH. The test results indicate that near-surface soils should be considered corrosive to buried iron and steel improvements, based on laboratory resistivity measurements. Chloride ion concentration was 140 milligrams per kilogram, which poses a risk of attack on steel embedded in concrete mortar coating. Sulfate ion concentration results were 300 milligram per kilogram and present a potential to be detrimental to reinforced concrete. The pH level was measured as about 6.4 and is considered a corrosion concern for buried iron, steel, mortar-coated steel, and reinforced concrete structures.

The results of our corrosion testing and a copy of CERCO's brief evaluation are presented in Appendix B.

Conclusions

Based on our explorations, testing, and analyses, we have formulated preliminary conclusions in this report for use in assessment of the seismic retrofit project's viability. We offer the following general summary.

- The site soil profile generally features a crust of granular fill and organic silt (historical wood waste) to approximately 7 feet bgs. These fill materials are underlain by thick deposits of very soft to soft elastic silts to approximately 90 to greater than 110 feet bgs. Weathered sedimentary bedrock is present below those depths. The groundwater table at the site is shallow at just several feet below the ground surface.
  - The near-surface granular fill is considered to be slightly to moderately strong, slightly compressible, and unlikely to be susceptible to liquefaction.
  - The organic silt/wood waste underlying the granular fill is considered to be very weak, highly compressible, and susceptible to seismically induced strength loss, though is not considered to be liquefiable.
  - The deeper, native elastic silt soils extending to depth are considered to be weak, compressible, and susceptible to seismically induced strength loss, though are not considered to be liquefiable.
  - The weathered bedrock at depth is considered to be competent (strong and generally incompressible) and not susceptible to liquefaction or seismically induced strength loss.
- The elastic silts underlying the Site are not expected to be subject to liquefaction but will likely experience cyclic softening under seismic loading conditions, resulting in a reduction of bearing capacity for foundations deriving their support in this material. This reduction in support capacity presents a likelihood for excessive vertical and/or lateral movements of existing building pile foundations. Therefore, the existing and any proposed new or upgraded foundations will need to be designed to tolerate or resist these seismically induced ground movements.
  - The magnitude of lateral deformations due to lateral spreading has the potential to be in the tens of feet, which will be too large to tolerate or resist with new or existing foundation systems. The use of specialized ground improvement would likely be required to mitigate this issue.
- Conceptually, we conclude the following regarding potential foundation retrofit and hazard mitigation alternatives:
  - Ground improvement: Performance of ground improvement (such as deep soil mixing) conceptually provides a solution for mitigation of seismic-induced lateral displacement. This ground improvement would span a large footprint area that would require partial demolition of some parking lot areas and major disruption to playgrounds, landscaping, and hardscaping to the north and east of the school building. The depth of treatment would potentially need to extend to depths ranging anywhere from 60 feet bgs to the bedrock contact at 90 or more feet bgs. The type of soils requiring improvement are fine-grained, and approaches such as deep soil mixing may require relatively high

cement volumes for treatment. For these reasons, this approach is technically feasible but is likely challenging from a cost standpoint.

- Deep foundations: The structure could feasibly be underpinned with additional micropile or small diameter pipe pile foundations to transfer building loads under seismic conditions down to deep bedrock. However, these foundations would not be capable of withstanding the large lateral loads induced by lateral seismic displacements. For this reason, we conclude that underpinning with deep foundations is not an effective approach for retrofit at this site.
- Shallow foundations: Conceptually, the structure could be retrofitted to perform in a seismic event as a shallow foundation-supported structure . This could be achieved by retrofitting the structure to feature a thickened structural mat, or alternatively, the existing pile caps could be connected with a network of strengthened grade beams designed to ignore capacity contributions from the underlying timber piles under seismic conditions. Vertical and lateral seismic forces induced upon the structure would then be resisted solely by the shallow foundation system. Life-safety conditions allowing for immediate egress in the event of an emergency would need to be achieved as a precondition for taking this approach. This retrofit approach would leave the school prone to significant shifting and distress as a result of design-level seismic shaking, especially under BSE-2N and BSE-2E events. This would very likely displace the school from its existing timber pile foundations and render the structure unusable post-earthquake. Also, it may not be possible to design it to accommodate the expected lateral ground deformations. This will require consideration by the structural engineer.

- Final design of geotechnical elements may require additional site characterization to verify subsurface conditions around the school building.

Closing

Thank you for the opportunity to perform these services for you. Please do not hesitate to contact us if you have any questions or comments.

Sincerely yours,
HALEY & ALDRICH, INC.

Tyler Slothower
Staff Engineer



Daniel J. Trisler, P.E.
Principal Geotechnical Engineer

Micah D. Hintz, P.E.
Geotechnical Engineer

Attachments:

Figure 1 – Vicinity Map
Figure 2 – Site and Exploration Plan
Appendix A – Exploration Logs
Appendix B – Laboratory Test Results
Appendix C – Historical Plans

https://haleyaldrich.sharepoint.com/sites/AberdeenSchoolDistrictNo.5/Shared Documents/0210368.Aberdeen SD Miller Junior High/Deliverables/In-Basket/Prelim_Findings/Final/2024_0705_HAI_0210368-000_MJH_Prelim_Findings_F.docx

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FIGURES







MAP SOURCE: ESRI
SITE COORDINATES: 46°57'49"N, 123°47'27"W

HALEY ALDRICH

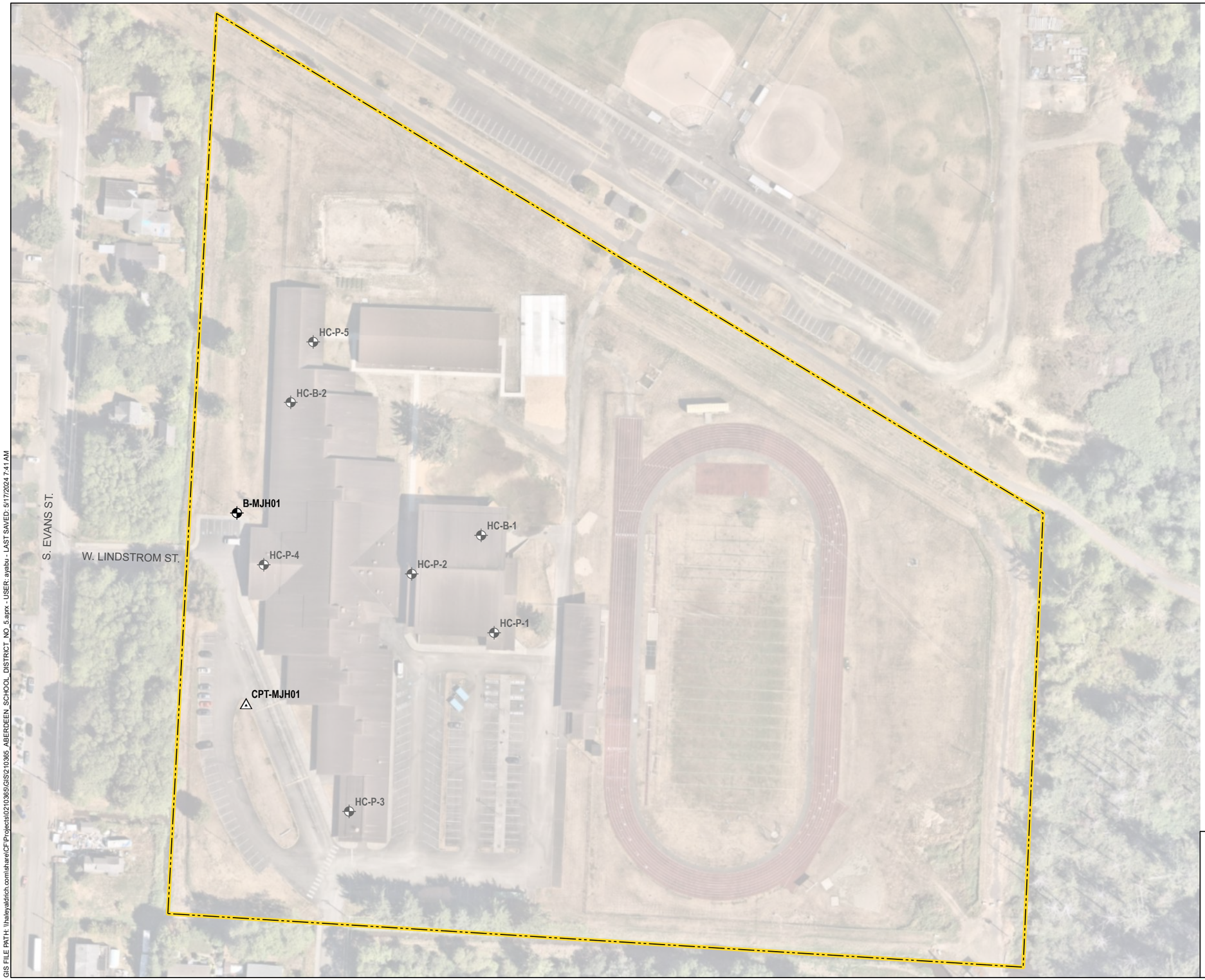
MILLER JUNIOR HIGH SCHOOL
SEISMIC SAFETY RETROFIT
ABERDEEN, WASHINGTON

PROJECT LOCUS

APPROXIMATE SCALE: 1 IN = 2000 FT
MAY 2024

FIGURE 1

GIS: \\haleyaldrich.com\share\CF\Projects\0210365\GIS\210365_ABERDEEN_SCHOOL_DISTRICT_NO_5.aprx - ayabu - 5/16/2024 4:38 PM



LEGEND

- CONE PENETRATION TEST
- MUD ROTARY BORING
- HISTORICAL EXPLORATION
- SITE BOUNDARY
- PARCEL BOUNDARY

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. AERIAL IMAGERY SOURCE: NEARMAP, 14 AUGUST 2023

N

0 120 240

SCALE IN FEET

HALEY ALDRICH

MILLER JUNIOR HIGH SCHOOL
SEISMIC SAFETY RETROFIT
ABERDEEN, WASHINGTON

SITE AND EXPLORATION PLAN

MAY 2024

FIGURE 2

GIS FILE PATH: \\haleyaldrich.com\share\CF\Projects\0210365\GIS\210365_ABERDEEN_SCHOOL_DISTRICT_NO_5.aprx - USER: ayabu - LAST SAVED: 5/17/2024 7:41 AM

APPENDIX A
Exploration Logs

APPENDIX A

Exploration Logs

Haley & Aldrich, Inc. (Haley & Aldrich) evaluated subsurface conditions at the site by completing one drilled boring on 12 April 2024 and performing one cone penetration test (CPT) on 10 April 2024. The field explorations were coordinated and overseen by geotechnical staff from Haley & Aldrich who classified the various soil units encountered, obtained representative soil samples for geotechnical testing, and maintained a detailed log of the boring. Exploration logs are included in this appendix. Figure 2 of the report shows the approximate locations of the explorations. Explorations were located in the field using landmarks on site. Results of the laboratory testing are indicated on the exploration logs and are included in Appendix B.

Boring

The boring was advanced using mud rotary methods using a track-mounted CME-75 drill rig operated by Western States Soil Conservation, Inc., of Hubbard, Oregon. The boring created a hole approximately 5 inches in diameter.

Soil Sampling and Classification

Materials encountered in the explorations were classified in the field in general accordance with ASTM International (ASTM) Standard Practice D 2488 "Standard Practice for the Classification of Soils (Visual-Manual Procedure)." The exploration logs in this appendix show our interpretation of the exploration, sampling, and testing data. The logs indicate the depth where the soils change. Note that the change may be gradual. In the field, we classified the samples taken from the explorations according to the methods presented on the *Figure A-1, Key to Exploration Logs*. This figure also provides a legend explaining the symbols and abbreviations used in the logs.

Sampling of soils was completed at regular intervals throughout the depth of each boring. The samples were collected with a Standard Penetration Test sampler used in general conformance with ASTM Test Method D 1586 "Standard Method for Penetration Test and Split-Barrel Sampling of Soils." The sampler was driven by a 140-pound auto-trip hammer falling 30 inches. The *N* value, or number of blows required to drive the sampler 1 foot, or as otherwise indicated into the soils, is shown adjacent to the sample symbols on the boring logs. Disturbed samples were obtained from the SPT sampler. A piston sampler was used to collect relatively undisturbed Shelby tube samples. Samples were used for classification and laboratory testing purposes.

Cone Penetration Tests

The CPT sounding was advanced by Conetec, Inc. of Seattle, Washington. The CPT was completed in general accordance with ASTM D 5778 using a seismic electronic cone penetrometer. The CPT sounding is an *in situ* test that provides assistance in characterizing subsurface stratigraphy. The test includes advancing a 35.6-millimeter-diameter cone equipped with a load cell, friction sleeve, strain gauges, porous stone, and geophone through the soil profile. The cone is advanced at a rate of approximately 2 centimeters per second. Tip resistance, sleeve friction, and pore pressure are typically recorded at 0.1-meter intervals. The log of the CPT sounding is presented in this appendix.

Sample Description

Identification of soils in this report is based on visual field and laboratory observations which include density/consistency, moisture condition, grain size, and plasticity estimates and should not be construed to imply field nor laboratory testing unless presented herein. ASTM D 2488 visual-manual identification methods were used as a guide. Where laboratory testing confirmed visual-manual identifications, then ASTM D 2487 was used to classify the soils.

Relative Density/Consistency

Soil density/consistency in borings is related primarily to the standard penetration resistance (N). Soil density/consistency in test pits and probes is estimated based on visual observation and is presented parenthetically on the logs.

SAND or GRAVEL Relative Density	N (Blows/Foot)	SILT or CLAY Consistency	N (Blows/Foot)
Very loose	0 to 4	Very soft	0 to 1
Loose	5 to 10	Soft	2 to 4
Medium dense	11 to 30	Medium stiff	5 to 8
Dense	31 to 50	Stiff	9 to 15
Very dense	>50	Very stiff	16 to 30
		Hard	>30

Moisture

Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

USCS Soil Classification Chart (ASTM D 2487)

Major Divisions			Symbols: Graph	Symbols: USCS	Typical Descriptions
Coarse Grained Soils: More than 50% of Material Retained on No. 200 Sieve	Gravel and Gravelly Soils: More than 50% of Coarse Fraction Retained on No. 4 Sieve	Clean Gravels (<5% fines)		GW	Well-Graded Gravel; Well-Graded Gravel with Sand
				GP	Poorly Graded Gravel; Poorly Graded Gravel with Sand
		Gravels (5-12% fines)		GW-GM	Well-Graded Gravel with Silt; Well-Graded Gravel with Silt and Sand
				GW-GC	Well-Graded Gravel with Clay; Well-Graded Gravel with Clay and Sand
				GP-GM	Poorly Graded Gravel with Silt; Poorly Graded Gravel with Silt and Sand
				GP-GC	Poorly Graded Gravel with Clay; Poorly Graded Gravel with Clay and Sand
		Gravels with Fines (>12% fines)		GM	Silty Gravel; Silty Gravel with Sand
				GC	Clayey Gravel; Clayey Gravel with Sand
	Sand and Sandy Soils: More than 50% of Coarse Fraction Passing No. 4 Sieve	Sands with few Fines (<5% fines)		SW	Well-Graded Sand; Well-Graded Sand with Gravel
				SP	Poorly Graded Sand; Poorly Graded Sand with Gravel
		Sands (5-12% fines)		SW-SM	Well-Graded Sand with Silt Well-Graded Sand with Silt and Gravel
				SW-SC	Well-Graded Sand with Clay; Well-Graded Sand with Clay and Gravel
				SP-SM	Poorly Graded Sand with Silt; Poorly Graded Sand with Silt and Gravel
				SP-SC	Poorly Graded Sand with Clay; Poorly Graded Sand with Clay and Gravel
		Sands with Fines (>12% fines)		SM	Silty Sand; Silty Sand with Gravel
				SC	Clayey Sand; Clayey Sand with Gravel
Fine Grained Soils: More than 50% of Material Passing No. 200 Sieve	Silts			ML	Silt; Silt with Sand or Gravel; Sandy or Gravelly Silt
				MH	Elastic Silt; Elastic Silt with Sand or Gravel; Sandy or Gravelly Elastic Silt
	Silty Clay (based on Atterberg Limits)			CL-ML	Silty Clay; Silty Clay with Sand or Gravel; Gravelly or Sandy Silty Clay
	Clays			CL	Lean Clay; Lean Clay with Sand or Gravel; Sandy or Gravelly Lean Clay
				CH	Fat Clay; Fat Clay with Sand or Gravel; Sandy or Gravelly Fat Clay
	Organics			OL/OH	Organic Soil; Organic Soil with Sand or Gravel; Sandy or Gravelly Organic Soil
Highly Organic (>50% organic material)				PT	Peat - Decomposing Vegetation - Fibrous to Amorphous Texture

Minor Constituents

	Estimated Percentage
Sand, Gravel	
Trace	<5
Few	5 - 15
Cobbles, Boulders	
Trace	<5
Few	5 - 10
Little	15 - 25
Some	30 - 45

Soil Test Symbols

%F	Percent Passing No. 200 Sieve
AL	Atterberg Limits (%)
	Liquid Limit (LL)
	Water Content (WC)
	Plastic Limit (PL)
CA	Chemical Analysis
CAUC	Consolidated Anisotropic Undrained Compression
CAUE	Consolidated Anisotropic Undrained Extension
CBR	California Bearing Ratio
CIDC	Consolidated Drained Isotropic Triaxial Compression
CIUC	Consolidated Isotropic Undrained Compression
CK0DC	Consolidated Drained k0 Triaxial Compression
CK0DSS	Consolidated k0 Undrained Direct Simple Shear
CK0UC	Consolidated k0 Undrained Compression
CK0UE	Consolidated k0 Undrained Extension
CRSCN	Constant Rate of Strain Consolidation
DS	Direct Shear
DSS	Direct Simple Shear
DT	In Situ Density
GS	Grain Size Classification
HYD	Hydrometer
ILCN	Incremental Load Consolidation
K0CN	k0 Consolidation
kc	Constant Head Permeability
kf	Falling Head Permeability
MD	Moisture Density Relationship
OC	Organic Content
OT	Tests by Others
P	Pressuremeter
PID	Photoionization Detector Reading
PP	Pocket Penetrometer
SG	Specific Gravity
TRS	Torsional Ring Shear
TV	Torvane
UC	Unconfined Compression
UUC	Unconsolidated Undrained Triaxial Compression
VS	Vane Shear
WC	Water Content (%)

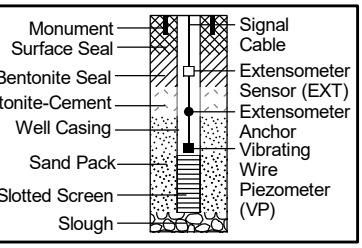
Groundwater Indicators

- Groundwater Level on Date or At Time of Drilling (ATD)
- Groundwater Level on Date Measured in Piezometer
- Groundwater Seepage (Test Pits)

Sample Symbols

- 1.5" I.D. Split Spoon
- 3.0" I.D. Split Spoon
- Modified California Sampler
- Rock Core Run
- Sonic Core
- Thin-walled Sampler
- Grab
- Cuttings
- Push Probe

Well Symbols



HALEY ALDRICH

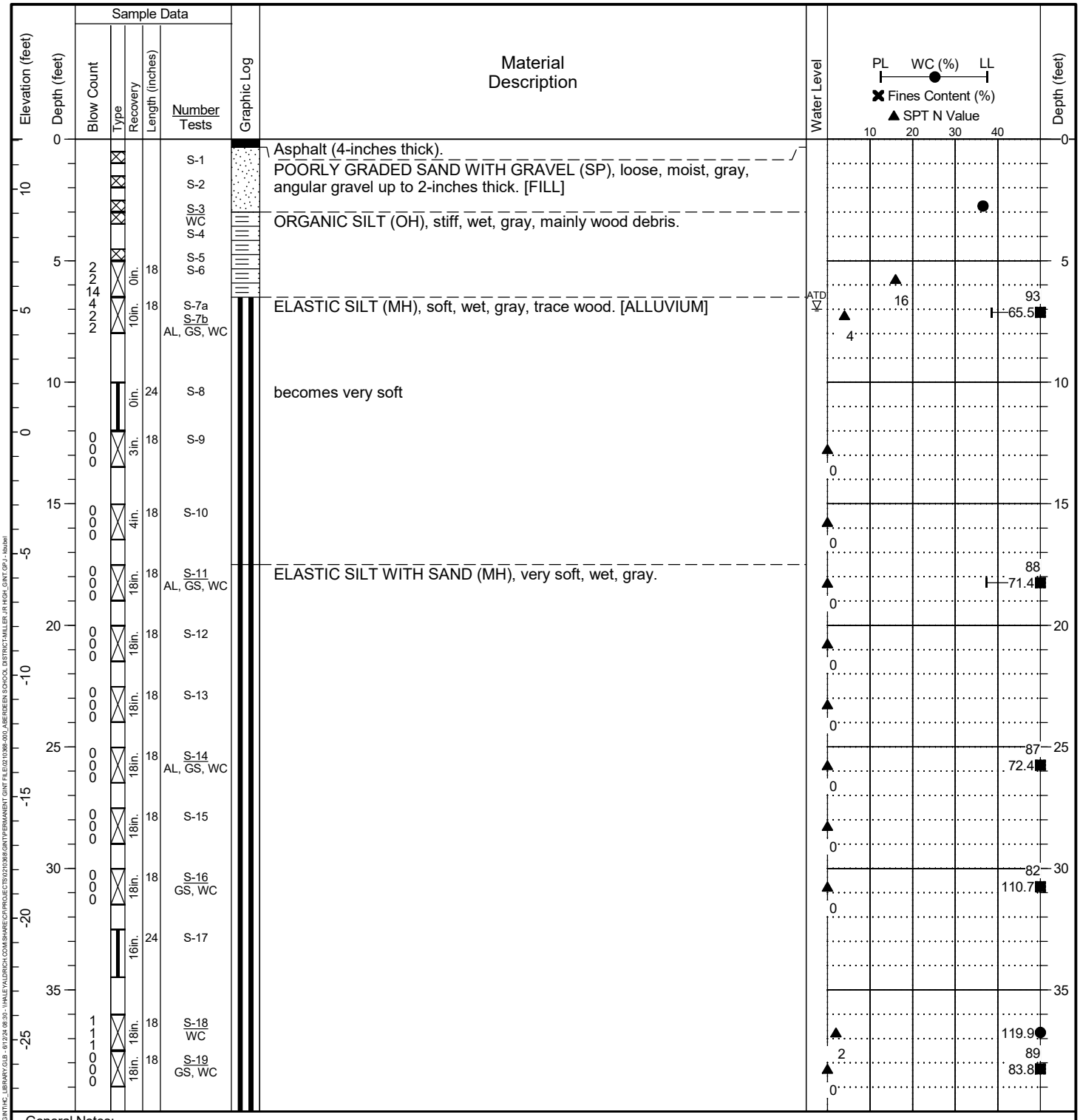
Project: Aberdeen School District - Miller Junior High
Location: Aberdeen, Washington
Project No.: 0210368-000

Key to Exploration Logs

Figure **A-1**
Sheet **1 of 1**

HA KEY TO EXP LOGS SOIL ONLY - \\HALEYALDRICH.COM\SHARES\CEA_DATA\GINT\HC_LIBRARY\GLB - 6/3/24 11:39 - \\HALEYALDRICH.COM\SHARES\CEA_DATA\GINT\HC_LIBRARY\GLB - 6/3/24 11:39 - \\HALEYALDRICH.COM\SHARES\CEA_DATA\GINT\PROJECTS\0210368\GINT\PERMANENT GINT FILE\0210368-000_ABERDEEN SCHOOL DISTRICT-MILLER JR HIGH_GINT.GPJ - ktubal

Date Started: 04/11/2024	Date Completed: 04/12/2024	Drilling Contractor/Crew: Western States Soil Conservation, Inc. / Ray	
Logged by: S. Sirmans	Checked by: M. Hintz	Drilling Method: Mud Rotary	
Location: Lat: 46.963770 Long: -123.792751 (WGS 84)		Rig Model/Type: CME-75 / Truck-mounted drill rig	
Ground Surface Elevation: 12.05 feet (NAVD 88)		Hammer Type: Auto-hammer	
Comments:		Hammer Weight (pounds): 140	Hammer Drop Height (inches): 30
		Measured Hammer Efficiency (%): 90.6	
		Hole Diameter: 5 inches	Well Casing Diameter: NA
		Total Depth: 121.5 feet	Depth to Groundwater: 7 feet



General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HALEY ALDRICH	Project: Aberdeen School District - Miller Junior High Location: Aberdeen, Washington Project No.: 0210368-000	Boring Log **B-MJH01**	Figure **A** Sheet **1 of 4**

HA BORING LOG - \\HALEYALDRICH.COM\SHARE\SEA_DATA\GINT\HC_LIBRARY.GLB - 6/12/24 08:30 - \\HALEYALDRICH.COM\SHARE\CORPROJECTS\0210368\GINT\PERMANENT GINT FILE\0210368-000_ABERDEEN SCHOOL DISTRICT-MILLER JR HIGH_GINT.GPJ - kbisbe

Date Started: 04/11/2024	Date Completed: 04/12/2024	Drilling Contractor/Crew: Western States Soil Conservation, Inc. / Ray	
Logged by: S. Sirmans	Checked by: M. Hintz	Drilling Method: Mud Rotary	
Location: Lat: 46.963770 Long: -123.792751 (WGS 84)		Rig Model/Type: CME-75 / Truck-mounted drill rig	
Ground Surface Elevation: 12.05 feet (NAVD 88)		Hammer Type: Auto-hammer	
Comments:		Hammer Weight (pounds): 140	Hammer Drop Height (inches): 30
		Measured Hammer Efficiency (%): 90.6	
		Hole Diameter: 5 inches	Well Casing Diameter: NA
		Total Depth: 121.5 feet	Depth to Groundwater: 7 feet

Elevation (feet)	Depth (feet)	Sample Data: Blow Count	Type	Recovery	Length (inches)	Number / Tests	Graphic Log	Material Description	Water Level	PL WC (%) LL / Fines Content (%) / SPT N Value	Depth (feet)
40	40	0 0 0		18in.	18	S-20 AL		ELASTIC SILT WITH SAND (MH), very soft, wet, gray.	0		40
-30											
45	45	0 0 0		18in.	18	S-21 GS, WC		ELASTIC SILT (MH), very soft, wet, gray, numerous organics.	0	92 / 72.2	45
-35											
50	50	0 0 0		18in.	18	S-22			0		50
-40											
55	55	0 0 0		18in.	18	S-23 WC		scattered organics	0	75.5	55
-45											
60	60	0 0 0		18in.	18	S-24			0		60
-50											
65	65	0 0 0		18in.	18	S-25 WC		occasional organics	0	56.2	65
-55											
70	70			20in.	20	S-26					70
-60		0 0 0		18in.	18	S-27		numerous organics	0		
75	75	0 0 0		18in.	18	S-28		scattered organics	0		75
-65											

General Notes:
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4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HALEY ALDRICH

Project: Aberdeen School District - Miller Junior High
Location: Aberdeen, Washington
Project No.: 0210368-000

Boring Log
B-MJH01

Figure **A**
Sheet **2 of 4**

HA BORING LOG - \\HALEYALDRICH.COM\SHARE\SEA_DATA\GINT\HC_LIBRARY.GLB - 6/12/24 08:30 - \\HALEYALDRICH.COM\SHARE\CORPROJECTS\0210368\GINT\PERMANENT GINT FILE\0210368-000_ABERDEEN SCHOOL DISTRICT-MILLER JR HIGH_GINT.GPJ - kbisbe

Date Started: 04/11/2024	Date Completed: 04/12/2024	Drilling Contractor/Crew: Western States Soil Conservation, Inc. / Ray	
Logged by: S. Sirmans	Checked by: M. Hintz	Drilling Method: Mud Rotary	
Location: Lat: 46.963770 Long: -123.792751 (WGS 84)		Rig Model/Type: CME-75 / Truck-mounted drill rig	
Ground Surface Elevation: 12.05 feet (NAVD 88)		Hammer Type: Auto-hammer	
Comments:		Hammer Weight (pounds): 140	Hammer Drop Height (inches): 30
		Measured Hammer Efficiency (%): 90.6	
		Hole Diameter: 5 inches	Well Casing Diameter: NA
		Total Depth: 121.5 feet	Depth to Groundwater: 7 feet

Elevation (feet)	Depth (feet)	Sample Data: Blow Count	Type	Recovery	Length (inches)	Number / Tests	Graphic Log	Material Description	Water Level	PL WC (%) LL; ✖ Fines Content (%); ▲ SPT N Value (10 20 30 40)	Depth (feet)
80	80	0 0 0		18in.	18	S-29		ELASTIC SILT (MH), very soft, wet, gray, scattered organics.		▲ 0	80
-70											
85	85	0 0 0		18in.	18	S-30				▲ 0	85
-75								WELL-GRADED SAND WITH GRAVEL (SW), dense, wet, gray, fine gravel, completely decomposed rock. [MONTESANO FORMATION]			
90	90	21 22 20		10in.	18	S-31				▲ 42	90
-80											
95	95	14 15 20		8in.	18	S-32				▲ 35	95
-85											
100	100	23 22 23		8in.	18	S-33				▲ 45	100
-90											
105	105										105
-95											
110	110	20 21 20		6in.	18	S-34		POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), dense, wet, gray, fine sand.		▲ 41	110
-100											
115	115										115
-105											

General Notes:
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5. Location and ground surface elevations are approximate.

HALEY ALDRICH

Project: Aberdeen School District - Miller Junior High
Location: Aberdeen, Washington
Project No.: 0210368-000

Boring Log
B-MJH01

Figure **A**
Sheet **3 of 4**

HA BORING LOG - \\HALEYALDRICH.COM\SHARE\SEA_DATA\GINT\HC_LIBRARY.GLB - 6/12/24 08:30 - \\HALEYALDRICH.COM\SHARE\CORPROJECTS\0210368\GINT\PERMANENT GINT FILE\0210368-000_ABERDEEN SCHOOL DISTRICT-MILLER JR HIGH_GINT.GPJ - kbisbe

Date Started: 04/11/2024	Date Completed: 04/12/2024
Logged by: S. Sirmans	Checked by: M. Hintz
Location: Lat: 46.963770 Long: -123.792751 (WGS 84)	
Ground Surface Elevation: 12.05 feet (NAVD 88)	
Comments:	
Drilling Contractor/Crew: Western States Soil Conservation, Inc. / Ray	
Drilling Method: Mud Rotary	
Rig Model/Type: CME-75 / Truck-mounted drill rig	
Hammer Type: Auto-hammer	
Hammer Weight (pounds): 140	Hammer Drop Height (inches): 30
Measured Hammer Efficiency (%): 90.6	
Hole Diameter: 5 inches	Well Casing Diameter: NA
Total Depth: 121.5 feet	Depth to Groundwater: 7 feet

Elevation (feet)	Depth (feet)	Sample Data: Blow Count	Type	Recovery	Length (inches)	Number / Tests	Graphic Log	Material Description	Water Level	PL WC (%) LL; ✖ Fines Content (%); ▲ SPT N Value (10 20 30 40)	Depth (feet)
120	0	31 32 32	X	6in.	18	S-35		WELL-GRADED GRAVEL WITH SILT (GW-GM), very dense, wet, gray, up to 1-inch diameter gravel.		▲ 64	120
								Bottom of Borehole at 121.5 feet.			
-110	125										125
-115	130										130
-120	135										135
-125	140										140
-130	145										145
-135	150										150
-140	155										155
-145											

General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
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4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
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HALEY ALDRICH

Project: Aberdeen School District - Miller Junior High
Location: Aberdeen, Washington
Project No.: 0210368-000

Boring Log
B-MJH01

Figure **A**
Sheet **4 of 4**

HA BORING LOG - \\HALEYALDRICH.COM\SHARE\SEA_DATA\GINT\HC_LIBRARY.GLB - 6/12/24 08:30 - \\HALEYALDRICH.COM\SHARE\CORPROJECTS\0210368\GINT\PERMANENT GINT FILE\0210368-000_ABERDEEN SCHOOL DISTRICT-MILLER JR HIGH_GINT.GPJ - kbisbe

PRESENTATION OF SITE INVESTIGATION RESULTS

Aberdeen Schools

Prepared for:

Client Name

ConeTec Job No: **24-59-27459**

Project Start Date: 2024-04-10
Project End Date: 2024-04-11
Release Date: 2024-04-22

Report Prepared by:

ConeTec, Inc.

1237 S Director Street, Seattle, WA 98108

Tel: (253) 397-4861

ConeTecWA@conetec.com
www.conetec.com
www.conetecdataservices.com



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ABOUT THIS REPORT

The enclosed report presents the results of the site investigation program conducted by ConeTec, Inc. for Client Name.

Please note that this report, which also includes all accompanying data, are subject to the 3rd Party Disclaimer and Client Disclaimer that follow in the 'Limitations' section of this report. Please refer to the list of attached documents following the text of this report. A site map, test summaries, and test plots are all included in the body of the report.

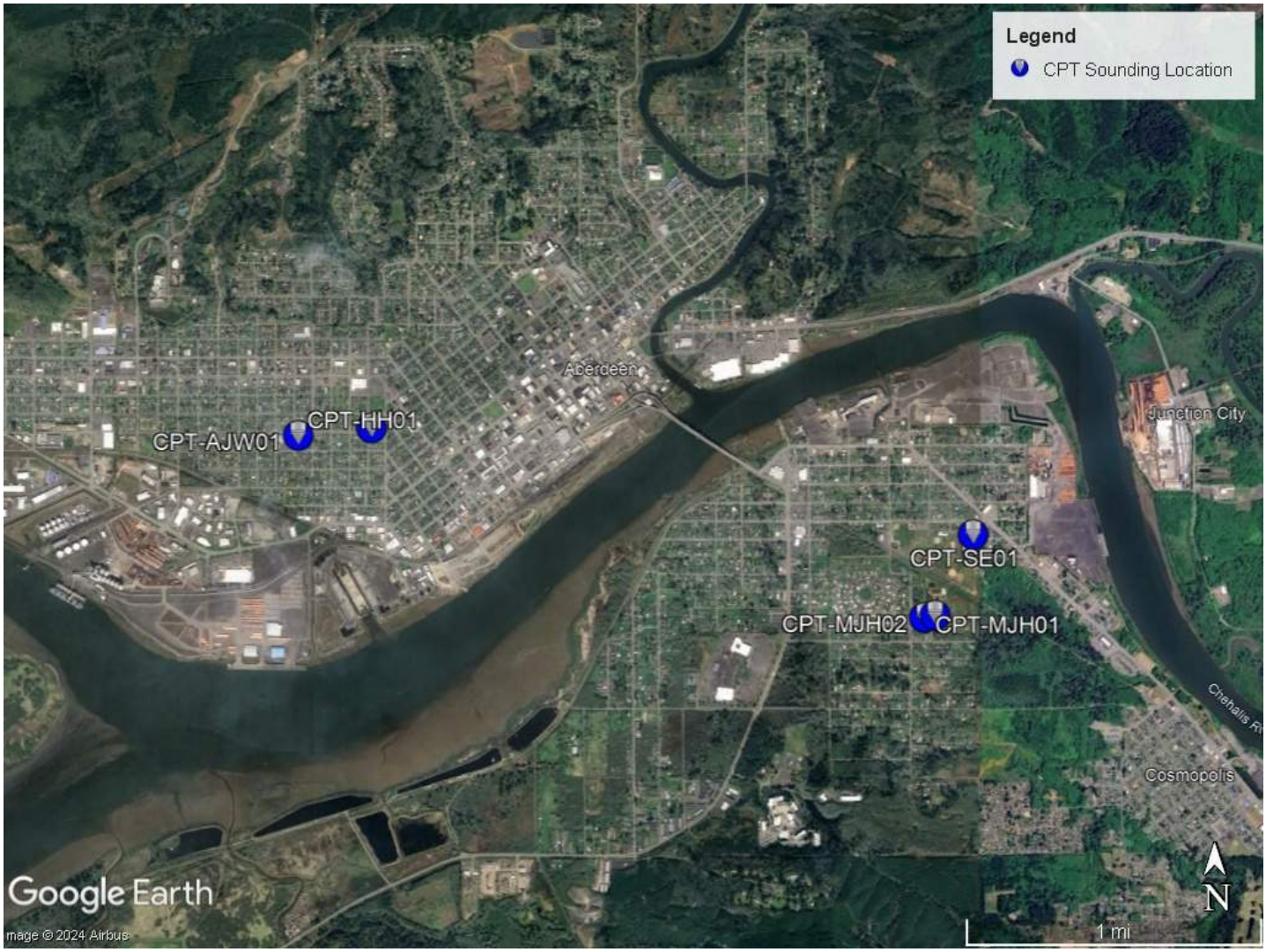
Project	
Client	Client Name
Project	Aberdeen Schools
ConeTec Project Number	24-59-27459
Test Types	SCPTu
Additional Comments	None

Contents

The following listed below are included in the body of this report:

- **Site Map**
- **Limitations and Closure**
- **Project Information**
- **Methodology Statements**
- **Report Appendices**

SITE MAP



All locations are approximate unless otherwise stated in the body of the report.

ConeTec Job Number: 24-59-27459

Client: Client Name

Project: Aberdeen Schools

Date: 2024-04-22

ConeTec

LIMITATIONS

3rd Party Disclaimer

The "Report" refers to this report titled: Aberdeen Schools

The Report was prepared by ConeTec for: Client Name

The Report is confidential and may not be distributed to or relied upon by any third parties without the express written consent of ConeTec. Any third parties gaining access to the Report do not acquire any rights as a result of such access. Any use which a third party makes of the Report, or any reliance on or decisions made based on it, are the responsibility of such third parties. ConeTec accepts no responsibility for loss, damage and/or expense, if any, suffered by any third parties as a result of decisions made, or actions taken or not taken, which are in any way based on, or related to, the Report or any portion(s) thereof.

Client Disclaimer

ConeTec was retained by: Client Name

The "Report" refers to this report titled: Aberdeen Schools

ConeTec was retained to collect and provide the raw data ("Data") which is included in the Report.

ConeTec has collected and reported the Data in accordance with current industry standards. No other warranty, express or implied, with respect to the Data is made by ConeTec. In order to properly understand the Data included in the Report, reference must be made to the documents accompanying and other sources referenced in the Report in their entirety. Other than the Data, the contents of the Report (including any Interpretations) should not be relied upon in any fashion without independent verification and ConeTec is in no way responsible for any loss, damage or expense resulting from the use of, and/or reliance on, such material by any party.

Closure

Thank you for the opportunity to work on this project. The equipment used as well the field procedures followed, all complied with current accepted best practice standards.

Report prepared by: MH, JM

PROJECT INFORMATION

Rig		
Description	**Deployment System**	**Test Type**
C02-020 CPT Truck Rig	Twin mounted cylinders	SCPTu

Coordinates		
Test Type	**Collection Method**	**EPSG Number**
SCPTu	Consumer Grade GPS	4326 (WGS84 / LatLong)

Piezocones Used for this Project						
Cone Description	**Cone Number**	**Cross Sectional Area** (cm^2)	**Sleeve Area** (cm^2)	**Tip Capacity** (bar)	**Sleeve Capacity** (bar)	**Pore Pressure Capacity** (bar)
EC1065:T1500F15U35	1065	15	225	1500	15	35

Cone Penetration Test (CPTu)	
Depth reference	Depths are referenced to the existing ground surface at the time of each test.
Tip and sleeve data offset	0.1 Meters. This has been accounted for in the CPT data files.

Calculated Geotechnical Parameters	
Additional information	The Normalized Soil Behaviour Type Chart based on Q_{tn} (SBT Q_{tn}) (Robertson, 2009) was used to classify the soil for this project. A detailed set of calculated CPTu parameters have been generated and are provided in Excel format files in the release folder. The CPTu parameter calculations are based on values of corrected tip resistance (q_t) sleeve friction (f_s) and pore pressure (u_2). Effective stresses are calculated based on unit weights that have been assigned to the individual soil behaviour type zones and the assumed equilibrium pore pressure profile. Soils were classified as either drained or undrained based on the Q_{tn} Normalized Soil Behaviour Type Chart (Robertson, 2009). Calculations for both drained and undrained parameters were included for materials that classified as silt mixtures (zone 4).

Methodology Statements and Data File Formats

CONETEC

METHODOLOGY STATEMENTS



CONE PENETRATION TEST (CPTu) - eSeries

Cone penetration tests (CPTu) are conducted using an integrated electronic piezocone penetrometer and data acquisition system manufactured by Adara Systems Ltd., a subsidiary of ConeTec.

ConeTec's piezocone penetrometers are compression type designs in which the tip and friction sleeve load cells are independent and have separate load capacities. The piezocones use strain gauged load cells for tip and sleeve friction and a strain gauged diaphragm type transducer for recording pore pressure. The piezocones also have a platinum resistive temperature device (RTD) for monitoring the temperature of the sensors, an accelerometer type dual axis inclinometer and two geophone sensors for recording seismic signals. All signals are amplified and measured with minimum sixteen-bit resolution down hole within the cone body, and the signals are sent to the surface using a high bandwidth, error corrected digital interface through a shielded cable.

ConeTec penetrometers are manufactured with various tip, friction and pore pressure capacities in both 10 cm^2 and 15 cm^2 tip base area configurations in order to maximize signal resolution for various soil conditions. The specific piezocone used for each test is described in the CPT summary table. The 15 cm^2 penetrometers do not require friction reducers as they have a diameter larger than the deployment rods. The 10 cm^2 piezocones use a friction reducer consisting of a rod adapter extension behind the main cone body with an enlarged cross sectional area (typically 44 millimeters diameter over a length of 32 millimeters with tapered leading and trailing edges) located at a distance of 585 millimeters above the cone tip.

The penetrometers are designed with equal end area friction sleeves, a net end area ratio of 0.8 and cone tips with a 60 degree apex angle.

All ConeTec piezocones can record pore pressure at various locations. Unless otherwise noted, the pore pressure filter is located directly behind the cone tip in the "u_2" position (ASTM Type 2). The filter is six millimeters thick, made of porous plastic (polyethylene) having an average pore size of 125 microns (90-160 microns). The function of the filter is to allow rapid movements of extremely small volumes of water needed to activate the pressure transducer while preventing soil ingress or blockage.

The piezocone penetrometers are manufactured with dimensions, tolerances and sensor characteristics that are in general accordance with the current ASTM D5778 standard. ConeTec's calibration criteria also meets or exceeds those of the current ASTM D5778 standard. An illustration of the piezocone penetrometer is presented in Figure CPTu.

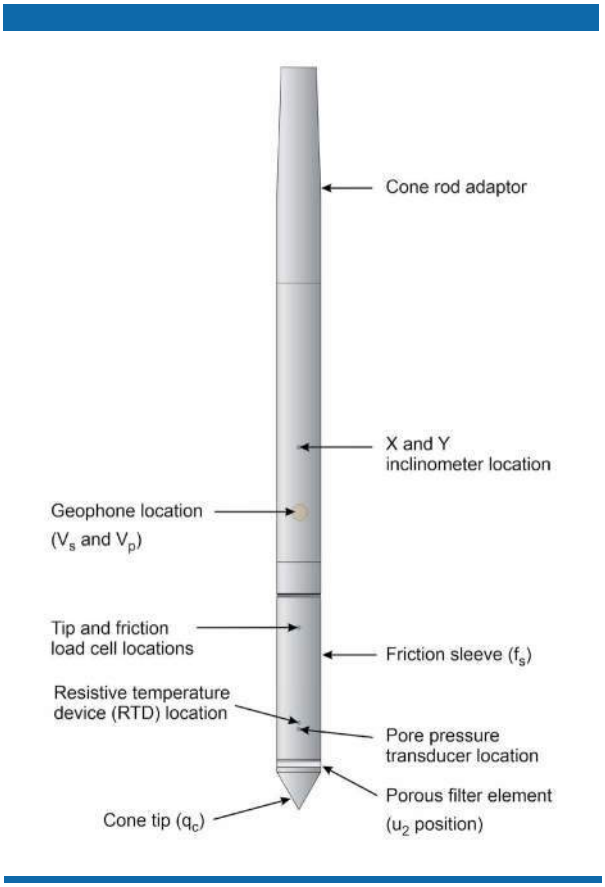


Figure CPTu. Piezocone Penetrometer (15 cm²)

The ConeTec data acquisition system consists of a Windows based computer, signal interface box, and power supply. The signal interface combines depth increment signals, seismic trigger signals and the downhole digital data. This combined data is then sent to the Windows based computer for collection and presentation. The data is recorded at fixed depth increments using a depth encoder that is either portable or integrated into the rig. The typical recording interval is 2.5 centimeters; custom recording intervals are possible.

The system displays the CPTu data in real time and records the following parameters to a storage media during penetration:

- Depth
- Uncorrected tip resistance (q_c)
- Sleeve friction (f_s)
- Dynamic pore pressure (u)
- Additional sensors such as resistivity, passive gamma, ultra violet induced fluorescence, if applicable

All testing is performed in accordance to ConeTec's CPTu operating procedures which are in general accordance with the current ASTM D5778 standard.

Prior to the start of a CPTu sounding a suitable cone is selected, the cone and data acquisition system are powered on, the pore pressure system is saturated with silicone oil and the baseline readings are recorded with the cone hanging freely in a vertical position.

The CPTu is conducted at a steady rate of two centimeters per second, within acceptable tolerances. Typically one meter length rods with an outer diameter of 1.5 inches are added to advance the cone to the sounding termination depth. After cone retraction final baselines are recorded.

Additional information pertaining to ConeTec's cone penetration testing procedures:

- Each filter is saturated in silicone oil under vacuum pressure prior to use
- Baseline readings are compared to previous readings
- Soundings are terminated at the client's target depth or at a depth where an obstruction is encountered, excessive rod flex occurs, excessive inclination occurs, equipment damage is likely to take place, or a dangerous working environment arises
- Differences between initial and final baselines are calculated to ensure zero load offsets have not occurred and to ensure compliance with ASTM standards

The interpretation of piezocone data for this report is based on the corrected tip resistance (q_t), sleeve friction (f_s) and pore water pressure (u). The interpretation of soil type is based on the correlations developed by Robertson, P.K., 2010. The Soil Behavior Type (SBT) classification chart developed by Robertson, P.K., 2010 is presented in Figure SBT. It should be noted that it is not always possible to accurately identify a soil behavior type based on these parameters. In these situations, experience, judgment and an assessment of other parameters may be used to infer soil behavior type.

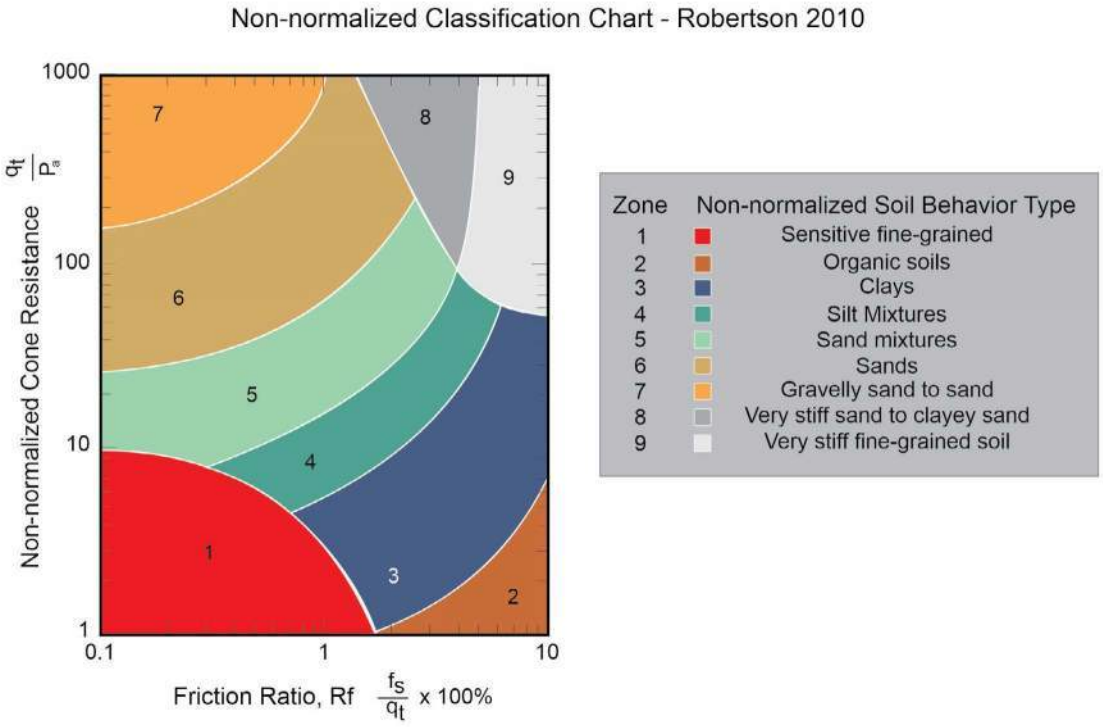


Figure SBT. Non-Normalized Soil Behavior Type Classification Chart (SBT)

The recorded tip resistance (q_c) is the total force acting on the piezocone tip divided by its base area. The tip resistance is corrected for pore pressure effects and termed corrected tip resistance (q_t) according to the following expression presented in Robertson et al. (1986):

$$q_t = q_c + (1-a) \bullet u_2$$

where: q_t is the corrected tip resistance
q_c is the recorded tip resistance
u_2 is the recorded dynamic pore pressure behind the tip (u_2 position)
a is the Net Area Ratio for the piezocone (0.8 for ConeTec probes)

The sleeve friction (f_s) is the frictional force on the sleeve divided by its surface area. As all ConeTec piezocones have equal end area friction sleeves, pore pressure corrections to the sleeve data are not required.

The dynamic pore pressure (u) is a measure of the pore pressures generated during cone penetration. To record equilibrium pore pressure, the penetration must be stopped to allow the dynamic pore pressures to stabilize. The rate at which this occurs is predominantly a function of the permeability of the soil and the diameter of the cone.

The friction ratio (Rf) is a calculated parameter. It is defined as the ratio of sleeve friction to the tip resistance expressed as a percentage. Generally, saturated cohesive soils have low tip resistance, high friction ratios and generate large excess pore water pressures. Cohesionless soils have higher tip resistances, lower friction ratios and do not generate significant excess pore water pressure.

For additional information on CPTu interpretations and calculated geotechnical parameters, refer to Robertson et al. (1986), Lunne et al. (1997), Robertson (2009), Mayne (2013, 2014) and Mayne and Peuchen (2012).

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Lunne, T., Robertson, P.K. and Powell, J. J. M., 1997, “Cone Penetration Testing in Geotechnical Practice”, Blackie Academic and Professional.

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PORE PRESSURE DISSIPATION TEST

The cone penetration test is halted at specific depths to carry out pore pressure dissipation (PPD) tests, shown in Figure PPD-1. For each dissipation test the cone and rods are decoupled from the rig and the data acquisition system measures and records the variation of the pore pressure (u) with time (t).

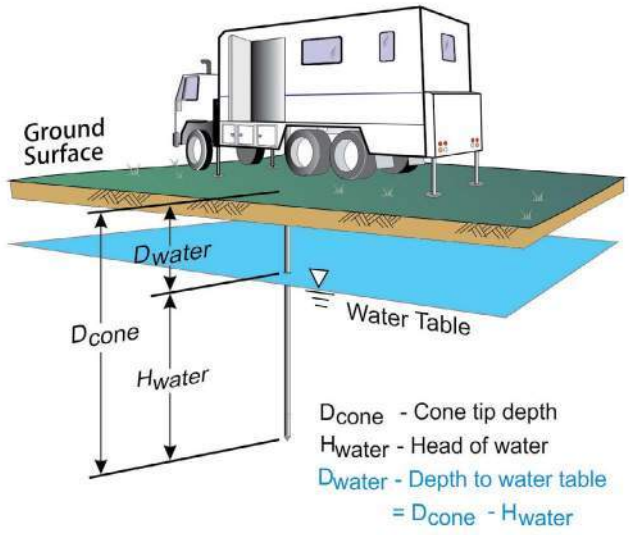


Figure PPD-1. Pore pressure dissipation test setup

Pore pressure dissipation data can be interpreted to provide estimates of ground water conditions, permeability, consolidation characteristics and soil behavior.

The typical shapes of dissipation curves shown in Figure PPD-2 are very useful in assessing soil type, drainage, in situ pore pressure and soil properties. A flat curve that stabilizes quickly is typical of a freely draining sand. Undrained soils such as clays will typically show positive excess pore pressure and have long dissipation times. Dilative soils will often exhibit dynamic pore pressures below equilibrium that then rise over time. Overconsolidated fine-grained soils will often exhibit an initial dilatory response where there is an initial rise in pore pressure before reaching a peak and dissipating.

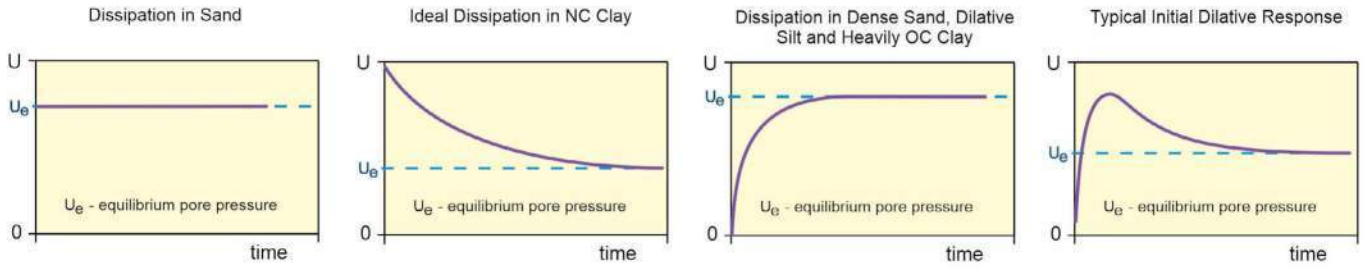
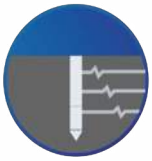


Figure PPD-2. Pore pressure dissipation curve examples

In order to interpret the equilibrium pore pressure (u_{eq}) and the apparent phreatic surface, the pore pressure should be monitored until such time as there is no variation in pore pressure with time as shown for each curve in Figure PPD-2.



SEISMIC CONE PENETRATION TEST (SCPTu) - eSeries

Shear wave velocity (Vs) testing is performed in conjunction with the piezocone penetration test (SCPTu) in order to collect interval velocities. For some projects seismic compression wave velocity (Vp) testing is also performed.

ConeTec's piezocone penetrometers are manufactured with one horizontally active geophone (28 hertz) and one vertically active geophone (28 hertz). Both geophones are rigidly mounted in the body of the cone penetrometer, 0.2 meters behind the cone tip. The vertically mounted geophone is more sensitive to compression waves.

Shear waves are typically generated by using an impact hammer horizontally striking a beam that is held in place by a normal load. In some instances, an auger source or an imbedded impulsive source may be used for both shear waves and compression waves. The hammer and beam act as a contact trigger that initiates the recording of the seismic wave traces. For impulsive devices an accelerometer trigger may be used. The traces are recorded in the memory of the cone using a fast analog to digital converter. The seismic trace is then transmitted digitally uphole to a Windows based computer through a signal interface box for recording and analysis. An illustration of the shear wave testing configuration is presented in Figure SCPTu-1.

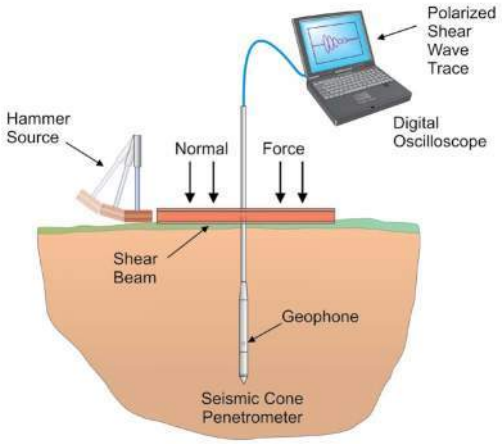


Figure SCPTu-1. Illustration of the SCPTu system

All testing is performed in accordance to ConeTec's SCPTu operating procedures which are in general accordance with the current ASTM D5778 and ASTM D7400 standards.

Prior to the start of a SCPTu sounding, the procedures described in the Cone Penetration Test section are followed. In addition, the active axis of the geophone is aligned parallel to the beam (or source) and the horizontal offset between the cone and the source is measured and recorded.

Prior to recording seismic waves at each test depth, cone penetration is stopped and the rods are decoupled from the rig to avoid transmission of rig energy down the rods. Typically, five wave traces for each orientation are recorded for quality control and uncertainty analysis purposes. After reviewing wave traces for consistency the cone is pushed to the next test depth (typically one meter intervals or as requested by the client). Figure SCPTu-2 presents an illustration of a SCPTu test.

For additional information on seismic cone penetration testing refer to Robertson et al. (1986).

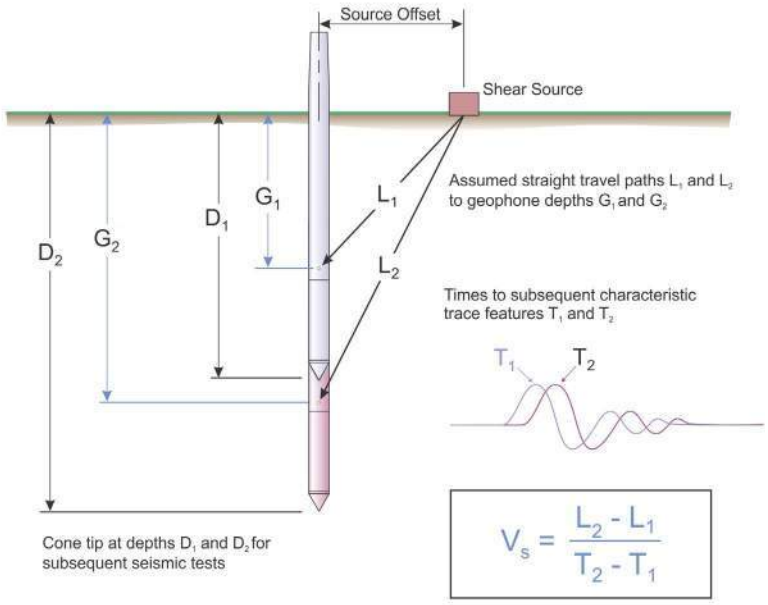


Figure SCPTu-2. Illustration of a seismic cone penetration test

For the determination of interval travel times the wave traces from all depths are displayed in analysis software. The results of the interval picks are supplied in the relevant appendix of this report. Standard practice for ConeTec is to record five wave traces for each source direction at each test depth. Outlier impacts are identified in the field and the impacts are repeated. For the final wave trace profile, the traces are stacked in the time domain to display a single average trace.

Calculation of the interval velocities are performed by visually picking a common feature (e.g. the first characteristic peak, trough, or crossover) on all of the recorded wave sets and taking the difference in ray path divided by the time difference between subsequent features. Ray path is defined as the straight line distance from the seismic source to the geophone, accounting for beam offset, source depth and geophone offset from the cone tip.

In some cases, usually for shear wave velocity testing, more than one characteristic marker may be used. If there is an overlap between different sets of characteristic markers, then the average time value for those sets of interval times is applied to the determination of velocity.

Ideally, all depths are used for the determination of the velocity profile. However, an interval may be skipped if there is some ambiguity or quality concern with a particular depth, resulting in a larger interval.

Tabular velocity results and SCPTu plots are presented in the relevant appendix.

For all SCPTu soundings that have achieved a depth of at least 100 feet (30 meters), the average shear wave velocity to a depth of 100 feet ($\overline{v}_S$) has been calculated and provided for all applicable soundings using the following equation presented in ASCE (2010).

$$\bar{v}_s = \frac{\sum_{i=1} d_i}{\sum_{i=1}^{n} \frac{d_i}{v_{si}}}$$

where: $\bar{v}_s$ = average shear wave velocity ft/s (m/s)
d_i = the thickness of any layer between 0 and 100 ft (30 m)
v_{si} = the shear wave velocity in ft/s (m/s)
$\sum_{i=1}^{n} d_i$ = the total thickness of all layers between 0 and 100 ft (30 m)

Average shear wave velocity, $\bar{v}_s$ is also referenced to V_{s100} or V_{s30}.

The layer travel times refers to the travel times propagating in the vertical direction, not the measured travel times from an offset source.

REFERENCES

American Society of Civil Engineers (ASCE), 2010, "Minimum Design Loads for Buildings and Other Structures", Standard ASCE/ SEI 7-10, American Society of Civil Engineers, ISBN 978-0-7844-1085-1, Reston, Virginia. DOI: 10.1061/9780784412916.

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CONE PENETRATION DIGITAL FILE FORMATS - eSeries

CPT Data Files (COR Extension)

ConeTec CPT data files are stored in ASCII text files that are readable by almost any text editor. ConeTec file names start with the job number (which includes the two digit year number) an underscore as a separating character, followed by two letters based on the type of test and the sounding ID. The last character position is reserved for an identifier letter (such as b, c, d etc) used to uniquely distinguish multiple soundings at the same location. The CPT sounding file has the extension COR. As an example, for job number 21-02-00001 the first CPT sounding will have file name 21-02-00001_CP01.COR

The sounding (COR) file consists of the following components:

1. Two lines of header information
2. Data records
3. End of data marker
4. Units information

Header Lines

Line 1: Columns 1-6 may be blank or may indicate the version number of the recording software
Columns 7-21 contain the sounding Date and Time (Date is MM:DD:YY)
Columns 23-38 contain the sounding Operator
Columns 51-100 contain extended Job Location information

Line 2: Columns 1-16 contain the Job Location
Columns 17-32 contain the Cone ID
Columns 33-47 contain the sounding number
Columns 51-100 may contain extended sounding ID information

Data Records

The data records contain 4 or more columns of data in floating point format. A comma and spaces separate each data item:

Column 1: Sounding Depth (meters)
Column 2: Tip (q_c), recorded in units selected by the operator
Column 3: Sleeve (f_s), recorded in units selected by the operator
Column 4: Dynamic pore pressure (u), recorded in units selected by the operator
Column 5: Empty or may contain other requested data such as Gamma, Resistivity or UVIF data

End of Data Marker

After the last line of data there is a line containing an ASCII 26 (CTL-Z) character (small rectangular shaped character) followed by a newline (carriage return / line feed). This is used to mark the end of data.

Units Information

The last section of the file contains information about the units that were selected for the sounding. A separator bar makes up the first line. The second line contains the type of units used for depth, q_c, f_s and u. The third line contains the conversion values required for ConeTec's software to convert the recorded data to an internal set of base units (bar for q_c, bar for f_s and meters for u). Additional lines intended for internal ConeTec use may appear following the conversion values.

CPT Data Files (XLS Extension)

Excel format files of ConeTec CPT data are also generated from corresponding COR files. The XLS files have the same base file name as the COR file with a -BSC suffix. The information in the file is presented in table format and contains additional information about the sounding such as coordinate information, and tip net area ratio.

The BSCI suffix is given to XLS files which are enhanced versions of the BSC files and include the same data records in addition to inclination data collected for each sounding.

CPT Dissipation Files (XLS Extension)

Pore pressure dissipation files are provided in Excel format and contain each dissipation trace that exceeds a minimum duration (selected during post-processing) formatted column wise within the spreadsheet. The first column (Column A) contains the time in seconds and the second column (Column B) contains the time in minutes. Subsequent columns contain the dissipation trace data. The columns extend to the longest trace of the data set.

Detailed header information is provided at the top of the worksheet. The test depth in meters and feet, the number of points in the trace and the particular units are all presented at the top of each trace column.

CPT Dissipation files have the same naming convention as the CPT sounding files with a "–PPD" suffix.

Data Records

Each file will contain dissipation traces that exceed a minimum duration (selected during post-processing) in a particular column. The dissipation pore pressure values are typically recorded at varying time intervals throughout the trace; rapidly to start and increasing as the duration of the test lengthens. The test depth in meters and feet, the number of points in the trace and the trace number are identified at the top of each trace column.

Cone Type Designations

Cone ID	Cone Description	Tip Cross Sect. Area (cm^2)	Tip Capacity (bar)	Sleeve Area (cm^2)**	Sleeve Capacity (bar)	Pore Pressure Capacity (bar)
EC###	A15T1500F15U35	15	1500	225	15	35
EC###	A15T375F10U35	15	375	225	10	35
EC###	A10T1000F10U35	10	1000	150	10	35

refers to the Cone ID number
**Outer Cylindrical Area

REPORT APPENDICES

The appendices listed below are included in the report:

- **Cone Penetration Test (CPTu) Summary and Standard CPTu Plots**
- **Standard CPTu Plots with Reduced Scales**
- **Normalized Cone Penetration Test Plots**
- **Advanced Cone Penetration Test Plots**
- **Soil Behavior Type (SBT) Scatter Plots**
- **Pore Pressure Dissipation Test (PPDT) Summary and PPDT Plots**
- **Seismic Cone Penetration Test (SCPTu) Tabular Results**
- **SCPTu Plots**
- **SCPTu Velocity Wave Traces**
- **Supplementary Documents and Materials**

Cone Penetration Test (CPTu) Summary and Standard CPTu Plots

CONETEC

Job No: 24-59-27459
Client: Haley & Aldrich, Inc.
Project: Aberdeen Schools
Start Date: 2024-04-10
End Date: 2024-04-11

CONE PENETRATION TEST SUMMARY

Sounding ID	File Name	Date	Cone	Cone Area (cm^2)	Assumed Phreatic Surface[1] (ft)	Final Depth (ft)	Seismic Intervals	Latitude[2]	Longitude[2]	Refer to Notation Number
CPT-AJW01	24-59-27459_SP-AJW01	2024-04-10	1065:T1500F15U35	15	3.2	121.39	36	46.97223	-123.83739	
CPT-HH01	24-59-27459_SP-HH01	2024-04-10	1065:T1500F15U35	15	2.4	109.17	32	46.97258	-123.83214	
CPT-MJH01	24-59-27459_SP-MJH01	2024-04-11	1065:T1500F15U35	15	7.1	111.55	33	46.96327	-123.79191	
CPT-MJH02	24-59-27459_SP-MJH02	2024-04-11	1065:T1500F15U35	15		4.92		46.96315	-123.79268	3
CPT-SE01	24-59-27459_SP-SE01	2024-04-11	1065:T1500F15U35	15	5.8	89.32	27	46.96719	-123.78915	
Totals	5 Soundings					436.35 ft	128			

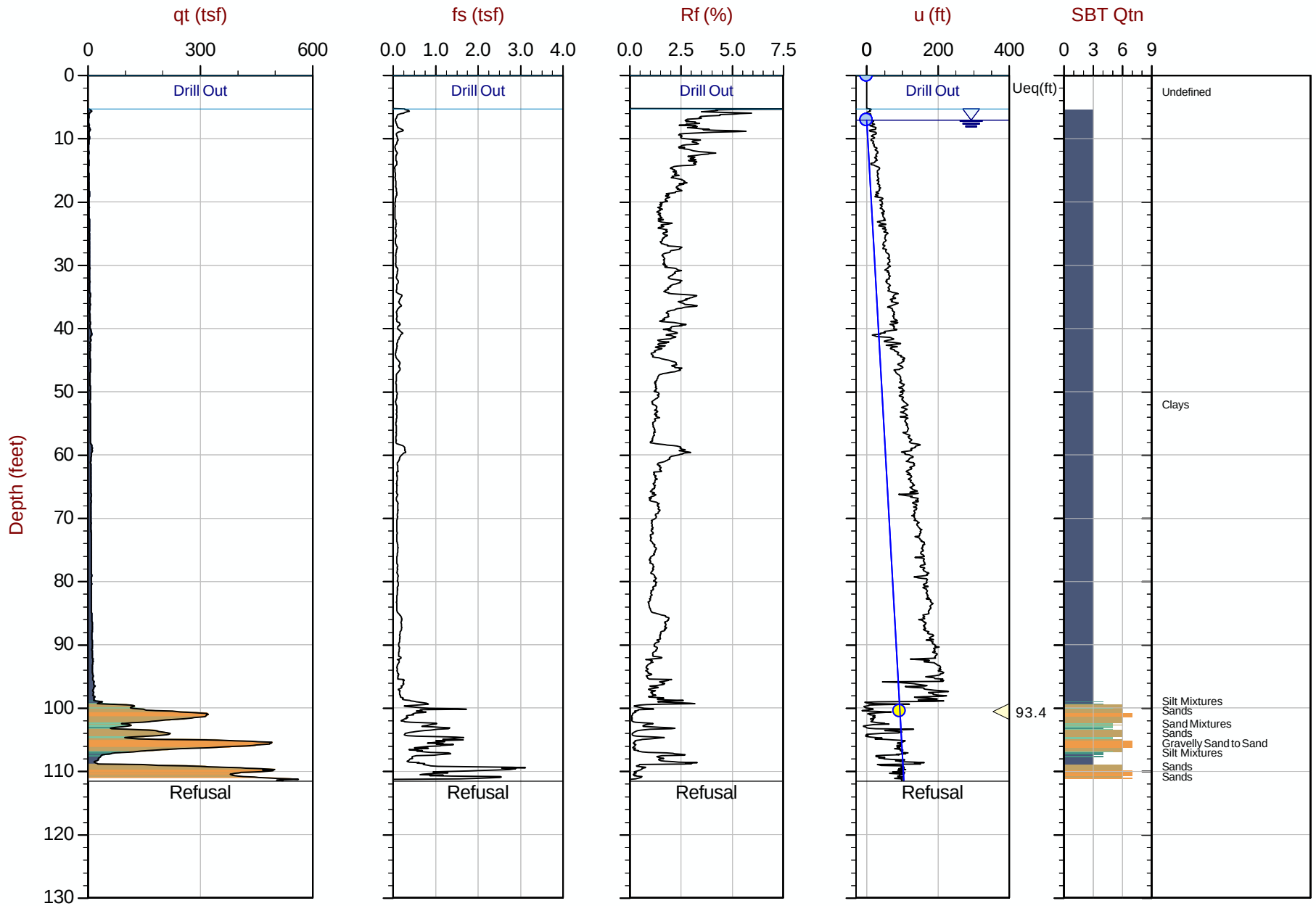
1. The assumed phreatic surface was based off the shallowest pore pressure dissipation tests performed within or nearest the sounding. Hydrostatic conditions were assumed for the calculated parameters.
2. The coordinates were collected using consumer grade GPS. EPSG number: 4326 (WGS84 / LatLong).
3. The phreatic surface is assumed to be deeper than the extent of the CPT final test depth.

CONETEC

Haley & Aldrich

Job No: 24-59-27459
Date: 2024-04-11 10:31
Site: Aberdeen Schools

Sounding: CPT-MJH01
Cone: 1065:T1500F15U35



Max Depth: 34.000 m / 111.55 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 24-59-27459_SP-MJH01.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 46.96327 Long: -123.79190

Overplot Item: Ueq, Assumed Ueq, Dissipation, Ueq achieved, Dissipation, Ueq not achieved, Dissipation, Ueq assumed, Hydrostatic Line

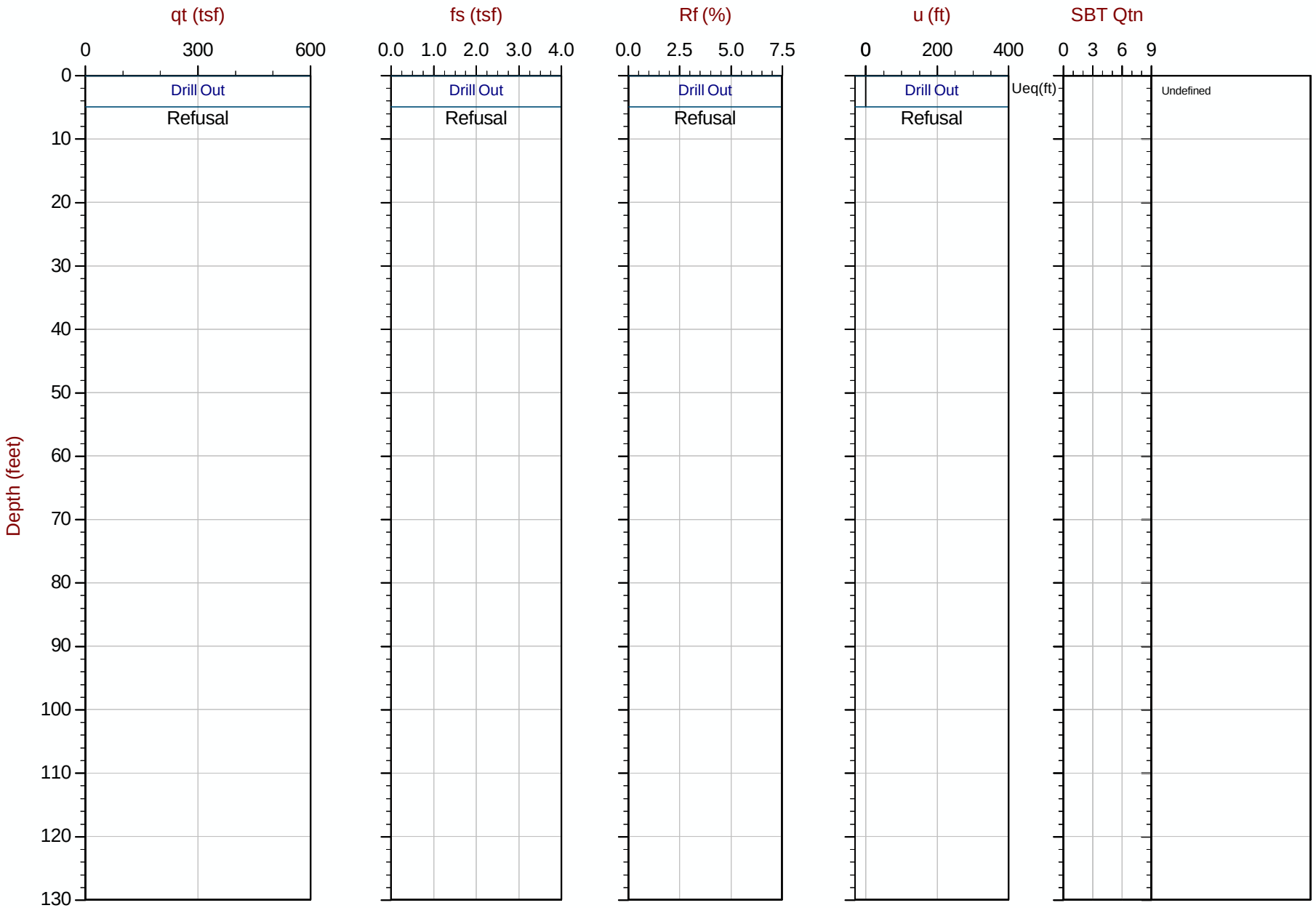
The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Haley & Aldrich

Job No: 24-59-27459
Date: 2024-04-11 08:40
Site: Aberdeen Schools

Sounding: CPT-MJH02
Cone: 1065:T1500F15U35



Max Depth: 1.500 m / 4.92 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

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Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 46.96315 Long: -123.79268

Overplot Item: Ueq, Assumed Ueq, Dissipation, Ueq achieved, Dissipation, Ueq not achieved, Dissipation, Ueq assumed, Hydrostatic Line

The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Standard CPTu Plots with Reduced Scales

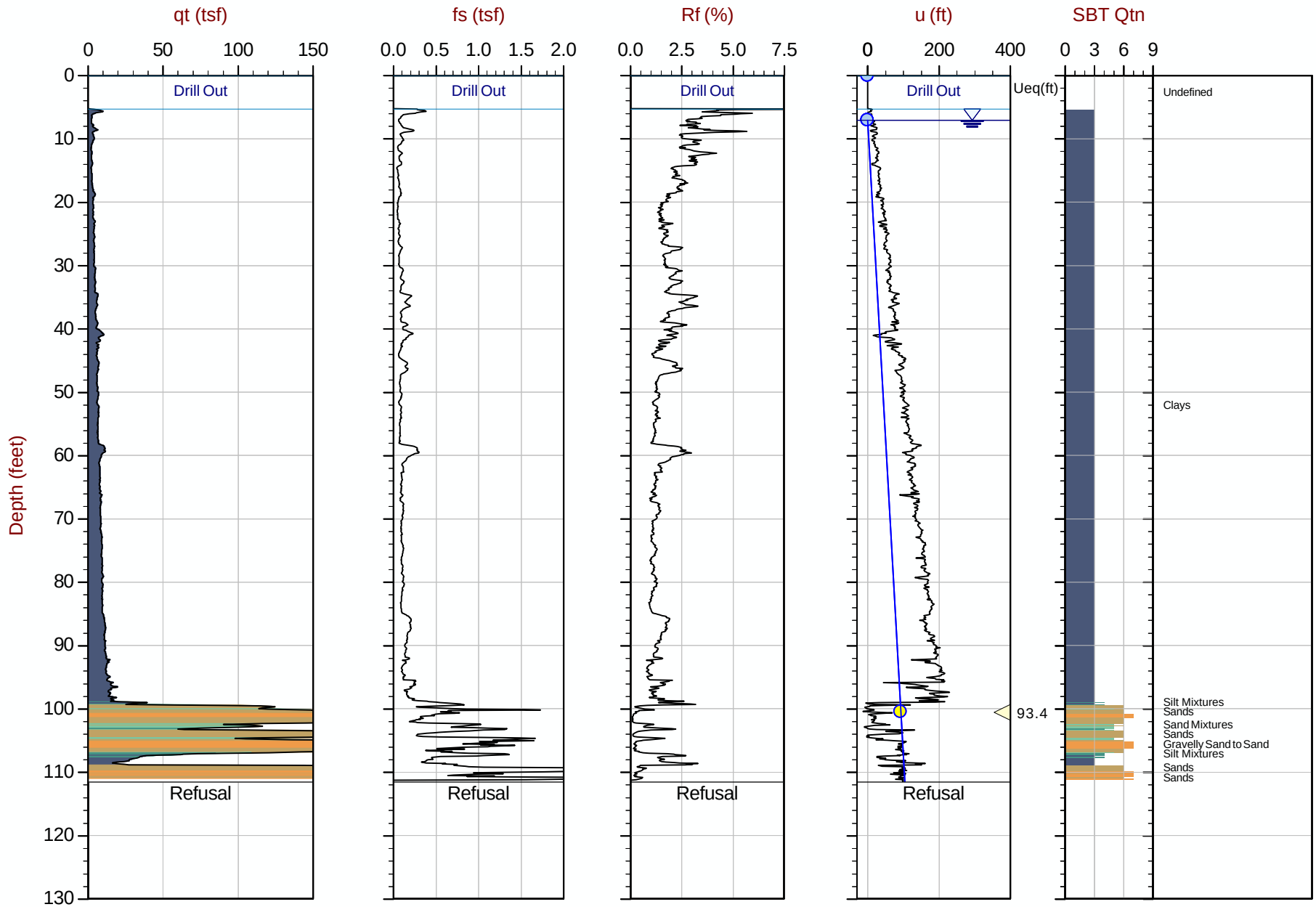
CONETEC

CONETEC

Haley & Aldrich

Job No: 24-59-27459
Date: 2024-04-11 10:31
Site: Aberdeen Schools

Sounding: CPT-MJH01
Cone: 1065:T1500F15U35



Max Depth: 34.000 m / 111.55 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 24-59-27459_SP-MJH01.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 46.96327 Long: -123.79190

Overplot Item: Ueq, Assumed Ueq, Dissipation, Ueq achieved, Dissipation, Ueq not achieved, Dissipation, Ueq assumed, Hydrostatic Line

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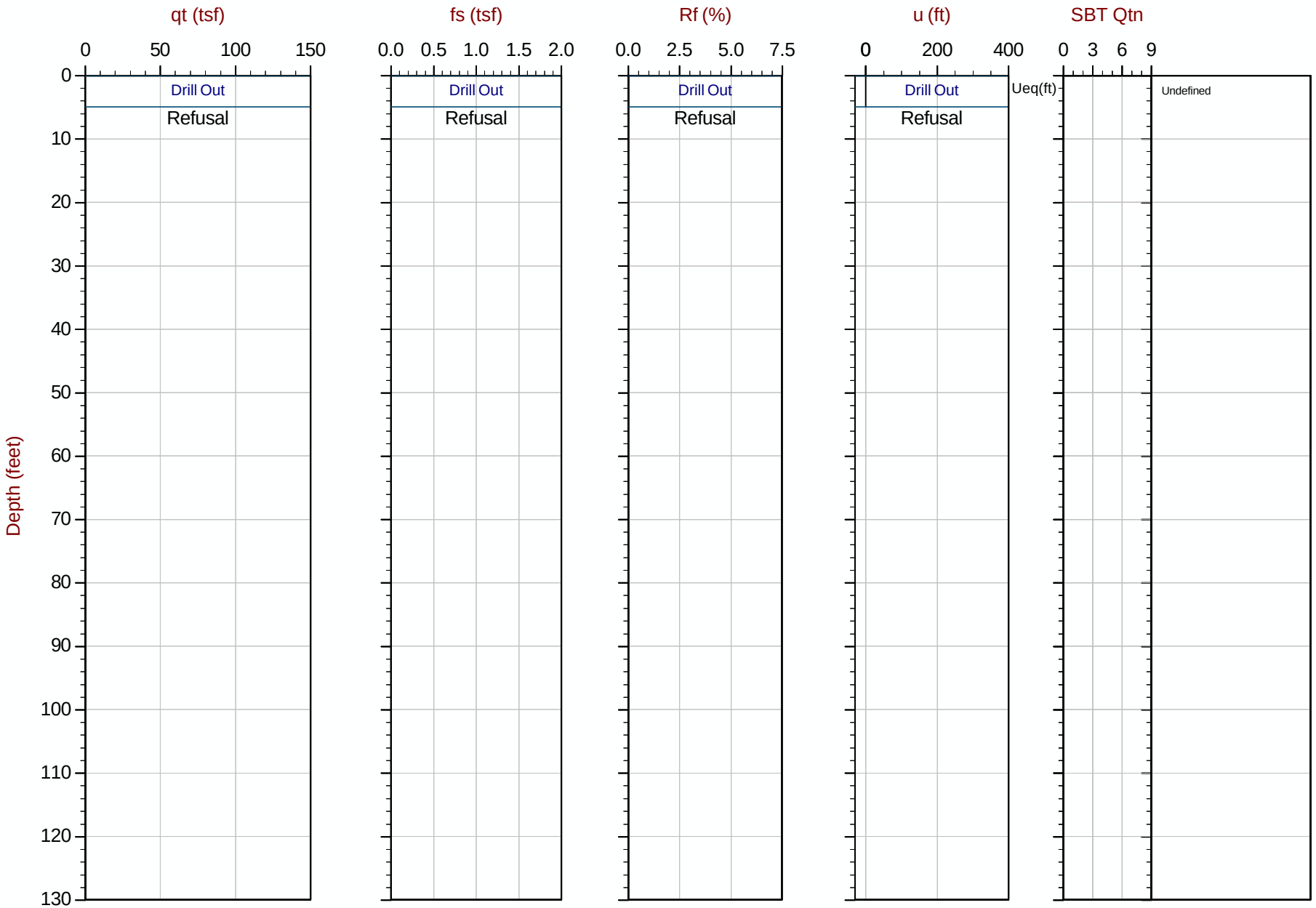
CONETEC

Haley & Aldrich

Job No: 24-59-27459
Date: 2024-04-11 08:40
Site: Aberdeen Schools

Sounding: CPT-MJH02
Cone: 1065:T1500F15U35



Max Depth: 1.500 m / 4.92 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 24-59-27459_SP-MJH02.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 46.96315 Long: -123.79268

Overplot Item: Ueq, Assumed Ueq, Dissipation, Ueq achieved, Dissipation, Ueq not achieved, Dissipation, Ueq assumed, Hydrostatic Line

The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Normalized Cone Penetration Test Plots

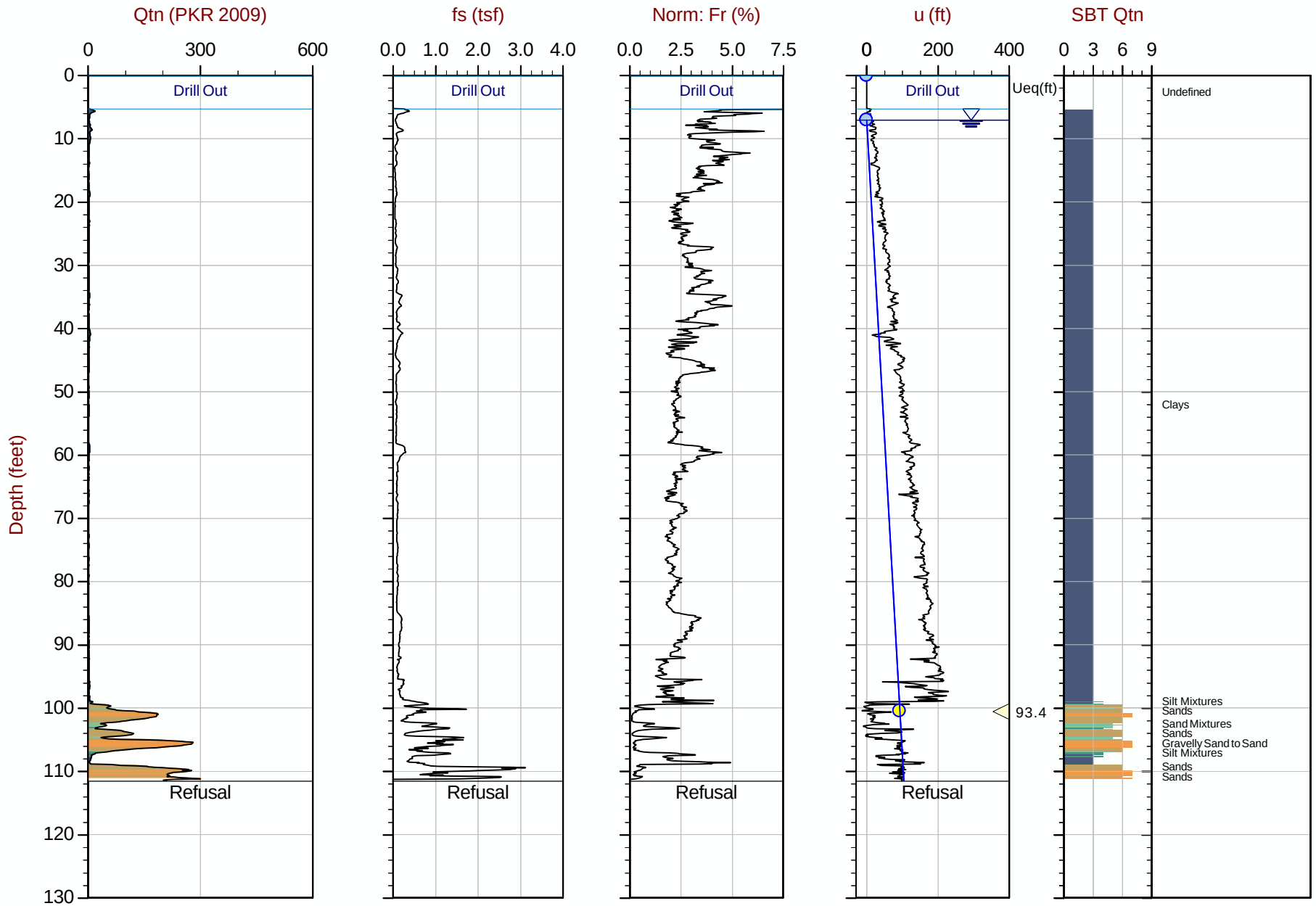
CONETEC

CONETEC

Haley & Aldrich

Job No: 24-59-27459
Date: 2024-04-11 10:31
Site: Aberdeen Schools

Sounding: CPT-MJH01
Cone: 1065:T1500F15U35



Max Depth: 34.000 m / 111.55 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 24-59-27459_SP-MJH01.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
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Overplot Item: Ueq, Assumed Ueq, Dissipation, Ueq achieved, Dissipation, Ueq not achieved, Dissipation, Ueq assumed, Hydrostatic Line

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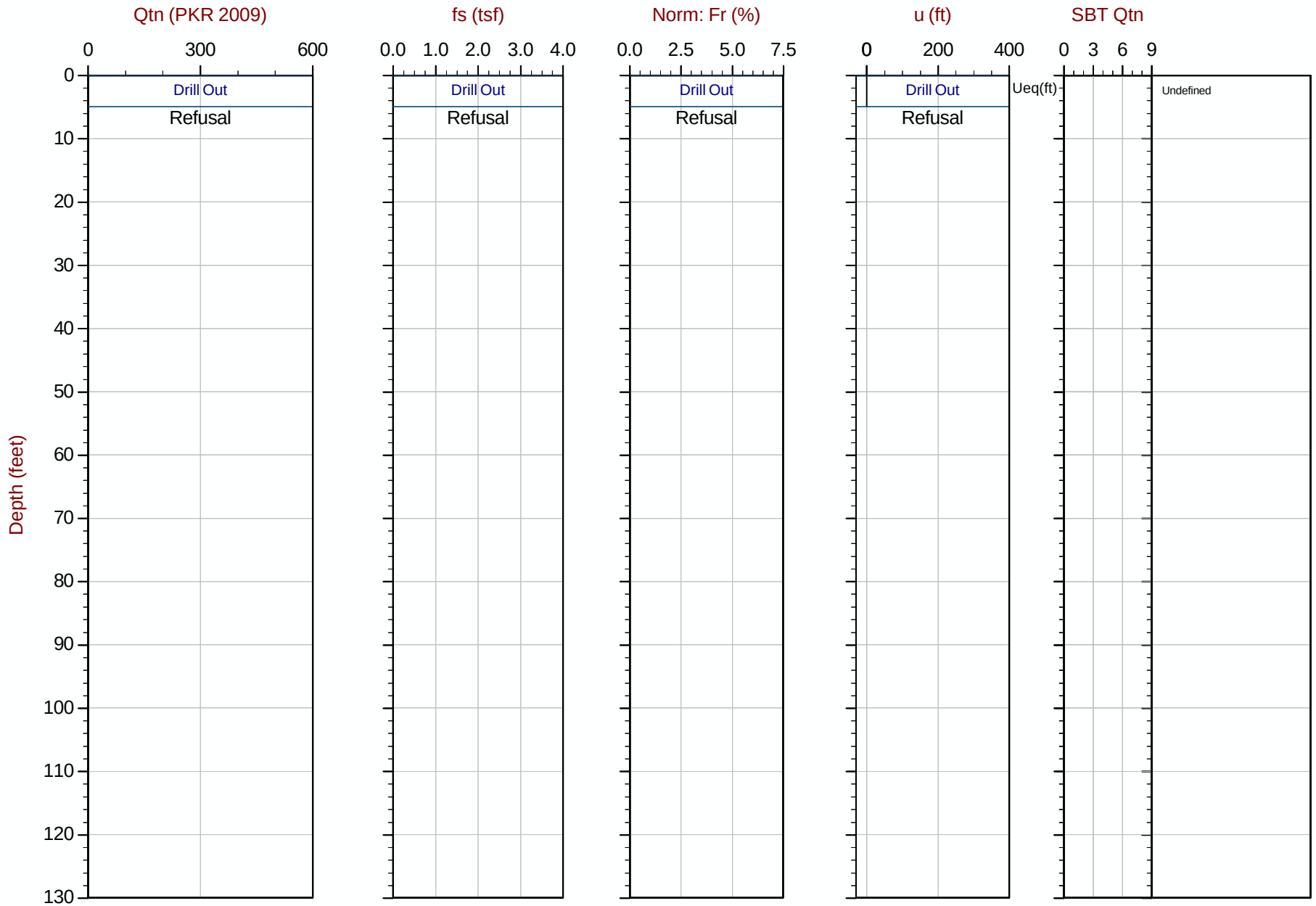
Job No: 24-59-27459
Date: 2024-04-11 08:40
Site: Aberdeen Schools

Sounding: CPT-MJH02
Cone: 1065:T1500F15U35



Max Depth: 1.500 m / 4.92 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 24-59-27459_SP-MJH02.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 46.96315 Long: -123.79268

Overplot Item: Ueq, Assumed Ueq, Dissipation, Ueq achieved, Dissipation, Ueq not achieved, Dissipation, Ueq assumed, Hydrostatic Line

The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Advanced Cone Penetration Test Plots with Ic, Su(Nkt), Phi, and N1(60)Ic

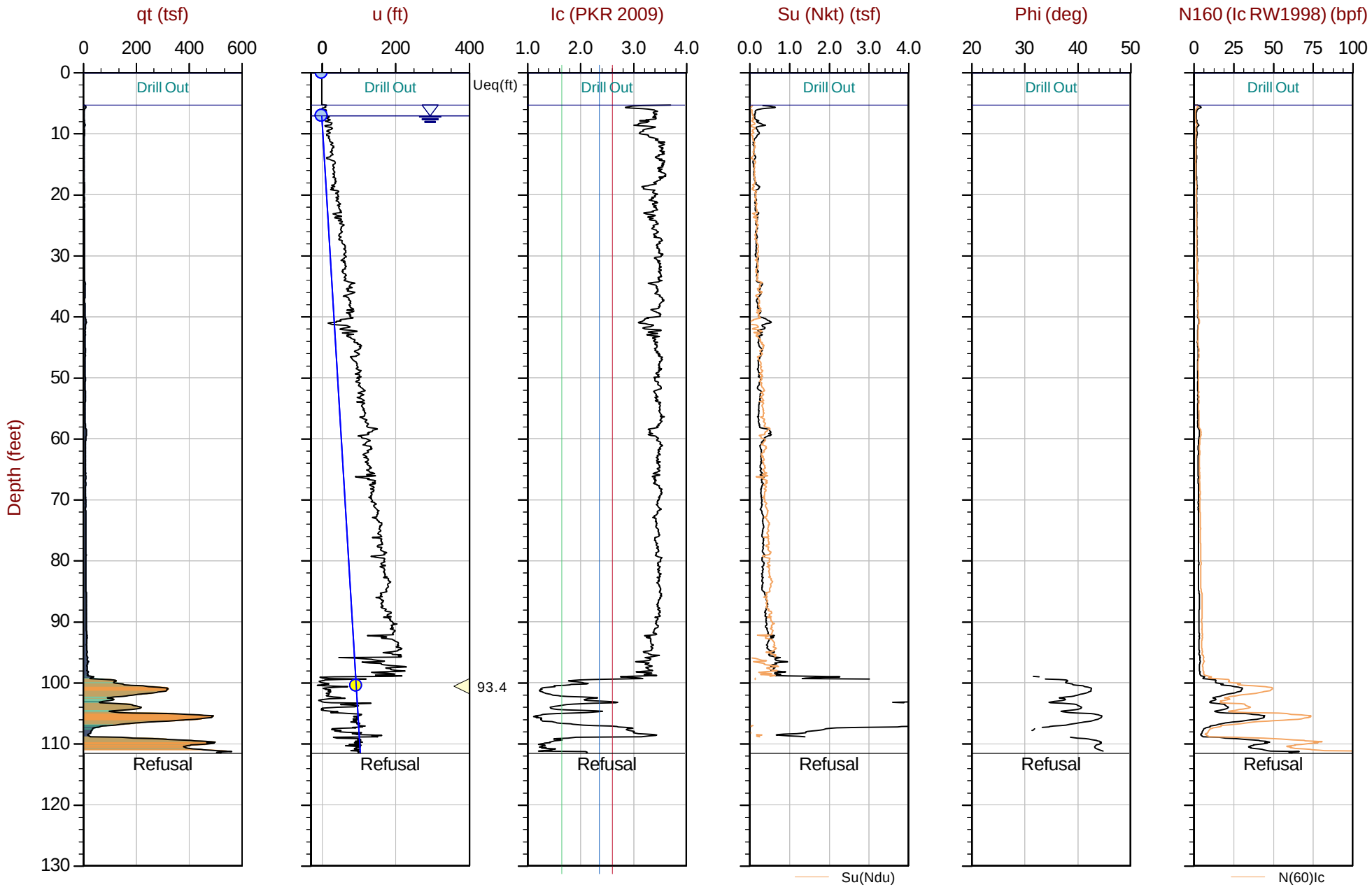
CONETEC

CONETEC

Haley & Aldrich

Job No: 24-59-27459
Date: 2024-04-11 10:31
Site: Aberdeen Schools

Sounding: CPT-MJH01
Cone: 1065:T1500F15U35



Max Depth: 34.000 m / 111.55 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 24-59-27459_SP-MJH01.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 46.96327 Long: -123.79190

Overplot Item: Ueq, Assumed Ueq, Dissipation, Ueq achieved, Dissipation, Ueq not achieved, Dissipation, Ueq assumed, Hydrostatic Line

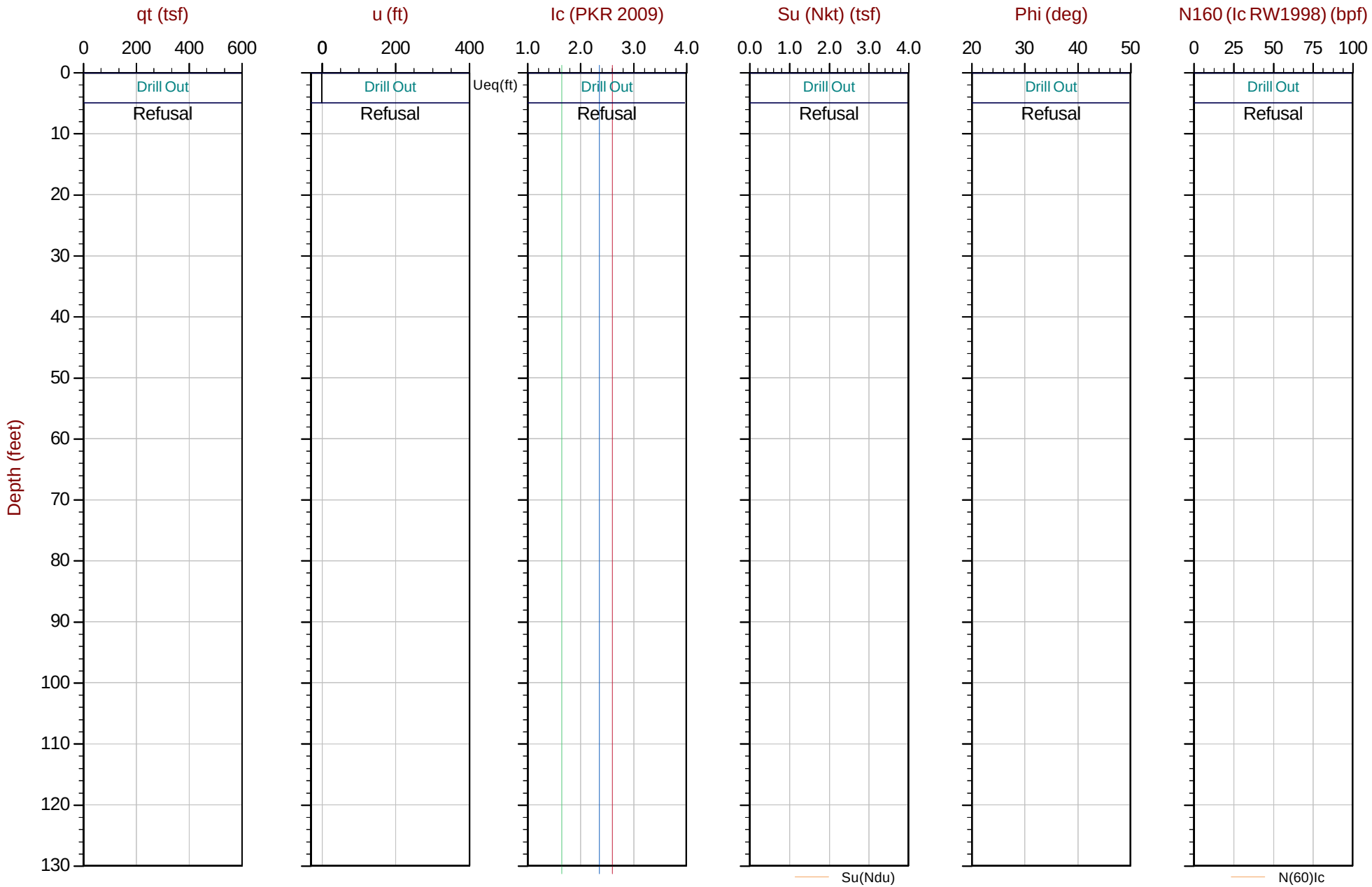
The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Haley & Aldrich

Job No: 24-59-27459
Date: 2024-04-11 08:40
Site: Aberdeen Schools

Sounding: CPT-MJH02
Cone: 1065:T1500F15U35



Max Depth: 1.500 m / 4.92 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 24-59-27459_SP-MJH02.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 46.96315 Long: -123.79268

Overplot Item: Ueq, Assumed Ueq, Dissipation, Ueq achieved, Dissipation, Ueq not achieved, Dissipation, Ueq assumed, Hydrostatic Line

The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Soil Behavior Type (SBT) Scatter Plots

CONETEC

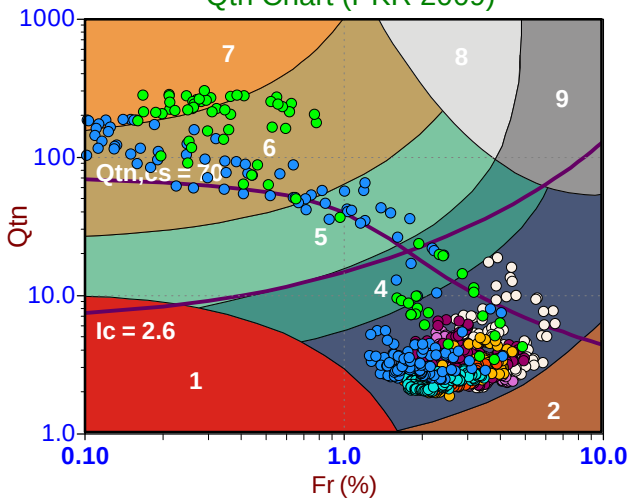
CONETEC

Haley & Aldrich

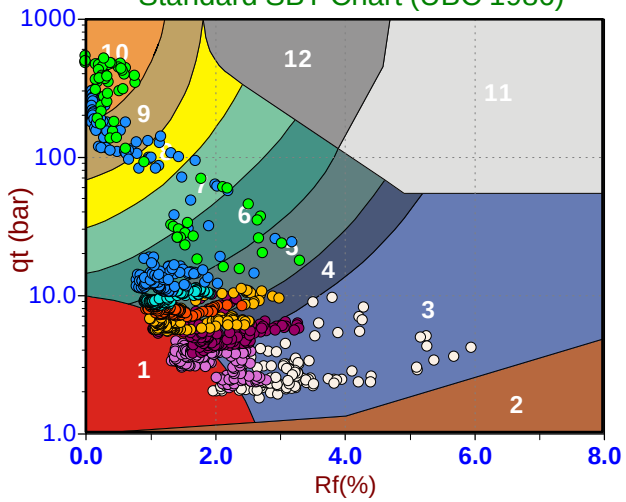
Job No: 24-59-27459
Date: 2024-04-11 10:31
Site: Aberdeen Schools

Sounding: CPT-MJH01
Cone: 1065:T1500F15U35

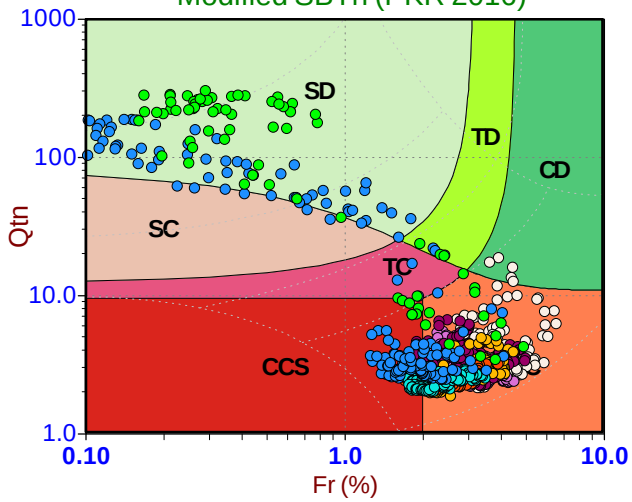
Qtn Chart (PKR 2009)



Standard SBT Chart (UBC 1986)



Modified SBTn (PKR 2016)



Depth Ranges

- >0.0 to 15.0 ft
- >15.0 to 30.0 ft
- >30.0 to 45.0 ft
- >45.0 to 60.0 ft
- >60.0 to 75.0 ft
- >75.0 to 90.0 ft
- >90.0 to 105.0 ft
- >105.0 to 120.0 ft
- >120.0 to 135.0 ft
- >135.0 to 150.0 ft
- >150.0 ft

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

Legend

- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

Pore Pressure Dissipation Test (PPDT) Summary and PPDT Plots

CONETEC

Job No:	24-59-27459
Client:	Haley & Aldrich, Inc.
Project:	Aberdeen Schools
Start Date:	2024-04-10
End Date:	2024-04-11

CPTu PORE PRESSURE DISSIPATION SUMMARY

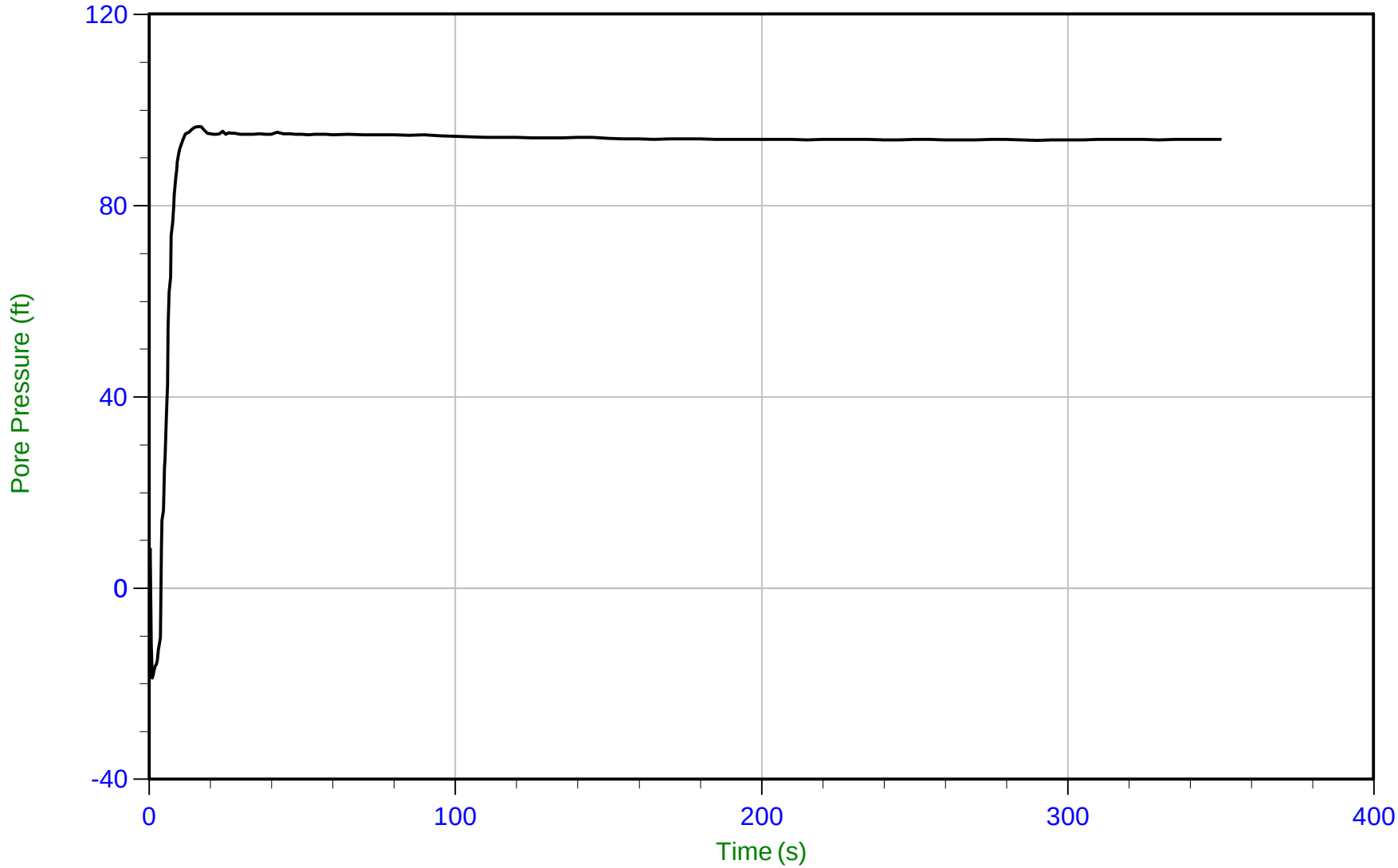
Sounding ID	File Name	Cone Area (cm^2)	Duration (s)	Test Depth (ft)	Estimated Equilibrium Pore Pressure U_{eq} (ft)	Calculated Phreatic Surface (ft)	Refer to Notation Number
CPT-AJW01	24-59-27459_SP-AJW01	15	400	29.12	25.9	3.2	
CPT-HH01	24-59-27459_SP-HH01	15	400	26.57	24.2	2.4	
CPT-MJH01	24-59-27459_SP-MJH01	15	350	100.56	93.5	7.1	
CPT-SE01	24-59-27459_SP-SE01	15	330	33.63	27.8	5.8	
Totals			25 min				

CONETEC

Haley & Aldrich

Job No: 24-59-27459
Date: 2024-04-11 10:31
Site: Aberdeen Schools

Sounding: CPT-MJH01
Cone: 1065:T1500F15U35 Area=15 cm²



Trace Summary:

Filename: 24-59-27459_SP-MJH01.PPR4
Depth: 30.650 m / 100.557 ft
Duration: 350.0 s

u Min: -18.9 ft
u Max: 96.5 ft
u Final: 93.8 ft

WT: 2.159 m / 7.083 ft
Ueq: 93.5 ft

Seismic Cone Penetration Test (SCPTu) Tabular Results

CONETEC

Job No:	24-59-27459
Client:	Haley & Aldrich, Inc.
Project:	Aberdeen Schools
Sounding ID:	CPT-MJH01
Date:	2024-04-11
Seismic Source:	Beam
Seismic Offset (ft):	8.79
Source Depth (ft):	0.00
Geophone Offset (ft):	0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
7.22	6.56	10.97			
10.50	9.84	13.20	2.23	15.70	142
13.88	13.22	15.88	2.68	16.98	158
17.06	16.40	18.61	2.73	20.23	135
20.34	19.69	21.56	2.95	14.47	204
23.62	22.97	24.59	3.03	13.04	233
26.90	26.25	27.68	3.09	12.33	250
30.18	29.53	30.81	3.13	14.74	212
33.46	32.81	33.97	3.16	12.94	244
36.75	36.09	37.15	3.18	12.89	247
39.96	39.30	40.28	3.13	13.77	227
43.31	42.65	43.55	3.27	10.69	306
46.52	45.87	46.70	3.15	10.19	310
49.87	49.21	49.99	3.29	10.65	309
53.15	52.49	53.22	3.23	9.46	342
56.43	55.77	56.46	3.24	9.43	343
59.71	59.06	59.71	3.24	9.04	359
62.99	62.34	62.95	3.25	10.21	318
66.21	65.55	66.14	3.19	8.08	394
69.55	68.90	69.46	3.32	8.36	397
72.83	72.18	72.71	3.26	7.51	433
76.12	75.46	75.97	3.26	8.54	382
79.33	78.68	79.17	3.20	7.64	418
82.68	82.02	82.49	3.33	8.10	410
85.96	85.30	85.75	3.26	7.53	434
89.24	88.58	89.02	3.26	8.59	380
92.52	91.86	92.28	3.27	7.34	445
95.80	95.14	95.55	3.27	6.66	490
99.08	98.43	98.82	3.27	5.12	639
102.36	101.71	102.09	3.27	4.93	664
105.71	105.05	105.42	3.33	4.10	814
108.92	108.27	108.62	3.21	3.74	857
111.55	110.89	111.24	2.62	2.98	878

SCPTu Test Plots

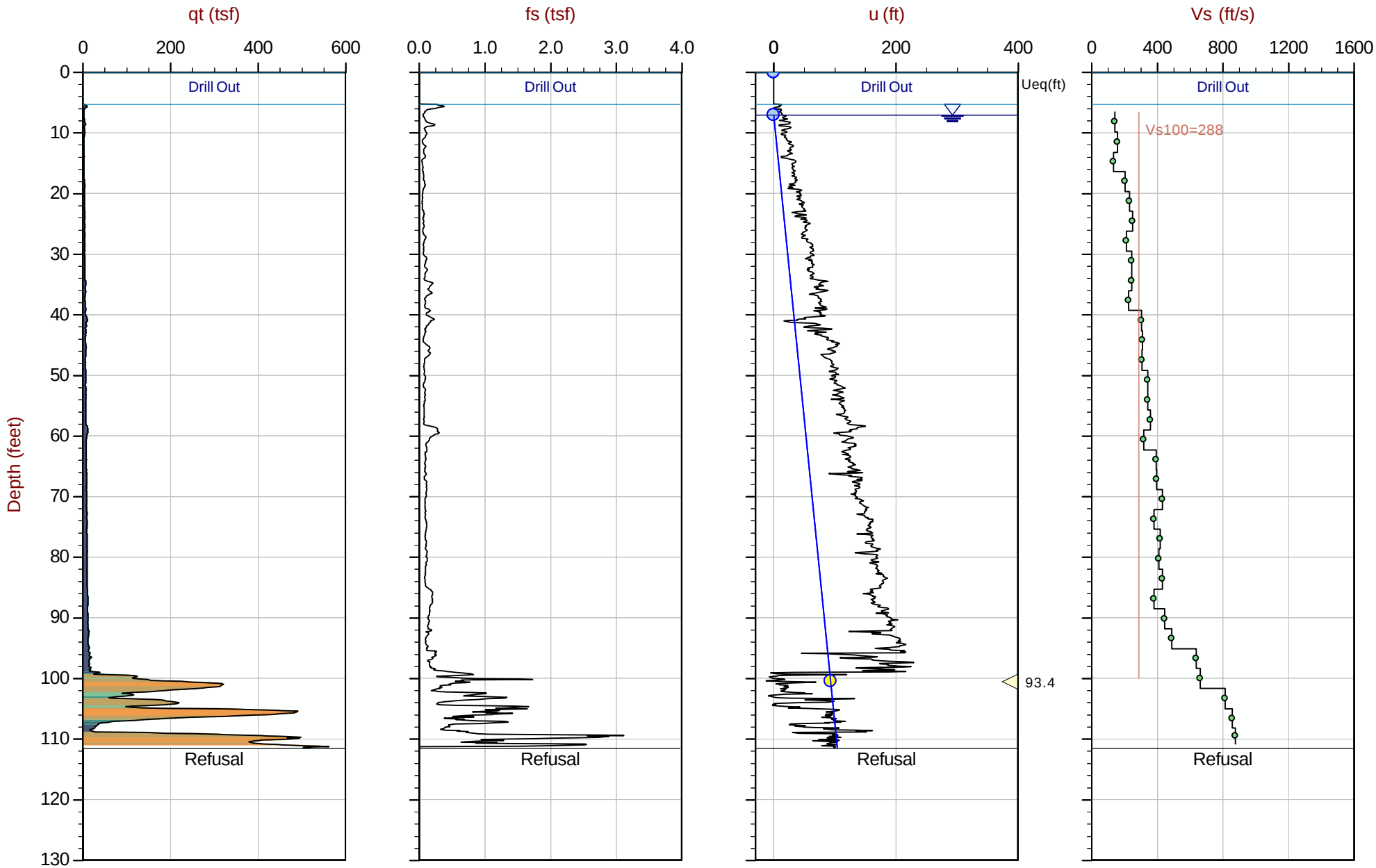
CONETEC

CONETEC

Haley & Aldrich

Job No: 24-59-27459
Date: 2024-04-11 10:31
Site: Aberdeen Schools

Sounding: CPT-MJH01
Cone: 1065:T1500F15U35



Max Depth: 34.000 m / 111.55 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 24-59-27459_SP-MJH01.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 46.96327 Long: -123.79190

Overplot Item: Ueq, Assumed Ueq, Dissipation, Ueq achieved, Dissipation, Ueq not achieved, Dissipation, Ueq assumed, Hydrostatic Line

The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

SCPTu Velocity Wave Traces

CONETEC

CONETEC

Job No: 24-59-27459
Date: 2024-04-11

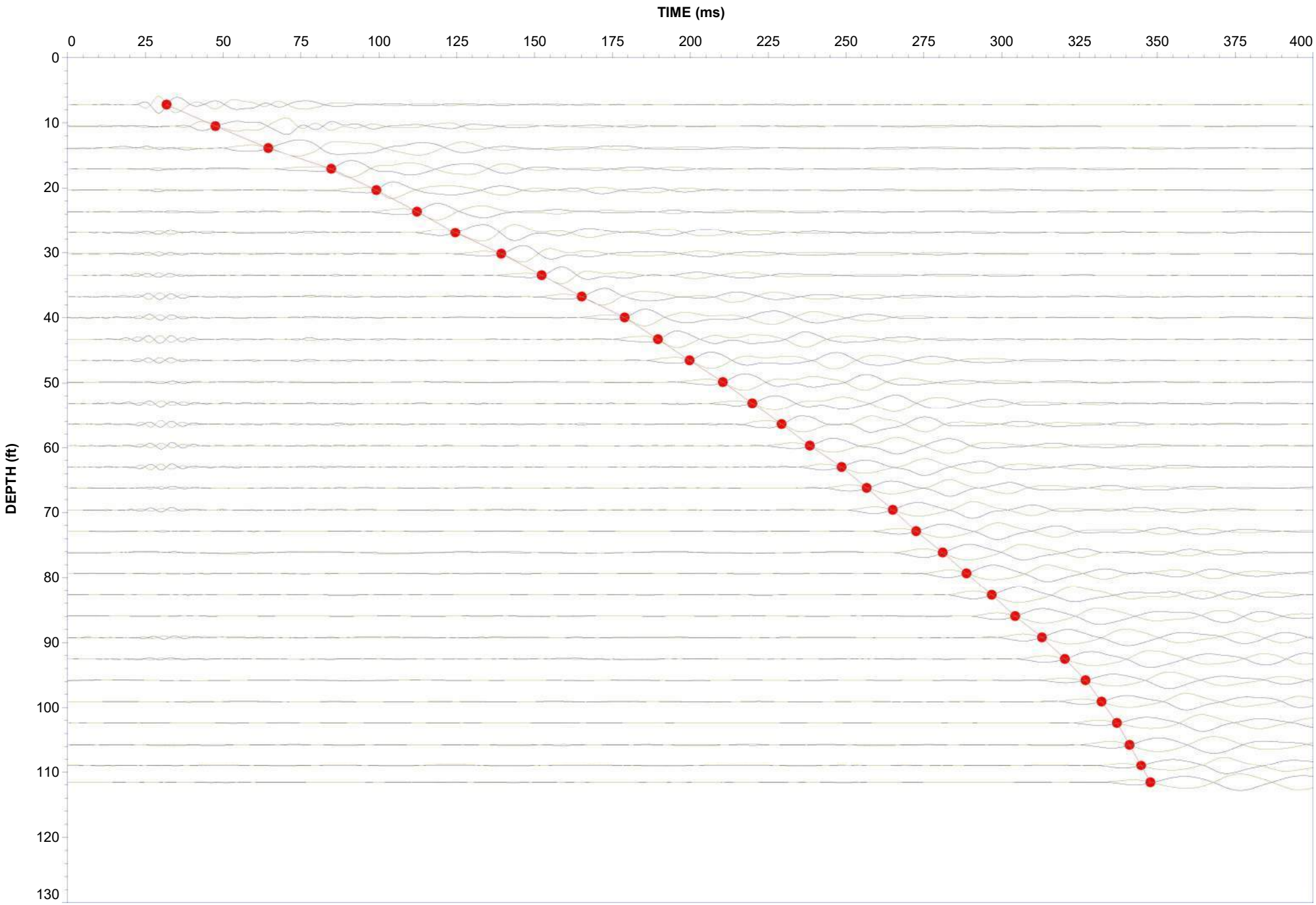
Client: Haley & Aldrich, Inc.
Cone: 1065:T1500F15U35

Project: Aberdeen Schools

Analysis: Shear Wave

Sounding: CPT-MJH01

Filter: BP 0 - 200 Hz



Supplementary Documents and Materials

CONETEC

Description of Methods for Calculated CPT Geotechnical Parameters

CONETEC

CALCULATED CPT GEOTECHNICAL PARAMETERS

A Detailed Description of the Methods Used in ConeTec's CPT Geotechnical Parameter Calculation and Plotting Software



Revision SZW-Rev 18

Revised February 10, 2023

Prepared by Jim Greig, M.A.Sc, P.Eng (BC, AB, ON)

CONETEC

Limitations

The geotechnical parameter output was prepared specifically for the site and project named in the accompanying report subject to objectives, site conditions and criteria provided to ConeTec by the client. The output may not be relied upon by any other party or for any other site without the express written permission of ConeTec Group (ConeTec) or any of its affiliates. For this project, ConeTec has provided site investigation services, prepared factual data reporting and produced geotechnical parameter calculations consistent with current best practices. No other warranty, expressed or implied, is made.

To understand the calculations that have been performed and to be able to reproduce the calculated parameters the user is directed to the basic descriptions for the methods in this document and the detailed descriptions and their associated limitations and appropriateness in the technical references cited for each parameter.

ConeTec's Calculated CPT Geotechnical Parameters as of February 10, 2023.

ConeTec's CPT parameter calculation and plotting routine provides a tabular output of geotechnical parameters based on current published CPT correlations and is subject to change to reflect the current state of practice. Due to drainage conditions and the basic assumptions and limitations of the correlations, not all geotechnical parameters provided are considered applicable for all soil types. The results are presented only as a guide for geotechnical use and should be carefully examined for consideration in any geotechnical design. Reference to current literature is strongly recommended. ConeTec does not warranty the correctness or the applicability of any of the geotechnical parameters calculated by the program and does not assume liability for any use of the results in any design or review. For verification purposes we recommend that representative hand calculations be done for any parameter that is critical for design purposes. The end user of the parameter output should also be fully aware of the techniques and the limitations of any method used by the program. The purpose of this document is to inform the user as to which methods were used and to direct the end user to the appropriate technical papers and/or publications for further reference.

The geotechnical parameter output was prepared specifically for the site and project named in the accompanying report subject to objectives, site conditions and criteria provided to ConeTec by the client. The output may not be relied upon by any other party or for any other site without the express written permission of ConeTec Group (ConeTec) or any of its affiliates.

The CPT calculations are based on values of tip resistance, sleeve friction and pore pressures considered at each data point or averaged over a user specified layer thickness (e.g., 0.20 m). Note that q_t is the tip resistance corrected for pore pressure effects and q_c is the recorded tip resistance. The corrected tip resistance (corrected using u_2 pore pressure values) is used for all calculations. Since all ConeTec cones have equal end area friction sleeves pore pressure corrections to sleeve friction, f_s, are not performed.

Corrected tip resistance: $q_t = q_c + (1-a) \cdot u_2$ (consistent units are required)

where: q_t is the corrected tip resistance
q_c is the recorded tip resistance
u_2 is the recorded dynamic pore pressure from behind the tip (u_2 position)
a is the Net Area Ratio for the cone (typically 0.80 for ConeTec cones)

The total stress calculations are based on soil unit weight values that have been assigned to the Soil Behavior Type (SBT) zones, from a user defined unit weight profile, by using a single uniform value throughout the profile, through unit weight estimation techniques described in various technical papers or from a combination of these methods. The parameter output files indicate the method(s) used.

Effective vertical overburden stresses are calculated using the total stress and equilibrium pore pressure (u_{eq} or u_o) values derived from an assumed hydrostatic distribution of pore pressures below the water table or from a user defined equilibrium pore pressure profile (typically obtained from CPT dissipation tests) or a combination of the two. For over water projects the stress effects of the column of water above the mudline are taken into account as is the appropriate unit weight of water. How this is done depends on where the instruments are zeroed (i.e. on deck or at the mudline). The parameter output files indicate the method(s) used.

A majority of parameter calculations are derived from or driven by results based on material types as determined by the various soil behavior type charts depicted in Figures 1 through 6. The parameter output files indicate the method(s) used.

The Soil Behavior Type classification chart shown in Figure 1 is the classic non-normalized SBT Chart developed at the University of British Columbia and reported in Robertson, Campanella, Gillespie and Greig (1986). Figure 2 shows the original normalized (linear method) SBTn chart developed by Robertson (1990). The Bq classification charts

shown in Figures 3a and 3b incorporate pore pressures into the SBT classification and are based on the methods described in Robertson (1990). Many of these charts have been summarized in Lunne, Robertson and Powell (1997). The Jefferies and Davies SBT chart shown in Figure 3c is based on the techniques discussed in Jefferies and Davies (1993) which introduced the concept of the Soil Behavior Type Index parameter, I_c. Take note that the I_c parameter developed by Robertson and Fear (1995) and Robertson and Wride (1998) is similar in concept but uses a slightly different calculation method than that defined by Jefferies and Davies (1993) as the latter incorporates pore pressure in their technique through the use of the Bq parameter. The normalized Qtn SBT chart shown in Figure 4 is based on the work by Robertson (2009) utilizing a variable stress ratio exponent, n, for normalization based on a slightly modified redefinition and iterative approach for I_c. The boundary curves drawn on the chart are based on the work described in Robertson (2010).

Figure 5 shows a revised 1986 SBT Chart presented to CPT'10 by Robertson (2010b). It is known as the Updated non-normalized Soil Behavior Chart (also referred to as the Rev SBT Chart (PKR2010) in our output files). This chart was produced to be more in line with all post-1986 Robertson charts having the same 9 soil type zones, a $\log_{10}$ axis for friction ratio, R_f in this case, and a unitless tip resistance axis.

Figure 6 shows a revised behavior based chart by Robertson (2016) depicting contractive-dilative zones. As the zones represent material behavior rather than soil gradation ConeTec has chosen a set of zone colors that are less likely to be confused with material type colors from previous SBT charts. These colors differ from those used by Dr. Robertson. A green palette was selected for the dilative (desirable) side of the chart and a red palette for the contractive side of the chart.

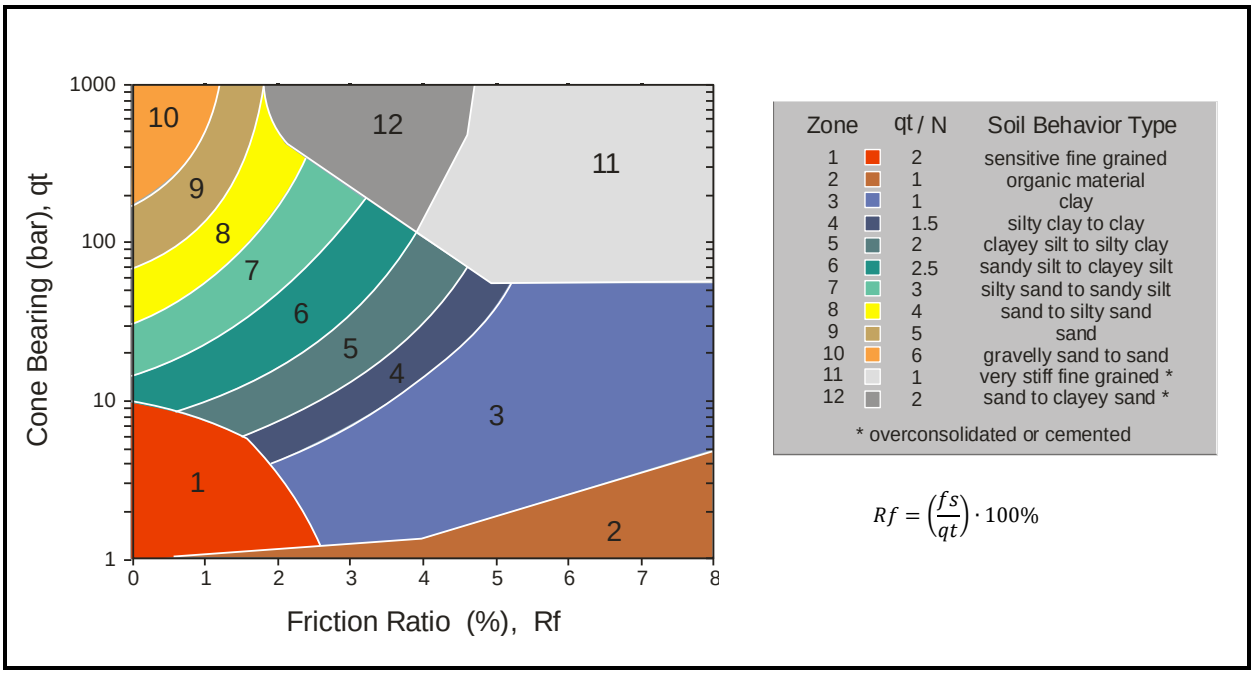


Figure 1. Non-normalized Soil Behavior Type Classification Chart (SBT)

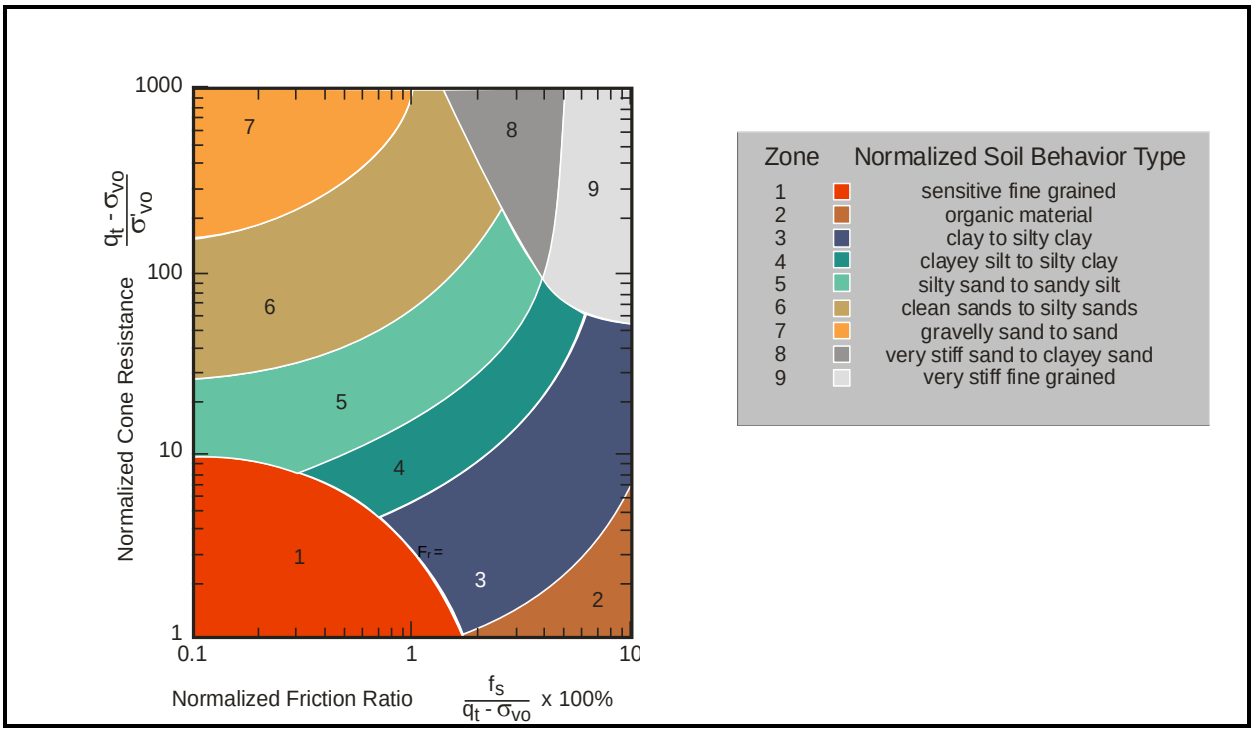


Figure 2. Normalized Soil Behavior Type Classification Chart (SBTn)

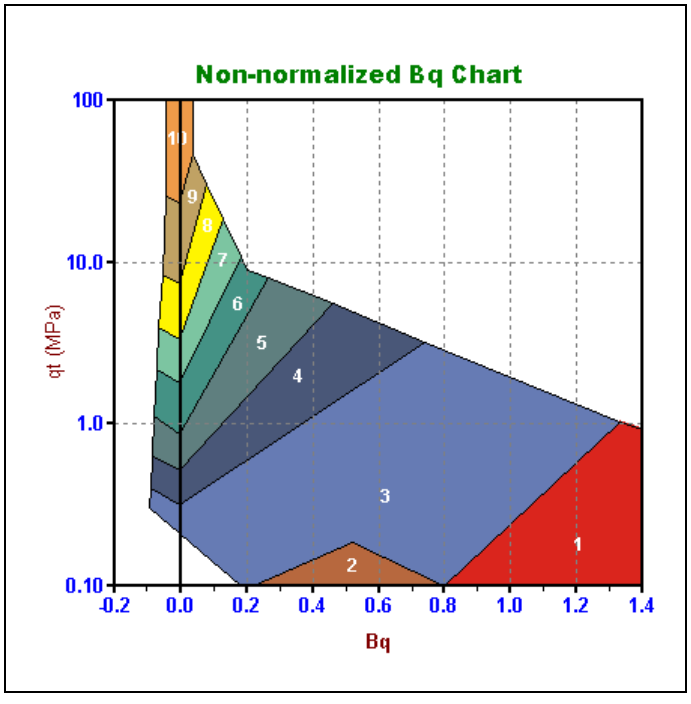


Figure 3a. Alternate Soil Behavior Type Chart (SBT Bq): q_t - B_q

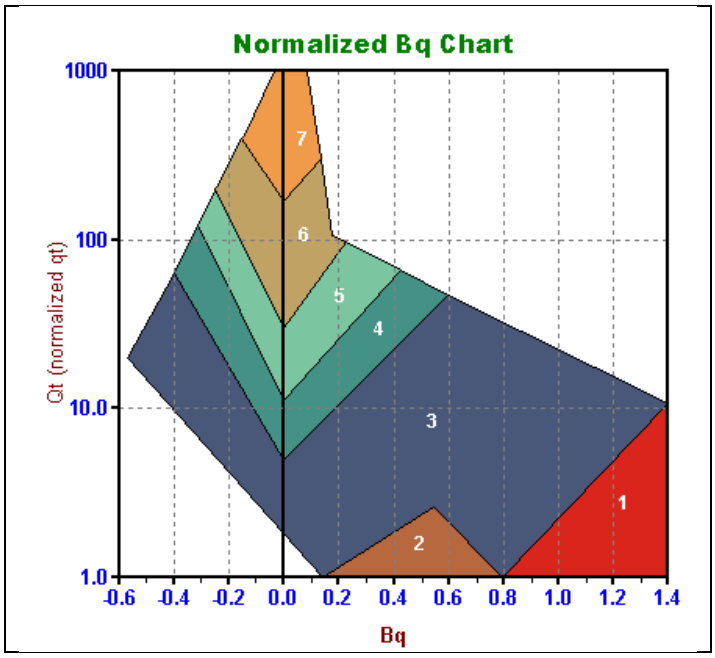


Figure 3b. Alternate Soil Behavior Type Charts (SBT Bqn): Q_t-B_q

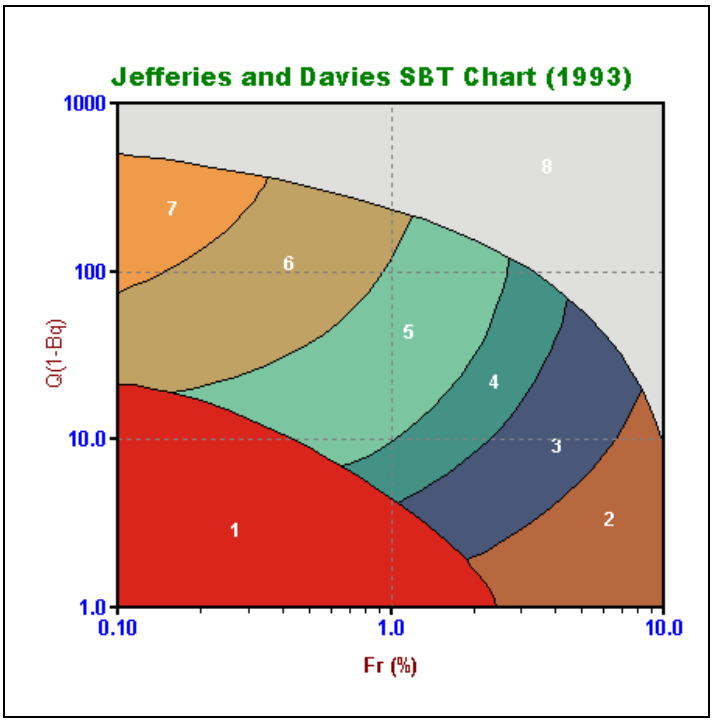


Figure 3c. Alternate Soil Behavior Type Charts: $Q(1-B_q)$ - F_r

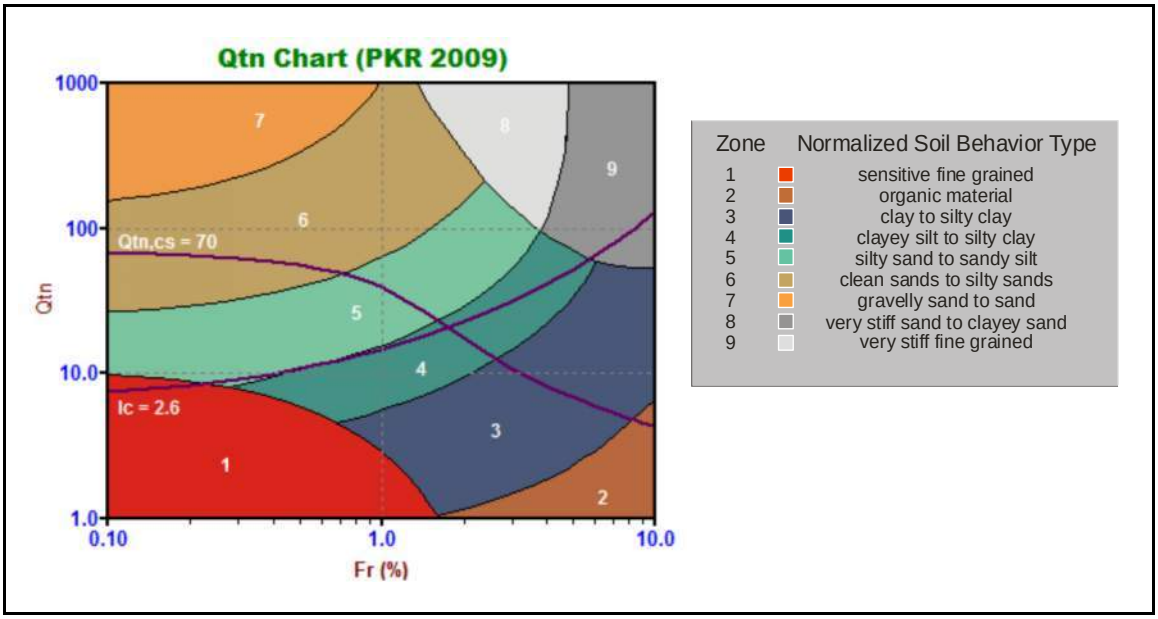


Figure 4. Normalized Soil Behavior Type Chart using Q_{tn} (SBT Qtn)

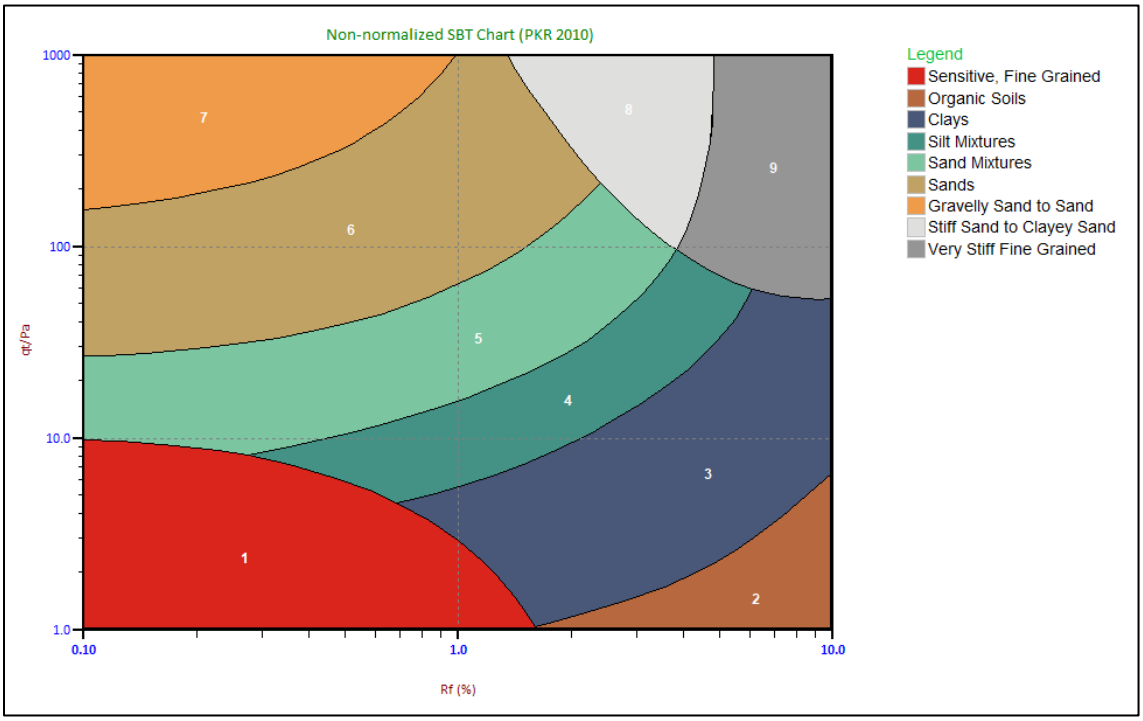


Figure 5. Non-normalized Soil Behavior Type Chart (2010)

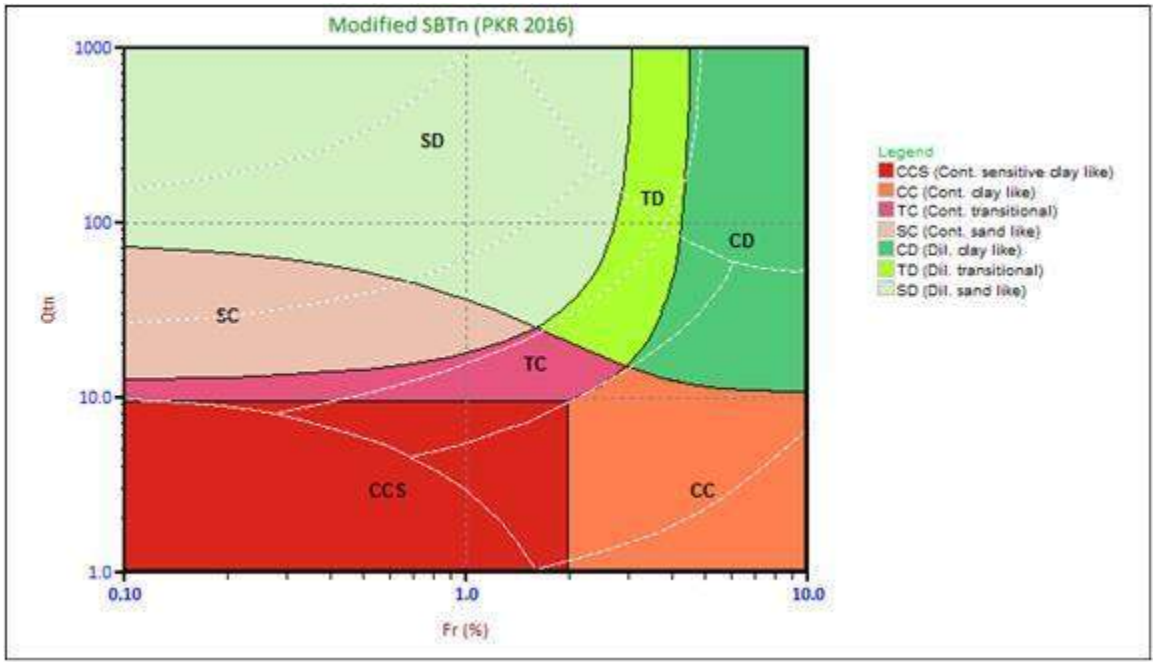


Figure 6. Modified SBTn Behavior Based Chart

Details regarding the geotechnical parameter calculations are provided in Tables 1a and 1b. The appropriate references cited are listed in Table 2. Non-liquefaction specific parameters are detailed in Table 1a and liquefaction specific parameters are detailed in Table 1b.

Where methods are based on charts or techniques that are too complex to describe in this summary, we recommend that the user refer to the cited material. Specific limitations for each method are described in the cited material.

Where the results of a calculation/correlation are deemed *'invalid'* the value will be represented by the text strings "-9999", "-9999.0", the value 0.0 (Zero) or an empty cell. Invalid results will occur because of (and not limited to) one or a combination of:

1. Invalid or undefined CPT data (e.g., drilled out section or data gap).

2. Where the calculation method is inappropriate, for example, drained parameters in a material behaving in an undrained manner (and vice versa).

3. Where input values are beyond the range of the referenced charts or specified limitations of the correlation method.

4. Where pre-requisite or intermediate parameter calculations are invalid.

The parameters selected for output from the program are often specific to a particular project. As such, not all of the calculated parameters listed in Tables 1and 1a may be included in the output files delivered with this report.

The output files are typically provided in Microsoft Excel XLS, XLSX or CSV format. The ConeTec software has several options for output depending on the number or types of calculated parameters desired or those specifically contracted for by the client. Each output file is named using the original file base name (from the .COR file) followed

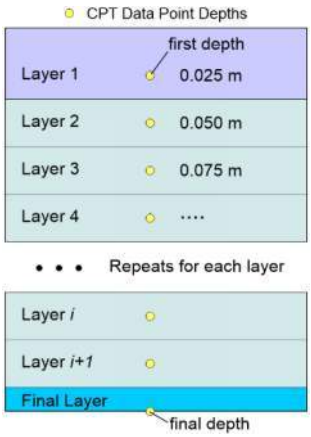
by a three or four character indicator of the output set selected (e.g. BSC, TBL, NLI, NL2, IFI, IFI2, IFI3) and possibly followed by an operator selected suffix identifying the characteristics of the particular calculation run.

Table 1a. CPT Parameter Calculation Methods – Non liquefaction Parameters

Reference Notes: CK* - Common Knowledge, U* - Unpublished

Calculated Parameter	Description	Equation	Ref
Depth	Mid Layer Depth *(where calculations are done at each point then Mid Layer Depth = Recorded Depth)*	*[Depth (Layer Top) + Depth (Layer Bottom)]/ 2.0*	CK*
Elevation	Elevation of Mid Layer is based on the sounding collar elevation supplied by the client or through a site survey In Sweden a variation of elevation is used where the elevation increases with depth. We refer to this as inverse elevation.	Elevation = Collar Elevation – Depth InverseElevation = Collar Elevation + Depth	CK* N/A
Avg qc	Averaged recorded tip value (q_c)	$Avgqc = \frac{1}{n}\sum_{i=1}^{n} q_c$ *n=1 when calculations are done at each point*	CK*
Avg qt	Averaged corrected tip (q_t) where: $q_t = q_c + (1-a)\cdot u_2$ Averaged q_t is not calculated using the average q_c and averaged u values. Averaged q_t is based on the average of the q_t values calculated at each data point.	$Avgqt = \frac{1}{n}\sum_{i=1}^{n} q_t$ *n=1 when calculations are done at each point*	1
Avg fs	Averaged sleeve friction (f_s) No pore pressure corrections are applied to f_s.	$Avgfs = \frac{1}{n}\sum_{i=1}^{n} fs$ *n=1 when calculations are done at each point*	CK*
Avg Rf	Averaged friction ratio (R_f) where friction ratio is defined as: $R_f = 100\% \cdot \frac{fs}{q_t}$	$AvgRf = 100\% \cdot \frac{Avgfs}{Avgqt}$ *not an average of individual R_f values*	CK*
Avg u	Averaged dynamic pore pressure *(u)*	$Avgu = \frac{1}{n}\sum_{i=1}^{n} u_i$ *n=1 when calculations are done at each point*	CK*
Avg Res	Averaged Resistivity (this data is not always available since it is a specialized test requiring an additional module)	$AvgRes = \frac{1}{n}\sum_{i=1}^{n} Resistivity_i$ *n=1 when calculations are done at each point*	CK*
Avg UVIF	Averaged UVIF ultra-violet induced fluorescence (this data is not always available since it is a specialized test requiring an additional module)	$AvgUVIF = \frac{1}{n}\sum_{i=1}^{n} UVIF_i$ *n=1 when calculations are done at each point*	CK*
Avg Temp	Averaged Temperature (this data is not always available)	$AvgTemp = \frac{1}{n}\sum_{i=1}^{n} Temperature_i$ *n=1 when calculations are done at each point*	CK*
Avg Gamma	Averaged Gamma Counts (this data is not always available since it is a specialized test requiring an additional module)	$AvgGamma = \frac{1}{n}\sum_{i=1}^{n} Gamma_i$ *n=1 when calculations are done at each point*	CK*
SBT	Soil Behavior Type as defined by Robertson et al 1986 (often referred to as Robertson and Campanella, 1986)	See Figure 1	1, 5
SBTn	Normalized Soil Behavior Type as defined by Robertson 1990 (linear normalization using Q_t, now referred to as Q_{t1})	See Figure 2	2, 5

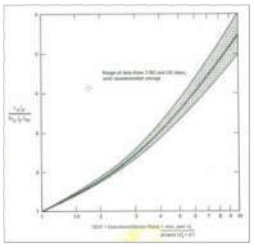
Calculated Parameter	Description	Equation	Ref
SBT-Bq	Non-normalized Soil Behavior type based on non-normalized tip resistance and the B_q parameter	See Figure 3a	1, 2, 5
SBT-Bqn	Normalized Soil Behavior type based on normalized tip resistance (Q_t, now called Q_{t1}) and the B_q parameter	See Figure 3b	2, 5
SBT-JandD	Soil Behavior Type as defined by Jeffries and Davies	See Figure 3c	7
SBT Qtn	Soil Behavior Type as defined by Robertson (2009) using a variable stress ratio exponent for normalization based on $I_{c\ (PKR\ 2009)}$	See Figure 4	15
Modified Non-normalized SBT Chart SBT (PKR2010)	This is a revised version of the simple 1986 non-normalized SBT chart (presented at CPT '10). The revised version has been reduced from 12 zones to 9 zones to be similar to the normalized Robertson charts. Other updates include a dimensionless tip resistance normalized to atmospheric pressure, q_t/P_a, on the vertical axis and a log scale for non-normalized friction ratio, R_f, along the horizontal axis.	See Figure 5	33
Modified SBTn (contractive /dilative)	Modified SBTn chart as defined by Robertson (2016) indicating zones of contractive/dilative behavior. Note that ConeTec displays the chart with colors different from Robertson. ConeTec's colors were chosen to avoid confusion with soil type descriptions.	See Figure 6	30
Unit Wt.	Unit Weight of soil determined from one of the following user selectable options: 1) uniform value 2) value assigned to each SBT zone 3) value assigned to each SBTn zone 4) value assigned to SBTn zone as determined from Robertson and Wride (1998) based on q_{c1n} 5) values assigned to SBT Qtn zones 6) values based on Robertson updated non-normalized Soil Behavior Type Chart (2010b) 6) Mayne f_s (sleeve friction) method 7) Robertson and Cabal 2010 method 8) user supplied unit weight profile The last option may co-exist with any of the other options.	See references	3, 5, 15, 21, 24, 29, 33

Calculated Parameter	Description	Equation	Ref
TStress σ_v	Total vertical overburden stress at Mid Layer Depth *A layer is defined as the averaging interval specified by the user where depths are reported at their respective mid-layer depth.* For data calculated at each point layers are defined using the recorded depth as the mid-point of the layer. Thus, a layer starts half-way between the previous depth and the current depth unless this is the first point in which case the layer start is at zero depth. The layer bottom is half-way from the current depth to the next depth unless it is the last data point. Defining layers affects how stresses are calculated since the unit weight attributed to a data point is used throughout the entire layer. This means that to calculate the stresses the total stress at the top and bottom of a layer are required. The stress at mid layer is determined by adding the incremental stress from the layer top to the mid-layer depth. The stress at the layer bottom becomes the stress at the top of the subsequent layer. Stresses are NOT calculated from mid-point to mid-point. For over-water work the total stress due to the column of water above the mid line is taken into account where appropriate.	$TStress = \sum_{i=1}^{n} \gamma_i h_i$ *where* γ_i is layer unit weight h_i is layer thickness 	CK*
EStress σ_v'	Effective vertical overburden stress at mid-layer depth.	$\sigma_v' = \sigma_v - u_{eq}$	CK*
Equil u u_{eq} or u_0	Equilibrium pore pressures are determined from one of the following user selectable options: 1) hydrostatic below the water table 2) user supplied profile 3) combination of those above When a user supplied profile is used/provided a linear interpolation is performed between equilibrium pore pressures defined at specific depths. If the profile values start below the water table then a linear transition from zero pressure at the water table to the first defined pointed is used. Equilibrium pore pressures may come from dissipation tests, adjacent piezometers or other sources. Occasionally, an extra equilibrium point ("assumed value") will be provided in the profile that does not come from a recorded value to smooth out any abrupt changes or to deal with material interfaces. These "assumed" values will be indicated on our plots and in tabular summaries.	For the hydrostatic option: $u_{eq} = \gamma_w \cdot (D - D_{wt})$ where u_{eq} is equilibrium pore pressure γ_w is the unit weight of water D is the current depth D_{wt} is the depth to the water table	CK*
K_0	Coefficient of earth pressure at rest, K_0.	$K_O = (1 - \sin\Phi') OCR^{\sin\Phi'}$	17
C_n	Overburden stress correction factor used for $(N_1)_{60}$ and older CPT parameters.	$C_n = (P_a/\sigma_v')^{0.5}$ where $0.0 < C_n < 2.0$ *(user adjustable, typically ranging from 1.7 to 2.0)* P_a *is atmospheric pressure (100 kPa)*	4, 12

Calculated Parameter	Description	Equation	Ref
C_q	Overburden stress normalizing factor.	$C_q = 1.8 / [0.8 + (\sigma_v'/P_a)]$ where *$0.0 < C_q < 2.0$ (user adjustable)* *P_a is atmospheric pressure (100 kPa)* *Robertson and Wride define C_q to be the same as C_n. The Olson definition above is used in the program.*	3, 12
N_{60}	SPT N value at 60% energy calculated from q_t/N ratios assigned to each SBT zone. This method has abrupt N value changes at zone boundaries.	*See Figure 1*	5
$(N_1)_{60}$	SPT N_{60} value corrected for overburden pressure.	*$(N_1)_{60} = C_n \bullet N_{60}$*	4
$N_{60}I_c$	SPT N_{60} values based on the I_c parameter, as defined by Robertson and Wride 1998 (3), or by Robertson 2009 (15).	$(q_t/P_a)/ N_{60} = 8.5 (1 – I_c/4.6)$ $(q_t/P_a)/ N_{60} = 10^{(1.1268 – 0.2817Ic)}$ P_a being atmospheric pressure	3, 5 15, 31
$(N_1)_{60}I_c$	SPT N_{60} value corrected for overburden pressure (using N_{60} I_c). User has 3 options.	*1) $(N_1)_{60}Ic = C_n \bullet (N_{60} I_c)$* 2) $q_{c1n}/ (N_1)_{60}I_c = 8.5 (1 – I_c/4.6)$ 3) $(Q_{tn})/ (N_1)_{60}I_c = 10^{(1.1268 – 0.2817Ic)}$	4 5 15, 31
S_u or S_u (N_{kt})	Undrained shear strength based on q_t S_u factor N_{kt} is user selectable.	$Su = \frac{qt - \sigma_v}{N_{kt}}$	1, 5
S_u or S_u (N_{du}) or S_u ($N_{\Delta u}$)	Undrained shear strength based on pore pressure S_u factor $N_{\Delta u}$ is user selectable.	$Su = \frac{u_2 - u_{eq}}{N_{\Delta u}}$	1, 5
D_r	Relative Density determined from one of the following user selectable options: 1) Ticino Sand 2) Hokksund Sand 3) Schmertmann (1978) 4) Jamiolkowski (1985) - All Sands 5) Jamiolkowski et al (2003) (various compressibilities, K_o)	See reference (methods 1 through 4) Jamiolkowski et al (2003) reference	5 14
PHI ϕ	Friction Angle determined from one of the following user selectable options (methods 1 through 4 are for sands and method 5 is for silts and clays): 1) Campanella and Robertson 2) Durgunoglu and Mitchel 3) Janbu 4) Kulhawy and Mayne 5) NTH method (clays and silts)	See appropriate reference	5 5 5 11 23
Delta U/q_t $\Delta u/q_t$ du/q_t	Differential pore pressure ratio (older parameter used before B_q was established)	$= \frac{\Delta u}{qt}$ *where:* $\Delta u = u - u_{eq}$ *and u = dynamic pore pressure* *u_{eq} = equilibrium pore pressure*	39

Calculated Parameter	Description	Equation	Ref
B_q	Pore pressure parameter	$Bq = \frac{\Delta u}{qt - \sigma_v}$ where: $\Delta u = u - u_{eq}$ *and u = dynamic pore pressure* *u_{eq} = equilibrium pore pressure*	1, 2, 5
Net q_t or qtNet	Net tip resistance (used in many subsequent correlations)	$qt - \sigma_v$	36
q_e or qE or q_E	Effective tip resistance (using the dynamic pore pressure u_2 and not equilibrium pore pressure)	$q_t - u_2$	36
qeNorm	Normalized effective tip resistance	$\frac{qt - u_2}{\sigma_v'}$	36
Q_t or Norm: Qt or Q_{t1}	Normalized q_t for Soil Behavior Type classification as defined by Robertson (1990) using a linear stress normalization. Note this is different from Q_{tn}. This parameter was renamed to Q_{t1} in Robertson, 2009. Without normalization limits this parameter calculates to very high unrealistic values at low stresses.	$Qt = \frac{qt - \sigma_v}{\sigma_v'}$	2, 5, 15
F_r or Norm: Fr	Normalized Friction Ratio for Soil Behavior Type classification as defined by Robertson (1990)	$Fr = 100\% \cdot \frac{fs}{qt - \sigma_v}$	2, 5
Q(1-B_q) Q(1-B_q) + 1	Q(1-B_q) grouping as suggested by Jefferies and Davies for their classification chart and the establishment of their I_c parameter. Later papers added the +1 term to the equation.	$Q \cdot (1 - Bq)$ $Q \cdot (1 - Bq) + 1$ *where Bq is defined as above and Q is the same as the normalized tip resistance, Q_{t1}, defined above*	6, 7, 34
q_{c1}	Normalized tip resistance, q_{c1}, using a fixed stress ratio exponent, n (this method has stress units)	$q_{c1} = q_t \cdot (Pa/\sigma_v')^{0.5}$ where: P_a = atmospheric pressure	21
q_{c1} (0.5)	Normalized tip resistance, q_{c1}, using a fixed stress ratio exponent, n (this method is unit-less)	$q_{c1}(0.5) = (q_t/P_a) \cdot (Pa/\sigma_v')^{0.5}$ where: P_a = atmospheric pressure	5
q_{c1} (C_n)	Normalized tip resistance, q_{c1}, based on C_n (this method has stress units)	$q_{c1}(Cn) = C_n * q_t$	5, 12
q_{c1} (C_q)	Normalized tip resistance, q_{c1}, based on C_q (this method has stress units)	$q_{c1}(Cq) = C_q * q_t$ (some papers use q_c)	5, 12
q_{c1n}	normalized tip resistance, q_{c1n}, using a variable stress ratio exponent, n (where n=0.0, 0.70, or 1.0) (this method is unit-less)	$q_{c1n} = (q_t / P_a)(P_a/\sigma_v')^n$ where: P_a = atm. Pressure and n varies as described below	3

Calculated Parameter	Description	Equation	Ref
I_c or Ic (RW1998)	Soil Behavior Type Index as defined by Robertson and Wride (1997, 1998) for estimating grain size characteristics and providing smooth gradational changes across the SBTn chart. Ic(RW1998) is different from that of Jefferies and Davies (7) and is different from Ic(PKR2009).	$I_c = [(3.47 - \log_{10}Q)^2 + (\log_{10} Fr + 1.22)^2]^{0.5}$ *Where:* $Q = \left(\frac{qt - \sigma_v}{P_a}\right)\left(\frac{P_a}{\sigma_v'}\right)^n$ *Or* $Q = q_{c1n} = \left(\frac{qt}{P_a}\right)\left(\frac{P_a}{\sigma_v'}\right)^n$ *depending on the iteration in determining I_c* *And Fr is in percent* *P_a = atmospheric pressure* *n has the following distinct values:* *0.5, 0.75 and 1.0* *and is determined in an iterative manner based on the resulting I_c in each iteration* *Note that NCEER replaced 0.75 with 0.70*	3, 4, 5 10
I_c (PKR 2009)	Soil Behavior Type Index, I_c (PKR 2009) is based on a variable stress ratio exponent n, which itself is based on I_c (PKR 2009). An iterative calculation is required to determine I_c (PKR 2009) and its corresponding n (PKR 2009).	*I_c (PKR 2009) =* *$[(3.47 - \log_{10}Q_{tn})^2 + (1.22 + \log_{10}F_r)^2]^{0.5}$*	15
n (PKR 2009)	Stress ratio exponent n, based on I_c (PKR 2009). An iterative calculation is required to determine n (PKR 2009) and its corresponding I_c (PKR 2009).	*n (PKR 2009) = 0.381 (I_c) + 0.05 (σ_v'/P_a) – 0.15*	15
Q_{tn} (PKR 2009)	Normalized tip resistance using a variable stress ratio exponent based on I_c (PKR 2009) and n (PKR 2009). An iterative calculation is required to determine Q_{tn} (PKR 2009).	*$Q_{tn} = [(qt - \sigma_v)/P_a](P_a/\sigma_v')^n$* *where P_a = atmospheric pressure (100 kPa)* *n = stress ratio exponent described above*	15
FC	Apparent fines content (%)	*$FC=1.75(Ic^{3.25}) - 3.7$* *$FC=100$ for $I_c > 3.5$* *$FC=0$ for $I_c < 1.26$* *FC = 5% if $1.64 < I_c < 2.6$ AND $F_r<0.5$*	3
I_c Zone	This parameter is the Soil Behavior Type zone based on the I_c parameter (valid for zones 2 through 7 on SBTn or SBT Qtn charts)	$I_c < 1.31$ Zone = 7 $1.31 < I_c < 2.05$ Zone = 6 $2.05 < I_c < 2.60$ Zone = 5 $2.60 < I_c < 2.95$ Zone = 4 $2.95 < I_c < 3.60$ Zone = 3 $I_c > 3.60$ Zone = 2	3
CD	The contractive / dilative boundary on Robertson's Modified SBTn (contractive/dilative) Chart shown in Figure 6 above. The boundary is marked as CD = 70 on the chart in the relevant paper. Similar to the $Q_{tn,cs}$ = 70 line in Figure 4.	$CD = 70 = (Q_{tn} - 11)(1 + 0.06F_r)^{17}$ lower bound of CD = 60: $CD = 60 = (Q_{tn} - 9.5)(1 + 0.06F_r)^{17}$	30

Calculated Parameter	Description	Equation	Ref
I_B	Hyberbolic fit defining the boundary between SBT soil types proposed by Schneider as a better fit than the I_c circles. I_B = 32 represents the boundary for most sand like soils. I_B = 22 represents the upper boundary for most clay like soils. The region between I_B=22 and I_B=32 is the "transitional soil" zone.	$I_B = 100\ (Q_{tn} + 10) / (70 + Q_{tn} F_r)$	30
State Param or State Parameter or ψ	The state parameter index, ψ, is defined as the difference between the current void ratio, e, and the critical void ratio, e_c. Positive ψ - contractive soil Negative ψ - dilative soil This is based on the work by Been and Jefferies (1985) and Plewes, Davies and Jefferies (1992) This method uses mean normal stresses based on a uniform value of K_0 or a calculated K_0 using methods described elsewhere in this document	See reference	6, 8
Yield Stress σ_p'	Yield stress is calculated using the following methods 1) General method 2) 1st order approximation using q_tNet (clays) 3) 1st order approximation using Δu_2 (clays) 4) 1st order approximation using q_e (clays) 5) Based on Vs	All stresses in kPa 1) $\sigma_p' = 0.33 \cdot (q_t - \sigma_v)^{m'} (\sigma_{atm}/100)^{1-m'}$ where $m' = 1 - \frac{0.28}{1 + (I_c / 2.65)^{25}}$ 2) $\sigma_p' = 0.33 \cdot (q_t - \sigma_v)$ 3) $\sigma_p' = 0.54 \cdot (\Delta u_2)$ $\Delta u_2 = u_2 - u_0$ 4) $\sigma_p' = 0.60 \cdot (q_t - u_2)$ 5) $\sigma_p' = (Vs/4.59)^{1.47}$	19 20 20 20 18
OCR OCR(JS1978) YSR(Mayne2014) YSR (qtNet) YSR (deltaU) YSR (qe) YSR (Vs) OCR (PKR2015)	Over Consolidation Ratio based on 1) Schmertmann (1978) method involving a plot plot of S_u/σ_v' /($S_u/\sigma_v')_{NC}$ and OCR  2) based on Yield stresses described above 3) approximate version based on qtNet 4) approximate version based on Δu 5) approximate version based on effective tip, q_e 6) approximate version based on shear wave velocity, V_s and σ_v' 7) based on Qt	1) requires a user defined value for NC Su/P_c' ratio 2 through 5) *based on yield stresses* 6) YSR (Vs) = $\sigma_p'(Vs) / \sigma_v'$ 7) OCR = $0.25 \cdot (Qt)^{1.25}$	9 19 20 20 20 18 32
Es/qt	Intermediate parameter for calculating Young's Modulus, E, in sands. It is the Y axis of the reference chart. Note that Figured 5.59 from reference 5, Lunne, Robertson and Powell, (LRP) has an error. The X axis values are too high by a factor of 10. The plot is based on Baldi's (not Bellotti as cited in	Based on Figure 5.59 in the reference	5, 37

Calculated Parameter	Description	Equation	Ref
	LRP) original Figure 3 where the X axis is: $\frac{q_c}{\sqrt{\sigma_v'}}$ (both in kPa) with a range of 200 to 3000. Figure 5.59 from LRP shows a dimensionless form of the equation, q_{c1}, displaying the same range of values. Figure 5.59's X axis uses $q_{c1} = \left(\frac{q_c}{P_a}\right)\left(\frac{P_a}{\sigma_v'}\right)^{0.5}$ The two expressions are not the same: they differ by a factor of $\frac{\sqrt{P_a}}{P_a}$. With P_a taken to be 100 kPa the factor is 1/10. Substituting typical values of 200 bar (20000 kPa) for q_c and 225 kPa for σ_v' one gets: 20000 / 15 = 1333.33 for Bellotti's axis and $(200/1)(100/225)^{0.5}$ = 200 * (10/15) = 133.3 for LRP's axis (noting that P_a = 1 bar) showing a factor of 10 difference.		
Es or E_s Young's Modulus E	Young's Modulus based on the work done in Italy. There are three types of sands considered in this technique. The user selects the appropriate type for the site from: a) OC Sands b) Aged NC Sands c) Recent NC Sands Each sand type has a family of curves that depend on mean normal stress. The program calculates mean normal stress and linearly interpolates between the two extremes provided in the E_s/q_t chart. E_s is evaluated for an axial strain of 0.1%.	Mean normal stress is evaluated from: $\sigma_m' = \frac{1}{3}(\sigma_v' + \sigma_h' + \sigma_h')$ where σ_v'= vertical effective stress σ_h'= horizontal effective stress *and* $\sigma_h = K_o \cdot \sigma_v'$ with K_o assumed to be 0.5	5
Delta U/TStress $\Delta u / \sigma_v$	Differential pore pressure ratio with respect to total stress	$= \frac{\Delta u}{\sigma_v}$ *where:* $\Delta u = u - u_{eq}$	39
Delta U/EStress, P Value, Excess Pore Pressure Ratio $\Delta u/\sigma_v'$	Differential pore pressure ratio with respect to effective stress. Key parameter (P, Normalized Pore Pressure Parameter, Excess Pore Pressure Ratio) in the Winckler et. al. static liquefaction method.	$= \frac{\Delta u}{\sigma_v'}$ *where:* $\Delta u = u - u_{eq}$	25, 25a
Su/EStress S_u/σ_v'	Undrained shear strength ratio with respect to vertical effective overburden stress using the S_u (N_{kt}) method	= *Su* (N_{kt}) / σ_v'	9, 23
Vs or V_s	Recorded shear wave velocities (not estimated). The shear wave velocities are typically collected over 1 m depth intervals. Each data point over the relevant depth range is assigned the same V_s value.	recorded data	27
Vp or V_p	Recorded compression wave (or P wave) velocities (not estimated). The P wave velocities are typically collected over 1 m depth intervals. Each data point over the relevant depth range is assigned the same V_p value.	recorded data	27

Calculated Parameter	Description	Equation	Ref
V_{s30} V_{s100}	The average shear wave velocity of the near surface materials to a depth of 30 m (100 ft). It is based on the sum of all travel times through all layers in the top 30m (100 ft). V_{s100} is the same calculation as V_{s30} except down to a depth of 100 feet.	$V_{s30} = \frac{total\ thickness\ of\ all\ layers\ to\ 30\ m}{\Sigma\left(\frac{layer\ thickness}{layer\ shear\ wave\ velocity}\right)}$ $V_{s30} = \frac{total\ thickness\ of\ all\ layers\ to\ 30\ m}{\Sigma\ (layer\ travel\ times)}$	38
G_{max}	G_{max} determined from SCPT shear wave velocities (not estimated values). Note that seismic data (V_s) is collected over set depth intervals (typically 1 meter). Each data point over the test segment is assigned the same V_s value. Since soil density changes with depth, slightly different G_{max} values may be calculated over the test depth interval.	$G_{max} = \rho V_s^2$ where ρ is the mass density of the soil determined from the estimated unit weights at each test depth	27
qtNet/G_{max}	Net tip resistance ratio with respect to the small strain modulus G_{max} determined from SCPT shear wave velocities (not estimated values)	$= (qt - \sigma_v) / G_{max}$ where $G_{max} = \rho V_s^2$ and ρ is the mass density of the soil determined from the estimated unit weights at each test depth	15, 28, 30
qUlt	A site specific and client specific parameter for estimating the limiting stress for "crane walk" accessibility	$q_{ult} = CraneWalkFactor \cdot S_u$ Where: *CraneWalkFactor* is client provided	U*
Estimated G_o	Estimated value for small strain shear modulus	$G_o = 0.0188[10^{(0.55Ic + 1,68)}](q_t - \sigma_v)$	15
Estimated E_{25}	Estimated value for Young's Modulus, E, at a 25% working load	$E_{25} = \alpha_E$ (qtNet) where $\alpha_E = 0.015[10^{(0.55Ic + 1,68)}]$	15
k_{SBT}	Estimated soil permeability derived from Soil Behavior Type (SBT) Chart I_c values.	For $1.0 < I_c \leq 3.27$: $k = 10^{(0.952 - 3.04Ic)}$ in m/s For $3.27 < Ic < 4.0$: $k = 10^{(-4.52 - 1.37Ic)}$ in m/s	35
M or D' Constrained Modulus	Constrained Modulus based on 1) Robertson, M 2) Mayne, D'	1) Robertson $M = \alpha_M (q_t - \sigma_v)$ $I_c > 2.2$ (fine grained) $\alpha_M = Qt$ when $Qt < 14$ $\alpha_M = 14$ when $Qt > 14$ $Ic < 2.2$ (coarse grained) $\alpha_M = 0.0188\ [10^{(0.55Ic + 1.68)}]$ $D' = \alpha_D (qt - \sigma_v)$ where $\alpha_D = 5$	32 23

Table 1b. CPT Parameter Calculation Methods – Liquefaction Parameters

Calculated Parameter	Description	Equation	Ref
K_{SPT} or K_s	Equivalent clean sand factor for $(N_1)60$	$K_{SPT} = 1 + ((0.75/30) \bullet (FC - 5))$	10
K_{CPT} or K_c (RW1998)	Equivalent clean sand correction for q_{c1N}	$K_{cpt} = 1.0$ for $I_c \leq 1.64$ $K_{cpt} = f(I_c)$ for $I_c > 1.64$ (see reference) $K_c = -0.403\ I_c^4 + 5.581\ I_c^3 - 21.63 I_c^2 + 33.75\ I_c - 17.88$	3, 10
K_c (PKR 2010)	Clean sand equivalent factor to be applied to Q_{tn}	$K_c = 1.0$ for $I_c \leq 1.64$ $K_c = -0.403\ I_c^4 + 5.581\ I_c^3 - 21.63 I_c^2 + 33.75\ I_c - 17.88$ for $I_c > 1.64$	16
$(N_1)_{60cs}I_C$	Clean sand equivalent SPT $(N_1)_{60}I_c$. User has 3 options.	1) $(N_1)_{60cs}Ic = \alpha + \beta((N_1)_{60}I_c)$ 2) $(N_1)_{60cs}Ic = K_{SPT} * ((N_1)_{60}I_c)$ 3) $(q_{c1ncs})/(N_1)_{60cs}I_c = 8.5\ (1 - I_c/4.6)$ FC ≤ 5%: $\alpha = 0,\ \beta = 1.0$ FC ≥ 35% $\alpha = 5.0,\ \beta = 1.2$ 5% < FC < 35% $\alpha = exp[1.76 - (190/FC^2)]$ $\beta = [0.99 + (FC^{1.5}/1000)]$	10 10 5
q_{c1ncs}	Clean sand equivalent q_{c1n}	$q_{c1ncs} = q_{c1n} \bullet K_{cpt}$	3
$Q_{tn,cs}$ (PKR 2010)	Clean sand equivalent for Q_{tn} described above - Q_{tn} being the normalized tip resistance based on a variable stress exponent as defined by Robertson (2009)	$Q_{tn,cs} = Q_{tn} \cdot K_c$ (PKR 2016)	16
Su(Liq)/ESv or $S_u(Liq)/\sigma_v'$	Liquefied shear strength ratio as defined by Olson and Stark	$\frac{S_u(Liq)}{\sigma_v'} = 0.03 + 0.0143(q_{c1})$ Note: σ_v' and s_v' are synonymous	13
Su(Liq)/ESv or $S_u(Liq)/\sigma_v'$ (PKR 2010)	Liquefied shear strength ratio as defined by Robertson (2010)	$\frac{S_u(Liq)}{\sigma_v'}$ Based on a function involving $Q_{tn,cs}$	16
S_u (Liq) (PKR 2010)	Liquefied shear strength derived from the liquefied shear strength ratio and effective overburden stress	$S_u(Liq) = \sigma_v' \cdot \left(\frac{S_u(Liq)}{\sigma_v'}\right)$	16
Cont/Dilat Tip	Contractive / Dilative q_{c1} Boundary based on $(N_1)_{60}$	$(\sigma_v')_{boundary} = 9.58 \times 10^{-4}\ [(N_1)_{60}]^{4.79}$ q_{c1} is calculated from specified q_t(MPa)/N ratio	13
CRR	Cyclic Resistance Ratio (for Magnitude 7.5)	$q_{c1ncs} < 50$: $CRR_{7.5} = 0.833\ [q_{c1ncs}/1000] + 0.05$ $50 \leq q_{c1ncs} < 160$: $CRR_{7.5} = 93\ [q_{c1ncs}/1000]^3 + 0.08$	10
Kg or K_g	Small strain Stiffness Ratio Factor, K_g	$[G_{max}/q_t]/[q_{c1n}{}^{-m}]$ m = empirical exponent, typically 0.75	26

Calculated Parameter	Description	Equation	Ref
K_g*	Revised K_g factor extended to fine grained soils (Robertson).	$K_g^* = (G_o / q_n)(Q_{tn})^{0.75}$ where q_n is the net tip resistance = $q_t - \sigma_v$	30
SP Distance	State Parameter Distance, Winckler static liquefaction method	Perpendicular distance on Q_{tn} chart from plotted point to state parameter Ψ = -0.05 curve	25
URS NP Fr	Normalized friction ratio point on Ψ = -0.05 curve used in SP distance calculation		25
URS NP Q_{tn}	Normalized tip resistance (Q_{tn}) point on Ψ = -0.05 curve used in SP Distance calculation		25

Table 2. References

No.	Reference
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16	Robertson, P.K., 2010a, "Evaluation of Flow Liquefaction and Liquefied Strength Using the Cone Penetration Test", Journal of Geotechnical and Geoenvironmental Engineering, ASCE, June 2010.
17	Mayne, P.W. and Kulhawy, F.H., 1982, "Ko-OCR Relationships in Soil", Journal of the Geotechnical Engineering Division, ASCE, Vol. 108, GT6, pp. 851-872.
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No.	Reference
19	Mayne, P.W., 2014, "Generalized CPT Method for Evaluating Yield Stress in Soils", Geocharacterization for Modeling and Sustainability (GSP 235: Proc. GeoCongress 2014, Atlanta, GA), ASCE, Reston, Virginia: 1336-1346.
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32	Robertson, P.K., Cabal, K.L. 2015, "Guide to Cone Penetration Testing for Geotechnical Engineering", 6th Edition.
33	Robertson, P.K., 2010b, "Soil behaviour type from CPT: an update", Proceedings of the 2nd International Symposium on Cone Penetration Testing (CPT '10), Huntington Beach, California.
34	Been, K., Romero, S., Obermeyer, J. and Hebeler, G., 2012, "Determining in situ state of sand and silt tailings from the CPT", Tailings and Mine Waster 2012, 325-333.
35	Robertson, P.K., 2010, "Estimating in-situ soil permeability from CPT & CPTu", Proceedings of the 2nd International Symposium on Cone Penetration Testing (CPT '10), Huntington Beach, California.
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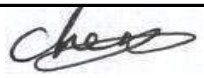
Piezocone Calibration Sheets

CONETEC

Adara Systems Ltd.
201-8327 Eastlake Drive, Burnaby, BC, Canada V5A4W2
Tel: 1-604-273-6013

CERTIFICATE OF CALIBRATION

Calibration Information			
Cone Serial Number	EC1065	Model	A15 T1500 F15 U35
Date	2024-01-17		
Technician Performing Calibration	Richard Chen	Signature	
Calibration Approved By	Vishrut Khunt	Signature	

Lab Condition	As Found	As Left		
Lab Temperature	N/A	24˚C		
Lab Humidity	N/A	19%	Reason for Calibration	new

Cone Information				
Tip Stress Limit	1500	bar	Tip End Area	15 cm²
Friction Stress Limit	15	bar	Friction Surface Area	225 cm²
Pressure Limit	35	bar	RTD Location	Pressure Carrier
X-Inclinometer Limit	30	degrees	Geophone	X and Z
Y-Inclinometer Limit	30	degrees	Temperature Range	-20°C to 60°C

Baseline Summary: (For Reference Only)

Channel	Units	As Found	As Left
Tip	bar	N/A	-0.245
Sleeve	bar	N/A	-0.055
Pressure	bar	N/A	0.992
X-Inclinometer	degrees	N/A	0.012
Y-Inclinometer	degrees	N/A	0.019
Temperature	˚C	N/A	22.538

Classified in accordance with ISO 22476-1:2012 Class 1
Classified in accordance with ISO 22476-1:2012 Class 2

Calibrated in general accordance with the ASTM D5778-20 and D7400-08 standards

Calibrated with Adara calibration procedure EC_CPTCAL-2.2

Collective uncertainty of the measurement standards conforms to a test uncertainty ratio (TUR) of 3:1 for tip and sleeve measurement and 4:1 for pressure measurement with a confidence level k=2

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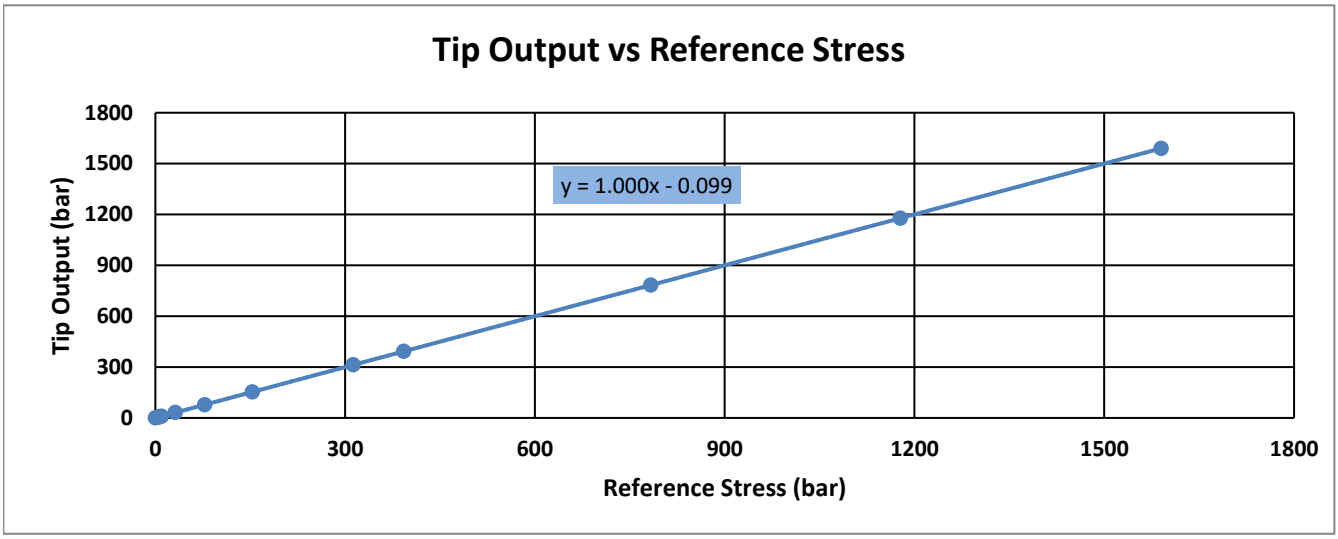
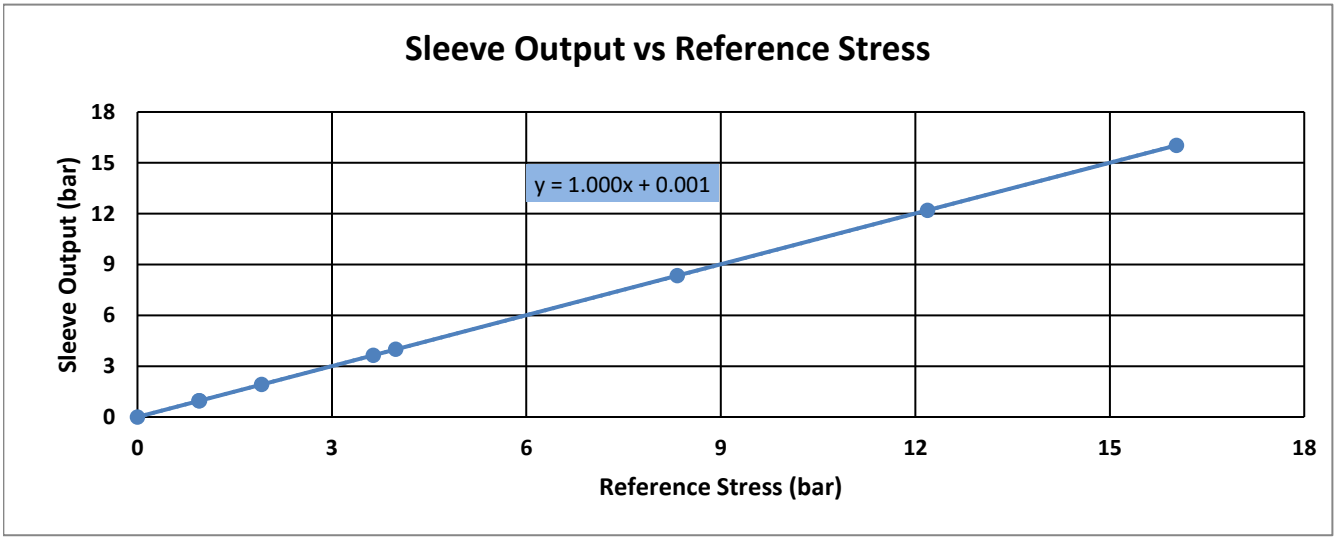
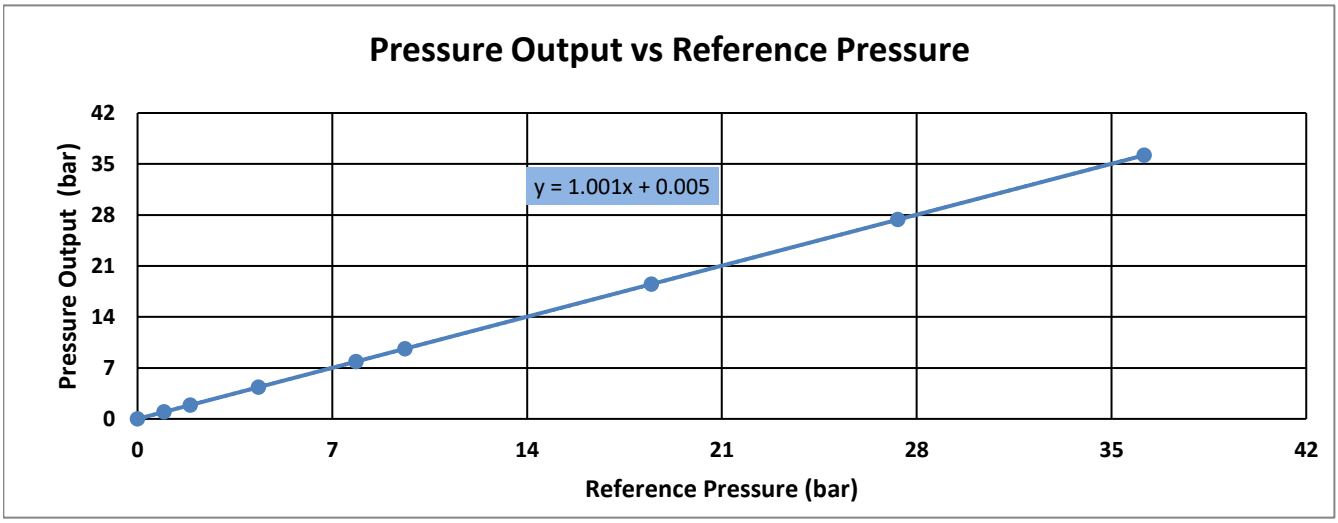
Cone Output vs Reference Stress/Pressure Plots







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Calibration Results

Tip Calibration					
As Found			As Left		
Max. Non Linearity	N/A	N/A	Max. Non Linearity	0.02%	PASS
Calibration Error	N/A	N/A	Calibration Error	0.11%	PASS

Sleeve Calibration					
As Found			As Left		
Max. Non Linearity	N/A	N/A	Max. Non Linearity	0.09%	PASS
Calibration Error	N/A	N/A	Calibration Error	0.16%	PASS

Pressure Calibration					
As Found			As Left		
Max. Non Linearity	N/A	N/A	Max. Non Linearity	0.10%	PASS
Calibration Error	N/A	N/A	Calibration Error	0.23%	PASS

X-Inclinometer Calibration					
As Found			As Left		
Max. Non Linearity	N/A	N/A	Max. Non Linearity	0.21%	PASS
Calibration Error	N/A	N/A	Calibration Error	-0.42%	PASS

Y-Inclinometer Calibration					
As Found			As Left		
Max. Non Linearity	N/A	N/A	Max. Non Linearity	0.04%	PASS
Calibration Error	N/A	N/A	Calibration Error	-0.08%	PASS

Seismic Calibration					
As Found			As Left		
Trigger Delay Error	N/A	N/A	Trigger Delay Error	0.01%	PASS

Temperature Calibration			
Full Scale Error	0.27%	PASS	

Channel	Cold	Room	Hot	Units
Ref_Temp	2.8	20.6	43.6	˚C
Tip	-2.954	-1.076	1.520	bar
Sleeve	-0.088	-0.068	-0.038	bar
Pressure	1.011	1.019	0.973	bar
Temperature	2.683	20.365	43.687	˚C

Tip Temperature Coefficient	0.110 bar/˚C	PASS
Sleeve Temperature Coefficient	0.001 bar/˚C	PASS
Pressure Temperature Coefficient	-0.001 bar/˚C	PASS

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Testing Equipment Details

Testing Machines	Model Number	Serial Number	Calibration Number	Due Date
Tip Load Cell	Precision	P-10289	100490	2025-09-18
Sleeve Load Cell	Precision	P-10868	100579	2025-10-01
Digital Loadcell Indicator	4215	62140	100490	2024-07-18
Fluke Reference Pressure Monitor	RPM4 A10Ms	3910	100835	2024-12-12
Tektronix Function Generator	AFG3021B	C030955	100751	2024-10-20
Thermometer	THS-222-555	D23255834	100410	2024-07-11
Thermometer	THS-222-555	D23255829	100410	2024-07-11
Thermometer	THS-222-555	D20345575	100565	2024-07-14

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Adara Error Definitions

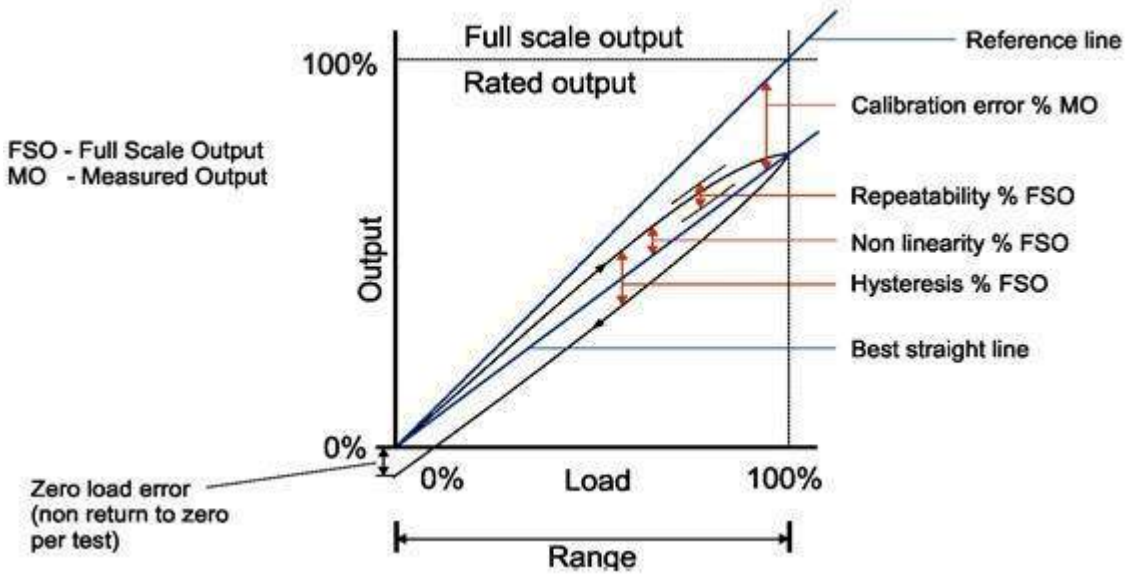

Figure 1: Definition of Calibration Terms for Load Cell and Transducers (Adapted from [1])

Actual Sensitivity	The slope of the best fit line through all data points starting at zero load.
Slope Error	The error in the best fit line compared to the ideal linear calibration in % . Slope Error = (Best Fit Slope - Ideal Slope) / Ideal Slope
Maximum Non Linearity	This value represents the maximum error (absolute value) relative to the best fit line considering each calibration point starting at loads greater than approximately 10% of FSO. The reported errors are a percent error of FSO. Adara's Pass/Fail criteria is 0.5% of FSO (ASTM is 0.5% of FSO at loads > 20% FSO).
Calibration Error	This value represents the maximum error (absolute value) in the recorded load value as compared to the actual load value for each calibration point for loads greater than approximately 10% of FSO. Adara's Pass/Fail criteria for the tip and sleeve is 0.5% of MO and 1.0% of MO for the pore pressure (ASTM for the tip and sleeve is 1.5% and 1.0% of MO respectively at loads greater than 20% of FSO)

Temperature Check Passing Criteria

Tip Temperature Coefficient	<0.200	bar/˚C
Sleeve Temperature Coefficient	<0.005	bar/˚C
Pressure Temperature Coefficient	<0.0196	bar/˚C

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ASTM D5778-20 Annex A Summary [1]

A1.4 Force Transducer Calibration Requirements

A1.4.1 states the following limits:

Non Linearity	Tip	≤ +0.5% of FSO
	Sleeve	≤ +1.0% of FSO
Calibration Error	Tip	≤ +1.5% of MO at loads > 20% FSO
	Sleeve	≤ +1.0% of MO at loads > 20% FSO

A1.5 Pressure Transducer Calibrations

A1.5.1 limits:

Non Linearity	Pore Pressure	≤ +1.0% of FSO
Calibration Error	Pore Pressure	not specified

ISO 22476 -1:2012 Summary [2]

Section 5.2 states the following allowable minimum accuracy

Class 1	Cone Resistance	35 kPa or 5%
	Sleeve Friction	5 kPa or 10%
	Pore Pressure	10 kPa or 2%
Class 2	Cone Resistance	100 kPa or 5%
	Sleeve Friction	15 kPa or 15%
	Pore Pressure	25 kPa or 3%

Note: ISO Compliance is based on low end calibration only.

References

[1] ASTM D5778-20. "Standard Test Method for Electronic Friction Cone and Piezocone Penetration Testing of Soils". ASTM, West Conshohocken, PA, USA.

[2] ISO 22476-1:2012. "Geotechnical investigation and testing - Field Testing - Part 1: Electrical cone and piezocone penetration test". ISO, Geneva, Switzerland.

ASTM D7400-08. "Standard Test Methods for Downhole Seismic Testing". ASTM, West Conshohocken, PA, USA.

APPENDIX B
Laboratory Test Results

APPENDIX B

Laboratory Testing

Soil samples obtained from the explorations were transported to Haley & Aldrich, Inc.'s laboratory and evaluated to confirm or modify field classifications, as well as to assess engineering properties of the soils encountered. Representative samples were selected for laboratory testing and transported to our geotechnical laboratory in Portland, Oregon. The tests were performed in general accordance with the test methods of ASTM International (ASTM) or other applicable procedures. One sample was submitted to CERCO Analytical, Inc. for corrosivity testing. A summary of the test results is included as Figure B-1.

Visual Classifications

Soil samples obtained from the explorations were visually classified in the field and in our geotechnical laboratory based on the Unified Soil Classification System and ASTM classification methods. ASTM Test Method D 2488 was used to classify soils using visual and manual methods. ASTM Test Method D 2487 was used to classify soils based on laboratory test results.

Laboratory Test Results

MOISTURE CONTENT

Moisture contents of samples were obtained in general accordance with ASTM Test Method D 2216. The results of the moisture content tests completed on samples from the explorations are presented on the exploration logs included in Appendix A and on Figure B-1 in this appendix.

ATTERBERG LIMITS TESTING

Atterberg limits (liquid limit, plastic limit, and plasticity index) of fine-grained soil samples were obtained in general accordance with ASTM Test Method D 4318. The results of the Atterberg Limits tests are presented on the exploration logs included in Appendix A, summarized on Figure B-1 in this appendix, and shown in detail on Figure B-2 in this appendix.

PARTICLE SIZE DISTRIBUTION

Sieve analysis tests were performed to determine the quantitative distribution of particle sizes in the sample. The tests were performed in general accordance with ASTM Test Method D 6913. The "percent fines" portions of the test results are indicated on the appropriate exploration logs included in Appendix A and on Figure B-1 in this appendix. The full test results are shown on Figure B-3 in this appendix.

CORROSIVITY TESTING

One corrosivity test suite was performed on a sample collected from boring B-MJH01. The test suites included testing for pH, redox, chloride, sulfate, and electrical resistivity. The results of the test are presented on the final sheet of this appendix.

Exploration	Sample ID	Depth	Water Content (%)	Dry Density (pcf)	Fines (%)	Sand (%)	Gravel (%)	Liquid Limit	Plastic Limit	Plasticity Index	Organic Content (%)	Pocket Pen (tsf)	Torvane (tsf)	
B-MJH01	S-3	2.5	36.5											
B-MJH01	S-7b	6.9	65.5		93	7	0	75	39	36				
B-MJH01	S-11	17.5	71.4		88	12	0	72	37	35				
B-MJH01	S-14	25.0	72.4		87	13	0	98	50	48				
B-MJH01	S-16	30.0	110.7		82	18	0							
B-MJH01	S-18	36.0	119.9											
B-MJH01	S-19	37.5	83.8		89	11	0							
B-MJH01	S-20	40.0						88	43	45				
B-MJH01	S-21	45.0	72.2		92	8	0							
B-MJH01	S-23	55.0	75.5											
B-MJH01	S-25	65.0	56.2											

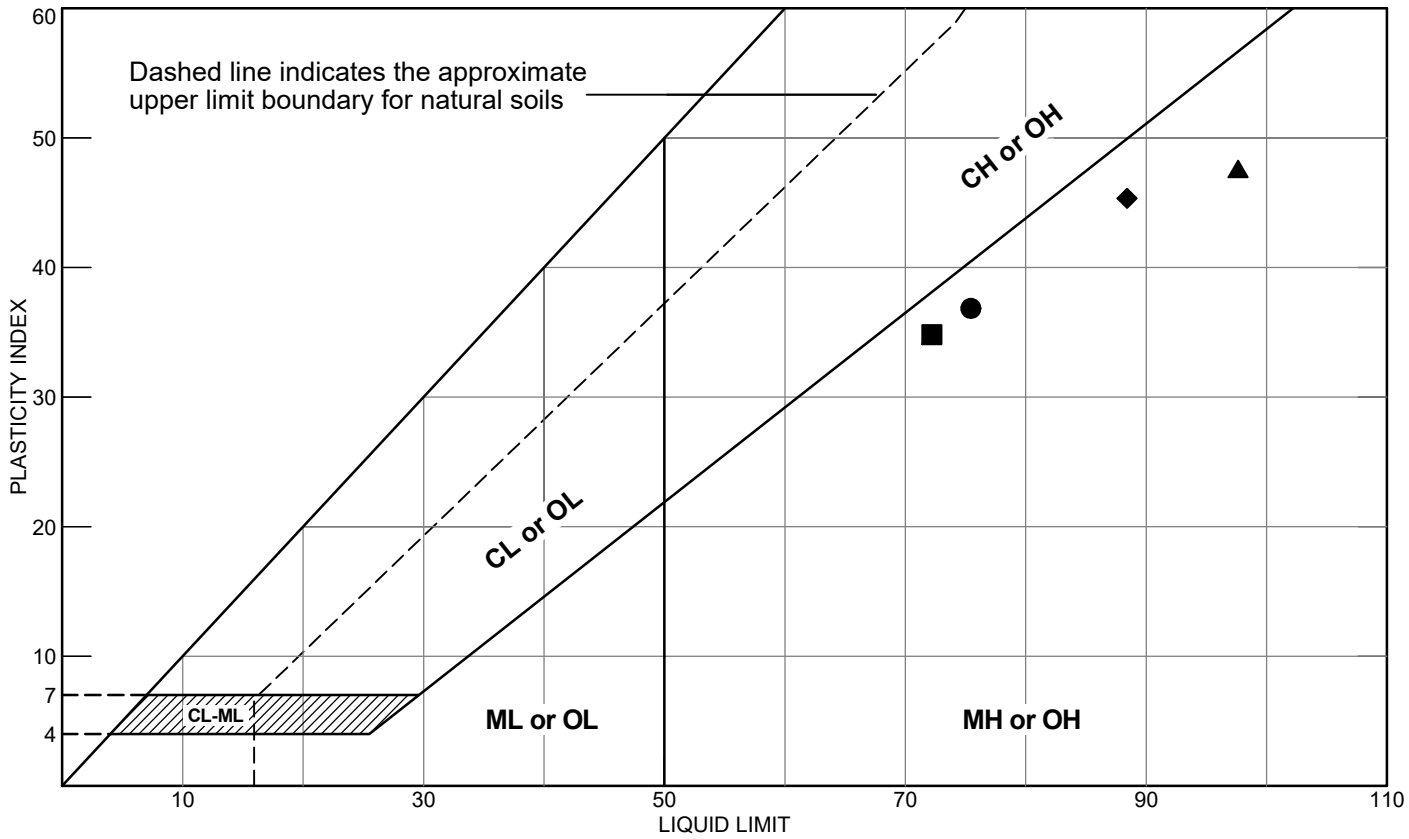
HALEY ALDRICH

Project: Aberdeen School District - Miller Junior High
Location: Aberdeen, Washington
Project No.: 0210368-000

Summary of Laboratory Results

Figure **B-1**
Sheet **1 of 1**

HA LAB SUMMARY (FOR REPORTS) - C:\USERS\TMERLINO\ONEDRIVE - HALEYALDRICH.COM\DESKTOP\HC_LIBRARY (GLB 5/17/24 14:49 - \\HALEYALDRICH.COM\SHARE\CF\PROJECTS\0210368\GINT\PERMANENT GINT FILE\0210368.000_ABERDEEN SCHOOL DISTRICT-MILLER JR HIGH_GINT.GPJ - tmerlin



Location and Description	LL	PL	PI	-#200	MC%	USCS
● **Source:** B-MJH01 **Sample No.:** S-7b **Depth:** 6.9 to 7.3 ELASTIC SILT	75	39	36	93	65	MH
■ **Source:** B-MJH01 **Sample No.:** S-11 **Depth:** 17.5 to 19.0 ELASTIC SILT WITH SAND	72	37	35	88	71	MH
▲ **Source:** B-MJH01 **Sample No.:** S-14 **Depth:** 25.0 to 26.5 ELASTIC SILT WITH SAND	98	50	48	87	72	MH
◆ **Source:** B-MJH01 **Sample No.:** S-20 **Depth:** 40.0 to 41.5 ELASTIC SILT	88	43	45	NT	NT	MH

Remarks:

●
■
▲
◆

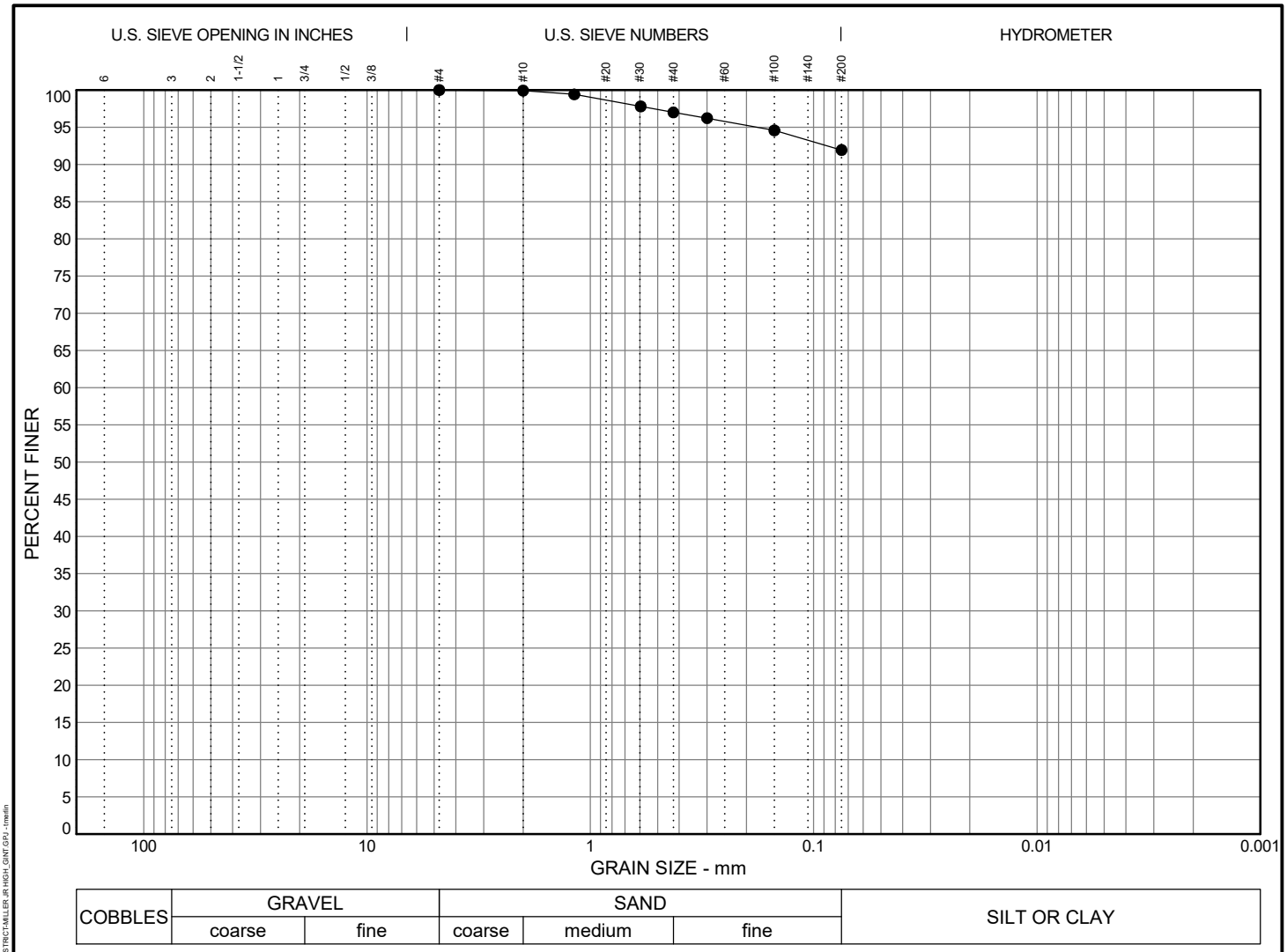
HALEY ALDRICH

Project: Aberdeen School District - Miller Junior High
Location: Aberdeen, Washington
Project No.: 0210368-000

Liquid Limit, Plastic Limit, and Plasticity Index

Figure **B-2**
Sheet **1 of 1**

HA ATTERBERG LIMITS C:\USERS\TIMERLIN\ONEDRIVE - HALEY ALDRICH,COM\DESKTOP\HC_LIBRARY GLB - 5/17/24 14:50 - \\HALEY ALDRICH.COM\SHARE\CPP\PROJECTS\0210368\GINT\PERMANENT GINT FILE\0210368-000_ABERDEEN SCHOOL DISTRICT-MILLER JR HIGH_GINT.GPJ - tmerlin



Location and Description	% Cobbles	% Gravel	% Sand	% Silt	% Clay	MC%	USCS
● **Source:** B-MJH01 **Sample No.:** S-21 **Depth:** 45.0 to 46.5 ELASTIC SILT	0.0	0.0	8.1	91.9		72	MH

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●										

Remarks:

●

HALEY ALDRICH

Project: Aberdeen School District - Miller Junior High
Location: Aberdeen, Washington
Project No.: 0210368-000

Particle-Size Analysis

Figure **B-3**
Sheet **1 of 1**

HA GRAIN SIZE - C:\USERS\TMERLIN\ONEDRIVE - HALEY ALDRICH.COM\DESKTOP\HC_LIBRARY.GLB - 5/17/24 14:50 - \\HALEY ALDRICH.COM\SHARE\CF\PROJECTS\0210368\GINT\PERMANENT GINT FILE\0210368-000_ABERDEEN SCHOOL DISTRICT-MILLER JR HIGH_GINT.GPJ - tmerlin

CERCO analytical
1100 Willow Pass Court, Suite A
Concord, CA 94520-1006
925 462 2771 Fax. 925 462 2775
www.cercoanalytical.com

21 May, 2024

Job No. 2405048
Cust. No. 13349

Mr. Micah Hintz
Haley & Aldrich
6420 S. Macadam Ave., Suite 100
Portland, OR 97239

Subject: Project No.: 0210365
Project Name: Aberdeen School District
Corrosivity Analysis –ASTM Test Methods

Dear Mr. Hintz:

Pursuant to your request, CERCO Analytical has analyzed the soil samples submitted on May 16, 2024. Based on the analytical results, this brief corrosivity evaluation is enclosed for your consideration.

Based upon the resistivity measurements, Samples No. 002-004 are classified as "corrosive" and Sample No. 001 is classified as "moderately corrosive". All buried iron, steel, cast iron, ductile iron, galvanized steel and dielectric coated steel or iron should be properly protected against corrosion depending upon the critical nature of the structure. All buried metallic pressure piping such as ductile iron firewater pipelines should be protected against corrosion.

The chloride ion concentrations ranged from none detected to 140 mg/kg and are determined to be insufficient to attack steel embedded in a concrete mortar coating.

The sulfate ion concentrations ranged from 61 mg/kg to 300 mg/kg and are determined to be sufficient to potentially be detrimental to reinforced concrete structures and cement mortar-coated steel at these locations. Therefore, concrete that comes into contact with this soil should use sulfate resistant cement such as Type II, with a maximum water-to-cement ratio of 0.55.

The pH of the soils range from 4.90 to 6.37, which is considered to be corrosive to buried iron, steel, mortar-coated steel and reinforced concrete structures. Therefore, corrosion prevention measures need to be considered for structures to be placed in this acidic soil.

The redox potentials range from 35-mV to 200-mV. Sample No.004 is indicative of potentially "severely corrosive" soils, Samples No. 001 and No. 002 are indicative of potentially "moderately corrosive" soils and Sample No. 003 is indicative of potentially "slightly corrosive" soils resulting from anaerobic soil conditions.

This corrosivity evaluation is based on general corrosion engineering standards and is non-specific in nature. For specific long-term corrosion control design recommendations or consultation, please call *JDH Corrosion Consultants, Inc. at (925) 927-6630.*

We appreciate the opportunity of working with you on this project. If you have any questions, or if you require further information, please do not hesitate to contact us.

Very truly yours,
CERCO ANALYTICAL, INC.

J. Darby Howard, Jr., P.E.
President

JDH/jdl
Enclosure

CERCO analytical
1100 Willow Pass Court, Suite A
Concord, CA 94520-1006
925 462 2771 Fax. 925 462 2775
www.cercoanalytical.com

Client: Haley & Aldrich, Inc.
Client's Project No.: 0210365
Client's Project Name: Aberdeen School District
Date Sampled: 8-Apr-2024, 10-Apr-2024, 11-Apr-2024, & 15-Apr-2024
Date Received: 16-May-24
Matrix: Soil
Authorization: Signed Chain of Custody

Date of Report: 21-May-2024

Job/Sample No.	Sample I.D.	Redox (mV)	pH	Conductivity (umhos/cm)*	Resistivity (100% Saturation) (ohms-cm)	Sulfide (mg/kg)*	Chloride (mg/kg)*	Sulfate (mg/kg)*
[redacted]								
2405048-004	0210368 B-1 @ 12+15'	35	6.37	-	630	-	140	300

Method:	ASTM D1498	ASTM D4972	ASTM D1125M	ASTM G57	ASTM D4658M	ASTM D4327	ASTM D4327
Reporting Limit:	-	-	10	-	50	15	15
Date Analyzed:	16-May-2024	17-May-2024	-	17-May-2024	-	17-May-2024	17-May-2024

* Results Reported on "As Received" Basis
N.D. - None Detected

Julia Clauson
Chemist

Quality Control Summary - **All laboratory quality control parameters were found to be within established limits**

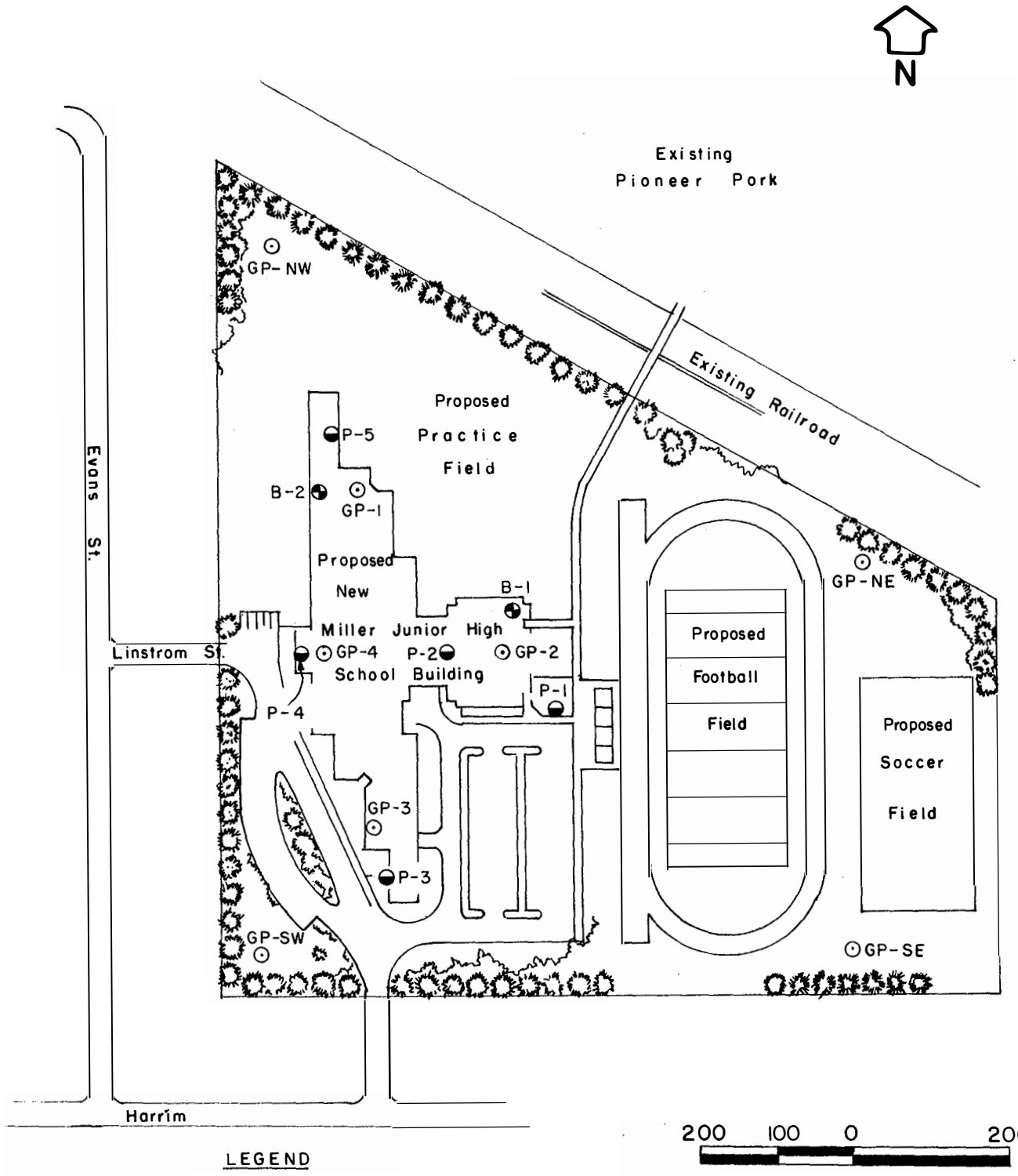
APPENDIX C
Historical Plans and Geotechnical Logs/Lab Results

GENERAL FOUNDATION INVESTIGATION FOR THE PROPOSED NEW MILLER JUNIOR HIGH SCHOOL ABERDEEN SCHOOL DISTRICT #5 ABERDEEN, WASHINGTON

JULY 15, 1976

J-304
HART-CROWSER & ASSOCIATES, INC.
705 NE NORTHLAKE WAY
SEATTLE, WASHINGTON 98105

SITE and EXPLORATION PLAN



LEGEND

B-1 Boring Location and Number

P-2 Dutch Cone Probe Location and Number

GP-NW Gas Probe Bore Hole Location and Letter and Number Designation

J-304 JUNE 1976

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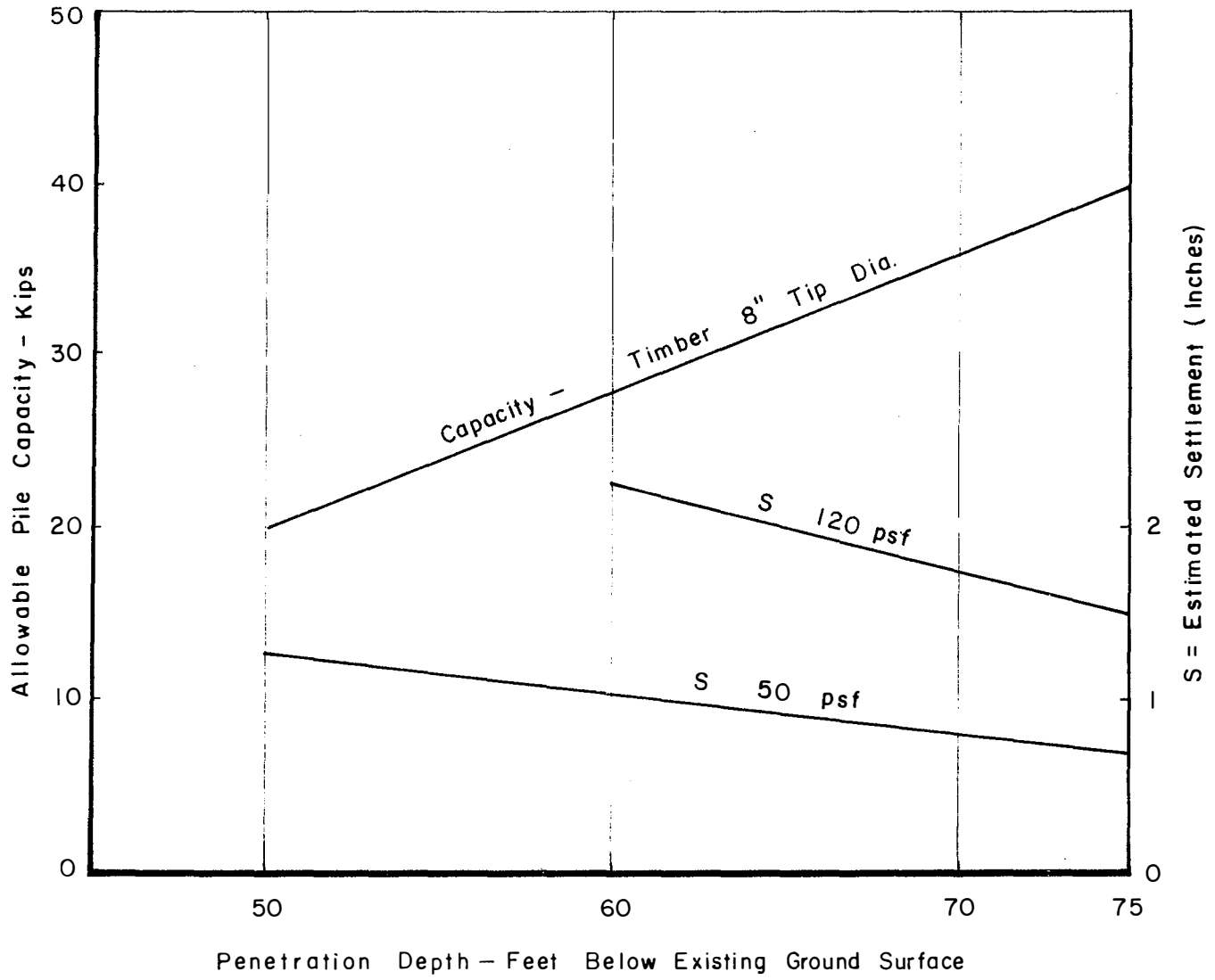
Figure 1

VERTICAL PILE CAPACITY and ESTIMATED SETTLEMENTS



Notes: 1) 50 PSF- INDICATES TOTAL DEADLOAD PLUS LONG-TERM LIVELOADS IN POUNDS PER SQUARE FOOT OF BUILDING AREA THAT WILL BE TRANSFERRED TO PILE FOUNDATIONS.

2) ESTIMATED SETTLEMENTS ARE BASED ON A MINIMUM PILE SPACING OF 8 FEET CENTER-TO-CENTER.

J-304 JUNE 1976

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Figure 2

APPENDIX A

FIELD EXPLORATIONS

Field explorations at the site consisted of a general reconnaissance, two borings, five Dutch cone penetrometer probes, and the installation of eight gas and leachate sampling probes. Field techniques and results for installation of the eight sampling probes, as well as measurement and sampling of combustible gas emissions, have been described in our report dated June 11, 1976. The explorations were coordinated in the field by an engineering geologist from our firm. Mr. Roger V. LeClerc, II.

Borings

The two borings were drilled to depths of 70½ and 104 feet on May 24 and 25, 1976, at the approximate locations shown on the Site Plan, Figure 1. The borings were made with a truck-mounted, Mobile B-61 drill rig using a 3 3/8-inch inside diameter continuous-flight, hollow-stem auger. Representative soil samples, both disturbed and relatively undisturbed, were generally obtained at 5-foot intervals. The representative but disturbed samples were obtained using the Stnadard Penetration Test procedure. This test is a means of determining the relative density of granular soil and the consistency of cohesive soil, and consists of driving a standard 2-inch O.D., split-barrel sampler a distance of 18 inches using a 140-pound hammer, free falling 30 inches. The number of blows of the hammer required to drive the sampler the last 12 inches is the Standard Penetration Resistance, shown graphically on the boring logs. All samples were classified in the field, placed in air-tight jars and transported to our laboratory for detailed examination and classification. In compressible SILT materials, several relatively undisturbed thin-walled steel tube samples were also obtained. The

ends of the tubes were sealed with caps and returned to our laboratory where they were extracted and tested. The drilling and sampling of borings were continuously observed by our engineering geologist who also prepared field boring logs on the basis of an examination of the samples secured and the excavated material, as well as the action of the drilling equipment. The Boring Logs, presented on Figures A-1 through A-3, are based on inspection of the samples secured, laboratory test results, and field boring logs.

Dutch Cone Penetrometer Probes

The five Dutch cone probes, designated P-1 through P-5 were advanced to depths ranging from 95 to 124 feet on May 7 through 13 at the approximate locations shown on the Site Plan, Figure 1. The Dutch cone used was the Begemann, type, the principles of which are shown in Figure A-4. The system is mounted on a truck which provides the necessary reaction for the applied loads.

From the results of the penetrometer probes, a direct correlation is obtained between the point resistance of the cone and bearing capacity of the soil, and between the sleeve friction and frictional characteristics of the soil. The relative density or consistency of the soil being probed is empirically related to the cone penetration resistance, q_c. Further, comparing the values of q_c, sleeve friction (f_s) and the friction ratio (FR = f_s/q_c in percent), leads to an interpretive soil classification. The soil classification chart developed by Schmertmann for use with the Dutch cone penetrometer results is presented on Figure A-5. Generally, a friction ratio value of less than 2 indicates sand; a value between 2 and 4 indicates a silt-sand mixture, clayey sand, or silt; and values greater than 4 are indicative of a clayey silt or clay. The descriptive soil interpretations presented on the probe logs have been developed using Figure A-5 as a guideline with modifications according to correlations of soil types disclosed in other projects within Western Washington and careful evaluation of the probe results. The results of the penetrometer probes accomplished for this study and interpretive soil logs are presented in Figures A-6 through A-10.

Leachate Sampling

A sample of ground water and leachate was obtained from each of the eight shallow gas and leachate sampling probes on June 3, 1976. Samples were obtained by inserting the end of a short length of plastic tubing into the probe and lowering it to a few inches below the water level. With the other end of the tubing attached to a small hand-operated bilge pump, the fluid was drawn through the tubing by the pump and discharged into a jar for transportation to the laboratory. Each jar and the entire sampling apparatus were rinsed with distilled water prior to sampling of each probe.

LEGEND

SYMBOL	DESCRIPTION
⊠	2.0 inch O.D. Split Spoon Sample
⊠	3.0 inch O.D. Thin-wall Sample
●	Moisture Content, Percent by Weight
▲	Standard Penetration Resistance N-value (140 pound weight, 30" drop, blows per foot)
⊢⊣	Indicates Water Content At Plastic Limit (lower value) and Liquid Limit (higher value)
UCS / WW	Unconfined Compressive Strength - tons per sq. ft / Wet Unit Weight - Pounds per Cubic Foot
	WOOD WASTE FILL
	ORGANIC SILT - Clay SILT (OH - MH) with Organic Mater
	VERY DENSE SAND

1. Soil descriptions are interpretive and actual changes may be gradual
2. Water level, if indicated, is for date indicated and will probably vary with time of year

J - 304 JUNE 1976

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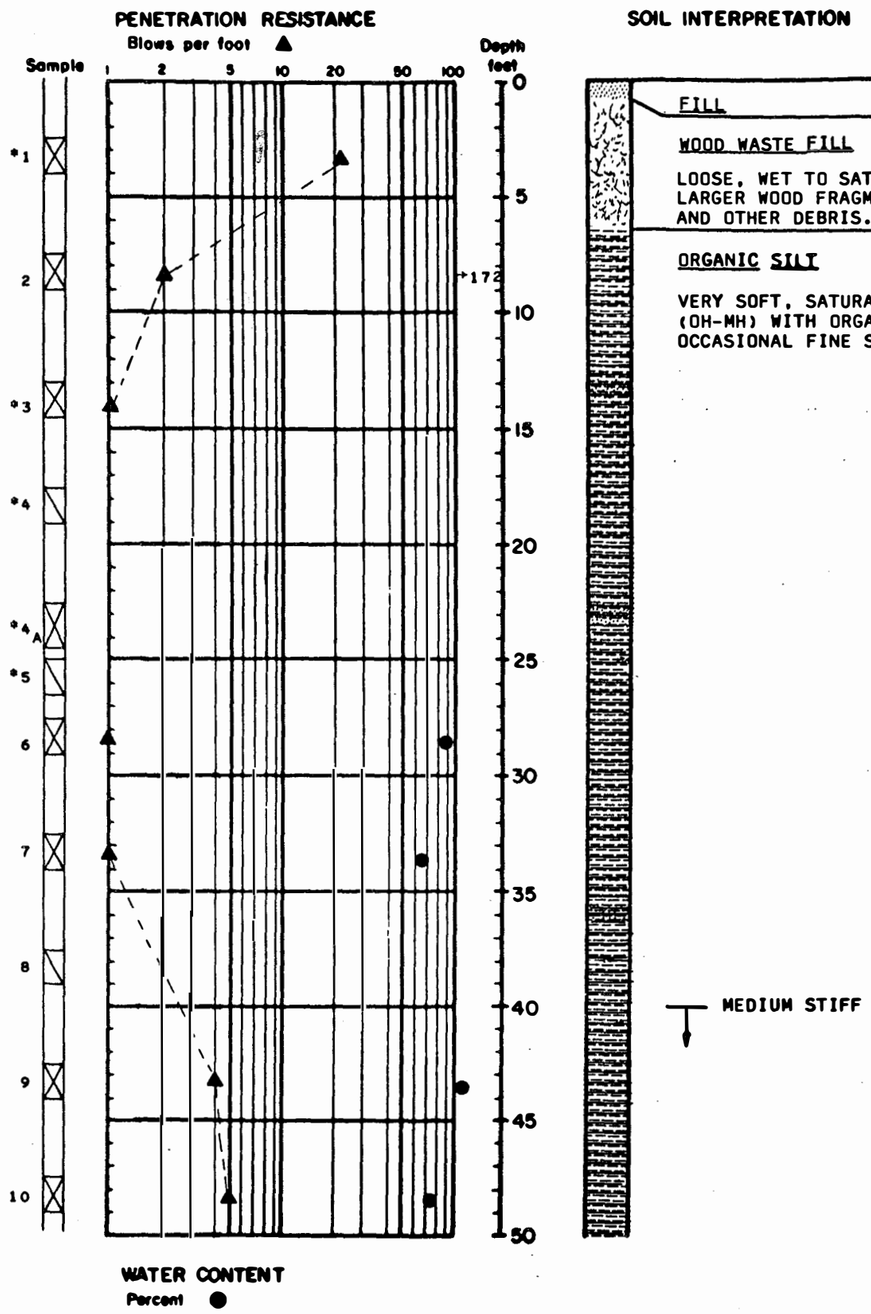
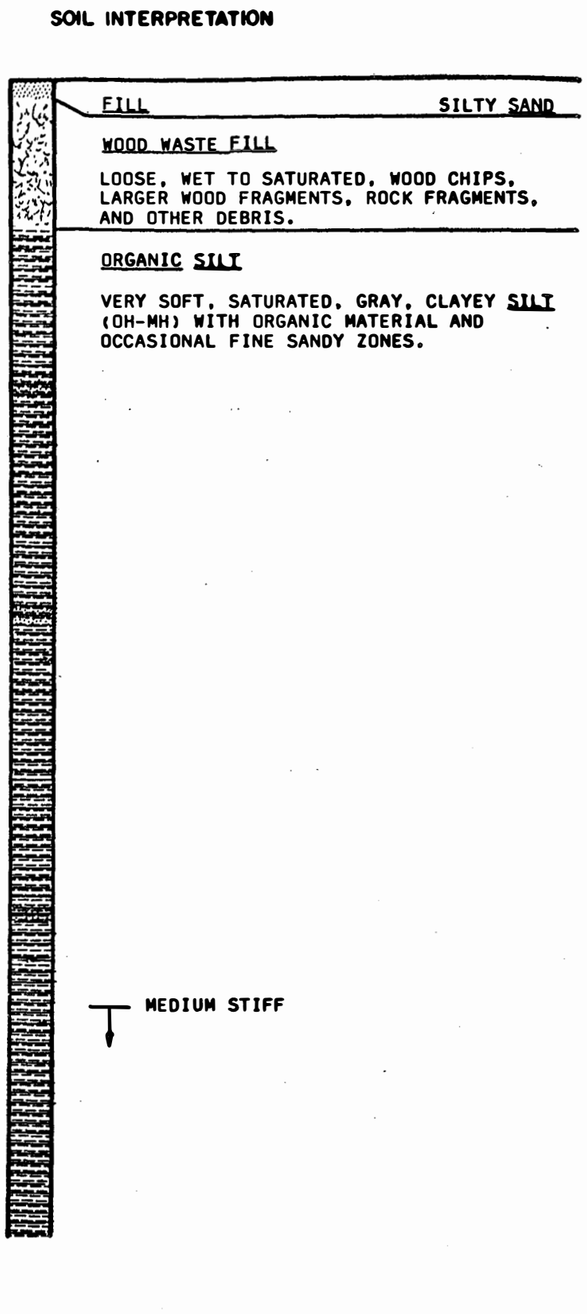
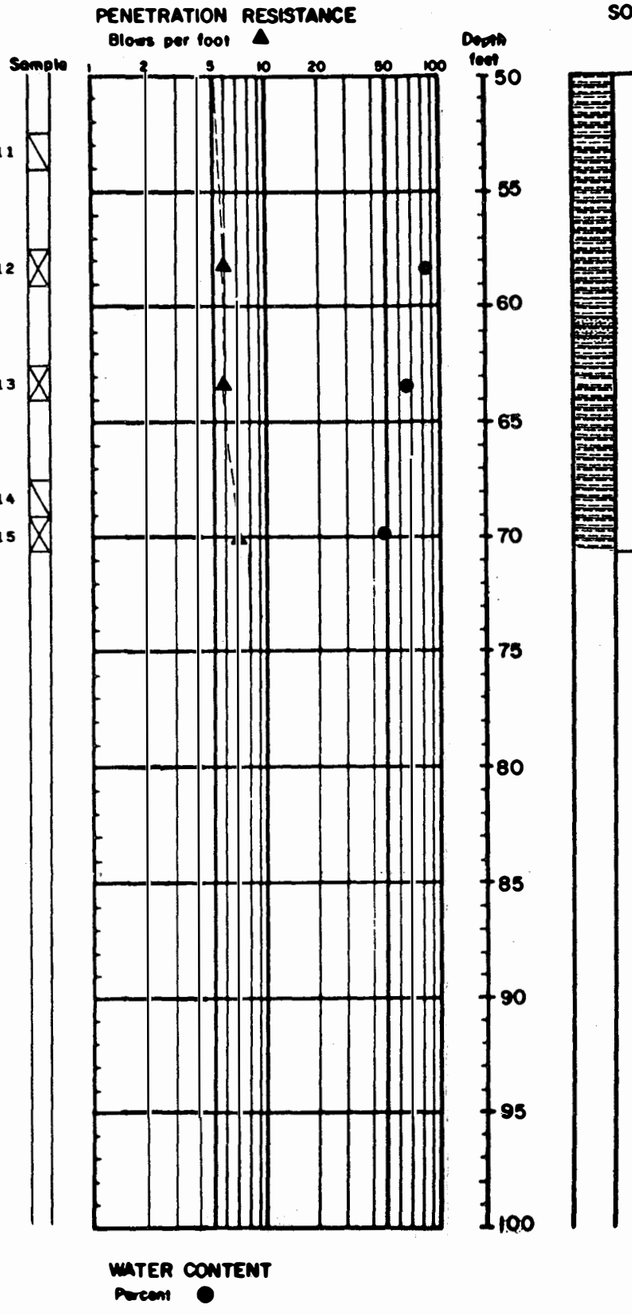
Figure A-1

BORING LOG B-1







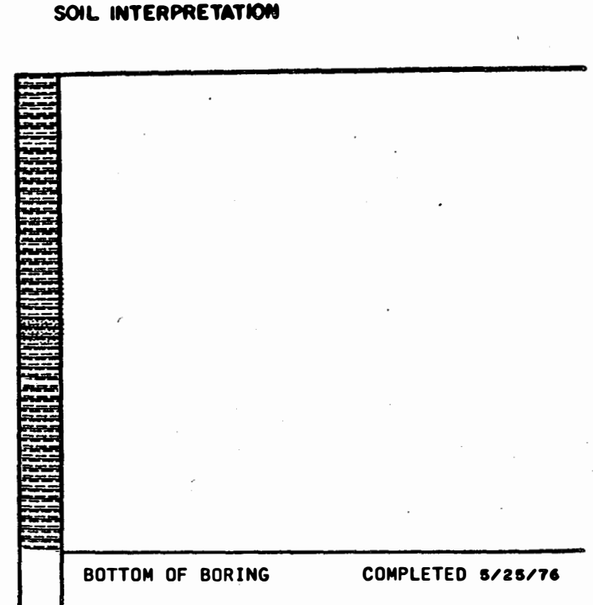


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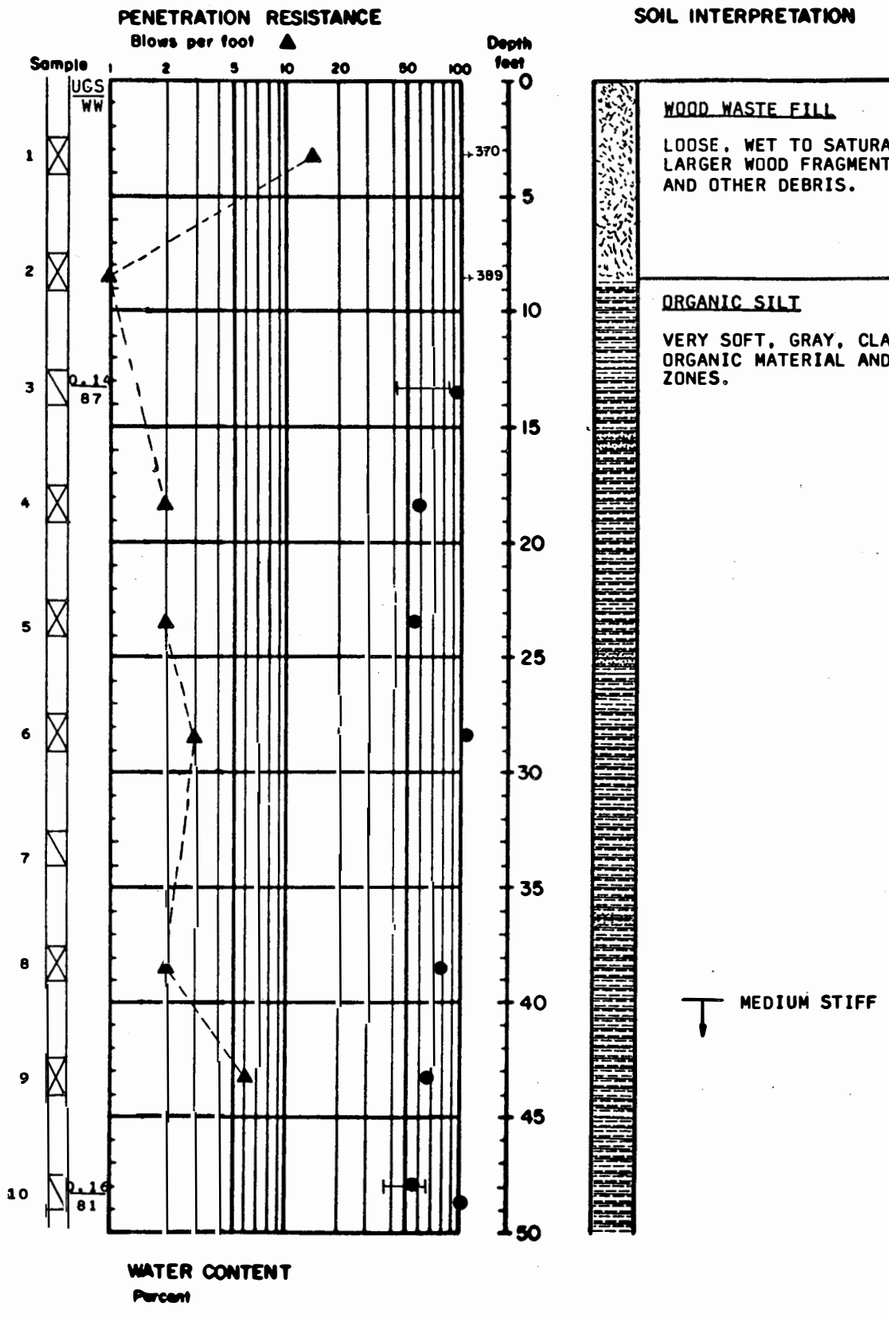
Figure A-2

BORING LOG B-2



SOIL INTERPRETATION

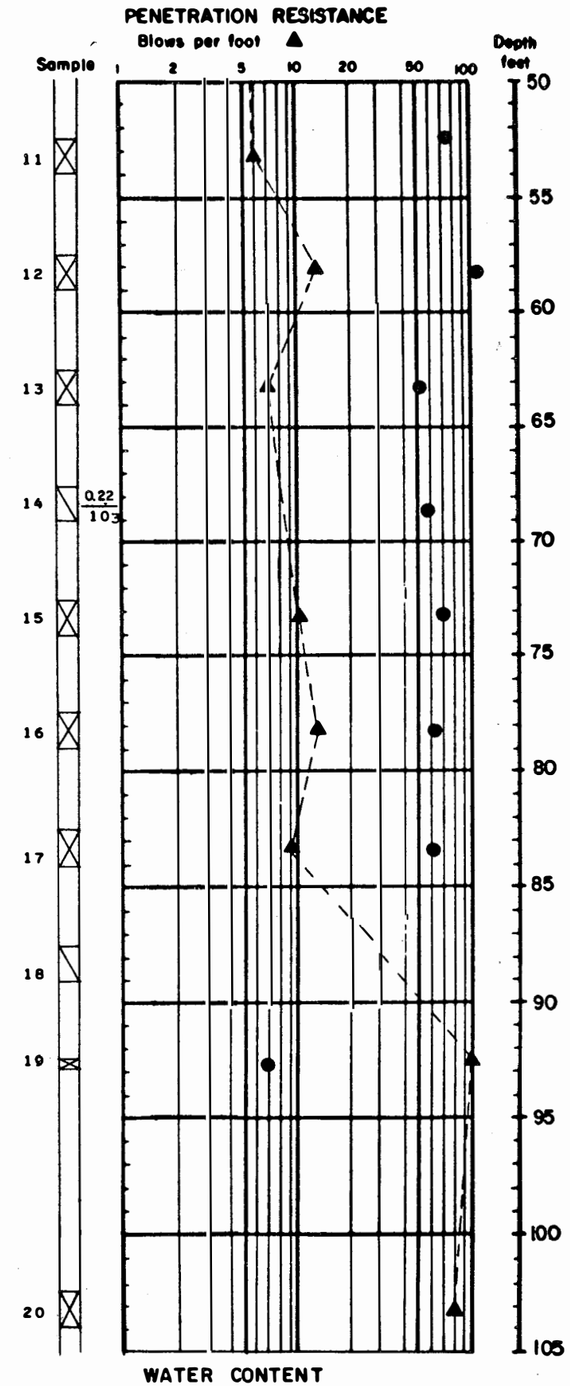
WOOD WASTE FILL

LOOSE, WET TO SATURATED, WOOD CHIPS, LARGER WOOD FRAGMENTS, ROCK FRAGMENTS, AND OTHER DEBRIS.

ORGANIC SILT

VERY SOFT, GRAY, CLAYEY SILT (OH-MH) WITH ORGANIC MATERIAL AND OCCASIONAL FINE SANDY ZONES.

MEDIUM STIFF



SOIL INTERPRETATION

STIFF

VERY DENSE SAND

VERY DENSE, SATURATED, GRAY, SILTY, GRAVELLY, FINE TO COARSE SAND (SM).

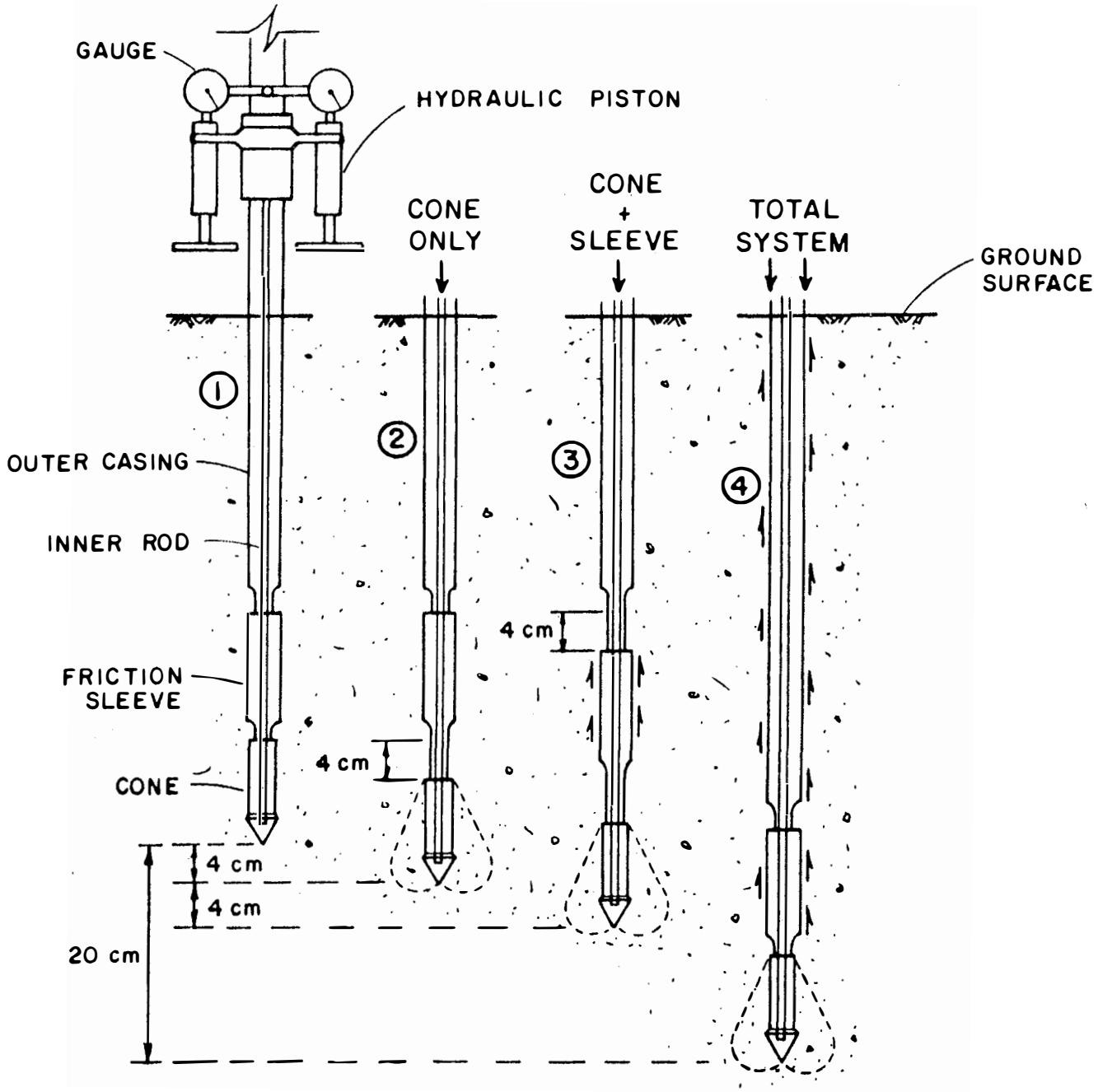
BOTTOM OF BORING J-304 COMPLETED 5/24/76

JUNE 1976

HART-CROWSER & associates inc

Figure A-3

PRINCIPLE OF DUTCH CONE PENETROMETER



PROCEDURE

1. The cone as shown in position 1 is pushed down by the inner rod for a depth of 4 cm, and the point resistance measured.
2. From position 2 the point is again pushed 4 cm and the combined point resistance and side friction is measured by causing the sleeve to be lowered as shown in position 3.
3. The total system is then advanced 20 cm by pushing the outer casing to position 4 from which the next test is accomplished.

NOTES:

1. The cone apex angle = 60°
   section area = 10 cm
2. Length of friction sleeve = 13 cm
   diameter = 36 mm

J-304 JUNE 1976

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Figure A-4

SOIL CLASSIFICATION CHART
(Schmertmann 1969)

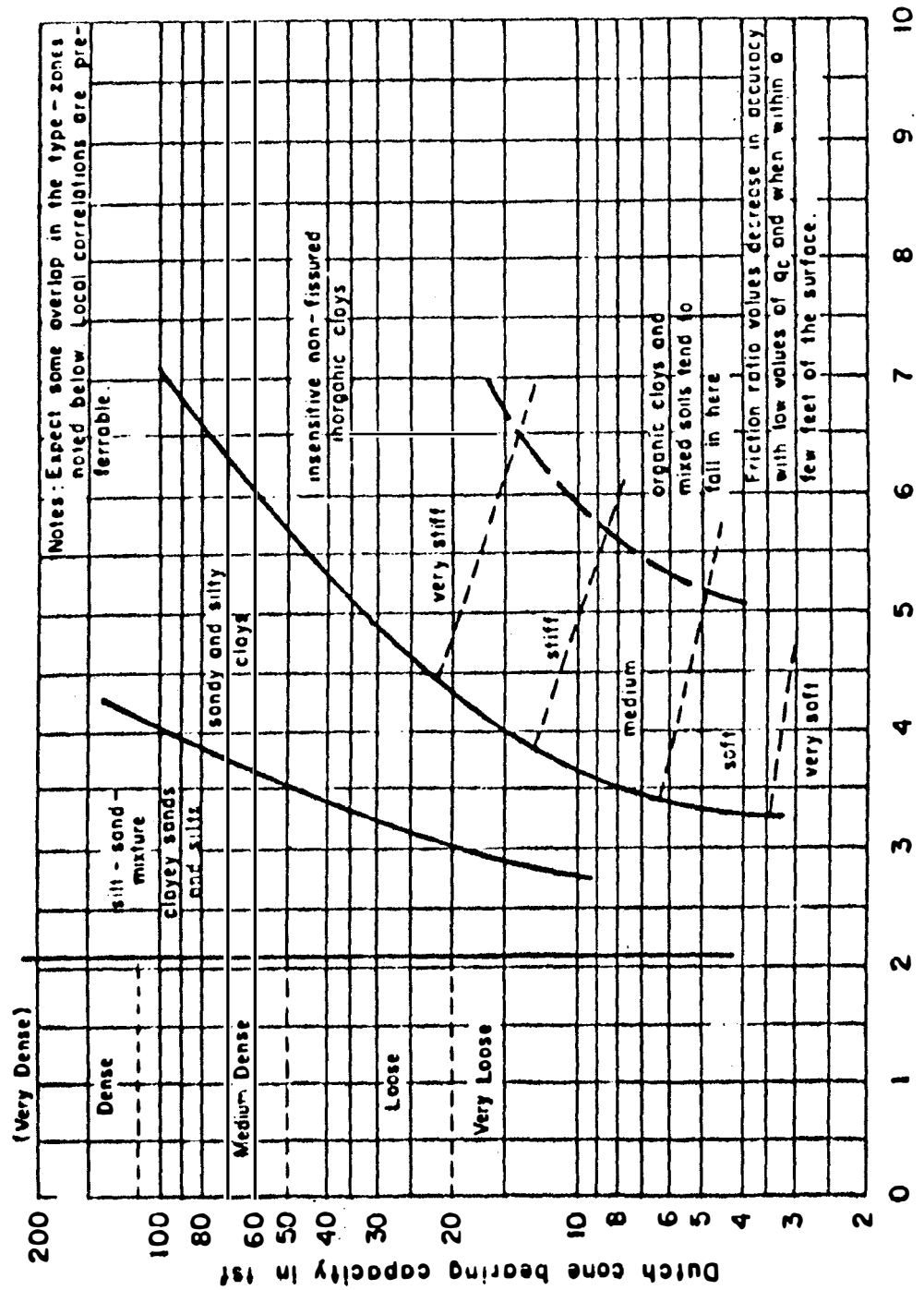

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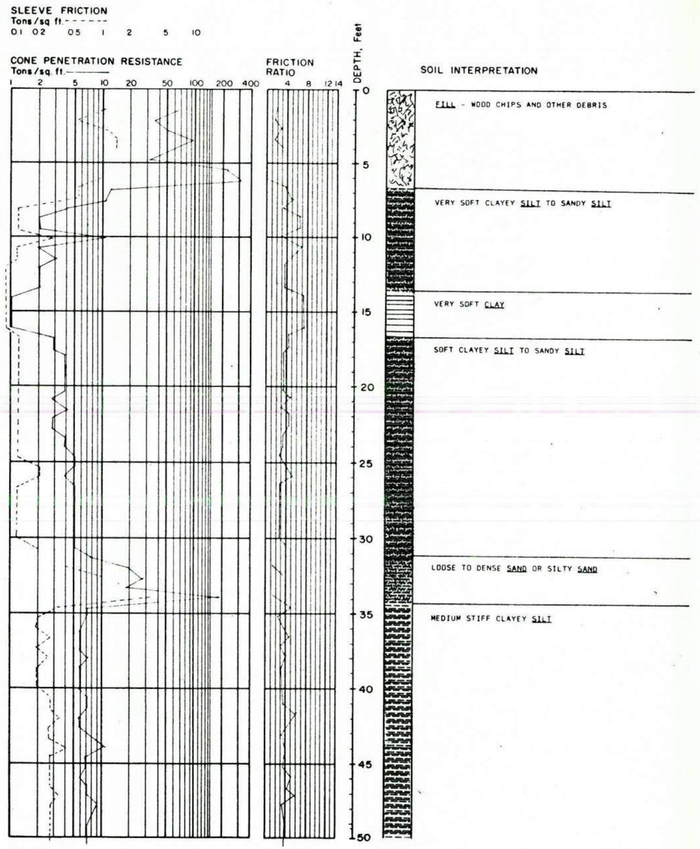
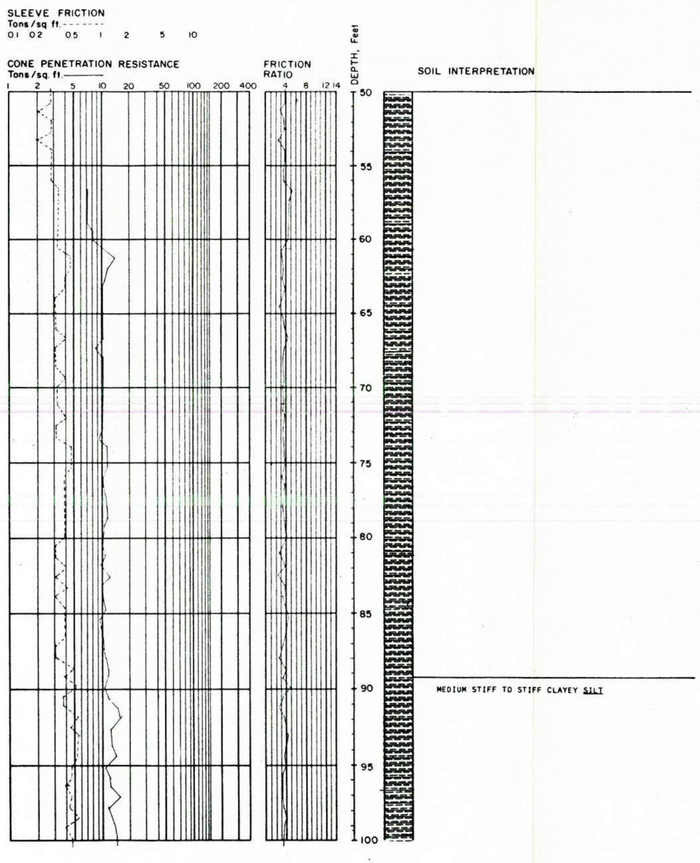
Figure A-5

LOG OF PROBE P-1





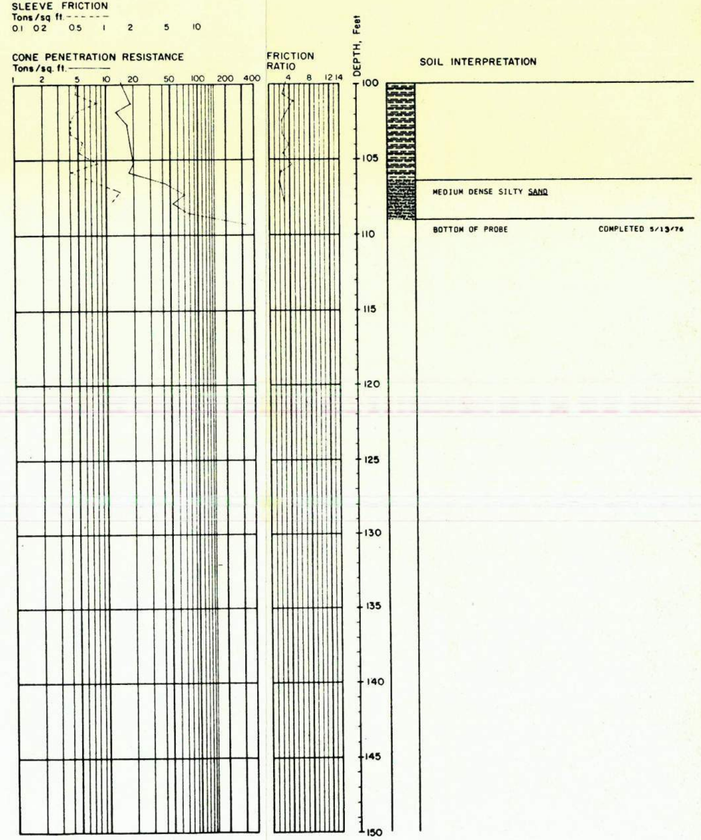


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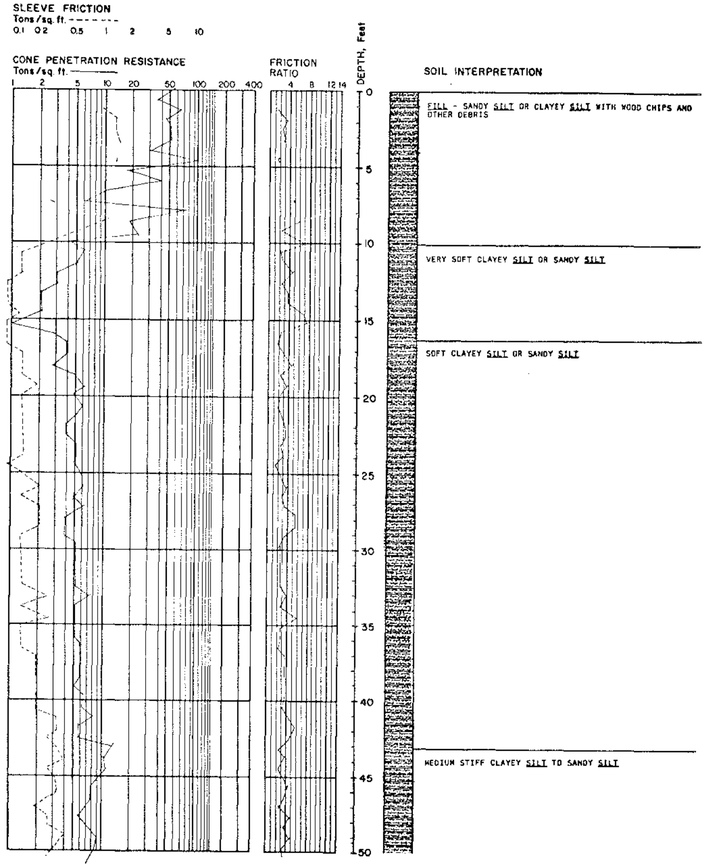
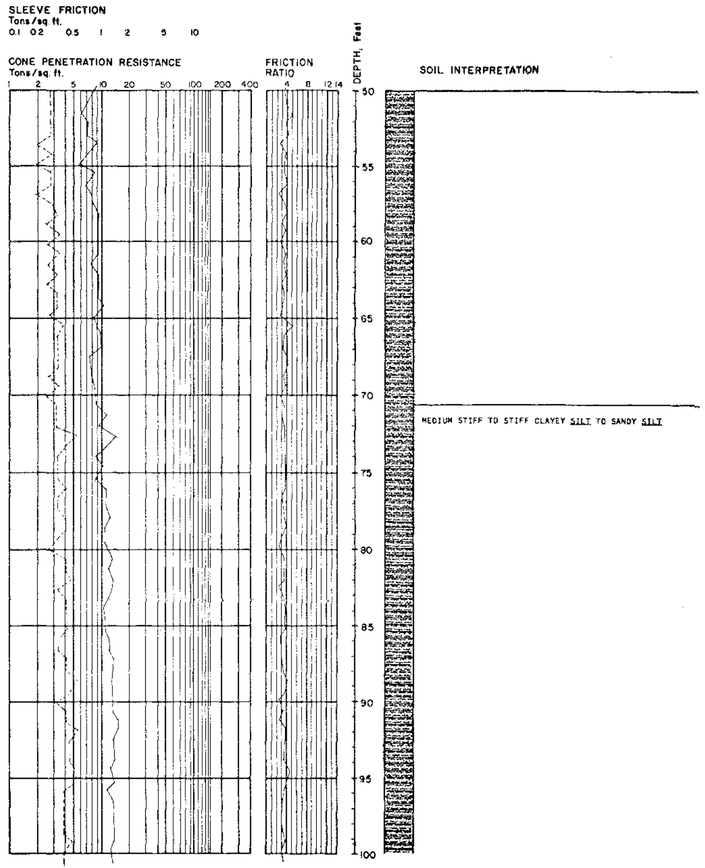
Figure A-6

LOG OF PROBE P-2





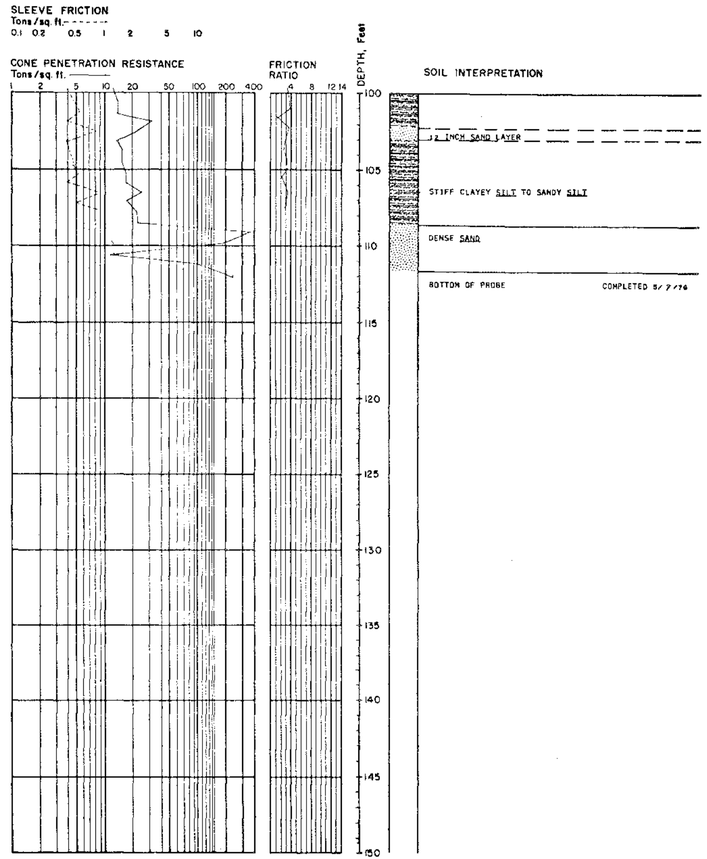


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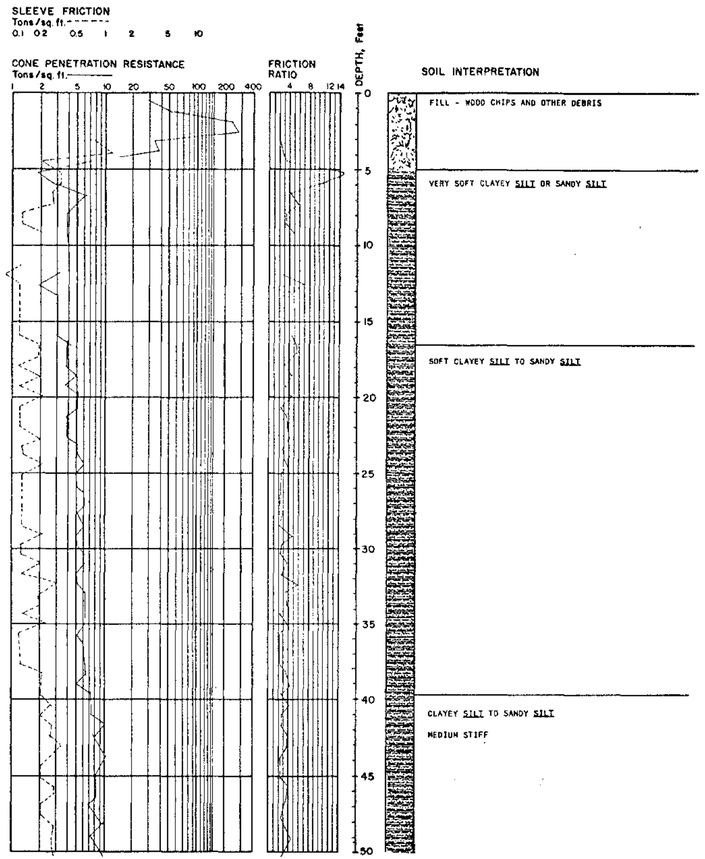
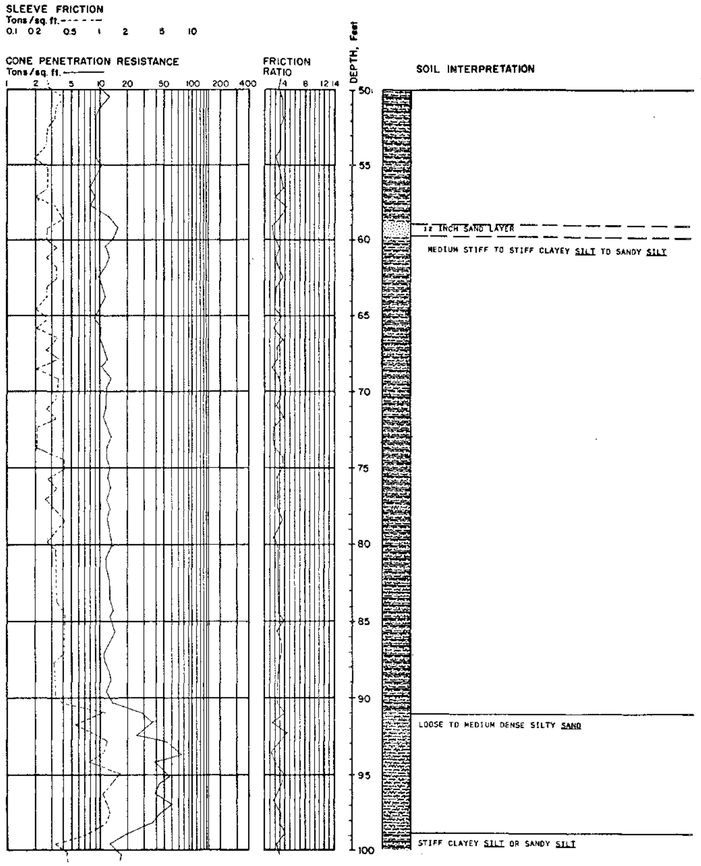
Figure A-7

LOG OF PROBE P-3





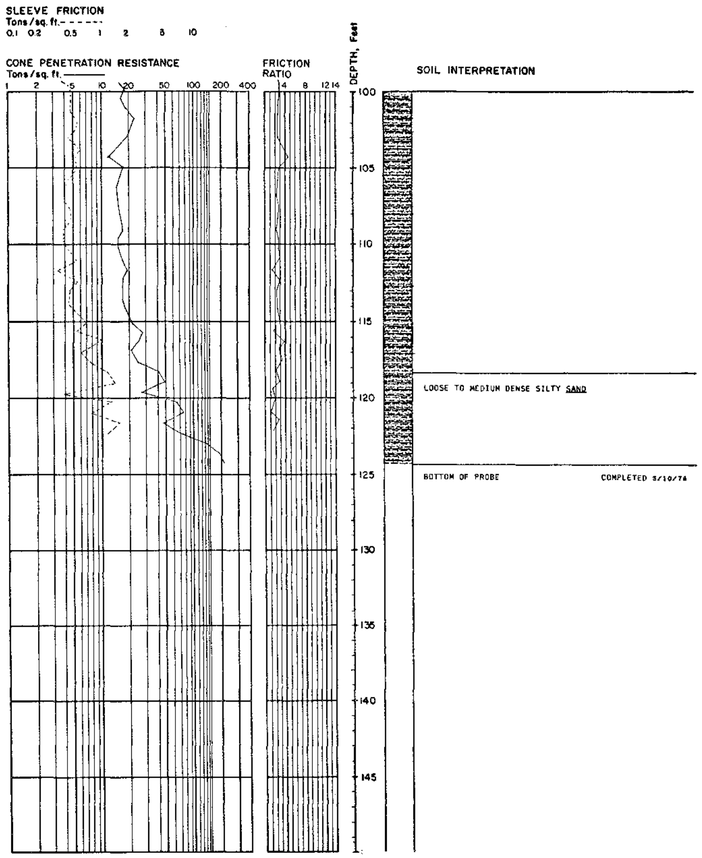


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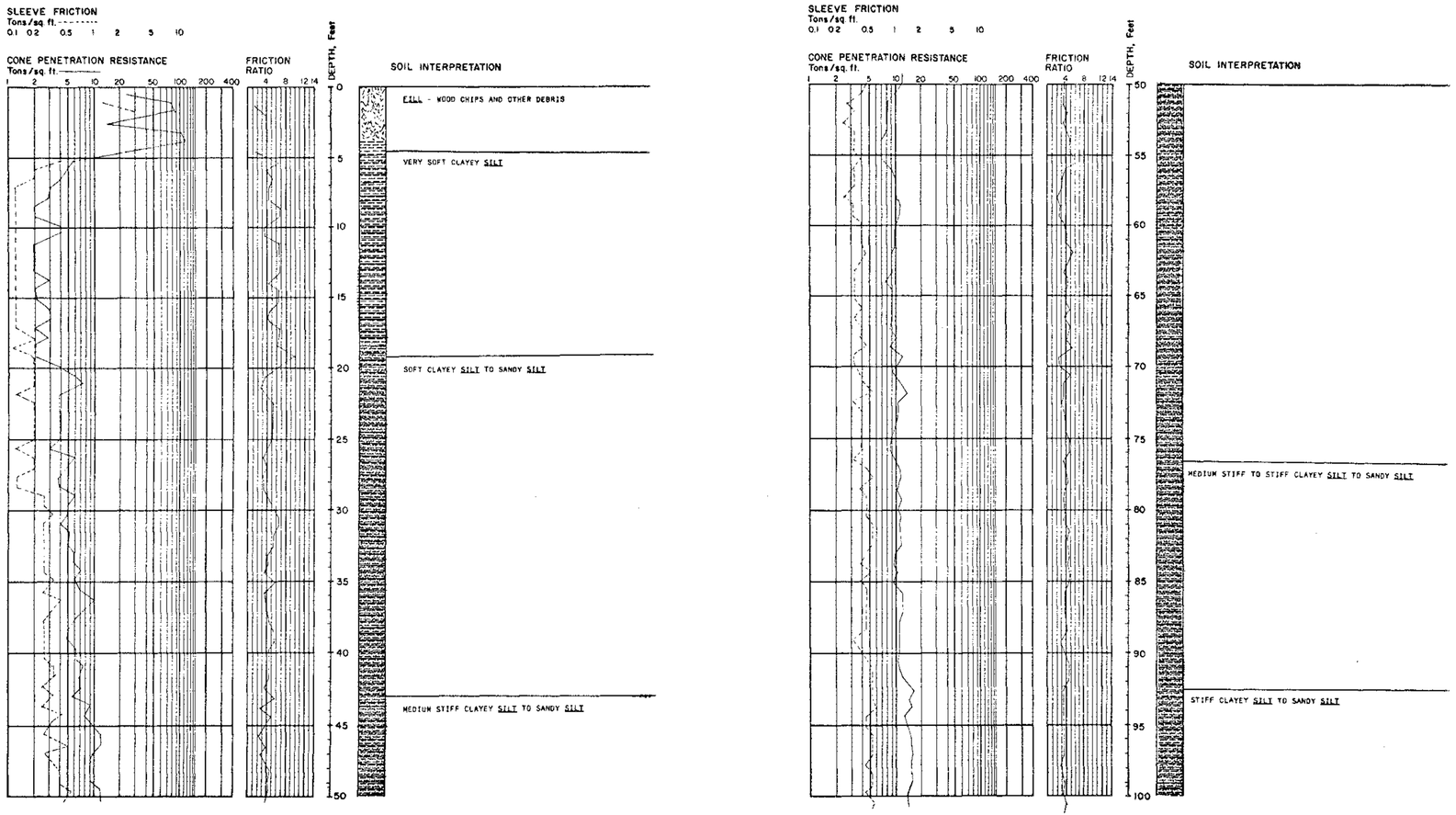
Figure A-8

LOG OF PROBE P-4



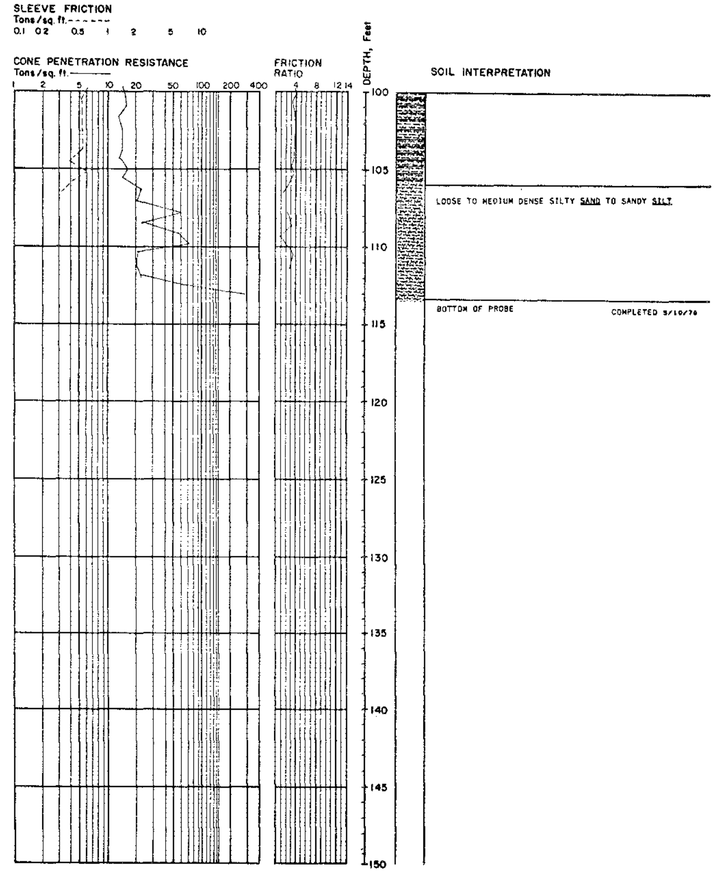


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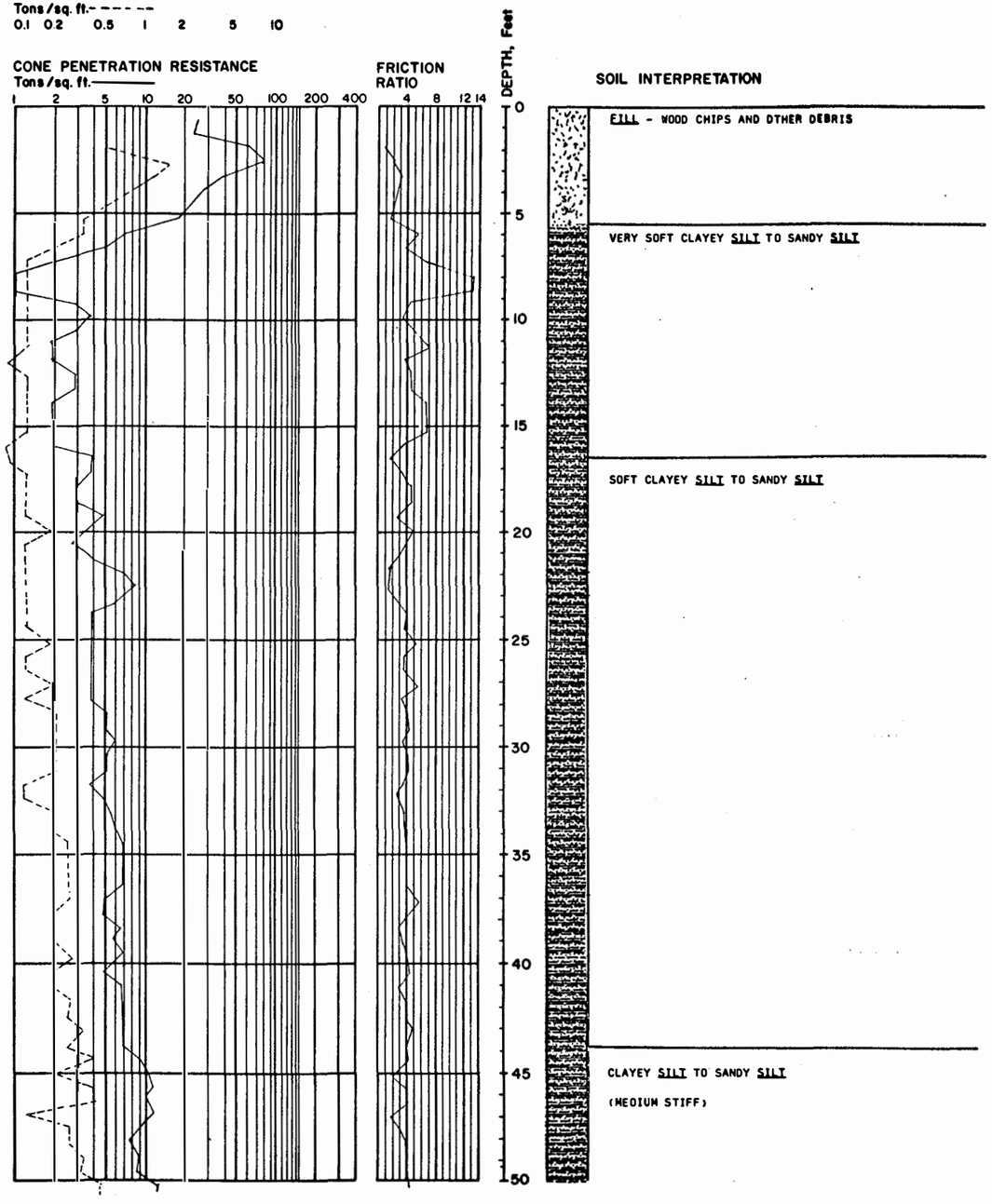
Figure A-9

LOG OF PROBE P-5



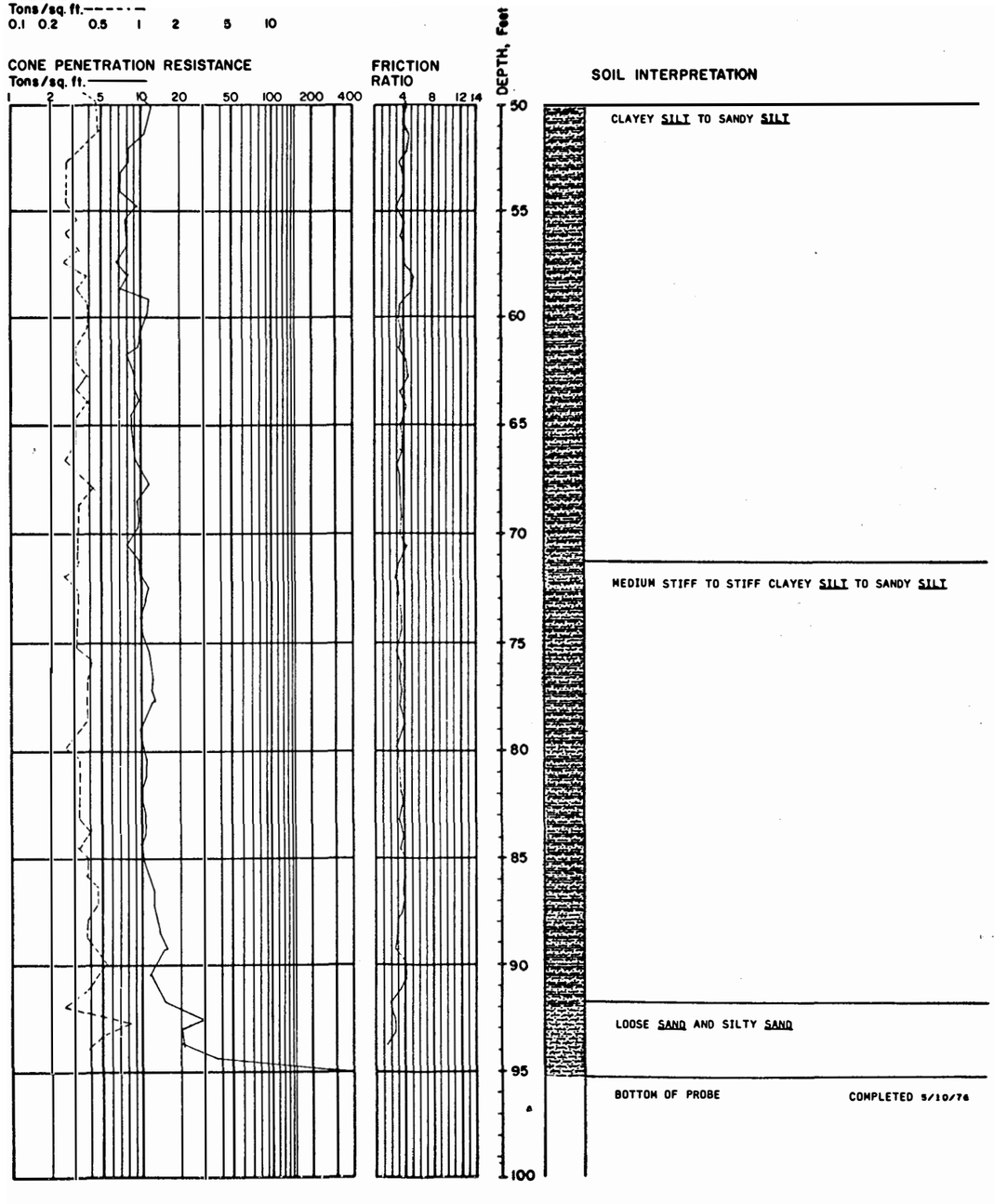


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Figure A-10

APPENDIX B

LABORATORY TESTING

A laboratory testing program was developed to establish the basic index and engineering properties of site soils. Particular attention was directed to determining the consolidation and shear strength characteristics of the compressible SILT soils.

Classification Tests

All samples were visually reclassified in our laboratory and the field logs verified and modified as required. In addition, the natural water content was determined for most samples and Atterberg limits performed on selected samples for the purposes of (1) identification and correlation of the soils, and (2) providing basic engineering properties. Natural water contents are presented on the logs of borings, Appendix A. Atterberg limits are presented on the plasticity chart, Figure B-1.

Unconfined Compression Tests

Unconfined compression tests were performed on selected, relatively undisturbed samples by subjecting a cylindrical specimen to axial compression until failure occurs at peak compressive stress. The undrained shear strength of a cohesive soil tested in this manner is generally taken as one-half its unconfined compressive strength. Wet unit weight and natural moisture content were also determined for all specimens. Unconfined compression test results and wet unit weights are presented on the logs of borings, Appendix A.

Direct Shear Tests

Direct shear tests were performed on selected samples to determine the shear strength characteristics of the SILT soils The test series was performed on relatively undisturbed soils placed into a 2.5-inch diameter shear box. A normal load was applied and the sample allowed to consolidate with access to water prior to testing. Shearing was conducted at a constant strain rate of 0.001 inches per minute with shear stress measured using a calibrated proving ring. Direct shear test results, plotted in terms of normal and shear stress, are presented on Fig. B-2.

Consolidation Tests

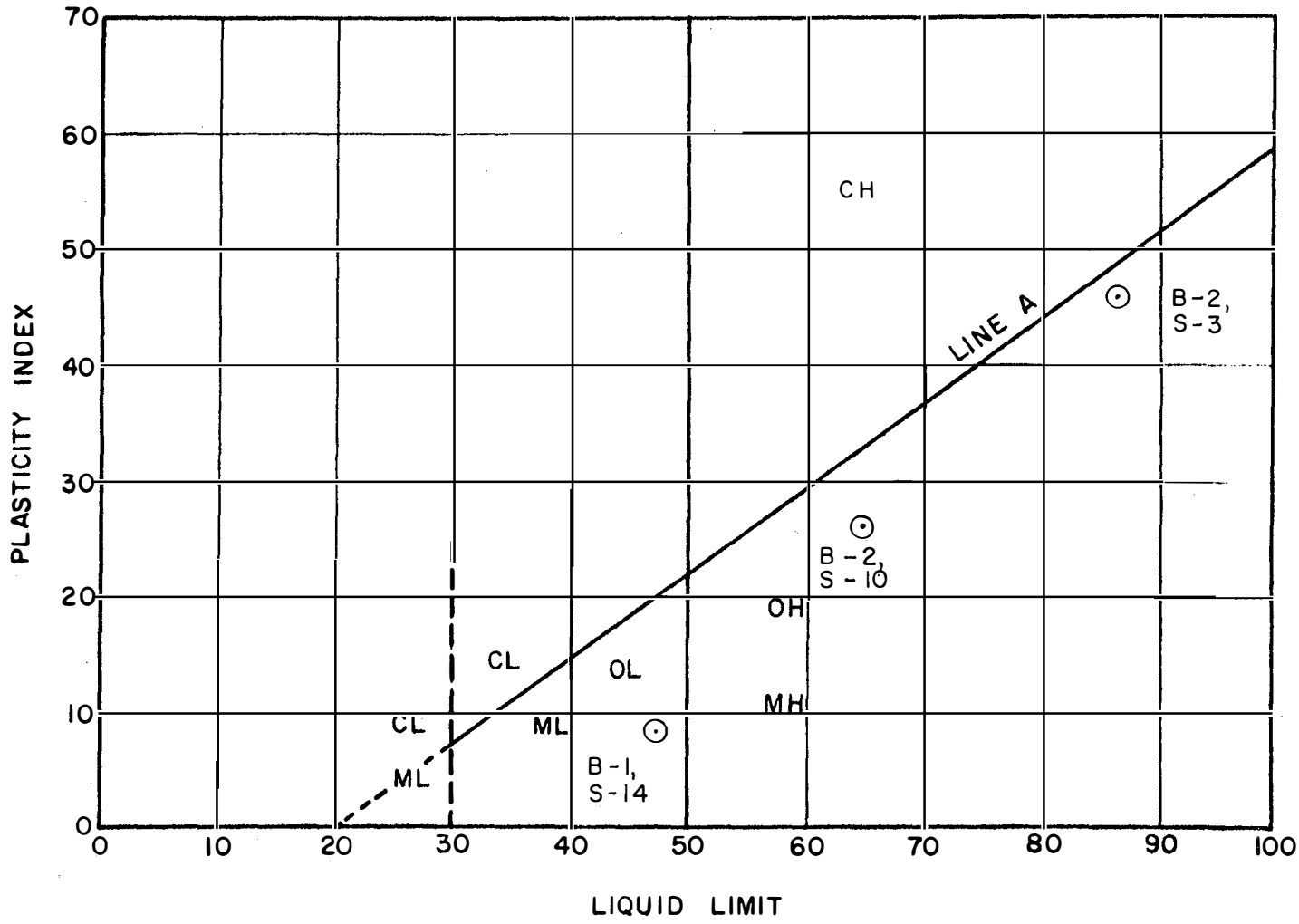
Three consolidation tests were performed on selected samples of compressible SILT soils to provide data for making settlement estimates. Relatively undisturbed samples were carefully trimmed and fitted into a rigid ring with porous stones placed on the top and bottom of the sample to allow drainage or absorption of water to approximate possible saturation under field conditions.

Vertical loads were then applied in increments with each load being allowed to consolidate prior to adding the following increment. Measurements of the time compression were obtained during each load increment and rebound was measured during the unloading portion. Consolidation test results, plotted in terms of percent consolidation (strain) versus applied load (stress), are presented on Figs. B-3 through B-5.

Groundwater and Leachate Analysis

Chemical and bacterial analyses were performed by Laucks Testing Laboratories Inc. of Seattle, Washington. The laboratory test results are presented in a certificate from Laucks Testing Laboratory on Figure B-6.

PLASTICITY CHART



		LL	PL	PI	
B-2, S-3	⊙	87	41	46	Organic Clayey SILT (OH-MH)
B-2, S-10	⊙	65	38	27	Organic Clayey SILT (OH-MH)
B-1, S-14		47	38	9	Organic SILT (OL-ML)

J-304 JUNE 1976

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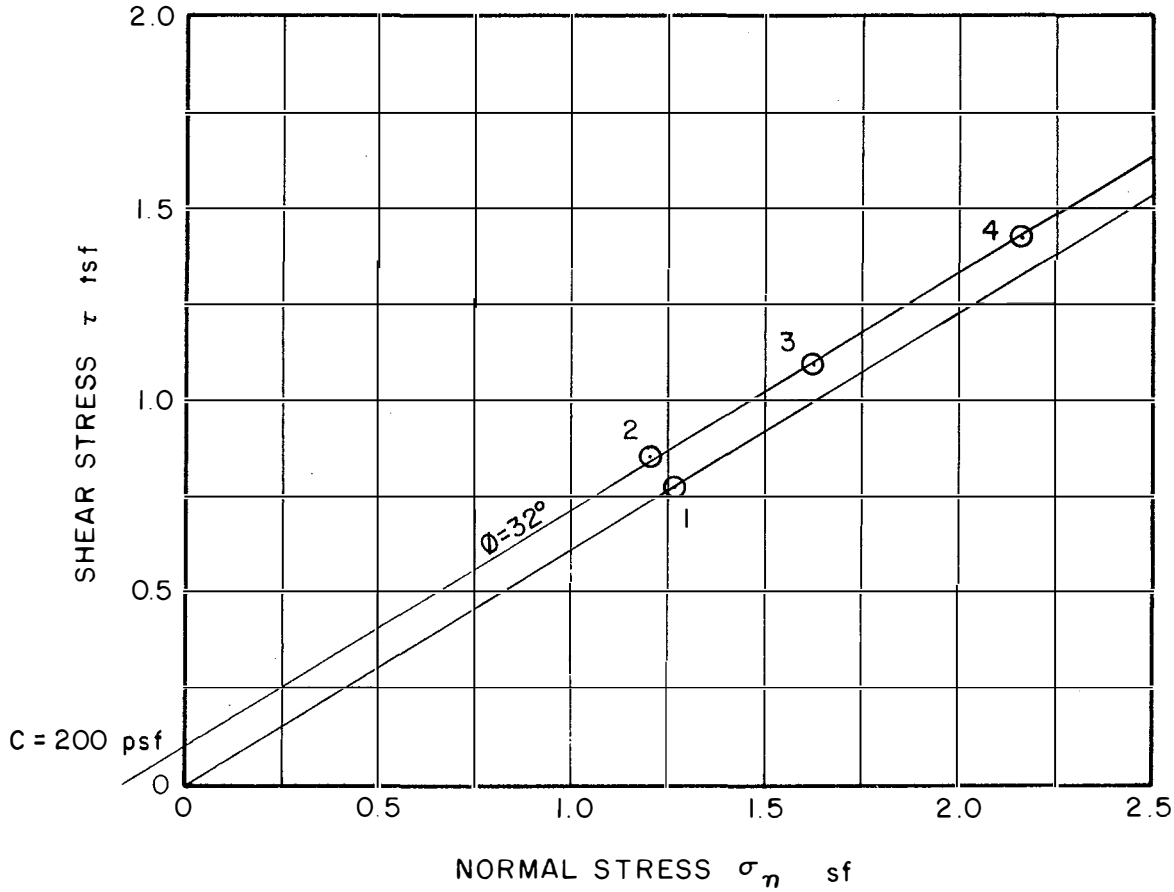
Figure B-1

DIRECT SHEAR TEST RESULTS



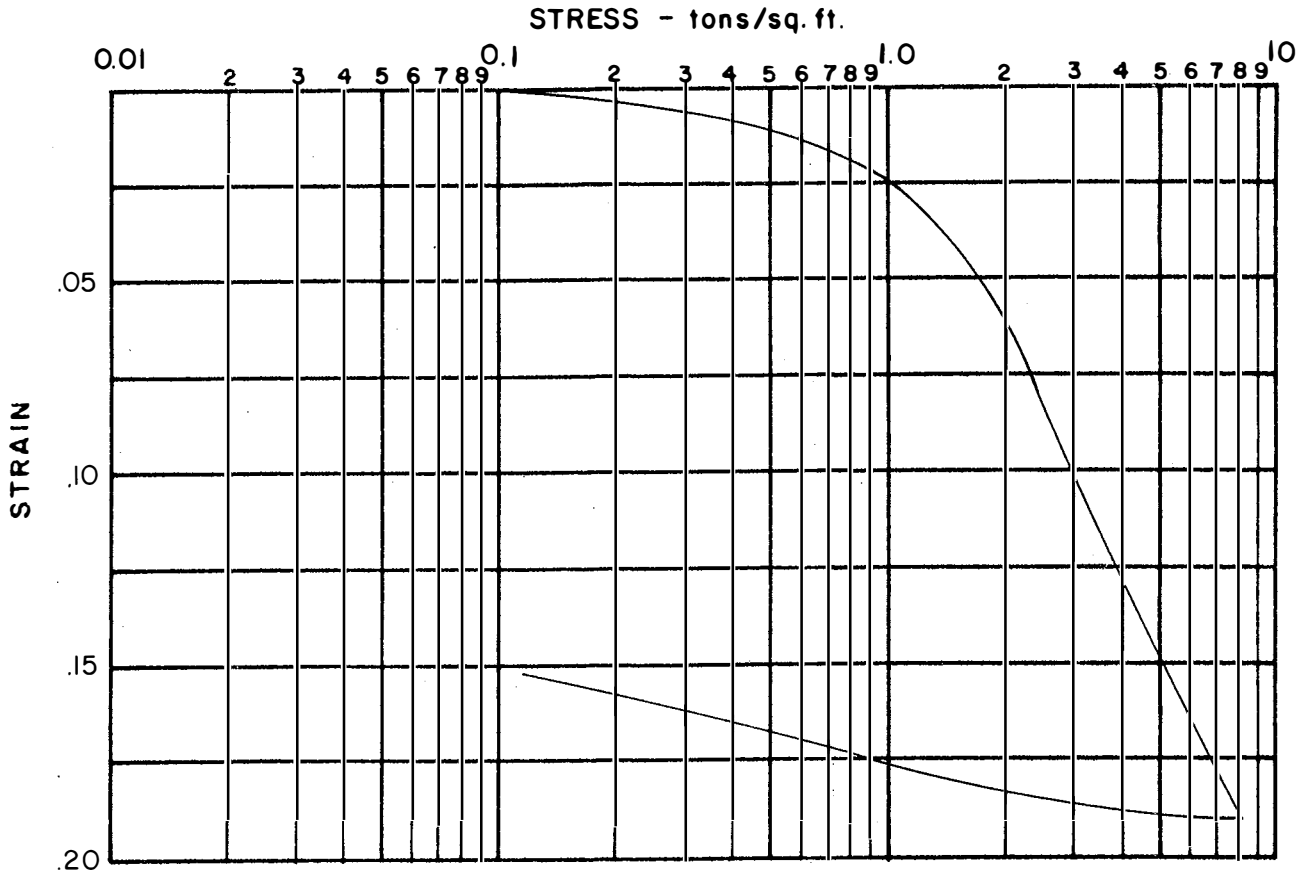
TEST NO.	SAMPLE	DEPTH FEET	UNDISTURBED SAMPLE WET UNIT WEIGHT (PCF)	NATURAL % W.C.	ATTERBERG LIMITS LL	PL	PI	CLASSIFICATION
1	B-1, S-8	37.5-39	90.7	55	—	—	—	
2	B-2 S-10	47.5-49			65	38	27	Organic Clayey SILT (OH-MH)
3	"	"	100.1	57	"	"	"	" " "
4	"	"	99.9	51	"	"	"	" " "

J-304 JUNE 1976

HART-CROWSER & associates inc

Figure B-2

CONSOLIDATION TEST RESULTS



SAMPLE	DEPTH, feet	% WATER CONTENT Before	After	ATTERBERG LIMITS LL	PL	PI	CLASSIFICATION
B-1, S-14	67.5-69.0	62	51	47	38	9	Organic SILT (OL-ML)

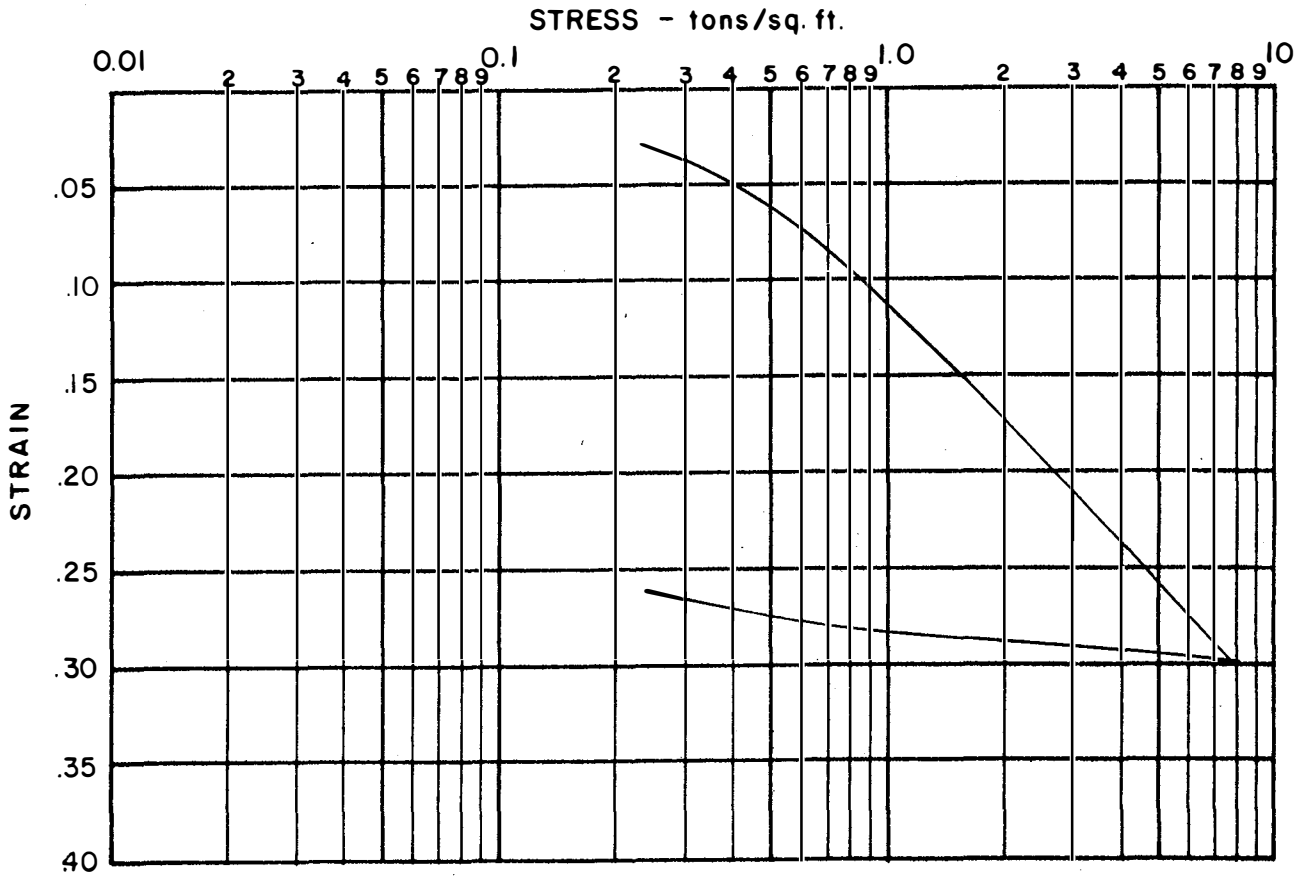
WET UNIT WEIGHT = 100.1 pcf

J-304 JUNE 1976

HART-CROWSER & associates inc.

Figure B-3

CONSOLIDATION TEST RESULTS



SAMPLE	DEPTH, feet	% WATER CONTENT Before	After	ATTERBERG LIMITS LL	PL	PI	CLASSIFICATION
B-2, S-3	12.5-14.0	90	51	87	41	46	Organic Clayey SILT (OH-MH)

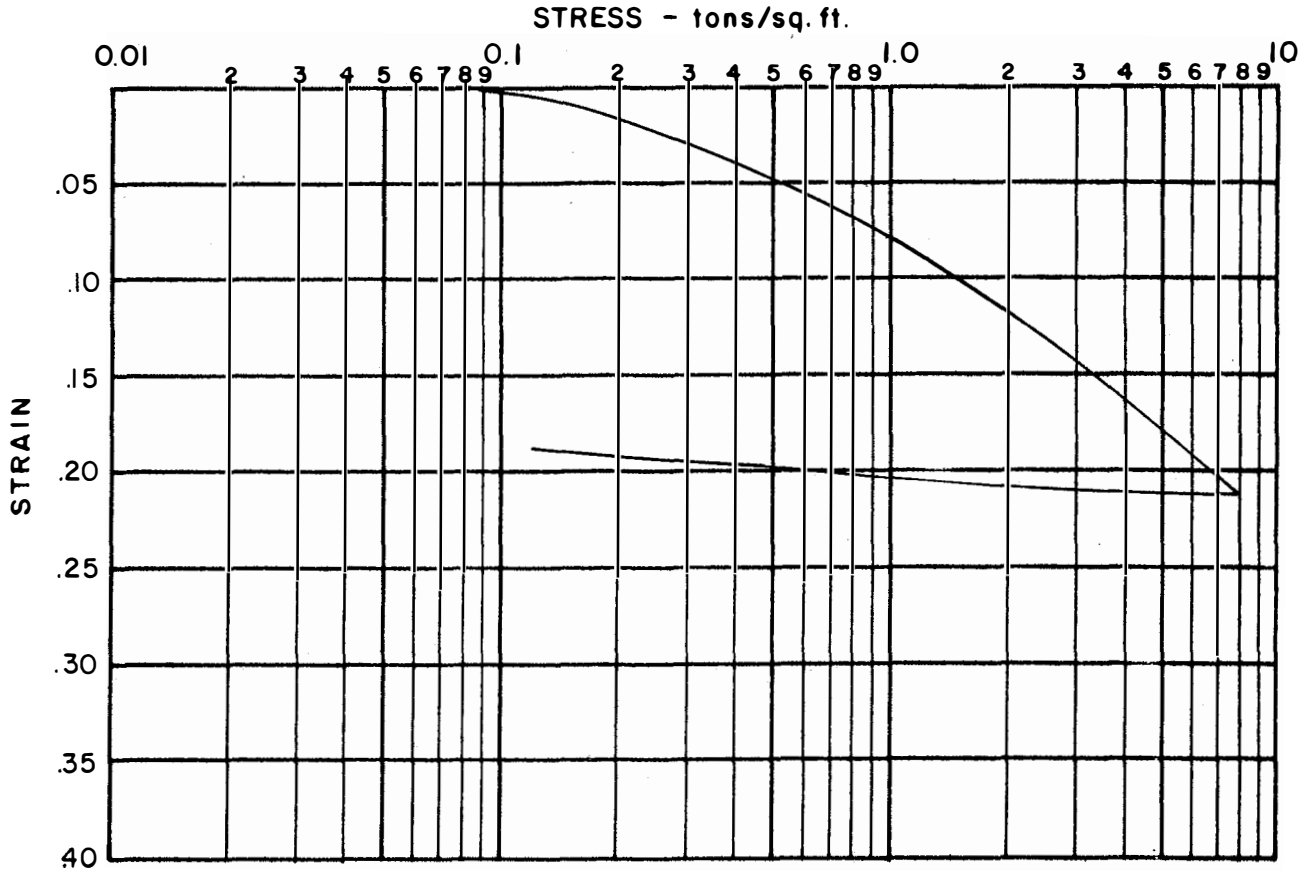
WET UNIT WEIGHT = 98.5 pcf

J-304 JUNE 1976

HART-CROWSER & associates inc.

Figure B-4

CONSOLIDATION TEST RESULTS



SAMPLE	DEPTH, feet	% WATER CONTENT Before	After	ATTERBERG LIMITS LL	PL	PI	CLASSIFICATION
B-2, S-10	47.5-49.0	57	28	65	38	27	Organic Clayey SILT (OH-MH)

WET UNIT WEIGHT = 105.1 pcf

J-304 JUNE 1976

HART-CROWSER & associates inc.

Figure B-5

CERTIFICATE

LAUCKS TESTING LABORATORIES

INCORPORATED

(206) 622-0727
1008 WESTERN AVENUE
SEATTLE, WASHINGTON 98104

CHEMISTS
SAMPLERS · INSPECTORS
ASSAYERS · SPECTROGRAPHERS
BIO-CLINICAL CHEMISTRIES

LABORATORY NO. 56490

DATE June 21, 1976

CLIENT Hart Crowser & Associates
Washington Plaza
Suite 1414
Tacoma, Washington 98402

RECEIVED
JUN 22 1976
HART - CROWSER

REPORT ON GROUND WATER

SAMPLE IDENTIFICATION Submitted: 6/11/76

Marked: Job WJ-304

TESTS PERFORMED AND RESULTS:

Identification	pH, glass electrode	Specific Conductance micromhos/cm	Chemical Oxygen Demand, milligrams/L	5 Day B.O.D. Milligram per Liter
GP-1	5.7	370	520	350
GP-2	5.5	225	460	250
GP-3	4.6	330	580	--
GP-4	5.3	380	350	--
NE	6.0	225	--	--
NW	6.2	505	--	--
SE	6.0	420	--	--
SW	6.1	555	--	--

	Milligrams/Liter		
Identification	Total Solids	Volatile Solids	Fixed Solids
GP-1	800	195	605
SE	5950	1740	4210

Fixed solids from above samples were analyzed qualitatively spectrographically, with results as follows:

THIS REPORT IS SUBMITTED FOR THE EXCLUSIVE USE OF THE PERSON, PARTNERSHIP, OR CORPORATION TO WHOM IT IS ADDRESSED. SUBSEQUENT USE OF THE NAME OF THIS COMPANY OR ANY MEMBER OF ITS STAFF IN CONNECTION WITH THE ADVERTISING OR SALE OF ANY PRODUCT OR PROCESS WILL BE GRANTED ONLY ON CONTRACT. THIS COMPANY ACCEPTS NO RESPONSIBILITY EXCEPT FOR THE DUE PERFORMANCE OF INSPECTION AND/OR ANALYSIS IN GOOD FAITH AND ACCORDING TO THE RULES OF THE TRADE AND OF SCIENCE.

Figure B-6

CERTIFICATE

LAUCKS TESTING LABORATORIES
INCORPORATED

MAin 2-0727
1008 WESTERN AVENUE
SEATTLE, WASHINGTON 98104

LABORATORY NO. 56490

Hart Crowser & Associates

	GP-1	SE
Major constituents	Magnesium & Calcium	Magnesium & Calcium
Minor constituents	Silicon & Sodium	Silicon
Trace constituents	Lead, Aluminum, Molybdenum, Nickel, Titanium, Manganese, Potassium, Chromium, and Vanadium	Lead, Aluminum, Sodium, Titanium, Manganese, Potassium, Chromium, Vanadium

Bacteriological Analyses

	NE	SW
Total Bacteria Count per ml	300,000	1,900,000
Total Coliform Count, M.P.N. per 100 ml of sample	greater/240,000	43
Fecal Coliform Count M.P.N. per 100 ml of sample	less/3	less/3
Fecal Strep. M.P.N. per 100 ml of sample	4,600	less/3

Respectfully submitted,

LAUCKS TESTING LABORATORIES, INC.

J. M. Owens

JMO:po

THIS REPORT IS SUBMITTED FOR THE EXCLUSIVE USE OF THE PERSON, PARTNERSHIP, OR CORPORATION TO WHOM IT IS ADDRESSED. SUBSEQUENT USE OF THE NAME OF THIS COMPANY OR ANY MEMBER OF ITS STAFF IN CONNECTION WITH THE ADVERTISING OR SALE OF ANY PRODUCT OR PROCESS WILL BE GRANTED ONLY ON CONTRACT. THIS COMPANY ACCEPTS NO RESPONSIBILITY EXCEPT FOR THE DUE PERFORMANCE OF INSPECTION AND/OR ANALYSIS IN GOOD FAITH AND ACCORDING TO THE RULES OF THE TRADE AND OF SCIENCE.

MILLER JUNIOR HIGH SCHOOL

ABERDEEN SCHOOL DISTRICT NO. 5 — **ABERDEEN, WASHINGTON**

ARCHITECTS

STREET & LUNDGREN
ABERDEEN, WA

WALDRON & POMEROY
SEATTLE, WA

STRUCTURAL ENGINEER — **CHALKER ENGINEERS**
MECHANICAL ENGINEER — **RALPH J. BAUM**
ELECTRICAL ENGINEER — **B.A. TRAVIS & ASSOC.**

LANDSCAPE ARCHITECT — **LEE/MERTL ASSOC.**

ABBREVIATIONS

THIS IS A COMPREHENSIVE LIST OF ABBREVIATIONS, SOME OF WHICH MAY NOT APPEAR ON THESE DRAWINGS.

AC.(ACOUS.)	ACOUSTICAL	MAX.	MAXIMUM
ADD.	ADDITION	M.B.	MACHINE BOLT
ADJ.	ADJUSTABLE	MECH.	MECHANICAL
ADJ'T	ADJACENT	MH.	MANHOLE
AGG.	AGGREGATE	MIN.	MINIMUM, OR MINUTE
ALT.	ALTERNATE	MET.	METAL
ALUM.	ALUMINUM	M.O.	MASONRY OPENING
ANOD.	ANODIZED	M.P.F.EXT.	MULTI-PURPOSE FIRE EXTINGUISHER
APPROX.	APPROXIMATE		
ARCH.	ARCHITECT		
ASPH.	ASPHALT	N.I.C.	NOT IN CONTRACT
A.F.F.	ABOVE FIN. FLOOR	NO.	NUMBER
		NOM.	NOMINAL
BD.	BOARD	NON-COM.	NON-COMBUSTIBLE
BLK'G	BLOCKING	N.T.S	NOT TO SCALE
BLDG	BUILDING		
B.M.	BENCH MARK	O.C.	ON CENTER
BM	BEAM	OFF.	OFFICE
B.N.	BULL-NOSE	O.D.	OUTSIDE DIAMETER
B.SPL.	BACKSPLASH	OVAL.	OVAL HEAD
B.T.	BLACKTOP	OPNG.	OPENING
		OPP.	OPPOSITE
		OVHD	OVERHEAD
C.A.B.	CEMENT ASBESTOS BOARD	PAR.	PARALLEL
CAB'T	CABINET	PART.	PARTITION
C.B.	CATCH BASIN	P.C.	PRECAST
CH.	CHAIN	P.D.	PLAZA DRAIN
CHANF.	CHAMFER	PERF.	PERFORATED
CHAN.	CHANNEL	PERP.	PERPENDICULAR
CH.BD.	CHALK BOARD	P.F.PLYWD	PLASTIC FACED PLYWOOD
C.I.	CAST IRON	P.GL.	PATTERNED GLASS
C.I.P.	CAST IN PLACE	PL.	PLATE
C.J.	CONSTRUCTION JOINT	PLA.	PLASTER
CLG	CEILING	PL.GL.	PLATE GLASS
C.M.U.	CONCRETE MASONRY UNIT	PLAS.LAM.	PLASTIC LAMINATE
C.O.	CLEANOUT	PLYWD	PLYWOOD
COL.	COLUMN	PNL	PANEL
CONC.	CONCRETE	POL.	POLISHED
CONSTR.	CONSTRUCTION	PORC.	PORCELAIN
CONT.	CONTINUOUS	PROP.	PROPERTY
CONTR.	CONTRACTOR	PT.	PAINT
CORR.	CORRUGATE	PTN.	PARTITION
COURS.	COURSES	PVG.	PAVING
CSK	COUNTERSUNK	P.W.GL.	PATTERNED WIRE GLASS
C.T.	CERAMIC TILE		
		Q.T.	QUARRY TILE
DBL.	DOUBLE	R.	RISER
DET.	DETAIL	RAD.	RADIUS
D.F.	DRINKING FOUNTAIN	R.B.	RESILIENT BASE
DIA.	DIAMETER	R.D.	ROOF DRAIN
DIM.	DIMENSION	REFR.	REFRIGERATOR
DISP'R	DISPENSER	REINF.	REINFORCING
DISP'L	DISPOSAL	REQ'D.	REQUIRED
DN	DOWN	R.L.	RAIN LEADER
DR	DOOR	RM.	ROOM
DRWG	DRAWING	R.D.	ROUGH DIMENSIONS
D.S.	DOWN SPOUT	R.T.	RESILIENT TILE
EA.	EACH	SAN.NAP.	SANITARY NAPKIN
EL.(ELEV.)	ELEVATION	S.BL.	SANDBLASTED
ELEC.	ELECTRICAL	SCHED.	SCHEDULE
ELEV'R	ELEVATOR	SECT.	SECTION
ENAM.	ENAMEL	S.F.	SQUARE FOOT
EQ.	EQUAL	S.GL.	SAFETY GLASS
EQUIP.	EQUIPMENT	SHT	SHEET
EXIST.	EXISTING	SHTHG.	SHEATHING
EXP.	EXPANSION, OR EXPOSED	SIM.	SIMILAR
EXT.	EXTERIOR	SL.	SLIDING
E.J.	EXPANSION JOINT	SQ.	SQUARE
		S.S.	STAINLESS STEEL
F.	FIRE	S.SINK	SERVICE SINK
F.A.F.	FLUID APPLIED FLOOR	STD	STANDARD
F.B.	FLAT BAR	STL.	STEEL
F.B.O.	FURNISHED BY OTHERS	STOR.	STORAGE
F.D.	FLOOR DRAIN	STR.	STRUCTURAL
F.EX.	FIRE EXTINGUISHER	SUSP.	SUSPENDED
F.H.	FLAT HEAD		
F.HYD.	FIRE HYDRANT	T.	TREAD
FIN.	FINISH	TEL.	TELEPHONE
FL. (FLR.)	FLOOR	T.GL.	TEMPERED GLASS
FLASH.	FLASHING	T & G	TONGUE & GROOVE
FND'N	FOUNDATION	T.P.RD	TOILET PAPER
F.O.I.C.	FURNISHED BY OTHERS, INSTALLED BY THIS CONTRACTOR	T.W.	TOP OF WALL
		TWL	TOWEL
FT	FEET	TYP.	TYPICAL
FTG	FOOTING		
G.T.	GLAZED TILE	UR.	URINAL
G.	GLAZE	U.V.	UNIT VENTILATOR
GA.	GAUGE		
GALV.	GALVANIZED		
GL.	GLASS		
GLU-LAM.	GLUE LAMINATED	VERT.	VERTICAL
GR.	GRADE	VEST.	VESTIBULE
GYP.BD.	GYPSUM BOARD		
HD	HEAD	W.C.	WATER CLOSET
HD BD	HARD BOARD	WD	WOOD
HD WD	HARD WOOD	W.GL.	WIRE GLASS
H.M.	HOLLOW METAL	WP.	WATERPROOF
HORIZ.	HORIZONTAL	W.R.	WATER RESISTANT
HR.	HOUR	W.S.	WEATHERSTRIPPING
HT.	HEIGHT		
I.D.	INSIDE DIAMETER	Y.D.	YARD DRAIN
IN.	INCHES	Y.H.	YARD HYDRANT
INSUL.	INSULATION		
INT.	INTERIOR		
INV.	INVERT		
JT	JOINT		
K.O.	KNOCKOUT		
LAV.	LAVATORY		

LEGEND

SITE

- exists. contour
- new contour
- exists. spot el.
- new spot el.
- water
- irrigation
- exists. drain
- new drain
- fire hydrant
- manhole
- catch basin
- yard or area drain
- slope grade
- property line
- conc. paving
- asph. paving
- gravel
- special surfacing
- new structure

PLAN, ELEVATION, DETAIL

- coordinate line
- section
- detail
- room no.
- door no.
- wood frame no.
- h.m. frame no.
- alum. frame no.
- alum. wdw. no.
- concrete
- c.m.u.
- brick
- stud wall
- acoustic wall
- drapery & track
- cabinets - base
- tall
- wall hung
- n.i.c./f.n.i.c. equipment

SECTION, DETAIL

- concrete
- asphalt
- grout/mortar
- plywood
- gyp. bd.
- cont. wd. framing
- wd. blocking
- fin. wd. trim
- metal
- batt insul.
- rigid insul.
- ac. insul.

BUILDING DEPT. NOTES

PER 1973 UNIFORM BUILDING CODE

C-1 Occupancy
Type V - 1 hour construction with Type III H. T. Roof
Fire Zone 3
Seismic Zone 3

BUILDING AREA

Main Floor	82,689
Upper Level Areas	9,128
	91,817

AREA SEPARATION

2 hour separation walls at 31,467 sq.ft. max.
Attic draft stop walls at 3,000 sq.ft. max.

CODE AUTHORITIES

Uniform Building Code	1973 & 1976 Ed.
Uniform Mechanical Code	1973 & 1976 Ed.
Uniform Plumbing Code	1973 & 1976 Ed.
Uniform Fire Code	1973 & 1976 Ed.
National Fire Code	1973 & 1976 Ed.
Washington State Electrical Code	

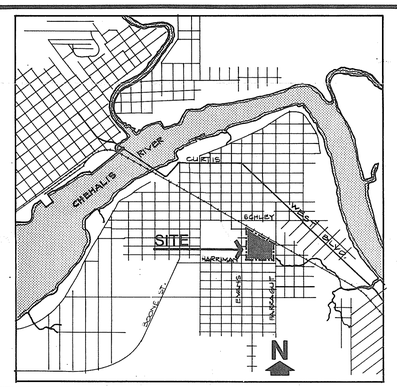
LEGAL DESCRIPTION

"That portion of the N.E. corridor of the N.W. corridor lying southerly of the Union Pacific Railroad right-of-way and easterly of Huotaris Addition to Aberdeen."

UTILITIES

CITY OF ABERDEEN SEWER & WATER:	SEWER:	RUDOLPH BALGAROO, P.E., CITY ENG. 532-4100
	WATER:	ROBERT SALMON, P.E. 532-4100
P.U.D. No. 1		BOYD WINTER, P.E. 532-4220
PACIFIC NORTHWEST BELL		GERRY FOY, MGR. 532-9000
COX CABLEVISION		KING KARAMATIC 532-5894

VICINITY MAP



INDEX OF DRAWINGS

LANDSCAPE

L1	SITE GRADING PLAN
L2	SITE PLANTING
L3	BUILDING PLANTING A
L4	BUILDING PLANTING B
L5	BUILDING IRRIGATION A
L6	BUILDING IRRIGATION B

ARCHITECTURAL

--	COVER SHEET
A1	SITE PLAN
A2	TRACK & FIELD PLAN, DETAILS
A3	SITE DETAILS
A4	COORDINATE PLAN, UPPER LEVEL PLAN
A5	ROOF PLAN
A6	ROOF DETAILS
A7A	UNIT A ROOM FINISH & DOOR SCHEDULES; WINDOW SCHEDULES; FRAME TYPES
A7	FLOOR PLAN
A8	REFLECTED CEILING PLAN
A9	INTERIOR ELEVATIONS
A10	INTERIOR ELEVATIONS
A11A	UNIT B ROOM FINISH & DOOR SCHEDULES
A11	FLOOR PLAN
A12	REFLECTED CEILING PLAN
A13	UPPER LEVEL PLAN
A14	INTERIOR ELEVATIONS
A15	INTERIOR ELEVATIONS
A16	INTERIOR ELEVATIONS
A17	INTERIOR ELEVATIONS
A18	INTERIOR ELEVATIONS
A19A	UNIT C ROOM FINISH & DOOR SCHEDULES, DETAILS
A19	FLOOR PLAN
A20	REFLECTED CEILING PLAN
A21	INTERIOR ELEVATIONS
A22	INTERIOR ELEVATIONS
A23A	UNIT D ROOM & DOOR FINISH SCHEDULES, DETAILS
A23	LOWER LEVEL FLOOR PLAN
A24	UPPER LEVEL FLOOR PLAN
A25	REFLECTED CEILING PLANS
A26	INTERIOR ELEVATIONS
A27	INTERIOR ELEVATIONS
A28	INTERIOR ELEVATIONS
A29	TOILET ROOM ELEVATIONS
A30	STAIRWAY PLANS & SECTIONS, DETAILS
A31	EXTERIOR ELEVATIONS
A32	BUILDING SECTIONS
A33	WALL SECTIONS
A34	WALL SECTIONS
A35	WALL SECTIONS
A36	WALL SECTIONS
A37	SPECIAL CABINETS, DETAILS
A38	KITCHEN EQUIPMENT
A39	UNIT D STRIPING PLAN, DETAILS
A40	DETAILS
A41	DETAILS; EXTERIOR WINDOW FRAMES
A42	DETAILS
A43	DETAILS
A44	DETAILS
A45	DETAILS

STRUCTURAL

S1	UNIT A PILE AND FLOOR FRAMING PLAN
S2	UNIT B PILE AND FLOOR FRAMING PLAN
S3	UNIT C PILE AND FLOOR FRAMING PLAN
S4	UNIT D PILE AND FLOOR FRAMING PLAN
S5	UNIT D SECOND LEVEL FRAMING PLAN
S6	UNIT A ROOF FRAMING PLAN
S7	UNIT B ROOF FRAMING PLAN
S8	UNIT C ROOF FRAMING PLAN
S9	UNIT D ROOF FRAMING PLAN
S10	SIDEWALL AND MISCELLANEOUS SECOND FLOOR FRAMING PLAN
S11	CONCRETE SECTIONS
S12	CONCRETE SECTIONS
S13	ROOF FRAMING SECTIONS
S14	ROOF FRAMING SECTIONS
S15	ROOF FRAMING SECTIONS
S16	STRUCTURAL SECTIONS
S17	TYPICAL DETAILS AND STRUCTURAL NOTES

LEGEND

+19.00	FINISH GRADE
0.00TC	TOP OF CURB OR CONCRETE
0.00TP	TOP OF PAVING
0.00TCB	TOP OF CATCH BASIN RIM
0.00TYD	TOP OF YARD DRAIN RIM
0.00D	BOTTOM OF DITCH
13.62	EXISTING GRADE
R=10	RADIUS OF CURVE
—□—	CATCH BASIN OR YARD DRAIN
—•—	DOWN SPOUT CATCH BASIN
———	DRAIN LINE
—IW—	IRRIGATION WATER MAIN
------	BOTTOM OF DITCH
—o—	CLEAN OUT
	WATER METER
	FIRE HYDRANT
	DRINKING FOUNTAIN
	FLAG POLE
	NEW BUILDING
	CONCRETE PAVING
	ASPHALT PAVING
	ALL WEATHER SURFACE

NOTE: VERTICAL DATUM, CITY OF ABERDEEN, MEAN LOWER LOW WATER

NOTE: COORDINATE SITE WORK WITH LANDSCAPE DRAWINGS: SHEETS L1-L6

NEW MILLER JR HIGH SCHOOL
FIN. FLR. ELEV. 14.00

FARRAGUT ST.
DEWEY ST.
TILDEN ST.
EVANS ST.
MACFARLANE ST.
STOCKWELL ST.
LINDSTROM ST.
FORDNEY ST.
HARRIMAN ST.
UNION PACIFIC R.R.
PACIFIC ADD.
UNION ADD.
ALLEY
DITCH
ROAD
EVANS CREEK

CONSULTANTS:

CHALKER ENGINEERS — STRUCTURAL ENG'R.
RALPH J. BAUM — MECHANICAL ENG'R.
BEVERLY A. TRAVIS & ASSOCIATES — ELECTRICAL ENG'R.

ARCHITECTS
STREET & LUNDGREN — WALDRON & POMEROY
100 west 1st, aberdeen, wn.
1721 eighth ave. no., seattle, wn.

REGISTERED ARCHITECT, STATE OF WASHINGTON

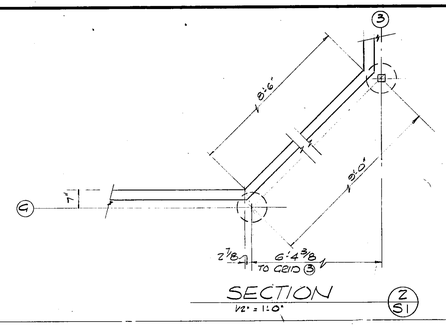
FILE NO. 75-13
DATE 4-12-77
DRAWN
PROJ. ARCH.

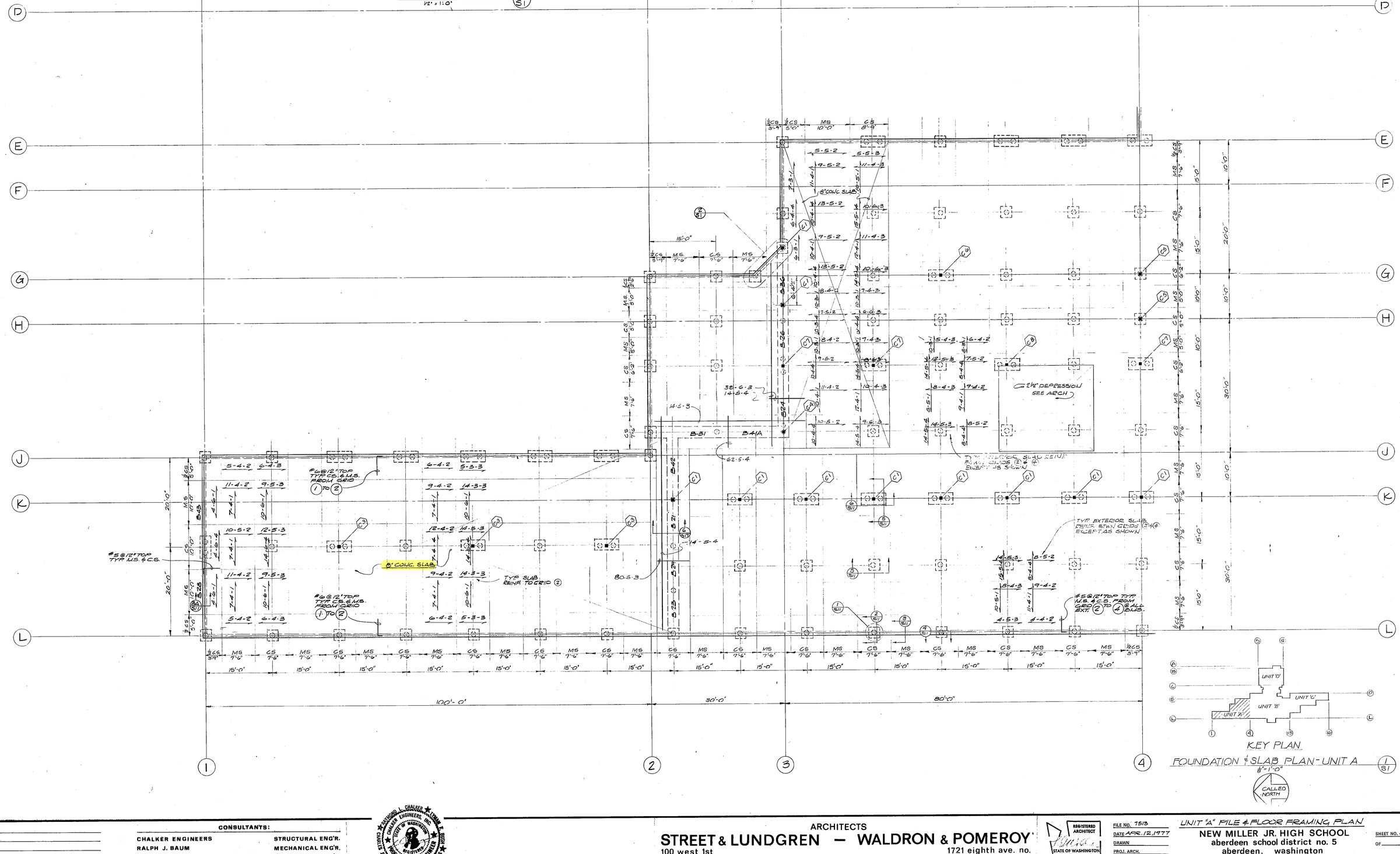
SITE PLAN
NEW MILLER JR. HIGH SCHOOL
aberdeen school district no. 5
aberdeen, washington

SHEET NO. A1
OF

NOTES

1. 6" CONC. SLAB TYPICAL UNLESS OTHERWISE NOTED
2. ⊕ INDICATES PILE LOCATION. ALL PILE TO BE 20 TON CAPACITY UNLESS OTHERWISE NOTED. MINIMUM CENTER TO CENTER OF PILES TO BE 2'-6" SEE (S1) & (S1)
3. FLAT SLAB REINFORCING SHOWN FOR TYPICAL CONDITIONS
4. BEAM SCHEDULE, SEE (S1); FOR DETAILS SEE (S1)
5. STL COLUMN SCHEDULE SEE (S1)
6. TYPICAL CONC. WALL DETAILS SEE (S1) & (S1)
7. WALL OPENG DETAILS SEE (S1)
8. SLAB OPENING DETAILS SEE (S1)
9. CONST. JOINT DETAILS SEE (S1)
10. SLAB REINFORCING DETAILS SEE (S1), (S1), (S1) & (S1)





FOUNDATION & SLAB PLAN - UNIT A (1/S1)
1/8" = 1'-0"

CALLED NORTH

CONSULTANTS:

CHALKER ENGINEERS	STRUCTURAL ENG'R.
RALPH J. BAUM	MECHANICAL ENG'R.
BEVERLY A. TRAVIS & ASSOCIATES	ELECTRICAL ENG'R.

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100 west 1st
aberdeen, wn.

1721 eighth ave. no.
seattle, wn.

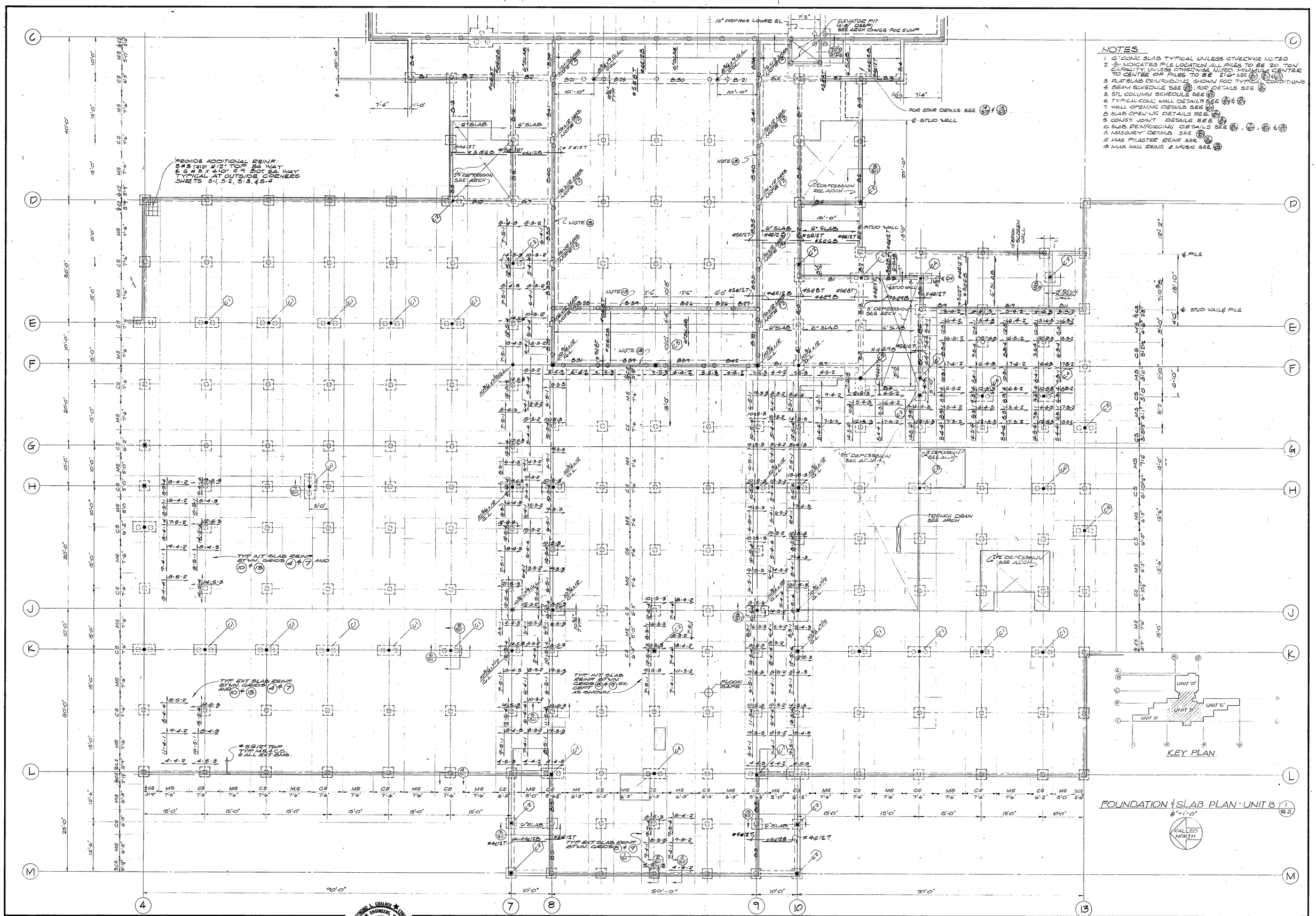
REGISTERED ARCHITECT
STATE OF WASHINGTON

FILE NO. 7513
DATE APR. 12, 1977
DRAWN
PROJ. ARCH.

UNIT "A" PILE & FLOOR FRAMING PLAN

NEW MILLER JR. HIGH SCHOOL
aberdeen school district no. 5
aberdeen, washington

SHEET NO. S1
OF



CONSULTANTS:

CHALKER ENGINEERS	STRUCTURAL ENG'R.
RALPH J. BAUM	MECHANICAL ENG'R.
BEVERLY A. TRAVIS & ASSOCIATES	ELECTRICAL ENG'R.

RAYMOND L. CHALKER · LYMAN F. BUSH · CHALKER ENGINEERS, INC. · STATE OF WASHINGTON · REGISTERED PROFESSIONAL ENGINEER · CHARLES MERGENS · RALPH J. FAIRBANKS

ARCHITECTS

STREET & LUNDGREN — WALDRON & POMEROY

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seattle, wn.

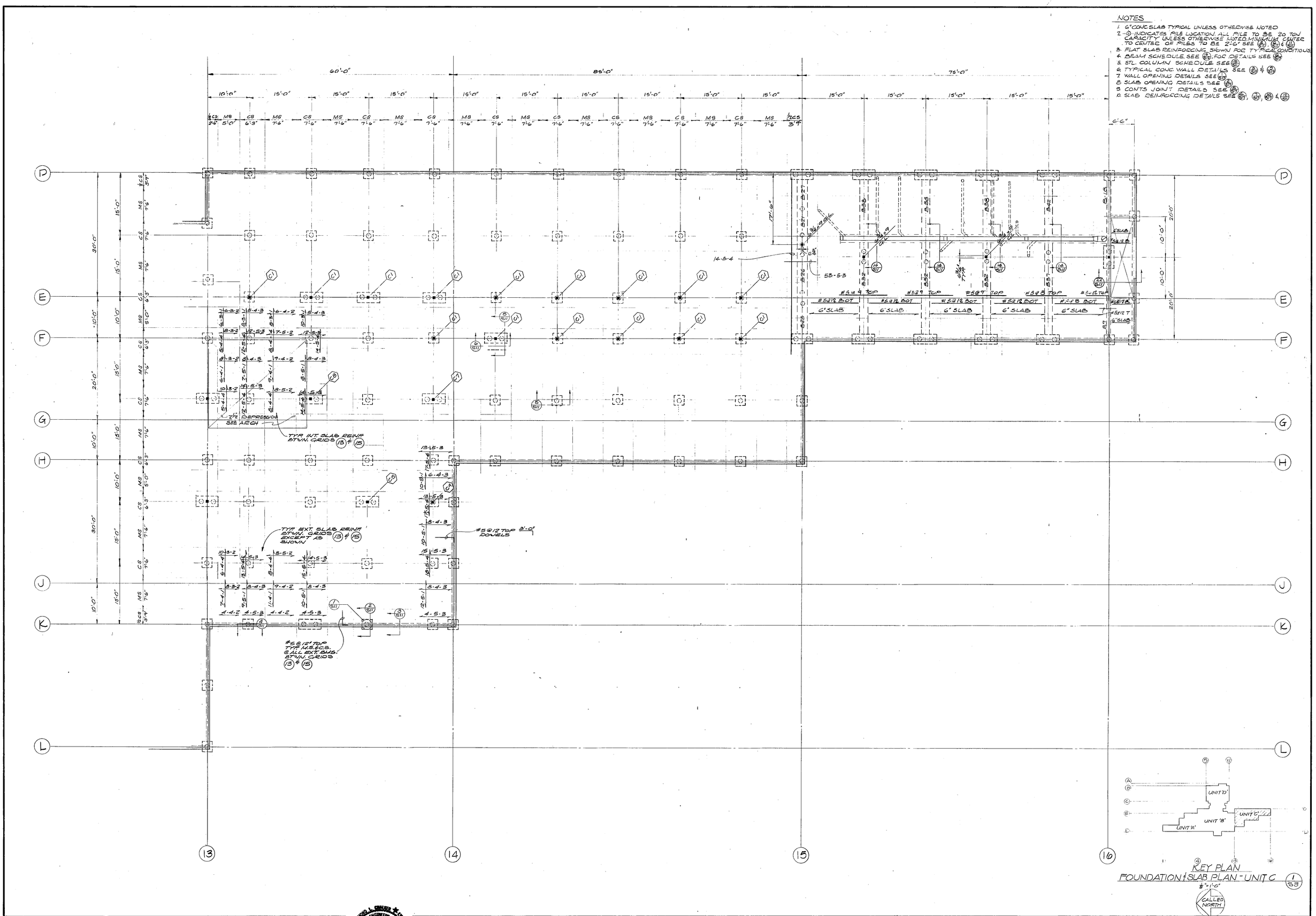
REGISTERED ARCHITECT · STATE OF WASHINGTON

FILE No. 7513
DATE APR. 12, 1977
DRAWN
PROJ. ARCH.

UNIT "B" PILE & FLOOR FRAMING PLAN

NEW MILLER JR. HIGH SCHOOL
aberdeen school district no. 5
aberdeen, washington

SHEET NO. S2
OF



CONSULTANTS:

CHALKER ENGINEERS	STRUCTURAL ENG'R.
RALPH J. BAUM	MECHANICAL ENG'R.
BEVERLY A. TRAVIS & ASSOCIATES	ELECTRICAL ENG'R.

ARCHITECTS

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aberdeen, wn.

1721 eighth ave. no.
seattle, wn.

REGISTERED ARCHITECT
STATE OF WASHINGTON

FILE NO. 7513
DATE APR. 12, 1977
DRAWN
PROJ. ARCH.

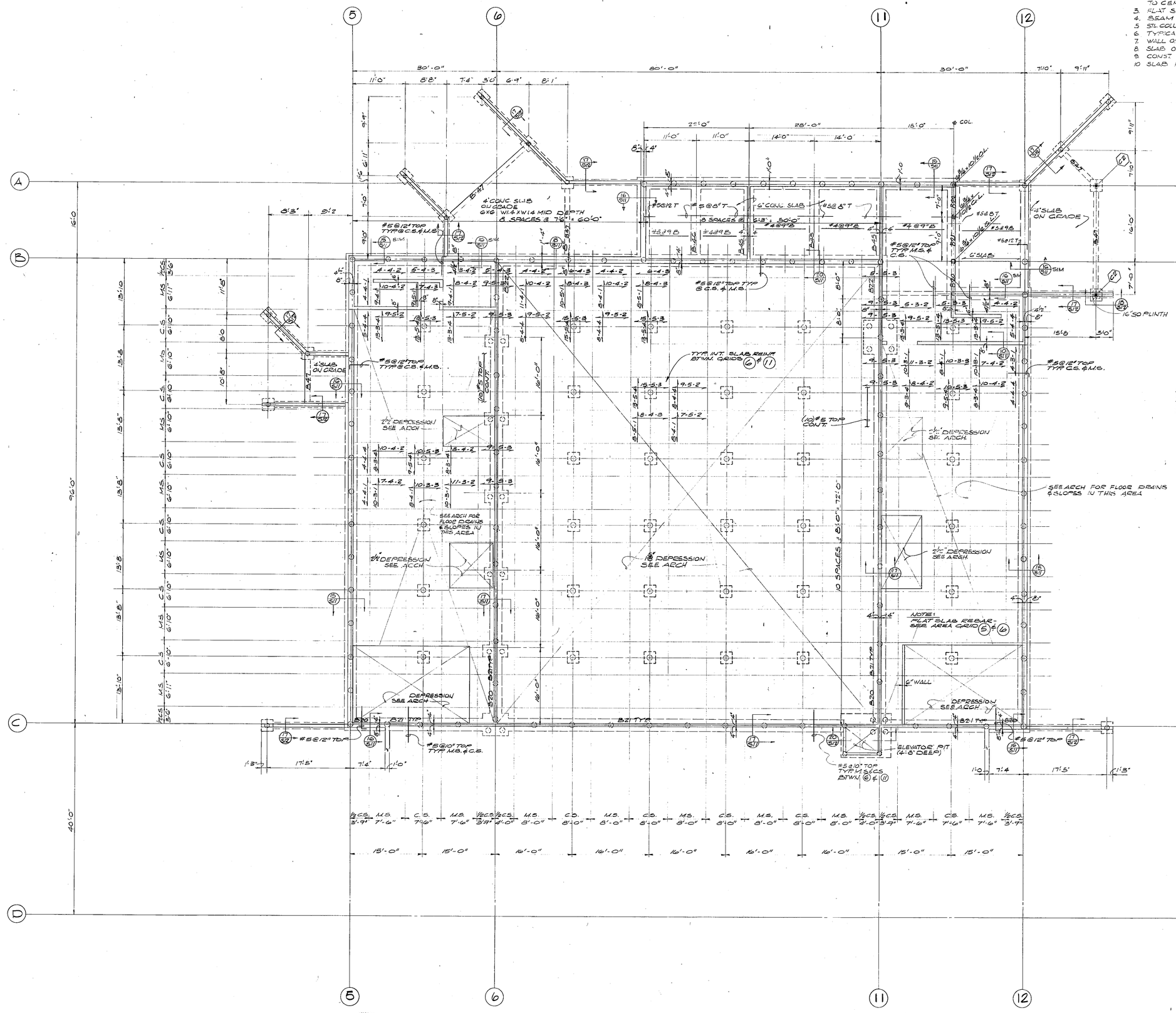
UNIT "C" PILE & FLOOR FRAMING PLAN

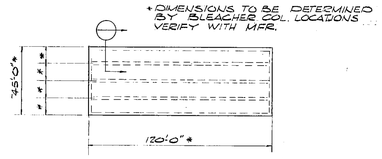
NEW MILLER JR. HIGH SCHOOL
aberdeen school district no. 5
aberdeen, washington

SHEET NO. S3
OF
J29-41

NOTES

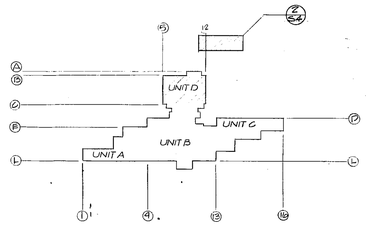
1. 6" CONC. SLAB TYPICAL UNLESS NOTED OTHERWISE
2. ⊕ INDICATES PILE LOCATION. ALL PILE TO BE 20 TON CAPACITY UNLESS OTHERWISE NOTED. MINIMUM CENTER TO CENTER OF PILES TO BE 2'-6 SEE (5/S11), (6/S11) & (11/S11)
3. FLAT SLAB REINFORCING SHOWN FOR TYPICAL CONDITIONS
4. BEAM SCHEDULE SEE (16/S11) FOR DETAILS SEE (6/S11)
5. STL. COLUMN SCHEDULE SEE (13/S11)
6. TYPICAL CONC. WALL DETAILS SEE (3/S11) & (9/S11)
7. WALL OPENING DETAILS SEE (1/S11)
8. SLAB OPENING DETAILS SEE (2/S11)
9. CONST. JOINT DETAILS SEE (3/S11)
10. SLAB REINFORCING DETAILS SEE (4/S11), (7/S11) & (10/S11)





SEE ARCH DWG A1 FOR LOCATION AND DIMENSIONS

BLEACHER SLAB (2/S4)
1" = 40'-0"



KEY PLAN

FOUNDATION & SLAB PLAN - UNIT D (1/S4)
⅛" = 1'-0"

CALLED NORTH

CONSULTANTS:

CHALKER ENGINEERS	STRUCTURAL ENG'R.
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BEVERLY A. TRAVIS & ASSOCIATES	ELECTRICAL ENG'R.

ARCHITECTS

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seattle, wn.

REGISTERED ARCHITECT
STATE OF WASHINGTON

FILE NO. 7513
DATE APR. 12, 1977
DRAWN
PROJ. ARCH.

UNIT "D" PILE & FLOOR FRAMING PLAN

NEW MILLER JR. HIGH SCHOOL
aberdeen school district no. 5
aberdeen, washington

SHEET NO. S4
OF
J 2991

HALEY ALDRICH

www.haleyaldrich.com

REPORT OF PRELIMINARY GEOTECHNICAL ENGINEERING FINDINGS
ABERDEEN SCHOOL DISTRICT NO. 5 SEISMIC SAFETY RETROFITS
STEVENS ELEMENTARY SCHOOL
ABERDEEN, WASHINGTON



by
Haley & Aldrich, Inc.
Vancouver, Washington

for
TCF Architecture PLLC
Tacoma, Washington

File No. 0210367-000
July 2024

HALEY & ALDRICH, INC.
300 W 15th S
Vancouver, WA 98660
360.448.4189

05 July 2024
File No. 0210367-000

TCF Architecture PLLC
902 N 2nd Street
Tacoma, Washington 98403

Attention: Steve Wachtler, AIA, Principal

Subject: Report of Preliminary Geotechnical Engineering Findings
Aberdeen School District No. 5 Seismic Safety Retrofits
Stevens Elementary School
301 S Farragut Street
Aberdeen, Washington 98520

Dear Steve Wachtler:

Haley & Aldrich, Inc. (Haley & Aldrich) is pleased to submit this report to TCF Architecture PLLC (TCF) and Aberdeen School District No. 5 (District) summarizing our preliminary geotechnical engineering services for the seismic retrofit of Stevens Elementary School in Aberdeen, Washington. Our work was completed in general accordance with our agreement executed 3 April 2024. In completing our services, we also collaborated with Degenkolb Engineers, Inc. (Degenkolb) and Educational Service District 112 (ESD 112) - Construction Services Group (CSG).

The project includes preliminary evaluation of the Stevens Elementary School in Aberdeen, Washington per American Society of Civil Engineers/Structural Engineering Institute (ASCE/SEI) 41-17 - Seismic Evaluation and Retrofit of Existing Buildings (ASCE 41-17). The study was funded by the Office of Superintendent of Public Instruction's (OPSI's) School Seismic Grant Program (SSGP). The findings from this preliminary evaluation will inform the District's and OPSI's decision-making to either advance full design efforts for seismic retrofit improvements at the existing campus or to explore re-siting the school to a new location.

This preliminary report provides a discussion of the site setting, surface and subsurface conditions, the seismic basis of design, and a preliminary geotechnical analysis of seismicity and seismic hazards that may impact plans for retrofit of the subject school. Our current scope of services does not include providing recommendations for design and construction of retrofit improvements, such as modification of existing foundations or installation of ground improvement elements. Preliminary recommendations for retrofit improvements may be provided using currently available subsurface data under a supplemental authorization.

Scope of Services

The purpose of our services was to preliminarily characterize subsurface conditions at the site and to provide geotechnical engineering guidance and recommendations that conform in a preliminary sense to the geotechnical requirements of ASCE 41-17. These services included conducting geologic research, subsurface explorations, laboratory testing, preliminary seismic ground motion assessments, seismic hazard evaluation, and preliminary engineering analyses.

We completed the following tasks in general accordance with *Part 1 – Geotechnical Field Services and Limited Seismic Hazard Evaluation* included in our proposal for Geotechnical Engineering Services dated 21 February 2024 and executed 3 April 2024:

- Reviewed readily available geologic and geologic hazard maps, water well logs, and other geotechnical reports and plans provided by others for general information regarding subsurface soil and groundwater conditions and geologic hazards.
- Drilled one boring to a depth of approximately 101.5 feet below ground surface (bgs) and advanced one seismic cone penetration test (CPT) sounding to a depth of approximately 89 feet bgs to characterize subsurface conditions.
- Observed the exploration, logged the subsurface conditions, collected representative soil samples, and transported the samples to our laboratory for further visual review and testing.
- Completed laboratory tests on select soil samples to evaluate soil engineering properties. Our specific tests included moisture content, Atterberg Limits, grain size distribution determinations, organic content, triaxial strength testing, and a suite of corrosion potential tests in accordance with current American Society for Testing and Materials (ASTM) or other applicable standards.
- Developed code-based seismic design values in conformance with ASCE 41 Section 2.4 and ASCE 7 Section 11.4, not including site-specific seismic or ground response analyses per ASCE 7 Chapter 21.
- Conducted limited seismic hazard analysis including:
  - Assessing liquefaction potential analysis per the method presented by Idriss & Boulanger (2008).
  - Assessing lateral spreading at the site, including an evaluation of local and regional topography and nearby bathymetry.
- Prepared this report summarizing our preliminary findings.

Site Conditions

SURFACE CONDITIONS

The Stevens Elementary School campus is bounded by Pioneer Park on the west and south, South Farragut Street on the east, and East Perry Street to the north. There is one large school structure on

site. Parking lots are present north and southeast of the building and an asphalt-paved play area is west of the building. The remainder of the site is generally occupied by landscaping and playground areas.

The school building is located on the south side of Aberdeen in the flats area. As such, the site topography is generally flat with an average surface elevation at approximately Elevation 12 feet (WGS84).

The Chehalis River is located approximately 0.5 miles to the east and north of the school. The bay of Grays Harbor begins approximately 1 mile west of the site at the mouth of the river. The Pacific Ocean is about 18 miles to the west of the school, beyond the northern peninsula of Grays Harbor.

Our understanding of the existing structure foundations is based on our review of the following construction plans:

- "Pioneer Park School", 17 sheets, prepared by John Paul Jones – Leonard W. Bindon Architects, dated 5 January 1953;
- "Special Services Addition, Stevens School," 14 sheets, prepared by Street & Lundgren, dated 21 May 1974; and,
- "Stevens Elementary School Addition," 28 sheets, prepared by Street & Lundgren, dated 3 May 1976.

The plans show that the school is founded on 12- to 13-inch-diameter timber piles interconnected with grade beams and arranged into pile groups of one to three piles. The piles for the original structure have a design load of 10 tons dead load per pile and were reportedly designed with an adhesion of 200 pounds per square foot and a minimum embedment of 40 feet below pile cap. The 1974 and 1976 additions were reportedly designed to bear on Class "B" timber piling, extending to a design depth of at least 32 feet below pile cap. The original structure features a crawlspace, though subsequent additions do not. The ground-level floors for both the original structure and additions are pile-supported. Excerpts from these historical plans are included in Appendix C.

GEOLOGIC AND SOIL MAPPING

The site is mapped as Quaternary alluvium described as "silt, sand, and gravel deposited in streambeds and fans," the surface of which is "relatively undissected" (Logan, 1987). The mapping also indicates that at depth, the alluvium is likely underlain by marine sedimentary rocks assigned to the Miocene Montesano Formation. This formation is described as predominantly silty sandstone with "local to widespread conglomerate, siltstone, and mudstone" that is generally blue gray where fresh and orange-brown where weathered (Logan, 1987). Our explorations encountered alluvium over dense materials at approximately 86 feet bgs, which are likely part of this sedimentary rock formation.

The near surface soils at the site are mapped by the U.S. Department of Agriculture (USDA) in the *Soil Survey of Grays Harbor County Area, Pacific County, and Wahkiakum County* (Pringle, 1986), as compiled in the Web Soil Survey (USDA, 2024), as Ocosta silty clay loam. Ocosta soils are described as very deep, poorly drained soils derived from alluvium along floodplains and deltas that are protected from tidal

overflow by dikes and flood control structures (Pringle, 1986). The typical soil profile generally comprises 12 inches of silty clay loam (United Soil Classification System [USCS] CL) overlying clay and silty clay (USCS MH, CH) to 20 inches that grades to clay (USCS CH) to 60 inches. Depth to water in this soil type is typically 12 to 35 inches and the soil is assigned to hydrologic soil group D, which are soils that generally have very slow infiltration and water transmission rates.

Based on our explorations, the native soils underlying some near surface imported fill are generally similar to those described in the geologic and soil mapping.

SUBSURFACE CONDITIONS

Subsurface conditions interpreted from the explorations advanced at the site as part of our current study, in conjunction with soil properties inferred from field and laboratory tests, formed the basis for the conclusions and recommendations in this report. The locations and depths of our explorations were selected considering the site features, under the constraints of surface access, time, and budget.

We explored subsurface soil and groundwater conditions at the site on 8 through 11 of April 2024 by drilling one boring (B-SE01) to a depth of approximately 101.5 feet bgs using the mud-rotary drilling method and advancing one CPT sounding (CPT-SE01) to a depth of approximately 89 feet bgs. The boring was located in the southwestern portion of the site and the CPT was performed in the northeastern portion of the site at the locations shown on Figure 2. Our field exploration procedures and exploration logs are in Appendix A. Laboratory soil testing procedures and results are in Appendix B.

The explorations indicate the site is blanketed by approximately 4.5 feet of fill consisting of poorly graded sand with silt and silty sand. The fill is underlain by approximately 3 feet of organic silt. We have judged this material to be native, alluvial deposits, though it could possibly be decomposed wood waste associated with historical timber processing activities in the area. The organic silt was underlain by very soft deposits of alluvial elastic silt and silt with sand and organics extending to a depth of about 25 feet bgs at B-SE01 and to a depth of about 30 feet bgs at CPT-SE01. This silt overlayed a zone of very loose to loose silty sand deposits extending to about 65 feet bgs, followed by an approximately 5-foot-thick layer of very dense well-graded sand with silt. The well-graded sand with silt was underlain by loose to medium dense poorly graded sand before encountering contact with completely decomposed Montesano Formation bedrock at 84 to 86 feet bgs in both B-SE01 and CPT-SE01. Exploration B-SE01 was advanced approximately 17 feet into this unit, reporting dense to very dense conditions, before being terminated at 101.5 feet bgs, whereas CPT-SE01 encountered refusal in this unit at a depth of about 89 feet bgs.

Historical explorations (Hart Crowser, 1976) located approximately 850 feet southwest of the Site at the Miller Junior High School reportedly encountered very soft to stiff silt with organics on the order of 75 to 90 feet thick. These logs indicate that the silt was directly underlain by very dense silty sand with gravel (likely decomposed bedrock).

Groundwater was identified in boring B-SE01 at an approximate depth of 4.5 feet bgs and pore pressure dissipation testing at CPT-SE01 indicated that the piezometric head at the site was 4.5 feet bgs. For our engineering analyses, we conservatively assumed groundwater is present at 1-foot bgs.

Seismic Basis of Design

SEISMIC SETTING

The site is in a seismically active area. In this section, we describe the seismic setting, identify the seismic basis of design, provide code-based design values, and discuss the seismic hazards at the site. Geologic hazards mapped near the project site are all related to seismicity and include tsunami inundation, very strong earthquake shaking, and a moderate to high liquefaction hazard (WADNR, 2023).

Regional Seismicity

Western Washington sits at the contact between two large crustal tectonic plates. The Juan de Fuca Plate forms the floor of the Pacific Ocean off the coast of the northwestern United States and moves northeastward from its spreading ridge boundary with the Pacific Plate at an average rate of approximately 1.5 inches per year. As it converges with the continental North American Plate, the Juan de Fuca Plate dips below (or "subducts") beneath the North American Plate forming a shallow, eastward-dipping contact interface. This boundary is known as the Cascadia Subduction Zone (CSZ) and is responsible for the seismicity in the western Washington regions, producing earthquakes associated with three types of source zones: subduction interface, subduction intraslab, and crustal. The CSZ is located offshore approximately 105 miles west of the site.

Subduction Interface Sources. The displacement caused by the subduction of the Juan de Fuca Plate below the North American Plate does not generally manifest as slip between the two plates; rather, it is absorbed by compression of the North American Plate at the interface at relatively shallow depths. This compression, based on geologic and historical evidence, is released every 300 to 600 years, on average, in the form of magnitude 8 to 9 or larger earthquakes, the last such event occurring in 1700. Characteristics of this type of earthquake may include very large ground accelerations, shaking durations in excess of 2 minutes, and particularly strong long-period ground motions that may affect tall or long-period structures.

Subduction Intraslab Sources. A deeper zone of seismicity is associated with a steeper bending of the Juan de Fuca Plate and the breaking of the plate under its own weight below the Pacific Northwest region. This region, termed the Benioff Zone, produces intraslab earthquakes at depths of 40 to 70 kilometers (km). Such past events in western Washington include the 1949 Puget Sound, 1965 Olympia, and 2001 Nisqually earthquakes. Deep, intraslab earthquakes tend to be felt over larger areas than shallower crustal events, and generally lack significant aftershocks.

Crustal Sources. Shallow crustal faults are caused by cracking of the continental crust, resulting from the stress that builds as the subduction zone plates remain locked together. Many small crustal faults are

mapped near the site that are a part of the greater Cascadia Fold and Thrust Belt (USGS, 2024). However, due to the size of these faults, their contribution to the site seismic hazard is relatively small.

SEISMIC BASIS OF DESIGN AND ANALYSIS METHODOLOGY

Preliminary site-specific seismic hazard analysis was conducted for the project site following the guidelines in ASCE 41-17 Section 2.4.1 *General Procedure for Hazard Caused by Ground Shaking*. The seismic hazard levels evaluated per this approach are as follows:

- **BSE-1E:** Basic Safety Earthquake-1 for use with the Basic Performance Objective for Existing Buildings, taken as a seismic hazard with a 20 percent probability of exceedance in 50 years (225-year return period), but not greater than the BSE-1N, at a site.
- **BSE-1N:** Basic Safety Earthquake-1 for use with the Basic Performance Objective Equivalent to New Building Standards taken as two-thirds of the BSE-2N at a site.
- **BSE-2E:** Basic Safety Earthquake-2 for use with the Basic Performance Objective for Existing Buildings, taken as a seismic hazard with a 5 percent probability of exceedance in 50 years (975-year return period), but not greater than the BSE-2N, at a site.
- **BSE-2N:** Basic Safety Earthquake-2 for use with the Basic Performance Objective Equivalent to New Building Standards, taken as the ground shaking based on the Risk-Targeted Maximum Considered Earthquake (MCE_R) per ASCE 7 at a site.

The BSE-2N hazard level is analogous to the maximum considered earthquake hazard level (MCE) in ASCE 7-16 (with a 2 percent probability of exceedance in 50 years or a 2,475-year return period), and the BSE-1N hazard level is consistent with a design-level event in ASCE 7-16.

Seismic Site Class

Thick sequences of unconsolidated, soft sediments typically amplify the shaking of long-period ground motions, such as those associated with subduction zone earthquakes; whereas areas underlain by shallow soil profiles are not likely to amplify seismic waves.

The “Site Class” is a designation used by ASCE 7-16, as referenced by ASCE 41-17 to quantify ground motion amplification. The classification is based on the stiffness in the upper 100 feet (roughly 30 meters) of soil and bedrock materials at a site.

- Seismic CPT shear wave velocity testing was performed at CPT-SE01. The test resulted in a weighted-average shear wave velocity of 398 feet per second (121 meters per second) for an 89-foot-deep profile. This weighted-average Vs profile falls within the limits of Site Class E, as defined in ASCE 7-16, as referenced by ASCE 41-17. Vs measurements were observed to generally increase with depth until reaching about 40 feet bgs, remaining within a fairly constant range thereafter to a depth of 89 feet bgs.
- Boring B-SE01 was evaluated for site class considering Standard Penetration Test (SPT) N-values and the stratigraphy identified in the boring. Boring B-SE01 encountered silt to silty sand to clean sands with N-values under 13 within the upper 80 feet with the exception of a very dense

well graded layer of sand with silt at 65 feet bgs. Based on the N-value approach for determination of site class, conditions are consistent with Site Class E, as defined in ASCE 7-16, as referenced by ASCE 41-17.

Based on our evaluation of the site-specific data, we find that without respect to seismic hazards, Site Class E is appropriate for this site. However, due to liquefaction hazard at this project site (discussed in the following section), the site is classified as Site Class F.

Per ASCE 41-17, a Site Class F designation requires a site-specific analysis including a seismic hazard analysis and a site response analysis; however, buildings with structural periods of less than 0.5 seconds may be designed using seismic parameters developed considering Site Class E conditions.

Preliminary Spectral Design Parameters

Acceleration response spectra for use in preliminary design have been developed following the procedures in ASCE 41-17 Section 2.4.1 *General Procedure for Hazard Caused by Ground Shaking*. These values are presented in Table 1.

Table 1. General Procedure Spectral Design Parameters

Design Parameters	Hazard Level			
	BSE-2N	BSE-1N	BSE-2E	BSE-1E
Site Class	E			
S_s	1.51	-	1.09	0.42
F_a (Site Class E)[1]	1.3	-	1.3	2.4
S_{xs}	1.96	1.31	1.42	0.81
S_1	0.69	-	0.46	0.13
F_v (Site Class E)[1]	4.2	-	4.2	4.2
S_{x1}	2.88	1.92	1.93	1.93
T_L	16 s	16 s	16 s	16 s

Notes:

1) *F_a and F_v are the ASCE 7-16 Chapter 21 site factors for Site Class E.*
2) *Site coordinates are Latitude/Longitude 46.966755°N / 123.789761°W*
3) *Values presented in this table are for Site Class E conditions. This site falls under Site Class F categorization; however, these values are provided assuming that the structures have a fundamental period of less than 0.5 seconds, in which case Site Class E may be used for design.*

LIQUEFACTION

General

When cyclic loading occurs during an earthquake, the shaking can increase the pore pressure in loose to medium dense saturated sand and cause liquefaction. The rapid increase in pore water pressure reduces the effective normal stress between soil particles, resulting in the sudden loss of shear strength in the soil. Granular soils, which rely on interparticle friction for strength, are susceptible to liquefaction until

the excess pore pressures can dissipate. Sand boils and flows observed at the ground surface after an earthquake are the result of excess pore pressures dissipating upward, carrying soil particles with the draining water. In general, loose, saturated sand soils with low silt and clay contents are the most susceptible to liquefaction. Silty soils with low plasticity are moderately susceptible to liquefaction under relatively higher levels of ground shaking. For any soil type, the soil must be saturated for liquefaction to occur.

We performed liquefaction potential analysis on soils logged at the site using the procedures outlined in Idriss and Boulanger (2008) and updated Magnitude Scaling Factor (MSF) as outlined in Boulanger and Idriss (2014).

We note the term liquefaction is defined very specifically by the simplified method that we used to evaluate the liquefaction hazard. Liquefaction is defined as when a soil under repeated cyclic loading exhibits the generation of increasing excess pore pressures until the pore pressure equals the total overburden stress. When this condition is reached, the normal stress acting between adjacent soil particles is effectively lost, and the soil, which derives its shear strength from interparticle friction, can lose much of its available shear strength. However, it is well documented that not all soils exhibit the same behavior after the initiation of liquefaction.

Loose sandy soils that achieve the condition of liquefaction during earthquake shaking can subsequently collapse and exhibit large shear strains under continued cyclic or static loading. This type of behavior is a well-documented result of numerous earthquakes, where structures underlain by shallow, liquefiable hydraulically placed fills have been observed to experience bearing capacity failures and collapse. Conversely, medium dense to dense sandy soils that achieve the condition of liquefaction will typically not collapse and can exhibit strain hardening behavior due to dilation effects. Therefore, despite the soil achieving the condition of liquefaction, there is little to no shear strength loss and only moderate shear strains under continued cyclic and static loading. This condition is termed “cyclic mobility.”

Analysis

In accordance with ASCE 7-16, as referenced by ASCE 41-17, we completed the liquefaction hazard analysis using the site class adjusted acceleration coefficient PGA_M for Site Class E. We performed our liquefaction analysis for three different hazard levels, including events with 225-year (corresponding to BSE-1E), 975-year (corresponding to BSE-2E), and 2,475-year (corresponding to BSE-2N) return periods. We performed liquefaction analysis using PGA_M values of 0.45g and 0.79g and associated earthquake magnitudes of 7.6 and 8.5 for BSE-1E and BSE-2E, respectively. We used a PGA_M of 1.27g and associated earthquake magnitude of 8.8 in our analysis for the BSE-2N event. We assumed a design groundwater depth at the ground surface for our liquefaction analyses.

Our analyses conclude that potential for liquefaction to occur at the site is high, due to the relatively shallow groundwater table and subsurface profile featuring dozens of feet of loose sands.

Settlement

Post-liquefaction settlement results from densification of liquefiable sandy soils following an earthquake. The permanent ground surface settlement is not typically uniform across the area and can result in significant differential settlement. Differential settlement will have the most significant effect on structures supported by shallow foundations. Based on our analysis, we estimate settlements on the order of 11 to 13 inches due to liquefaction could occur throughout the site. Differential settlements can preliminarily be assumed as one-half of the total settlements occurring over a lateral distance of 50 feet.

We note that the settlement estimates provided above do not account for movements of foundations which may occur due to bearing capacity failure due to seismic strength loss or localized ground deformations that may result due to surface effects of shallow liquefaction, such as sand boils. (Both conditions are described below in more detail.) Therefore, actual ground and building settlements may be greater than the values noted above.

Seismic Strength Loss

We anticipate considerable reductions in the strength of the liquefiable layers of the site soil profile. The shear strength loss was determined by using the recommendations of Idriss and Boulanger (2008) and Bray and Sancio (2006). Simplistically, the liquefied shear strength directly correlates to the soil's pre-liquefied relative density. The relative density is estimated based on the SPT blow counts. The higher the relative density, the higher the liquefied shear strength. The typical residual strength of liquefiable soils at the site is expected to be less than 20-percent of the static strength (e.g., 80-percent or more strength loss).

Additionally, some strength loss due to cyclic shear stresses are expected to occur in the fine-grained elastic silt soils within the upper approximately 25 feet bgs. Full cyclic softening and development of lowered residual strengths within these materials are likely to occur. Supplemental exploration including performance of cyclic direct simple shear testing would be required to accurately estimate residual strength ratios for these soils.

As a result of the high expected soil strength loss, the pile foundation system at the site may experience bearing shear failure and cause additional foundation settlement.

Surface Effects

We evaluated the potential for liquefaction-related surface manifestations (such as sand boils) to occur using the procedures presented by Ishihara (1985) and by Hutabarat and Bray (2022).

The Ishihara (1985) procedure compares the thickness of a given liquefiable soil layer to the thickness of the overlying non-liquefiable soil mantle to determine if surface manifestations are possible at a given peak ground acceleration. This approach has several limitations and may overestimate potential for surface manifestations to occur in silty sands and sandy silts, as the relatively low permeability of these materials has potential to prevent pore water from flowing quickly enough to produce sand boils

(Kramer, 1996). The Ishihara (1985) analyses indicate that the potential for surface manifestations is high; however, the presence of a non-liquefiable crust between depths of about 5 and 25 feet bgs presents a measure of uncertainty to this evaluation. The 4-foot-thick layer of shallow silty sand and poorly graded sand that mantles the site may be subject to limited-scale surface manifestations, if the seasonal high groundwater is present, even if the underlying elastic silt prevents manifestations from migrating to the surface from deeper liquefiable layers.

The Hutabarat and Bray (2022) method is a CPT-based procedure for estimating liquefaction-induced ejecta severity. The calculation compares the liquefaction ejecta demand to the crust layer resistance. Liquefaction ejecta demand is typically higher at sites with thick deposits of clean sands and lower at sites with stratified soil sites. The results of these analyses indicate that the estimated liquefaction ejecta severity is “None,” due to the thickness of the non-liquefiable crust layer.

We preliminarily conclude that the probability of surface effects of liquefaction is low, unless the seasonal groundwater is high and then will be limited to saturated sands within the upper 4.5 feet bgs. Surface manifestations occurring from deeper layers have a low probability of occurring, due to the thickness of the non-liquefiable crust spanning the site.

LATERAL SPREADING

Lateral spreading occurs when large blocks of ground are displaced down gentle slopes or toward the free face of river channels, ditches, etc. as a result of earthquake-induced inertial forces acting on the soil mass. Initiation of lateral spreading is often made worse when the soils within and beneath the soil mass liquefy or soften as a result of the shaking. Lateral spreading deformations can be experienced relatively far from a free face. Similar to lateral spread, flow failures result when large volumes of soil near the free face of river channels or lake bottoms displace vertically and laterally during or after earthquakes. As the ground begins to shake and the shearing resistance of liquefied soils decreases, ground displacement occurs in response to mainly static shear forces present within the soil mass and, to a lesser extent, earthquake-induced inertial forces. Flow failures typically manifest larger deformations than lateral spreading; however, the extent of the deformations is typically localized to the area behind the free face of the channel. Both lateral spreading and flow failures can be destructive and pose a significant risk to structures.

We performed lateral spread analyses using the procedures presented by Youd, Hansen, and Bartlett (2002) and Youd (2018) to evaluate the stability of the site once liquefaction-susceptible layers had liquefied, using a generalized subsurface soil profile extrapolating site conditions outwards to the Chehalis River. The Youd, Hansen, and Barlett procedure performs a one-dimensional analysis which uses the slope and the liquefiable soil to compute the approximate amount of lateral spreading under the BSE-2N, BSE-2E, and BSE-1E scenarios. The results in BSE-1E were found to be roughly 1 to 4 feet with BSE-2E and BSE-2N resulting in tens of feet. In addition, we performed a displacement analysis using the simplified procedure for estimating seismic slope displacements in subduction zones by Bray, Macedo, and Liu (2023). The analysis indicates that the mean level of expected lateral displacement at the building footprint under the BSE-1E event is roughly 6 to 8 feet. For both the BSE-2E and BSE-2N seismic events, the calculated displacement is estimated to be in tens of feet.

FAULT SURFACE RUPTURE

We used the U.S. Geologic Survey (USGS) U.S. Quaternary faults web application (USGS, 2024) to identify earthquake-producing faults near the project site. No mapped earthquake-producing crustal faults are present at the site. The closest mapped fault is a strand of the Cascadia Fold and Fault Belt located more than 12 miles to the west of the site. The USGS has mapped the "Cascadia Megathrust" portion of the Cascadia Subduction Zone approximately 85 miles west of the site.

Based on known fault locations, we consider the potential for fault rupture to occur at the site to be low unless occurring on an unmapped or otherwise unknown fault.

TSUNAMI HAZARD

The tsunami hazard at the site is mapped in the *Tsunami Hazard Maps of Southwest Washington - Model Results from a ~2,500-Year Cascadia Subduction Zone Earthquake Scenario* by the WADNR (Eungard et. al., 2018). Based on this reference, the site is located within an area expected to be inundated from a CSZ-induced tsunami, with an expected inundation depth in excess of 6 feet. Similarly, tsunami wave simulation for Grays Harbor, Washington, performed by WADNR shows that the site will be inundated by 5 to 10 feet in the event of a hypothetical magnitude 9.0 earthquake on the CSZ (WADNR, 2020).

The ASCE Tsunami Hazard Tool (https://asce7tsunami.online/) maps probabilistic inundation hazards for all potential tsunami sources, not just a CSZ-related event. ASCE has not mapped tsunami hazards as far east as the school site, with mapping limits ending approximately ½-mile west of the school. However, it is reasonable to conclude that extrapolation of the mapped hazard zone further east would result in the school being inundated by tsunami (ASCE, 2022).

Based on the findings presented by Washington DNR, we consider the potential for tsunami inundation to occur at the site to be high.

Corrosivity

One soil sample was collected and tested for corrosivity characteristics by CERCO of Concord, California. The tested sample consisted of near-surface soils and was tested for resistivity, redox potential, sulfate and chloride ion concentrations, and pH. The test results indicate that near-surface soils should be considered corrosive to buried iron and steel improvements, based on laboratory resistivity measurements. Chloride ion concentrations were not detected and insufficient to attack steel embedded in concrete mortar coating. Sulfate ion concentration results were 180 milligram per kilogram and present a potential to be detrimental to reinforced concrete. The pH level was measured as about 4.9 and is considered a corrosion concern for buried iron, steel, mortar-coated steel, and reinforced concrete structures.

The results of our corrosion testing and a copy of CERCO's brief evaluation are presented in Appendix B.

Conclusions

Based on our explorations, testing, and analyses, we have formulated preliminary conclusions in this report for use in assessment of the seismic retrofit project's viability. We offer the following general summary:

- The site soil profile generally features a thin layer of granular fill underlain by very soft to soft organic silt and elastic silt soils within the upper 25 feet bgs. These soils are underlain by very loose to medium dense sands with silt interbeds to approximately 85 feet bgs. Decomposed sedimentary bedrock is present below that depth. The groundwater table at the site is shallow at just several feet below the ground surface.
  - The near-surface granular fill is considered to be slightly to moderately strong, slightly compressible, and moderately susceptible to liquefaction and seismically induced strength loss, if the seasonal groundwater is high.
  - The soft silt soils in the upper 25 feet are considered to be weak, compressible and susceptible to seismically induced strength loss, though are not considered to be liquefiable.
  - The deeper, primarily granular deposits are considered to be slightly to moderately strong, slightly to moderately compressible, and highly susceptible to liquefaction and seismically induced strength loss.
  - The weathered bedrock at depth is considered to be competent (strong and generally incompressible) and not susceptible to liquefaction or seismically induced strength loss.
- Due to the presence of liquefaction and related hazards, there is a likelihood for excessive vertical and/or lateral movements of existing building foundations. Therefore, the existing and any proposed new or upgraded foundations will need to be designed to tolerate or resist these seismically induced ground movements.
  - The magnitude of lateral deformations due to lateral spreading has the potential to be in the tens of feet, which will be too large to tolerate or resist with new or existing foundation systems. The use of specialized ground improvement would likely be required to mitigate this issue.
- Conceptually, we conclude the following regarding potential foundation retrofit and hazard mitigation alternatives:
  - Ground improvement: Performance of ground improvement (such as deep soil mixing) conceptually provides a solution for mitigation of lateral displacement and spreading. However, to be effective, the ground improvement would require a footprint area that would encroach well into the adjacent city streets and potentially beyond. Additionally, the depth of treatment would potentially need to extend to depths ranging anywhere from 60 feet bgs to the bedrock contact at about 85 feet bgs. For these reasons, this approach appears unfeasible from economic and logistical standpoints.
  - Deep foundations: The structure could feasibly be underpinned with additional micropile or small diameter pipe pile foundations to transfer building loads under seismic conditions down to deep bedrock. However, these foundations would not be

capable of withstanding the large lateral loads induced by lateral spreading. For this reason, we conclude that underpinning with deep foundations is not an effective approach for retrofit at this site.

- Shallow foundations: Conceptually, the structure could be retrofitted to perform in a seismic event as a shallow foundation-supported structure. This could be achieved by retrofitting the structure to feature a thickened structural mat, or alternatively, the existing pile caps could be connected with a network of strengthened grade beams designed to ignore capacity contributions from the underlying timber piles under seismic conditions. Vertical and lateral seismic forces induced upon the structure would then be resisted solely by the shallow foundation system. Life-safety conditions allowing for immediate egress in the event of an emergency would need to be achieved as a precondition for taking this approach. This retrofit approach would leave the school prone to significant shifting and distress as a result of design-level seismic shaking, very likely displacing the school from its existing timber pile foundations and rendering the structure unusable post-earthquake. Also, it may be feasible to design such an augmented shallow foundation system to accommodate the vertical ground deformations but may not be possible to design it to accommodate the expected lateral ground deformations. This will require consideration by the structure engineer.

- Final design of geotechnical elements may require additional site characterization to verify subsurface conditions around the school building.

Closing

Thank you for the opportunity to perform these services for you. Please do not hesitate to contact us if you have any questions or comments.

Sincerely yours,
HALEY & ALDRICH, INC.

Tyler Slothower
Staff Engineer

Daniel J. Trisler, PE
Principal Geotechnical Engineer



Micah D. Hintz, PE
Geotechnical Engineer

Enclosures:

- Figure 1 – Vicinity Map
- Figure 2 – Site and Exploration Plan
- Appendix A – Exploration Logs
- Appendix B – Laboratory Test Results
- Appendix C – Historical Plans

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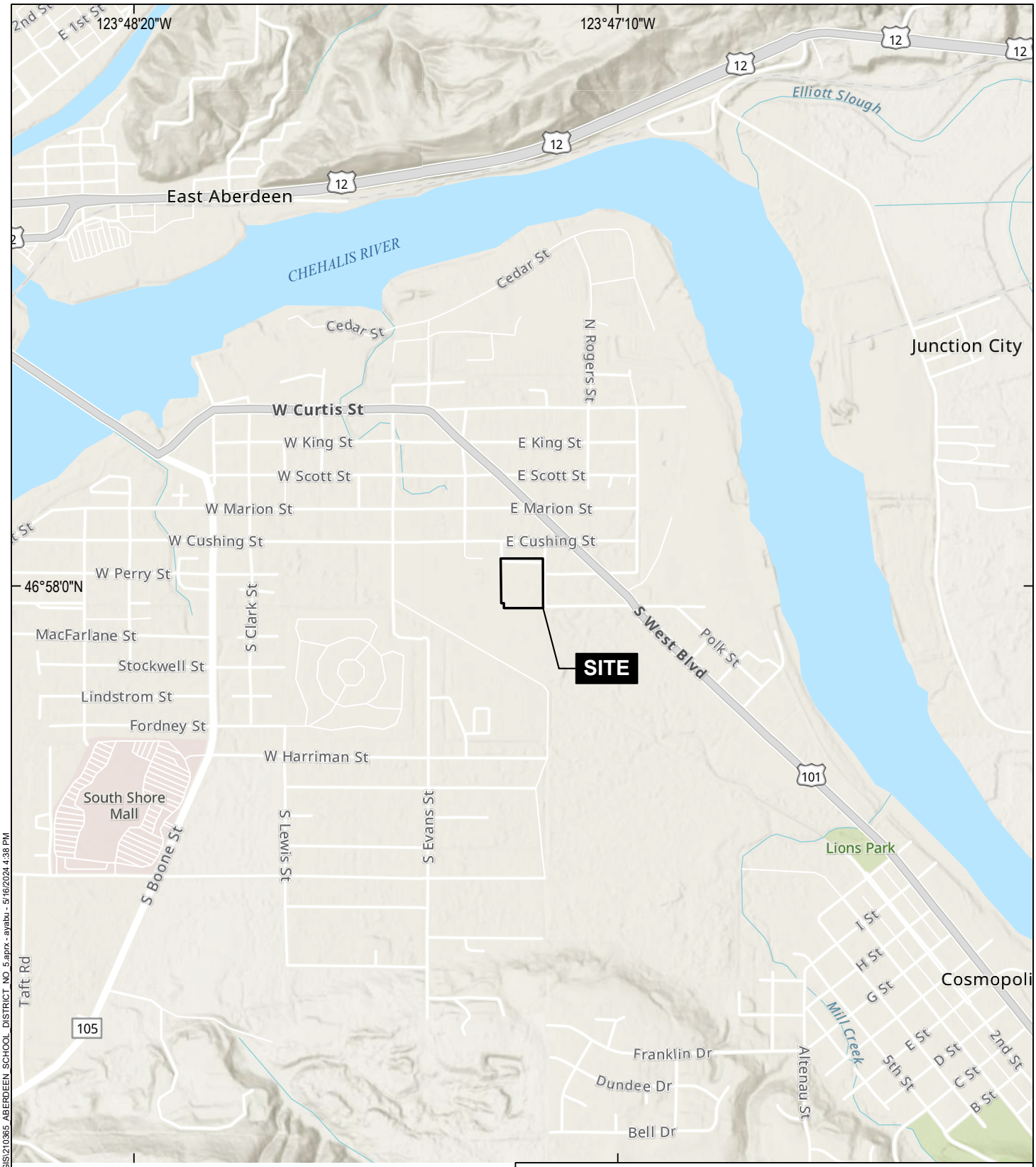
FIGURES







MAP SOURCE: ESRI
SITE COORDINATES: 46°58'N, 123°47'24"W

HALEY ALDRICH

STEVENS ELEMENTARY SCHOOL
SEISMIC SAFETY RETROFIT
ABERDEEN, WASHINGTON

PROJECT LOCUS

APPROXIMATE SCALE: 1 IN = 2000 FT
MAY 2024

FIGURE 1

GIS: \\haleyaldrich.com\share\CF\Projects\0210365\GIS\210365_ABERDEEN_SCHOOL_DISTRICT_NO_5.aprx - ayabu - 5/16/2024 4:38 PM



LEGEND

- CONE PENETRATION TEST
- MUD ROTARY BORING
- SITE BOUNDARY

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. AERIAL IMAGERY SOURCE: NEARMAP, 14 AUGUST 2023

N

0 80 160
SCALE IN FEET

HALEY ALDRICH

STEVENS ELEMENTARY SCHOOL
SEISMIC SAFETY RETROFIT
ABERDEEN, WASHINGTON

SITE AND EXPLORATION PLAN

MAY 2024

FIGURE 2

GIS FILE PATH: \\haleyaldrich.com\share\CF\Projects\021036\5\GIS\210365_ABERDEEN_SCHOOL_DISTRICT_NO_5.aprx - USER: ayabu - LAST SAVED: 5/16/2024 5:09 PM

APPENDIX A
Exploration Logs

APPENDIX A

Exploration Logs

We evaluated subsurface conditions at the site by completing one drilled boring on 11 April 2024 and performing one cone penetration test (CPT) on 10 April 2024. The field explorations were coordinated and overseen by geotechnical staff from Haley & Aldrich, Inc. who classified the various soil units encountered, obtained representative soil samples for geotechnical testing, and maintained a detailed log of the boring. Exploration logs are included in this appendix. Figure 2 of the report shows the approximate locations of the explorations. Explorations were located in the field using landmarks on site. Results of the laboratory testing are indicated on the exploration logs and are included in Appendix B.

BORING

The boring was advanced using mud rotary methods using a track-mounted CME-75 drill rig operated by Western States Soil Conservation, Inc., of Hubbard, Oregon. The boring created a hole approximately 5 inches in diameter.

SOIL SAMPLING AND CLASSIFICATION

Materials encountered in the explorations were classified in the field in general accordance with ASTM International (ASTM) Standard Practice D 2488 "Standard Practice for the Classification of Soils (Visual-Manual Procedure)." The exploration logs in this appendix show our interpretation of the exploration, sampling, and testing data. The logs indicate the depth where the soils change. Note that the change may be gradual. In the field, we classified the samples taken from the explorations according to the methods presented on the *Figure A-1, Key to Exploration Logs*. This figure also provides a legend explaining the symbols and abbreviations used in the logs.

Sampling of soils was completed at regular intervals throughout the depth of each boring. The samples were collected with a Standard Penetration Test sampler used in general conformance with ASTM Test Method D 1586 "Standard Method for Penetration Test and Split-Barrel Sampling of Soils." The sampler was driven by a 140-pound auto-trip hammer falling 30 inches. The *N* value, or number of blows required to drive the sampler 1 foot, or as otherwise indicated into the soils, is shown adjacent to the sample symbols on the boring logs. Disturbed samples were obtained from the SPT sampler. A piston sampler was used to collect relatively undisturbed Shelby tube samples. Samples were used for classification and laboratory testing purposes.

CONE PENETRATION TESTS

The CPT sounding was advanced by Conetec, Inc. of Seattle, Washington. The CPT was completed in general accordance with ASTM D 5778 using a seismic electronic cone penetrometer. The CPT sounding is an *in situ* test that provides assistance in characterizing subsurface stratigraphy. The test includes advancing a 35.6-millimeter-diameter cone equipped with a load cell, friction sleeve, strain gages, porous stone, and geophone through the soil profile. The cone is advanced at a rate of approximately 2 centimeters per second. Tip resistance, sleeve friction, and pore pressure are typically recorded at 0.1-meter intervals. The log of the CPT sounding is presented in this appendix.

Sample Description

Identification of soils in this report is based on visual field and laboratory observations which include density/consistency, moisture condition, grain size, and plasticity estimates and should not be construed to imply field nor laboratory testing unless presented herein. ASTM D 2488 visual-manual identification methods were used as a guide. Where laboratory testing confirmed visual-manual identifications, then ASTM D 2487 was used to classify the soils.

Relative Density/Consistency

Soil density/consistency in borings is related primarily to the standard penetration resistance (N). Soil density/consistency in test pits and probes is estimated based on visual observation and is presented parenthetically on the logs.

SAND or GRAVEL Relative Density	N (Blows/Foot)	SILT or CLAY Consistency	N (Blows/Foot)
Very loose	0 to 4	Very soft	0 to 1
Loose	5 to 10	Soft	2 to 4
Medium dense	11 to 30	Medium stiff	5 to 8
Dense	31 to 50	Stiff	9 to 15
Very dense	>50	Very stiff	16 to 30
		Hard	>30

Moisture

Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

USCS Soil Classification Chart (ASTM D 2487)

Major Divisions			Symbols: Graph	Symbols: USCS	Typical Descriptions
Coarse Grained Soils: More than 50% of Material Retained on No. 200 Sieve	Gravel and Gravelly Soils: More than 50% of Coarse Fraction Retained on No. 4 Sieve	Clean Gravels (<5% fines)		GW	Well-Graded Gravel; Well-Graded Gravel with Sand
				GP	Poorly Graded Gravel; Poorly Graded Gravel with Sand
		Gravels (5-12% fines)		GW-GM	Well-Graded Gravel with Silt; Well-Graded Gravel with Silt and Sand
				GW-GC	Well-Graded Gravel with Clay; Well-Graded Gravel with Clay and Sand
				GP-GM	Poorly Graded Gravel with Silt; Poorly Graded Gravel with Silt and Sand
				GP-GC	Poorly Graded Gravel with Clay; Poorly Graded Gravel with Clay and Sand
		Gravels with Fines (>12% fines)		GM	Silty Gravel; Silty Gravel with Sand
				GC	Clayey Gravel; Clayey Gravel with Sand
	Sand and Sandy Soils: More than 50% of Coarse Fraction Passing No. 4 Sieve	Sands with few Fines (<5% fines)		SW	Well-Graded Sand; Well-Graded Sand with Gravel
				SP	Poorly Graded Sand; Poorly Graded Sand with Gravel
		Sands (5-12% fines)		SW-SM	Well-Graded Sand with Silt Well-Graded Sand with Silt and Gravel
				SW-SC	Well-Graded Sand with Clay; Well-Graded Sand with Clay and Gravel
				SP-SM	Poorly Graded Sand with Silt; Poorly Graded Sand with Silt and Gravel
				SP-SC	Poorly Graded Sand with Clay; Poorly Graded Sand with Clay and Gravel
		Sands with Fines (>12% fines)		SM	Silty Sand; Silty Sand with Gravel
				SC	Clayey Sand; Clayey Sand with Gravel
Fine Grained Soils: More than 50% of Material Passing No. 200 Sieve	Silts			ML	Silt; Silt with Sand or Gravel; Sandy or Gravelly Silt
				MH	Elastic Silt; Elastic Silt with Sand or Gravel; Sandy or Gravelly Elastic Silt
	Silty Clay (based on Atterberg Limits)			CL-ML	Silty Clay; Silty Clay with Sand or Gravel; Gravelly or Sandy Silty Clay
	Clays			CL	Lean Clay; Lean Clay with Sand or Gravel; Sandy or Gravelly Lean Clay
				CH	Fat Clay; Fat Clay with Sand or Gravel; Sandy or Gravelly Fat Clay
	Organics			OL/OH	Organic Soil; Organic Soil with Sand or Gravel; Sandy or Gravelly Organic Soil
Highly Organic (>50% organic material)				PT	Peat - Decomposing Vegetation - Fibrous to Amorphous Texture

Minor Constituents

	Estimated Percentage
Sand, Gravel	
Trace	<5
Few	5 - 15
Cobbles, Boulders	
Trace	<5
Few	5 - 10
Little	15 - 25
Some	30 - 45

Soil Test Symbols

%F	Percent Passing No. 200 Sieve
AL	Atterberg Limits (%)
	Liquid Limit (LL)
	Water Content (WC)
	Plastic Limit (PL)
CA	Chemical Analysis
CAUC	Consolidated Anisotropic Undrained Compression
CAUE	Consolidated Anisotropic Undrained Extension
CBR	California Bearing Ratio
CIDC	Consolidated Drained Isotropic Triaxial Compression
CIUC	Consolidated Isotropic Undrained Compression
CK0DC	Consolidated Drained k0 Triaxial Compression
CK0DSS	Consolidated k0 Undrained Direct Simple Shear
CK0UC	Consolidated k0 Undrained Compression
CK0UE	Consolidated k0 Undrained Extension
CRSCN	Constant Rate of Strain Consolidation
DS	Direct Shear
DSS	Direct Simple Shear
DT	In Situ Density
GS	Grain Size Classification
HYD	Hydrometer
ILCN	Incremental Load Consolidation
K0CN	k0 Consolidation
kc	Constant Head Permeability
kf	Falling Head Permeability
MD	Moisture Density Relationship
OC	Organic Content
OT	Tests by Others
P	Pressuremeter
PID	Photoionization Detector Reading
PP	Pocket Penetrometer
SG	Specific Gravity
TRS	Torsional Ring Shear
TV	Torvane
UC	Unconfined Compression
UUC	Unconsolidated Undrained Triaxial Compression
VS	Vane Shear
WC	Water Content (%)

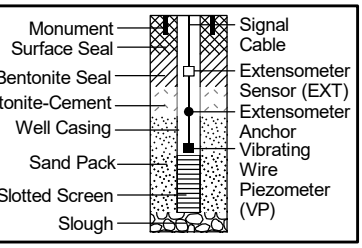
Groundwater Indicators

- Groundwater Level on Date or At Time of Drilling (ATD)
- Groundwater Level on Date Measured in Piezometer
- Groundwater Seepage (Test Pits)

Sample Symbols

- 1.5" I.D. Split Spoon
- 3.0" I.D. Split Spoon
- Modified California Sampler
- Rock Core Run
- Sonic Core
- Thin-walled Sampler
- Grab
- Cuttings
- Push Probe

Well Symbols



HALEY ALDRICH	Project: Aberdeen School District - Stevens Elementary Location: Aberdeen, Washington Project No.: 0210367-000	**Key to Exploration Logs**	Figure **A-1** Sheet **1 of 1**

HA KEY TO EXP LOGS (SOIL ONLY) - \\HALEYALDRICH.COM\SHARES\EA_DATA\GINT\HC_LIBRARY\GLB - 6/3/24 11:36 - \\HALEYALDRICH.COM\SHARES\CP\PROJECTS\02 10367\GINT\PERMANENT GINT FILES\0210367-000_ABERDEEN SCHOOL DISTRICT-STEVENS ELEMENTARY_GINT.GPJ - kbutler

Date Started: 04/10/2024	Date Completed: 04/11/2024	Drilling Contractor/Crew: Western States Soil Conservation, Inc. / Ray	
Logged by: S. Sirmans	Checked by: M. Hintz	Drilling Method: Mud Rotary	
Location: Lat: 46.966316 Long: -123.790090 (WGS 84)		Rig Model/Type: CME-75 / Truck-mounted drill rig	
Ground Surface Elevation: 11.84 feet (NAVD 88)		Hammer Type: Auto-hammer	
Comments:		Hammer Weight (pounds): 140	Hammer Drop Height (inches): 30
		Measured Hammer Efficiency (%): 90.6	
		Hole Diameter: 5 inches	Well Casing Diameter: NA
		Total Depth: 101.5 feet	Depth to Groundwater: 4.5 feet

Elevation (feet)	Depth (feet)	Sample Data: Blow Count	Type	Recovery	Length (inches)	Number / Tests	Graphic Log	Material Description	PL WC (%) LL; ✖ Fines Content (%); ▲ SPT N Value (10 20 30 40)	Depth (feet)
10	0					S-1		Asphalt (2-inches thick).		0
						S-2 WC		POORLY GRADED SAND WITH SILT (SP-SM), loose, dry, red-brown. [FILL]	58.8	
						S-3		SILTY SAND (SM), loose, moist, gray.		
5	5	0 0 0		12in.	18	S-4 S-5 AL, WC		ORGANIC SILT (OH), very soft, moist, dark gray with black layers, low plasticity, strong organic odor. [ALLUVIUM]	133.7 ▲0	5
0	10	0 0 0		18in.	18	S-6		ELASTIC SILT (MH), very soft, wet, gray, occasional organics.	▲0	10
				24in.	24	S-7				
		0 0 0		18in.	18	S-8 WC			89.7 ▲0	
-5	15	0 0 0		18in.	18	S-9 AL, GS, WC		ELASTIC SILT WITH SAND (MH), very soft, wet, gray, occasional organics.	75 62.0 ▲0	15
		0 0 0		18in.	18	S-10			▲0	
-10	20	0 0 0		12in.	18	S-11 WC			75.4 ▲0	20
-15	25	0 0 0		18in.	18	S-12 GS, WC		SILTY SAND (SM), very loose, wet, gray, fine sand, homogeneous.	29 ✖ ● ▲0	25
-20	30	3 2 1		18in.	18	S-13 GS			30 ✖ ▲3	30
-25	35	3 3 6		15in.	18	S-14 GS, WC		becomes loose	26 ✖ ● ▲9	35

General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HALEY ALDRICH

Project: Aberdeen School District - Stevens Elementary
Location: Aberdeen, Washington
Project No.: 0210367-000

Boring Log
B-SE01

Figure **A**
Sheet **1 of 3**

HA BORING LOG - \\HALEYALDRICH.COM\SHARE\SEA_DATA\GINTHC_LIBRARY.GLB - 6/12/24 08:29 - \\HALEYALDRICH.COM\SHARE\CORPROJECTS\0210367\GINT\PERMANENT GINT FILE\0210367-000_ABERDEEN SCHOOL DISTRICT-STEVENS ELEMENTARY_GINT.GPJ - kbutler

Date Started: 04/10/2024	Date Completed: 04/11/2024	Drilling Contractor/Crew: Western States Soil Conservation, Inc. / Ray	
Logged by: S. Sirmans	Checked by: M. Hintz	Drilling Method: Mud Rotary	
Location: Lat: 46.966316 Long: -123.790090 (WGS 84)		Rig Model/Type: CME-75 / Truck-mounted drill rig	
Ground Surface Elevation: 11.84 feet (NAVD 88)		Hammer Type: Auto-hammer	
Comments:		Hammer Weight (pounds): 140	Hammer Drop Height (inches): 30
		Measured Hammer Efficiency (%): 90.6	
		Hole Diameter: 5 inches	Well Casing Diameter: NA
		Total Depth: 101.5 feet	Depth to Groundwater: Not Identified

Elevation (feet)	Depth (feet)	Sample Data: Blow Count	Type	Recovery	Length (inches)	Number / Tests	Graphic Log	Material Description	PL WC (%) LL; ✖ Fines Content (%); ▲ SPT N Value (10 20 30 40)	Depth (feet)
-30	40	0 1 3		18in.	18	S-15		SILTY SAND (SM), loose, wet, gray, fine sand, homogeneous.	▲ 4	40
-35	45	4 3 5		18in.	18	S-16 GS			✖ 28 ▲ 8	45
-40	50	2 3 5		18in.	18	S-17			▲ 8	50
-45	55	0 0 0		18in.	18	S-18 WC		becomes very loose	▲ 0 ●	55
-50	60	13 7 3		16in.	18	S-19		becomes loose	▲ 10	60
-55	65	20 27 28		18in.	18	S-20 GS		WELL-GRADED SAND WITH SILT (SW-SM), trace gravel, very dense, wet, gray, fine gravel.	✖ 8 ▲ 55	65
-60	70	1 3 9		16in.	18	S-21 WC		POORLY GRADED SAND (SP), medium dense, wet, gray, silty sand lenses.	▲ 12 ● 52.2	70
-65	75	17 9 4		10in.	18	S-22			▲ 13	75

General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HALEY ALDRICH

Project: Aberdeen School District - Stevens Elementary
Location: Aberdeen, Washington
Project No.: 0210367-000

Boring Log
B-SE01

Figure **A**
Sheet **2 of 3**

HA BORING LOG - \\HALEYALDRICH.COM\SHARE\SEA_DATA\GINT\HC_LIBRARY.GLB - 6/12/24 08:29 - \\HALEYALDRICH.COM\SHARE\CORPROJECTS\0210367\GINT\PERMANENT GINT FILE\0210367-000_ABERDEEN SCHOOL DISTRICT-STEVENS ELEMENTARY_GINT.GPJ - kbutel

Date Started: 04/10/2024	Date Completed: 04/11/2024	Drilling Contractor/Crew: Western States Soil Conservation, Inc. / Ray	
Logged by: S. Sirmans	Checked by: M. Hintz	Drilling Method: Mud Rotary	
Location: Lat: 46.966316 Long: -123.790090 (WGS 84)		Rig Model/Type: CME-75 / Truck-mounted drill rig	
Ground Surface Elevation: 11.84 feet (NAVD 88)		Hammer Type: Auto-hammer	
Comments:		Hammer Weight (pounds): 140	Hammer Drop Height (inches): 30
		Measured Hammer Efficiency (%): 90.6	
		Hole Diameter: 5 inches	Well Casing Diameter: NA
		Total Depth: 101.5 feet	Depth to Groundwater: Not Identified

Elevation (feet)	Depth (feet)	Sample Data: Blow Count	Type	Recovery	Length (inches)	Number / Tests	Graphic Log	Material Description	PL WC (%) LL; ✖ Fines Content (%); ▲ SPT N Value (10 20 30 40)	Depth (feet)
-70	80	0 0 4		18in.	18	S-23 WC		POORLY GRADED SAND (SP), loose, wet, gray, silty sand lenses.	▲ 4; ✖ 58.2	80
-75	85	17 23 21		9in.	18	S-24		POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), dense, wet, gray, fine sand, completely decomposed rock. [MONTESANO FORMATION]	▲ 44	85
-80	90	27 32 40		14in.	18	S-25 WC		becomes very dense	● ▲ 72	90
-85	95	19 24 22		12in.	18	S-26		becomes dense	▲ 46	95
-90	100	30 30 25		10in.	18	S-27		becomes very dense	▲ 55	100
-95	105							Bottom of Borehole at 101.5 feet.		105
-100	110									110
-105	115									115

General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HALEY ALDRICH

Project: Aberdeen School District - Stevens Elementary
Location: Aberdeen, Washington
Project No.: 0210367-000

Boring Log
B-SE01

Figure **A**
Sheet **3 of 3**

HA BORING LOG - \\HALEYALDRICH.COM\SHARE\SEA_DATA\GINT\HC_LIBRARY.GLB - 6/12/24 08:29 - \\HALEYALDRICH.COM\SHARE\CORPROJECTS\0210367\GINT\PERMANENT GINT FILE\0210367-000_ABERDEEN SCHOOL DISTRICT-STEVENS ELEMENTARY_GINT.GPJ - kbutler

PRESENTATION OF SITE INVESTIGATION RESULTS

Aberdeen Schools

Prepared for:

Client Name

ConeTec Job No: **24-59-27459**

Project Start Date: 2024-04-10
Project End Date: 2024-04-11
Release Date: 2024-04-22

Report Prepared by:

ConeTec, Inc.

1237 S Director Street, Seattle, WA 98108

Tel: (253) 397-4861

ConeTecWA@conetec.com
www.conetec.com
www.conetecdataservices.com



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ABOUT THIS REPORT

The enclosed report presents the results of the site investigation program conducted by ConeTec, Inc. for Client Name.

Please note that this report, which also includes all accompanying data, are subject to the 3rd Party Disclaimer and Client Disclaimer that follow in the 'Limitations' section of this report. Please refer to the list of attached documents following the text of this report. A site map, test summaries, and test plots are all included in the body of the report.

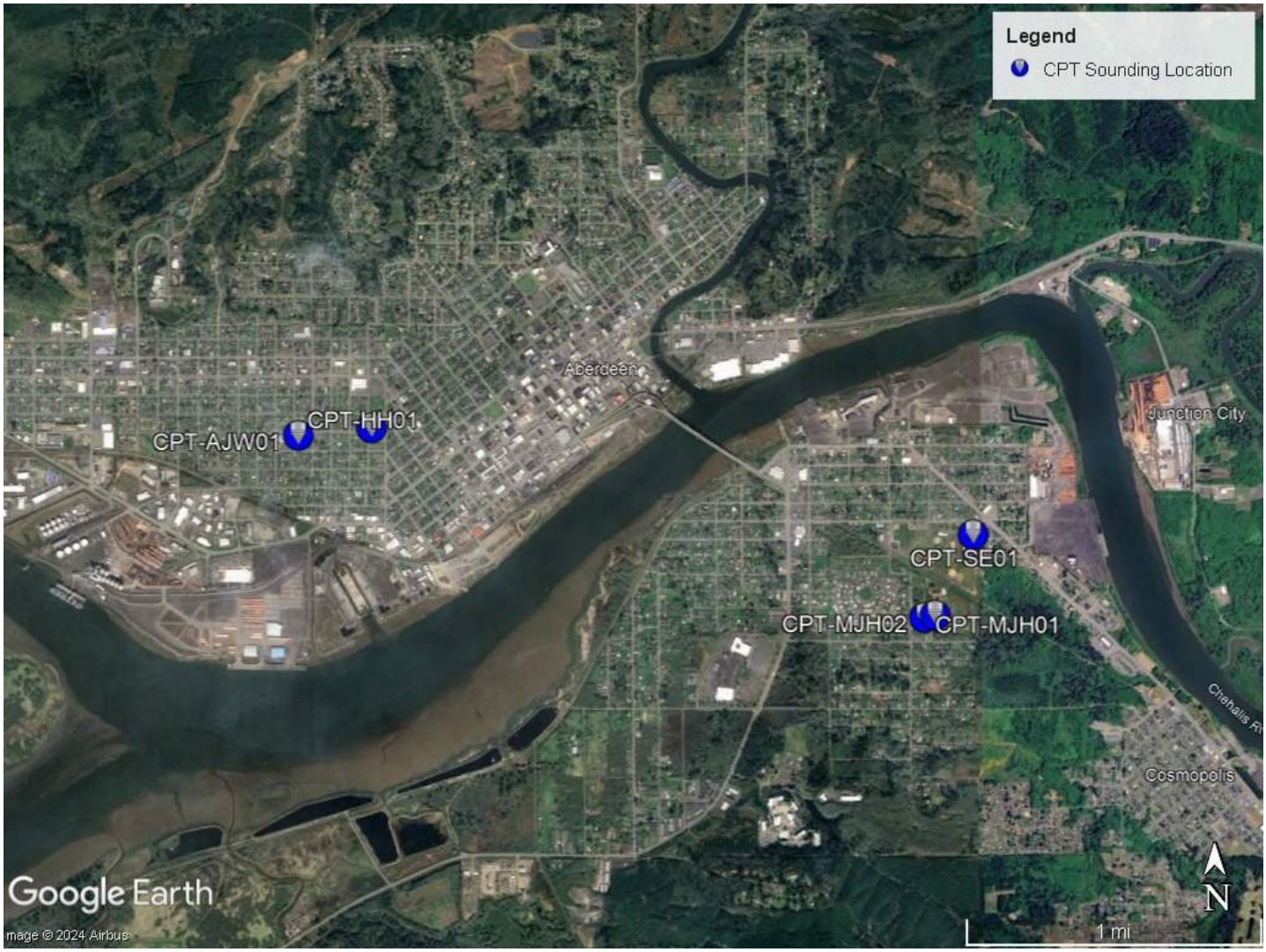
Project	
Client	Client Name
Project	Aberdeen Schools
ConeTec Project Number	24-59-27459
Test Types	SCPTu
Additional Comments	None

Contents

The following listed below are included in the body of this report:

- **Site Map**
- **Limitations and Closure**
- **Project Information**
- **Methodology Statements**
- **Report Appendices**

SITE MAP



All locations are approximate unless otherwise stated in the body of the report.

ConeTec Job Number: 24-59-27459

Client: Client Name

Project: Aberdeen Schools

Date: 2024-04-22

ConeTec

LIMITATIONS

3rd Party Disclaimer

The "Report" refers to this report titled: Aberdeen Schools

The Report was prepared by ConeTec for: Client Name

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Client Disclaimer

ConeTec was retained by: Client Name

The "Report" refers to this report titled: Aberdeen Schools

ConeTec was retained to collect and provide the raw data ("Data") which is included in the Report.

ConeTec has collected and reported the Data in accordance with current industry standards. No other warranty, express or implied, with respect to the Data is made by ConeTec. In order to properly understand the Data included in the Report, reference must be made to the documents accompanying and other sources referenced in the Report in their entirety. Other than the Data, the contents of the Report (including any Interpretations) should not be relied upon in any fashion without independent verification and ConeTec is in no way responsible for any loss, damage or expense resulting from the use of, and/or reliance on, such material by any party.

Closure

Thank you for the opportunity to work on this project. The equipment used as well the field procedures followed, all complied with current accepted best practice standards.

Report prepared by: MH, JM

PROJECT INFORMATION

Rig		
Description	**Deployment System**	**Test Type**
C02-020 CPT Truck Rig	Twin mounted cylinders	SCPTu

Coordinates		
Test Type	**Collection Method**	**EPSG Number**
SCPTu	Consumer Grade GPS	4326 (WGS84 / LatLong)

Piezocones Used for this Project						
Cone Description	**Cone Number**	**Cross Sectional Area** (cm^2)	**Sleeve Area** (cm^2)	**Tip Capacity** (bar)	**Sleeve Capacity** (bar)	**Pore Pressure Capacity** (bar)
EC1065:T1500F15U35	1065	15	225	1500	15	35

Cone Penetration Test (CPTu)	
Depth reference	Depths are referenced to the existing ground surface at the time of each test.
Tip and sleeve data offset	0.1 Meters. This has been accounted for in the CPT data files.

Calculated Geotechnical Parameters	
Additional information	The Normalized Soil Behaviour Type Chart based on Q_{tn} (SBT Q_{tn}) (Robertson, 2009) was used to classify the soil for this project. A detailed set of calculated CPTu parameters have been generated and are provided in Excel format files in the release folder. The CPTu parameter calculations are based on values of corrected tip resistance (q_t) sleeve friction (f_s) and pore pressure (u_2). Effective stresses are calculated based on unit weights that have been assigned to the individual soil behaviour type zones and the assumed equilibrium pore pressure profile. Soils were classified as either drained or undrained based on the Q_{tn} Normalized Soil Behaviour Type Chart (Robertson, 2009). Calculations for both drained and undrained parameters were included for materials that classified as silt mixtures (zone 4).

Methodology Statements and Data File Formats

CONETEC

METHODOLOGY STATEMENTS



CONE PENETRATION TEST (CPTu) - eSeries

Cone penetration tests (CPTu) are conducted using an integrated electronic piezocone penetrometer and data acquisition system manufactured by Adara Systems Ltd., a subsidiary of ConeTec.

ConeTec's piezocone penetrometers are compression type designs in which the tip and friction sleeve load cells are independent and have separate load capacities. The piezocones use strain gauged load cells for tip and sleeve friction and a strain gauged diaphragm type transducer for recording pore pressure. The piezocones also have a platinum resistive temperature device (RTD) for monitoring the temperature of the sensors, an accelerometer type dual axis inclinometer and two geophone sensors for recording seismic signals. All signals are amplified and measured with minimum sixteen-bit resolution down hole within the cone body, and the signals are sent to the surface using a high bandwidth, error corrected digital interface through a shielded cable.

ConeTec penetrometers are manufactured with various tip, friction and pore pressure capacities in both 10 cm^2 and 15 cm^2 tip base area configurations in order to maximize signal resolution for various soil conditions. The specific piezocone used for each test is described in the CPT summary table. The 15 cm^2 penetrometers do not require friction reducers as they have a diameter larger than the deployment rods. The 10 cm^2 piezocones use a friction reducer consisting of a rod adapter extension behind the main cone body with an enlarged cross sectional area (typically 44 millimeters diameter over a length of 32 millimeters with tapered leading and trailing edges) located at a distance of 585 millimeters above the cone tip.

The penetrometers are designed with equal end area friction sleeves, a net end area ratio of 0.8 and cone tips with a 60 degree apex angle.

All ConeTec piezocones can record pore pressure at various locations. Unless otherwise noted, the pore pressure filter is located directly behind the cone tip in the "u_2" position (ASTM Type 2). The filter is six millimeters thick, made of porous plastic (polyethylene) having an average pore size of 125 microns (90-160 microns). The function of the filter is to allow rapid movements of extremely small volumes of water needed to activate the pressure transducer while preventing soil ingress or blockage.

The piezocone penetrometers are manufactured with dimensions, tolerances and sensor characteristics that are in general accordance with the current ASTM D5778 standard. ConeTec's calibration criteria also meets or exceeds those of the current ASTM D5778 standard. An illustration of the piezocone penetrometer is presented in Figure CPTu.

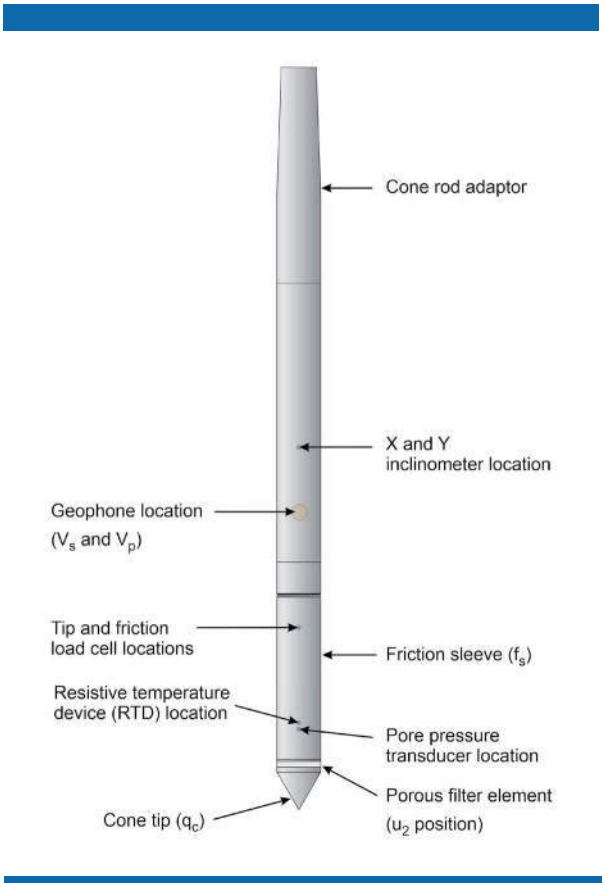

Figure CPTu. Piezocone Penetrometer (15 cm²)

The ConeTec data acquisition system consists of a Windows based computer, signal interface box, and power supply. The signal interface combines depth increment signals, seismic trigger signals and the downhole digital data. This combined data is then sent to the Windows based computer for collection and presentation. The data is recorded at fixed depth increments using a depth encoder that is either portable or integrated into the rig. The typical recording interval is 2.5 centimeters; custom recording intervals are possible.

The system displays the CPTu data in real time and records the following parameters to a storage media during penetration:

- Depth
- Uncorrected tip resistance (q_c)
- Sleeve friction (f_s)
- Dynamic pore pressure (u)
- Additional sensors such as resistivity, passive gamma, ultra violet induced fluorescence, if applicable

All testing is performed in accordance to ConeTec's CPTu operating procedures which are in general accordance with the current ASTM D5778 standard.

Prior to the start of a CPTu sounding a suitable cone is selected, the cone and data acquisition system are powered on, the pore pressure system is saturated with silicone oil and the baseline readings are recorded with the cone hanging freely in a vertical position.

The CPTu is conducted at a steady rate of two centimeters per second, within acceptable tolerances. Typically one meter length rods with an outer diameter of 1.5 inches are added to advance the cone to the sounding termination depth. After cone retraction final baselines are recorded.

Additional information pertaining to ConeTec's cone penetration testing procedures:

- Each filter is saturated in silicone oil under vacuum pressure prior to use
- Baseline readings are compared to previous readings
- Soundings are terminated at the client's target depth or at a depth where an obstruction is encountered, excessive rod flex occurs, excessive inclination occurs, equipment damage is likely to take place, or a dangerous working environment arises
- Differences between initial and final baselines are calculated to ensure zero load offsets have not occurred and to ensure compliance with ASTM standards

The interpretation of piezocone data for this report is based on the corrected tip resistance (q_t), sleeve friction (f_s) and pore water pressure (u). The interpretation of soil type is based on the correlations developed by Robertson, P.K., 2010. The Soil Behavior Type (SBT) classification chart developed by Robertson, P.K., 2010 is presented in Figure SBT. It should be noted that it is not always possible to accurately identify a soil behavior type based on these parameters. In these situations, experience, judgment and an assessment of other parameters may be used to infer soil behavior type.

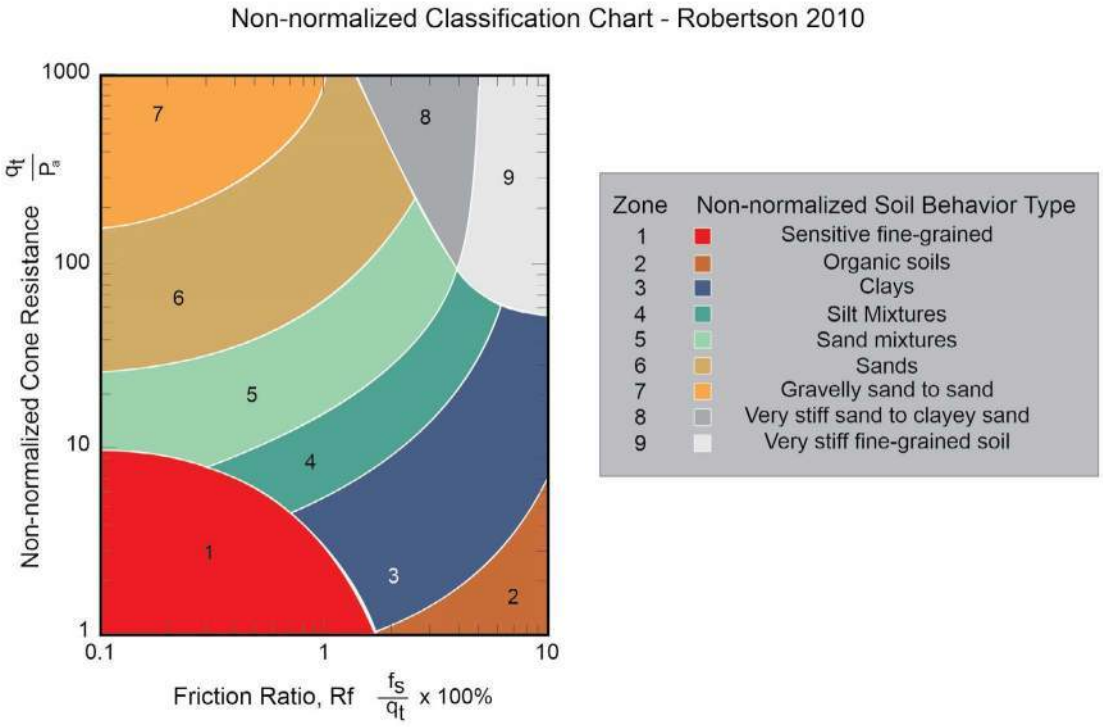

Figure SBT. Non-Normalized Soil Behavior Type Classification Chart (SBT)

The recorded tip resistance (q_c) is the total force acting on the piezocone tip divided by its base area. The tip resistance is corrected for pore pressure effects and termed corrected tip resistance (q_t) according to the following expression presented in Robertson et al. (1986):

$$q_t = q_c + (1-a) \bullet u_2$$

where: q_t is the corrected tip resistance
q_c is the recorded tip resistance
u_2 is the recorded dynamic pore pressure behind the tip (u_2 position)
a is the Net Area Ratio for the piezocone (0.8 for ConeTec probes)

The sleeve friction (f_s) is the frictional force on the sleeve divided by its surface area. As all ConeTec piezocones have equal end area friction sleeves, pore pressure corrections to the sleeve data are not required.

The dynamic pore pressure (u) is a measure of the pore pressures generated during cone penetration. To record equilibrium pore pressure, the penetration must be stopped to allow the dynamic pore pressures to stabilize. The rate at which this occurs is predominantly a function of the permeability of the soil and the diameter of the cone.

The friction ratio (Rf) is a calculated parameter. It is defined as the ratio of sleeve friction to the tip resistance expressed as a percentage. Generally, saturated cohesive soils have low tip resistance, high friction ratios and generate large excess pore water pressures. Cohesionless soils have higher tip resistances, lower friction ratios and do not generate significant excess pore water pressure.

For additional information on CPTu interpretations and calculated geotechnical parameters, refer to Robertson et al. (1986), Lunne et al. (1997), Robertson (2009), Mayne (2013, 2014) and Mayne and Peuchen (2012).

REFERENCES

ASTM D5778-20, 2020, “Standard Test Method for Performing Electronic Friction Cone and Piezocone Penetration Testing of Soils”, ASTM International, West Conshohocken, PA. DOI: 10.1520/D5778-20.

Lunne, T., Robertson, P.K. and Powell, J. J. M., 1997, “Cone Penetration Testing in Geotechnical Practice”, Blackie Academic and Professional.

Mayne, P.W., 2013, “Evaluating yield stress of soils from laboratory consolidation and in-situ cone penetration tests”, Sound Geotechnical Research to Practice (Holtz Volume) GSP 230, ASCE, Reston/VA: 406-420. DOI: 10.1061/9780784412770.027.

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Robertson, P.K., 2010. Soil behavior type from the CPT: an update. 2nd International Symposium on Cone Penetration Testing, CPT’10, Huntington Beach, CA, USA

PORE PRESSURE DISSIPATION TEST

The cone penetration test is halted at specific depths to carry out pore pressure dissipation (PPD) tests, shown in Figure PPD-1. For each dissipation test the cone and rods are decoupled from the rig and the data acquisition system measures and records the variation of the pore pressure (u) with time (t).

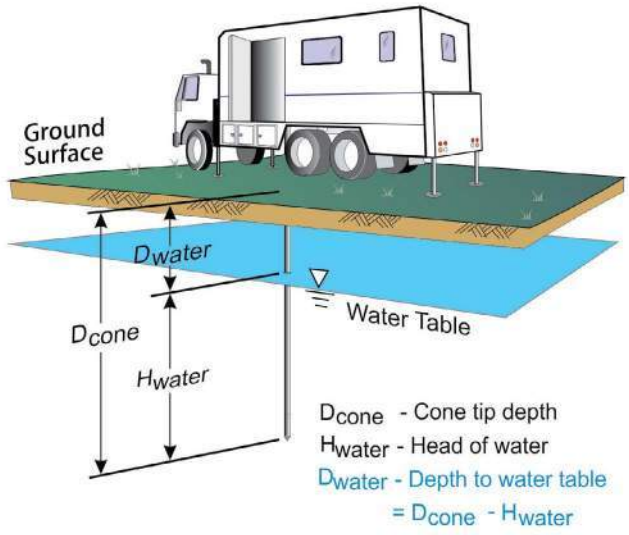


Figure PPD-1. Pore pressure dissipation test setup

Pore pressure dissipation data can be interpreted to provide estimates of ground water conditions, permeability, consolidation characteristics and soil behavior.

The typical shapes of dissipation curves shown in Figure PPD-2 are very useful in assessing soil type, drainage, in situ pore pressure and soil properties. A flat curve that stabilizes quickly is typical of a freely draining sand. Undrained soils such as clays will typically show positive excess pore pressure and have long dissipation times. Dilative soils will often exhibit dynamic pore pressures below equilibrium that then rise over time. Overconsolidated fine-grained soils will often exhibit an initial dilatory response where there is an initial rise in pore pressure before reaching a peak and dissipating.

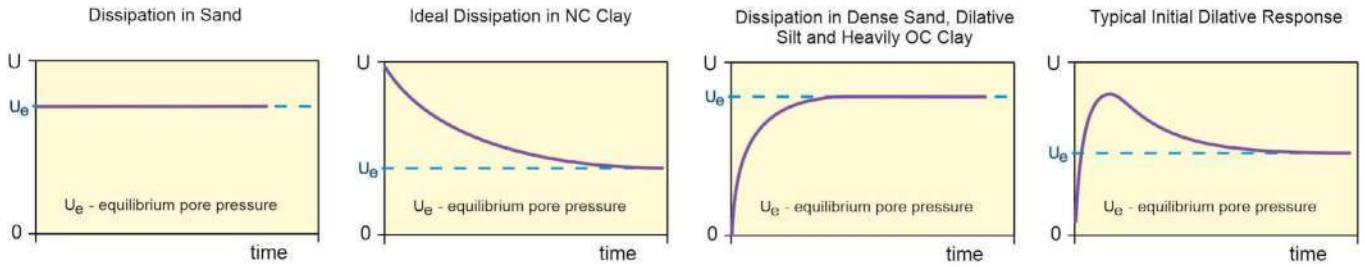
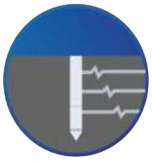


Figure PPD-2. Pore pressure dissipation curve examples

In order to interpret the equilibrium pore pressure (u_{eq}) and the apparent phreatic surface, the pore pressure should be monitored until such time as there is no variation in pore pressure with time as shown for each curve in Figure PPD-2.



SEISMIC CONE PENETRATION TEST (SCPTu) - eSeries

Shear wave velocity (Vs) testing is performed in conjunction with the piezocone penetration test (SCPTu) in order to collect interval velocities. For some projects seismic compression wave velocity (Vp) testing is also performed.

ConeTec's piezocone penetrometers are manufactured with one horizontally active geophone (28 hertz) and one vertically active geophone (28 hertz). Both geophones are rigidly mounted in the body of the cone penetrometer, 0.2 meters behind the cone tip. The vertically mounted geophone is more sensitive to compression waves.

Shear waves are typically generated by using an impact hammer horizontally striking a beam that is held in place by a normal load. In some instances, an auger source or an imbedded impulsive source may be used for both shear waves and compression waves. The hammer and beam act as a contact trigger that initiates the recording of the seismic wave traces. For impulsive devices an accelerometer trigger may be used. The traces are recorded in the memory of the cone using a fast analog to digital converter. The seismic trace is then transmitted digitally uphole to a Windows based computer through a signal interface box for recording and analysis. An illustration of the shear wave testing configuration is presented in Figure SCPTu-1.

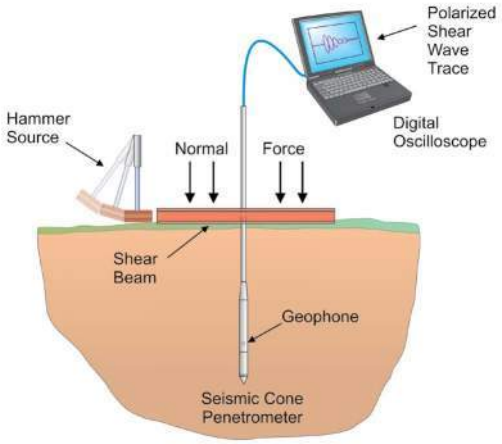


Figure SCPTu-1. Illustration of the SCPTu system

All testing is performed in accordance to ConeTec's SCPTu operating procedures which are in general accordance with the current ASTM D5778 and ASTM D7400 standards.

Prior to the start of a SCPTu sounding, the procedures described in the Cone Penetration Test section are followed. In addition, the active axis of the geophone is aligned parallel to the beam (or source) and the horizontal offset between the cone and the source is measured and recorded.

Prior to recording seismic waves at each test depth, cone penetration is stopped and the rods are decoupled from the rig to avoid transmission of rig energy down the rods. Typically, five wave traces for each orientation are recorded for quality control and uncertainty analysis purposes. After reviewing wave traces for consistency the cone is pushed to the next test depth (typically one meter intervals or as requested by the client). Figure SCPTu-2 presents an illustration of a SCPTu test.

For additional information on seismic cone penetration testing refer to Robertson et al. (1986).

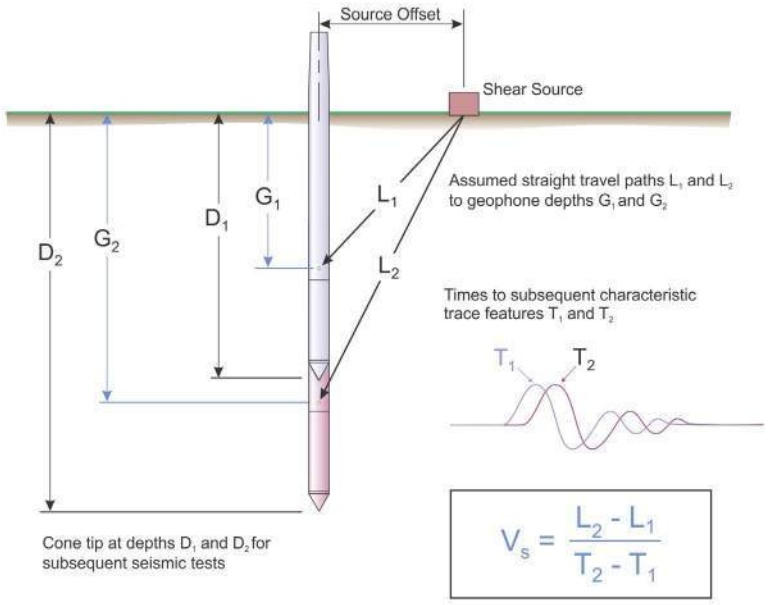


Figure SCPTu-2. Illustration of a seismic cone penetration test

For the determination of interval travel times the wave traces from all depths are displayed in analysis software. The results of the interval picks are supplied in the relevant appendix of this report. Standard practice for ConeTec is to record five wave traces for each source direction at each test depth. Outlier impacts are identified in the field and the impacts are repeated. For the final wave trace profile, the traces are stacked in the time domain to display a single average trace.

Calculation of the interval velocities are performed by visually picking a common feature (e.g. the first characteristic peak, trough, or crossover) on all of the recorded wave sets and taking the difference in ray path divided by the time difference between subsequent features. Ray path is defined as the straight line distance from the seismic source to the geophone, accounting for beam offset, source depth and geophone offset from the cone tip.

In some cases, usually for shear wave velocity testing, more than one characteristic marker may be used. If there is an overlap between different sets of characteristic markers, then the average time value for those sets of interval times is applied to the determination of velocity.

Ideally, all depths are used for the determination of the velocity profile. However, an interval may be skipped if there is some ambiguity or quality concern with a particular depth, resulting in a larger interval.

Tabular velocity results and SCPTu plots are presented in the relevant appendix.

For all SCPTu soundings that have achieved a depth of at least 100 feet (30 meters), the average shear wave velocity to a depth of 100 feet ($\overline{v}_S$) has been calculated and provided for all applicable soundings using the following equation presented in ASCE (2010).

$$\bar{v}_s = \frac{\sum_{i=1} d_i}{\sum_{i=1}^{n} \frac{d_i}{v_{si}}}$$

where: $\bar{v}_s$ = average shear wave velocity ft/s (m/s)
d_i = the thickness of any layer between 0 and 100 ft (30 m)
v_{si} = the shear wave velocity in ft/s (m/s)
$\sum_{i=1}^{n} d_i$ = the total thickness of all layers between 0 and 100 ft (30 m)

Average shear wave velocity, $\bar{v}_s$ is also referenced to V_{s100} or V_{s30}.

The layer travel times refers to the travel times propagating in the vertical direction, not the measured travel times from an offset source.

REFERENCES

American Society of Civil Engineers (ASCE), 2010, "Minimum Design Loads for Buildings and Other Structures", Standard ASCE/ SEI 7-10, American Society of Civil Engineers, ISBN 978-0-7844-1085-1, Reston, Virginia. DOI: 10.1061/9780784412916.

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ASTM D7400/D7400M-19, 2019, "Standard Test Methods for Downhole Seismic Testing", ASTM International, West Conshohocken, PA. DOI: 10.1520/D7400_D7400M-19.

Robertson, P.K., Campanella, R.G., Gillespie D and Rice, A., 1986, "Seismic CPT to Measure In-Situ Shear Wave Velocity", Journal of Geotechnical Engineering ASCE, Vol. 112, No. 8: 791-803. DOI: 10.1061/(ASCE)0733-9410(1986)112:8(791).

CONE PENETRATION DIGITAL FILE FORMATS - eSeries

CPT Data Files (COR Extension)

ConeTec CPT data files are stored in ASCII text files that are readable by almost any text editor. ConeTec file names start with the job number (which includes the two digit year number) an underscore as a separating character, followed by two letters based on the type of test and the sounding ID. The last character position is reserved for an identifier letter (such as b, c, d etc) used to uniquely distinguish multiple soundings at the same location. The CPT sounding file has the extension COR. As an example, for job number 21-02-00001 the first CPT sounding will have file name 21-02-00001_CP01.COR

The sounding (COR) file consists of the following components:

1. Two lines of header information
2. Data records
3. End of data marker
4. Units information

Header Lines

Line 1: Columns 1-6 may be blank or may indicate the version number of the recording software
Columns 7-21 contain the sounding Date and Time (Date is MM:DD:YY)
Columns 23-38 contain the sounding Operator
Columns 51-100 contain extended Job Location information

Line 2: Columns 1-16 contain the Job Location
Columns 17-32 contain the Cone ID
Columns 33-47 contain the sounding number
Columns 51-100 may contain extended sounding ID information

Data Records

The data records contain 4 or more columns of data in floating point format. A comma and spaces separate each data item:

Column 1: Sounding Depth (meters)
Column 2: Tip (q_c), recorded in units selected by the operator
Column 3: Sleeve (f_s), recorded in units selected by the operator
Column 4: Dynamic pore pressure (u), recorded in units selected by the operator
Column 5: Empty or may contain other requested data such as Gamma, Resistivity or UVIF data

End of Data Marker

After the last line of data there is a line containing an ASCII 26 (CTL-Z) character (small rectangular shaped character) followed by a newline (carriage return / line feed). This is used to mark the end of data.

Units Information

The last section of the file contains information about the units that were selected for the sounding. A separator bar makes up the first line. The second line contains the type of units used for depth, q_c, f_s and u. The third line contains the conversion values required for ConeTec's software to convert the recorded data to an internal set of base units (bar for q_c, bar for f_s and meters for u). Additional lines intended for internal ConeTec use may appear following the conversion values.

CPT Data Files (XLS Extension)

Excel format files of ConeTec CPT data are also generated from corresponding COR files. The XLS files have the same base file name as the COR file with a -BSC suffix. The information in the file is presented in table format and contains additional information about the sounding such as coordinate information, and tip net area ratio.

The BSCI suffix is given to XLS files which are enhanced versions of the BSC files and include the same data records in addition to inclination data collected for each sounding.

CPT Dissipation Files (XLS Extension)

Pore pressure dissipation files are provided in Excel format and contain each dissipation trace that exceeds a minimum duration (selected during post-processing) formatted column wise within the spreadsheet. The first column (Column A) contains the time in seconds and the second column (Column B) contains the time in minutes. Subsequent columns contain the dissipation trace data. The columns extend to the longest trace of the data set.

Detailed header information is provided at the top of the worksheet. The test depth in meters and feet, the number of points in the trace and the particular units are all presented at the top of each trace column.

CPT Dissipation files have the same naming convention as the CPT sounding files with a "–PPD" suffix.

Data Records

Each file will contain dissipation traces that exceed a minimum duration (selected during post-processing) in a particular column. The dissipation pore pressure values are typically recorded at varying time intervals throughout the trace; rapidly to start and increasing as the duration of the test lengthens. The test depth in meters and feet, the number of points in the trace and the trace number are identified at the top of each trace column.

Cone Type Designations

Cone ID	Cone Description	Tip Cross Sect. Area (cm^2)	Tip Capacity (bar)	Sleeve Area (cm^2)**	Sleeve Capacity (bar)	Pore Pressure Capacity (bar)
EC###	A15T1500F15U35	15	1500	225	15	35
EC###	A15T375F10U35	15	375	225	10	35
EC###	A10T1000F10U35	10	1000	150	10	35

refers to the Cone ID number
**Outer Cylindrical Area

REPORT APPENDICES

The appendices listed below are included in the report:

- **Cone Penetration Test (CPTu) Summary and Standard CPTu Plots**
- **Standard CPTu Plots with Reduced Scales**
- **Normalized Cone Penetration Test Plots**
- **Advanced Cone Penetration Test Plots**
- **Soil Behavior Type (SBT) Scatter Plots**
- **Pore Pressure Dissipation Test (PPDT) Summary and PPDT Plots**
- **Seismic Cone Penetration Test (SCPTu) Tabular Results**
- **SCPTu Plots**
- **SCPTu Velocity Wave Traces**
- **Supplementary Documents and Materials**

Cone Penetration Test (CPTu) Summary and Standard CPTu Plots

CONETEC

Job No: 24-59-27459
Client: Haley & Aldrich, Inc.
Project: Aberdeen Schools
Start Date: 2024-04-10
End Date: 2024-04-11

CONE PENETRATION TEST SUMMARY

Sounding ID	File Name	Date	Cone	Cone Area (cm^2)	Assumed Phreatic Surface[1] (ft)	Final Depth (ft)	Seismic Intervals	Latitude[2]	Longitude[2]	Refer to Notation Number
CPT-AJW01	24-59-27459_SP-AJW01	2024-04-10	1065:T1500F15U35	15	3.2	121.39	36	46.97223	-123.83739	
CPT-HH01	24-59-27459_SP-HH01	2024-04-10	1065:T1500F15U35	15	2.4	109.17	32	46.97258	-123.83214	
CPT-MJH01	24-59-27459_SP-MJH01	2024-04-11	1065:T1500F15U35	15	7.1	111.55	33	46.96327	-123.79191	
CPT-MJH02	24-59-27459_SP-MJH02	2024-04-11	1065:T1500F15U35	15		4.92		46.96315	-123.79268	3
CPT-SE01	24-59-27459_SP-SE01	2024-04-11	1065:T1500F15U35	15	5.8	89.32	27	46.96719	-123.78915	
Totals	5 Soundings					436.35 ft	128			

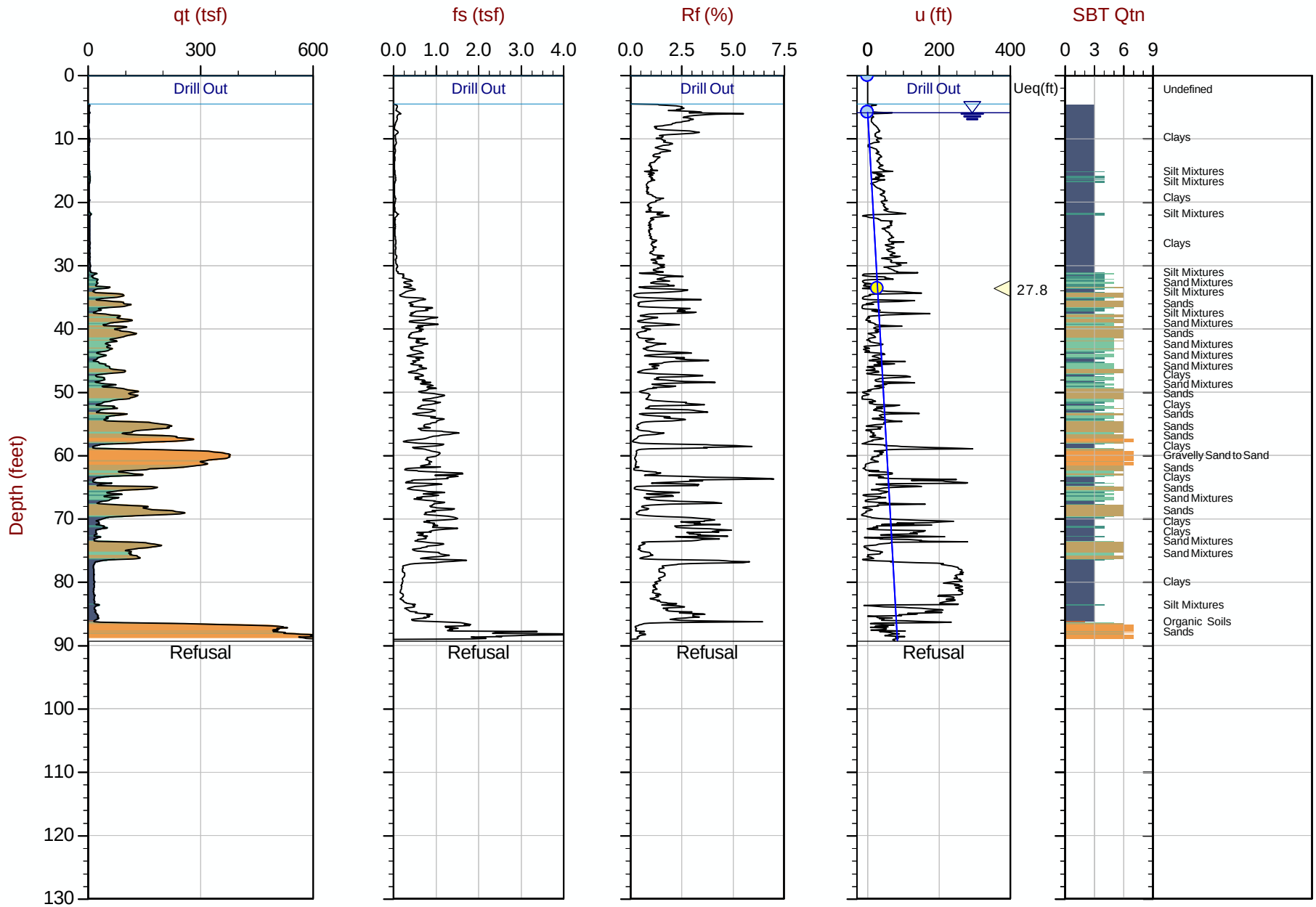
1. The assumed phreatic surface was based off the shallowest pore pressure dissipation tests performed within or nearest the sounding. Hydrostatic conditions were assumed for the calculated parameters.
2. The coordinates were collected using consumer grade GPS. EPSG number: 4326 (WGS84 / LatLong).
3. The phreatic surface is assumed to be deeper than the extent of the CPT final test depth.

CONETEC

Haley & Aldrich

Job No: 24-59-27459
Date: 2024-04-11 13:02
Site: Aberdeen Schools

Sounding: CPT-SE01
Cone: 1065:T1500F15U35



Max Depth: 27.225 m / 89.32 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 24-59-27459_SP-SE01.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 46.96719 Long: -123.78915

Overplot Item: Ueq, Assumed Ueq, Dissipation, Ueq achieved, Dissipation, Ueq not achieved, Dissipation, Ueq assumed, Hydrostatic Line

The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Standard CPTu Plots with Reduced Scales

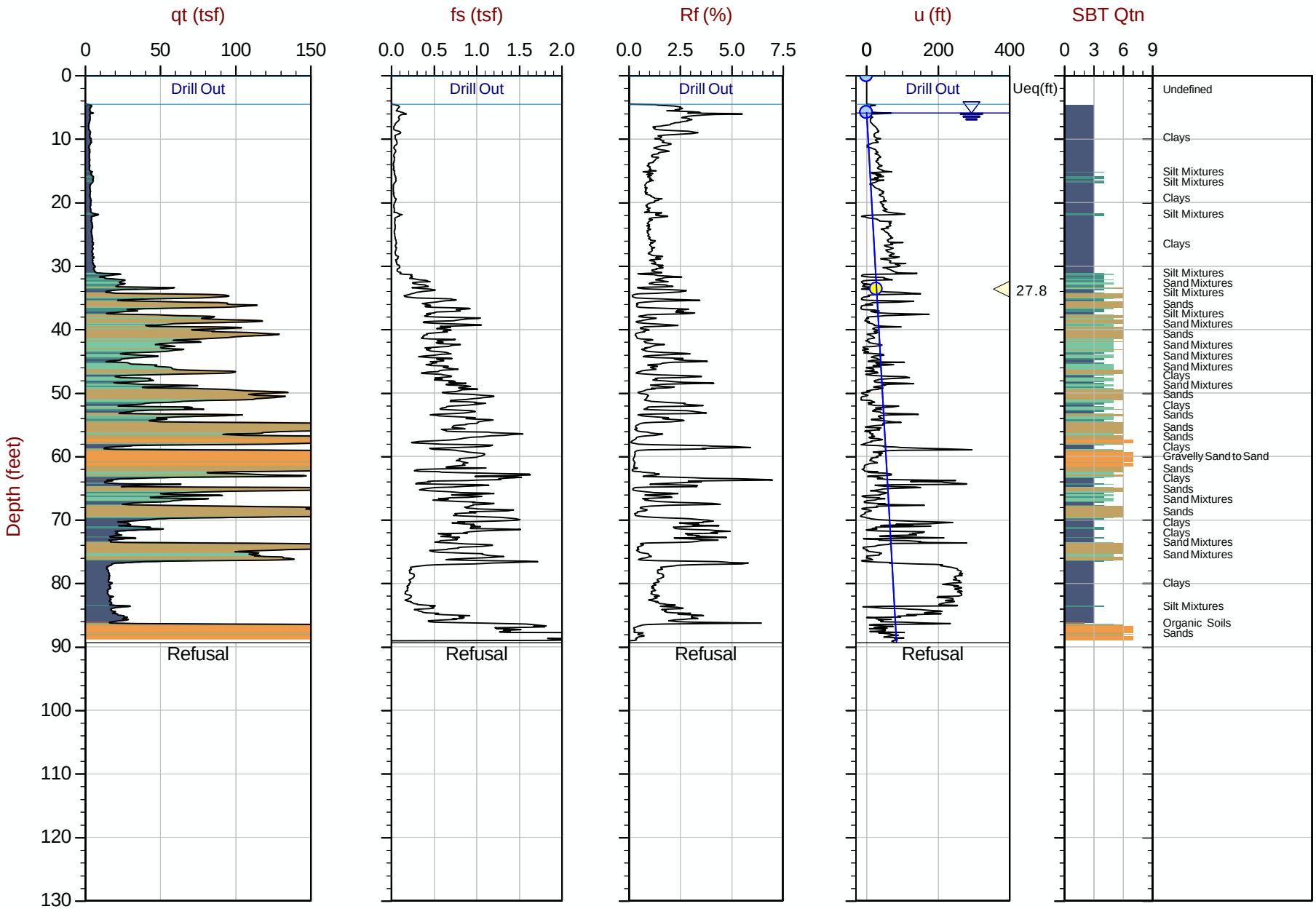
CONETEC

CONETEC

Haley & Aldrich

Job No: 24-59-27459
Date: 2024-04-11 13:02
Site: Aberdeen Schools

Sounding: CPT-SE01
Cone: 1065:T1500F15U35



Max Depth: 27.225 m / 89.32 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 24-59-27459_SP-SE01.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 46.96719 Long: -123.78915

Overplot Item: Ueq, Assumed Ueq, Dissipation, Ueq achieved, Dissipation, Ueq not achieved, Dissipation, Ueq assumed, Hydrostatic Line

The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Normalized Cone Penetration Test Plots

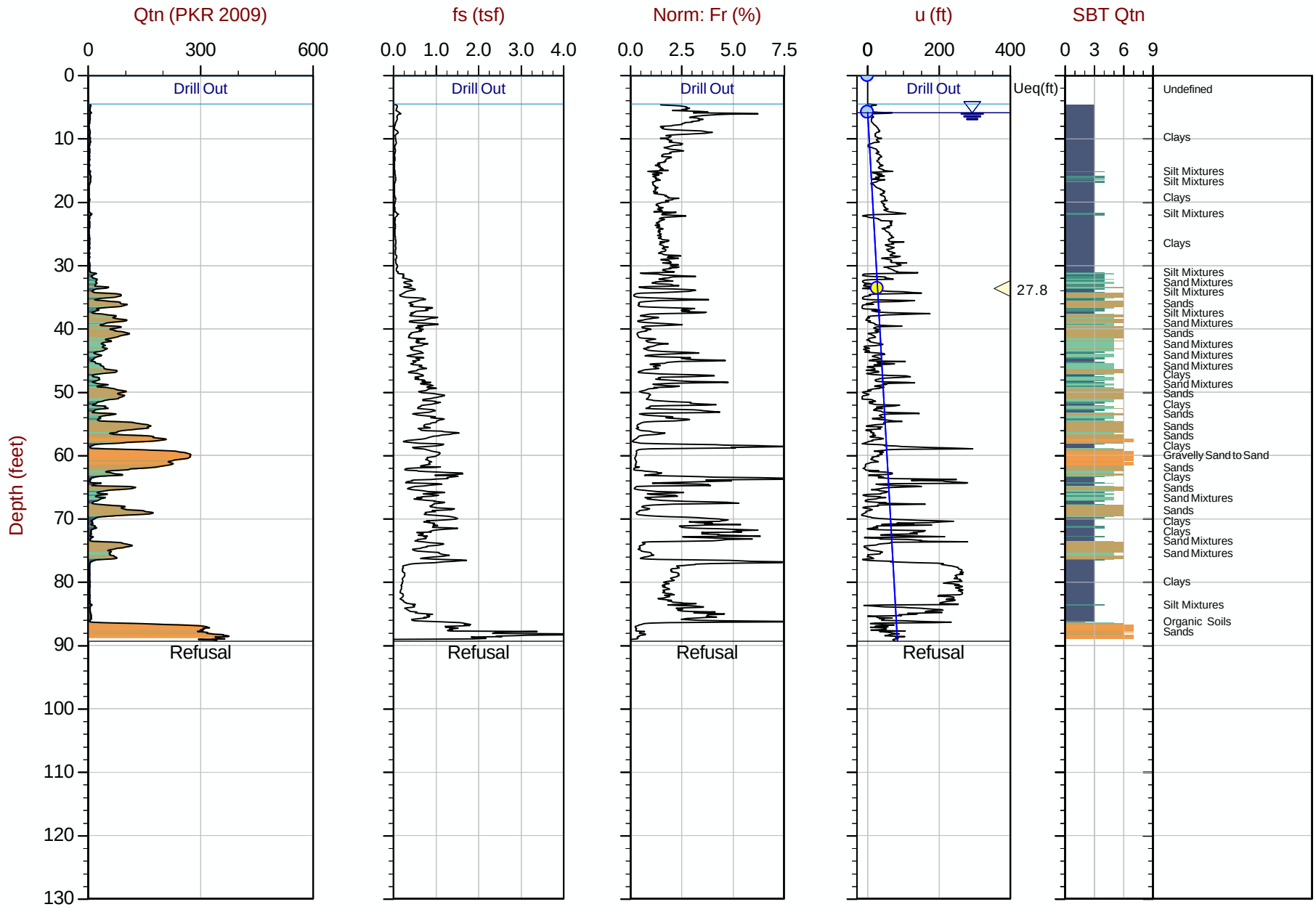
CONETEC

CONETEC

Haley & Aldrich

Job No: 24-59-27459
Date: 2024-04-11 13:02
Site: Aberdeen Schools

Sounding: CPT-SE01
Cone: 1065:T1500F15U35



Max Depth: 27.225 m / 89.32 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 24-59-27459_SP-SE01.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 46.96719 Long: -123.78915

Overplot Item: Ueq, Assumed Ueq, Dissipation, Ueq achieved, Dissipation, Ueq not achieved, Dissipation, Ueq assumed, Hydrostatic Line

The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Advanced Cone Penetration Test Plots with Ic, Su(Nkt), Phi, and N1(60)Ic

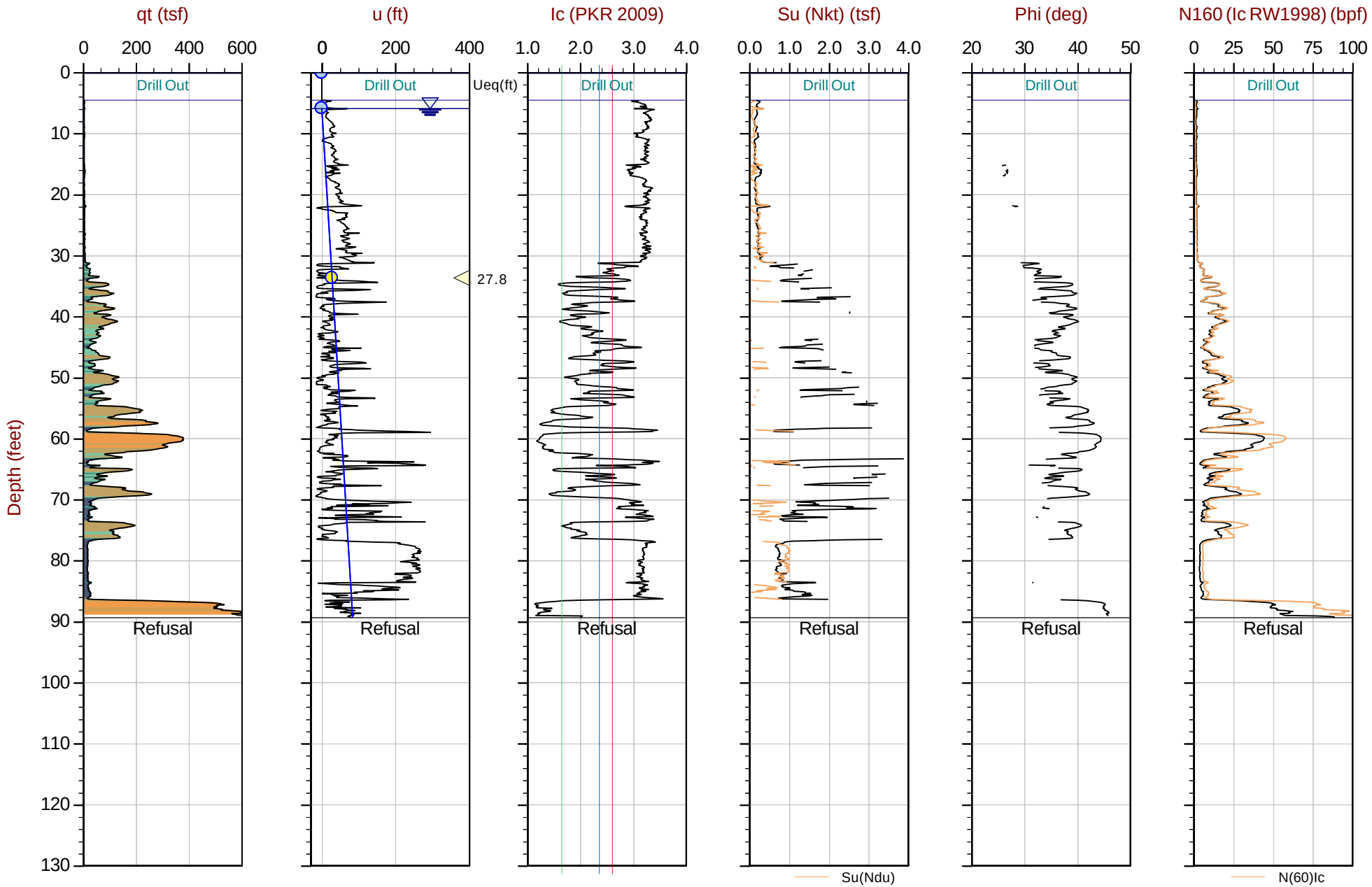
CONETEC

CONETEC

Haley & Aldrich

Job No: 24-59-27459
Date: 2024-04-11 13:02
Site: Aberdeen Schools

Sounding: CPT-SE01
Cone: 1065:T1500F15U35



Max Depth: 27.225 m / 89.32 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 24-59-27459_SP-SE01.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 46.96719 Long: -123.78915

Overplot Item: Ueq, Assumed Ueq, Dissipation, Ueq achieved, Dissipation, Ueq not achieved, Dissipation, Ueq assumed, Hydrostatic Line

The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Soil Behavior Type (SBT) Scatter Plots

CONETEC

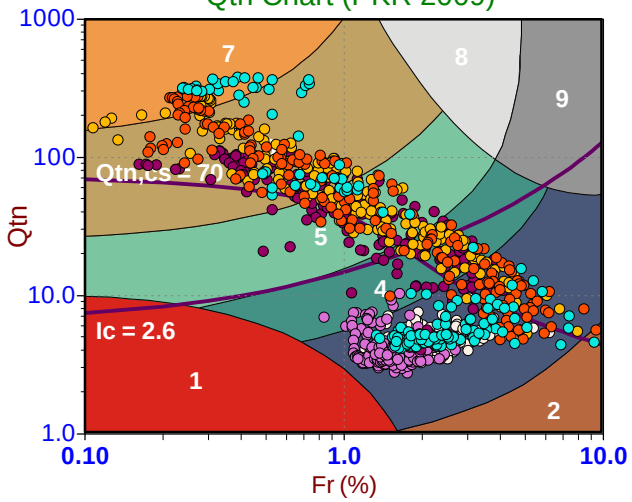
CONETEC

Haley & Aldrich

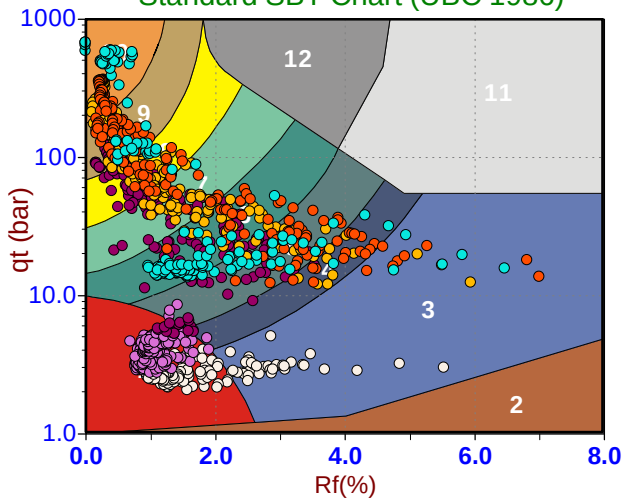
Job No: 24-59-27459
Date: 2024-04-11 13:02
Site: Aberdeen Schools

Sounding: CPT-SE01
Cone: 1065:T1500F15U35

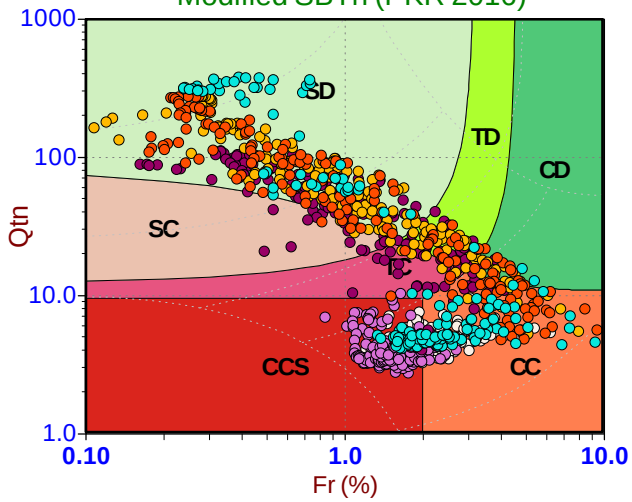
Qtn Chart (PKR 2009)



Standard SBT Chart (UBC 1986)



Modified SBTn (PKR 2016)



Depth Ranges

- >0.0 to 15.0 ft
- >15.0 to 30.0 ft
- >30.0 to 45.0 ft
- >45.0 to 60.0 ft
- >60.0 to 75.0 ft
- >75.0 to 90.0 ft
- >90.0 to 105.0 ft
- >105.0 to 120.0 ft
- >120.0 to 135.0 ft
- >135.0 to 150.0 ft
- >150.0 ft

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

Legend

- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

Pore Pressure Dissipation Test (PPDT) Summary and PPDT Plots

CONETEC

Job No:	24-59-27459
Client:	Haley & Aldrich, Inc.
Project:	Aberdeen Schools
Start Date:	2024-04-10
End Date:	2024-04-11

CPTu PORE PRESSURE DISSIPATION SUMMARY

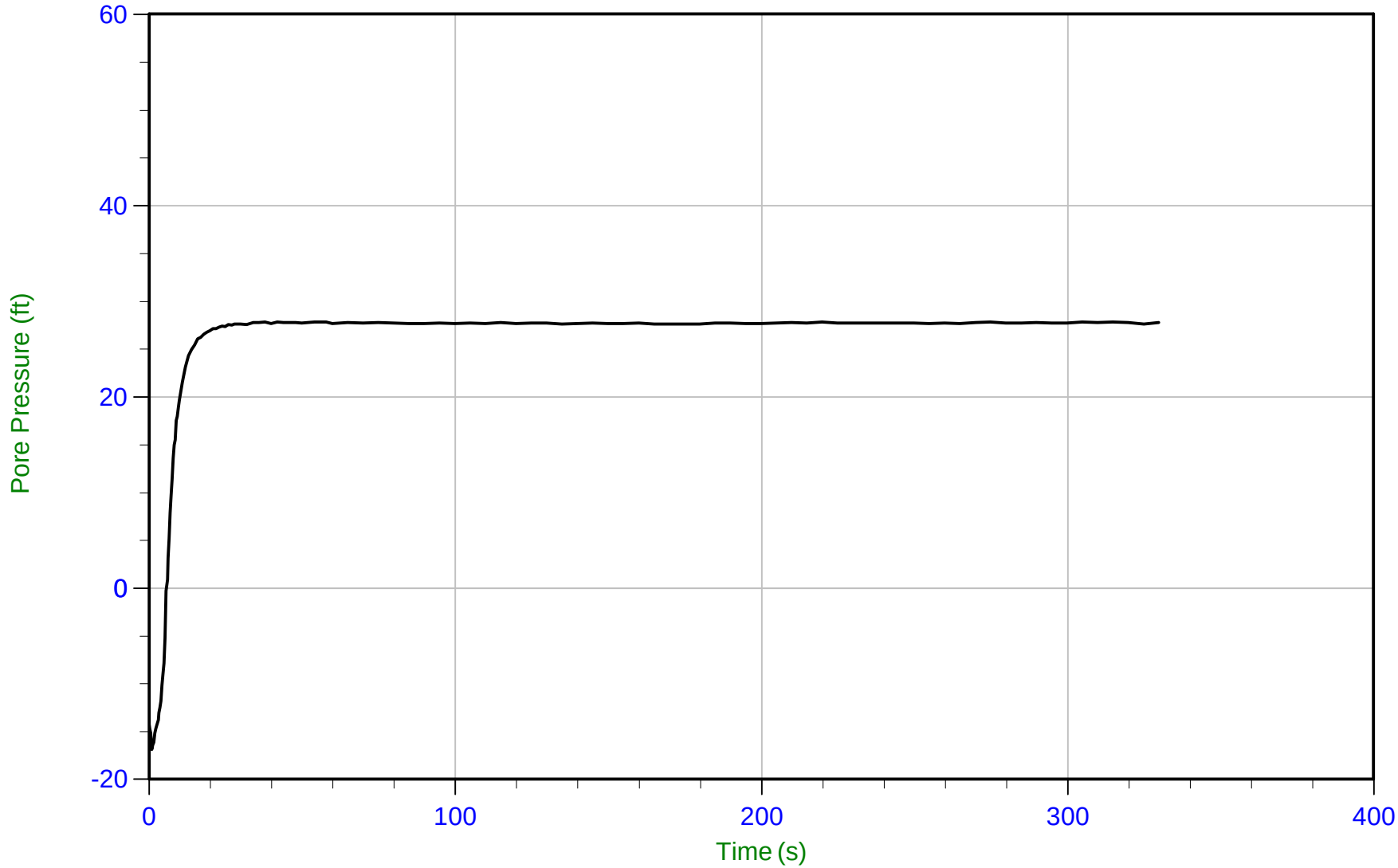
Sounding ID	File Name	Cone Area (cm^2)	Duration (s)	Test Depth (ft)	Estimated Equilibrium Pore Pressure U_{eq} (ft)	Calculated Phreatic Surface (ft)	Refer to Notation Number
CPT-AJW01	24-59-27459_SP-AJW01	15	400	29.12	25.9	3.2	
CPT-HH01	24-59-27459_SP-HH01	15	400	26.57	24.2	2.4	
CPT-MJH01	24-59-27459_SP-MJH01	15	350	100.56	93.5	7.1	
CPT-SE01	24-59-27459_SP-SE01	15	330	33.63	27.8	5.8	
Totals			25 min				

CONETEC

Haley & Aldrich

Job No: 24-59-27459
Date: 2024-04-11 13:02
Site: Aberdeen Schools

Sounding: CPT-SE01
Cone: 1065:T1500F15U35 Area=15 cm²



Trace Summary:

Filename: 24-59-27459_SP-SE01.PPR4
Depth: 10.250 m / 33.628 ft
Duration: 330.0 s

u Min: -16.9 ft
u Max: 27.8 ft
u Final: 27.7 ft

WT: 1.780 m / 5.840 ft
Ueq: 27.8 ft

Seismic Cone Penetration Test (SCPTu) Tabular Results

CONETEC

Job No:	24-59-27459
Client:	Haley & Aldrich, Inc.
Project:	Aberdeen Schools
Sounding ID:	CPT-SE01
Date:	2024-04-11
Seismic Source:	Beam
Seismic Offset (ft):	8.79
Source Depth (ft):	0.00
Geophone Offset (ft):	0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
6.56	5.91	10.59			
9.84	9.19	12.72	2.12	14.35	148
13.12	12.47	15.26	2.54	14.21	179
16.40	15.75	18.04	2.78	13.72	203
19.69	19.03	20.96	2.93	10.86	269
22.97	22.31	23.98	3.02	13.04	232
26.25	25.59	27.06	3.08	11.25	274
29.53	28.87	30.18	3.12	11.00	284
32.81	32.15	33.33	3.15	9.55	330
36.09	35.43	36.51	3.18	6.21	512
39.37	38.71	39.70	3.19	5.29	604
42.65	42.00	42.91	3.21	5.38	596
45.93	45.28	46.12	3.22	5.86	549
49.21	48.56	49.35	3.22	5.80	556
52.49	51.84	52.58	3.23	4.67	692
55.77	55.12	55.82	3.24	5.08	637
59.06	58.40	59.06	3.24	4.26	760
62.34	61.68	62.30	3.25	4.81	675
65.62	64.96	65.55	3.25	4.48	725
68.90	68.24	68.81	3.25	5.45	597
72.18	71.52	72.06	3.26	4.95	657
75.46	74.80	75.32	3.26	6.21	525
78.74	78.08	78.58	3.26	5.48	595
82.02	81.37	81.84	3.26	5.48	595
85.30	84.65	85.10	3.26	4.37	747
89.30	88.65	89.08	3.98	6.54	609

SCPTu Test Plots

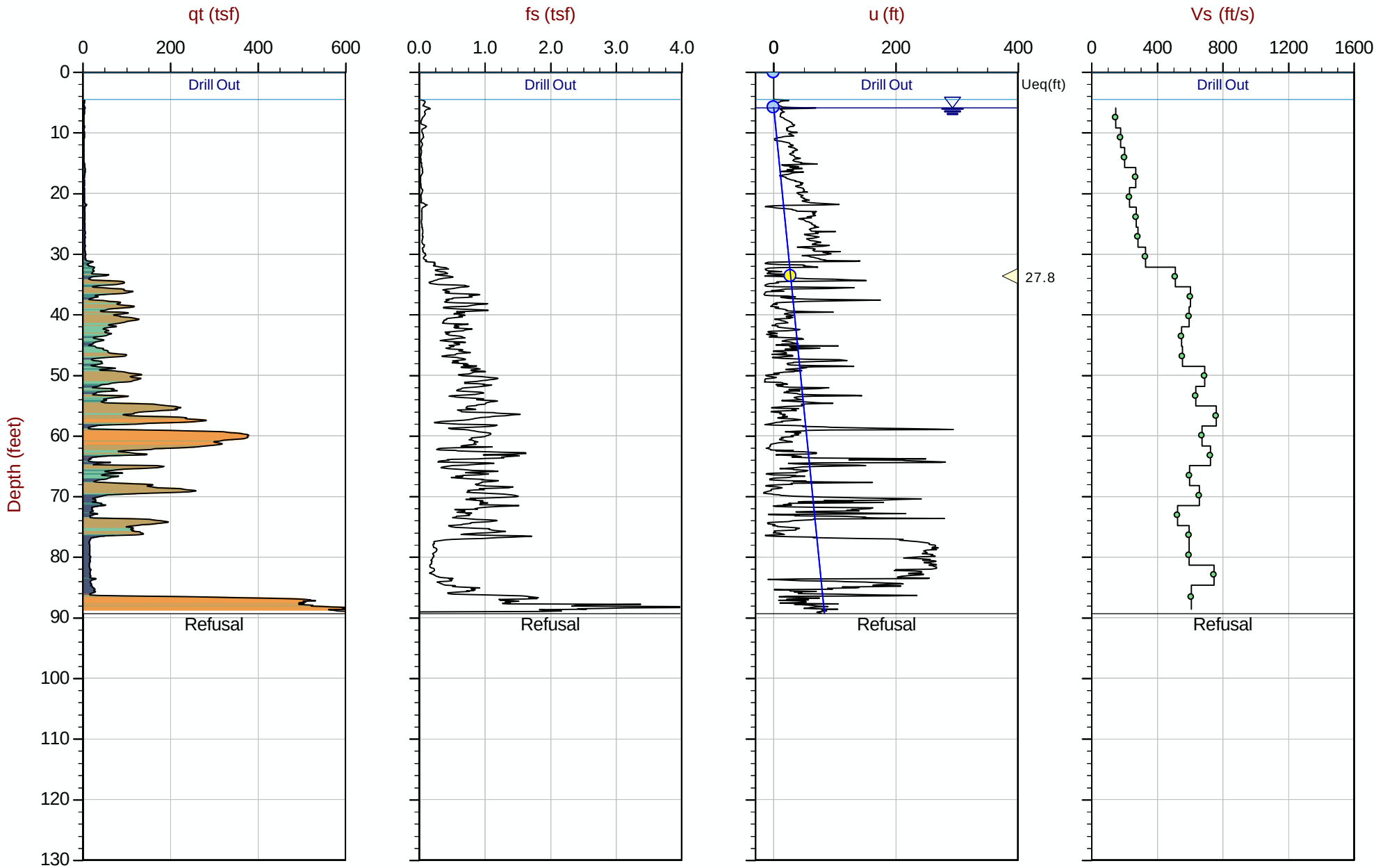
CONETEC

CONETEC

Haley & Aldrich

Job No: 24-59-27459
Date: 2024-04-11 13:02
Site: Aberdeen Schools

Sounding: CPT-SE01
Cone: 1065:T1500F15U35



Max Depth: 27.225 m / 89.32 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 24-59-27459_SP-SE01.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 46.96719 Long: -123.78915

Overplot Item: Ueq, Assumed Ueq, Dissipation, Ueq achieved, Dissipation, Ueq not achieved, Dissipation, Ueq assumed, Hydrostatic Line

The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

SCPTu Velocity Wave Traces

CONETEC

CONETEC

Job No: 24-59-27459
Date: 2024-04-11

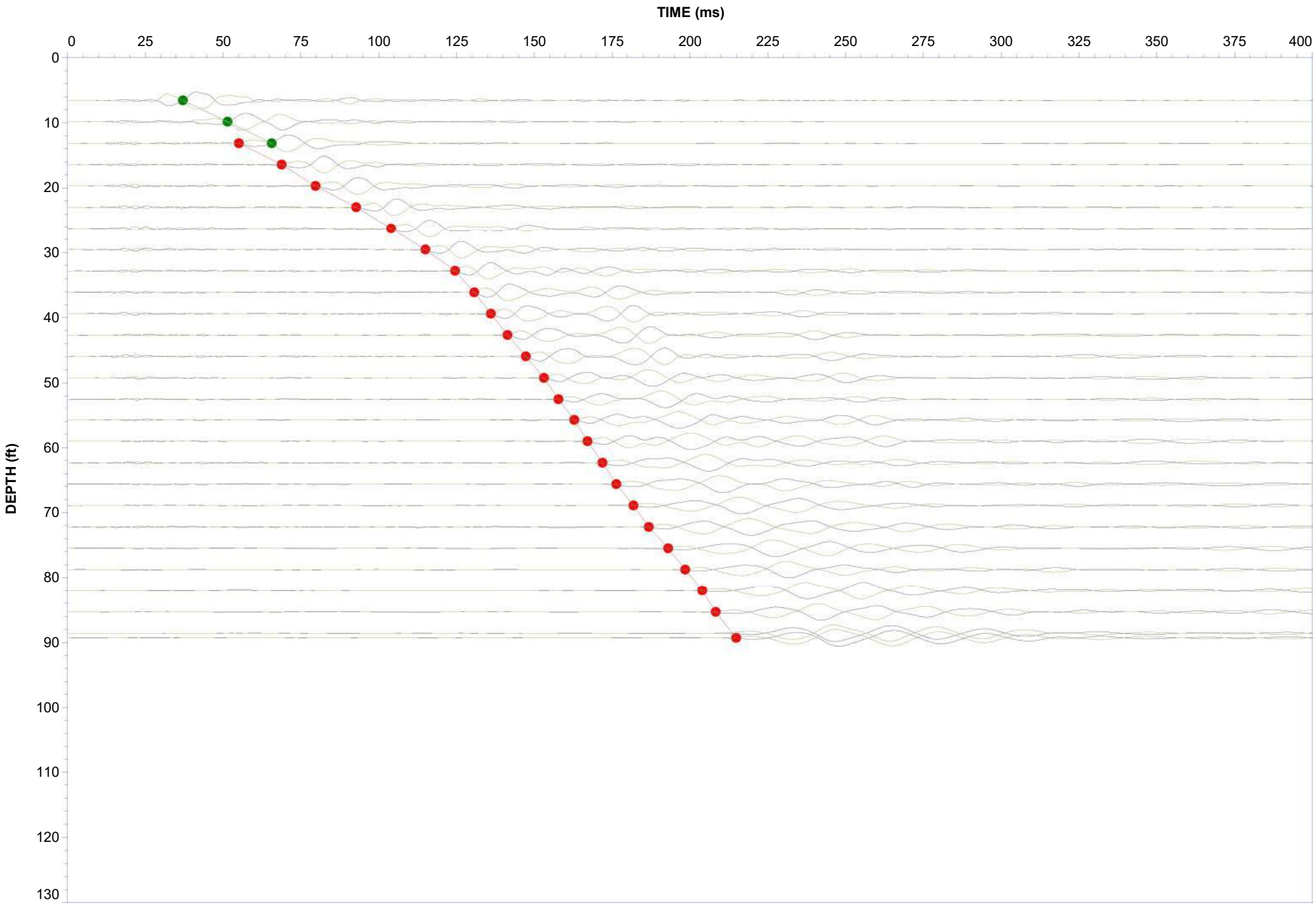
Client: Haley & Aldrich, Inc.
Cone: 1065:T1500F15U35

Project: Aberdeen Schools

Analysis: Shear Wave

Sounding: CPT-SE01

Filter: BP 0 - 200 Hz



Supplementary Documents and Materials

CONETEC

Description of Methods for Calculated CPT Geotechnical Parameters

CONETEC

CALCULATED CPT GEOTECHNICAL PARAMETERS

A Detailed Description of the Methods Used in ConeTec's CPT Geotechnical Parameter Calculation and Plotting Software



Revision SZW-Rev 18

Revised February 10, 2023

Prepared by Jim Greig, M.A.Sc, P.Eng (BC, AB, ON)

CONETEC

Limitations

The geotechnical parameter output was prepared specifically for the site and project named in the accompanying report subject to objectives, site conditions and criteria provided to ConeTec by the client. The output may not be relied upon by any other party or for any other site without the express written permission of ConeTec Group (ConeTec) or any of its affiliates. For this project, ConeTec has provided site investigation services, prepared factual data reporting and produced geotechnical parameter calculations consistent with current best practices. No other warranty, expressed or implied, is made.

To understand the calculations that have been performed and to be able to reproduce the calculated parameters the user is directed to the basic descriptions for the methods in this document and the detailed descriptions and their associated limitations and appropriateness in the technical references cited for each parameter.

ConeTec's Calculated CPT Geotechnical Parameters as of February 10, 2023.

ConeTec's CPT parameter calculation and plotting routine provides a tabular output of geotechnical parameters based on current published CPT correlations and is subject to change to reflect the current state of practice. Due to drainage conditions and the basic assumptions and limitations of the correlations, not all geotechnical parameters provided are considered applicable for all soil types. The results are presented only as a guide for geotechnical use and should be carefully examined for consideration in any geotechnical design. Reference to current literature is strongly recommended. ConeTec does not warranty the correctness or the applicability of any of the geotechnical parameters calculated by the program and does not assume liability for any use of the results in any design or review. For verification purposes we recommend that representative hand calculations be done for any parameter that is critical for design purposes. The end user of the parameter output should also be fully aware of the techniques and the limitations of any method used by the program. The purpose of this document is to inform the user as to which methods were used and to direct the end user to the appropriate technical papers and/or publications for further reference.

The geotechnical parameter output was prepared specifically for the site and project named in the accompanying report subject to objectives, site conditions and criteria provided to ConeTec by the client. The output may not be relied upon by any other party or for any other site without the express written permission of ConeTec Group (ConeTec) or any of its affiliates.

The CPT calculations are based on values of tip resistance, sleeve friction and pore pressures considered at each data point or averaged over a user specified layer thickness (e.g., 0.20 m). Note that q_t is the tip resistance corrected for pore pressure effects and q_c is the recorded tip resistance. The corrected tip resistance (corrected using u_2 pore pressure values) is used for all calculations. Since all ConeTec cones have equal end area friction sleeves pore pressure corrections to sleeve friction, f_s, are not performed.

Corrected tip resistance: $q_t = q_c + (1-a) \cdot u_2$ (consistent units are required)

where: q_t is the corrected tip resistance
q_c is the recorded tip resistance
u_2 is the recorded dynamic pore pressure from behind the tip (u_2 position)
a is the Net Area Ratio for the cone (typically 0.80 for ConeTec cones)

The total stress calculations are based on soil unit weight values that have been assigned to the Soil Behavior Type (SBT) zones, from a user defined unit weight profile, by using a single uniform value throughout the profile, through unit weight estimation techniques described in various technical papers or from a combination of these methods. The parameter output files indicate the method(s) used.

Effective vertical overburden stresses are calculated using the total stress and equilibrium pore pressure (u_{eq} or u_o) values derived from an assumed hydrostatic distribution of pore pressures below the water table or from a user defined equilibrium pore pressure profile (typically obtained from CPT dissipation tests) or a combination of the two. For over water projects the stress effects of the column of water above the mudline are taken into account as is the appropriate unit weight of water. How this is done depends on where the instruments are zeroed (i.e. on deck or at the mudline). The parameter output files indicate the method(s) used.

A majority of parameter calculations are derived from or driven by results based on material types as determined by the various soil behavior type charts depicted in Figures 1 through 6. The parameter output files indicate the method(s) used.

The Soil Behavior Type classification chart shown in Figure 1 is the classic non-normalized SBT Chart developed at the University of British Columbia and reported in Robertson, Campanella, Gillespie and Greig (1986). Figure 2 shows the original normalized (linear method) SBTn chart developed by Robertson (1990). The Bq classification charts

shown in Figures 3a and 3b incorporate pore pressures into the SBT classification and are based on the methods described in Robertson (1990). Many of these charts have been summarized in Lunne, Robertson and Powell (1997). The Jefferies and Davies SBT chart shown in Figure 3c is based on the techniques discussed in Jefferies and Davies (1993) which introduced the concept of the Soil Behavior Type Index parameter, I_c. Take note that the I_c parameter developed by Robertson and Fear (1995) and Robertson and Wride (1998) is similar in concept but uses a slightly different calculation method than that defined by Jefferies and Davies (1993) as the latter incorporates pore pressure in their technique through the use of the Bq parameter. The normalized Qtn SBT chart shown in Figure 4 is based on the work by Robertson (2009) utilizing a variable stress ratio exponent, n, for normalization based on a slightly modified redefinition and iterative approach for I_c. The boundary curves drawn on the chart are based on the work described in Robertson (2010).

Figure 5 shows a revised 1986 SBT Chart presented to CPT'10 by Robertson (2010b). It is known as the Updated non-normalized Soil Behavior Chart (also referred to as the Rev SBT Chart (PKR2010) in our output files). This chart was produced to be more in line with all post-1986 Robertson charts having the same 9 soil type zones, a $\log_{10}$ axis for friction ratio, R_f in this case, and a unitless tip resistance axis.

Figure 6 shows a revised behavior based chart by Robertson (2016) depicting contractive-dilative zones. As the zones represent material behavior rather than soil gradation ConeTec has chosen a set of zone colors that are less likely to be confused with material type colors from previous SBT charts. These colors differ from those used by Dr. Robertson. A green palette was selected for the dilative (desirable) side of the chart and a red palette for the contractive side of the chart.

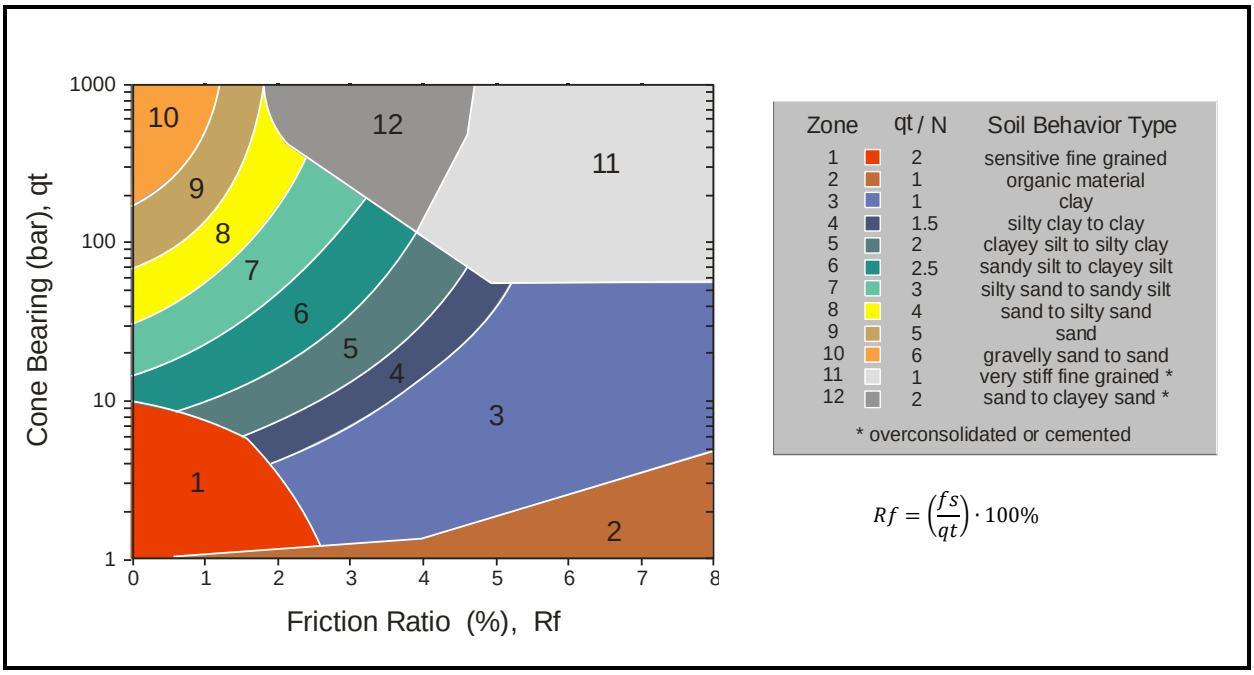


Figure 1. Non-normalized Soil Behavior Type Classification Chart (SBT)

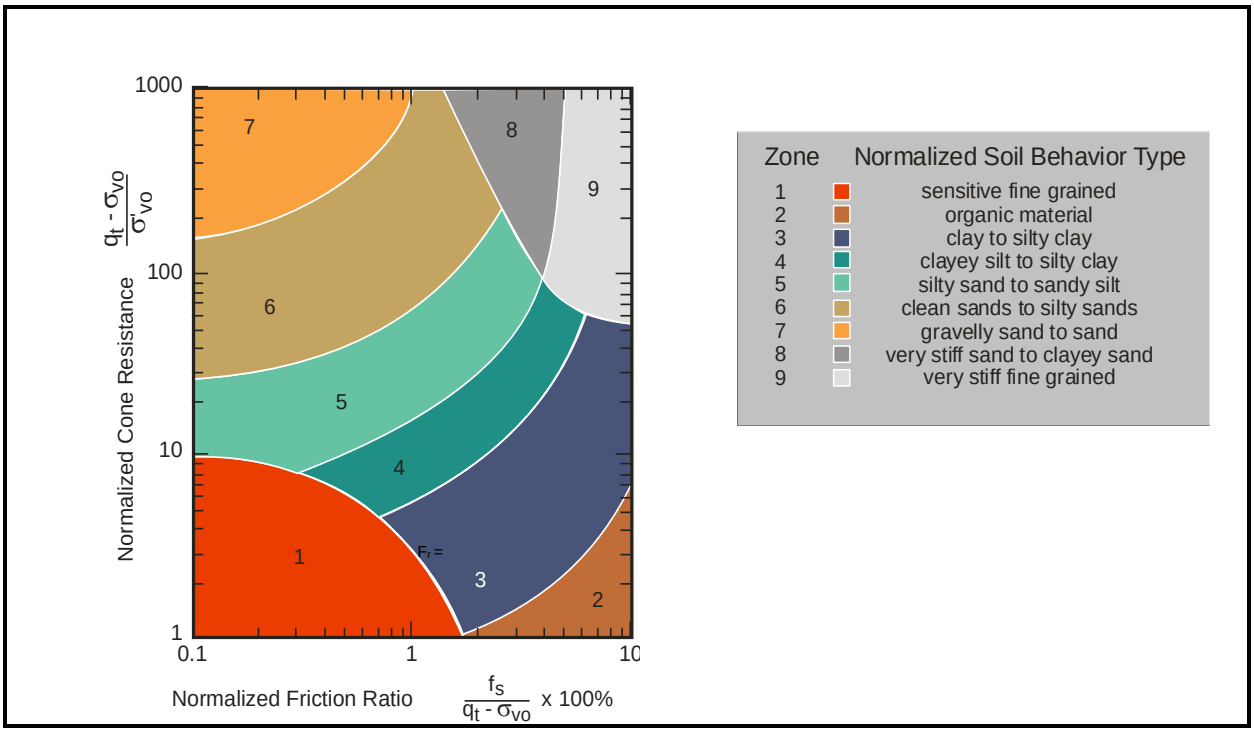


Figure 2. Normalized Soil Behavior Type Classification Chart (SBTn)

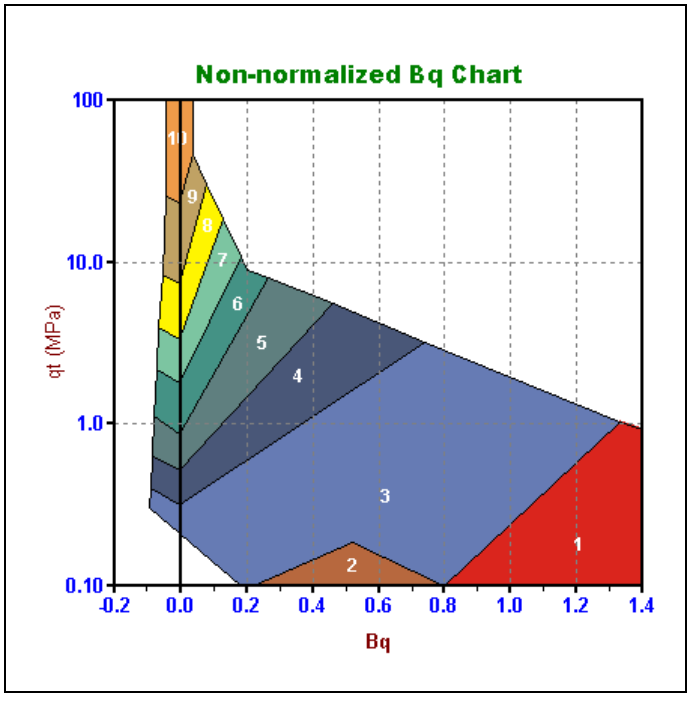


Figure 3a. Alternate Soil Behavior Type Chart (SBT Bq): q_t - B_q

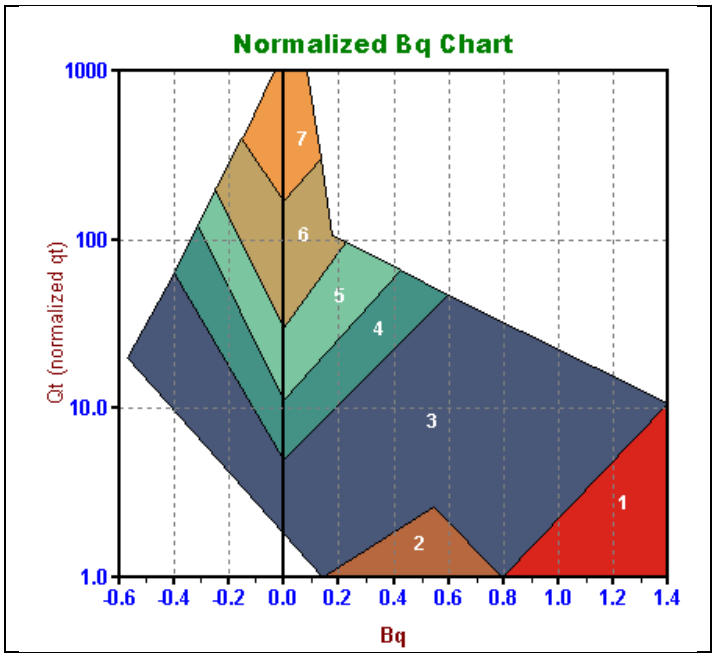


Figure 3b. Alternate Soil Behavior Type Charts (SBT Bqn): Q_t-B_q

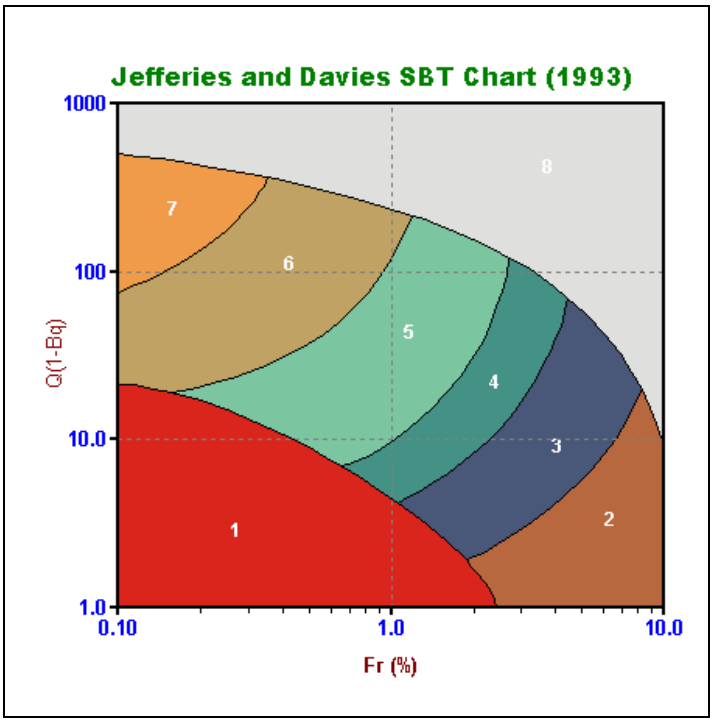


Figure 3c. Alternate Soil Behavior Type Charts: $Q(1-B_q)$ - F_r

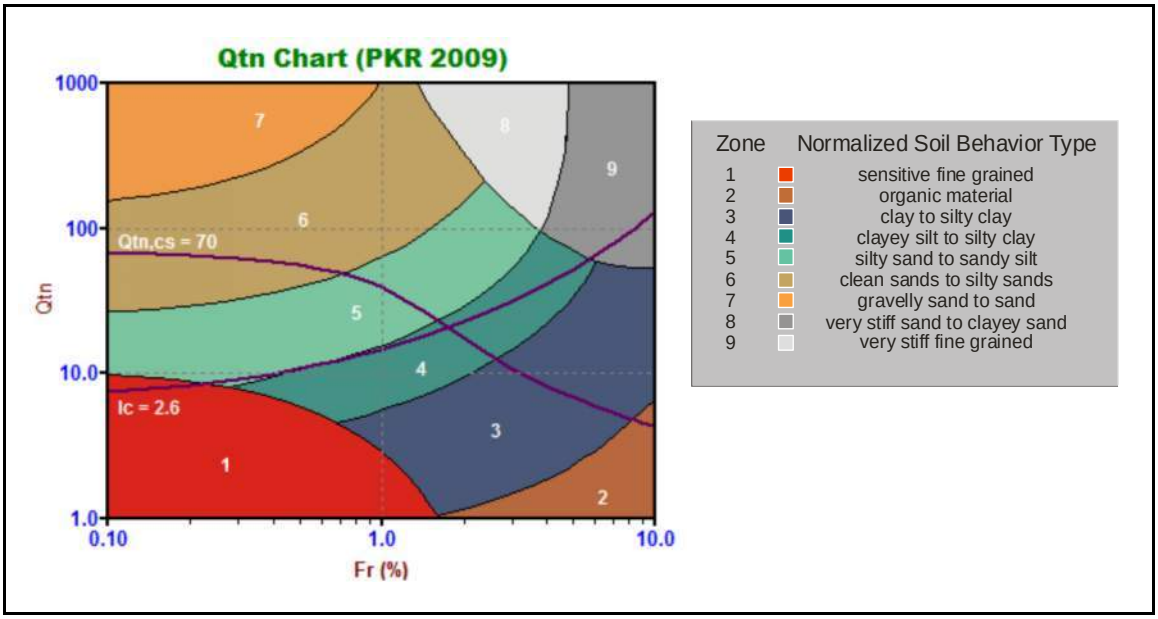


Figure 4. Normalized Soil Behavior Type Chart using Q_{tn} (SBT Qtn)

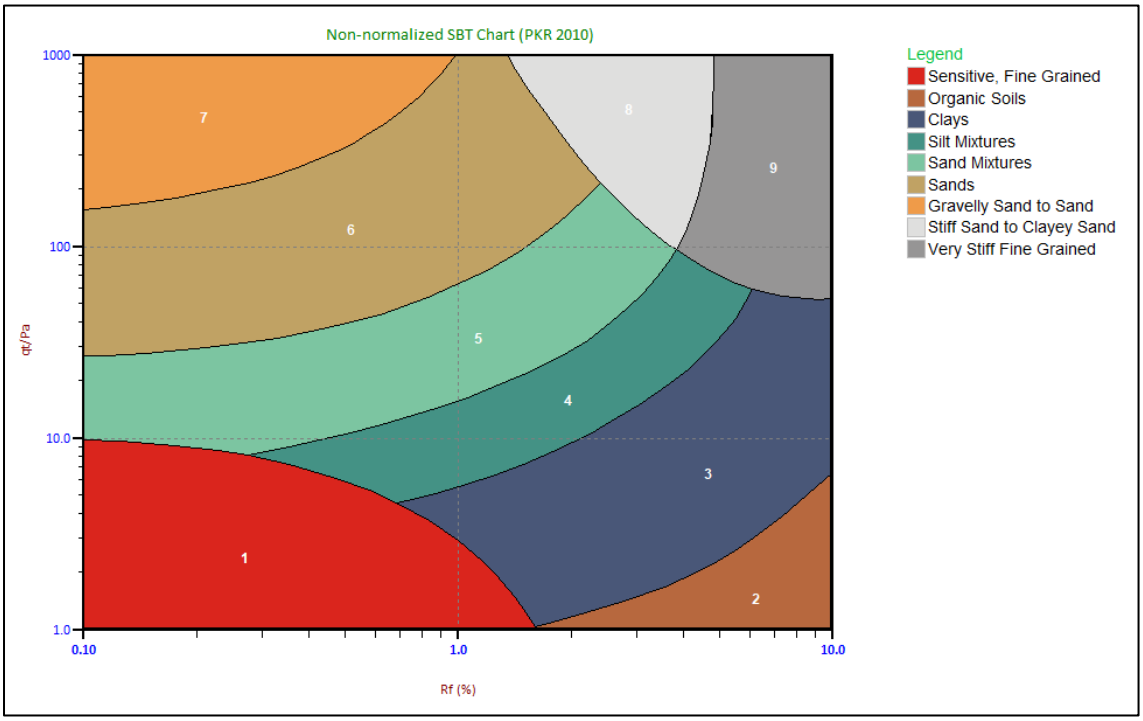


Figure 5. Non-normalized Soil Behavior Type Chart (2010)

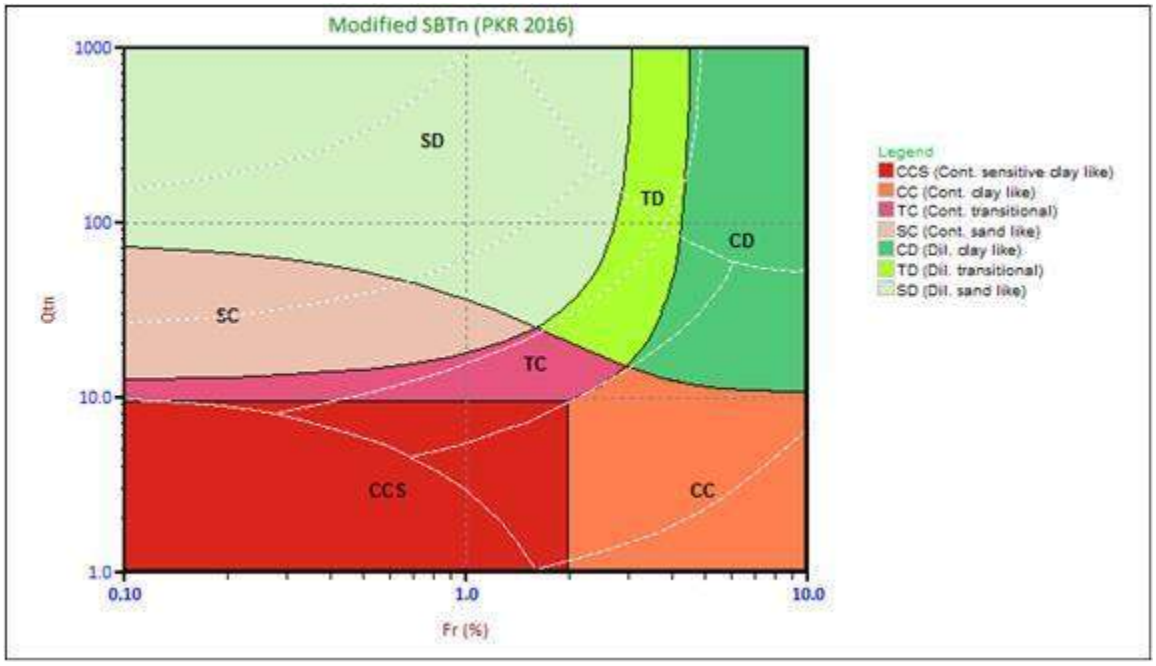


Figure 6. Modified SBTn Behavior Based Chart

Details regarding the geotechnical parameter calculations are provided in Tables 1a and 1b. The appropriate references cited are listed in Table 2. Non-liquefaction specific parameters are detailed in Table 1a and liquefaction specific parameters are detailed in Table 1b.

Where methods are based on charts or techniques that are too complex to describe in this summary, we recommend that the user refer to the cited material. Specific limitations for each method are described in the cited material.

Where the results of a calculation/correlation are deemed *'invalid'* the value will be represented by the text strings "-9999", "-9999.0", the value 0.0 (Zero) or an empty cell. Invalid results will occur because of (and not limited to) one or a combination of:

1. Invalid or undefined CPT data (e.g., drilled out section or data gap).

2. Where the calculation method is inappropriate, for example, drained parameters in a material behaving in an undrained manner (and vice versa).

3. Where input values are beyond the range of the referenced charts or specified limitations of the correlation method.

4. Where pre-requisite or intermediate parameter calculations are invalid.

The parameters selected for output from the program are often specific to a particular project. As such, not all of the calculated parameters listed in Tables 1and 1a may be included in the output files delivered with this report.

The output files are typically provided in Microsoft Excel XLS, XLSX or CSV format. The ConeTec software has several options for output depending on the number or types of calculated parameters desired or those specifically contracted for by the client. Each output file is named using the original file base name (from the .COR file) followed

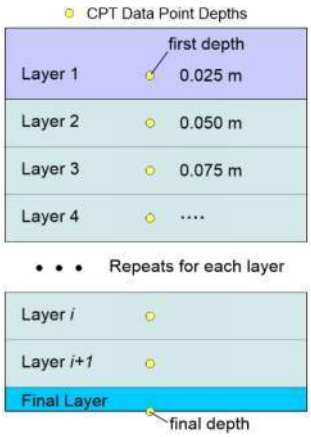
by a three or four character indicator of the output set selected (e.g. BSC, TBL, NLI, NL2, IFI, IFI2, IFI3) and possibly followed by an operator selected suffix identifying the characteristics of the particular calculation run.

Table 1a. CPT Parameter Calculation Methods – Non liquefaction Parameters

Reference Notes: CK* - Common Knowledge, U* - Unpublished

Calculated Parameter	Description	Equation	Ref
Depth	Mid Layer Depth *(where calculations are done at each point then Mid Layer Depth = Recorded Depth)*	*[Depth (Layer Top) + Depth (Layer Bottom)]/ 2.0*	CK*
Elevation	Elevation of Mid Layer is based on the sounding collar elevation supplied by the client or through a site survey In Sweden a variation of elevation is used where the elevation increases with depth. We refer to this as inverse elevation.	Elevation = Collar Elevation – Depth InverseElevation = Collar Elevation + Depth	CK* N/A
Avg qc	Averaged recorded tip value (q_c)	$Avgqc = \frac{1}{n}\sum_{i=1}^{n} q_c$ *n=1 when calculations are done at each point*	CK*
Avg qt	Averaged corrected tip (q_t) where: $q_t = q_c + (1-a)\cdot u_2$ Averaged q_t is not calculated using the average q_c and averaged u values. Averaged q_t is based on the average of the q_t values calculated at each data point.	$Avgqt = \frac{1}{n}\sum_{i=1}^{n} q_t$ *n=1 when calculations are done at each point*	1
Avg fs	Averaged sleeve friction (f_s) No pore pressure corrections are applied to f_s.	$Avgfs = \frac{1}{n}\sum_{i=1}^{n} fs$ *n=1 when calculations are done at each point*	CK*
Avg Rf	Averaged friction ratio (R_f) where friction ratio is defined as: $R_f = 100\% \cdot \frac{fs}{q_t}$	$AvgRf = 100\% \cdot \frac{Avgfs}{Avgqt}$ *not an average of individual R_f values*	CK*
Avg u	Averaged dynamic pore pressure *(u)*	$Avgu = \frac{1}{n}\sum_{i=1}^{n} u_i$ *n=1 when calculations are done at each point*	CK*
Avg Res	Averaged Resistivity (this data is not always available since it is a specialized test requiring an additional module)	$AvgRes = \frac{1}{n}\sum_{i=1}^{n} Resistivity_i$ *n=1 when calculations are done at each point*	CK*
Avg UVIF	Averaged UVIF ultra-violet induced fluorescence (this data is not always available since it is a specialized test requiring an additional module)	$AvgUVIF = \frac{1}{n}\sum_{i=1}^{n} UVIF_i$ *n=1 when calculations are done at each point*	CK*
Avg Temp	Averaged Temperature (this data is not always available)	$AvgTemp = \frac{1}{n}\sum_{i=1}^{n} Temperature_i$ *n=1 when calculations are done at each point*	CK*
Avg Gamma	Averaged Gamma Counts (this data is not always available since it is a specialized test requiring an additional module)	$AvgGamma = \frac{1}{n}\sum_{i=1}^{n} Gamma_i$ *n=1 when calculations are done at each point*	CK*
SBT	Soil Behavior Type as defined by Robertson et al 1986 (often referred to as Robertson and Campanella, 1986)	See Figure 1	1, 5
SBTn	Normalized Soil Behavior Type as defined by Robertson 1990 (linear normalization using Q_t, now referred to as Q_{t1})	See Figure 2	2, 5

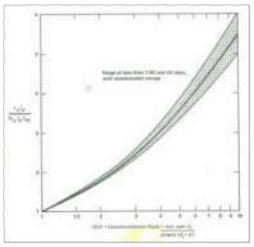
Calculated Parameter	Description	Equation	Ref
SBT-Bq	Non-normalized Soil Behavior type based on non-normalized tip resistance and the B_q parameter	See Figure 3a	1, 2, 5
SBT-Bqn	Normalized Soil Behavior type based on normalized tip resistance (Q_t, now called Q_{t1}) and the B_q parameter	See Figure 3b	2, 5
SBT-JandD	Soil Behavior Type as defined by Jeffries and Davies	See Figure 3c	7
SBT Qtn	Soil Behavior Type as defined by Robertson (2009) using a variable stress ratio exponent for normalization based on $I_{c\ (PKR\ 2009)}$	See Figure 4	15
Modified Non-normalized SBT Chart SBT (PKR2010)	This is a revised version of the simple 1986 non-normalized SBT chart (presented at CPT '10). The revised version has been reduced from 12 zones to 9 zones to be similar to the normalized Robertson charts. Other updates include a dimensionless tip resistance normalized to atmospheric pressure, q_t/P_a, on the vertical axis and a log scale for non-normalized friction ratio, R_f, along the horizontal axis.	See Figure 5	33
Modified SBTn (contractive /dilative)	Modified SBTn chart as defined by Robertson (2016) indicating zones of contractive/dilative behavior. Note that ConeTec displays the chart with colors different from Robertson. ConeTec's colors were chosen to avoid confusion with soil type descriptions.	See Figure 6	30
Unit Wt.	Unit Weight of soil determined from one of the following user selectable options: 1) uniform value 2) value assigned to each SBT zone 3) value assigned to each SBTn zone 4) value assigned to SBTn zone as determined from Robertson and Wride (1998) based on q_{c1n} 5) values assigned to SBT Qtn zones 6) values based on Robertson updated non-normalized Soil Behavior Type Chart (2010b) 6) Mayne f_s (sleeve friction) method 7) Robertson and Cabal 2010 method 8) user supplied unit weight profile The last option may co-exist with any of the other options.	See references	3, 5, 15, 21, 24, 29, 33

Calculated Parameter	Description	Equation	Ref
TStress σ_v	Total vertical overburden stress at Mid Layer Depth *A layer is defined as the averaging interval specified by the user where depths are reported at their respective mid-layer depth.* For data calculated at each point layers are defined using the recorded depth as the mid-point of the layer. Thus, a layer starts half-way between the previous depth and the current depth unless this is the first point in which case the layer start is at zero depth. The layer bottom is half-way from the current depth to the next depth unless it is the last data point. Defining layers affects how stresses are calculated since the unit weight attributed to a data point is used throughout the entire layer. This means that to calculate the stresses the total stress at the top and bottom of a layer are required. The stress at mid layer is determined by adding the incremental stress from the layer top to the mid-layer depth. The stress at the layer bottom becomes the stress at the top of the subsequent layer. Stresses are NOT calculated from mid-point to mid-point. For over-water work the total stress due to the column of water above the mid line is taken into account where appropriate.	$TStress = \sum_{i=1}^{n} \gamma_i h_i$ *where* γ_i is layer unit weight h_i is layer thickness 	CK*
EStress σ_v'	Effective vertical overburden stress at mid-layer depth.	$\sigma_v' = \sigma_v - u_{eq}$	CK*
Equil u u_{eq} or u_0	Equilibrium pore pressures are determined from one of the following user selectable options: 1) hydrostatic below the water table 2) user supplied profile 3) combination of those above When a user supplied profile is used/provided a linear interpolation is performed between equilibrium pore pressures defined at specific depths. If the profile values start below the water table then a linear transition from zero pressure at the water table to the first defined pointed is used. Equilibrium pore pressures may come from dissipation tests, adjacent piezometers or other sources. Occasionally, an extra equilibrium point ("assumed value") will be provided in the profile that does not come from a recorded value to smooth out any abrupt changes or to deal with material interfaces. These "assumed" values will be indicated on our plots and in tabular summaries.	For the hydrostatic option: $u_{eq} = \gamma_w \cdot (D - D_{wt})$ where u_{eq} is equilibrium pore pressure γ_w is the unit weight of water D is the current depth D_{wt} is the depth to the water table	CK*
K_0	Coefficient of earth pressure at rest, K_0.	$K_O = (1 - \sin\Phi') OCR^{\sin\Phi'}$	17
C_n	Overburden stress correction factor used for $(N_1)_{60}$ and older CPT parameters.	$C_n = (P_a/\sigma_v')^{0.5}$ where $0.0 < C_n < 2.0$ *(user adjustable, typically ranging from 1.7 to 2.0)* P_a *is atmospheric pressure (100 kPa)*	4, 12

Calculated Parameter	Description	Equation	Ref
C_q	Overburden stress normalizing factor.	$C_q = 1.8 / [0.8 + (\sigma_v'/P_a)]$ where *$0.0 < C_q < 2.0$ (user adjustable)* *P_a is atmospheric pressure (100 kPa)* *Robertson and Wride define C_q to be the same as C_n. The Olson definition above is used in the program.*	3, 12
N_{60}	SPT N value at 60% energy calculated from q_t/N ratios assigned to each SBT zone. This method has abrupt N value changes at zone boundaries.	*See Figure 1*	5
$(N_1)_{60}$	SPT N_{60} value corrected for overburden pressure.	*$(N_1)_{60} = C_n \bullet N_{60}$*	4
$N_{60}I_c$	SPT N_{60} values based on the I_c parameter, as defined by Robertson and Wride 1998 (3), or by Robertson 2009 (15).	$(q_t/P_a)/ N_{60} = 8.5 (1 – I_c/4.6)$ $(q_t/P_a)/ N_{60} = 10^{(1.1268 – 0.2817Ic)}$ P_a being atmospheric pressure	3, 5 15, 31
$(N_1)_{60}I_c$	SPT N_{60} value corrected for overburden pressure (using N_{60} I_c). User has 3 options.	*1) $(N_1)_{60}Ic = C_n \bullet (N_{60} I_c)$* 2) $q_{c1n}/ (N_1)_{60}I_c = 8.5 (1 – I_c/4.6)$ 3) $(Q_{tn})/ (N_1)_{60}I_c = 10^{(1.1268 – 0.2817Ic)}$	4 5 15, 31
S_u or S_u (N_{kt})	Undrained shear strength based on q_t S_u factor N_{kt} is user selectable.	$Su = \frac{qt - \sigma_v}{N_{kt}}$	1, 5
S_u or S_u (N_{du}) or S_u ($N_{\Delta u}$)	Undrained shear strength based on pore pressure S_u factor $N_{\Delta u}$ is user selectable.	$Su = \frac{u_2 - u_{eq}}{N_{\Delta u}}$	1, 5
D_r	Relative Density determined from one of the following user selectable options: 1) Ticino Sand 2) Hokksund Sand 3) Schmertmann (1978) 4) Jamiolkowski (1985) - All Sands 5) Jamiolkowski et al (2003) (various compressibilities, K_o)	See reference (methods 1 through 4) Jamiolkowski et al (2003) reference	5 14
PHI ϕ	Friction Angle determined from one of the following user selectable options (methods 1 through 4 are for sands and method 5 is for silts and clays): 1) Campanella and Robertson 2) Durgunoglu and Mitchel 3) Janbu 4) Kulhawy and Mayne 5) NTH method (clays and silts)	See appropriate reference	5 5 5 11 23
Delta U/q_t $\Delta u/q_t$ du/q_t	Differential pore pressure ratio (older parameter used before B_q was established)	$= \frac{\Delta u}{qt}$ *where:* $\Delta u = u - u_{eq}$ *and u = dynamic pore pressure* *u_{eq} = equilibrium pore pressure*	39

Calculated Parameter	Description	Equation	Ref
B_q	Pore pressure parameter	$Bq = \frac{\Delta u}{qt - \sigma_v}$ where: $\Delta u = u - u_{eq}$ *and u = dynamic pore pressure* *u_{eq} = equilibrium pore pressure*	1, 2, 5
Net q_t or qtNet	Net tip resistance (used in many subsequent correlations)	$qt - \sigma_v$	36
q_e or qE or q_E	Effective tip resistance (using the dynamic pore pressure u_2 and not equilibrium pore pressure)	$q_t - u_2$	36
qeNorm	Normalized effective tip resistance	$\frac{qt - u_2}{\sigma_v'}$	36
Q_t or Norm: Qt or Q_{t1}	Normalized q_t for Soil Behavior Type classification as defined by Robertson (1990) using a linear stress normalization. Note this is different from Q_{tn}. This parameter was renamed to Q_{t1} in Robertson, 2009. Without normalization limits this parameter calculates to very high unrealistic values at low stresses.	$Qt = \frac{qt - \sigma_v}{\sigma_v'}$	2, 5, 15
F_r or Norm: Fr	Normalized Friction Ratio for Soil Behavior Type classification as defined by Robertson (1990)	$Fr = 100\% \cdot \frac{fs}{qt - \sigma_v}$	2, 5
Q(1-B_q) Q(1-B_q) + 1	Q(1-B_q) grouping as suggested by Jefferies and Davies for their classification chart and the establishment of their I_c parameter. Later papers added the +1 term to the equation.	$Q \cdot (1 - Bq)$ $Q \cdot (1 - Bq) + 1$ *where Bq is defined as above and Q is the same as the normalized tip resistance, Q_{t1}, defined above*	6, 7, 34
q_{c1}	Normalized tip resistance, q_{c1}, using a fixed stress ratio exponent, n (this method has stress units)	$q_{c1} = q_t \cdot (Pa/\sigma_v')^{0.5}$ where: P_a = atmospheric pressure	21
q_{c1} (0.5)	Normalized tip resistance, q_{c1}, using a fixed stress ratio exponent, n (this method is unit-less)	$q_{c1}(0.5) = (q_t/P_a) \cdot (Pa/\sigma_v')^{0.5}$ where: P_a = atmospheric pressure	5
q_{c1} (C_n)	Normalized tip resistance, q_{c1}, based on C_n (this method has stress units)	$q_{c1}(Cn) = C_n * q_t$	5, 12
q_{c1} (C_q)	Normalized tip resistance, q_{c1}, based on C_q (this method has stress units)	$q_{c1}(Cq) = C_q * q_t$ (some papers use q_c)	5, 12
q_{c1n}	normalized tip resistance, q_{c1n}, using a variable stress ratio exponent, n (where n=0.0, 0.70, or 1.0) (this method is unit-less)	$q_{c1n} = (q_t / P_a)(P_a/\sigma_v')^n$ where: P_a = atm. Pressure and n varies as described below	3

Calculated Parameter	Description	Equation	Ref
I_c or Ic (RW1998)	Soil Behavior Type Index as defined by Robertson and Wride (1997, 1998) for estimating grain size characteristics and providing smooth gradational changes across the SBTn chart. Ic(RW1998) is different from that of Jefferies and Davies (7) and is different from Ic(PKR2009).	$I_c = [(3.47 - \log_{10}Q)^2 + (\log_{10} Fr + 1.22)^2]^{0.5}$ *Where:* $Q = \left(\frac{qt - \sigma_v}{P_a}\right)\left(\frac{P_a}{\sigma_v'}\right)^n$ *Or* $Q = q_{c1n} = \left(\frac{qt}{P_a}\right)\left(\frac{P_a}{\sigma_v'}\right)^n$ *depending on the iteration in determining I_c* *And Fr is in percent* *P_a = atmospheric pressure* *n has the following distinct values:* *0.5, 0.75 and 1.0* *and is determined in an iterative manner based on the resulting I_c in each iteration* *Note that NCEER replaced 0.75 with 0.70*	3, 4, 5 10
I_c (PKR 2009)	Soil Behavior Type Index, I_c (PKR 2009) is based on a variable stress ratio exponent n, which itself is based on I_c (PKR 2009). An iterative calculation is required to determine I_c (PKR 2009) and its corresponding n (PKR 2009).	*I_c (PKR 2009) =* *$[(3.47 - \log_{10}Q_{tn})^2 + (1.22 + \log_{10}F_r)^2]^{0.5}$*	15
n (PKR 2009)	Stress ratio exponent n, based on I_c (PKR 2009). An iterative calculation is required to determine n (PKR 2009) and its corresponding I_c (PKR 2009).	*n (PKR 2009) = 0.381 (I_c) + 0.05 (σ_v'/P_a) – 0.15*	15
Q_{tn} (PKR 2009)	Normalized tip resistance using a variable stress ratio exponent based on I_c (PKR 2009) and n (PKR 2009). An iterative calculation is required to determine Q_{tn} (PKR 2009).	*$Q_{tn} = [(qt - \sigma_v)/P_a](P_a/\sigma_v')^n$* *where P_a = atmospheric pressure (100 kPa)* *n = stress ratio exponent described above*	15
FC	Apparent fines content (%)	*$FC=1.75(Ic^{3.25}) - 3.7$* *$FC=100$ for $I_c > 3.5$* *$FC=0$ for $I_c < 1.26$* *FC = 5% if $1.64 < I_c < 2.6$ AND $F_r<0.5$*	3
I_c Zone	This parameter is the Soil Behavior Type zone based on the I_c parameter (valid for zones 2 through 7 on SBTn or SBT Qtn charts)	$I_c < 1.31$ Zone = 7 $1.31 < I_c < 2.05$ Zone = 6 $2.05 < I_c < 2.60$ Zone = 5 $2.60 < I_c < 2.95$ Zone = 4 $2.95 < I_c < 3.60$ Zone = 3 $I_c > 3.60$ Zone = 2	3
CD	The contractive / dilative boundary on Robertson's Modified SBTn (contractive/dilative) Chart shown in Figure 6 above. The boundary is marked as CD = 70 on the chart in the relevant paper. Similar to the $Q_{tn,cs}$ = 70 line in Figure 4.	$CD = 70 = (Q_{tn} - 11)(1 + 0.06F_r)^{17}$ lower bound of CD = 60: $CD = 60 = (Q_{tn} - 9.5)(1 + 0.06F_r)^{17}$	30

Calculated Parameter	Description	Equation	Ref
I_B	Hyberbolic fit defining the boundary between SBT soil types proposed by Schneider as a better fit than the I_c circles. I_B = 32 represents the boundary for most sand like soils. I_B = 22 represents the upper boundary for most clay like soils. The region between I_B=22 and I_B=32 is the "transitional soil" zone.	$I_B = 100\ (Q_{tn} + 10) / (70 + Q_{tn} F_r)$	30
State Param or State Parameter or ψ	The state parameter index, ψ, is defined as the difference between the current void ratio, e, and the critical void ratio, e_c. Positive ψ - contractive soil Negative ψ - dilative soil This is based on the work by Been and Jefferies (1985) and Plewes, Davies and Jefferies (1992) This method uses mean normal stresses based on a uniform value of K_0 or a calculated K_0 using methods described elsewhere in this document	See reference	6, 8
Yield Stress σ_p'	Yield stress is calculated using the following methods 1) General method 2) 1st order approximation using q_tNet (clays) 3) 1st order approximation using Δu_2 (clays) 4) 1st order approximation using q_e (clays) 5) Based on Vs	All stresses in kPa 1) $\sigma_p' = 0.33 \cdot (q_t - \sigma_v)^{m'} (\sigma_{atm}/100)^{1-m'}$ where $m' = 1 - \frac{0.28}{1 + (I_c / 2.65)^{25}}$ 2) $\sigma_p' = 0.33 \cdot (q_t - \sigma_v)$ 3) $\sigma_p' = 0.54 \cdot (\Delta u_2)$ $\Delta u_2 = u_2 - u_0$ 4) $\sigma_p' = 0.60 \cdot (q_t - u_2)$ 5) $\sigma_p' = (Vs/4.59)^{1.47}$	19 20 20 20 18
OCR OCR(JS1978) YSR(Mayne2014) YSR (qtNet) YSR (deltaU) YSR (qe) YSR (Vs) OCR (PKR2015)	Over Consolidation Ratio based on 1) Schmertmann (1978) method involving a plot plot of S_u/σ_v' /($S_u/\sigma_v')_{NC}$ and OCR  2) based on Yield stresses described above 3) approximate version based on qtNet 4) approximate version based on Δu 5) approximate version based on effective tip, q_e 6) approximate version based on shear wave velocity, V_s and σ_v' 7) based on Qt	1) requires a user defined value for NC Su/P_c' ratio 2 through 5) *based on yield stresses* 6) YSR (Vs) = $\sigma_p'(Vs) / \sigma_v'$ 7) OCR = $0.25 \cdot (Qt)^{1.25}$	9 19 20 20 20 18 32
Es/qt	Intermediate parameter for calculating Young's Modulus, E, in sands. It is the Y axis of the reference chart. Note that Figured 5.59 from reference 5, Lunne, Robertson and Powell, (LRP) has an error. The X axis values are too high by a factor of 10. The plot is based on Baldi's (not Bellotti as cited in	Based on Figure 5.59 in the reference	5, 37

Calculated Parameter	Description	Equation	Ref
	LRP) original Figure 3 where the X axis is: $\frac{q_c}{\sqrt{\sigma_v'}}$ (both in kPa) with a range of 200 to 3000. Figure 5.59 from LRP shows a dimensionless form of the equation, q_{c1}, displaying the same range of values. Figure 5.59's X axis uses $q_{c1} = \left(\frac{q_c}{P_a}\right)\left(\frac{P_a}{\sigma_v'}\right)^{0.5}$ The two expressions are not the same: they differ by a factor of $\frac{\sqrt{P_a}}{P_a}$. With P_a taken to be 100 kPa the factor is 1/10. Substituting typical values of 200 bar (20000 kPa) for q_c and 225 kPa for σ_v' one gets: 20000 / 15 = 1333.33 for Bellotti's axis and $(200/1)(100/225)^{0.5}$ = 200 * (10/15) = 133.3 for LRP's axis (noting that P_a = 1 bar) showing a factor of 10 difference.		
Es or E_s Young's Modulus E	Young's Modulus based on the work done in Italy. There are three types of sands considered in this technique. The user selects the appropriate type for the site from: a) OC Sands b) Aged NC Sands c) Recent NC Sands Each sand type has a family of curves that depend on mean normal stress. The program calculates mean normal stress and linearly interpolates between the two extremes provided in the E_s/q_t chart. E_s is evaluated for an axial strain of 0.1%.	Mean normal stress is evaluated from: $\sigma_m' = \frac{1}{3}(\sigma_v' + \sigma_h' + \sigma_h')$ where σ_v'= vertical effective stress σ_h'= horizontal effective stress *and* $\sigma_h = K_o \cdot \sigma_v'$ with K_o assumed to be 0.5	5
Delta U/TStress $\Delta u / \sigma_v$	Differential pore pressure ratio with respect to total stress	$= \frac{\Delta u}{\sigma_v}$ *where:* $\Delta u = u - u_{eq}$	39
Delta U/EStress, P Value, Excess Pore Pressure Ratio $\Delta u/\sigma_v'$	Differential pore pressure ratio with respect to effective stress. Key parameter (P, Normalized Pore Pressure Parameter, Excess Pore Pressure Ratio) in the Winckler et. al. static liquefaction method.	$= \frac{\Delta u}{\sigma_v'}$ *where:* $\Delta u = u - u_{eq}$	25, 25a
Su/EStress S_u/σ_v'	Undrained shear strength ratio with respect to vertical effective overburden stress using the S_u (N_{kt}) method	= *Su* (N_{kt}) / σ_v'	9, 23
Vs or V_s	Recorded shear wave velocities (not estimated). The shear wave velocities are typically collected over 1 m depth intervals. Each data point over the relevant depth range is assigned the same V_s value.	recorded data	27
Vp or V_p	Recorded compression wave (or P wave) velocities (not estimated). The P wave velocities are typically collected over 1 m depth intervals. Each data point over the relevant depth range is assigned the same V_p value.	recorded data	27

Calculated Parameter	Description	Equation	Ref
V_{s30} V_{s100}	The average shear wave velocity of the near surface materials to a depth of 30 m (100 ft). It is based on the sum of all travel times through all layers in the top 30m (100 ft). V_{s100} is the same calculation as V_{s30} except down to a depth of 100 feet.	$V_{s30} = \frac{total\ thickness\ of\ all\ layers\ to\ 30\ m}{\Sigma\left(\frac{layer\ thickness}{layer\ shear\ wave\ velocity}\right)}$ $V_{s30} = \frac{total\ thickness\ of\ all\ layers\ to\ 30\ m}{\Sigma\ (layer\ travel\ times)}$	38
G_{max}	G_{max} determined from SCPT shear wave velocities (not estimated values). Note that seismic data (V_s) is collected over set depth intervals (typically 1 meter). Each data point over the test segment is assigned the same V_s value. Since soil density changes with depth, slightly different G_{max} values may be calculated over the test depth interval.	$G_{max} = \rho V_s^2$ where ρ is the mass density of the soil determined from the estimated unit weights at each test depth	27
qtNet/G_{max}	Net tip resistance ratio with respect to the small strain modulus G_{max} determined from SCPT shear wave velocities (not estimated values)	$= (qt - \sigma_v) / G_{max}$ where $G_{max} = \rho V_s^2$ and ρ is the mass density of the soil determined from the estimated unit weights at each test depth	15, 28, 30
qUlt	A site specific and client specific parameter for estimating the limiting stress for "crane walk" accessibility	$q_{ult} = CraneWalkFactor \cdot S_u$ Where: *CraneWalkFactor* is client provided	U*
Estimated G_o	Estimated value for small strain shear modulus	$G_o = 0.0188[10^{(0.55Ic + 1,68)}](q_t - \sigma_v)$	15
Estimated E_{25}	Estimated value for Young's Modulus, E, at a 25% working load	$E_{25} = \alpha_E$ (qtNet) where $\alpha_E = 0.015[10^{(0.55Ic + 1,68)}]$	15
k_{SBT}	Estimated soil permeability derived from Soil Behavior Type (SBT) Chart I_c values.	For $1.0 < I_c \leq 3.27$: $k = 10^{(0.952 - 3.04Ic)}$ in m/s For $3.27 < Ic < 4.0$: $k = 10^{(-4.52 - 1.37Ic)}$ in m/s	35
M or D' Constrained Modulus	Constrained Modulus based on 1) Robertson, M 2) Mayne, D'	1) Robertson $M = \alpha_M (q_t - \sigma_v)$ $I_c > 2.2$ (fine grained) $\alpha_M = Qt$ when $Qt < 14$ $\alpha_M = 14$ when $Qt > 14$ $Ic < 2.2$ (coarse grained) $\alpha_M = 0.0188\ [10^{(0.55Ic + 1.68)}]$ $D' = \alpha_D (qt - \sigma_v)$ where $\alpha_D = 5$	32 23

Table 1b. CPT Parameter Calculation Methods – Liquefaction Parameters

Calculated Parameter	Description	Equation	Ref
K_{SPT} or K_s	Equivalent clean sand factor for $(N_1)60$	$K_{SPT} = 1 + ((0.75/30) \bullet (FC - 5))$	10
K_{CPT} or K_c (RW1998)	Equivalent clean sand correction for q_{c1N}	$K_{cpt} = 1.0$ for $I_c \leq 1.64$ $K_{cpt} = f(I_c)$ for $I_c > 1.64$ (see reference) $K_c = -0.403\ I_c^4 + 5.581\ I_c^3 - 21.63 I_c^2 + 33.75\ I_c - 17.88$	3, 10
K_c (PKR 2010)	Clean sand equivalent factor to be applied to Q_{tn}	$K_c = 1.0$ for $I_c \leq 1.64$ $K_c = -0.403\ I_c^4 + 5.581\ I_c^3 - 21.63 I_c^2 + 33.75\ I_c - 17.88$ for $I_c > 1.64$	16
$(N_1)_{60cs}I_C$	Clean sand equivalent SPT $(N_1)_{60}I_c$. User has 3 options.	1) $(N_1)_{60cs}Ic = \alpha + \beta((N_1)_{60}I_c)$ 2) $(N_1)_{60cs}Ic = K_{SPT} * ((N_1)_{60}I_c)$ 3) $(q_{c1ncs})/(N_1)_{60cs}I_c = 8.5\ (1 - I_c/4.6)$ FC ≤ 5%: $\alpha = 0,\ \beta = 1.0$ FC ≥ 35% $\alpha = 5.0,\ \beta = 1.2$ 5% < FC < 35% $\alpha = exp[1.76 - (190/FC^2)]$ $\beta = [0.99 + (FC^{1.5}/1000)]$	10 10 5
q_{c1ncs}	Clean sand equivalent q_{c1n}	$q_{c1ncs} = q_{c1n} \bullet K_{cpt}$	3
$Q_{tn,cs}$ (PKR 2010)	Clean sand equivalent for Q_{tn} described above - Q_{tn} being the normalized tip resistance based on a variable stress exponent as defined by Robertson (2009)	$Q_{tn,cs} = Q_{tn} \cdot K_c$ (PKR 2016)	16
Su(Liq)/ESv or $S_u(Liq)/\sigma_v'$	Liquefied shear strength ratio as defined by Olson and Stark	$\frac{S_u(Liq)}{\sigma_v'} = 0.03 + 0.0143(q_{c1})$ Note: σ_v' and s_v' are synonymous	13
Su(Liq)/ESv or $S_u(Liq)/\sigma_v'$ (PKR 2010)	Liquefied shear strength ratio as defined by Robertson (2010)	$\frac{S_u(Liq)}{\sigma_v'}$ Based on a function involving $Q_{tn,cs}$	16
S_u (Liq) (PKR 2010)	Liquefied shear strength derived from the liquefied shear strength ratio and effective overburden stress	$S_u(Liq) = \sigma_v' \cdot \left(\frac{S_u(Liq)}{\sigma_v'}\right)$	16
Cont/Dilat Tip	Contractive / Dilative q_{c1} Boundary based on $(N_1)_{60}$	$(\sigma_v')_{boundary} = 9.58 \times 10^{-4}\ [(N_1)_{60}]^{4.79}$ q_{c1} is calculated from specified q_t(MPa)/N ratio	13
CRR	Cyclic Resistance Ratio (for Magnitude 7.5)	$q_{c1ncs} < 50$: $CRR_{7.5} = 0.833\ [q_{c1ncs}/1000] + 0.05$ $50 \leq q_{c1ncs} < 160$: $CRR_{7.5} = 93\ [q_{c1ncs}/1000]^3 + 0.08$	10
Kg or K_g	Small strain Stiffness Ratio Factor, K_g	$[G_{max}/q_t]/[q_{c1n}{}^{-m}]$ m = empirical exponent, typically 0.75	26

Calculated Parameter	Description	Equation	Ref
K_g*	Revised K_g factor extended to fine grained soils (Robertson).	$K_g^* = (G_o / q_n)(Q_{tn})^{0.75}$ where q_n is the net tip resistance = $q_t - \sigma_v$	30
SP Distance	State Parameter Distance, Winckler static liquefaction method	Perpendicular distance on Q_{tn} chart from plotted point to state parameter Ψ = -0.05 curve	25
URS NP Fr	Normalized friction ratio point on Ψ = -0.05 curve used in SP distance calculation		25
URS NP Q_{tn}	Normalized tip resistance (Q_{tn}) point on Ψ = -0.05 curve used in SP Distance calculation		25

Table 2. References

No.	Reference
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No.	Reference
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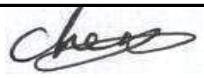
Piezocone Calibration Sheets

CONETEC

Adara Systems Ltd.
201-8327 Eastlake Drive, Burnaby, BC, Canada V5A4W2
Tel: 1-604-273-6013

CERTIFICATE OF CALIBRATION

Calibration Information			
Cone Serial Number	EC1065	Model	A15 T1500 F15 U35
Date	2024-01-17		
Technician Performing Calibration	Richard Chen	Signature	
Calibration Approved By	Vishrut Khunt	Signature	

Lab Condition	As Found	As Left		
Lab Temperature	N/A	24˚C		
Lab Humidity	N/A	19%	Reason for Calibration	new

Cone Information				
Tip Stress Limit	1500	bar	Tip End Area	15 cm²
Friction Stress Limit	15	bar	Friction Surface Area	225 cm²
Pressure Limit	35	bar	RTD Location	Pressure Carrier
X-Inclinometer Limit	30	degrees	Geophone	X and Z
Y-Inclinometer Limit	30	degrees	Temperature Range	-20°C to 60°C

Baseline Summary: (For Reference Only)

Channel	Units	As Found	As Left
Tip	bar	N/A	-0.245
Sleeve	bar	N/A	-0.055
Pressure	bar	N/A	0.992
X-Inclinometer	degrees	N/A	0.012
Y-Inclinometer	degrees	N/A	0.019
Temperature	˚C	N/A	22.538

Classified in accordance with ISO 22476-1:2012 Class 1
Classified in accordance with ISO 22476-1:2012 Class 2

Calibrated in general accordance with the ASTM D5778-20 and D7400-08 standards

Calibrated with Adara calibration procedure EC_CPTCAL-2.2

Collective uncertainty of the measurement standards conforms to a test uncertainty ratio (TUR) of 3:1 for tip and sleeve measurement and 4:1 for pressure measurement with a confidence level k=2

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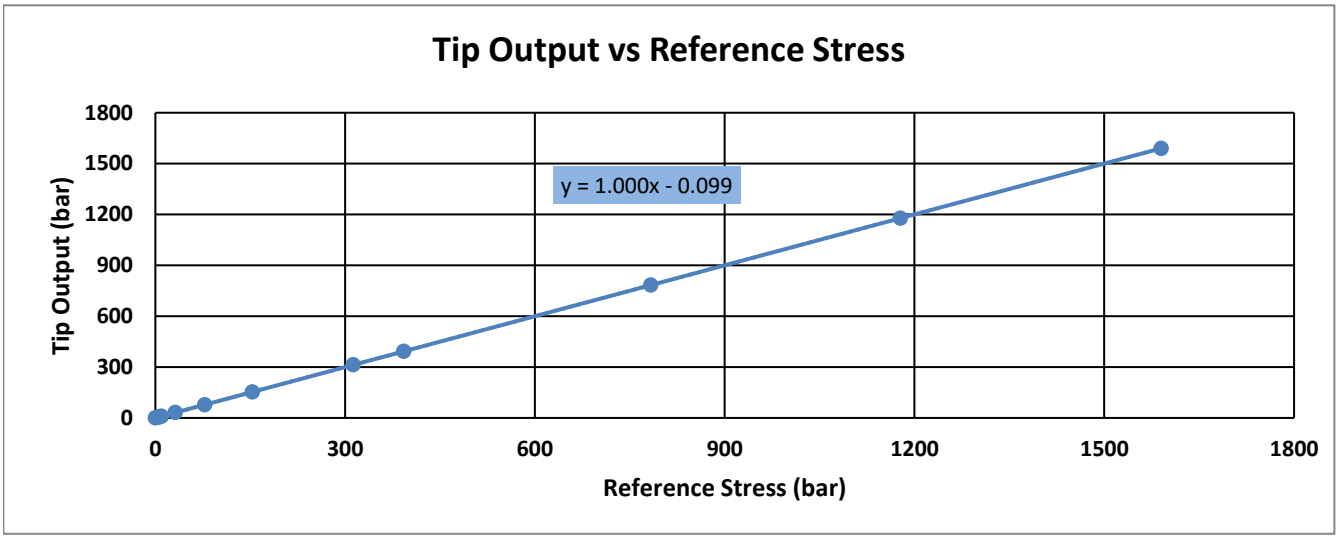
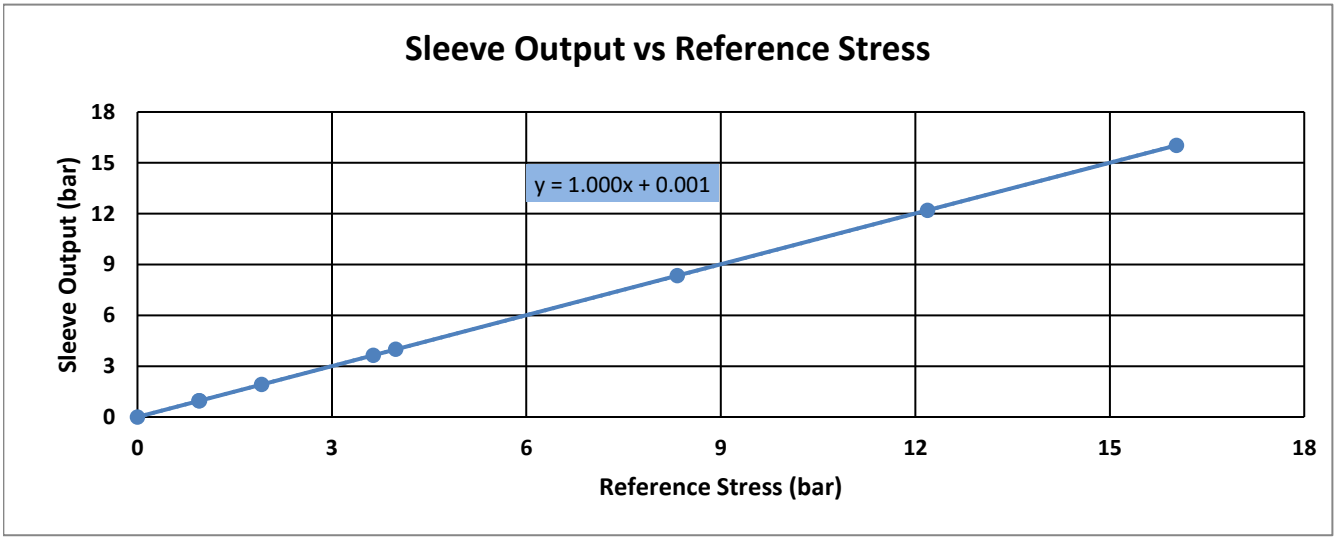
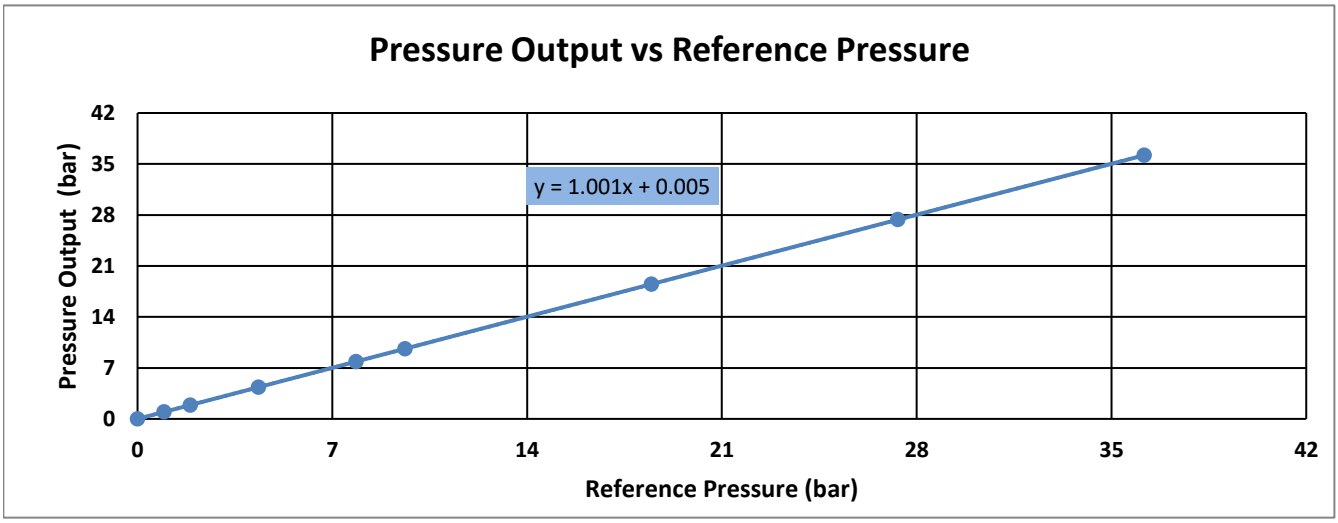
Cone Output vs Reference Stress/Pressure Plots







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Calibration Results

Tip Calibration					
As Found			As Left		
Max. Non Linearity	N/A	N/A	Max. Non Linearity	0.02%	PASS
Calibration Error	N/A	N/A	Calibration Error	0.11%	PASS

Sleeve Calibration					
As Found			As Left		
Max. Non Linearity	N/A	N/A	Max. Non Linearity	0.09%	PASS
Calibration Error	N/A	N/A	Calibration Error	0.16%	PASS

Pressure Calibration					
As Found			As Left		
Max. Non Linearity	N/A	N/A	Max. Non Linearity	0.10%	PASS
Calibration Error	N/A	N/A	Calibration Error	0.23%	PASS

X-Inclinometer Calibration					
As Found			As Left		
Max. Non Linearity	N/A	N/A	Max. Non Linearity	0.21%	PASS
Calibration Error	N/A	N/A	Calibration Error	-0.42%	PASS

Y-Inclinometer Calibration					
As Found			As Left		
Max. Non Linearity	N/A	N/A	Max. Non Linearity	0.04%	PASS
Calibration Error	N/A	N/A	Calibration Error	-0.08%	PASS

Seismic Calibration					
As Found			As Left		
Trigger Delay Error	N/A	N/A	Trigger Delay Error	0.01%	PASS

Temperature Calibration			
Full Scale Error	0.27%	PASS	

Channel	Cold	Room	Hot	Units
Ref_Temp	2.8	20.6	43.6	˚C
Tip	-2.954	-1.076	1.520	bar
Sleeve	-0.088	-0.068	-0.038	bar
Pressure	1.011	1.019	0.973	bar
Temperature	2.683	20.365	43.687	˚C

Tip Temperature Coefficient	0.110 bar/˚C	PASS
Sleeve Temperature Coefficient	0.001 bar/˚C	PASS
Pressure Temperature Coefficient	-0.001 bar/˚C	PASS

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Testing Equipment Details

Testing Machines	Model Number	Serial Number	Calibration Number	Due Date
Tip Load Cell	Precision	P-10289	100490	2025-09-18
Sleeve Load Cell	Precision	P-10868	100579	2025-10-01
Digital Loadcell Indicator	4215	62140	100490	2024-07-18
Fluke Reference Pressure Monitor	RPM4 A10Ms	3910	100835	2024-12-12
Tektronix Function Generator	AFG3021B	C030955	100751	2024-10-20
Thermometer	THS-222-555	D23255834	100410	2024-07-11
Thermometer	THS-222-555	D23255829	100410	2024-07-11
Thermometer	THS-222-555	D20345575	100565	2024-07-14

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Adara Error Definitions

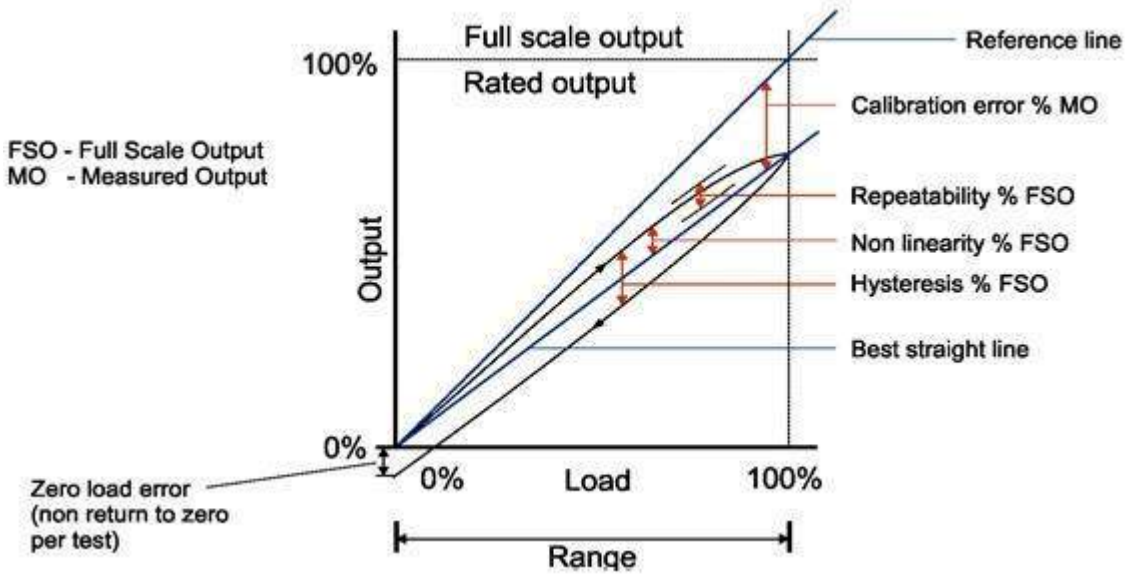

Figure 1: Definition of Calibration Terms for Load Cell and Transducers (Adapted from [1])

Actual Sensitivity	The slope of the best fit line through all data points starting at zero load.
Slope Error	The error in the best fit line compared to the ideal linear calibration in % . Slope Error = (Best Fit Slope - Ideal Slope) / Ideal Slope
Maximum Non Linearity	This value represents the maximum error (absolute value) relative to the best fit line considering each calibration point starting at loads greater than approximately 10% of FSO. The reported errors are a percent error of FSO. Adara's Pass/Fail criteria is 0.5% of FSO (ASTM is 0.5% of FSO at loads > 20% FSO).
Calibration Error	This value represents the maximum error (absolute value) in the recorded load value as compared to the actual load value for each calibration point for loads greater than approximately 10% of FSO. Adara's Pass/Fail criteria for the tip and sleeve is 0.5% of MO and 1.0% of MO for the pore pressure (ASTM for the tip and sleeve is 1.5% and 1.0% of MO respectively at loads greater than 20% of FSO)

Temperature Check Passing Criteria

Tip Temperature Coefficient	<0.200	bar/˚C
Sleeve Temperature Coefficient	<0.005	bar/˚C
Pressure Temperature Coefficient	<0.0196	bar/˚C

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ASTM D5778-20 Annex A Summary [1]

A1.4 Force Transducer Calibration Requirements

A1.4.1 states the following limits:

Non Linearity	Tip	≤ +0.5% of FSO
	Sleeve	≤ +1.0% of FSO
Calibration Error	Tip	≤ +1.5% of MO at loads > 20% FSO
	Sleeve	≤ +1.0% of MO at loads > 20% FSO

A1.5 Pressure Transducer Calibrations

A1.5.1 limits:

Non Linearity	Pore Pressure	≤ +1.0% of FSO
Calibration Error	Pore Pressure	not specified

ISO 22476 -1:2012 Summary [2]

Section 5.2 states the following allowable minimum accuracy

Class 1	Cone Resistance	35 kPa or 5%
	Sleeve Friction	5 kPa or 10%
	Pore Pressure	10 kPa or 2%
Class 2	Cone Resistance	100 kPa or 5%
	Sleeve Friction	15 kPa or 15%
	Pore Pressure	25 kPa or 3%

Note: ISO Compliance is based on low end calibration only.

References

[1] ASTM D5778-20. "Standard Test Method for Electronic Friction Cone and Piezocone Penetration Testing of Soils". ASTM, West Conshohocken, PA, USA.

[2] ISO 22476-1:2012. "Geotechnical investigation and testing - Field Testing - Part 1: Electrical cone and piezocone penetration test". ISO, Geneva, Switzerland.

ASTM D7400-08. "Standard Test Methods for Downhole Seismic Testing". ASTM, West Conshohocken, PA, USA.

APPENDIX B
Laboratory Test Results

APPENDIX B

Laboratory Testing

Soil samples obtained from the explorations were transported to our laboratory and evaluated to confirm or modify field classifications, as well as to assess engineering properties of the soils encountered. Representative samples were selected for laboratory testing and transported to our geotechnical laboratory in Portland, Oregon. The tests were performed in general accordance with the test methods of ASTM International or other applicable procedures. One sample was submitted to CERCO Analytical, Inc. for corrosivity testing. A summary of the test results is included as Figure B-1.

Visual Classifications

Soil samples obtained from the explorations were visually classified in the field and in our geotechnical laboratory based on the Unified Soil Classification System and ASTM classification methods. ASTM Test Method D 2488 was used to classify soils using visual and manual methods. ASTM Test Method D 2487 was used to classify soils based on laboratory test results.

Laboratory Test Results

Moisture Content

Moisture contents of samples were obtained in general accordance with ASTM Test Method D 2216. The results of the moisture content tests completed on samples from the explorations are presented on the exploration logs included in Appendix A and on Figure B-1 in this appendix.

Atterberg Limits Testing

Atterberg limits (liquid limit, plastic limit, and plasticity index) of fine-grained soil samples were obtained in general accordance with ASTM Test Method D 4318. The results of the Atterberg Limits tests are presented on the exploration logs included in Appendix A, summarized on Figure B-1 in this appendix, and shown in detail on Figure B-2 in this appendix.

Particle Size Distribution

Sieve analysis tests were performed to determine the quantitative distribution of particle sizes in the sample. The tests were performed in general accordance with ASTM Test Method D 6913. The “percent fines” portions of the test results are indicated on the appropriate exploration logs included in Appendix A and on Figure B-1 in this appendix. The full test results are shown on Figure B-3 in this appendix.

Corrosivity Testing

One corrosivity test suite was performed on a sample collected from boring B-AJW01. The test suites included testing for pH, redox, chloride, sulfate, and electrical resistivity. The results of the test are presented on the final sheet of this appendix.

Exploration	Sample ID	Depth	Gravel (%)	Sand (%)	Fines (%)	Liquid Limit	Plastic Limit	Water Content (%)	USCS Group Symbol	Soil Description
B-SE01	S-1	0.5								
B-SE01	S-2	1.5						58.8		
B-SE01	S-3	2.5								
B-SE01	S-4	4.5								
B-SE01	S-5	5.0				118	55	133.7	MH	ORGANIC SILT
B-SE01	S-6	7.5								
B-SE01	S-7	10.0								
B-SE01	S-8	12.5						89.7		
B-SE01	S-9	15.0	0.0	25.4	74.6	72	39	62.0	MH	ELASTIC SILT WITH SAND
B-SE01	S-10	17.5								
B-SE01	S-11	20.0						75.4		
B-SE01	S-12	25.0	0.0	71.2	28.8			42.4		
B-SE01	S-13	30.0	0.0	69.7	30.3				SM	SILTY SAND
B-SE01	S-14	35.0	0.0	73.5	26.5			36.3		
B-SE01	S-15	40.0								
B-SE01	S-16	45.0	0.0	72.2	27.8				SM	SILTY SAND
B-SE01	S-17	50.0								
B-SE01	S-18	55.0						48.8		
B-SE01	S-19	60.0								
B-SE01	S-20	65.0	8.5	83.1	8.4				SW-SM	WELL-GRADED SAND WITH SILT
B-SE01	S-21	70.0						52.2		
B-SE01	S-22	75.0								
B-SE01	S-23	80.0						58.2		
B-SE01	S-24	85.0								
B-SE01	S-25	90.0						12.5		
B-SE01	S-26	95.0								
B-SE01	S-27	100.0								

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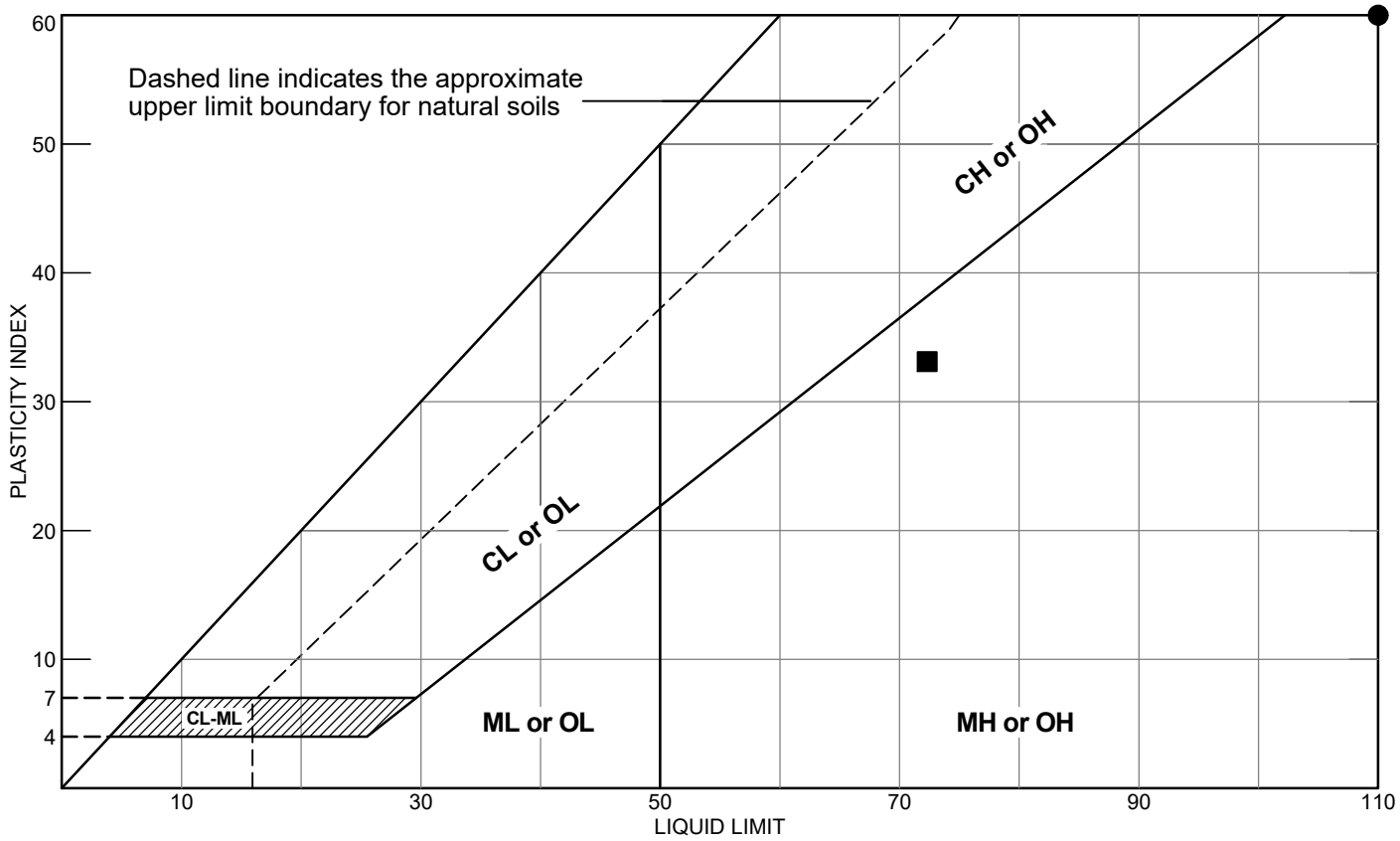
HALEY ALDRICH

Project: Aberdeen School District - Stevens Elementary
Location: Aberdeen, Washington
Project No.: 0210367-000

Summary of Laboratory Results

Figure **B-1**
Sheet **1 of 1**



Location and Description	LL	PL	PI	-#200	MC%	USCS
● **Source:** B-SE01 **Sample No.:** S-5 **Depth:** 5.0 to 6.5 ORGANIC SILT	118	55	63	NT	134	MH
■ **Source:** B-SE01 **Sample No.:** S-9 **Depth:** 15.0 to 16.5 ELASTIC SILT WITH SAND	72	39	33	75	62	MH

Remarks:

●

■

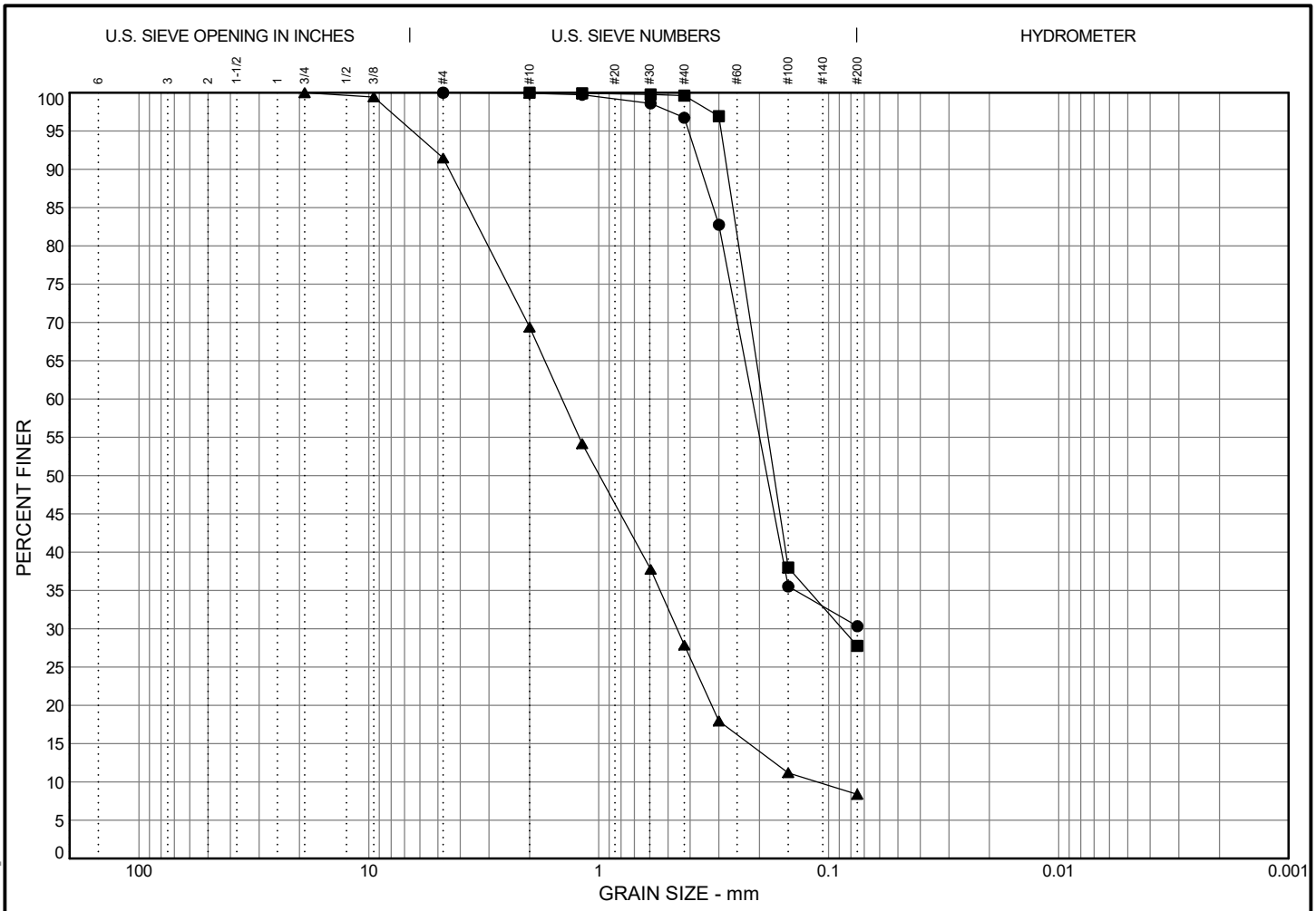
HALEY ALDRICH

Project: Aberdeen School District - Stevens Elementary
Location: Aberdeen, Washington
Project No.: 0210367-000

Liquid Limit, Plastic Limit, and Plasticity Index

Figure **B-2**
Sheet **1 of 1**

HA ATTERBERG LIMITS C:\USERS\TIMERLIN\ONEDRIVE - HALEY ALDRICH,COM\DESKTOP\HC_LIBRARY GLB 5/17/24 14:39 - \\HALEYALDRICH.COM\SHARE\CPP\PROJECTS\0210367\GINT\PERMANENT GINT FILE\0210367-000_ABERDEEN SCHOOL DISTRICT-STEVENS ELEMENTARY_GINT.GPJ - timerlin



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Location and Description	% Cobbles	% Gravel	% Sand	% Silt	% Clay	MC%	USCS
● **Source:** B-SE01 **Sample No.:** S-13 **Depth:** 30.0 to 31.5 SILTY SAND	0.0	0.0	69.7	30.3		NT	SM
■ **Source:** B-SE01 **Sample No.:** S-16 **Depth:** 45.0 to 46.5 SILTY SAND	0.0	0.0	72.2	27.8		NT	SM
▲ **Source:** B-SE01 **Sample No.:** S-20 **Depth:** 65.0 to 66.5 WELL-GRADED SAND WITH SILT	0.0	8.5	83.1	8.4		NT	SW-SM

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.317	0.215	0.186					
■			0.261	0.194	0.173	0.087				
▲			3.687	1.445	0.992	0.457	0.222	0.112	1.29	12.90

Remarks:

●

■

▲

HALEY ALDRICH

Project: Aberdeen School District - Stevens Elementary
Location: Aberdeen, Washington
Project No.: 0210367-000

Particle-Size Analysis

Figure **B-3**
Sheet **1 of 1**

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CERCO analytical
1100 Willow Pass Court, Suite A
Concord, CA 94520-1006
925 462 2771 Fax. 925 462 2775
www.cercoanalytical.com

21 May, 2024

Job No. 2405048
Cust. No. 13349

Mr. Micah Hintz
Haley & Aldrich
6420 S. Macadam Ave., Suite 100
Portland, OR 97239

Subject: Project No.: 0210365
Project Name: Aberdeen School District
Corrosivity Analysis –ASTM Test Methods

Dear Mr. Hintz:

Pursuant to your request, CERCO Analytical has analyzed the soil samples submitted on May 16, 2024. Based on the analytical results, this brief corrosivity evaluation is enclosed for your consideration.

Based upon the resistivity measurements, Samples No. 002-004 are classified as "corrosive" and Sample No. 001 is classified as "moderately corrosive". All buried iron, steel, cast iron, ductile iron, galvanized steel and dielectric coated steel or iron should be properly protected against corrosion depending upon the critical nature of the structure. All buried metallic pressure piping such as ductile iron firewater pipelines should be protected against corrosion.

The chloride ion concentrations ranged from none detected to 140 mg/kg and are determined to be insufficient to attack steel embedded in a concrete mortar coating.

The sulfate ion concentrations ranged from 61 mg/kg to 300 mg/kg and are determined to be sufficient to potentially be detrimental to reinforced concrete structures and cement mortar-coated steel at these locations. Therefore, concrete that comes into contact with this soil should use sulfate resistant cement such as Type II, with a maximum water-to-cement ratio of 0.55.

The pH of the soils range from 4.90 to 6.37, which is considered to be corrosive to buried iron, steel, mortar-coated steel and reinforced concrete structures. Therefore, corrosion prevention measures need to be considered for structures to be placed in this acidic soil.

The redox potentials range from 35-mV to 200-mV. Sample No.004 is indicative of potentially "severely corrosive" soils, Samples No. 001 and No. 002 are indicative of potentially "moderately corrosive" soils and Sample No. 003 is indicative of potentially "slightly corrosive" soils resulting from anaerobic soil conditions.

This corrosivity evaluation is based on general corrosion engineering standards and is non-specific in nature. For specific long-term corrosion control design recommendations or consultation, please call *JDH Corrosion Consultants, Inc. at (925) 927-6630.*

We appreciate the opportunity of working with you on this project. If you have any questions, or if you require further information, please do not hesitate to contact us.

Very truly yours,
CERCO ANALYTICAL, INC.

J. Darby Howard, Jr., P.E.
President

JDH/jdl
Enclosure

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Client: Haley & Aldrich, Inc.
Client's Project No.: 0210365
Client's Project Name: Aberdeen School District
Date Sampled: 8-Apr-2024, 10-Apr-2024, 11-Apr-2024, & 15-Apr-2024
Date Received: 16-May-24
Matrix: Soil
Authorization: Signed Chain of Custody

Date of Report: 21-May-2024

Job/Sample No.	Sample I.D.	Redox (mV)	pH	Conductivity (umhos/cm)*	Resistivity (100% Saturation) (ohms-cm)	Sulfide (mg/kg)*	Chloride (mg/kg)*	Sulfate (mg/kg)*
[redacted]								
[redacted]								
2405048-003	0210367 B-1 @ 7.5'	200	4.90	-	1,300	-	N.D.	180
[redacted]								

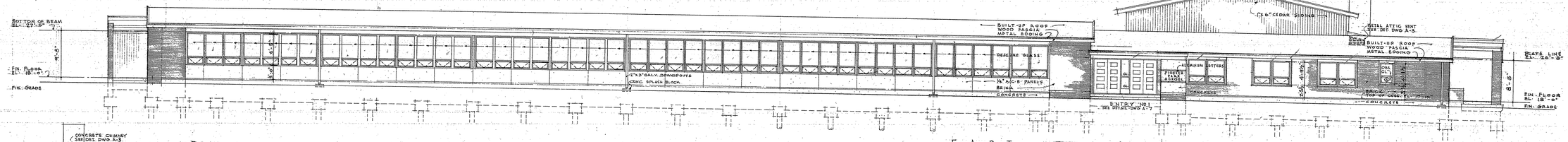
Method:	ASTM D1498	ASTM D4972	ASTM D1125M	ASTM G57	ASTM D4658M	ASTM D4327	ASTM D4327
Reporting Limit:	-	-	10	-	50	15	15
Date Analyzed:	16-May-2024	17-May-2024	-	17-May-2024	-	17-May-2024	17-May-2024

* Results Reported on "As Received" Basis
N.D. - None Detected

Julia Clauson
Chemist

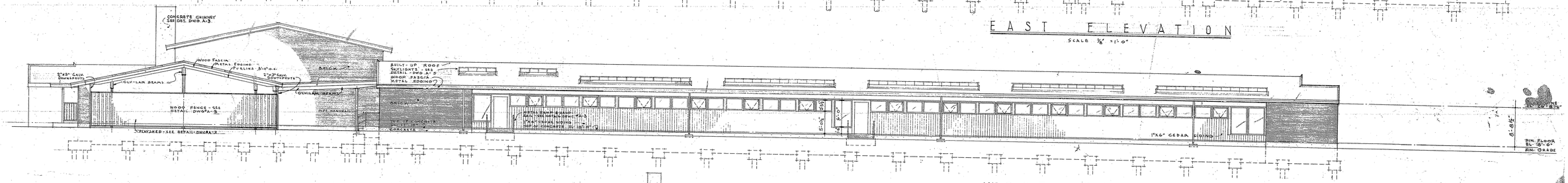
Quality Control Summary - **All laboratory quality control parameters were found to be within established limits**

APPENDIX C
Historical Plans



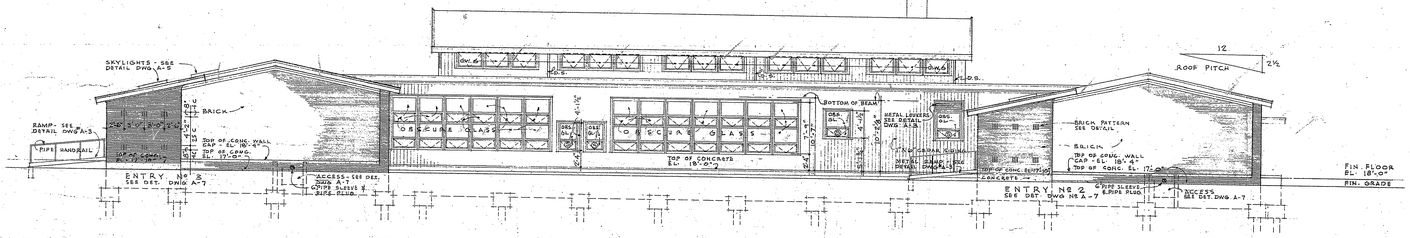
EAST ELEVATION

SCALE 1/8" = 1'-0"



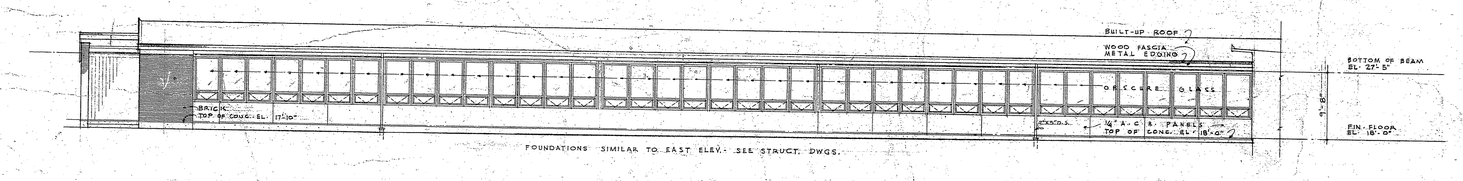
WEST ELEVATION

SCALE - 1/8" = 1'-0"



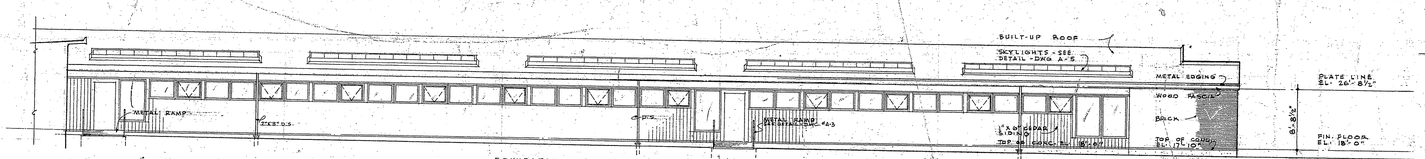
SOUTH ELEVATION

NORTH ELEVATION



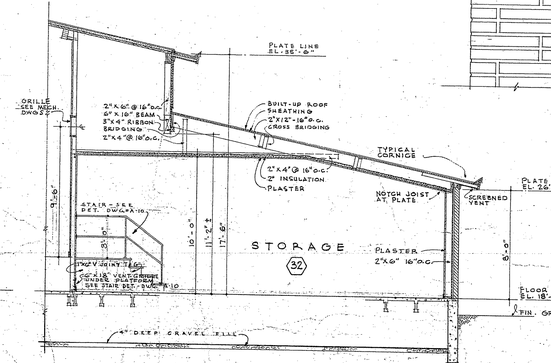
FOUNDATIONS SIMILAR TO EAST ELEV. - SEE STRUCT. DWGS.

COURT ELEVATION LOOKING WEST



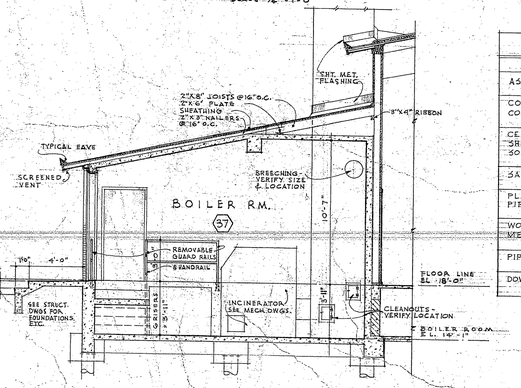
FOUNDATIONS SIMILAR TO WEST ELEVATION - SEE STRUCT. DWGS.

COURT ELEVATION LOOKING EAST



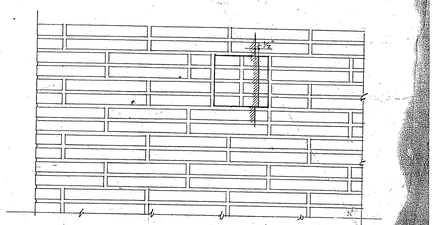
SECTION "D-D"

SCALE - 1/4" = 1'-0"



SECTION "E-E"

SCALE 1/4" = 1'-0"



DETAIL OF TYPICAL BRICK COURSING AND BRICK PATTERN AT ENTRY NO. 2 & NO. 3

SCALE 1 1/2" = 1'-0"

EXTERIOR PAINTING SCHEDULE

ALL PAINT COLORS SELECTED FROM "PLOCHERE COLOR SYSTEM"

MATERIAL	FINISH
ASBESTOS CEMENT BOARD	#315 RED
CONCRETE CHIMNEY CONC. PIER AT ENTRY NO. 1	#37 YELLOW GREEN #55 GREEN
CEDAR SIDING, FENCE AT PLAYSHED, LOUVERS AT ENTRY NO. 5, SOFFITS & ENTRY CEILINGS	CABOT'S STAIN #345 GRAY
SASH, FRAMES, TRIM & FASCIA	#37 YELLOW GREEN
PLAYSHED CEILING PIPE COLUMNS	#61 YELLOW #315 RED
WOOD DOORS & FRAMES METAL DOORS	NATURAL - SEE SPECS. #315 RED
PIPE RAILS	#37 YELLOW GREEN
DOWNSPOUTS & MET. LOUVERS	#189 GRAY

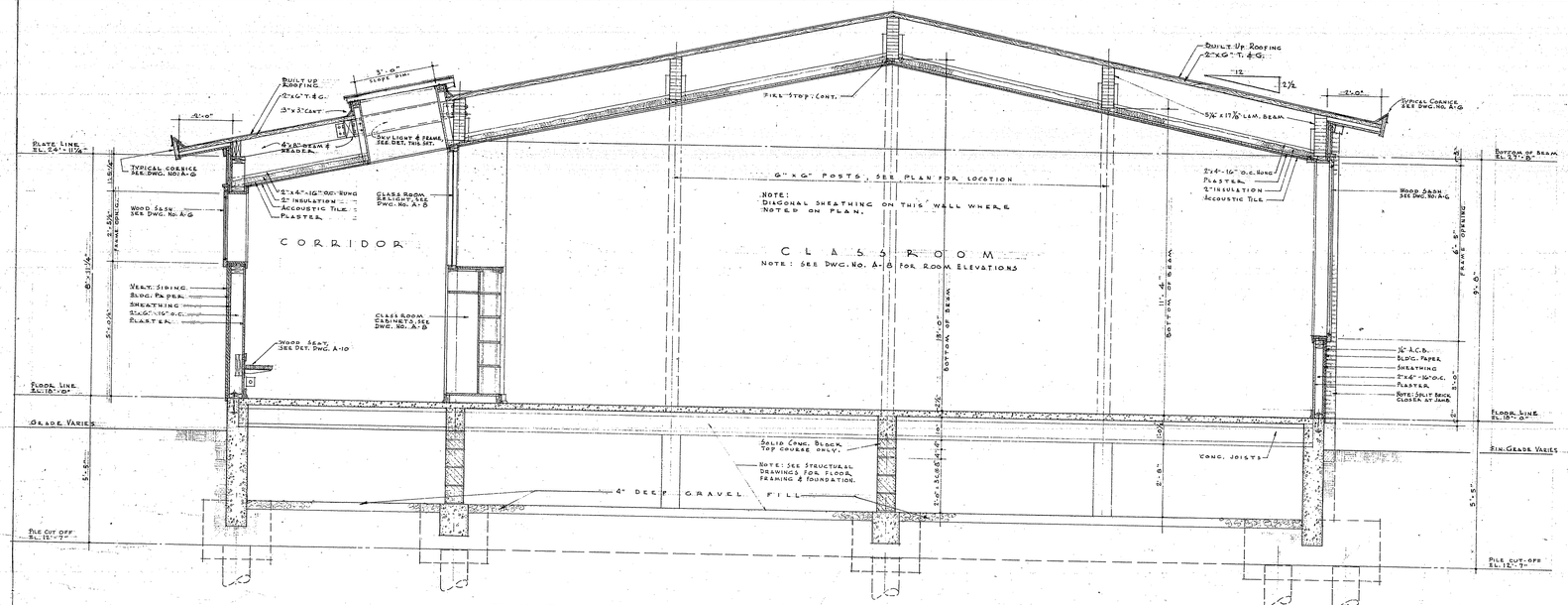
JOHN PAUL JONES — LICENSED ARCHITECT — STATE OF WASHINGTON

LEONARD WILLIAM BINDON — REGISTERED ARCHITECT — STATE OF WASHINGTON — 1952

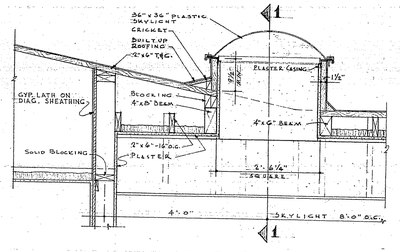
ELEVATIONS

DRAWN BY M-I-M	PIONEER PARK ···SCHOOL··· ABERDEEN, WASHINGTON
CHECKED BY	DATE JAN. 5 '53
APPROVED	FILE NO. 244
SCALE AS NOTED	DWG. NO. A4

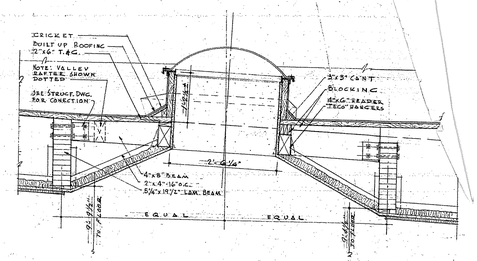
JOHN PAUL JONES - LEONARD W. BINDON ARCHITECTS
715 NORIE BUILDING SEATTLE 4, WASHINGTON



TYPICAL CLASSROOM SECT. "A-A"
SCALE ½" = 1'-0"



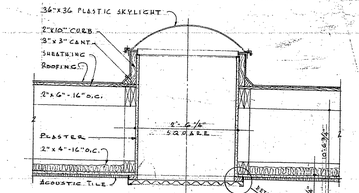
SECT. "X-X"
NOTE: SEE ROOF PLAN FOR LOCATION



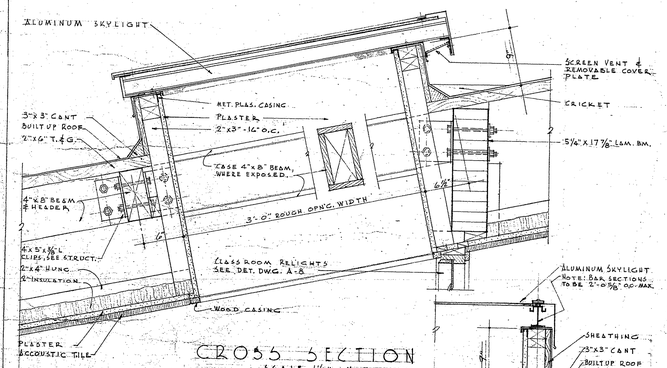
SECT. "1-1"
NOTE: ALL OTHER KINDERGARTEN SKYLIGHTS SIMILAR

KINDERGARTEN SKYLIGHT DETAILS
SCALE ¾" = 1'-0"

PLASTIC SKYLIGHT DETAILS



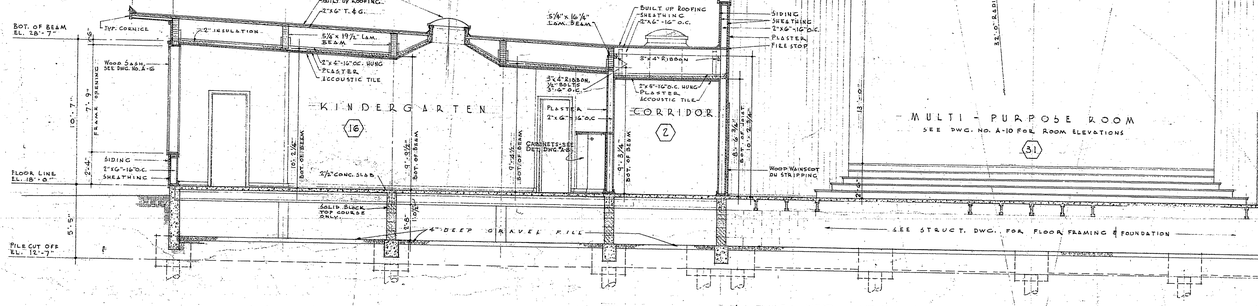
SECTION "Y-Y"
CORRIDOR PLASTIC SKYLIGHTS
SCALE: ¾" = 1'-0"



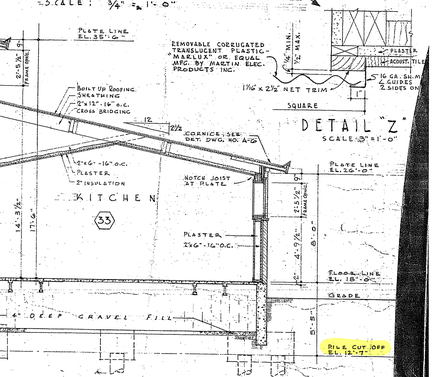
CROSS SECTION
SCALE 1½" = 1'-0"

ALUMINUM SKYLIGHT DETAIL

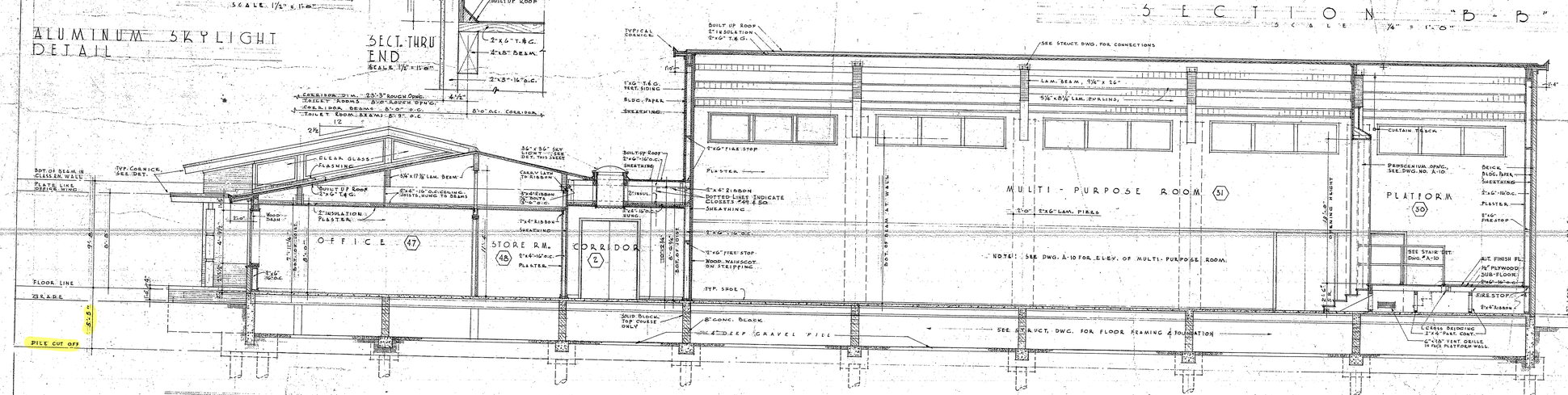
SECT. THRU END
SCALE 1½" = 1'-0"



SECTION "B-B"
SCALE ¼" = 1'-0"



DETAIL "Z"
SCALE 3" = 1'-0"



SECTION "C-C"
SCALE ¼" = 1'-0"

NOTE:
ALL GRAVEL FILL SHALL BE CLEAN PIT-RUN SAND AND GRAVEL, NOT OVER 10% SILT, EVENLY GRADED 3" & MINUS.

SECTIONS

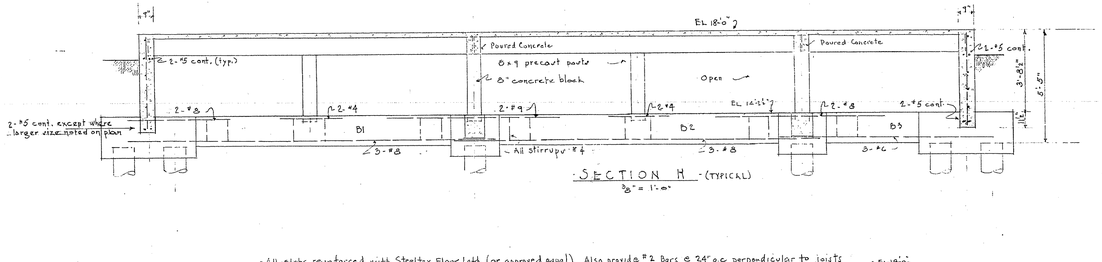
DRAWN BY	D.M.E.
CHECKED BY	
APPROVED	
SCALE	AS NOTED

PIONEER PARK ·· SCHOOL ··
ABERDEEN · WASHINGTON.

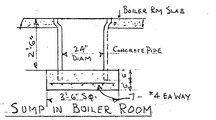
DATE JAN. 5, 1953
FILE NO. 244.
DWG. NO. A5

JOHN PAUL JONES - LEONARD W. BINDON
ARCHITECTS
715 HOGE BUILDING · SEATTLE 4, WASHINGTON

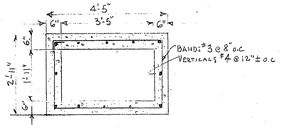
JOHN PAUL JONES — STATE OF WASHINGTON — LICENSED ARCHITECT
LEONARD WILLIAM BINDON — STATE OF WASHINGTON — LICENSED ARCHITECT



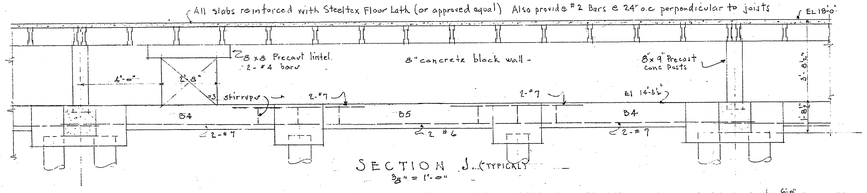
SECTION H (TYPICAL)
3/8" = 1'-0"



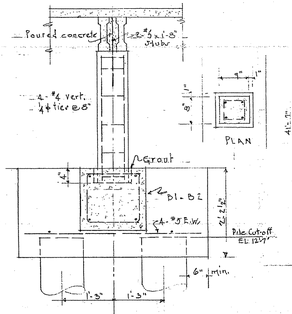
SUMP IN BOILER ROOM



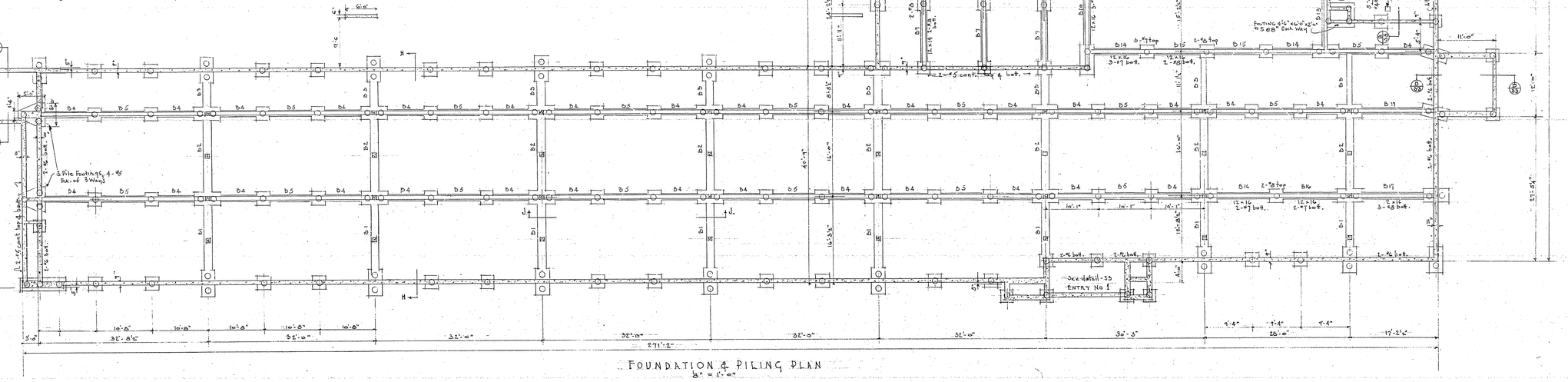
DETAIL OF CHIMNEY



SECTION J (TYPICAL)
3/8" = 1'-0"



TYPICAL POST & FOOTING
3/4" = 1'-0"



FOUNDATION & PILING PLAN
3/8" = 1'-0"

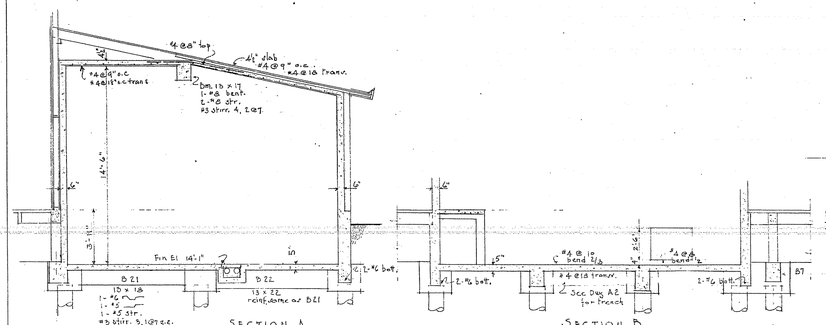
M. O. SYLLIAASEN — STATE OF WASHINGTON — REGISTERED PROFESSIONAL ENGINEER

JOHN PAUL JONES — LICENSED ARCHITECT — STATE OF WASHINGTON

LEONARD WILLIAM BINDON — LICENSED ARCHITECT — STATE OF WASHINGTON

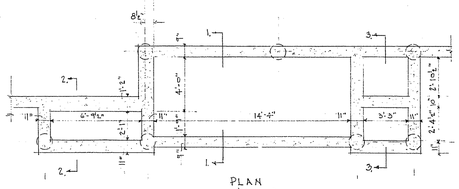
FOUNDATION & PILING PLAN

DRAWN BY: L. D.	PIONEER PARK SCHOOL	DATE: JAN. 5, 53
CHECKED BY: L.D. E.C.A.	ABERDEEN WASHINGTON	FILE NO. 244
APPROVED: E.C.A.		DWG. NO. S1
SCALE: AS NOTED	JOHN PAUL JONES - LEONARD W. BINDON ARCHITECTS 715 HOGE BUILDING SEATTLE 4, WASHINGTON	

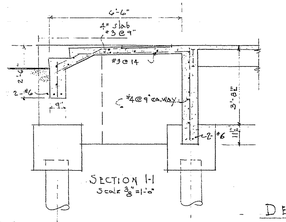


SECTION A
1/4" = 1'-0"

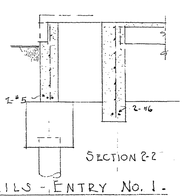
SECTION B
1/4" = 1'-0"



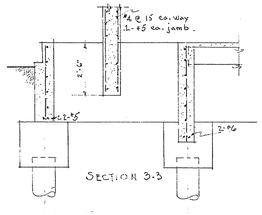
PLAN
1/4" = 1'-0"



SECTION 1-1
Scale 3/8"=1'-0"

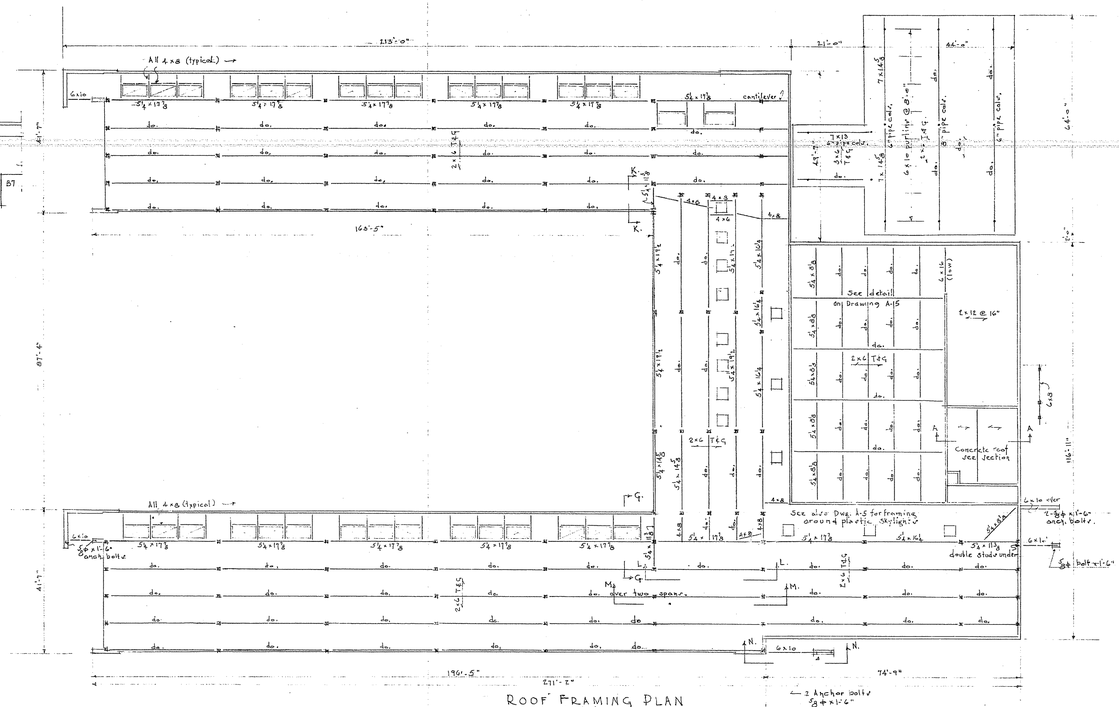


SECTION 2-2

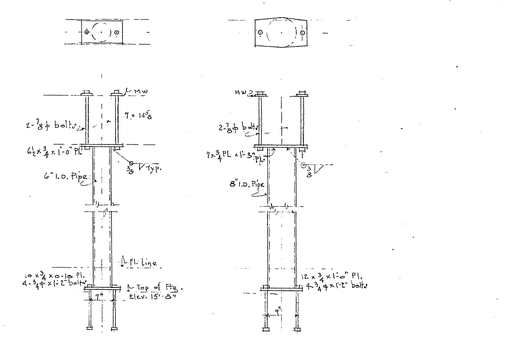


SECTION 3-3

DETAILS - ENTRY NO. 1.



ROOF FRAMING PLAN
Scale 1/16" = 1'-0"



COLUMNS IN PLAY SHED -
3/4" = 1'-0"

GENERAL NOTES

PILING DESIGN LOAD: 40 tons dead load per pile, computed on a basis of 200#/sq. in. of pile surface area below pile cap and a minimum length of 40 feet below cut-off.

FILL: Earth fill where required to be of approved material thoroly compacted.

DESIGN SOIL PRESSURE: For Play Shed footings, 900#/sq. for dead load only.

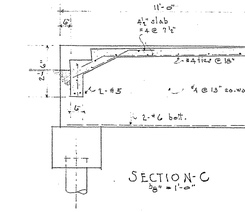
DESIGN LIVE LOAD: Roof 15#/sq.; Class Rooms 40#/sq.; Multi-purpose Room, stairs and Corridors 100#/sq.

STRUCTURAL CONCRETE: f'c = 3000#/sq., fs = 18000#/sq. Reinforcement to be intermediate grade deformed. Deformations are to conform to A.S.T.M. designation A305-50T except that ¼ø may be plain. All concrete to be made and placed under expert supervision. Test cylinders shall be made and tested as directed in the specifications, which also cover cement, aggregates, etc.

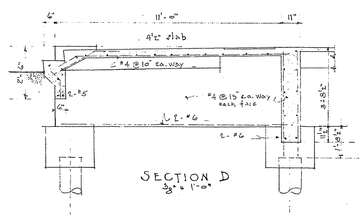
COVER FOR REINFORCEMENT: Walls, columns & bottoms of beams exposed to earth 2"; beams elsewhere 1½"; slabs ¾"; footings 3", unless otherwise shown. All steel shall be accurately positioned by spacers, chairs or other approved supports and shall be securely held in place and tied at intersections.

WALL REINFORCEMENT: Except as otherwise shown, reinforce concrete walls as follows —
6" walls - #4 each way @ 15" in center } Lap or splice all
8"&9" walls #4 - - @ 9" - - } bars 30 diameters.
11" walls & thicker #4 - - @ 15" - each face } Lap around corners or provide corner bars
Provide 2-#5 bars around all openings not otherwise detailed, extending 2'-0 beyond opening.

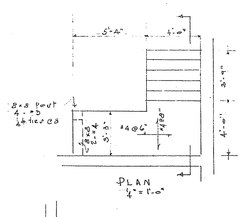
WOOD FRAMING: To comply with National Design Specification for Stress Grade Lumber and its Fastenings (Rev. 1951) and to grade as follows:-
Joists, rafters & roof decking 1450 f DF, Par. 204, W.C.L.I. A-1 Grading Rules, #14.
One piece posts larger than 2x4, Select structural D.F., Par. 216.
Glued Laminated all D.F. Par. 204 except beams over Playshed to be Par. 202 in upper and lower fifths. All beams are Glulam except the 4x6, 4x8, 6x8, 6x10 and 6x16.
All posts to be solid members, grade shown above. For location of diagonal sheathed partitions see Architectural plan A-2.



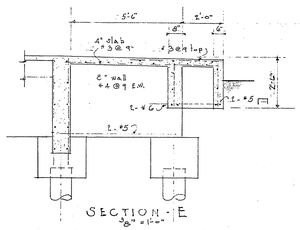
SECTION C
3/8" = 1'-0"



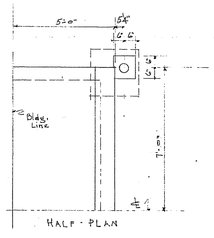
SECTION D
3/8" = 1'-0"



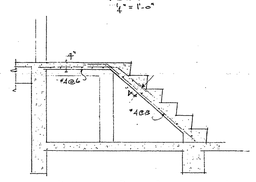
PLAN
1/4" = 1'-0"



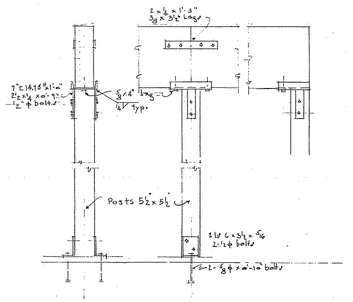
SECTION E
3/8" = 1'-0"



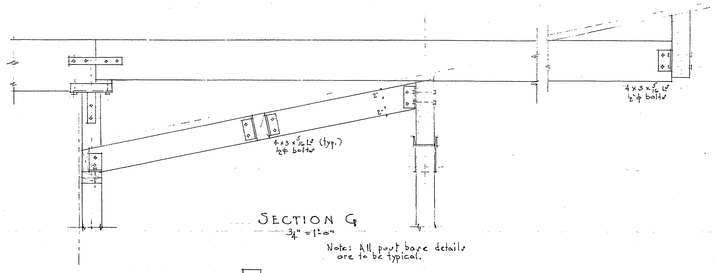
HALF PLAN



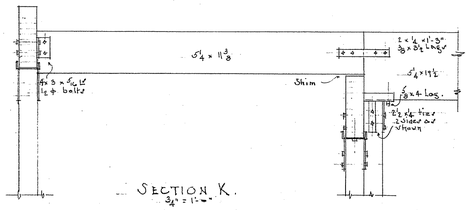
BOILER RM. STAIR
3/8" = 1'-0"



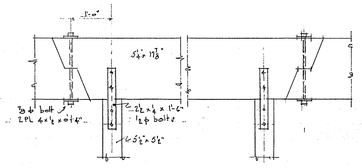
TYPICAL POST & BEAM DETAIL
Scale 3/4" = 1'-0"



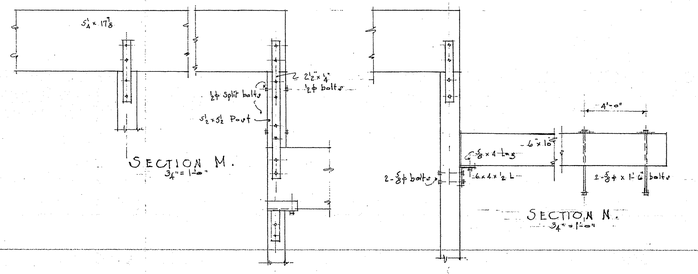
SECTION G
3/4" = 1'-0"



SECTION K.
3/4" = 1'-0"



SECTION L.
3/4" = 1'-0"



SECTION M.
3/4" = 1'-0"

SECTION N.
3/4" = 1'-0"

SECTION F
3/8" = 1'-0"

FOR LOCATION OF SECTIONS SEE DRGS S1 AND S2

ROOF FRAMING PLAN & DETAILS

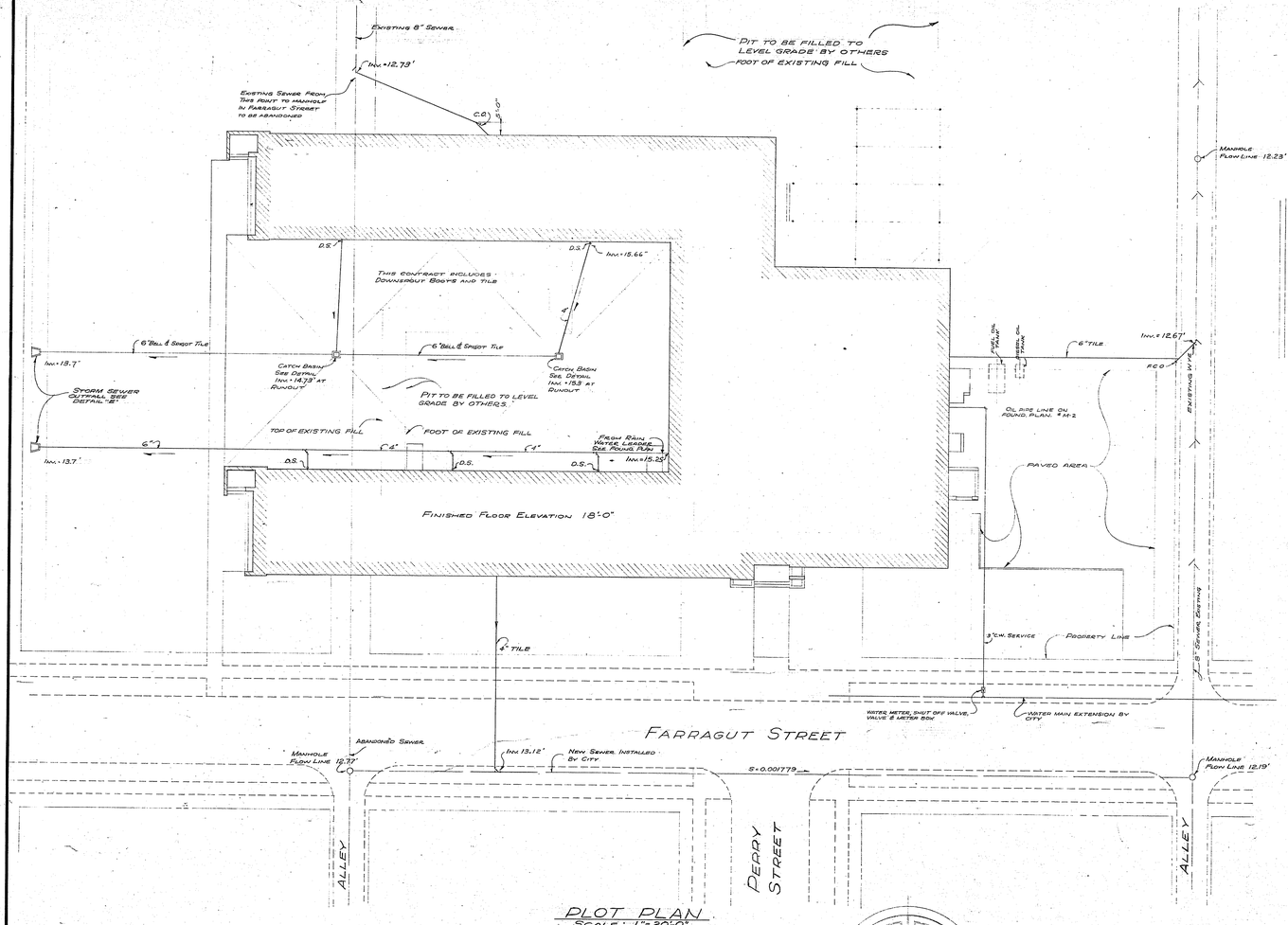
DRAWN BY L.D	PIONEER PARK SCHOOL ABERDEEN · WASHINGTON	DATE JAN. 5, '53
CHECKED BY LD ECA		FILE NO. 2-46
APPROVED ECA		DWG. NO. S3
SCALE AS NOTED	JOHN PAUL JONES - LEONARD W. BINDON ARCHITECTS 715 HOGE BUILDING SEATTLE 4, WASHINGTON	

M. O. SYLLIAASEN REGISTERED PROFESSIONAL ENGINEER STATE OF WASHINGTON

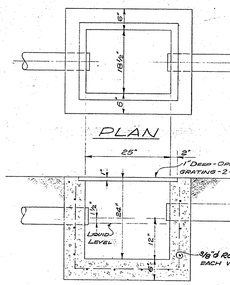
JOHN PAUL JONES 10 STATE OF WASHINGTON LICENSED ARCHITECT

LEONARD WILLIAM BINDON 1953 STATE OF WASHINGTON LICENSED ARCHITECT

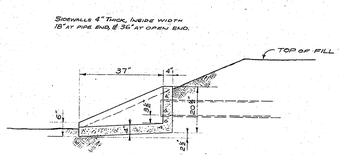
2/19/53



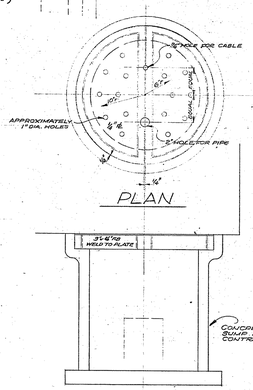
PLOT PLAN
SCALE: 1"=20'-0"



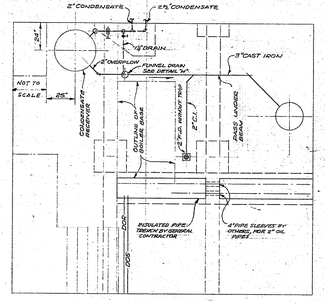
SECTION "D-D"
CATCH BASIN DETAIL
SCALE: ⅜"=1'-0"



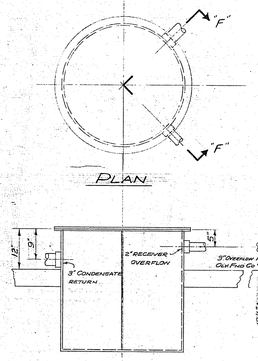
DETAIL "E"
STORM DRAIN DISCHARGE
SCALE: ½"=1'-0"



SECTION "G-G"
SUMP PUMP PIT
SCALE: 1"=1'-0"

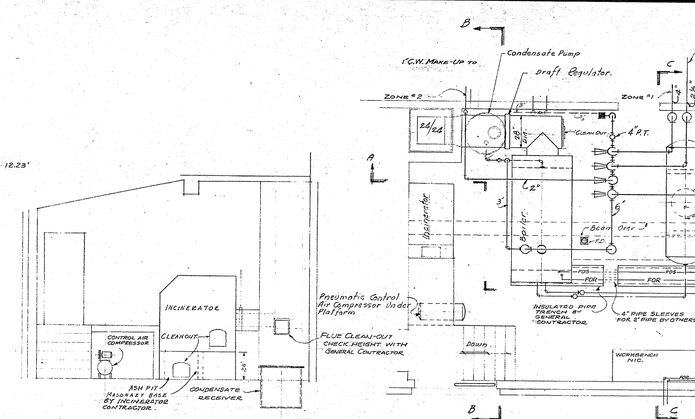


PIPING PLAN BELOW BOILER ROOM FLOOR
SCALE: ½"=1'-0"



SECTION "F-F"
CONDENSATE RECEIVER
SCALE: 3/4"=1'-0"

DETAIL "H"
FUNNEL DRAIN CONNECTION
SCALE: ⅜"=1'-0"



BOILER ROOM PIPING DETAILS
Scale ¼"=1'-0"

FIXTURE CONNECTION SCHEDULE

FIXTURE	SYMBOL	W.	V.	H.W.	C.W.
WATER CLOSET	T	4"	2"	-	½"
LAVATORY	L	½"	1¼"	½"	½"
URINAL	U	½"	1¼"	-	½"
DRINK. FOUNT.	D.F.	½"	1¼"	-	½"
SERVICE SINK	S.S.	2"	2"	¾"	¾"
KITCHEN SINK	K.S.	½"	½"	½"	½"
VEG. PEELER	V.P.	2"	2"	-	½"
CLASSROOM SINK	S	1½"	1½"	½"	½"

LEGEND - SYMBOLS - ABBREVIATIONS

T		WATER CLOSET - TANK TYPE
T		WATER CLOSET - FLUSH VALVE
U		URINAL
L		LAVATORY OR WASH BASIN
SS		SERVICE SINK
SH.		SHOWER
D.F.		DRINKING FOUNTAIN - INTERIOR
D.F.		DRINKING FOUNTAIN - EXTERIOR
K.S.		KITCHEN SINK - 2 COMPARTMENT
D.W.S		DISHWASHING SINK - 3 COMPARTMENT
		THERMOSTAT
		STEAM
		CONDENSATE RETURN - GRAVITY
		CONDENSATE RETURN - PUMPED
	C.W.	COLD WATER
	H.W.	HOT WATER
	H.W.C.	HOT WATER CIRCULATING
	S.&W.	SOIL OR WASTE
	V.	VENT, PLUMBING
	G.V.	GATE VALVE
	G.V.	GLOBE VALVE OR RADIATOR VALVE
		MOTORIZED VALVE
		STEAM TRAP
		CHECK VALVE
	V.T.R.	VENT THRU ROOF
		DIRECTION OF FLOW
		PITCH DOWN IN DIRECTION OF ARROW
	C.O.	CLEAN OUT
	H.B.	HOSE BIBB
	S.&W.	STOP & WASTE
	S.T. W.H.	SLOPING TOP WALL HUNG
	F.O.	FRONT OUTLET
	F.C.O.	FLUSH CLEAN OUT
	INV.	INVERT HEIGHT OF SEWER PIPE
	S	MULTI-SPEED SWITCH - ELECTRIC
	R.W.L.	RAIN WATER LEADER
	[S]	CLASSROOM SINK
	D.G.S.	DIESEL OIL SUPPLY
	D.O.R.	DIESEL OIL RETURN
	F.O.S.	FUEL OIL SUPPLY
	F.O.R.	FUEL OIL RETURN

PLY No	DATE	REVISION	BY
1	30 APR '53	ELIMINATION OF INDUCED DRAFT FAN & STACK DIMENSIONS & INCINERATOR, BASE CHANGED	ECF

C. W. MAY — STATE OF WASHINGTON — REGISTERED PROFESSIONAL ENGINEER

JOHN PAUL JONES — LICENSED ARCHITECT — STATE OF WASHINGTON — 19

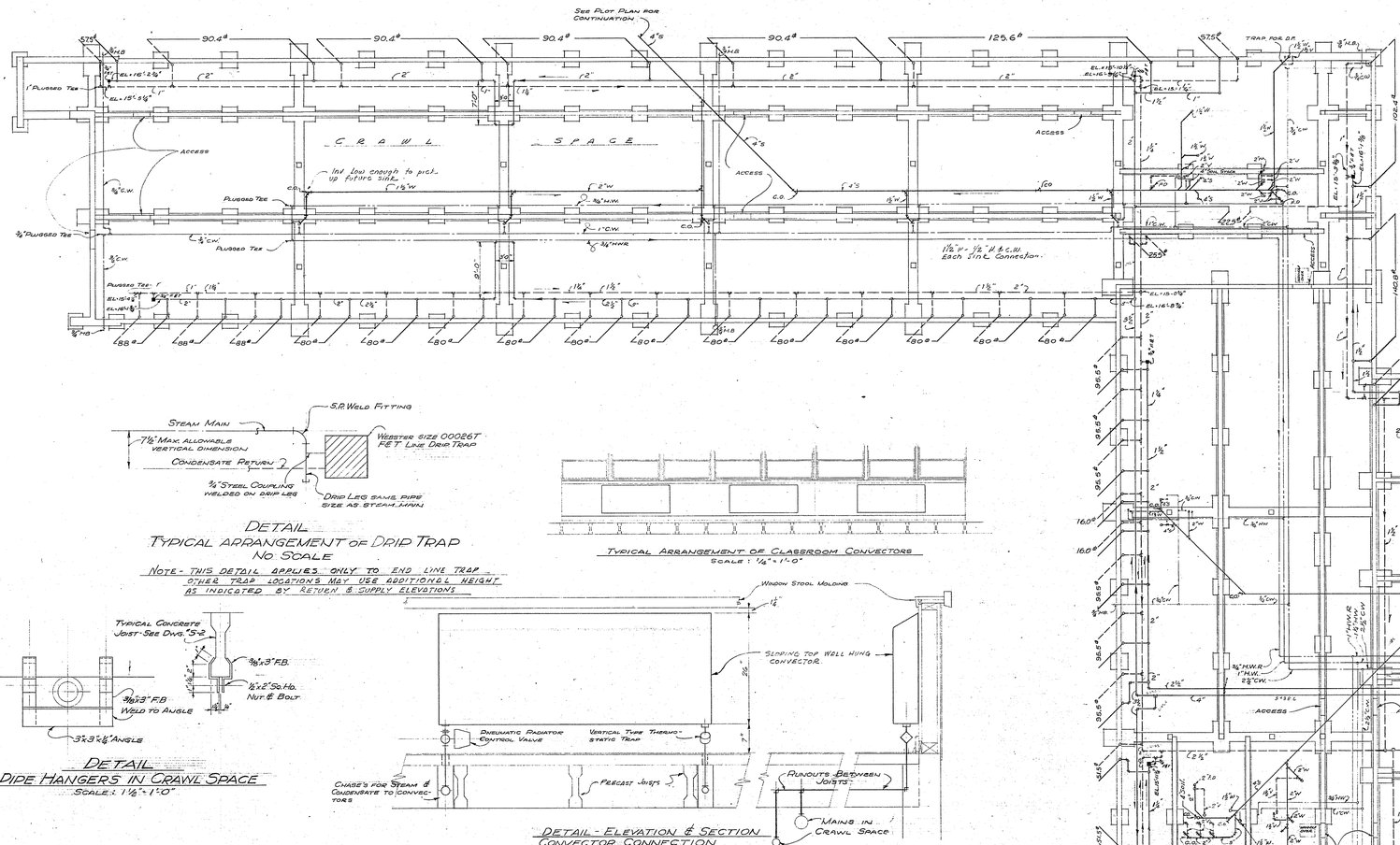
LICENSED WITH PRIVILEGE TO PRACTICE ARCHITECTURE — STATE OF WASHINGTON

SITE PLAN & DETAILS

DRAWN BY	RES. ENT.
TRACED BY	E.C.F.
CHECKED BY	C.W.M.
SCALE	AS NOTED
DATE	JAN. 5-53
FILE NO.	244
DWG. NO.	M1

PIONEER PARK SCHOOL
ABERDEEN - WASHINGTON

JOHN PAUL JONES - LEONARD W. SIMDON
ARCHITECTS
715 LOCK BUILDING SEATTLE 4, WASHINGTON



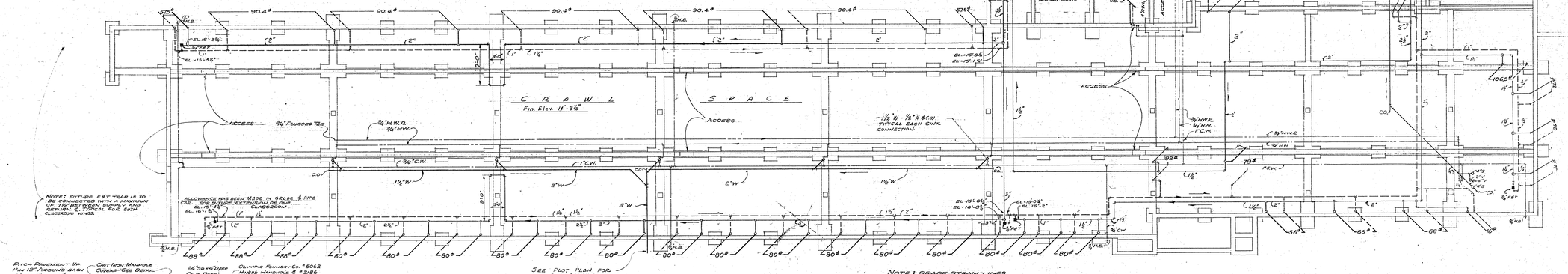
Detail
Typical Arrangement of Drip Trap
No Scale

Note - this detail applies only to end line trap. Other trap locations may use additional height as indicated by return & supply elevations

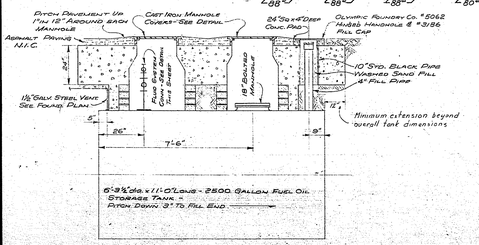
Typical Arrangement of Classroom Convectors
Scale: 1/4" = 1'-0"

Detail
Dipe Hangers in Crawl Space
Scale: 1½" = 1'-0"

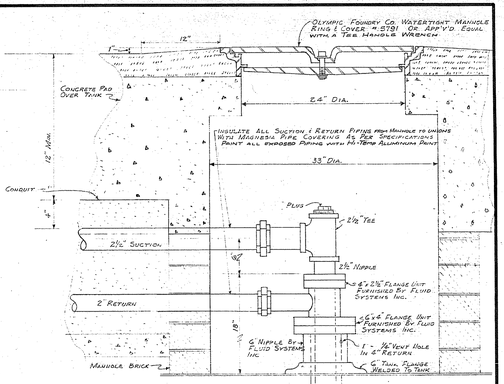
Detail - Elevation & Section
Convector Connection
Scale: 1" = 1'-0"



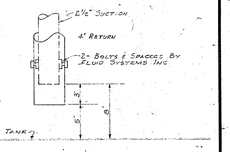
F O U N D A T I O N P L A N
Scale 1/8" = 1'-0"



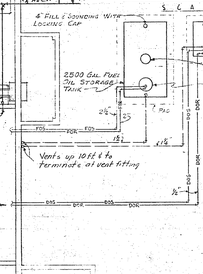
O I L T A N K D E T A I L



Note - Manhole Detail applies except as to dimensions to 30" ø manhole for 18" ø bolted manhole



Fuel Oil Suction & Return Connection Detail
Scale 1½" = 1'-0"



Note:
Elevations shown on steam & condensate lines are ℄ elevations. Contractor to notify architect before installation of any possible difficulties in meeting these elevations. Grade steam lines 1" in 20' except classroom wings. Grade all condensate lines 1" in 40'.

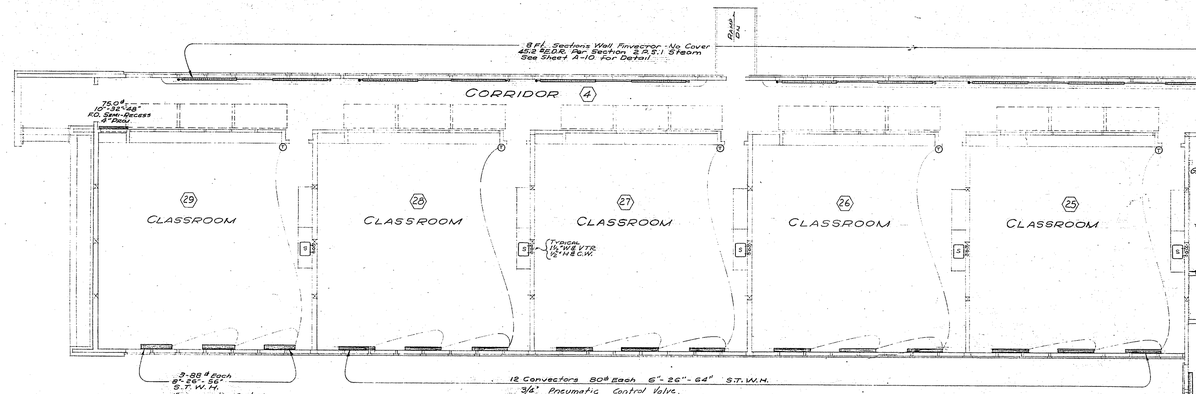
FOUNDATION PLAN

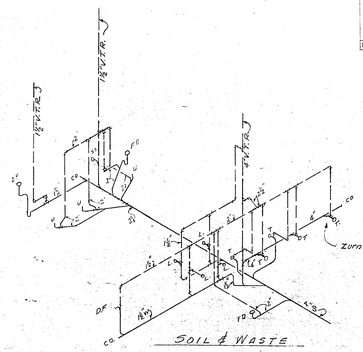
DRAWN BY	ECF & RRS
DIRECTED BY	EWT
APPROVED	C.W.M
SCALE	AS SHOWN
DATE	JAN. 5-53
FILE NO.	244
DWG. NO.	M2

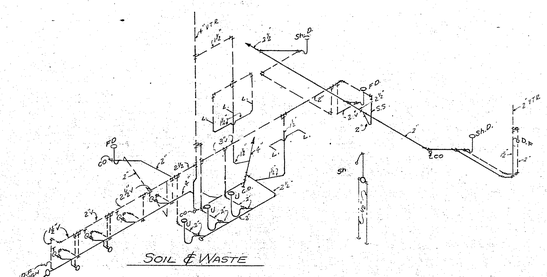
PIONEER PARK SCHOOL
ABERDEEN - WASHINGTON

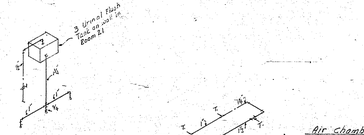
JOHN PAUL JONES - LEONARD W. BINDON
ARCHITECTS
715 HOGE BUILDING SEATTLE 4, WASHINGTON

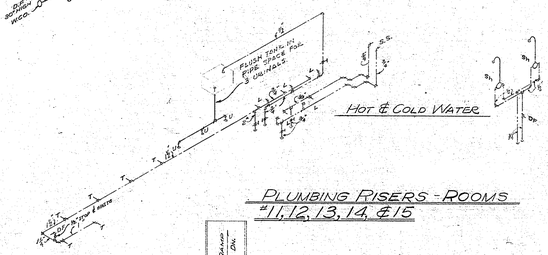
C. W. MAY — State of Washington — Registered Professional Engineer
John Paul Jones — Licensed Architect — State of Washington
Leonard William Bindon — Licensed Architect — State of Washington

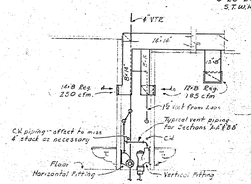


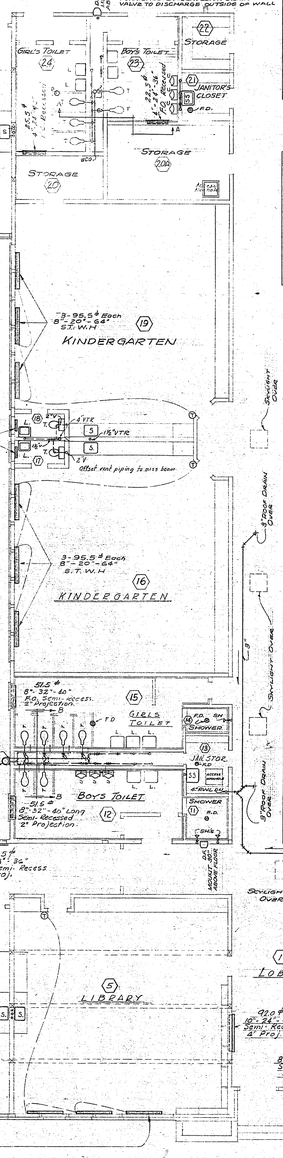


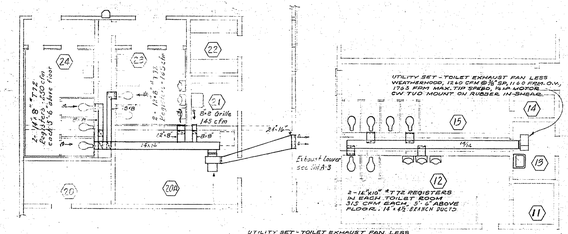












FLOOR PLAN

Scale 1/8" = 1'-0"

FLOOR PLAN

DRAWN BY: F.L.S. E.G.P.	PIONEER PARK SCHOOL ABERDEEN - WASHINGTON	DATE: JAN. 5-53
CHECKED BY: [illegible]		FILE: 244
APPROVED:		DWG. NO. M3
SCALE: 1/8"=1'-0"	JOHN PAUL JONES - LEONARD W. SIMDON ARCHITECTS 715 HOGE BUILDING - SEATTLE 4, WASHINGTON	

SHILEY

EXIST. CONC. WALK

EXIST

NEW

SEE SHT. A-2 FOR SITE WORK THIS AREA

NEW CONC. WALK

NEW BLDG. WALL LINE

NEW ADDITION
STEVENS SCHOOL

DRAFT DOOR

RIDGE

DRAFT DOOR

DRAFT STOP

R.D. (TYP.)

VALLEY

INSUL. CRICKET

REMOVE THIS PORTION EXISTING ROOF

REMOVE EXIST. CONC. WALL & MET. RAMP

EXISTING BUILDING

NEW CONC. RAMP - SEE SHT. A-2 FOR SITE WORK THIS AREA

EXIST. CONC. WALK

FARRAGUT STREET

NORTH

SCALE 0 16'

Stevens

INDEX OF DRAWINGS

A 1	SITE AND ROOF PLAN
A 2	FLOOR PLAN
A 3	SCHEDULES, DETAILS
A 4	ELEVATIONS
A 5	FOUNDATION PLAN
A 6	BUILDING SECTION
A 7	BUILDING SECTION, DETAILS
A 8	INTERIOR ELEVATIONS
A 9	INTERIOR ELEVATIONS
A 10	DETAILS
A 11	DETAILS
A 12	CABINET DETAILS
M 1	MECHANICAL
E 1	ELECTRICAL

LEGEND

- STUD PARTITION
- ACOUSTICAL PARTITION
- CONCRETE WALL
- GYPSUM BOARD
- ACOUSTIC TILE
- FINISH WOOD
- CONT. FRAMING MEMBER
- NON-CONT. FRAMING MEMBER
- RIGID INSULATION
- BATT INSULATION
- PLYWOOD
- GRAVEL FILL
- 101 — ROOM NO.
- 2 — GRID LINE
- 4/10 DETAIL NO. ON DRWG. NO. — DETAIL
- A/6 SECTION NO. ON DRWG. NO. — BLDG. SECTION
- 3 — H.M. FRAME NO.
- E — WINDOW NO.
- 3 — DOOR NO.
- B — CABINET NO.

OFFICE

SHOWS LOCATION OF H.V. UNITS IN CLASSRMS

Set #7

S-1 STATE
DATE PRINTSTO

DATE NO. REVISION

CONSULTANTS:
HANSEN & CHAUCER ENGINEERS INC. — STRUCTURAL ENGINEERS
WIELAND ENDGREN & ASSOC. — MECH. & ELEC. ENGINEERS

ASSOCIATED ARCHITECTS AIA

STREET & LUNDGREN
ABERDEEN WASHINGTON 98520 532-4341

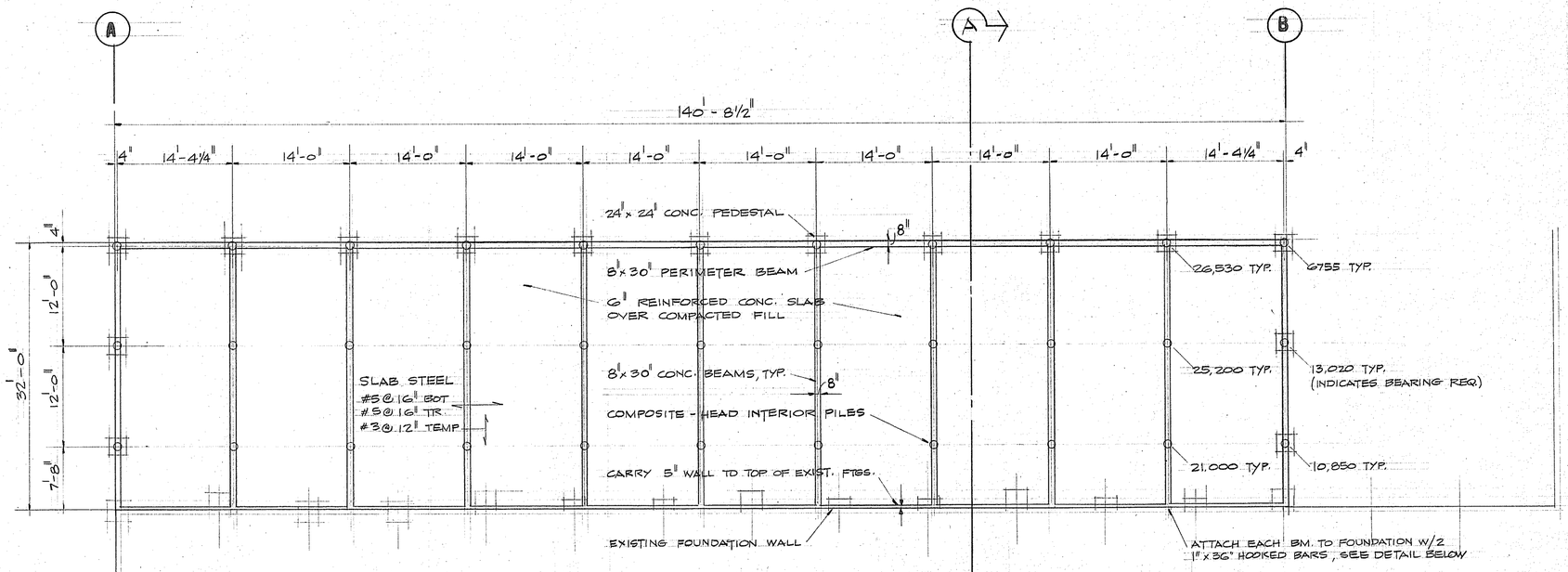
WALDRON & POMEROY
SEATTLE WASHINGTON 98109 MA3-4516

REGISTERED ARCHITECT
STATE OF WASHINGTON

FILE NO. 74-2
DATE MAY 21 1974
DRAWN GS
PROJ. ARCH. LE

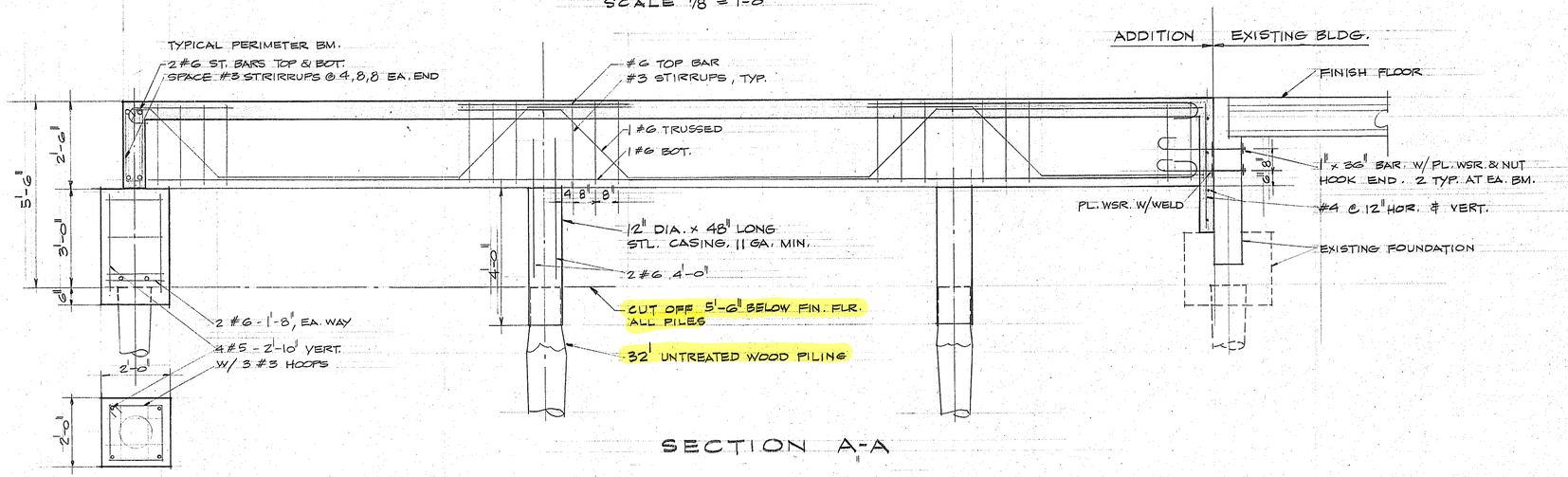
SITE PLAN ROOF PLAN
SPECIAL SERVICES ADDITION
STEVENS SCHOOL
ABERDEEN SCHOOL DISTRICT No. 5

SHEET NO. A 1
OF A 12



FOUNDATION PLAN

SCALE 1/8" = 1'-0"



SECTION A-A

PLAN OF PEDESTAL

½" = 1'-0"

GENERAL NOTES

GENERAL

A. Any discrepancies found among the Drawings, Specifications, and Notes shall be reported to the owner's representative for clarification.

B. Unless specifically noted otherwise, the Contractor shall furnish all material, labor, plant, equipment, and services to accomplish all work defined on these drawings and specifications.

C. Contractor shall verify and coordinate dimensions among all drawings prior to proceeding with any work or fabrication.

D. Contractor responsible for all erection bracing, and shoring during construction.

STANDARDS

All methods, materials and workmanship shall conform to the 1973 Uniform Building Code.

DESIGN CRITERIA

A. Vertical Loads (PSF)

	Roof	Floor
Live Load	25	50
Dead Load	Actual	Actual

B. Lateral Loads:

1. Forces transmitted by plywood roof diaphragms to gypsum board shear walls where displacement is resisted by passive pressure and sliding friction of earth.

2. Wind: 20 PSF on vertical surface.

3. Seismic: V=ZKCW, Z=1.0, K=1.0, C=0.10, W=Dead Load of portion of building under consideration. V=Base Shear.

C. Uplift:
Enclosed Roof Areas: 75% of wind load less 2/3 design dead load.
Open Roof Areas: 125% of wind load less 2/3 design dead load.

D. Piling: 20 Ton Composite Piles.

BACKFILL

Backfilling at building foundations or as required under building slab on grade to be done with material approved by Architect. Compact to 90% minimum of maximum dry density as determined by AASHO Standard Method T-180, Modified.

CONCRETE

A. Working Stress Design per Building Code and ACI 318-63.

B. Reinforcement

1. Reinforcing Bars: New billet stock ASTM A 615, Grade 40. Detail, fabricate and place per ACI 315-67 and ACI 318-63. Splice bars 24 bar diameter or 1'-6" minimum. Provide the following minimum cover over reinforcement:

On ground . . . . . 3"
Poured against forms, exposed to weather . . . . . 1½"
exposed to earth . . . . . 2"
Poured against forms, not exposed to weather
Walls and slabs . . . . . 3/4"
Beams . . . . . 1½"

2. Welded Wire Fabric: ASTM A 82 and ASTM A 185, splice with at least one full mesh. Place at mid-depth of slabs or as shown. Block up with brick or concrete blocks to secure while placing concrete.

C. Materials

Item	Min. f'c 28 Days	Slump Inches Max.	Slump Inches Min.
Structural Beams and Slabs	3000	4	2
Pile Caps	2000	5	3

Coarse and Fine Aggregate: ASTM C 33. Maximum size 1".
Water: Clean and potable.
Portland Cement: ASTM C 150 Type 1.
All cement of same manufacturer and same color throughout project.

D. Admixtures

1. Air entraining agent (AEA) Darex or approved to attain 4% to 6% entrained air, by volume, per ASTM C 175. Use AEA for concrete exposed to the weather and to freeze-thaw cycles such as exterior slabs and exposed walls.

2. Water reducing agent Master Builders "Pozzolith" per manufacturer's recommendation.

E. Mixing Concrete: Ready-mix per ASTM C 94 and ACI 304.

F. Cold Weather Concreting: Per "Recommended Practice for Winter Concreting" ACI 604 (306).

G. Hot Weather Concreting: Per "Recommended Practice for Hot Weather Concreting" ACI 605 (305).

H. Transporting, conveying, placing, and joints per ACI 604. Use interior mechanical vibrators with 7000 rpm minimum frequency. Do not over vibrate.

I. Concrete Curing: Maintain curing for seven days in which mean daily temperature is above 40°F.

1. Slabs - Concrete Curing Paper per ASTM C171 Type I, Burkekraft Reinforced Paper Type I or approved or spray with liquid membrane forming compound conforming to ASTM C 309, Type I. Do not use liquid membrane on surfaces to received additional concrete or cementitious finishing materials, hardeners or sheet vinyl floor covering.

2. Formed Surfaces - Use continuous sprinkling or absorptive mats or fabric kept continuously wet.

Framing Lumber

#2 Douglas Fir, Fb=1250 PSI. Each piece shall be grade stamped showing WWPA trademark.

Plywood shall be Group I species, C-D grade, with exterior glue conforming to PS 1-66. Each piece shall bear the grade trademark of the American Plywood Association. Layout as shown on structural drawings.

Truss Joists

As manufactured by Trus-Joist or approved equal. Shop drawings shall bear the seal of a structural engineer licensed in the State of Washington.

Piling

Piling shall be untreated, Class "B" piles fir or cedar 20 ton capacity per Engineering News Record Formula.

SCALE 0 2'

5-1 STATE
DATE | PRINTSTO

DATE | NO. | REVISION

CONSULTANTS:
HANSEN & CHALKER ENGINEERS INC.
WIELAND ENDGREN & ASSOC.

STRUCTURAL ENGINEERS
MECH. & ELECT. ENGINEERS

ASSOCIATED ARCHITECTS A.I.A.

STREET & LUNDGREN
ABERDEEN. WASHINGTON 98520 · 532-4341

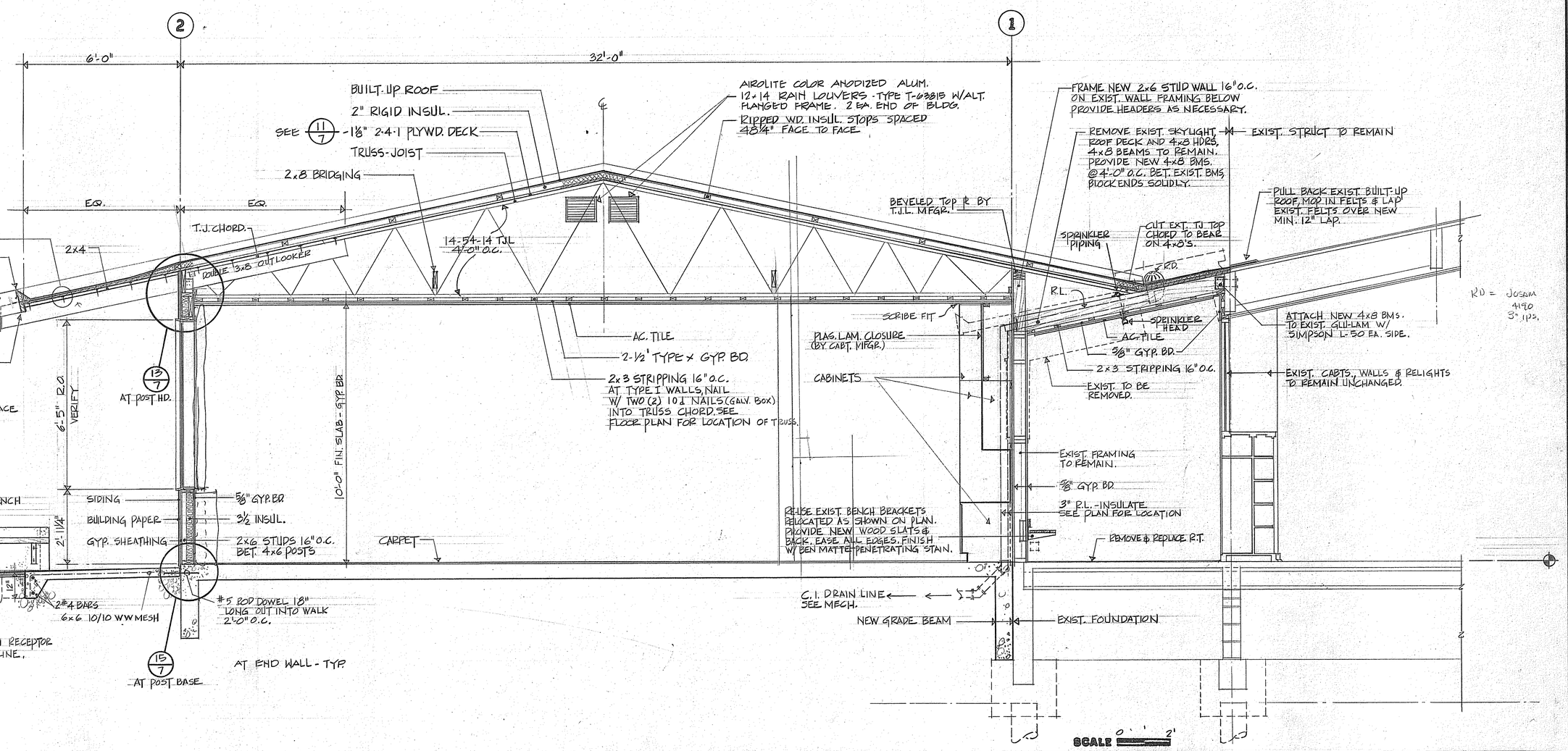
WALDRON & POMEROY
SEATTLE. WASHINGTON 98109 · MA3-4516

REGISTERED ARCHITECT
B. Waldron
STATE OF WASHINGTON

FILE NO. 74-2
DATE MAY 21 1974
DRAWN
PROJ. ARCH. LE

FOUNDATION PLAN
SPECIAL SERVICES ADDITION
STEVENS SCHOOL
ABERDEEN SCHOOL DISTRICT No. 5

SHEET NO. A5
OF 12



DATE	NO.	REVISION
5-1		STATE
4-29		W-L
4-19		S-L

CONSULTANTS:
HANSEN & CHALKER ENGINEERS INC. — STRUCTURAL ENGINEERS
WIELAND, LINDGREN & ASSOC. — MECH. & ELECT. ENGINEERS

ASSOCIATED ARCHITECTS A.I.A.

STREET & LUNDGREN
ABERDEEN. WASHINGTON 98520 · 532-4341

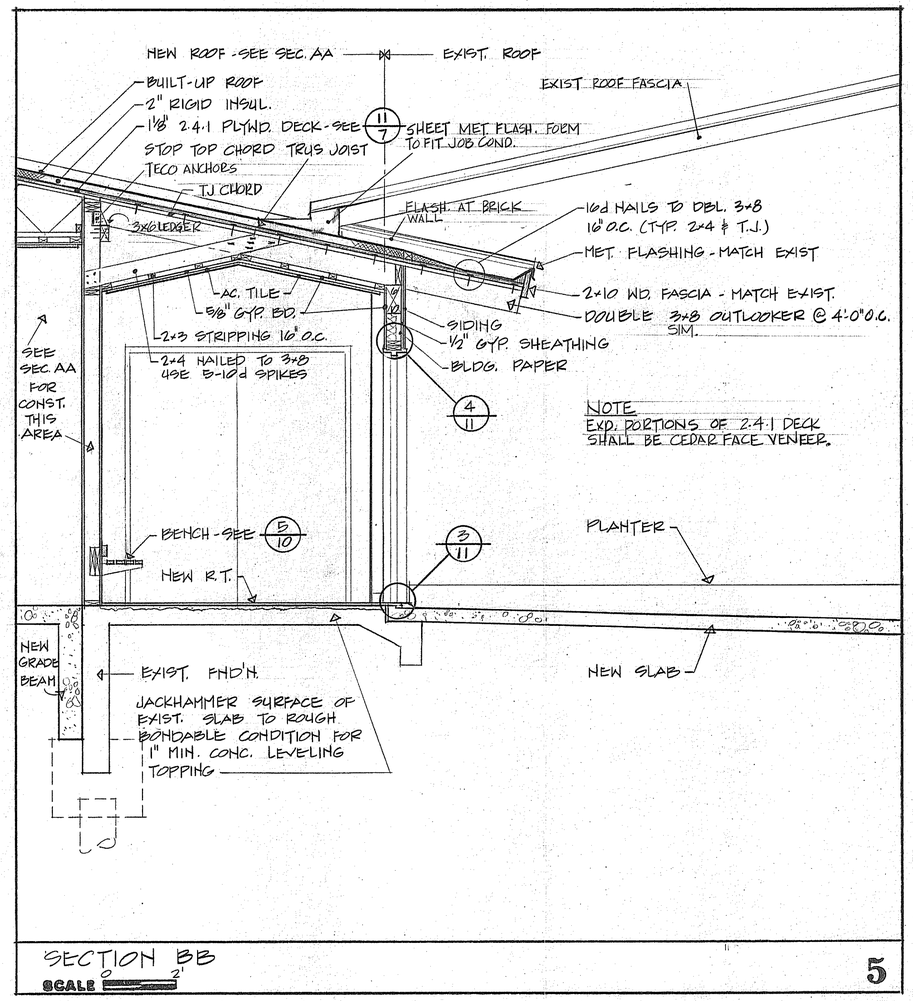
WALDRON & POMEROY
SEATTLE. WASHINGTON 98109 · MA3-4516

REGISTERED ARCHITECT
STATE OF WASHINGTON

FILE NO. 74-2
DATE MAY 21 1974
DRAWN LE
PROJ. ARCH. LE

SECTION AA
SPECIAL SERVICES ADDITION
STEVENS SCHOOL
ABERDEEN SCHOOL DISTRICT No. 5

SHEET NO. A6
OF 12



SECTION BB
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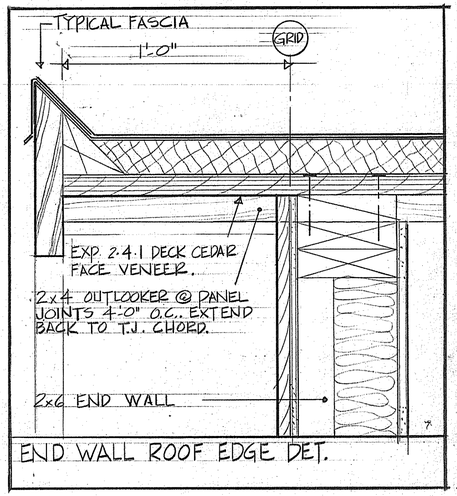
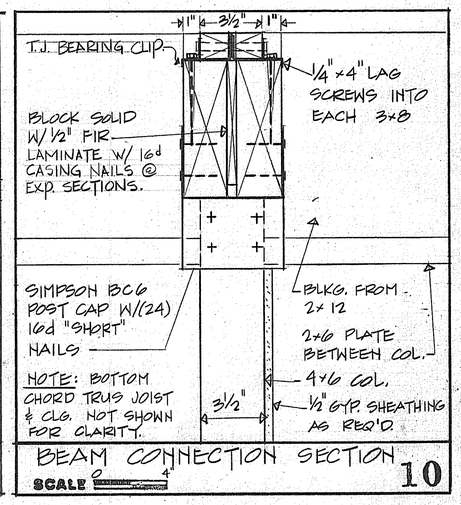


END WALL ROOF EDGE DET.



BEAM CONNECTION SECTION
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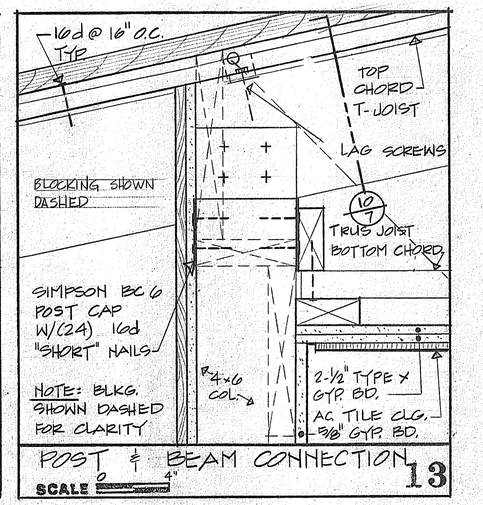

POST & BEAM CONNECTION
SCALE 0 4"
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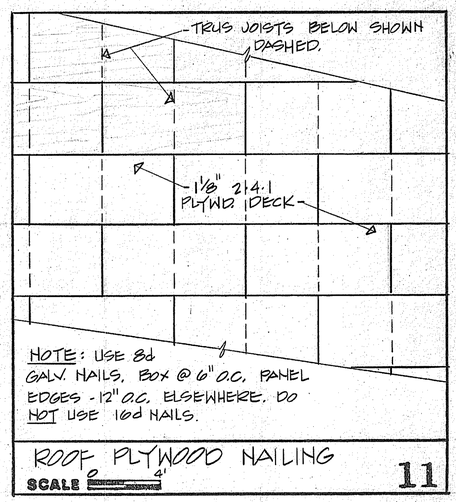

ROOF PLYWOOD NAILING
SCALE 0 4'
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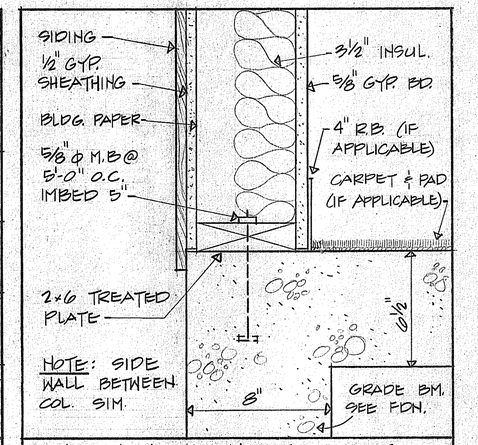

END WALL FOUNDATION DET.
SCALE 0 4"
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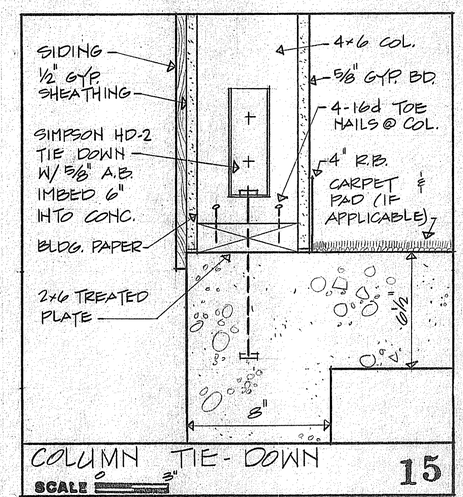

COLUMN TIE-DOWN
SCALE 0 3"
15

5-1 STATE
DATE PRINTSTO

DATE | NO. | REVISION

CONSULTANTS:
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WIELAND, LINDGREN & ASSOC. — MECH. & ELECT. ENGINEERS

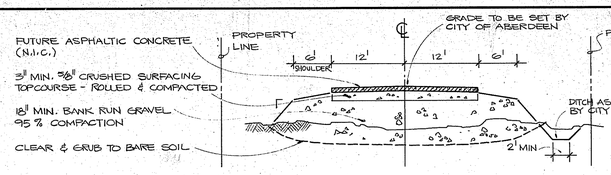
ASSOCIATED ARCHITECTS A.I.A.
STREET & LUNDGREN
ABERDEEN. WASHINGTON 98520 · 532-4341
WALDRON & POMEROY
SEATTLE. WASHINGTON 98109 · MA3-4516

REGISTERED ARCHITECT
STATE OF WASHINGTON

FILE NO. 74-2
DATE MAY 21 1974
DRAWN GS
PROJ. ARCH. LE

SECTION BB DETAILS
SPECIAL SERVICES ADDITION
STEVENS SCHOOL
ABERDEEN SCHOOL DISTRICT No. 5

SHEET NO. A7
OF 12



Roadway Detail - Alternate No. 3

ALTERNATE NO. 3 : SEE SPEC'S. EXTEND ROADWAY TO CUSHING ST. AS DETAILED.

APPROX. 150' TO EDGE OF EXISTING PAVEMENT.

Dewey Street

PROPERTY LINE

Pioneer Park

EDGE OF ASPHALT

EXISTING ASPHALT PAVING

CITY TO RELOCATE (2) EXISTING HORSESHOE PITS.

REMOVE EXISTING CHAIN LINK FENCE & DELIVER TO OWNER.

PROVIDE NEW ASPHALT AROUND EDGES OF NEW ADDITIONS & OVER STORM DRAIN & UTILITY DITCHES WHERE EXISTING ASPHALT HAS BEEN REMOVED OR DAMAGED. TYPICAL.

(2) TETHER BALL POSTS. RELOCATE AT DIRECTION OF OWNER

Gymnasium
FL. ELEVATION 19.00

Covered Play

EXISTING RAMP TO REMAIN

REMOVE EXISTING RAMP

Existing School

REMOVE EXISTING CONC. SLAB

REMOVE EXISTING PLANTER.

Classroom Addition
FL. ELEVATION 19.00

Courtyard

REMOVE EXISTING CHAIN LINK FENCE & DELIVER TO OWNER.

NEW WALL & GATE. SEE PLAN.

REMOVE EXISTING CONCRETE WALK

NEW CONCRETE WALK

EXISTING CONCRETE WALK. REMOVE EXISTING CONC. WALK AS REQ'D.

EXISTING ASPHALT PAVING

EDGE OF ASPHALT

PROPERTY LINE

Existing Covered Play

Parking

NEW 6" ASPHALT CURB

NEW ASPHALT

PROPERTY LINE

PAINTED STRIPES TO DESIGNATE EDGE OF BUS LOADING AREA & PARKING SPACES

EDGE OF EXISTING ASPHALT

NEW 6" ASPHALT CURB

Bus Loading

EXISTING MONKEY PARD. RE-LOCATE AT OWNERS' DIRECTION

140'-0"

85' R. MIN.

NEW ASPHALT 3" OF NEW ASPHALT WHERE SHOWN

EXISTING ASPHALT RESURFACE W/ 1½" NEW ASPHALT

74'-0"

REMOVE EXISTING CHAIN LINK FENCE & DELIVER TO OWNER.

END NEW ASPHALT RESURFACING AT THIS POINT

PAINTED STRIPE

35'-0"

20'-0" 24'-0" 20'-0" TYP.

REMOVE EXISTING ASPHALT PAVING THESE AREAS

Parking

RESURFACE EXISTING ASPHALT WALK W/ 1½" NEW ASPHALT TO THIS POINT

RESURFACE EXISTING ASPHALT

NEW 6" ASPHALT CURB, TYPICAL

REMOVE EXISTING ASPHALT CURB & REPLACE W/ NEW 6" ASPHALT CURB

EXISTING CONCRETE

Farragut Street

REMOVE EXISTING ASPHALT PAVING THESE AREAS

Perry Street

Schley Street

+ Existing Elevation

• Finished Elevation

SITE PLAN
Scale: 1" = 20'-0"

INDEX OF DRAWINGS

1	SITE PLAN
2	FOUNDATION PLAN & DETAILS
3	FOUNDATION PLAN & DETAILS
4	FLOOR PLAN
5	FLOOR PLAN
6	EXTERIOR ELEVATIONS
7	ROOF FRAMING PLAN
8	ROOF FRAMING PLAN
9	FRAMING DETAILS
10	SECTIONS
11	INTERIOR ELEVATIONS
12	INTERIOR ELEVATIONS
13	1/4" LIBRARY PLAN
14	SCHEDULES
15	ROOF PLAN
ME 1	MECH. & ELEC. SITE PLAN
M 2	MECH. FLOOR PLAN
M 3	MECH. FLOOR PLAN
M 4	MECH. SCHEDULES & DETAILS
E 2	POWER FLOOR PLAN
E 3	POWER FLOOR PLAN
E 4	LIGHTING FLOOR PLAN
E 5	LIGHTING FLOOR PLAN
E 6	PANEL SCHEDULES
E 7	POWER DIAGRAMS

LEGEND

- BRICK VENEER
- EXISTING WALL
- NEW WALL
- (A) WINDOW NO.
- (1) DOOR NO.
- (3) GENERAL NOTE REFERENCE
- (B1) CABINET NO.
- (100) ROOM NO.

FIRE ZONE: III
OCCUPANCY GROUP: C — DIVISION 1
TYPE OF CONSTRUCTION: TYPE V; ONE HOUR

STREET & LUNDGREN REGISTERED ARCHITECTS STATE OF WASHINGTON

DATE NO. REVISION

CONSULTANTS:
CHALKER ENGINEERS INC. STRUCTURAL
ELMER E. SCOTT & ASSOC. MECH. & ELEC.

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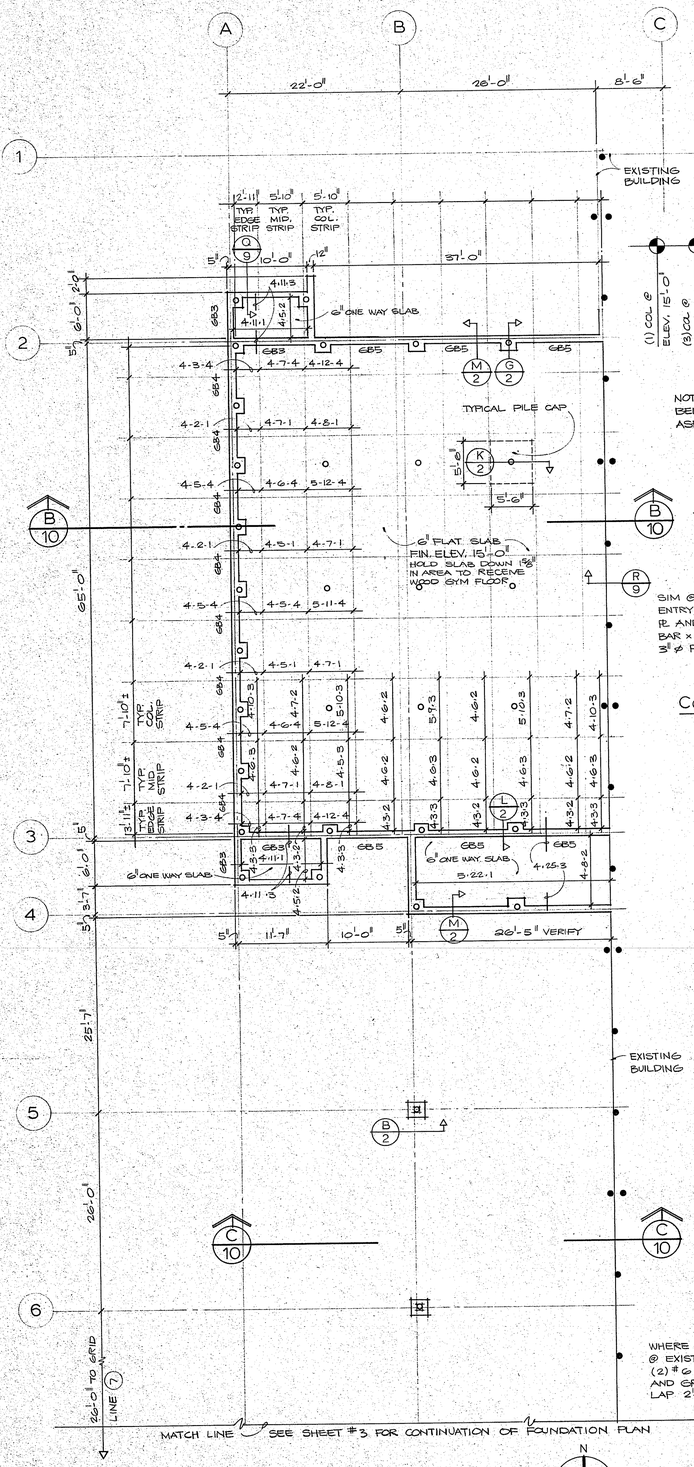
STEVENS ELEMENTARY SCHOOL ADDITION
ABERDEEN SCHOOL DISTRICT NO. 5

SITE PLAN

FILE NO.
DATE May 3, 1976
DRAWN WF
PROJ. ARCH.

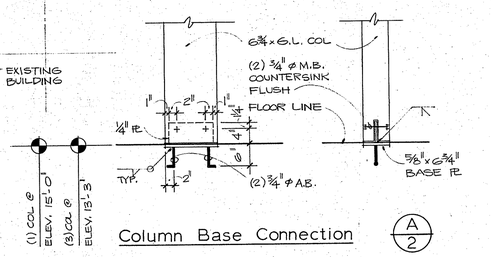
1
OF 15



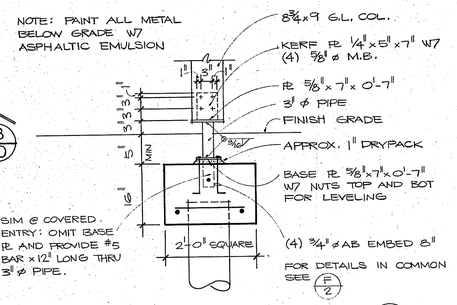
PARTIAL FOUNDATION PLAN

Scale 1/8"=1'-0"

● Indicates Existing Piling
o Indicates New Piling



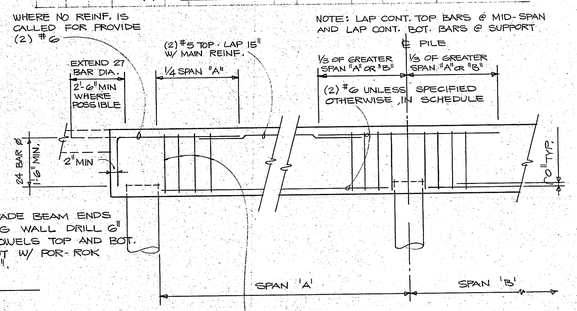
Column Base Connection (A/2)



Col. Base and Pilecap at Playshed (B/2)

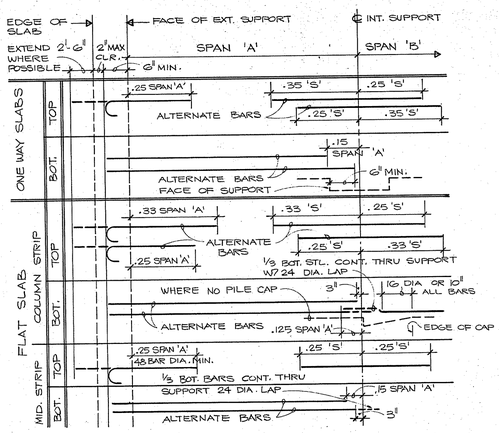
Grade Beam Schedule

BEAM MARK	SIZE b'	SIZE d'	FACE OF SO. OR EAST. SUPPORT	FACE OF NO. OR WEST. SUPPORT	STIRRUPS SIZE	STIRRUPS SPACING	REMARKS
GB1			(2)#8		#3	(6)@9" FROM SO. SUPP (10)@9" FROM NO. SUPP.	
GB2			(3)#8	(2)#7 (2)#7	II	(6)@4"(7)@9" FROM SO.SUPP. (7)@9" FROM NO. SUPP.	
GB3			(2)#7	(2)#7	II	(7)@9" EA. END	
GB4			(2)#7 (2)#6		II	(7)@9" EA. END	
GB5			(2)#7		II	(7)@9" EA. END	
GB6			2#9		II	@9" THROUGHOUT	
GB7			(2)#7	(2)#8	II	@9" THROUGHOUT	*SPECIAL STIRRUPS (6)@4" (3)@6" FROM EAST SUPPORT.

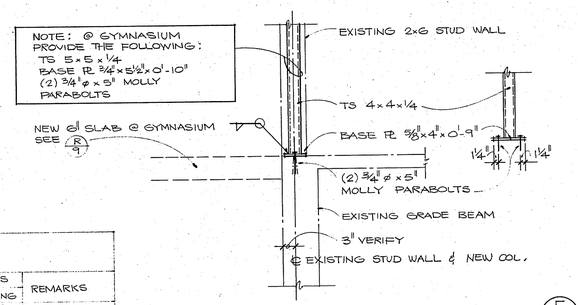


Grade Beam Details (C/2)

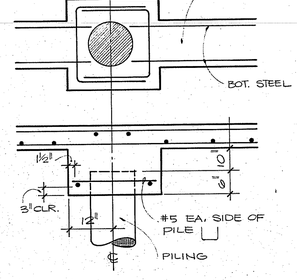
Slab Reinforcing Bar Length Schedule (D/2)



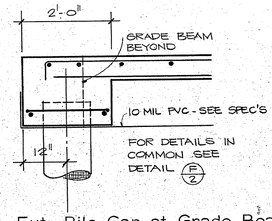
NOTE: 'S' IS GREATER OF SPANS 'A' OR 'B'.



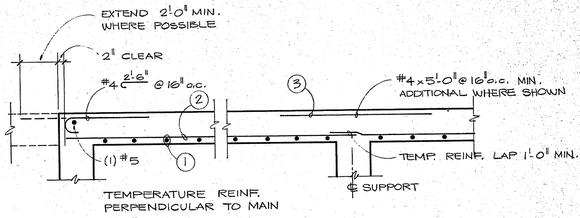
Column Base Conn. at Playshed (E/2)



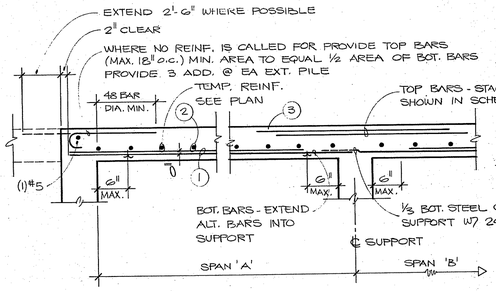
Typ. Int. Pile Cap at Grade Beam (F/2)



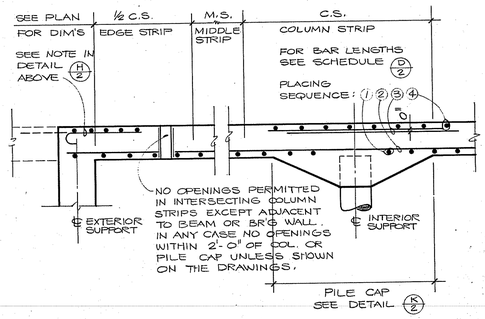
Typ. Ext. Pile Cap at Grade Beam (G/2)



Temperature Reinforcement

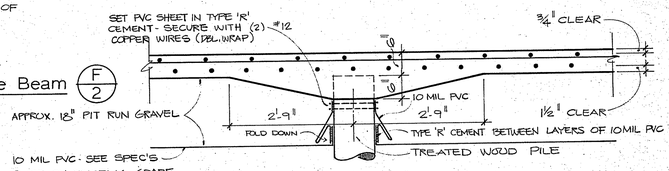


Main Reinforcement
ONE WAY SLAB DETAILS (H/2)

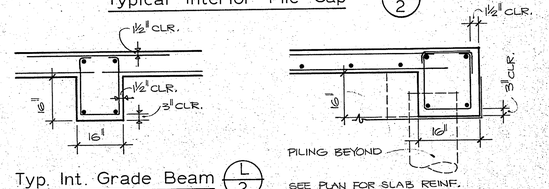


REINFORCING NOTED THUS ON PLANS:
(5) · (11) · (2)
(5) PLACING SEQUENCE
(11) NUMBER OF BARS IN STRIP
(2) BAR SIZE

Flat Slab Details (J/2)



Typical Interior Pile Cap (K/2)



Typ. Int. Grade Beam (L/2)

Typ. Ext. Grade Beam (M/2)

NOTE; PROVIDE (2) #6 CORNER BARS TOP AND BOT. @ INTERSECTION OF ALL GRADE BEAMS, FOR REINF. SEE (C/2).

CONSULTANTS:
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SEATTLE, WASHINGTON 98109 MA3-4516

STEVENS ELEMENTARY SCHOOL ADDITION
ABERDEEN SCHOOL DISTRICT NO. 5

FOUNDATION PLAN & DETAILS

FILE NO.
DATE May 3, 1976
DRAWN RAB
PROJ. ARCH.

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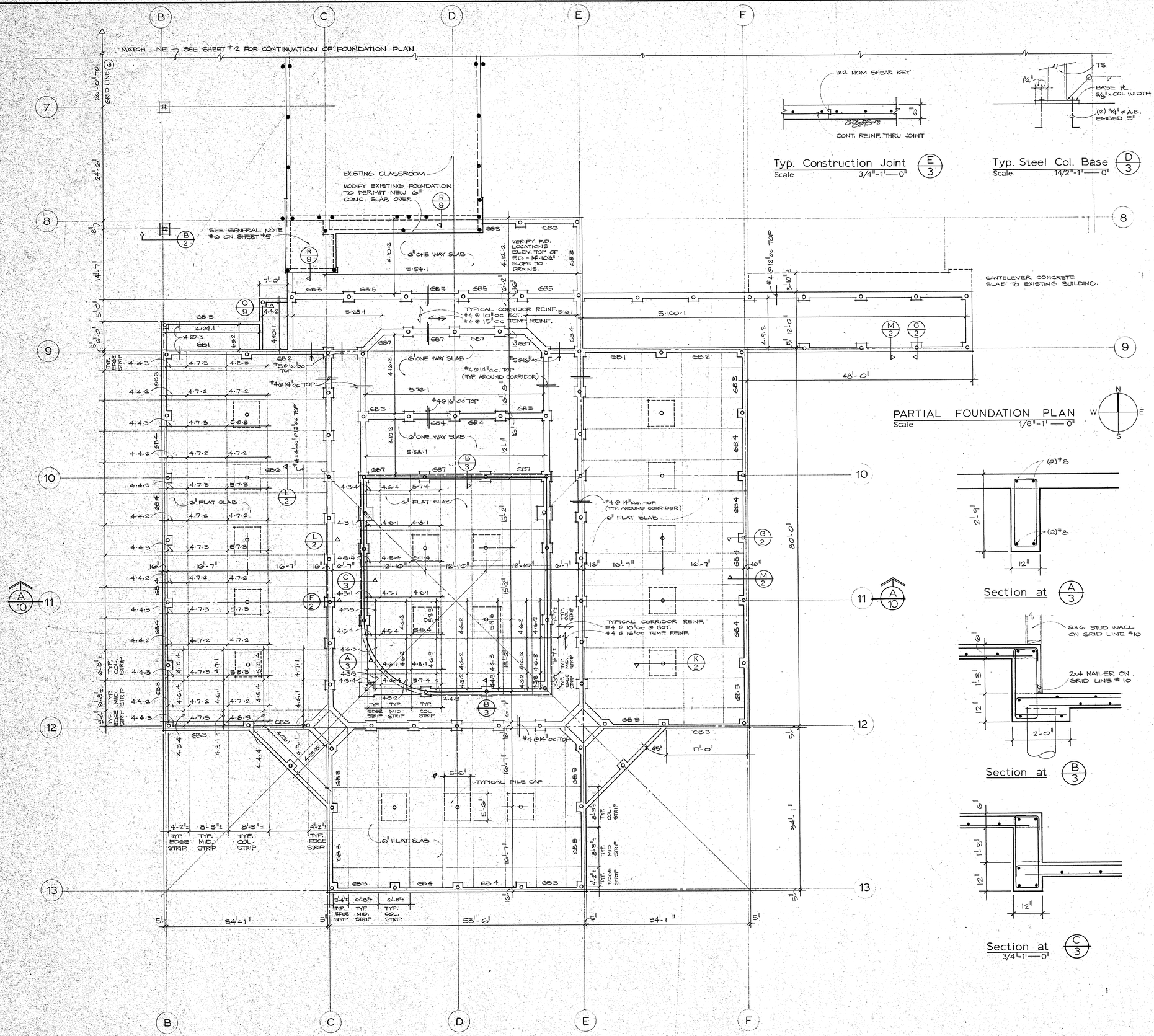
OF 15

DATE NO. REVISION



PARTIAL FOUNDATION PLAN
Scale 1/8"=1'—0"

Typ. Construction Joint (E/3)
Scale 3/4"=1'—0"

Typ. Steel Col. Base (D/3)
Scale 1-1/2"=1'—0"

Section at (A/3)

Section at (B/3)

Section at (C/3)
3/4"=1'—0"

GENERAL NOTES

These General Notes supplement the Specifications. Any discrepancies found among the Drawings, Specifications, these General Notes and the site conditions shall be reported to the Architect, who shall correct such error or omission in writing. Any work done by the Contractor after discovery of such error shall be done at the Contractor's risk. The Contractor shall verify and coordinate dimensions among all drawings prior to proceeding with any work or fabrication. The Contractor is responsible for all bracing and shoring during construction.

Standards

All methods, materials and workmanship shall conform to the 1973 Uniform Building Code (UBC).

DESIGN CRITERIA

Loads	Live Load: Uniform	Dead Load
Roof	25 PSF	Actual
Floors		
Corridors & Gym	100 PSF	Actual
Classrooms	40 PSF	Actual
Library	60 PSF	Actual
Storage	125 PSF	Actual

1. Lateral forces transmitted by diaphragm action of roof and floors to shear walls. Loads are then transferred to footings by shear wall action where ultimate displacement is resisted by passive pressure of earth and sliding friction of earth. Overturning is resisted by dead load of structure.
2. Wind: 25 PSF "Wind-Pressure-Map" Area per 1973 UBC.
   Uplift: Enclosed Roof Areas: 75% of wind load less 2/3 design dead load.
   Overhangs and Partly Enclosed Areas: 125% of wind load less 2/3 design dead load.
3. Seismic: Zone 2 per 1973 UBC.
   V=CKZW: V=Base Shear C=0.1, Z=0.5
   K=1.33 for "Box" type structure.
   W=Dead load of portion of building under consideration.

CONCRETE

Metal Reinforcement

All reinforcing shall conform to ASTM A 615. Use Grade 60 for bars #6 and larger, Grade 40 for smaller. (Except in two-way floor slab where all bars shall be Grade 60.) Detail, fabricate and place per ACI 315 and ACI 318.

Concrete

Shall be made with Portland Cement ASTM C-150 Type 1, coarse and fine aggregate ASTM C-33, water clean and potable and shall be ready-mixed per ASTM C-94 unless otherwise approved. Add to all exterior concrete an air-entraining agent to attain 5% to 7% entrained air, by volume, conforming to ASTM C-260. Minimum concrete compressive strength and slump:

Item	Min. 28 day compressive strength f'c	Slump Max.	Slump Min.
Footings	2500 PSI	5	1
Floor Slab	4000 PSI	4	1
All other concrete	3000 PSI	5	1

Place Concrete

Per ACI 304 and conform ACI 604 (306) Winter Concreting and ACI 605 (305) for Hot Weather Concreting. Use interior mechanical vibrators with 7000 RPM minimum frequency. Do not over vibrate.

Concrete shall be poured monolithically between construction JOINTS. Protect all freshly placed concrete from premature drying, excessive hot or cold temperature for seven days after pouring. Provide construction joint LAYOUT TO ARCHITECT FOR APPROVAL.

Grout for Bearing Plates

Shall be made from 1 part ASTM C-150 Type 1 Portland Cement, one part fine sand ASTM C-33, and 1 part "Embeco". Mix dry as can be worked and pack solid to fill entire space under plates.

METALS

Welding

a. All welding shall be in accordance with Code for Welding in Building Construction AWS D 1.1-75.

b. Reinforcing bars shall be welded only upon approval of the Engineer and be accomplished per "Reinforcing Bar Splices" by Concrete Reinforcing Steel Institute, 1968. In no case will a weld be made within 6 bar diameter of a cold bend.

c. All welding shall be by certified welders, use E60 or E70 electrodes.

Steel Shapes and Plates

Shall be ASTM A 36 unless otherwise notedon the Drawings. Structural tubing shall be ASTM A 501, Fy=36 ksi or ASTM A 500 Grade B, Fy=46 ksi.

All Detailing, Fabrication and Erection

Shall conform to the AISC Manual of Steel Construction, 7th Edition. All miscellaneous steel and hardware exposed to view or to the ground shall be galvanized per ASTM A-123 with 1.25 oz. of zinc spelter per sq. ft. of surface area. All other steel surfaced to be shop painted after fabrication with one coat of red lead in oil primer Federal Specifications TT-P-00615C Type II to a thickness of 2 mils minimum dry thickness.

CARPENTRY

Framing Lumber

Shall be Coast Region Douglas Fir #2 (1250f) or better for all members. Each piece shall bear the stamp of WCLIB showing trademark. Provide minimum nailing per Table 25 P, 1973 UBC, more where shown on the drawings. Use only common nails of American or Canadian manufacturer.

Plywood

Shall be Group 1 species C-D Grade with exterior glue conforming to PS 1-74. Each piece shall bear the grade trademark of the American Plywood Association. Layout as shown on structural drawings.

Glue-Laminated Timber

Shall conform to PS-56-73 and each member shall bear the AITC "Quality Mark". Lumber shall conform to the West Coast Lumbermen's Association "Standard Specifications for Structural Glued Laminated Douglas Fir". All members shall be Combination "C" (2000f) Architectural Appearance Grade where exposed to view, Industrial Appearance where not exposed. Treat and protect Glu-lam members per AITC-111 Standard Protection for Structural Timber Framing, use exterior glue only. Camber 1½ times dead load deflection. Provide cut washer under all bolt heads and nuts that bear on wood. Provide 15# bldg. paper between timber in contact with concrete.

Wood Piles

Shall be Douglas Fir, Coast Region Class "B", treated per Washington State Department of Highways Standard Specifications for Road and Bridge Construction with Creosote oils, ASTM Designation D 390 with a retention of 10 lb. per cubic foot of wood. Drive piles with a single acting vulcan #1 steam or 15,000 ft. lb. air hammer. Drive to 20 tons capacity per Engineering News Record Formula. Piles shall be either treated wood or, at the Contractor's option, composite piles.

Composite Piles

Shall be Douglas Fir Coast Region, Class "B", untreated below stable ground water level, with a 12" diameter 12 gage casing, extending to the concrete pile cap.

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STEVENS ELEMENTARY SCHOOL ADDITION
ABERDEEN SCHOOL DISTRICT NO. 5

FOUNDATION PLAN & DETAILS

FILE NO.
DATE May 3, 1976
DRAWN RAB
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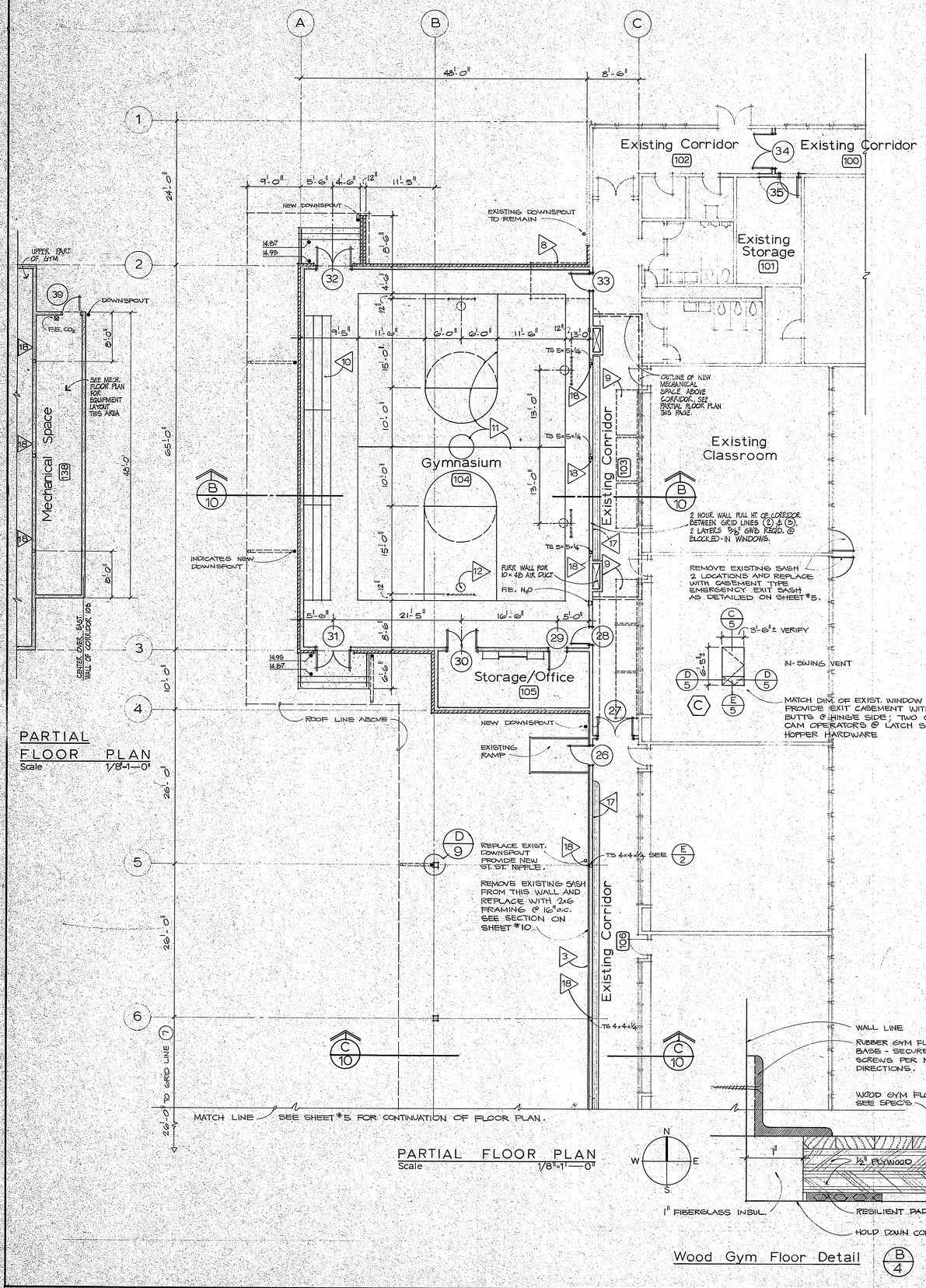
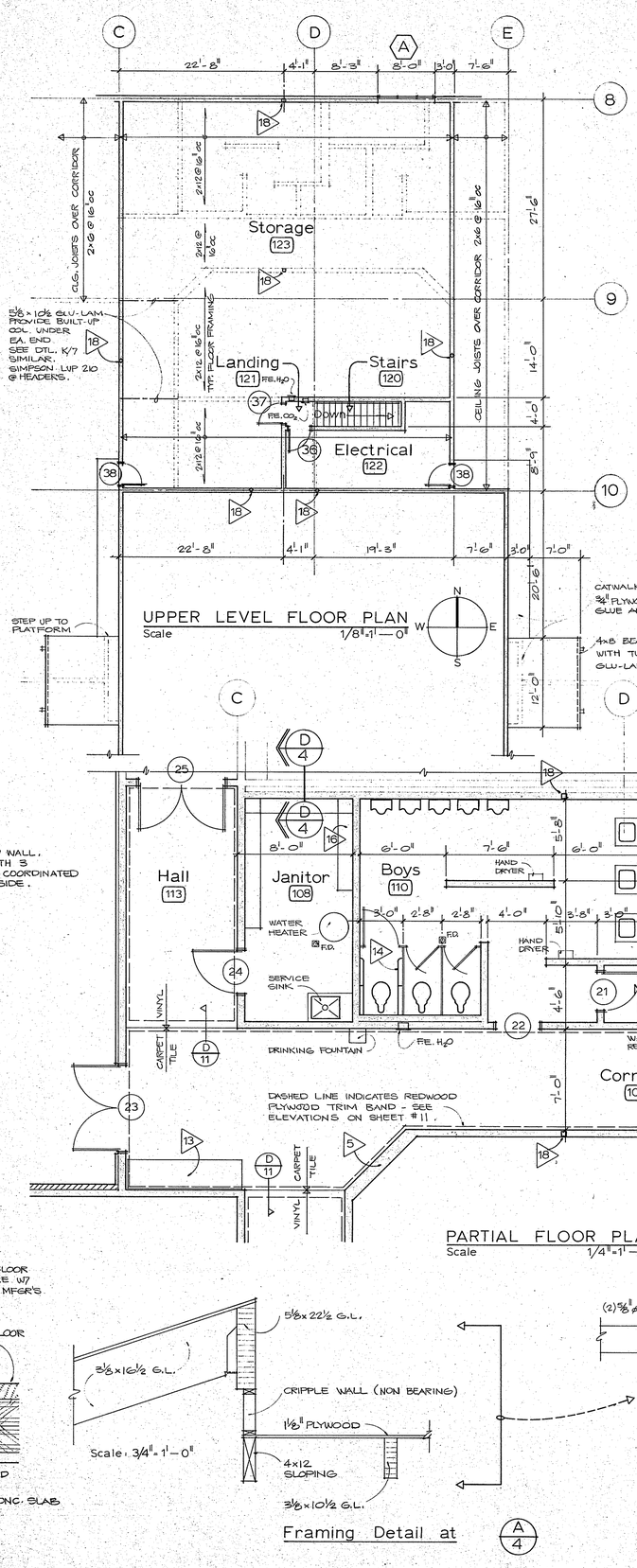
3 OF 15



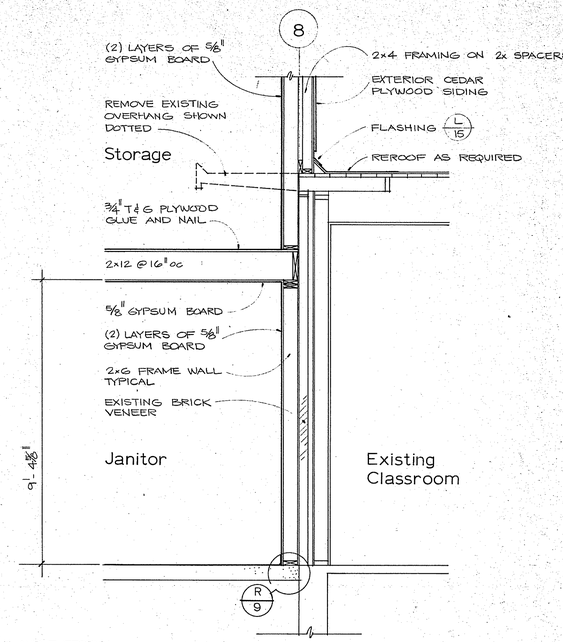
PARTIAL FLOOR PLAN
Scale 1/8"=1'—0"

Wood Gym Floor Detail B/4

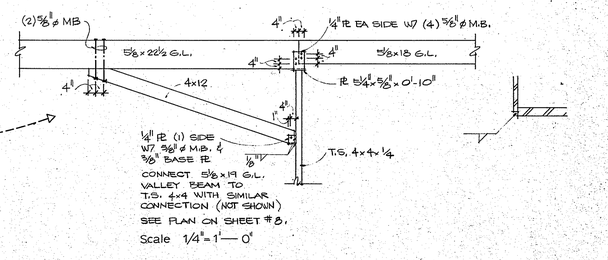


UPPER LEVEL FLOOR PLAN
Scale 1/8"=1'—0"

PARTIAL FLOOR PLAN
Scale 1/4"=1'—0"



SECTION at D-D
Scale 1/2"=1'—0"



Framing Detail at A/4

CONSULTANTS:
CHALKER ENGINEERS INC. — STRUCTURAL
ELMER E. SCOTT & ASSOC. — MECH. & ELEC.

DATE | NO. | REVISION

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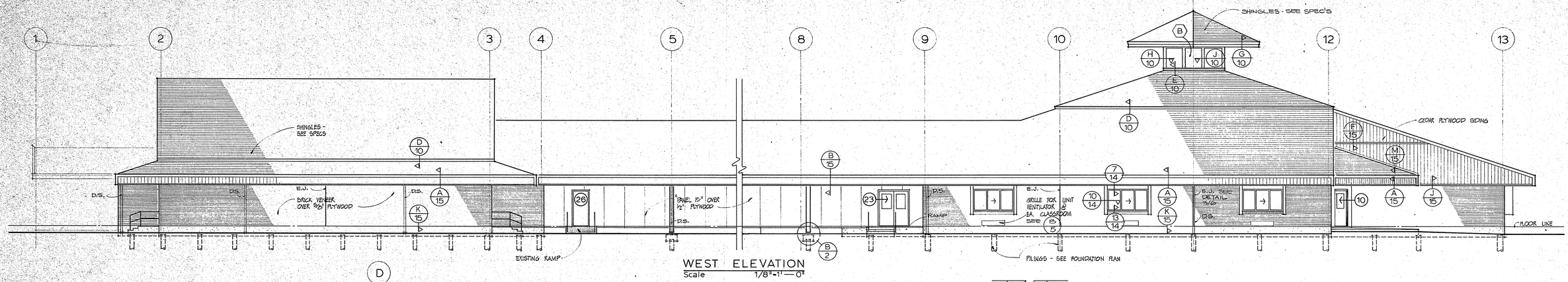
STEVENS ELEMENTARY SCHOOL ADDITION
ABERDEEN SCHOOL DISTRICT NO. 5

FLOOR PLANS

FILE NO.
DATE May 3,1976
DRAWN RAB
PROJ. ARCH.

4 OF 15



WEST ELEVATION
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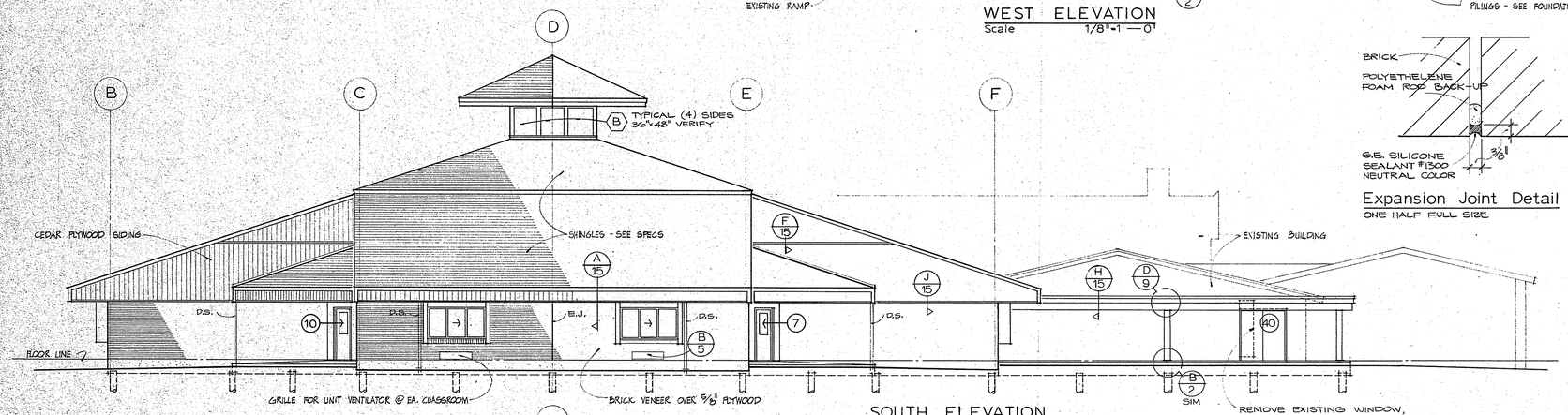
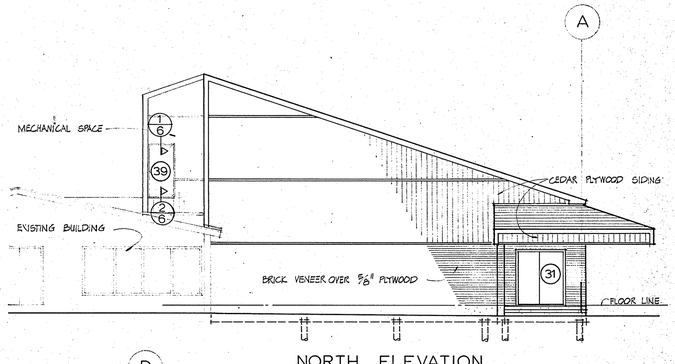


SOUTH ELEVATION
Scale 1/8"=1'—0"

Expansion Joint Detail 3/6
ONE HALF FULL SIZE



NORTH ELEVATION
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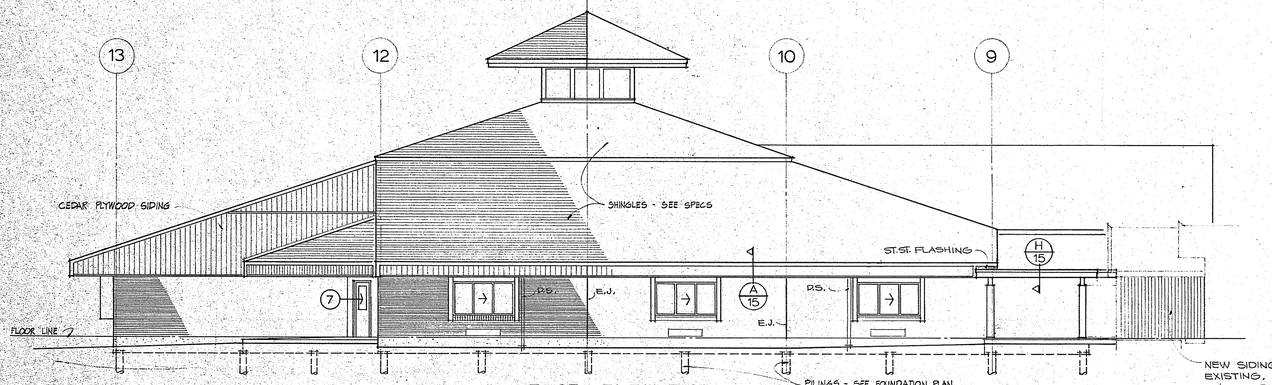
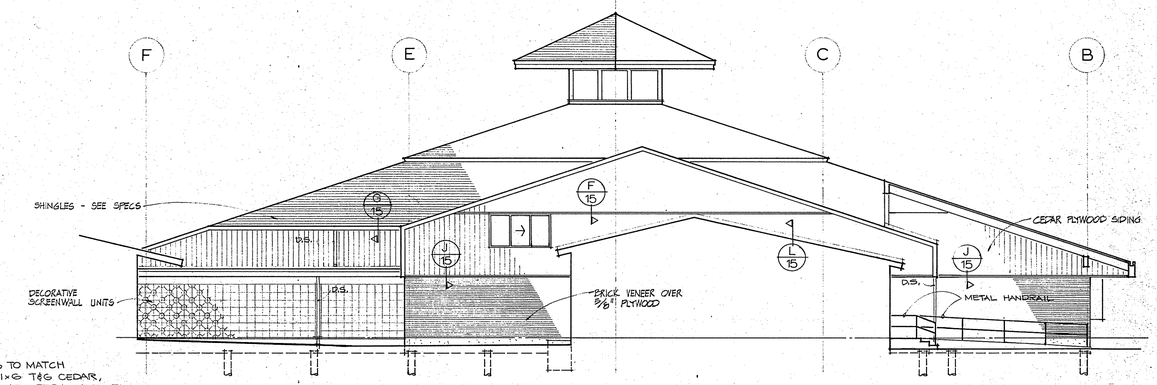
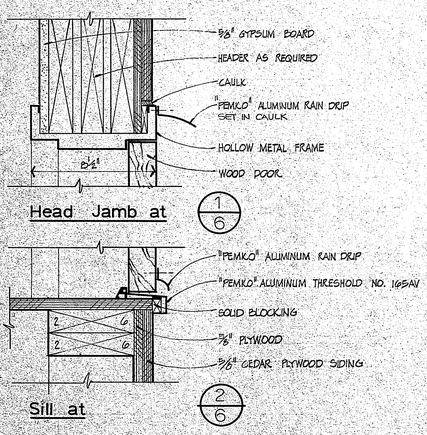
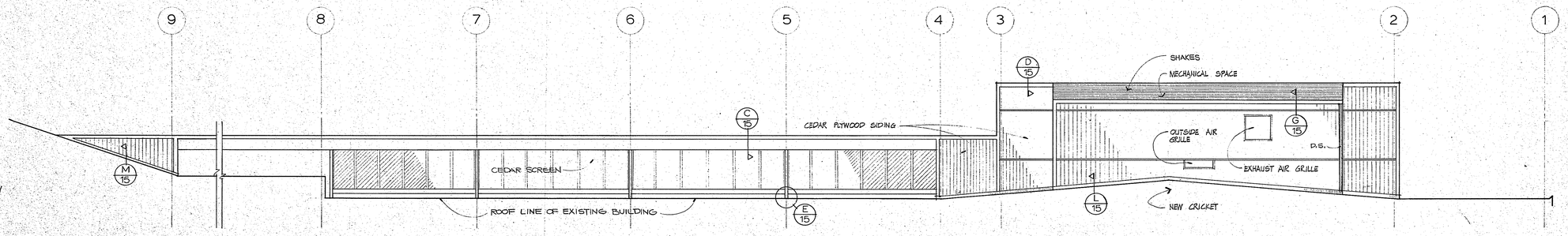


EAST ELEVATION
Scale 1/8"=1'—0"



COURT ELEVATION - LOOKING SOUTH
Scale 1/8"=1'—0"





COURT ELEVATION - LOOKING WEST
Scale 1/8"=1'—0"

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STEVENS ELEMENTARY SCHOOL ADDITION
ABERDEEN SCHOOL DISTRICT NO. 5

EXTERIOR ELEVATIONS

FILE NO.
DATE May 3, 1976
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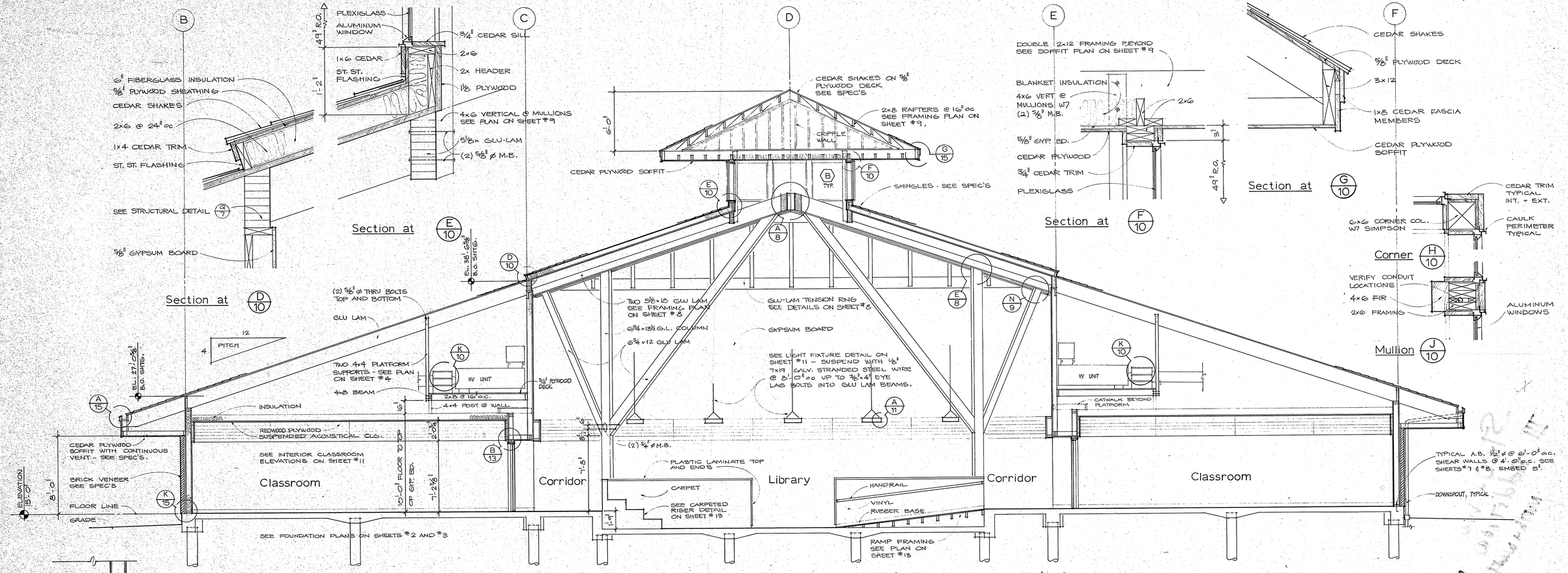
PROJ. ARCH.

6
OF 15



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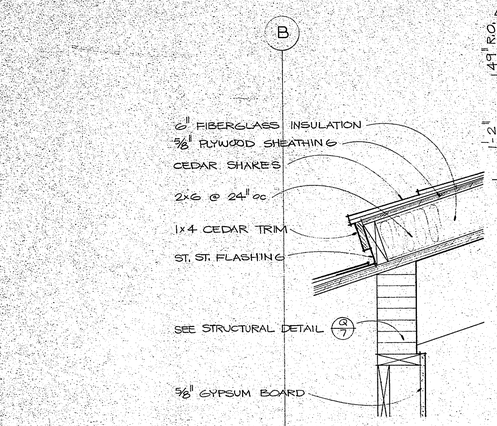
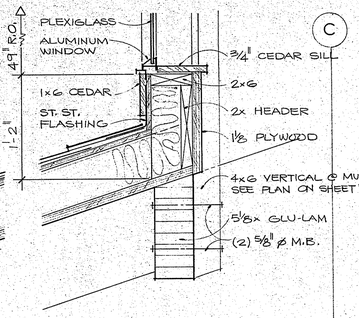
STEVENS ELEMENTARY SCHOOL ADDITION
ABERDEEN SCHOOL DISTRICT NO. 5

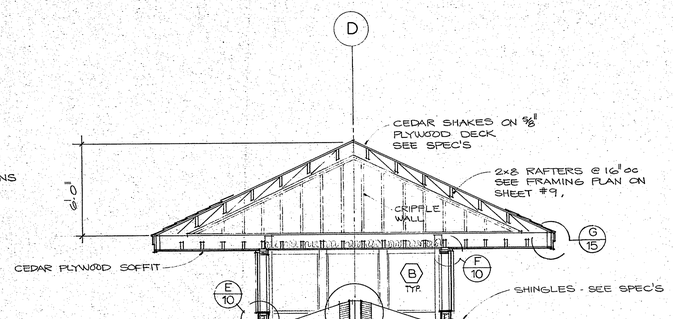
SECTIONS

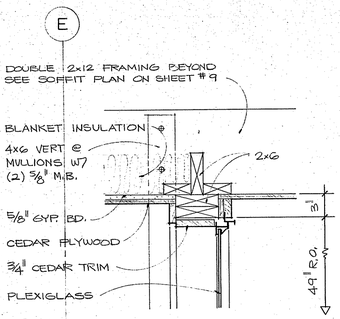
FILE NO.
DATE May 3, 1976
DRAWN RAB
PROJ. ARCH.

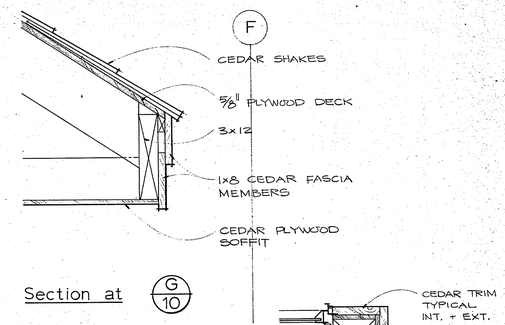
1
OF







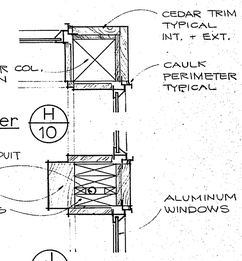


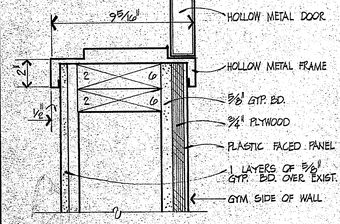


Section at E/10

Section at F/10

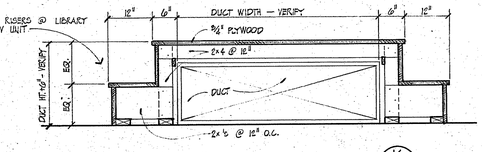
Section at G/10





L/10 Jamb / Head at Gym
3"=1'-0"

CROSS SECTION at A-A
Scale 1/4"=1'-0"



Step Over Duct at K/10

CROSS SECTION at B-B
Scale 1/4"=1'-0"

CROSS SECTION at C-C
Scale 1/4"=1'-0"

CONSULTANTS:
CHALKER ENGINEERS INC. STRUCTURAL
ELMER E. SCOTT & ASSOC. MECH. & ELEC.

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STEVENS ELEMENTARY SCHOOL ADDITION
ABERDEEN SCHOOL DISTRICT NO. 5

SECTIONS

DATE NO. REVISION

FILE NO.
DATE May 3, 1976
DRAWN RAB
PROJ. ARCH.

HALEY ALDRICH

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REPORT OF PRELIMINARY GEOTECHNICAL ENGINEERING FINDINGS
ABERDEEN SCHOOL DISTRICT NO. 5 SEISMIC SAFETY RETROFITS
AJ WEST ELEMENTARY SCHOOL
ABERDEEN, WASHINGTON



by
Haley & Aldrich, Inc.
Vancouver, Washington

for
TCF Architecture PLLC
Tacoma, Washington

File No. 0210366-000
July 2024

HALEY & ALDRICH, INC.
300 W. 15th Street
Vancouver, WA 98660
360.448.4189

5 July 2024
File No. 0210366-000

TCF Architecture PLLC
902 N 2nd Street
Tacoma, Washington 98403

Attention: Steve Wachtler, AIA, Principal

Subject: Report of Preliminary Geotechnical Engineering Findings
Aberdeen School District No. 5 Seismic Safety Retrofits
AJ West Elementary School
1801 Bay Avenue
Aberdeen, Washington 98520

Dear Steve Wachtler:

Haley & Aldrich, Inc. (Haley & Aldrich) is pleased to submit this report to TCF Architecture PLLC (TCF) and Aberdeen School District No. 5 (District) summarizing our preliminary geotechnical engineering services for the seismic retrofit of AJ West Elementary in Aberdeen, Washington. Our work was completed in general accordance with our agreement executed 3 April 2024. In completing our services, we also collaborated with Degenkolb Engineers, Inc. (Degenkolb) and Educational Service District 112 (ESD 112) - Construction Services Group (CSG).

The project includes preliminary evaluation of the AJ West Elementary in Aberdeen, Washington per *American Society of Civil Engineers/Structural Engineering Institute (ASCE/SEI) 41-17 - Seismic Evaluation and Retrofit of Existing Buildings* (ASCE 41-17; ASCE 2017b). The study was funded by the Office of Superintendent of Public Instruction's (OPSI's) School Seismic Grant Program (SSGP). The findings from this preliminary evaluation will inform the District's and OPSI's decision-making to either advance full design efforts for seismic retrofit improvements at the existing campus or to explore re-siting the school to a new location.

This preliminary report provides a discussion of the site setting, surface and subsurface conditions, the seismic basis of design, and a preliminary geotechnical analysis of seismicity and seismic hazards that may impact plans for retrofit of the subject school. Our current scope of services does not include providing recommendations for design and construction of retrofit improvements, such as modification of existing foundations or installation of ground improvement elements. Preliminary recommendations for retrofit improvements may be provided using currently available subsurface data under a supplemental authorization.

Scope of Services

The purpose of our services was to preliminarily characterize subsurface conditions at the site and to provide geotechnical engineering guidance and recommendations that conform in a preliminary sense to the geotechnical requirements of ASCE 41-17. These services included conducting geologic research, subsurface explorations, laboratory testing, preliminary seismic ground motion assessments, seismic hazard evaluations, and preliminary engineering analyses.

We completed the following tasks in general accordance with *Part 1 – Geotechnical Field Services and Limited Seismic Hazard Evaluation* included in our proposal for Geotechnical Engineering Services dated 21 February 2024 and executed 3 April 2024:

- Reviewed readily available geologic and geologic hazard maps, water well logs, and other geotechnical reports and plans provided by others for general information regarding subsurface soil and groundwater conditions and geologic hazards.
- Drilled one boring to a depth of approximately 125.5 feet below ground surface (bgs) and advanced one seismic cone penetration test (CPT) sounding to a depth of approximately 121.3 feet bgs to characterize subsurface conditions.
- Observed the exploration, logged the subsurface conditions, collected representative soil samples, and transported the samples to our laboratory for further visual review and testing.
- Completed laboratory tests on select soil samples to evaluate soil engineering properties. Our specific tests included moisture content, Atterberg Limits, grain size distribution determinations, organic content, triaxial strength testing, and a suite of corrosion potential tests in accordance with current American Society for Testing and Materials (ASTM) or other applicable standards.
- Developed code-based seismic design values in conformance with ASCE 41 Section 2.4 and ASCE 7 Section 11.4, not including site-specific seismic or ground response analyses per ASCE 7 Chapter 21 (ASCE 2017a).
- Conducted limited seismic hazard analyses including:
  - Assessing liquefaction potential analysis per the method presented by Boulanger and Idriss (2014).
  - Assessing lateral spreading at the site, including an evaluation of local and regional topography and nearby bathymetry.
- Prepared this report summarizing our preliminary findings.

Site Conditions

SURFACE CONDITIONS

The AJ West Elementary campus encompasses an approximately 3-acre site located at 1801 Bay Avenue in Aberdeen, Washington. The site is bounded by Conger Street on the west, W Second Street to the south, N Scammel Street on the east, and Bay Avenue to the north. There is one large school structure

and three small buildings on site. One playground area is present in the southwest portion of the parcel. The northeast portion of the campus is covered by an asphalt-paved parking lot. The area east of the school contains a landscaped field.

The school building is located on the west side of Aberdeen in the flats area. As such, the site topography is generally flat with an average surface elevation at approximately Elevation 12 feet (WGS84).

The Chehalis River is located approximately 0.7 miles to the southeast of the school. The bay of Grays Harbor begins approximately 1 mile west-southwest of the site at the mouth of the river. The Pacific Ocean is about 16 miles to the west of the school, beyond the northern peninsula of Grays Harbor.

Our understanding of the existing structure foundations is based on our review of a 30-sheet set of construction plans titled, "West Aberdeen Jr. High School", prepared by Jensen & Mills Architects, and dated October 1956. According to the plans, the entire building is founded on timber piles (plans do not indicate capacity), typically appearing as single piles but occasionally clustered into groups of two. The pile caps do not appear to be interconnected with grade beams. The depth and diameter of the piles were not indicated on the plans, though based on scaling of the drawings, they appear to have a minimum top diameter of 12 inches. The school floors consist of concrete slabs-on-grade with thickened sections under partition walls. Excerpts from the historical plans are included in Appendix C.

GEOLOGIC AND SOIL MAPPING

The site is mapped as Quaternary alluvium described as "silt, sand, and gravel deposited in streambeds and fans," the surface of which is "relatively undissected" (Logan, 1987). The mapping also indicates that at depth, the alluvium is likely underlain by marine sedimentary rocks assigned to the Miocene Montesano Formation. This formation is described as predominantly silty sandstone with "local to widespread conglomerate, siltstone, and mudstone" that is generally blue gray where fresh and orange-brown where weathered (Logan, 1987). Our explorations encountered fill and alluvium over dense materials at approximately 124 feet bgs, which are likely part of this sedimentary rock formation.

The near surface soils at the site are mapped by the U.S. Department of Agriculture (USDA) in the *Soil Survey of Grays Harbor County Area, Pacific County, and Wahkiakum County* (Pringle, 1986), as compiled in the Web Soil Survey (USDA, 2024), as Udorthents, level. Udorthents soils are described as very deep, moderately to excessively drained soils found on former tidelands and/or sandy and loamy river dredgings that have been protected from flooding by dikes (Pringle, 1986). Pringle (1986) notes that "no single profile is representative of these soils" but a common profile generally comprises 6 inches of sandy loam (United Soil Classification System [USCS] SC-SM, SM) overlying loamy sand, loam, and sandy loam (USCS CL-ML, SM, ML, SC-SM) to 60 inches. Depth to water in this soil type is reported as typically 24 to 79 inches and the soil is assigned to hydrologic soil group A, which are soils that generally have high infiltration and water transmission rates.

Based on our explorations, the native soils underlying some near surface imported fills are generally similar to those described in the geologic and soil mapping.

SUBSURFACE CONDITIONS

Subsurface conditions interpreted from the explorations advanced at the site as part of our current study, in conjunction with soil properties inferred from field and laboratory tests, formed the basis for the conclusions and recommendations in this report. The locations and depths of our explorations were selected considering the site features, under the constraints of surface access, time, and budget.

We explored subsurface soil and groundwater conditions at the site on 10 through 16 of April 2024, by drilling one boring (B-AJW01) to a depth of approximately 125.5 feet bgs using the mud-rotary drilling method, and advancing one CPT sounding (CPT-AJW01) to a depth of approximately 121 feet bgs. The boring was located in the northwestern portion of the site and the CPT was performed in the north-central portion of the site at the locations shown on Figure 2. Our field exploration procedures and exploration logs are in Appendix A. Laboratory soil testing procedures and results are in Appendix B.

The explorations indicate the site is blanketed by approximately 3 feet of fill consisting of poorly graded sand with gravel. This was underlain by a 2-foot layer of elastic silt with organics thought to be associated with an alluvial marsh/mud flat deposit. The silt is underlain by very loose, alluvial silty sand with gravel extending to a depth of about 13 feet bgs. Below this layer was approximately 27 feet of very soft elastic silt with gravel soils. The silts were underlain by typically very loose to medium dense deposits of alluvial silty sand (with one very dense layer identified at 70 feet bgs) and very soft sandy silt and silt with sand to a depth of about 115 feet bgs. A layer of medium dense poorly graded sand with silt and trace organics was identified below this zone to a depth of approximately 124 feet in the boring, though was not identified in the CPT sounding.

Boring B-AJW01 was terminated at 125.5 feet bgs in very dense well-graded sand with silt and gravel (interpreted to be decomposed bedrock), which initiated at a depth of about 124 feet bgs. This bedrock contact was interpreted to be at approximately 120 feet bgs in the CPT sounding, though that potentially may also have been the medium dense sand layer encountered at 115 feet in the boring.

Groundwater was identified in boring B-AJW01 at an approximate depth of 4.5 feet bgs. Pore pressure dissipation testing at CPT-AJW01 indicated that the piezometric head at the site was 3 feet bgs at the time of testing. For our engineering analyses, we conservatively assumed groundwater to be present at the ground surface.

Seismic Basis of Design

SEISMIC SETTING

The site is in a seismically active area. In this section, we describe the seismic setting, identify the seismic basis of design, provide code-based design values, and discuss the seismic hazards at the site. Geologic hazards mapped near the project site are all related to seismicity and include tsunami inundation, very strong earthquake shaking, and a moderate to high liquefaction hazard (Washington State Department of Natural Resources [WADNR], 2024).

Regional Seismicity

Western Washington sits at the contact between two large crustal tectonic plates. The Juan de Fuca Plate forms the floor of the Pacific Ocean off the coast of the northwestern United States and moves northeastward from its spreading ridge boundary with the Pacific Plate at an average rate of approximately 1.5 inches per year. As it converges with the continental North American Plate, the Juan de Fuca Plate dips below (or "subducts") beneath the North American Plate forming a shallow, eastward-dipping contact interface. This boundary is known as the Cascadia Subduction Zone (CSZ) and is responsible for the seismicity in the western Washington regions, producing earthquakes associated with three types of source zones: subduction interface, subduction intraslab, and crustal. The CSZ is located offshore approximately 101 miles west of the site.

Subduction Interface Sources. The displacement caused by the subduction of the Juan de Fuca Plate below the North American Plate does not generally manifest as slip between the two plates; rather, it is absorbed by compression of the North American Plate at the interface at relatively shallow depths. This compression, based on geologic and historical evidence, is released every 300 to 600 years, on average, in the form of magnitude 8 to 9 or larger earthquakes, the last such event occurring in 1700. Characteristics of this type of earthquake may include very large ground accelerations, shaking durations in excess of two minutes, and particularly strong long-period ground motions that may affect tall or long-period structures.

Subduction Intraslab Sources. A deeper zone of seismicity is associated with a steeper bending of the Juan de Fuca Plate and the breaking of the plate under its own weight below the Pacific Northwest region. This region, termed the Benioff Zone, produces intraslab earthquakes at depths of 40 to 70 kilometers (km). Such past events in western Washington include the 1949 Puget Sound, 1965 Olympia, and 2001 Nisqually earthquakes. Deep, intraslab earthquakes tend to be felt over larger areas than shallower crustal events, and generally lack significant aftershocks.

Crustal Sources. Shallow crustal faults are caused by cracking of the continental crust, resulting from the stress that builds as the subduction zone plates remain locked together. Many small crustal faults are mapped near the site that are a part of the greater Cascadia Fold and Thrust Belt (U.S. Geological Survey [USGS], 2024). However, due to the size of these faults, their contribution to the site seismic hazard is relatively small.

SEISMIC BASIS OF DESIGN AND ANALYSIS METHODOLOGY

Preliminary site-specific seismic hazard analysis was conducted for the project site following the guidelines in ASCE 41-17 Section 2.4.1 *General Procedure for Hazard Caused by Ground Shaking*. The seismic hazard levels evaluated per this approach are as follows:

- **BSE-1E:** Basic Safety Earthquake-1 for use with the Basic Performance Objective for Existing Buildings, taken as a seismic hazard with a 20 percent probability of exceedance in 50 years (225-year return period), but not greater than the BSE-1N, at a site.

- **BSE-1N:** Basic Safety Earthquake-1 for use with the Basic Performance Objective Equivalent to New Building Standards taken as two-thirds of the BSE-2N at a site.
- **BSE-2E:** Basic Safety Earthquake-2 for use with the Basic Performance Objective for Existing Buildings, taken as a seismic hazard with a 5 percent probability of exceedance in 50 years (975-year return period), but not greater than the BSE-2N, at a site.
- **BSE-2N:** Basic Safety Earthquake-2 for use with the Basic Performance Objective Equivalent to New Building Standards, taken as the ground shaking based on the Risk-Targeted Maximum Considered Earthquake (MCE_R) per ASCE 7 at a site.

The BSE-2N hazard level is analogous to the maximum considered earthquake hazard level (MCE) in ASCE 7-16 (with a 2 percent probability of exceedance in 50 years or a 2,475-year return period), and the BSE-1N hazard level is consistent with a design-level event in ASCE 7-16.

Seismic Site Class

Thick sequences of unconsolidated, soft sediments typically amplify the shaking of long-period ground motions, such as those associated with subduction zone earthquakes; whereas areas underlain by shallow soil profiles are not likely to amplify seismic waves.

The "Site Class" is a designation used by ASCE 7-16, as referenced by ASCE 41-17 to quantify ground motion amplification. The classification is based on the stiffness in the upper 100 feet (roughly 30 meters) of soil and bedrock materials at a site. Several data sources were considered in estimating the stiffness profile at this site:

- A WADNR geophysical survey performed approximately 0.5 miles to the east of the subject site presents a shear wave velocity (Vs) profile within the upper 100 feet (30 meters), otherwise known as V_{S30} (WADNR, 2011). The survey used surface-based geophysical testing methods. The weighted-average shear wave velocity in the top 100 feet of the measured V_S profile was computed to be approximately 154 meters per second (505 feet per second). This V_{S30} is consistent with Site Class E, as defined in ASCE 7-16, as referenced by ASCE 41-17.
- Seismic CPT shear wave velocity testing was performed at CPT-AJW01. The test resulted in a weighted-average shear wave velocity of 445 feet per second for a 100-foot-deep profile. This weighted-average V_s profile is similar to the WADNR results and also falls within the limits of Site Class E, as defined in ASCE 7-16, as referenced by ASCE 41-17. V_s measurements were observed to generally increase with depth.
- Boring B-AJW01 was evaluated for site class considering standard penetration test (SPT) N-values and the stratigraphy identified in the boring. Boring B-AJW01 encountered clayey to silty to clean sands with N-values under 15 within the upper 65 feet. Based on the SPT N-value approach for determination of site class, conditions are consistent with Site Class E, as defined in ASCE 7-16, as referenced by ASCE 41-17.

Site class determination was largely based on evaluation of shear wave velocity data from the seismic CPT testing, WADNR geophysical testing, and SPT N-values derived data from boring B-AJW01. Based on

our evaluation of the data on hand, we find that without respect to seismic hazards, Site Class E is appropriate for this site. However, due to liquefaction hazard at this project site (discussed in the following section), the site is classified as Site Class F.

Per ASCE 41-17, a Site Class F designation requires a site-specific analysis including a seismic hazard analysis and a site response analysis; however, buildings with structural periods of less than 0.5 seconds may be designed using seismic parameters developed considering Site Class E conditions.

Preliminary Spectral Design Parameters

Acceleration response spectra for use in preliminary design have been developed following the procedures in ASCE 41-17 Section 2.4.1 *General Procedure for Hazard Caused by Ground Shaking*. These values are presented in Table 1.

Table 1. General Procedure Spectral Design Parameters

Design Parameters	Hazard Level			
	BSE-2N	BSE-1N	BSE-2E	BSE-1E
Site Class	E			
S_s	1.52	-	1.09	0.41
F_a (Site Class E)[1]	1.3	-	1.3	1.96
S_{xs}	1.97	1.32	1.42	0.80
S_1	0.70	-	0.46	0.12
F_v (Site Class E)[1]	4.2	-	4.2	4.2
S_{x1}	2.92	1.95	1.94	0.52
T_L	16 s	16 s	16 s	16 s

Notes:

1. *F_a and F_v are the ASCE 7-16 Chapter 21 site factors for Site Class E.*
2. *Site coordinates are Latitude/Longitude 46.972019°N / 123.838148°W*
3. *Values presented in this table are for Site Class E conditions. This site falls under Site Class F categorization; however, these values are provided assuming that the structures have a fundamental period of less than 0.5 seconds, in which case Site Class E may be used for design.*

LIQUEFACTION

General

When cyclic loading occurs during an earthquake, the shaking can increase the pore pressure in loose to medium dense saturated sand and cause liquefaction. The rapid increase in pore water pressure reduces the effective normal stress between soil particles, resulting in the sudden loss of shear strength in the soil. Granular soils, which rely on interparticle friction for strength, are susceptible to liquefaction until the excess pore pressures can dissipate. Sand boils and flows observed at the ground surface after an earthquake are the result of excess pore pressures dissipating upward, carrying soil particles with the draining water. In general, loose, saturated sand soils with low silt and clay contents are the most susceptible to liquefaction. Silty soils with low plasticity are moderately susceptible to liquefaction under

relatively higher levels of ground shaking. For any soil type, the soil must be saturated for liquefaction to occur.

We performed liquefaction potential analysis on soils logged at the site using the procedures outlined in Idriss and Boulanger (2008) and updated Magnitude Scaling Factor (MSF) as outlined in Boulanger and Idriss (2014).

We note the term liquefaction is defined very specifically by the simplified method that we used to evaluate the liquefaction hazard. Liquefaction is defined as when a soil under repeated cyclic loading exhibits the generation of increasing excess pore pressures until the pore pressure equals the total overburden stress. When this condition is reached, the normal stress acting between adjacent soil particles is effectively lost, and the soil, which derives its shear strength from interparticle friction, can lose much of its available shear strength. However, it is well documented that not all soils exhibit the same behavior after the initiation of liquefaction.

Loose sandy soils that achieve the condition of liquefaction during earthquake shaking can subsequently collapse and exhibit large shear strains under continued cyclic or static loading. This type of behavior was well documented during the 1989 Loma Prieta earthquake when several structures underlain by shallow, liquefiable hydraulically placed fills experienced bearing capacity failures and collapse. Conversely, medium dense to dense sandy soils that achieve the condition of liquefaction will typically not collapse and can exhibit strain hardening behavior due to dilation effects. Therefore, despite the soil achieving the condition of liquefaction, there is little to no shear strength loss and only moderate shear strains under continued cyclic and static loading. This condition is termed “cyclic mobility”.

Analysis

In accordance with ASCE 7-16, as referenced by ASCE 41-17, we completed the liquefaction hazard analysis using the site class adjusted acceleration coefficient PGA_M for Site Class E. We performed our liquefaction analysis for three different hazard levels, including events with 225-year (corresponding to BSE-1E), 975-year (corresponding to BSE-2E), and 2475-year (corresponding to BSE-2N) return periods. We performed liquefaction analysis using PGA_M values of 0.44g and 0.80g, and associated earthquake magnitudes of 7.6 and 8.5 for BSE-1E and BSE-2E, respectively. We used a PGA_M of 1.30g and associated earthquake magnitude of 8.8 in our analysis for the BSE-2N event. We assumed a design groundwater depth at the ground surface for our liquefaction analyses.

Our analyses conclude that potential for liquefaction to occur at the site is high, due to the relatively shallow groundwater table and subsurface profile featuring dozens of feet of loose sands.

Settlement

Post-liquefaction settlement results from densification of liquefiable sandy soils following an earthquake. The permanent ground surface settlement is not typically uniform across the area and can result in significant differential settlement. Differential settlement will have the most significant effect on structures supported by shallow foundations. Based on our analysis, we estimate liquefaction-

induced settlements on the order of 13 to 17 inches could occur throughout the site. Differential settlements can preliminarily be assumed as one-half of the total settlements occurring over a lateral distance of 50 feet.

We note that the settlement estimates provided above do not account for movements of foundations which may occur due to bearing capacity failure due to seismic strength loss or localized ground deformations that may result due to surface effects of shallow liquefaction, such as sand boils. (Both conditions are described below in more detail.) Therefore, actual ground and building settlements may be greater than the values noted above.

Seismic Strength Loss

We anticipate considerable reductions in the strength of the liquefiable layers of the site soil profile. The shear strength loss was determined by using the recommendations of Idriss and Boulanger (2008), and Bray and Sancio (2006). Simplistically, the liquefied shear strength directly correlates to the soil's pre-liquefied relative density. The relative density is estimated based on the SPT blow counts. The higher the relative density, the higher the liquefied shear strength. The typical residual strength of liquefiable soils at the site is expected to be less than 20 percent of the static strength (e.g., 80 percent or more strength loss).

Additionally, some strength loss due to cyclic shear stresses are expected to occur in the fine-grained elastic silt soils within the upper approximately 40 feet bgs. Full cyclic softening and development of lowered residual strengths within these materials are likely to occur. Supplemental exploration including performance of cyclic direct simple shear testing would be required to accurately estimate residual strength ratios for these soils.

As a result of the high expected soil strength loss, the pile foundation system at the site may experience bearing shear failure and cause additional foundation settlement.

Surface Effects

We evaluated the potential for liquefaction-related surface manifestations (such as sand boils) to occur using the procedures presented by Ishihara (1985), and by Hutabarat and Bray (2022).

The Ishihara (1985) procedure compares the thickness of a given liquefiable soil layer to the thickness of the overlying non-liquefiable soil mantle to determine if surface manifestations are possible at a given peak ground acceleration. This approach has several limitations and may overestimate potential for surface manifestations to occur in silty sands and sandy silts, as the relatively low permeability of these materials has potential to prevent pore water from flowing quickly enough to produce sand boils (Kramer, 1996). The Ishihara (1985) analyses indicate that the potential for surface manifestations is high.

The Hutabarat and Bray (2022) method is a CPT-based procedure for estimating liquefaction-induced ejecta severity. The calculation compares the liquefaction ejecta demand to the crust layer resistance.

Liquefaction ejecta demand is typically higher at sites with thick deposits of clean sands and lower at sites with stratified soil sites. The results of these analyses indicate that the estimated liquefaction ejecta severity is "None." It is noted that the layer of liquefiable silty sand logged between 5 and 12.5 feet bgs at B-AJW01 was not identified at CPT-AJW01, thus this ejecta severity classification did not account for the presence of that sand layer, which would have resulted in a higher classification.

We preliminarily conclude that the probability of surface effects of liquefaction is high, primarily due to the presence of shallow liquefiable soils identified at boring B-AJW01.

LATERAL SPREADING

Lateral spreading occurs when large blocks of ground are displaced down gentle slopes or toward the free face of river channels, ditches, etc. as a result of earthquake-induced inertial forces acting on the soil mass. Initiation of lateral spreading is often made worse when the soils within and beneath the soil mass liquefy or soften as a result of the shaking. Lateral spreading deformations can be experienced relatively far from a free face. Similar to lateral spread, flow failures result when large volumes of soil near the free face of river channels or lake bottoms displace vertically and laterally during or after earthquakes. As the ground begins to shake and the shearing resistance of liquefied soils decreases, ground displacement occurs in response to mainly static shear forces present within the soil mass and, to a lesser extent, earthquake-induced inertial forces. Flow failures typically manifest larger deformations than lateral spreading; however, the extent of the deformations is typically localized to the area behind the free face of the channel. Both lateral spreading and flow failures can be destructive and pose a significant risk to structures.

We performed lateral spread analyses using the commercial code Slide2 by RocScience to evaluate the stability of the site once liquefaction-susceptible layers had liquefied, using a generalized subsurface soil profile extrapolating site conditions outwards to the Chehalis River. The Slide program performs two-dimensional limit equilibrium analysis to analyze slope stability and to determine a factor of safety (FS) against global failure. Our preliminary analyses indicate that the site and surrounding area are susceptible to lateral spread under all considered seismic events.

To quantify an estimate of the amount of ground displacement that could occur as a result of lateral spreading under the BSE-2N scenario, we performed a displacement analysis using the simplified procedure for estimating seismic slope displacements in subduction zones by Bray, Macedo, and Liu (2023). The analysis indicates that the mean level of expected lateral displacement at the building footprint under the BSE-1E event is roughly 1 1/2 to 3 feet. For both the BSE-2E and BSE-2N seismic events, the calculated displacement is estimated to be in tens of feet.

FAULT SURFACE RUPTURE

We used the USGS U.S. Quaternary faults web application (USGS, 2024) to identify earthquake-producing faults near the project site. No mapped earthquake-producing crustal faults are present at the site. The closest mapped fault is a strand of the Cascadia Fold and Fault Belt located more than

12 miles to the west of the site. The USGS has mapped the "Cascadia Megathrust" portion of the CSZ approximately 85 miles west of the site.

Based on known fault locations, we consider the potential for fault rupture to occur at the site to be low unless occurring on an unmapped or otherwise unknown fault.

TSUNAMI HAZARD

The tsunami hazard at the site is mapped in the *Tsunami Hazard Maps of Southwest Washington - Model Results from a ~2,500-Year Cascadia Subduction Zone Earthquake Scenario* by the WADNR (Eungard et al., 2018). Based on this reference, the site is located within an area expected to be inundated from a CSZ-induced tsunami, with an expected inundation depth in excess of 6 feet. Similarly, tsunami wave simulation for Grays Harbor, Washington, performed by WADNR, shows that the site will be inundated by 5 to 10 feet in the event of a hypothetical magnitude 9.0 earthquake on the CSZ (WADNR, 2020).

The ASCE Tsunami Hazard Tool (https://asce7tsunami.online/) maps probabilistic inundation hazards for all potential tsunami sources, not just a CSZ-related event, and indicates the school site is not within a tsunami inundation zone; however, tsunami inundation is expected to reach 2nd Street, which borders the south of the school site (ASCE, 2022).

Based on the findings presented by WADNR, we consider the potential for tsunami inundation to occur at the site to be high.

Corrosivity

One soil sample was collected and tested for corrosivity characteristics by CERCO of Concord, California. The tested sample consisted of near-surface soils and was tested for resistivity, redox potential, sulfate and chloride ion concentrations, and pH. The test results indicate that near-surface soils should be considered corrosive to buried iron and steel improvements, based on laboratory resistivity measurements. Chloride ion concentrations were 25 milligrams per kilogram and sufficient to attack steel embedded in concrete mortar coating. Sulfate ion concentration results were 100 milligrams per kilogram and present a potential to be detrimental to reinforced concrete. The pH level was measured as about 5.2 and is considered a corrosion concern for buried iron, steel, mortar-coated steel, and reinforced concrete structures.

The results of our corrosion testing and a copy of CERCO's brief evaluation are presented in Appendix B.

Conclusions

Based on our explorations, testing, and analyses, we have formulated preliminary conclusions in this report for use in assessment of the seismic retrofit project's viability. We offer the following general summary:

- The site soil profile generally features a thin layer of granular fill underlain by a thin layer of very soft to soft elastic silt soils to about 5 feet below grade. These soils are underlain by approximately 0 to 7.5 feet of loose sand overlying more very soft to soft elastic silt soils to approximately 40 feet bgs. The primarily silt soils are underlain by very loose to medium dense sands and very soft to medium stiff silts to approximately 124 feet below grade, where weathered sedimentary bedrock was encountered. The groundwater table at the site is shallow at just several feet below the ground surface.
  - Where present, the upper sandy soils are considered to be slightly to moderately strong, slightly compressible, and highly susceptible to liquefaction and seismically induced strength loss.
  - The soft silt soils in the upper 40 feet are considered to be weak, compressible and susceptible to seismically induced strength loss, though are not considered to be liquefiable.
  - The deeper interbedded deposits are considered to be slightly to moderately strong, moderately compressible, and highly susceptible to liquefaction and seismically induced strength loss.
  - The weathered bedrock at depth is considered to be competent (strong and generally incompressible) and not susceptible to liquefaction or seismically induced strength loss.
- Due to the presence of liquefaction and related hazards, there is a likelihood for excessive vertical and/or lateral movements of existing building foundations. Therefore, the existing and any proposed new or upgraded foundations will need to be designed to tolerate or resist these seismically induced ground movements.
  - The magnitude of lateral deformations due to lateral spreading has the potential to be in the tens of feet, which will be too large to tolerate or resist with new or existing foundation systems. The use of specialized ground improvement would likely be required to mitigate this issue.
- Conceptually, we conclude the following regarding potential foundation retrofit and hazard mitigation alternatives:
  - Ground improvement: Performance of ground improvement (such as deep soil mixing) conceptually provides a solution for mitigation of lateral displacement and spreading. However, to be effective, the ground improvement would require a footprint area that would encroach well into the adjacent city streets and potentially beyond. Additionally, the depth of treatment would potentially need to extend to depths ranging anywhere from 60 feet bgs to the bedrock contact at greater than 120 feet bgs. For these reasons, this approach appears unfeasible from economic and logistical standpoints.
  - Deep foundations: The structure could feasibly be underpinned with micropile or small diameter pipe pile foundations to transfer building loads under seismic conditions down to deep bedrock. However, these foundations would not be capable of withstanding the large lateral loads induced by lateral spreading. For this reason, we conclude that underpinning with deep foundations is not an effective approach for retrofit at this site.

  - Shallow foundations: Conceptually, the structure could be retrofitted to perform in a seismic event as a shallow foundation-supported structure. This could be achieved by retrofitting the structure to feature a thickened structural mat, or alternatively, the existing pile caps could be connected with a network of strengthened grade beams designed to ignore capacity contributions from the underlying timber piles under seismic conditions. Vertical and lateral seismic forces induced upon the structure would then be resisted solely by the shallow foundation system. Life-safety conditions allowing for immediate egress in the event of an emergency would need to be achieved as a precondition for taking this approach. This retrofit approach would leave the school prone to significant shifting and distress as a result of design-level seismic shaking, very likely displacing the school from its existing timber pile foundations and rendering the structure unusable post-earthquake. Also, it may be feasible to design such an augmented shallow foundation system to accommodate the vertical ground deformations, but may not be possible to design it to accommodate the expected lateral ground deformations. This will require consideration by the structure engineer.

- Final design of geotechnical elements may require additional site characterization to verify subsurface conditions around the school building.

Closing

Thank you for the opportunity to perform these services for you. Please do not hesitate to contact us if you have any questions or comments.

Sincerely yours,
HALEY & ALDRICH, INC.

Tyler Slothower
Staff Engineer

Daniel J. Trisler, P.E.
Principal Geotechnical Engineer



Micah D. Hintz, P.E.
Geotechnical Engineer

Attachments:

References

Figure 1 – Vicinity Map
Figure 2 – Site and Exploration Plan

Appendix A – Exploration Logs
Appendix B – Laboratory Test Results
Appendix C – Historical Plans

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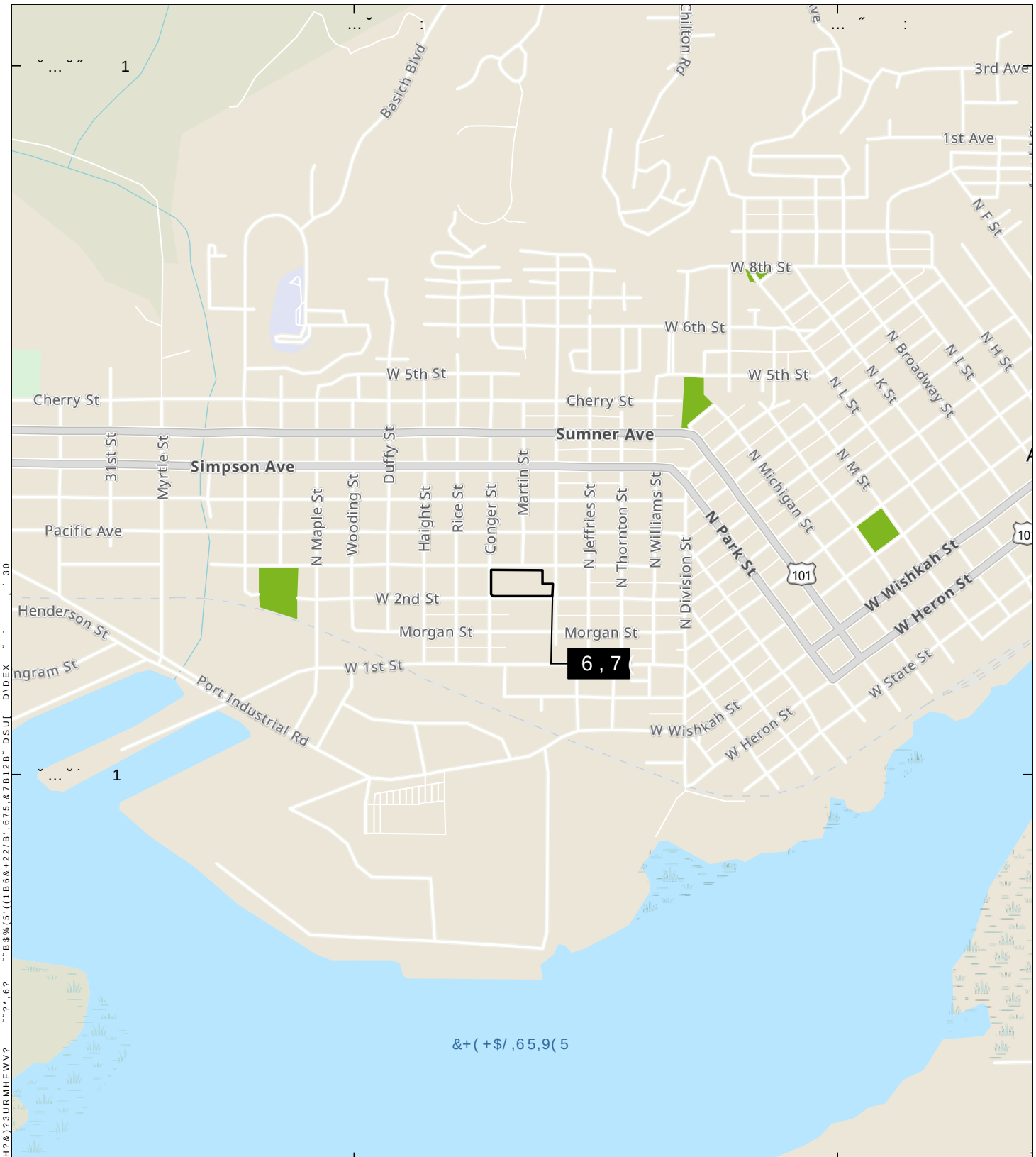
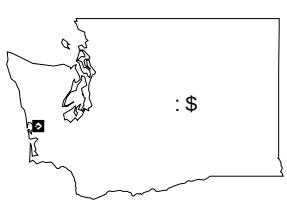
FIGURES







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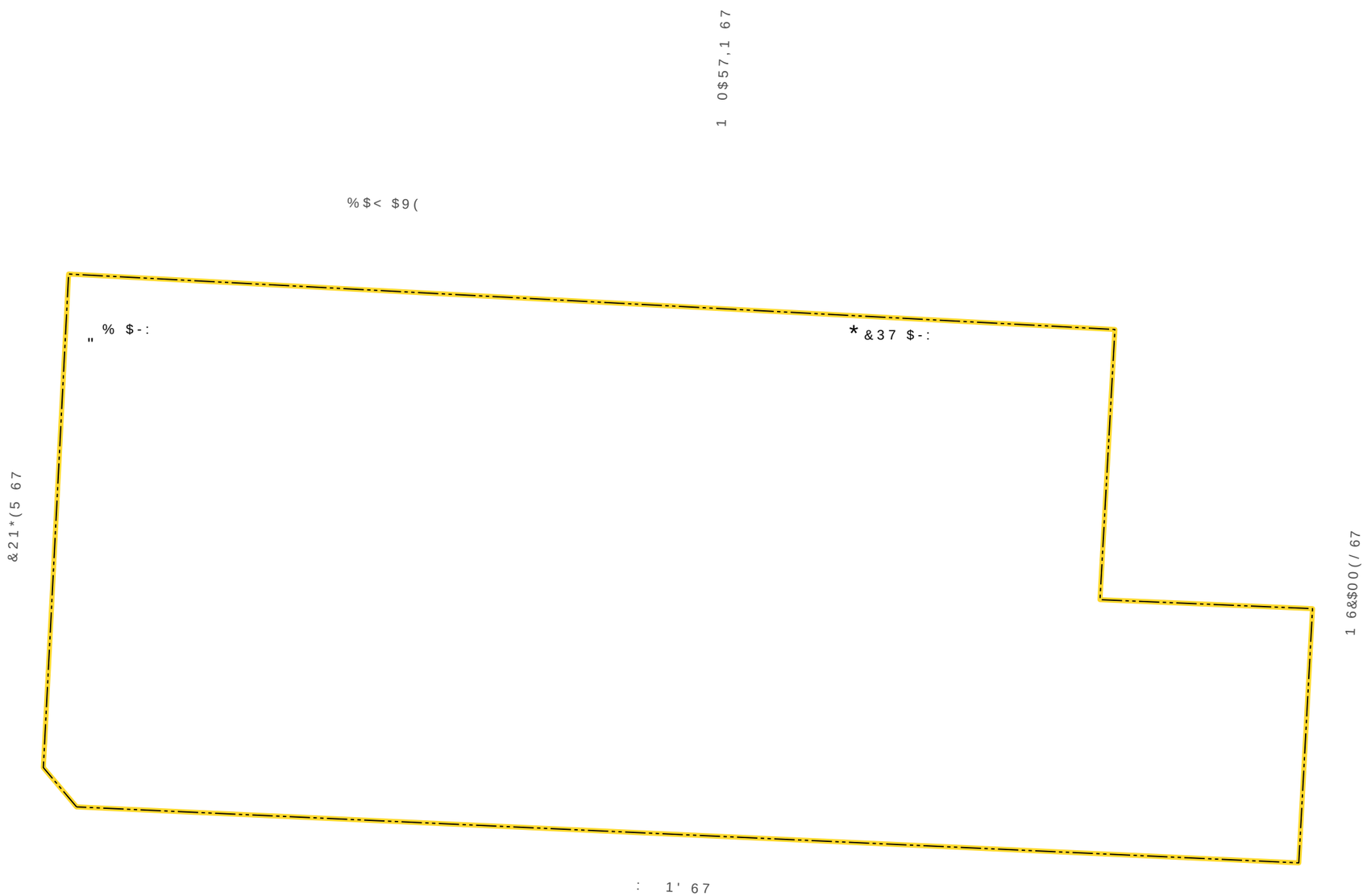

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APPENDIX A
Exploration Logs

APPENDIX A

Exploration Logs

We evaluated subsurface conditions at the site by completing one drilled boring on 16 April 2024, and performing one cone penetration test (CPT) on 10 April 2024. The field explorations were coordinated and overseen by geotechnical staff from Haley & Aldrich, Inc. who classified the various soil units encountered, obtained representative soil samples for geotechnical testing, and maintained a detailed log of the boring. Exploration logs are included in this appendix. Figure 2 of the report shows the approximate locations of the explorations. Explorations were located in the field using landmarks on site. Results of the laboratory testing are indicated on the exploration logs and are included in Appendix B.

BORING

The boring was advanced using mud rotary methods using a track-mounted CME-75 drill rig operated by Western States Soil Conservation, Inc., of Hubbard, Oregon. The boring created a hole approximately 5 inches in diameter.

SOIL SAMPLING AND CLASSIFICATION

Materials encountered in the explorations were classified in the field in general accordance with ASTM International (ASTM) Standard Practice D 2488 "Standard Practice for the Classification of Soils (Visual-Manual Procedure)." The exploration logs in this appendix show our interpretation of the exploration, sampling, and testing data. The logs indicate the depth where the soils change. Note that the change may be gradual. In the field, we classified the samples taken from the explorations according to the methods presented on the *Figure A-1, Key to Exploration Logs*. This figure also provides a legend explaining the symbols and abbreviations used in the logs.

Sampling of soils was completed at regular intervals throughout the depth of each boring. The samples were collected with a standard penetration test (SPT) sampler used in general conformance with ASTM Test Method D 1586 "Standard Method for Penetration Test and Split-Barrel Sampling of Soils." The sampler was driven by a 140-pound auto-trip hammer falling 30 inches. The *N* value, or number of blows required to drive the sampler 1 foot, or as otherwise indicated into the soils, is shown adjacent to the sample symbols on the boring logs. Disturbed samples were obtained from the SPT sampler. A piston sampler was used to collect relatively undisturbed Shelby tube samples. Samples were used for classification and laboratory testing purposes.

CONE PENETRATION TESTS

The CPT sounding was advanced by Conetec, Inc. of Seattle, Washington. The CPT was completed in general accordance with ASTM D 5778 using a seismic electronic cone penetrometer. The CPT sounding is an *in situ* test that provides assistance in characterizing subsurface stratigraphy. The test includes advancing a 35.6-millimeter-diameter cone equipped with a load cell, friction sleeve, strain gages, porous stone, and geophone through the soil profile. The cone is advanced at a rate of approximately 2 centimeters per second. Tip resistance, sleeve friction, and pore pressure are typically recorded at 0.1-meter intervals. The log of the CPT sounding is presented in this appendix.

Sample Description

Identification of soils in this report is based on visual field and laboratory observations which include density/consistency, moisture condition, grain size, and plasticity estimates and should not be construed to imply field nor laboratory testing unless presented herein. ASTM D 2488 visual-manual identification methods were used as a guide. Where laboratory testing confirmed visual-manual identifications, then ASTM D 2487 was used to classify the soils.

Relative Density/Consistency

Soil density/consistency in borings is related primarily to the standard penetration resistance (N). Soil density/consistency in test pits and probes is estimated based on visual observation and is presented parenthetically on the logs.

SAND or GRAVEL Relative Density	N (Blows/Foot)	SILT or CLAY Consistency	N (Blows/Foot)
Very loose	0 to 4	Very soft	0 to 1
Loose	5 to 10	Soft	2 to 4
Medium dense	11 to 30	Medium stiff	5 to 8
Dense	31 to 50	Stiff	9 to 15
Very dense	>50	Very stiff	16 to 30
		Hard	>30

Moisture

Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

USCS Soil Classification Chart (ASTM D 2487)

Major Divisions			Symbols: Graph	Symbols: USCS	Typical Descriptions
Coarse Grained Soils: More than 50% of Material Retained on No. 200 Sieve	Gravel and Gravelly Soils: More than 50% of Coarse Fraction Retained on No. 4 Sieve	Clean Gravels (<5% fines)		GW	Well-Graded Gravel; Well-Graded Gravel with Sand
				GP	Poorly Graded Gravel; Poorly Graded Gravel with Sand
		Gravels (5-12% fines)		GW-GM	Well-Graded Gravel with Silt; Well-Graded Gravel with Silt and Sand
				GW-GC	Well-Graded Gravel with Clay; Well-Graded Gravel with Clay and Sand
				GP-GM	Poorly Graded Gravel with Silt; Poorly Graded Gravel with Silt and Sand
				GP-GC	Poorly Graded Gravel with Clay; Poorly Graded Gravel with Clay and Sand
		Gravels with Fines (>12% fines)		GM	Silty Gravel; Silty Gravel with Sand
				GC	Clayey Gravel; Clayey Gravel with Sand
	Sand and Sandy Soils: More than 50% of Coarse Fraction Passing No. 4 Sieve	Sands with few Fines (<5% fines)		SW	Well-Graded Sand; Well-Graded Sand with Gravel
				SP	Poorly Graded Sand; Poorly Graded Sand with Gravel
		Sands (5-12% fines)		SW-SM	Well-Graded Sand with Silt Well-Graded Sand with Silt and Gravel
				SW-SC	Well-Graded Sand with Clay; Well-Graded Sand with Clay and Gravel
				SP-SM	Poorly Graded Sand with Silt; Poorly Graded Sand with Silt and Gravel
				SP-SC	Poorly Graded Sand with Clay; Poorly Graded Sand with Clay and Gravel
		Sands with Fines (>12% fines)		SM	Silty Sand; Silty Sand with Gravel
				SC	Clayey Sand; Clayey Sand with Gravel
Fine Grained Soils: More than 50% of Material Passing No. 200 Sieve	Silts			ML	Silt; Silt with Sand or Gravel; Sandy or Gravelly Silt
				MH	Elastic Silt; Elastic Silt with Sand or Gravel; Sandy or Gravelly Elastic Silt
	Silty Clay (based on Atterberg Limits)			CL-ML	Silty Clay; Silty Clay with Sand or Gravel; Gravelly or Sandy Silty Clay
	Clays			CL	Lean Clay; Lean Clay with Sand or Gravel; Sandy or Gravelly Lean Clay
				CH	Fat Clay; Fat Clay with Sand or Gravel; Sandy or Gravelly Fat Clay
	Organics			OL/OH	Organic Soil; Organic Soil with Sand or Gravel; Sandy or Gravelly Organic Soil
Highly Organic (>50% organic material)				PT	Peat - Decomposing Vegetation - Fibrous to Amorphous Texture

Minor Constituents

	Estimated Percentage
Sand, Gravel	
Trace	<5
Few	5 - 15
Cobbles, Boulders	
Trace	<5
Few	5 - 10
Little	15 - 25
Some	30 - 45

Soil Test Symbols

%F	Percent Passing No. 200 Sieve
AL	Atterberg Limits (%)
	Liquid Limit (LL)
	Water Content (WC)
	Plastic Limit (PL)
CA	Chemical Analysis
CAUC	Consolidated Anisotropic Undrained Compression
CAUE	Consolidated Anisotropic Undrained Extension
CBR	California Bearing Ratio
CIDC	Consolidated Drained Isotropic Triaxial Compression
CIUC	Consolidated Isotropic Undrained Compression
CK0DC	Consolidated Drained k0 Triaxial Compression
CK0DSS	Consolidated k0 Undrained Direct Simple Shear
CK0UC	Consolidated k0 Undrained Compression
CK0UE	Consolidated k0 Undrained Extension
CRSCN	Constant Rate of Strain Consolidation
DS	Direct Shear
DSS	Direct Simple Shear
DT	In Situ Density
GS	Grain Size Classification
HYD	Hydrometer
ILCN	Incremental Load Consolidation
K0CN	k0 Consolidation
kc	Constant Head Permeability
kf	Falling Head Permeability
MD	Moisture Density Relationship
OC	Organic Content
OT	Tests by Others
P	Pressuremeter
PID	Photoionization Detector Reading
PP	Pocket Penetrometer
SG	Specific Gravity
TRS	Torsional Ring Shear
TV	Torvane
UC	Unconfined Compression
UUC	Unconsolidated Undrained Triaxial Compression
VS	Vane Shear
WC	Water Content (%)

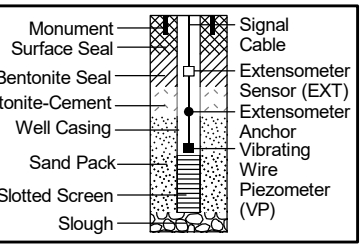
Groundwater Indicators

- Groundwater Level on Date or At Time of Drilling (ATD)
- Groundwater Level on Date Measured in Piezometer
- Groundwater Seepage (Test Pits)

Sample Symbols

- 1.5" I.D. Split Spoon
- 3.0" I.D. Split Spoon
- Modified California Sampler
- Rock Core Run
- Sonic Core
- Thin-walled Sampler
- Grab
- Cuttings
- Push Probe

Well Symbols



HALEY ALDRICH

Project: Aberdeen School District - AJ West
Location: Aberdeen, Washington
Project No.: 0210366-000

Key to Exploration Logs

Figure **A-1**
Sheet **1 of 1**

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Date Started: 04/15/2024	Date Completed: 04/16/2024	Drilling Contractor/Crew: Western States Soil Conservation, Inc. / Ray	
Logged by: S. Sirmans	Checked by: M. Hintz	Drilling Method: Mud Rotary	
Location: Lat: 46.972192 Long: -123.838878 (WGS 84)		Rig Model/Type: CME-75 / Truck-mounted drill rig	
Ground Surface Elevation: 11.14 feet (NAVD 88)		Hammer Type: Auto-hammer	
Comments: Hand augered to 4.5 ft.		Hammer Weight (pounds): 140	Hammer Drop Height (inches): 30
		Measured Hammer Efficiency (%): 90.6	
		Hole Diameter: 5 inches	Well Casing Diameter: NA
		Total Depth: 125.5 feet	Depth to Groundwater: 4.5 feet

Elevation (feet)	Depth (feet)	Sample Data: Blow Count	Type	Recovery	Length (inches)	Number / Tests	Graphic Log	Material Description	Water Level	PL WC (%) LL; Fines Content (%); SPT N Value	Depth (feet)
10	0					S-1		Topsoil (18-inches thick).			0
						S-2		POORLY GRADED SAND WITH GRAVEL (SP), loose, dry, red-brown, trace organics. [FILL]			
						S-3					
						S-4 AL, WC		ELASTIC SILT (MH), soft, moist, gray, scattered black organics [ALLUVIUM]	ATD	114.8	
5	5	1 0 1		15in.	18	S-5 GS, WC		SILTY SAND WITH GRAVEL (SM), very loose, wet, dark gray, strong organic odor.		47 91.0 1	5
		0 0 0		0in.	18	S-6				0	
0	10			24in.	24	S-7					10
		0 0 0		4in.	18	S-8 WC		ELASTIC SILT (MH), very soft, wet, gray, trace organics.		66.1 0	
-5	15	0 0 0		18in.	18	S-9 AL, WC				88.5 0	15
		0 0 0		18in.	18	S-10 WC				85.8 0	
-10	20	0 0 0		81in.	18	S-11 GS, WC				92 84.3 0	20
		0 0 0		5in.	18	S-12 WC				81.6 0	
-15	25	0 0 0		18in.	18	S-13				0	25
		0 0 0		0in.	18	S-14				0	
-20	30	0 0 0		18in.	18	S-15 WC				80.4 0	30
		0 0 0		0in.	18	S-16				0	
-25	35	2 1 2		18in.	18	S-17 GS, WC		ELASTIC SILT WITH SAND (MH), soft, wet, gray.		75 72.7 3	35
				24in.	24	S-18					

General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HALEY ALDRICH

Project: Aberdeen School District - AJ West
Location: Aberdeen, Washington
Project No.: 0210366-000

Boring Log
B-AJW01

Figure **A**
Sheet **1 of 4**

HA BORING LOG - \\HALEYALDRICH.COM\SHARE\SEA_DATA\GINT\HC_LIBRARY.GLB - 6/12/24 09:28 - \\HALEYALDRICH.COM\SHARE\CORPROJECTS\V2\10366\GINT\PERMANENT GINT FILE\0210366-000_ABERDEEN SCHOOL DISTRICT-AJ WEST_GINT.GPJ - Model

Date Started: 04/15/2024	Date Completed: 04/16/2024	Drilling Contractor/Crew: Western States Soil Conservation, Inc. / Ray	
Logged by: S. Sirmans	Checked by: M. Hintz	Drilling Method: Mud Rotary	
Location: Lat: 46.972192 Long: -123.838878 (WGS 84)		Rig Model/Type: CME-75 / Truck-mounted drill rig	
Ground Surface Elevation: 11.14 feet (NAVD 88)		Hammer Type: Auto-hammer	
Comments: Hand augered to 4.5 ft.		Hammer Weight (pounds): 140	Hammer Drop Height (inches): 30
		Measured Hammer Efficiency (%): 90.6	
		Hole Diameter: 5 inches	Well Casing Diameter: NA
		Total Depth: 125.5 feet	Depth to Groundwater: 4.5 feet

Elevation (feet)	Depth (feet)	Sample Data: Blow Count	Type	Recovery	Length (inches)	Number / Tests	Graphic Log	Material Description	Water Level	PL WC (%) LL; ✖ Fines Content (%); ▲ SPT N Value	Depth (feet)
40	40	1 1 1		16in.	18	S-19 GS, WC		SILTY SAND (SM), very loose, wet, gray.		▲2 ✖36	40
45	45	1 4 1		15in.	18	S-20 WC		becomes loose		▲5	45
50	50	2 5 3		14in.	18	S-21 GS, WC				▲8 ✖25	50
55	55	2 5 4		12in.	18	S-22				▲9	55
60	60	7 7 6		13in.	18	S-23 GS, WC		becomes medium dense		▲13 ✖19	60
65	65	6 11 17		14in.	18	S-24				▲28	65
70	70	31 50		10in.	10	S-25 GS, WC		becomes very dense		✖31 ▲50/4"	70
75	75	2 0 1		16in.	18	S-26 GS, WC		becomes very loose, trace organics SANDY SILT (ML), very soft, wet, gray.		▲1 ✖59 ■53.4	75

General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HALEY ALDRICH

Project: Aberdeen School District - AJ West
Location: Aberdeen, Washington
Project No.: 0210366-000

Boring Log
B-AJW01

Figure **A**
Sheet **2 of 4**

HA BORING LOG - \\HALEYALDRICH.COM\SHARE\SEA_DATA\GINT\HC_LIBRARY.GLB - 6/12/24 09:28 - \\HALEYALDRICH.COM\SHARE\CORPROJECTS\0210366\GINT\PERMANENT GINT FILE\0210366-000_ABERDEEN SCHOOL DISTRICT-AJ WEST_GINT.GPJ - kbutler

Date Started: 04/15/2024	Date Completed: 04/16/2024	Drilling Contractor/Crew: Western States Soil Conservation, Inc. / Ray	
Logged by: S. Sirmans	Checked by: M. Hintz	Drilling Method: Mud Rotary	
Location: Lat: 46.972192 Long: -123.838878 (WGS 84)		Rig Model/Type: CME-75 / Truck-mounted drill rig	
Ground Surface Elevation: 11.14 feet (NAVD 88)		Hammer Type: Auto-hammer	
Comments: Hand augered to 4.5 ft.		Hammer Weight (pounds): 140	Hammer Drop Height (inches): 30
		Measured Hammer Efficiency (%): 90.6	
		Hole Diameter: 5 inches	Well Casing Diameter: NA
		Total Depth: 125.5 feet	Depth to Groundwater: 4.5 feet

Elevation (feet)	Depth (feet)	Sample Data: Blow Count	Type	Recovery	Length (inches)	Number / Tests	Graphic Log	Material Description	Water Level	PL WC (%) LL; Fines Content (%); SPT N Value	Depth (feet)
80	-70	3 4 6		18in.	18	S-27 GS, WC		SILTY SAND (SM), medium dense, wet, gray, fine sand, trace organics.		10; 43	80
85	-75	4 4 9		18in.	18	S-28				13	85
90	-80	9 8 12		18in.	18	S-29				20	90
95	-85	0 0 0		18in.	18	S-30		SILT WITH SAND (ML), very soft, wet, gray, scattered organics.		0	95
100	-90			24in.	24	S-31					100
105	-95	0 0 0		18in.	18	S-32				0	105
110	-100	0 2 3		18in.	18	S-33		becomes medium stiff		5	110
115	-105	1 4 8		18in.	18	S-34		POORLY GRADED SAND WITH SILT (SP-SM), medium dense, wet, gray, fine sand, trace organics.		12	115

General Notes:
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Date Started: 04/15/2024	Date Completed: 04/16/2024	Drilling Contractor/Crew: Western States Soil Conservation, Inc. / Ray	
Logged by: S. Sirmans	Checked by: M. Hintz	Drilling Method: Mud Rotary	
Location: Lat: 46.972192 Long: -123.838878 (WGS 84)		Rig Model/Type: CME-75 / Truck-mounted drill rig	
Ground Surface Elevation: 11.14 feet (NAVD 88)		Hammer Type: Auto-hammer	
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		Measured Hammer Efficiency (%): 90.6	
		Hole Diameter: 5 inches	Well Casing Diameter: NA
		Total Depth: 125.5 feet	Depth to Groundwater: 4.5 feet

Elevation (feet)	Depth (feet)	Sample Data: Blow Count	Type	Recovery	Length (inches)	Number / Tests	Graphic Log	Material Description	Water Level	PL WC (%) LL; ✖ Fines Content (%); ▲ SPT N Value (10 20 30 40)	Depth (feet)
120								POORLY GRADED SAND WITH SILT (SP-SM), medium dense, wet, gray, fine sand, trace organics. *(continued)*			120
-110											
		32 42 50		10in.	17	S-35		WELL-GRADED SAND WITH SILT AND GRAVEL (SW-SM), very dense, wet, gray, fine gravel, weathered rock. [MONTESANO FORMATION]		▲ 92/11"	
125								Bottom of Borehole at 125.5 feet.			125
-115											
130											130
-120											
135											135
-125											
140											140
-130											
145											145
-135											
150											150
-140											
155											155
-145											

General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HALEY ALDRICH

Project: Aberdeen School District - AJ West
Location: Aberdeen, Washington
Project No.: 0210366-000

Boring Log
B-AJW01

Figure **A**
Sheet **4 of 4**

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PRESENTATION OF SITE INVESTIGATION RESULTS

Aberdeen Schools

Prepared for:

Client Name

ConeTec Job No: **24-59-27459**

Project Start Date: 2024-04-10
Project End Date: 2024-04-11
Release Date: 2024-04-22

Report Prepared by:

ConeTec, Inc.

1237 S Director Street, Seattle, WA 98108

Tel: (253) 397-4861

ConeTecWA@conetec.com
www.conetec.com
www.conetecdataservices.com



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ABOUT THIS REPORT

The enclosed report presents the results of the site investigation program conducted by ConeTec, Inc. for Client Name.

Please note that this report, which also includes all accompanying data, are subject to the 3rd Party Disclaimer and Client Disclaimer that follow in the 'Limitations' section of this report. Please refer to the list of attached documents following the text of this report. A site map, test summaries, and test plots are all included in the body of the report.

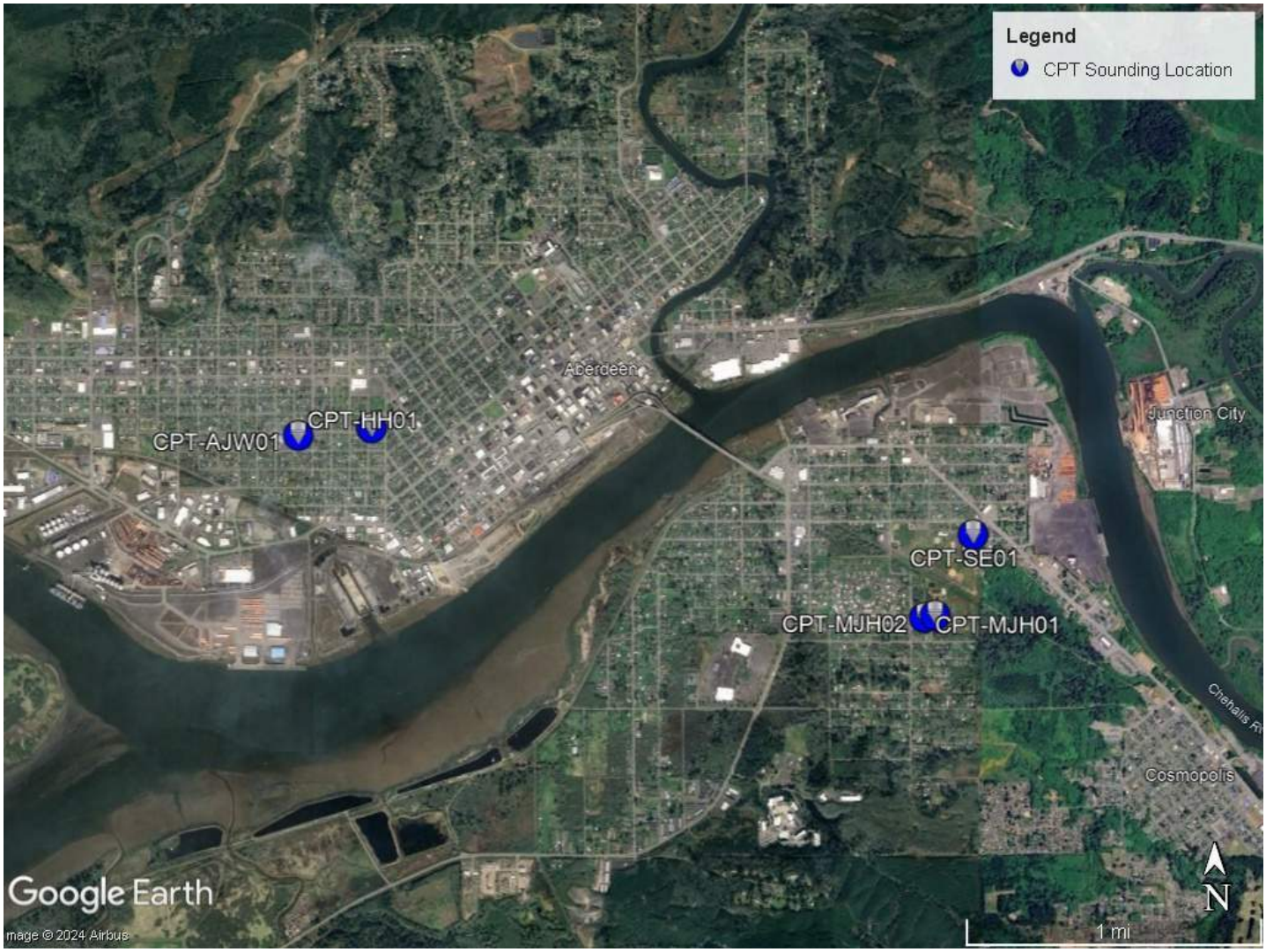
Project	
Client	Client Name
Project	Aberdeen Schools
ConeTec Project Number	24-59-27459
Test Types	SCPTu
Additional Comments	None

Contents

The following listed below are included in the body of this report:

- **Site Map**
- **Limitations and Closure**
- **Project Information**
- **Methodology Statements**
- **Report Appendices**

SITE MAP



All locations are approximate unless otherwise stated in the body of the report.

ConeTec Job Number: 24-59-27459

Client: Client Name

Project: Aberdeen Schools

Date: 2024-04-22

ConeTec

LIMITATIONS

3rd Party Disclaimer

The "Report" refers to this report titled: Aberdeen Schools

The Report was prepared by ConeTec for: Client Name

The Report is confidential and may not be distributed to or relied upon by any third parties without the express written consent of ConeTec. Any third parties gaining access to the Report do not acquire any rights as a result of such access. Any use which a third party makes of the Report, or any reliance on or decisions made based on it, are the responsibility of such third parties. ConeTec accepts no responsibility for loss, damage and/or expense, if any, suffered by any third parties as a result of decisions made, or actions taken or not taken, which are in any way based on, or related to, the Report or any portion(s) thereof.

Client Disclaimer

ConeTec was retained by: Client Name

The "Report" refers to this report titled: Aberdeen Schools

ConeTec was retained to collect and provide the raw data ("Data") which is included in the Report.

ConeTec has collected and reported the Data in accordance with current industry standards. No other warranty, express or implied, with respect to the Data is made by ConeTec. In order to properly understand the Data included in the Report, reference must be made to the documents accompanying and other sources referenced in the Report in their entirety. Other than the Data, the contents of the Report (including any Interpretations) should not be relied upon in any fashion without independent verification and ConeTec is in no way responsible for any loss, damage or expense resulting from the use of, and/or reliance on, such material by any party.

Closure

Thank you for the opportunity to work on this project. The equipment used as well the field procedures followed, all complied with current accepted best practice standards.

Report prepared by: MH, JM

PROJECT INFORMATION

Rig		
Description	**Deployment System**	**Test Type**
C02-020 CPT Truck Rig	Twin mounted cylinders	SCPTu

Coordinates		
Test Type	**Collection Method**	**EPSG Number**
SCPTu	Consumer Grade GPS	4326 (WGS84 / LatLong)

Piezocones Used for this Project						
Cone Description	**Cone Number**	**Cross Sectional Area** (cm^2)	**Sleeve Area** (cm^2)	**Tip Capacity** (bar)	**Sleeve Capacity** (bar)	**Pore Pressure Capacity** (bar)
EC1065:T1500F15U35	1065	15	225	1500	15	35

Cone Penetration Test (CPTu)	
Depth reference	Depths are referenced to the existing ground surface at the time of each test.
Tip and sleeve data offset	0.1 Meters. This has been accounted for in the CPT data files.

Calculated Geotechnical Parameters	
Additional information	The Normalized Soil Behaviour Type Chart based on Q_{tn} (SBT Q_{tn}) (Robertson, 2009) was used to classify the soil for this project. A detailed set of calculated CPTu parameters have been generated and are provided in Excel format files in the release folder. The CPTu parameter calculations are based on values of corrected tip resistance (q_t) sleeve friction (f_s) and pore pressure (u_2). Effective stresses are calculated based on unit weights that have been assigned to the individual soil behaviour type zones and the assumed equilibrium pore pressure profile. Soils were classified as either drained or undrained based on the Q_{tn} Normalized Soil Behaviour Type Chart (Robertson, 2009). Calculations for both drained and undrained parameters were included for materials that classified as silt mixtures (zone 4).

Methodology Statements and Data File Formats

CONETEC

METHODOLOGY STATEMENTS



CONE PENETRATION TEST (CPTu) - eSeries

Cone penetration tests (CPTu) are conducted using an integrated electronic piezocone penetrometer and data acquisition system manufactured by Adara Systems Ltd., a subsidiary of ConeTec.

ConeTec's piezocone penetrometers are compression type designs in which the tip and friction sleeve load cells are independent and have separate load capacities. The piezocones use strain gauged load cells for tip and sleeve friction and a strain gauged diaphragm type transducer for recording pore pressure. The piezocones also have a platinum resistive temperature device (RTD) for monitoring the temperature of the sensors, an accelerometer type dual axis inclinometer and two geophone sensors for recording seismic signals. All signals are amplified and measured with minimum sixteen-bit resolution down hole within the cone body, and the signals are sent to the surface using a high bandwidth, error corrected digital interface through a shielded cable.

ConeTec penetrometers are manufactured with various tip, friction and pore pressure capacities in both 10 cm^2 and 15 cm^2 tip base area configurations in order to maximize signal resolution for various soil conditions. The specific piezocone used for each test is described in the CPT summary table. The 15 cm^2 penetrometers do not require friction reducers as they have a diameter larger than the deployment rods. The 10 cm^2 piezocones use a friction reducer consisting of a rod adapter extension behind the main cone body with an enlarged cross sectional area (typically 44 millimeters diameter over a length of 32 millimeters with tapered leading and trailing edges) located at a distance of 585 millimeters above the cone tip.

The penetrometers are designed with equal end area friction sleeves, a net end area ratio of 0.8 and cone tips with a 60 degree apex angle.

All ConeTec piezocones can record pore pressure at various locations. Unless otherwise noted, the pore pressure filter is located directly behind the cone tip in the "u_2" position (ASTM Type 2). The filter is six millimeters thick, made of porous plastic (polyethylene) having an average pore size of 125 microns (90-160 microns). The function of the filter is to allow rapid movements of extremely small volumes of water needed to activate the pressure transducer while preventing soil ingress or blockage.

The piezocone penetrometers are manufactured with dimensions, tolerances and sensor characteristics that are in general accordance with the current ASTM D5778 standard. ConeTec's calibration criteria also meets or exceeds those of the current ASTM D5778 standard. An illustration of the piezocone penetrometer is presented in Figure CPTu.

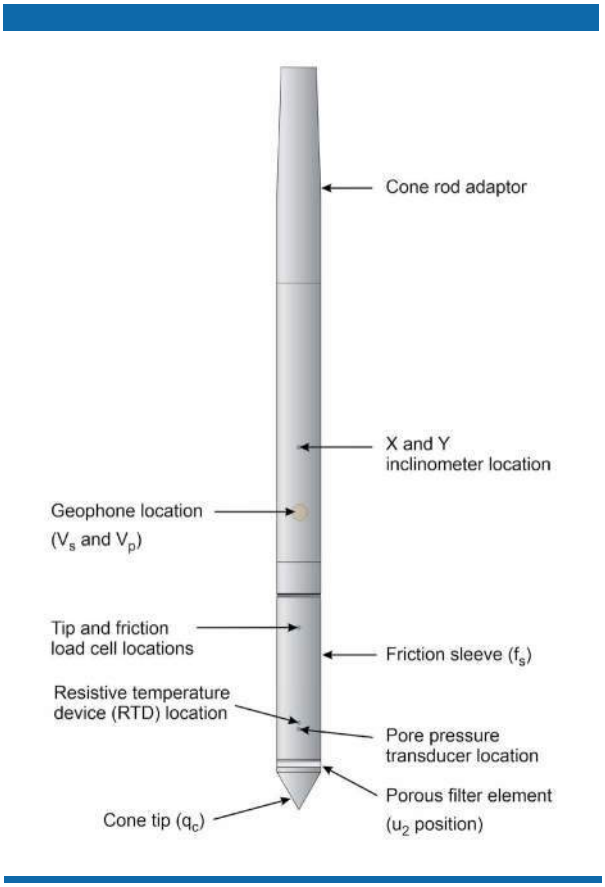


Figure CPTu. Piezocone Penetrometer (15 cm²)

The ConeTec data acquisition system consists of a Windows based computer, signal interface box, and power supply. The signal interface combines depth increment signals, seismic trigger signals and the downhole digital data. This combined data is then sent to the Windows based computer for collection and presentation. The data is recorded at fixed depth increments using a depth encoder that is either portable or integrated into the rig. The typical recording interval is 2.5 centimeters; custom recording intervals are possible.

The system displays the CPTu data in real time and records the following parameters to a storage media during penetration:

- Depth
- Uncorrected tip resistance (q_c)
- Sleeve friction (f_s)
- Dynamic pore pressure (u)
- Additional sensors such as resistivity, passive gamma, ultra violet induced fluorescence, if applicable

All testing is performed in accordance to ConeTec's CPTu operating procedures which are in general accordance with the current ASTM D5778 standard.

Prior to the start of a CPTu sounding a suitable cone is selected, the cone and data acquisition system are powered on, the pore pressure system is saturated with silicone oil and the baseline readings are recorded with the cone hanging freely in a vertical position.

The CPTu is conducted at a steady rate of two centimeters per second, within acceptable tolerances. Typically one meter length rods with an outer diameter of 1.5 inches are added to advance the cone to the sounding termination depth. After cone retraction final baselines are recorded.

Additional information pertaining to ConeTec's cone penetration testing procedures:

- Each filter is saturated in silicone oil under vacuum pressure prior to use
- Baseline readings are compared to previous readings
- Soundings are terminated at the client's target depth or at a depth where an obstruction is encountered, excessive rod flex occurs, excessive inclination occurs, equipment damage is likely to take place, or a dangerous working environment arises
- Differences between initial and final baselines are calculated to ensure zero load offsets have not occurred and to ensure compliance with ASTM standards

The interpretation of piezocone data for this report is based on the corrected tip resistance (q_t), sleeve friction (f_s) and pore water pressure (u). The interpretation of soil type is based on the correlations developed by Robertson, P.K., 2010. The Soil Behavior Type (SBT) classification chart developed by Robertson, P.K., 2010 is presented in Figure SBT. It should be noted that it is not always possible to accurately identify a soil behavior type based on these parameters. In these situations, experience, judgment and an assessment of other parameters may be used to infer soil behavior type.

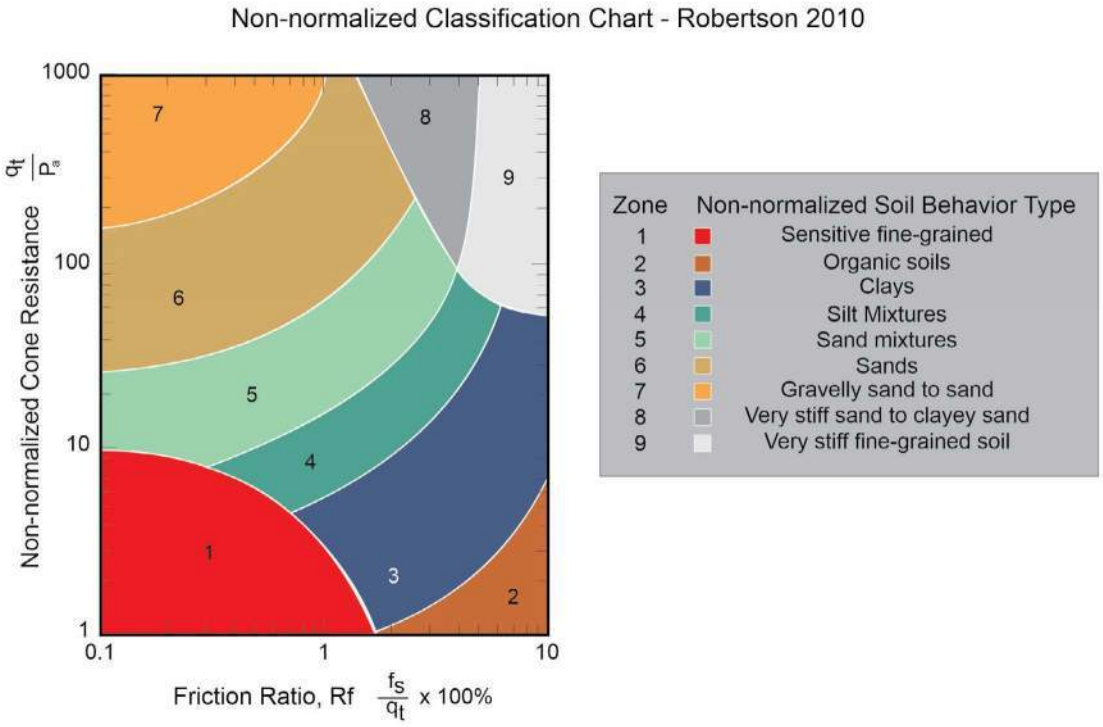


Figure SBT. Non-Normalized Soil Behavior Type Classification Chart (SBT)

The recorded tip resistance (q_c) is the total force acting on the piezocone tip divided by its base area. The tip resistance is corrected for pore pressure effects and termed corrected tip resistance (q_t) according to the following expression presented in Robertson et al. (1986):

$$q_t = q_c + (1-a) \bullet u_2$$

where: q_t is the corrected tip resistance
q_c is the recorded tip resistance
u_2 is the recorded dynamic pore pressure behind the tip (u_2 position)
a is the Net Area Ratio for the piezocone (0.8 for ConeTec probes)

The sleeve friction (f_s) is the frictional force on the sleeve divided by its surface area. As all ConeTec piezocones have equal end area friction sleeves, pore pressure corrections to the sleeve data are not required.

The dynamic pore pressure (u) is a measure of the pore pressures generated during cone penetration. To record equilibrium pore pressure, the penetration must be stopped to allow the dynamic pore pressures to stabilize. The rate at which this occurs is predominantly a function of the permeability of the soil and the diameter of the cone.

The friction ratio (Rf) is a calculated parameter. It is defined as the ratio of sleeve friction to the tip resistance expressed as a percentage. Generally, saturated cohesive soils have low tip resistance, high friction ratios and generate large excess pore water pressures. Cohesionless soils have higher tip resistances, lower friction ratios and do not generate significant excess pore water pressure.

For additional information on CPTu interpretations and calculated geotechnical parameters, refer to Robertson et al. (1986), Lunne et al. (1997), Robertson (2009), Mayne (2013, 2014) and Mayne and Peuchen (2012).

REFERENCES

ASTM D5778-20, 2020, “Standard Test Method for Performing Electronic Friction Cone and Piezocone Penetration Testing of Soils”, ASTM International, West Conshohocken, PA. DOI: 10.1520/D5778-20.

Lunne, T., Robertson, P.K. and Powell, J. J. M., 1997, “Cone Penetration Testing in Geotechnical Practice”, Blackie Academic and Professional.

Mayne, P.W., 2013, “Evaluating yield stress of soils from laboratory consolidation and in-situ cone penetration tests”, Sound Geotechnical Research to Practice (Holtz Volume) GSP 230, ASCE, Reston/VA: 406-420. DOI: 10.1061/9780784412770.027.

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Mayne, P.W., 2014, “Interpretation of geotechnical parameters from seismic piezocone tests”, CPT’14 Keynote Address, Las Vegas, NV, May 2014.

Robertson, P.K., Campanella, R.G., Gillespie, D. and Greig, J., 1986, “Use of Piezometer Cone Data”, Proceedings of InSitu 86, ASCE Specialty Conference, Blacksburg, Virginia.

Robertson, P.K., 2009, “Interpretation of cone penetration tests – a unified approach”, Canadian Geotechnical Journal, Volume 46: 1337-1355. DOI: 10.1139/T09-065.

Robertson, P.K., 2010. Soil behavior type from the CPT: an update. 2nd International Symposium on Cone Penetration Testing, CPT’10, Huntington Beach, CA, USA

PORE PRESSURE DISSIPATION TEST

The cone penetration test is halted at specific depths to carry out pore pressure dissipation (PPD) tests, shown in Figure PPD-1. For each dissipation test the cone and rods are decoupled from the rig and the data acquisition system measures and records the variation of the pore pressure (u) with time (t).

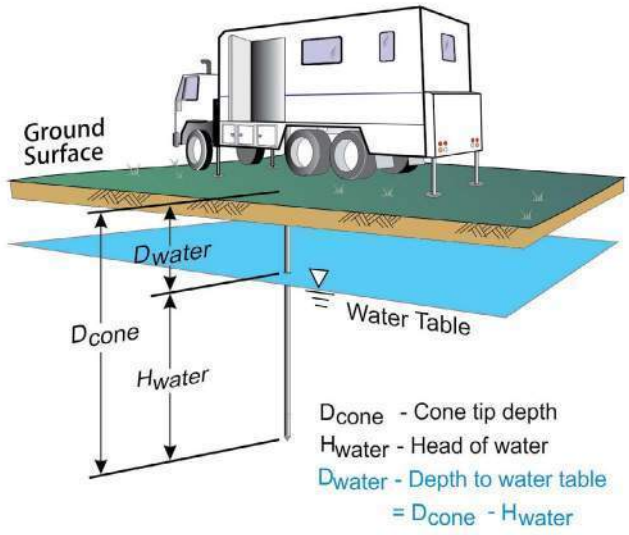


Figure PPD-1. Pore pressure dissipation test setup

Pore pressure dissipation data can be interpreted to provide estimates of ground water conditions, permeability, consolidation characteristics and soil behavior.

The typical shapes of dissipation curves shown in Figure PPD-2 are very useful in assessing soil type, drainage, in situ pore pressure and soil properties. A flat curve that stabilizes quickly is typical of a freely draining sand. Undrained soils such as clays will typically show positive excess pore pressure and have long dissipation times. Dilative soils will often exhibit dynamic pore pressures below equilibrium that then rise over time. Overconsolidated fine-grained soils will often exhibit an initial dilatory response where there is an initial rise in pore pressure before reaching a peak and dissipating.

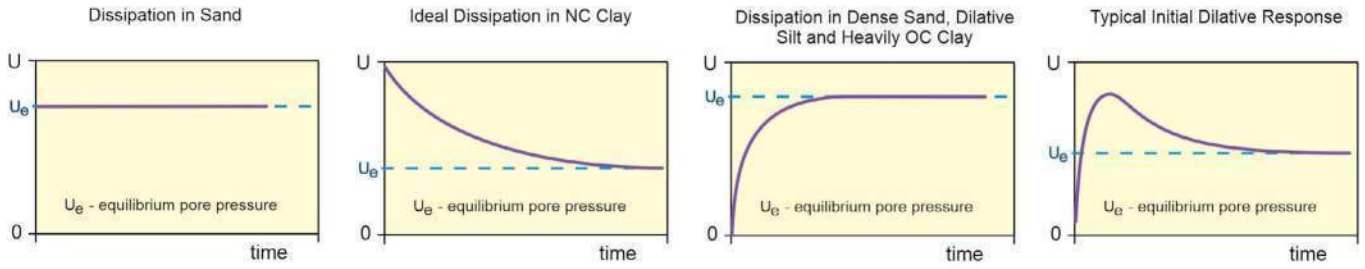
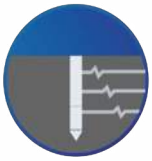


Figure PPD-2. Pore pressure dissipation curve examples

In order to interpret the equilibrium pore pressure (u_{eq}) and the apparent phreatic surface, the pore pressure should be monitored until such time as there is no variation in pore pressure with time as shown for each curve in Figure PPD-2.



SEISMIC CONE PENETRATION TEST (SCPTu) - eSeries

Shear wave velocity (Vs) testing is performed in conjunction with the piezocone penetration test (SCPTu) in order to collect interval velocities. For some projects seismic compression wave velocity (Vp) testing is also performed.

ConeTec's piezocone penetrometers are manufactured with one horizontally active geophone (28 hertz) and one vertically active geophone (28 hertz). Both geophones are rigidly mounted in the body of the cone penetrometer, 0.2 meters behind the cone tip. The vertically mounted geophone is more sensitive to compression waves.

Shear waves are typically generated by using an impact hammer horizontally striking a beam that is held in place by a normal load. In some instances, an auger source or an imbedded impulsive source may be used for both shear waves and compression waves. The hammer and beam act as a contact trigger that initiates the recording of the seismic wave traces. For impulsive devices an accelerometer trigger may be used. The traces are recorded in the memory of the cone using a fast analog to digital converter. The seismic trace is then transmitted digitally uphole to a Windows based computer through a signal interface box for recording and analysis. An illustration of the shear wave testing configuration is presented in Figure SCPTu-1.

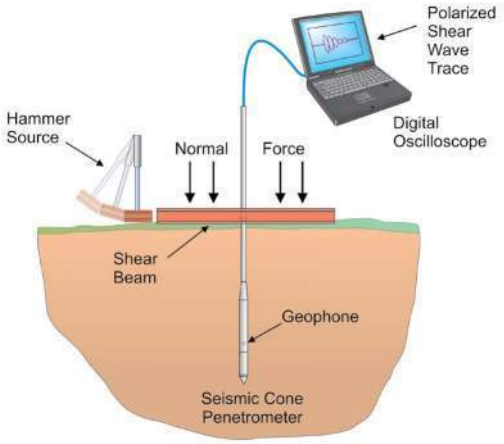


Figure SCPTu-1. Illustration of the SCPTu system

All testing is performed in accordance to ConeTec's SCPTu operating procedures which are in general accordance with the current ASTM D5778 and ASTM D7400 standards.

Prior to the start of a SCPTu sounding, the procedures described in the Cone Penetration Test section are followed. In addition, the active axis of the geophone is aligned parallel to the beam (or source) and the horizontal offset between the cone and the source is measured and recorded.

Prior to recording seismic waves at each test depth, cone penetration is stopped and the rods are decoupled from the rig to avoid transmission of rig energy down the rods. Typically, five wave traces for each orientation are recorded for quality control and uncertainty analysis purposes. After reviewing wave traces for consistency the cone is pushed to the next test depth (typically one meter intervals or as requested by the client). Figure SCPTu-2 presents an illustration of a SCPTu test.

For additional information on seismic cone penetration testing refer to Robertson et al. (1986).

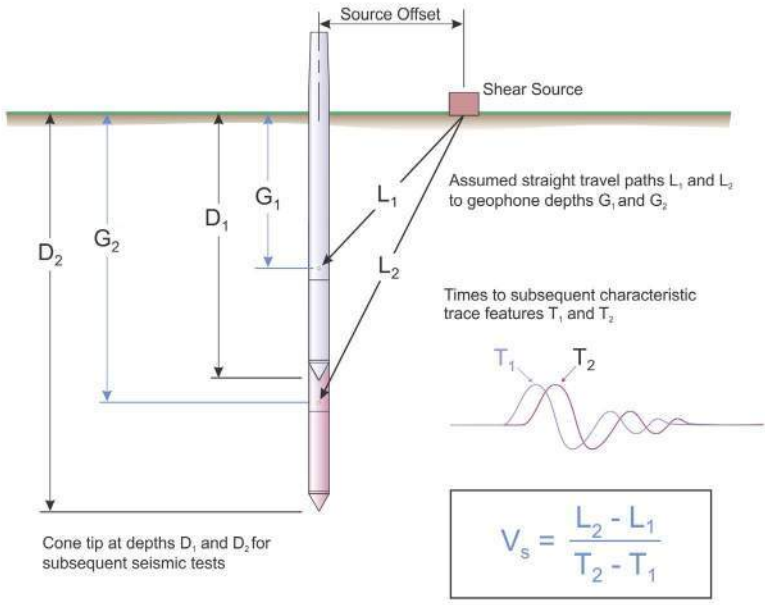


Figure SCPTu-2. Illustration of a seismic cone penetration test

For the determination of interval travel times the wave traces from all depths are displayed in analysis software. The results of the interval picks are supplied in the relevant appendix of this report. Standard practice for ConeTec is to record five wave traces for each source direction at each test depth. Outlier impacts are identified in the field and the impacts are repeated. For the final wave trace profile, the traces are stacked in the time domain to display a single average trace.

Calculation of the interval velocities are performed by visually picking a common feature (e.g. the first characteristic peak, trough, or crossover) on all of the recorded wave sets and taking the difference in ray path divided by the time difference between subsequent features. Ray path is defined as the straight line distance from the seismic source to the geophone, accounting for beam offset, source depth and geophone offset from the cone tip.

In some cases, usually for shear wave velocity testing, more than one characteristic marker may be used. If there is an overlap between different sets of characteristic markers, then the average time value for those sets of interval times is applied to the determination of velocity.

Ideally, all depths are used for the determination of the velocity profile. However, an interval may be skipped if there is some ambiguity or quality concern with a particular depth, resulting in a larger interval.

Tabular velocity results and SCPTu plots are presented in the relevant appendix.

For all SCPTu soundings that have achieved a depth of at least 100 feet (30 meters), the average shear wave velocity to a depth of 100 feet ($\overline{v}_S$) has been calculated and provided for all applicable soundings using the following equation presented in ASCE (2010).

$$\bar{v}_s = \frac{\sum_{i=1} d_i}{\sum_{i=1}^{n} \frac{d_i}{v_{si}}}$$

where: $\bar{v}_s$ = average shear wave velocity ft/s (m/s)
d_i = the thickness of any layer between 0 and 100 ft (30 m)
v_{si} = the shear wave velocity in ft/s (m/s)
$\sum_{i=1}^{n} d_i$ = the total thickness of all layers between 0 and 100 ft (30 m)

Average shear wave velocity, $\bar{v}_s$ is also referenced to V_{s100} or V_{s30}.

The layer travel times refers to the travel times propagating in the vertical direction, not the measured travel times from an offset source.

REFERENCES

American Society of Civil Engineers (ASCE), 2010, "Minimum Design Loads for Buildings and Other Structures", Standard ASCE/ SEI 7-10, American Society of Civil Engineers, ISBN 978-0-7844-1085-1, Reston, Virginia. DOI: 10.1061/9780784412916.

ASTM D5778-20, 2020, "Standard Test Method for Performing Electronic Friction Cone and Piezocone Penetration Testing of Soils", ASTM International, West Conshohocken, PA. DOI: 10.1520/D5778-20.

ASTM D7400/D7400M-19, 2019, "Standard Test Methods for Downhole Seismic Testing", ASTM International, West Conshohocken, PA. DOI: 10.1520/D7400_D7400M-19.

Robertson, P.K., Campanella, R.G., Gillespie D and Rice, A., 1986, "Seismic CPT to Measure In-Situ Shear Wave Velocity", Journal of Geotechnical Engineering ASCE, Vol. 112, No. 8: 791-803. DOI: 10.1061/(ASCE)0733-9410(1986)112:8(791).

CONE PENETRATION DIGITAL FILE FORMATS - eSeries

CPT Data Files (COR Extension)

ConeTec CPT data files are stored in ASCII text files that are readable by almost any text editor. ConeTec file names start with the job number (which includes the two digit year number) an underscore as a separating character, followed by two letters based on the type of test and the sounding ID. The last character position is reserved for an identifier letter (such as b, c, d etc) used to uniquely distinguish multiple soundings at the same location. The CPT sounding file has the extension COR. As an example, for job number 21-02-00001 the first CPT sounding will have file name 21-02-00001_CP01.COR

The sounding (COR) file consists of the following components:

1. Two lines of header information
2. Data records
3. End of data marker
4. Units information

Header Lines

Line 1: Columns 1-6 may be blank or may indicate the version number of the recording software
Columns 7-21 contain the sounding Date and Time (Date is MM:DD:YY)
Columns 23-38 contain the sounding Operator
Columns 51-100 contain extended Job Location information

Line 2: Columns 1-16 contain the Job Location
Columns 17-32 contain the Cone ID
Columns 33-47 contain the sounding number
Columns 51-100 may contain extended sounding ID information

Data Records

The data records contain 4 or more columns of data in floating point format. A comma and spaces separate each data item:

Column 1: Sounding Depth (meters)
Column 2: Tip (q_c), recorded in units selected by the operator
Column 3: Sleeve (f_s), recorded in units selected by the operator
Column 4: Dynamic pore pressure (u), recorded in units selected by the operator
Column 5: Empty or may contain other requested data such as Gamma, Resistivity or UVIF data

End of Data Marker

After the last line of data there is a line containing an ASCII 26 (CTL-Z) character (small rectangular shaped character) followed by a newline (carriage return / line feed). This is used to mark the end of data.

Units Information

The last section of the file contains information about the units that were selected for the sounding. A separator bar makes up the first line. The second line contains the type of units used for depth, q_c, f_s and u. The third line contains the conversion values required for ConeTec's software to convert the recorded data to an internal set of base units (bar for q_c, bar for f_s and meters for u). Additional lines intended for internal ConeTec use may appear following the conversion values.

CPT Data Files (XLS Extension)

Excel format files of ConeTec CPT data are also generated from corresponding COR files. The XLS files have the same base file name as the COR file with a -BSC suffix. The information in the file is presented in table format and contains additional information about the sounding such as coordinate information, and tip net area ratio.

The BSCI suffix is given to XLS files which are enhanced versions of the BSC files and include the same data records in addition to inclination data collected for each sounding.

CPT Dissipation Files (XLS Extension)

Pore pressure dissipation files are provided in Excel format and contain each dissipation trace that exceeds a minimum duration (selected during post-processing) formatted column wise within the spreadsheet. The first column (Column A) contains the time in seconds and the second column (Column B) contains the time in minutes. Subsequent columns contain the dissipation trace data. The columns extend to the longest trace of the data set.

Detailed header information is provided at the top of the worksheet. The test depth in meters and feet, the number of points in the trace and the particular units are all presented at the top of each trace column.

CPT Dissipation files have the same naming convention as the CPT sounding files with a "–PPD" suffix.

Data Records

Each file will contain dissipation traces that exceed a minimum duration (selected during post-processing) in a particular column. The dissipation pore pressure values are typically recorded at varying time intervals throughout the trace; rapidly to start and increasing as the duration of the test lengthens. The test depth in meters and feet, the number of points in the trace and the trace number are identified at the top of each trace column.

Cone Type Designations

Cone ID	Cone Description	Tip Cross Sect. Area (cm^2)	Tip Capacity (bar)	Sleeve Area (cm^2)**	Sleeve Capacity (bar)	Pore Pressure Capacity (bar)
EC###	A15T1500F15U35	15	1500	225	15	35
EC###	A15T375F10U35	15	375	225	10	35
EC###	A10T1000F10U35	10	1000	150	10	35

refers to the Cone ID number
**Outer Cylindrical Area

REPORT APPENDICES

The appendices listed below are included in the report:

- **Cone Penetration Test (CPTu) Summary and Standard CPTu Plots**
- **Standard CPTu Plots with Reduced Scales**
- **Normalized Cone Penetration Test Plots**
- **Advanced Cone Penetration Test Plots**
- **Soil Behavior Type (SBT) Scatter Plots**
- **Pore Pressure Dissipation Test (PPDT) Summary and PPDT Plots**
- **Seismic Cone Penetration Test (SCPTu) Tabular Results**
- **SCPTu Plots**
- **SCPTu Velocity Wave Traces**
- **Supplementary Documents and Materials**

Cone Penetration Test (CPTu) Summary and Standard CPTu Plots

CONETEC

Job No: 24-59-27459
Client: Haley & Aldrich, Inc.
Project: Aberdeen Schools
Start Date: 2024-04-10
End Date: 2024-04-11

CONE PENETRATION TEST SUMMARY

Sounding ID	File Name	Date	Cone	Cone Area (cm^2)	Assumed Phreatic Surface[1] (ft)	Final Depth (ft)	Seismic Intervals	Latitude[2]	Longitude[2]	Refer to Notation Number
CPT-AJW01	24-59-27459_SP-AJW01	2024-04-10	1065:T1500F15U35	15	3.2	121.39	36	46.97223	-123.83739	
CPT-HH01	24-59-27459_SP-HH01	2024-04-10	1065:T1500F15U35	15	2.4	109.17	32	46.97258	-123.83214	
CPT-MJH01	24-59-27459_SP-MJH01	2024-04-11	1065:T1500F15U35	15	7.1	111.55	33	46.96327	-123.79191	
CPT-MJH02	24-59-27459_SP-MJH02	2024-04-11	1065:T1500F15U35	15		4.92		46.96315	-123.79268	3
CPT-SE01	24-59-27459_SP-SE01	2024-04-11	1065:T1500F15U35	15	5.8	89.32	27	46.96719	-123.78915	
Totals	5 Soundings					436.35 ft	128			

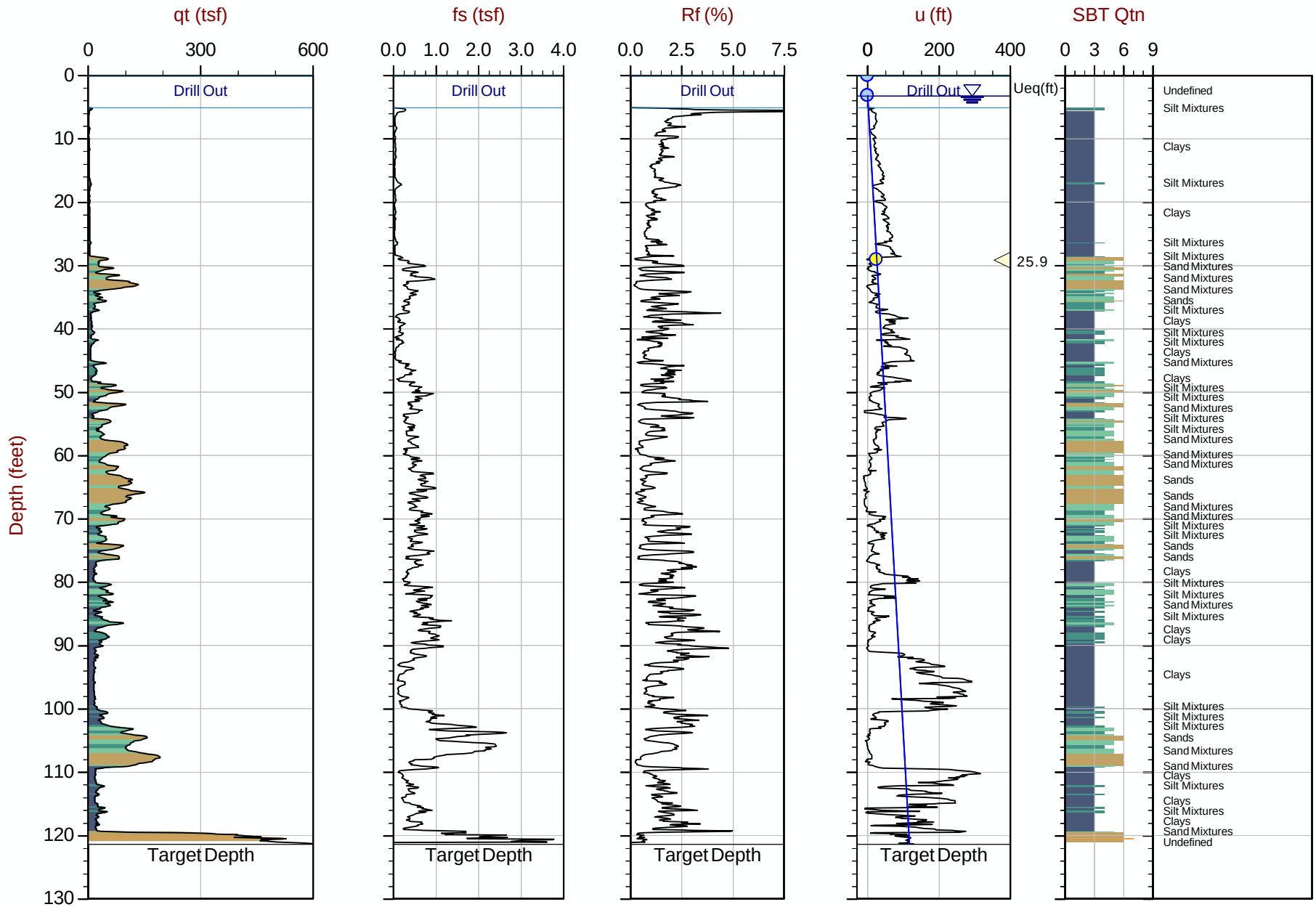
1. The assumed phreatic surface was based off the shallowest pore pressure dissipation tests performed within or nearest the sounding. Hydrostatic conditions were assumed for the calculated parameters.
2. The coordinates were collected using consumer grade GPS. EPSG number: 4326 (WGS84 / LatLong).
3. The phreatic surface is assumed to be deeper than the extent of the CPT final test depth.

CONETEC

Haley & Aldrich

Job No: 24-59-27459
Date: 2024-04-10 10:23
Site: Aberdeen Schools

Sounding: CPT-AJW01
Cone: 1065:T1500F15U35



Max Depth: 37.000 m / 121.39 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 24-59-27459_SP-AJW01.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 46.97223 Long: -123.83739

Overplot Item: Ueq, Assumed Ueq, Dissipation, Ueq achieved, Dissipation, Ueq not achieved, Dissipation, Ueq assumed, Hydrostatic Line

The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Standard CPTu Plots with Reduced Scales

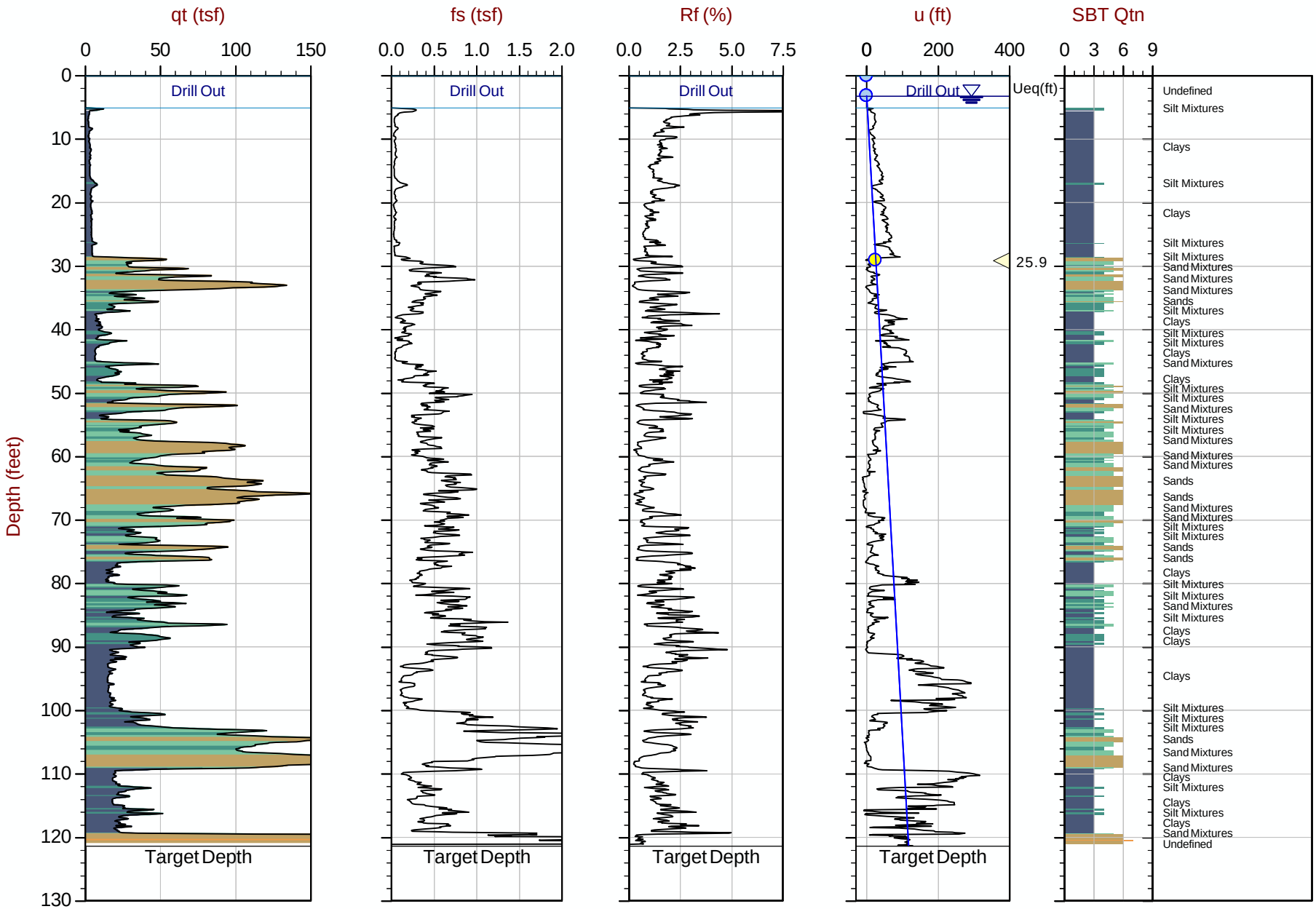
CONETEC

CONETEC

Haley & Aldrich

Job No: 24-59-27459
Date: 2024-04-10 10:23
Site: Aberdeen Schools

Sounding: CPT-AJW01
Cone: 1065:T1500F15U35



Max Depth: 37.000 m / 121.39 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 24-59-27459_SP-AJW01.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 46.97223 Long: -123.83739

Overplot Item: Ueq, Assumed Ueq, Dissipation, Ueq achieved, Dissipation, Ueq not achieved, Dissipation, Ueq assumed, Hydrostatic Line

The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Normalized Cone Penetration Test Plots

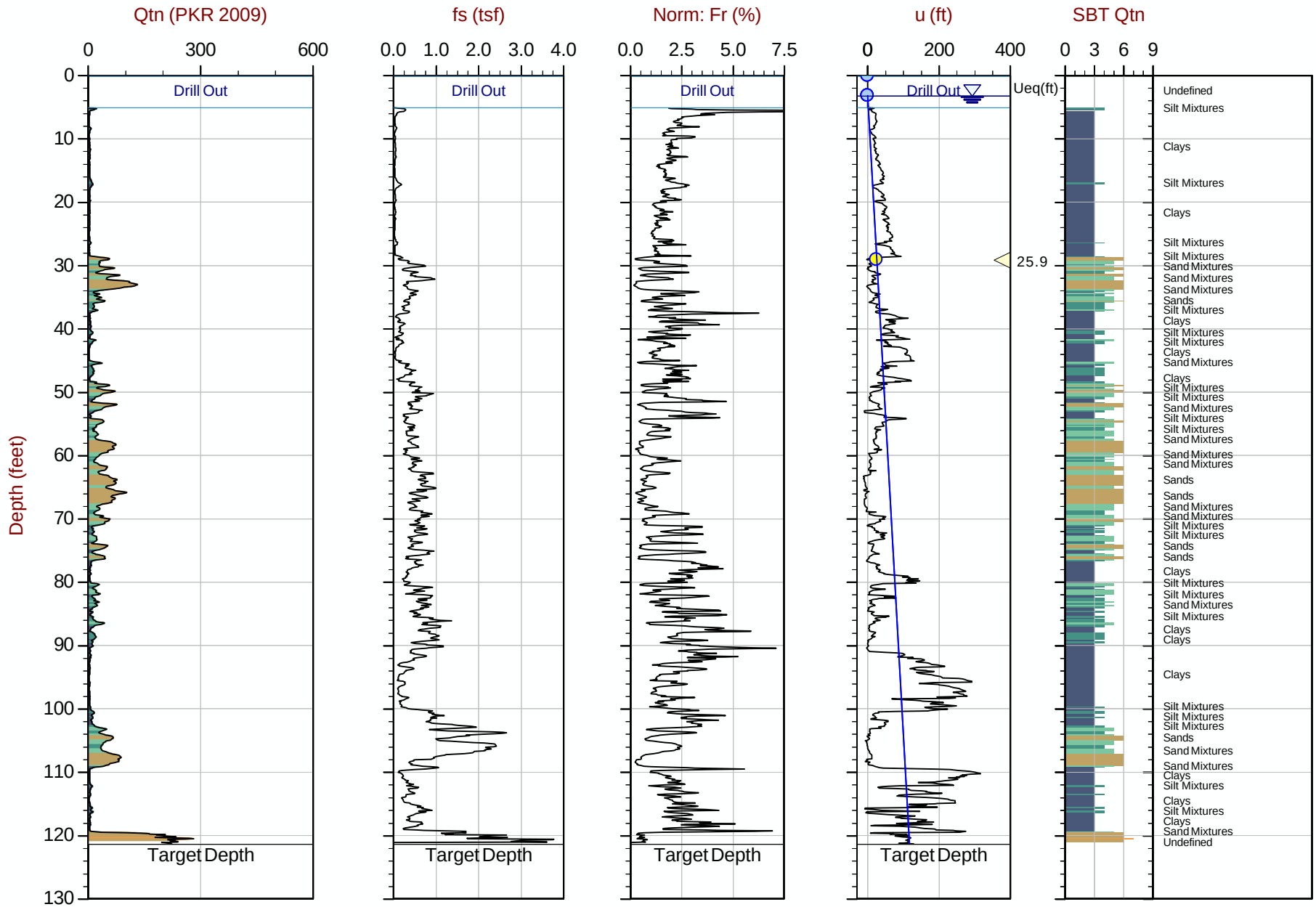
CONETEC

CONETEC

Haley & Aldrich

Job No: 24-59-27459
Date: 2024-04-10 10:23
Site: Aberdeen Schools

Sounding: CPT-AJW01
Cone: 1065:T1500F15U35



Max Depth: 37.000 m / 121.39 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 24-59-27459_SP-AJW01.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 46.97223 Long: -123.83739

Overplot Item: Ueq, Assumed Ueq, Dissipation, Ueq achieved, Dissipation, Ueq not achieved, Dissipation, Ueq assumed, Hydrostatic Line

The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Advanced Cone Penetration Test Plots with Ic, Su(Nkt), Phi, and N1(60)Ic

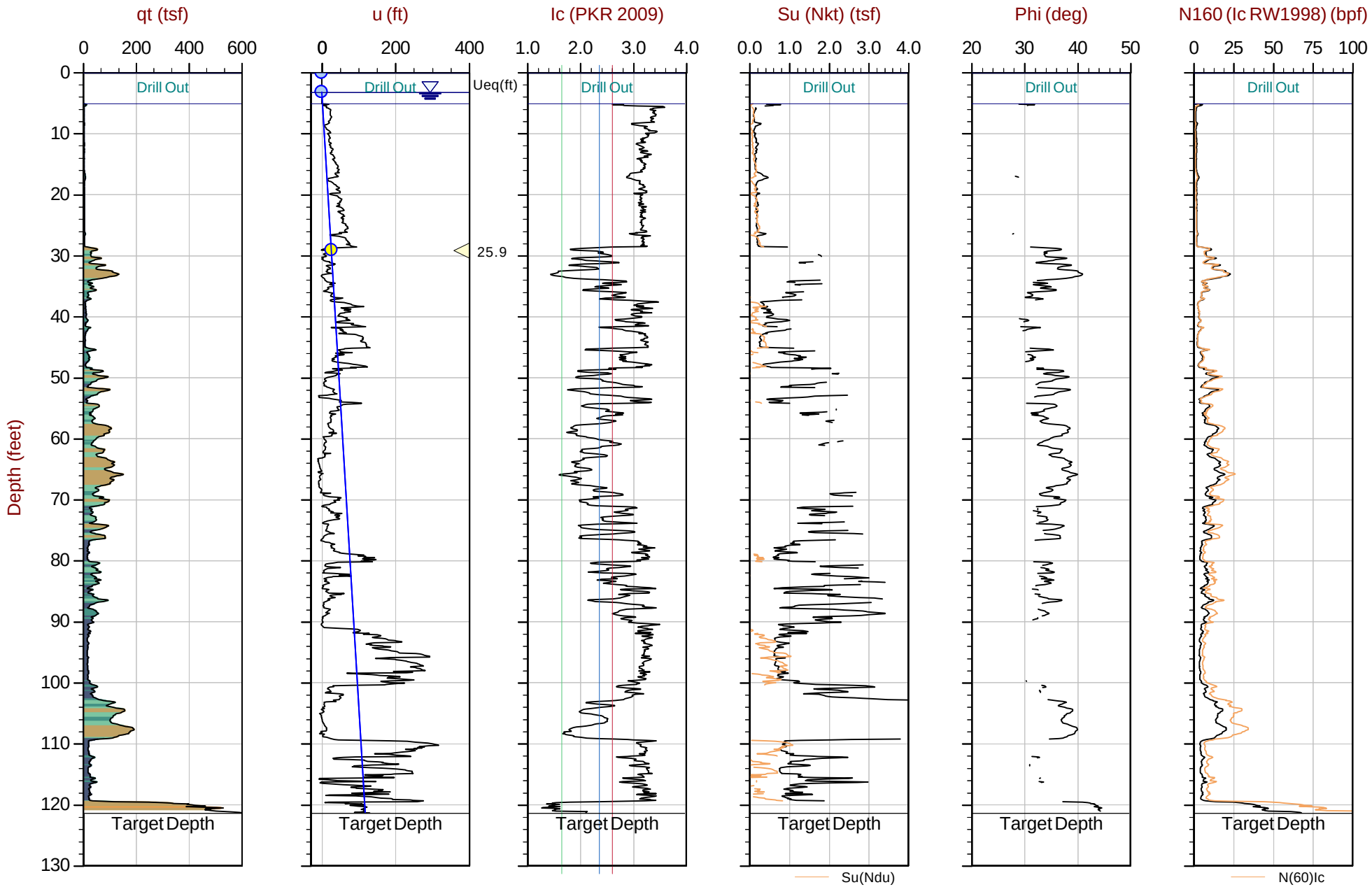
CONETEC

CONETEC

Haley & Aldrich

Job No: 24-59-27459
Date: 2024-04-10 10:23
Site: Aberdeen Schools

Sounding: CPT-AJW01
Cone: 1065:T1500F15U35



Max Depth: 37.000 m / 121.39 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 24-59-27459_SP-AJW01.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 46.97223 Long: -123.83739

Overplot Item: Ueq, Assumed Ueq, Dissipation, Ueq achieved, Dissipation, Ueq not achieved, Dissipation, Ueq assumed, Hydrostatic Line

The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Soil Behavior Type (SBT) Scatter Plots

CONETEC

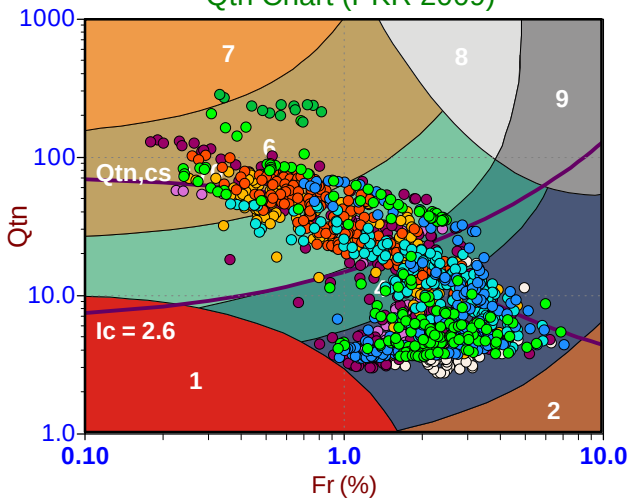
CONETEC

Haley & Aldrich

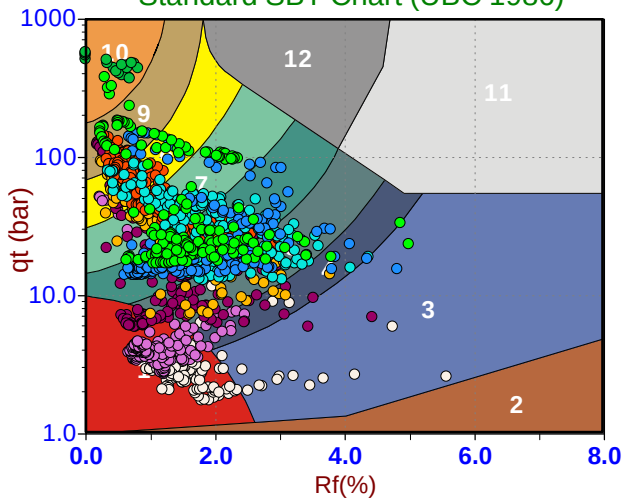
Job No: 24-59-27459
Date: 2024-04-10 10:23
Site: Aberdeen Schools

Sounding: CPT-AJW01
Cone: 1065:T1500F15U35

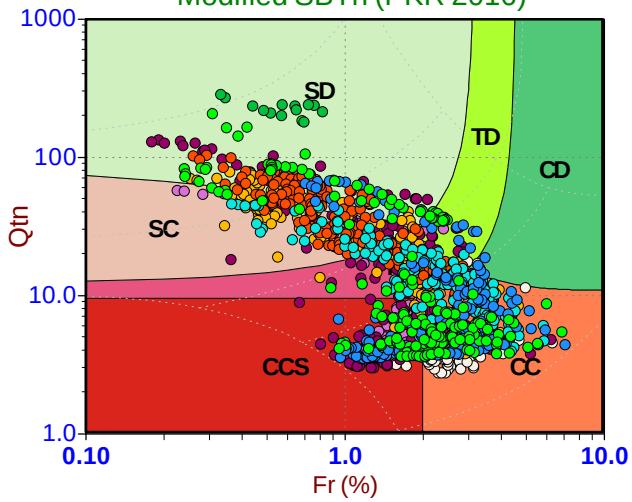
Qtn Chart (PKR 2009)



Standard SBT Chart (UBC 1986)



Modified SBTn (PKR 2016)



Depth Ranges

- >0.0 to 15.0 ft
- >15.0 to 30.0 ft
- >30.0 to 45.0 ft
- >45.0 to 60.0 ft
- >60.0 to 75.0 ft
- >75.0 to 90.0 ft
- >90.0 to 105.0 ft
- >105.0 to 120.0 ft
- >120.0 to 135.0 ft
- >135.0 to 150.0 ft
- >150.0 ft

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

Legend

- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

Pore Pressure Dissipation Test (PPDT) Summary and PPDT Plots

CONETEC

Job No:	24-59-27459
Client:	Haley & Aldrich, Inc.
Project:	Aberdeen Schools
Start Date:	2024-04-10
End Date:	2024-04-11

CPTu PORE PRESSURE DISSIPATION SUMMARY

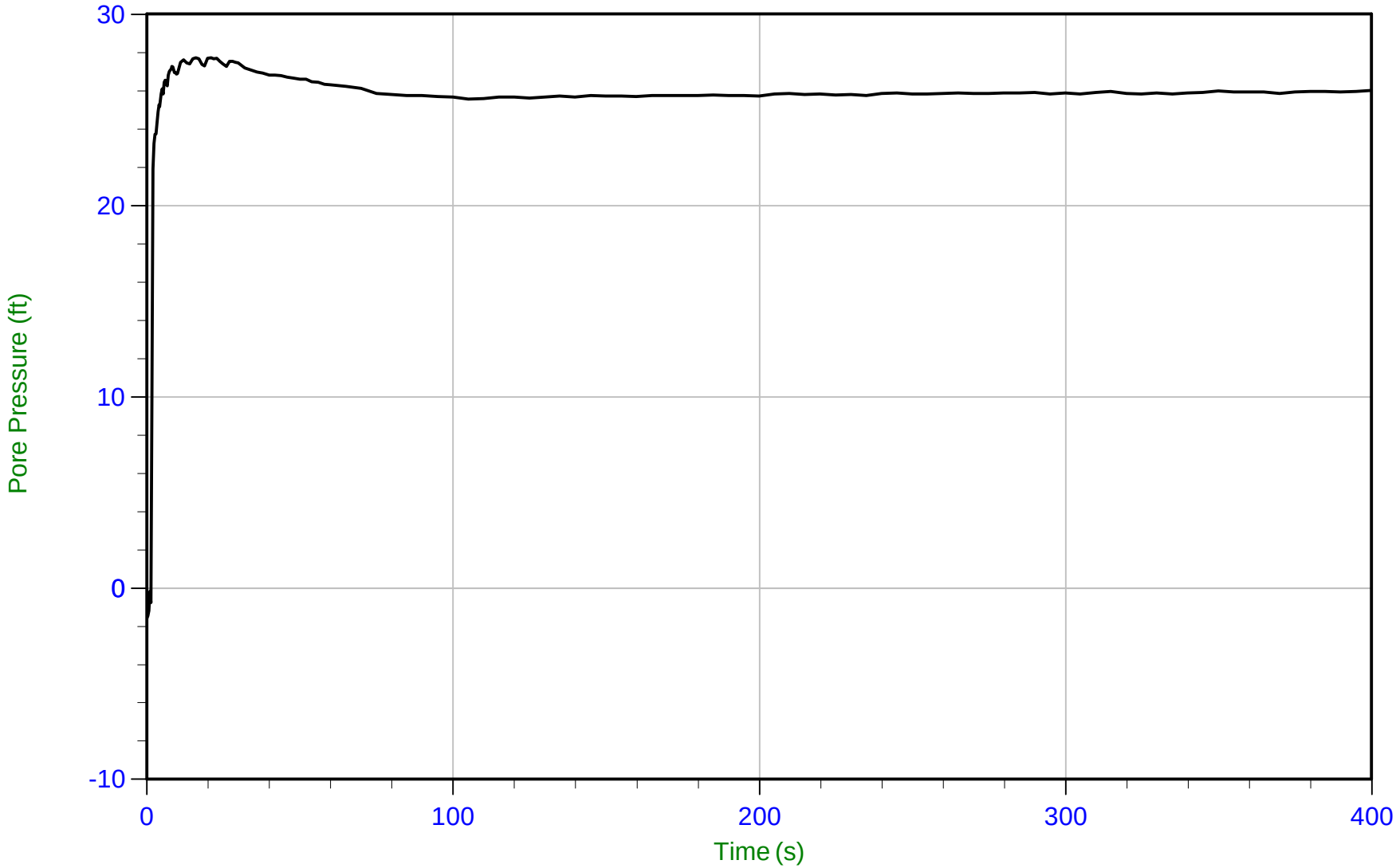
Sounding ID	File Name	Cone Area (cm^2)	Duration (s)	Test Depth (ft)	Estimated Equilibrium Pore Pressure U_{eq} (ft)	Calculated Phreatic Surface (ft)	Refer to Notation Number
CPT-AJW01	24-59-27459_SP-AJW01	15	400	29.12	25.9	3.2	
CPT-HH01	24-59-27459_SP-HH01	15	400	26.57	24.2	2.4	
CPT-MJH01	24-59-27459_SP-MJH01	15	350	100.56	93.5	7.1	
CPT-SE01	24-59-27459_SP-SE01	15	330	33.63	27.8	5.8	
Totals			25 min				

CONETEC

Haley & Aldrich

Job No: 24-59-27459
Date: 2024-04-10 10:23
Site: Aberdeen Schools

Sounding: CPT-AJW01
Cone: 1065:T1500F15U35 Area=15 cm²



Trace Summary:

Filename: 24-59-27459_SP-AJW01.PPR4
Depth: 8.875 m / 29.117 ft
Duration: 400.0 s

u Min: -1.6 ft
u Max: 27.7 ft
u Final: 26.0 ft

WT: 0.982 m / 3.222 ft
Ueq: 25.9 ft

Seismic Cone Penetration Test (SCPTu) Tabular Results

CONETEC

Job No:	24-59-27459
Client:	Haley & Aldrich, Inc.
Project:	Aberdeen Schools
Sounding ID:	CPT-AJW01
Date:	2024-04-10
Seismic Source:	Beam
Seismic Offset (ft):	8.79
Source Depth (ft):	0.00
Geophone Offset (ft):	0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
9.84	9.19	12.72			
13.12	12.47	15.26	2.54	12.76	199
16.40	15.75	18.04	2.78	11.29	246
19.69	19.03	20.96	2.93	11.92	245
22.90	22.24	23.92	2.96	10.60	279
26.18	25.53	27.00	3.08	10.99	280
29.46	28.81	30.12	3.12	8.76	356
32.81	32.15	33.33	3.22	6.78	475
36.09	35.43	36.51	3.18	5.36	592
39.37	38.71	39.70	3.19	6.86	465
42.65	42.00	42.91	3.21	7.83	409
45.93	45.28	46.12	3.22	7.64	421
49.21	48.56	49.35	3.22	6.06	532
52.59	51.94	52.68	3.33	6.58	506
55.87	55.22	55.91	3.24	6.35	510
59.06	58.40	59.06	3.14	5.37	585
62.34	61.68	62.30	3.25	5.33	610
65.62	64.96	65.55	3.25	5.33	610
68.90	68.24	68.81	3.25	4.67	697
72.18	71.52	72.06	3.26	5.23	623
75.46	74.80	75.32	3.26	5.96	547
78.74	78.08	78.58	3.26	5.37	608
82.02	81.37	81.84	3.26	6.17	528
85.30	84.65	85.10	3.26	5.22	625
88.58	87.93	88.37	3.26	5.31	614
91.86	91.21	91.63	3.27	5.61	582
95.14	94.49	94.90	3.27	5.61	582
98.43	97.77	98.16	3.27	5.51	593
101.71	101.05	101.43	3.27	4.89	668
104.99	104.33	104.70	3.27	4.05	806
108.33	107.68	108.04	3.33	4.56	731
111.61	110.96	111.31	3.27	4.34	755
114.90	114.24	114.58	3.27	4.93	664

Job No:	24-59-27459
Client:	Haley & Aldrich, Inc.
Project:	Aberdeen Schools
Sounding ID:	CPT-AJW01
Date:	2024-04-10
Seismic Source:	Beam
Seismic Offset (ft):	8.79
Source Depth (ft):	0.00
Geophone Offset (ft):	0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
118.18	117.52	117.85	3.27	4.55	719
121.39	120.74	121.06	3.21	3.87	829

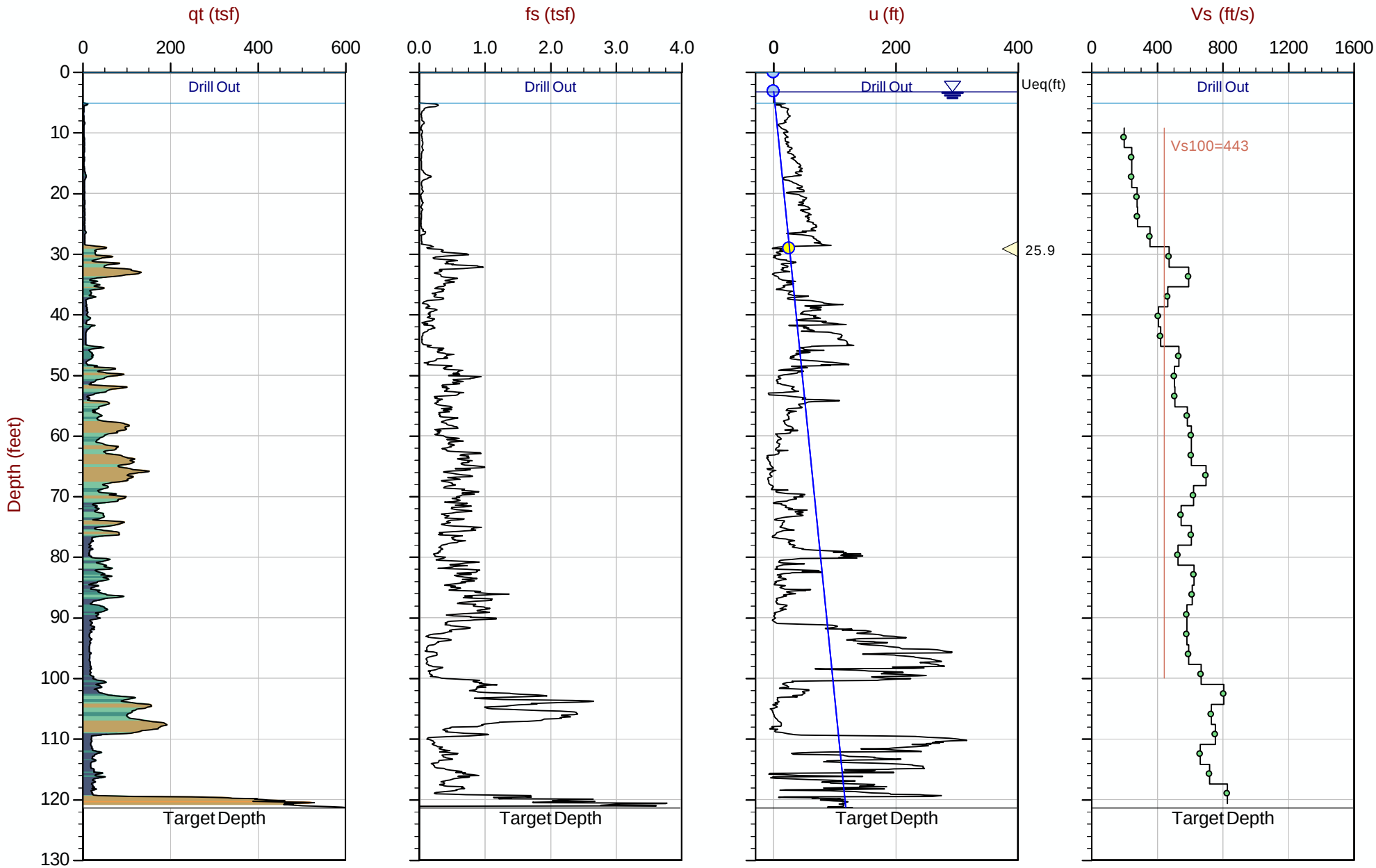
SCPTu Test Plots

CONETEC

Haley & Aldrich

Job No: 24-59-27459
Date: 2024-04-10 10:23
Site: Aberdeen Schools

Sounding: CPT-AJW01
Cone: 1065:T1500F15U35



Max Depth: 37.000 m / 121.39 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 24-59-27459_SP-AJW01.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 46.97223 Long: -123.83739

Overplot Item: Ueq, Assumed Ueq, Dissipation, Ueq achieved, Dissipation, Ueq not achieved, Dissipation, Ueq assumed, Hydrostatic Line

The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

SCPTu Velocity Wave Traces

CONETEC

CONETEC

Job No: 24-59-27459
Date: 2024-04-10

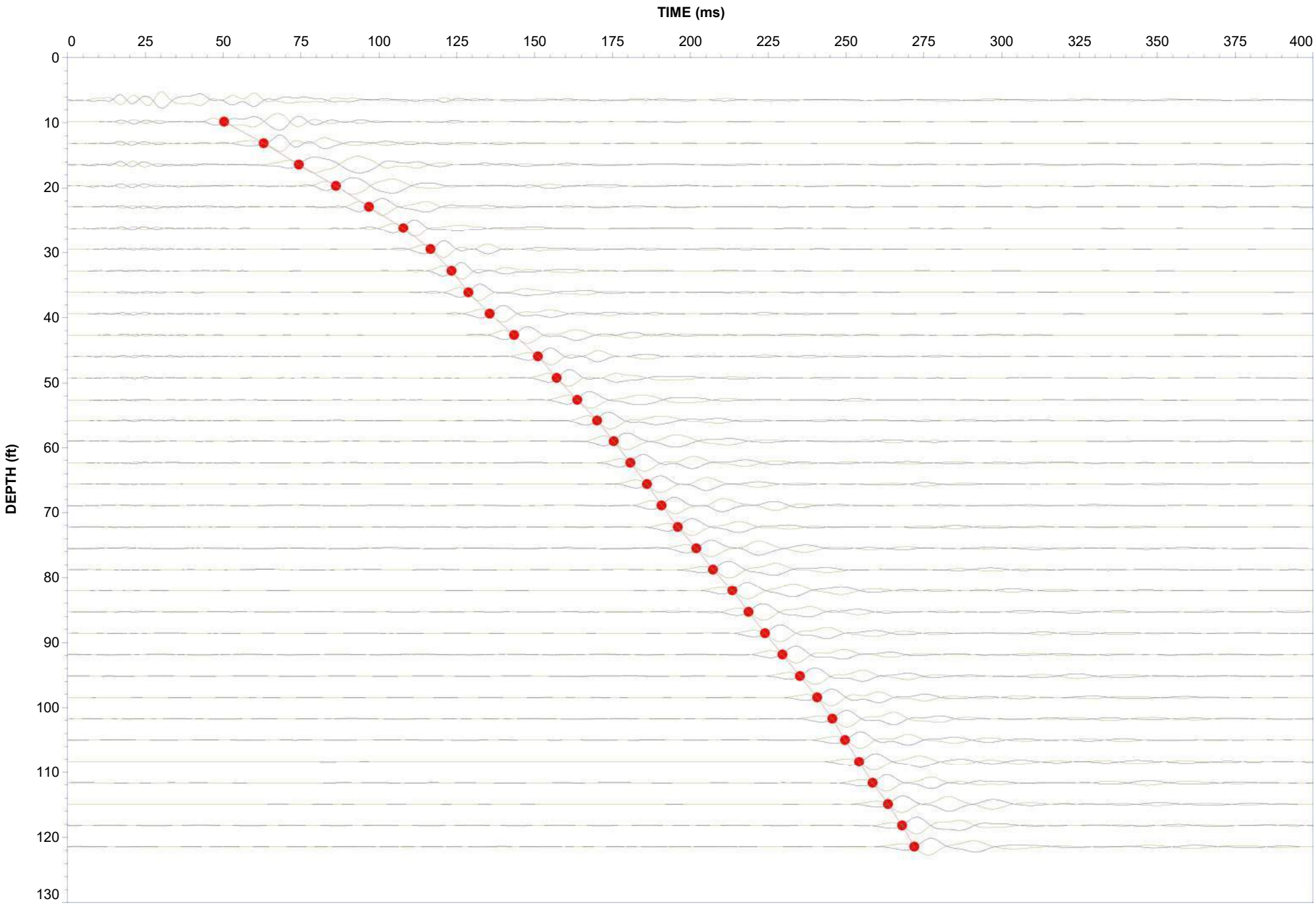
Client: Haley & Aldrich, Inc.
Cone: 1065:T1500F15U35

Project: Aberdeen Schools

Analysis: Shear Wave

Sounding: CPT-AJW01

Filter: BP 0 - 200 Hz



Supplementary Documents and Materials

CONETEC

Description of Methods for Calculated CPT Geotechnical Parameters

CONETEC

CALCULATED CPT GEOTECHNICAL PARAMETERS

A Detailed Description of the Methods Used in ConeTec's CPT Geotechnical Parameter Calculation and Plotting Software



Revision SZW-Rev 18

Revised February 10, 2023

Prepared by Jim Greig, M.A.Sc, P.Eng (BC, AB, ON)

CONETEC

Limitations

The geotechnical parameter output was prepared specifically for the site and project named in the accompanying report subject to objectives, site conditions and criteria provided to ConeTec by the client. The output may not be relied upon by any other party or for any other site without the express written permission of ConeTec Group (ConeTec) or any of its affiliates. For this project, ConeTec has provided site investigation services, prepared factual data reporting and produced geotechnical parameter calculations consistent with current best practices. No other warranty, expressed or implied, is made.

To understand the calculations that have been performed and to be able to reproduce the calculated parameters the user is directed to the basic descriptions for the methods in this document and the detailed descriptions and their associated limitations and appropriateness in the technical references cited for each parameter.

ConeTec's Calculated CPT Geotechnical Parameters as of February 10, 2023.

ConeTec's CPT parameter calculation and plotting routine provides a tabular output of geotechnical parameters based on current published CPT correlations and is subject to change to reflect the current state of practice. Due to drainage conditions and the basic assumptions and limitations of the correlations, not all geotechnical parameters provided are considered applicable for all soil types. The results are presented only as a guide for geotechnical use and should be carefully examined for consideration in any geotechnical design. Reference to current literature is strongly recommended. ConeTec does not warranty the correctness or the applicability of any of the geotechnical parameters calculated by the program and does not assume liability for any use of the results in any design or review. For verification purposes we recommend that representative hand calculations be done for any parameter that is critical for design purposes. The end user of the parameter output should also be fully aware of the techniques and the limitations of any method used by the program. The purpose of this document is to inform the user as to which methods were used and to direct the end user to the appropriate technical papers and/or publications for further reference.

The geotechnical parameter output was prepared specifically for the site and project named in the accompanying report subject to objectives, site conditions and criteria provided to ConeTec by the client. The output may not be relied upon by any other party or for any other site without the express written permission of ConeTec Group (ConeTec) or any of its affiliates.

The CPT calculations are based on values of tip resistance, sleeve friction and pore pressures considered at each data point or averaged over a user specified layer thickness (e.g., 0.20 m). Note that q_t is the tip resistance corrected for pore pressure effects and q_c is the recorded tip resistance. The corrected tip resistance (corrected using u_2 pore pressure values) is used for all calculations. Since all ConeTec cones have equal end area friction sleeves pore pressure corrections to sleeve friction, f_s, are not performed.

Corrected tip resistance: $q_t = q_c + (1-a) \cdot u_2$ (consistent units are required)

where: q_t is the corrected tip resistance
q_c is the recorded tip resistance
u_2 is the recorded dynamic pore pressure from behind the tip (u_2 position)
a is the Net Area Ratio for the cone (typically 0.80 for ConeTec cones)

The total stress calculations are based on soil unit weight values that have been assigned to the Soil Behavior Type (SBT) zones, from a user defined unit weight profile, by using a single uniform value throughout the profile, through unit weight estimation techniques described in various technical papers or from a combination of these methods. The parameter output files indicate the method(s) used.

Effective vertical overburden stresses are calculated using the total stress and equilibrium pore pressure (u_{eq} or u_o) values derived from an assumed hydrostatic distribution of pore pressures below the water table or from a user defined equilibrium pore pressure profile (typically obtained from CPT dissipation tests) or a combination of the two. For over water projects the stress effects of the column of water above the mudline are taken into account as is the appropriate unit weight of water. How this is done depends on where the instruments are zeroed (i.e. on deck or at the mudline). The parameter output files indicate the method(s) used.

A majority of parameter calculations are derived from or driven by results based on material types as determined by the various soil behavior type charts depicted in Figures 1 through 6. The parameter output files indicate the method(s) used.

The Soil Behavior Type classification chart shown in Figure 1 is the classic non-normalized SBT Chart developed at the University of British Columbia and reported in Robertson, Campanella, Gillespie and Greig (1986). Figure 2 shows the original normalized (linear method) SBTn chart developed by Robertson (1990). The Bq classification charts

shown in Figures 3a and 3b incorporate pore pressures into the SBT classification and are based on the methods described in Robertson (1990). Many of these charts have been summarized in Lunne, Robertson and Powell (1997). The Jefferies and Davies SBT chart shown in Figure 3c is based on the techniques discussed in Jefferies and Davies (1993) which introduced the concept of the Soil Behavior Type Index parameter, I_c. Take note that the I_c parameter developed by Robertson and Fear (1995) and Robertson and Wride (1998) is similar in concept but uses a slightly different calculation method than that defined by Jefferies and Davies (1993) as the latter incorporates pore pressure in their technique through the use of the Bq parameter. The normalized Qtn SBT chart shown in Figure 4 is based on the work by Robertson (2009) utilizing a variable stress ratio exponent, n, for normalization based on a slightly modified redefinition and iterative approach for I_c. The boundary curves drawn on the chart are based on the work described in Robertson (2010).

Figure 5 shows a revised 1986 SBT Chart presented to CPT'10 by Robertson (2010b). It is known as the Updated non-normalized Soil Behavior Chart (also referred to as the Rev SBT Chart (PKR2010) in our output files). This chart was produced to be more in line with all post-1986 Robertson charts having the same 9 soil type zones, a $\log_{10}$ axis for friction ratio, R_f in this case, and a unitless tip resistance axis.

Figure 6 shows a revised behavior based chart by Robertson (2016) depicting contractive-dilative zones. As the zones represent material behavior rather than soil gradation ConeTec has chosen a set of zone colors that are less likely to be confused with material type colors from previous SBT charts. These colors differ from those used by Dr. Robertson. A green palette was selected for the dilative (desirable) side of the chart and a red palette for the contractive side of the chart.

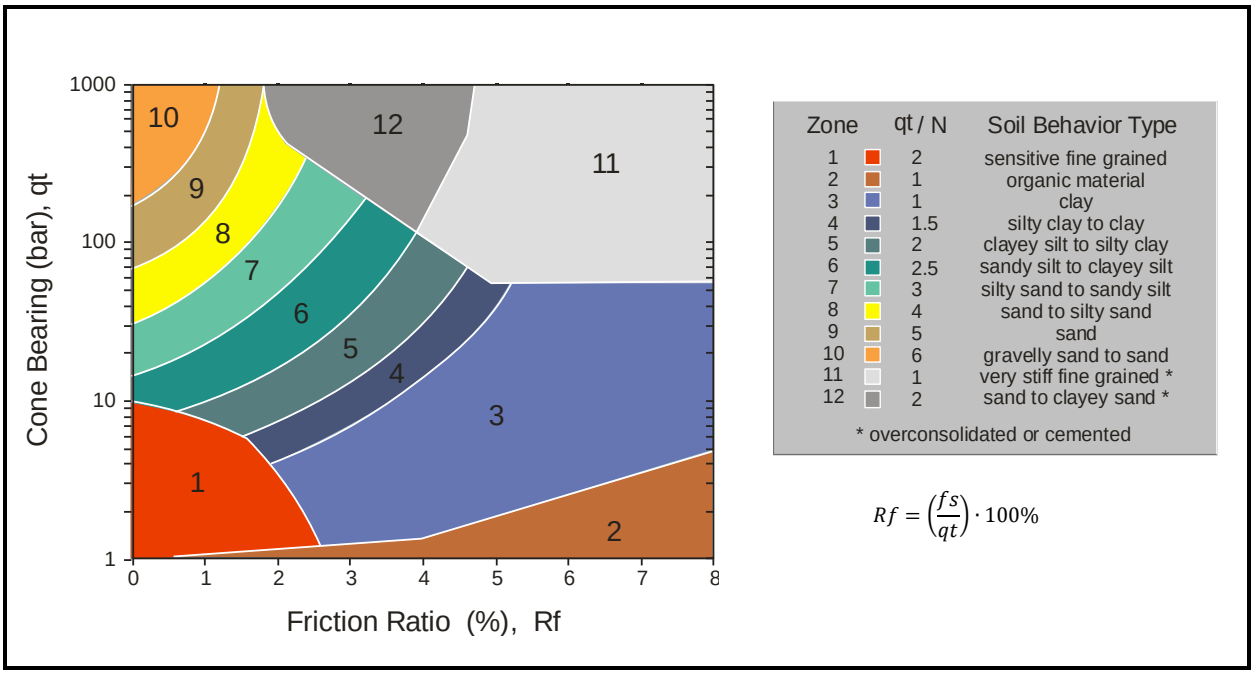


Figure 1. Non-normalized Soil Behavior Type Classification Chart (SBT)

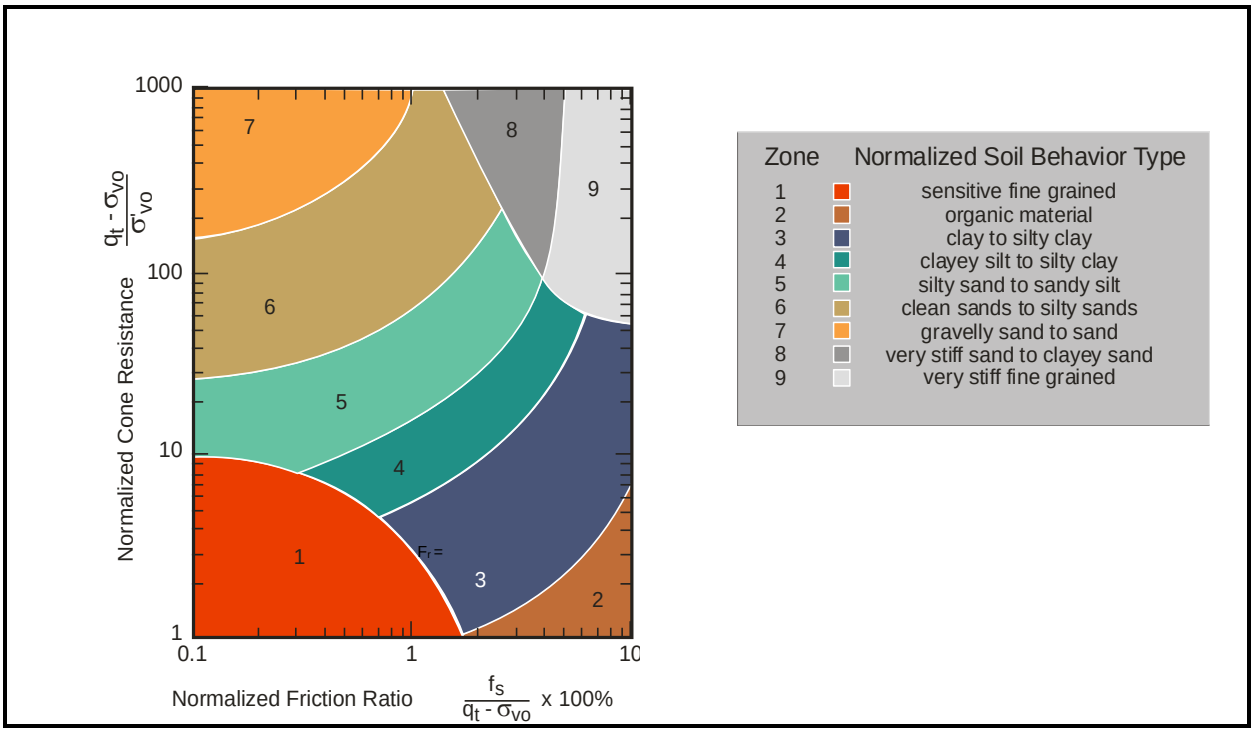


Figure 2. Normalized Soil Behavior Type Classification Chart (SBTn)

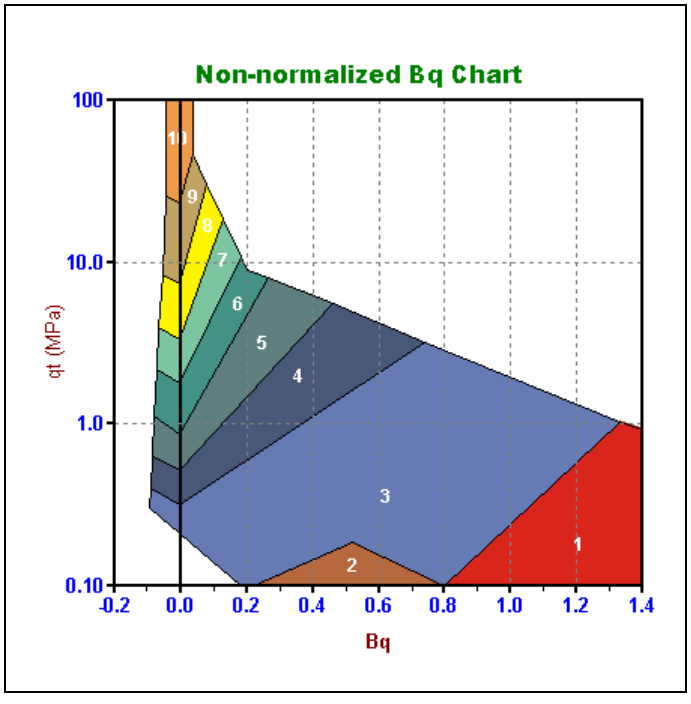


Figure 3a. Alternate Soil Behavior Type Chart (SBT Bq): q_t - B_q

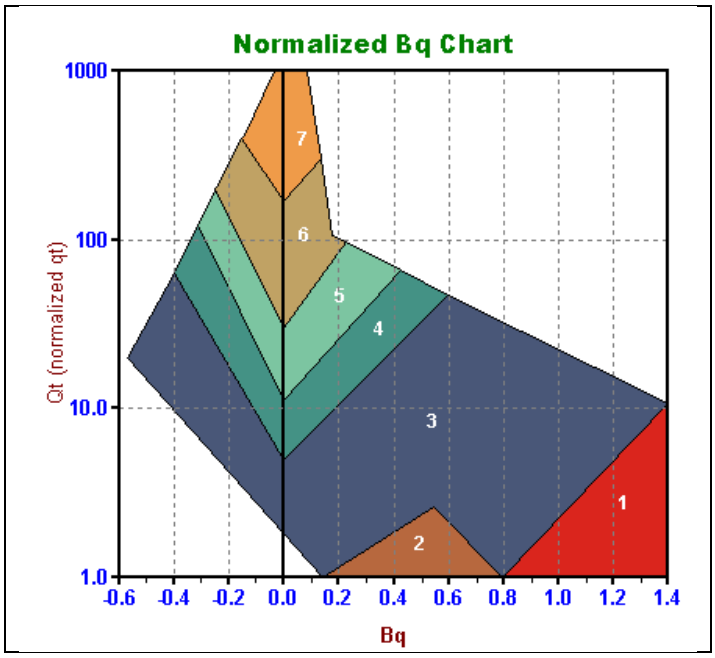


Figure 3b. Alternate Soil Behavior Type Charts (SBT Bqn): Q_t-B_q

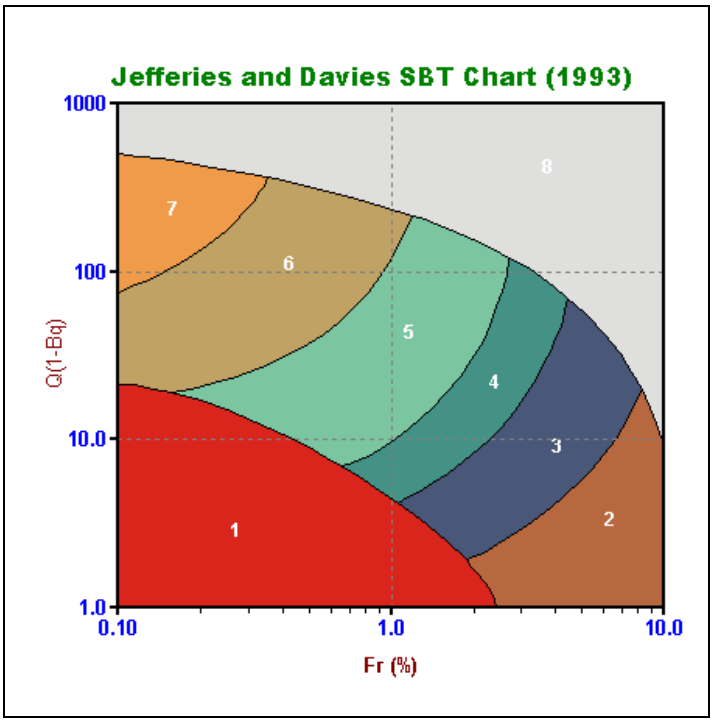


Figure 3c. Alternate Soil Behavior Type Charts: $Q(1-B_q)$ - F_r

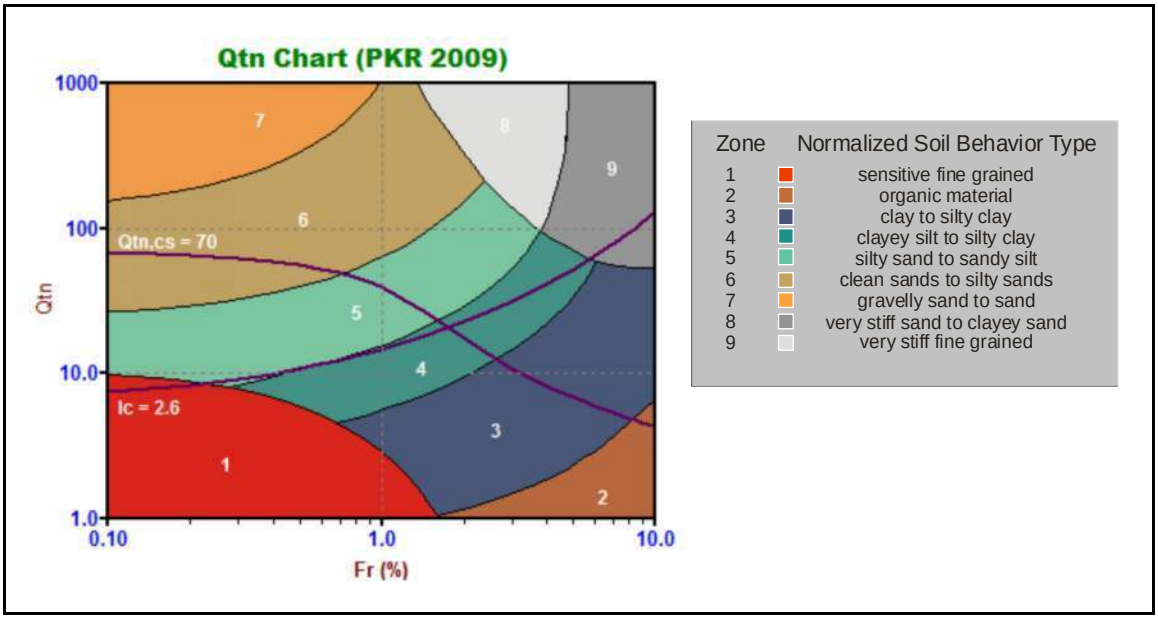


Figure 4. Normalized Soil Behavior Type Chart using Q_{tn} (SBT Qtn)

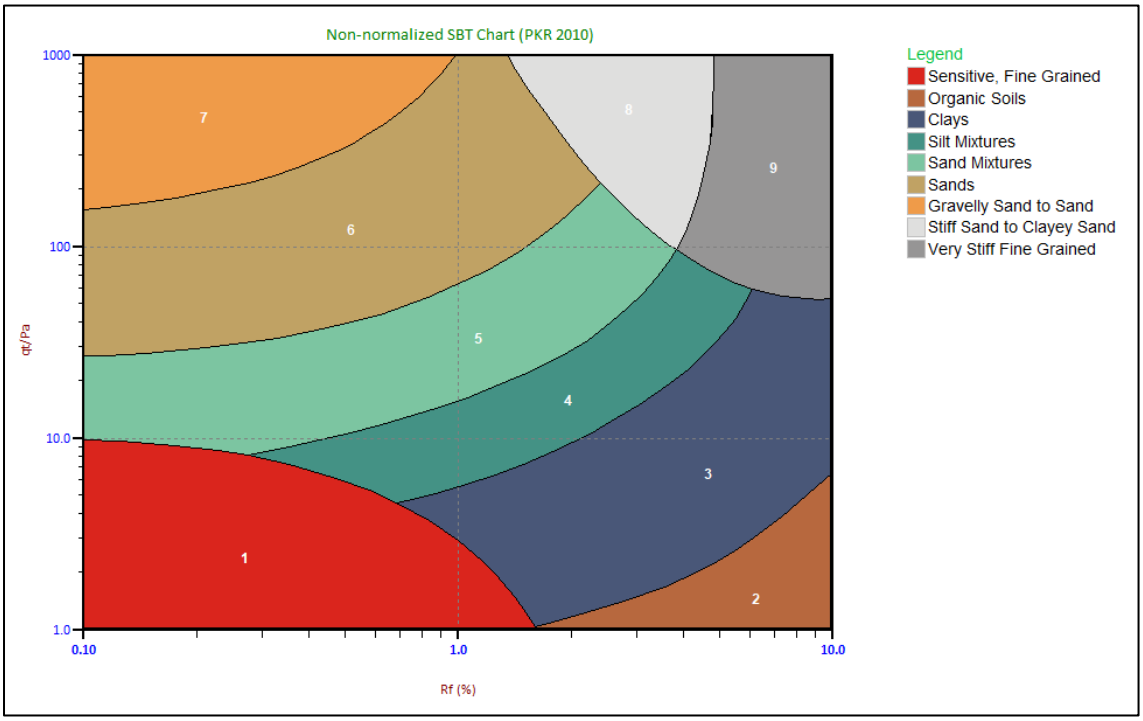


Figure 5. Non-normalized Soil Behavior Type Chart (2010)

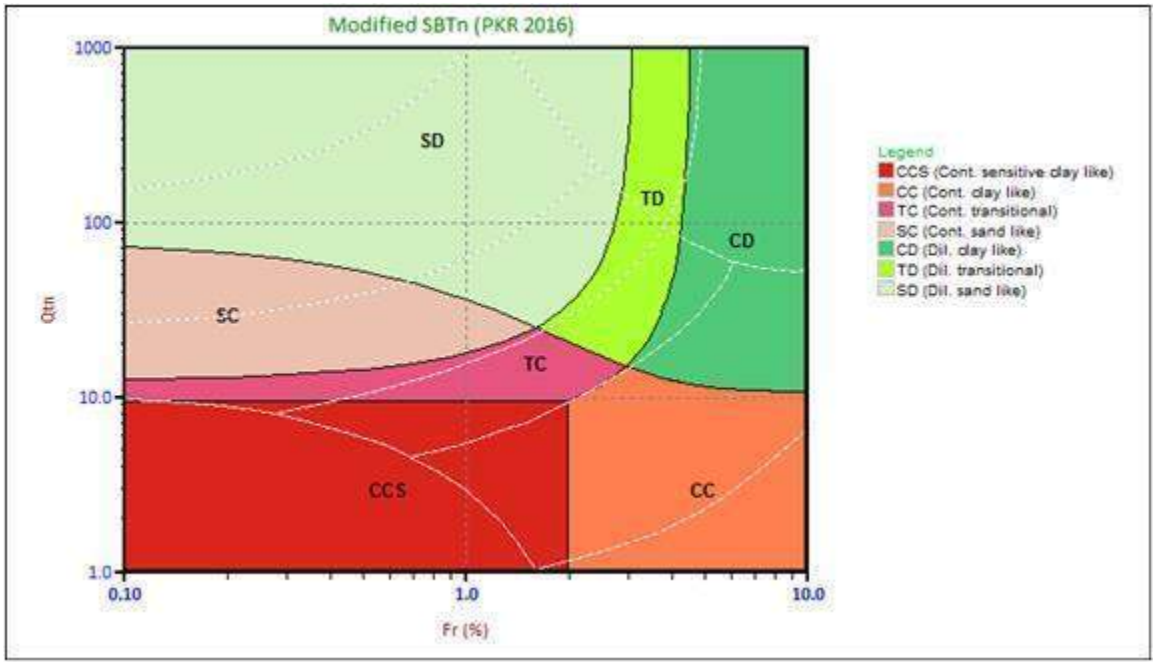


Figure 6. Modified SBTn Behavior Based Chart

Details regarding the geotechnical parameter calculations are provided in Tables 1a and 1b. The appropriate references cited are listed in Table 2. Non-liquefaction specific parameters are detailed in Table 1a and liquefaction specific parameters are detailed in Table 1b.

Where methods are based on charts or techniques that are too complex to describe in this summary, we recommend that the user refer to the cited material. Specific limitations for each method are described in the cited material.

Where the results of a calculation/correlation are deemed *'invalid'* the value will be represented by the text strings "-9999", "-9999.0", the value 0.0 (Zero) or an empty cell. Invalid results will occur because of (and not limited to) one or a combination of:

1. Invalid or undefined CPT data (e.g., drilled out section or data gap).

2. Where the calculation method is inappropriate, for example, drained parameters in a material behaving in an undrained manner (and vice versa).

3. Where input values are beyond the range of the referenced charts or specified limitations of the correlation method.

4. Where pre-requisite or intermediate parameter calculations are invalid.

The parameters selected for output from the program are often specific to a particular project. As such, not all of the calculated parameters listed in Tables 1and 1a may be included in the output files delivered with this report.

The output files are typically provided in Microsoft Excel XLS, XLSX or CSV format. The ConeTec software has several options for output depending on the number or types of calculated parameters desired or those specifically contracted for by the client. Each output file is named using the original file base name (from the .COR file) followed

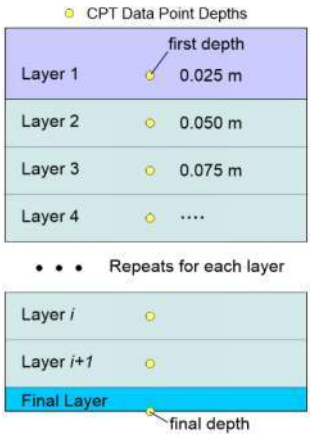
by a three or four character indicator of the output set selected (e.g. BSC, TBL, NLI, NL2, IFI, IFI2, IFI3) and possibly followed by an operator selected suffix identifying the characteristics of the particular calculation run.

Table 1a. CPT Parameter Calculation Methods – Non liquefaction Parameters

Reference Notes: CK* - Common Knowledge, U* - Unpublished

Calculated Parameter	Description	Equation	Ref
Depth	Mid Layer Depth *(where calculations are done at each point then Mid Layer Depth = Recorded Depth)*	*[Depth (Layer Top) + Depth (Layer Bottom)]/ 2.0*	CK*
Elevation	Elevation of Mid Layer is based on the sounding collar elevation supplied by the client or through a site survey In Sweden a variation of elevation is used where the elevation increases with depth. We refer to this as inverse elevation.	Elevation = Collar Elevation – Depth InverseElevation = Collar Elevation + Depth	CK* N/A
Avg qc	Averaged recorded tip value (q_c)	$Avgqc = \frac{1}{n}\sum_{i=1}^{n} q_c$ *n=1 when calculations are done at each point*	CK*
Avg qt	Averaged corrected tip (q_t) where: $q_t = q_c + (1-a)\cdot u_2$ Averaged q_t is not calculated using the average q_c and averaged u values. Averaged q_t is based on the average of the q_t values calculated at each data point.	$Avgqt = \frac{1}{n}\sum_{i=1}^{n} q_t$ *n=1 when calculations are done at each point*	1
Avg fs	Averaged sleeve friction (f_s) No pore pressure corrections are applied to f_s.	$Avgfs = \frac{1}{n}\sum_{i=1}^{n} fs$ *n=1 when calculations are done at each point*	CK*
Avg Rf	Averaged friction ratio (R_f) where friction ratio is defined as: $R_f = 100\% \cdot \frac{fs}{q_t}$	$AvgRf = 100\% \cdot \frac{Avgfs}{Avgqt}$ *not an average of individual R_f values*	CK*
Avg u	Averaged dynamic pore pressure *(u)*	$Avgu = \frac{1}{n}\sum_{i=1}^{n} u_i$ *n=1 when calculations are done at each point*	CK*
Avg Res	Averaged Resistivity (this data is not always available since it is a specialized test requiring an additional module)	$AvgRes = \frac{1}{n}\sum_{i=1}^{n} Resistivity_i$ *n=1 when calculations are done at each point*	CK*
Avg UVIF	Averaged UVIF ultra-violet induced fluorescence (this data is not always available since it is a specialized test requiring an additional module)	$AvgUVIF = \frac{1}{n}\sum_{i=1}^{n} UVIF_i$ *n=1 when calculations are done at each point*	CK*
Avg Temp	Averaged Temperature (this data is not always available)	$AvgTemp = \frac{1}{n}\sum_{i=1}^{n} Temperature_i$ *n=1 when calculations are done at each point*	CK*
Avg Gamma	Averaged Gamma Counts (this data is not always available since it is a specialized test requiring an additional module)	$AvgGamma = \frac{1}{n}\sum_{i=1}^{n} Gamma_i$ *n=1 when calculations are done at each point*	CK*
SBT	Soil Behavior Type as defined by Robertson et al 1986 (often referred to as Robertson and Campanella, 1986)	See Figure 1	1, 5
SBTn	Normalized Soil Behavior Type as defined by Robertson 1990 (linear normalization using Q_t, now referred to as Q_{t1})	See Figure 2	2, 5

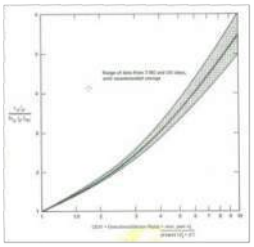
Calculated Parameter	Description	Equation	Ref
SBT-Bq	Non-normalized Soil Behavior type based on non-normalized tip resistance and the B_q parameter	See Figure 3a	1, 2, 5
SBT-Bqn	Normalized Soil Behavior type based on normalized tip resistance (Q_t, now called Q_{t1}) and the B_q parameter	See Figure 3b	2, 5
SBT-JandD	Soil Behavior Type as defined by Jeffries and Davies	See Figure 3c	7
SBT Qtn	Soil Behavior Type as defined by Robertson (2009) using a variable stress ratio exponent for normalization based on $I_{c\ (PKR\ 2009)}$	See Figure 4	15
Modified Non-normalized SBT Chart SBT (PKR2010)	This is a revised version of the simple 1986 non-normalized SBT chart (presented at CPT '10). The revised version has been reduced from 12 zones to 9 zones to be similar to the normalized Robertson charts. Other updates include a dimensionless tip resistance normalized to atmospheric pressure, q_t/P_a, on the vertical axis and a log scale for non-normalized friction ratio, R_f, along the horizontal axis.	See Figure 5	33
Modified SBTn (contractive /dilative)	Modified SBTn chart as defined by Robertson (2016) indicating zones of contractive/dilative behavior. Note that ConeTec displays the chart with colors different from Robertson. ConeTec's colors were chosen to avoid confusion with soil type descriptions.	See Figure 6	30
Unit Wt.	Unit Weight of soil determined from one of the following user selectable options: 1) uniform value 2) value assigned to each SBT zone 3) value assigned to each SBTn zone 4) value assigned to SBTn zone as determined from Robertson and Wride (1998) based on q_{c1n} 5) values assigned to SBT Qtn zones 6) values based on Robertson updated non-normalized Soil Behavior Type Chart (2010b) 6) Mayne f_s (sleeve friction) method 7) Robertson and Cabal 2010 method 8) user supplied unit weight profile The last option may co-exist with any of the other options.	See references	3, 5, 15, 21, 24, 29, 33

Calculated Parameter	Description	Equation	Ref
TStress σ_v	Total vertical overburden stress at Mid Layer Depth *A layer is defined as the averaging interval specified by the user where depths are reported at their respective mid-layer depth.* For data calculated at each point layers are defined using the recorded depth as the mid-point of the layer. Thus, a layer starts half-way between the previous depth and the current depth unless this is the first point in which case the layer start is at zero depth. The layer bottom is half-way from the current depth to the next depth unless it is the last data point. Defining layers affects how stresses are calculated since the unit weight attributed to a data point is used throughout the entire layer. This means that to calculate the stresses the total stress at the top and bottom of a layer are required. The stress at mid layer is determined by adding the incremental stress from the layer top to the mid-layer depth. The stress at the layer bottom becomes the stress at the top of the subsequent layer. Stresses are NOT calculated from mid-point to mid-point. For over-water work the total stress due to the column of water above the mid line is taken into account where appropriate.	$TStress = \sum_{i=1}^{n} \gamma_i h_i$ *where* γ_i is layer unit weight h_i is layer thickness 	CK*
EStress σ_v'	Effective vertical overburden stress at mid-layer depth.	$\sigma_v' = \sigma_v - u_{eq}$	CK*
Equil u u_{eq} or u_0	Equilibrium pore pressures are determined from one of the following user selectable options: 1) hydrostatic below the water table 2) user supplied profile 3) combination of those above When a user supplied profile is used/provided a linear interpolation is performed between equilibrium pore pressures defined at specific depths. If the profile values start below the water table then a linear transition from zero pressure at the water table to the first defined pointed is used. Equilibrium pore pressures may come from dissipation tests, adjacent piezometers or other sources. Occasionally, an extra equilibrium point ("assumed value") will be provided in the profile that does not come from a recorded value to smooth out any abrupt changes or to deal with material interfaces. These "assumed" values will be indicated on our plots and in tabular summaries.	For the hydrostatic option: $u_{eq} = \gamma_w \cdot (D - D_{wt})$ where u_{eq} is equilibrium pore pressure γ_w is the unit weight of water D is the current depth D_{wt} is the depth to the water table	CK*
K_0	Coefficient of earth pressure at rest, K_0.	$K_O = (1 - \sin\Phi') OCR^{\sin\Phi'}$	17
C_n	Overburden stress correction factor used for $(N_1)_{60}$ and older CPT parameters.	$C_n = (P_a/\sigma_v')^{0.5}$ where *$0.0 < C_n < 2.0$ (user adjustable, typically ranging from 1.7 to 2.0)* *P_a is atmospheric pressure (100 kPa)*	4, 12

Calculated Parameter	Description	Equation	Ref
C_q	Overburden stress normalizing factor.	$C_q = 1.8 / [0.8 + (\sigma_v'/P_a)]$ where *$0.0 < C_q < 2.0$ (user adjustable)* *P_a is atmospheric pressure (100 kPa)* *Robertson and Wride define C_q to be the same as C_n. The Olson definition above is used in the program.*	3, 12
N_{60}	SPT N value at 60% energy calculated from q_t/N ratios assigned to each SBT zone. This method has abrupt N value changes at zone boundaries.	*See Figure 1*	5
$(N_1)_{60}$	SPT N_{60} value corrected for overburden pressure.	*$(N_1)_{60} = C_n \bullet N_{60}$*	4
$N_{60}I_c$	SPT N_{60} values based on the I_c parameter, as defined by Robertson and Wride 1998 (3), or by Robertson 2009 (15).	$(q_t/P_a)/ N_{60} = 8.5 (1 – I_c/4.6)$ $(q_t/P_a)/ N_{60} = 10^{(1.1268 – 0.2817Ic)}$ P_a being atmospheric pressure	3, 5 15, 31
$(N_1)_{60}I_c$	SPT N_{60} value corrected for overburden pressure (using N_{60} I_c). User has 3 options.	*1) $(N_1)_{60}Ic = C_n \bullet (N_{60} I_c)$* 2) $q_{c1n}/ (N_1)_{60}I_c = 8.5 (1 – I_c/4.6)$ 3) $(Q_{tn})/ (N_1)_{60}I_c = 10^{(1.1268 – 0.2817Ic)}$	4 5 15, 31
S_u or S_u (N_{kt})	Undrained shear strength based on q_t S_u factor N_{kt} is user selectable.	$Su = \frac{qt - \sigma_v}{N_{kt}}$	1, 5
S_u or S_u (N_{du}) or S_u ($N_{\Delta u}$)	Undrained shear strength based on pore pressure S_u factor $N_{\Delta u}$ is user selectable.	$Su = \frac{u_2 - u_{eq}}{N_{\Delta u}}$	1, 5
D_r	Relative Density determined from one of the following user selectable options: 1) Ticino Sand 2) Hokksund Sand 3) Schmertmann (1978) 4) Jamiolkowski (1985) - All Sands 5) Jamiolkowski et al (2003) (various compressibilities, K_o)	See reference (methods 1 through 4) Jamiolkowski et al (2003) reference	5 14
PHI ϕ	Friction Angle determined from one of the following user selectable options (methods 1 through 4 are for sands and method 5 is for silts and clays): 1) Campanella and Robertson 2) Durgunoglu and Mitchel 3) Janbu 4) Kulhawy and Mayne 5) NTH method (clays and silts)	See appropriate reference	5 5 5 11 23
Delta U/q_t $\Delta u/q_t$ du/q_t	Differential pore pressure ratio (older parameter used before B_q was established)	$= \frac{\Delta u}{qt}$ *where:* $\Delta u = u - u_{eq}$ *and u = dynamic pore pressure* *u_{eq} = equilibrium pore pressure*	39

Calculated Parameter	Description	Equation	Ref
B_q	Pore pressure parameter	$Bq = \frac{\Delta u}{qt - \sigma_v}$ where: $\Delta u = u - u_{eq}$ *and u = dynamic pore pressure* *u_{eq} = equilibrium pore pressure*	1, 2, 5
Net q_t or qtNet	Net tip resistance (used in many subsequent correlations)	$qt - \sigma_v$	36
q_e or qE or q_E	Effective tip resistance (using the dynamic pore pressure u_2 and not equilibrium pore pressure)	$q_t - u_2$	36
qeNorm	Normalized effective tip resistance	$\frac{qt - u_2}{\sigma_v'}$	36
Q_t or Norm: Qt or Q_{t1}	Normalized q_t for Soil Behavior Type classification as defined by Robertson (1990) using a linear stress normalization. Note this is different from Q_{tn}. This parameter was renamed to Q_{t1} in Robertson, 2009. Without normalization limits this parameter calculates to very high unrealistic values at low stresses.	$Qt = \frac{qt - \sigma_v}{\sigma_v'}$	2, 5, 15
F_r or Norm: Fr	Normalized Friction Ratio for Soil Behavior Type classification as defined by Robertson (1990)	$Fr = 100\% \cdot \frac{fs}{qt - \sigma_v}$	2, 5
Q(1-B_q) Q(1-B_q) + 1	Q(1-B_q) grouping as suggested by Jefferies and Davies for their classification chart and the establishment of their I_c parameter. Later papers added the +1 term to the equation.	$Q \cdot (1 - Bq)$ $Q \cdot (1 - Bq) + 1$ *where Bq is defined as above and Q is the same as the normalized tip resistance, Q_{t1}, defined above*	6, 7, 34
q_{c1}	Normalized tip resistance, q_{c1}, using a fixed stress ratio exponent, n (this method has stress units)	$q_{c1} = q_t \cdot (Pa/\sigma_v')^{0.5}$ where: P_a = atmospheric pressure	21
q_{c1} (0.5)	Normalized tip resistance, q_{c1}, using a fixed stress ratio exponent, n (this method is unit-less)	$q_{c1}(0.5) = (q_t/P_a) \cdot (Pa/\sigma_v')^{0.5}$ where: P_a = atmospheric pressure	5
q_{c1} (C_n)	Normalized tip resistance, q_{c1}, based on C_n (this method has stress units)	$q_{c1}(Cn) = C_n * q_t$	5, 12
q_{c1} (C_q)	Normalized tip resistance, q_{c1}, based on C_q (this method has stress units)	$q_{c1}(Cq) = C_q * q_t$ (some papers use q_c)	5, 12
q_{c1n}	normalized tip resistance, q_{c1n}, using a variable stress ratio exponent, n (where n=0.0, 0.70, or 1.0) (this method is unit-less)	$q_{c1n} = (q_t / P_a)(P_a/\sigma_v')^n$ where: P_a = atm. Pressure and n varies as described below	3

Calculated Parameter	Description	Equation	Ref
I_c or Ic (RW1998)	Soil Behavior Type Index as defined by Robertson and Wride (1997, 1998) for estimating grain size characteristics and providing smooth gradational changes across the SBTn chart. Ic(RW1998) is different from that of Jefferies and Davies (7) and is different from Ic(PKR2009).	$I_c = [(3.47 - \log_{10}Q)^2 + (\log_{10} Fr + 1.22)^2]^{0.5}$ *Where:* $Q = \left(\frac{qt - \sigma_v}{P_a}\right)\left(\frac{P_a}{\sigma_v'}\right)^n$ *Or* $Q = q_{c1n} = \left(\frac{qt}{P_a}\right)\left(\frac{P_a}{\sigma_v'}\right)^n$ *depending on the iteration in determining I_c* *And Fr is in percent* *P_a = atmospheric pressure* *n has the following distinct values:* *0.5, 0.75 and 1.0* *and is determined in an iterative manner based on the resulting I_c in each iteration* *Note that NCEER replaced 0.75 with 0.70*	3, 4, 5 10
I_c (PKR 2009)	Soil Behavior Type Index, I_c (PKR 2009) is based on a variable stress ratio exponent n, which itself is based on I_c (PKR 2009). An iterative calculation is required to determine I_c (PKR 2009) and its corresponding n (PKR 2009).	*I_c (PKR 2009) =* *$[(3.47 - \log_{10}Q_{tn})^2 + (1.22 + \log_{10}F_r)^2]^{0.5}$*	15
n (PKR 2009)	Stress ratio exponent n, based on I_c (PKR 2009). An iterative calculation is required to determine n (PKR 2009) and its corresponding I_c (PKR 2009).	*n (PKR 2009) = 0.381 (I_c) + 0.05 (σ_v'/P_a) – 0.15*	15
Q_{tn} (PKR 2009)	Normalized tip resistance using a variable stress ratio exponent based on I_c (PKR 2009) and n (PKR 2009). An iterative calculation is required to determine Q_{tn} (PKR 2009).	*$Q_{tn} = [(qt - \sigma_v)/P_a](P_a/\sigma_v')^n$* *where P_a = atmospheric pressure (100 kPa)* *n = stress ratio exponent described above*	15
FC	Apparent fines content (%)	*$FC=1.75(Ic^{3.25}) - 3.7$* *$FC=100$ for $I_c > 3.5$* *$FC=0$ for $I_c < 1.26$* *FC = 5% if $1.64 < I_c < 2.6$ AND $F_r<0.5$*	3
I_c Zone	This parameter is the Soil Behavior Type zone based on the I_c parameter (valid for zones 2 through 7 on SBTn or SBT Qtn charts)	$I_c < 1.31$ Zone = 7 $1.31 < I_c < 2.05$ Zone = 6 $2.05 < I_c < 2.60$ Zone = 5 $2.60 < I_c < 2.95$ Zone = 4 $2.95 < I_c < 3.60$ Zone = 3 $I_c > 3.60$ Zone = 2	3
CD	The contractive / dilative boundary on Robertson's Modified SBTn (contractive/dilative) Chart shown in Figure 6 above. The boundary is marked as CD = 70 on the chart in the relevant paper. Similar to the $Q_{tn,cs}$ = 70 line in Figure 4.	$CD = 70 = (Q_{tn} - 11)(1 + 0.06F_r)^{17}$ lower bound of CD = 60: $CD = 60 = (Q_{tn} - 9.5)(1 + 0.06F_r)^{17}$	30

Calculated Parameter	Description	Equation	Ref
I_B	Hyberbolic fit defining the boundary between SBT soil types proposed by Schneider as a better fit than the I_c circles. I_B = 32 represents the boundary for most sand like soils. I_B = 22 represents the upper boundary for most clay like soils. The region between I_B=22 and I_B=32 is the "transitional soil" zone.	$I_B = 100\ (Q_{tn} + 10) / (70 + Q_{tn} F_r)$	30
State Param or State Parameter or ψ	The state parameter index, ψ, is defined as the difference between the current void ratio, e, and the critical void ratio, e_c. Positive ψ - contractive soil Negative ψ - dilative soil This is based on the work by Been and Jefferies (1985) and Plewes, Davies and Jefferies (1992) This method uses mean normal stresses based on a uniform value of K_0 or a calculated K_0 using methods described elsewhere in this document	See reference	6, 8
Yield Stress σ_p'	Yield stress is calculated using the following methods 1) General method 2) 1st order approximation using q_tNet (clays) 3) 1st order approximation using Δu_2 (clays) 4) 1st order approximation using q_e (clays) 5) Based on Vs	All stresses in kPa 1) $\sigma_p' = 0.33 \cdot (q_t - \sigma_v)^{m'} (\sigma_{atm}/100)^{1-m'}$ where $m' = 1 - \frac{0.28}{1 + (I_c / 2.65)^{25}}$ 2) $\sigma_p' = 0.33 \cdot (q_t - \sigma_v)$ 3) $\sigma_p' = 0.54 \cdot (\Delta u_2)$ $\Delta u_2 = u_2 - u_0$ 4) $\sigma_p' = 0.60 \cdot (q_t - u_2)$ 5) $\sigma_p' = (Vs/4.59)^{1.47}$	19 20 20 20 18
OCR OCR(JS1978) YSR(Mayne2014) YSR (qtNet) YSR (deltaU) YSR (qe) YSR (Vs) OCR (PKR2015)	Over Consolidation Ratio based on 1) Schmertmann (1978) method involving a plot plot of S_u/σ_v' /($S_u/\sigma_v')_{NC}$ and OCR  2) based on Yield stresses described above 3) approximate version based on qtNet 4) approximate version based on Δu 5) approximate version based on effective tip, q_e 6) approximate version based on shear wave velocity, V_s and σ_v' 7) based on Qt	1) requires a user defined value for NC Su/P_c' ratio 2 through 5) *based on yield stresses* 6) YSR (Vs) = $\sigma_p'(Vs) / \sigma_v'$ 7) OCR = $0.25 \cdot (Qt)^{1.25}$	9 19 20 20 20 18 32
Es/qt	Intermediate parameter for calculating Young's Modulus, E, in sands. It is the Y axis of the reference chart. Note that Figured 5.59 from reference 5, Lunne, Robertson and Powell, (LRP) has an error. The X axis values are too high by a factor of 10. The plot is based on Baldi's (not Bellotti as cited in	Based on Figure 5.59 in the reference	5, 37

Calculated Parameter	Description	Equation	Ref
	LRP) original Figure 3 where the X axis is: $\frac{q_c}{\sqrt{\sigma_v'}}$ (both in kPa) with a range of 200 to 3000. Figure 5.59 from LRP shows a dimensionless form of the equation, q_{c1}, displaying the same range of values. Figure 5.59's X axis uses $q_{c1} = \left(\frac{q_c}{P_a}\right)\left(\frac{P_a}{\sigma_v'}\right)^{0.5}$ The two expressions are not the same: they differ by a factor of $\frac{\sqrt{P_a}}{P_a}$. With P_a taken to be 100 kPa the factor is 1/10. Substituting typical values of 200 bar (20000 kPa) for q_c and 225 kPa for σ_v' one gets: 20000 / 15 = 1333.33 for Bellotti's axis and $(200/1)(100/225)^{0.5}$ = 200 * (10/15) = 133.3 for LRP's axis (noting that P_a = 1 bar) showing a factor of 10 difference.		
Es or E_s Young's Modulus E	Young's Modulus based on the work done in Italy. There are three types of sands considered in this technique. The user selects the appropriate type for the site from: a) OC Sands b) Aged NC Sands c) Recent NC Sands Each sand type has a family of curves that depend on mean normal stress. The program calculates mean normal stress and linearly interpolates between the two extremes provided in the E_s/q_t chart. E_s is evaluated for an axial strain of 0.1%.	Mean normal stress is evaluated from: $\sigma_m' = \frac{1}{3}(\sigma_v' + \sigma_h' + \sigma_h')$ where σ_v'= vertical effective stress σ_h'= horizontal effective stress *and* $\sigma_h = K_o \cdot \sigma_v'$ with K_o assumed to be 0.5	5
Delta U/TStress $\Delta u / \sigma_v$	Differential pore pressure ratio with respect to total stress	$= \frac{\Delta u}{\sigma_v}$ *where:* $\Delta u = u - u_{eq}$	39
Delta U/EStress, P Value, Excess Pore Pressure Ratio $\Delta u/\sigma_v'$	Differential pore pressure ratio with respect to effective stress. Key parameter (P, Normalized Pore Pressure Parameter, Excess Pore Pressure Ratio) in the Winckler et. al. static liquefaction method.	$= \frac{\Delta u}{\sigma_v'}$ *where:* $\Delta u = u - u_{eq}$	25, 25a
Su/EStress S_u/σ_v'	Undrained shear strength ratio with respect to vertical effective overburden stress using the S_u (N_{kt}) method	= *Su* (N_{kt}) / σ_v'	9, 23
Vs or V_s	Recorded shear wave velocities (not estimated). The shear wave velocities are typically collected over 1 m depth intervals. Each data point over the relevant depth range is assigned the same V_s value.	recorded data	27
Vp or V_p	Recorded compression wave (or P wave) velocities (not estimated). The P wave velocities are typically collected over 1 m depth intervals. Each data point over the relevant depth range is assigned the same V_p value.	recorded data	27

Calculated Parameter	Description	Equation	Ref
V_{s30} V_{s100}	The average shear wave velocity of the near surface materials to a depth of 30 m (100 ft). It is based on the sum of all travel times through all layers in the top 30m (100 ft). V_{s100} is the same calculation as V_{s30} except down to a depth of 100 feet.	$V_{s30} = \frac{total\ thickness\ of\ all\ layers\ to\ 30\ m}{\Sigma\left(\frac{layer\ thickness}{layer\ shear\ wave\ velocity}\right)}$ $V_{s30} = \frac{total\ thickness\ of\ all\ layers\ to\ 30\ m}{\Sigma\ (layer\ travel\ times)}$	38
G_{max}	G_{max} determined from SCPT shear wave velocities (not estimated values). Note that seismic data (V_s) is collected over set depth intervals (typically 1 meter). Each data point over the test segment is assigned the same V_s value. Since soil density changes with depth, slightly different G_{max} values may be calculated over the test depth interval.	$G_{max} = \rho V_s^2$ where ρ is the mass density of the soil determined from the estimated unit weights at each test depth	27
qtNet/G_{max}	Net tip resistance ratio with respect to the small strain modulus G_{max} determined from SCPT shear wave velocities (not estimated values)	$= (qt - \sigma_v) / G_{max}$ where $G_{max} = \rho V_s^2$ and ρ is the mass density of the soil determined from the estimated unit weights at each test depth	15, 28, 30
qUlt	A site specific and client specific parameter for estimating the limiting stress for "crane walk" accessibility	$q_{ult} = CraneWalkFactor \cdot S_u$ Where: *CraneWalkFactor* is client provided	U*
Estimated G_o	Estimated value for small strain shear modulus	$G_o = 0.0188[10^{(0.55Ic + 1,68)}](q_t - \sigma_v)$	15
Estimated E_{25}	Estimated value for Young's Modulus, E, at a 25% working load	$E_{25} = \alpha_E$ (qtNet) where $\alpha_E = 0.015[10^{(0.55Ic + 1,68)}]$	15
k_{SBT}	Estimated soil permeability derived from Soil Behavior Type (SBT) Chart I_c values.	For $1.0 < I_c \leq 3.27$: $k = 10^{(0.952 - 3.04Ic)}$ in m/s For $3.27 < Ic < 4.0$: $k = 10^{(-4.52 - 1.37Ic)}$ in m/s	35
M or D' Constrained Modulus	Constrained Modulus based on 1) Robertson, M 2) Mayne, D'	1) Robertson $M = \alpha_M (q_t - \sigma_v)$ $I_c > 2.2$ (fine grained) $\alpha_M = Qt$ when $Qt < 14$ $\alpha_M = 14$ when $Qt > 14$ $Ic < 2.2$ (coarse grained) $\alpha_M = 0.0188\ [10^{(0.55Ic + 1.68)}]$ $D' = \alpha_D (qt - \sigma_v)$ where $\alpha_D = 5$	32 23

Table 1b. CPT Parameter Calculation Methods – Liquefaction Parameters

Calculated Parameter	Description	Equation	Ref
K_{SPT} or K_s	Equivalent clean sand factor for $(N_1)60$	$K_{SPT} = 1 + ((0.75/30) \bullet (FC - 5))$	10
K_{CPT} or K_c (RW1998)	Equivalent clean sand correction for q_{c1N}	$K_{cpt} = 1.0$ for $I_c \leq 1.64$ $K_{cpt} = f(I_c)$ for $I_c > 1.64$ (see reference) $K_c = -0.403\ I_c^4 + 5.581\ I_c^3 - 21.63 I_c^2 + 33.75\ I_c - 17.88$	3, 10
K_c (PKR 2010)	Clean sand equivalent factor to be applied to Q_{tn}	$K_c = 1.0$ for $I_c \leq 1.64$ $K_c = -0.403\ I_c^4 + 5.581\ I_c^3 - 21.63 I_c^2 + 33.75\ I_c - 17.88$ for $I_c > 1.64$	16
$(N_1)_{60cs}I_C$	Clean sand equivalent SPT $(N_1)_{60}I_c$. User has 3 options.	1) $(N_1)_{60cs}Ic = \alpha + \beta((N_1)_{60}I_c)$ 2) $(N_1)_{60cs}Ic = K_{SPT} * ((N_1)_{60}I_c)$ 3) $(q_{c1ncs})/(N_1)_{60cs}I_c = 8.5\ (1 - I_c/4.6)$ FC ≤ 5%: $\alpha = 0,\ \beta = 1.0$ FC ≥ 35% $\alpha = 5.0,\ \beta = 1.2$ 5% < FC < 35% $\alpha = exp[1.76 - (190/FC^2)]$ $\beta = [0.99 + (FC^{1.5}/1000)]$	10 10 5
q_{c1ncs}	Clean sand equivalent q_{c1n}	$q_{c1ncs} = q_{c1n} \bullet K_{cpt}$	3
$Q_{tn,cs}$ (PKR 2010)	Clean sand equivalent for Q_{tn} described above - Q_{tn} being the normalized tip resistance based on a variable stress exponent as defined by Robertson (2009)	$Q_{tn,cs} = Q_{tn} \cdot K_c$ (PKR 2016)	16
Su(Liq)/ESv or $S_u(Liq)/\sigma_v'$	Liquefied shear strength ratio as defined by Olson and Stark	$\frac{S_u(Liq)}{\sigma_v'} = 0.03 + 0.0143(q_{c1})$ Note: σ_v' and s_v' are synonymous	13
Su(Liq)/ESv or $S_u(Liq)/\sigma_v'$ (PKR 2010)	Liquefied shear strength ratio as defined by Robertson (2010)	$\frac{S_u(Liq)}{\sigma_v'}$ Based on a function involving $Q_{tn,cs}$	16
S_u (Liq) (PKR 2010)	Liquefied shear strength derived from the liquefied shear strength ratio and effective overburden stress	$S_u(Liq) = \sigma_v' \cdot \left(\frac{S_u(Liq)}{\sigma_v'}\right)$	16
Cont/Dilat Tip	Contractive / Dilative q_{c1} Boundary based on $(N_1)_{60}$	$(\sigma_v')_{boundary} = 9.58 \times 10^{-4}\ [(N_1)_{60}]^{4.79}$ q_{c1} is calculated from specified q_t(MPa)/N ratio	13
CRR	Cyclic Resistance Ratio (for Magnitude 7.5)	$q_{c1ncs} < 50$: $CRR_{7.5} = 0.833\ [q_{c1ncs}/1000] + 0.05$ $50 \leq q_{c1ncs} < 160$: $CRR_{7.5} = 93\ [q_{c1ncs}/1000]^3 + 0.08$	10
Kg or K_g	Small strain Stiffness Ratio Factor, K_g	$[G_{max}/q_t]/[q_{c1n}{}^{-m}]$ m = empirical exponent, typically 0.75	26

Calculated Parameter	Description	Equation	Ref
K_g*	Revised K_g factor extended to fine grained soils (Robertson).	$K_g^* = (G_o / q_n)(Q_{tn})^{0.75}$ where q_n is the net tip resistance = $q_t - \sigma_v$	30
SP Distance	State Parameter Distance, Winckler static liquefaction method	Perpendicular distance on Q_{tn} chart from plotted point to state parameter Ψ = -0.05 curve	25
URS NP Fr	Normalized friction ratio point on Ψ = -0.05 curve used in SP distance calculation		25
URS NP Q_{tn}	Normalized tip resistance (Q_{tn}) point on Ψ = -0.05 curve used in SP Distance calculation		25

Table 2. References

No.	Reference
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Piezocone Calibration Sheets

CONETEC

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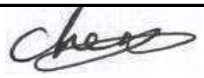
Tel: 1-604-273-6013

CERTIFICATE OF CALIBRATION

Calibration Information			
Cone Serial Number	EC1065	Model	A15 T1500 F15 U35
Date	2024-01-17		
Technician Performing Calibration	Richard Chen	Signature	
Calibration Approved By	Vishrut Khunt	Signature	

Lab Condition	As Found	As Left		
Lab Temperature	N/A	24˚C		
Lab Humidity	N/A	19%	Reason for Calibration	new

Cone Information				
Tip Stress Limit	1500	bar	Tip End Area	15 cm²
Friction Stress Limit	15	bar	Friction Surface Area	225 cm²
Pressure Limit	35	bar	RTD Location	Pressure Carrier
X-Inclinometer Limit	30	degrees	Geophone	X and Z
Y-Inclinometer Limit	30	degrees	Temperature Range	-20°C to 60°C

Baseline Summary: (For Reference Only)

Channel	Units	As Found	As Left
Tip	bar	N/A	-0.245
Sleeve	bar	N/A	-0.055
Pressure	bar	N/A	0.992
X-Inclinometer	degrees	N/A	0.012
Y-Inclinometer	degrees	N/A	0.019
Temperature	˚C	N/A	22.538

Classified in accordance with ISO 22476-1:2012 Class 1
Classified in accordance with ISO 22476-1:2012 Class 2

Calibrated in general accordance with the ASTM D5778-20 and D7400-08 standards

Calibrated with Adara calibration procedure EC_CPTCAL-2.2

Collective uncertainty of the measurement standards conforms to a test uncertainty ratio (TUR) of 3:1 for tip and sleeve measurement and 4:1 for pressure measurement with a confidence level k=2

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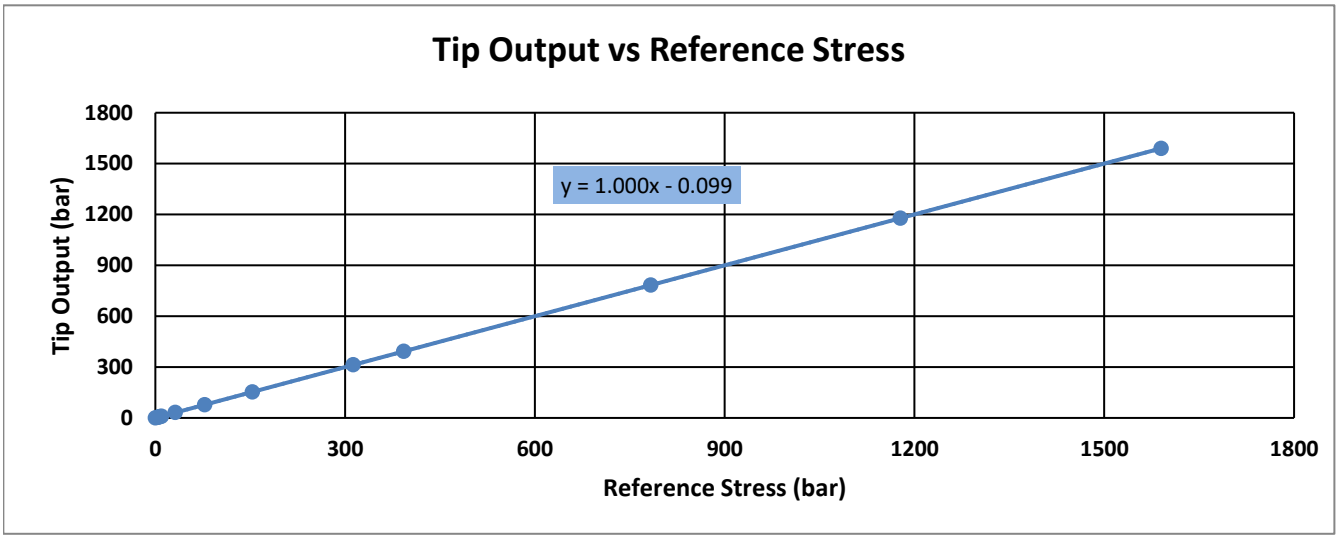
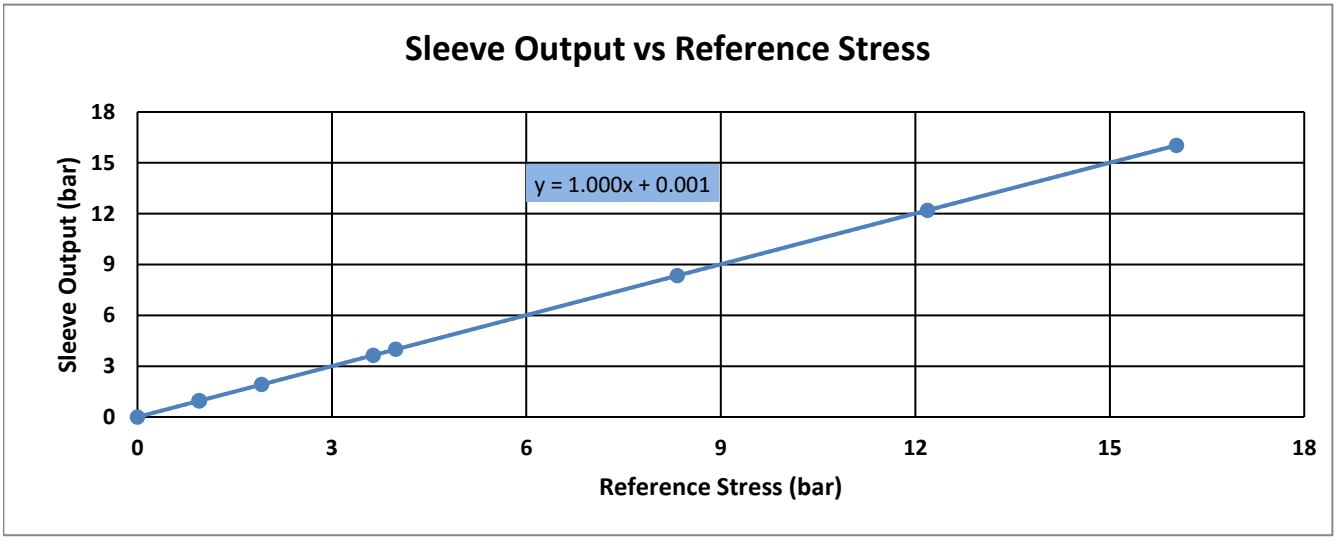
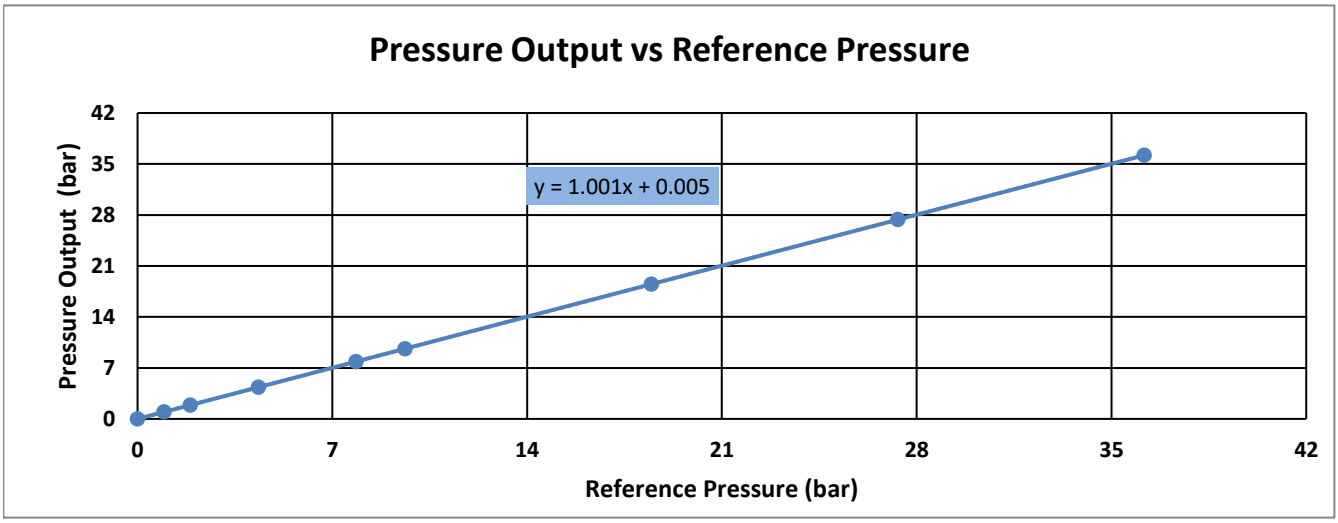
Cone Output vs Reference Stress/Pressure Plots







Adara Systems Ltd.
201-8327 Eastlake Drive, Burnaby, BC, Canada V5A4W2
Tel: 1-604-273-6013

Calibration Results

Tip Calibration					
As Found			As Left		
Max. Non Linearity	N/A	N/A	Max. Non Linearity	0.02%	PASS
Calibration Error	N/A	N/A	Calibration Error	0.11%	PASS

Sleeve Calibration					
As Found			As Left		
Max. Non Linearity	N/A	N/A	Max. Non Linearity	0.09%	PASS
Calibration Error	N/A	N/A	Calibration Error	0.16%	PASS

Pressure Calibration					
As Found			As Left		
Max. Non Linearity	N/A	N/A	Max. Non Linearity	0.10%	PASS
Calibration Error	N/A	N/A	Calibration Error	0.23%	PASS

X-Inclinometer Calibration					
As Found			As Left		
Max. Non Linearity	N/A	N/A	Max. Non Linearity	0.21%	PASS
Calibration Error	N/A	N/A	Calibration Error	-0.42%	PASS

Y-Inclinometer Calibration					
As Found			As Left		
Max. Non Linearity	N/A	N/A	Max. Non Linearity	0.04%	PASS
Calibration Error	N/A	N/A	Calibration Error	-0.08%	PASS

Seismic Calibration					
As Found			As Left		
Trigger Delay Error	N/A	N/A	Trigger Delay Error	0.01%	PASS

Temperature Calibration			
Full Scale Error	0.27%	PASS	

Channel	Cold	Room	Hot	Units
Ref_Temp	2.8	20.6	43.6	˚C
Tip	-2.954	-1.076	1.520	bar
Sleeve	-0.088	-0.068	-0.038	bar
Pressure	1.011	1.019	0.973	bar
Temperature	2.683	20.365	43.687	˚C

Tip Temperature Coefficient	0.110 bar/˚C	PASS
Sleeve Temperature Coefficient	0.001 bar/˚C	PASS
Pressure Temperature Coefficient	-0.001 bar/˚C	PASS

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Tel: 1-604-273-6013

Testing Equipment Details

Testing Machines	Model Number	Serial Number	Calibration Number	Due Date
Tip Load Cell	Precision	P-10289	100490	2025-09-18
Sleeve Load Cell	Precision	P-10868	100579	2025-10-01
Digital Loadcell Indicator	4215	62140	100490	2024-07-18
Fluke Reference Pressure Monitor	RPM4 A10Ms	3910	100835	2024-12-12
Tektronix Function Generator	AFG3021B	C030955	100751	2024-10-20
Thermometer	THS-222-555	D23255834	100410	2024-07-11
Thermometer	THS-222-555	D23255829	100410	2024-07-11
Thermometer	THS-222-555	D20345575	100565	2024-07-14

Adara Systems Ltd.
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Tel: 1-604-273-6013

Adara Error Definitions

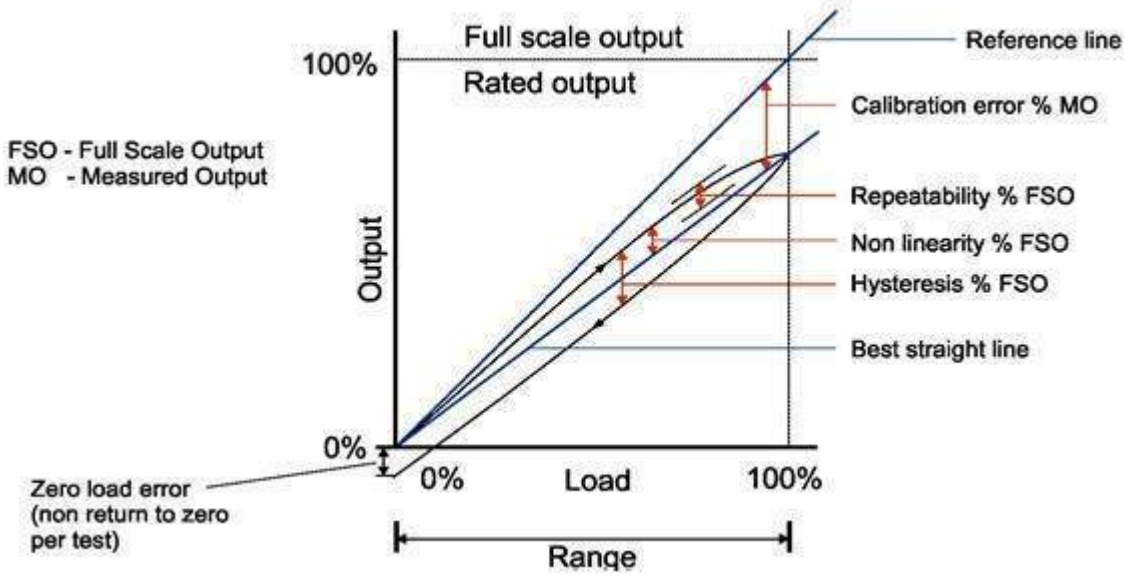

Figure 1: Definition of Calibration Terms for Load Cell and Transducers (Adapted from [1])

Actual Sensitivity	The slope of the best fit line through all data points starting at zero load.
Slope Error	The error in the best fit line compared to the ideal linear calibration in % . Slope Error = (Best Fit Slope - Ideal Slope) / Ideal Slope
Maximum Non Linearity	This value represents the maximum error (absolute value) relative to the best fit line considering each calibration point starting at loads greater than approximately 10% of FSO. The reported errors are a percent error of FSO. Adara's Pass/Fail criteria is 0.5% of FSO (ASTM is 0.5% of FSO at loads > 20% FSO).
Calibration Error	This value represents the maximum error (absolute value) in the recorded load value as compared to the actual load value for each calibration point for loads greater than approximately 10% of FSO. Adara's Pass/Fail criteria for the tip and sleeve is 0.5% of MO and 1.0% of MO for the pore pressure (ASTM for the tip and sleeve is 1.5% and 1.0% of MO respectively at loads greater than 20% of FSO)

Temperature Check Passing Criteria

Tip Temperature Coefficient	<0.200	bar/˚C
Sleeve Temperature Coefficient	<0.005	bar/˚C
Pressure Temperature Coefficient	<0.0196	bar/˚C

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ASTM D5778-20 Annex A Summary [1]

A1.4 Force Transducer Calibration Requirements

A1.4.1 states the following limits:

Non Linearity	Tip	≤ +0.5% of FSO
	Sleeve	≤ +1.0% of FSO
Calibration Error	Tip	≤ +1.5% of MO at loads > 20% FSO
	Sleeve	≤ +1.0% of MO at loads > 20% FSO

A1.5 Pressure Transducer Calibrations

A1.5.1 limits:

Non Linearity	Pore Pressure	≤ +1.0% of FSO
Calibration Error	Pore Pressure	not specified

ISO 22476 -1:2012 Summary [2]

Section 5.2 states the following allowable minimum accuracy

Class 1	Cone Resistance	35 kPa or 5%
	Sleeve Friction	5 kPa or 10%
	Pore Pressure	10 kPa or 2%
Class 2	Cone Resistance	100 kPa or 5%
	Sleeve Friction	15 kPa or 15%
	Pore Pressure	25 kPa or 3%

Note: ISO Compliance is based on low end calibration only.

References

[1] ASTM D5778-20. "Standard Test Method for Electronic Friction Cone and Piezocone Penetration Testing of Soils". ASTM, West Conshohocken, PA, USA.

[2] ISO 22476-1:2012. "Geotechnical investigation and testing - Field Testing - Part 1: Electrical cone and piezocone penetration test". ISO, Geneva, Switzerland.

ASTM D7400-08. "Standard Test Methods for Downhole Seismic Testing". ASTM, West Conshohocken, PA, USA.

APPENDIX B
Laboratory Test Results

APPENDIX B

Laboratory Testing

Soil samples obtained from the explorations were transported to our laboratory and evaluated to confirm or modify field classifications, as well as to assess engineering properties of the soils encountered. Representative samples were selected for laboratory testing and transported to our geotechnical laboratory in Portland, Oregon. The tests were performed in general accordance with the test methods of ASTM International (ASTM) or other applicable procedures. One sample was submitted to CERCO Analytical, Inc. for corrosivity testing. A summary of the test results is included as Figure B-1.

Visual Classifications

Soil samples obtained from the explorations were visually classified in the field and in our geotechnical laboratory based on the Unified Soil Classification System and ASTM classification methods. ASTM Test Method D 2488 was used to classify soils using visual and manual methods. ASTM Test Method D 2487 was used to classify soils based on laboratory test results.

Laboratory Test Results

Moisture Content

Moisture contents of samples were obtained in general accordance with ASTM Test Method D 2216. The results of the moisture content tests completed on samples from the explorations are presented on the exploration logs included in Appendix A and on Figure B-1 in this appendix.

Atterberg Limits Testing

Atterberg limits (liquid limit, plastic limit, and plasticity index) of fine-grained soil samples were obtained in general accordance with ASTM Test Method D 4318. The results of the Atterberg Limits tests are presented on the exploration logs included in Appendix A, summarized on Figure B-1 in this appendix, and shown in detail on Figure B-2 in this appendix.

Particle Size Distribution

Sieve analysis tests were performed to determine the quantitative distribution of particle sizes in the sample. The tests were performed in general accordance with ASTM Test Method D 6913. The “percent fines” portions of the test results are indicated on the appropriate exploration logs included in Appendix A and on Figure B-1 in this appendix. The full test results are shown on Figure B-3 in this appendix.

Corrosivity Testing

One corrosivity test suite was performed on a sample collected from boring B-AJW01. The test suites included testing for pH, redox, chloride, sulfate, and electrical resistivity. The results of the test are presented on the final sheet of this appendix.

Exploration	Sample ID	Depth	Gravel (%)	Sand (%)	Fines (%)	Liquid Limit	Plastic Limit	Water Content (%)	USCS Group Symbol	Soil Description
B-1	S-1	0.5								
B-1	S-2	1.5								
B-1	S-3	2.5								
B-1	S-4	3.0				112	50	114.8	MH	ELASTIC SILT
B-1	S-5	5.0	17.4	35.4	47.2			91.0	SM	SILTY SAND WITH GRAVEL
B-1	S-6	7.5								
B-1	S-7	10.0								
B-1	S-8	12.5						66.1		
B-1	S-9	15.0				93	48	88.5	MH	ELASTIC SILT
B-1	S-10	17.5						85.8		
B-1	S-11	20.0	0.0	8.2	91.8			84.3		
B-1	S-12	22.5						81.6		
B-1	S-13	25.0								
B-1	S-14	27.5								
B-1	S-15	30.0						80.4		
B-1	S-16	32.5								
B-1	S-17	35.0	0.0	24.9	75.1			72.7		
B-1	S-18	37.5								
B-1	S-19	40.0	0.0	63.7	36.3			39.2	SM	SILTY SAND
B-1	S-20	45.0						42.1		
B-1	S-21	50.0	0.0	75.0	25.0			35.5		
B-1	S-22	55.0								
B-1	S-23	60.0	0.5	80.3	19.3			38.7	SM	SILTY SAND
B-1	S-24	65.0								
B-1	S-25	70.0	0.2	68.9	30.9			41.8	SM	SILTY SAND
B-1	S-26	75.0	0.0	41.0	59.0			53.4		
B-1	S-27	80.0	0.0	57.4	42.6			42.9	SM	SILTY SAND
B-1	S-28	85.0								
B-1	S-29	90.0								
B-1	S-30	95.0								
B-1	S-31	100.0								
B-1	S-32	105.0								
B-1	S-33	110.0								
B-1	S-34	115.0								
B-1	S-35	124.0								

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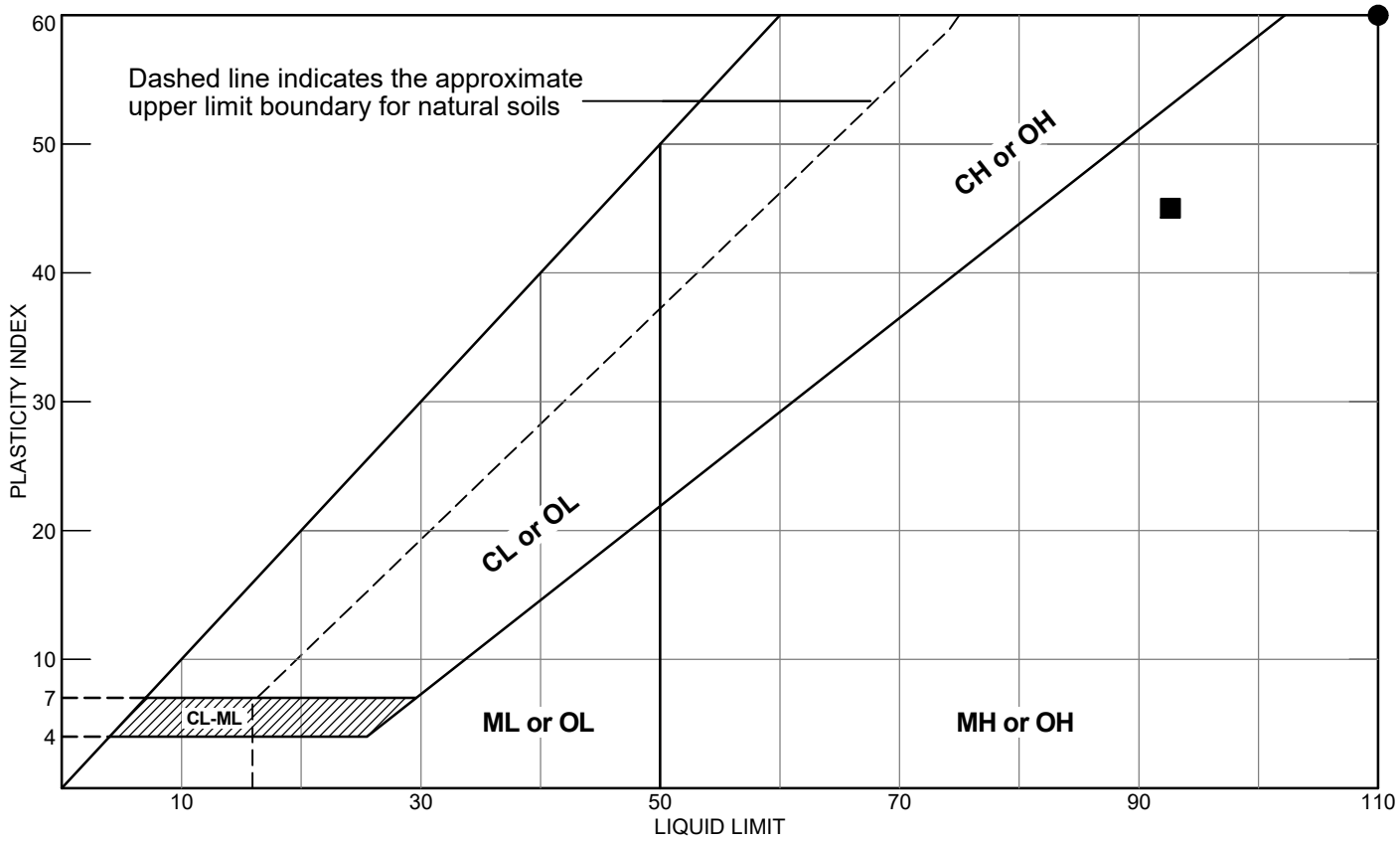
HALEY ALDRICH

Project: Aberdeen School District - AJ West
Location: Aberdeen, Washington
Project No.: 0210366-000

Summary of Laboratory Results

Figure **B-1**
Sheet **1 of 1**



Location and Description	LL	PL	PI	-#200	MC%	USCS
● **Source:** B-1 **Sample No.:** S-4 **Depth:** 3.0 to 3.5 ELASTIC SILT	112	50	62	NT	115	MH
■ **Source:** B-1 **Sample No.:** S-9 **Depth:** 15.0 to 16.5 ELASTIC SILT	93	48	45	NT	89	MH

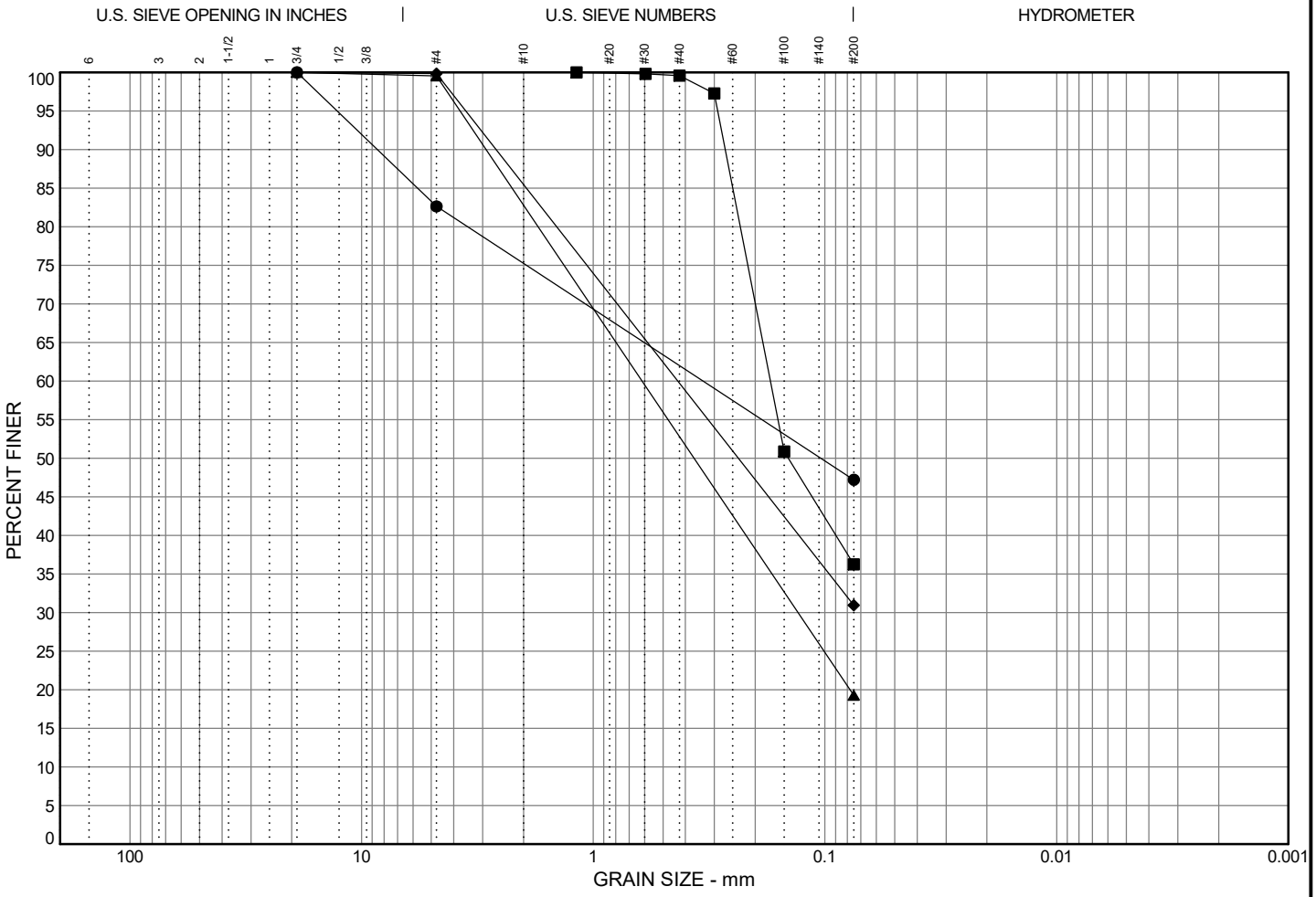
Remarks:

●

■

HALEY ALDRICH	Project: Aberdeen School District - AJ West Location: Aberdeen, Washington Project No.: 0210366-000	**Liquid Limit, Plastic Limit, and Plasticity Index**	Figure **B-2** Sheet **1 of 1**

HA ATTERBERG LIMITS C:\USERS\TIMERLIN\ONEDRIVE - HALEY ALDRICH.COM\DESKTOP\HC_LIBRARY GLB 5/17/24 14:33 - \\HALEYALDRICH.COM\SHARE\CPP\PROJECTS\0210366\GINT\PERMANENT GINT FILE\0210366-000_ABERDEEN SCHOOL DISTRICT-AJ WEST_GINT.GPJ - tmerlin



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Location and Description	% Cobbles	% Gravel	% Sand	% Silt	% Clay	MC%	USCS
● **Source:** B-1 **Sample No.:** S-5 **Depth:** 5.0 to 6.5 SANDY ELASTIC SILT WITH GRAVEL	0.0	17.4	35.4	47.2		91	MH
■ **Source:** B-1 **Sample No.:** S-19 **Depth:** 40.0 to 41.5 SILTY SAND	0.0	0.0	63.7	36.3		39	SM
▲ **Source:** B-1 **Sample No.:** S-23 **Depth:** 60.0 to 61.5 SILTY SAND	0.0	0.5	80.3	19.3		39	SM
◆ **Source:** B-1 **Sample No.:** S-25 **Depth:** 70.0 to 70.8 SILTY SAND	0.0	0.2	68.9	30.9		42	SM

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			5.738	0.335	0.104					
■			0.250	0.172	0.144					
▲			2.241	0.616	0.367	0.131				
◆			1.943	0.431	0.236					

Remarks:

● ■ ▲ ◆

HALEY ALDRICH

Project: Aberdeen School District - AJ West
Location: Aberdeen, Washington
Project No.: 0210366-000

Particle-Size Analysis

Figure **B-3**
Sheet **1 of 2**

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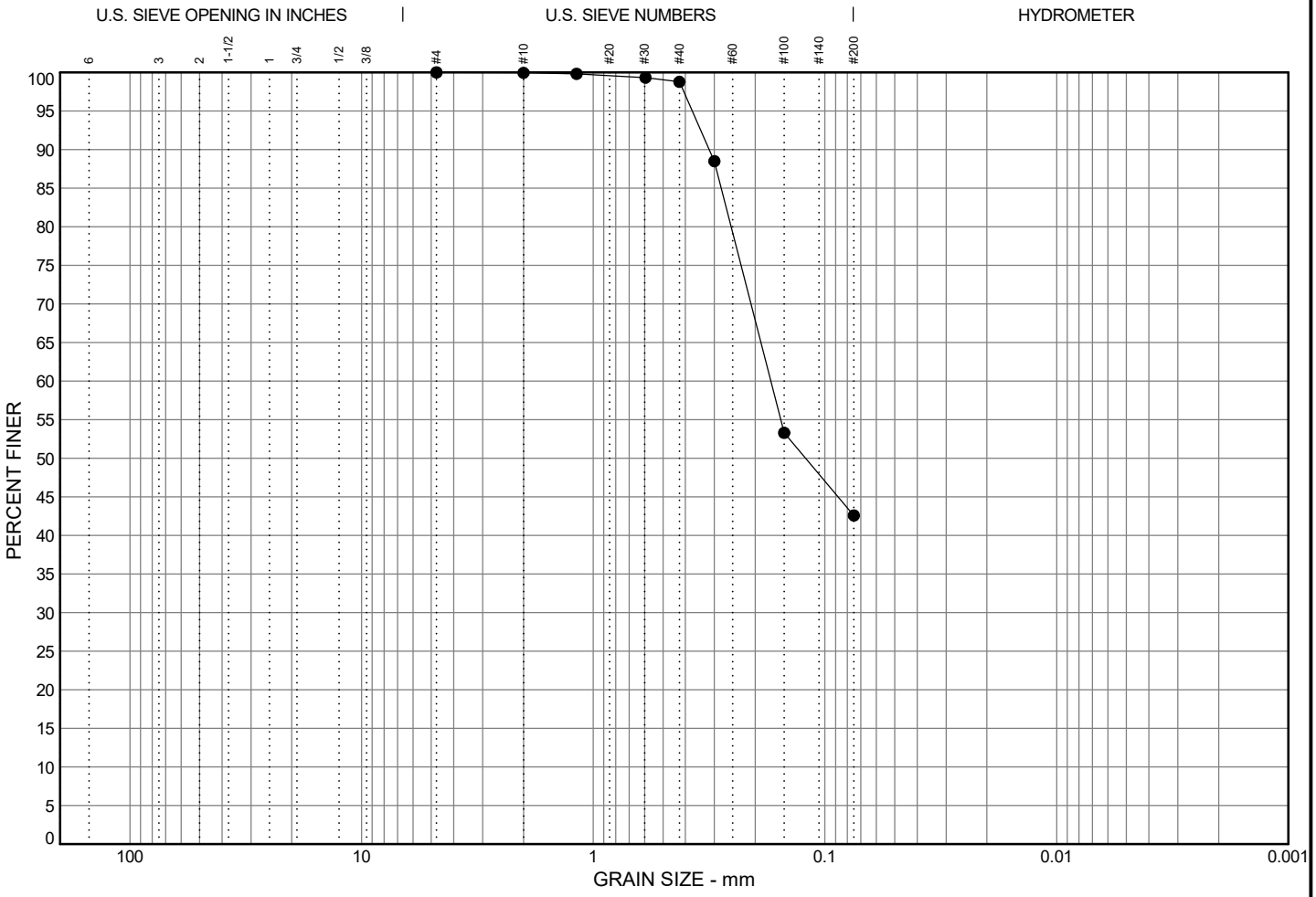

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Location and Description	% Cobbles	% Gravel	% Sand	% Silt	% Clay	MC%	USCS
● **Source:** B-1 **Sample No.:** S-27 **Depth:** 80.0 to 81.5 SILTY SAND	0.0	0.0	57.4	42.6		43	SM

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.280	0.171	0.121					

Remarks:

●

HALEY ALDRICH

Project: Aberdeen School District - AJ West
Location: Aberdeen, Washington
Project No.: 0210366-000

Particle-Size Analysis

Figure **B-3**
Sheet **2 of 2**

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CERCO analytical
1100 Willow Pass Court, Suite A
Concord, CA 94520-1006
925 462 2771 Fax. 925 462 2775
www.cercoanalytical.com

21 May, 2024

Job No. 2405048
Cust. No. 13349

Mr. Micah Hintz
Haley & Aldrich
6420 S. Macadam Ave., Suite 100
Portland, OR 97239

Subject: Project No.: 0210365
Project Name: Aberdeen School District
Corrosivity Analysis –ASTM Test Methods

Dear Mr. Hintz:

Pursuant to your request, CERCO Analytical has analyzed the soil samples submitted on May 16, 2024. Based on the analytical results, this brief corrosivity evaluation is enclosed for your consideration.

Based upon the resistivity measurements, Samples No. 002-004 are classified as "corrosive" and Sample No. 001 is classified as "moderately corrosive". All buried iron, steel, cast iron, ductile iron, galvanized steel and dielectric coated steel or iron should be properly protected against corrosion depending upon the critical nature of the structure. All buried metallic pressure piping such as ductile iron firewater pipelines should be protected against corrosion.

The chloride ion concentrations ranged from none detected to 140 mg/kg and are determined to be insufficient to attack steel embedded in a concrete mortar coating.

The sulfate ion concentrations ranged from 61 mg/kg to 300 mg/kg and are determined to be sufficient to potentially be detrimental to reinforced concrete structures and cement mortar-coated steel at these locations. Therefore, concrete that comes into contact with this soil should use sulfate resistant cement such as Type II, with a maximum water-to-cement ratio of 0.55.

The pH of the soils range from 4.90 to 6.37, which is considered to be corrosive to buried iron, steel, mortar-coated steel and reinforced concrete structures. Therefore, corrosion prevention measures need to be considered for structures to be placed in this acidic soil.

The redox potentials range from 35-mV to 200-mV. Sample No.004 is indicative of potentially "severely corrosive" soils, Samples No. 001 and No. 002 are indicative of potentially "moderately corrosive" soils and Sample No. 003 is indicative of potentially "slightly corrosive" soils resulting from anaerobic soil conditions.

This corrosivity evaluation is based on general corrosion engineering standards and is non-specific in nature. For specific long-term corrosion control design recommendations or consultation, please call *JDH Corrosion Consultants, Inc. at (925) 927-6630.*

We appreciate the opportunity of working with you on this project. If you have any questions, or if you require further information, please do not hesitate to contact us.

Very truly yours,
CERCO ANALYTICAL, INC.

J. Darby Howard, Jr., P.E.
President

JDH/jdl
Enclosure

CERCO analytical
1100 Willow Pass Court, Suite A
Concord, CA 94520-1006
925 462 2771 Fax. 925 462 2775
www.cercoanalytical.com

Client: Haley & Aldrich, Inc.
Client's Project No.: 0210365
Client's Project Name: Aberdeen School District
Date Sampled: 8-Apr-2024, 10-Apr-2024, 11-Apr-2024, & 15-Apr-2024
Date Received: 16-May-24
Matrix: Soil
Authorization: Signed Chain of Custody

Date of Report: 21-May-2024

Job/Sample No.	Sample I.D.	Redox (mV)	pH	Conductivity (umhos/cm)*	Resistivity (100% Saturation) (ohms-cm)	Sulfide (mg/kg)*	Chloride (mg/kg)*	Sulfate (mg/kg)*
[redacted]								
2405048-002	0210366 B-1 @ 5'	130	5.17	-	970	-	25	100
[redacted]								
[redacted]								

Method:	ASTM D1498	ASTM D4972	ASTM D1125M	ASTM G57	ASTM D4658M	ASTM D4327	ASTM D4327
Reporting Limit:	-	-	10	-	50	15	15
Date Analyzed:	16-May-2024	17-May-2024	-	17-May-2024	-	17-May-2024	17-May-2024

Julia Clauson
Chemist

* Results Reported on "As Received" Basis
N.D. - None Detected

Quality Control Summary - **All laboratory quality control parameters were found to be within established limits**

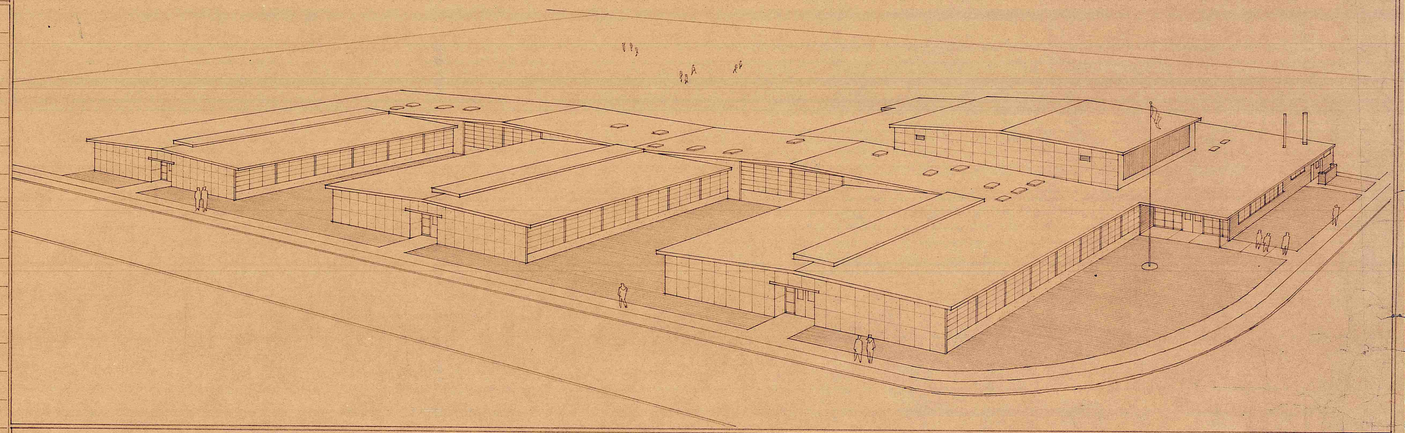
APPENDIX C
Historical Plans

WEST ABERDEEN JR. HIGH SCHOOL

FOR ABERDEEN SCHOOL DISTRICT Nº 5 . . . . . ABERDEEN, WASHINGTON

DRAWING INDEX

DWG. NO.	DWG. TITLE
	ARCHITECTURAL
1	PLOT PLAN & DETAILS
2	PART FLOOR PLAN
3	PART FLOOR PLAN
4	ELEVATIONS
5	PART ROOF & FRAMING PLAN
6	PART ROOF & FRAMING PLAN
7	BLD'G. SECTIONS & DETAILS
8	BLD'G SECTIONS & DETAILS
9	WALL SECTIONS & DETAILS
10	WALL SECTIONS & DETAILS
11	LIBRARY • TOILETS & CLASSROOM DETAILS
12	ADMINISTRATION AREA • PLAN & DETAILS
13	SHOP & SHOWER ROOM DETAILS
14	MUSIC ROOM & HOMEMAKING RM. DETAILS
15	ENTRANCE DETAILS
16	DOOR • SASH & FINISH SCHEDULES
17	PART FOUNDATION PLAN
18	PART FOUNDATION PLAN
19	STRUCTURAL WALL ELEVATIONS
20	STRUCTURAL SECTIONS & DETAILS
	MECHANICAL
M-1	PLOT PLAN
M-2	PART FOUNDATION PLAN
M-3	PART FOUNDATION PLAN
M-4	PART FLOOR PLAN
M-5	PART FLOOR PLAN
M-6	DETAILS
	ELECTRICAL
E-1	PLOT PLAN • RISER DIAGRAM • SYMBOL & FIXTURE LIST
E-2	PART FLOOR PLAN
E-3	PART FLOOR PLAN



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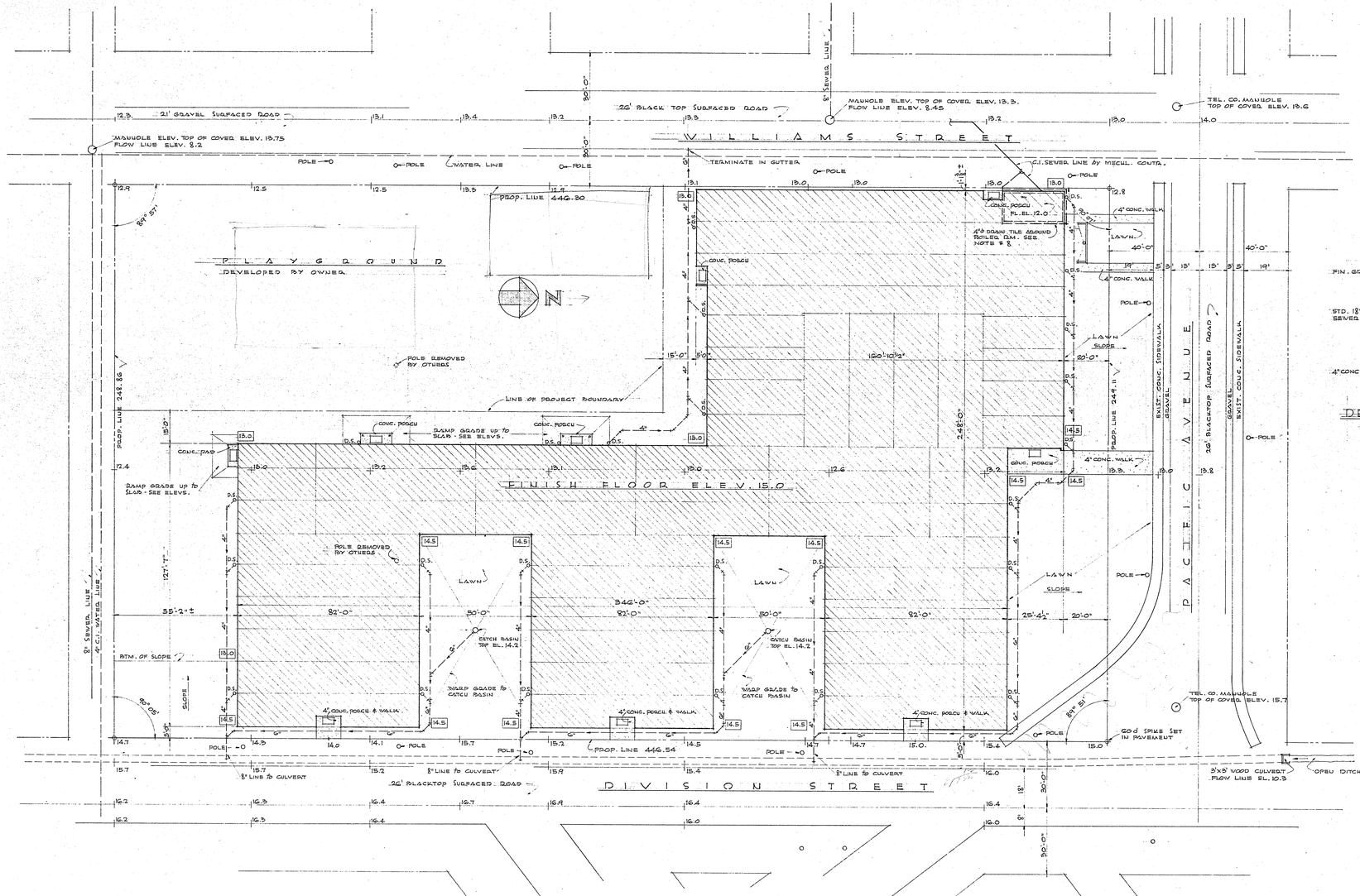
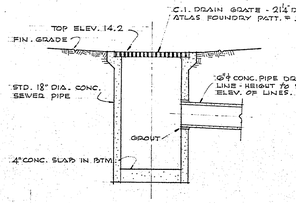


PLOT PLAN

SCALE = 1" = 20'-0"

GENERAL NOTES

1. ELEVATIONS SHOWN THUS 13.0 ARE EXISTING GRADES.
2. ELEVATIONS SHOWN THUS 15.0 ARE FINISHED GRADES.
3. SEE MECH'L. DRWGS. FOR LOCATIONS OF FUEL OIL & DIESEL OIL STORAGE TANKS.
4. DOWNSPOUTS NOT SHOWN CONNECTED TO DRAIN LINES SHALL TERMINATE AT GRADE IN A 90° ELL AND REST IN STANDARD TYPE CONCRETE SPLASH BLOCK.
5. GENERAL CONTRACTOR SHALL CONNECT ALL DOWNSPOUTS, (EXCEPT AS SHOWN) AND CATCH BASINS TO CLOSED JOINT CONCRETE SEWER PIPE LINE OF SIZE INDICATED. ALL DRAINAGE LINES SHALL BE PITCHED A MIN. OF 1/16" PER FOOT. TERMINATE IN EXIST. CULVERT OR STREET GUTTER AS SHOWN.
6. IN AREAS MARKED "LAWN" AND WITHIN PROJECT BOUNDARY, CONTRACTOR SHALL ROUGH GRADE TO FINISHED ELEVATIONS SHOWN. OWNER WILL FURNISH & INSTALL TOP SOIL AND LAWN.
7. CONTRACTOR SHALL REPAIR OR REPLACE EXIST. CONCRETE SIDEWALK DAMAGED DURING CONSTRUCTION.
8. GENL. CONTR. SHALL PROVIDE 4"ϕ OPEN JOINT CONC. DRAIN TILE AROUND BOILER ROOM AS SHOWN. CONNECT TO C.I. SEWER LINE AS SHOWN WITH 4"ϕ CLOSED JOINT TILE. MECH'L. CONTR. SHALL PROVIDE C.I. FITTING FOR CONNECTION.
9. EXTENT OF PROJECT BOUNDARY SHALL BE SIDEWALK AT NORTH SIDE, PROPERTY LINES AT EAST, WEST & SOUTH SIDES, AND AS MARKED AT PLAYFIELD.



DET. OF CATCH BASIN

SCALE = 3/4" = 1'-0"

PROPERTY DESCRIPTION

SURVEY OF LOTS 1-12 INCL. BLOCK 1 AND LOTS 1-6 INCL. BLOCK 2, A.J. WEST SUBDIVISION OF TRACT 1, BLOCK 2, EVANS AND LEWIS GRAYS HARBOR HOMESTEADS.

● INDICATES IRON PIPE SET UNLESS OTHERWISE NOTED.

THE CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS ON THE JOB BEFORE PROCEEDING WITH THIS WORK.

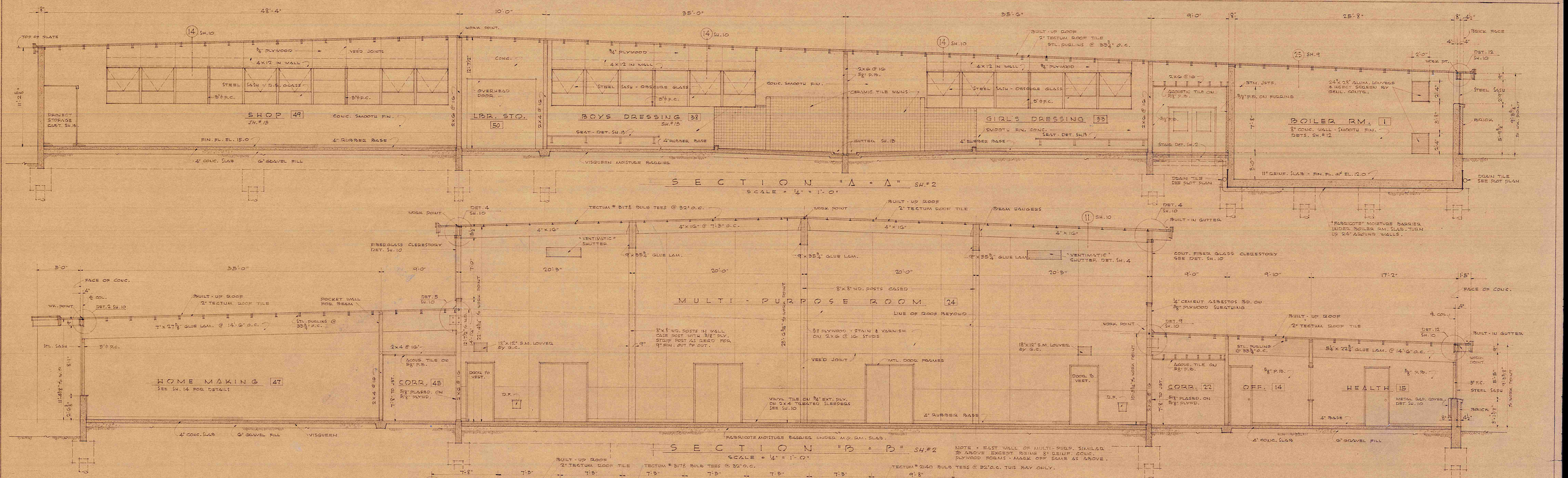
JENSEN & MILLS ARCHITECTS PROFESSIONAL ARCHITECTS

PLOT PLAN & DETS.

WEST ABERDEEN JR. HIGH SCHOOL

FOR ABERDEEN SCHOOL DIST. #5 ABERDEEN, WASHINGTON

SHEET		DATE
1 OF 20	JENSEN & MILLS ARCHITECTS 802 So. Tacoma Ave - Tacoma, Wash.	OCT. 26 JOB NO. 5340



BLDG. SECTIONS & DETS.

WEST ABERDEEN JR. HIGH SCHOOL

FOR ABERDEEN SCHOOL DIST. #5
ABERDEEN, WASHINGTON

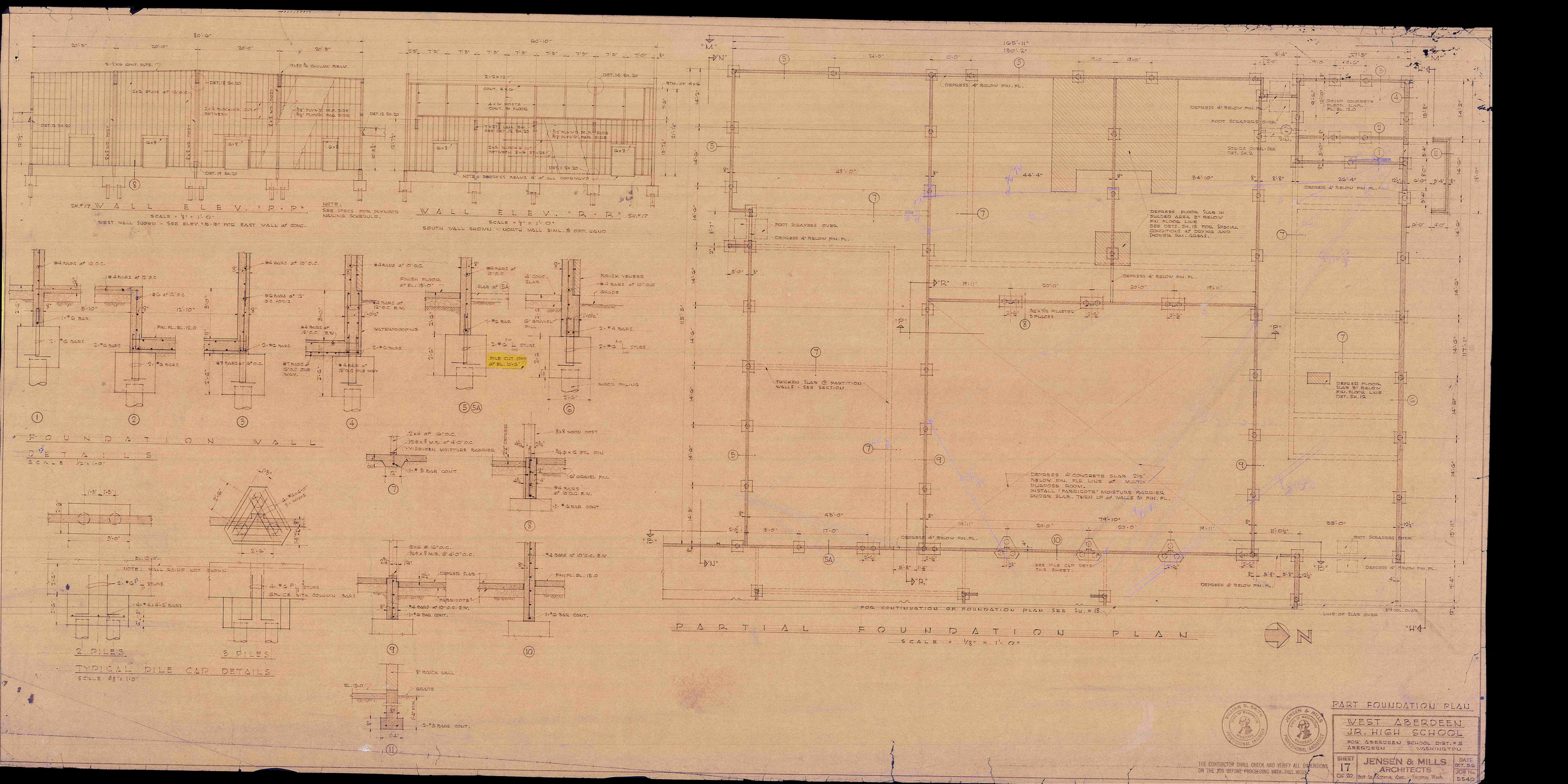
JENSEN & MILLS
ARCHITECTS
808 So. Tacoma Ave. - Tacoma, Wash.

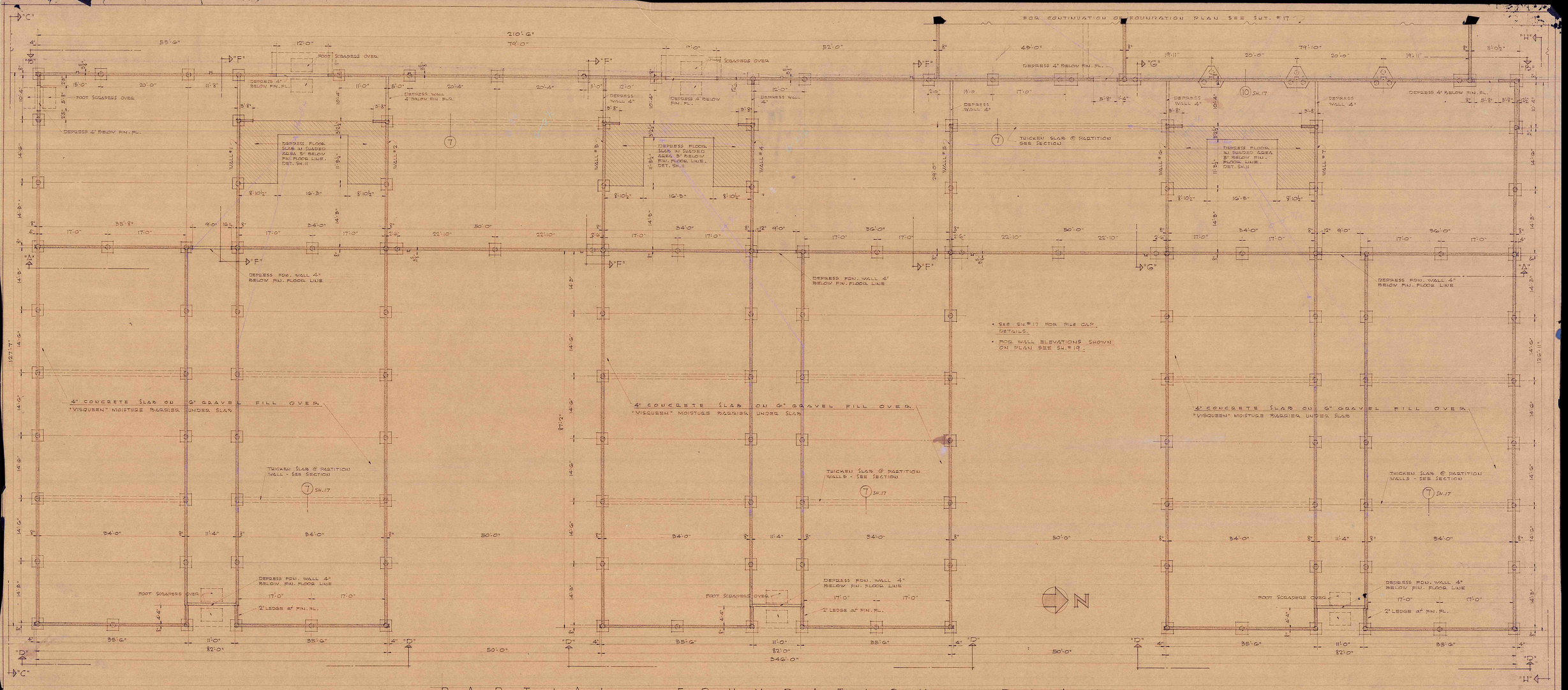
SHEET 7 OF 20

DATE OCT. 56

JOB No. 5540

THE CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS ON THE JOB BEFORE PROCEEDING WITH THIS WORK.


WALL ELEV. "P-P"
SCALE = 1/8" = 1'-0"
WEST WALL SHOWN - SEE ELEV. "B-B" FOR EAST WALL of CONC.
NOTE. SEE SPECS. FOR PLYWOOD NAILING SCHEDULE.
WALL ELEV. "R-R"
SCALE = 1/8" = 1'-0"
SOUTH WALL SHOWN - NORTH WALL SIML. to OPP. HAND
FOUNDATION WALL DETAILS
SCALE 1/2" = 1'-0"
2 PILES
3 PILES
TYPICAL PILE CAP DETAILS
SCALE 3/8" = 1'-0"
PARTIAL FOUNDATION PLAN
SCALE = 1/8" = 1'-0"
FOR CONTINUATION OF FOUNDATION PLAN SEE SH. # 18.
PART FOUNDATION PLAN
WEST ABERDEEN JR. HIGH SCHOOL
FOR ABERDEEN SCHOOL DIST. # 5
ABERDEEN WASHINGTON
SHEET 17 OF 20
JENSEN & MILLS ARCHITECTS
308 So. Tacoma Ave. - Tacoma, Wash.
DATE OCT. 56
JOB No. 5540
THE CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS ON THE JOB BEFORE PROCEEDING WITH THIS WORK.



PARTIAL FOUNDATION PLAN

SCALE • 1/8" = 1'-0"

PART FOUNDATION PLAN

WEST ABERDEEN JR. HIGH SCHOOL

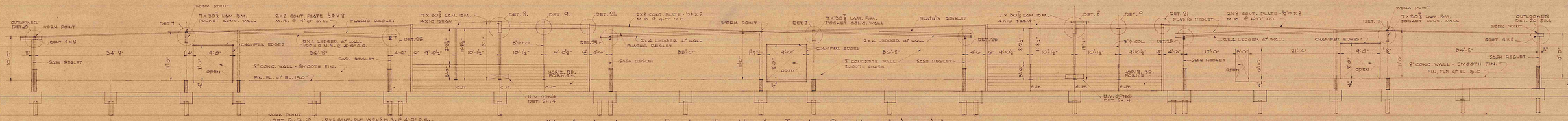
FOR ABERDEEN SCHOOL DIST. #5
ABERDEEN WASHINGTON

SHEET 18 OF 20

JENSEN & MILLS ARCHITECTS
808 So. Tacoma Ave. - Tacoma, Wash.

DATE OCT. 52
JOB No. 5540

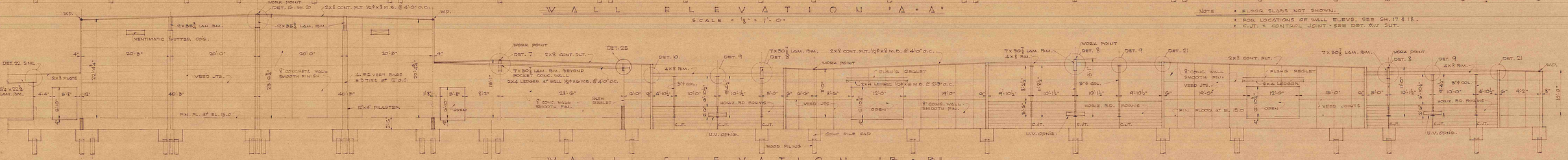
THE CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS ON THE JOB BEFORE PROCEEDING WITH THIS WORK.



WALL ELEVATION "A-A"

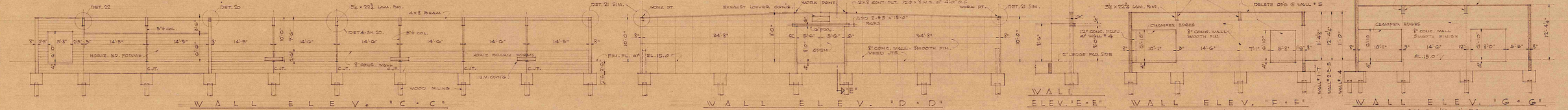
SCALE - 1/8" = 1'-0"

NOTE
- FLOOR SLABS NOT SHOWN.
- FOR LOCATIONS OF WALL ELEVS. SEE SH. 17 & 18.
- C.J.T. = CONTROL JOINT - SEE DET. 7/15 SHT.



WALL-L ELEVATION "B-B"

SCALE - 1/8" = 1'-0"



WALL ELEV. "C-C"

SCALE - 1/8" = 1'-0"

WALL ELEV. "D-D"

SCALE - 1/8" = 1'-0"

WALL ELEV. "E-E"

SCALE - 1/8" = 1'-0"

WALL ELEV. "F-F"

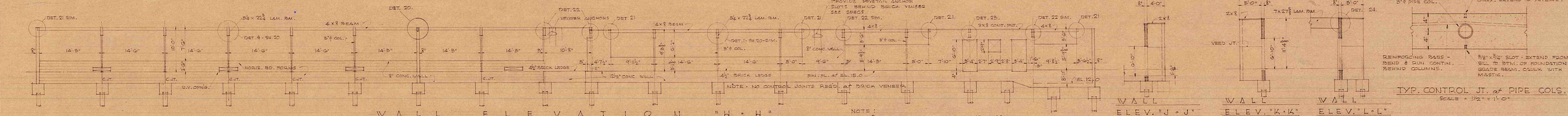
SCALE - 1/8" = 1'-0"

- WALL # 1, 3 & 5 AS SHOWN OR NOTED
- WALL # 2, 4 & 7 SIML. TO OPP. WALL

WALL ELEV. "G-G"

SCALE - 1/2" = 1'-0"

- WALL # 6 SHOWN



WALL ELEVATION "H-H"

SCALE - 1/8" = 1'-0"

PILE CUTOFF AT ELEVATION 10'-6"

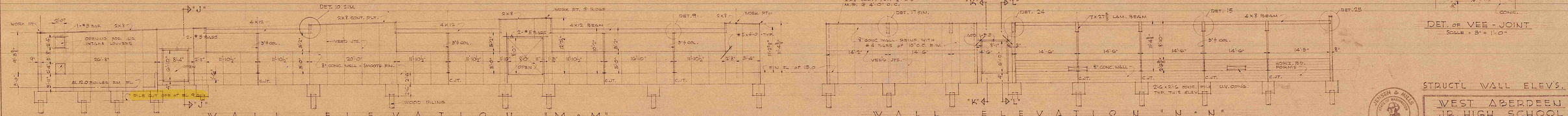
NOTE:
- ADD 1-#5 BAR TO PERIMETER OF ALL OPENINGS.
- ADD 1-#5 X 4'-0 AT ALL VERTICAL CORNERS.
- PROVIDE #4 BAR "L" THRU AT ALL HORIZONTAL CORNERS @ 10" O.C.

WALL ELEV. "J-J"

SCALE - 1/8" = 1'-0"

WALL ELEV. "K-K"

WALL ELEV. "L-L"



WALL ELEVATION "N-N"

SCALE - 1/8" = 1'-0"

TYP. CONTROL JT. at PIPE COLS.

SCALE - 1 1/2" = 1'-0"

DET. OF VEE-JOINT

SCALE - 3" = 1'-0"

STRUCT'L WALL ELEVS.

JENSEN & MILLS ARCHITECTURAL ASSOCIATES PROFESSIONAL ARCHITECT

WILLIAM D. MILLS REGISTERED ARCHITECT PROFESSIONAL ARCHITECT

THE CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS ON THE JOB BEFORE PROCEEDING WITH THIS WORK.

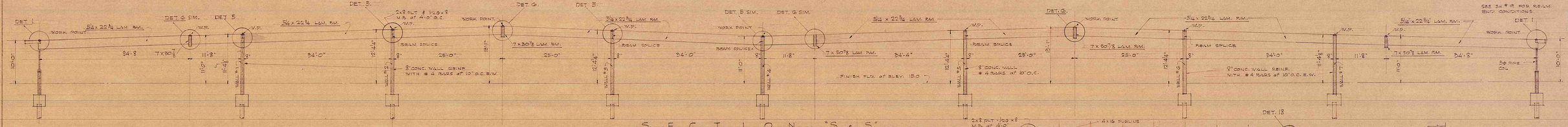
WEST ABERDEEN JR. HIGH SCHOOL
FOR ABERDEEN SCHOOL DIST. # 5
ABERDEEN WASHINGTON

SHEET 19 OF 20

JENSEN & MILLS ARCHITECTS
308 So. Tacoma Ave. - Tacoma, Wash.

DATE OCT. '52
JOB NO. 554C

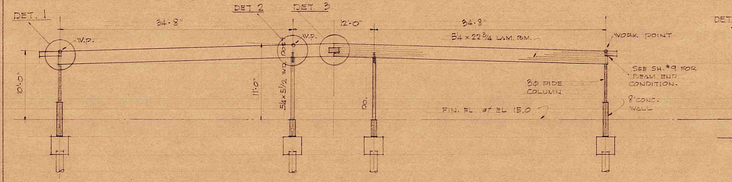
- NOTE: SEE SHEET 20 FOR ALL DETAILS -



S E C T I O N "S - S"

SEE SHEET 6 FOR LOCATION

SCALE ⅛" = 1'-0"

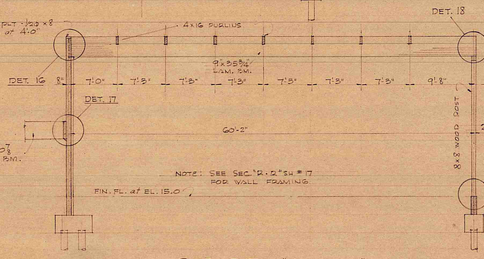


S E C T I O N "T - T" SH. 6

SCALE ⅛" = 1'-0"

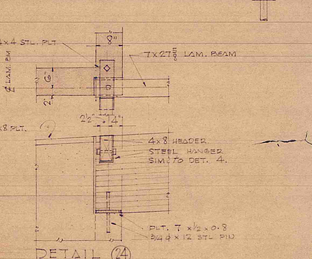
S E C T. "U - U" SH. 6

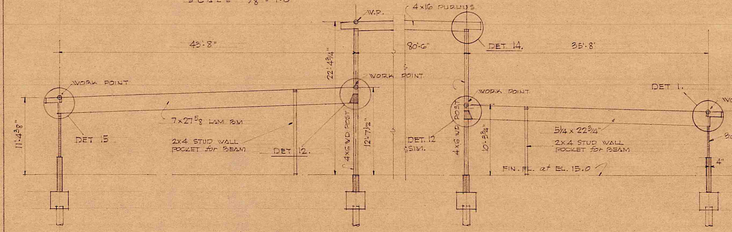
SCALE ⅛" = 1'-0"



S E C T "V - V" SH. 5

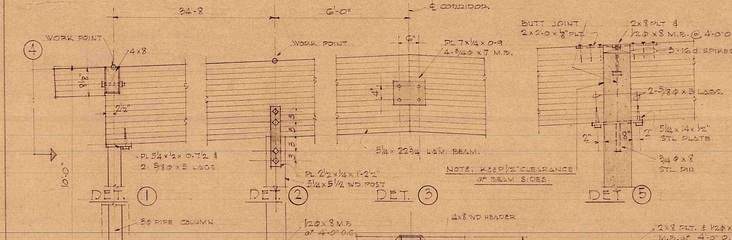
SCALE ⅛" = 1'-0"



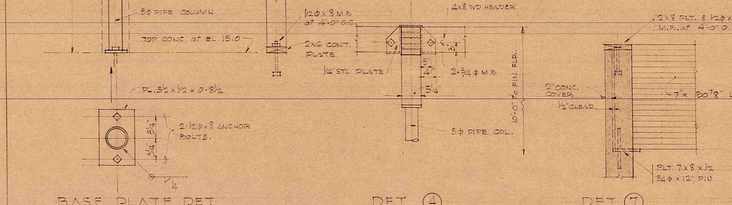


S E C T I O N "W - W" SH. 5

SCALE ⅛" = 1'-0"



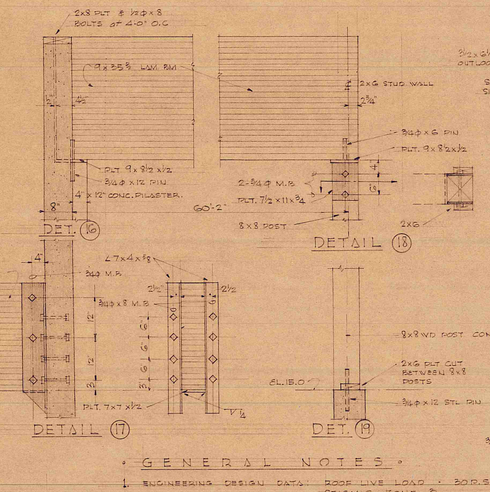
BASE PLATE DET. of 3ø COLUMN

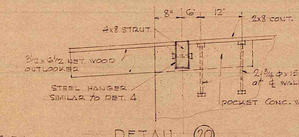


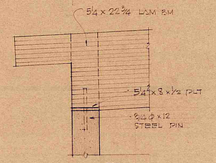
° C O N N E C T I O N D E T A I L S °

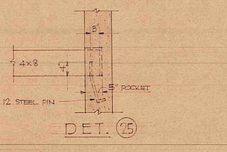
SCALE ¾" = 1'-0"

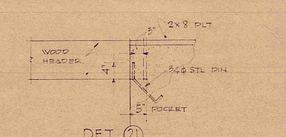


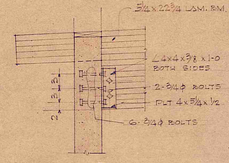












° G E N E R A L N O T E S °

1. ENGINEERING DESIGN DATA: ROOF LIVE LOAD = 20 P.S.F.
   SEISMIC ZONE 2.
   CONCRETE = 2500 P.S.I. @ 28 DAYS.
   REINF. STEEL = INTERMEDIATE GRADE DEFORMED BARS - ASTM DESIGNATION A-305.
2. WOOD PILING SHALL BE UNTREATED DARK STUCK FIR. PILING SIZE AS SPECIFIED
3. ALL PILING SHALL BE DRIVEN TO A BEARING CAPACITY OF 15 TONS
4. ALL WOOD SURFACES IN CONTACT WITH CONCRETE (EXCEPT PILING) SHALL BE PRESERVATIVE TREATED AS SPECIFIED
5. PROVIDE 4" SAND-GRAVEL FILL & 2" WASHED GRAVEL FILL UNDER ALL CONCRETE SLABS.
6. PROVIDE "VISQUEEN" MOISTURE BARRIER UNDER ALL CONCRETE SLABS, EXCEPT AT MULTI-PURP. RM., & SOILED RM. USE "BARRICOTE", TURN UP 4" AT WALLS OR AS NOTED ON DWGS. SEE DETS.
7. SHEAR PLATES SHALL BE 2⅝ø TECO MALLEABLE IRON PLATES.
8. GLUED LAMINATED BEAMS SHALL CONFORM TO W.C.L.A. SPECIFICATIONS STRESS COMBINATION 14 - ARCHITECTURAL APPEARANCE GRADE. SEE SPECS.

STRUCTURAL SECTIONS & DETAILS.

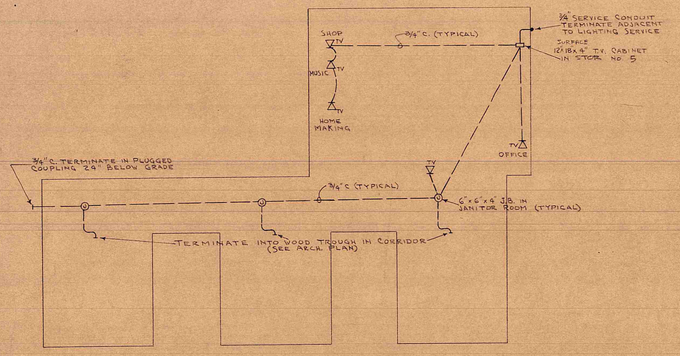
WEST ABERDEEN JR. HIGH SCHOOL
FOR ABERDEEN SCHOOL DIST #5
ABERDEEN WASHINGTON

SHEET 20 OF 20

JENSEN & MILLS ARCHITECTS
809 So. Tacoma Ave. - Tacoma, Wash.

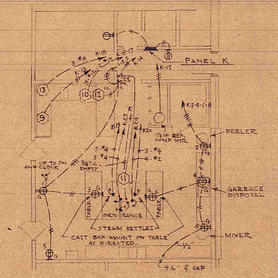
DATE OCT. 56
JOB NO. 5540

THE CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS ON THE JOB BEFORE PROCEEDING WITH THIS WORK.

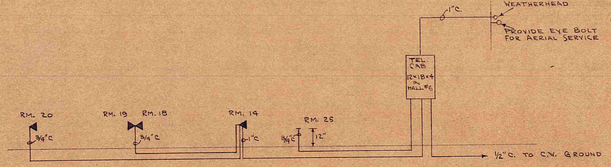


CONDUIT PLAN FOR FUTURE TELEVISION ANTENNA LEADS
SCALE 1" = 40'

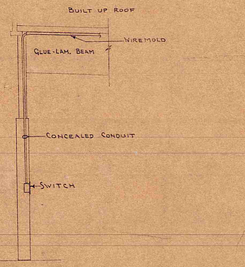
NOTE
SEE ⅛" SCALE PLANS FOR EXACT LOCATION OF OUTLETS



KITCHEN EQUIPMENT PLAN
SCALE ⅛"=1'-0"



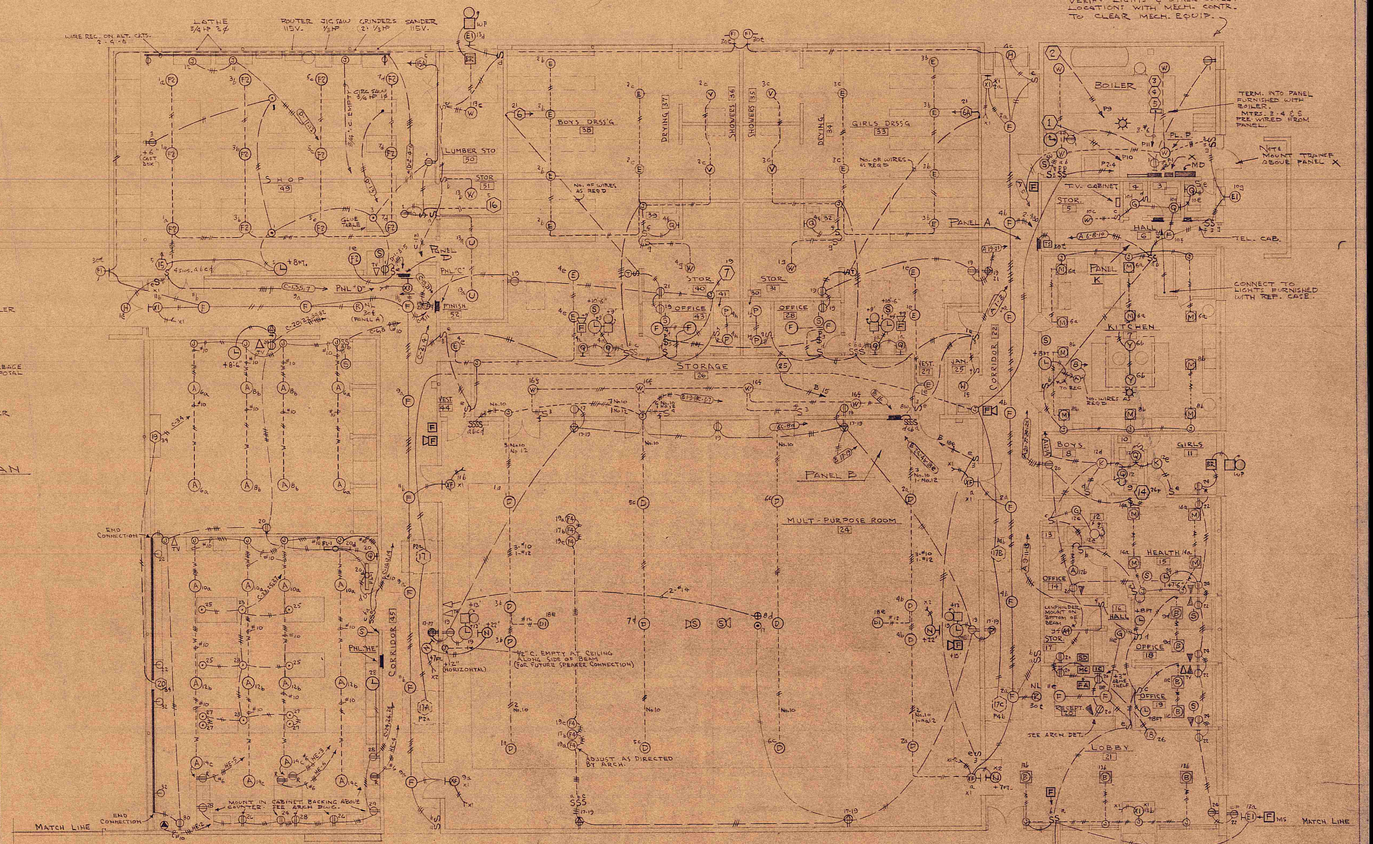
TELEPHONE CONDUIT RISER DIAGRAM
NO SCALE



TYPICAL DETAIL OF CONNECTION FROM CONCEALED CONDUIT TO EXPOSED WIREMOLD
SCALE ⅜"=1'-0"

MOTOR LIST

No.	EQUIPMENT	H.P. OR K.V.A.	VOLTS	PH	LOCATION
1	HEATING PUMP-1	5	208	3	BOILER ROOM
2	HEATING PUMP-2	3	208	3	
3	BURNER MOTOR	1	208	3	
4	INDUCED DRAFT FAN	5	208	3	
5	OIL PREHEATER	3 KW	208	1	
6-6A	UNIT HEATERS	1/15	115	1	BOY'S & GIRLS DRESSING RMS.
7	EXHAUST FAN-1	1/6	115	1	STORAGE RM. 40
8	UNIT HEATER	1/40	115	1	KITCHEN
9	SCRAPPER	1½	208	3	
9A	GARBAGE DISPOSAL	½	115	1	
10	DISHWASHER MOTOR	1	208	3	
10A	DISHWASHER BOOSTER	5 KW	208	1	
11	ROOF FAN-1	1	208	3	ROOF OVER KITCHEN
12	ROOF FAN-2	1/6	115	1	ROOF OVER KITCHEN
13	HOT WATER BOOSTER TANK	12 KW	208	3	KITCHEN
14	ROOF FAN-3	1/15	115	1	ROOF OVER BOYS RM. 9
15-15A	UNIT HEATERS	1/40	115	1	TWO IN SHOP-RM. 49
16	EXHAUST FAN	1/6	115	1	STORAGE - RM. 51
17-17A	UNIT VENTILATORS	1/8	115	1	OVER CORRIDOR-No. 45
17B-17C	UNIT VENTILATORS	1/8	115	1	OVER CORRIDOR-No. 22
18	CABINET UNIT HEATER	1/6	115	1	LOBBY NO. 21
19 TO 19S	UNIT VENTILATORS	1/8	115	1	CLASS ROOMS
20 TO 20E	UNIT VENTILATORS	1/6	115	1	HOMEMAKING, LIBRARY & ACTIVITY AREAS
21-21E	CABINET UNIT HEATERS	1/6	115	1	ACTIVITY AREAS
22 TO 22A	EXHAUST FANS	1/6	115	1	JANITOR RMS. NOS. 69, 85 & 92
23 TO 23A	HOT WATER STORAGE TANKS	5 KW	208	1	JANITOR RMS. NOS. 69, 85 & 92
24 TO 24A	EXHAUST FANS	1/6	115	1	END OF CORRIDORS NOS. 65, 81 & 104
25	HOT WATER RECIRC. PUMP	¼	115	1	STORAGE No. 26


NOTE
VERIFY LIGHTS & OTHER OUTLET LOCATIONS WITH MECH. CONTR. TO CLEAR MECH. EQUIP.
LATHE 5/8 H.P. 3¢
ROUTER 115V.
JIG SAW 1/2 H.P.
GRINDER 1/2 H.P.
SANDER 115V.
WIRE REC. ON ALT. CCT'S 1 & 3
BOILER
TERM. INTO PANEL FURNISHED WITH BOILER. NOTE 3 & 5 PE REQUIRED FROM PANEL
NOTE WALNUT TRIMMER ABOUT PANEL K
TEL. CAB.
CONNECT TO LIGHTS FURNISHED WITH REF. CASE.
SHOP 49
LUMBER STO 50
STOR 51
BOYS DRESS'G 38
GIRLS DRESS'G 33
SHOWERS 36
SHOWERS 35
DRYING 37
DRYING 34
PANEL A
PANEL K
PANEL P
STORAGE 26
MULT-PURPOSE ROOM 24
CORRIDOR 22
KITCHEN
BOYS 8
GIRLS 11
HEALTH 14
LOBBY 21
OFFICE 28
OFFICE 43
OFFICE 18
OFFICE 19
STOR 7
STOR 17
STOR 27
STOR 42
TV. CABINET
PHL "D"
PHL "E"
PHL "F"
PHL "G"
PHL "H"
PHL "J"
PHL "K"
PHL "L"
PHL "M"
PHL "N"
PHL "P"
PHL "R"
PHL "S"
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PHL "BU"
PHL "BV"
PHL "BW"
PHL "BX"
PHL "BY"
PHL "BZ"
PHL "CA"
PHL "CB"
PHL "CC"
PHL "CD"
PHL "CE"
PHL "CF"
PHL "CG"
PHL "CH"
PHL "CJ"
PHL "CK"
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PHL "CP"
PHL "CR"
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PHL "CX"
PHL "CY"
PHL "CZ"
PHL "DA"
PHL "DB"
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PHL "DD"
PHL "DE"
PHL "DF"
PHL "DG"
PHL "DH"
PHL "DJ"
PHL "DK"
PHL "DL"
PHL "DM"
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PHL "DR"
PHL "DS"
PHL "DT"
PHL "DU"
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PHL "EB"
PHL "EC"
PHL "ED"
PHL "EE"
PHL "EF"
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PHL "EH"
PHL "EJ"
PHL "EK"
PHL "EL"
PHL "EM"
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PHL "EV"
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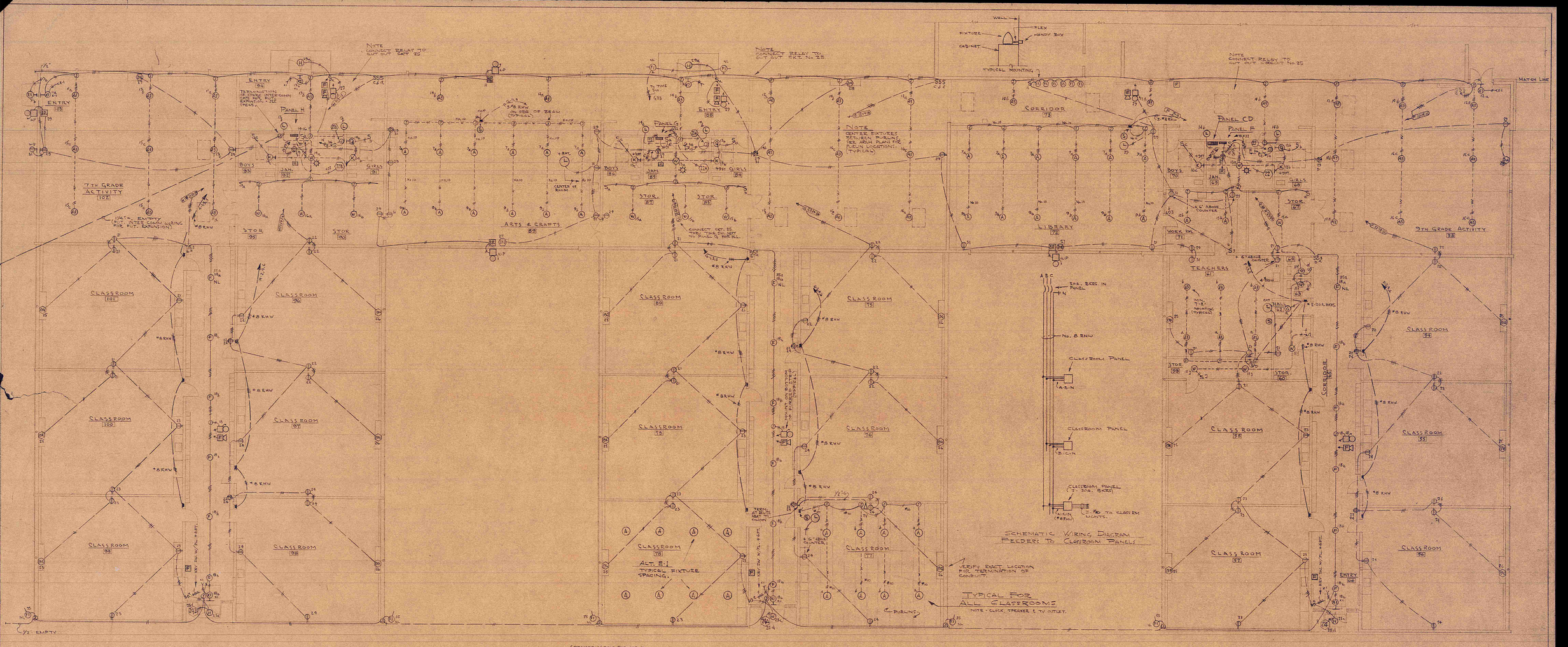

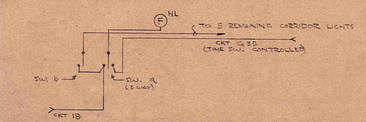

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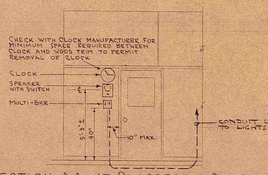
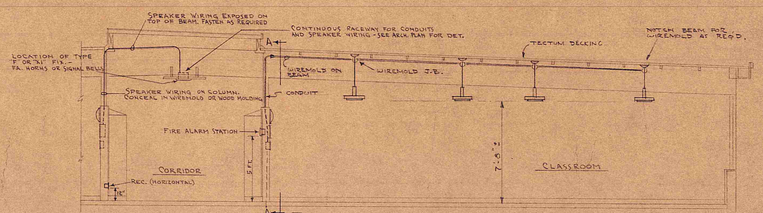


SECTION A-A AT CLASSROOM DOOR
SCALE 1/4" = 1'-0"



TYPICAL CLASSROOM SECTION
SCALE 1/4" = 1'-0"

WALTER S. GORDON
Consulting Electrical Engineer
200 SOUTH 5TH STREET
TACOMA 2, WASHINGTON 6127-H

ELECTRICAL
PART FLOOR PLAN

WEST ABERDEEN JR. HIGH SCHOOL
FOR ABERDEEN SCHOOL DIST. # 5
ABERDEEN WASHINGTON

SHEET	JENSEN & MILLS ARCHITECTS	DATE
E-3 OF 3	308 So Tacoma Ave - Tacoma, Wash.	OCT. 56 JOB No. 5540

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REPORT OF PRELIMINARY GEOTECHNICAL ENGINEERING FINDINGS
ABERDEEN SCHOOL DISTRICT NO. 5 SEISMIC SAFETY RETROFITS
HARBOR LEARNING CENTER
ABERDEEN, WASHINGTON



by
Haley & Aldrich, Inc.
Vancouver, Washington

for
TCF Architecture PLLC
Tacoma, Washington

File No. 0210365-000
July 2024

HALEY & ALDRICH, INC.
300 W 15th S
Vancouver, WA 98660
360.448.4189

5 July 2024
File No. 0210365-000

TCF Architecture PLLC
902 N 2nd Street
Tacoma, Washington 98403

Attention: Steve Wachtler, AIA, Principal

Subject: Report of Preliminary Geotechnical Engineering Findings
Aberdeen School District No. 5 Seismic Safety Retrofits
Harbor Learning Center
300 North Williams Street
Aberdeen, Washington 98520

Dear Steve Wachtler:

Haley & Aldrich, Inc. (Haley & Aldrich) is pleased to submit this report to TCF Architecture PLLC and Aberdeen School District No. 5 (District) summarizing our preliminary geotechnical engineering services for the seismic retrofit of Harbor Learning Center in Aberdeen, Washington. Our work was completed in general accordance with our agreement executed 3 April 2024. In completing our services, we collaborated with Degenkolb Engineers, Inc. (Degenkolb) and Educational Service District 112 - Construction Services Group.

The project involves preliminary evaluation of the Harbor Learning Center in Aberdeen, Washington per *American Society of Civil Engineers/Structural Engineering Institute (ASCE/SEI) 41-17 - Seismic Evaluation and Retrofit of Existing Buildings* (ASCE 41-17; ASCE 2017b). The study was funded by the Office of Superintendent of Public Instruction's (OPSI's) School Seismic Grant Program. The findings from this preliminary evaluation will inform the District's and OPSI's decision-making to either advance full design efforts for seismic retrofit improvements at the existing campus or to explore re-siting the school to a new location.

This preliminary report provides a discussion of the site setting, surface and subsurface conditions, the seismic basis of design, and a preliminary geotechnical analysis of seismicity and seismic hazards that may impact plans for retrofit of the subject school. Our current scope of services does not include developing recommendations for design and construction of retrofit improvements, such as modification of existing foundations or installation of ground improvement elements. Preliminary recommendations for retrofit improvements may be provided using currently available subsurface data under a supplemental authorization.

Scope of Services

The purpose of our services was to preliminarily characterize subsurface conditions at the site and to provide geotechnical engineering guidance and recommendations that conform in a preliminary sense to the geotechnical requirements of ASCE 41-17. These services included conducting geologic research, subsurface explorations, laboratory testing, preliminary seismic ground motion assessments, seismic hazard evaluations, and preliminary engineering analyses.

We completed the following tasks in general accordance with *Part 1 – Geotechnical Field Services and Limited Seismic Hazard Evaluation* included in our proposal for Geotechnical Engineering Services dated 21 February 2024 and executed 3 April 2024.

- Reviewed readily available geologic and geologic hazard maps, water well logs, and geotechnical reports and construction plans provided by others for general information regarding subsurface soil and groundwater conditions and geologic hazards.
- Drilled one boring to a depth of approximately 121.5 feet below ground surface (bgs) and advanced one seismic cone penetration test (CPT) sounding to a depth of approximately 109 feet bgs to characterize subsurface conditions.
- Observed the exploration, logged the subsurface conditions, collected representative soil samples, and transported the samples to our laboratory for further visual review and testing.
- Completed laboratory tests on select soil samples to evaluate soil engineering properties. Our specific tests included moisture content, Atterberg Limits, grain size distribution determinations, organic content, triaxial strength testing, and a suite of corrosion potential tests in accordance with current ASTM International or other applicable standards.
- Developed code-based seismic design values in conformance with ASCE 41 Section 2.4 and ASCE 7 Section 11.4, not including site-specific seismic or ground response analyses per ASCE 7 Chapter 21 (ASCE 2017a).
- Conducted limited seismic hazard analyses including:
  - Assessing liquefaction potential analysis per the method presented by Idriss & Boulanger (2008); and
  - Assessing lateral spreading at the site, including an evaluation of local and regional topography and nearby bathymetry.
- Prepared this report summarizing our preliminary findings.

Site Conditions

SURFACE CONDITIONS

The Harbor Learning Center campus encompasses an approximately 2.3-acre site located at 300 N Williams Street in Aberdeen, Washington. The site is bounded by N Williams Street on the west, single-family residences to the south, N Division Street on the east, and Pacific Avenue to the north.

There is one large school structure on site composed of several interconnected wings. Two playground areas are present in courtyards between sections of the school. The southwest portion of the campus is covered by an asphalt-paved parking lot. The area north of the school contains a lawn strip and raised garden.

The school building is located on the west side of Aberdeen in the flats area. As such, the site topography is generally flat with an average surface elevation at approximately Elevation 11 feet (World Geodectic System 84).

The Chehalis River is located approximately 0.6 miles to the southeast of the school. The bay of Grays Harbor begins approximately 1 mile west-southwest of the site at the mouth of the river. The Pacific Ocean is about 16.5 miles to the west of the school, beyond the northern peninsula of Grays Harbor.

Our understanding of the existing structure foundations is based on our review of a 30-sheet set of construction plans titled, "West Aberdeen Jr. High School", prepared by Jensen & Mills Architects, and dated October 1956. According to the plan, the entire building is supported by driven timber piles with a capacity of 15 tons each. The depth and diameter of the piles was not indicated on the plans, though based on scaling of the drawings they appear to have a minimum top diameter of 12 inches. Individual piles include 2.5-foot-square pile caps, while pile groups (up to three piles) have larger pile caps. The pile caps do not appear to be interconnected with grade beams. The school floors consist of concrete slabs-on-grade with thickened sections under partition walls. Excerpts from the historical plans are included in Appendix C.

GEOLOGIC AND SOIL MAPPING

The site is mapped as Quaternary alluvium described as "silt, sand, and gravel deposited in streambeds and fans," the surface of which is "relatively undissected" (Logan, 1987). The mapping also indicates that at depth, the alluvium is likely underlain by marine sedimentary rocks assigned to the Miocene Montesano Formation. This formation is described as predominantly silty sandstone with "local to widespread conglomerate, siltstone, and mudstone" that is generally blue gray where fresh and orange-brown where weathered (Logan, 1987). Our explorations encountered alluvium over dense materials at approximately 108 feet bgs, which are likely part of this sedimentary rock formation.

The near-surface soils at the site are mapped by the U.S. Department of Agriculture (USDA) in the *Soil Survey of Grays Harbor County Area, Pacific County, and Wahkiakum County* (Pringle, 1986), as compiled in the Web Soil Survey (USDA, 2024), as "Udorthents, level". Udorthents soils are described as very deep, moderately to excessively drained soils found on former tidelands and/or sandy and loamy river dredgings that have been protected from flooding by dikes (Pringle, 1986). Pringle (1986) notes that "no single profile is representative of these soils" but a common profile generally comprises 6 inches of sandy loam (United Soil Classification System [USCS] SC-SM, SM) overlying loamy sand, loam, and sandy loam (USCS CL-ML, SM, ML, SC-SM) to 60 inches. Depth to water in this soil type is reported as typically 24 to 79 inches and the soil is assigned to hydrologic soil group A, which are soils that generally have high infiltration and water transmission rates.

Based on our explorations, the native soils underlying some near surface imported fills are somewhat similar to those described in the geologic and soil mapping; however, the native materials are generally more fine-grained than those described by mapping and are expected to have poor infiltration characteristics.

SUBSURFACE CONDITIONS

Subsurface conditions interpreted from the explorations advanced at the site as part of our current study, in conjunction with soil properties inferred from field and laboratory tests, formed the basis for the conclusions and recommendations in this report. The locations and depths of our explorations were selected considering the site features, under the constraints of surface access, time, and budget.

We explored subsurface soil and groundwater conditions at the site on 8 through 11 of April 2024 by drilling one boring (B-HH01) to a depth of approximately 121.5 feet bgs using the mud-rotary drilling method and advancing one CPT sounding (CPT-HH01) to a depth of approximately 109 feet bgs. The boring was located in the southern portion of the site and the CPT was performed in the central western portion of the site, at the locations shown on Figure 2. Our field exploration procedures and exploration logs are in Appendix A. Laboratory soil testing procedures and results are in Appendix B.

The explorations indicate the site is blanketed by approximately 3 feet of fill consisting of 4 inches of asphalt concrete over well-graded sand with gravel and silty sand with gravel. The fill is underlain by approximately 16 feet of very soft elastic silt with gravel alluvial soils. These upper silts are further underlain by approximately 88 feet of interbedded alluvial deposits of clayey sand, silty sand, and poorly graded sand with silt with thin layers of sandy elastic silt. The sand layers were typically very loose to loose with infrequent medium dense zones, whereas the silt layers were typically soft with infrequent layers of medium stiff to stiff silts.

At a depth of 108 feet bgs, both explorations encountered very dense silty sand with gravel interpreted to be completely decomposed marine bedrock. The CPT sounding hit refusal at 109 feet bgs, while the boring extended to 121.5 feet bgs and terminated in this material.

Groundwater was identified in boring B-HH01 at an approximate depth of 4 feet bgs. Pore pressure dissipation testing at CPT-HH01 indicated that the piezometric head at the site was 1 to 2 feet bgs at the time of testing. For our engineering analyses, we conservatively assumed groundwater to be present at the ground surface.

Seismic Basis of Design

SEISMIC SETTING

The site is in a seismically active area. In this section, we describe the seismic setting, identify the seismic basis of design, provide code-based design values, and discuss the seismic hazards at the site. Geologic hazards mapped near the project site are all related to seismicity and include tsunami

inundation, very strong earthquake shaking, and a moderate to high liquefaction hazard (Washington Department of Natural Resources [WADNR], 2024.

Regional Seismicity

Western Washington sits at the contact between two large crustal tectonic plates. The Juan de Fuca Plate forms the floor of the Pacific Ocean off the coast of the northwestern United States and moves northeastward from its spreading ridge boundary with the Pacific Plate at an average rate of approximately 1.5 inches per year. As it converges with the continental North American Plate, the Juan de Fuca Plate dips below (or "subducts") beneath the North American Plate forming a shallow, eastward-dipping contact interface. This boundary is known as the Cascadia Subduction Zone (CSZ) and is responsible for the seismicity in the western Washington regions, producing earthquakes associated with three types of source zones: subduction interface, subduction intraslab, and crustal. The CSZ is located offshore approximately 101 miles west of the site.

Subduction Interface Sources. The displacement caused by the subduction of the Juan de Fuca Plate below the North American Plate does not generally manifest as slip between the two plates; rather, it is absorbed by compression of the North American Plate at the interface at relatively shallow depths. This compression, based on geologic and historical evidence, is released every 300 to 600 years, on average, in the form of magnitude 8 to 9 or larger earthquakes, the last such event occurring in 1700. Characteristics of this type of earthquake may include very large ground accelerations, shaking durations in excess of 2 minutes, and particularly strong long-period ground motions that may affect tall or long-period structures.

Subduction Intraslab Sources. A deeper zone of seismicity is associated with a steeper bending of the Juan de Fuca Plate and the breaking of the plate under its own weight below the Pacific Northwest region. This region, termed the Benioff Zone, produces intraslab earthquakes at depths of 40 to 70 kilometers. Such past events in western Washington include the 1949 Puget Sound, 1965 Olympia, and 2001 Nisqually earthquakes. Deep, intraslab earthquakes tend to be felt over larger areas than shallower crustal events, and generally lack significant aftershocks.

Crustal Sources. Shallow crustal faults are caused by cracking of the continental crust, resulting from the stress that builds as the subduction zone plates remain locked together. Many small crustal faults are mapped near the site that are a part of the greater Cascadia Fold and Thrust Belt (U.S. Geologic Survey [USGS], 2024). However, due to the size of these faults, their contribution to the site seismic hazard is relatively small.

SEISMIC BASIS OF DESIGN AND ANALYSIS METHODOLOGY

Preliminary site-specific seismic hazard analysis was conducted for the project site following the guidelines in ASCE 41-17 Section 2.4.1 *General Procedure for Hazard Caused by Ground Shaking*. The seismic hazard levels evaluated per this approach are as follows.

- **BSE-1E:** Basic Safety Earthquake-1 for use with the Basic Performance Objective for Existing Buildings, taken as a seismic hazard with a 20 percent probability of exceedance in 50 years (225-year return period), but not greater than the BSE-1N, at a site.
- **BSE-1N:** Basic Safety Earthquake-1 for use with the Basic Performance Objective Equivalent to New Building Standards taken as two-thirds of the BSE-2N at a site.
- **BSE-2E:** Basic Safety Earthquake-2 for use with the Basic Performance Objective for Existing Buildings, taken as a seismic hazard with a 5 percent probability of exceedance in 50 years (975-year return period), but not greater than the BSE-2N, at a site.
- **BSE-2N:** Basic Safety Earthquake-2 for use with the Basic Performance Objective Equivalent to New Building Standards, taken as the ground shaking based on the Risk-Targeted Maximum Considered Earthquake (MCE_R) per ASCE 7 at a site.

The BSE-2N hazard level is analogous to the maximum considered earthquake hazard level (MCE) in ASCE 7-16 (with a 2 percent probability of exceedance in 50 years or a 2,475-year return period), and the BSE-1N hazard level is consistent with a design-level event in ASCE 7-16.

Seismic Site Class

Thick sequences of unconsolidated, soft sediments typically amplify the shaking of long-period ground motions, such as those associated with subduction zone earthquakes, whereas areas underlain by shallow soil profiles are not likely to amplify seismic waves.

The "Site Class" is a designation used by ASCE 7-16, as referenced by ASCE 41-17, to quantify ground motion amplification. The classification is based on the stiffness in the upper 100 feet (roughly 30 meters) of soil and bedrock materials at a site. Several data sources were considered in estimating the stiffness profile at this site, as follows.

- A WADNR geophysical survey performed approximately 0.25 miles to the east of the subject site presents a shear wave velocity (V_s) profile within the upper 100 feet (30 meters), otherwise known as V_{S30} (WADNR, 2011). The survey used surface-based geophysical testing methods. The weighted-average shear wave velocity in the top 100 feet of the measured V_S profile was computed to be approximately 154 meters per second (505 feet per second). This V_{S30} is consistent with Site Class E, as defined in ASCE 7-16 as referenced by ASCE 41-17.
- Seismic CPT shear wave velocity testing was performed at CPT-HH01. The test resulted in a weighted-average shear wave velocity of 476 feet per second for a 100-foot-deep profile. This weighted-average Vs profile is very similar to the WADNR results and also falls within the limits of Site Class E, as defined in ASCE 7-16, as referenced by ASCE 41-17.
- Boring B-HH01 was evaluated for site class considering Standard Penetration Test (SPT) N-values and the stratigraphy identified in the boring. Boring B-HH01 encountered clayey to silty to clean sands with N-values under 15 within the upper 70 feet. Additionally, an approximately 25-foot-thick layer of poorly graded sand with blow counts of 0 to 8 was encountered beginning around 80 feet bgs. Based on the SPT N-value approach for determination of site class, conditions are consistent with Site Class E, as defined in ASCE 7-16, as referenced by ASCE 41-17.

Site class determination was largely based on evaluation of shear wave velocity data from the seismic CPT testing, WADNR geophysical testing, and SPT N-values derived data from boring B-HH01. Based on our evaluation of the data on hand, we find that without respect to seismic hazards, Site Class E is appropriate for this site. However, due to liquefaction hazard at this project site (discussed in the following section), the site is classified as Site Class F.

Per ASCE 41-17, a Site Class F designation requires a site-specific analysis including a seismic hazard analysis and a site response analysis; however, buildings with structural periods of less than 0.5 seconds may be designed using seismic parameters developed considering Site Class E conditions.

Preliminary Spectral Design Parameters

Acceleration response spectra for use in preliminary design have been developed following the procedures in ASCE 41-17 Section 2.4.1 *General Procedure for Hazard Caused by Ground Shaking*. These values are presented in Table 1.

Table 1. General Procedure Spectral Design Parameters

Design Parameters	Hazard Level			
	BSE-2N	BSE-1N	BSE-2E	BSE-1E
Site Class	E			
S_s	1.52	-	1.09	0.41
F_a (Site Class E)[1]	1.3	-	1.3	1.96
S_{xs}	1.97	1.32	1.42	0.80
S_1	0.69	-	0.46	0.12
F_v (Site Class E)[1]	4.2	-	4.2	4.2
S_{x1}	2.92	1.94	1.94	0.52
T_L	16 s	16 s	16 s	16 s

Notes:

1) *F_a and F_V are the ASCE 7-16 Chapter 21 site factors for Site Class E.*
2) *Site coordinates are Latitude/Longitude 46.972529°N / 123.831616°W.*
3) *Values presented in this table are for Site Class E conditions. This site falls under Site Class F categorization; however, these values are provided assuming that the structures have a fundamental period of less than 0.5 seconds, in which case Site Class E may be used for design.*

LIQUEFACTION

General

When cyclic loading occurs during an earthquake, the shaking can increase the pore pressure in loose to medium dense saturated sand and cause liquefaction. The rapid increase in pore water pressure reduces the effective normal stress between soil particles, resulting in the sudden loss of shear strength in the soil. Granular soils, which rely on interparticle friction for strength, are susceptible to liquefaction until

the excess pore pressures can dissipate. Sand boils and flows observed at the ground surface after an earthquake are the result of excess pore pressures dissipating upward, carrying soil particles with the draining water. In general, loose, saturated sand soils with low silt and clay contents are the most susceptible to liquefaction. Silty soils with low plasticity are moderately susceptible to liquefaction under relatively higher levels of ground shaking. For any soil type, the soil must be saturated for liquefaction to occur.

We performed liquefaction potential analysis on soils logged at the site using the procedures outlined in Idriss and Boulanger (2008) and updated Magnitude Scaling Factor as outlined in Boulanger and Idriss (2014).

We note the term liquefaction is defined very specifically by the simplified method that we used to evaluate the liquefaction hazard. Liquefaction is defined as when a soil under repeated cyclic loading exhibits the generation of increasing excess pore pressures until the pore pressure equals the total overburden stress. When this condition is reached, the normal stress acting between adjacent soil particles is effectively lost, and the soil, which derives its shear strength from interparticle friction, can lose much of its available shear strength. However, it is well documented that not all soils exhibit the same behavior after the initiation of liquefaction.

Loose sandy soils that achieve the condition of liquefaction during earthquake shaking can subsequently collapse and exhibit large shear strains under continued cyclic or static loading. This type of behavior is a well-documented result of numerous earthquakes, where structures underlain by shallow, liquefiable hydraulically placed fills have been observed to experience bearing capacity failures and collapse. Conversely, medium dense to dense sandy soils that achieve the condition of liquefaction will typically not collapse and can exhibit strain hardening behavior due to dilation effects. Therefore, despite the soil achieving the condition of liquefaction, there is little to no shear strength loss and only moderate shear strains under continued cyclic and static loading. This condition is termed “cyclic mobility.”

Analysis

In accordance with ASCE 7-16, as referenced by ASCE 41-17, we completed the liquefaction hazard analysis using the site-class-adjusted acceleration coefficient PGA_M for Site Class E. We performed our liquefaction analysis for three different hazard levels, including events with 225-year (corresponding to BSE-1E), 975-year (corresponding to BSE-2E), and 2475-year (corresponding to BSE-2N) return periods. We performed liquefaction analysis using PGA_M values of 0.44g and 0.80g and associated earthquake magnitudes of 7.6 and 8.5 for BSE-1E and BSE-2E, respectively. We used a PGA_M of 1.30g and associated earthquake magnitude of 8.8 in our analysis for the BSE-2N event. We assumed a design groundwater depth at the ground surface for our liquefaction analyses.

Our analyses conclude that potential for liquefaction to occur at the site is high, due to the relatively shallow groundwater table and subsurface profile featuring dozens of feet of loose sands.

Settlement

Post-liquefaction settlement results from densification of liquefiable sandy soils following an earthquake. The permanent ground surface settlement is not typically uniform across the area and can result in significant differential settlement. Differential settlement will have the most significant effect on structures supported by shallow foundations. Based on our analysis, we estimate settlements on the order of 11 to 25 inches due to liquefaction could occur throughout the site. Differential settlements can preliminarily be assumed as one-half of the total settlements occurring over a lateral distance of 50 feet.

We note that the settlement estimates provided above do not account for movements of foundations which may occur due to bearing capacity failure due to seismic strength loss or localized ground deformations that may result due to surface effects of shallow liquefaction, such as sand boils. (Both conditions are described below in more detail.) Therefore, actual ground and building settlements may be greater than the values noted above.

Seismic Strength Loss

We anticipate considerable reductions in the strength of the liquefiable layers of the site soil profile. The shear strength loss was determined by using the recommendations of Idriss and Boulanger (2008) and Bray and Sancio (2006). Simplistically, the liquefied shear strength directly correlates to the soil's pre-liquefied relative density. The relative density is estimated based on the SPT blow counts. The higher the relative density, the higher the liquefied shear strength. The typical residual strength of liquefiable soils at the site is expected to be less than 20 percent of the static strength (e.g., 80 percent or more strength loss).

Additionally, some strength loss due to cyclic shear stresses are expected to occur in the fine-grained elastic silt soils within the upper approximately 20 feet bgs. Full cyclic softening and development of lowered residual strengths within these materials are likely to occur. Supplemental exploration including performance of cyclic direct simple shear testing would be required to accurately estimate residual strength ratios for these soils.

As a result of the high expected soil strength loss, the pile foundation system at the site may experience bearing shear failure and cause additional foundation settlement.

Surface Effects

We evaluated the potential for liquefaction-related surface manifestations (such as sand boils) to occur using the procedures presented by Ishihara (1985) and by Hutabarat and Bray (2022).

The Ishihara (1985) procedure compares the thickness of a given liquefiable soil layer to the thickness of the overlying non-liquefiable soil mantle to determine if surface manifestations are possible at a given peak ground acceleration. This approach has several limitations and may overestimate potential for surface manifestations to occur in silty sands and sandy silts, as the relatively low permeability of these materials has potential to prevent pore water from flowing quickly enough to produce sand boils

(Kramer, 1996). The Ishihara (1985) analyses indicate that the potential for surface manifestations is high; however, the presence of a 20-foot-thick non-liquefiable crust presents a measure of uncertainty to this evaluation.

The Hutabarat and Bray (2022) method is a CPT-based procedure for estimating liquefaction-induced ejecta severity. The calculation compares the liquefaction ejecta demand to the crust layer resistance. Liquefaction ejecta demand is typically higher at sites with thick deposits of clean sands and lower at sites with stratified soil sites. The results of these analyses indicate that the estimated liquefaction ejecta severity is "None," due to the thickness of the non-liquefiable crust layer.

We preliminarily conclude that the probability of direct surface effects of liquefaction is low, due to the thickness of the non-liquefiable crust spanning the site.

LATERAL SPREADING

Lateral spreading occurs when large blocks of ground are displaced down gentle slopes or toward the free face of river channels, ditches, etc. as a result of earthquake-induced inertial forces acting on the soil mass. Initiation of lateral spreading is often made worse when the soils within and beneath the soil mass liquefy or soften as a result of the shaking. Lateral spreading deformations can be experienced relatively far from a free face. Similar to lateral spread, flow failures result when large volumes of soil near the free face of river channels or lake bottoms displace vertically and laterally during or after earthquakes. As the ground begins to shake and the shearing resistance of liquefied soils decreases, ground displacement occurs in response to mainly static shear forces present within the soil mass and, to a lesser extent, earthquake-induced inertial forces. Flow failures typically manifest larger deformations than lateral spreading; however, the extent of the deformations is typically localized to the area behind the free face of the channel. Both lateral spreading and flow failures can be destructive and pose a significant risk to structures.

We performed lateral spread analyses using the commercial code Slide2 by RocScience to evaluate the stability of the site once liquefaction-susceptible layers had liquefied, using a generalized subsurface soil profile extrapolating site conditions outwards to the Chehalis River. The Slide program performs two-dimensional limit equilibrium analysis to analyze slope stability and to determine a factor of safety against global failure. Our preliminary analyses indicate that the site and surrounding area are susceptible to lateral spread under all considered seismic events.

To quantify an estimate of the amount of ground displacement that could occur as a result of lateral spreading under the BSE-2N scenario, we performed a displacement analysis using the simplified procedure for estimating seismic slope displacements in subduction zones by Bray, Macedo, and Liu (2023). The analysis indicates that the mean level of expected lateral displacement at the building footprint under the BSE-1E event is roughly 1 1/2 to 3 feet. For both the BSE-2E and BSE-2N seismic events, the calculated displacement is estimated to be in tens of feet.

FAULT SURFACE RUPTURE

We used the USGS U.S. Quaternary faults web application (USGS, 2024) to identify earthquake-producing faults near the project site. No mapped earthquake-producing crustal faults are present at the site. The closest mapped fault is a strand of the Cascadia Fold and Fault Belt located more than 12 miles to the west of the site. The USGS has mapped the "Cascadia Megathrust" portion of the Cascadia Subduction Zone approximately 101 miles west of the site.

Based on known fault locations, we consider the potential for fault rupture to occur at the site to be low unless occurring on an unmapped or otherwise unknown fault.

TSUNAMI HAZARD

The tsunami hazard at the site is mapped in the *Tsunami Hazard Maps of Southwest Washington - Model Results from a ~2,500-Year Cascadia Subduction Zone Earthquake Scenario* by the WADNR (Eungard et al., 2018). Based on this reference, the site is located within an area expected to be inundated from a CSZ-induced tsunami, with an expected inundation depth in excess of 6 feet. Similarly, tsunami wave simulation for Grays Harbor, Washington, performed by WADNR shows that the site will be inundated by 5 to 10 feet in the event of a hypothetical magnitude 9.0 earthquake on the CSZ (WADNR, 2020).

The ASCE Tsunami Hazard Tool (https://asce7tsunami.online/) maps probabilistic inundation hazards for all potential tsunami sources, not just a CSZ-related event, and indicates the school site is not within a tsunami inundation zone; however, tsunami inundation is expected to reach areas 750 feet to the south of the school site (ASCE, 2022).

Based on the findings presented by WADNR, we consider the potential for tsunami inundation to occur at the site to be high.

Corrosivity

One soil sample was collected and tested for corrosivity characteristics by CERCO of Concord, California. The tested sample consisted of near-surface soils and was tested for resistivity, redox potential, sulfate and chloride ion concentrations, and pH. The test results indicate that near-surface soils should be considered corrosive to buried iron and steel improvements based on laboratory resistivity measurements. Chloride ion concentrations were not detected and insufficient to attack steel embedded in concrete mortar coating. Sulfate ion concentration results were 61 milligram per kilogram and present a potential to be detrimental to reinforced concrete. The pH level was measured as about 4.9 and is considered a corrosion concern for buried iron, steel, mortar-coated steel, and reinforced concrete structures.

The results of our corrosion testing and a copy of CERCO's brief evaluation are presented in Appendix B.

Conclusions

Based on our explorations, testing, and analyses, we have formulated preliminary conclusions in this report for use in assessment of the seismic retrofit project's viability. We offer the following general summary.

- The site soil profile generally features a thin layer of granular fill, underlain by soft elastic silt to about 20 feet bgs. These soils are underlain by thick deposits of very loose to medium dense sands and soft to stiff silts to a depth of approximately 108 feet bgs. Weathered sedimentary bedrock was encountered below this depth. The groundwater table at the site is shallow at just several feet below the ground surface.
  - The upper soft silt soils are considered to be weak, compressible, and susceptible to seismically induced strength loss, though are not considered to be liquefiable.
  - The thick interbedded deposits are considered to be slightly to moderately strong, moderately compressible, and highly susceptible to liquefaction and seismically induced strength loss.
  - The weathered bedrock is considered to be competent (strong and generally incompressible) and not susceptible to liquefaction or seismically induced strength loss.
- Due to the presence of liquefaction and related hazards, there is a likelihood for excessive vertical and/or lateral movements of existing building foundations. Therefore, the existing and any proposed new or upgraded foundations will need to be designed to tolerate or resist these seismically induced ground movements.
  - The magnitude of lateral deformations due to lateral spreading has the potential to be in the tens of feet, which will be too large to tolerate or resist with new or existing foundation systems. The use of specialized ground improvement would likely be required to mitigate this issue.
- Conceptually, we conclude the following regarding potential foundation retrofit and hazard mitigation alternatives:
  - Ground improvement: Performance of ground improvement (such as deep soil mixing) conceptually provides a solution for mitigation of lateral displacement and spreading. However, to be effective, the ground improvement would require a footprint area that would encroach well into the adjacent city streets and potentially beyond. Additionally, the depth of treatment would potentially need to extend to depths ranging anywhere from 60 feet bgs to the bedrock contact at greater than 100 feet bgs. For these reasons, this approach appears unfeasible from economic and logistical standpoints.
  - Deep foundations: The structure could feasibly be underpinned with micropile or small diameter pipe pile foundations to transfer building loads under seismic conditions down to deep bedrock. However, these foundations would not be capable of withstanding the large lateral loads induced by lateral spreading. For this reason, we conclude that underpinning with deep foundations is not an effective approach for retrofit at this site.
  - Shallow foundations: Conceptually, the structure could be retrofitted to perform in a seismic event as a shallow foundation-supported structure. This could be achieved by

retrofitting the structure to feature a thickened structural mat, or alternatively, the existing pile caps could be connected with a network of strengthened grade beams designed to ignore capacity contributions from the underlying timber piles under seismic conditions. Vertical and lateral seismic forces induced upon the structure would then be resisted solely by the shallow foundation system. Life-safety conditions allowing for immediate egress in the event of an emergency would need to be achieved as a precondition for taking this approach. This retrofit approach would leave the school prone to significant shifting and distress as a result of design-level seismic shaking, very likely displacing the school from its existing timber pile foundations and rendering the structure unusable post-earthquake. Also, it may be feasible to design such an augmented shallow foundation system to accommodate the vertical ground deformations but may not be possible to design it to accommodate the expected lateral ground deformations. This will require consideration by the structural engineer.

- Final design of geotechnical elements may require additional site characterization to verify subsurface conditions around the school building.

Closing

Thank you for the opportunity to perform these services for you. Please do not hesitate to contact us if you have any questions or comments.

Sincerely yours,
HALEY & ALDRICH, INC.

Tyler Slothower
Staff Engineer



Daniel J. Trisler, P.E.
Principal Geotechnical Engineer

Micah D. Hintz, P.E.
Geotechnical Engineer

Attachments:
Appendix A – Exploration Logs
Appendix B – Laboratory Test Results
Appendix C – Historical Plans

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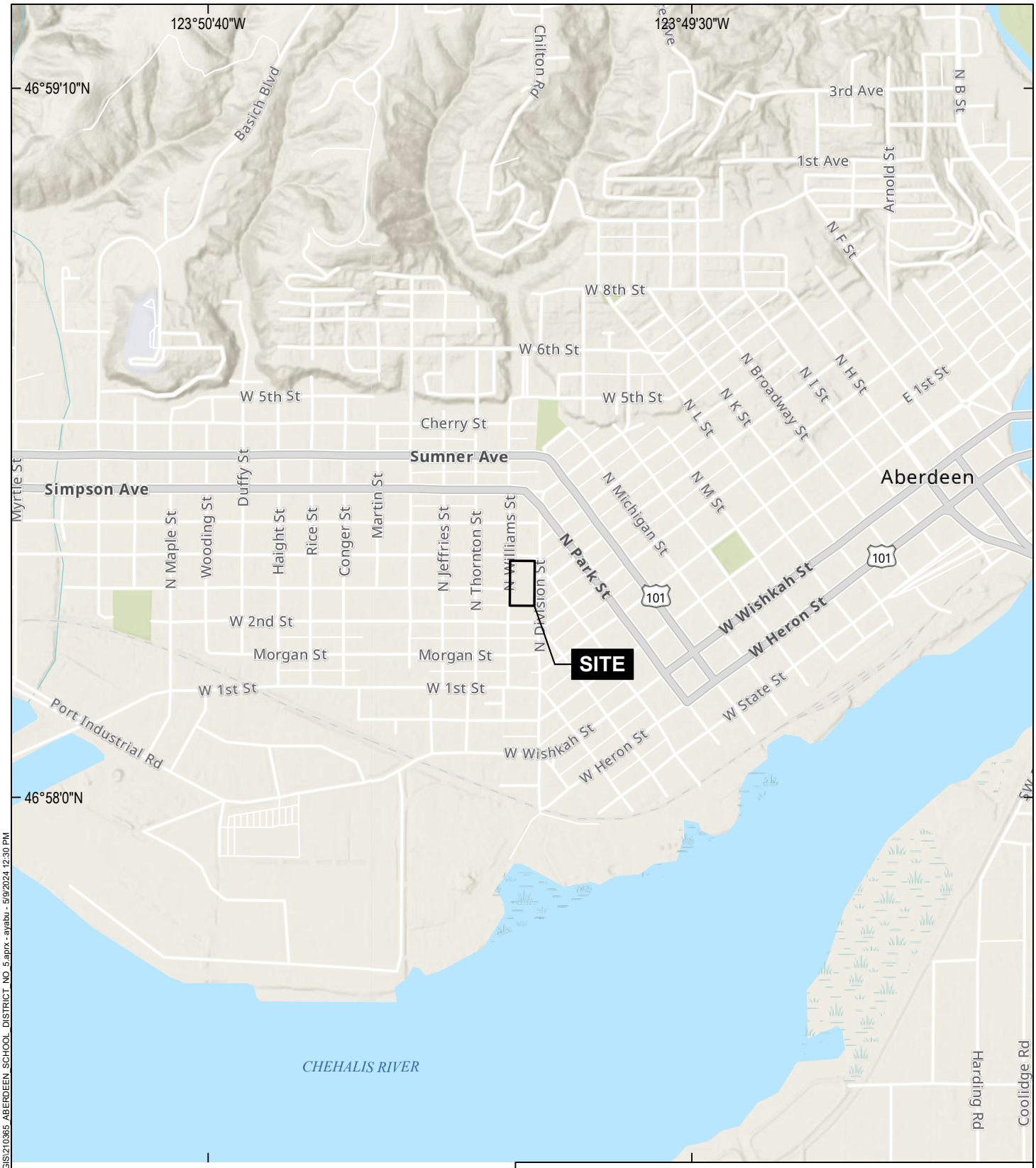
FIGURES


123°50'40"W
123°49'30"W
46°59'10"N
46°58'0"N
Basich Blvd
Chilton Rd
3rd Ave
1st Ave
N B St
Arnold St
N F St
W 8th St
W 6th St
W 5th St
W 5th St
N L St
N K St
N Broadway St
N I St
N H St
E 1st St
Cherry St
Sumner Ave
Simpson Ave
Myrtle St
Duffy St
Martin St
Aberdeen
N Michigan St
N M St
N Maple St
Wooding St
Haight St
Rice St
Conger St
N Jeffries St
N Thornton St
N Williams St
N Division St
N Park St
101
101
W Wishkah St
W Heron St
W 2nd St
Morgan St
Morgan St
SITE
W 1st St
W 1st St
W State St
Port Industrial Rd
W Wishkah St
W Heron St
CHEHALIS RIVER
Harding Rd
Coolidge Rd
WA
N
MAP SOURCE: ESRI
SITE COORDINATES: 46°58'21"N, 123°49'55"W
HALEY ALDRICH
HARBOR LEARNING CENTER
SEISMIC SAFETY RETROFIT
ABERDEEN, WASHINGTON
PROJECT LOCUS
APPROXIMATE SCALE: 1 IN = 2000 FT
MAY 2024
FIGURE 1
GIS: \\haleyaldrich.com\share\CF\Projects\0210365\GIS\210365_ABERDEEN_SCHOOL_DISTRICT_NO_5.aprx - ayabu - 5/9/2024 12:30 PM



LEGEND

- CONE PENETRATION TEST
- MUD ROTARY BORING
- SITE BOUNDARY

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. AERIAL IMAGERY SOURCE: NEARMAP, 14 AUGUST 2023

N

0 60 120

SCALE IN FEET

HALEY ALDRICH

HARBOR LEARNING CENTER
SEISMIC SAFETY RETROFIT
ABERDEEN, WASHINGTON

SITE AND EXPLORATION PLAN

MAY 2024

FIGURE 2

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APPENDIX A
Exploration Logs

APPENDIX A

Exploration Logs

We evaluated subsurface conditions at the site by completing one drilled boring on 11 April 2024 and performing one cone penetration test (CPT) on 10 April 2024. The field explorations were coordinated and overseen by geotechnical staff from Haley & Aldrich, Inc., who classified the various soil units encountered, obtained representative soil samples for geotechnical testing, and maintained a detailed log of the boring. Exploration logs are included in this appendix. Figure 2 of the report shows the approximate locations of the explorations. Explorations were located in the field using landmarks on site. Results of the laboratory testing are indicated on the exploration logs and are included in Appendix B.

Boring

The boring was advanced using mud rotary methods using a track-mounted CME-75 drill rig operated by Western States Soil Conservation, Inc., of Hubbard, Oregon. The boring created a hole approximately 5 inches in diameter.

Soil Sampling and Classification

Materials encountered in the explorations were classified in the field in general accordance with ASTM International (ASTM) Standard Practice D 2488 "Standard Practice for the Classification of Soils (Visual-Manual Procedure)." The exploration logs in this appendix show our interpretation of the exploration, sampling, and testing data. The logs indicate the depth where the soils change. Note that the change may be gradual. In the field, we classified the samples taken from the explorations according to the methods presented on the *Figure A-1, Key to Exploration Logs*. This figure also provides a legend explaining the symbols and abbreviations used in the logs.

Sampling of soils was completed at regular intervals throughout the depth of each boring. The samples were collected with a Standard Penetration Test sampler used in general conformance with ASTM Test Method D 1586 "Standard Method for Penetration Test and Split-Barrel Sampling of Soils." The sampler was driven by a 140-pound auto-trip hammer falling 30 inches. The *N* value, or number of blows required to drive the sampler 1 foot, or as otherwise indicated into the soils, is shown adjacent to the sample symbols on the boring logs. Disturbed samples were obtained from the SPT sampler. A piston sampler was used to collect relatively undisturbed Shelby tube samples. Samples were used for classification and laboratory testing purposes.

Cone Penetration Tests

The CPT sounding was advanced by Conetec, Inc. of Seattle, Washington. The CPT was completed in general accordance with ASTM D 5778 using a seismic electronic cone penetrometer. The CPT sounding is an *in situ* test that provides assistance in characterizing subsurface stratigraphy. The test includes advancing a 35.6-millimeter-diameter cone equipped with a load cell, friction sleeve, strain gages, porous stone, and geophone through the soil profile. The cone is advanced at a rate of approximately 2 centimeters per second. Tip resistance, sleeve friction, and pore pressure are typically recorded at 0.1-meter intervals. The log of the CPT sounding is presented in this appendix.

Sample Description

Identification of soils in this report is based on visual field and laboratory observations which include density/consistency, moisture condition, grain size, and plasticity estimates and should not be construed to imply field nor laboratory testing unless presented herein. ASTM D 2488 visual-manual identification methods were used as a guide. Where laboratory testing confirmed visual-manual identifications, then ASTM D 2487 was used to classify the soils.

Relative Density/Consistency

Soil density/consistency in borings is related primarily to the standard penetration resistance (N). Soil density/consistency in test pits and probes is estimated based on visual observation and is presented parenthetically on the logs.

SAND or GRAVEL Relative Density	N (Blows/Foot)	SILT or CLAY Consistency	N (Blows/Foot)
Very loose	0 to 4	Very soft	0 to 1
Loose	5 to 10	Soft	2 to 4
Medium dense	11 to 30	Medium stiff	5 to 8
Dense	31 to 50	Stiff	9 to 15
Very dense	>50	Very stiff	16 to 30
		Hard	>30

Moisture

Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

USCS Soil Classification Chart (ASTM D 2487)

Major Divisions			Symbols: Graph	Symbols: USCS	Typical Descriptions
Coarse Grained Soils: More than 50% of Material Retained on No. 200 Sieve	Gravel and Gravelly Soils: More than 50% of Coarse Fraction Retained on No. 4 Sieve	Clean Gravels (<5% fines)		GW	Well-Graded Gravel; Well-Graded Gravel with Sand
				GP	Poorly Graded Gravel; Poorly Graded Gravel with Sand
		Gravels (5-12% fines)		GW-GM	Well-Graded Gravel with Silt; Well-Graded Gravel with Silt and Sand
				GW-GC	Well-Graded Gravel with Clay; Well-Graded Gravel with Clay and Sand
				GP-GM	Poorly Graded Gravel with Silt; Poorly Graded Gravel with Silt and Sand
				GP-GC	Poorly Graded Gravel with Clay; Poorly Graded Gravel with Clay and Sand
		Gravels with Fines (>12% fines)		GM	Silty Gravel; Silty Gravel with Sand
				GC	Clayey Gravel; Clayey Gravel with Sand
	Sand and Sandy Soils: More than 50% of Coarse Fraction Passing No. 4 Sieve	Sands with few Fines (<5% fines)		SW	Well-Graded Sand; Well-Graded Sand with Gravel
				SP	Poorly Graded Sand; Poorly Graded Sand with Gravel
		Sands (5-12% fines)		SW-SM	Well-Graded Sand with Silt Well-Graded Sand with Silt and Gravel
				SW-SC	Well-Graded Sand with Clay; Well-Graded Sand with Clay and Gravel
				SP-SM	Poorly Graded Sand with Silt; Poorly Graded Sand with Silt and Gravel
				SP-SC	Poorly Graded Sand with Clay; Poorly Graded Sand with Clay and Gravel
		Sands with Fines (>12% fines)		SM	Silty Sand; Silty Sand with Gravel
				SC	Clayey Sand; Clayey Sand with Gravel
Fine Grained Soils: More than 50% of Material Passing No. 200 Sieve	Silts			ML	Silt; Silt with Sand or Gravel; Sandy or Gravelly Silt
				MH	Elastic Silt; Elastic Silt with Sand or Gravel; Sandy or Gravelly Elastic Silt
	Silty Clay (based on Atterberg Limits)			CL-ML	Silty Clay; Silty Clay with Sand or Gravel; Gravelly or Sandy Silty Clay
	Clays			CL	Lean Clay; Lean Clay with Sand or Gravel; Sandy or Gravelly Lean Clay
				CH	Fat Clay; Fat Clay with Sand or Gravel; Sandy or Gravelly Fat Clay
	Organics			OL/OH	Organic Soil; Organic Soil with Sand or Gravel; Sandy or Gravelly Organic Soil
Highly Organic (>50% organic material)				PT	Peat - Decomposing Vegetation - Fibrous to Amorphous Texture

Minor Constituents

	Estimated Percentage
Sand, Gravel	
Trace	<5
Few	5 - 15
Cobbles, Boulders	
Trace	<5
Few	5 - 10
Little	15 - 25
Some	30 - 45

Soil Test Symbols

%F	Percent Passing No. 200 Sieve
AL	Atterberg Limits (%)
	Liquid Limit (LL)
	Water Content (WC)
	Plastic Limit (PL)
CA	Chemical Analysis
CAUC	Consolidated Anisotropic Undrained Compression
CAUE	Consolidated Anisotropic Undrained Extension
CBR	California Bearing Ratio
CIDC	Consolidated Drained Isotropic Triaxial Compression
CIUC	Consolidated Isotropic Undrained Compression
CK0DC	Consolidated Drained k0 Triaxial Compression
CK0DSS	Consolidated k0 Undrained Direct Simple Shear
CK0UC	Consolidated k0 Undrained Compression
CK0UE	Consolidated k0 Undrained Extension
CRSCN	Constant Rate of Strain Consolidation
DS	Direct Shear
DSS	Direct Simple Shear
DT	In Situ Density
GS	Grain Size Classification
HYD	Hydrometer
ILCN	Incremental Load Consolidation
K0CN	k0 Consolidation
kc	Constant Head Permeability
kf	Falling Head Permeability
MD	Moisture Density Relationship
OC	Organic Content
OT	Tests by Others
P	Pressuremeter
PID	Photoionization Detector Reading
PP	Pocket Penetrometer
SG	Specific Gravity
TRS	Torsional Ring Shear
TV	Torvane
UC	Unconfined Compression
UUC	Unconsolidated Undrained Triaxial Compression
VS	Vane Shear
WC	Water Content (%)

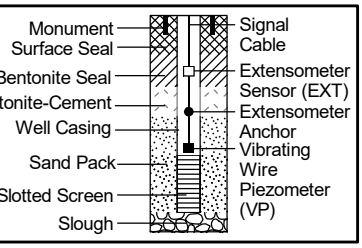
Groundwater Indicators

- Groundwater Level on Date or At Time of Drilling (ATD)
- Groundwater Level on Date Measured in Piezometer
- Groundwater Seepage (Test Pits)

Sample Symbols

- 1.5" I.D. Split Spoon
- 3.0" I.D. Split Spoon
- Modified California Sampler
- Rock Core Run
- Sonic Core
- Thin-walled Sampler
- Grab
- Cuttings
- Push Probe

Well Symbols



HALEY ALDRICH

Project: Aberdeen School District - Harbor Learning Center
Location: Aberdeen, Washington
Project No.: 0210365-000

Key to Exploration Logs

Figure **A-1**
Sheet **1 of 1**

HA KEY TO EXP LOGS (SOIL ONLY) - I:\HALEYALDRICH.COM\SHARES\EA_DATA\GINT\HC_LIBRARY\GLB - 8/31/24 13:41 - I:\HALEYALDRICH.COM\SHARES\CPROJECTS\0210365\GINT\PERMANENT\GINT FILES\0210365-000_ABERDEEN SCHOOL DISTRICT-HARBOR LEARNING CENTER_GINT.GPJ - kfuller

Date Started: 04/08/2024	Date Completed: 04/11/2024	Drilling Contractor/Crew: Western States Soil Conservation, Inc. / Ray	
Logged by: S. Sirmans	Checked by: M. Hintz	Drilling Method: Mud Rotary	
Location: Lat: 46.972025 Long: -123.831712 (WGS 84)		Rig Model/Type: CME-75 / Truck-mounted drill rig	
Ground Surface Elevation: 11.29 feet (NAVD 88)		Hammer Type: Auto-hammer	
Comments:		Hammer Weight (pounds): 140	Hammer Drop Height (inches): 30
		Measured Hammer Efficiency (%): 90.6	
		Hole Diameter: 5 inches	Well Casing Diameter: NA
		Total Depth: 121.5 feet	Depth to Groundwater: 4 feet

Elevation (feet)	Depth (feet)	Sample Data: Blow Count	Type	Recovery	Length (inches)	Number / Tests	Graphic Log	Material Description	Water Level
10	0					S-1		Asphalt (4-inches thick).	
						S-2 WC		WELL-GRADED SAND WITH GRAVEL (SW), medium dense, wet, brown-red, trace organics. [FILL]	
						S-3 WC S-4		SILTY SAND WITH GRAVEL (SM), loose, moist, gray, scattered organics (wood, roots).	ATD
5	5	1 1 0		10in.	18	S-5 AL, WC		ELASTIC SILT WITH GRAVEL (MH), very soft, moist, gray, homogeneous, low plasticity. [ALLUVIUM] scattered black organics (wood, roots)	
0				24in.	24	S-6			
-5	10	2 1 0		4in.	18	S-7			
-10	15	0 0 0		18in.	18	S-8 AL, WC			
	20	0 0 0		18in.	18	S-9		CLAYEY SAND (SC), very loose, wet, gray, homogeneous.	
-15	25			24in.	24	S-10			
-20	30	4 6 9 2 1 1		12in.	18	S-11 GS, WC		POORLY GRADED SAND WITH SILT (SP-SM), medium dense, moist, gray, 1-inch pocket of black-brown organics.	
					18	S-12 WC		grades to very loose, wet, fine sand, frequent/occasional lenses of silt	
-25	35	0 1 2		18in.	18	S-13 GS, WC		SANDY ELASTIC SILT (MH), soft, wet, gray, stratified, trace organics.	

PL WC (%) LL
✖ Fines Content (%)
▲ SPT N Value
10 20 30 40

55.3
1
66.4
0
0
11
15
63.0
2
58
60.2
3

Depth (feet): 0 5 10 15 20 25 30 35

General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HALEY ALDRICH

Project: Aberdeen School District - Harbor Learning Center
Location: Aberdeen, Washington
Project No.: 0210365-000

Boring Log
B-HH01

Figure **A-2**
Sheet **1 of 4**

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Date Started: 04/08/2024	Date Completed: 04/11/2024	Drilling Contractor/Crew: Western States Soil Conservation, Inc. / Ray	
Logged by: S. Sirmans	Checked by: M. Hintz	Drilling Method: Mud Rotary	
Location: Lat: 46.972025 Long: -123.831712 (WGS 84)		Rig Model/Type: CME-75 / Truck-mounted drill rig	
Ground Surface Elevation: 11.29 feet (NAVD 88)		Hammer Type: Auto-hammer	
Comments:		Hammer Weight (pounds): 140	Hammer Drop Height (inches): 30
		Measured Hammer Efficiency (%): 90.6	
		Hole Diameter: 5 inches	Well Casing Diameter: NA
		Total Depth: 121.5 feet	Depth to Groundwater: 4 feet

Elevation (feet)	Depth (feet)	Sample Data: Blow Count	Type	Recovery	Length (inches)	Number / Tests	Graphic Log	Material Description	Water Level	PL WC (%) LL; ✖ Fines Content (%); ▲ SPT N Value (10 20 30 40)	Depth (feet)
-30	40	3 3 3		18in.	18	S-14 GS, WC		SILTY SAND (SM), loose, wet, gray, stratified with sandy silt, trace organics.		▲6 ✖27 ●40	40
-35	45	0 1 2		18in.	18	S-15 GS, WC		grades to very loose		▲3 ✖45 ●45	45
-40	50	1 1 5		18in.	18	S-16 GS, WC		SANDY ELASTIC SILT (MH), medium stiff, wet, gray, fine sand, stratified.		▲6 ✖56 ■51.5	50
-45	55	3 5 7		18in.	18	S-17 WC		grades to stiff		▲12 ●	55
-50	60	1 2 0		18in.	18	S-18 GS, WC		grades to soft		▲2 ✖57 ■52.7	60
-55	65			24in.	24	S-19					65
-60	70	3 10 20		12in.	18	S-20 GS, WC		SILTY SAND (SM), medium dense, wet, gray, fine sand.		✖12 ●30	70
-65	75	6 8 11		24in.	24	S-21 WC				▲19 ●	75

General Notes:
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HALEY ALDRICH

Project: Aberdeen School District - Harbor Learning Center
Location: Aberdeen, Washington
Project No.: 0210365-000

Boring Log
B-HH01

Figure **A-2**
Sheet **2 of 4**

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Date Started: 04/08/2024	Date Completed: 04/11/2024	Drilling Contractor/Crew: Western States Soil Conservation, Inc. / Ray	
Logged by: S. Sirmans	Checked by: M. Hintz	Drilling Method: Mud Rotary	
Location: Lat: 46.972025 Long: -123.831712 (WGS 84)		Rig Model/Type: CME-75 / Truck-mounted drill rig	
Ground Surface Elevation: 11.29 feet (NAVD 88)		Hammer Type: Auto-hammer	
Comments:		Hammer Weight (pounds): 140	Hammer Drop Height (inches): 30
		Measured Hammer Efficiency (%): 90.6	
		Hole Diameter: 5 inches	Well Casing Diameter: NA
		Total Depth: 121.5 feet	Depth to Groundwater: 4 feet

Elevation (feet)	Depth (feet)	Sample Data: Blow Count	Type	Recovery	Length (inches)	Number / Tests	Graphic Log	Material Description	Water Level	PL WC (%) LL; Fines Content (%); SPT N Value	Depth (feet)
80	80	1 3 5		18in.	18	S-22 GS, WC		SILTY SAND (SM), loose, wet, gray, fine sand, frequent/occasional sandy silt lenses.		8; 39	80
-70											
85	85	0 0 0		18in.	18	S-23		grades to very loose		0	85
-75											
90	90	0 0 4		16in.	18	S-24 GS, WC		ELASTIC SILT WITH SAND (MH), soft, wet, gray, fine sand.		4; 83; 55.7	90
-80											
95	95										95
-85											
100	100	0 0 4		18in.	18	S-25 WC				4; 73.1	100
-90											
105	105										105
-95											
110	110	42 50		9in.	11	S-26		SILTY SAND WITH GRAVEL (SM), very dense, wet, gray, subangular gravel, complete decomposed conglomerate rock. [MONTESANO FORMATION]		50/5"	110
-100											
115	115										115
-105											

General Notes:
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HALEY ALDRICH

Project: Aberdeen School District - Harbor Learning Center
Location: Aberdeen, Washington
Project No.: 0210365-000

Boring Log
B-HH01

Figure **A-2**
Sheet **3 of 4**

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Date Started: 04/08/2024	Date Completed: 04/11/2024	Drilling Contractor/Crew: Western States Soil Conservation, Inc. / Ray	
Logged by: S. Sirmans	Checked by: M. Hintz	Drilling Method: Mud Rotary	
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Ground Surface Elevation: 11.29 feet (NAVD 88)		Hammer Type: Auto-hammer	
Comments:		Hammer Weight (pounds): 140	Hammer Drop Height (inches): 30
		Measured Hammer Efficiency (%): 90.6	
		Hole Diameter: 5 inches	Well Casing Diameter: NA
		Total Depth: 121.5 feet	Depth to Groundwater: 4 feet

Elevation (feet)	Depth (feet)	Sample Data: Blow Count	Type	Recovery	Length (inches)	Number / Tests	Graphic Log	Material Description	Water Level	PL WC (%) LL; ✖ Fines Content (%); ▲ SPT N Value (10 20 30 40)	Depth (feet)
120	0	31 30 35	X	7in.	18	S-27				▲ 65	120
-110								Bottom of Borehole at 121.5 feet.			
125	5										125
-115											
130	10										130
-120											
135	15										135
-125											
140	20										140
-130											
145	25										145
-135											
150	30										150
-140											
155	35										155
-145											

General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
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3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
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HALEY ALDRICH

Project: Aberdeen School District - Harbor Learning Center
Location: Aberdeen, Washington
Project No.: 0210365-000

Boring Log
B-HH01

Figure **A-2**
Sheet **4 of 4**

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PRESENTATION OF SITE INVESTIGATION RESULTS

Aberdeen Schools

Prepared for:

Client Name

ConeTec Job No: **24-59-27459**

Project Start Date: 2024-04-10
Project End Date: 2024-04-11
Release Date: 2024-04-22

Report Prepared by:

ConeTec, Inc.

1237 S Director Street, Seattle, WA 98108

Tel: (253) 397-4861

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www.conetecdataservices.com



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ABOUT THIS REPORT

The enclosed report presents the results of the site investigation program conducted by ConeTec, Inc. for Client Name.

Please note that this report, which also includes all accompanying data, are subject to the 3rd Party Disclaimer and Client Disclaimer that follow in the 'Limitations' section of this report. Please refer to the list of attached documents following the text of this report. A site map, test summaries, and test plots are all included in the body of the report.

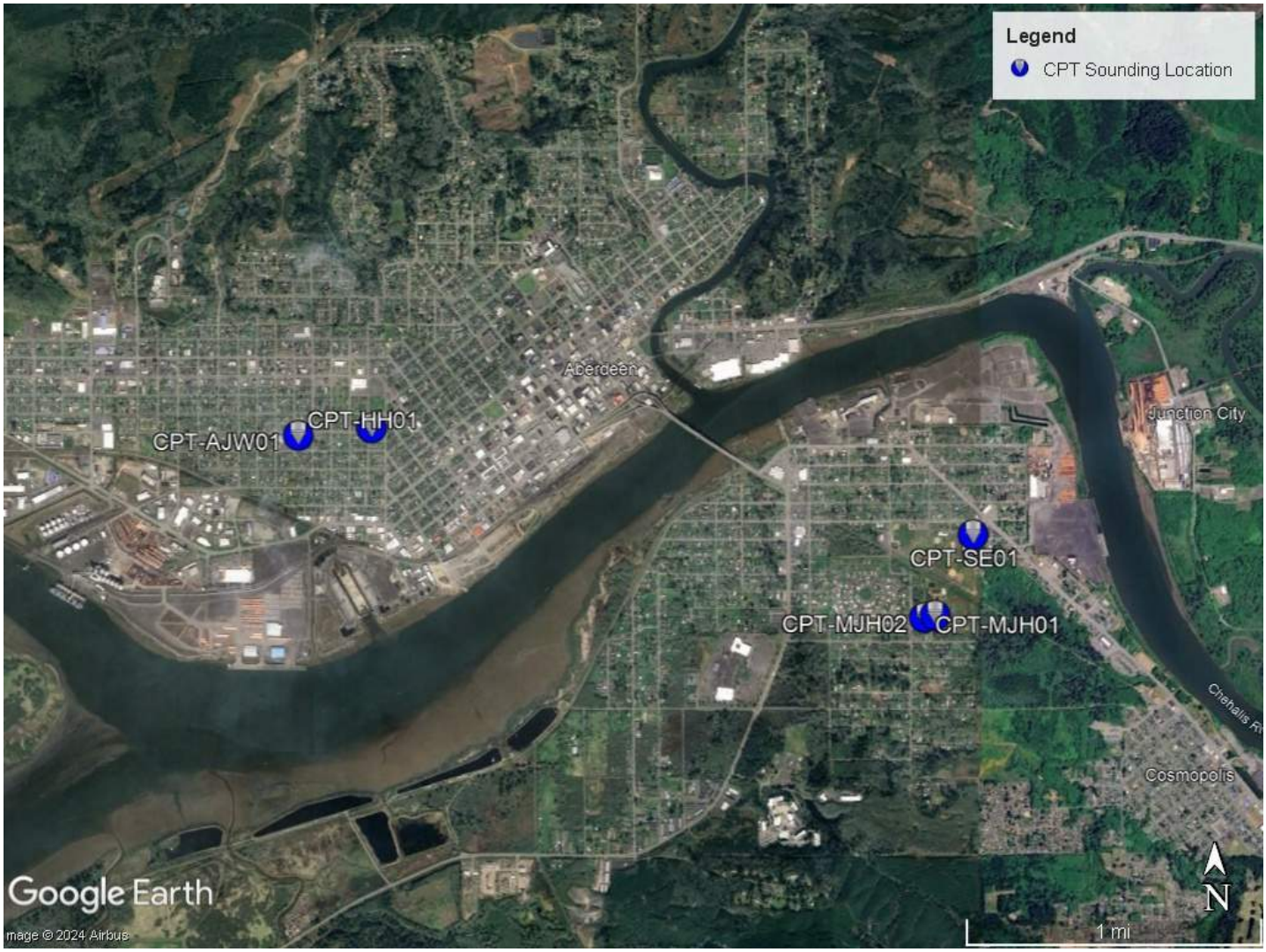
Project	
Client	Client Name
Project	Aberdeen Schools
ConeTec Project Number	24-59-27459
Test Types	SCPTu
Additional Comments	None

Contents

The following listed below are included in the body of this report:

- **Site Map**
- **Limitations and Closure**
- **Project Information**
- **Methodology Statements**
- **Report Appendices**

SITE MAP



All locations are approximate unless otherwise stated in the body of the report.

ConeTec Job Number: 24-59-27459

Client: Client Name

Project: Aberdeen Schools

Date: 2024-04-22

ConeTec

LIMITATIONS

3rd Party Disclaimer

The "Report" refers to this report titled: Aberdeen Schools

The Report was prepared by ConeTec for: Client Name

The Report is confidential and may not be distributed to or relied upon by any third parties without the express written consent of ConeTec. Any third parties gaining access to the Report do not acquire any rights as a result of such access. Any use which a third party makes of the Report, or any reliance on or decisions made based on it, are the responsibility of such third parties. ConeTec accepts no responsibility for loss, damage and/or expense, if any, suffered by any third parties as a result of decisions made, or actions taken or not taken, which are in any way based on, or related to, the Report or any portion(s) thereof.

Client Disclaimer

ConeTec was retained by: Client Name

The "Report" refers to this report titled: Aberdeen Schools

ConeTec was retained to collect and provide the raw data ("Data") which is included in the Report.

ConeTec has collected and reported the Data in accordance with current industry standards. No other warranty, express or implied, with respect to the Data is made by ConeTec. In order to properly understand the Data included in the Report, reference must be made to the documents accompanying and other sources referenced in the Report in their entirety. Other than the Data, the contents of the Report (including any Interpretations) should not be relied upon in any fashion without independent verification and ConeTec is in no way responsible for any loss, damage or expense resulting from the use of, and/or reliance on, such material by any party.

Closure

Thank you for the opportunity to work on this project. The equipment used as well the field procedures followed, all complied with current accepted best practice standards.

Report prepared by: MH, JM

PROJECT INFORMATION

Rig		
Description	**Deployment System**	**Test Type**
C02-020 CPT Truck Rig	Twin mounted cylinders	SCPTu

Coordinates		
Test Type	**Collection Method**	**EPSG Number**
SCPTu	Consumer Grade GPS	4326 (WGS84 / LatLong)

Piezocones Used for this Project						
Cone Description	**Cone Number**	**Cross Sectional Area** (cm^2)	**Sleeve Area** (cm^2)	**Tip Capacity** (bar)	**Sleeve Capacity** (bar)	**Pore Pressure Capacity** (bar)
EC1065:T1500F15U35	1065	15	225	1500	15	35

Cone Penetration Test (CPTu)	
Depth reference	Depths are referenced to the existing ground surface at the time of each test.
Tip and sleeve data offset	0.1 Meters. This has been accounted for in the CPT data files.

Calculated Geotechnical Parameters	
Additional information	The Normalized Soil Behaviour Type Chart based on Q_{tn} (SBT Q_{tn}) (Robertson, 2009) was used to classify the soil for this project. A detailed set of calculated CPTu parameters have been generated and are provided in Excel format files in the release folder. The CPTu parameter calculations are based on values of corrected tip resistance (q_t) sleeve friction (f_s) and pore pressure (u_2). Effective stresses are calculated based on unit weights that have been assigned to the individual soil behaviour type zones and the assumed equilibrium pore pressure profile. Soils were classified as either drained or undrained based on the Q_{tn} Normalized Soil Behaviour Type Chart (Robertson, 2009). Calculations for both drained and undrained parameters were included for materials that classified as silt mixtures (zone 4).

Methodology Statements and Data File Formats

CONETEC

METHODOLOGY STATEMENTS



CONE PENETRATION TEST (CPTu) - eSeries

Cone penetration tests (CPTu) are conducted using an integrated electronic piezocone penetrometer and data acquisition system manufactured by Adara Systems Ltd., a subsidiary of ConeTec.

ConeTec's piezocone penetrometers are compression type designs in which the tip and friction sleeve load cells are independent and have separate load capacities. The piezocones use strain gauged load cells for tip and sleeve friction and a strain gauged diaphragm type transducer for recording pore pressure. The piezocones also have a platinum resistive temperature device (RTD) for monitoring the temperature of the sensors, an accelerometer type dual axis inclinometer and two geophone sensors for recording seismic signals. All signals are amplified and measured with minimum sixteen-bit resolution down hole within the cone body, and the signals are sent to the surface using a high bandwidth, error corrected digital interface through a shielded cable.

ConeTec penetrometers are manufactured with various tip, friction and pore pressure capacities in both 10 cm^2 and 15 cm^2 tip base area configurations in order to maximize signal resolution for various soil conditions. The specific piezocone used for each test is described in the CPT summary table. The 15 cm^2 penetrometers do not require friction reducers as they have a diameter larger than the deployment rods. The 10 cm^2 piezocones use a friction reducer consisting of a rod adapter extension behind the main cone body with an enlarged cross sectional area (typically 44 millimeters diameter over a length of 32 millimeters with tapered leading and trailing edges) located at a distance of 585 millimeters above the cone tip.

The penetrometers are designed with equal end area friction sleeves, a net end area ratio of 0.8 and cone tips with a 60 degree apex angle.

All ConeTec piezocones can record pore pressure at various locations. Unless otherwise noted, the pore pressure filter is located directly behind the cone tip in the "u_2" position (ASTM Type 2). The filter is six millimeters thick, made of porous plastic (polyethylene) having an average pore size of 125 microns (90-160 microns). The function of the filter is to allow rapid movements of extremely small volumes of water needed to activate the pressure transducer while preventing soil ingress or blockage.

The piezocone penetrometers are manufactured with dimensions, tolerances and sensor characteristics that are in general accordance with the current ASTM D5778 standard. ConeTec's calibration criteria also meets or exceeds those of the current ASTM D5778 standard. An illustration of the piezocone penetrometer is presented in Figure CPTu.

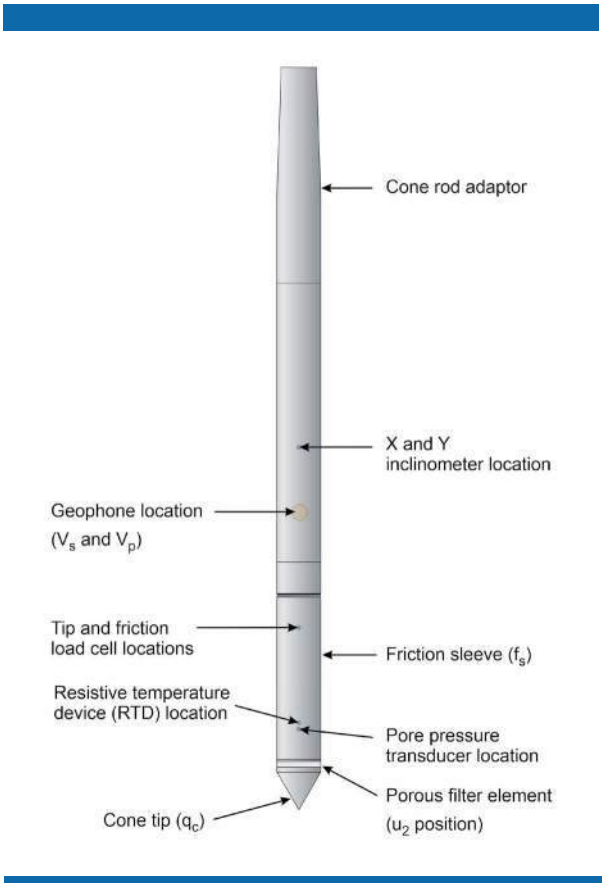


Figure CPTu. Piezocone Penetrometer (15 cm²)

The ConeTec data acquisition system consists of a Windows based computer, signal interface box, and power supply. The signal interface combines depth increment signals, seismic trigger signals and the downhole digital data. This combined data is then sent to the Windows based computer for collection and presentation. The data is recorded at fixed depth increments using a depth encoder that is either portable or integrated into the rig. The typical recording interval is 2.5 centimeters; custom recording intervals are possible.

The system displays the CPTu data in real time and records the following parameters to a storage media during penetration:

- Depth
- Uncorrected tip resistance (q_c)
- Sleeve friction (f_s)
- Dynamic pore pressure (u)
- Additional sensors such as resistivity, passive gamma, ultra violet induced fluorescence, if applicable

All testing is performed in accordance to ConeTec's CPTu operating procedures which are in general accordance with the current ASTM D5778 standard.

Prior to the start of a CPTu sounding a suitable cone is selected, the cone and data acquisition system are powered on, the pore pressure system is saturated with silicone oil and the baseline readings are recorded with the cone hanging freely in a vertical position.

The CPTu is conducted at a steady rate of two centimeters per second, within acceptable tolerances. Typically one meter length rods with an outer diameter of 1.5 inches are added to advance the cone to the sounding termination depth. After cone retraction final baselines are recorded.

Additional information pertaining to ConeTec's cone penetration testing procedures:

- Each filter is saturated in silicone oil under vacuum pressure prior to use
- Baseline readings are compared to previous readings
- Soundings are terminated at the client's target depth or at a depth where an obstruction is encountered, excessive rod flex occurs, excessive inclination occurs, equipment damage is likely to take place, or a dangerous working environment arises
- Differences between initial and final baselines are calculated to ensure zero load offsets have not occurred and to ensure compliance with ASTM standards

The interpretation of piezocone data for this report is based on the corrected tip resistance (q_t), sleeve friction (f_s) and pore water pressure (u). The interpretation of soil type is based on the correlations developed by Robertson, P.K., 2010. The Soil Behavior Type (SBT) classification chart developed by Robertson, P.K., 2010 is presented in Figure SBT. It should be noted that it is not always possible to accurately identify a soil behavior type based on these parameters. In these situations, experience, judgment and an assessment of other parameters may be used to infer soil behavior type.

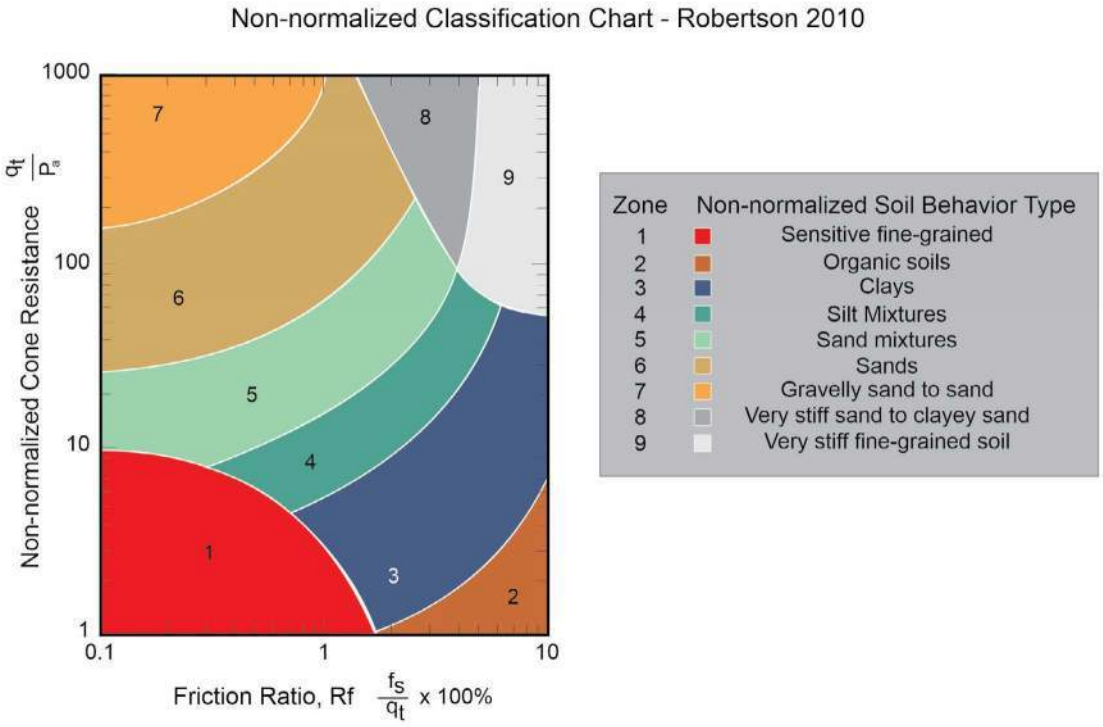


Figure SBT. Non-Normalized Soil Behavior Type Classification Chart (SBT)

The recorded tip resistance (q_c) is the total force acting on the piezocone tip divided by its base area. The tip resistance is corrected for pore pressure effects and termed corrected tip resistance (q_t) according to the following expression presented in Robertson et al. (1986):

$$q_t = q_c + (1-a) \bullet u_2$$

where: q_t is the corrected tip resistance
q_c is the recorded tip resistance
u_2 is the recorded dynamic pore pressure behind the tip (u_2 position)
a is the Net Area Ratio for the piezocone (0.8 for ConeTec probes)

The sleeve friction (f_s) is the frictional force on the sleeve divided by its surface area. As all ConeTec piezocones have equal end area friction sleeves, pore pressure corrections to the sleeve data are not required.

The dynamic pore pressure (u) is a measure of the pore pressures generated during cone penetration. To record equilibrium pore pressure, the penetration must be stopped to allow the dynamic pore pressures to stabilize. The rate at which this occurs is predominantly a function of the permeability of the soil and the diameter of the cone.

The friction ratio (Rf) is a calculated parameter. It is defined as the ratio of sleeve friction to the tip resistance expressed as a percentage. Generally, saturated cohesive soils have low tip resistance, high friction ratios and generate large excess pore water pressures. Cohesionless soils have higher tip resistances, lower friction ratios and do not generate significant excess pore water pressure.

For additional information on CPTu interpretations and calculated geotechnical parameters, refer to Robertson et al. (1986), Lunne et al. (1997), Robertson (2009), Mayne (2013, 2014) and Mayne and Peuchen (2012).

REFERENCES

ASTM D5778-20, 2020, “Standard Test Method for Performing Electronic Friction Cone and Piezocone Penetration Testing of Soils”, ASTM International, West Conshohocken, PA. DOI: 10.1520/D5778-20.

Lunne, T., Robertson, P.K. and Powell, J. J. M., 1997, “Cone Penetration Testing in Geotechnical Practice”, Blackie Academic and Professional.

Mayne, P.W., 2013, “Evaluating yield stress of soils from laboratory consolidation and in-situ cone penetration tests”, Sound Geotechnical Research to Practice (Holtz Volume) GSP 230, ASCE, Reston/VA: 406-420. DOI: 10.1061/9780784412770.027.

Mayne, P.W. and Peuchen, J., 2012, “Unit weight trends with cone resistance in soft to firm clays”, Geotechnical and Geophysical Site Characterization 4, Vol. 1 (Proc. ISC-4, Pernambuco), CRC Press, London: 903-910.

Mayne, P.W., 2014, “Interpretation of geotechnical parameters from seismic piezocone tests”, CPT’14 Keynote Address, Las Vegas, NV, May 2014.

Robertson, P.K., Campanella, R.G., Gillespie, D. and Greig, J., 1986, “Use of Piezometer Cone Data”, Proceedings of InSitu 86, ASCE Specialty Conference, Blacksburg, Virginia.

Robertson, P.K., 2009, “Interpretation of cone penetration tests – a unified approach”, Canadian Geotechnical Journal, Volume 46: 1337-1355. DOI: 10.1139/T09-065.

Robertson, P.K., 2010. Soil behavior type from the CPT: an update. 2nd International Symposium on Cone Penetration Testing, CPT’10, Huntington Beach, CA, USA

PORE PRESSURE DISSIPATION TEST

The cone penetration test is halted at specific depths to carry out pore pressure dissipation (PPD) tests, shown in Figure PPD-1. For each dissipation test the cone and rods are decoupled from the rig and the data acquisition system measures and records the variation of the pore pressure (u) with time (t).

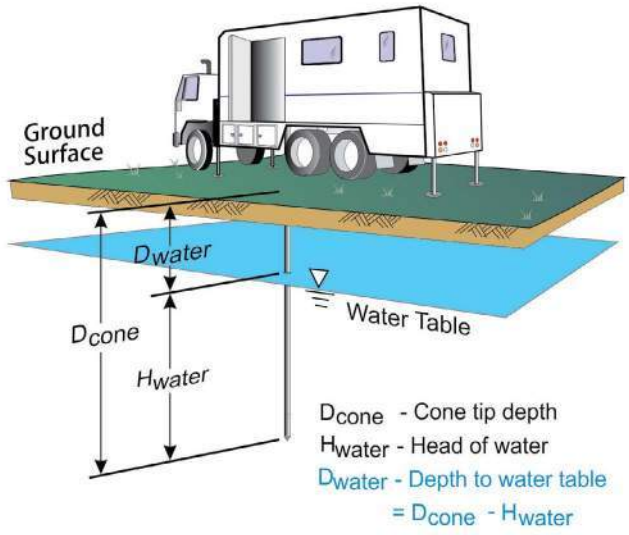


Figure PPD-1. Pore pressure dissipation test setup

Pore pressure dissipation data can be interpreted to provide estimates of ground water conditions, permeability, consolidation characteristics and soil behavior.

The typical shapes of dissipation curves shown in Figure PPD-2 are very useful in assessing soil type, drainage, in situ pore pressure and soil properties. A flat curve that stabilizes quickly is typical of a freely draining sand. Undrained soils such as clays will typically show positive excess pore pressure and have long dissipation times. Dilative soils will often exhibit dynamic pore pressures below equilibrium that then rise over time. Overconsolidated fine-grained soils will often exhibit an initial dilatory response where there is an initial rise in pore pressure before reaching a peak and dissipating.

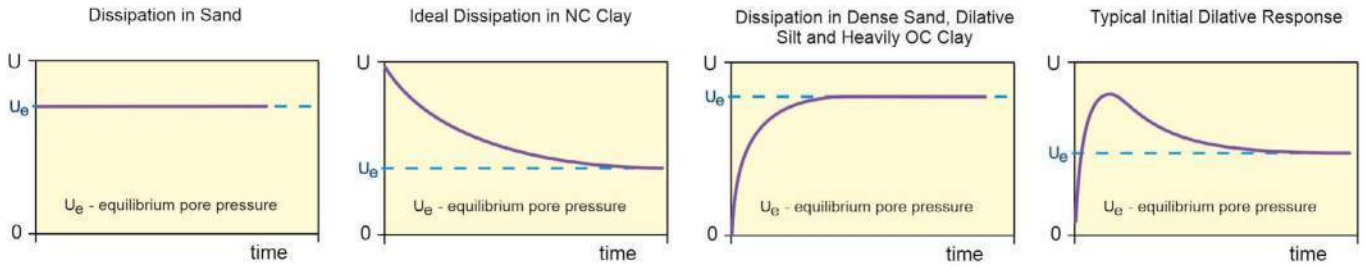
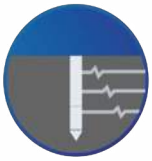


Figure PPD-2. Pore pressure dissipation curve examples

In order to interpret the equilibrium pore pressure (u_{eq}) and the apparent phreatic surface, the pore pressure should be monitored until such time as there is no variation in pore pressure with time as shown for each curve in Figure PPD-2.



SEISMIC CONE PENETRATION TEST (SCPTu) - eSeries

Shear wave velocity (Vs) testing is performed in conjunction with the piezocone penetration test (SCPTu) in order to collect interval velocities. For some projects seismic compression wave velocity (Vp) testing is also performed.

ConeTec's piezocone penetrometers are manufactured with one horizontally active geophone (28 hertz) and one vertically active geophone (28 hertz). Both geophones are rigidly mounted in the body of the cone penetrometer, 0.2 meters behind the cone tip. The vertically mounted geophone is more sensitive to compression waves.

Shear waves are typically generated by using an impact hammer horizontally striking a beam that is held in place by a normal load. In some instances, an auger source or an imbedded impulsive source may be used for both shear waves and compression waves. The hammer and beam act as a contact trigger that initiates the recording of the seismic wave traces. For impulsive devices an accelerometer trigger may be used. The traces are recorded in the memory of the cone using a fast analog to digital converter. The seismic trace is then transmitted digitally uphole to a Windows based computer through a signal interface box for recording and analysis. An illustration of the shear wave testing configuration is presented in Figure SCPTu-1.

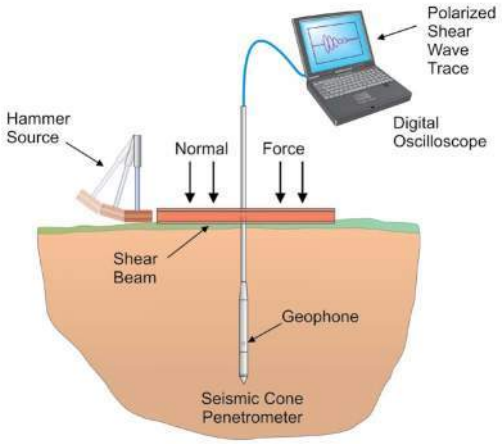


Figure SCPTu-1. Illustration of the SCPTu system

All testing is performed in accordance to ConeTec's SCPTu operating procedures which are in general accordance with the current ASTM D5778 and ASTM D7400 standards.

Prior to the start of a SCPTu sounding, the procedures described in the Cone Penetration Test section are followed. In addition, the active axis of the geophone is aligned parallel to the beam (or source) and the horizontal offset between the cone and the source is measured and recorded.

Prior to recording seismic waves at each test depth, cone penetration is stopped and the rods are decoupled from the rig to avoid transmission of rig energy down the rods. Typically, five wave traces for each orientation are recorded for quality control and uncertainty analysis purposes. After reviewing wave traces for consistency the cone is pushed to the next test depth (typically one meter intervals or as requested by the client). Figure SCPTu-2 presents an illustration of a SCPTu test.

For additional information on seismic cone penetration testing refer to Robertson et al. (1986).

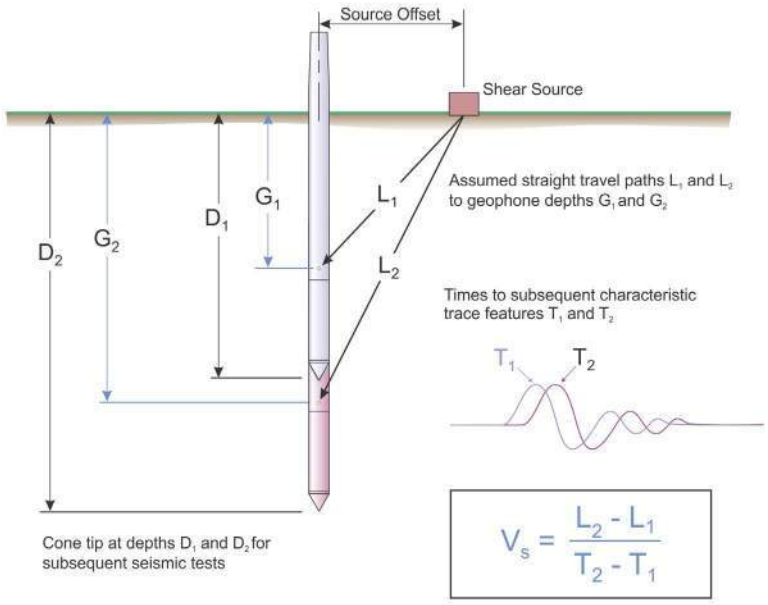


Figure SCPTu-2. Illustration of a seismic cone penetration test

For the determination of interval travel times the wave traces from all depths are displayed in analysis software. The results of the interval picks are supplied in the relevant appendix of this report. Standard practice for ConeTec is to record five wave traces for each source direction at each test depth. Outlier impacts are identified in the field and the impacts are repeated. For the final wave trace profile, the traces are stacked in the time domain to display a single average trace.

Calculation of the interval velocities are performed by visually picking a common feature (e.g. the first characteristic peak, trough, or crossover) on all of the recorded wave sets and taking the difference in ray path divided by the time difference between subsequent features. Ray path is defined as the straight line distance from the seismic source to the geophone, accounting for beam offset, source depth and geophone offset from the cone tip.

In some cases, usually for shear wave velocity testing, more than one characteristic marker may be used. If there is an overlap between different sets of characteristic markers, then the average time value for those sets of interval times is applied to the determination of velocity.

Ideally, all depths are used for the determination of the velocity profile. However, an interval may be skipped if there is some ambiguity or quality concern with a particular depth, resulting in a larger interval.

Tabular velocity results and SCPTu plots are presented in the relevant appendix.

For all SCPTu soundings that have achieved a depth of at least 100 feet (30 meters), the average shear wave velocity to a depth of 100 feet ($\overline{v}_S$) has been calculated and provided for all applicable soundings using the following equation presented in ASCE (2010).

$$\bar{v}_s = \frac{\sum_{i=1} d_i}{\sum_{i=1}^{n} \frac{d_i}{v_{si}}}$$

where: $\bar{v}_s$ = average shear wave velocity ft/s (m/s)
d_i = the thickness of any layer between 0 and 100 ft (30 m)
v_{si} = the shear wave velocity in ft/s (m/s)
$\sum_{i=1}^{n} d_i$ = the total thickness of all layers between 0 and 100 ft (30 m)

Average shear wave velocity, $\bar{v}_s$ is also referenced to V_{s100} or V_{s30}.

The layer travel times refers to the travel times propagating in the vertical direction, not the measured travel times from an offset source.

REFERENCES

American Society of Civil Engineers (ASCE), 2010, "Minimum Design Loads for Buildings and Other Structures", Standard ASCE/ SEI 7-10, American Society of Civil Engineers, ISBN 978-0-7844-1085-1, Reston, Virginia. DOI: 10.1061/9780784412916.

ASTM D5778-20, 2020, "Standard Test Method for Performing Electronic Friction Cone and Piezocone Penetration Testing of Soils", ASTM International, West Conshohocken, PA. DOI: 10.1520/D5778-20.

ASTM D7400/D7400M-19, 2019, "Standard Test Methods for Downhole Seismic Testing", ASTM International, West Conshohocken, PA. DOI: 10.1520/D7400_D7400M-19.

Robertson, P.K., Campanella, R.G., Gillespie D and Rice, A., 1986, "Seismic CPT to Measure In-Situ Shear Wave Velocity", Journal of Geotechnical Engineering ASCE, Vol. 112, No. 8: 791-803. DOI: 10.1061/(ASCE)0733-9410(1986)112:8(791).

CONE PENETRATION DIGITAL FILE FORMATS - eSeries

CPT Data Files (COR Extension)

ConeTec CPT data files are stored in ASCII text files that are readable by almost any text editor. ConeTec file names start with the job number (which includes the two digit year number) an underscore as a separating character, followed by two letters based on the type of test and the sounding ID. The last character position is reserved for an identifier letter (such as b, c, d etc) used to uniquely distinguish multiple soundings at the same location. The CPT sounding file has the extension COR. As an example, for job number 21-02-00001 the first CPT sounding will have file name 21-02-00001_CP01.COR

The sounding (COR) file consists of the following components:

1. Two lines of header information
2. Data records
3. End of data marker
4. Units information

Header Lines

Line 1: Columns 1-6 may be blank or may indicate the version number of the recording software
Columns 7-21 contain the sounding Date and Time (Date is MM:DD:YY)
Columns 23-38 contain the sounding Operator
Columns 51-100 contain extended Job Location information

Line 2: Columns 1-16 contain the Job Location
Columns 17-32 contain the Cone ID
Columns 33-47 contain the sounding number
Columns 51-100 may contain extended sounding ID information

Data Records

The data records contain 4 or more columns of data in floating point format. A comma and spaces separate each data item:

Column 1: Sounding Depth (meters)
Column 2: Tip (q_c), recorded in units selected by the operator
Column 3: Sleeve (f_s), recorded in units selected by the operator
Column 4: Dynamic pore pressure (u), recorded in units selected by the operator
Column 5: Empty or may contain other requested data such as Gamma, Resistivity or UVIF data

End of Data Marker

After the last line of data there is a line containing an ASCII 26 (CTL-Z) character (small rectangular shaped character) followed by a newline (carriage return / line feed). This is used to mark the end of data.

Units Information

The last section of the file contains information about the units that were selected for the sounding. A separator bar makes up the first line. The second line contains the type of units used for depth, q_c, f_s and u. The third line contains the conversion values required for ConeTec's software to convert the recorded data to an internal set of base units (bar for q_c, bar for f_s and meters for u). Additional lines intended for internal ConeTec use may appear following the conversion values.

CPT Data Files (XLS Extension)

Excel format files of ConeTec CPT data are also generated from corresponding COR files. The XLS files have the same base file name as the COR file with a -BSC suffix. The information in the file is presented in table format and contains additional information about the sounding such as coordinate information, and tip net area ratio.

The BSCI suffix is given to XLS files which are enhanced versions of the BSC files and include the same data records in addition to inclination data collected for each sounding.

CPT Dissipation Files (XLS Extension)

Pore pressure dissipation files are provided in Excel format and contain each dissipation trace that exceeds a minimum duration (selected during post-processing) formatted column wise within the spreadsheet. The first column (Column A) contains the time in seconds and the second column (Column B) contains the time in minutes. Subsequent columns contain the dissipation trace data. The columns extend to the longest trace of the data set.

Detailed header information is provided at the top of the worksheet. The test depth in meters and feet, the number of points in the trace and the particular units are all presented at the top of each trace column.

CPT Dissipation files have the same naming convention as the CPT sounding files with a "–PPD" suffix.

Data Records

Each file will contain dissipation traces that exceed a minimum duration (selected during post-processing) in a particular column. The dissipation pore pressure values are typically recorded at varying time intervals throughout the trace; rapidly to start and increasing as the duration of the test lengthens. The test depth in meters and feet, the number of points in the trace and the trace number are identified at the top of each trace column.

Cone Type Designations

Cone ID	Cone Description	Tip Cross Sect. Area (cm^2)	Tip Capacity (bar)	Sleeve Area (cm^2)**	Sleeve Capacity (bar)	Pore Pressure Capacity (bar)
EC###	A15T1500F15U35	15	1500	225	15	35
EC###	A15T375F10U35	15	375	225	10	35
EC###	A10T1000F10U35	10	1000	150	10	35

refers to the Cone ID number
**Outer Cylindrical Area

REPORT APPENDICES

The appendices listed below are included in the report:

- **Cone Penetration Test (CPTu) Summary and Standard CPTu Plots**
- **Standard CPTu Plots with Reduced Scales**
- **Normalized Cone Penetration Test Plots**
- **Advanced Cone Penetration Test Plots**
- **Soil Behavior Type (SBT) Scatter Plots**
- **Pore Pressure Dissipation Test (PPDT) Summary and PPDT Plots**
- **Seismic Cone Penetration Test (SCPTu) Tabular Results**
- **SCPTu Plots**
- **SCPTu Velocity Wave Traces**
- **Supplementary Documents and Materials**

Cone Penetration Test (CPTu) Summary and Standard CPTu Plots

CONETEC

Job No: 24-59-27459
Client: Haley & Aldrich, Inc.
Project: Aberdeen Schools
Start Date: 2024-04-10
End Date: 2024-04-11

CONE PENETRATION TEST SUMMARY

Sounding ID	File Name	Date	Cone	Cone Area (cm^2)	Assumed Phreatic Surface[1] (ft)	Final Depth (ft)	Seismic Intervals	Latitude[2]	Longitude[2]	Refer to Notation Number
CPT-AJW01	24-59-27459_SP-AJW01	2024-04-10	1065:T1500F15U35	15	3.2	121.39	36	46.97223	-123.83739	
CPT-HH01	24-59-27459_SP-HH01	2024-04-10	1065:T1500F15U35	15	2.4	109.17	32	46.97258	-123.83214	
CPT-MJH01	24-59-27459_SP-MJH01	2024-04-11	1065:T1500F15U35	15	7.1	111.55	33	46.96327	-123.79191	
CPT-MJH02	24-59-27459_SP-MJH02	2024-04-11	1065:T1500F15U35	15		4.92		46.96315	-123.79268	3
CPT-SE01	24-59-27459_SP-SE01	2024-04-11	1065:T1500F15U35	15	5.8	89.32	27	46.96719	-123.78915	
Totals	5 Soundings					436.35 ft	128			

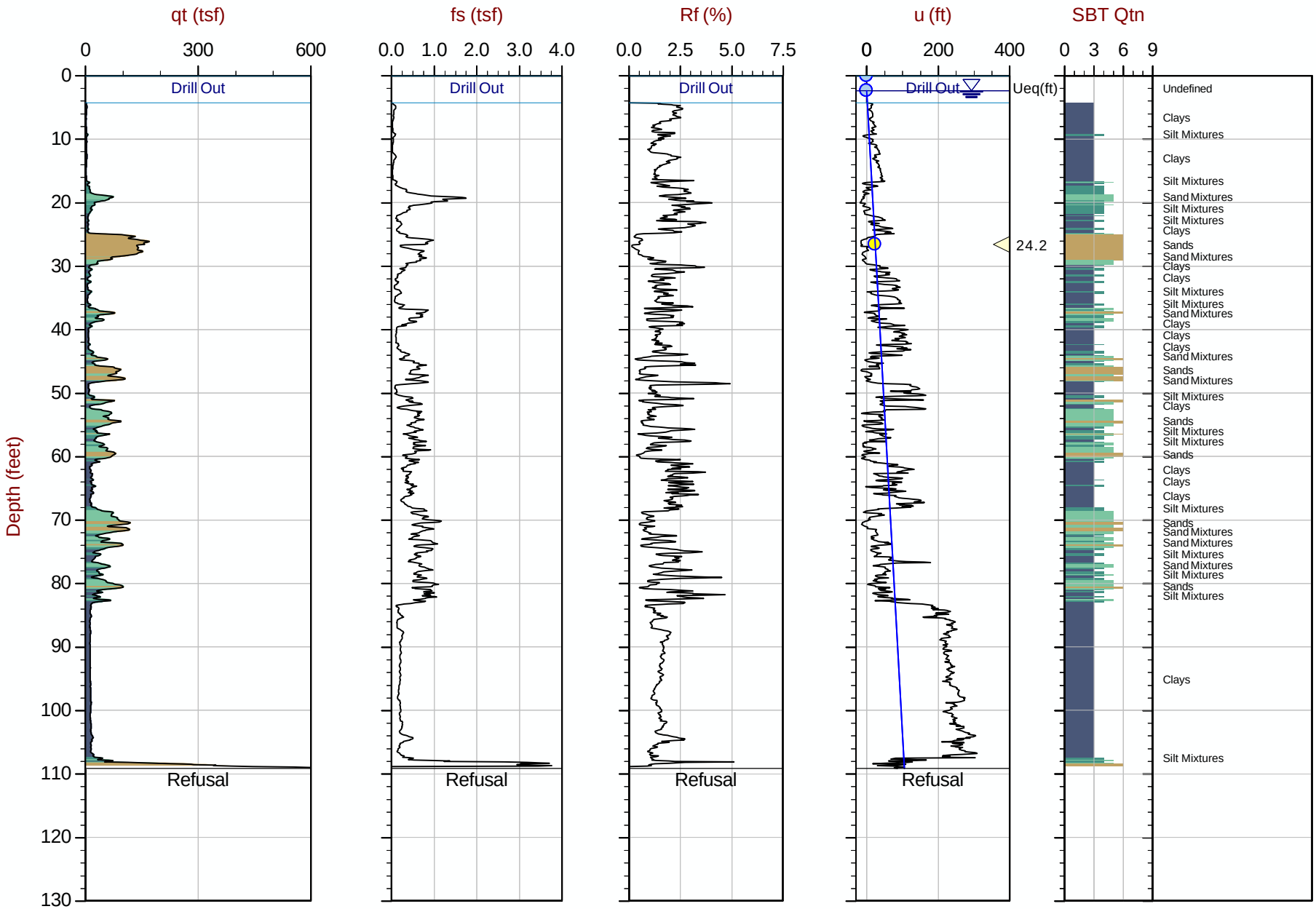
1. The assumed phreatic surface was based off the shallowest pore pressure dissipation tests performed within or nearest the sounding. Hydrostatic conditions were assumed for the calculated parameters.
2. The coordinates were collected using consumer grade GPS. EPSG number: 4326 (WGS84 / LatLong).
3. The phreatic surface is assumed to be deeper than the extent of the CPT final test depth.

CONETEC

Haley & Aldrich

Job No: 24-59-27459
Date: 2024-04-10 14:02
Site: Aberdeen Schools

Sounding: CPT-HH01
Cone: 1065:T1500F15U35



Max Depth: 33.275 m / 109.17 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 24-59-27459_SP-HH01.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 46.97258 Long: -123.83214

Overplot Item: Ueq, Assumed Ueq, Dissipation, Ueq achieved, Dissipation, Ueq not achieved, Dissipation, Ueq assumed, Hydrostatic Line

The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Standard CPTu Plots with Reduced Scales

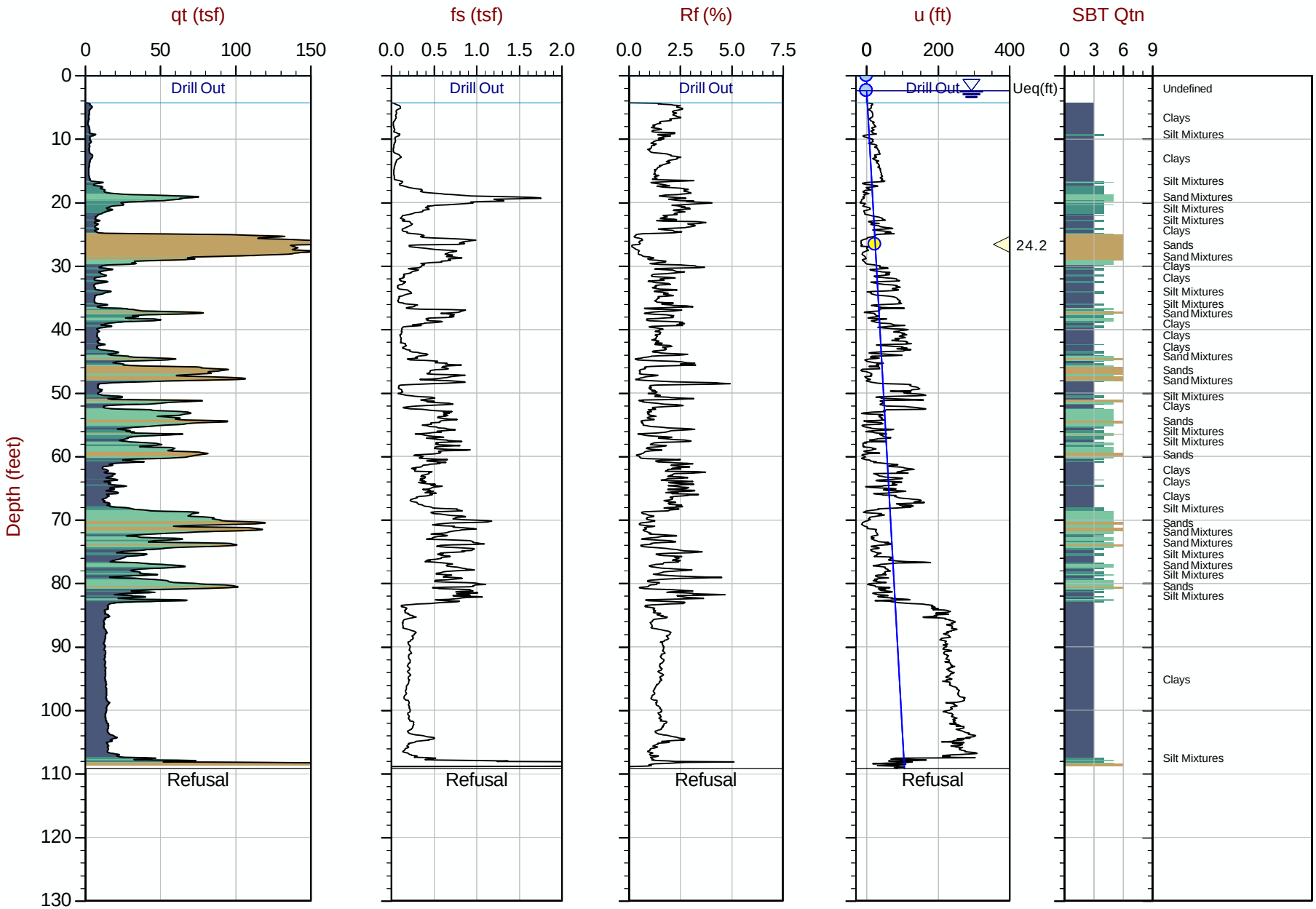
CONETEC

CONETEC

Haley & Aldrich

Job No: 24-59-27459
Date: 2024-04-10 14:02
Site: Aberdeen Schools

Sounding: CPT-HH01
Cone: 1065:T1500F15U35



Max Depth: 33.275 m / 109.17 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 24-59-27459_SP-HH01.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 46.97258 Long: -123.83214

Overplot Item: Ueq, Assumed Ueq, Dissipation, Ueq achieved, Dissipation, Ueq not achieved, Dissipation, Ueq assumed, Hydrostatic Line

The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Normalized Cone Penetration Test Plots

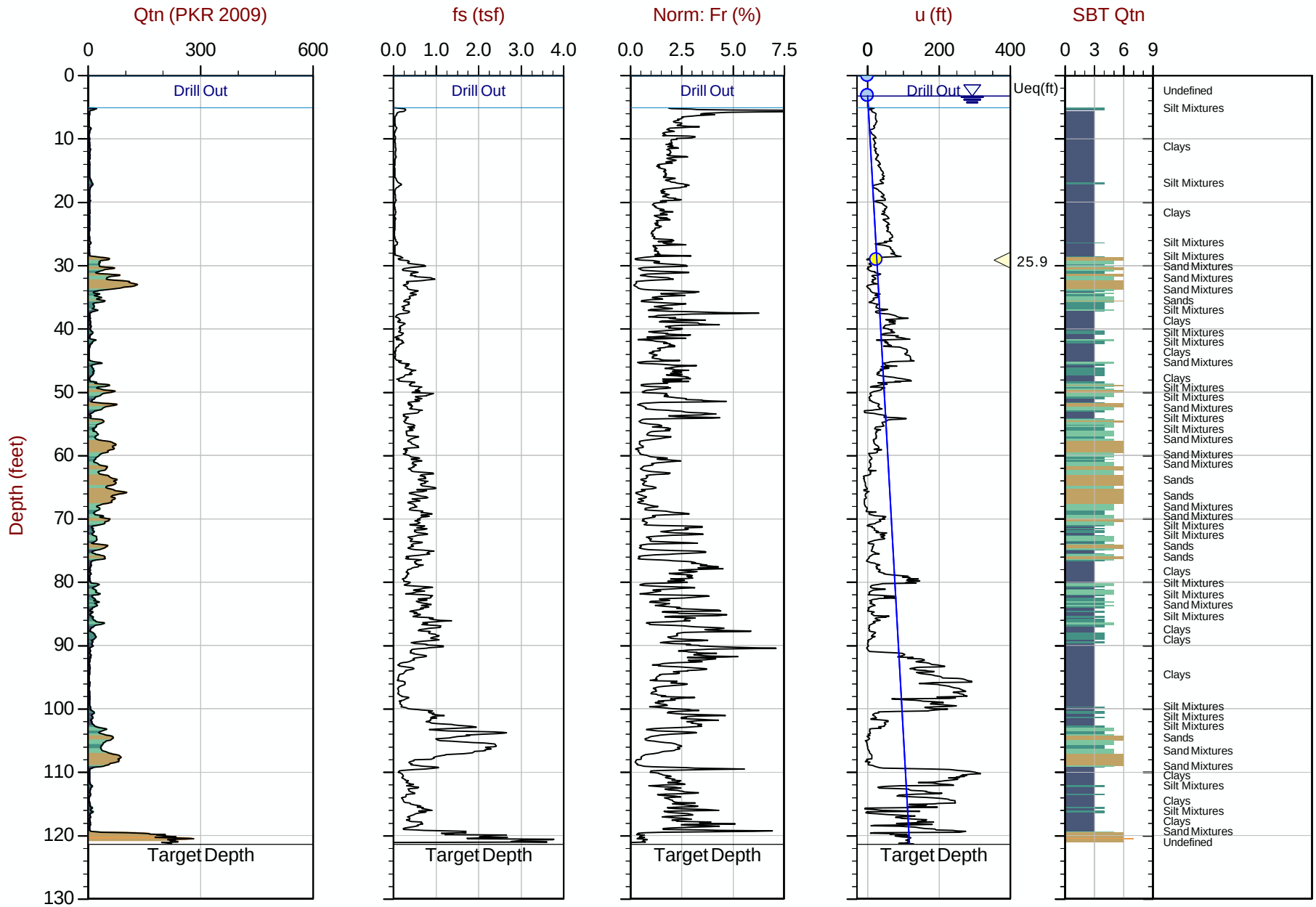
CONETEC

CONETEC

Haley & Aldrich

Job No: 24-59-27459
Date: 2024-04-10 10:23
Site: Aberdeen Schools

Sounding: CPT-AJW01
Cone: 1065:T1500F15U35



Max Depth: 37.000 m / 121.39 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 24-59-27459_SP-AJW01.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 46.97223 Long: -123.83739

Overplot Item: Ueq, Assumed Ueq, Dissipation, Ueq achieved, Dissipation, Ueq not achieved, Dissipation, Ueq assumed, Hydrostatic Line

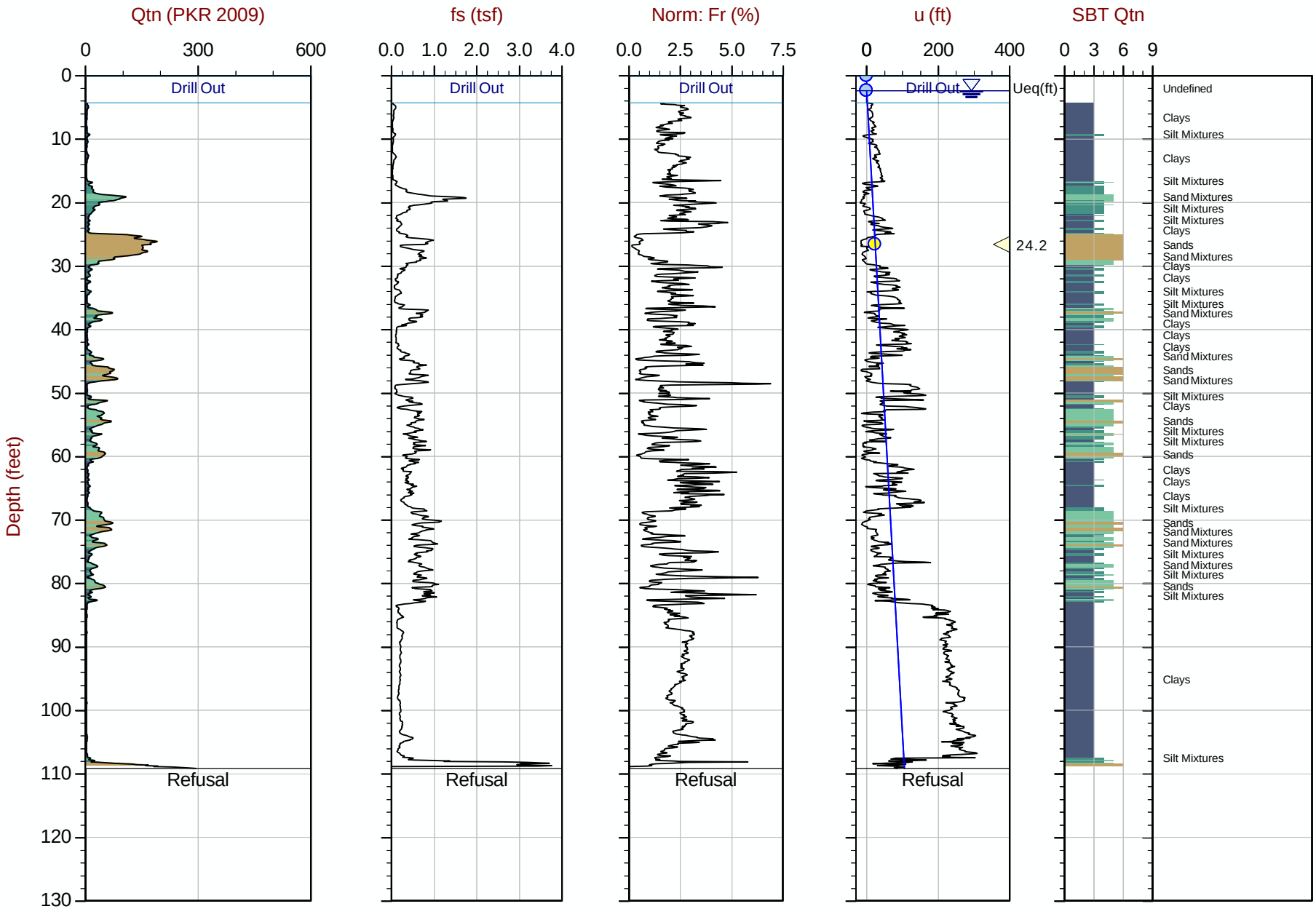
The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Haley & Aldrich

Job No: 24-59-27459
Date: 2024-04-10 14:02
Site: Aberdeen Schools

Sounding: CPT-HH01
Cone: 1065:T1500F15U35



Max Depth: 33.275 m / 109.17 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 24-59-27459_SP-HH01.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 46.97258 Long: -123.83214

Overplot Item: Ueq, Assumed Ueq, Dissipation, Ueq achieved, Dissipation, Ueq not achieved, Dissipation, Ueq assumed, Hydrostatic Line

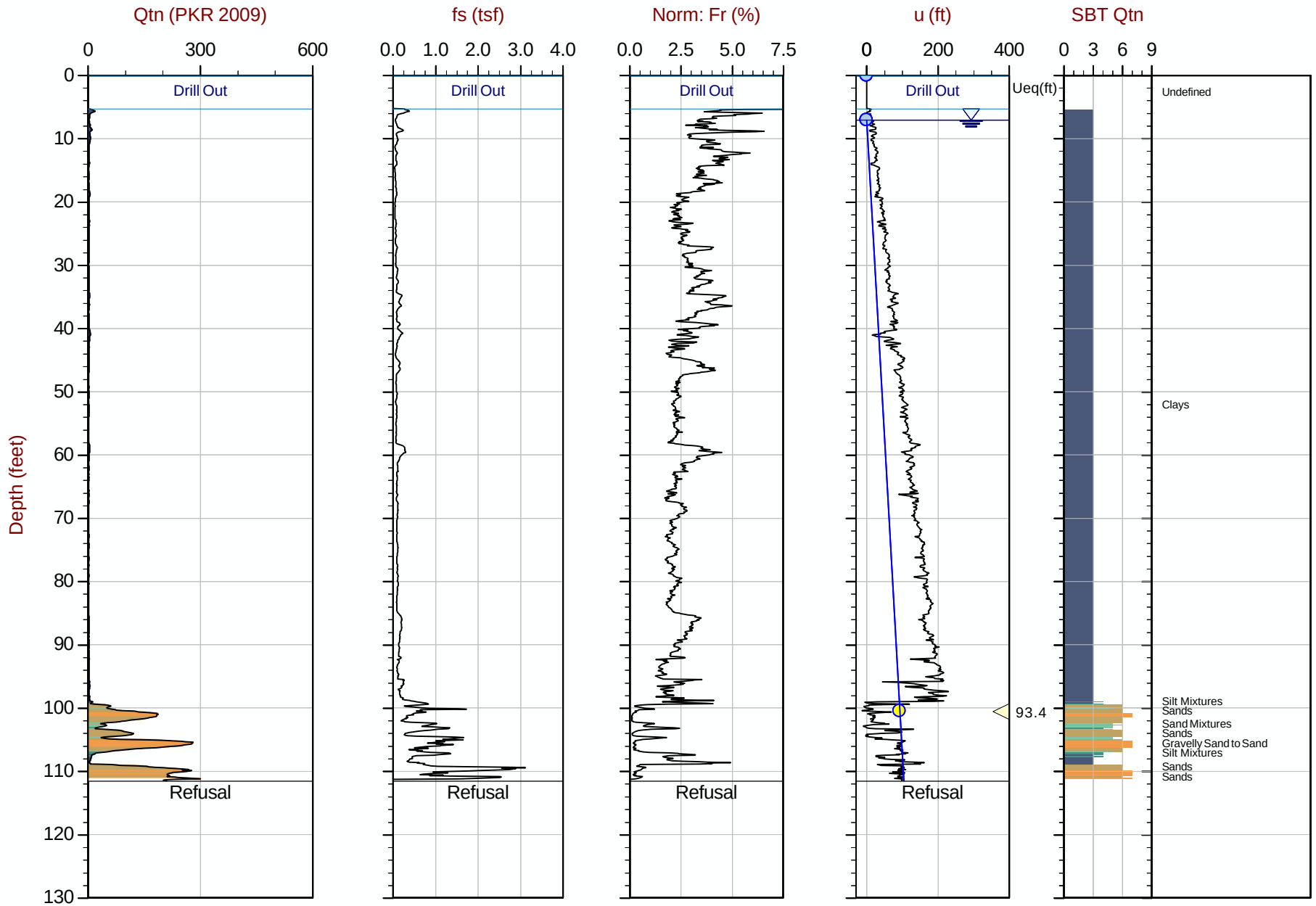
The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Haley & Aldrich

Job No: 24-59-27459
Date: 2024-04-11 10:31
Site: Aberdeen Schools

Sounding: CPT-MJH01
Cone: 1065:T1500F15U35



Max Depth: 34.000 m / 111.55 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 24-59-27459_SP-MJH01.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 46.96327 Long: -123.79190

Overplot Item: Ueq, Assumed Ueq, Dissipation, Ueq achieved, Dissipation, Ueq not achieved, Dissipation, Ueq assumed, Hydrostatic Line

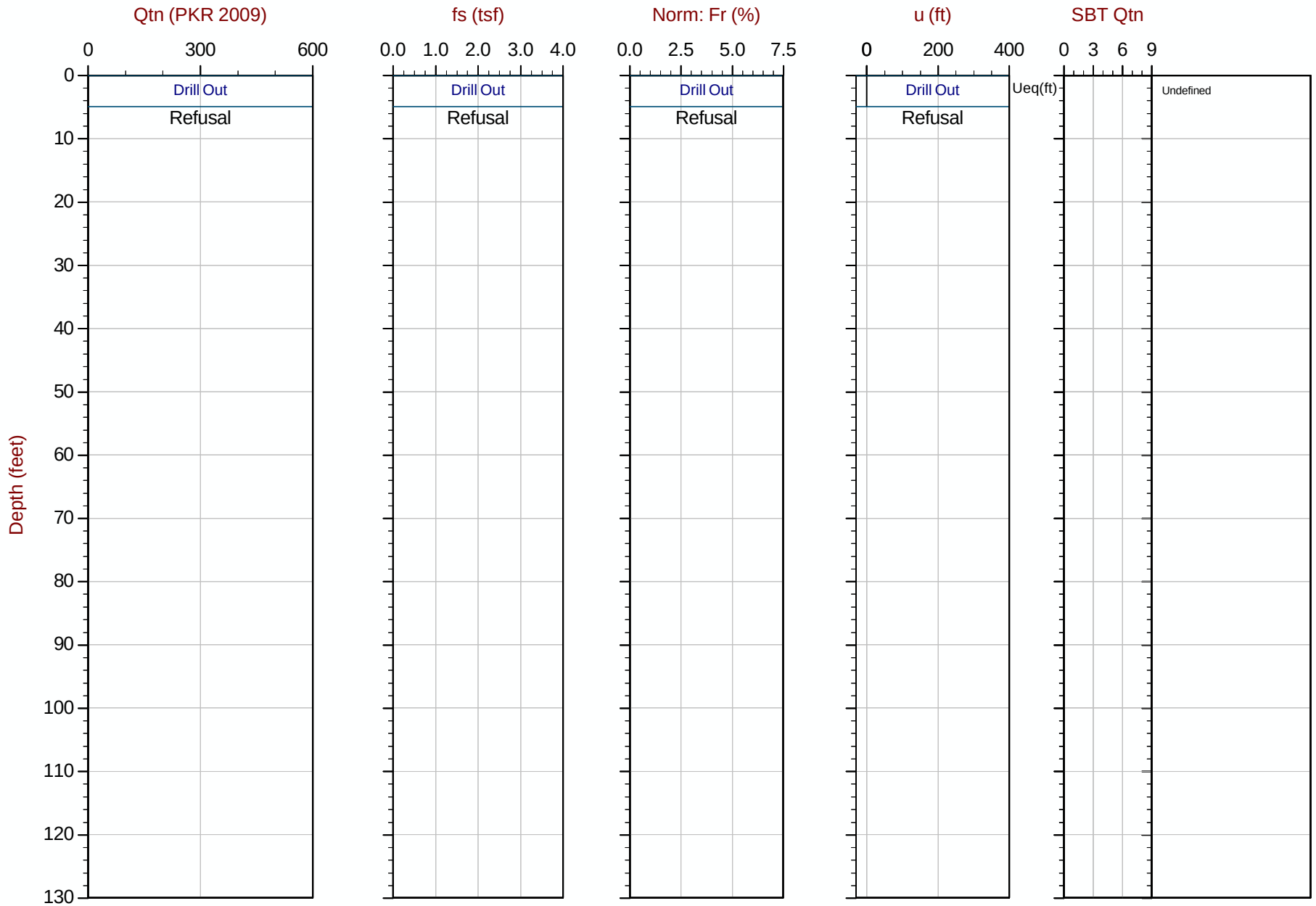
The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Haley & Aldrich

Job No: 24-59-27459
Date: 2024-04-11 08:40
Site: Aberdeen Schools

Sounding: CPT-MJH02
Cone: 1065:T1500F15U35



Max Depth: 1.500 m / 4.92 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 24-59-27459_SP-MJH02.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 46.96315 Long: -123.79268

Overplot Item: Ueq, Assumed Ueq, Dissipation, Ueq achieved, Dissipation, Ueq not achieved, Dissipation, Ueq assumed, Hydrostatic Line

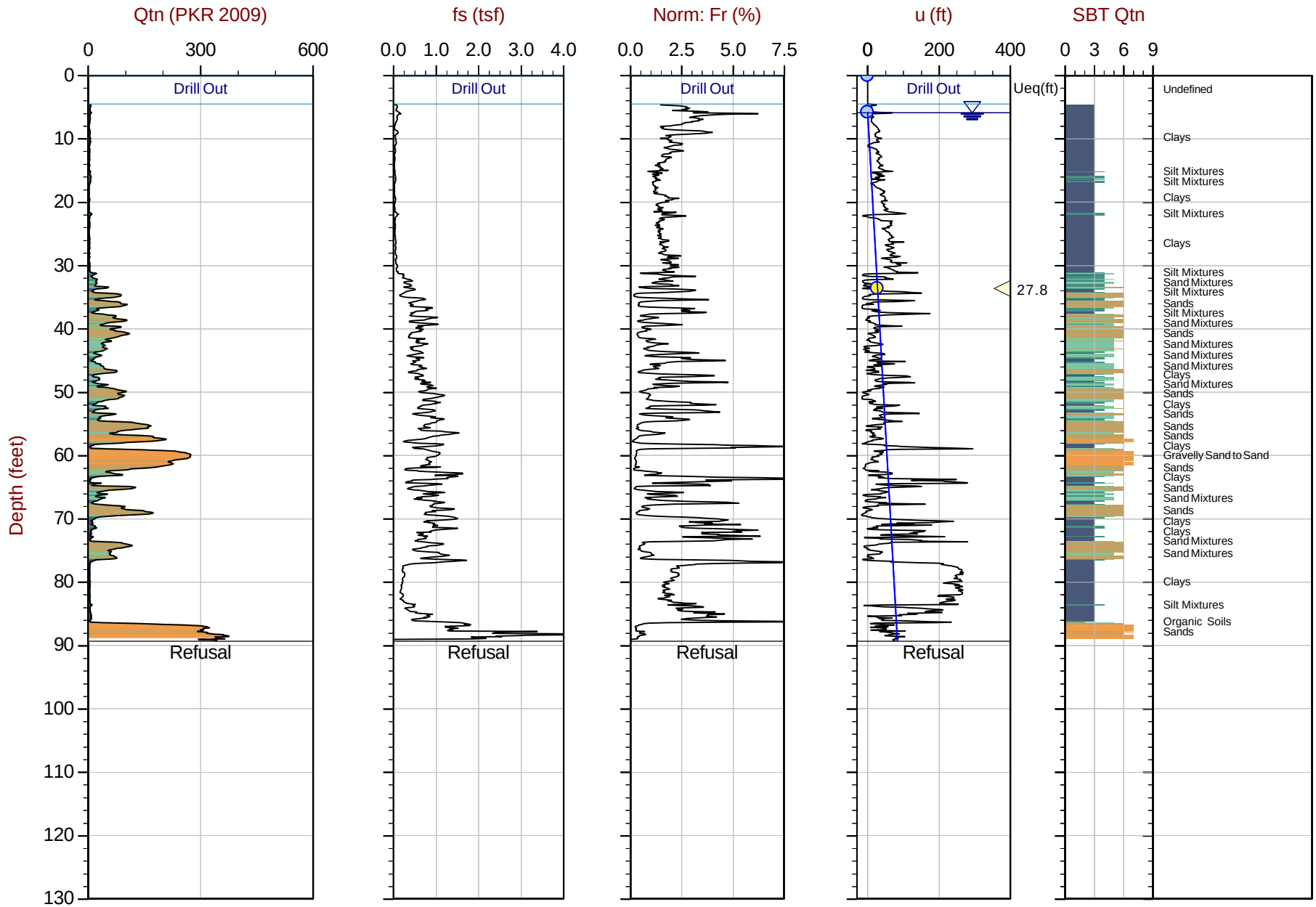
The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Haley & Aldrich

Job No: 24-59-27459
Date: 2024-04-11 13:02
Site: Aberdeen Schools

Sounding: CPT-SE01
Cone: 1065:T1500F15U35



Max Depth: 27.225 m / 89.32 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 24-59-27459_SP-SE01.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 46.96719 Long: -123.78915

Overplot Item: Ueq, Assumed Ueq, Dissipation, Ueq achieved, Dissipation, Ueq not achieved, Dissipation, Ueq assumed, Hydrostatic Line

The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Advanced Cone Penetration Test Plots with Ic, Su(Nkt), Phi, and N1(60)Ic

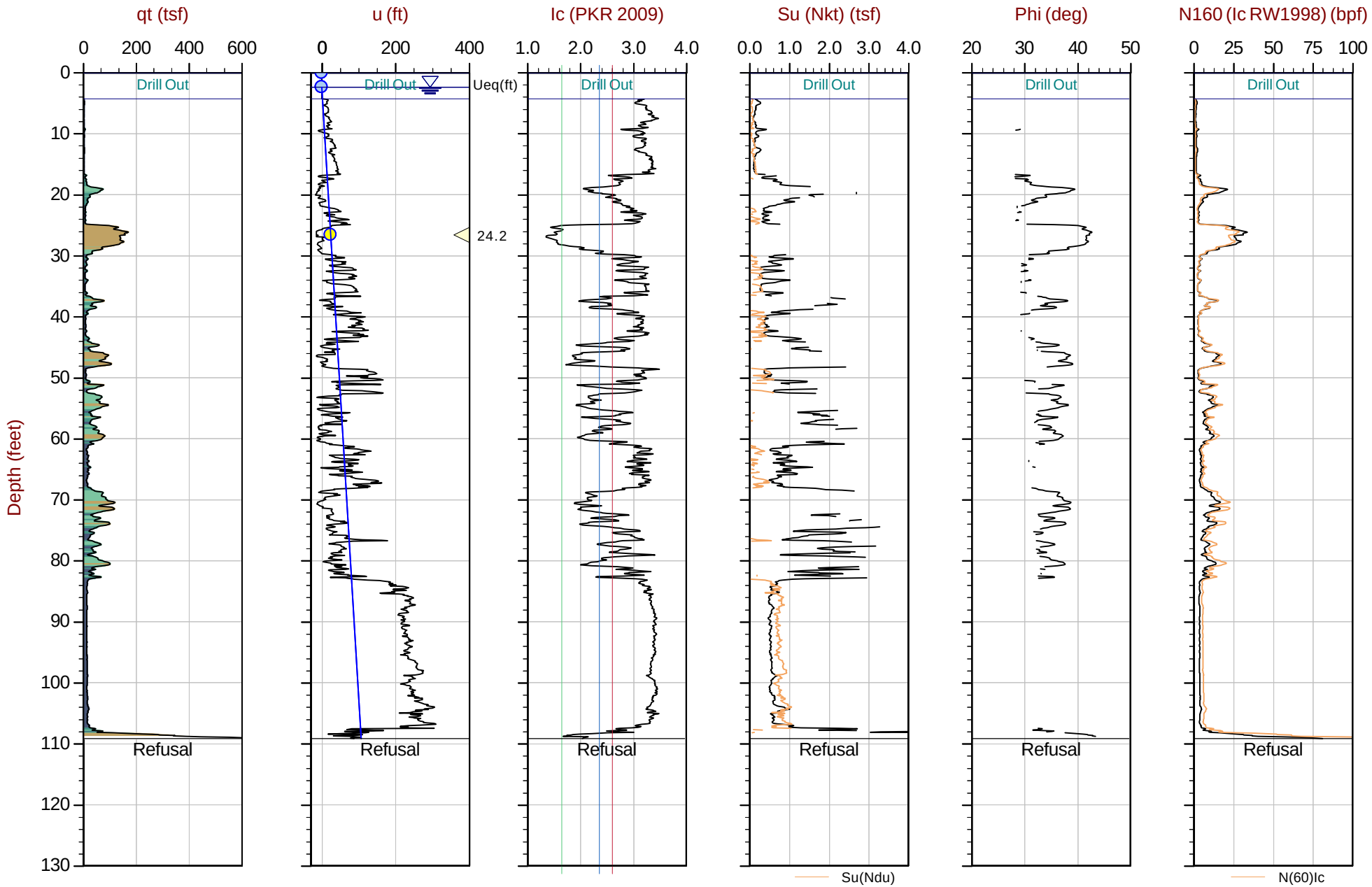
CONETEC

CONETEC

Haley & Aldrich

Job No: 24-59-27459
Date: 2024-04-10 14:02
Site: Aberdeen Schools

Sounding: CPT-HH01
Cone: 1065:T1500F15U35



Max Depth: 33.275 m / 109.17 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 24-59-27459_SP-HH01.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 46.97258 Long: -123.83214

Overplot Item: Ueq, Assumed Ueq, Dissipation, Ueq achieved, Dissipation, Ueq not achieved, Dissipation, Ueq assumed, Hydrostatic Line

The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Soil Behavior Type (SBT) Scatter Plots

CONETEC

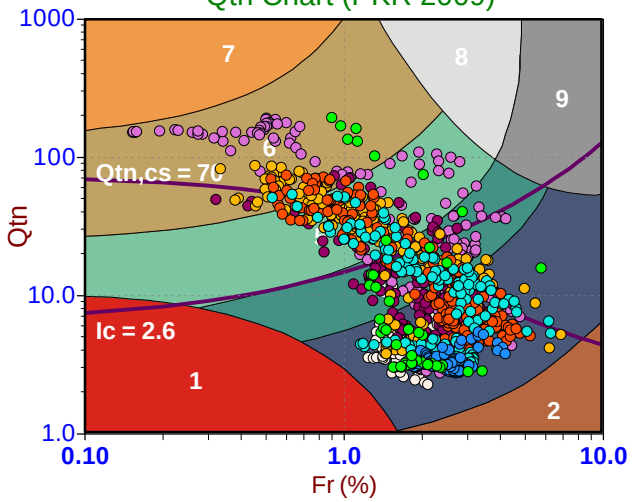
CONETEC

Haley & Aldrich

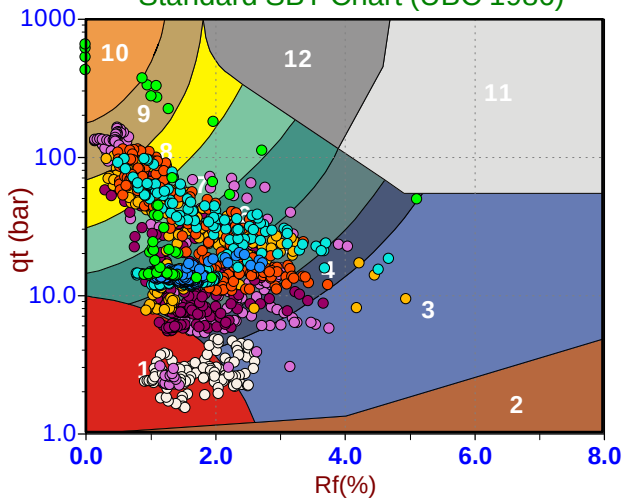
Job No: 24-59-27459
Date: 2024-04-10 14:02
Site: Aberdeen Schools

Sounding: CPT-HH01
Cone: 1065:T1500F15U35

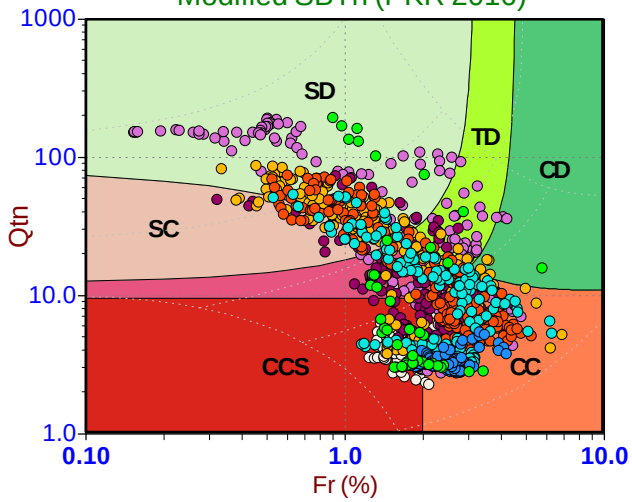
Qtn Chart (PKR 2009)



Standard SBT Chart (UBC 1986)



Modified SBTn (PKR 2016)



Depth Ranges

- >0.0 to 15.0 ft
- >15.0 to 30.0 ft
- >30.0 to 45.0 ft
- >45.0 to 60.0 ft
- >60.0 to 75.0 ft
- >75.0 to 90.0 ft
- >90.0 to 105.0 ft
- >105.0 to 120.0 ft
- >120.0 to 135.0 ft
- >135.0 to 150.0 ft
- >150.0 ft

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

Legend

- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

Pore Pressure Dissipation Test (PPDT) Summary and PPDT Plots

CONETEC

Job No:	24-59-27459
Client:	Haley & Aldrich, Inc.
Project:	Aberdeen Schools
Start Date:	2024-04-10
End Date:	2024-04-11

CPTu PORE PRESSURE DISSIPATION SUMMARY

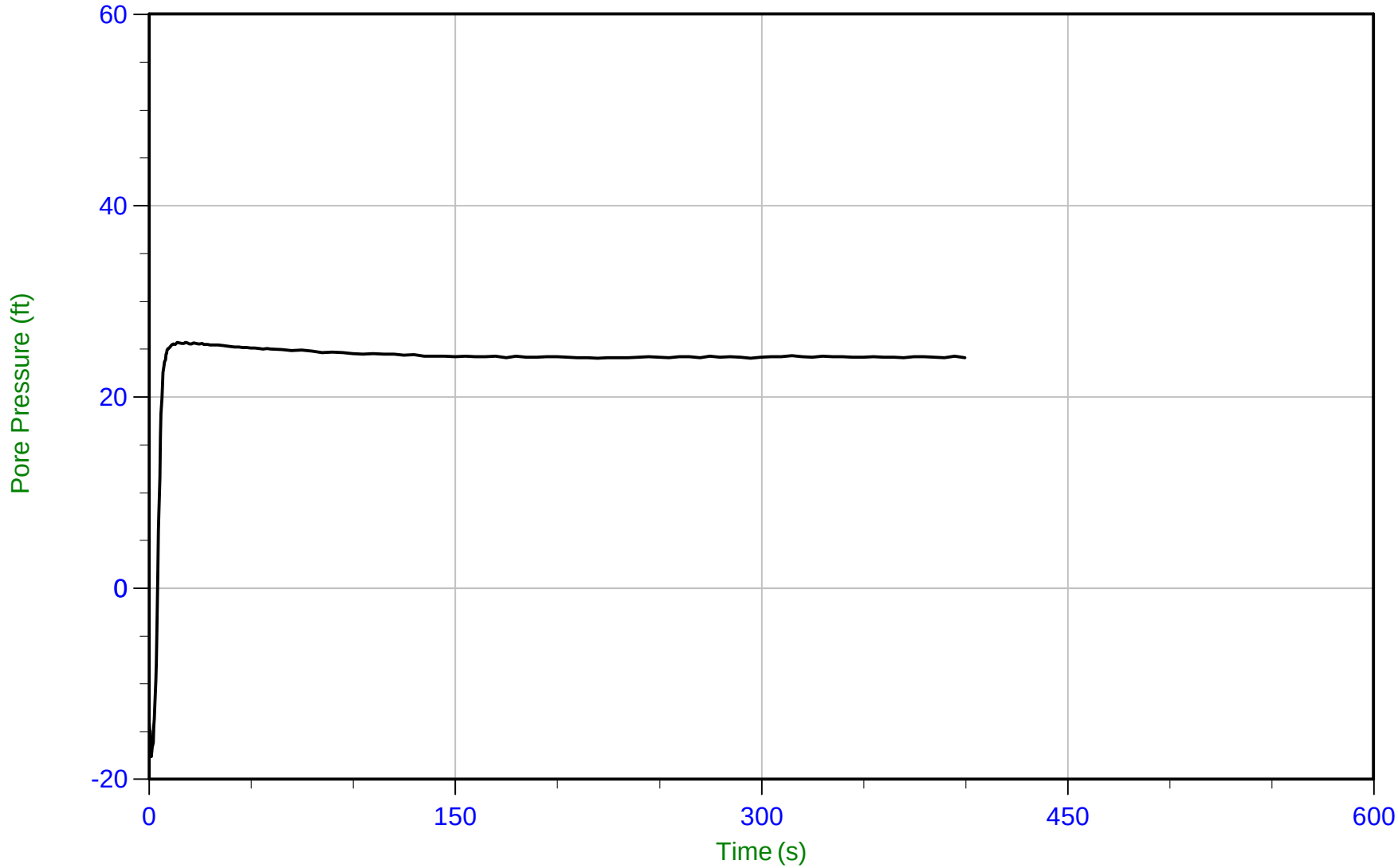
Sounding ID	File Name	Cone Area (cm^2)	Duration (s)	Test Depth (ft)	Estimated Equilibrium Pore Pressure U_{eq} (ft)	Calculated Phreatic Surface (ft)	Refer to Notation Number
CPT-AJW01	24-59-27459_SP-AJW01	15	400	29.12	25.9	3.2	
CPT-HH01	24-59-27459_SP-HH01	15	400	26.57	24.2	2.4	
CPT-MJH01	24-59-27459_SP-MJH01	15	350	100.56	93.5	7.1	
CPT-SE01	24-59-27459_SP-SE01	15	330	33.63	27.8	5.8	
Totals			25 min				

CONETEC

Haley & Aldrich

Job No: 24-59-27459
Date: 2024-04-10 14:02
Site: Aberdeen Schools

Sounding: CPT-HH01
Cone: 1065:T1500F15U35 Area=15 cm²



Trace Summary:

Filename: 24-59-27459_SP-HH01.PPR4
Depth: 8.100 m / 26.574 ft
Duration: 400.0 s

u Min: -17.6 ft
u Max: 25.7 ft
u Final: 24.1 ft

WT: 0.721 m / 2.365 ft
Ueq: 24.2 ft

Seismic Cone Penetration Test (SCPTu) Tabular Results

CONETEC

Job No:	24-59-27459
Client:	Haley & Aldrich, Inc.
Project:	Aberdeen Schools
Sounding ID:	CPT-HH01
Date:	2024-04-10
Seismic Source:	Beam
Seismic Offset (ft):	8.79
Source Depth (ft):	0.00
Geophone Offset (ft):	0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
10.17	9.51	12.96			
13.45	12.80	15.53	2.57	7.98	322
16.73	16.08	18.32	2.80	10.14	276
20.08	19.42	21.32	3.00	8.79	341
23.29	22.64	24.29	2.97	6.01	493
26.58	25.92	27.37	3.09	6.51	474
29.79	29.13	30.43	3.06	5.24	584
33.14	32.48	33.65	3.22	7.48	430
36.42	35.76	36.83	3.18	8.68	366
39.63	38.98	39.96	3.13	7.32	428
42.98	42.32	43.23	3.27	6.67	491
46.19	45.54	46.38	3.15	6.42	491
49.61	48.95	49.73	3.35	6.51	516
52.82	52.17	52.90	3.17	6.26	506
56.04	55.38	56.07	3.17	5.61	566
59.38	58.73	59.38	3.31	6.53	507
62.66	62.01	62.63	3.25	5.77	563
66.01	65.35	65.94	3.32	6.67	497
69.23	68.57	69.13	3.19	5.72	558
72.44	71.78	72.32	3.19	5.25	608
75.79	75.13	75.64	3.32	5.44	610
79.13	78.48	78.97	3.33	5.84	569
82.28	81.63	82.10	3.13	5.44	575
85.56	84.91	85.36	3.26	7.00	466
88.91	88.26	88.69	3.33	6.15	542
92.26	91.60	92.02	3.33	7.00	476
95.41	94.75	95.16	3.14	6.25	502
98.75	98.10	98.49	3.33	6.45	517
102.03	101.38	101.76	3.27	5.84	560
105.15	104.49	104.86	3.10	5.84	531
108.53	107.87	108.23	3.37	4.53	744

SCPTu Test Plots

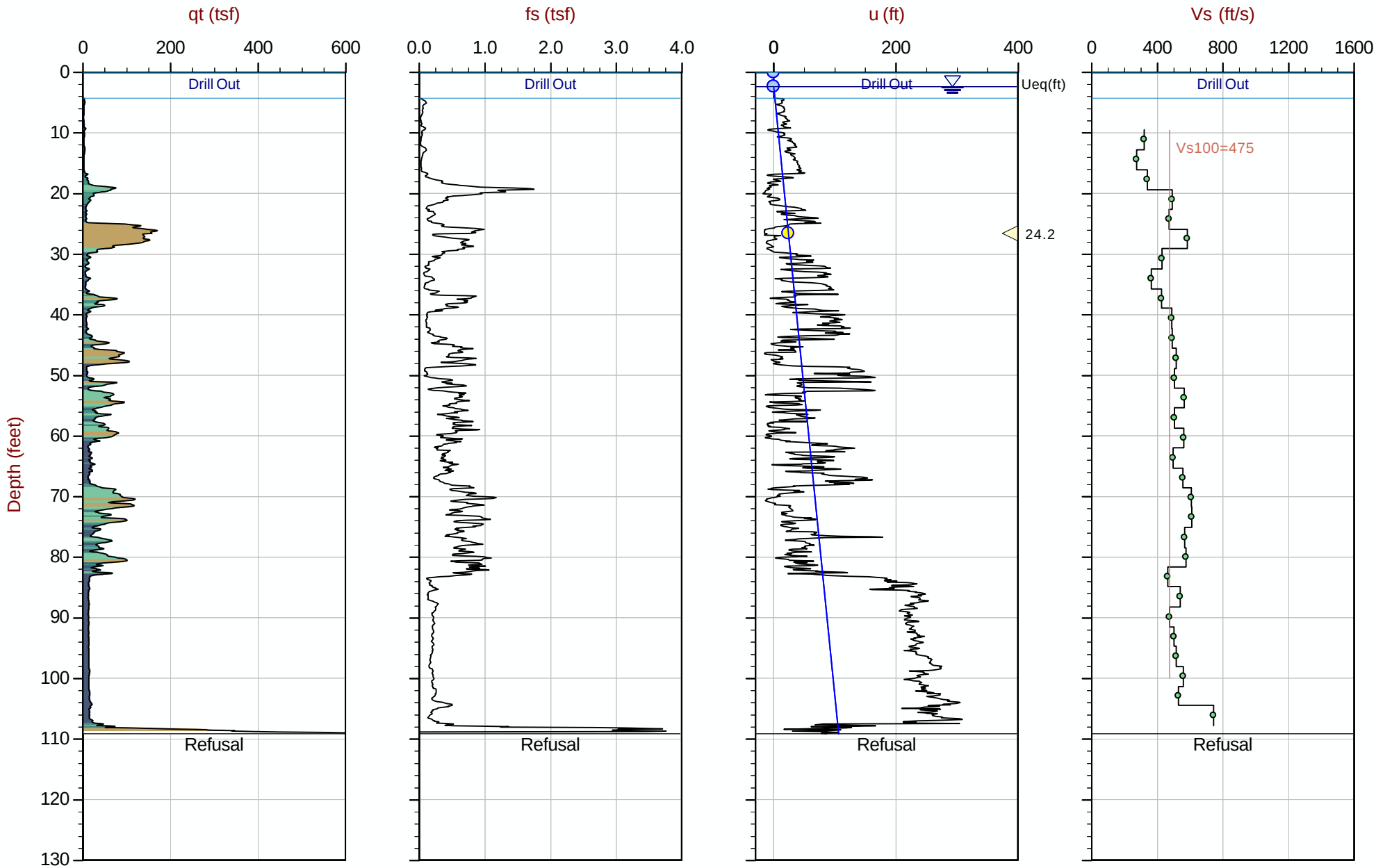
CONETEC

CONETEC

Haley & Aldrich

Job No: 24-59-27459
Date: 2024-04-10 14:02
Site: Aberdeen Schools

Sounding: CPT-HH01
Cone: 1065:T1500F15U35



Max Depth: 33.275 m / 109.17 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 24-59-27459_SP-HH01.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 46.97258 Long: -123.83214

Overplot Item: Ueq, Assumed Ueq, Dissipation, Ueq achieved, Dissipation, Ueq not achieved, Dissipation, Ueq assumed, Hydrostatic Line

The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

SCPTu Velocity Wave Traces

CONETEC

Job No: 24-59-27459
Date: 2024-04-10

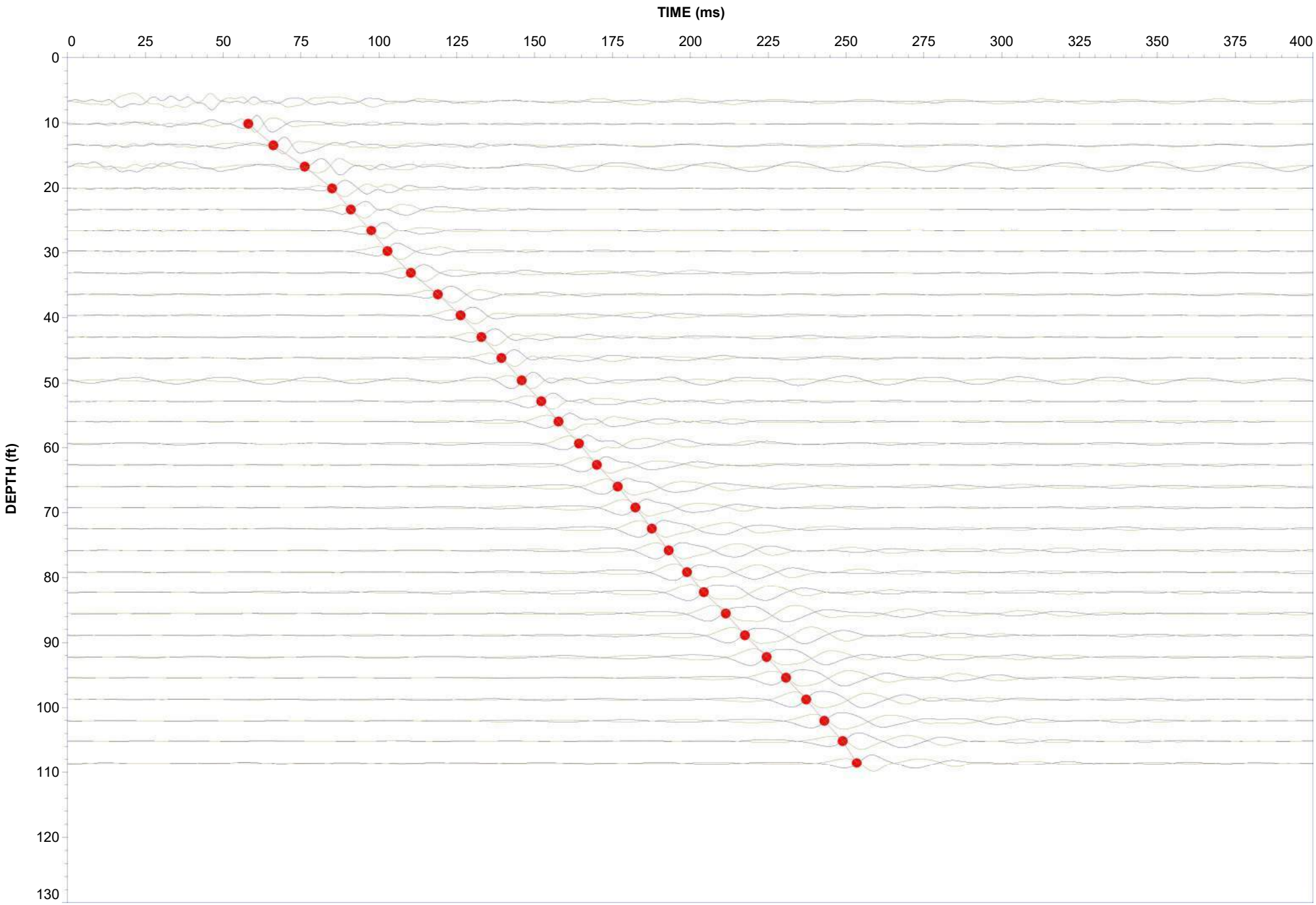
Client: Haley & Aldrich, Inc.
Cone: 1065:T1500F15U35

Project: Aberdeen Schools

Analysis: Shear Wave

Sounding: CPT-HH01

Filter: BP 25 - 200 Hz



Supplementary Documents and Materials

CONETEC

Description of Methods for Calculated CPT Geotechnical Parameters

CONETEC

CALCULATED CPT GEOTECHNICAL PARAMETERS

A Detailed Description of the Methods Used in ConeTec's CPT Geotechnical Parameter Calculation and Plotting Software



Revision SZW-Rev 18

Revised February 10, 2023

Prepared by Jim Greig, M.A.Sc, P.Eng (BC, AB, ON)

CONETEC

Limitations

The geotechnical parameter output was prepared specifically for the site and project named in the accompanying report subject to objectives, site conditions and criteria provided to ConeTec by the client. The output may not be relied upon by any other party or for any other site without the express written permission of ConeTec Group (ConeTec) or any of its affiliates. For this project, ConeTec has provided site investigation services, prepared factual data reporting and produced geotechnical parameter calculations consistent with current best practices. No other warranty, expressed or implied, is made.

To understand the calculations that have been performed and to be able to reproduce the calculated parameters the user is directed to the basic descriptions for the methods in this document and the detailed descriptions and their associated limitations and appropriateness in the technical references cited for each parameter.

ConeTec's Calculated CPT Geotechnical Parameters as of February 10, 2023.

ConeTec's CPT parameter calculation and plotting routine provides a tabular output of geotechnical parameters based on current published CPT correlations and is subject to change to reflect the current state of practice. Due to drainage conditions and the basic assumptions and limitations of the correlations, not all geotechnical parameters provided are considered applicable for all soil types. The results are presented only as a guide for geotechnical use and should be carefully examined for consideration in any geotechnical design. Reference to current literature is strongly recommended. ConeTec does not warranty the correctness or the applicability of any of the geotechnical parameters calculated by the program and does not assume liability for any use of the results in any design or review. For verification purposes we recommend that representative hand calculations be done for any parameter that is critical for design purposes. The end user of the parameter output should also be fully aware of the techniques and the limitations of any method used by the program. The purpose of this document is to inform the user as to which methods were used and to direct the end user to the appropriate technical papers and/or publications for further reference.

The geotechnical parameter output was prepared specifically for the site and project named in the accompanying report subject to objectives, site conditions and criteria provided to ConeTec by the client. The output may not be relied upon by any other party or for any other site without the express written permission of ConeTec Group (ConeTec) or any of its affiliates.

The CPT calculations are based on values of tip resistance, sleeve friction and pore pressures considered at each data point or averaged over a user specified layer thickness (e.g., 0.20 m). Note that q_t is the tip resistance corrected for pore pressure effects and q_c is the recorded tip resistance. The corrected tip resistance (corrected using u_2 pore pressure values) is used for all calculations. Since all ConeTec cones have equal end area friction sleeves pore pressure corrections to sleeve friction, f_s, are not performed.

Corrected tip resistance: $q_t = q_c + (1-a) \cdot u_2$ (consistent units are required)

where: q_t is the corrected tip resistance
q_c is the recorded tip resistance
u_2 is the recorded dynamic pore pressure from behind the tip (u_2 position)
a is the Net Area Ratio for the cone (typically 0.80 for ConeTec cones)

The total stress calculations are based on soil unit weight values that have been assigned to the Soil Behavior Type (SBT) zones, from a user defined unit weight profile, by using a single uniform value throughout the profile, through unit weight estimation techniques described in various technical papers or from a combination of these methods. The parameter output files indicate the method(s) used.

Effective vertical overburden stresses are calculated using the total stress and equilibrium pore pressure (u_{eq} or u_o) values derived from an assumed hydrostatic distribution of pore pressures below the water table or from a user defined equilibrium pore pressure profile (typically obtained from CPT dissipation tests) or a combination of the two. For over water projects the stress effects of the column of water above the mudline are taken into account as is the appropriate unit weight of water. How this is done depends on where the instruments are zeroed (i.e. on deck or at the mudline). The parameter output files indicate the method(s) used.

A majority of parameter calculations are derived from or driven by results based on material types as determined by the various soil behavior type charts depicted in Figures 1 through 6. The parameter output files indicate the method(s) used.

The Soil Behavior Type classification chart shown in Figure 1 is the classic non-normalized SBT Chart developed at the University of British Columbia and reported in Robertson, Campanella, Gillespie and Greig (1986). Figure 2 shows the original normalized (linear method) SBTn chart developed by Robertson (1990). The Bq classification charts

shown in Figures 3a and 3b incorporate pore pressures into the SBT classification and are based on the methods described in Robertson (1990). Many of these charts have been summarized in Lunne, Robertson and Powell (1997). The Jefferies and Davies SBT chart shown in Figure 3c is based on the techniques discussed in Jefferies and Davies (1993) which introduced the concept of the Soil Behavior Type Index parameter, I_c. Take note that the I_c parameter developed by Robertson and Fear (1995) and Robertson and Wride (1998) is similar in concept but uses a slightly different calculation method than that defined by Jefferies and Davies (1993) as the latter incorporates pore pressure in their technique through the use of the Bq parameter. The normalized Qtn SBT chart shown in Figure 4 is based on the work by Robertson (2009) utilizing a variable stress ratio exponent, n, for normalization based on a slightly modified redefinition and iterative approach for I_c. The boundary curves drawn on the chart are based on the work described in Robertson (2010).

Figure 5 shows a revised 1986 SBT Chart presented to CPT'10 by Robertson (2010b). It is known as the Updated non-normalized Soil Behavior Chart (also referred to as the Rev SBT Chart (PKR2010) in our output files). This chart was produced to be more in line with all post-1986 Robertson charts having the same 9 soil type zones, a $\log_{10}$ axis for friction ratio, R_f in this case, and a unitless tip resistance axis.

Figure 6 shows a revised behavior based chart by Robertson (2016) depicting contractive-dilative zones. As the zones represent material behavior rather than soil gradation ConeTec has chosen a set of zone colors that are less likely to be confused with material type colors from previous SBT charts. These colors differ from those used by Dr. Robertson. A green palette was selected for the dilative (desirable) side of the chart and a red palette for the contractive side of the chart.

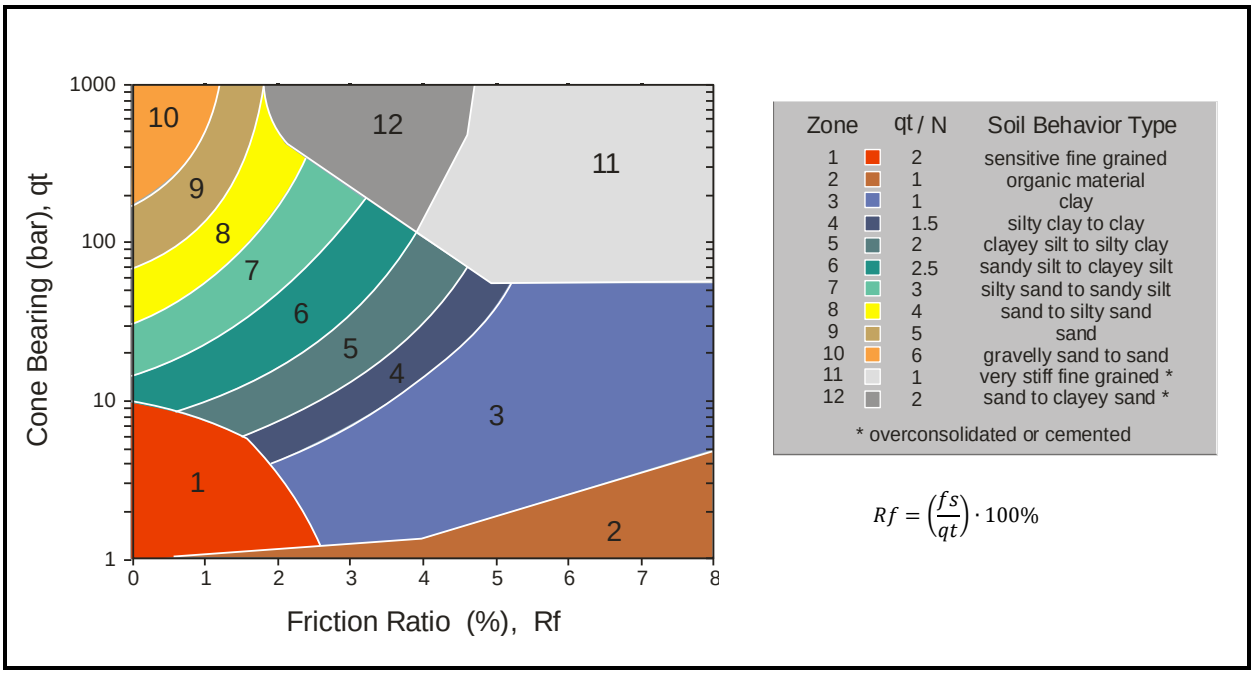


Figure 1. Non-normalized Soil Behavior Type Classification Chart (SBT)

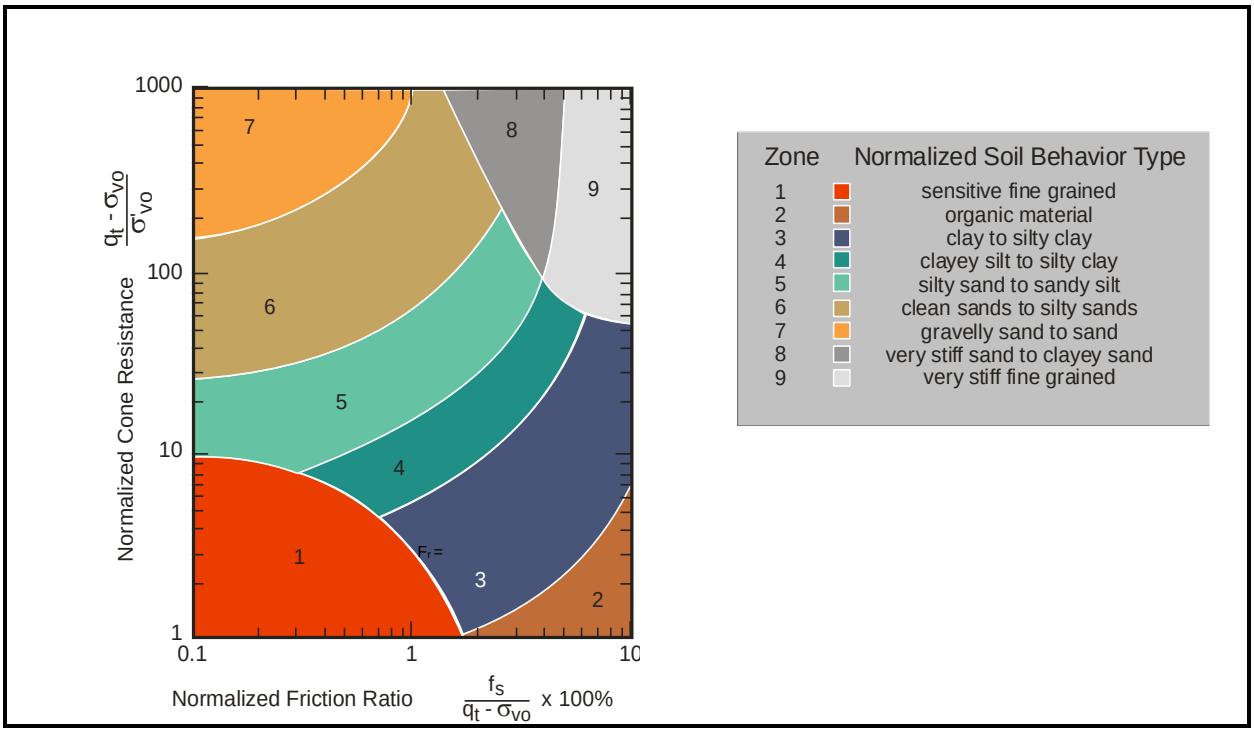


Figure 2. Normalized Soil Behavior Type Classification Chart (SBTn)

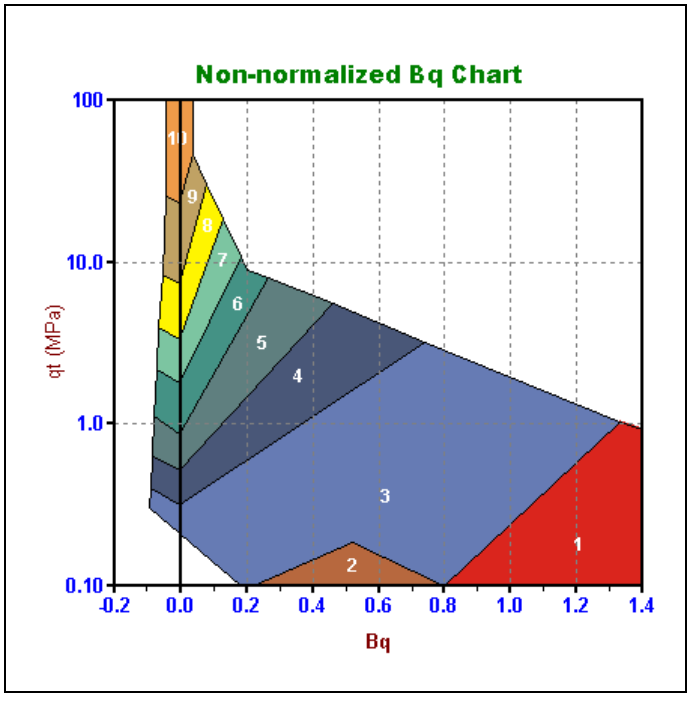


Figure 3a. Alternate Soil Behavior Type Chart (SBT Bq): q_t - B_q

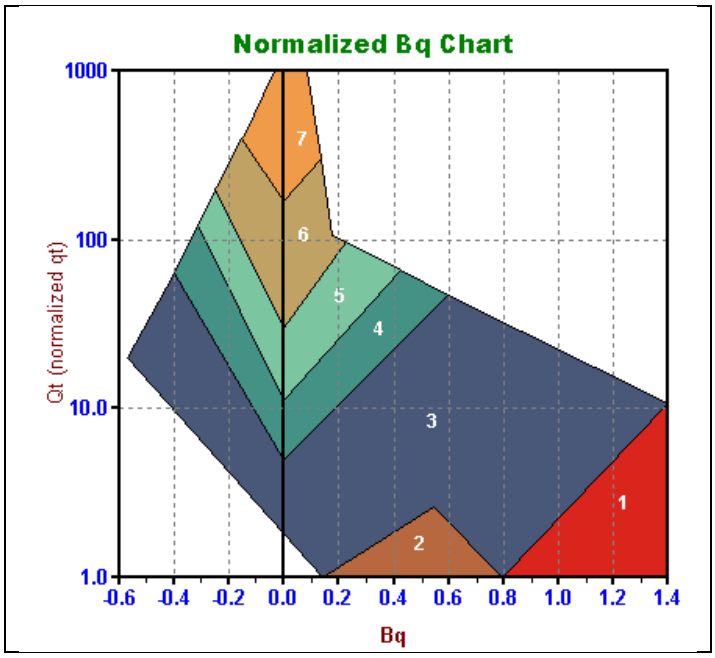


Figure 3b. Alternate Soil Behavior Type Charts (SBT Bqn): Q_t-B_q

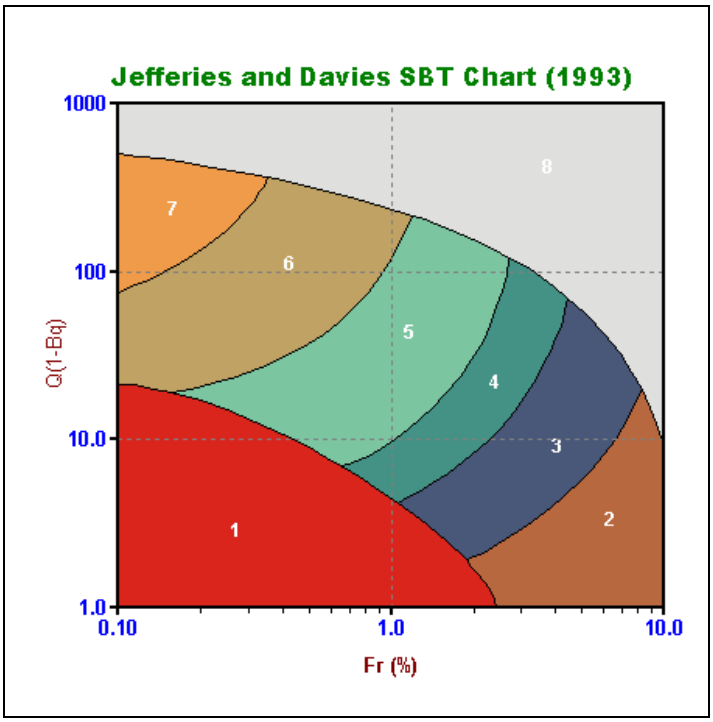


Figure 3c. Alternate Soil Behavior Type Charts: $Q(1-B_q)$ - F_r

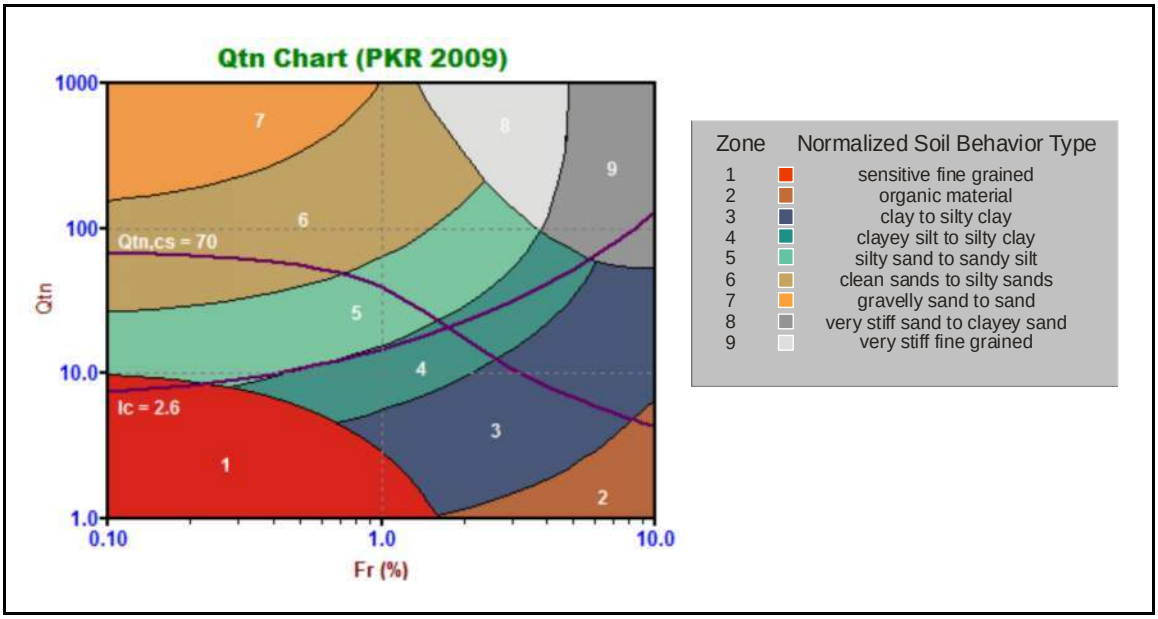


Figure 4. Normalized Soil Behavior Type Chart using Q_{tn} (SBT Qtn)

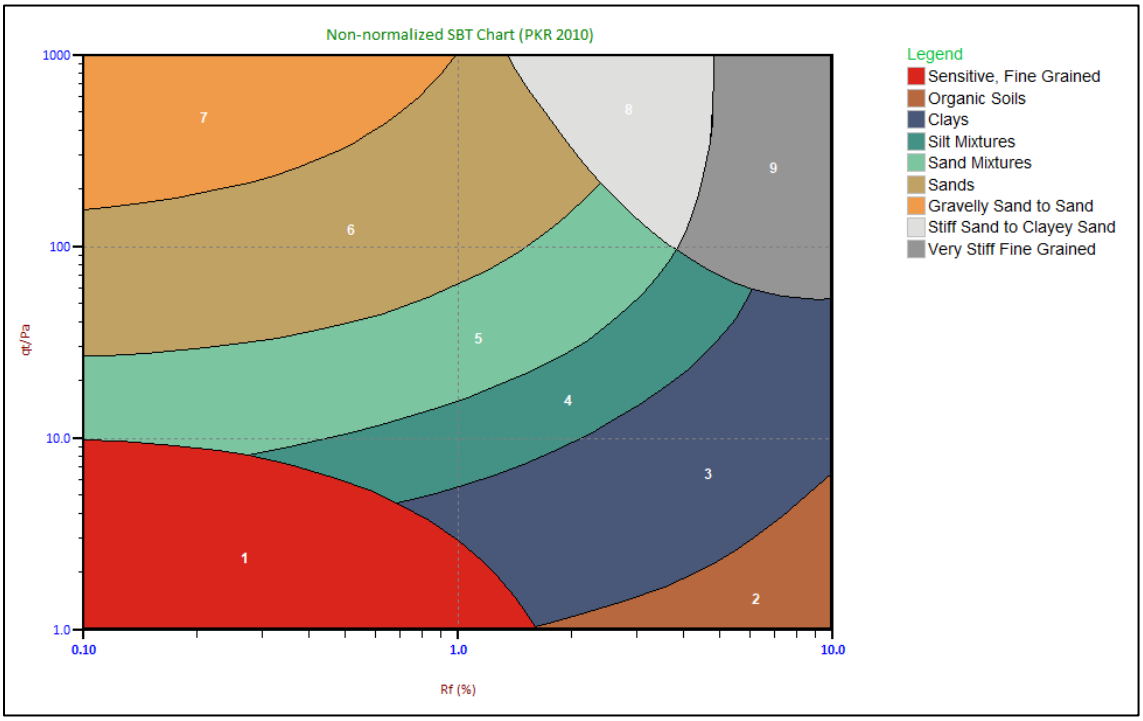


Figure 5. Non-normalized Soil Behavior Type Chart (2010)

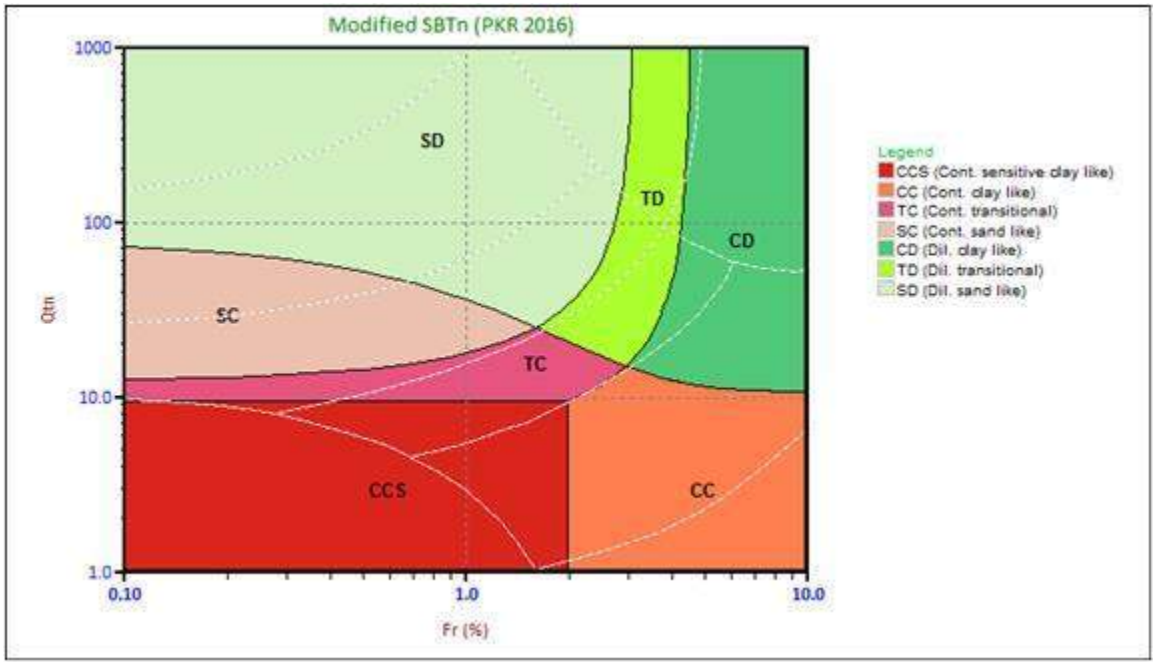


Figure 6. Modified SBTn Behavior Based Chart

Details regarding the geotechnical parameter calculations are provided in Tables 1a and 1b. The appropriate references cited are listed in Table 2. Non-liquefaction specific parameters are detailed in Table 1a and liquefaction specific parameters are detailed in Table 1b.

Where methods are based on charts or techniques that are too complex to describe in this summary, we recommend that the user refer to the cited material. Specific limitations for each method are described in the cited material.

Where the results of a calculation/correlation are deemed *'invalid'* the value will be represented by the text strings "-9999", "-9999.0", the value 0.0 (Zero) or an empty cell. Invalid results will occur because of (and not limited to) one or a combination of:

1. Invalid or undefined CPT data (e.g., drilled out section or data gap).

2. Where the calculation method is inappropriate, for example, drained parameters in a material behaving in an undrained manner (and vice versa).

3. Where input values are beyond the range of the referenced charts or specified limitations of the correlation method.

4. Where pre-requisite or intermediate parameter calculations are invalid.

The parameters selected for output from the program are often specific to a particular project. As such, not all of the calculated parameters listed in Tables 1and 1a may be included in the output files delivered with this report.

The output files are typically provided in Microsoft Excel XLS, XLSX or CSV format. The ConeTec software has several options for output depending on the number or types of calculated parameters desired or those specifically contracted for by the client. Each output file is named using the original file base name (from the .COR file) followed

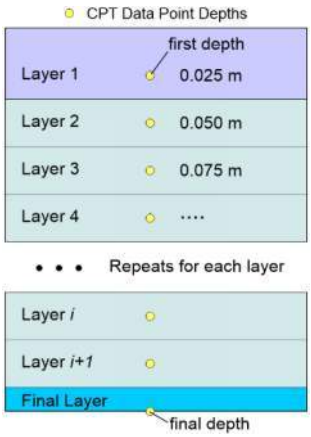
by a three or four character indicator of the output set selected (e.g. BSC, TBL, NLI, NL2, IFI, IFI2, IFI3) and possibly followed by an operator selected suffix identifying the characteristics of the particular calculation run.

Table 1a. CPT Parameter Calculation Methods – Non liquefaction Parameters

Reference Notes: CK* - Common Knowledge, U* - Unpublished

Calculated Parameter	Description	Equation	Ref
Depth	Mid Layer Depth *(where calculations are done at each point then Mid Layer Depth = Recorded Depth)*	*[Depth (Layer Top) + Depth (Layer Bottom)]/ 2.0*	CK*
Elevation	Elevation of Mid Layer is based on the sounding collar elevation supplied by the client or through a site survey In Sweden a variation of elevation is used where the elevation increases with depth. We refer to this as inverse elevation.	Elevation = Collar Elevation – Depth InverseElevation = Collar Elevation + Depth	CK* N/A
Avg qc	Averaged recorded tip value (q_c)	$Avgqc = \frac{1}{n}\sum_{i=1}^{n} q_c$ *n=1 when calculations are done at each point*	CK*
Avg qt	Averaged corrected tip (q_t) where: $q_t = q_c + (1-a)\cdot u_2$ Averaged q_t is not calculated using the average q_c and averaged u values. Averaged q_t is based on the average of the q_t values calculated at each data point.	$Avgqt = \frac{1}{n}\sum_{i=1}^{n} q_t$ *n=1 when calculations are done at each point*	1
Avg fs	Averaged sleeve friction (f_s) No pore pressure corrections are applied to f_s.	$Avgfs = \frac{1}{n}\sum_{i=1}^{n} fs$ *n=1 when calculations are done at each point*	CK*
Avg Rf	Averaged friction ratio (R_f) where friction ratio is defined as: $R_f = 100\% \cdot \frac{fs}{q_t}$	$AvgRf = 100\% \cdot \frac{Avgfs}{Avgqt}$ *not an average of individual R_f values*	CK*
Avg u	Averaged dynamic pore pressure *(u)*	$Avgu = \frac{1}{n}\sum_{i=1}^{n} u_i$ *n=1 when calculations are done at each point*	CK*
Avg Res	Averaged Resistivity (this data is not always available since it is a specialized test requiring an additional module)	$AvgRes = \frac{1}{n}\sum_{i=1}^{n} Resistivity_i$ *n=1 when calculations are done at each point*	CK*
Avg UVIF	Averaged UVIF ultra-violet induced fluorescence (this data is not always available since it is a specialized test requiring an additional module)	$AvgUVIF = \frac{1}{n}\sum_{i=1}^{n} UVIF_i$ *n=1 when calculations are done at each point*	CK*
Avg Temp	Averaged Temperature (this data is not always available)	$AvgTemp = \frac{1}{n}\sum_{i=1}^{n} Temperature_i$ *n=1 when calculations are done at each point*	CK*
Avg Gamma	Averaged Gamma Counts (this data is not always available since it is a specialized test requiring an additional module)	$AvgGamma = \frac{1}{n}\sum_{i=1}^{n} Gamma_i$ *n=1 when calculations are done at each point*	CK*
SBT	Soil Behavior Type as defined by Robertson et al 1986 (often referred to as Robertson and Campanella, 1986)	See Figure 1	1, 5
SBTn	Normalized Soil Behavior Type as defined by Robertson 1990 (linear normalization using Q_t, now referred to as Q_{t1})	See Figure 2	2, 5

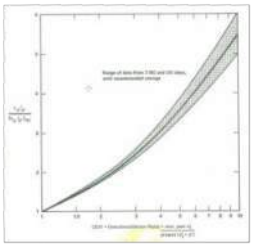
Calculated Parameter	Description	Equation	Ref
SBT-Bq	Non-normalized Soil Behavior type based on non-normalized tip resistance and the B_q parameter	See Figure 3a	1, 2, 5
SBT-Bqn	Normalized Soil Behavior type based on normalized tip resistance (Q_t, now called Q_{t1}) and the B_q parameter	See Figure 3b	2, 5
SBT-JandD	Soil Behavior Type as defined by Jeffries and Davies	See Figure 3c	7
SBT Qtn	Soil Behavior Type as defined by Robertson (2009) using a variable stress ratio exponent for normalization based on $I_{c\ (PKR\ 2009)}$	See Figure 4	15
Modified Non-normalized SBT Chart SBT (PKR2010)	This is a revised version of the simple 1986 non-normalized SBT chart (presented at CPT '10). The revised version has been reduced from 12 zones to 9 zones to be similar to the normalized Robertson charts. Other updates include a dimensionless tip resistance normalized to atmospheric pressure, q_t/P_a, on the vertical axis and a log scale for non-normalized friction ratio, R_f, along the horizontal axis.	See Figure 5	33
Modified SBTn (contractive /dilative)	Modified SBTn chart as defined by Robertson (2016) indicating zones of contractive/dilative behavior. Note that ConeTec displays the chart with colors different from Robertson. ConeTec's colors were chosen to avoid confusion with soil type descriptions.	See Figure 6	30
Unit Wt.	Unit Weight of soil determined from one of the following user selectable options: 1) uniform value 2) value assigned to each SBT zone 3) value assigned to each SBTn zone 4) value assigned to SBTn zone as determined from Robertson and Wride (1998) based on q_{c1n} 5) values assigned to SBT Qtn zones 6) values based on Robertson updated non-normalized Soil Behavior Type Chart (2010b) 6) Mayne f_s (sleeve friction) method 7) Robertson and Cabal 2010 method 8) user supplied unit weight profile The last option may co-exist with any of the other options.	See references	3, 5, 15, 21, 24, 29, 33

Calculated Parameter	Description	Equation	Ref
TStress σ_v	Total vertical overburden stress at Mid Layer Depth *A layer is defined as the averaging interval specified by the user where depths are reported at their respective mid-layer depth.* For data calculated at each point layers are defined using the recorded depth as the mid-point of the layer. Thus, a layer starts half-way between the previous depth and the current depth unless this is the first point in which case the layer start is at zero depth. The layer bottom is half-way from the current depth to the next depth unless it is the last data point. Defining layers affects how stresses are calculated since the unit weight attributed to a data point is used throughout the entire layer. This means that to calculate the stresses the total stress at the top and bottom of a layer are required. The stress at mid layer is determined by adding the incremental stress from the layer top to the mid-layer depth. The stress at the layer bottom becomes the stress at the top of the subsequent layer. Stresses are NOT calculated from mid-point to mid-point. For over-water work the total stress due to the column of water above the mid line is taken into account where appropriate.	$TStress = \sum_{i=1}^{n} \gamma_i h_i$ *where* γ_i is layer unit weight h_i is layer thickness 	CK*
EStress σ_v'	Effective vertical overburden stress at mid-layer depth.	$\sigma_v' = \sigma_v - u_{eq}$	CK*
Equil u u_{eq} or u_0	Equilibrium pore pressures are determined from one of the following user selectable options: 1) hydrostatic below the water table 2) user supplied profile 3) combination of those above When a user supplied profile is used/provided a linear interpolation is performed between equilibrium pore pressures defined at specific depths. If the profile values start below the water table then a linear transition from zero pressure at the water table to the first defined pointed is used. Equilibrium pore pressures may come from dissipation tests, adjacent piezometers or other sources. Occasionally, an extra equilibrium point ("assumed value") will be provided in the profile that does not come from a recorded value to smooth out any abrupt changes or to deal with material interfaces. These "assumed" values will be indicated on our plots and in tabular summaries.	For the hydrostatic option: $u_{eq} = \gamma_w \cdot (D - D_{wt})$ where u_{eq} is equilibrium pore pressure γ_w is the unit weight of water D is the current depth D_{wt} is the depth to the water table	CK*
K_0	Coefficient of earth pressure at rest, K_0.	$K_O = (1 - \sin\Phi') OCR^{\sin\Phi'}$	17
C_n	Overburden stress correction factor used for $(N_1)_{60}$ and older CPT parameters.	$C_n = (P_a/\sigma_v')^{0.5}$ where $0.0 < C_n < 2.0$ *(user adjustable, typically ranging from 1.7 to 2.0)* P_a *is atmospheric pressure (100 kPa)*	4, 12

Calculated Parameter	Description	Equation	Ref
C_q	Overburden stress normalizing factor.	$C_q = 1.8 / [0.8 + (\sigma_v'/P_a)]$ where *$0.0 < C_q < 2.0$ (user adjustable)* *P_a is atmospheric pressure (100 kPa)* *Robertson and Wride define C_q to be the same as C_n. The Olson definition above is used in the program.*	3, 12
N_{60}	SPT N value at 60% energy calculated from q_t/N ratios assigned to each SBT zone. This method has abrupt N value changes at zone boundaries.	*See Figure 1*	5
$(N_1)_{60}$	SPT N_{60} value corrected for overburden pressure.	*$(N_1)_{60} = C_n \bullet N_{60}$*	4
$N_{60}I_c$	SPT N_{60} values based on the I_c parameter, as defined by Robertson and Wride 1998 (3), or by Robertson 2009 (15).	$(q_t/P_a)/ N_{60} = 8.5 (1 – I_c/4.6)$ $(q_t/P_a)/ N_{60} = 10^{(1.1268 – 0.2817Ic)}$ P_a being atmospheric pressure	3, 5 15, 31
$(N_1)_{60}I_c$	SPT N_{60} value corrected for overburden pressure (using N_{60} I_c). User has 3 options.	*1) $(N_1)_{60}Ic = C_n \bullet (N_{60} I_c)$* 2) $q_{c1n}/ (N_1)_{60}I_c = 8.5 (1 – I_c/4.6)$ 3) $(Q_{tn})/ (N_1)_{60}I_c = 10^{(1.1268 – 0.2817Ic)}$	4 5 15, 31
S_u or S_u (N_{kt})	Undrained shear strength based on q_t S_u factor N_{kt} is user selectable.	$Su = \frac{qt - \sigma_v}{N_{kt}}$	1, 5
S_u or S_u (N_{du}) or S_u ($N_{\Delta u}$)	Undrained shear strength based on pore pressure S_u factor $N_{\Delta u}$ is user selectable.	$Su = \frac{u_2 - u_{eq}}{N_{\Delta u}}$	1, 5
D_r	Relative Density determined from one of the following user selectable options: 1) Ticino Sand 2) Hokksund Sand 3) Schmertmann (1978) 4) Jamiolkowski (1985) - All Sands 5) Jamiolkowski et al (2003) (various compressibilities, K_o)	See reference (methods 1 through 4) Jamiolkowski et al (2003) reference	5 14
PHI ϕ	Friction Angle determined from one of the following user selectable options (methods 1 through 4 are for sands and method 5 is for silts and clays): 1) Campanella and Robertson 2) Durgunoglu and Mitchel 3) Janbu 4) Kulhawy and Mayne 5) NTH method (clays and silts)	See appropriate reference	5 5 5 11 23
Delta U/q_t $\Delta u/q_t$ du/q_t	Differential pore pressure ratio (older parameter used before B_q was established)	$= \frac{\Delta u}{qt}$ *where:* $\Delta u = u - u_{eq}$ *and u = dynamic pore pressure* *u_{eq} = equilibrium pore pressure*	39

Calculated Parameter	Description	Equation	Ref
B_q	Pore pressure parameter	$Bq = \frac{\Delta u}{qt - \sigma_v}$ where: $\Delta u = u - u_{eq}$ *and u = dynamic pore pressure* *u_{eq} = equilibrium pore pressure*	1, 2, 5
Net q_t or qtNet	Net tip resistance (used in many subsequent correlations)	$qt - \sigma_v$	36
q_e or qE or q_E	Effective tip resistance (using the dynamic pore pressure u_2 and not equilibrium pore pressure)	$q_t - u_2$	36
qeNorm	Normalized effective tip resistance	$\frac{qt - u_2}{\sigma_v'}$	36
Q_t or Norm: Qt or Q_{t1}	Normalized q_t for Soil Behavior Type classification as defined by Robertson (1990) using a linear stress normalization. Note this is different from Q_{tn}. This parameter was renamed to Q_{t1} in Robertson, 2009. Without normalization limits this parameter calculates to very high unrealistic values at low stresses.	$Qt = \frac{qt - \sigma_v}{\sigma_v'}$	2, 5, 15
F_r or Norm: Fr	Normalized Friction Ratio for Soil Behavior Type classification as defined by Robertson (1990)	$Fr = 100\% \cdot \frac{fs}{qt - \sigma_v}$	2, 5
Q(1-B_q) Q(1-B_q) + 1	Q(1-B_q) grouping as suggested by Jefferies and Davies for their classification chart and the establishment of their I_c parameter. Later papers added the +1 term to the equation.	$Q \cdot (1 - Bq)$ $Q \cdot (1 - Bq) + 1$ *where Bq is defined as above and Q is the same as the normalized tip resistance, Q_{t1}, defined above*	6, 7, 34
q_{c1}	Normalized tip resistance, q_{c1}, using a fixed stress ratio exponent, n (this method has stress units)	$q_{c1} = q_t \cdot (Pa/\sigma_v')^{0.5}$ where: P_a = atmospheric pressure	21
q_{c1} (0.5)	Normalized tip resistance, q_{c1}, using a fixed stress ratio exponent, n (this method is unit-less)	$q_{c1}(0.5) = (q_t/P_a) \cdot (Pa/\sigma_v')^{0.5}$ where: P_a = atmospheric pressure	5
q_{c1} (C_n)	Normalized tip resistance, q_{c1}, based on C_n (this method has stress units)	$q_{c1}(Cn) = C_n * q_t$	5, 12
q_{c1} (C_q)	Normalized tip resistance, q_{c1}, based on C_q (this method has stress units)	$q_{c1}(Cq) = C_q * q_t$ (some papers use q_c)	5, 12
q_{c1n}	normalized tip resistance, q_{c1n}, using a variable stress ratio exponent, n (where n=0.0, 0.70, or 1.0) (this method is unit-less)	$q_{c1n} = (q_t / P_a)(P_a/\sigma_v')^n$ where: P_a = atm. Pressure and n varies as described below	3

Calculated Parameter	Description	Equation	Ref
I_c or Ic (RW1998)	Soil Behavior Type Index as defined by Robertson and Wride (1997, 1998) for estimating grain size characteristics and providing smooth gradational changes across the SBTn chart. Ic(RW1998) is different from that of Jefferies and Davies (7) and is different from Ic(PKR2009).	$I_c = [(3.47 - \log_{10}Q)^2 + (\log_{10} Fr + 1.22)^2]^{0.5}$ *Where:* $Q = \left(\frac{qt - \sigma_v}{P_a}\right)\left(\frac{P_a}{\sigma_v'}\right)^n$ *Or* $Q = q_{c1n} = \left(\frac{qt}{P_a}\right)\left(\frac{P_a}{\sigma_v'}\right)^n$ *depending on the iteration in determining I_c* *And Fr is in percent* *P_a = atmospheric pressure* *n has the following distinct values:* *0.5, 0.75 and 1.0* *and is determined in an iterative manner based on the resulting I_c in each iteration* *Note that NCEER replaced 0.75 with 0.70*	3, 4, 5 10
I_c (PKR 2009)	Soil Behavior Type Index, I_c (PKR 2009) is based on a variable stress ratio exponent n, which itself is based on I_c (PKR 2009). An iterative calculation is required to determine I_c (PKR 2009) and its corresponding n (PKR 2009).	*I_c (PKR 2009) =* *$[(3.47 - \log_{10}Q_{tn})^2 + (1.22 + \log_{10}F_r)^2]^{0.5}$*	15
n (PKR 2009)	Stress ratio exponent n, based on I_c (PKR 2009). An iterative calculation is required to determine n (PKR 2009) and its corresponding I_c (PKR 2009).	*n (PKR 2009) = 0.381 (I_c) + 0.05 (σ_v'/P_a) – 0.15*	15
Q_{tn} (PKR 2009)	Normalized tip resistance using a variable stress ratio exponent based on I_c (PKR 2009) and n (PKR 2009). An iterative calculation is required to determine Q_{tn} (PKR 2009).	*$Q_{tn} = [(qt - \sigma_v)/P_a](P_a/\sigma_v')^n$* *where P_a = atmospheric pressure (100 kPa)* *n = stress ratio exponent described above*	15
FC	Apparent fines content (%)	*$FC=1.75(Ic^{3.25}) - 3.7$* *$FC=100$ for $I_c > 3.5$* *$FC=0$ for $I_c < 1.26$* *FC = 5% if $1.64 < I_c < 2.6$ AND $F_r<0.5$*	3
I_c Zone	This parameter is the Soil Behavior Type zone based on the I_c parameter (valid for zones 2 through 7 on SBTn or SBT Qtn charts)	$I_c < 1.31$ Zone = 7 $1.31 < I_c < 2.05$ Zone = 6 $2.05 < I_c < 2.60$ Zone = 5 $2.60 < I_c < 2.95$ Zone = 4 $2.95 < I_c < 3.60$ Zone = 3 $I_c > 3.60$ Zone = 2	3
CD	The contractive / dilative boundary on Robertson's Modified SBTn (contractive/dilative) Chart shown in Figure 6 above. The boundary is marked as CD = 70 on the chart in the relevant paper. Similar to the $Q_{tn,cs}$ = 70 line in Figure 4.	$CD = 70 = (Q_{tn} - 11)(1 + 0.06F_r)^{17}$ lower bound of CD = 60: $CD = 60 = (Q_{tn} - 9.5)(1 + 0.06F_r)^{17}$	30

Calculated Parameter	Description	Equation	Ref
I_B	Hyberbolic fit defining the boundary between SBT soil types proposed by Schneider as a better fit than the I_c circles. I_B = 32 represents the boundary for most sand like soils. I_B = 22 represents the upper boundary for most clay like soils. The region between I_B=22 and I_B=32 is the "transitional soil" zone.	$I_B = 100\ (Q_{tn} + 10) / (70 + Q_{tn} F_r)$	30
State Param or State Parameter or ψ	The state parameter index, ψ, is defined as the difference between the current void ratio, e, and the critical void ratio, e_c. Positive ψ - contractive soil Negative ψ - dilative soil This is based on the work by Been and Jefferies (1985) and Plewes, Davies and Jefferies (1992) This method uses mean normal stresses based on a uniform value of K_0 or a calculated K_0 using methods described elsewhere in this document	See reference	6, 8
Yield Stress σ_p'	Yield stress is calculated using the following methods 1) General method 2) 1st order approximation using q_tNet (clays) 3) 1st order approximation using Δu_2 (clays) 4) 1st order approximation using q_e (clays) 5) Based on Vs	All stresses in kPa 1) $\sigma_p' = 0.33 \cdot (q_t - \sigma_v)^{m'} (\sigma_{atm}/100)^{1-m'}$ where $m' = 1 - \frac{0.28}{1 + (I_c / 2.65)^{25}}$ 2) $\sigma_p' = 0.33 \cdot (q_t - \sigma_v)$ 3) $\sigma_p' = 0.54 \cdot (\Delta u_2)$ $\Delta u_2 = u_2 - u_0$ 4) $\sigma_p' = 0.60 \cdot (q_t - u_2)$ 5) $\sigma_p' = (Vs/4.59)^{1.47}$	19 20 20 20 18
OCR OCR(JS1978) YSR(Mayne2014) YSR (qtNet) YSR (deltaU) YSR (qe) YSR (Vs) OCR (PKR2015)	Over Consolidation Ratio based on 1) Schmertmann (1978) method involving a plot plot of S_u/σ_v' /($S_u/\sigma_v')_{NC}$ and OCR  2) based on Yield stresses described above 3) approximate version based on qtNet 4) approximate version based on Δu 5) approximate version based on effective tip, q_e 6) approximate version based on shear wave velocity, V_s and σ_v' 7) based on Qt	1) requires a user defined value for NC Su/P_c' ratio 2 through 5) *based on yield stresses* 6) YSR (Vs) = $\sigma_p'(Vs) / \sigma_v'$ 7) OCR = $0.25 \cdot (Qt)^{1.25}$	9 19 20 20 20 18 32
Es/qt	Intermediate parameter for calculating Young's Modulus, E, in sands. It is the Y axis of the reference chart. Note that Figured 5.59 from reference 5, Lunne, Robertson and Powell, (LRP) has an error. The X axis values are too high by a factor of 10. The plot is based on Baldi's (not Bellotti as cited in	Based on Figure 5.59 in the reference	5, 37

Calculated Parameter	Description	Equation	Ref
	LRP) original Figure 3 where the X axis is: $\frac{q_c}{\sqrt{\sigma_v'}}$ (both in kPa) with a range of 200 to 3000. Figure 5.59 from LRP shows a dimensionless form of the equation, q_{c1}, displaying the same range of values. Figure 5.59's X axis uses $q_{c1} = \left(\frac{q_c}{P_a}\right)\left(\frac{P_a}{\sigma_v'}\right)^{0.5}$ The two expressions are not the same: they differ by a factor of $\frac{\sqrt{P_a}}{P_a}$. With P_a taken to be 100 kPa the factor is 1/10. Substituting typical values of 200 bar (20000 kPa) for q_c and 225 kPa for σ_v' one gets: 20000 / 15 = 1333.33 for Bellotti's axis and $(200/1)(100/225)^{0.5}$ = 200 * (10/15) = 133.3 for LRP's axis (noting that P_a = 1 bar) showing a factor of 10 difference.		
Es or E_s Young's Modulus E	Young's Modulus based on the work done in Italy. There are three types of sands considered in this technique. The user selects the appropriate type for the site from: a) OC Sands b) Aged NC Sands c) Recent NC Sands Each sand type has a family of curves that depend on mean normal stress. The program calculates mean normal stress and linearly interpolates between the two extremes provided in the E_s/q_t chart. E_s is evaluated for an axial strain of 0.1%.	Mean normal stress is evaluated from: $\sigma_m' = \frac{1}{3}(\sigma_v' + \sigma_h' + \sigma_h')$ where σ_v'= vertical effective stress σ_h'= horizontal effective stress *and* $\sigma_h = K_o \cdot \sigma_v'$ with K_o assumed to be 0.5	5
Delta U/TStress $\Delta u / \sigma_v$	Differential pore pressure ratio with respect to total stress	$= \frac{\Delta u}{\sigma_v}$ *where:* $\Delta u = u - u_{eq}$	39
Delta U/EStress, P Value, Excess Pore Pressure Ratio $\Delta u/\sigma_v'$	Differential pore pressure ratio with respect to effective stress. Key parameter (P, Normalized Pore Pressure Parameter, Excess Pore Pressure Ratio) in the Winckler et. al. static liquefaction method.	$= \frac{\Delta u}{\sigma_v'}$ *where:* $\Delta u = u - u_{eq}$	25, 25a
Su/EStress S_u/σ_v'	Undrained shear strength ratio with respect to vertical effective overburden stress using the S_u (N_{kt}) method	= *Su* (N_{kt}) / σ_v'	9, 23
Vs or V_s	Recorded shear wave velocities (not estimated). The shear wave velocities are typically collected over 1 m depth intervals. Each data point over the relevant depth range is assigned the same V_s value.	recorded data	27
Vp or V_p	Recorded compression wave (or P wave) velocities (not estimated). The P wave velocities are typically collected over 1 m depth intervals. Each data point over the relevant depth range is assigned the same V_p value.	recorded data	27

Calculated Parameter	Description	Equation	Ref
V_{s30} V_{s100}	The average shear wave velocity of the near surface materials to a depth of 30 m (100 ft). It is based on the sum of all travel times through all layers in the top 30m (100 ft). V_{s100} is the same calculation as V_{s30} except down to a depth of 100 feet.	$V_{s30} = \frac{total\ thickness\ of\ all\ layers\ to\ 30\ m}{\Sigma\left(\frac{layer\ thickness}{layer\ shear\ wave\ velocity}\right)}$ $V_{s30} = \frac{total\ thickness\ of\ all\ layers\ to\ 30\ m}{\Sigma\ (layer\ travel\ times)}$	38
G_{max}	G_{max} determined from SCPT shear wave velocities (not estimated values). Note that seismic data (V_s) is collected over set depth intervals (typically 1 meter). Each data point over the test segment is assigned the same V_s value. Since soil density changes with depth, slightly different G_{max} values may be calculated over the test depth interval.	$G_{max} = \rho V_s^2$ where ρ is the mass density of the soil determined from the estimated unit weights at each test depth	27
qtNet/G_{max}	Net tip resistance ratio with respect to the small strain modulus G_{max} determined from SCPT shear wave velocities (not estimated values)	$= (qt - \sigma_v) / G_{max}$ where $G_{max} = \rho V_s^2$ and ρ is the mass density of the soil determined from the estimated unit weights at each test depth	15, 28, 30
qUlt	A site specific and client specific parameter for estimating the limiting stress for "crane walk" accessibility	$q_{ult} = CraneWalkFactor \cdot S_u$ Where: *CraneWalkFactor* is client provided	U*
Estimated G_o	Estimated value for small strain shear modulus	$G_o = 0.0188[10^{(0.55Ic + 1,68)}](q_t - \sigma_v)$	15
Estimated E_{25}	Estimated value for Young's Modulus, E, at a 25% working load	$E_{25} = \alpha_E$ (qtNet) where $\alpha_E = 0.015[10^{(0.55Ic + 1,68)}]$	15
k_{SBT}	Estimated soil permeability derived from Soil Behavior Type (SBT) Chart I_c values.	For $1.0 < I_c \leq 3.27$: $k = 10^{(0.952 - 3.04Ic)}$ in m/s For $3.27 < Ic < 4.0$: $k = 10^{(-4.52 - 1.37Ic)}$ in m/s	35
M or D' Constrained Modulus	Constrained Modulus based on 1) Robertson, M 2) Mayne, D'	1) Robertson $M = \alpha_M (q_t - \sigma_v)$ $I_c > 2.2$ (fine grained) $\alpha_M = Qt$ when $Qt < 14$ $\alpha_M = 14$ when $Qt > 14$ $Ic < 2.2$ (coarse grained) $\alpha_M = 0.0188\ [10^{(0.55Ic + 1.68)}]$ $D' = \alpha_D (qt - \sigma_v)$ where $\alpha_D = 5$	32 23

Table 1b. CPT Parameter Calculation Methods – Liquefaction Parameters

Calculated Parameter	Description	Equation	Ref
K_{SPT} or K_s	Equivalent clean sand factor for $(N_1)60$	$K_{SPT} = 1 + ((0.75/30) \bullet (FC - 5))$	10
K_{CPT} or K_c (RW1998)	Equivalent clean sand correction for q_{c1N}	$K_{cpt} = 1.0$ for $I_c \leq 1.64$ $K_{cpt} = f(I_c)$ for $I_c > 1.64$ (see reference) $K_c = -0.403\ I_c^4 + 5.581\ I_c^3 - 21.63 I_c^2 + 33.75\ I_c - 17.88$	3, 10
K_c (PKR 2010)	Clean sand equivalent factor to be applied to Q_{tn}	$K_c = 1.0$ for $I_c \leq 1.64$ $K_c = -0.403\ I_c^4 + 5.581\ I_c^3 - 21.63 I_c^2 + 33.75\ I_c - 17.88$ for $I_c > 1.64$	16
$(N_1)_{60cs}I_C$	Clean sand equivalent SPT $(N_1)_{60}I_c$. User has 3 options.	1) $(N_1)_{60cs}Ic = \alpha + \beta((N_1)_{60}I_c)$ 2) $(N_1)_{60cs}Ic = K_{SPT} * ((N_1)_{60}I_c)$ 3) $(q_{c1ncs})/(N_1)_{60cs}I_c = 8.5\ (1 - I_c/4.6)$ FC ≤ 5%: $\alpha = 0,\ \beta = 1.0$ FC ≥ 35% $\alpha = 5.0,\ \beta = 1.2$ 5% < FC < 35% $\alpha = exp[1.76 - (190/FC^2)]$ $\beta = [0.99 + (FC^{1.5}/1000)]$	10 10 5
q_{c1ncs}	Clean sand equivalent q_{c1n}	$q_{c1ncs} = q_{c1n} \bullet K_{cpt}$	3
$Q_{tn,cs}$ (PKR 2010)	Clean sand equivalent for Q_{tn} described above - Q_{tn} being the normalized tip resistance based on a variable stress exponent as defined by Robertson (2009)	$Q_{tn,cs} = Q_{tn} \cdot K_c$ (PKR 2016)	16
Su(Liq)/ESv or $S_u(Liq)/\sigma_v'$	Liquefied shear strength ratio as defined by Olson and Stark	$\frac{S_u(Liq)}{\sigma_v'} = 0.03 + 0.0143(q_{c1})$ Note: σ_v' and s_v' are synonymous	13
Su(Liq)/ESv or $S_u(Liq)/\sigma_v'$ (PKR 2010)	Liquefied shear strength ratio as defined by Robertson (2010)	$\frac{S_u(Liq)}{\sigma_v'}$ Based on a function involving $Q_{tn,cs}$	16
S_u (Liq) (PKR 2010)	Liquefied shear strength derived from the liquefied shear strength ratio and effective overburden stress	$S_u(Liq) = \sigma_v' \cdot \left(\frac{S_u(Liq)}{\sigma_v'}\right)$	16
Cont/Dilat Tip	Contractive / Dilative q_{c1} Boundary based on $(N_1)_{60}$	$(\sigma_v')_{boundary} = 9.58 \times 10^{-4}\ [(N_1)_{60}]^{4.79}$ q_{c1} is calculated from specified q_t(MPa)/N ratio	13
CRR	Cyclic Resistance Ratio (for Magnitude 7.5)	$q_{c1ncs} < 50$: $CRR_{7.5} = 0.833\ [q_{c1ncs}/1000] + 0.05$ $50 \leq q_{c1ncs} < 160$: $CRR_{7.5} = 93\ [q_{c1ncs}/1000]^3 + 0.08$	10
Kg or K_g	Small strain Stiffness Ratio Factor, K_g	$[G_{max}/q_t]/[q_{c1n}{}^{-m}]$ m = empirical exponent, typically 0.75	26

Calculated Parameter	Description	Equation	Ref
K_g*	Revised K_g factor extended to fine grained soils (Robertson).	$K_g^* = (G_o / q_n)(Q_{tn})^{0.75}$ where q_n is the net tip resistance = $q_t - \sigma_v$	30
SP Distance	State Parameter Distance, Winckler static liquefaction method	Perpendicular distance on Q_{tn} chart from plotted point to state parameter Ψ = -0.05 curve	25
URS NP Fr	Normalized friction ratio point on Ψ = -0.05 curve used in SP distance calculation		25
URS NP Q_{tn}	Normalized tip resistance (Q_{tn}) point on Ψ = -0.05 curve used in SP Distance calculation		25

Table 2. References

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CONETEC

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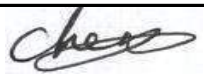
201-8327 Eastlake Drive, Burnaby, BC, Canada V5A4W2
Tel: 1-604-273-6013

CERTIFICATE OF CALIBRATION

Calibration Information			
Cone Serial Number	EC1065	Model	A15 T1500 F15 U35
Date	2024-01-17		
Technician Performing Calibration	Richard Chen	Signature	
Calibration Approved By	Vishrut Khunt	Signature	

Lab Condition	As Found	As Left		
Lab Temperature	N/A	24˚C		
Lab Humidity	N/A	19%	Reason for Calibration	new

Cone Information				
Tip Stress Limit	1500	bar	Tip End Area	15 cm²
Friction Stress Limit	15	bar	Friction Surface Area	225 cm²
Pressure Limit	35	bar	RTD Location	Pressure Carrier
X-Inclinometer Limit	30	degrees	Geophone	X and Z
Y-Inclinometer Limit	30	degrees	Temperature Range	-20°C to 60°C

Baseline Summary: (For Reference Only)

Channel	Units	As Found	As Left
Tip	bar	N/A	-0.245
Sleeve	bar	N/A	-0.055
Pressure	bar	N/A	0.992
X-Inclinometer	degrees	N/A	0.012
Y-Inclinometer	degrees	N/A	0.019
Temperature	˚C	N/A	22.538

Classified in accordance with ISO 22476-1:2012 Class 1
Classified in accordance with ISO 22476-1:2012 Class 2

Calibrated in general accordance with the ASTM D5778-20 and D7400-08 standards

Calibrated with Adara calibration procedure EC_CPTCAL-2.2

Collective uncertainty of the measurement standards conforms to a test uncertainty ratio (TUR) of 3:1 for tip and sleeve measurement and 4:1 for pressure measurement with a confidence level k=2

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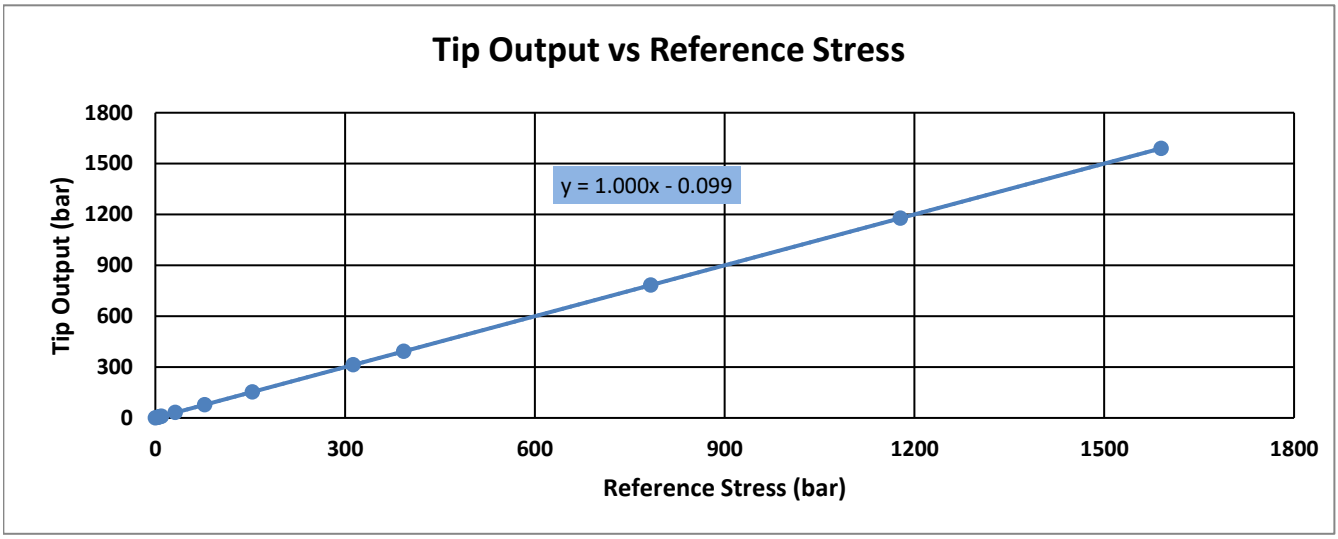
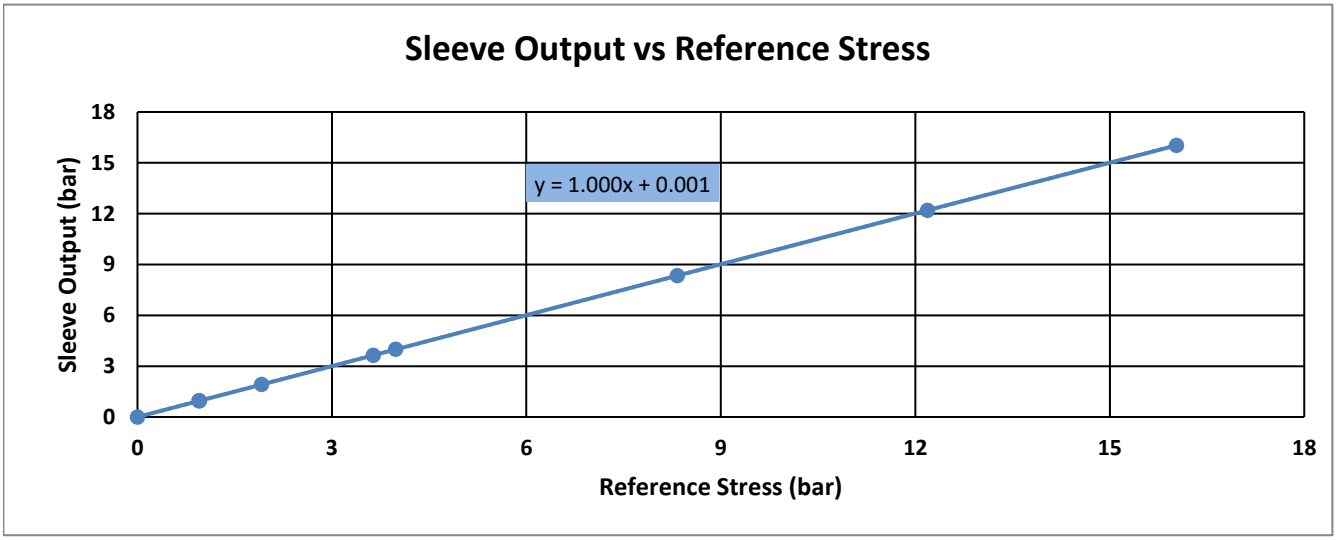
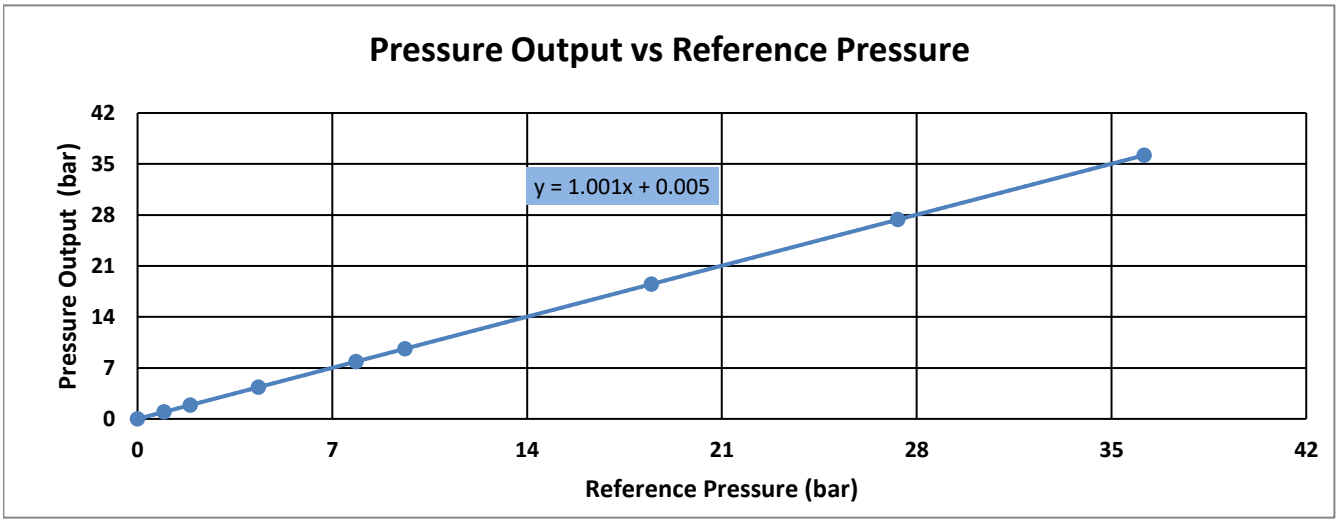
Cone Output vs Reference Stress/Pressure Plots







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Calibration Results

Tip Calibration					
As Found			As Left		
Max. Non Linearity	N/A	N/A	Max. Non Linearity	0.02%	PASS
Calibration Error	N/A	N/A	Calibration Error	0.11%	PASS

Sleeve Calibration					
As Found			As Left		
Max. Non Linearity	N/A	N/A	Max. Non Linearity	0.09%	PASS
Calibration Error	N/A	N/A	Calibration Error	0.16%	PASS

Pressure Calibration					
As Found			As Left		
Max. Non Linearity	N/A	N/A	Max. Non Linearity	0.10%	PASS
Calibration Error	N/A	N/A	Calibration Error	0.23%	PASS

X-Inclinometer Calibration					
As Found			As Left		
Max. Non Linearity	N/A	N/A	Max. Non Linearity	0.21%	PASS
Calibration Error	N/A	N/A	Calibration Error	-0.42%	PASS

Y-Inclinometer Calibration					
As Found			As Left		
Max. Non Linearity	N/A	N/A	Max. Non Linearity	0.04%	PASS
Calibration Error	N/A	N/A	Calibration Error	-0.08%	PASS

Seismic Calibration					
As Found			As Left		
Trigger Delay Error	N/A	N/A	Trigger Delay Error	0.01%	PASS

Temperature Calibration			
Full Scale Error	0.27%	PASS	

Channel	Cold	Room	Hot	Units
Ref_Temp	2.8	20.6	43.6	˚C
Tip	-2.954	-1.076	1.520	bar
Sleeve	-0.088	-0.068	-0.038	bar
Pressure	1.011	1.019	0.973	bar
Temperature	2.683	20.365	43.687	˚C

Tip Temperature Coefficient	0.110 bar/˚C	PASS
Sleeve Temperature Coefficient	0.001 bar/˚C	PASS
Pressure Temperature Coefficient	-0.001 bar/˚C	PASS

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Testing Equipment Details

Testing Machines	Model Number	Serial Number	Calibration Number	Due Date
Tip Load Cell	Precision	P-10289	100490	2025-09-18
Sleeve Load Cell	Precision	P-10868	100579	2025-10-01
Digital Loadcell Indicator	4215	62140	100490	2024-07-18
Fluke Reference Pressure Monitor	RPM4 A10Ms	3910	100835	2024-12-12
Tektronix Function Generator	AFG3021B	C030955	100751	2024-10-20
Thermometer	THS-222-555	D23255834	100410	2024-07-11
Thermometer	THS-222-555	D23255829	100410	2024-07-11
Thermometer	THS-222-555	D20345575	100565	2024-07-14

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Adara Error Definitions

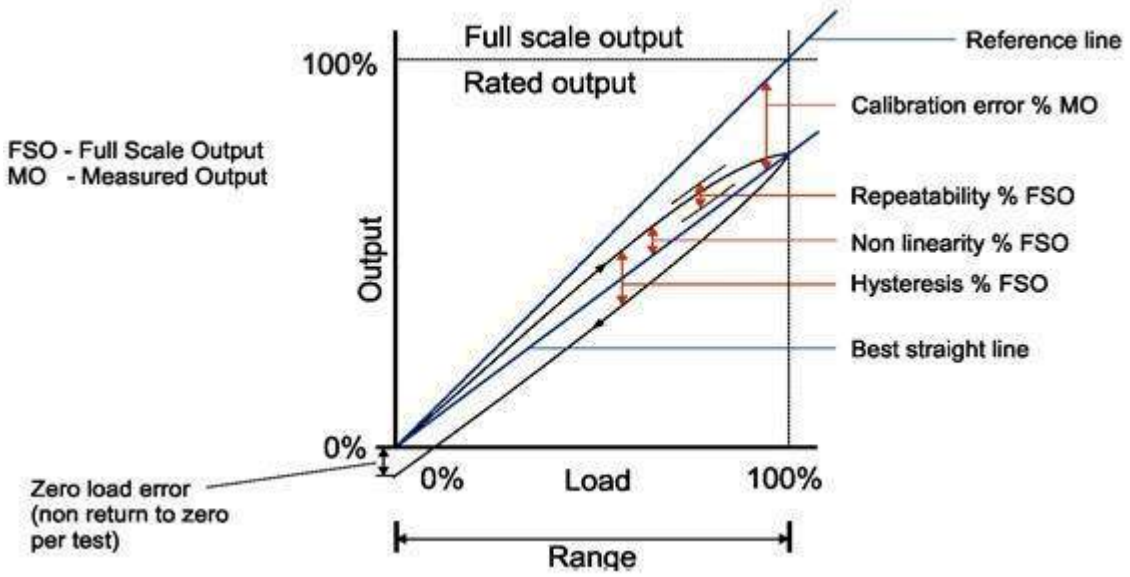

Figure 1: Definition of Calibration Terms for Load Cell and Transducers (Adapted from [1])

Actual Sensitivity	The slope of the best fit line through all data points starting at zero load.
Slope Error	The error in the best fit line compared to the ideal linear calibration in % . Slope Error = (Best Fit Slope - Ideal Slope) / Ideal Slope
Maximum Non Linearity	This value represents the maximum error (absolute value) relative to the best fit line considering each calibration point starting at loads greater than approximately 10% of FSO. The reported errors are a percent error of FSO. Adara's Pass/Fail criteria is 0.5% of FSO (ASTM is 0.5% of FSO at loads > 20% FSO).
Calibration Error	This value represents the maximum error (absolute value) in the recorded load value as compared to the actual load value for each calibration point for loads greater than approximately 10% of FSO. Adara's Pass/Fail criteria for the tip and sleeve is 0.5% of MO and 1.0% of MO for the pore pressure (ASTM for the tip and sleeve is 1.5% and 1.0% of MO respectively at loads greater than 20% of FSO)

Temperature Check Passing Criteria

Tip Temperature Coefficient	<0.200	bar/˚C
Sleeve Temperature Coefficient	<0.005	bar/˚C
Pressure Temperature Coefficient	<0.0196	bar/˚C

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ASTM D5778-20 Annex A Summary [1]

A1.4 Force Transducer Calibration Requirements

A1.4.1 states the following limits:

Non Linearity	Tip	≤ +0.5% of FSO
	Sleeve	≤ +1.0% of FSO
Calibration Error	Tip	≤ +1.5% of MO at loads > 20% FSO
	Sleeve	≤ +1.0% of MO at loads > 20% FSO

A1.5 Pressure Transducer Calibrations

A1.5.1 limits:

Non Linearity	Pore Pressure	≤ +1.0% of FSO
Calibration Error	Pore Pressure	not specified

ISO 22476 -1:2012 Summary [2]

Section 5.2 states the following allowable minimum accuracy

Class 1	Cone Resistance	35 kPa or 5%
	Sleeve Friction	5 kPa or 10%
	Pore Pressure	10 kPa or 2%
Class 2	Cone Resistance	100 kPa or 5%
	Sleeve Friction	15 kPa or 15%
	Pore Pressure	25 kPa or 3%

Note: ISO Compliance is based on low end calibration only.

References

[1] ASTM D5778-20. "Standard Test Method for Electronic Friction Cone and Piezocone Penetration Testing of Soils". ASTM, West Conshohocken, PA, USA.

[2] ISO 22476-1:2012. "Geotechnical investigation and testing - Field Testing - Part 1: Electrical cone and piezocone penetration test". ISO, Geneva, Switzerland.

ASTM D7400-08. "Standard Test Methods for Downhole Seismic Testing". ASTM, West Conshohocken, PA, USA.

APPENDIX B
Laboratory Test Results

APPENDIX B

Laboratory Testing

Soil samples obtained from the explorations were transported to Haley & Aldrich, Inc.'s laboratory and evaluated to confirm or modify field classifications, as well as to assess engineering properties of the soils encountered. Representative samples were selected for laboratory testing and transported to our geotechnical laboratory in Portland, Oregon. The tests were performed in general accordance with the test methods of ASTM International (ASTM) or other applicable procedures. One sample was submitted to CERCO Analytical, Inc. for corrosivity testing. A summary of the test results is included as Figure B-1.

Visual Classifications

Soil samples obtained from the explorations were visually classified in the field and in our geotechnical laboratory based on the Unified Soil Classification System and ASTM classification methods. ASTM Test Method D 2488 was used to classify soils using visual and manual methods. ASTM Test Method D 2487 was used to classify soils based on laboratory test results.

Laboratory Test Results

Moisture Content

Moisture contents of samples were obtained in general accordance with ASTM Test Method D 2216. The results of the moisture content tests completed on samples from the explorations are presented on the exploration logs included in Appendix A and on Figure B-1 in this appendix.

Atterberg Limits Testing

Atterberg limits (liquid limit, plastic limit, and plasticity index) of fine-grained soil samples were obtained in general accordance with ASTM Test Method D 4318. The results of the Atterberg Limits tests are presented on the exploration logs included in Appendix A, summarized on Figure B-1 in this appendix, and shown in detail on Figure B-2 in this appendix.

Particle Size Distribution

Sieve analysis tests were performed to determine the quantitative distribution of particle sizes in the sample. The tests were performed in general accordance with ASTM Test Method D 6913. The "percent fines" portions of the test results are indicated on the appropriate exploration logs included in Appendix A and on Figure B-1 in this appendix. The full test results are shown on Figure B-3 in this appendix.

Corrosivity Testing

One corrosivity test suite was performed on a sample collected from boring B-HH01. The test suites included testing for pH, redox, chloride, sulfate, and electrical resistivity. The results of the test are presented on the final sheet of this appendix.

Exploration	Sample ID	Depth	Water Content (%)	Dry Density (pcf)	Fines (%)	Sand (%)	Gravel (%)	Liquid Limit	Plastic Limit	Plasticity Index	Organic Content (%)	Pocket Pen (tsf)	Torvane (tsf)	
B-HH01	S-2	1.0	17.6											
B-HH01	S-3	2.5	23.5											
B-HH01	S-5	5.0	55.3					67	37	30				
B-HH01	S-8	15.0	66.4					65	37	28				
B-HH01	S-11	28.5	33.9		11	88	0							
B-HH01	S-12	30.0	63.0											
B-HH01	S-13	35.0	60.2		58	42	0							
B-HH01	S-14	40.0	44.1		27	73	0							
B-HH01	S-15	45.0	44.6		45	55	0							
B-HH01	S-16	50.0	51.5		56	43	0							
B-HH01	S-17	55.0	42.2											
B-HH01	S-18	60.0	52.7		57	43	0							
B-HH01	S-20	70.0	30.9		12	88	0							
B-HH01	S-21	75.0	38.2											
B-HH01	S-22	80.0	43.8		39	61	0							
B-HH01	S-24	90.0	55.7		83	17	0							
B-HH01	S-25	100.0	73.1											

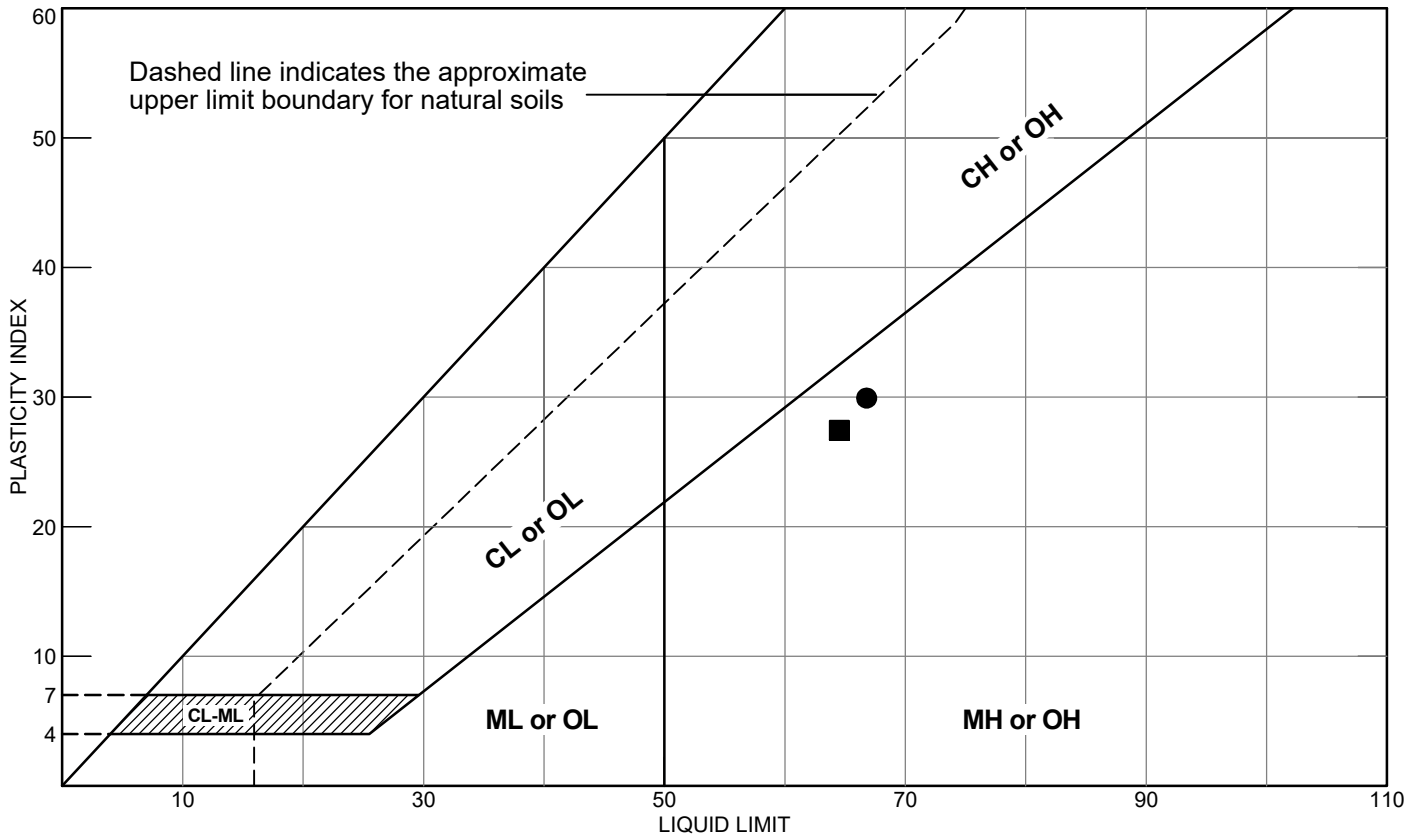
HALEY ALDRICH

Project: Aberdeen School District - Harbor Learning Center
Location: Aberdeen, Washington
Project No.: 0210365-000

Summary of Laboratory Results

Figure **B-1**
Sheet **1 of 1**

HA LAB SUMMARY (FOR REPORTS) - C:\USERS\TMERLIN\ONEDRIVE - HALEYALDRICH.COM\DESKTOP\HC_LIBRARY (GLB 8/28/24 09:39 - \\HALEYALDRICH.COM\SHARE\CF\PROJECTS\0210365\GINT\PERMANENT GINT FILE\0210365-000_ABERDEEN SCHOOL DISTRICT-HARBOR LEARNING CENTER_GINT.GPJ - tmerlin



Location and Description	LL	PL	PI	-#200	MC%	USCS
● **Source:** B-HH01 **Sample No.:** S-5 **Depth:** 5.0 to 6.5 ELASTIC SILT WITH GRAVEL	67	37	30	NT	55	MH
■ **Source:** B-HH01 **Sample No.:** S-8 **Depth:** 15.0 to 16.5 ELASTIC SILT WITH GRAVEL	65	37	28	NT	66	MH

Remarks:

●

■

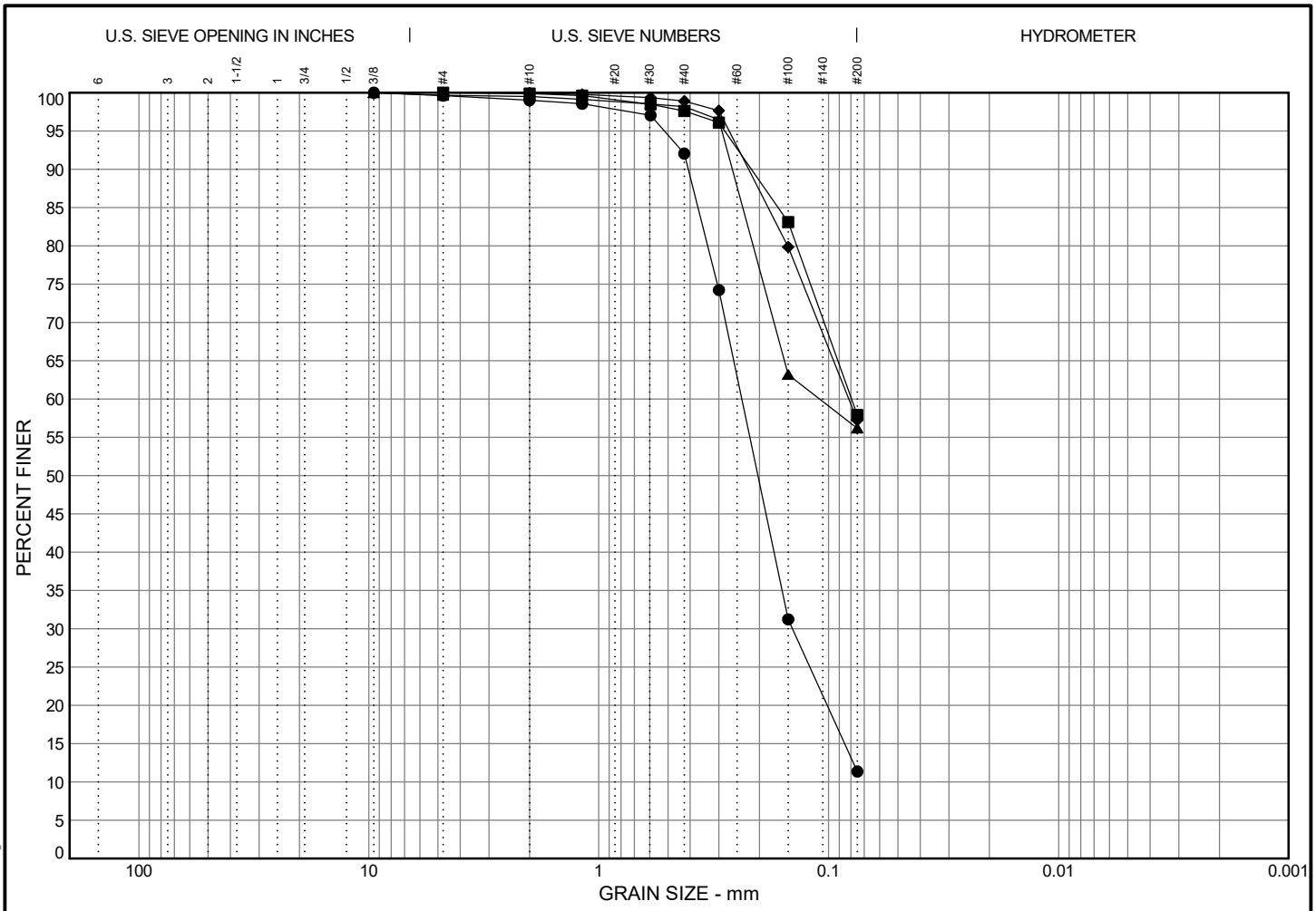
HALEY ALDRICH

Project: Aberdeen School District - Harbor Learning Center
Location: Aberdeen, Washington
Project No.: 0210365-000

Liquid Limit, Plastic Limit, and Plasticity Index

Figure **B-2**
Sheet **1 of 1**

HA ATTERBERG LIMITS C:\USERS\TIMERLIN\ONEDRIVE - HALEY ALDRICH.COM\DESKTOP\HC_LIBRARY GLB 4/29/24 09:39 - \\HALEYALDRICH.COM\SHARE\CITPROJECTS\0210365\GINT\PERMANENT GINT FILE\0210365-000_ABERDEEN SCHOOL DISTRICT-HARBOR LEARNING CENTER_GINT.GPJ - tmerlin



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Location and Description	% Cobbles	% Gravel	% Sand	% Silt	% Clay	MC%	USCS
● **Source:** B-HH01 **Sample No.:** S-11 **Depth:** 28.5 to 30.0 POORLY GRADED SAND WITH SILT	0.0	0.4	88.3	11.4		34	SP-SM
■ **Source:** B-HH01 **Sample No.:** S-13 **Depth:** 35.0 to 36.5 SANDY ELASTIC SILT	0.0	0.0	42.1	57.9		60	MH
▲ **Source:** B-HH01 **Sample No.:** S-16 **Depth:** 50.0 to 51.5 SANDY ELASTIC SILT	0.0	0.3	43.5	56.2		52	MH
◆ **Source:** B-HH01 **Sample No.:** S-18 **Depth:** 60.0 to 61.5 SANDY ELASTIC SILT	0.0	0.0	42.8	57.2		53	MH

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.370	0.239	0.203	0.144	0.085		1.21	3.33
■			0.166	0.079						
▲			0.236	0.109						
◆			0.183	0.082						

Remarks:

● ■ ▲ ◆

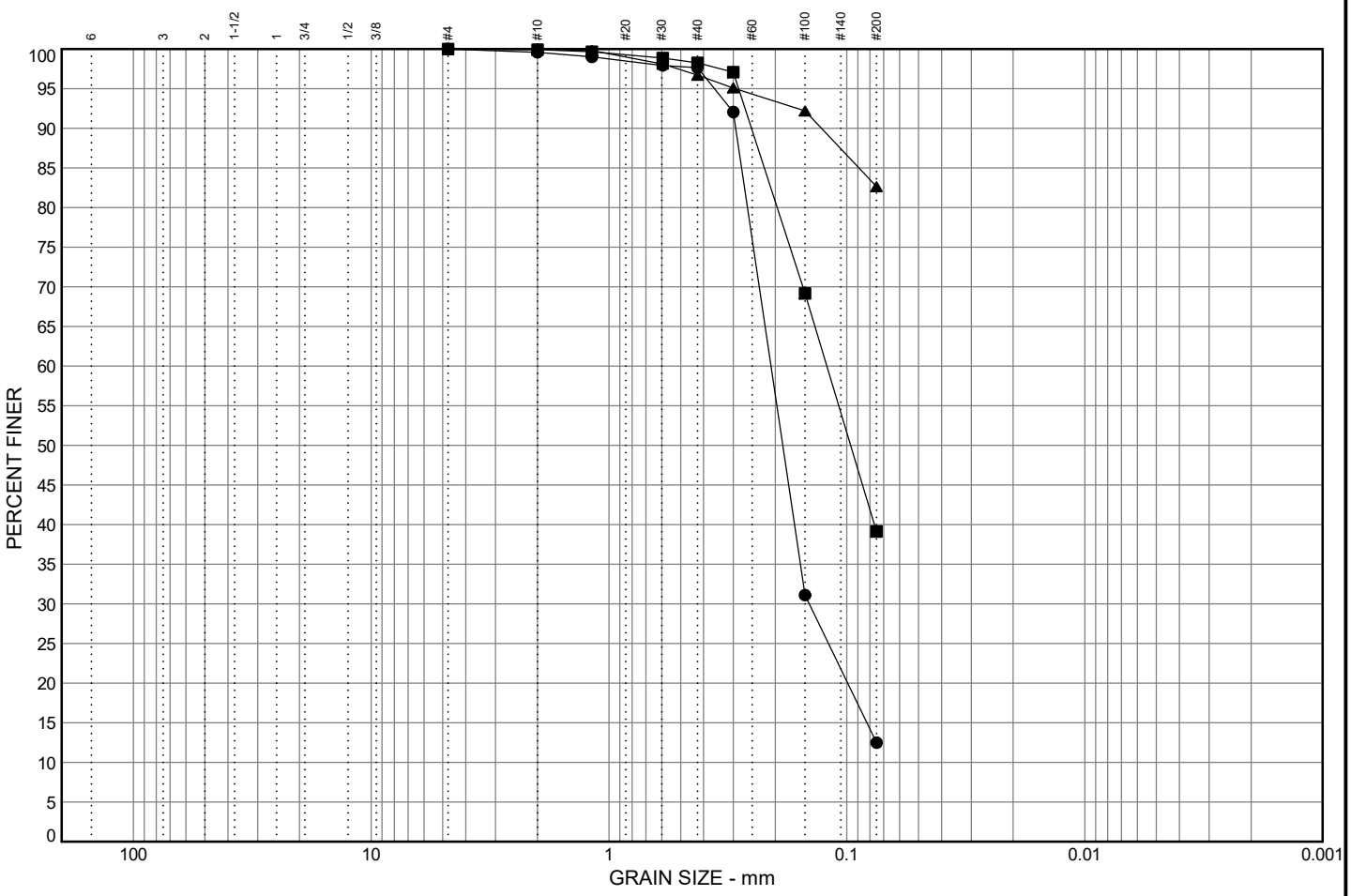
HALEY ALDRICH

Project: Aberdeen School District - Harbor Learning Center
Location: Aberdeen, Washington
Project No.: 0210365-000

Particle-Size Analysis

Figure **B-3**
Sheet **1 of 2**

HA GRAIN SIZE - C:\USERS\TMERLIN\ONEDRIVE - HALEY ALDRICH\DESKTOP\HC_LIBRARY.GLB - 5/29/24 09:37 - \\HALEY ALDRICH.COM\SHARED\PROJECTS\0210365\000_ABERDEEN SCHOOL DISTRICT\HARBOR LEARNING CENTER_GINT.GPJ - tmerlin



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Location and Description	% Cobbles	% Gravel	% Sand	% Silt	% Clay	MC%	USCS
● **Source:** B-HH01 **Sample No.:** S-20 **Depth:** 70.0 to 71.5 SILTY SAND	0.0	0.0	87.5	12.5		31	SM
■ **Source:** B-HH01 **Sample No.:** S-22 **Depth:** 80.0 to 81.5 SILTY SAND	0.0	0.0	60.9	39.1		44	SM
▲ **Source:** B-HH01 **Sample No.:** S-24 **Depth:** 90.0 to 91.5 ELASTIC SILT WITH SAND	0.0	0.0	17.4	82.6		56	MH

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.277	0.208	0.186	0.144	0.082		1.45	3.05
■			0.222	0.121	0.096					
▲			0.089							

Remarks:

●

■

▲

HALEY ALDRICH

Project: Aberdeen School District - Harbor Learning Center
Location: Aberdeen, Washington
Project No.: 0210365-000

Particle-Size Analysis

Figure **B-3**
Sheet **2 of 2**

HA GRAIN SIZE - C:\USERS\TMERLIN\ONEDRIVE - HALEY ALDRICH\DESKTOP\HC_LIBRARY GLB - 5/29/24 09:36 - \\HALEY ALDRICH.COM\SHARED\PROJECTS\0210365\000_ABERDEEN SCHOOL DISTRICT\HARBOR LEARNING CENTER_GINT.GPJ - tmerlin

CERCO analytical
1100 Willow Pass Court, Suite A
Concord, CA 94520-1006
925 462 2771 Fax. 925 462 2775
www.cercoanalytical.com

21 May, 2024

Job No. 2405048
Cust. No. 13349

Mr. Micah Hintz
Haley & Aldrich
6420 S. Macadam Ave., Suite 100
Portland, OR 97239

Subject: Project No.: 0210365
Project Name: Aberdeen School District
Corrosivity Analysis –ASTM Test Methods

Dear Mr. Hintz:

Pursuant to your request, CERCO Analytical has analyzed the soil samples submitted on May 16, 2024. Based on the analytical results, this brief corrosivity evaluation is enclosed for your consideration.

Based upon the resistivity measurements, Samples No. 002-004 are classified as "corrosive" and Sample No. 001 is classified as "moderately corrosive". All buried iron, steel, cast iron, ductile iron, galvanized steel and dielectric coated steel or iron should be properly protected against corrosion depending upon the critical nature of the structure. All buried metallic pressure piping such as ductile iron firewater pipelines should be protected against corrosion.

The chloride ion concentrations ranged from none detected to 140 mg/kg and are determined to be insufficient to attack steel embedded in a concrete mortar coating.

The sulfate ion concentrations ranged from 61 mg/kg to 300 mg/kg and are determined to be sufficient to potentially be detrimental to reinforced concrete structures and cement mortar-coated steel at these locations. Therefore, concrete that comes into contact with this soil should use sulfate resistant cement such as Type II, with a maximum water-to-cement ratio of 0.55.

The pH of the soils range from 4.90 to 6.37, which is considered to be corrosive to buried iron, steel, mortar-coated steel and reinforced concrete structures. Therefore, corrosion prevention measures need to be considered for structures to be placed in this acidic soil.

The redox potentials range from 35-mV to 200-mV. Sample No.004 is indicative of potentially "severely corrosive" soils, Samples No. 001 and No. 002 are indicative of potentially "moderately corrosive" soils and Sample No. 003 is indicative of potentially "slightly corrosive" soils resulting from anaerobic soil conditions.

This corrosivity evaluation is based on general corrosion engineering standards and is non-specific in nature. For specific long-term corrosion control design recommendations or consultation, please call *JDH Corrosion Consultants, Inc. at (925) 927-6630.*

We appreciate the opportunity of working with you on this project. If you have any questions, or if you require further information, please do not hesitate to contact us.

Very truly yours,
CERCO ANALYTICAL, INC.

J. Darby Howard, Jr., P.E.
President

JDH/jdl
Enclosure

CERCO analytical
1100 Willow Pass Court, Suite A
Concord, CA 94520-1006
925 462 2771 Fax. 925 462 2775
www.cercoanalytical.com

Client: Haley & Aldrich, Inc.
Client's Project No.: 0210365
Client's Project Name: Aberdeen School District
Date Sampled: 8-Apr-2024, 10-Apr-2024, 11-Apr-2024, & 15-Apr-2024
Date Received: 16-May-24
Matrix: Soil
Authorization: Signed Chain of Custody

Date of Report: 21-May-2024

Job/Sample No.	Sample I.D.	Redox (mV)	pH	Conductivity (umhos/cm)*	Resistivity (100% Saturation) (ohms-cm)	Sulfide (mg/kg)*	Chloride (mg/kg)*	Sulfate (mg/kg)*
2405048-001	0210365 B-1 @ 3.5'	160	4.91	-	3,300	-	N.D.	61
[redacted]								
[redacted]								
[redacted]								

Method:	ASTM D1498	ASTM D4972	ASTM D1125M	ASTM G57	ASTM D4658M	ASTM D4327	ASTM D4327
Reporting Limit:	-	-	10	-	50	15	15
Date Analyzed:	16-May-2024	17-May-2024	-	17-May-2024	-	17-May-2024	17-May-2024

* Results Reported on "As Received" Basis
N.D. - None Detected

Julia Clauson
Chemist

Quality Control Summary - **All laboratory quality control parameters were found to be within established limits**

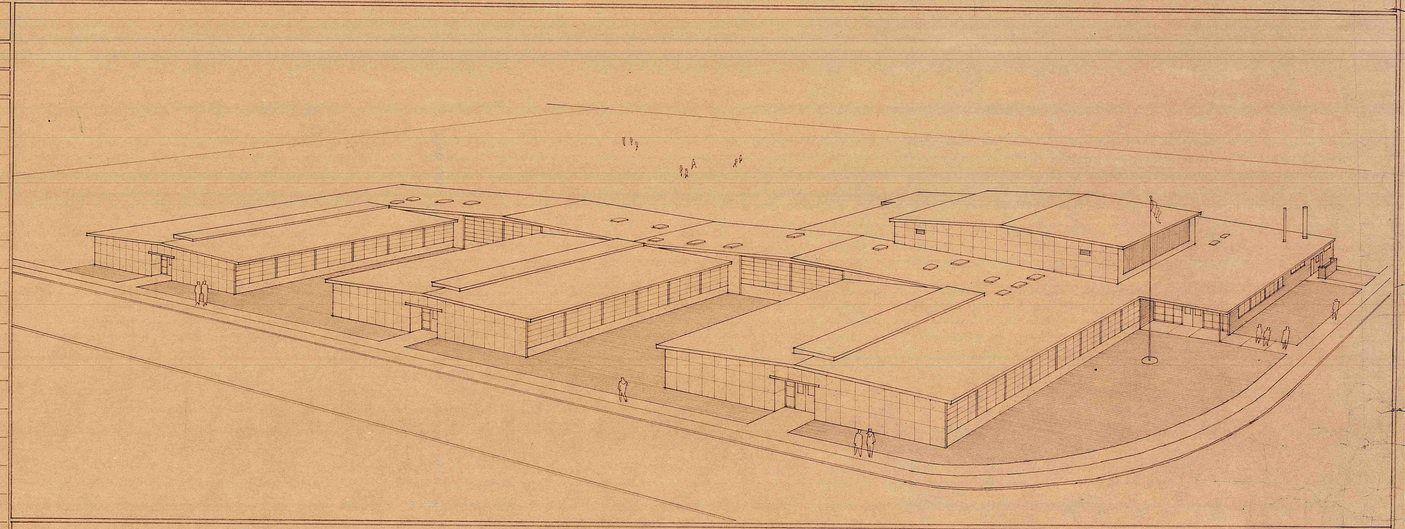
APPENDIX C
Historical Plans

WEST ABERDEEN JR. HIGH SCHOOL

FOR ABERDEEN SCHOOL DISTRICT Nº 5 . . . . . ABERDEEN, WASHINGTON

DRAWING INDEX

DWG. NO.	DWG. TITLE
	ARCHITECTURAL
1	PLOT PLAN & DETAILS
2	PART FLOOR PLAN
3	PART FLOOR PLAN
4	ELEVATIONS
5	PART ROOF & FRAMING PLAN
6	PART ROOF & FRAMING PLAN
7	BLD'G. SECTIONS & DETAILS
8	BLD'G SECTIONS & DETAILS
9	WALL SECTIONS & DETAILS
10	WALL SECTIONS & DETAILS
11	LIBRARY • TOILETS & CLASSROOM DETAILS
12	ADMINISTRATION AREA • PLAN & DETAILS
13	SHOP & SHOWER ROOM DETAILS
14	MUSIC ROOM & HOMEMAKING RM. DETAILS
15	ENTRANCE DETAILS
16	DOOR • SASH & FINISH SCHEDULES
17	PART FOUNDATION PLAN
18	PART FOUNDATION PLAN
19	STRUCTURAL WALL ELEVATIONS
20	STRUCTURAL SECTIONS & DETAILS
	MECHANICAL
M-1	PLOT PLAN
M-2	PART FOUNDATION PLAN
M-3	PART FOUNDATION PLAN
M-4	PART FLOOR PLAN
M-5	PART FLOOR PLAN
M-6	DETAILS
	ELECTRICAL
E-1	PLOT PLAN • RISER DIAGRAM • SYMBOL & FIXTURE LIST
E-2	PART FLOOR PLAN
E-3	PART FLOOR PLAN



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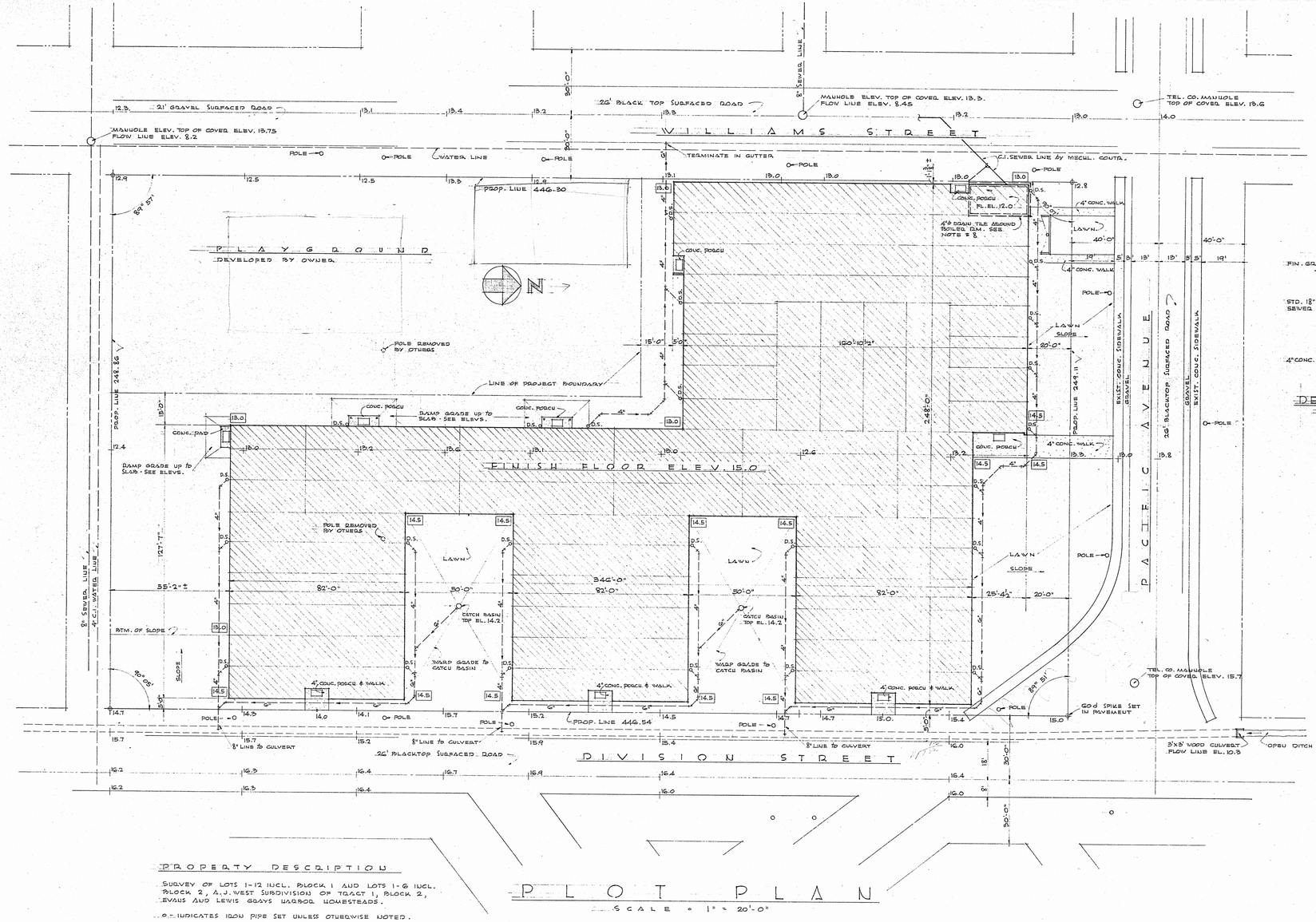
WALTER S. GORDON • ELECTRICAL ENGR'S
260 So. FIFTH STREET TACOMA, WASH. FU. 2544



PLOT PLAN

SCALE = 1" = 20'-0"

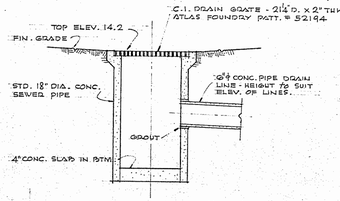
PROPERTY DESCRIPTION

SURVEY OF LOTS 1-12 INCL. BLOCK 1 AND LOTS 1-6 INCL. BLOCK 2, A.J. WEST SUBDIVISION OF TRACT 1, BLOCK 2, LEVAUS AND LEWIS GRAYS HARBOR HOMESTEADS.

⊙ INDICATES IRON PIPE SET UNLESS OTHERWISE NOTED.

GENERAL NOTES

1. ELEVATIONS SHOWN THUS 13.0 ARE EXISTING GRADES.
2. ELEVATIONS SHOWN THUS 15.0 ARE FINISHED GRADES.
3. SEE MECH'L. DRWGS. FOR LOCATIONS OF FUEL OIL & DIESEL OIL STORAGE TANKS.
4. DOWNSPOUTS NOT SHOWN CONNECTED TO DRAIN LINES SHALL TERMINATE AT GRADE IN A 90° ELL AND REST IN STANDARD TYPE CONCRETE SPLASH BLOCK.
5. GENERAL CONTRACTOR SHALL CONNECT ALL DOWNSPOUTS, (EXCEPT AS SHOWN) AND CATCH BASINS TO CLOSED JOINT CONCRETE SEWER PIPE LINE OF SIZE INDICATED. ALL DRAINAGE LINES SHALL BE PITCHED A MIN. OF ½" PER FOOT. TERMINATE IN EXIST. CULVERT OR STREET GUTTER AS SHOWN.
6. IN AREAS MARKED "LAWN" AND WITHIN PROJECT BOUNDARY, CONTRACTOR SHALL ROUGH GRADE TO FINISHED ELEVATIONS SHOWN. OWNER WILL FURNISH & INSTALL TOP SOIL AND LAWN.
7. CONTRACTOR SHALL REMOVE OR REPLACE EXIST. CONCRETE SIDEWALK DAMAGED DURING CONSTRUCTION.
8. GENL. CONTR. SHALL PROVIDE 4"ø OPEN JOINT CONC. DRAIN TILE AROUND BOILER ROOM AS SHOWN. CONNECT TO C.I. SEWER LINE AS SHOWN WITH 4"ø CLOSED JOINT TILE. MECH'L. CONTR. SHALL PROVIDE C.I. FITTING FOR CONNECTION.
9. EXTENT OF PROJECT BOUNDARY SHALL BE SIDEWALK AT NORTH SIDE, PROPERTY LINES AT EAST, WEST & SOUTH SIDES, AND AS MARKED AT PLAYFIELD.



C.I. DRAIN GRATE - 21¼" D. x 2" THK. ATLAS FOUNDRY PATT. # 52184

DET. OF CATCH BASIN

SCALE = ¾" = 1'-0"

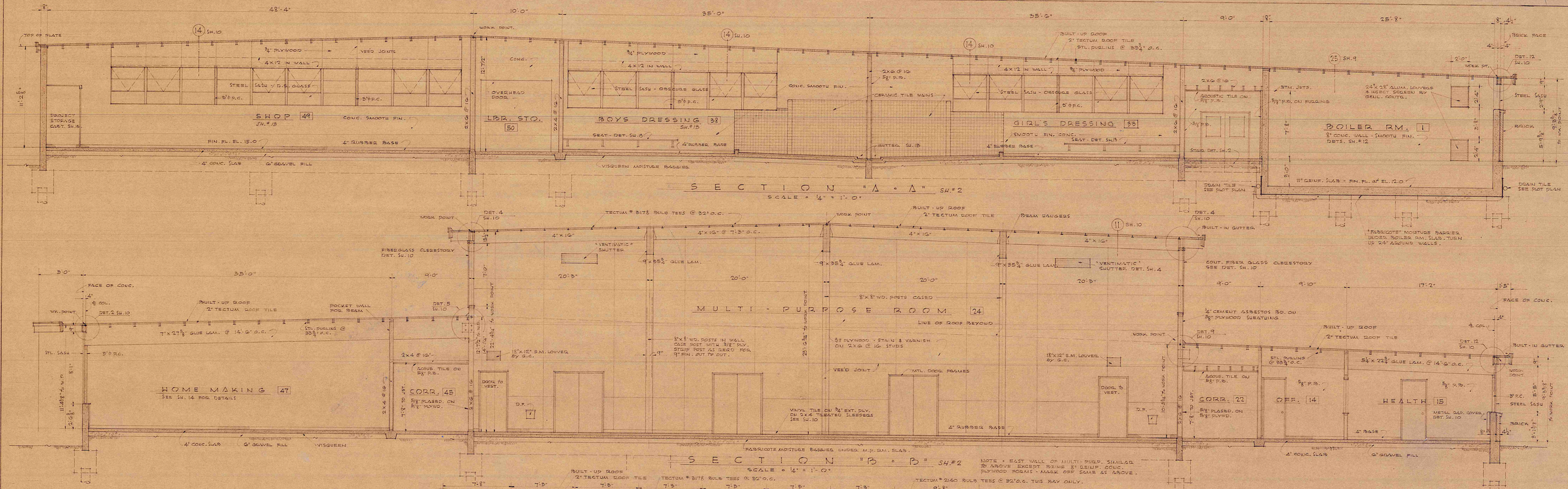
THE CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS ON THE JOB BEFORE PROCEEDING WITH THIS WORK.

PLOT PLAN & DETS.

WEST ABERDEEN JR. HIGH SCHOOL

FOR ABERDEEN SCHOOL DIST. # 5 ABERDEEN WASHINGTON

SHEET		DATE
1 OF 20	JENSEN & MILLS ARCHITECTS, 302 So. Tacoma Ave. Tacoma, Wash.	OCT. 56
		JOB NO. 5540



BLDG. SECTIONS & DETS.

WEST ABERDEEN JR. HIGH SCHOOL

FOR ABERDEEN SCHOOL DIST. #5
ABERDEEN, WASHINGTON

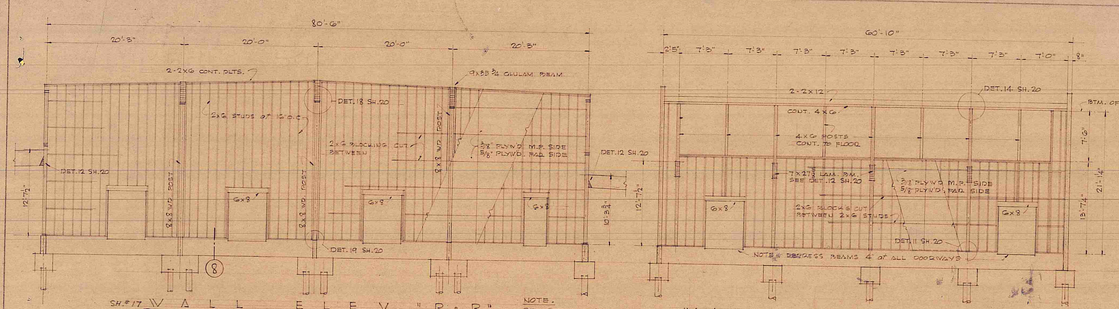
THE CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS ON THE JOB BEFORE PROCEEDING WITH THIS WORK.

JENSEN & MILLS ARCHITECTS
808 So. Tacoma Ave., Tacoma, Wash.

SHEET 7 OF 23

DATE OCT. 55

JOB No. 5540



SH.#17 WALL ELEV. "P-P"

SCALE = 1/4" = 1'-0"

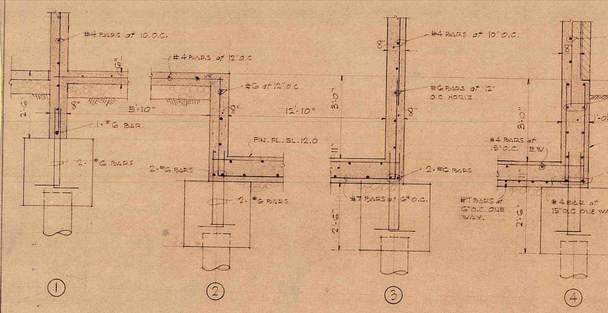
WEST WALL SHOWN - SEE ELEV.'S "B-B" FOR EAST WALL of CONC.

NOTE:
SEE SPECS. FOR PLYWOOD NAILING SCHEDULE.

WALL ELEV. "R-R" SH.#17

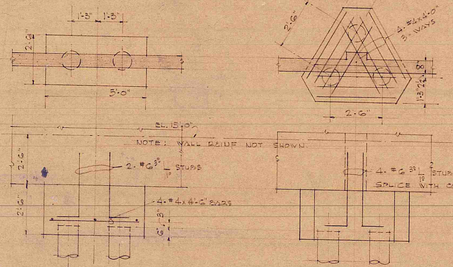
SCALE = 1/4" = 1'-0"

SOUTH WALL SHOWN - NORTH WALL SIML. TO OPP. HAND



FOUNDATION WALL DETAILS

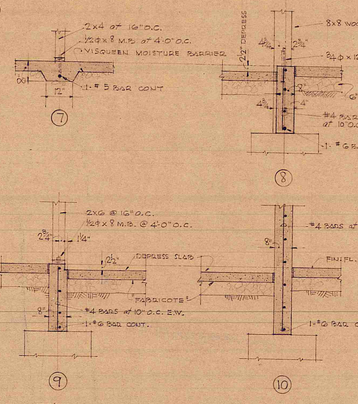
SCALE 1/2"=1'-0"

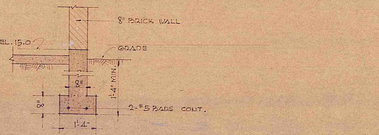


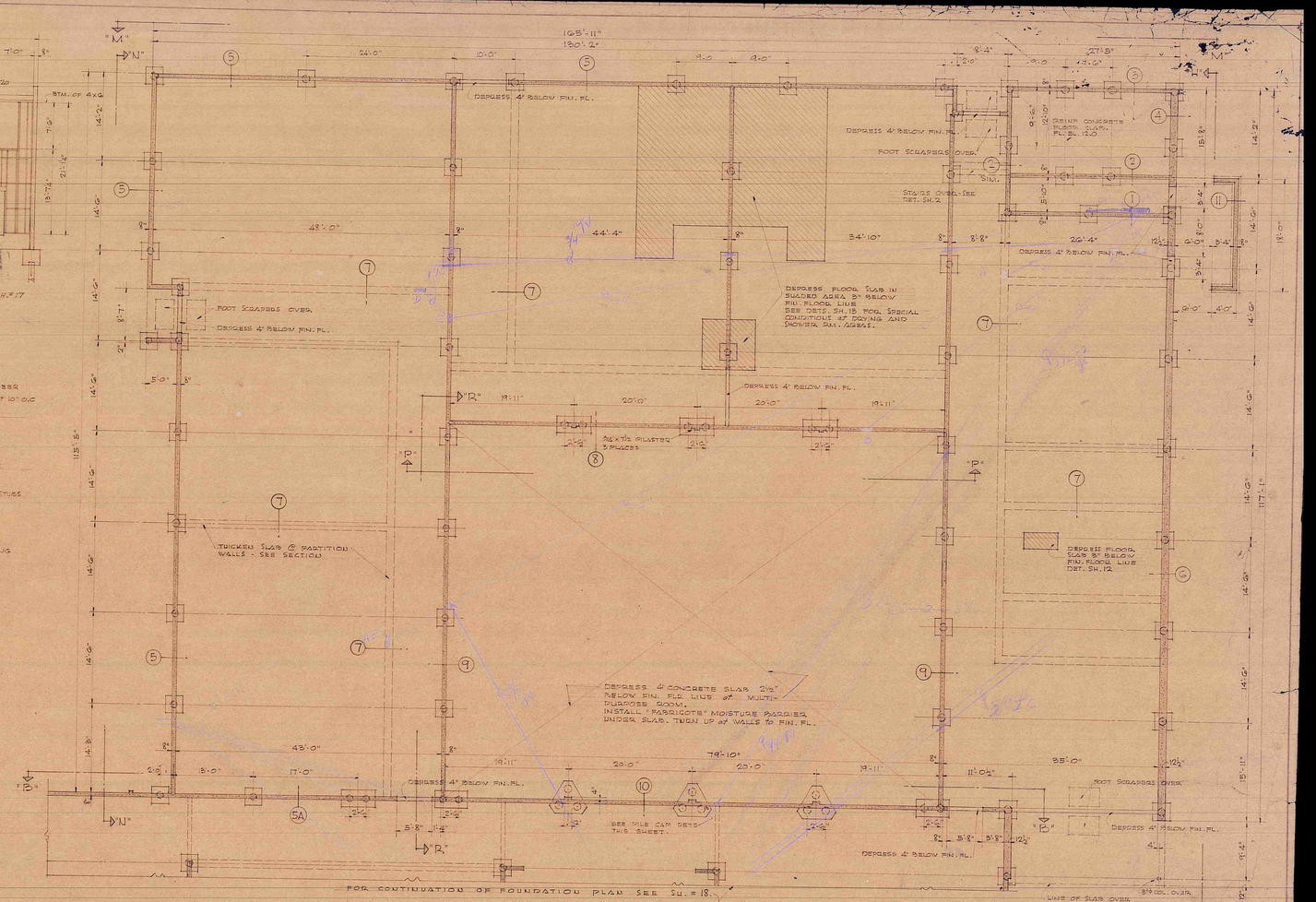
2 PILES 3 PILES

TYPICAL PILE CAP DETAILS

SCALE 3/8"=1'-0"







PARTIAL FOUNDATION PLAN

SCALE = 1/8" = 1'-0"

FOR CONTINUATION OF FOUNDATION PLAN SEE SH. # 18.

PART FOUNDATION PLAN

WEST ABERDEEN JR. HIGH SCHOOL

FOR ABERDEEN SCHOOL DIST. # 5 ABERDEEN WASHINGTON

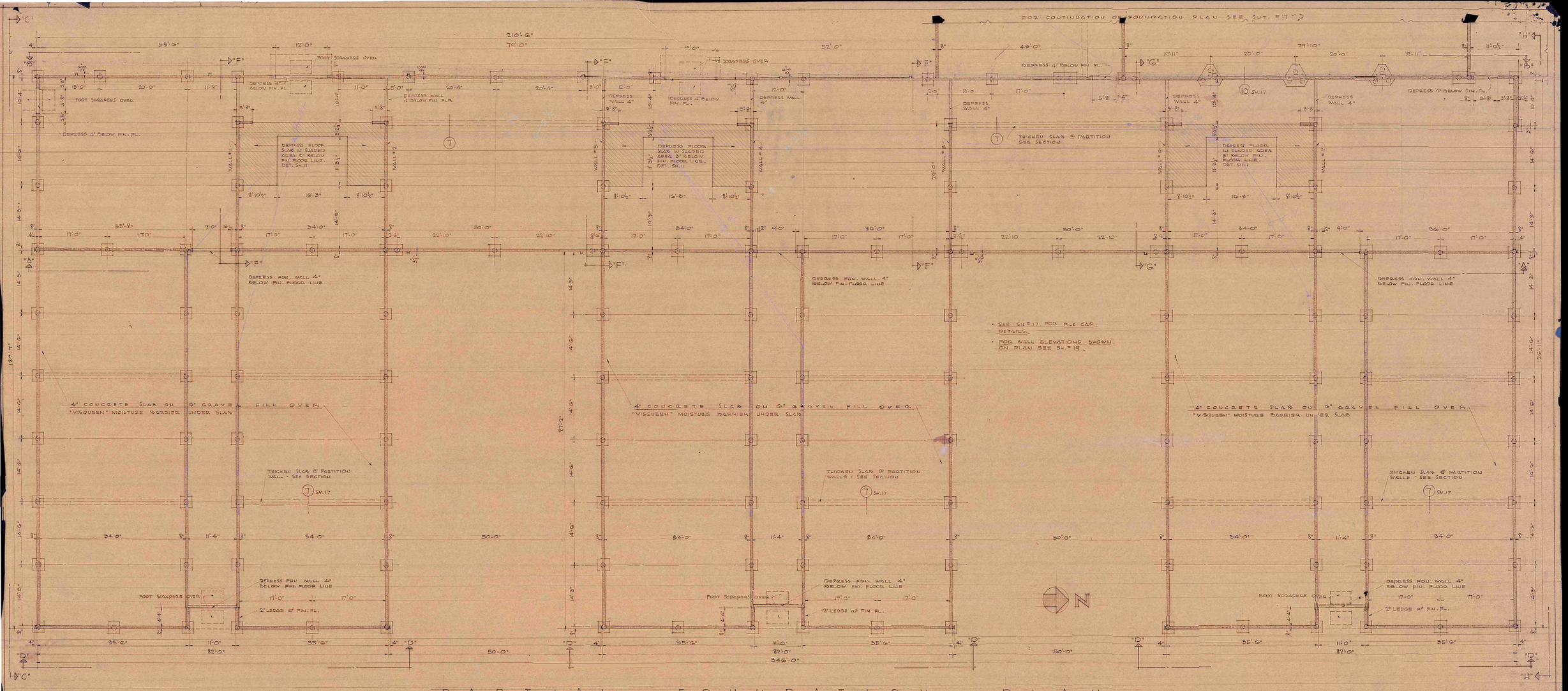
SHEET 17 OF 20

JENSEN & MILLS ARCHITECTS 808 So. Broadway Ave., Tacoma, Wash.

DATE OCT. 52

JOB No. 5540

THE CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS ON THE JOB BEFORE PROCEEDING WITH THIS WORK



PARTIAL FOUNDATION PLAN

SCALE = 1/8" = 1'-0"

PART FOUNDATION PLAN

WEST ABERDEEN JR. HIGH SCHOOL

FOR ABERDEEN SCHOOL DIST. #5
ABERDEEN WASHINGTON

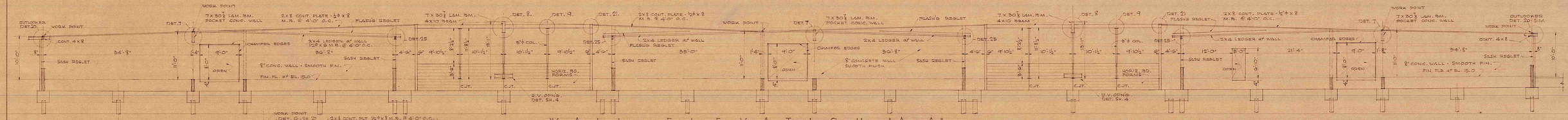
SHEET 18 OF 22

JENSEN & MILLS ARCHITECTS
308 So. Tacoma Ave. - Tacoma, Wash.

DATE OCT. 56

JOB No. 5540

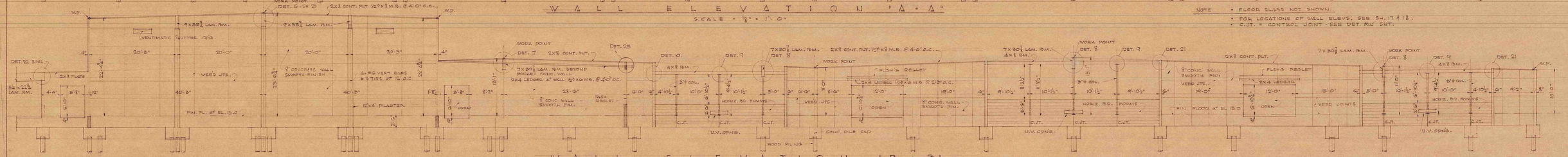
THE CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS ON THE JOB BEFORE PROCEEDING WITH THIS WORK.



WALL ELEVATION "A-A"

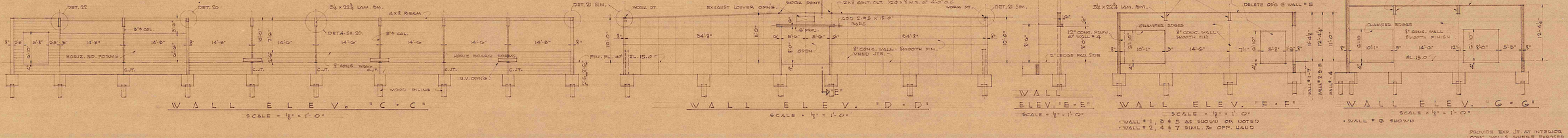
SCALE = ⅛" = 1'-0"

NOTE
- FLOOR SLABS NOT SHOWN.
- FOR LOCATIONS OF WALL ELEVS. SEE SH. 17 & 18.
- C.J.T. = CONTROL JOINT - SEE DET. 7/15 SHT.



WALL-L ELEVATION "B-B"

SCALE = ⅛" = 1'-0"



WALL ELEV. "C-C"

SCALE = ⅛" = 1'-0"

WALL ELEV. "D-D"

SCALE = ⅛" = 1'-0"

WALL ELEV. "E-E"

SCALE = ⅛" = 1'-0"

WALL ELEV. "F-F"

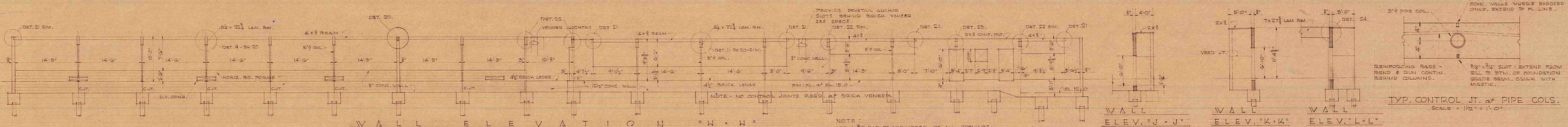
SCALE = ⅛" = 1'-0"

- WALL # 1, 3 & 5 AS SHOWN OR NOTED
- WALL # 2, 4 & 7 SIML. to OPP. WALL

WALL ELEV. "G-G"

SCALE = ⅛" = 1'-0"

- WALL # 6 SHOWN



WALL ELEVATION "H-H"

SCALE = ⅛" = 1'-0"

PILE CUTOFF at ELEVATION 10'-6"

NOTE:
- ADD 1-#5 BAR TO PERIMETER OF ALL OPENINGS.
- ADD 1-#5 x 4'-0 AT ALL VERTICAL CORNERS.
- PROVIDE #4 BAR "L" THRU AT ALL HORIZONTAL CORNERS @ 10" O.C.

WALL ELEV. "J-J"

SCALE = ⅛" = 1'-0"

WALL ELEV. "K-K"

WALL ELEV. "L-L"

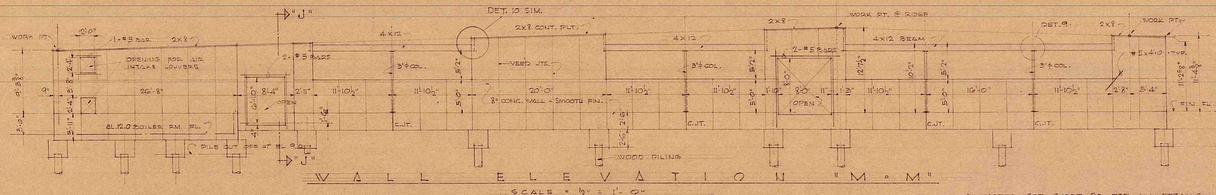
TYP. CONTROL JT. at PIPE COLS.

SCALE = 1½" = 1'-0"



DET. OF VEE - JOINT

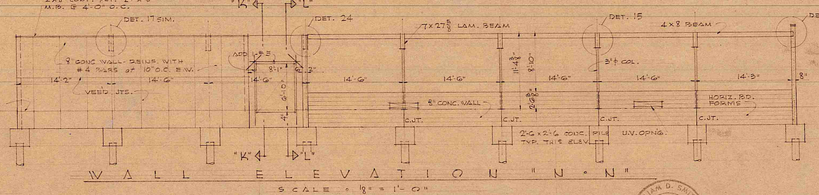
SCALE = 3" = 1'-0"



WALL ELEVATION "M-M"

SCALE = ⅛" = 1'-0"

NOTE: SEE SHEET 20 FOR ALL DETAILS



WALL ELEVATION "N-N"

SCALE = ⅛" = 1'-0"

STRUCTL WALL ELEVS.

WEST ABERDEEN JR. HIGH SCHOOL

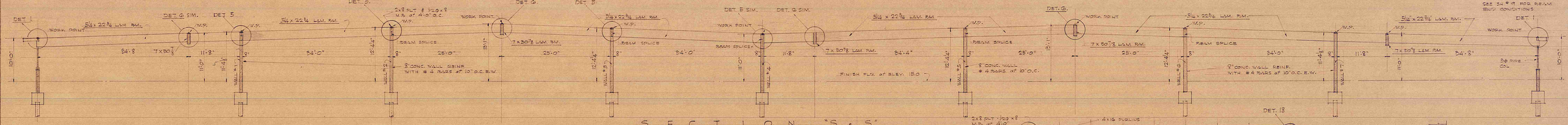
FOR ABERDEEN SCHOOL DIST. # 5
ABERDEEN WASHINGTON

SHEET 19 OF 20

JENSEN & MILLS ARCHITECTS
308 So. Tacoma Ave. - Tacoma, Wash.

DATE OCT. 52
JOB NO. 554C

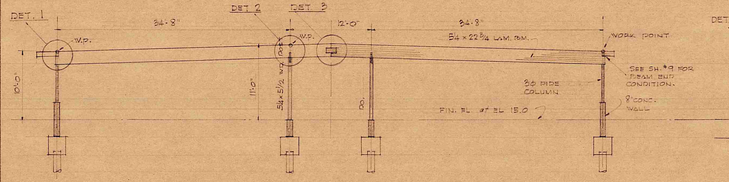
THE CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS ON THE JOB BEFORE PROCEEDING WITH THIS WORK.



S E C T I O N "S . S"

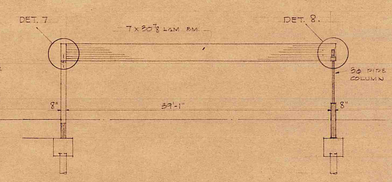
SEE SHEET 6 FOR LOCATION

SCALE ⅛" = 1'-0"



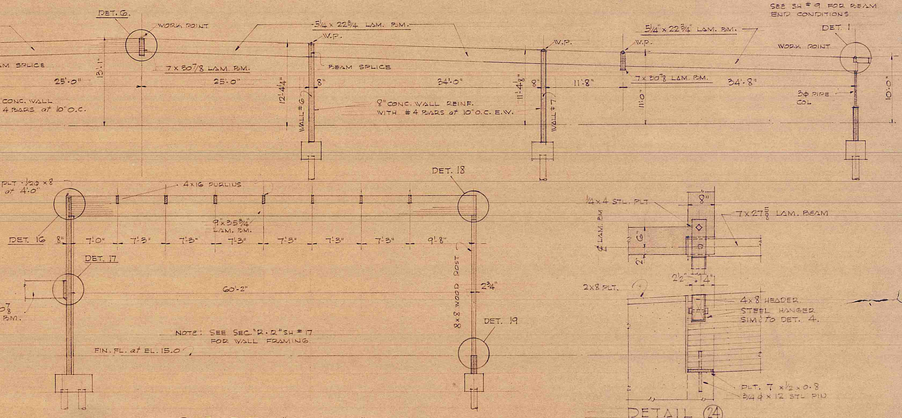
S E C T I O N "T . T" SH. 6

SCALE ⅛" = 1'-0"



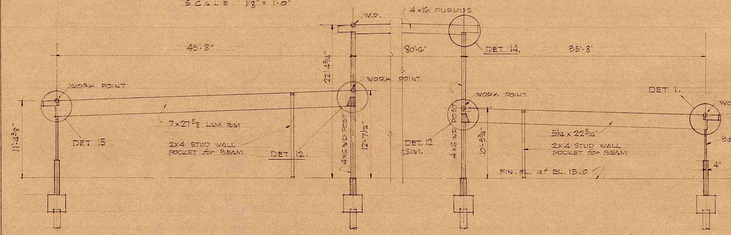
S E C T . "U . U" SH. 6

SCALE ⅛" = 1'-0"



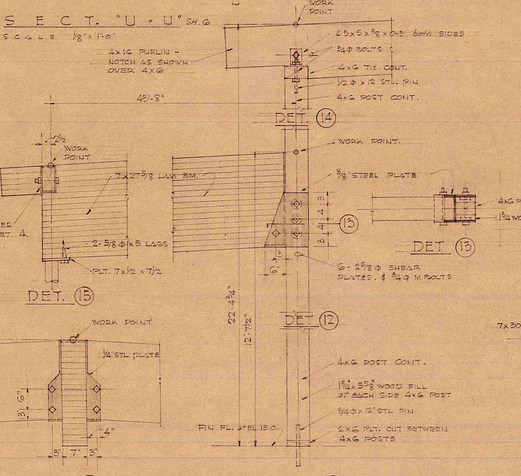
S E C T "V . V" SH. 5

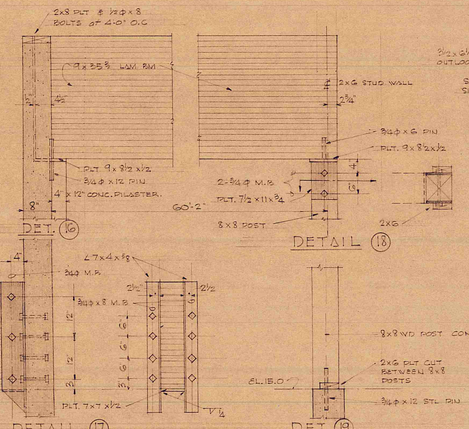
SCALE ⅛" = 1'-0"

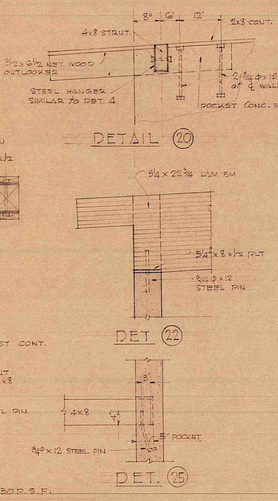


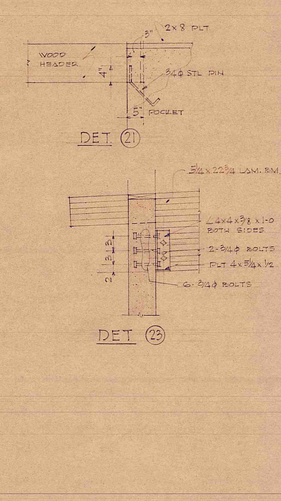
S E C T I O N "W . W" SH. 5

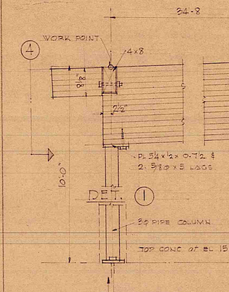
SCALE ⅛" = 1'-0"

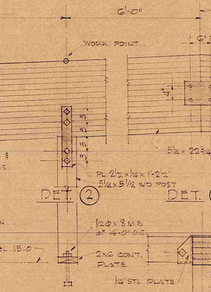




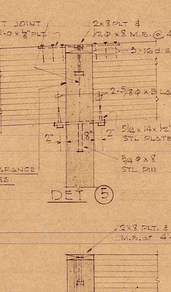


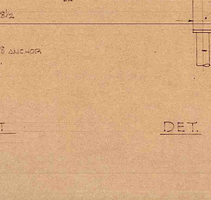


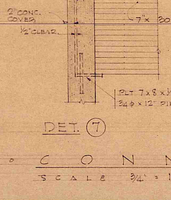


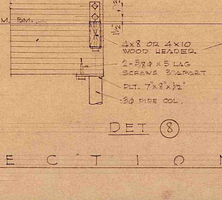


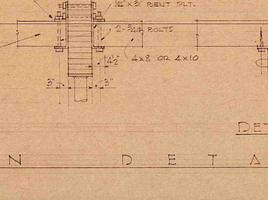


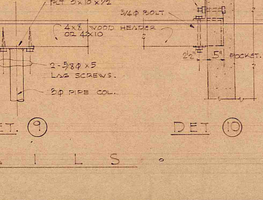












C O N N E C T I O N D E T A I L S

SCALE ¾" = 1'-0"

G E N E R A L N O T E S

1. ENGINEERING DESIGN DATA: ROOF LIVE LOAD = 20 P.S.F.
   SEISMIC ZONE 2.
   CONCRETE = 2500 P.S.I. @ 28 DAYS.
   REINF. STEEL = INTERMEDIATE GRADE DEFORMED BARS - ASTM DESIGNATION A-305.
2. WOOD PILING SHALL BE UNTREATED DOUGLAS FIR PILING - SIZE AS SPECIFIED.
3. ALL PILING SHALL BE DRIVEN TO A BEARING CAPACITY OF 15 TONS.
4. ALL WOOD SURFACES IN CONTACT WITH CONCRETE (EXCEPT PILING) SHALL BE PRESERVATIVE TREATED AS SPECIFIED.
5. PROVIDE 4" SAND-GRAVEL FILL & 2" WASHED GRAVEL FILL UNDER ALL CONCRETE SLABS.
6. PROVIDE "VISQUEEN" MOISTURE BARRIER UNDER ALL CONCRETE SLABS, EXCEPT AT MULTI-PURP. RM., & SCALES RM. USE "BARRICOTE", TURN UP 4" AT WALLS OR AS NOTED ON DWGS. SEE DETS.
7. SHEAR PLATES SHALL BE 2½ TECO MALLEABLE IRON PLATES.
8. GLUED LAMINATED BEAMS SHALL CONFORM TO W.C.L.A. SPECIFICATIONS STRESS COMBINATION 14 - ARCHITECTURAL APPEARANCE GRADE. SEE SPECS.

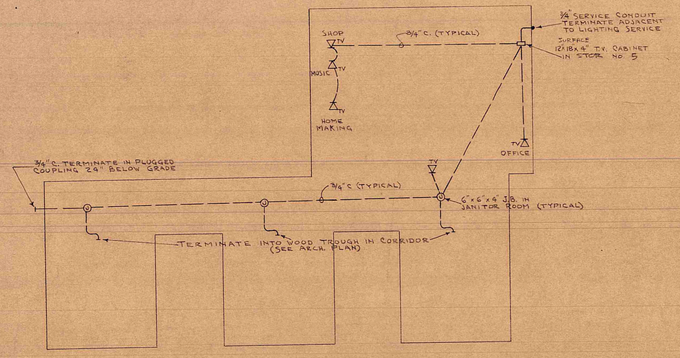
STRUCTURAL SECTIONS & DETAILS.

WEST ABERDEEN JR. HIGH SCHOOL
FOR ABERDEEN SCHOOL DIST #5
ABERDEEN WASHINGTON

JENSEN & MILLS ARCHITECTS
809 So. Tacoma Ave. - Tacoma, Wash.

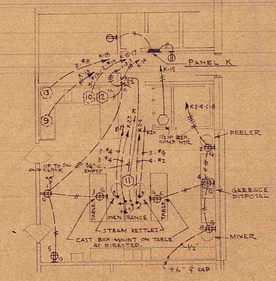
SHEET 20 OF 20 | DATE OCT. 56 | JOB NO. 5540

THE CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS ON THE JOB BEFORE PROCEEDING WITH THIS WORK.

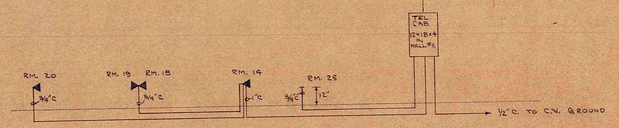


CONDUIT PLAN FOR FUTURE TELEVISION ANTENNA LEADS
SCALE 1" = 40'

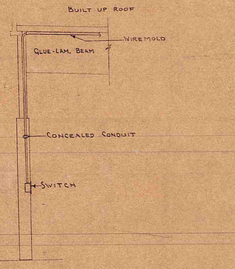
NOTE
SEE 1/8" SCALE PLANS FOR EXACT LOCATION OF OUTLETS



KITCHEN EQUIPMENT PLAN
SCALE 1/8"=1'-0"



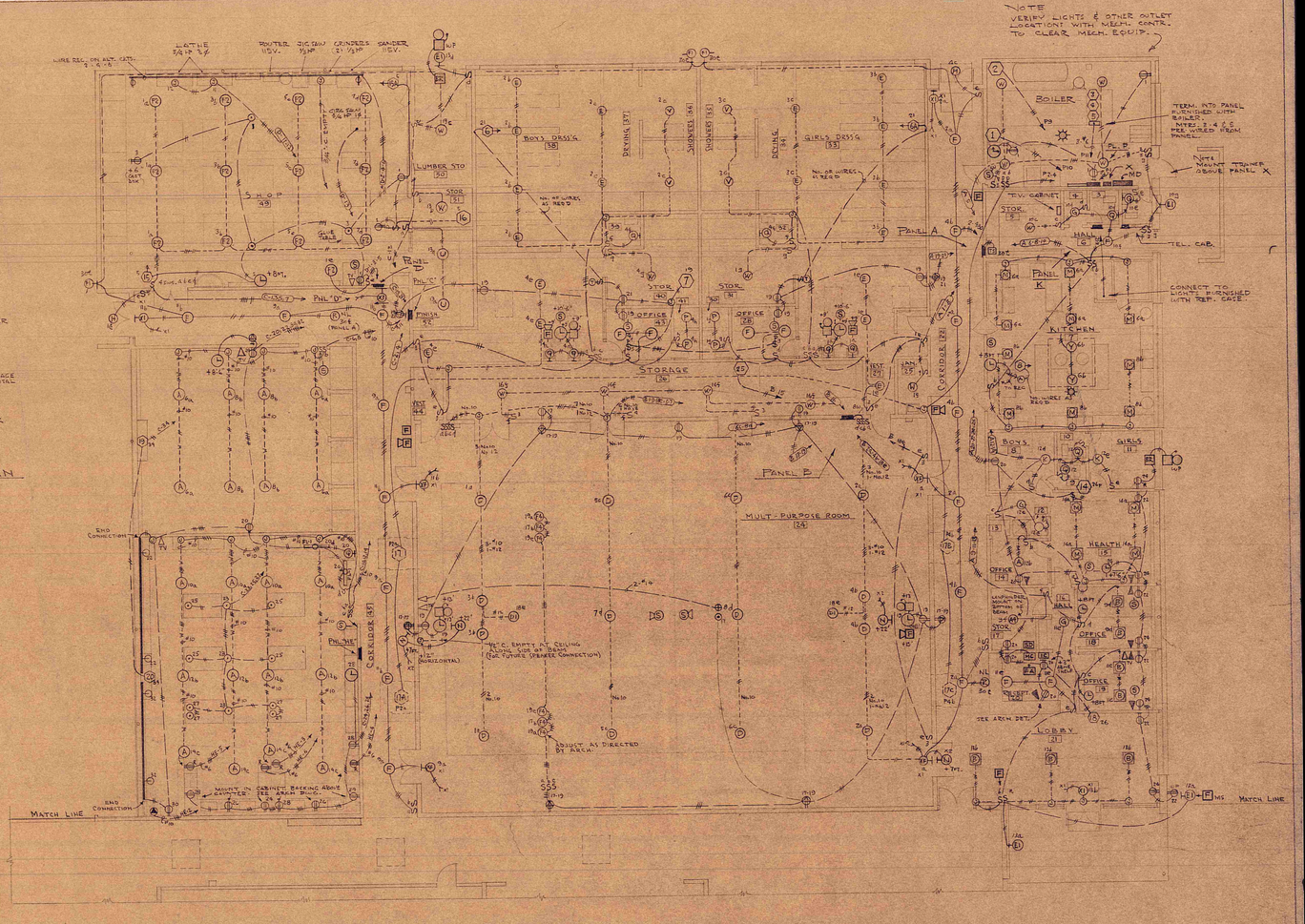
TELEPHONE CONDUIT RISER DIAGRAM
NO SCALE



TYPICAL DETAIL OF CONNECTION FROM CONCEALED CONDUIT TO EXPOSED WIREMOLD
SCALE 3/8"=1'-0"

MOTOR LIST

No.	EQUIPMENT	H.P. OR K.V.A.	VOLTS	PH	LOCATION
1	HEATING PUMP -1	5	208	3	BOILER ROOM
2	HEATING PUMP- 2	3	208	3	
3	BURNER MOTOR	1	208	3	
4	INDUCED DRAFT FAN	5	208	3	
5	OIL PREHEATER	3 KW	208	1	
6+6A	UNIT HEATERS	1/15	115	1	BOYS & GIRLS DRESSING RMS.
7	EXHAUST FAN -1	1/6	115	1	STORAGE RM. 40
8	UNIT HEATER -	1/40	115	1	KITCHEN
9	SCRAPPER	1½	208	3	
9A	GARBAGE DISPOSAL	½	115	1	
10	DISHWASHER MOTOR	1	208	3	
10A	DISHWASHER BOOSTER	5 KW	208	1	
11	ROOF FAN -1	1	208	3	ROOF OVER KITCHEN
12	ROOF FAN -2	1/20	115	1	ROOF OVER KITCHEN
13	HOT WATER BOOSTER TANK	12 KW	208	3	KITCHEN
14	ROOF FAN -3	1/15	115	1	ROOF OVER BOYS RM. 9
15+15A	UNIT HEATERS	1/40	115	1	TWO IN SHOP - RM. 49
16	EXHAUST FAN	1/6	115	1	STORAGE - RM. 51
17+17A	UNIT VENTILATORS	1/8	115	1	OVER CORRIDOR-No. 95
17B+17C	UNIT VENTILATORS	1/8	115	1	OVER CORRIDOR-No. 22
18	CABINET UNIT HEATER	1/6	115	1	LOBBY No. 21
19 TO 19S	UNIT VENTILATORS	1/8	115	1	CLASS ROOMS
20 TO 20E	UNIT VENTILATORS	1/6	115	1	HOMEMAKING, LIBRARY & ACTIVITY AREAS
~~21 TO 21B~~	~~CABINET UNIT HEATERS~~	~~½~~	~~115~~	~~1~~	~~ACTIVITY AREAS~~
22 TO 22B	EXHAUST FANS	1/6	115	1	JANITOR RMS. Nos. 69, 85 & 92
23 TO 23B	HOT WATER STORAGE TANKS	5 KW	208	1	JANITOR RMS. Nos. 69, 85 & 92
24 TO 24B	EXHAUST FANS	1/6	115	1	END OF CORRIDORS, Nos. 65, 81 & 104
25	HOT WATER RECIRC. PUMP	1/3	115	1	STORAGE No. 26



PARTIAL FLOOR PLAN
SCALE 1/8"=1'-0"

NOTE
EXCEPT FOR MULTI-PURPOSE ROOM, CENTER FIXTURES BETWEEN PURLINS. SEE ARCHITECTS PLANS FOR PURLIN LOCATIONS. (TYPICAL)

ELECTRICAL
PART FLOOR PLAN

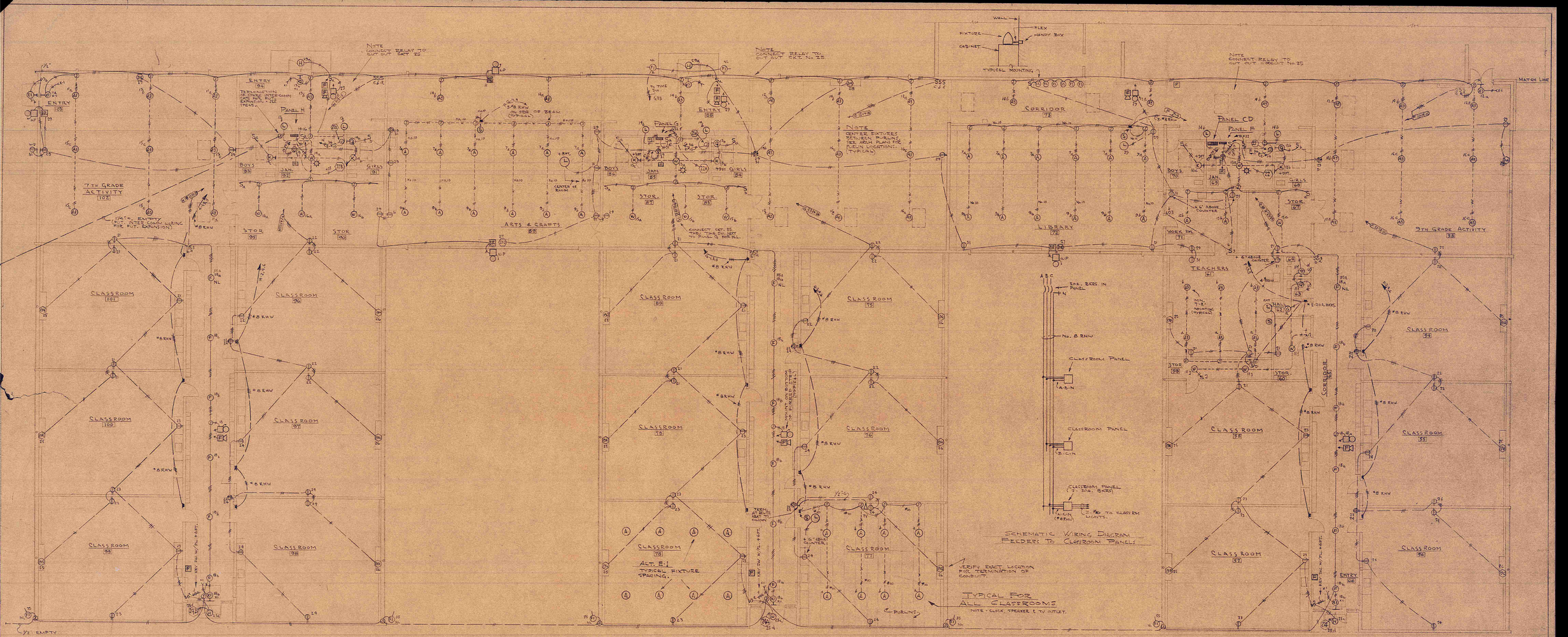
WEST ABERDEEN JR. HIGH SCHOOL
FOR ABERDEEN SCHOOL DIST. # 5
ABERDEEN WASHINGTON

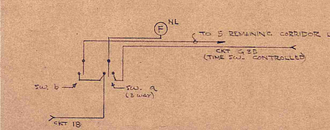
WALTER S. GORDON
Consulting Electrical Engineer
260 South 8th Street
Tacoma 2, Washington

SHEET E-2 OF 3

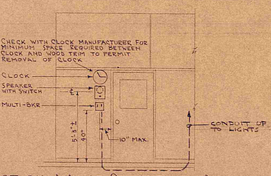
JENSEN & MILLS ARCHITECTS
308 So Tacoma Ave - Tacoma, Wash.

DATE OCT. '56
JOB No. 55-40

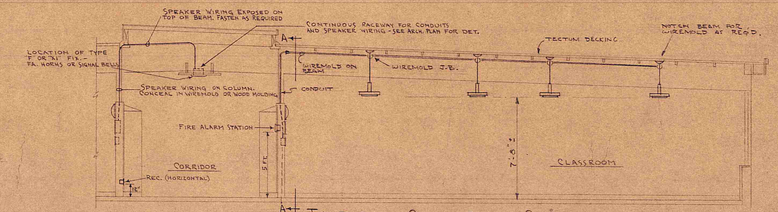




WIRING DIAGRAM FOR CONTROL OF NIGHT LIGHT IN CORRIDORS 65, 81 AND 104



SECTION A-A AT CLASSROOM DOOR
SCALE 1/4" = 1'-0"



TYPICAL CLASSROOM SECTION
SCALE 1/4" = 1'-0"

WALTER S. GORDON
Consulting Electrical Engineer
200 SOUTH 5TH STREET
TACOMA 2, WASHINGTON 6127-H

ELECTRICAL
PART FLOOR PLAN

WEST ABERDEEN JR. HIGH SCHOOL
FOR ABERDEEN SCHOOL DIST. # 5
ABERDEEN, WASHINGTON

SHEET	JENSEN & MILLS ARCHITECTS	DATE
E-3 OF 3	308 So Tacoma Ave - Tacoma, Wash.	OCT. 56 JOB No. 5540

HALEY ALDRICH

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REPORT OF PRELIMINARY GEOTECHNICAL ENGINEERING FINDINGS
ABERDEEN SCHOOL DISTRICT NO. 5 SEISMIC SAFETY RETROFITS
MCDERMOTH ELEMENTARY SCHOOL
ABERDEEN, WASHINGTON



by
Haley & Aldrich, Inc.
Vancouver, Washington

for
TCF Architecture PLLC
Tacoma, Washington

File No. 0210748-000
September 2024

HALEY & ALDRICH, INC.
300 W 15th S
Vancouver, WA 98660
360.448.4189

23 September 2024
File No. 0210748-000

TCF Architecture PLLC
902 N 2nd Street
Tacoma, Washington 98403

Attention: Steve Wachtler, AIA, Principal

Subject: Report of Preliminary Geotechnical Engineering Findings
Aberdeen School District No. 5 Seismic Safety Retrofits
McDermoth Elementary School
409 N K Street
Aberdeen, Washington 98520

Dear Steve Wachtler:

Haley & Aldrich, Inc. (Haley & Aldrich) is pleased to submit this report to TCF Architecture PLLC (TCF) and Aberdeen School District No. 5 (District) summarizing our preliminary geotechnical engineering services for the seismic retrofit of McDermoth Elementary School in Aberdeen, Washington. Our work was completed in general accordance with our agreement executed 24 April 2024. In completing our services, we collaborated with Degenkolb Engineers, Inc. (Degenkolb) and Educational Service District 112 - Construction Services Group.

The project involves preliminary evaluation of the McDermoth Elementary School in Aberdeen, Washington per *American Society of Civil Engineers/Structural Engineering Institute (ASCE/SEI) 41-17 - Seismic Evaluation and Retrofit of Existing Buildings* (ASCE 41-17; ASCE 2017b). The study was funded by the Office of Superintendent of Public Instruction's (OSPI's) School Seismic Grant Program. The findings from this preliminary evaluation will inform the District's and OSPI's decision-making to either advance full design efforts for seismic retrofit improvements at the existing campus or to explore re-siting the school to a new location.

This preliminary report provides a discussion of the site setting, surface and subsurface conditions, the seismic basis of design, and a preliminary geotechnical analysis of seismicity and seismic hazards that may impact plans for retrofit of the subject school. Our current scope of services does not include developing recommendations for design and construction of retrofit improvements, such as modification of existing foundations or installation of ground improvement elements. Preliminary recommendations for retrofit improvements may be provided using currently available subsurface data under a supplemental authorization.

Scope of Services

The purpose of our services was to preliminarily characterize subsurface conditions at the site and to provide geotechnical engineering guidance and recommendations that conform in a preliminary sense to the geotechnical requirements of ASCE 41-17. These services included conducting geologic research, limited field explorations, limited laboratory testing, preliminary seismic ground motion assessments, seismic hazard evaluations, and preliminary engineering analyses.

We completed the following tasks in general accordance with *Part 1 – Geotechnical Field Services and Limited Seismic Hazard Evaluation* included in our proposal for Geotechnical Engineering Services dated 10 April 2024 and executed 24 April 2024.

- Reviewed readily available geologic and geologic hazard maps and geotechnical reports and construction plans provided by others for general information regarding subsurface soil and groundwater conditions and geologic hazards.
- Drilled three borings to depths of approximately 31 to 36 feet below ground surface (bgs).
- Performed two multi-channel analysis of surface waves (MASW) geophysical tests.
- Observed the explorations, logged the subsurface conditions, collected representative soil samples, and transported the samples to our laboratory for further visual review and testing.
- Completed laboratory tests on select soil samples to evaluate soil engineering properties. Our specific tests included moisture content, Atterberg Limits, grain size distribution determinations, and a suite of corrosion potential tests in accordance with current ASTM International or other applicable standards.
- Developed code-based seismic design values in conformance with ASCE 41 Section 2.4 and ASCE 7 Section 11.4, not including site-specific seismic or ground response analyses per ASCE 7 Chapter 21 (ASCE 2017a).
- Conducted limited seismic hazard analyses including:
  - Assessing liquefaction potential analysis per the method presented by Idriss & Boulanger (2008); and
  - Assessing lateral spreading at the site, including an evaluation of local and regional topography and nearby bathymetry.
- Prepared this report summarizing our preliminary findings.

Site Conditions

SURFACE CONDITIONS

The McDermoth Elementary School campus encompasses an approximately 2.07-acre site located at 409 N K Street in Aberdeen, Washington. The site is bounded by W 4th Street to the northwest, N K Street to the northeast, W 3rd Street to the southeast, and N L Street to the southwest. The elementary school building is located in the northern and eastern portions of the campus. The school building is a

two- to three-story structure. The school features a lower level that acts as a daylight basement, exposed at ground level along the southwestern face of the structure but buried along the northeastern face. The remainder of the campus is occupied by asphalt-paved play areas and landscape zones.

The site topography slopes downward to the southwest. The average surface elevation in the upslope, northeastern area is approximately Elevation 32 feet, while the surface elevation in the southwestern, downslope area is about Elevation 15 feet (World Geodetic System 84).

The Chehalis River is located approximately 0.6 miles to the southeast of the school. The bay of Grays Harbor begins approximately 1.5 miles southwest of the site at the mouth of the Chehalis River. The Pacific Ocean is about 16 miles to the west of the school, beyond the northern peninsula of Grays Harbor.

Our understanding of the existing structure foundations is based on our review of the following documents:

- The BJSS Group Architects and Engineers, AIA, 1997. *McDermoth Elementary Modernization & Additions.* 49 Sheets, dated 23 September 1997.
- Giles Engineering Associates, Inc., 1997. *Geotechnical Engineering Exploration and Analyses, Proposed McDermoth Elementary School Additions and Renovations, 409 North "K" Street, Aberdeen, Washington, Project No. 6G-9701013*, dated 7 April 1997.
- Blueprints (untitled) from 1929 additions.

According to these documents, the original building and 1929 additions are supported on shallow spread footings. The 1997 modernization and addition improvements are largely supported on 18-inch-diameter augercast piles bearing on weathered sandstone. Pile-supported sections of the structure are interconnected via grade beams. Excerpts from the historical plans are included in Appendix D.

GEOLOGIC AND SOIL MAPPING

The site is mapped in Logan (1987) as Quaternary alluvium (Qal) described as "silt, sand, and gravel deposited in streambeds and fans," the surface of which is "relatively undissected" while Rau (1986) maps the site as Quaternary deposits (Qd) that is described as undifferentiated "alluvium and glacial drift," that latter of which is described as "outwash and gravel deposits" (Rau 1986). In mapping that starts approximately 1.5 miles north of the site, Logan (2003) describes Quaternary alluvium (Qa) at the floor of river valleys as locally containing peat and lacustrine deposits. The mapping also indicates that at depth, the alluvium is likely underlain by marine sedimentary rocks assigned to the Miocene Montesano Formation. This formation is described as predominantly silty "coarse- to fine-grained" sandstone with "local to widespread conglomerate, siltstone, and mudstone" that is generally blue gray where fresh and orange-brown where weathered (Logan, 1987; Logan, 2003). Our explorations encountered dense materials at approximately 25 to 27.5 feet bgs, which are likely part of this sedimentary rock formation.

The near surface soils at the site are mapped by the U.S. Department of Agriculture (USDA) in the *Soil Survey of Grays Harbor County Area, Pacific County, and Wahkiakum County* (Pringle, 1986), as compiled

in the Web Soil Survey (USDA, 2024), as Elochoman silt loam, 1 to 8 percent slopes, and Udorthents, level. The site is split nearly evenly between the two soil types with Elochoman soils found in the north and Udorthents soils to the south, as shown on Figure 3. A summary of the physical properties of each soil type is presented below.

- Elochoman soils are described as very deep, well drained soils derived from sandstone along shoulders of uplands (Pringle, 1986). The typical soil profile generally comprises 60 inches of medial loam (United Soil Classification System [USCS] ML, MH). Depth to water in this soil type is typically greater than 80 inches and the soil is assigned to hydrologic soil group B, which are soils that generally have moderate infiltration and water transmission rates. The risk of corrosion is rated as "high" for both uncoated steel and concrete with typical effective cation-exchange capacity ranging of 45 to 70 milliequivalents per 100 grams of soil (meq/100g).
- Udorthents soils are very deep, moderately to excessively drained soils found on former tidelands and/or sandy and loamy river dredgings that have been protected from flooding by dikes (Pringle, 1986). Pringle (1986) notes that "no single profile is representative of these soils" but a common profile generally comprises 6 inches of sandy loam (USCS SC-SM, SM) overlying loamy sand, loam, and sandy loam (USCS CL-ML, SM, ML, SC-SM) to 60 inches. Depth to water in this soil type is typically 24 to 79 inches and the soil is assigned to hydrologic soil group A, which are soils that generally have high infiltration and water transmission rates. The risk of corrosion is rated as "moderate" for uncoated steel and "high" for concrete with typical effective cation-exchange capacity ranging from 5 to 20 meq/100g in the upper 6 inches and from 5 to 15 below 6 inches depth.

Based on our explorations, the soils identified as "native" soils in our exploration logs are generally similar to those described in the geologic and soil mapping.

SUBSURFACE CONDITIONS

Subsurface conditions interpreted from the explorations advanced at the site as part of our current study and previous studies, in conjunction with soil properties inferred from field and laboratory tests, formed the basis for the conclusions and recommendations in this report. The locations and depths of our explorations were selected considering the site features, under the constraints of surface access, time, and budget.

We explored subsurface soil and groundwater conditions at the site on 7 and 8 June 2024 by drilling three borings (designated MDB-1, MDB-2, and MDB-3) to depths of approximately 31 to 36 feet bgs using the mud-rotary drilling method. The borings were located southwest, southeast, and in the central area of the school structure at the locations shown on Figure 2. Additionally, we performed two MASW geophysical tests to estimate the shear wave velocity profile of soils within the upper 100 feet bgs, at locations shown on Figure 2. Our field exploration procedures and exploration logs are in Appendix A. Laboratory soil testing procedures and results are in Appendix B. The report of MASW findings is presented in Appendix C.

Previous geotechnical studies at the site include a geotechnical exploration and report for the 1997 school expansion, performed by Giles Engineering Associates (Giles), as well as an exploratory boring program conducted in 1929 as presented on design plans from that time. The Giles report includes logs for three mud rotary borings, two test pits, and two hand auger borings. The 1929 explorations consisted of 19 borings drilled by unknown means, with results presented on subsurface profiles within the design plans; conventional boring logs were not provided. All historical borings generally encountered a dense soil or weathered bedrock condition at depth, typically underlying soft or loose soils in the western portions of the site, and more competent medium dense soils in the upslope areas in the eastern portion of the site. The locations of historical explorations are shown on Figure 2.

The explorations indicate the site is blanketed by 3 feet to up to 15 feet of fill in places, attributed to historical grading activities. This fill is composed of approximately 5 to 8 feet of very loose to medium dense well-graded gravel with silt at MDB-1 and MDB-2 with fill composed of sand and silty sand with gravel extended to approximately 15 feet bgs at MDB-1, located near the southeastern building entrance. Exploration MDB-3 was located at the eastern corner of the schoolyard in a grassy area adjacent to the sidewalk where fill consisted of approximately 3 feet of loamy soil beneath 4 inches of sod.

The fill is underlain by alluvial soils consisting of sandy organic silt, gravelly organic silt with sand, silt, sandy elastic silt, silty gravel with sand, and silty sand. Fine-grained alluvium is described as very soft to medium stiff, and coarse-grained layers are described as loose to dense. Several very soft to soft peat layers were identified within the alluvium, between depths of 18 and 20 feet bgs at MDB-1 and between 11 and 17.5 feet bgs at boring MDB-3.

Weathered sandstone underlies the alluvium at all three boring locations. The weathered sandstone contact appears to descend in elevation towards the southwest. This increase in depth of the sandstone is likely related to a natural topographical break that extends from east to west across the site and separates uplands to the north and former wetlands to the south, as shown on Figure 4. Soil mapping also indicates a change in soil units along a similar orientation, as shown on Figure 3. The location of this topographic break at the site has been obscured by grading activities likely associated with historical roadway and school construction but appears on a 1929 topographic plan sheet included in Giles (1997), excerpts of which are found in Appendix D of this report.

Groundwater was encountered at a depth of 3 feet bgs at boring MDB-2 but was not encountered within the upper 5 feet bgs in borings MDB-1 and MDB-3 before mud rotary drilling was initiated and obscured the location of the water table. Historical boring logs by Giles show a water level within a few feet of the ground surface. For our engineering analyses, we assumed groundwater to be present at a depth of 3 feet bgs in the lower elevation areas of the site. A groundwater gradient that increases in elevation upslope to the west is expected to be present as well.

Seismic Basis of Design

SEISMIC SETTING

The site is in a seismically active area. In this section, we describe the seismic setting, identify the seismic basis of design, provide code-based design values, and discuss the seismic hazards at the site. Geologic hazards mapped near the project site are all related to seismicity and include tsunami inundation, very strong earthquake shaking, and a moderate to high liquefaction hazard (Washington Department of Natural Resources [WADNR], 2024).

Regional Seismicity

Western Washington sits at the contact between two large crustal tectonic plates. The Juan de Fuca Plate forms the floor of the Pacific Ocean off the coast of the northwestern United States and moves northeastward from its spreading ridge boundary with the Pacific Plate at an average rate of approximately 1.5 inches per year. As it converges with the continental North American Plate, the Juan de Fuca Plate dips below (or "subducts") beneath the North American Plate forming a shallow, eastward-dipping contact interface. This boundary is known as the Cascadia Subduction Zone (CSZ) and is responsible for the seismicity in the western Washington regions, producing earthquakes associated with three types of source zones: subduction interface, subduction intraslab, and crustal. The CSZ is located offshore approximately 101 miles west of the site.

Subduction Interface Sources. The displacement caused by the subduction of the Juan de Fuca Plate below the North American Plate does not generally manifest as slip between the two plates; rather, it is absorbed by compression of the North American Plate at the interface at relatively shallow depths. This compression, based on geologic and historical evidence, is released every 300 to 600 years, on average, in the form of magnitude 8 to 9 or larger earthquakes, the last such event occurring in 1700. Characteristics of this type of earthquake may include very large ground accelerations, shaking durations in excess of 2 minutes, and particularly strong long-period ground motions that may affect tall or long-period structures.

Subduction Intraslab Sources. A deeper zone of seismicity is associated with a steeper bending of the Juan de Fuca Plate and the breaking of the plate under its own weight below the Pacific Northwest region. This region, termed the Benioff Zone, produces intraslab earthquakes at depths of 40 to 70 kilometers. Such past events in western Washington include the 1949 Puget Sound, 1965 Olympia, and 2001 Nisqually earthquakes. Deep, intraslab earthquakes tend to be felt over larger areas than shallower crustal events, and generally lack significant aftershocks.

Crustal Sources. Shallow crustal faults are caused by cracking of the continental crust, resulting from the stress that builds as the subduction zone plates remain locked together. Many small crustal faults are mapped near the site that are a part of the greater Cascadia Fold and Thrust Belt (U.S. Geologic Survey [USGS], 2024). However, due to the size of these faults, their contribution to the site seismic hazard is relatively small. The closest mapped fault is a strand of the Cascadia Fold and Fault Belt located more than 11 miles to the west of the site.

SEISMIC BASIS OF DESIGN AND ANALYSIS METHODOLOGY

Preliminary site-specific seismic hazard analysis was conducted for the project site following the guidelines in ASCE 41-17 Section 2.4.1 *General Procedure for Hazard Caused by Ground Shaking*. The seismic hazard levels evaluated per this approach are as follows.

- **BSE-1E:** Basic Safety Earthquake-1 for use with the Basic Performance Objective for Existing Buildings, taken as a seismic hazard with a 20 percent probability of exceedance in 50 years (225-year return period), but not greater than the BSE-1N, at a site. This seismic design level corresponds to a design earthquake magnitude of 7.6 and design PGA_M of 0.24g.
- **BSE-1N:** Basic Safety Earthquake-1 for use with the Basic Performance Objective Equivalent to New Building Standards taken as two-thirds of the BSE-2N at a site.
- **BSE-2E:** Basic Safety Earthquake-2 for use with the Basic Performance Objective for Existing Buildings, taken as a seismic hazard with a 5 percent probability of exceedance in 50 years (975-year return period), but not greater than the BSE-2N, at a site. This seismic design level corresponds to a design earthquake magnitude of 8.4 and design PGA_M of 0.52g.
- **BSE-2N:** Basic Safety Earthquake-2 for use with the Basic Performance Objective Equivalent to New Building Standards, taken as the ground shaking based on the Risk-Targeted Maximum Considered Earthquake (MCE_R) per ASCE 7 at a site. This seismic design level corresponds to a design earthquake magnitude of 8.6 and design PGA_M of 0.79g.

The BSE-2N hazard level is analogous to the maximum considered earthquake hazard level (MCE) in ASCE 7-16 (with a 2 percent probability of exceedance in 50 years or a 2,475-year return period), and the BSE-1N hazard level is consistent with a design-level event in ASCE 7-16.

Seismic Site Class

Thick sequences of unconsolidated, soft sediments typically amplify the shaking of long-period ground motions, such as those associated with subduction zone earthquakes, whereas areas underlain by shallow soil profiles are not likely to amplify seismic waves.

The “Site Class” is a designation used by ASCE 7-16, as referenced by ASCE 41-17, to quantify ground motion amplification. The classification is based on the stiffness in the upper 100 feet (roughly 30 meters) of soil and bedrock materials at a site.

Site class determination was based on two MASW geophysical tests performed to the northwest and southwest of the school structure. The southwestern test array detected very soft soil conditions, which limited the ability for the test to reach a measurement depth of 100 feet bgs. An average shear wave velocity of just 423 feet per second was calculated for the subsurface profile in this location, covering a depth range of 38 feet bgs. The northwestern test resulted in a weighted-average shear wave velocity values of 1,343 feet per second for a 100-foot-deep profile which would imply a Site Class C. However, the northwestern test potentially overestimates the average shear wave velocity throughout the school structure, as it is centered on a location where the thickness of alluvial soils overlying sandstone is likely less than average. An evaluation of current and historical borings for average N60 values over the upper 100 feet bgs (extrapolating the very dense sandstone conditions to depth) results in an estimated

subsurface profile consistent with Site Class D. For these reasons, we conclude that the site is most accurately classified as Site Class D, as defined in ASCE 7-16, as referenced by ASCE 41-17. However, due to liquefaction hazard at this project site (discussed in the following section), the site is classified as Site Class F.

Per ASCE 41-17, a Site Class F designation requires a site-specific analysis including a seismic hazard analysis and a site response analysis; however, buildings with structural periods of less than 0.5 seconds may be designed using seismic parameters developed considering Site Class D conditions.

Preliminary Spectral Design Parameters

Acceleration response spectra for use in preliminary design have been developed following the procedures in ASCE 41-17 Section 2.4.1 *General Procedure for Hazard Caused by Ground Shaking*. These values are presented in Table 1.

Table 1. General Procedure Spectral Design Parameters

Design Parameters	Hazard Level			
	BSE-2N	BSE-1N	BSE-2E	BSE-1E
Site Class	D			
S_s	1.52	-	1.09	0.41
F_a (Site Class E)[1]	1.00	-	1.06	1.47
S_{xs}	1.52	1.01	1.16	0.61
S_1	0.69	-	0.46	0.13
F_v (Site Class E)[1]	1.70	-	1.84	2.35
S_{x1}	1.18	0.79	0.85	0.29
T_L	16 s	16 s	16 s	16 s

Notes:

1) *F_a and F_V are the ASCE 7-16 Chapter 21 site factors for Site Class D.*
2) *Site coordinates are Latitude/Longitude 46.976995°N / 123.8235444°W.*
3) *Values presented in this table are for Site Class D conditions. This site falls under Site Class F categorization; however, these values are provided assuming that the structures have a fundamental period of less than 0.5 seconds, in which case Site Class D may be used for design.*

LIQUEFACTION

General

When cyclic loading occurs during an earthquake, the shaking can increase the pore pressure in loose to medium dense saturated sand and cause liquefaction. The rapid increase in pore water pressure reduces the effective normal stress between soil particles, resulting in the sudden loss of shear strength in the soil. Granular soils, which rely on interparticle friction for strength, are susceptible to liquefaction until the excess pore pressures can dissipate. Sand boils and flows observed at the ground surface after an

earthquake are the result of excess pore pressures dissipating upward, carrying soil particles with the draining water. In general, loose, saturated sand soils with low silt and clay contents are the most susceptible to liquefaction. Silty soils with low plasticity are moderately susceptible to liquefaction under relatively higher levels of ground shaking. For any soil type, the soil must be saturated for liquefaction to occur.

We performed liquefaction potential analysis on soils logged at the site using the procedures outlined in Idriss and Boulanger (2008) and updated Magnitude Scaling Factor as outlined in Boulanger and Idriss (2014).

We note the term liquefaction is defined very specifically by the simplified method that we used to evaluate the liquefaction hazard. Liquefaction is defined as when a soil under repeated cyclic loading exhibits the generation of increasing excess pore pressures until the pore pressure equals the total overburden stress. When this condition is reached, the normal stress acting between adjacent soil particles is effectively lost, and the soil, which derives its shear strength from interparticle friction, can lose much of its available shear strength. However, it is well documented that not all soils exhibit the same behavior after the initiation of liquefaction.

Loose sandy soils that achieve the condition of liquefaction during earthquake shaking can subsequently collapse and exhibit large shear strains under continued cyclic or static loading. This type of behavior is a well-documented result of numerous earthquakes, where structures underlain by shallow, liquefiable hydraulically placed fills have been observed to experience bearing capacity failures and collapse. Conversely, medium dense to dense sandy soils that achieve the condition of liquefaction will typically not collapse and can exhibit strain hardening behavior due to dilation effects. Therefore, despite the soil achieving the condition of liquefaction, there is little to no shear strength loss and only moderate shear strains under continued cyclic and static loading. This condition is termed “cyclic mobility.”

Analysis

In accordance with ASCE 7-16, as referenced by ASCE 41-17, we completed the liquefaction hazard analysis using the site-class-adjusted acceleration coefficient PGA_M for Site Class D. We performed our liquefaction analysis for three different hazard levels, including events with 225-year (corresponding to BSE-1E), 975-year (corresponding to BSE-2E), and 2,475-year (corresponding to BSE-2N) return periods. We performed liquefaction analysis using PGA_M values of 0.24g and 0.52g and associated earthquake magnitudes of 7.6 and 8.4 for BSE-1E and BSE-2E, respectively. We used a PGA_M of 0.79g and associated earthquake magnitude of 8.6 in our analysis for the BSE-2N event. We assumed a design groundwater depth of 3 feet bgs for our liquefaction analyses.

Our analyses conclude that potential for liquefaction to occur at the site for all seismic hazard levels is high, due to the relatively shallow groundwater table and subsurface profile featuring loose sands. Liquefaction is expected to be most severe in the western portion of the site bearing on loose sands and soft silt deposits, and is typically expected to be most severe within the upper 20 feet bgs in this area. Liquefaction is not expected to pose a significant hazard in the upslope areas in the northern and eastern parts of the site.

Settlement

Post-liquefaction settlement results from densification of liquefiable sandy soils following an earthquake. The permanent ground surface settlement is not typically uniform across the area and can result in significant differential settlement. Differential settlement will have the most significant effect on structures supported by shallow foundations. Based on our analysis, we estimate settlements on the order of 3 to 13 inches due to liquefaction could occur primarily throughout the southwestern half of the site, including the area occupied by the augercast pile-supported gymnasium addition. Additionally, some degree of liquefaction is possible in soils underlying the southwestern portions of the pre-1997 structure, most notably in the vicinity of MDB-1. Analyses indicate that alluvial soils underlying fill are subject to over 9 inches of liquefaction-induced settlement. Similar conditions may be present at nearby spread footings in this portion of the structure. Differential settlements can preliminarily be assumed as one-half of the total settlements occurring over a lateral distance of 50 feet.

We note that the settlement estimates provided above do not account for movements of foundations which may occur due to bearing capacity failure due to seismic strength loss or localized ground deformations that may result due to surface effects of shallow liquefaction, such as sand boils. (Both conditions are described below in more detail.) Therefore, actual ground and building settlements may be greater than the values noted above.

Seismic Strength Loss

We anticipate considerable reductions in the strength of the liquefiable layers of the site soil profile. The shear strength loss was determined by using the recommendations of Idriss and Boulanger (2008) and Bray and Sancio (2006). Simplistically, the liquefied shear strength directly correlates to the soil's pre-liquefied relative density. The relative density is estimated based on the standard penetration test (SPT) blow counts. The higher the relative density, the higher the liquefied shear strength. The typical residual strength of liquefiable soils at the site is expected to be less than 20 percent of the static strength (e.g., 80 percent or more strength loss).

Additionally, some strength loss due to cyclic shear stresses are expected to occur in the fine-grained elastic silt and organic silt soils overlying bedrock. Full cyclic softening and development of lowered residual strengths within these materials are likely to occur. Supplemental exploration including performance of cyclic direct simple shear testing would be required to accurately estimate residual strength ratios for these soils.

The pile foundation system at the site is reportedly drilled into weathered sandstone bedrock, limiting the probability and severity of bearing shear failure for deep foundation elements. Shallow foundations bearing on this material may experience reduced bearing capacity under seismic conditions. We expect that the loss of support may result in seismic bearing capacities in this area to a condition of no more than 1,000 pounds per square foot.

Surface Effects

We evaluated the potential for liquefaction-related surface manifestations (such as sand boils) to occur using the procedures presented by Ishihara (1985).

The Ishihara (1985) procedure compares the thickness of a given liquefiable soil layer to the thickness of the overlying non-liquefiable soil mantle to determine if surface manifestations are possible at a given peak ground acceleration. This approach has several limitations and may overestimate potential for surface manifestations to occur in silty sands and sandy silts, as the relatively low permeability of these materials has potential to prevent pore water from flowing quickly enough to produce sand boils (Kramer, 1996). The Ishihara (1985) analyses indicate that there is potential for surface manifestations to occur locally throughout the site. The potential for surface manifestations appears high especially in areas adjacent to the school at its western and southern ends.

We preliminarily conclude that the probability of direct surface effects of liquefaction is high, based on our analysis of existing subsurface data.

LATERAL SPREADING

Lateral spreading occurs when large blocks of ground are displaced down gentle slopes or toward the free face of river channels, ditches, etc. as a result of earthquake-induced inertial forces acting on the soil mass. Initiation of lateral spreading is often made worse when the soils within and beneath the soil mass liquefy or soften as a result of the shaking. Lateral spreading deformations can be experienced relatively far from a free face. Similar to lateral spread, flow failures result when large volumes of soil near the free face of river channels or lake bottoms displace vertically and laterally during or after earthquakes. As the ground begins to shake and the shearing resistance of liquefied soils decreases, ground displacement occurs in response to mainly static shear forces present within the soil mass and, to a lesser extent, earthquake-induced inertial forces. Flow failures typically manifest larger deformations than lateral spreading; however, the extent of the deformations is typically localized to the area behind the free face of the channel. Both lateral spreading and flow failures can be destructive and pose a significant risk to structures.

Based on the presence of relatively shallow weathered sandstone at the site, and the distance from the site to the Chehalis River, we conclude that the probability of lateral spread occurring at the site is low.

FAULT SURFACE RUPTURE

We used the USGS U.S. Quaternary faults web application (USGS, 2024) to identify earthquake-producing faults near the project site. No mapped earthquake-producing crustal faults are present at the site. Based on known fault locations, we consider the potential for fault rupture to occur at the site to be low unless occurring on an unmapped or otherwise unknown fault.

TSUNAMI HAZARD

The tsunami hazard at the site is mapped in the *Tsunami Hazard Maps of Southwest Washington - Model Results from a ~2,500-Year Cascadia Subduction Zone Earthquake Scenario* by the WADNR (Eungard et al., 2018). Based on this reference, the southwestern portion of the campus is located within an area expected to be inundated from a CSZ-induced tsunami. The portions of the site occupied by the school structure appear to be just beyond the mapped tsunami inundation limits.

The ASCE Tsunami Hazard Tool (https://asce7tsunami.online/) maps probabilistic inundation hazards for all potential tsunami sources, not just a CSZ-related event, and indicates the school site is not within a tsunami inundation zone (ASCE, 2022).

Based on the findings presented by WADNR and ASCE, we consider the potential for tsunami inundation to occur at the site to be moderate, but mostly limited to the portions of the site not occupied by structures.

Corrosivity

One soil sample was collected and tested for corrosivity characteristics by CERCO of Concord, California. The tested sample consisted of near-surface soils and was tested for resistivity, redox potential, sulfate and chloride ion concentrations, and pH. The test results indicate that near-surface soils should be considered moderately corrosive to buried iron and steel improvements based on laboratory resistivity measurements. Chloride ion concentrations were not detected and insufficient to attack steel embedded in concrete mortar coating. Sulfate ion concentration results were not detected and insufficient to be detrimental to reinforced concrete. The pH level was measured as about 5.8 and is considered a corrosion concern for buried iron, steel, mortar-coated steel, and reinforced concrete structures.

The results of our corrosion testing and a copy of CERCO's brief evaluation are presented in Appendix B.

Conclusions

Based on our explorations, testing, and analyses, we have formulated preliminary conclusions in this report for use in assessment of the seismic retrofit project's viability. We offer the following general summary.

- The site subsurface profile generally consists of a surficial fill layer of variable thickness overlying deposits of alluvium, with weathered sandstone bedrock present at depth. The alluvial soils are often soft, loose, and compressible in the southwestern portion of the site, including areas underlying portions of the building footprint.
- There is a high potential for liquefaction to occur at the site, most notably in the southwestern half of the site. The gymnasium and other 1997 modernization additions are supported on augercast piles embedded in weathered sandstone, so impacts of liquefaction on these improvements are likely to be limited. The effects of downdrag on these piles should be

evaluated as part of final design. However, some portions of the pre-1997 structure bear on spread footings which may overlie liquefiable alluvium, possibly resulting in settlements of 9 inches or greater.

- Augercast pile foundations supporting much of the 1997 structure additions are expected to maintain bearing capacity during a major seismic event.
- Shallow foundations supporting the pre-1997 structure, especially along the southern and southwestern sides of the structure, have a high potential for experiencing distress related to excessive seismic settlements and reduced bearing capacity of subgrade soils.
  - The existing shallow foundations will need to be analyzed for ability to tolerate or resist these seismically induced ground movements and reduced bearing capacity.
  - The shallow foundations could feasibly be underpinned to transfer building loads under seismic conditions through the upper liquefiable and cyclic softening-susceptible soils into deeper, competent materials. The use of micropiles, helical augers, pin piles, or similar systems can be considered.
- Final design of geotechnical elements may require additional site characterization to verify subsurface conditions around the school building.

Closing

Thank you for the opportunity to perform these services for you. Please do not hesitate to contact us if you have any questions or comments.

Sincerely yours,
HALEY & ALDRICH, INC.



Daniel J. Trisler, P.E.
Principal Geotechnical Engineer

Micah D. Hintz, P.E.
Geotechnical Engineer

Attachments:

Figure 1 – Project Locus
Figure 2 – Site and Exploration Plan
Figure 3 – Soil Map
Figure 4 – LiDAR Hillshade Map
Appendix A – Exploration Logs
Appendix B – Laboratory Test Results
Appendix C – MASW Report
Appendix D – Historical Plans

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FIGURES



HALEY ALDRICH

MCDERMOTH ELEMENTARY SCHOOL
SEISMIC SAFETY RETROFIT
ABERDEEN, WASHINGTON

PROJECT LOCUS

MAP SOURCE: ESRI
SITE COORDINATES: 46°58'37"N, 123°49'25"W

APPROXIMATE SCALE: 1 IN = 2000 FT
AUGUST 2024

FIGURE 1

GIS: \\haleyaldrich\share\CF\Projects\0210746\GIS\210746_ABERDEEN_SCHOOL_DISTRICT.aprx - ayabu - 8/21/2024 9:59 AM



LEGEND

- MUD ROTARY BORING (THIS STUDY)
- MULTI-CHANNEL ANALYSIS OF SURFACE WAVES (MASW) LOCATION (THIS STUDY)
- HAND AUGER BORING (GILES ENGINEERING 1997)
- HOLLOW STEM AUGER BORING (GILES ENGINEERING 1997)
- TEST PIT (GILES ENGINEERING 1997)
- BORING (1929)
- MASW ARRAY
- ESTIMATED DEPTH TO WEATHERED BEDROCK OR DENSE SOIL
- SITE BOUNDARY
- PILE SUPPORTED FOUNDATION

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. AERIAL IMAGERY SOURCE: NEARMAP, 14 AUGUST 2023

N

0 50 100
SCALE IN FEET

HALEY ALDRICH

MCDERMOTH ELEMENTARY SCHOOL
SEISMIC SAFETY RETROFIT
ABERDEEN, WASHINGTON

SITE AND EXPLORATION PLAN

SEPTEMBER 2024

FIGURE 2

GIS FILE PATH: \\haleyaldrich\share\CF\Projects\0210746\GIS\210746_ABERDEEN_SCHOOL_DISTRICT.aprx - USER: ayabu - LAST SAVED: 9/11/2024 1:24 PM



LEGEND

- MUD ROTARY BORING (THIS STUDY)
- MULTI-CHANNEL ANALYSIS OF SURFACE WAVES (MASW) LOCATION (THIS STUDY)
- HAND AUGER BORING (GILES ENGINEERING 1997)
- HOLLOW STEM AUGER BORING (GILES ENGINEERING 1997)
- TEST PIT (GILES ENGINEERING 1997)
- BORING (1929)
- MASW ARRAY
- SOIL MAP UNIT
- SITE BOUNDARY

MAP UNIT SYMBOL	MAP UNIT NAME
37	ELOCHOMAN SILT LOAM, 8 TO 30 PERCENT SLOPES
147	UDORTHENTS, LEVEL

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. SOIL MAP UNIT SOURCE: UNITED STATES DEPARTMENT OF AGRICULTURE (USDA) NATURAL RESOURCES CONSERVATION SERVICE (NRCS) WEB SOIL SURVEY
3. AERIAL IMAGERY SOURCE: NEARMAP, 14 AUGUST 2023

N

0 50 100
SCALE IN FEET

HALEY ALDRICH

MCDERMOTH ELEMENTARY SCHOOL
SEISMIC SAFETY RETROFIT
ABERDEEN, WASHINGTON

SOIL MAP

AUGUST 2024

FIGURE 3

GIS FILE PATH: \\haleyaldrich\share\CF\Projects\0210746\GIS\210746_ABERDEEN_SCHOOL_DISTRICT.aprx - USER: ayabu - LAST SAVED: 8/21/2024 10:02 AM



LEGEND

SITE BOUNDARY

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.

2. LIDAR HILLSHADE SOURCE: WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES. WASHINGTON LIDAR PORTAL, 2019.

N

0 500 1,000

SCALE IN FEET

HALEY ALDRICH

MCDERMOTH ELEMENTARY SCHOOL
SEISMIC SAFETY RETROFIT
ABERDEEN, WASHINGTON

LIDAR HILLSHADE MAP

AUGUST 2024

FIGURE 4

GIS FILE PATH: \\haleyaldrich\share\CF\Projects\0210746\GIS\210746_ABERDEEN_SCHOOL_DISTRICT.aprx - USER: ayabu - LAST SAVED: 8/21/2024 10:02 AM

APPENDIX A
Exploration Logs

APPENDIX A

Exploration Logs

We evaluated subsurface conditions at the site by completing three drilled borings on 7 and 8 June 2024. The field explorations were coordinated and overseen by geotechnical staff from Haley & Aldrich, Inc., who classified the various soil units encountered, obtained representative soil samples for geotechnical testing, and maintained a detailed log of the boring. Exploration logs are included in this appendix. Figure 2 of the report shows the approximate locations of the explorations. Explorations were located in the field using landmarks on site. Results of the laboratory testing are indicated on the exploration logs and are included in Appendix B.

The borings were advanced using mud rotary methods using a track-mounted GeoProbe 7822DT drill rig operated by Western States Soil Conservation, Inc., of Hubbard, Oregon. The boring created a hole approximately 5 inches in diameter.

Materials encountered in the explorations were classified in the field in general accordance with ASTM International (ASTM) Standard Practice D 2488 “Standard Practice for the Classification of Soils (Visual-Manual Procedure).” The exploration logs in this appendix show our interpretation of the exploration, sampling, and testing data. The logs indicate the depth where the soils change. Note that the change may be gradual. In the field, we classified the samples taken from the explorations according to the methods presented on the *Figure A-1, Key to Exploration Logs*. This figure also provides a legend explaining the symbols and abbreviations used in the logs.

Sampling of soils was completed at regular intervals throughout the depth of each boring. The samples were collected with a Standard Penetration Test sampler used in general conformance with ASTM Test Method D 1586 “Standard Method for Penetration Test and Split-Barrel Sampling of Soils.” The sampler was driven by a 140-pound auto-trip hammer falling 30 inches. The *N* value, or number of blows required to drive the sampler 1 foot, or as otherwise indicated into the soils, is shown adjacent to the sample symbols on the boring logs. Disturbed samples were obtained from the SPT sampler. A piston sampler was used to collect relatively undisturbed Shelby tube samples. Samples were used for classification and laboratory testing purposes.

Sample Description

Identification of soils in this report is based on visual field and laboratory observations which include density/consistency, moisture condition, grain size, and plasticity estimates and should not be construed to imply field nor laboratory testing unless presented herein. ASTM D 2488 visual-manual identification methods were used as a guide. Where laboratory testing confirmed visual-manual identifications, then ASTM D 2487 was used to classify the soils.

Relative Density/Consistency

Soil density/consistency in borings is related primarily to the standard penetration resistance (N). Soil density/consistency in test pits and probes is estimated based on visual observation and is presented parenthetically on the logs.

SAND or GRAVEL Relative Density	N (Blows/Foot)	SILT or CLAY Consistency	N (Blows/Foot)
Very loose	0 to 4	Very soft	0 to 1
Loose	5 to 10	Soft	2 to 4
Medium dense	11 to 30	Medium stiff	5 to 8
Dense	31 to 50	Stiff	9 to 15
Very dense	>50	Very stiff	16 to 30
		Hard	>30

Moisture

Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

USCS Soil Classification Chart (ASTM D 2487)

Major Divisions			Symbols: Graph	Symbols: USCS	Typical Descriptions
Coarse Grained Soils: More than 50% of Material Retained on No. 200 Sieve	Gravel and Gravelly Soils: More than 50% of Coarse Fraction Retained on No. 4 Sieve	Clean Gravels (<5% fines)		GW	Well-Graded Gravel; Well-Graded Gravel with Sand
				GP	Poorly Graded Gravel; Poorly Graded Gravel with Sand
		Gravels (5-12% fines)		GW-GM	Well-Graded Gravel with Silt; Well-Graded Gravel with Silt and Sand
				GW-GC	Well-Graded Gravel with Clay; Well-Graded Gravel with Clay and Sand
				GP-GM	Poorly Graded Gravel with Silt; Poorly Graded Gravel with Silt and Sand
				GP-GC	Poorly Graded Gravel with Clay; Poorly Graded Gravel with Clay and Sand
		Gravels with Fines (>12% fines)		GM	Silty Gravel; Silty Gravel with Sand
				GC	Clayey Gravel; Clayey Gravel with Sand
	Sand and Sandy Soils: More than 50% of Coarse Fraction Passing No. 4 Sieve	Sands with few Fines (<5% fines)		SW	Well-Graded Sand; Well-Graded Sand with Gravel
				SP	Poorly Graded Sand; Poorly Graded Sand with Gravel
		Sands (5-12% fines)		SW-SM	Well-Graded Sand with Silt Well-Graded Sand with Silt and Gravel
				SW-SC	Well-Graded Sand with Clay; Well-Graded Sand with Clay and Gravel
				SP-SM	Poorly Graded Sand with Silt; Poorly Graded Sand with Silt and Gravel
				SP-SC	Poorly Graded Sand with Clay; Poorly Graded Sand with Clay and Gravel
		Sands with Fines (>12% fines)		SM	Silty Sand; Silty Sand with Gravel
				SC	Clayey Sand; Clayey Sand with Gravel
Fine Grained Soils: More than 50% of Material Passing No. 200 Sieve	Silts			ML	Silt; Silt with Sand or Gravel; Sandy or Gravelly Silt
				MH	Elastic Silt; Elastic Silt with Sand or Gravel; Sandy or Gravelly Elastic Silt
	Silty Clay (based on Atterberg Limits)			CL-ML	Silty Clay; Silty Clay with Sand or Gravel; Gravelly or Sandy Silty Clay
	Clays			CL	Lean Clay; Lean Clay with Sand or Gravel; Sandy or Gravelly Lean Clay
				CH	Fat Clay; Fat Clay with Sand or Gravel; Sandy or Gravelly Fat Clay
	Organics			OL/OH	Organic Soil; Organic Soil with Sand or Gravel; Sandy or Gravelly Organic Soil
Highly Organic (>50% organic material)				PT	Peat - Decomposing Vegetation - Fibrous to Amorphous Texture

Minor Constituents

	Estimated Percentage
Sand, Gravel	
Trace	<5
Few	5 - 15
Cobbles, Boulders	
Trace	<5
Few	5 - 10
Little	15 - 25
Some	30 - 45

Soil Test Symbols

%F	Percent Passing No. 200 Sieve
AL	Atterberg Limits (%)
	Liquid Limit (LL)
	Water Content (WC)
	Plastic Limit (PL)
CA	Chemical Analysis
CAUC	Consolidated Anisotropic Undrained Compression
CAUE	Consolidated Anisotropic Undrained Extension
CBR	California Bearing Ratio
CIDC	Consolidated Drained Isotropic Triaxial Compression
CIUC	Consolidated Isotropic Undrained Compression
CK0DC	Consolidated Drained k0 Triaxial Compression
CK0DSS	Consolidated k0 Undrained Direct Simple Shear
CK0UC	Consolidated k0 Undrained Compression
CK0UE	Consolidated k0 Undrained Extension
CRSCN	Constant Rate of Strain Consolidation
DS	Direct Shear
DSS	Direct Simple Shear
DT	In Situ Density
GS	Grain Size Classification
HYD	Hydrometer
ILCN	Incremental Load Consolidation
K0CN	k0 Consolidation
kc	Constant Head Permeability
kf	Falling Head Permeability
MD	Moisture Density Relationship
OC	Organic Content
OT	Tests by Others
P	Pressuremeter
PID	Photoionization Detector Reading
PP	Pocket Penetrometer
SG	Specific Gravity
TRS	Torsional Ring Shear
TV	Torvane
UC	Unconfined Compression
UUC	Unconsolidated Undrained Triaxial Compression
VS	Vane Shear
WC	Water Content (%)

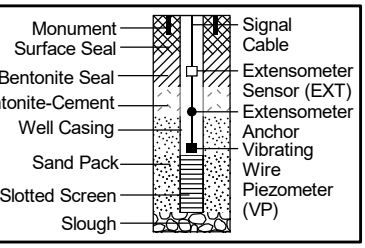
Groundwater Indicators

- Groundwater Level on Date or At Time of Drilling (ATD)
- Groundwater Level on Date Measured in Piezometer
- Groundwater Seepage (Test Pits)

Sample Symbols

- 1.5" I.D. Split Spoon
- 3.0" I.D. Split Spoon
- Modified California Sampler
- Rock Core Run
- Sonic Core
- Thin-walled Sampler
- Grab
- Cuttings
- Push Probe

Well Symbols



HALEY ALDRICH	Project: Aberdeen School District - McDermoth Elementary Location: Aberdeen, Washington Project No.: 0210748-000	**Key to Exploration Logs**	Figure **A-1** Sheet **1 of 1**

HA KEY TO EXP LOGS (SOIL ONLY) - I:\HALEYALDRICH.COM\SHARES\EA_DATA\GINT\HC_LIBRARY\GLB - 6/1/24 13:41 - I:\HALEYALDRICH.COM\SHARES\PROJECTS\0210\365-000_ABERDEEN SCHOOL DISTRICT-HARBOR LEARNING CENTER_GINT FILE\02 10365-000_ABERDEEN SCHOOL DISTRICT-HARBOR LEARNING CENTER_GINT.GPJ - kfuller

Date Started: 06/07/2024	Date Completed: 06/07/2024	Drilling Contractor/Crew: Western States Soil Conservation, Inc. / Ty/Juan	
Logged by: D. Knapp	Checked by: M. Hintz	Drilling Method: Mud Rotary	
Location: Lat: 46.976731 Long: -123.823110 (WGS 84)		Rig Model/Type: GeoProbe® 7822DT / Track-mounted drill rig	
Ground Surface Elevation: 25.41 feet (NAVD 88)		Hammer Type: Auto-hammer	
Comments: Hand augered to 5 ft bgs.		Hammer Weight (pounds): 140	Hammer Drop Height (inches): 30
		Measured Hammer Efficiency (%): 74.6	
		Hole Diameter: 3.875 inches	Well Casing Diameter: NA
		Total Depth: 36.5 feet	Depth to Groundwater: Not Identified

Elevation (feet)	Depth (feet)	Sample Data: Blow Count	Type	Recovery	Length (inches)	Number / Tests	Graphic Log	Material Description	PL WC (%) LL; ✖ Fines Content (%); ▲ SPT N Value (10 20 30 40)	Depth (feet)
25	0					G-1		Asphalt concrete (4-inches thick). WELL-GRADED GRAVEL WITH SILT AND SAND (GW-GM), few cobbles, medium dense, moist, gray-brown, fine to coarse subrounded to rounded sand and gravel, metal debris. [FILL]		0
20	5	2 2 1		0in.	18	S-2		SILTY SAND WITH GRAVEL (SM), very loose, moist, brown with orange mottling, fine to coarse sand, fine to coarse rounded gravel, trace rootlets.	▲ 3	5
		0 2 1		3in.	18	S-3			▲ 3	
15	10	1 0 1		9in.	18	S-4 GS, WC		grades to orange-brown to gray-green, subrounded to rounded sand, pockets of sandy lean clay	▲ 1 ✖ 29 ●	10
10	15	0 0 0		8in.	18	S-5 PP, TV		SANDY ORGANIC SILT (OL), trace fine rounded gravel, very soft, wet, gray to brown, some layering with wood debris. [ALLUVIUM]	▲ 0	15
				19.5in.	21	U-6		(PP = 0.25 tsf, TV = 0.05 tsf)		
5	20	1 1 1		12in.	18	S-7 WC		PEAT (PT), very soft, wet, dark brown, wood debris and pieces of wood (2- to 3-inches thick).	▲ 2 ● 309.3	20
		8 2 4		8in.	18	S-8 AL, GS, WC		GRAVELLY ORGANIC SILT WITH SAND (OH), medium stiff, wet, gray to brown, fine to coarse sand stratified with layers of fine to coarse silty sand (1- to 2-inch thick), micaceous, wood debris.	▲ 6 ● 61 ● 52.1	
0	25	1 1 2		18in.	18	S-9 AL, PP, TV, WC		SILT (ML), trace fine sand, soft, wet, blue-gray, micaceous.	▲ 3	25
				19.5in.	20	U-10		(PP = 1.5-1.75 tsf, TV = 0.45 tsf)		
		2 5 40		18in.	18	S-11a S-11b		SANDY ELASTIC SILT (MH), medium stiff, wet, red-brown to brown, fine to medium sand, micaceous. SILTY GRAVEL (GM), dense, red-brown to orange, fine to coarse subrounded to rounded sand and gravel, stratified. [WEATHERED SANDSTONE]	▲ 45	
-5	30	35 21 16		15in.	18	S-12		moderate cementation	▲ 37	30
-10	35	18 18 19		18in.	18	S-13		grades to orange, stratified with occasional layers of clayey sand	▲ 37	35
								Bottom of Borehole at 36.5 feet.		

General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HALEY ALDRICH

Project: Aberdeen School District - McDermoth Elementary
Location: Aberdeen, Washington
Project No.: 0210748-000

Boring Log
MDB-1

Figure **A-2**
Sheet **1 of 1**

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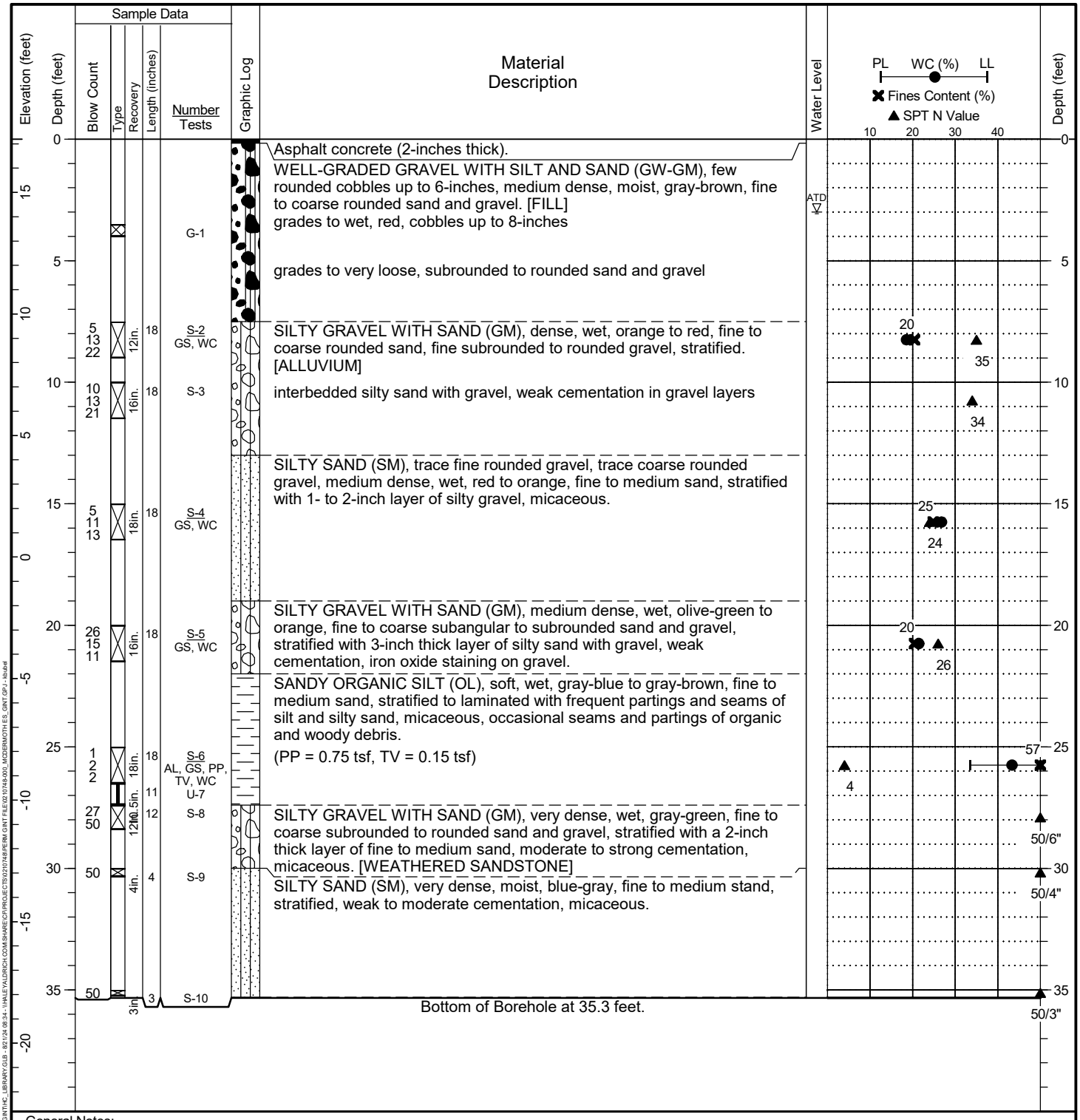
Date Started: 06/07/2024	Date Completed: 06/07/2024	Drilling Contractor/Crew: Western States Soil Conservation, Inc. / Ty/Juan	
Logged by: D. Knapp	Checked by: M. Hintz	Drilling Method: Mud Rotary	
Location: Lat: 46.977033 Long: -123.823677 (WGS 84)		Rig Model/Type: GeoProbe® 7822DT / Track-mounted drill rig	
Ground Surface Elevation: 17.19 feet (NAVD 88)		Hammer Type: Auto-hammer	
Comments: Hand augered to 5 ft bgs.		Hammer Weight (pounds): 140	Hammer Drop Height (inches): 30
		Measured Hammer Efficiency (%): 74.6	
		Hole Diameter: 3.875 inches	Well Casing Diameter: NA
		Total Depth: 35.3 feet	Depth to Groundwater: 3 feet



General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HALEY ALDRICH	Project: Aberdeen School District - McDermoth Elementary Location: Aberdeen, Washington Project No.: 0210748-000	Boring Log **MDB-2**	Figure **A-3** Sheet **1 of 1**

HA BORING LOG - \\HALEYALDRICH.COM\SHARE\SEA_DATA\GINT\HC_LIBRARY.GLB - 8/21/24 08:34 - \\HALEYALDRICH.COM\SHARE\CORPROJECTS\210748\PERM\GINT FILE\210748-000_MCDERMOTH ES_GINT.GPJ - kbuhl

Date Started: 06/07/2024	Date Completed: 06/07/2024	Drilling Contractor/Crew: Western States Soil Conservation, Inc. / Ty/Juan	
Logged by: D. Knapp	Checked by: M. Hintz	Drilling Method: Mud Rotary	
Location: Lat: 46.977097 Long: -123.824286 (WGS 84)		Rig Model/Type: GeoProbe® 7822DT / Track-mounted drill rig	
Ground Surface Elevation: 19.62 feet (NAVD 88)		Hammer Type: Auto-hammer	
Comments: Hand augered to 5 ft bgs.		Hammer Weight (pounds): 140	Hammer Drop Height (inches): 30
		Measured Hammer Efficiency (%): 74.6	
		Hole Diameter: 3.875 inches	Well Casing Diameter: NA
		Total Depth: 31.3 feet	Depth to Groundwater: Not Identified

Elevation (feet)	Depth (feet)	Sample Data: Blow Count	Type	Recovery	Length (inches)	Number / Tests	Graphic Log	Material Description	WC (%) ● / Fines Content (%) ✖ / SPT N Value ▲	Depth (feet)
	0							Topsoil (4-inches thick).		0
						G-1		SANDY SILT (ML), very soft, moist, brown, fine sand, numerous organics (rootlet). [FILL/SUBSOIL]		
						G-2		SANDY SILT (ML), very soft, wet, orange to light brown, fine sand, micaceous. [ALLUVIUM]		
15	5	0 0 0		0in.	18	G-3 S-4			▲ 0	5
				24in.	24	U-5		grades to gray		
		0 0 0		0in.	18	S-6			▲ 0	
10	10									10
								PEAT (PT), soft, moist, brown, wood debris.		
		0 1 1		2in.	18	S-7 WC			▲ 2 ● 266.0	
5	15			0in.	24	U-8				15
		4 5 5		12in.	18	S-9 GS, WC		SILTY SAND (SM), loose, moist, blue-gray, fine to medium sand, trace coarse sand, micaceous, trace organic debris throughout.	▲ 10 ● ✖ 37	
0	20	2 3 3		18in.	18	S-10 GS, PP, TV, WC		(PP = 1.5 tsf, TV = 0.5 tsf)	▲ 6 ● ✖ 39	20
-5	25	12 17 39		17in.	18	S-11		SILTY SAND WITH GRAVEL (SM), very dense, wet, blue-gray to gray, fine to coarse sand, fine subangular gravel, trace coarse gravel, matrix supported, well-graded. [WEATHERED BEDROCK]	▲ 56	25
-10	30	15 26 50		0in.	15	S-12		SILTY GRAVEL WITH SAND (GM), very dense, wet, gray-brown, fine to coarse subrounded to subangular sand and gravel.	▲ 76/9"	30
-15	35							Bottom of Borehole at 31.3 feet.		35
-20										

WC (%) ● Fines Content (%) ✖ SPT N Value ▲ — 10 20 30 40

General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HALEY ALDRICH

Project: Aberdeen School District - McDermoth Elementary
Location: Aberdeen, Washington
Project No.: 0210748-000

Boring Log
MDB-3

Figure **A-4**
Sheet **1 of 1**

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APPENDIX B
Laboratory Test Results

APPENDIX B

Laboratory Testing

Soil samples obtained from the explorations were transported to Haley & Aldrich, Inc.'s laboratory and evaluated to confirm or modify field classifications, as well as to assess engineering properties of the soils encountered. Representative samples were selected for laboratory testing and transported to our geotechnical laboratory in Portland, Oregon. The tests were performed in general accordance with the test methods of ASTM International (ASTM) or other applicable procedures. One sample was submitted to CERCO Analytical, Inc. for corrosivity testing. A summary of the test results is included as Figure B-1.

Visual Classifications

Soil samples obtained from the explorations were visually classified in the field and in our geotechnical laboratory based on the Unified Soil Classification System and ASTM classification methods. ASTM Test Method D 2488 was used to classify soils using visual and manual methods. ASTM Test Method D 2487 was used to classify soils based on laboratory test results.

Laboratory Test Results

Moisture Content

Moisture contents of samples were obtained in general accordance with ASTM Test Method D 2216. The results of the moisture content tests completed on samples from the explorations are presented on the exploration logs included in Appendix A and on Figure B-1 in this appendix.

Atterberg Limits Testing

Atterberg limits (liquid limit, plastic limit, and plasticity index) of fine-grained soil samples were obtained in general accordance with ASTM Test Method D 4318. The results of the Atterberg Limits tests are presented on the exploration logs included in Appendix A, summarized on Figure B-1 in this appendix, and shown in detail on Figure B-2 in this appendix.

Particle Size Distribution

Sieve analysis tests were performed to determine the quantitative distribution of particle sizes in the sample. The tests were performed in general accordance with ASTM Test Method D 6913. The "percent fines" portions of the test results are indicated on the appropriate exploration logs included in Appendix A and on Figure B-1 in this appendix. The full test results are shown on Figure B-3 in this appendix.

Corrosivity Testing

One corrosivity test suite was performed on a sample collected from boring MDB-3. The test suites included testing for pH, redox, chloride, sulfate, and electrical resistivity. The results of the test are presented on the final sheet of this appendix.

Exploration	Sample ID	Depth	Gravel (%)	Sand (%)	Fines (%)	Liquid Limit	Plastic Limit	Water Content (%)	USCS Group Symbol	Soil Description
MDB-1	G-1	2.0								
MDB-1	S-2	5.0								
MDB-1	S-3	7.5								
MDB-1	S-4	10.0	24.7	46.8	28.5			42	SM	SILTY SAND WITH GRAVEL
MDB-1	S-5	15.0								
MDB-1	U-6	16.5								
MDB-1	S-7	18.3						309		
MDB-1	S-8	20.0	21.5	17.1	61.4	59	32	52	OH	GRAVELLY ORGANIC SILT WITH SAND
MDB-1	S-9	25.0				48	34	40	ML	SILT
MDB-1	U-10	26.5								
MDB-1	S-11a	28.1								
MDB-1	S-11b	29.3								
MDB-1	S-12	30.0								
MDB-1	S-13	35.0								
MDB-2	G-1	3.5								
MDB-2	S-2	7.5	42.1	37.4	20.4			19	GM	SILTY GRAVEL WITH SAND
MDB-2	S-3	10.0								
MDB-2	S-4	15.0	10.5	64.7	24.8			27	SM	SILTY SAND
MDB-2	S-5	20.0	41.1	38.5	20.4			21	GM	SILTY GRAVEL WITH SAND
MDB-2	S-6	25.0	0.0	43.3	56.7	50	34	43	OL	SANDY ORGANIC SILT
MDB-2	U-7	26.5								
MDB-2	S-8	27.4								
MDB-2	S-9	30.0								
MDB-2	S-10	35.0								
MDB-3	G-1	1.0								
MDB-3	G-2	3.0								
MDB-3	G-3	4.5								
MDB-3	S-4	5.0								
MDB-3	U-5	6.5								
MDB-3	S-6	8.5								
MDB-3	S-7	12.5						266		
MDB-3	U-8	15.0								
MDB-3	S-9	17.5	0.0	63.3	36.7			26	SM	SILTY SAND
MDB-3	S-10	20.0	0.0	60.8	39.2			30	SM	SILTY SAND
MDB-3	S-11	25.0								
MDB-3	S-12	30.0								

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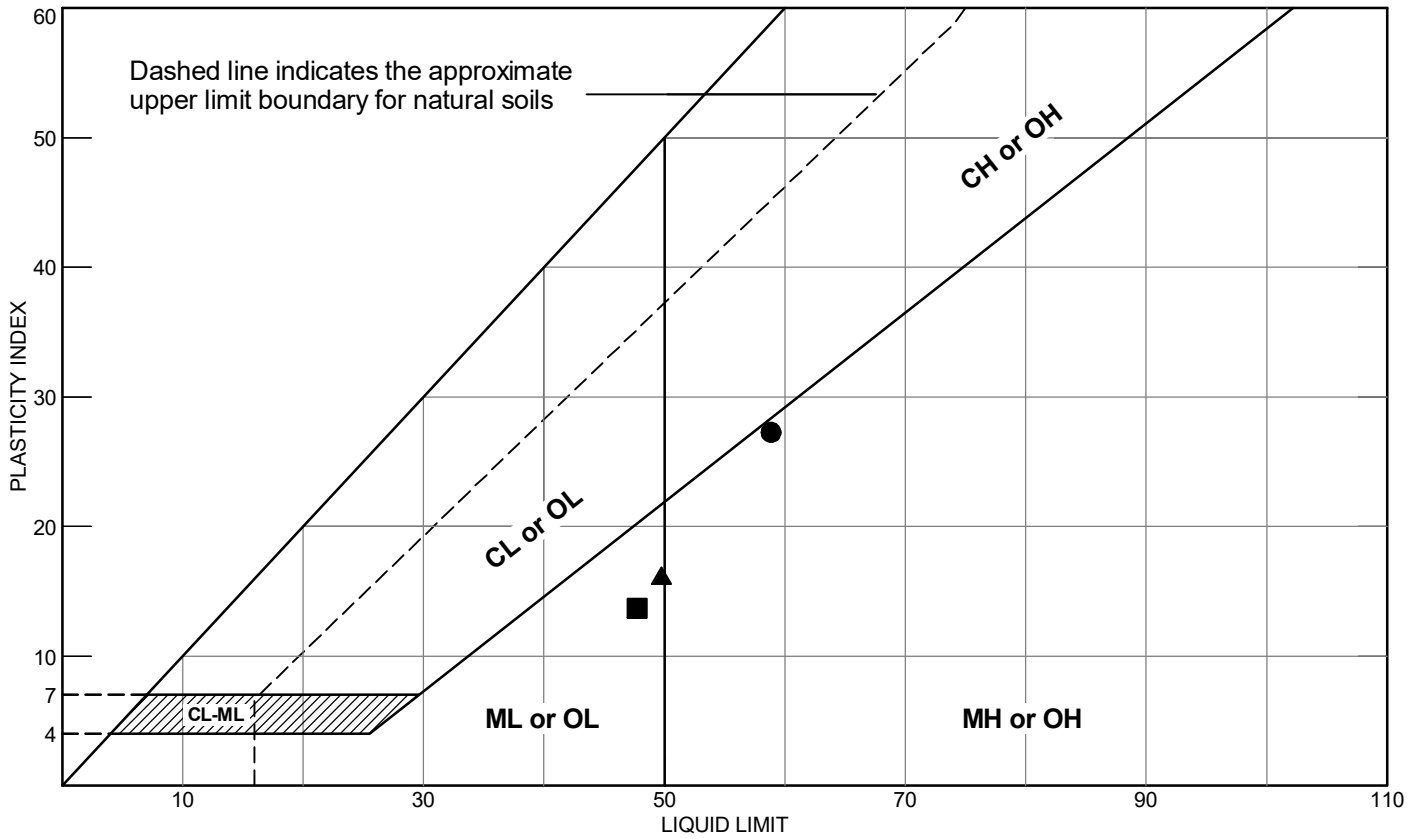

Location and Description	LL	PL	PI	-#200	MC%	USCS
● **Source:** MDB-1 **Sample No.:** S-8 **Depth:** 20.0 to 21.5 GRAVELLY ORGANIC SILT WITH SAND	59	32	27	61	52	OH
■ **Source:** MDB-1 **Sample No.:** S-9 **Depth:** 25.0 to 26.5 SILT	48	34	14	NT	40	ML
▲ **Source:** MDB-2 **Sample No.:** S-6 **Depth:** 25.0 to 26.5 SANDY ORGANIC SILT	50	34	16	57	43	OL

Remarks:

●

■

▲

HALEY ALDRICH	Project: Aberdeen School District - McDermoth Elementary Location: Aberdeen, Washington Project No.: 0210748-000	**Liquid Limit, Plastic Limit, and Plasticity Index**	Figure **B-2** Sheet **1 of 1**

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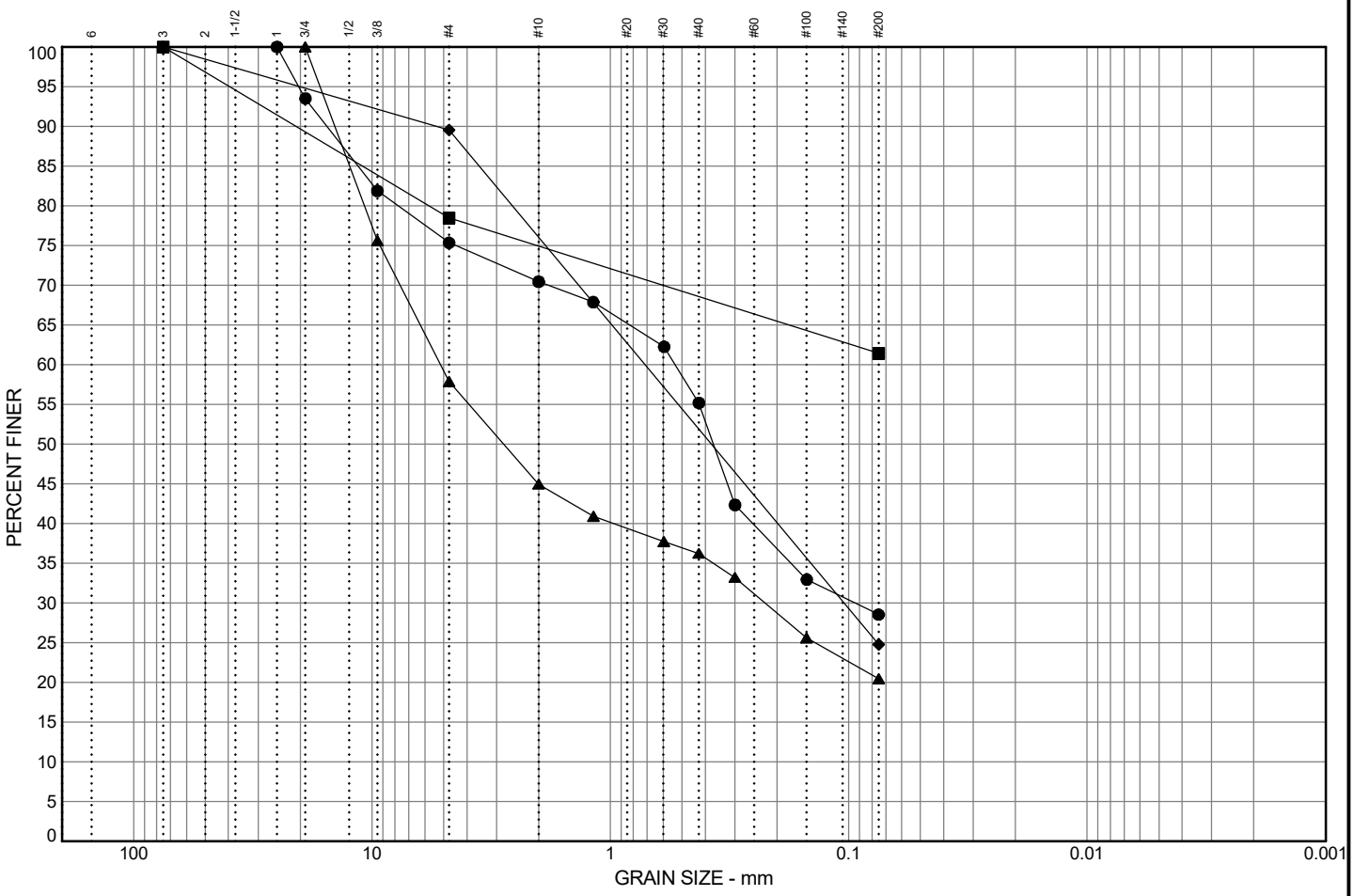

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Location and Description	% Cobbles	% Gravel	% Sand	% Silt	% Clay	MC%	USCS
● **Source:** MDB-1 **Sample No.:** S-4 **Depth:** 10.0 to 11.5 SILTY SAND WITH GRAVEL	0.0	24.7	46.8	28.5		42	SM
■ **Source:** MDB-1 **Sample No.:** S-8 **Depth:** 20.0 to 21.5 GRAVELLY ORGANIC SILT WITH SAND	0.0	21.5	17.1	61.4		52	OH
▲ **Source:** MDB-2 **Sample No.:** S-2 **Depth:** 7.5 to 9.0 SILTY GRAVEL WITH SAND	0.0	42.1	37.4	20.4		19	GM
◆ **Source:** MDB-2 **Sample No.:** S-4 **Depth:** 15.0 to 16.5 SILTY SAND	0.0	10.5	64.7	24.8		27	SM

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			11.445	0.535	0.369	0.095				
■	59	27	10.947							
▲			12.408	5.164	2.804	0.224				
◆			3.557	0.716	0.377	0.105				

Remarks:

● ■ ▲ ◆

HALEY ALDRICH

Project: Aberdeen School District - McDermoth Elementary
Location: Aberdeen, Washington
Project No.: 0210748-000

Particle-Size Analysis

Figure **B-3**
Sheet **1 of 2**

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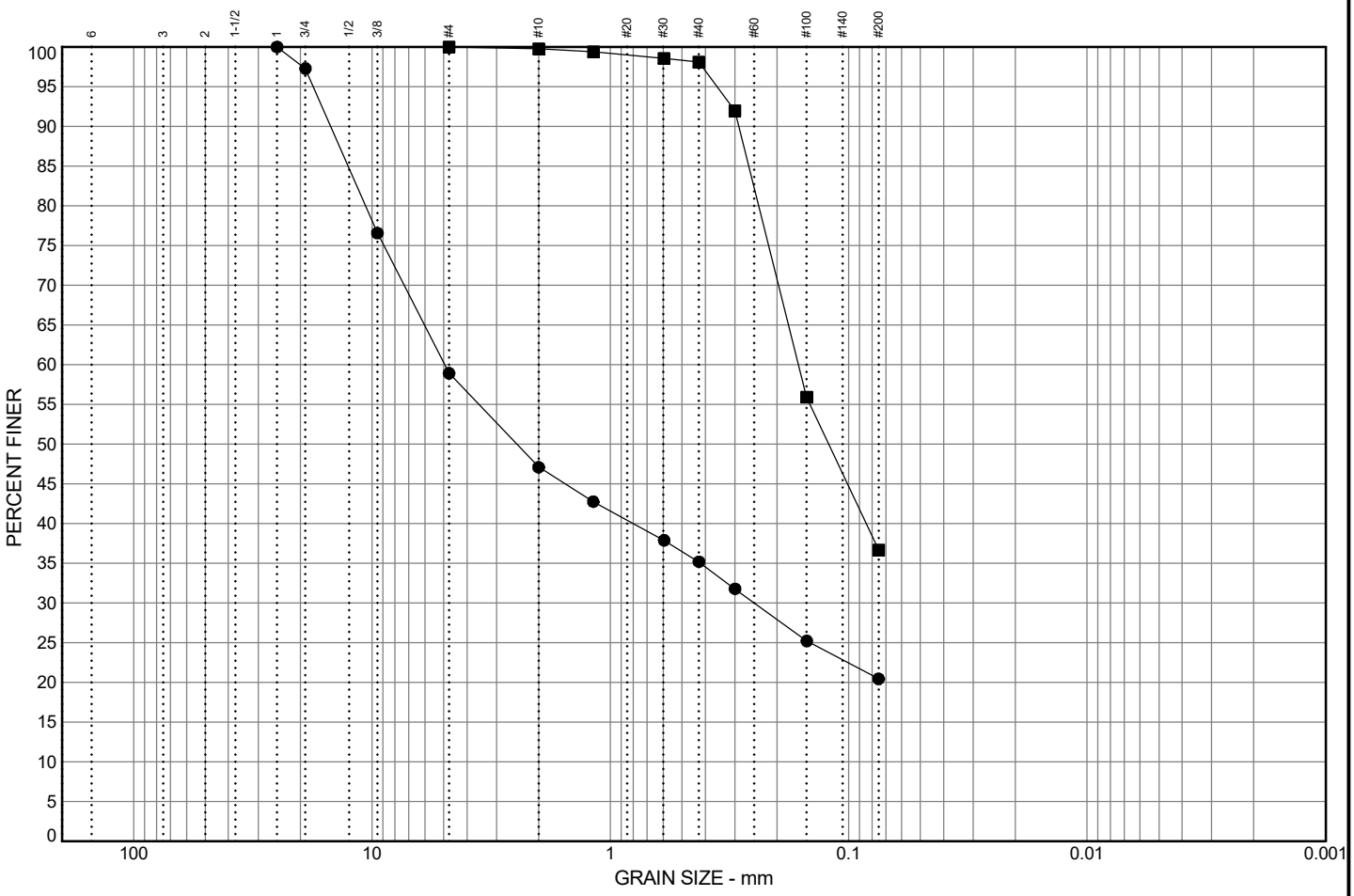

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Location and Description	% Cobbles	% Gravel	% Sand	% Silt	% Clay	MC%	USCS
● **Source:** MDB-2 **Sample No.:** S-5 **Depth:** 20.0 to 21.5 SILTY GRAVEL WITH SAND	0.0	41.1	38.5	20.4		21	GM
■ **Source:** MDB-3 **Sample No.:** S-9 **Depth:** 17.5 to 19.0 SILTY SAND	0.0	0.0	63.3	36.7		26	SM

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			12.598	4.956	2.475	0.249				
■			0.262	0.162	0.121					

Remarks:

●

■

HALEY ALDRICH

Project: Aberdeen School District - McDermoth Elementary
Location: Aberdeen, Washington
Project No.: 0210748-000

Particle-Size Analysis

Figure **B-3**
Sheet **2 of 2**

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CERCO analytical
1100 Willow Pass Court, Suite A
Concord, CA 94520-1006
925 462 2771 Fax. 925 462 2775
www.cercoanalytical.com

15 July, 2024

Job No. 2407012
Cust. No. 13349

Mr. Micah Hintz
Haley & Aldrich
6420 S. Macadam Avenue, Suite 100
Portland, OR 97239

Subject: Project No.: 0210746-000
Project Name: Aberdeen School District
Corrosivity Analysis –ASTM Test Methods

Dear Mr. Hintz:

Pursuant to your request, CERCO Analytical has analyzed the soil samples submitted on July 08, 2024. Based on the analytical results, this brief corrosivity evaluation is enclosed for your consideration.

Based upon the resistivity measurements, Sample No.003 is classified as "moderately corrosive". Samples No. 001 and No. 002 are classified as "mildly corrosive". All buried iron, steel, cast iron, ductile iron, galvanized steel and dielectric coated steel or iron should be properly protected against corrosion depending upon the critical nature of the structure. All buried metallic pressure piping such as ductile iron firewater pipelines should be protected against corrosion.

The chloride ion concentrations reflect none detected with a reporting limit of 15 mg/kg.

The sulfate ion concentrations reflect none detected with a reporting limit of 15 mg/kg.

The pH of the soils ranged from 5.36 to 6.29, which does present corrosion problems for buried iron, steel, mortar-coated steel and reinforced concrete structures. Therefore, corrosion prevention measures need to be considered for structures to be placed in this acidic soil.

The redox potentials range from 310-mV to 320-mV and are indicative of potentially "slightly corrosive" soils resulting from anaerobic soil conditions.

This corrosivity evaluation is based on general corrosion engineering standards and is non-specific in nature. For specific long-term corrosion control design recommendations or consultation, please call *JDH Corrosion Consultants, Inc. at (925) 927-6630.*

We appreciate the opportunity of working with you on this project. If you have any questions, or if you require further information, please do not hesitate to contact us.

Very truly yours,
CERCO ANALYTICAL, INC.

J. Darby Howard, Jr., P.E.
President

JDH/jdl
Enclosure

CERCO analytical
1100 Willow Pass Court, Suite A
Concord, CA 94520-1006
925 462 2771 Fax. 925 462 2775
www.cercoanalytical.com

Client: Haley & Aldrich, Inc.
Client's Project No.: 0210746-000
Client's Project Name: Aberdeen School District
Date Sampled: 4-Jun-24, 6-Jun-24, & 7-Jun-24
Date Received: 8-Jul-24
Matrix: Soil
Authorization: Signed Chain of Custody

Date of Report: 15-Jul-2024

Job/Sample No.	Sample I.D.	Redox (mV)	pH	Conductivity (umhos/cm)*	Resistivity (100% Saturation) (ohms-cm)	Sulfide (mg/kg)*	Chloride (mg/kg)*	Sulfate (mg/kg)*
[redacted]								
[redacted]								
2407012-003	MDB-3 / G-3 / 4.5-5'	310	6.29	-	7,800	-	N.D.	N.D.

Method:	ASTM D1498	ASTM D4972	ASTM D1125M	ASTM G57	ASTM D4658M	ASTM D4327	ASTM D4327
Reporting Limit:	-	-	10	-	50	15	15
Date Analyzed:	9-Jul-2024	9-Jul-2024		9-Jul-2024		9-Jul-2024	9-Jul-2024

* Results Reported on "As Received" Basis

N.D. - None Detected

Julia Clauson
Chemist

Quality Control Summary - All laboratory quality control parameters were found to be within established limits

APPENDIX C
MASW Report

PRESENTATION OF SITE INVESTIGATION RESULTS

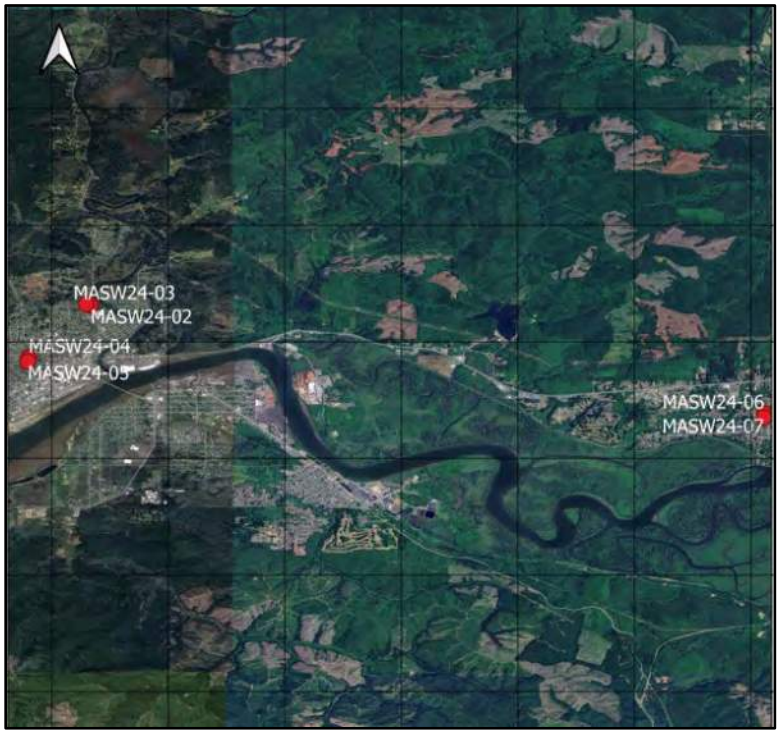
Aberdeen MASW

Prepared for:

Haley & Aldrich, Inc.

ConeTec Job No: 24-59-27777

Project Start Date: 06-June-2024
Project End Date: 07-June-2024
Report Date: 20-June-2024



Prepared by:

ConeTec Inc.
1237 S Director St.
Seattle, WA 98108
Tel: (253) 397-4861

ConeTecWA@conetec.com
www.conetec.com
www.conetecdataservices.com

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Introduction

The enclosed report presents the results of the geophysical site investigation program conducted by ConeTec, Inc. for Haley & Aldrich, Inc. at the Aberdeen MASW project in Aberdeen, Washington. The program consisted of six one-dimensional (1D) Multichannel Analysis of Surface Waves (MASW) tests to provide shear wave velocity (Vs) sounding and calculate time weighted average Vs of the upper 100 feet (Vs100) below grade. Please note that this report, which also includes all accompanying data, are subject to the 3rd Party Disclaimer and Client Disclaimer that follow in the 'Limitations' section of this report.

Project Information

Project	
Client	Haley & Aldrich, Inc.
Project	Aberdeen MASW
ConeTec project number	24-59-27777

Coordinates		
Test Type	Collection Method	Coordinate Reference System
MASW	Handheld GPS	WGS84 Lat long

MASW Equipment Used for this Project				
Seismograph(s)	Geophones	Coupling Mechanism	Trigger Style	Seismic Sources
Summit X One	25 x 4.5 Hz vertical	PVC pucks or spikes	Piezoelectric	Sledgehammer and plate, passive sources

MASW Data and Results

The data quality for this project was good. The main source of seismic noise was wind and was mitigated by taking multiple stacks to help improve signal to noise ratio. Co-centered arrays with 3-foot and 10-foot geophone spacing were used to provide a better resolved frequency spectrum. Dispersion curves from each array size were combined in post processing to create one dispersion curve for further analysis. In addition, passive seismic readings were collected to take advantage of low frequency seismic signals to increase the depth of investigation. Coherent surface wave energy in the 5 – 45 Hz band allowed the determination of 1D Vs models up to 110 feet deep.

Despite their proximity, MASW24-02 and MASW24-03 had significantly different Vs100 results. The thicker deposits of slow Vs material measured for MASW24-02 compared to MASW24-03 caused this discrepancy and could be the result of the survey area being located on more variable fluvial deposits. Slow velocity material with no coherent surface wave energy less than 7 Hz was observed on MASW24-05 resulting in a depth of investigation insufficient to calculate Vs100. This contrasted with the results collected for MASW24-04 which again suggest variable deposits in the survey area. A future 2D MASW survey would be recommended to delineate the Vs variations of the soil. The shear wave velocity results and Vs100 calculation tables are included in the appendices and digital release of this report. Examples of the raw time domain traces and overtone images are also included in the appendices of this report.

Closure

Thank you for the opportunity to work on this project. The equipment used and the field procedures followed complied with current accepted practice standards.

ConeTec Inc.

Limitations

3rd Party Disclaimer

This report titled “Aberdeen MASW”, referred to as the (“Report”), was prepared by ConeTec for Haley & Aldrich, Inc.. The Report is confidential and may not be distributed to or relied upon by any third parties without the express written consent of ConeTec. Any third parties gaining access to the Report do not acquire any rights as a result of such access. Any use which a third party makes of the Report, or any reliance on or decisions made based on it, are the responsibility of such third parties. ConeTec accepts no responsibility for loss, damage and/or expense, if any, suffered by any third parties as a result of decisions made, or actions taken or not taken, which are in any way based on, or related to, the Report or any portion(s) thereof.

Client Disclaimer

ConeTec was retained by Haley & Aldrich, Inc. to collect MASW readings (“Data”) for the purpose of measuring 1D Vs soundings and to calculate Vs100. The Data is included in this report titled “Aberdeen MASW” which is referred to as the (“Report”). ConeTec has collected and reported the Data in accordance with current industry standards. No other warranty, express or implied, with respect to the Data is made by ConeTec. In order to properly understand the Data included in the Report, reference must be made to the documents accompanying and other sources referenced in the Report in their entirety. Other than the Data, the contents of the Report should not be relied upon in any fashion without independent verification and ConeTec is in no way responsible for any loss, damage or expense resulting from the use of, and/or reliance on, such material by any party.

Multichannel analysis of surface waves (MASW) is a non-intrusive in-situ test that uses the principles of elasticity and surface wave dispersion to determine the variation of shear wave velocity with depth at a site. The observation that surface waves (Rayleigh waves) of different wavelengths propagate at different phase velocities in non-ideal media, is called dispersion. This is a direct result of the fact that surface waves of different wavelengths propagate along the surface to varying depths, and hence, if material stiffness changes with depth (as is the case with most non-ideal materials), then an appropriately selected wavelength band will reflect such changes in the velocity of propagation.

The field methods for surface wave testing are very similar to other surface seismic data collection methods. Surface geophones are placed in a linear array along a survey line at a known separation (typically one metre). A series of recordings (shots) are collected with a known in-line source offset from the array. Each shot gather is represented in the time-offset domain and shows the amplitude of wave propagation through the array (refer to Figure MASW-1). For detailed frequency analysis, multiple records with different shot offset distances are collected to help better define the broad spectrum frequency-phase velocity response of the medium. Two-dimensional cross sections can be collected by moving the geophone array a small distance (typically two meters) along the line and repeating the shots at set offsets.

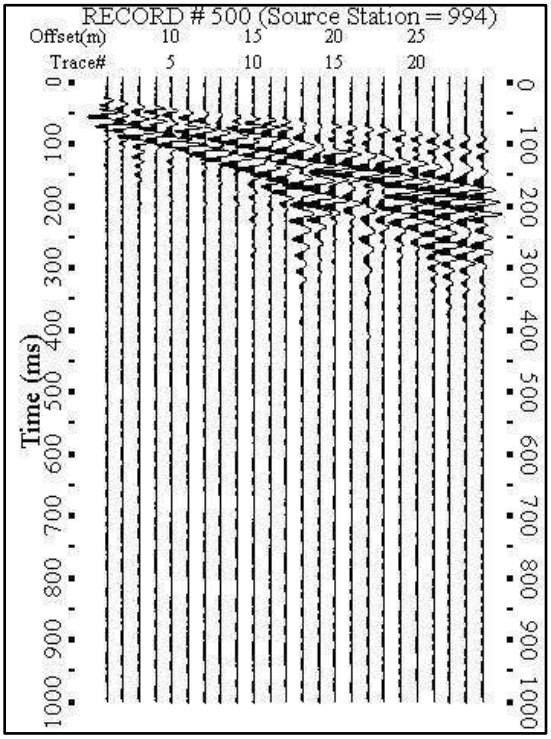


Figure MASW-1. Typical MASW time domain record (shot gather)

Given that surface wave velocity is closely related to the shear wave velocity and the wavelength related to depth, the surface wave results can be used to develop a profile of shear wave velocity versus depth through a process referred to as inversion. The program used to perform the inversion is SurfSeis 4.0, developed by the Kansas Geological Survey. In SurfSeis, the raw time domain traces are transformed to the frequency domain to create what is referred to as an overtone image as shown in Figure MASW-2. The overtone image displays the amplitude of the primary surface wave mode and any potential higher modes. A dispersion curve is fitted to the overtone image, and the inversion process is then used to

determine the most appropriate shear wave velocity profile. The parameters used for the inversion of the dispersion data are provided in the data release folder in an Excel table.

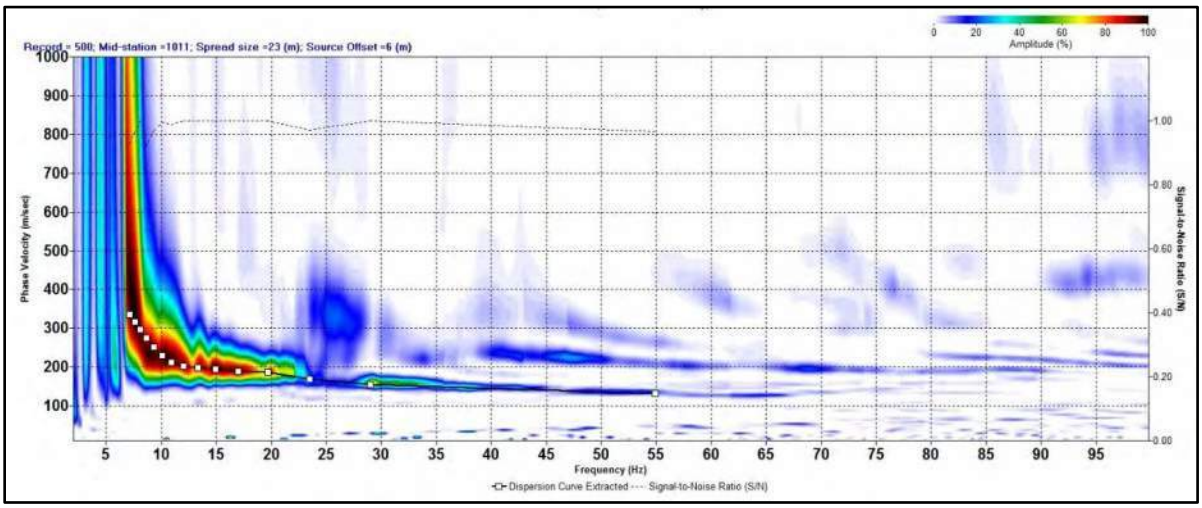


Figure MASW-2. Overtone image and a picked dispersion curve

For each test location, a 1D shear wave velocity profile comprising of a number of velocity layers of variable thickness (refer to Figure MASW-3) is provided . For 2D testing a series of 1D tests are combined to produce a shear wave velocity cross section.

The depth of investigation is related to the ground conditions and the amount of energy delivered by the surface wave source. The surface wave method uses Rayleigh waves that travel horizontally along the ground surface to a depth of about one wavelength. The actual depth of sampling of the ground is considered to be one-half to one-third of the Rayleigh (surface) wave wavelength. The wavelengths measured by the equipment will be a function of the frequency of the source and the velocity of the surface waves through the ground. As the depth of investigation increases, there will be less certainty in terms of layer boundaries and velocity values.

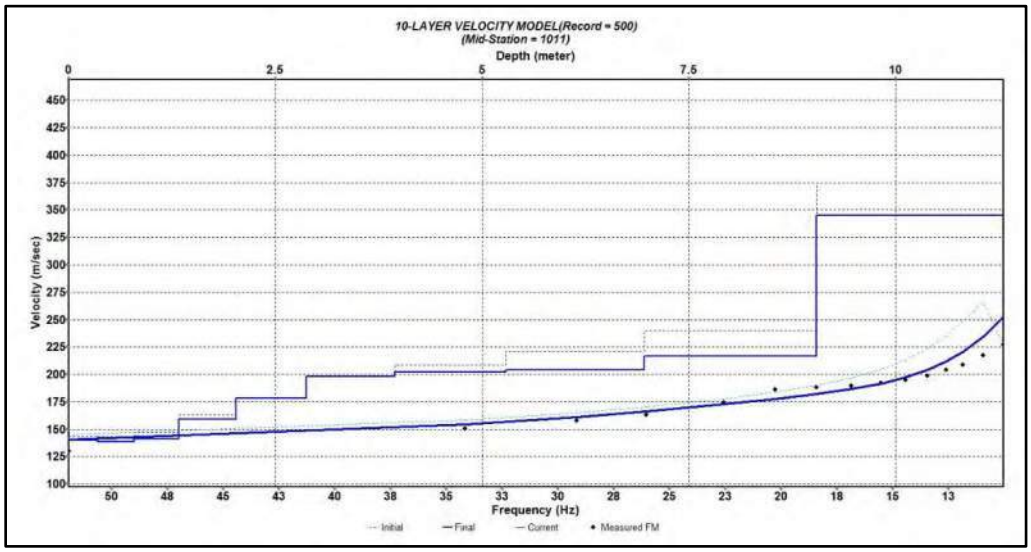


Figure MASW-3. 1D inversion result with fitted dispersion curve

The equipment, field procedures, and analysis software used by ConeTec all conform to the currently accepted best practices for MASW testing. The results of geophysical testing are always interpretative to a certain extent and should be confirmed by drilling or other intrusive testing.

References

Miller, R.D., Xia, J., Park, C.B., and Ivanov, J.M., 1999, Multichannel analysis of surface waves to map bedrock, Kansas Geological Survey, The Leading Edge, December, p. 1392-1396.

Park, C.B., Miller, R.D., and Xia, J., 1998b, Ground roll as a tool to image near-surface anomaly: 68th Ann. Internat. Mtg. Soc. Expl.Geophys., Expanded Abstracts, p. 874-877.

Park, C.B., Miller, R.D., and Xia, J., 1999, Multichannel analysis of surface waves: Geophysics, v. 64, n. 3, pp. 800-808.

Park, C.B., Miller, R.D., Xia, J., and Ivanov, J., 2007, Multichannel analysis of surface waves (MASW)-active and passive methods: The Leading Edge, January.

SurfSeis website: http://www.kgs.ku.edu/software/surfseis/index.html

Xia, J., R.D. Miller, and C.B. Park, 2000a, Advantages of calculating shear-wave velocity from surface waves with higher modes: [Exp. Abs.]: Soc. Expl. Geophys., p. 1295-1298.

Xia, J., Miller, R.D., Park, C.B., and Ivanov, J., 2000b, Construction of 2-D vertical shear-wave velocity field by the Multichannel Analysis of Surface Wave technique, Proceedings of the Symposium on the Application of Geophysics to Engineering and Environmental Problems (SAGEEP 2000), Washington D.C, February 20-24, p. 1197-1206.

The following appendices listed below are included in the report:

- 1D MASW Summary and Maps
- 1D MASW Results
- Vs100 Calculation Tables
- MASW Time Domain Traces and Overtone Images

1D MASW Summary and Maps

CONETEC

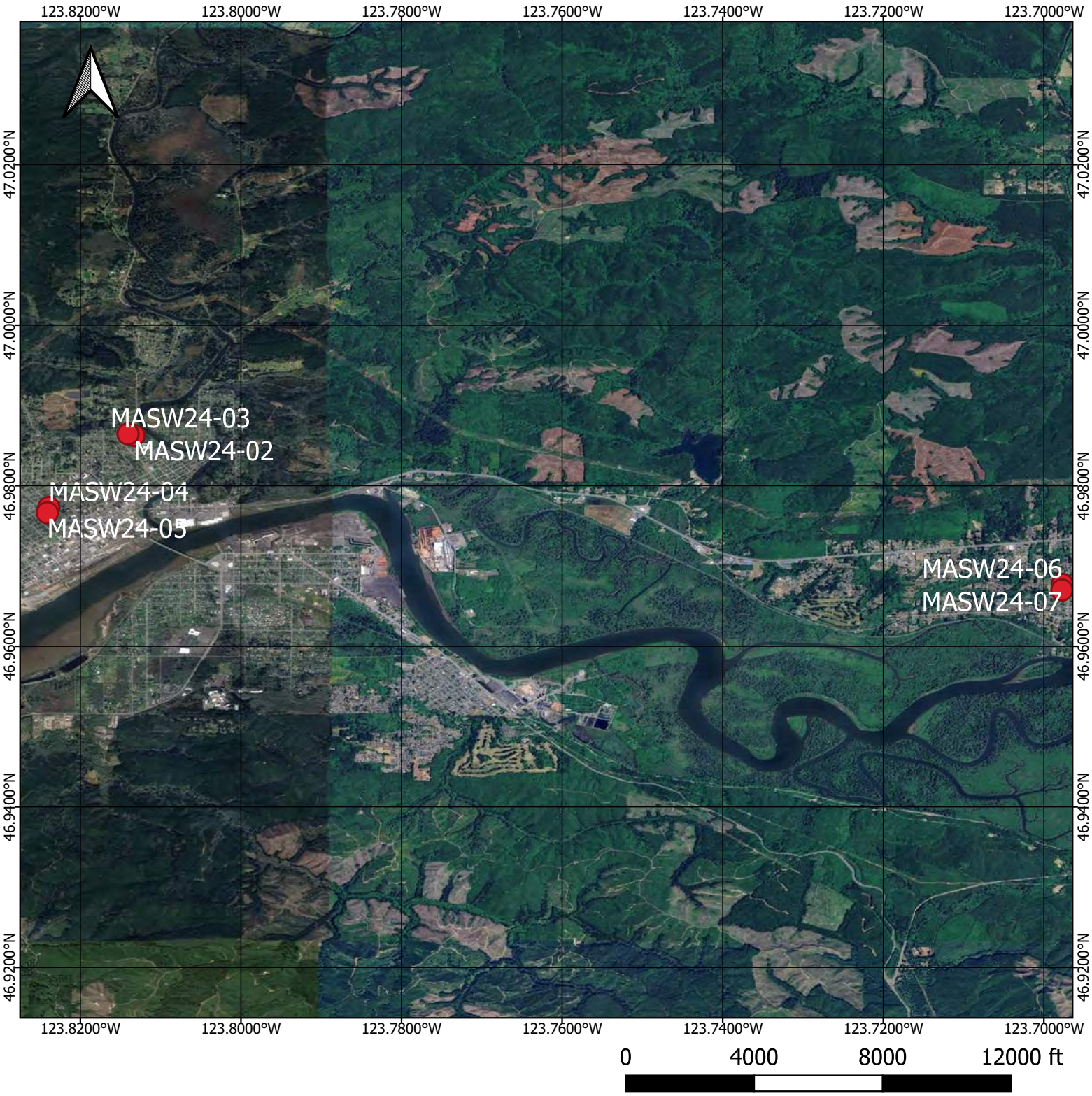
Job No:	24-59-27777
Client:	Haley & Aldrich, Inc.
Project:	Aberdeen MASW
Start Date:	06-Jun-2024
End Date:	07-Jun-2024

1D MASW TEST SUMMARY

Sounding ID	Date	Seismic Source	Geophone Spacing (ft)	Array Length (ft)	Northing[1] (decimal deg)	Easting (decimal deg)	Refer to Notation Number
MASW24-02	06-Jun-2024	Sledgehammer	10, 3	240, 72	46.9863	-123.8133	
MASW24-03	06-Jun-2024	Sledgehammer	10, 3	240, 72	46.9865	-123.8141	
MASW24-04	06-Jun-2024	Sledgehammer	10, 3	240, 72	46.9773	-123.8239	
MASW24-05	07-Jun-2024	Sledgehammer	10, 3	240, 72	46.9766	-123.8241	
MASW24-06	07-Jun-2024	Sledgehammer	10, 3	240, 72	46.9677	-123.6977	
MASW24-07	07-Jun-2024	Sledgehammer	10, 3	240, 72	46.9670	-123.6978	

1. Coordinates were recorded with a handheld GPS in WGS84 lat/long

Aberdeen MASW - MASW Survey Overview Map



Legend

- MASW Location
- MASW Arrays

ConeTec Job Number: 24-59-27777
Survey Date(s): 06-June-2024- 07-June-2024
Coordinate Reference System: WGS84 Lat Long
Map Scale: 1:35000
Units: Decimal degrees
Imagery Source: Google Earth

CONETEC

Aberdeen MASW - Robert Gray Elementary Map



Legend

- MASW Location
- MASW Arrays

ConeTec Job Number: 24-59-27777
Survey Date(s): 06-June-2024- 07-June-2024
Coordinate Reference System: WGS84 Lat Long
Map Scale: 1:1000
Units: Decimal degrees
Imagery Source: Google Earth

CONETEC

Aberdeen MASW - Mc Dermoth Elementary Map



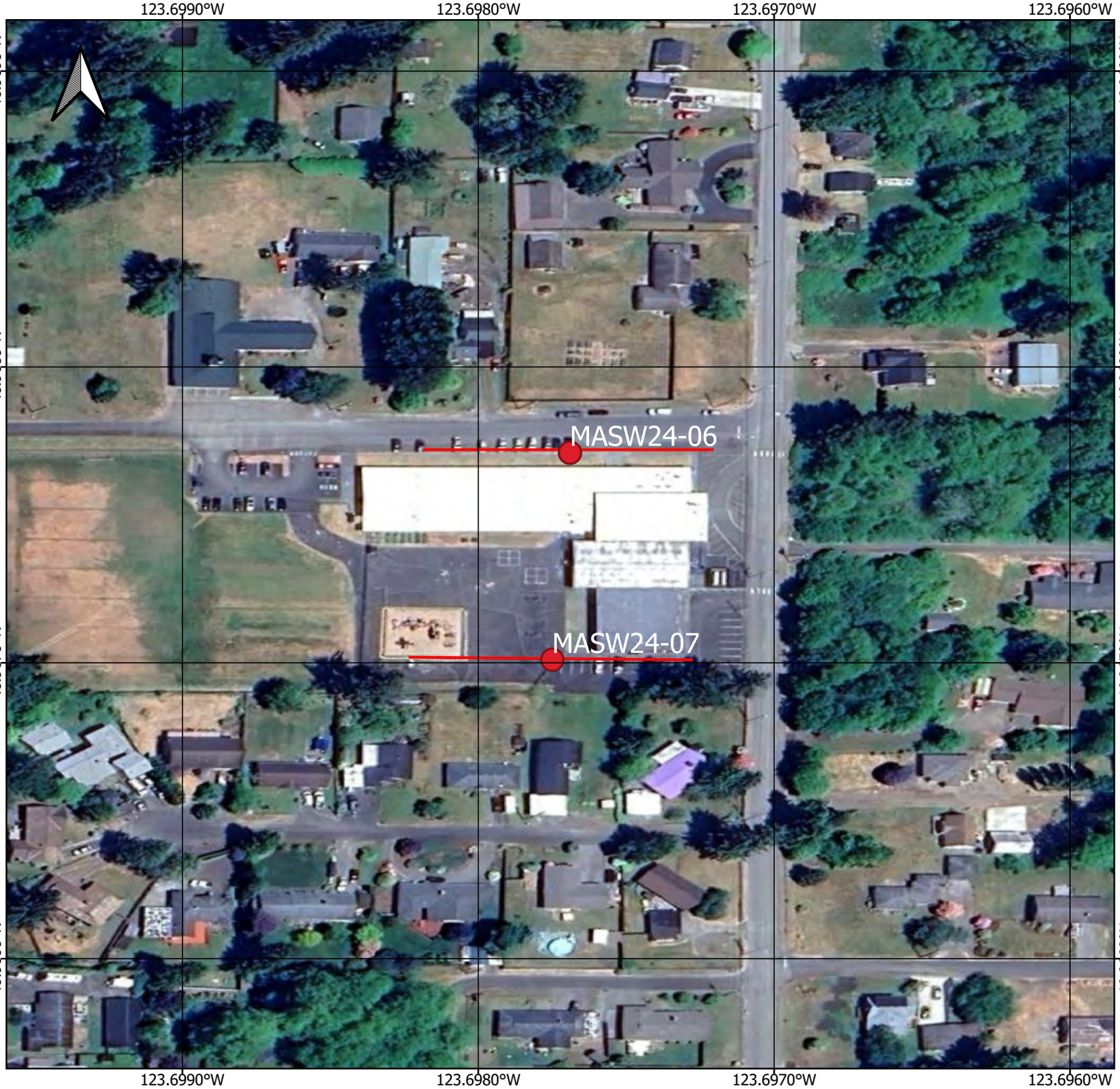
Legend

- MASW Location
- MASW Arrays

ConeTec Job Number: 24-59-27777
Survey Date(s): 06-June-2024- 07-June-2024
Coordinate Reference System: WGS84 Lat Long
Map Scale: 1:1000
Units: Decimal degrees
Imagery Source: Google Earth

CONETEC

Aberdeen MASW - Central Park Elementary Map



Legend

- MASW Location
- MASW Arrays

ConeTec Job Number: 24-59-27777
Survey Date(s): 06-June-2024- 07-June-2024
Coordinate Reference System: WGS84 Lat Long
Map Scale: 1:1000
Units: Decimal degrees
Imagery Source: Google Earth

CONETEC

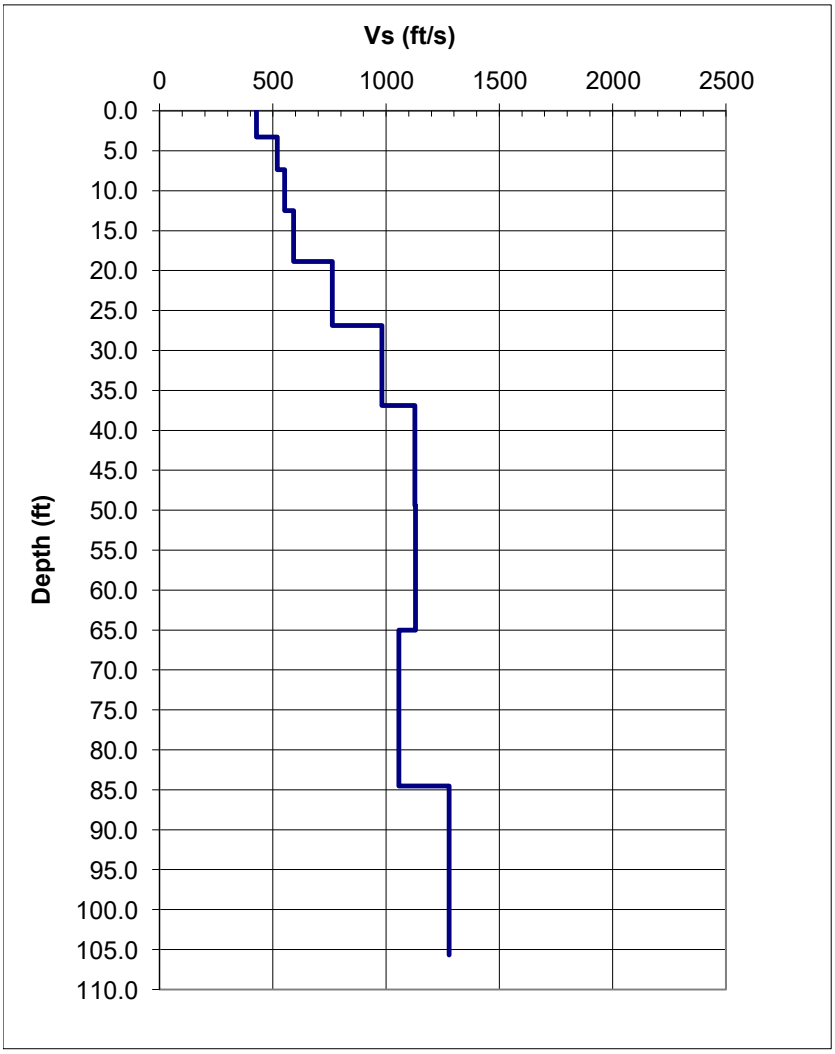
1D MASW Results

CONETEC

Job No:	24-59-27777
Client:	Haley & Aldrich, Inc.
Project:	Aberdeen MASW
Sounding ID:	MASW24-02
Date:	06-Jun-2024

1D MASW SHEAR WAVE VELOCITY TEST RESULTS

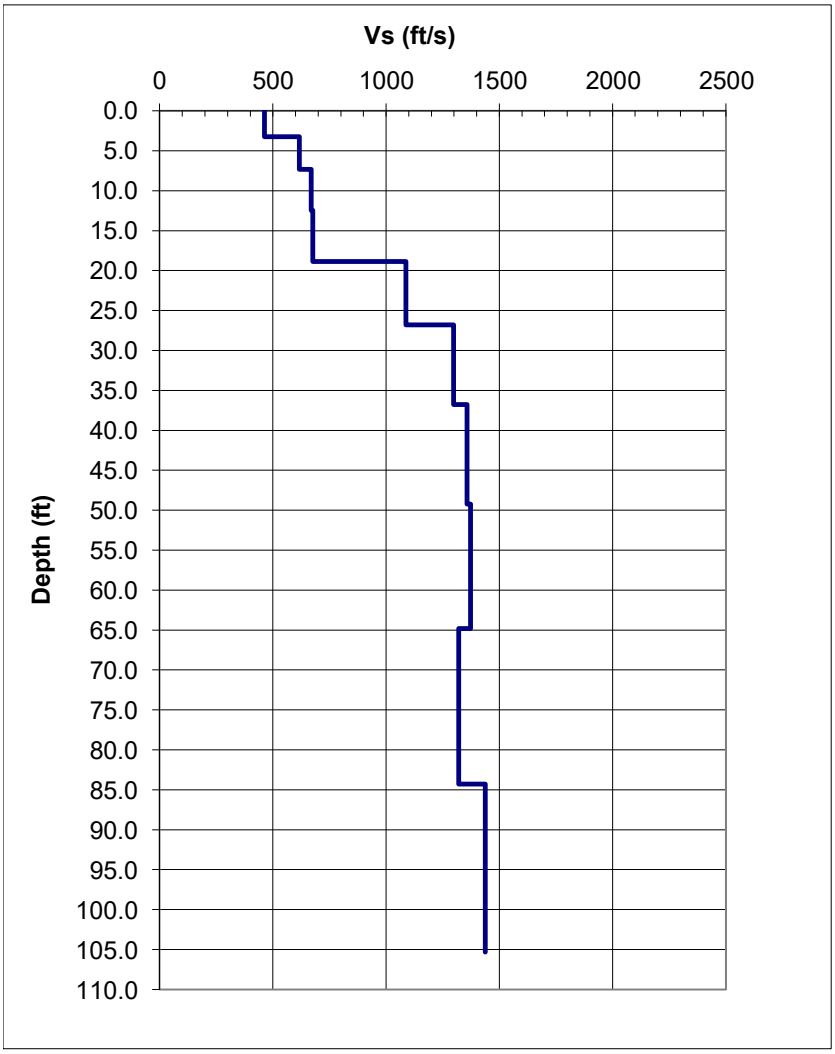
Layer	Layer Thickness (ft)	Depth of Bottom of Layer (ft)	Vs (ft/s)
1	3.3	3.3	428
2	4.1	7.4	520
3	5.1	12.5	553
4	6.4	18.9	591
5	8.0	26.9	763
6	10.0	36.9	981
7	12.5	49.4	1127
8	15.6	65.0	1130
9	19.5	84.5	1056
10	21.1	105.7	1278



Job No:	24-59-27777
Client:	Haley & Aldrich, Inc.
Project:	Aberdeen MASW
Sounding ID:	MASW24-03
Date:	06-Jun-2024

1D MASW SHEAR WAVE VELOCITY TEST RESULTS

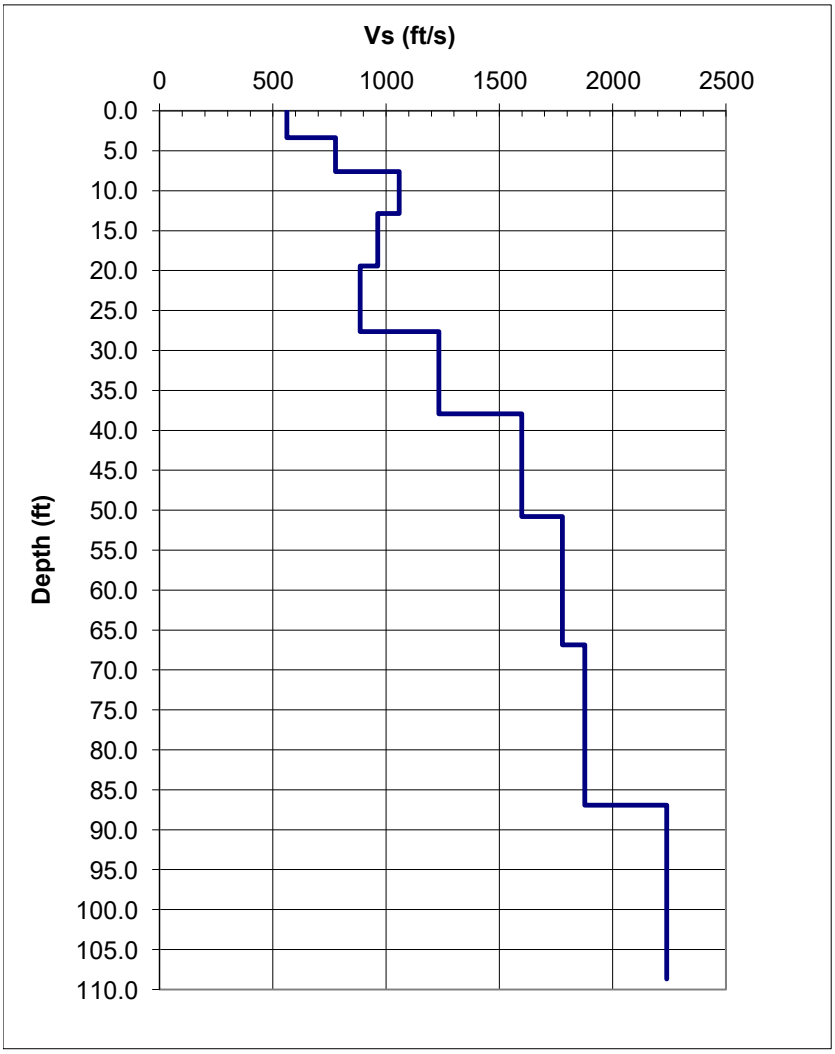
Layer	Layer Thickness (ft)	Depth of Bottom of Layer (ft)	Vs (ft/s)
1	3.3	3.3	463
2	4.1	7.3	616
3	5.1	12.5	669
4	6.4	18.8	676
5	8.0	26.8	1088
6	10.0	36.8	1298
7	12.5	49.2	1358
8	15.6	64.8	1374
9	19.5	84.3	1320
10	21.1	105.3	1438



Job No:	24-59-27777
Client:	Haley & Aldrich, Inc.
Project:	Aberdeen MASW
Sounding ID:	MASW24-04
Date:	06-Jun-2024

1D MASW SHEAR WAVE VELOCITY TEST RESULTS

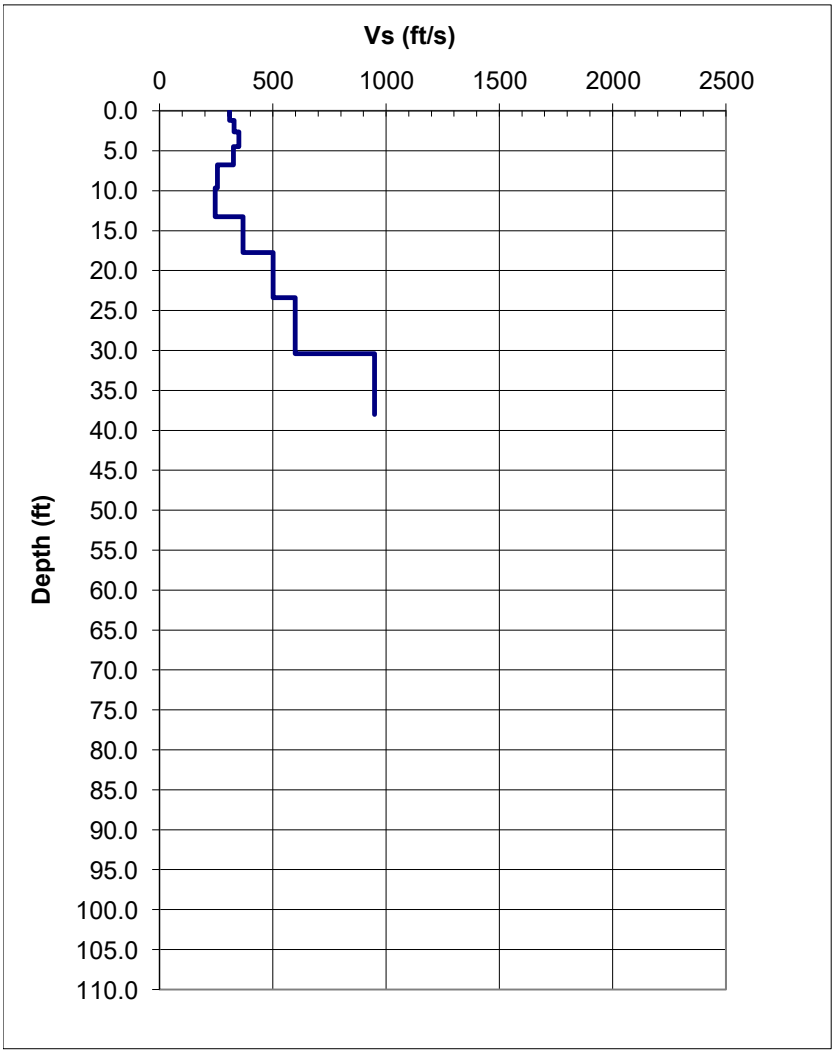
Layer	Layer Thickness (ft)	Depth of Bottom of Layer (ft)	Vs (ft/s)
1	3.4	3.4	562
2	4.2	7.6	777
3	5.3	12.8	1059
4	6.6	19.4	963
5	8.2	27.7	885
6	10.3	37.9	1232
7	12.9	50.8	1599
8	16.1	66.9	1778
9	20.1	86.9	1877
10	21.7	108.7	2238



Job No:	24-59-27777
Client:	Haley & Aldrich, Inc.
Project:	Aberdeen MASW
Sounding ID:	MASW24-05
Date:	07-Jun-2024

1D MASW SHEAR WAVE VELOCITY TEST RESULTS

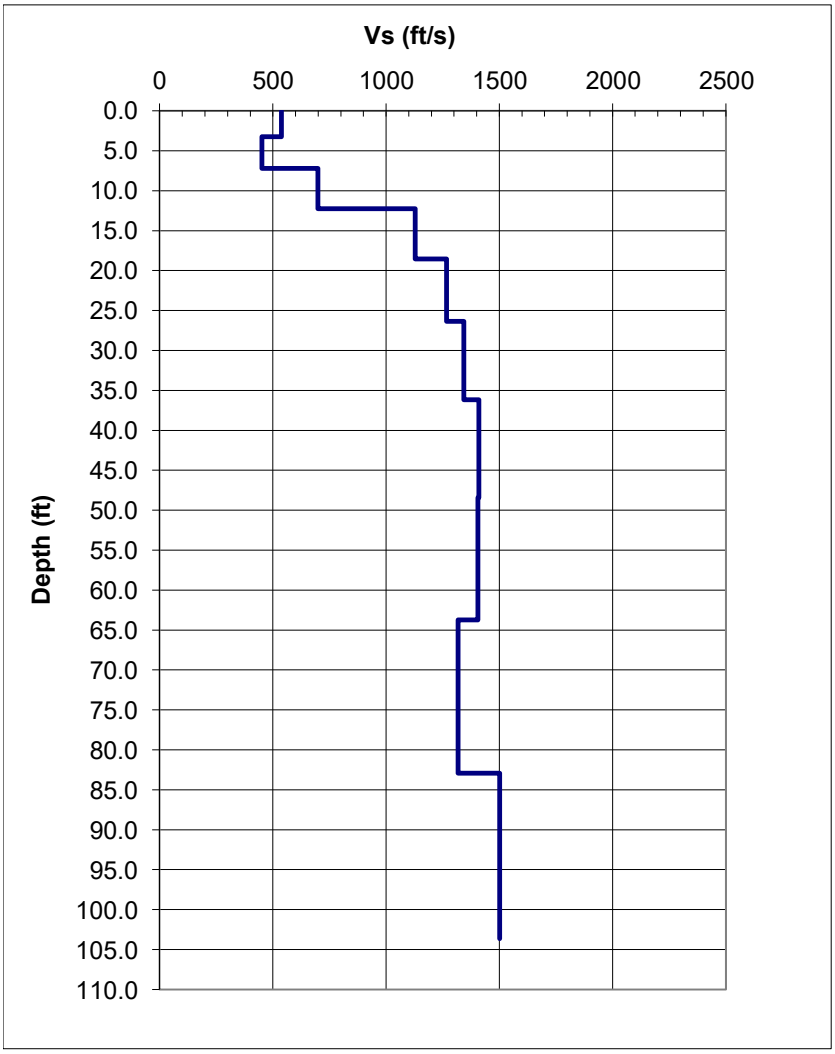
Layer	Layer Thickness (ft)	Depth of Bottom of Layer (ft)	Vs (ft/s)
1	1.2	1.2	309
2	1.5	2.7	329
3	1.8	4.5	350
4	2.3	6.8	326
5	2.9	9.7	256
6	3.6	13.3	245
7	4.5	17.8	369
8	5.6	23.4	500
9	7.0	30.4	599
10	7.6	38.0	949



Job No:	24-59-27777
Client:	Haley & Aldrich, Inc.
Project:	Aberdeen MASW
Sounding ID:	MASW24-06
Date:	07-Jun-2024

1D MASW SHEAR WAVE VELOCITY TEST RESULTS

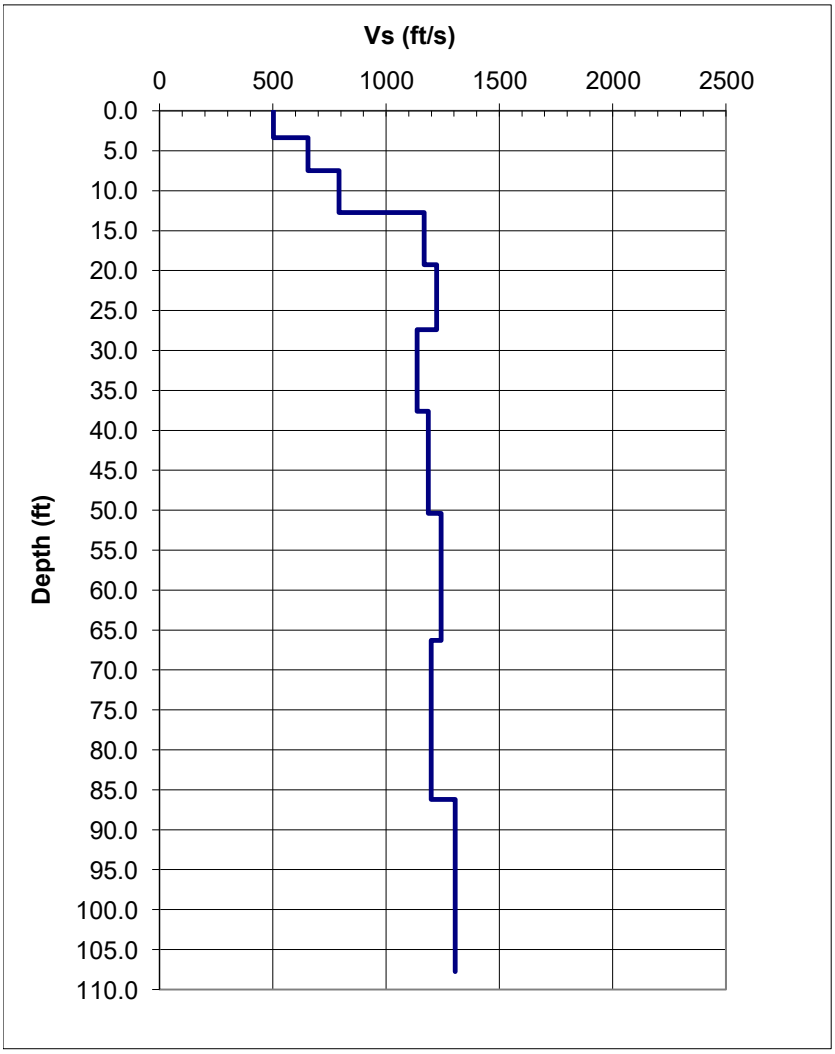
Layer	Layer Thickness (ft)	Depth of Bottom of Layer (ft)	Vs (ft/s)
1	3.2	3.2	538
2	4.0	7.2	452
3	5.0	12.3	699
4	6.3	18.5	1128
5	7.8	26.4	1267
6	9.8	36.2	1343
7	12.3	48.4	1409
8	15.3	63.8	1405
9	19.2	82.9	1319
10	20.7	103.7	1502



Job No:	24-59-27777
Client:	Haley & Aldrich, Inc.
Project:	Aberdeen MASW
Sounding ID:	MASW24-07
Date:	07-Jun-2024

1D MASW SHEAR WAVE VELOCITY TEST RESULTS

Layer	Layer Thickness (ft)	Depth of Bottom of Layer (ft)	Vs (ft/s)
1	3.3	3.3	502
2	4.2	7.5	655
3	5.2	12.7	792
4	6.5	19.3	1167
5	8.2	27.4	1224
6	10.2	37.6	1137
7	12.7	50.4	1186
8	15.9	66.3	1242
9	19.9	86.2	1199
10	21.6	107.8	1305



Vs100 Calculation Tables

CONETEC

Job No:	24-59-27777
Client:	Haley & Aldrich, Inc.
Project:	Aberdeen MASW
Sounding:	MASW24-02
Date:	06-Jun-2024

VS100 CALCULATION

Layer Number	Layer Thickness (ft)	Layer Bottom (ft)	Vs (ft/s)	Equivalent Vertical Travel Time (s)
1	3.3	3.3	428	0.00766
2	4.1	7.4	520	0.00788
3	5.1	12.5	553	0.00926
4	6.4	18.9	591	0.01082
5	8.0	26.9	763	0.01049
6	10.0	36.9	981	0.01020
7	12.5	49.4	1127	0.01109
8	15.6	65.0	1130	0.01383
9	19.5	84.5	1056	0.01849
10	15.5	100.0	1278	0.01210
Total Vertical Travel Time for 100ft (s)				0.11181
Average Travel Time Weighted Shear Wave Velocity (ft/s)				894

Notes: Yellow Highlighted Cells Indicate Projected Vs

Job No:	24-59-27777
Client:	Haley & Aldrich, Inc.
Project:	Aberdeen MASW
Sounding:	MASW24-03
Date:	06-Jun-2024

VS100 CALCULATION

Layer Number	Layer Thickness (ft)	Layer Bottom (ft)	Vs (ft/s)	Equivalent Vertical Travel Time (s)
1	3.3	3.3	463	0.00705
2	4.1	7.3	616	0.00662
3	5.1	12.5	669	0.00763
4	6.4	18.8	676	0.00944
5	8.0	26.8	1088	0.00733
6	10.0	36.8	1298	0.00768
7	12.5	49.2	1358	0.00917
8	15.6	64.8	1374	0.01134
9	19.5	84.3	1320	0.01474
10	15.7	100.0	1438	0.01094
Total Vertical Travel Time for 100ft (s)				0.09193
Average Travel Time Weighted Shear Wave Velocity (ft/s)				1088

Notes: Yellow Highlighted Cells Indicate Projected Vs

Job No:	24-59-27777
Client:	Haley & Aldrich, Inc.
Project:	Aberdeen MASW
Sounding:	MASW24-04
Date:	06-Jun-2024

VS100 CALCULATION

Layer Number	Layer Thickness (ft)	Layer Bottom (ft)	Vs (ft/s)	Equivalent Vertical Travel Time (s)
1	3.4	3.4	562	0.00600
2	4.2	7.6	777	0.00542
3	5.3	12.8	1059	0.00497
4	6.6	19.4	963	0.00683
5	8.2	27.7	885	0.00930
6	10.3	37.9	1232	0.00835
7	12.9	50.8	1599	0.00804
8	16.1	66.9	1778	0.00904
9	20.1	86.9	1877	0.01070
10	13.1	100.0	2238	0.00583
Total Vertical Travel Time for 100ft (s)				0.07447
Average Travel Time Weighted Shear Wave Velocity (ft/s)				1343

Notes: Yellow Highlighted Cells Indicate Projected Vs

Job No:	24-59-27777
Client:	Haley & Aldrich, Inc.
Project:	Aberdeen MASW
Sounding:	MASW24-06
Date:	07-Jun-2024

VS100 CALCULATION

Layer Number	Layer Thickness (ft)	Layer Bottom (ft)	Vs (ft/s)	Equivalent Vertical Travel Time (s)
1	3.2	3.2	538	0.00597
2	4.0	7.2	452	0.00889
3	5.0	12.3	699	0.00718
4	6.3	18.5	1128	0.00556
5	7.8	26.4	1267	0.00619
6	9.8	36.2	1343	0.00730
7	12.3	48.4	1409	0.00870
8	15.3	63.8	1405	0.01090
9	19.2	82.9	1319	0.01453
10	17.1	100.0	1502	0.01137
Total Vertical Travel Time for 100ft (s)				0.08660
Average Travel Time Weighted Shear Wave Velocity (ft/s)				1155

Notes: Yellow Highlighted Cells Indicate Projected Vs

Job No:	24-59-27777
Client:	Haley & Aldrich, Inc.
Project:	Aberdeen MASW
Sounding:	MASW24-07
Date:	07-Jun-2024

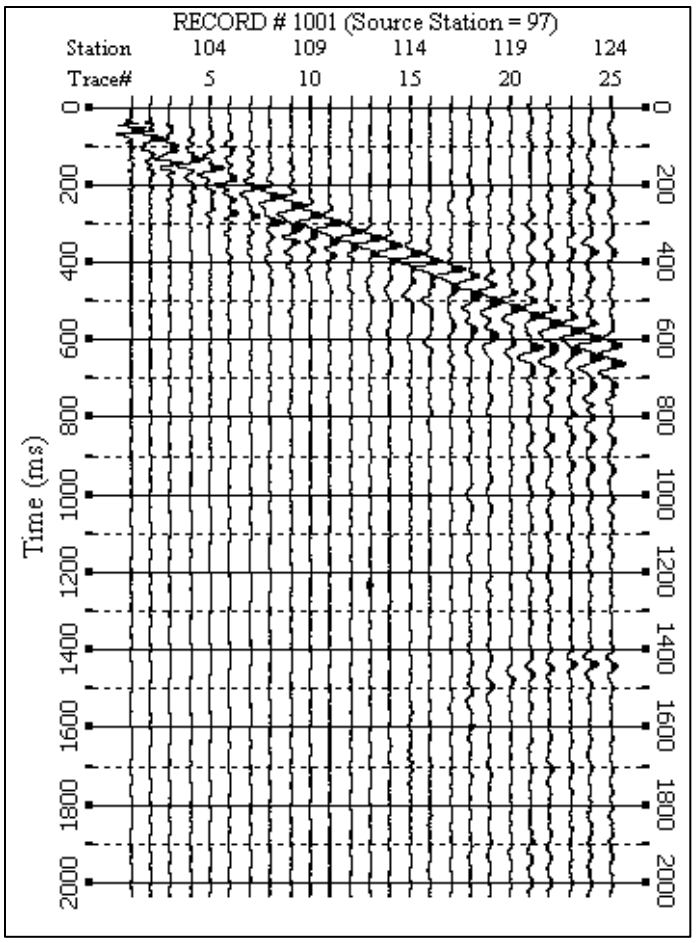
VS100 CALCULATION

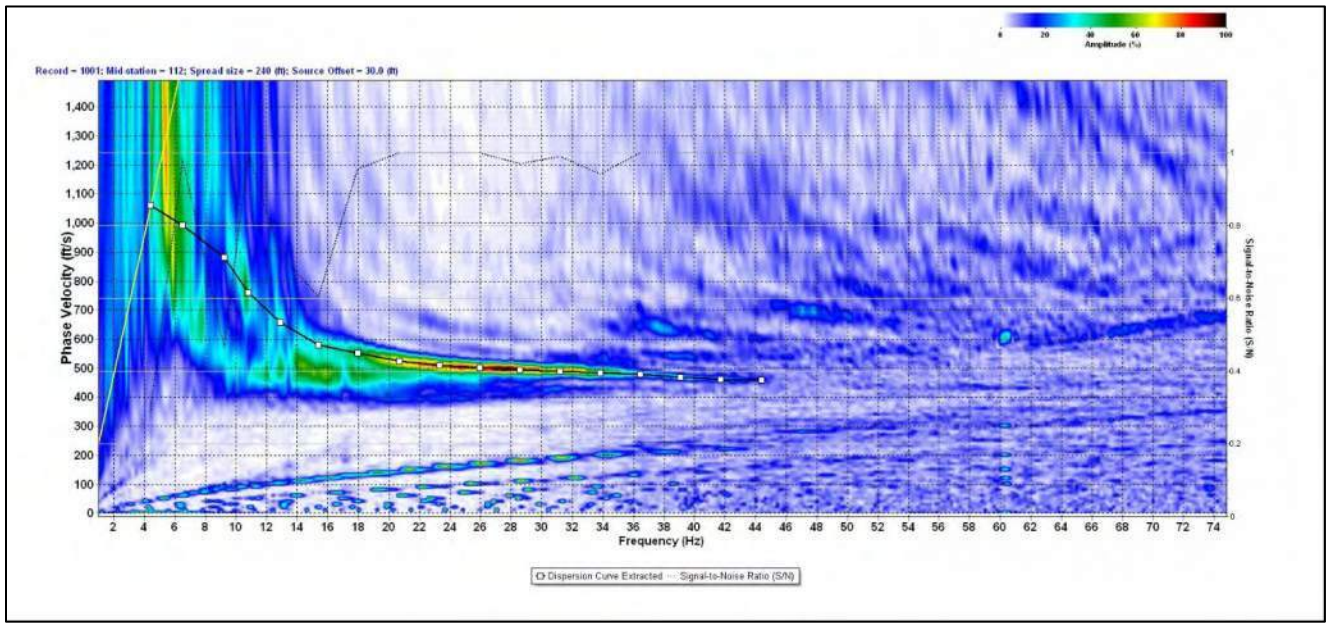
Layer Number	Layer Thickness (ft)	Layer Bottom (ft)	Vs (ft/s)	Equivalent Vertical Travel Time (s)
1	3.3	3.3	502	0.00666
2	4.2	7.5	655	0.00637
3	5.2	12.7	792	0.00659
4	6.5	19.3	1167	0.00559
5	8.2	27.4	1224	0.00667
6	10.2	37.6	1137	0.00897
7	12.7	50.4	1186	0.01075
8	15.9	66.3	1242	0.01282
9	19.9	86.2	1199	0.01660
10	13.8	100.0	1305	0.01057
Total Vertical Travel Time for 100ft (s)				0.09159
Average Travel Time Weighted Shear Wave Velocity (ft/s)				1092

Notes: Yellow Highlighted Cells Indicate Projected Vs

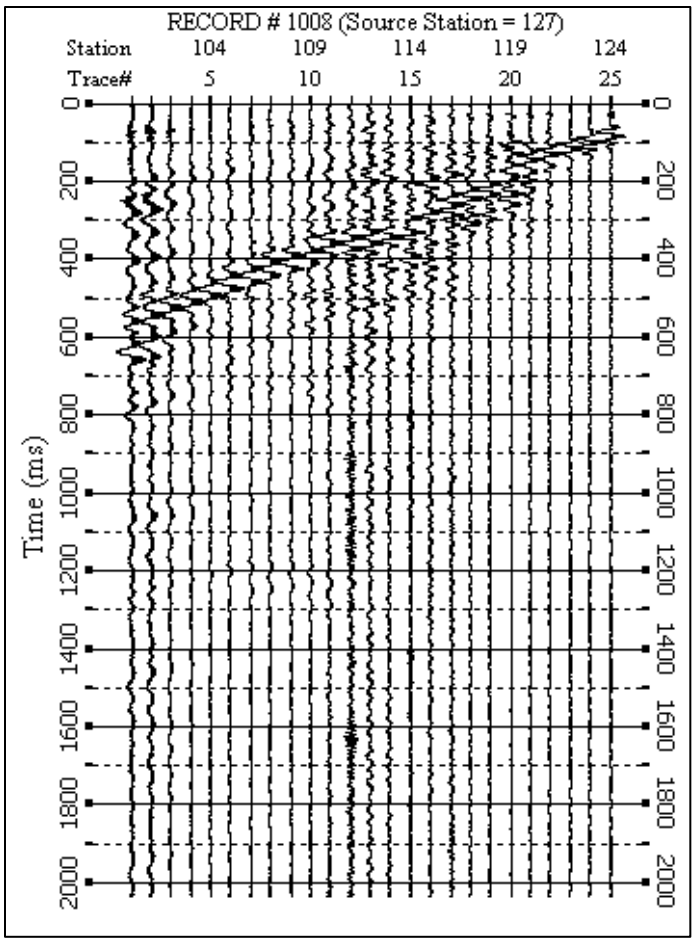
MASW Time Domain Traces and Overtone Images

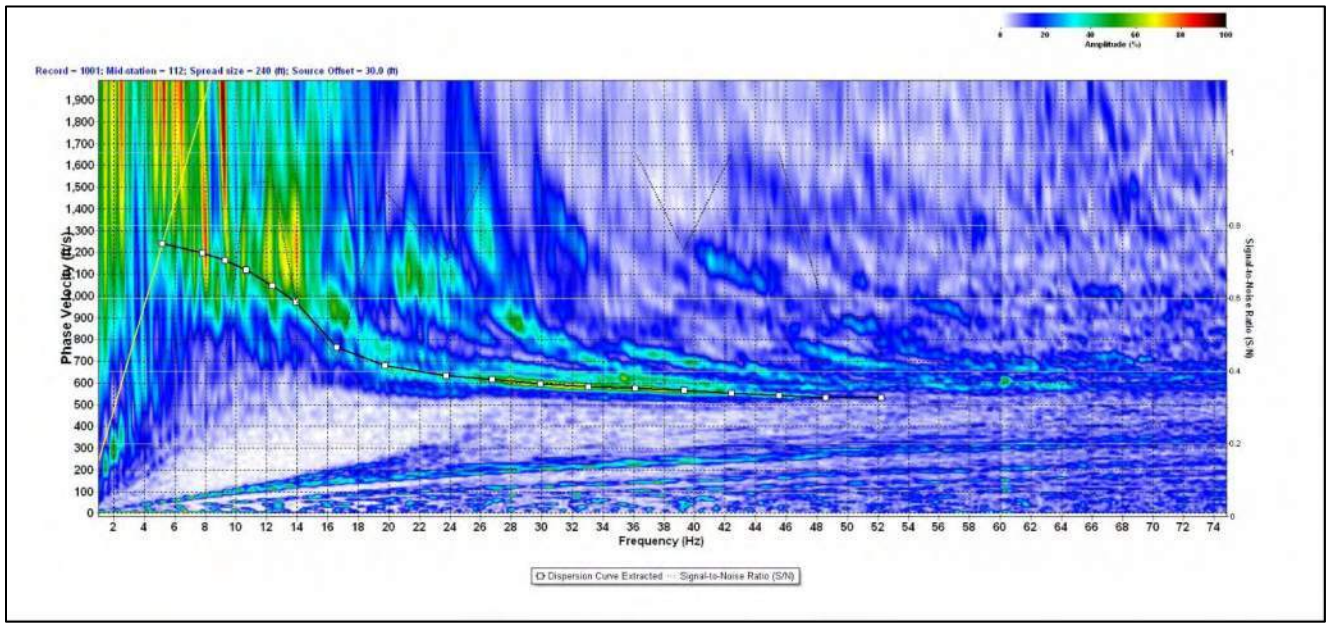
CONETEC



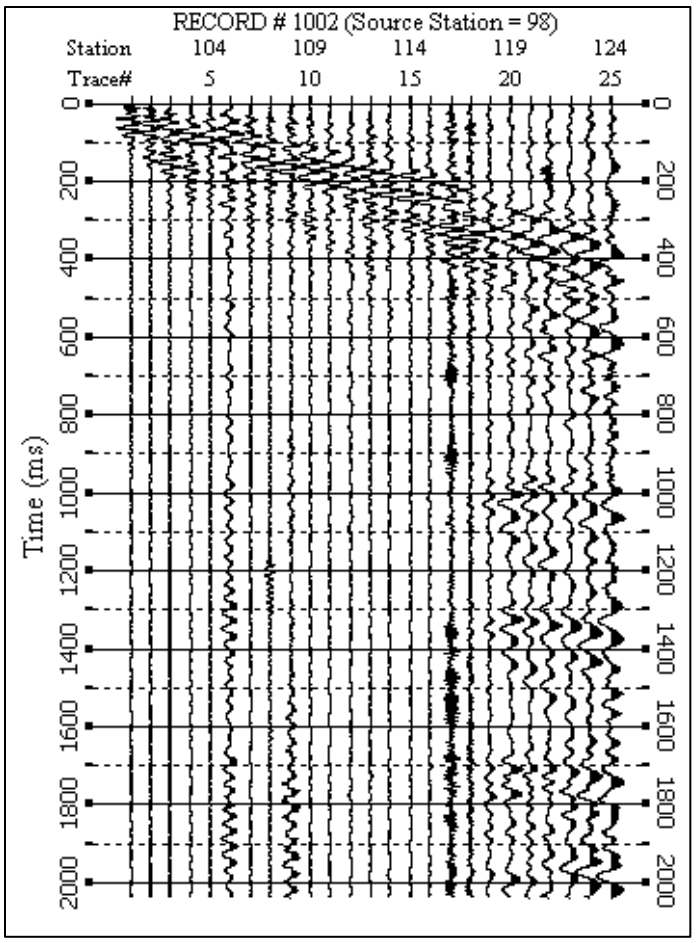


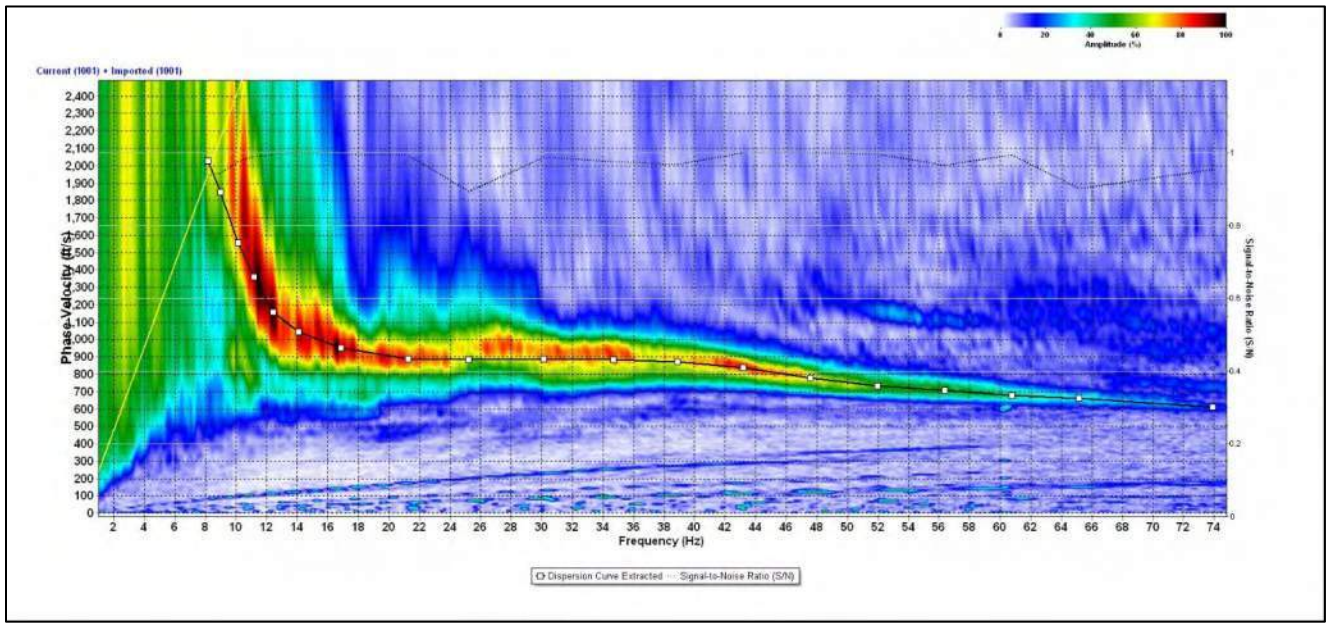
MASW24-02: Example time domain trace (top) and overtone image with picked dispersion curve (bottom).



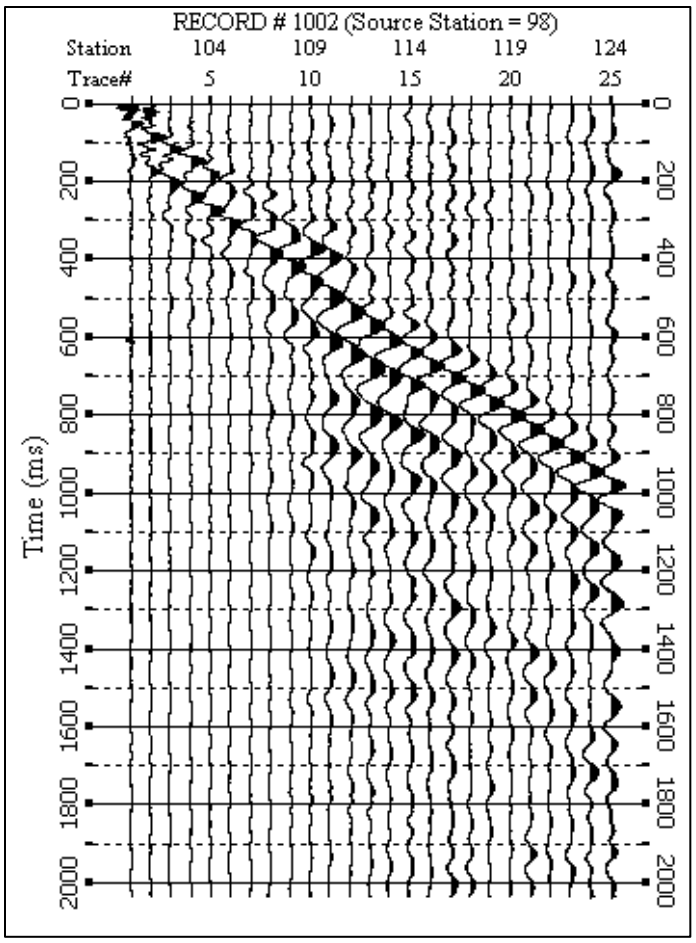


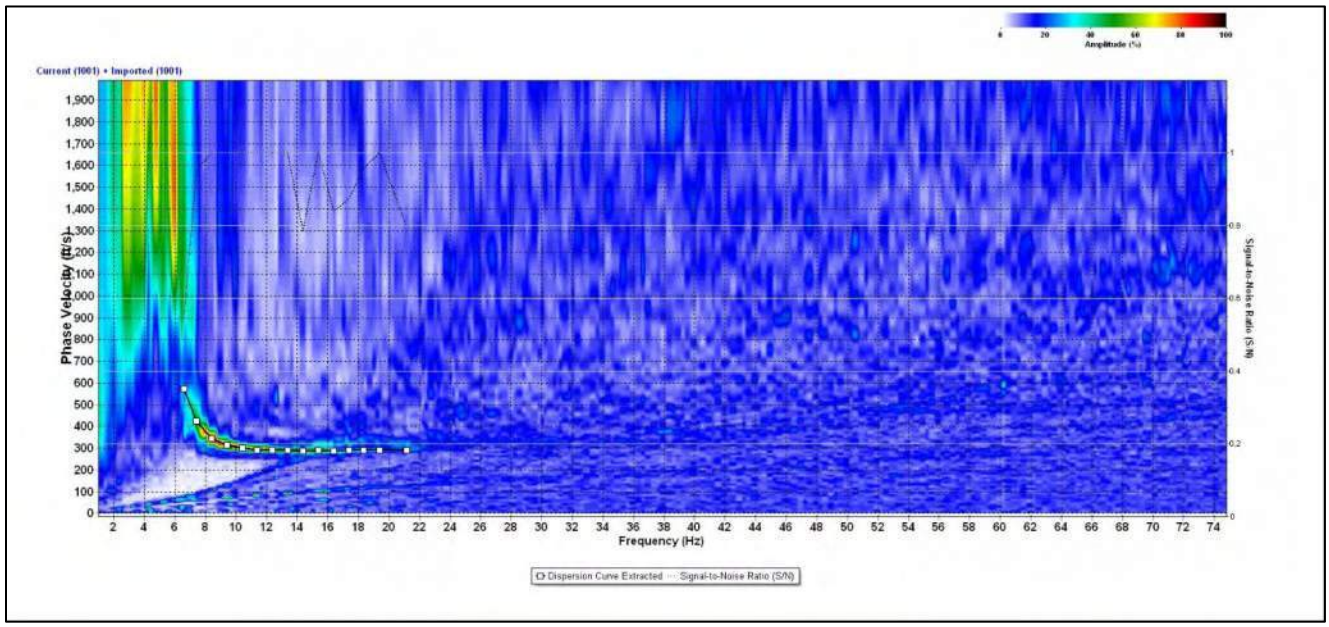
MASW24-03: Example time domain trace (top) and overtone image with picked dispersion curve (bottom).



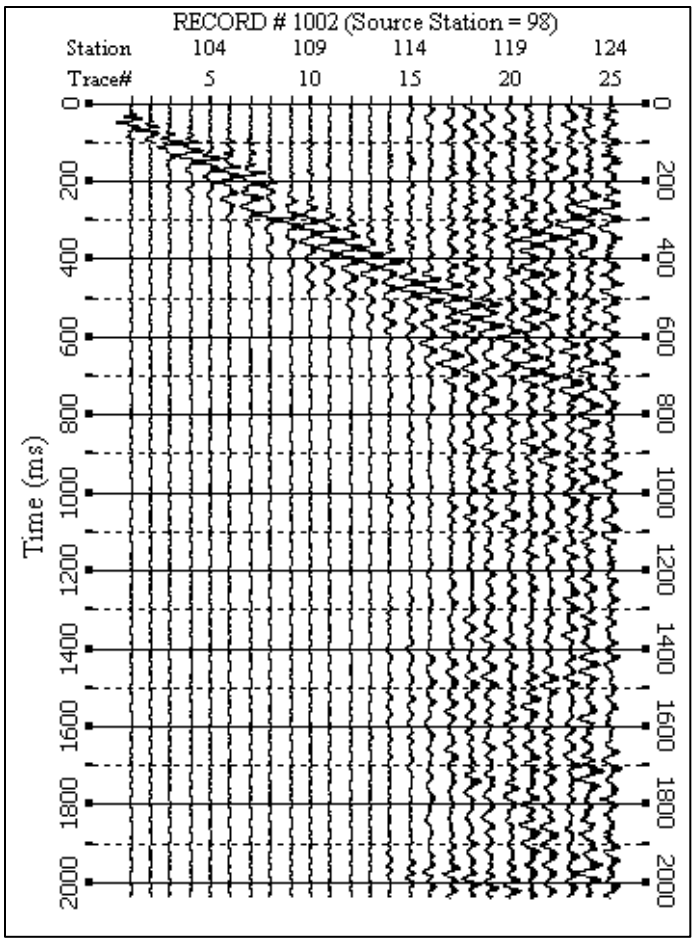


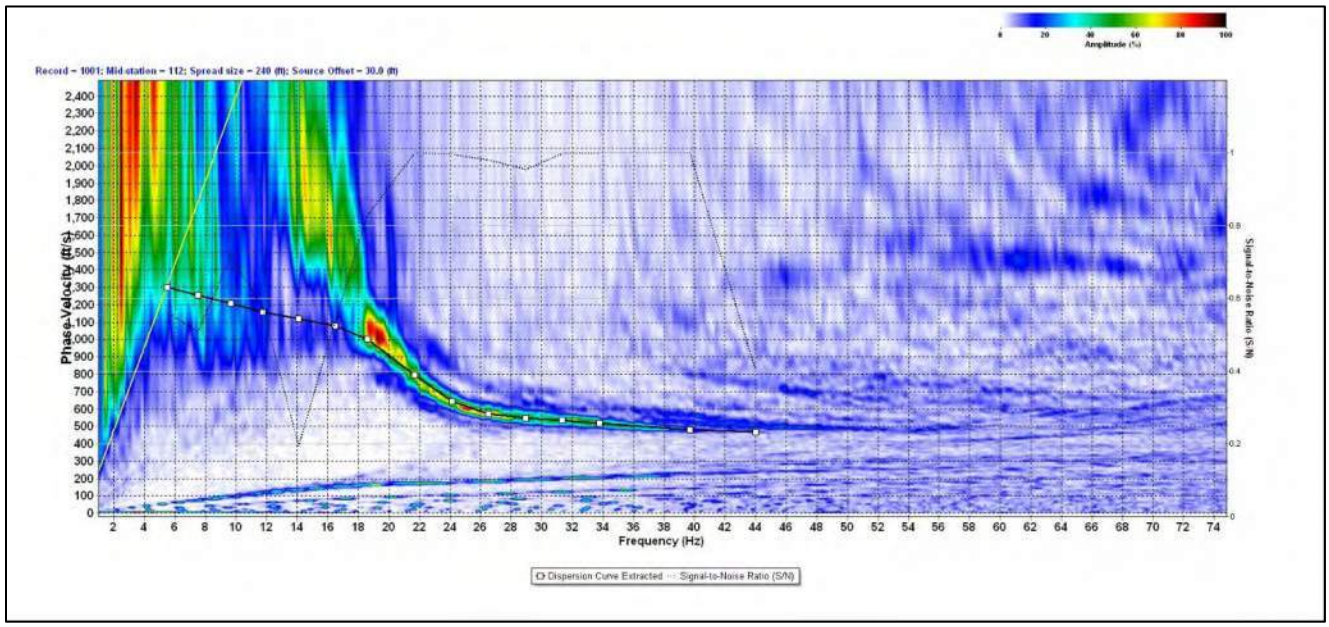
MASW24-04: Example time domain trace (top) and overtone image with picked dispersion curve (bottom).



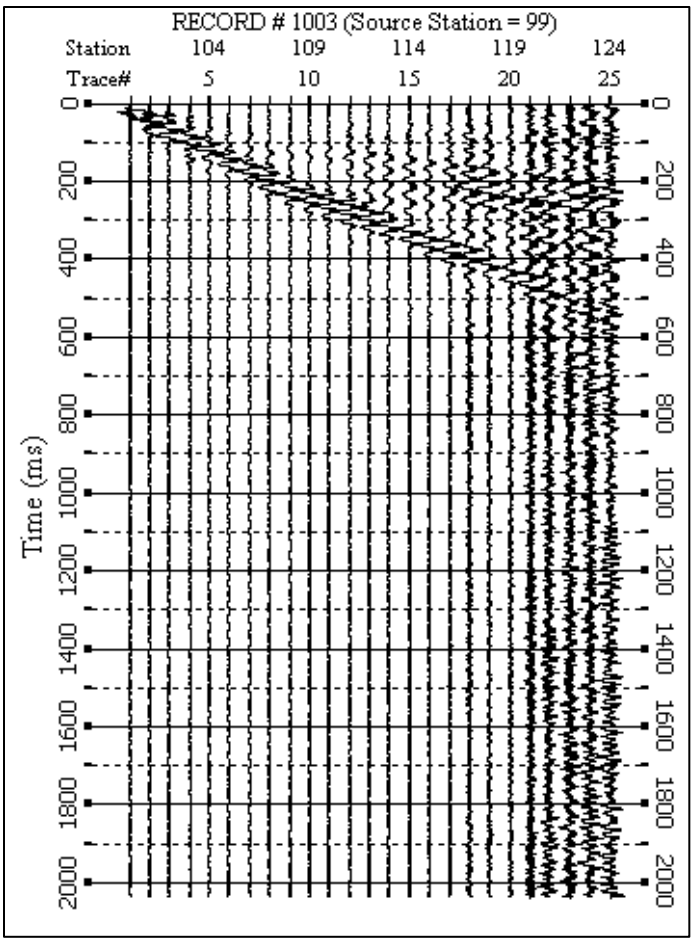


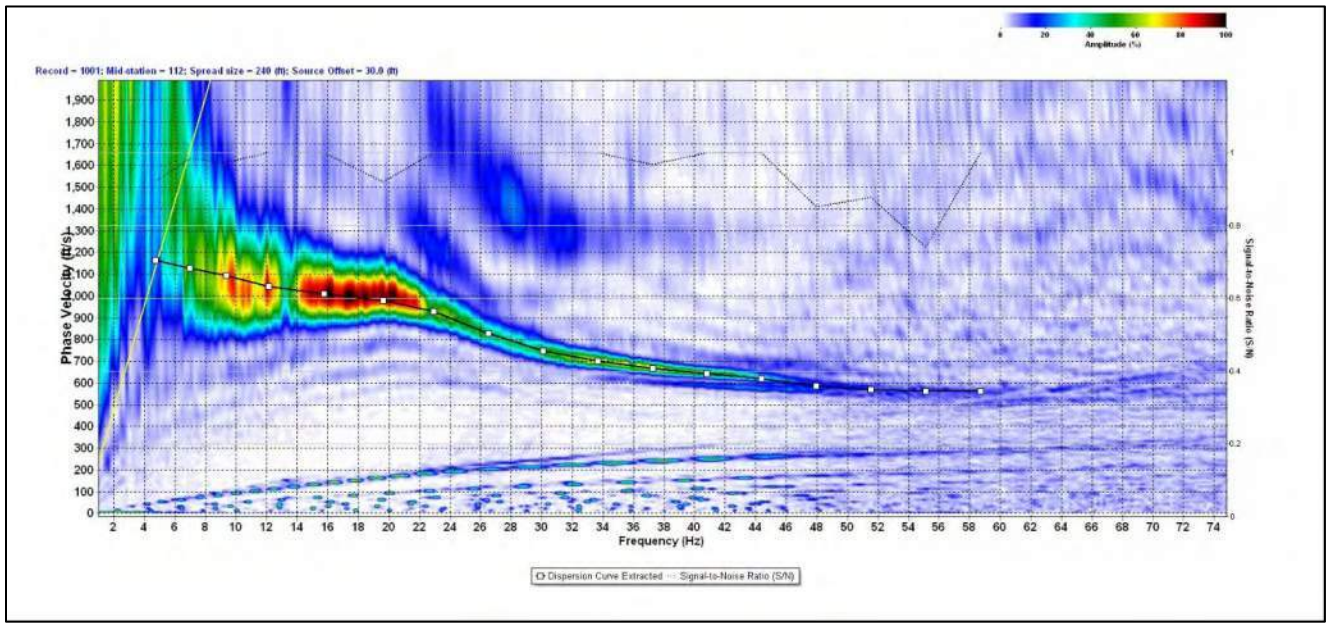
MASW24-05: Example time domain trace (top) and overtone image with picked dispersion curve (bottom).





MASW24-06: Example time domain trace (top) and overtone image with picked dispersion curve (bottom).





MASW24-07: Example time domain trace (top) and overtone image with picked dispersion curve (bottom).

APPENDIX D
Historical Plans

GROUND FLOOR PLAN

Boys Play Court

Girls Play Court

Typical Cabinet Detail

Typical Cabinet Plan

Typical Cabinet Elevation

Typical Cabinet Section

Typical Cabinet Base Detail

Typical Cabinet Top Detail

Typical Cabinet Back Detail

Typical Cabinet Front Detail

Typical Cabinet Side Detail

Typical Cabinet Drawer Detail

Typical Cabinet Door Detail

Typical Cabinet Shelf Detail

Typical Cabinet Hardware Detail

Typical Cabinet Finish Detail

Typical Cabinet Assembly Detail

Typical Cabinet Installation Detail

Typical Cabinet Anchorage Detail

Typical Cabinet Fastening Detail

Typical Cabinet Adjustment Detail

Typical Cabinet Maintenance Detail

Typical Cabinet Cleaning Detail

Typical Cabinet Repair Detail

Typical Cabinet Replacement Detail

Typical Cabinet Removal Detail

Typical Cabinet Disposal Detail

Typical Cabinet Recycling Detail

Typical Cabinet Environmental Detail

Typical Cabinet Safety Detail

Typical Cabinet Warning Detail

Typical Cabinet Caution Detail

Typical Cabinet Danger Detail

Typical Cabinet Emergency Detail

Typical Cabinet Evacuation Detail

Typical Cabinet Rescue Detail

Typical Cabinet First Aid Detail

Typical Cabinet Medical Detail

Typical Cabinet Hospital Detail

Typical Cabinet Ambulance Detail

Typical Cabinet Fire Detail

Typical Cabinet Police Detail

Typical Cabinet Security Detail

Typical Cabinet Surveillance Detail

Typical Cabinet Monitoring Detail

Typical Cabinet Alarm Detail

Typical Cabinet Communication Detail

Typical Cabinet Telephone Detail

Typical Cabinet Intercom Detail

Typical Cabinet Radio Detail

Typical Cabinet Television Detail

Typical Cabinet Video Detail

Typical Cabinet Audio Detail

Typical Cabinet Lighting Detail

Typical Cabinet Electrical Detail

Typical Cabinet Plumbing Detail

Typical Cabinet Mechanical Detail

Typical Cabinet Structural Detail

Typical Cabinet Foundation Detail

Typical Cabinet Roofing Detail

Typical Cabinet Flashing Detail

Typical Cabinet Gutter Detail

Typical Cabinet Downspout Detail

Typical Cabinet Drainage Detail

Typical Cabinet Grading Detail

Typical Cabinet Paving Detail

Typical Cabinet Landscaping Detail

Typical Cabinet Irrigation Detail

Typical Cabinet Fencing Detail

Typical Cabinet Gate Detail

Typical Cabinet Signage Detail

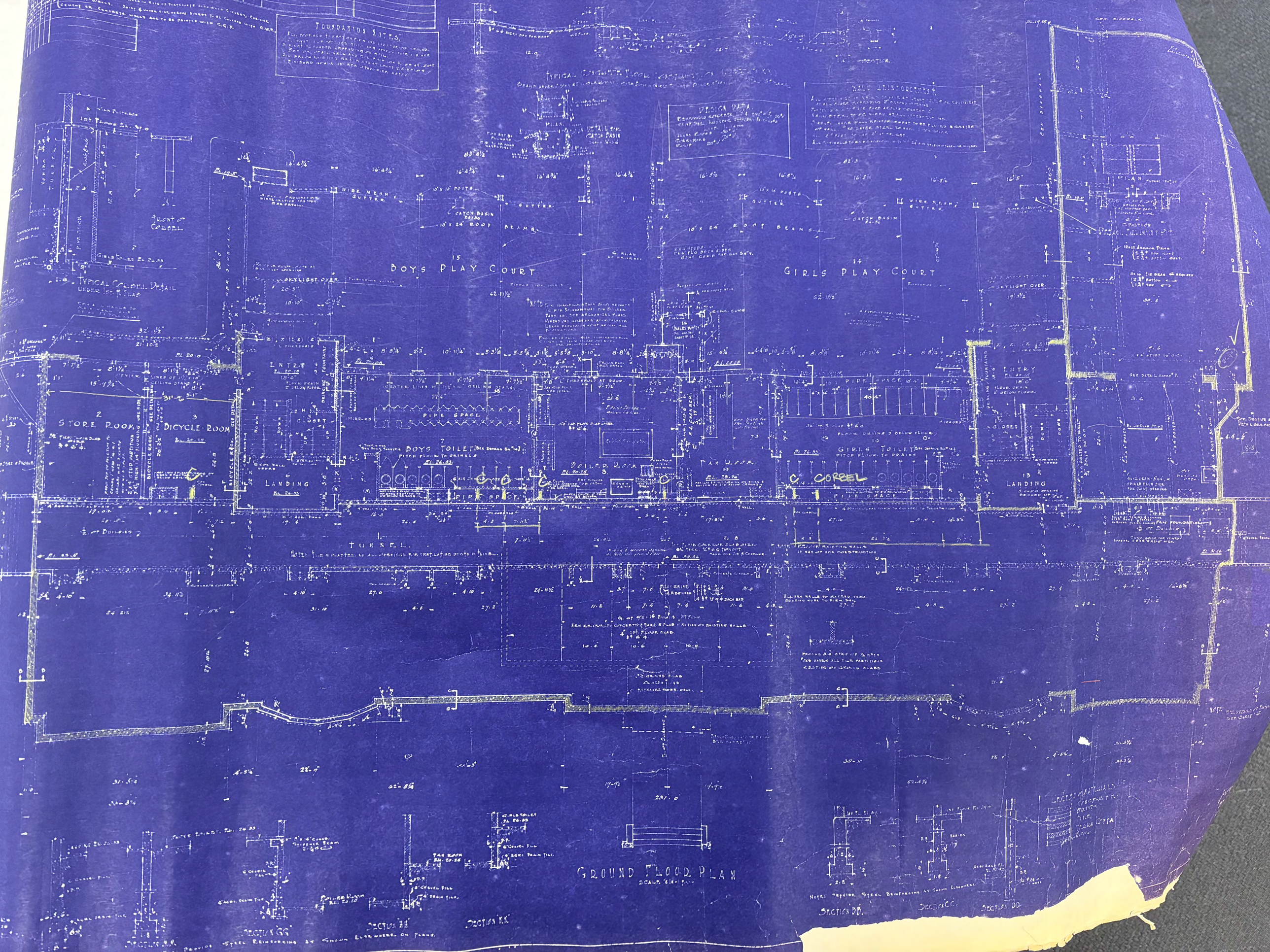
Typical Cabinet Lighting Detail

Typical Cabinet Furniture Detail

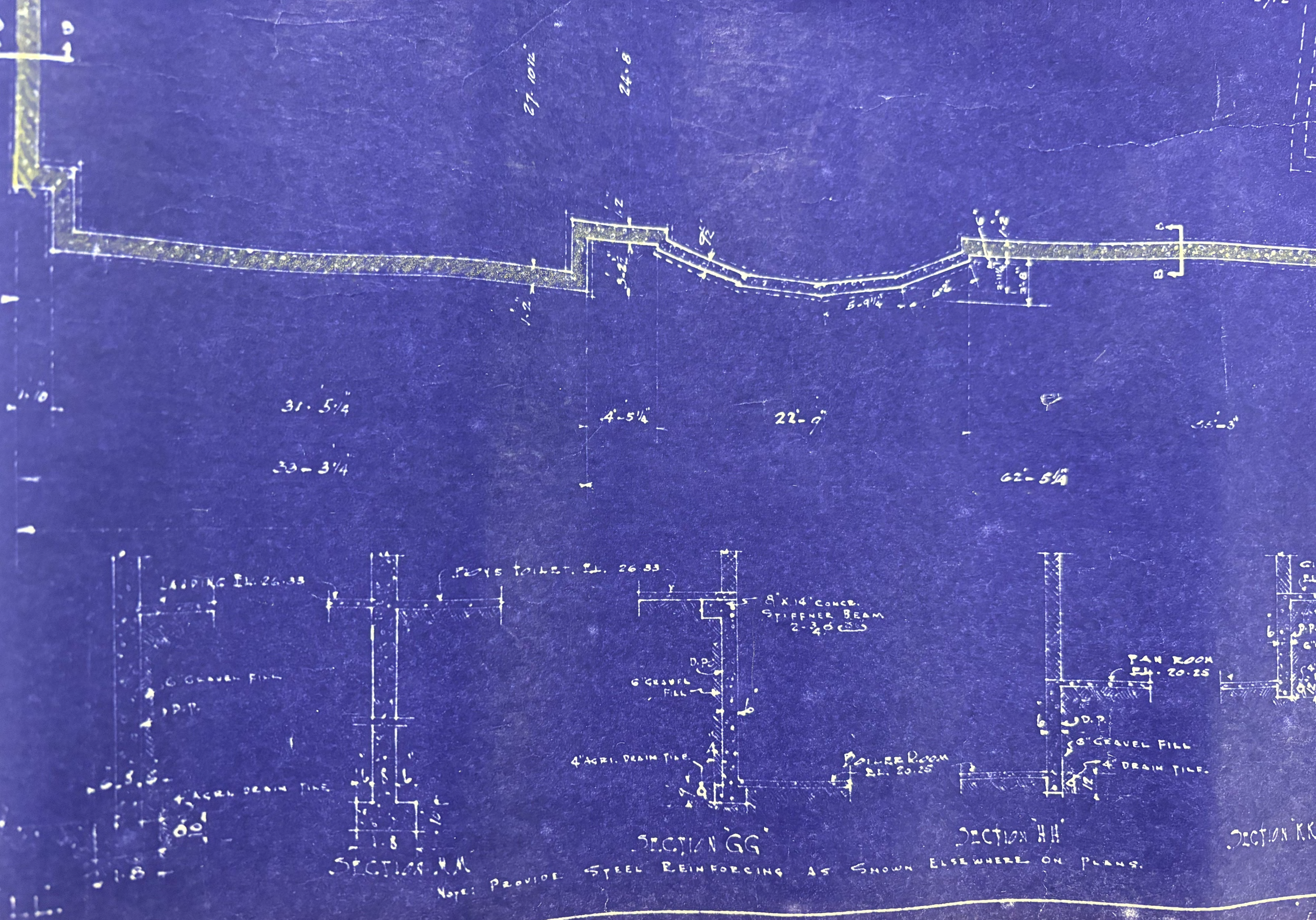
Typical Cabinet Equipment Detail

Typical Cabinet Accessory Detail

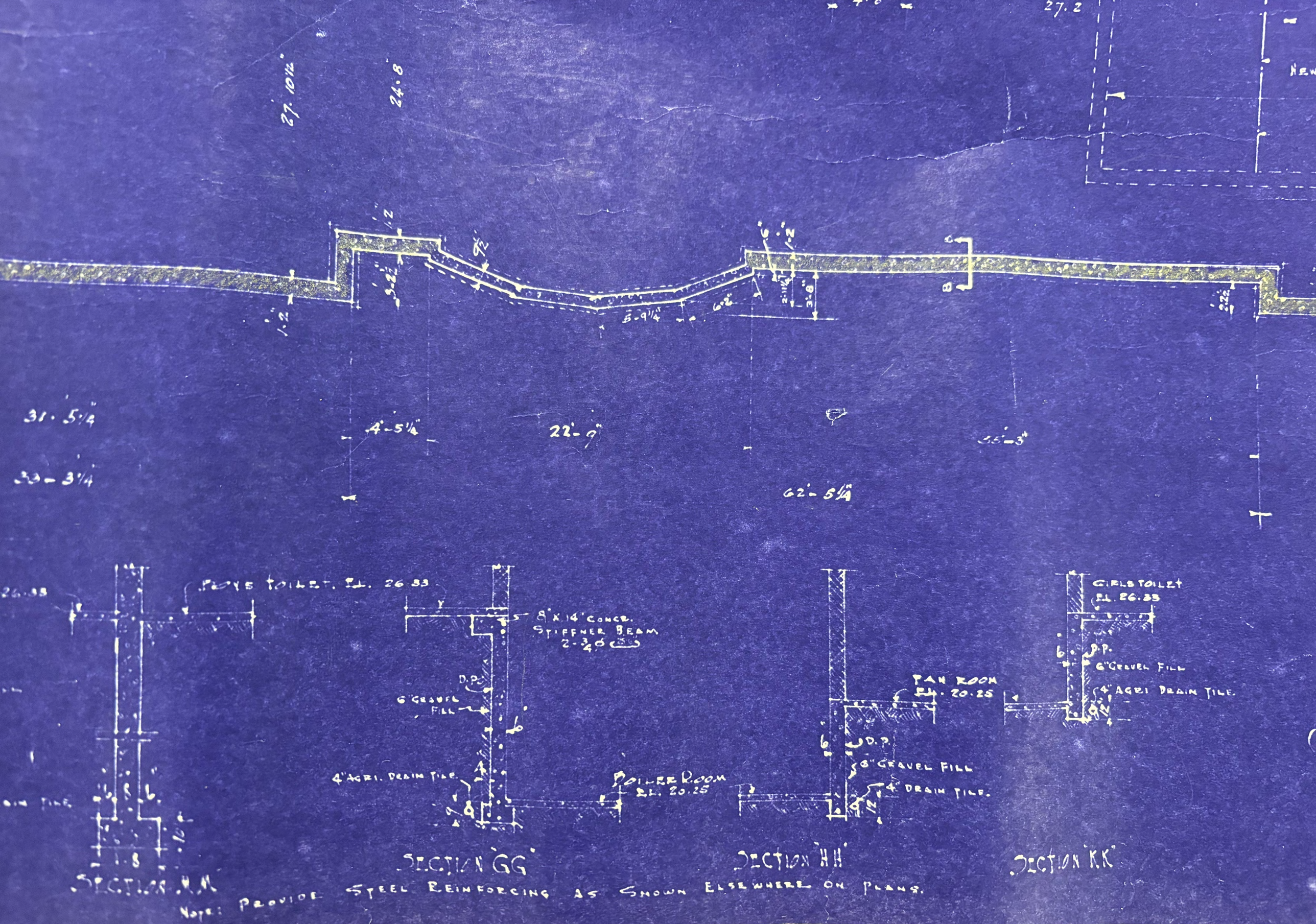
Typical Cabinet Miscellaneous Detail

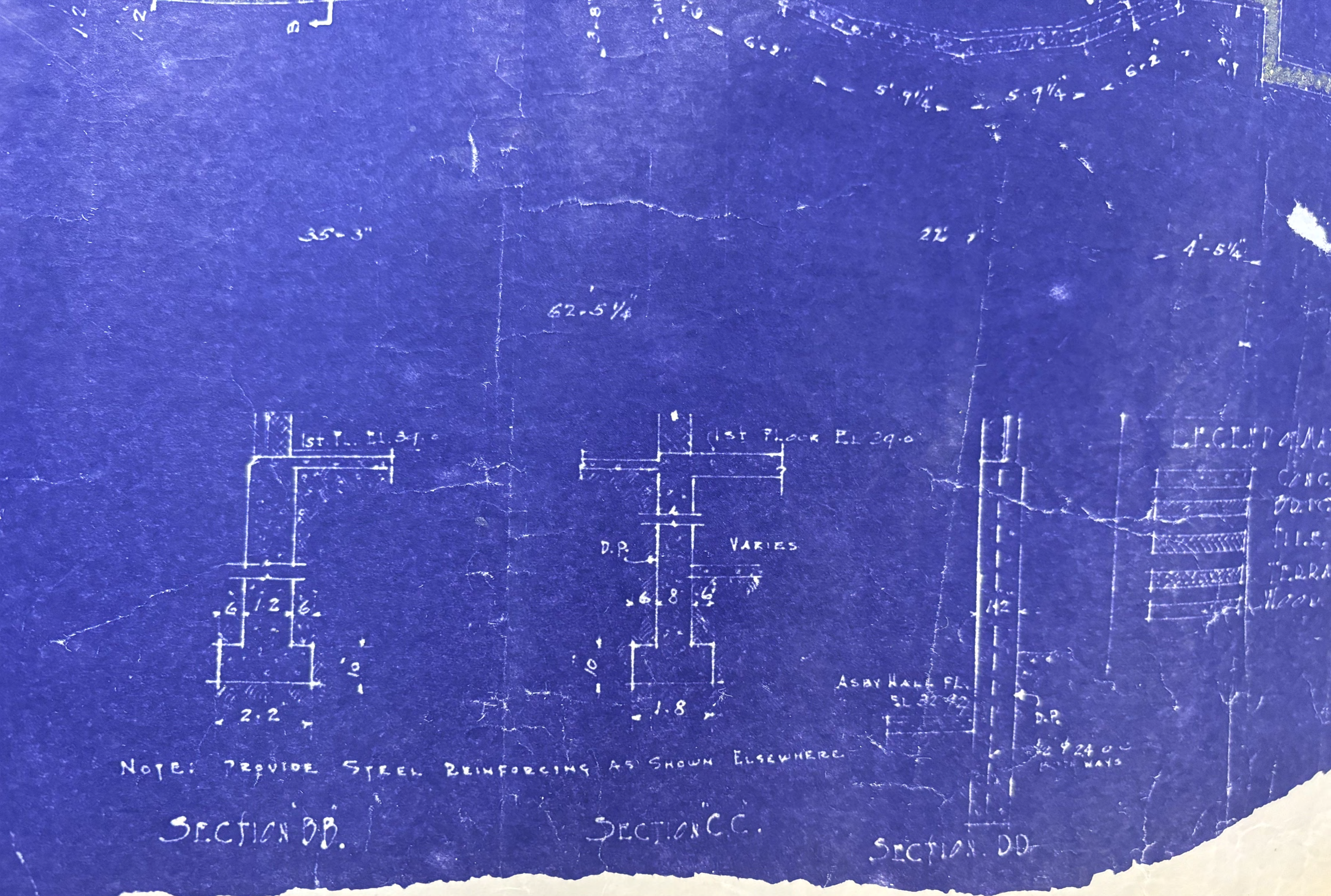


FOUNDATION NOTES
DESIGN DATA
WALL REINFORCEMENT
BOYS PLAY COURT
GIRLS PLAY COURT
TYPICAL CORBEL DETAIL
FRONT OF CORBEL
STORE ROOM
BICYCLE ROOM
ENTRY
LANDING
BOYS TOILET
GIRLS TOILET
BOILER ROOM
FAN ROOM
PIPE SPACE
CORBEL
TUNNEL
GROUND FLOOR PLAN
SECTION BB
SECTION CC
SECTION DD
SECTION GG
SECTION HH
SECTION KK

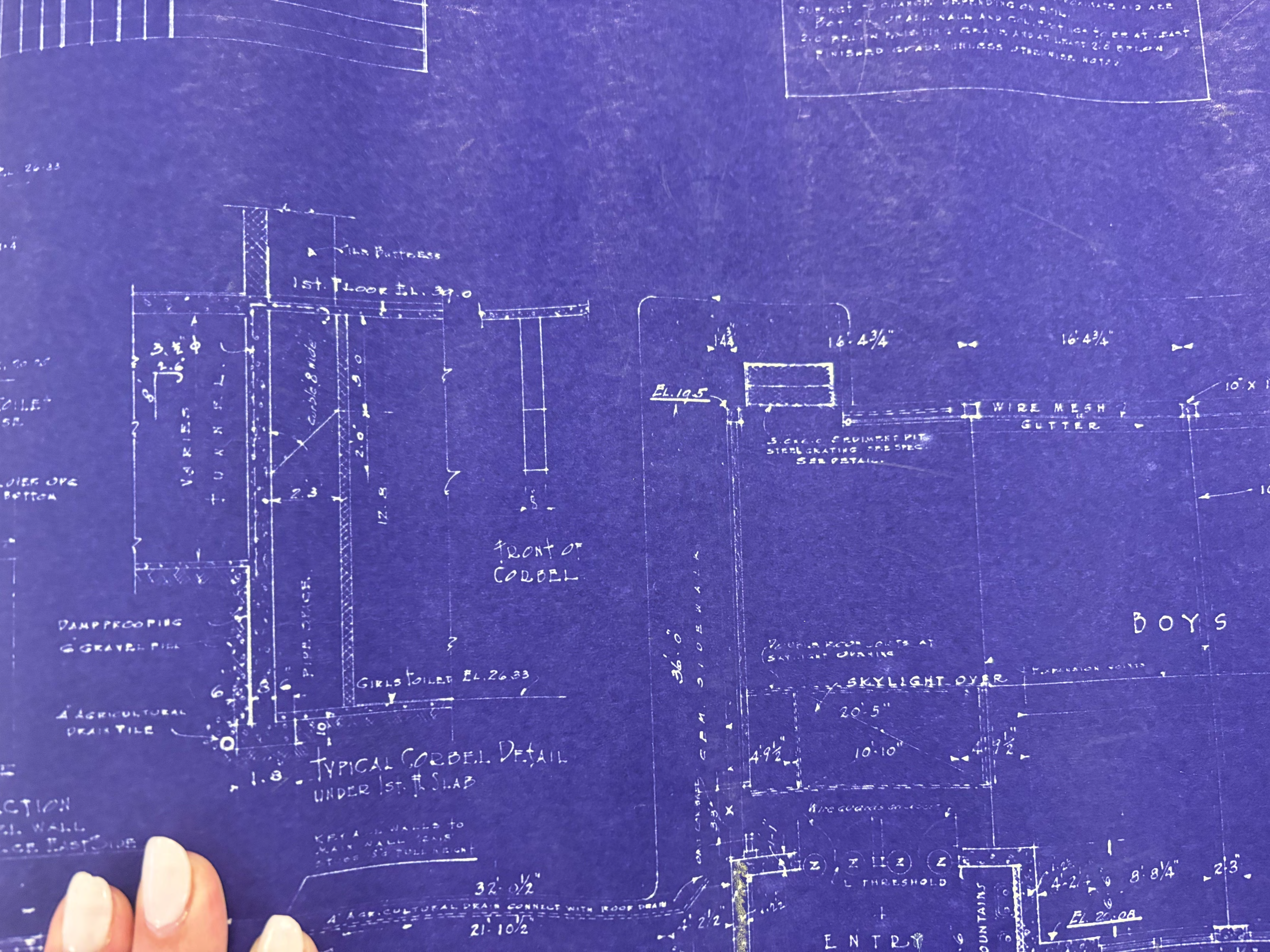


Note: Provide Steel Reinforcing as Shown Elsewhere on Plans.


27.2
27.10½"
24.8"
1.2"
5-9¼"
6.2"
3'-8"
31.5¼"
4'-5¼"
22'-9"
55'-3"
33-3¼
62'-5¼"
Boys Toilet. El. 26.33
8"x14" Concr. Stiffner Beam 2-¾ϕ
D.P.
6" Gravel Fill
4" Agri. Drain Tile
Boiler Room El. 20.25
Pan Room El. 20.25
D.P.
6" Gravel Fill
4" Drain Tile
Girls Toilet El. 26.33
D.P.
6" Gravel Fill
4" Agri Drain Tile
Section "GG"
Section "HH"
Section "KK"
Section "MM"
Note: Provide Steel Reinforcing as Shown Elsewhere on Plans.



35-3"
62-5 1/4"
22'
4'-5 1/4"
5'-9 1/4"
5'-9 1/4"
6'-2"
1st Fl. El. 39.0
1st Floor El. 39.0
D.P.
Varies
6
1.2
6
2.2
10
6
8
6
1.8
10
1.2
Asby Hall Fl.
El. 32.42
D.P.
Note: Provide Steel Reinforcing as Shown Elsewhere
Section BB.
Section C.C.
Section DD



1st. FLOOR EL. 39.0
TILE BUTTRESS
VARIES
TUNNEL
curble 8 wide
FRONT OF CORBEL
DAMPPROOFING
6" GRAVEL FILL
4" AGRICULTURAL DRAIN TILE
GIRLS TOILET EL. 26.33
TYPICAL CORBEL DETAIL UNDER 1st. FL. SLAB
EL. 19.5
16'-4 3/4"
WIRE MESH GUTTER
BOYS
SKYLIGHT OVER
20'-5"
10'-10"
4'-9 1/2"
36'-0"
32'-0 1/2"
21'-10 1/2"
4" AGRICULTURAL DRAIN CONNECT WITH ROOF DRAIN
L THRESHOLD
ENTRY
8'-8 1/4"
2'-3"

FOR SECTION & DETAIL SEE SHEET "4".

4.4 6" 11 3'-6

1/4 BOLTS 30" O.C.

GIRLS TOILET F.L. 26.33

D.P.

PLAY COURT F.L. 20.08

SECTION EE

GI CONCR. BRACKET

UP 10 R

PRESENT RUBBLE WALL APPROVED MET. TIPS

ASSEMBLY HALL F.L. 32.9

4.4 30" CENT AT TIE BEAMS

F.L. 31.0

EL. 31.46

TYPICAL RCC RIBF FOR S.W & S.E WALL AT ASSEMBLY ROOM

STOP ALT. BARS AT F.L 32.0

½" ϕ @ 0.C VERT 24" OC HOR

PLAY COURT

DO NOT DISTURB EARTH SHOULDER IN FRONT OF RET. WALLS

F.L. 17.25

NOTE: FOR DETAILS OF FIXTURES SEE SHEET "16".

SECTION FF

GILES
ENGINEERING ASSOCIATES, INC.
GEOTECHNICAL, ENVIRONMENTAL & CONSTRUCTION MATERIALS CONSULTANTS

• Dallas, TX
• Los Angeles, CA
• Madison, WI
• Milwaukee, WI
• Seattle, WA
• Washington, D.C.

April 7, 1997

Aberdeen School District
216 North "G" Street
Aberdeen, Washington 98520

111

Attention: Mr. Greg Young

Subject: Geotechnical Engineering Exploration and Analys
Proposed McDermoth Elementary School
Additions and Renovations
409 North "K" Street, Aberdeen, Washington
Project No. 6G-9701013

Dear Mr. Young:

In accordance with your request and authorization, Giles Engineering Associates, Inc. (*Giles*) has conducted a Geotechnical Engineering Exploration and Analysis for the above-referenced project. The conclusions and recommendations developed from the analysis are discussed in detail in the accompanying report.

We appreciate the opportunity to have been of service on this project. If there are any questions or if *Giles* may be of further service, please do not hesitate to call at any time.



Respectfully submitted,

GILES ENGINEERING ASSOCIATES, INC.

Monte M. Reinders
Staff Engineer

Kurt D. Merriman, P.E.
Senior Project Manager

Distribution: Aberdeen School District (3)
Attn: Mr. Greg Young
BJSS Architects (1)
Attn: Mr. Curtis Clarke
AHBL Civil Engineers (1)
Attn: Mr. Geoffrey Hodsdon

APPENDIX C

FIELD PROCEDURES AND EXPLORATION LOGS

The field operations were conducted in general accordance with the procedures recommended by the American Society for Testing and Materials (ASTM) designation D 420 entitled "Standard Guide for Sampling Soil and Rock" and/or other relevant specifications. Soil samples were preserved and transported to Giles' laboratory in general accordance with the procedures recommended by ASTM designation D 4220 entitled "standard practice for preserving and transporting soil samples." Brief descriptions of the sampling, testing and field procedures commonly performed by Giles are provided herein.

The Exploration Logs and related information enclosed herein depict the subsurface (soil and water) conditions encountered at the specific exploration locations on the date that the exploration was performed. Subsurface conditions may differ between exploration locations and within areas of the site that were not explored. The subsurface conditions may also change at the exploration locations over the passage of time.

GENERAL FIELD PROCEDURES

Surface and subsurface conditions at the project site were explored on February 14 and 27, 1997. The surface evaluation consisted of a visual reconnaissance, and the subsurface exploration consisted of advancing 3 hollow-stem auger soil borings (B-1 through B-3), 2 test pits (TP-1 and TP-2), and 2 hand auger borings (HB-1 and HB-2). The location of the explorations is shown on the Site and Exploration Plan, Figure 2 in Appendix B.

Exploration Locations and Elevations

The location and depth of the explorations were selected with regard to the proposed site developments and under the constraints of budget and site access. The locations of the explorationswere determined using a site plan provided to Giles and by measuring from existing site features with a handheld measuring tape. As such, the exploration locations shown on Figure 2 should be considered accurate only to the degree implied by the measuring methods.

It should be emphasized that the explorations revealed subsurface conditions only at discrete locations on the project site and that actual conditions could vary at other locations. The nature and extent of any such variations would not become evident until construction activities have begun. If significant variations are observed at that time, the conclusions and recommendations may need to be modified to reflect actual conditions.

Test Boring Methods

Soil borings were advanced with 4¼" I.D. continuous-flight hollow-stem auger, using a truck-mounted drill rig operated by an independent firm working under subcontract to Giles. An experienced geotechnical engineer from Giles continuously observed the boring, logged the subsurface conditions, obtained representative soil samples, and transported the samples to Giles' laboratory for further classification and testing as deemed necessary.

Throughout the drilling operation, soil samples were obtained from the borings at 2½-foot to 5-foot depth intervals by means of the Standard Penetration Test procedure (ASTM:D-1586). This test and sampling method consists of driving a standard 2-inch (outside diameter) split-barrel sampler a distance of 18" into the soil with a 140-pound hammer free-falling a distance of 30 inches. The number of blows required to drive the sampler through each of three 6-inch penetration intervals is counted, and the total number of blows struck during the final 12 inches is considered the Standard Penetration Resistance, or "blow count." If a total of 50 blows is struck within one 6-inch interval, the driving is ceased and the blow count is recorded as 50 blows for the actual number of inches of penetration. The resulting Standard Penetration Resistance values (N-values) provide a measure of the relative density of granular soils and the relative consistency of cohesive soils.

Test Boring Logs

The boring logs describe the various types of soils encountered in the boring, based primarily on visual interpretations made in the field and supported by subsequent laboratory testing of selected samples, if necessary. The logs also indicate the approximate depth of the contacts

between different soil types, although these contacts may be gradational or undulating. Where a change in soil type occurred between sampling intervals, the depth of contact was inferred. In addition, the log indicates the Standard Penetration Resistance at each sample location, and any laboratory tests performed on the soil samples. Depth to groundwater is also indicated on the boring logs, where applicable. Groundwater depth is typically estimated from the moisture content of soil samples, the wetted height of the drilling rods, and/or the groundwater level measured in the boring before and/or after the auger has been extracted.

Test Pit Exploration Procedures

The field exploration phase of this project consisted of excavating 15 test pits (TP-1 through TP-15) using a Case 580 rubber-tired backhoe. The test pits permitted a detailed evaluation of the character of the shallow subsurface soils underlying the proposed development. Test pits generally extended to depths of 7 to 11 feet below the existing ground surface.

Each test pit was continuously logged and observed in the field by an experienced staff-level geotechnical engineer. In-situ strength and quality attributes of materials encountered were estimated by Giles' field representative based on experience with similar soils and the difficulty incurred during excavation. Relative density estimates are presented in the test pit logs; however, the densities are not based on actual SPT blowcounts. Representative samples of the soils in the test pits were retrieved, classified in the field and transported to our laboratory for a detailed evaluation and classification as deemed necessary. The test pit logs are presented in Appendix B and the soil descriptions are based on inspection of the samples secured, field logs and laboratory testing. Explanation of the terms and symbols shown on the logs are provided on the appendix enclosure entitled "General Notes."

The test pits were loosely backfilled with the excavated soils at the completion of each test pit. Test pits may need to be compacted if located below proposed foundation or other developments.

Hand Boring Methods

Hand borings were performed using a portable, 3-inch diameter, hand-operated hollow auger. Soils removed from the auger were visually classified in the field and transported to our laboratory for testing as deemed appropriate. The relative density of soils encountered is estimated based on the relative ease of auger advancement.

Sampling and Testing Procedures

The field testing and sampling operations were conducted in general accordance with the procedures recommended by the American Society for Testing and Materials (ASTM) and/or other relevant specifications. Results of the field testing (i.e., N-values) are reported on the Test Boring Logs. Explanation of the terms and symbols shown on the logs are provided on the appendix enclosure entitled "General Notes."

RECORD OF SUBSURFACE EXPLORATION

BORING NO. & LOCATION: B-1	PROJECT: MCDERMOTH ELEMENTARY SCHOOL
SURFACE ELEVATION: 18 Ft.	PROJECT LOCATION: 409 N "K" STREET
COMPLETION DATE: 2/27/97	ABERDEEN, WASHINGTON
FIELD REPRESENTATIVE: MMR	PROJECT NUMBER: 6G-9701013

GILES ENGINEERING ASSOCIATES, INC.
Dallas Madison Seattle
Milwaukee Los Angeles
Washington, D.C.

MATERIAL DESCRIPTION	Feet Below Surface	Sample No. & Type	N	q_u (tsf)	q_p (tsf)	q_s (tsf)	w (%)	PID	NOTES
1 inch asphalt over loose, wet, tan, medium SAND with some fine gravel; becomes saturated at 1.5 feet; organic stained below 2 feet (Probable Fill)	▽	1-SS	1				60		
Very loose/ loose, saturated, gray-green, SILT with some fine sand to silty fine SAND; trace clay and gravel; trace to some organics and wood throughout	5	2-SS	2				35		sieve test
		3-SS	9*				40		*wood in sample
	10	4-SS	6				95		sieve test
	15	5-SS	16*				44		*wood in sample
	20	6-SS	12						
Becomes stiff, wet, gray SILT with trace clay; trace organics									
	25								
Firm to dense, saturated, medium to coarse SAND with some fine gravel		7-SS	50/6						
Very dense, damp, dark gray, silty fine SAND with trace gravel (Weathered SANDSTONE)		8-SS	50/3						
Boring terminated at approximately 29.5 feet; refusal									

	WATER OBSERVATION DATA	REMARKS
▽	WATER ENCOUNTERED DURING DRILLING:1.5 ft	
▼	WATER LEVEL AFTER REMOVAL:	
	CAVE DEPTH AFTER REMOVAL:	
▼	WATER LEVEL AFTER HOURS:	
	CAVE DEPTH AFTER HOURS:	

Changes in strata indicated by the lines are approximate boundary between soil types. The actual transition may be gradual and may vary considerably between borings. Location of Test Boring is shown on the Boring Location Plan.

RECORD OF SUBSURFACE EXPLORATION

BORING NO. & LOCATION: B-2	PROJECT: MCDERMOTH ELEMENTARY SCHOOL
SURFACE ELEVATION: 18 Ft.	PROJECT LOCATION: 409 N "K" STREET
COMPLETION DATE: 2/27/97	ABERDEEN, WASHINGTON
FIELD REPRESENTATIVE: MMR	PROJECT NUMBER: 6G-9701013

GILES ENGINEERING ASSOCIATES, INC.
Dallas Madison Seattle
Milwaukee Los Angeles
Washington, D.C.

MATERIAL DESCRIPTION	Feet Below Surface	Sample No. & Type	N	q_u (tsf)	q_p (tsf)	q_s (tsf)	w (%)	PID	NOTES
1 inch Asphalt Firm, wet becoming saturated, tan, medium to coarse SAND with little gravel	▽	1-SS	22				16		
	5								
Firm, wet, orange, clayey, gravelly, coarse SAND		2-SS	50/6						
Stiff, wet, gray SILT with trace fine sand and clay	10	3-SS	30		1.25		46		
	15								
Becoming sandier; pebbles		4-SS	17		1.1		26		
Dense, wet to saturated, dark gray, fine gravelly, fine to coarse, interbedded SAND with trace silt	20	5-SS	50/6						
	25								
Grades to no silt		6-SS	50/3						
Very dense, damp, dark gray, silty fine SAND with trace gravel(Weathered SANDSTONE)		7-SS	50/3						
Boring terminated at approximately 29.2 feet; refusal									

	WATER OBSERVATION DATA	REMARKS
▽	WATER ENCOUNTERED DURING DRILLING: 1.5	
▽	WATER LEVEL AFTER REMOVAL:	
	CAVE DEPTH AFTER REMOVAL:	
▼	WATER LEVEL AFTER HOURS:	
	CAVE DEPTH AFTER HOURS:	

Changes in strata indicated by the lines are approximate boundary between soil types. The actual transition may be gradual and may vary considerably between borings. Location of Test Boring is shown on the Boring Location Plan.

RECORD OF SUBSURFACE EXPLORATION

BORING NO. & LOCATION:	PROJECT:
B-3	MCDERMOTH ELEMENTARY SCHOOL
SURFACE ELEVATION:	PROJECT LOCATION:
18 Ft.	409 N "K" STREET
COMPLETION DATE:	ABERDEEN, WASHINGTON
2/27/97	
FIELD REPRESENTATIVE:	PROJECT NUMBER: 6G-9701013
MMR	

GILES ENGINEERING ASSOCIATES, INC.
Dallas Madison Seattle
Milwaukee Los Angeles
Washington, D.C.

MATERIAL DESCRIPTION	Feet Below Surface	Sample No. & Type	N	q_u (tsf)	q_p (tsf)	q_s (tsf)	w (%)	PID	NOTES
1 inch Asphalt Firm, wet becoming saturated, orange-tan, medium SAND with little silt and gravel (Probable Fill)	▽	1-SS	2				44		
Loose, saturated, gray-green, fine sandy SILT with silty fine SAND interbeds; trace organics	5	2-SS	10				29		
Highly decayed WOOD	10								
Medium stiff to stiff, saturated, gray-green SILT with little fine sand; trace gravel and clay; trace organics throughout		3-SS	32*		0.25		37		*
	15	4-SS	16		1.25		36		
Becomes tan sandy SILT with intense orange staining in sand stringers Boring terminated at approximately 19 feet									

	WATER OBSERVATION DATA	REMARKS
▽	WATER ENCOUNTERED DURING DRILLING:1.5 ft	*blowcount possibly overstated
▽	WATER LEVEL AFTER REMOVAL:	
—	CAVE DEPTH AFTER REMOVAL:	
▼	WATER LEVEL AFTER HOURS:	
—	CAVE DEPTH AFTER HOURS:	

Changes in strata indicated by the lines are approximate boundary between soil types. The actual transition may be gradual and may vary considerably between borings. Location of Test Boring is shown on the Boring Location Plan.

TEST PIT LOGS
6G-9701013

Depth (feet)	Material Description	Testing
	Test Pit TP-1 Location: *Site and Exploration Plan*, Figure 2 Approximate ground surface elevation: 18	
0.0 - 0.3 0.3 - 4.0	Asphalt Soft/medium stiff, wet to saturated, orange-brown grading to gray below 2 feet, SILT with little to some fine sand; scattered logs to 4-inch diameter; organic odor	q_p=0.5-0.75tsf q_v=1.25tsf
	Heavy seepage below 2 feet Moderate caving below 1 foot grading to severe below 3 feet	

	Test Pit TP-2 Location: *Site and Exploration Plan*, Figure 2 Approximate ground surface elevation: 18	
0.0 - 0.2 0.2 - 0.5 0.5 - 2.0 2.0	Asphalt Loose, wet, reddish-brown, gravelly, fine to medium SAND with some silt Medium stiff, wet, gray, SILT with little fine sand Refusal on obstacle	
	Heavy seepage at 1.8 feet No caving observed	

Field Representative: BWG

HAND AUGER LOGS
6G-9701013

ft.	HAND AUGER 1 Date Completed: Feb. 14, 1997 Apprx. Elevation: 30 Location: Retaining wall backfill Field Representative: BWG	$N_{(DCP)}$
	Topsoil and grass	
1		
	Loose to firm, wet, orange-brown, fine to coarse SAND with little fine gravel; trace to little silt; trace brick fragments (Probable Fill)	
2		
3		
4		
5		
6		
	Refusal on rock and concrete at 6.0 feet No seepage or caving	
7		
8		
9		
10		
11		
12		

ft.	HAND AUGER 2 Date Completed: Jan. 6, 1997 Apprx. Elevation: 36.5 Location: Northwest side of school Field Representative: BWG	$N_{(DCP)}$
	Topsoil and grass	
1	Soft to medium stiff, wet, orange-brown, fine sandy SILT (Probable Fill)	
2		
3		
	Firm, wet, reddish-brown, silty, fine to medium SAND with some gravel and trace brick (Probable Fill)	
4		
5		
	Boring terminated at approximately 5 feet No seepage or caving	
6		
7		
8		
9		
10		
11		
12		

① $N_{(DCP)}$ represents the Standard Penetration Resistance value (N) correlated with Dynamic Cone Penetration values obtained in the field by dividing the total field blows by the number of 1¾ - inch increments driven (see ASTM *Special Technical Publication #399).*

GENERAL NOTES

GILES ENGINEERING ASSOCIATES, INC.

SAMPLE IDENTIFICATION

All samples are visually classified in general accordance with the Unified Soil Classification System (ASTM D-2487-75 or D-2488-75)

DESCRIPTIVE TERM (% BY DRY WEIGHT)

Trace:	1-10%
Little:	11-20%
Some:	21-35%
And/Adjective	36-50%

PARTICLE SIZE (DIAMETER)

Boulders:	8 in and larger	
Cobbles:	3 in to 8 in	
Gravel:	coarse-	3/4 to 3 in
	fine-	No. 4 (4.76mm) to 3/4 in
Sand:	coarse-	No. 4 (4.76mm) to No. 10 (2.0mm)
	medium-	No.10 (2.0mm) to No. 40 (0.42mm)
	fine-	No. 40 (0.42mm) to No. 200 (0.074mm)
Silt:	No. 200 (0.074mm) and smaller (Non-plastic)	
Clay:	No. 200 (0.074mm) and smaller (Plastic)	

SOIL PROPERTY SYMBOLS

- Dd: Dry Density (pcf)
- LL: Liquid Limit, percent
- PL: Plastic Limit, percent
- PI: Plasticity Index (LL-PL)
- LOI: Loss on Ignition, percent
- Gs: Specific Gravity
- K: Coefficient of Permeability
- w: Moisture content, percent
- qp: Calibrated Penetrometer Resistance, tsf
- qs: Vane-Shear Strength, tsf
- qu: Unconfined Compressive Strength, tsf
- qc: Static Cone Penetrometer Resistance. Correlated to Unconfined Compressive Strength, tsf
- PID: Results of vapor analysis conducted on representative samples utilizing a Photoionization Detector calibrated to a benzene standard. Results expressed in HNU-units (BDL=Below Detection Limits)
- N': Penetration Resistance per 6 inch interval, or fraction thereof, for a standard 2 inch O.D. (1-3/8 inch I.D.) split spoon sampler driven with a 140 pound weight free-falling 30 inches. Performed in genral accordance with Standard Penetration Test Specifications (ASTM D-1586). N in blows per foot equals sum of N' values where plus sign is shown.
- Nc: Penetration Resistance per 1-3/4 inches of Dynamic Cone Penetrometer. Approximately equivalent to Standard Penetration Test N-Value in blows per foot.
- Nr': Penetration Resistance per 6 inch interval, or fraction thereof, for California Ring Sampler driven with a 140 pound weight free-falling 30 inches perASTM D-3550. Not equivalent to Standard Penetration Test N-Value.

DRILLING AND SAMPLING SYMBOLS

- SS: Split-Spoon
- ST: Shelby Tube - 3" O.D. (except where noted)
- CS: 3" O.D. California Ring Sampler
- DC: Dynamic Cone Penetrometer per ASTM Special Technical Publication No. 399
- AU: Auger Sample
- DB: Diamond Bit
- CB: Carbide Bit
- WS: Wash Sample
- RB: Rock-Roller Bit
- BS: Bulk Sample

Note: Depth intervals for sampling shown on Record of Subsurface Exploration are not indicative of sample recovery, but position where sampling initiated.

SOIL STRENGTH CHARACTERISTICS

COHESIVE (CLAYEY) SOILS

COMPARATIVE CONSISTENCY	BLOWS PER FOOT (N)	UNCONFINED COMPRESSIVE STRENGTH (TSF)
Very Soft	0-2	0 - 0.25
Soft	3-4	0.25 - 0.50
Medium Stiff	5-8	0.50 - 1.00
Stiff	9-15	1.00 - 2.00
Very Stiff	16-30	2.00 - 4.00
Hard	31+	4.00+

NON-COHESIVE (GRANULAR) SOILS

RELATIVE DENSITY	BLOWS PER FOOT (N)
Very Loose	0-4
Loose	5-10
Firm	11-30
Dense	31-50
Very Dense	51+

DEGREE OF PLASTICITY	PI
None to Slight	0-4
Slight	5-10
Medium	11-30
High to Very High	31+

DEGREE OF EXPANSIVE POTENTIAL	PI
Low	0-15
Medium	15-25
High	25+

GEA446/kah

Recycled Paper

APPENDIX D

LABORATORY TESTING AND SOIL CLASSIFICATION

The laboratory testing was conducted under the supervision of a geotechnical engineer in general accordance with the procedures recommended by the American Society for Testing and Materials (ASTM) and/or other relevant specifications. Brief descriptions of laboratory procedures, testing results, and soil classifications are included herein.

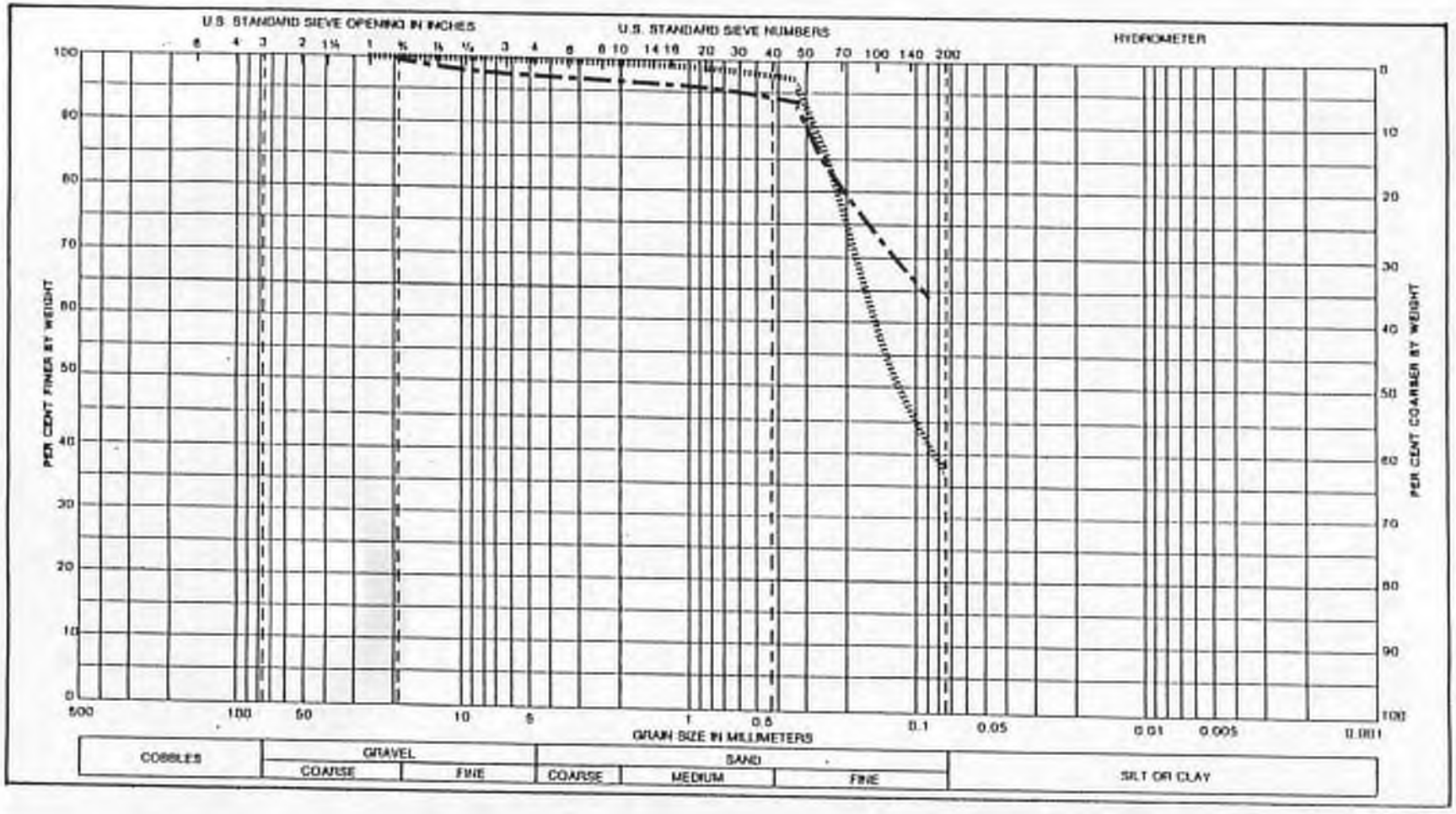
LABORATORY TESTING AND CLASSIFICATION

Moisture Content (w) (ASTM D 2216)

Moisture content is defined as the ratio of the weight of water contained within a soil sample to the weight of the dry solids within the sample. Moisture content is expressed as a percentage.

Particle Size Distribution (ASTM D 421, D 422)

This test is performed to determine the distribution of specific particle sizes (diameters) within a soil sample. The distribution of coarse-grained soil particles (sand and gravel) is determined from a "sieve analysis", which is conducted by passing the sample through a series of nested sieves. Soils passing the U.S. No. 200 sieve are considered fine grained soils consisting of silt and clay.



Boring No.	Sample No.	Depth (Ft)	Classification	Nat. w %	McDermoth Elementary
B-1	S-2	5.0-6.5	Silty SAND	35.0	Project No. : 6G-9701013
B-1	S-4 - - — - — - — - .	12.5-14.0	SILT with some sand & trace gravel	95.0	Aberdeen, Washington
					Mar. 3, 1997
					REPORT OF SOIL ANALYSIS ASTM STANDARD D-422

* Not shown graphically, the samples have more than 80 % (by weight) passing 200 sieve.

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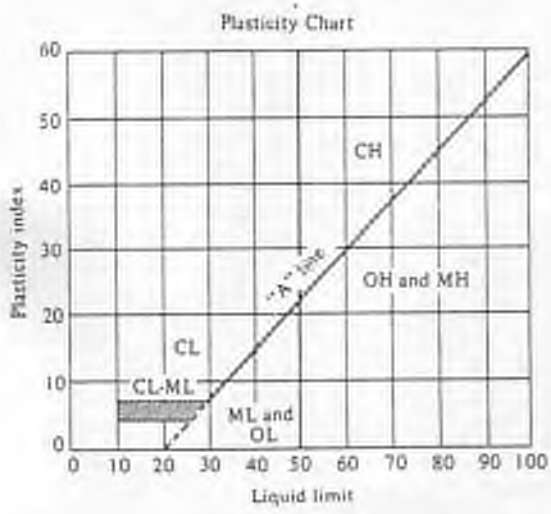
MOISTURE CONTENT SUMMMARY			
McDermoth Elementary, Aberdeen, Washington			
Boring No.	**Sample**	**Depth (ft)**	**Water Content %**
B-1	1-SS	2.5-4.0	60
B-1	2-SS	5.0-6.5	35
B-1	3-SS	7.5-9.0	40
B-1	4-SS	12.5-14.0	95
B-1	5-SS	17.5-19.0	44
B-2	1-SS	2.5-4.0	16
B-2	3-SS	12.5-14.0	46
B-2	4-SS	17.5-19.0	26
B-3	1-SS	2.5-4.0	44
B-3	2-SS	7.5-9.0	29
B-3	3-SS	12.5-14.0	37
B-3	4-SS	17.5-19.0	36

UNIFIED SOIL CLASSIFICATION SYSTEM. (ASTM D-2487)

Major Divisions			Group Symbols	Typical Names	Laboratory Classification Criteria	
Coarse-grained soils (More than half of material is larger than No. 200 sieve size)	Gravels (More than half of coarse fraction is larger than No. 4 sieve size)	Clean gravels (Little or no fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines	Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows: Less than 5 per cent: GW, GP, SW, SP. More than 12 per cent: GM, GC, SM, SC. 5 to 12 per cent: *Borderline* cases requiring dual symbols[b]	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3
			GP	Poorly graded gravels, gravel-sand mixtures, little or no fines		Not meeting all gradation requirements for GW
		Gravels with fines (Appreciable amount of fines)	GM[a] d / u	Silty gravels, gravel-sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are *borderline* cases requiring use of dual symbols
			GC	Clayey gravels, gravel-sand-clay mixtures	Atterberg limits below "A" line with P.I. greater than 7	
	Sands (More than half of coarse fraction is smaller than No. 4 sieve size)	Clean sands (Little or no fines)	SW	Well-graded sands, gravelly sands, little or no fines	$C_u = \frac{D_{60}}{D_{10}}$ greater than 6; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	
			SP	Poorly graded sands, gravelly sands, little or no fines	Not meeting all gradation requirements for SW	
		Sands with fines (Appreciable amount of fines)	SM[a] d / u	Silty sands, sand-silt mixtures	Atterberg limits above "A" line or P.I. less than 4	Limits plotting in hatched zone with P.I. between 4 and 7 are *borderline* cases requiring use of dual symbols
			SC	Clayey sands, sand-clay mixtures	Atterberg limits above "A" line with P.I. greater than 7	
Fine-grained soils (More than half material is smaller than No. 200 sieve)	Silts and clays (Liquid limit less than 50)		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity		
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays		
			OL	Organic silts and organic silty clays of low plasticity		
	Silts and clays (Liquid limit greater than 50)		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts		
			CH	Inorganic clays of high plasticity, fat clays		
			OH	Organic clays of medium to high plasticity, organic silts		
	Highly organic soils		Pt	Peat and other highly organic soils		



[a] Division of GM and SM groups into subdivisions of d and u are for roads and airfields only. Subdivision is based on Atterberg limits; suffix d used when L.L. is 28 or less and the P.I. is 6 or less; the suffix u used when L.L. is greater than 28.

[b] Borderline classifications, used for soils possessing characteristics of two groups, are designated by combinations of group symbols. For example: GW-GC, well-graded gravel-sand mixture with clay binder.

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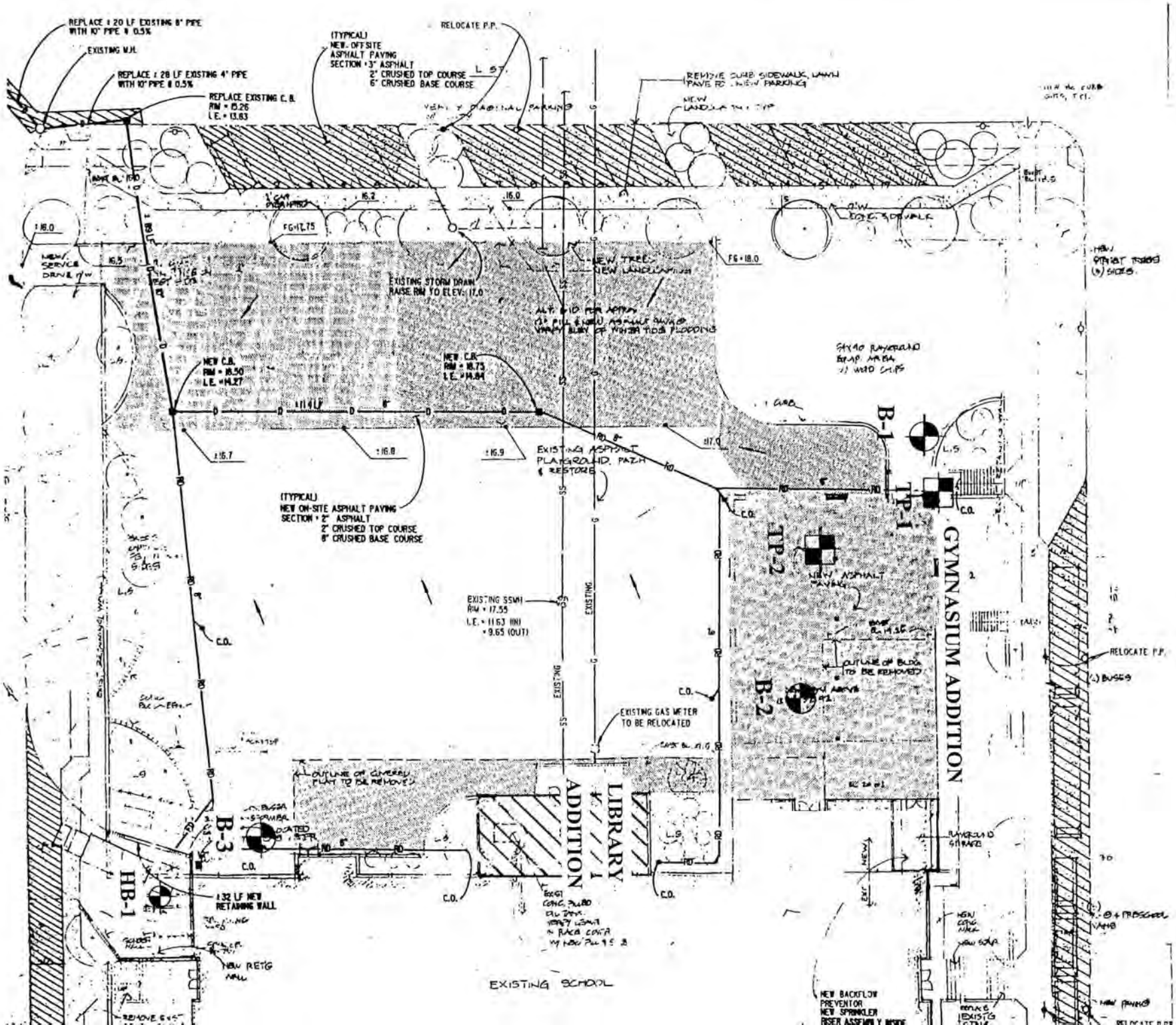
CHARACTERISTICS AND RATINGS OF UNIFIED SOIL SYSTEM CLASSES FOR SOIL CONSTRUCTION *

Class	Compaction Characteristics	Maximum Dry Density Standard Proctor (pcf)	Compressibility and Expansion	Drainage and Permeability	Value as an Embankment Material	Value as Subgrade when Not Subject to Frost	Value as Base Course	Value as Temporary Pavement	
								With Dust Palliative	With Bituminous Treatment
GW	Good: tractor, rubber-tired, steel wheel or vibratory roller	125-135	Almost none	Good drainage, pervious	Very stable	Excellent	Good	Fair to poor	Excellent
GP	Good: tractor, rubber-tired, steel wheel, or vibratory roller	115-125	Almost none	Good drainage, pervious	Reasonably stable	Excellent to good	Poor to fair	Poor	
GM	Good: rubber-tired or light sheepsfoot roller	120-135	Slight	Poor drainage, semipervious	Reasonably stable	Excellent to good	Fair to poor	Poor	Poor to fair
GC	Good to fair: rubber-tired or sheepsfoot roller	115-130	Slight	Poor drainage, impervious	Reasonably stable	Good	Good to fair **	Excellent	Excellent
SW	Good: tractor, rubber-tired or vibratory roller	110-130	Almost none	Good drainage, pervious	Very stable	Good	Fair to poor	Fair to poor	Good
SP	Good: tractor, rubber-tired or vibratory roller	100-120	Almost none	Good drainage, pervious	Reasonably stable when dense	Good to fair	Poor	Poor	Poor to fair
SM	Good: rubber-tired or sheepsfoot roller	110-125	Slight	Poor drainage, impervious	Reasonably stable when dense	Good to fair	Poor	Poor	Poor to fair
SC	Good to fair: rubber-tired or sheepsfoot roller	105-125	Slight to medium	Poor drainage, impervious	Reasonably stable	Good to fair	Fair to poor	Excellent	Excellent
ML	Good to poor: Rubber-tired or sheepsfoot roller	95-120	Slight to medium	Poor drainage, impervious	Poor stability, high density required	Fair to poor	Not suitable	Poor	Poor
CL	Good to fair: sheepsfoot or rubber-tired roller	95-120	Medium	No drainage, impervious	Good stability	Fair to poor	Not suitable	Poor	Poor
OL	Fair to poor: sheepsfoot or rubber-tired roller	80-100	Medium to high	Poor drainage, impervious	Unstable, should not be used	Poor	Not suitable	Not suitable	Not suitable
MH	Fair to poor: Sheepsfoot or rubber-tired roller	70-95	High	Poor drainage, impervious	Poor stability, should not be used	Poor	Not suitable	Very poor	Very poor
CH	Fair to poor: sheepsfoot roller	80-105	Very high	No drainage, impervious	Fair stability, may soften on expansion	Poor to very poor	Not suitable	Very poor	Not suitable
OH	Fair to poor: sheepsfoot roller	65-100	High	No drainage, impervious	Unstable, should not be used	Very poor	Not suitable	Not suitable	Not suitable
Pt	Not suitable		Very high	Fair to poor drainage	Should not be used	Not suitable	Not suitable	Not suitable	Not suitable

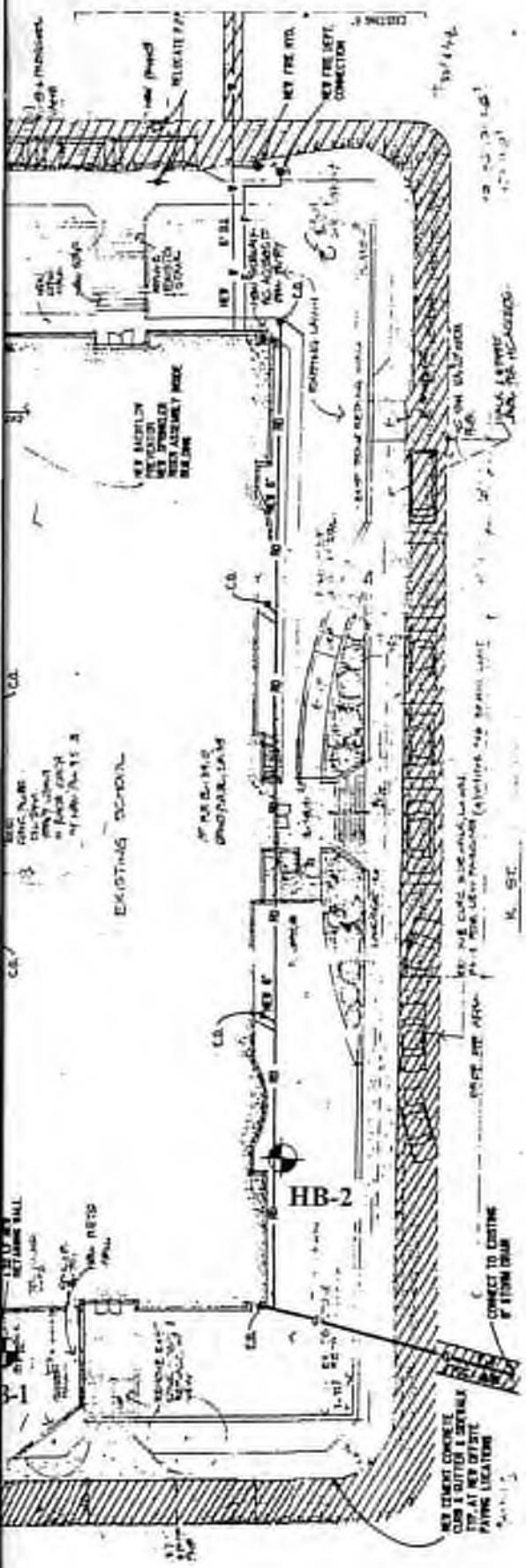
* "The Unified Classification: Appendix A - Characteristics of Soil Groups Pertaining to Roads and Airfields, and Appendix B - Characteristics of Soil Groups Pertaining to Embankments and Foundations," *Technical Memorandum 357*, U.S. Waterways Experiment Station, Vicksburg, 1953.

** Not suitable if subject to frost.

Giles Engineering Associates, Inc.



DRAWING FROM PRELIMINARY LAYOUT PLAN BY AHBL CIVIL AND STRUCTURAL ENGINEERS





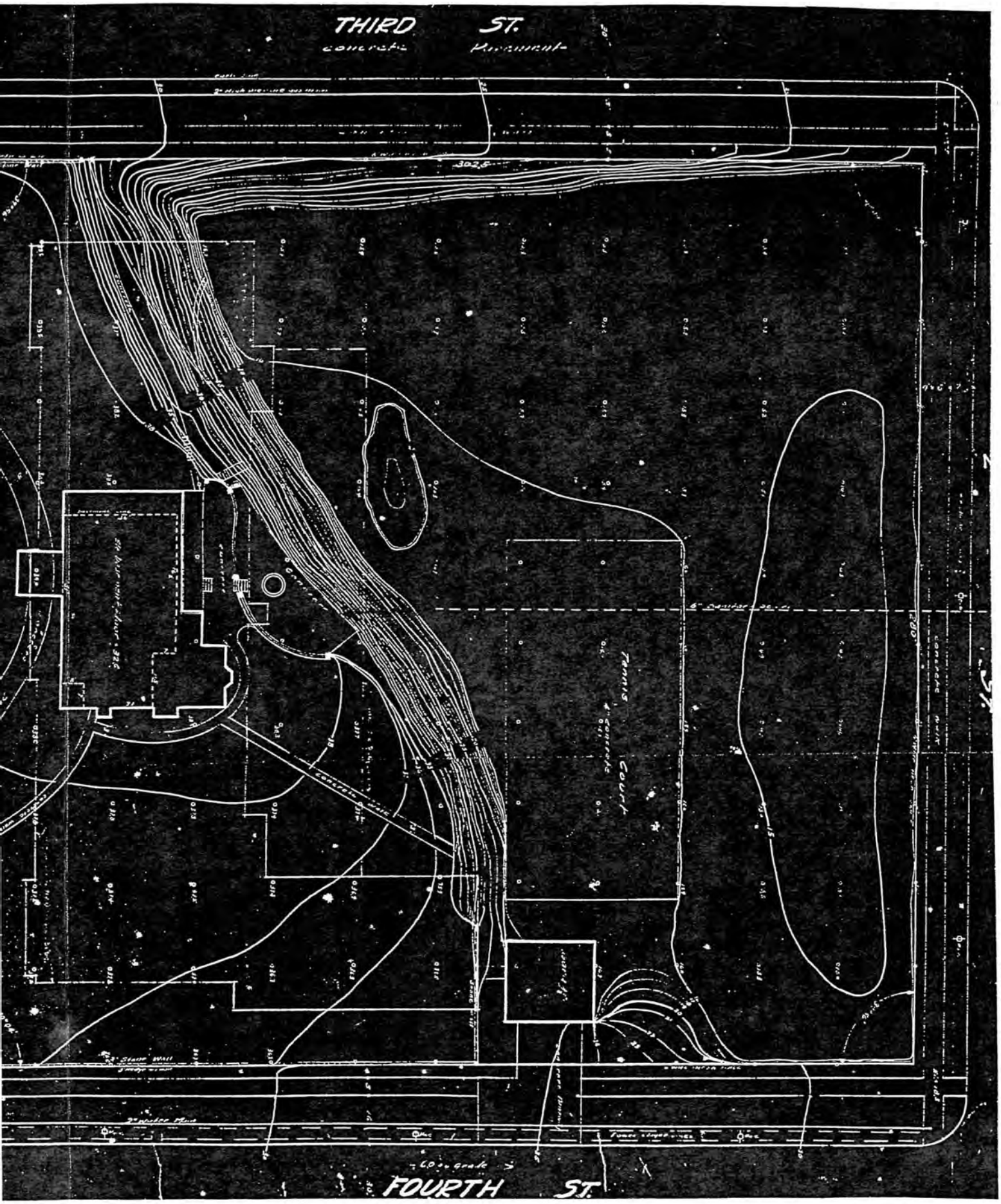
LEGEND

B-1	BORING NUMBER AND APPROXIMATE LOCATION
TP-1	TEST PIT NUMBER AND AND APPROXIMATE LOCATION
HB-1	HAND BORING NUMBER AND APPROXIMATE LOCATION

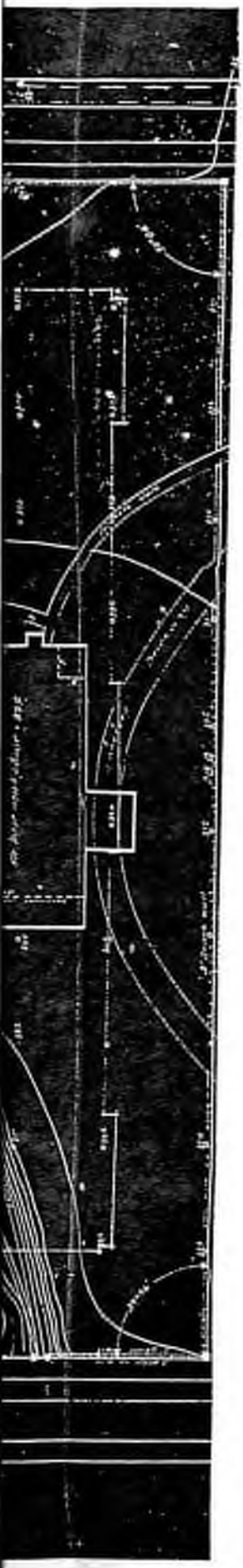
SITE AND EXPLORATION PLAN - FIGURE 2
McDERMOTH ELEMENTARY SCHOOL UPGRADES
409 NORTH "K" STREET
ABERDEEN, WASHINGTON
GILES JOB No. 6G-9701013
NOT TO SCALE

GILES ENGINEERING ASSOCIATES, INC.
GEOTECHNICAL GEOENVIRONMENTAL
AND CONSTRUCTION MATERIALS CONSULTANTS

ENGINEERS


THIRD ST.
concrete Pavement
302.5
Tennis Court
FOURTH ST.

ADAPTED FROM 1929 SITE PLAN "SURVEY AND TEST HOLE BORINGS"





HISTORIC SITE PLAN - FIGURE 3
McDERMOTH ELEMENTARY SCHOOL
409 NORTH "K" STREET
ABERDEEN, WASHINGTON
GILES JOB No. 6G-9701013
NOT TO SCALE

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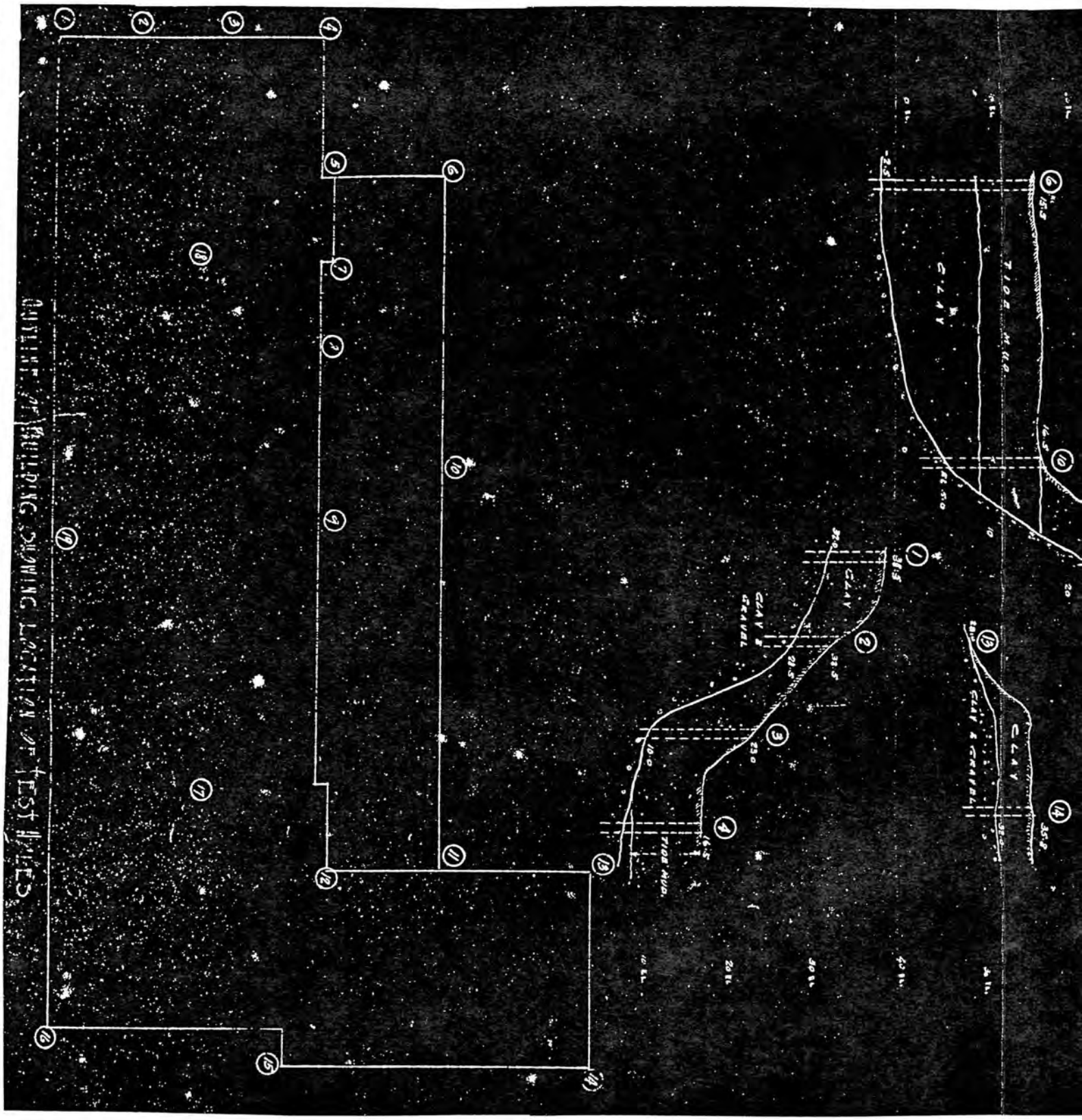

ADAPTED FROM 1929 SITE PLAN "SURVEY AND TEST HOLE BORINGS"

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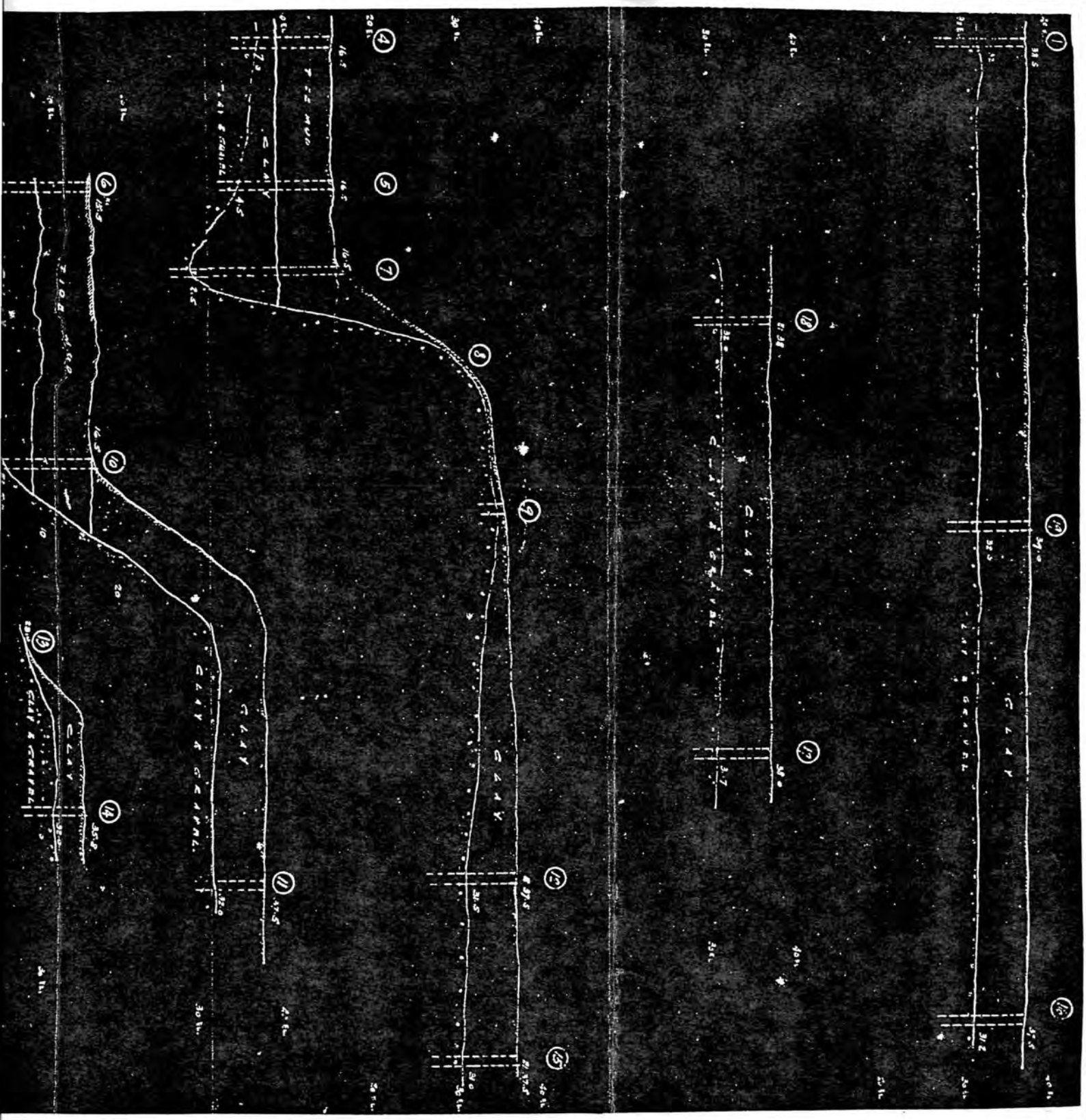

HISTORIC SOIL LOGS - FIGURE 4
McDERMOTH ELEMENTARY SCHOOL
409 NORTH "K" STREET
ABERDEEN, WASHINGTON
GILES JOB No. 6G-9701013
NOT TO SCALE

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AND CONSTRUCTION MATERIALS CONSULTANTS



SCALE 1:24 000

SOIL SURVEY OF GRAYS HARBOR - FIGURE 5
McDERMOTH ELEMENTARY SCHOOL UPGRADES
409 NORTH "K" STREET
ABERDEEN, WASHINGTON
GILES JOB No: 6G-9701013

N
W
E
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GILES
ENGINEERING ASSOCIATES, INC.

MAP FROM SOIL SURVEY OF GRAYS HARBOR COUNTY AREA, U.S. DEPARTMENT OF AGRICULTURE AND THE SOIL CONSERVATION SERVICE, ISSUED JULY, 1986

LEGEND

- SHORE & REMOVE BEARING WALL
- REMOVE CONC. FLOOR
- ECSG EXISTING CONC. SLAB ON GRADE
- ECSS EXISTING CONC. STRUCTURAL SLAB

SHORE & REMOVE EXISTING BEARING WALL

6 X 12 BEAM

6 X 12 BEAM

ELEVATOR SHAFT. VERIFY FLOOR DEMOLITION REQUIRED FOR CLEARANCE ABOVE ELEVATOR WITH ELEVATOR SUPPLIER.

6 X 12 CONT. PURLIN

F.O. MASONRY ABOVE

OUTLINE OF GYM

REMOVE EXISTING BOARD RUNWAY (NEW SHEAR PLYWOOD TO FOLLOW)

REMOVE LADDER, LEAVE SCUTTLE TO FLOOR BELOW

EXISTING LADDER & SCUTTLE ON ROOF. REMOVE, INFILL & PATCH ROOF. RELOCATE LADDER PER A2.04

NEW FLOOR OPENING FOR MECH. DUCTWORK

FLR. ELEV.

NEW FLOOR OPENING FOR MECH. DUCTWORK

EXISTING SCUTTLE ON ROOF. REMOVE, INFILL & PATCH ROOF.

NEW FLOOR OPENING FOR ACCESS HATCH

REMOVE LADDER & SCUTTLE TO FLOOR BELOW, INFILL OPENING.

REMOVE EXISTING BOARD RUNWAY (NEW SHEAR PLYWOOD TO FOLLOW)

6 X 6 WD. COL. TYP.

NEW FLOOR OPENINGS FOR MECH DUCTWORK

LEVEL CHANGE FLOOR LINE

EXISTING SCUTTLE ON ROOF. REMOVE, INFILL & PATCH ROOF.

NEW FLOOR OPENINGS FOR MECH DUCTWORK

REMOVE ASBESTOS WALL SHINGLES ON CUPOLA ABOVE. DISPOSE OF PER CODE.

6 X 8 INCLINED POST, TYP.

REMOVE CLAY TILE & BRICK VENT CHASES FROM ATTIC FLOOR TO 1'-0" ABOVE ROOF LINE. REMOVE 12" THICK CONC. BASE AT ATTIC FLOOR.

MASONRY VENT SHAFTS TO REMAIN. SIM. AT SOUTH.

STRAP AT WALL, TYP.

6 X 8 INCLINED POST, TYP.

6 X 12 CONT. PURLIN

REMOVE CLAY TILE & BRICK VENT CHASES FROM ATTIC FLOOR TO 1'-0" ABOVE ROOF LINE. REMOVE 12" THICK CONC. BASE AT ATTIC FLOOR.

2x4 STUD WALL

2x4 STUD WALL

ROOF OVERHANG

15'-6" | 12'-0" | 12'-0" | 12'-0" | 13'-10" | 13'-1 1/2" | 11'-4" | 11'-4" | 11'-2 1/2" | 7'-1" | 14'-3 1/2" | 18'-6" | 18'-6" | 11'-8 1/2" | 13'-4" | 12'-2" | 11'-0" | 11'-0" | 11'-4"

DEMOLITION PLAN ATTIC FLOOR

SCALE: 1/8" = 1' - 0"

PLAN NORTH

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Mc DERMOTH ELEMENTARY MODERNIZATION & ADDITIONS

ABERDEEN SCHOOL DISTRICT NO. 5 ABERDEEN WASHINGTON

REGISTERED ARCHITECT FRANK L. SMITH STATE OF WASHINGTON 1888

DATE 9/23/97
REVISED 1
COMM. NO. 961413

The BJSS GROUP
ARCHITECTS & PLANNERS, AIA
320 WEST BAY DRIVE SUITE 212 OLYMPIA, WA 98502 (360) 943-4650

PHASE 3

D2.04

Mc DERMOTH ELEMENTARY
MODERNIZATION & ADDITIONS
ABERDEEN SCHOOL DISTRICT NO. 5 ABERDEEN WASHINGTON

GENERAL NOTES

1) SEE SHEETS A2.05 & A2.06 FOR 1/4" TOILET ROOM PLANS & ELEVATIONS
2) SEE SECTIONS FOR BASKETBALL BACKBOARD NOTES.

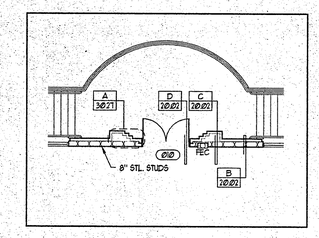
LEGEND

- EXISTING EXTERIOR 8" CLAY TILE AND 4" BRICK VENEER
- EXIST. CONCRETE WALL
- CONCRETE WALL, INST. IN PHASE 2

NEW WALLS

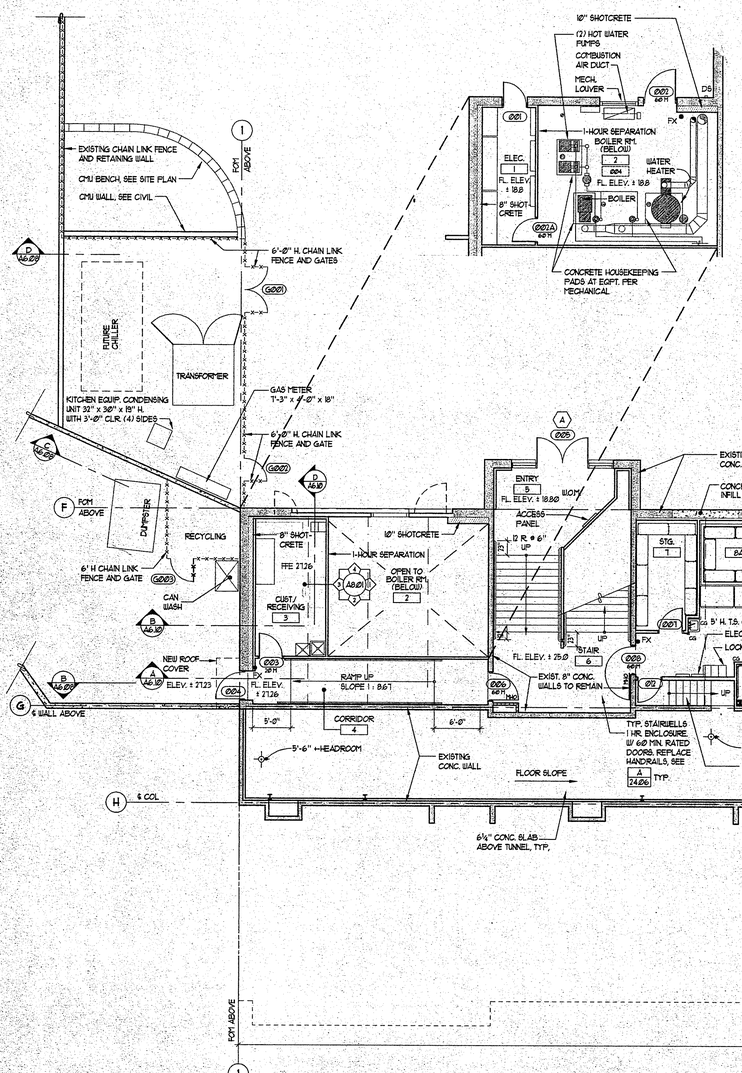
- WOOD STUD WALL U.N.O.
- BRICK VENEER
- 2x8 WOOD STUD AT EXTERIOR WALLS
- METAL STUD WALL
- SHOTCRETE WALL
- CONCRETE WALL
- CONCRETE MASONRY UNIT (CMU)
- 4'-0" HIGH CORNER GUARD
- 5"x5" T.S. COLUMN IN 2x6 WALL @ INTERIOR
- 6"x6" T.S. COLUMN IN 2x8 WALL @ EXTERIOR
- INTERIOR ELEVATION REFERENCE SYMBOL. SEE SHEETS A5 INDICATED ON PLANS.

FX	FIRE EXTINGUISHER ON WALL BRACKET
FEC (D)	FIRE EXTINGUISHER IN SEMI-RECESSED CABT.
2HM	2Ø MINUTE FIRE-RATED ASS'Y.
EDO	ELECTRIC DOOR OPENER
EDOS	ELECTRIC DOOR OPENER SWITCH
FOM	FACE OF MASONRY
MHO	MAGNETIC HOLD OPEN
PB	WHITE PEINBOARD, 4' H.
TB	TACKBOARD, 4' H.
WOM	WALK OFF MAT.
WOM	WALK OFF MAT
BB	BASKETBALL BACKBOARD



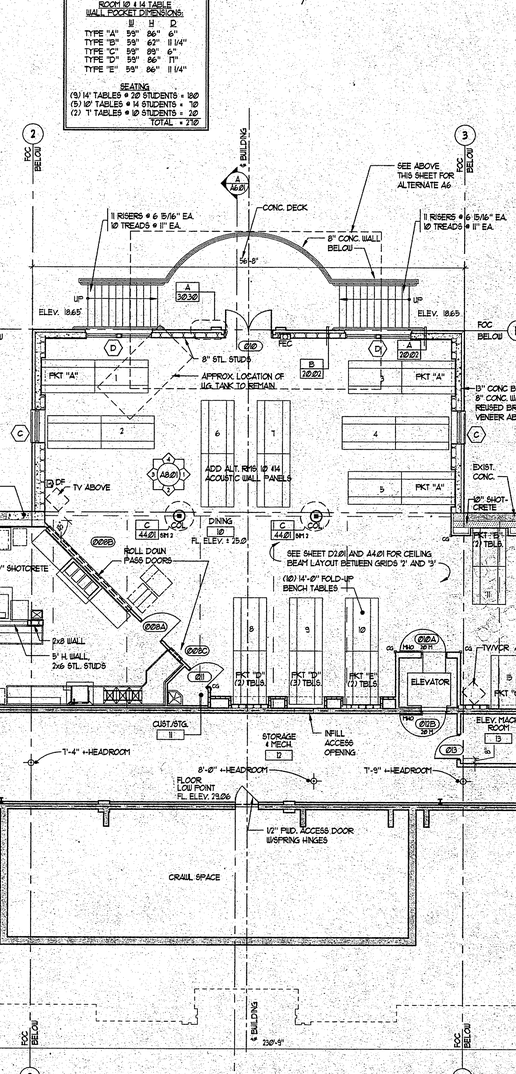
CANOPY - ALTERNATE A6

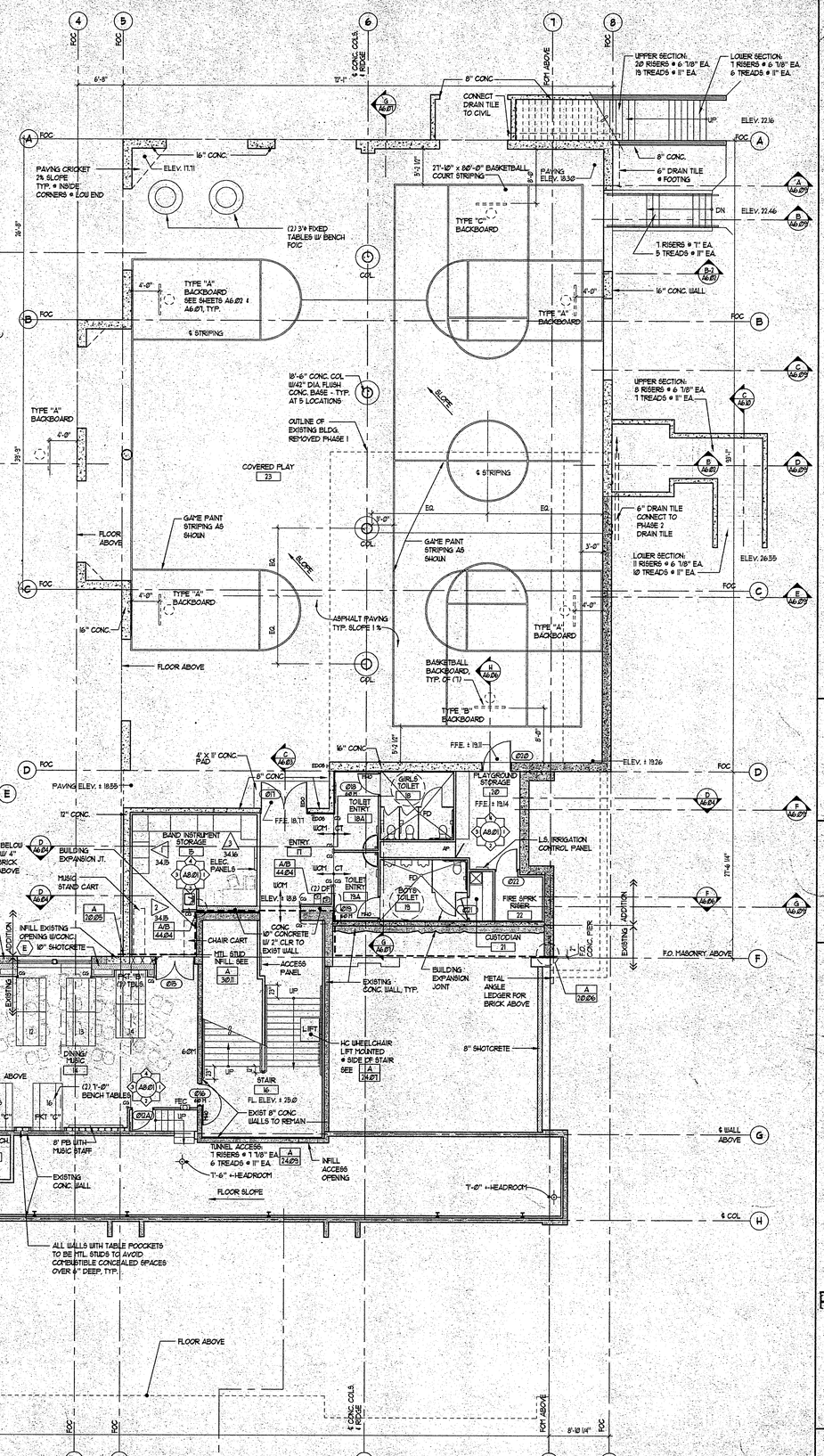
SCALE: 1/8" = 1' - Ø"



ROOM Nº & 14 TABLE WALL POCKET DIMENSIONS:			
	W	H	D
TYPE "A"	59"	86"	6"
TYPE "B"	59"	62"	11 1/4"
TYPE "C"	59"	89"	6"
TYPE "D"	59"	86"	11"
TYPE "E"	59"	86"	11 1/4"

SEATING
(9) 14" TABLES @ 2Ø STUDENTS = 18Ø
(5) 18" TABLES @ 14 STUDENTS = 7Ø
(2) 1' TABLES @ 1Ø STUDENTS = 2Ø
TOTAL = 27Ø





GROUND FLOOR PLAN

SCALE: 1/8" = 1' - Ø"

PLAN NORTH

The BJSS GROUP
ARCHITECTS & PLANNERS, AIA
320 WEST BAY DRIVE SUITE 212 OLYMPIA, WA 98502 (360) 943-4650

REGISTERED ARCHITECT 9179 FRANK L. SMITH STATE OF WASHINGTON 1888

DATE	REVISED	COMM. NO. 961413
9/23/97		

PHASE 3

A2.01

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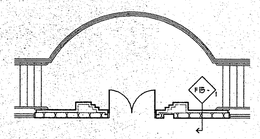


ADD. ALT. A-6
SCALE: 1/8" = 1' - 0"



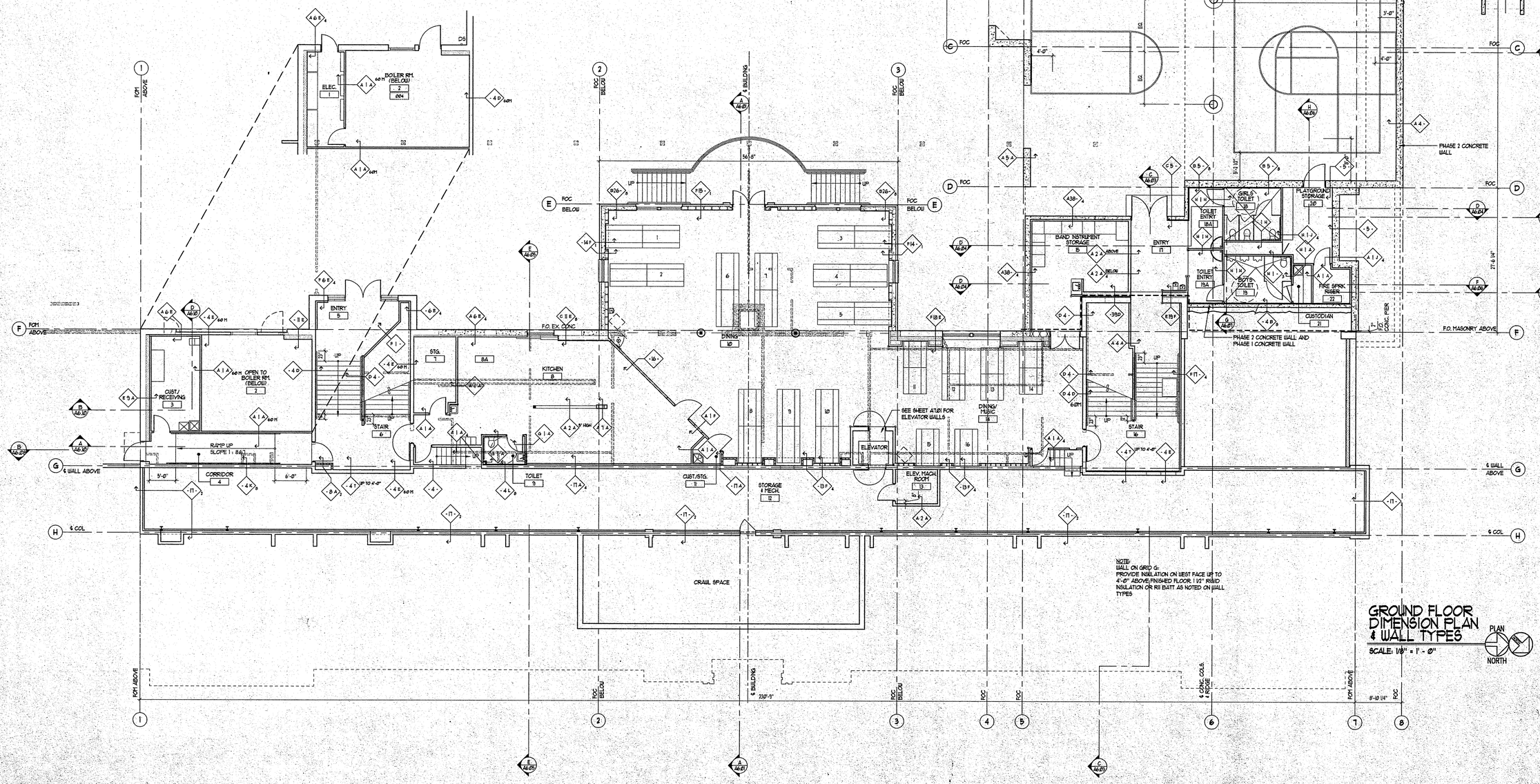
LEGEND

WALL FINISH - OUTSIDE LETTERS
1-HR FIRE RATED ASSEMBLY
SEE DET. BOOK SECT 45
INSULATION
WALL CONSTRUCTION - CENTER NUMBER

SEE SECTION 42 - DETAIL BOOK FOR WALL TYPES

WALLS REMOVED IN PHASE I

NOTE: DIMENSIONS WILL BE PROVIDED BY ARCHITECT BEFORE BEGINNING OF CONSTRUCTION



GROUND FLOOR DIMENSION PLAN & WALL TYPES
SCALE: 1/8" = 1' - 0"

Mc DERMOTH ELEMENTARY MODERNIZATION & ADDITIONS

ABERDEEN SCHOOL DISTRICT NO. 5 ABERDEEN WASHINGTON

REGISTERED ARCHITECT
FRANK L. SMITH
STATE OF WASHINGTON

DATE 9/23/97
REVISED
COMM. NO. 961413

The BJSS GROUP
ARCHITECTS & PLANNERS, AIA
320 WEST BAY DRIVE SUITE 212 OLYMPIA WA 98502 (360) 943-4650

PHASE 3

A2.01d

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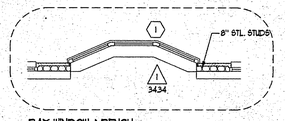
LEGEND

EXISTING EXTERIOR 8" CLAY TILE AND 4" BRICK VENEER	FX FIRE EXTINGUISHER ON WALL BRACKET
EXIST. CONCRETE WALL	FEC FIRE EXTINGUISHER IN SEMI-RECESSED CABT.
CONCRETE WALL, INST. IN PHASE 2	2HM 2Ø MINUTE FIRE-RATED A55'Y
NEW WALLS	EDO ELECTRIC DOOR OPENER
WOOD STUD WALL U.N.O.	EDOS ELECTRIC DOOR OPENER SWITCH
BRICK VENEER	FOM FACE OF MASONRY
2x8 WOOD STUD AT EXTERIOR WALLS	MHO MAGNETIC HOLD OPEN
METAL STUD WALL	PB WHITE PEINBOARD, 4' H.
SHOTCRETE WALL	TB TACKBOARD, 4' H.
CONCRETE WALL	WOM WALK OFF MAT
CONCRETE MASONRY UNIT (CMU)	WOM WALK OFF MAT
4'-Ø" HIGH CORNER GUARD	BB BASKETBALL BACKBOARD
5"x5" T.S. COLUMN IN 2x6 WALL @ INTERIOR. 6"x6" T.S. COLUMN IN 2x8 WALL @ EXTERIOR	
INTERIOR ELEVATION REFERENCE SYMBOL. SEE SHEETS A5 INDICATED ON PLANS.	

GENERAL NOTES

1) SEE SHEETS A2.05 & A2.06 FOR 1/4" TOILET ROOM PLANS & ELEVATIONS
2) SEE SECTIONS FOR BASKETBALL BACKBOARD NOTES.

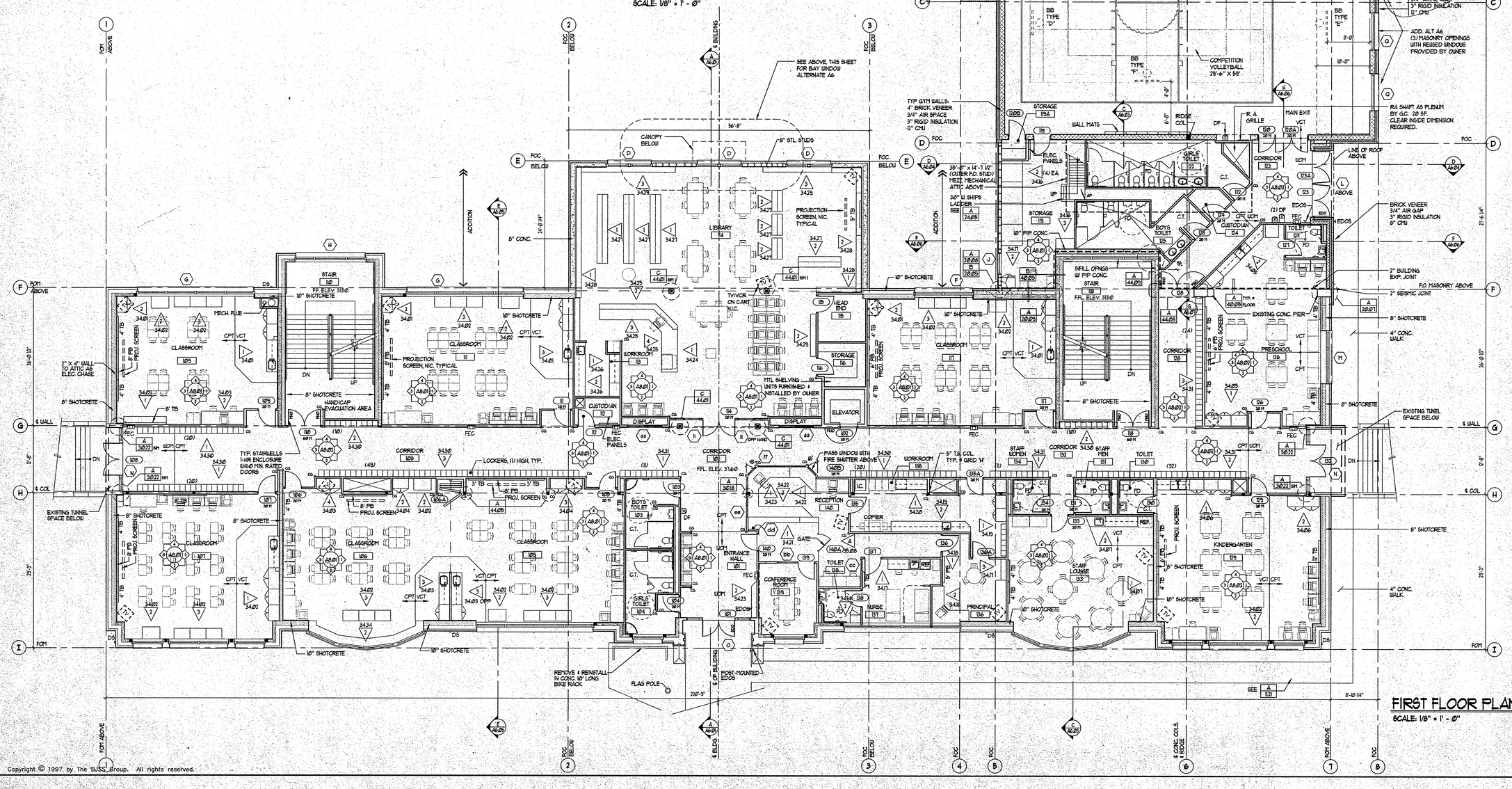
CORRIDOR STUDENT LOCKERS
ONE HIGH TYP. THIS FLOOR
SIZE 12"W x 15"D x 36"H
NO DOORS
QUANTITY THIS FLOOR: 207



BAY WINDOW & BENCH

ADDITIVE ALTERNATE A-6

SCALE: 1/8" = 1' - Ø"



Mc DERMOTH ELEMENTARY MODERNIZATION & ADDITIONS

ABERDEEN SCHOOL DISTRICT NO. 5 ABERDEEN WASHINGTON

REGISTERED ARCHITECT JAMES S. BOUSLOG 1988 STATE OF WASHINGTON

DATE 9/23/97
REVISED
COMM. NO. 96143

The BJSS GROUP
ARCHITECTS & PLANNERS, AIA
3001 WEST BAY DRIVE, SUITE 212 OLYMPIA, WA 98502 (360) 943-4650

PHASE 3

A2.02

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LEGEND

WALL FINISH - OUTSIDE LETTERS
1-HR FIRE RATED ASSEMBLY SEE DET. BOOK SECT 42
INSULATION
WALL CONSTRUCTION - CENTER NUMBER

SEE SECTION 42 - DETAIL BOOK FOR WALL TYPES

WALLS REMOVED IN PHASE 1

NOTE: DIMENSIONS WILL BE PROVIDED BY ARCHITECT BEFORE BEGINNING OF CONSTRUCTION

GYMNASIUM GAME LINES

(1) BASKETBALL COURT - 47'-6" x 77'-8" 2" STRIPING

(1) VOLLEYBALL COURT - 30'-0" x 60'-0" 2" STRIPING

(3) BADMINTON COURTS - 20'-0" x 44'-0" 1 1/2" STRIPING

ADD. ALT. A-6

SCALE: 1/8" = 1' - 0"

Mc DERMOTH ELEMENTARY MODERNIZATION & ADDITIONS

ABERDEEN SCHOOL DISTRICT NO. 5 ABERDEEN WASHINGTON

REGISTERED ARCHITECT FRANK L. SMITH STATE OF WASHINGTON

DATE 9/23/97
REVISED
COMM. NO. 961413

The BJSS GROUP
ARCHITECTS & PLANNERS, AIA
320 WEST 5TH DRIVE SUITE 212 OLYMPIA, WA 98502 (360) 943-4650

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A2.02d

FIRST FLOOR DIMENSION PLAN & WALL TYPES

SCALE: 1/8" = 1' - 0"

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LEGEND

- EXISTING EXTERIOR 8" CLAY TILE AND 4" BRICK VENEER
- EXIST. CONCRETE WALL
- CONCRETE WALL, INST. IN PHASE 2

NEW WALLS

- WOOD STUD WALL U.N.O.
- BRICK VENEER
- 2x8 WOOD STUD AT EXTERIOR WALLS
- METAL STUD WALL
- SHOTCRETE WALL
- CONCRETE WALL
- CONCRETE MASONRY UNIT (CMU)
- CG 4'-0" HIGH CORNER GUARD
- 5"x5" T.S. COLUMN IN 2x6 WALL @ INTERIOR
- 6"x6" T.S. COLUMN IN 2x8 WALL @ EXTERIOR
- A8.01 INTERIOR ELEVATION REFERENCE SYMBOL. SEE SHEETS AS INDICATED ON PLANS.

FX	FIRE EXTINGUISHER ON WALL BRACKET
FEC	FIRE EXTINGUISHER IN SEMI-RECESSED CABT.
20M	20 MINUTE FIRE-RATED ASS'Y
EDO	ELECTRIC DOOR OPENER
EDOS	ELECTRIC DOOR OPENER SWITCH
FOM	FACE OF MASONRY
MHO	MAGNETIC HOLD OPEN
PB	WHITE PENBOARD, 4' H.
TB	TACKBOARD, 4' H.
WOM	WALK OFF MAT
WOM	WALK OFF MAT
BB	BASKETBALL BACKBOARD

GENERAL NOTES

1) SEE SHEETS A2.05 & A2.06 FOR 1/4" TOILET ROOM PLANS & ELEVATIONS
2) SEE SECTIONS FOR BASKETBALL BACKBOARD NOTES.

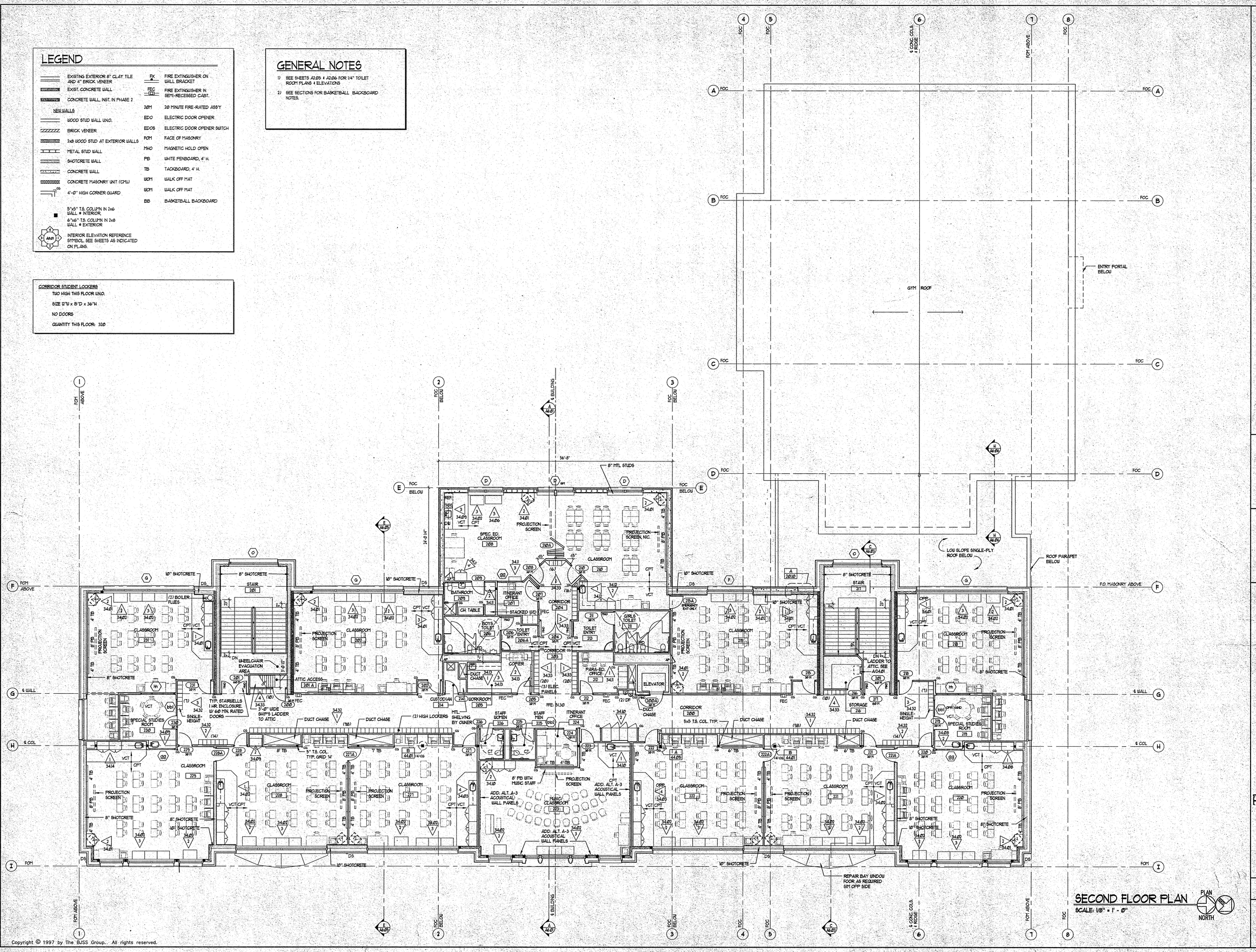
CORRIDOR STUDENT LOCKERS

TWO HIGH THIS FLOOR U.N.O.

SIZE 12"W x 15"D x 36"H

NO DOORS

QUANTITY THIS FLOOR: 320



SECOND FLOOR PLAN

SCALE: 1/8" = 1' - 0"

PLAN NORTH

Mc DERMOTH ELEMENTARY MODERNIZATION & ADDITIONS

ABERDEEN SCHOOL DISTRICT NO. 5 ABERDEEN WASHINGTON

REGISTERED ARCHITECT FRANK L. SMITH STATE OF WASHINGTON 1888

DATE 9/23/97

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A2.03

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Mc DERMOTH ELEMENTARY
MODERNIZATION & ADDITIONS
ABERDEEN SCHOOL DISTRICT NO. 5 ABERDEEN WASHINGTON

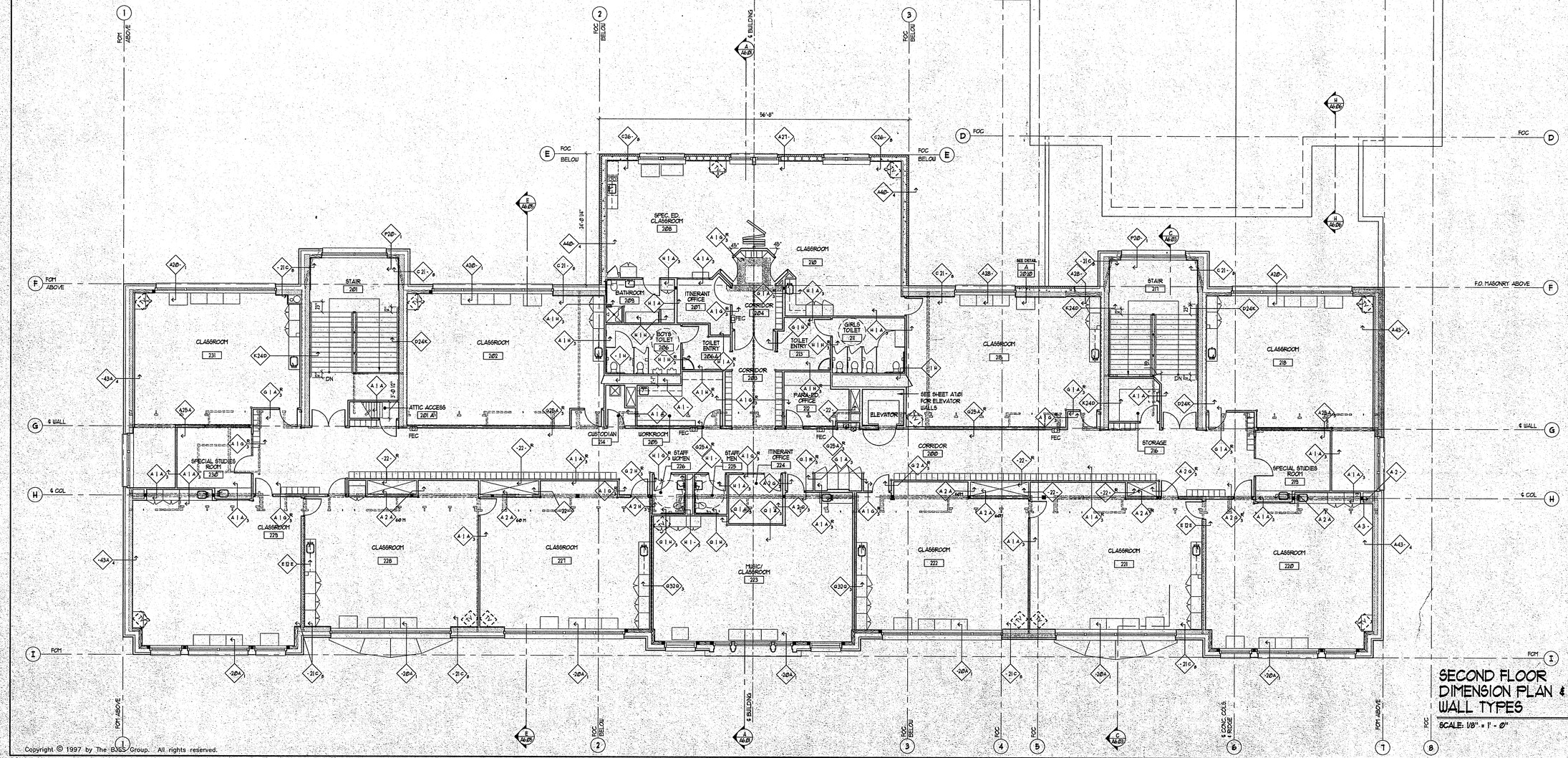
LEGEND

WALL FINISH - OUTSIDE LETTERS
1-HR FIRE RATED ASSEMBLY SEE DET. BOOK SECT 45
INSULATION
WALL CONSTRUCTION - CENTER NUMBER

SEE SECTION 42 - DETAIL BOOK FOR WALL TYPES

WALLS REMOVED IN PHASE 1

NOTE: DIMENSIONS WILL BE PROVIDED BY ARCHITECT BEFORE BEGINNING OF CONSTRUCTION



SECOND FLOOR DIMENSION PLAN & WALL TYPES

SCALE: 1/8" = 1' - 0"

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A2.03d

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GENERAL NOTES & FLAG NOTES

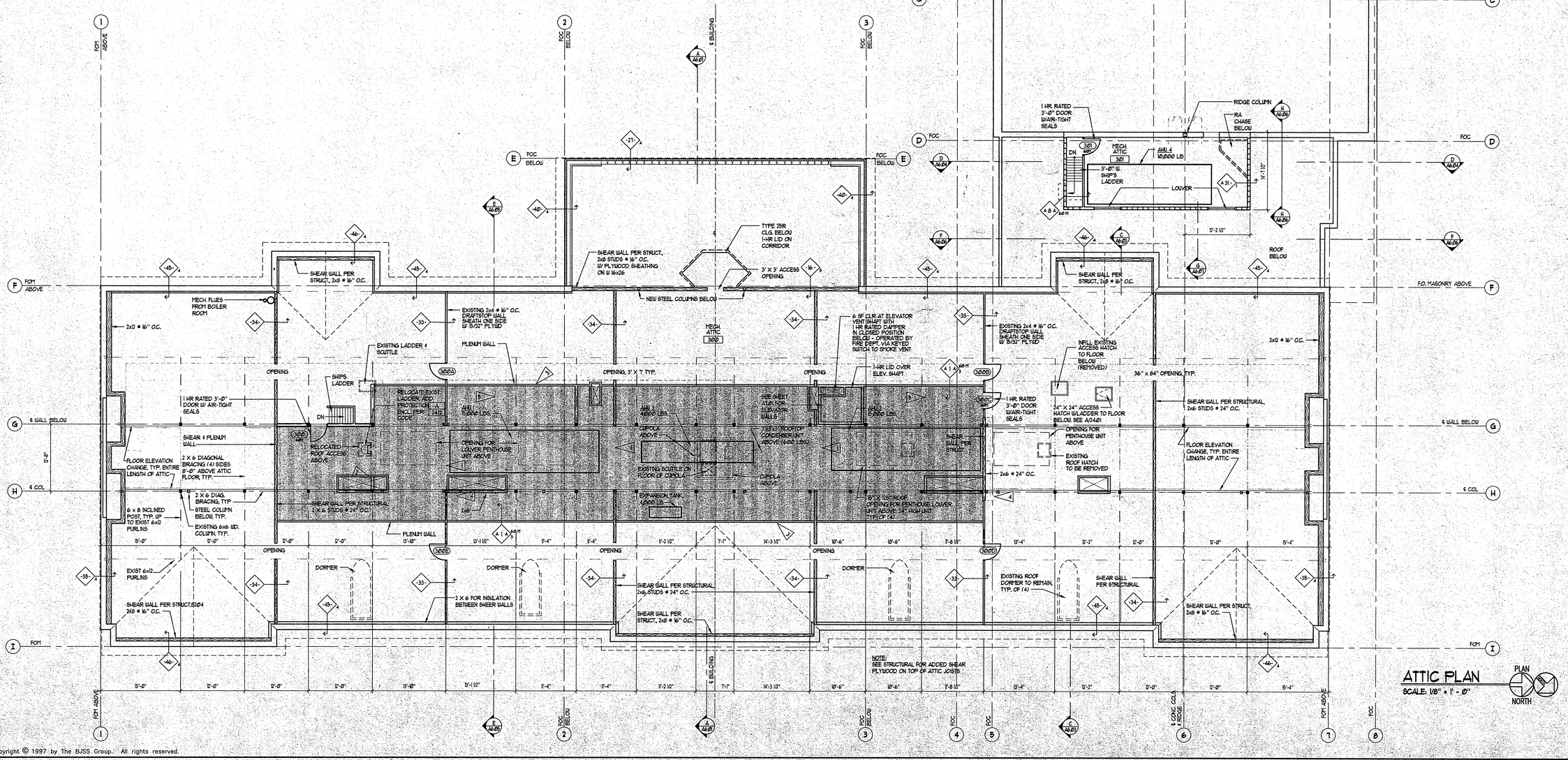
L. RELOCATE ATTIC FLOOR INSULATION TO ROOF JOISTS TO CREATE "WARM" ATTIC. SEE SECTION FOR JOIST VENTING FOR NEW INSULATION.

1. 8'-0" HIGH x 12'-0" WIDE OPENING IN SHEAR WALL.
2. (3) 2x8 HORIZ. STRUTS @ FLOOR. WRAP W/ GWB.
3. RELIEF AIR PLENUM SPACE ENCLOSURE.
   WALLS: 2x4 @ 24" O.C., 3" ACOUSTIC BATT, (2) LAYERS 5/8" GWB ONE SIDE, (1) LAYER 5/8" GWB OPP. SIDE. NORTH AND SOUTH SHEAR WALLS: 2x6 @ 24" O.C. WITH 1/2" PLYWOOD AND GWB AND INSULATION SAME AS 2x4 WALL.
   CEILING: 2x6 @ 16" O.C., 3" ACOUSTIC BATT, (2) LAYERS 5/8" GWB ONE SIDE, (1) LAYER 5/8" GWB OPP. SIDE.
   FLOOR: 1/2" PARTICLEBOARD ON 1/2" GYPSUM SHEATHING ON STRUCTURAL PLYWOOD.
4. REMOVE EXISTING MASONRY SHAFT FROM ABOVE ROOF TO ATTIC FLOOR. INFILL ROOF OPENING.
5. COIL PULLOUT SPACE.

LEGEND

- 5x5 T.S. COLUMN BELOW.
- NEW 6x6 WOOD COLUMN.
- EXISTING 6x6 WOOD COLUMN.
- SLOPED 6x8 BRACING TOWARDS EXTERIOR WALL (NOT SHOWN ON PLAN). LOCATED ON SOUTH SIDE OF COLUMN FOR SOUTHERN HALF OF BUILDING. LOCATED ON NORTH SIDE OF COLUMN FOR NORTHERN HALF OF BUILDING.
- PLENUM AREA.
- WALL FINISH - OUTSIDE LETTERS
- INSULATION
- WALL CONSTRUCTION - CENTER NUMBER

SEE SECTION 42 - DETAIL BOOK FOR WALL TYPES



ATTIC PLAN

SCALE: 1/8" = 1'-0"

PLAN NORTH

Mc DERMOTH ELEMENTARY MODERNIZATION & ADDITIONS

ABERDEEN SCHOOL DISTRICT NO. 5 ABERDEEN WASHINGTON

REGISTERED ARCHITECT 1888 STATE OF WASHINGTON

DATE 9/23/97
REVISED
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A2.04

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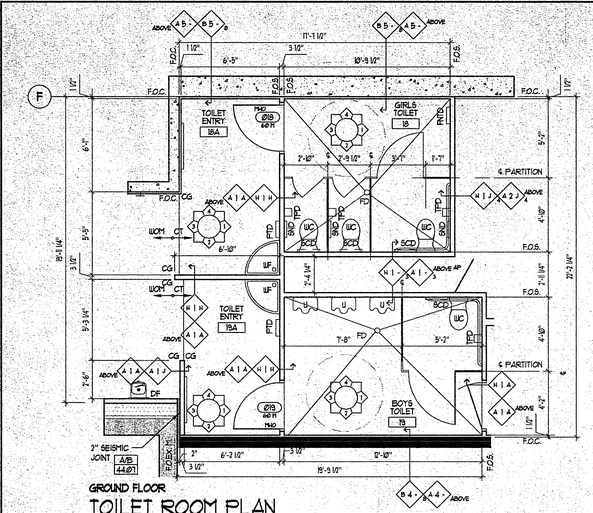
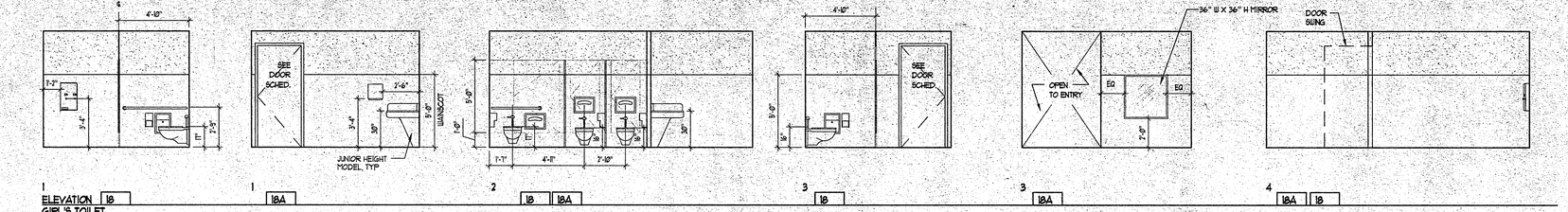
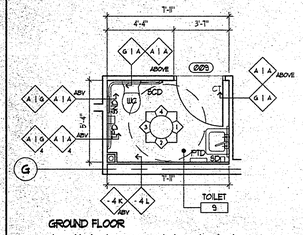
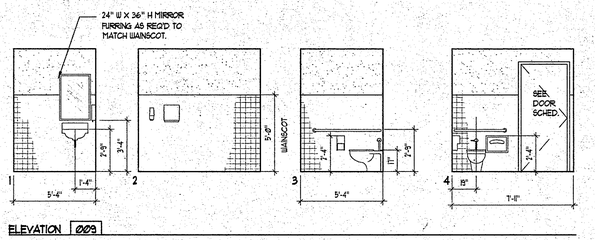
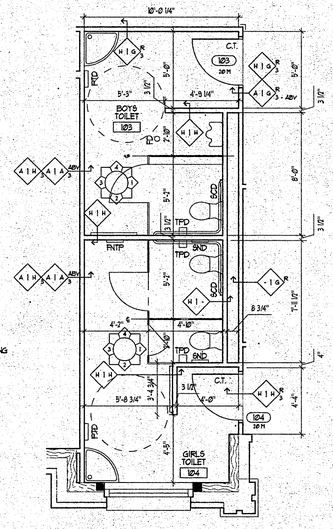


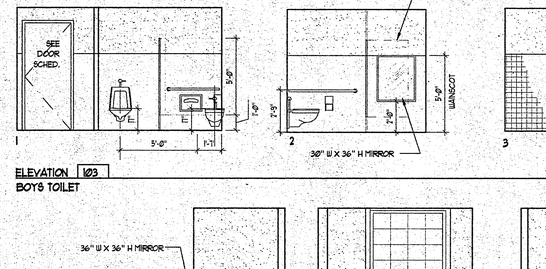
GROUND FLOOR
TOILET ROOM PLAN
SCALE: 1/4" = 1'-Ø" 18 19

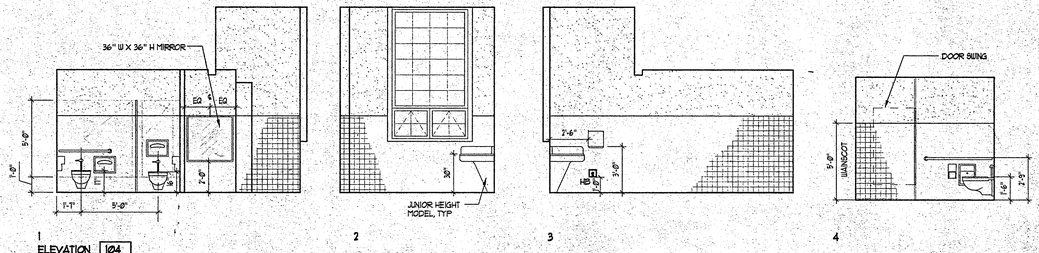


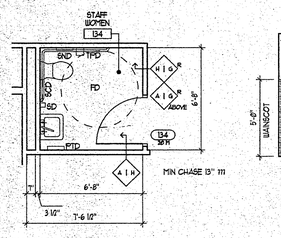


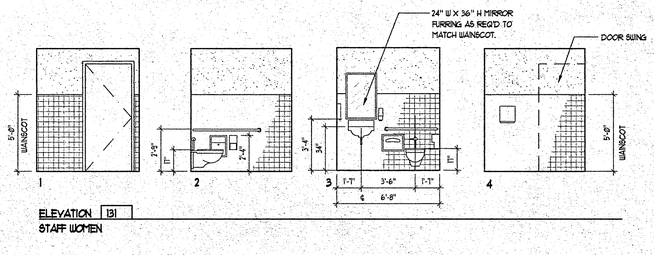




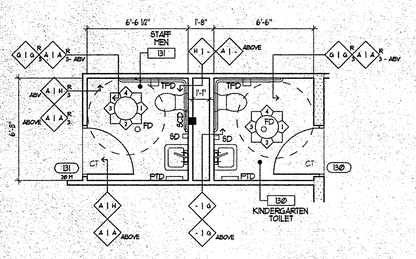


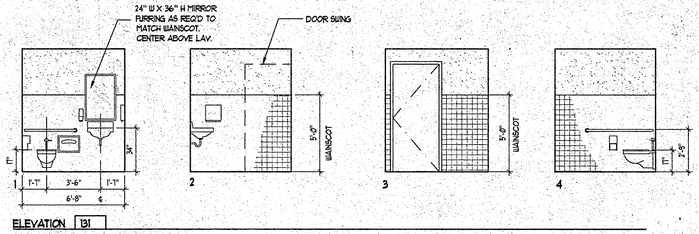


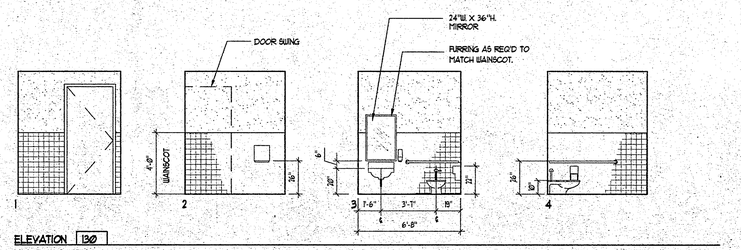




FIRST FLOOR
TOILET ROOM PLAN
SCALE: 1/4" = 1'-Ø" 134

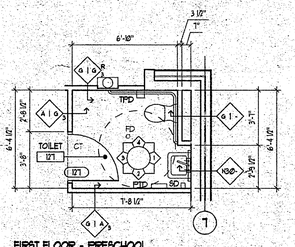




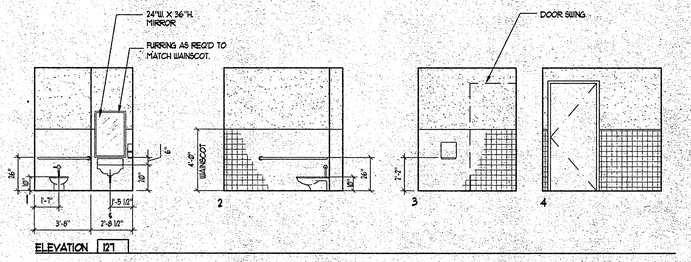


FIRST FLOOR
TOILET ROOM PLAN
SCALE: 1/4" = 1'-Ø" 130 131

FIRST FLOOR
TOILET ROOM PLAN
SCALE: 1/4" = 1'-Ø" 103 104



FIRST FLOOR - PRESCHOOL
TOILET ROOM PLAN
SCALE: 1/4" = 1'-Ø" 121



TOILET RM GENERAL NOTES

1) SEE SECTION 10 IN DETAIL BOOK FOR TYP. MOUNTING HEIGHTS OF FIXTURES AND ACCESSORIES.
2) ALL GWB AT WALLS TO BE WATER RESISTANT TYPE.
3) SEE ELEVATIONS FOR ADDITIONAL DIMENSIONS.

TOILET RM LEGEND

CT	CERAMIC TILE	SCD	TOILET SEAT COVER DISPENSER
FD	FLOOR DRAIN	SD	SOAP DISPENSER
FH	FIRE HORN	SND	SANITARY NAPKIN DISPOSAL
FNTD	FEMININE NAPKIN/TAMPON DISPENSER	TPD	TOILET PAPER DISPENSER
HB	HOSE BIB	UR	URINAL
PTD	PAPER TOILET DISPENSER	WC	WATER CLOSET

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Mc DERMOTH ELEMENTARY MODERNIZATION & ADDITIONS
ABERDEEN SCHOOL DISTRICT NO. 5 ABERDEEN WASHINGTON

REGISTERED ARCHITECT FRANK L. SMITH STATE OF WASHINGTON 1888

DATE 9/23/97
REVISED
COMM. NO. 961413

The BJSS GROUP
ARCHITECTS & PLANNERS, AIA
320 WEST BAY DRIVE SUITE 212 OLYMPIA WA 98502 (360) 943-4650

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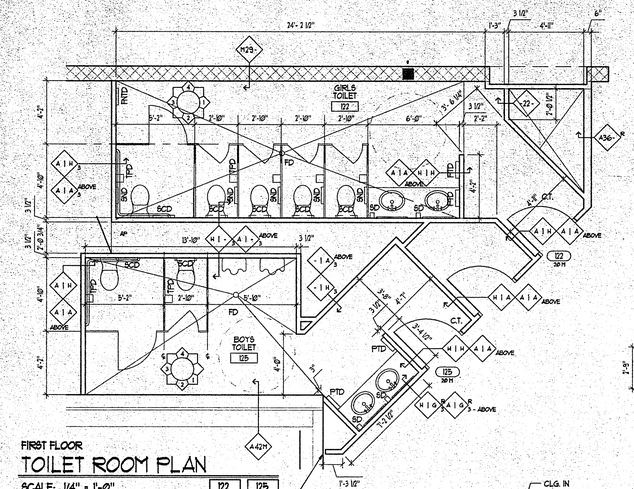
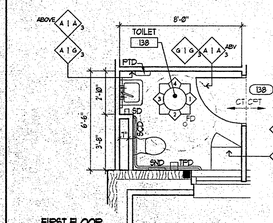
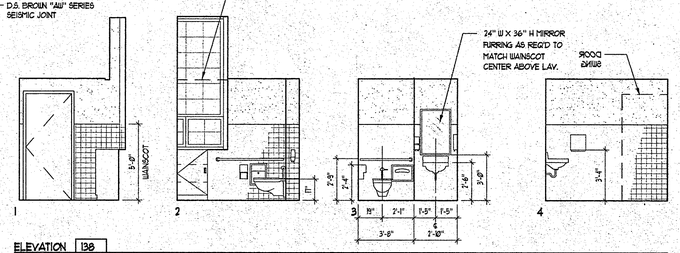
A2.05



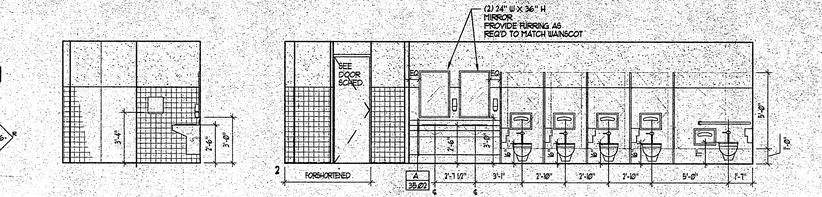
FIRST FLOOR
TOILET ROOM PLAN
SCALE: 1/4" = 1'-0" 122 125



FIRST FLOOR
TOILET ROOM PLAN
SCALE: 1/4" = 1'-0" 138
NURSE



ELEVATION 138



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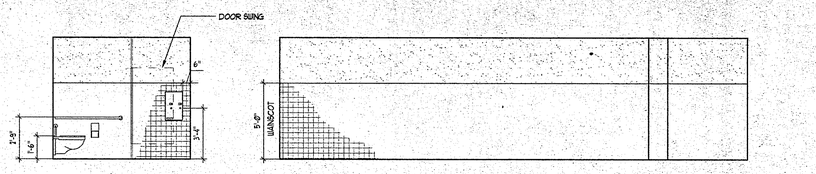
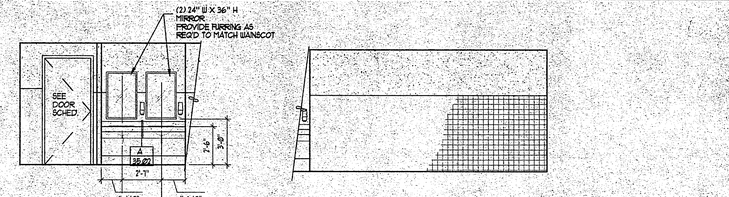
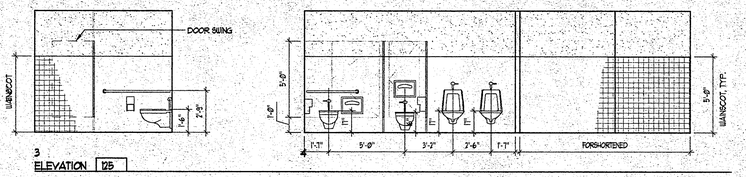


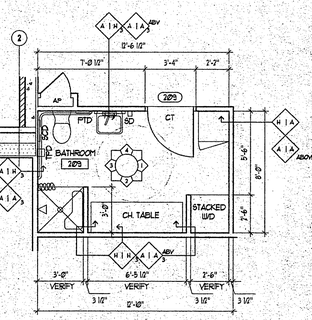
ELEVATION 122
GIRL'S TOILET



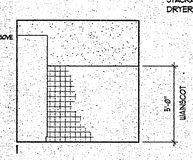
ELEVATION 125
BOY'S' TOILET



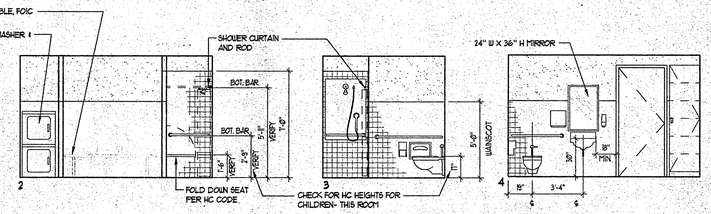
ELEVATION 125

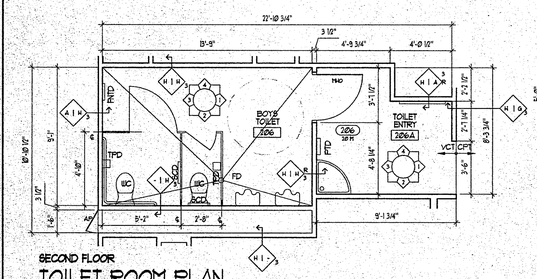


SECOND FLOOR
TOILET ROOM PLAN
SCALE: 1/4" = 1'-0" 209

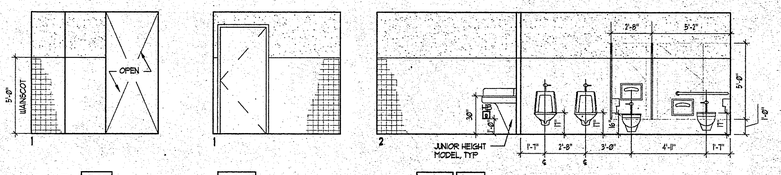


ELEVATION 209

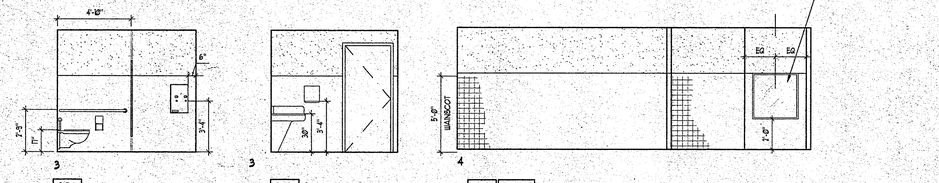




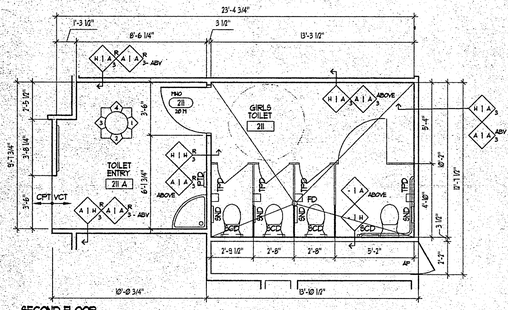
SECOND FLOOR
TOILET ROOM PLAN
SCALE: 1/4" = 1'-0" 206 206 A



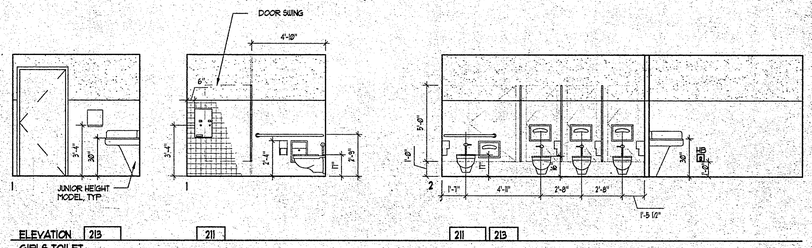
ELEVATION 206 206 A 206 A 206



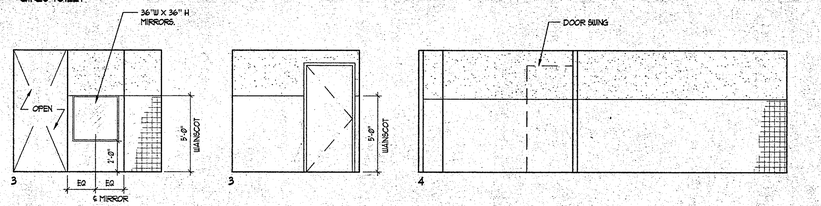
206 206 206 A 206 A



SECOND FLOOR
TOILET ROOM PLAN
SCALE: 1/4" = 1'-0" 213 211
GIRL'S TOILET



ELEVATION 213 211
GIRL'S TOILET



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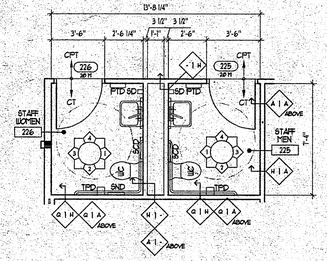
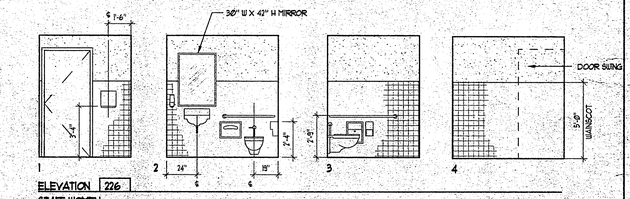
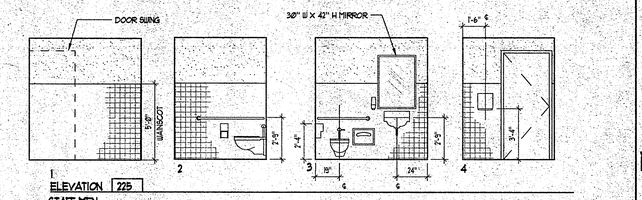


SECOND FLOOR
TOILET ROOM PLAN
SCALE: 1/4" = 1'-0" 225 226
STAFF



ELEVATION 226
STAFF WOMEN



ELEVATION 225
STAFF MEN

TOILET RM GENERAL NOTES

1) SEE SECTION 10 IN DETAIL BOOK FOR TYP. MOUNTING HEIGHTS OF FIXTURES AND ACCESSORIES.
2) ALL GWB AT WALLS TO BE WATER RESISTANT TYPE.
3) SEE ELEVATIONS FOR ADDITIONAL DIMENSIONS.

TOILET RM LEGEND

CT	CERAMIC TILE	SCD	TOILET SEAT COVER DISPENSER
FD	FLOOR DRAIN	SD	SOAP DISPENSER
FH	FIRE HORN	SND	SANITARY NAPKIN DISPOSAL
FNTD	FEMININE NAPKIN/TAMPON DISPENSER	TPD	TOILET PAPER DISPENSER
HB	HOSE BIB	UR	URINAL
FTD	PAPER TOWEL DISPENSER	UC	WATER CLOSET

Mc DERMOTH ELEMENTARY MODERNIZATION & ADDITIONS
ABERDEEN SCHOOL DISTRICT NO. 5 ABERDEEN WASHINGTON

DATE 9/23/97
REVISED
COMM. NO. 9614.13

PHASE 3

A2.06

The BJSS GROUP
ARCHITECTS & PLANNERS, AIA
320 WEST 4TH AVENUE SUITE 212 OLYMPIA WA 98502 (360) 943-4650

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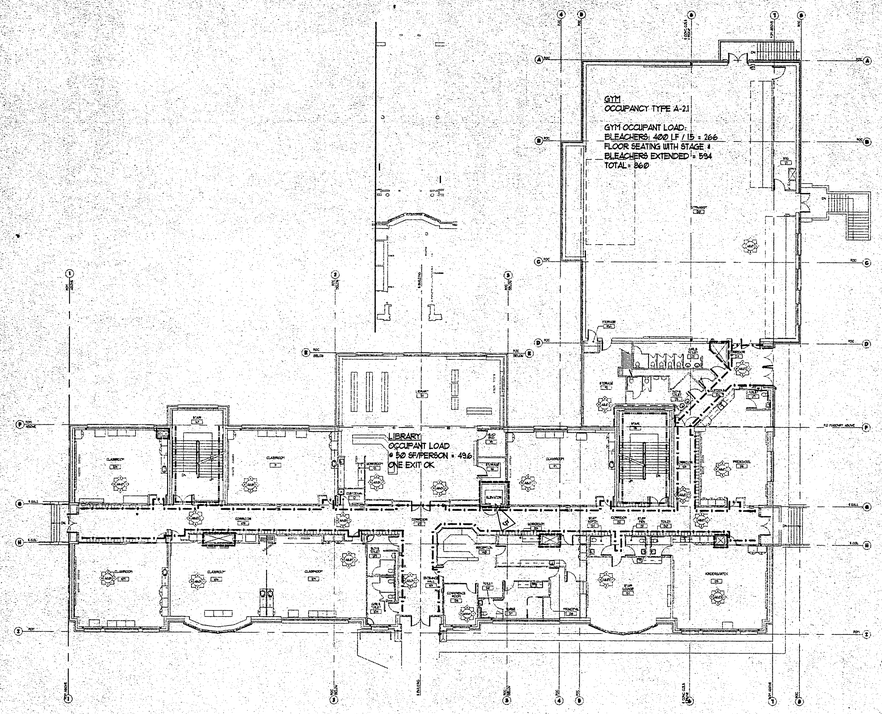
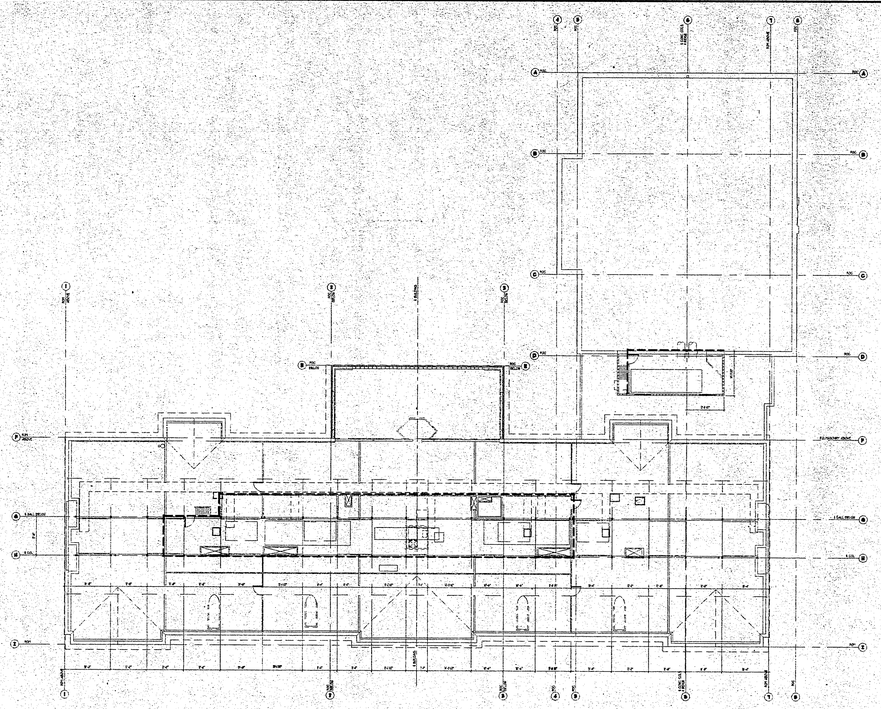


FIRST FLOOR PLAN

SCALE: 1" = 20'-0"

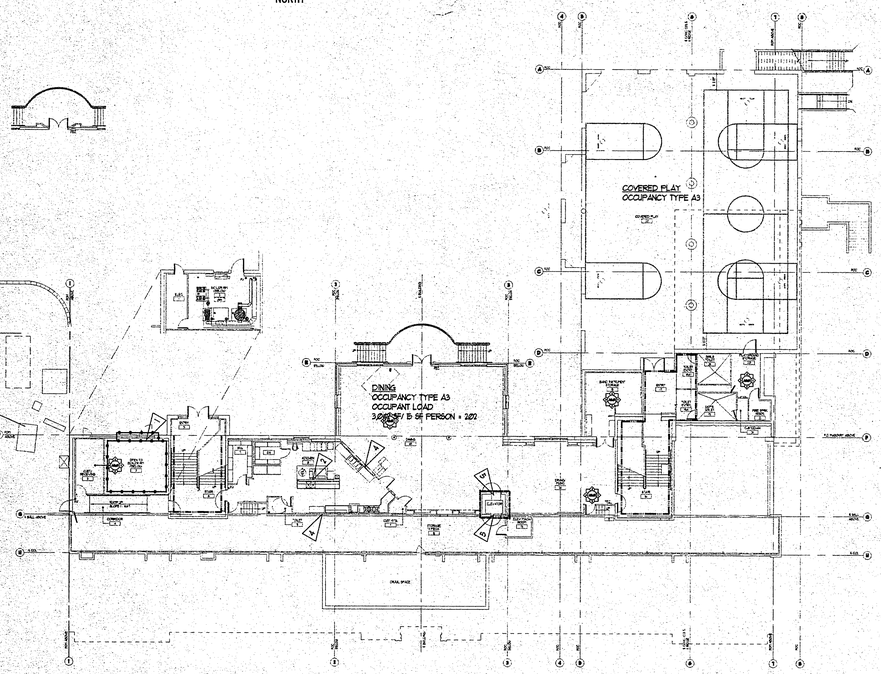
PLAN NORTH



ATTIC PLAN

SCALE: 1" = 20'-0"

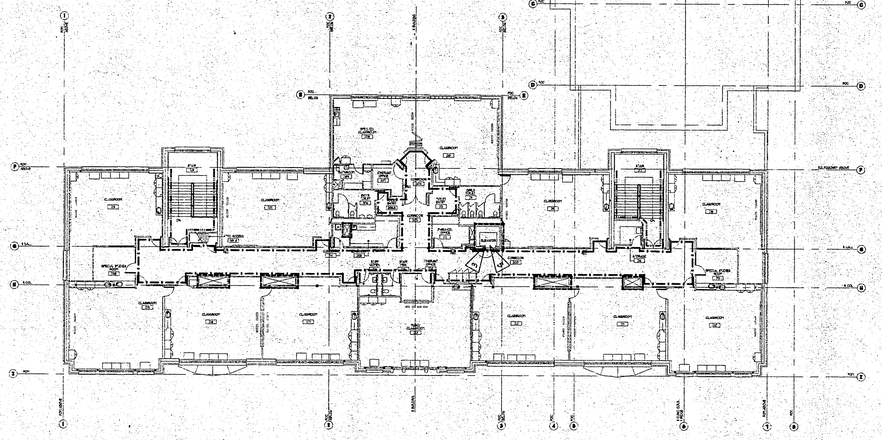
PLAN NORTH



GROUND FLOOR PLAN

SCALE: 1" = 20'-0"

PLAN NORTH



SECOND FLOOR PLAN

SCALE: 1" = 20'-0"

PLAN NORTH

FIRE PROTECTION PLAN

FIRE RATED CONSTRUCTION

- 1-HR FIRE RESISTIVE CORRIDOR CONSTRUCTION W/20 MIN RATED DOOR OPENINGS+ 3/4 HR RATED RELIGHT OPENINGS. UBC 1005.7, 1005.8, 1005.8.2
- 1-HR FIRE RESISTIVE CONSTRUCTION STAIR ENCLOSURE, OPENINGS 60 MIN FIRE RATED. UBC 1009.2, 1009.3
- 1-HR FIRE RESISTIVE SHAFT CONSTRUCTION, OPENINGS 60 MIN FIRE RATED. UBC TABLE 6-A, 711, 713.4 (SIMILAR AT MECH. ATTIC SPACES AS PLENUMS)
- 1-HR OCCUPANCY SEPARATION FOR BOILER ROOM W/60 MIN FIRE RATED OPENINGS. UBC 307.5

FLAG NOTES

1. 3/4 HR FIRE RATED EXTERIOR OPENINGS @ BOILER ROOM UBC 307.5.8
2. KITCHEN HOOD TYPE 2, NO GREASE PRODUCING FOOD PRODUCTION OR APPLIANCES
3. ELEVATOR SHAFT ROOFTOP VENT 3 SF
4. OCCUPANCY SEPARATION AROUND KITCHEN SUBJECT TO BLDG. DEPT. RULING. AE PROPOSES EXCEPTION PER UBC 307.1 EXCEPTION 2.4
5. ELEVATOR SHAFT AT WALL W/DOOR. 2 HR, NONCOMBUSTIBLE

MCDERMOTH ELEMENTARY SCHOOL
CODE ANALYSIS
August 18, 1997

1. Building Area:
   Building area interior 53,0535F
   Covered play at full 6,9395F
   Total 59,9925F

2. Construction Type: V, 1-hour with fire sprinklers substituted for 1-hour.

3. Uniform Fire Code fire flow requirements: Appendix III-A.
a. 59,992 SF, type VN requires 6,238 GPM
b. 75% reduction allowance per UBC exception and per Aberdeen Fire Department.
   = 6,238 x 25 = 1560 GPM
c. Site fire flow data at 20 psi
   4th / K Fire Hydrant: 1,624 GPM
   4th / L Fire Hydrant: 1,545 GPM

4. UBC Allowable Area:
a. Lower floor "basement" with (2) stories above.
b. Type V 1-hour with fire sprinkling substituted for 1-hour.
c. Areas and occupancy types:

1. Lower level or basement.	
A-3: Covered Play, Dining, & associated Kitchen and Band	10,875 SF
E-1: Remainder of ground floor	5,675 SF
Total	16,1250 SF
2. Main level	
A-2.1: Gym & associated storage	6,500 SF
E-3: Preschool	725 SF
E-1: Remainder of main floor	17,000 SF
Total	24,225 SF
3. Upper level	
E-1: Entire floor	16,875 SF

d. Allowable Area (Basement not included)
Formula: Allowable area = Basic area x Increase for yards x Increase for Multi-Story
Allowable area for E-1 Occupancy: 15,1250 SF x 2 x 2 = 67,5000 SF
Allowable area for E-3 Occupancy: 15,1250 SF x 2 x 2 = 67,5000 SF
Allowable area forA-2.1 Occupancy: 10,5000 SF x 2 x 2 = 42,0000 SF
Allowable area for A-3 Occupancy: 10,5000 SF x 2 x 2 = 42,0000 SF

Mixed Occupancy Calculation for Allowable Area:

E-1 Actual Area / Allow Area		E-3 Actual Area / Allow Area		A-2.1 Actual Area / Allow Area		A-3 Actual Area / Allow Area		<1
33,875 / 67,500	+	725 / 67,500	+	6,500 / 42,000	+	N/A		
.535	+	.012	+	.155	+	= .706		<1 OK

e. Allowable Area (single largest floor - main level)

E-1 Actual Area / Allow Area		E-3 Actual Area / Allow Area		A-2.1 Actual Area / Allow Area		A-3 Actual Area / Allow Area		<1
17,000 / 31,400	+	725 / 31,400	+	6,500 / 21,000	+	N/A		
.541	+	.023	+	.310	+	= .874		<1 OK

f. Area Separation Walls:
Area separation walls are not required (lower floor is counted as basement). Gymnasium A2.1 requires 1-hour construction. Type V with fire sprinkling substituted for 1-hour.

5. Exiting and Occupant Loads:

a. Ground Floor / Dining:
Area is 3,042 SF, at 15 square feet per person, occupant load is 202, exit width required is 202 x .2" = 40", 2 exits OK.

b. 1st Floor / Library:
Area is 2,484 SF, at 150 square feet per person, occupant load is 49.6, 1 exit OK.

c. 1st Floor / Gym:
1. Bleacher seating: 400 LF at 15"/person = 266
2. Floor seating with fold-up stage extended and bleachers extended: 4,358 SF, at 7 square feet per person, occupant load = 594
3. Total occupant load = 594 + 266 = 860
4. Exit width = 860 x .2" = 14.3 ft.
5. 3 exits required: 1 main exit at 14.3' x .5 = 7.2 ft, 2 side exits at .33 = 4.76 ft, side exits require "exit passageway" protection
6. Plumbing Fixture Code Review Per Washington State Amendments to the 1994 UBC
a. Ground Floor
Occupancy for Dining Room = 1,060 SF
243 SF / 30 = 11.36 m/f
Female Water Closets: 26-75=2
Female Lavatories: 1 per 2 water closets = 1
Male Water Closets: 26-75=2 water closet or 1 water closet, 1 urinal
Male Lavatories: 1 per 2 water closets = 1

b. First Floor
1. Gym: 15 SF / Occupant
6,050 / 15 = 403 occupants, 201.5 m/f
Female Water Closets: 1/75: 5
Female Lavatories: 1 per 2 water closets: 3
Male Water Closets: 1/30: 4 water closets or 2 water closets, 2 urinals
2. Total Floor to E Occupancy
a. Students occupant load 1,000 SF
25,165 / 1,000 = 252.1 26 m/f
Female Water Closets: 1/75: 5
Female Lavatories: 1 per 2 water closets: 3
Male Water Closets: 1/30: 4 water closets or 2 water closets, 2 urinals
b. Staff 1/20 Students
252 / 20 = 13 staff
Female Water Closet: 1
Male Water Closet: 1

c. Second Floor (16,800 SF)
Students: 1,00 SF / occupant 16,800 SF/100 = 1,651 83 m/f
Female Water Closets: 1/75 = 4
Female Lavatories: 1 per 2 water closets = 2
Male Water Closets: 1/50 = 3 water closets or 1 urinal, 2 water closets
Male Lavatories: 1 per 2 water closets = 2

Washington State Energy Code:
Zone 1, Table 13-1, VAV Heating

A. Roofs over attics: R=30
   All other roofs R=21
B. Opaque walls: R=11
C. Glazing: 15 to 20% glass area
   Vert. glass U=.75
   Actual glass used: Gray/LOE-T11 U=.30
   Actual glass and wall area:
   Glass: 4861 SF
   Wall: 28915 SF
   Ratio: 16.8%

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Mc DERMOTH ELEMENTARY
MODERNIZATION & ADDITIONS
ABERDEEN SCHOOL DISTRICT NO. 5 ABERDEEN WASHINGTON

REGISTERED ARCHITECT FRANK L. SMITH STATE OF WASHINGTON 1988

DATE 9/23/97
REVISED
COMM. NO. 961413

The BJSS GROUP
ARCHITECTS & PLANNERS, AIA
320 WEST BAY DRIVE SUITE 212 OLYMPIA, WA 98502 (360) 943-4650

PHASE 3

A2.07

GENERAL NOTES

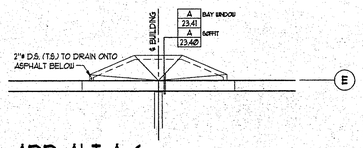
1. SEE EXTERIOR ELEVATIONS FOR BASE BID AND ADDITIVE ALTERNATE A-6 ELEVATIONS.

CIRCLE NOTES

1. 2" SEISMIC JOINT.
2. NEW MECHANICAL EQUIPMENT PENTHOUSE.
3. WATERPROOF MEMBRANE 6'-0" WIDE ALL VALLEYS.
4. INSTALL 36" WIDE WATERPROOF MEMBRANE AT SINGLE-PLY / COMP SHINGLE TRANSITION.
5. RIGID INSULATION CRICKET.
6. ADD WATERPROOF MEMBRANE 6'-0" WIDE AT HIGH SIDE OF EXISTING ROOF DORMERS.

LEGEND

CS	COMP SHINGLES OVER NETED NAILABLE DECKING.
CSR	REMOVE EXIST. COMP SHINGLES, REPLACE WITH NEW OVER EXISTING SHEATHING.
CST	COMP SHINGLES OVER P.E. TRUSSES.
DS	DOWNSPOUT, SIZE AS NOTED, PVC.
DS (TS)	DOWNSPOUT - TUBE STEEL.
ESP	EXIST. SINGLE-PLY. NO WORK EXCEPT AT PENETRATIONS.
RTV	ROOF-TOP VENTILATOR.
RV	RIDGE VENT.
SP	SINGLE-PLY ON 3" RIGID INSUL. DENS DECK, METAL DECKING.



ADD ALT A-6

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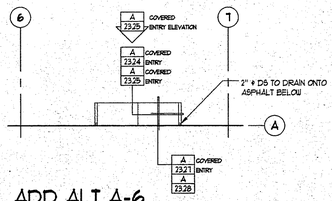

ADD ALT A-6

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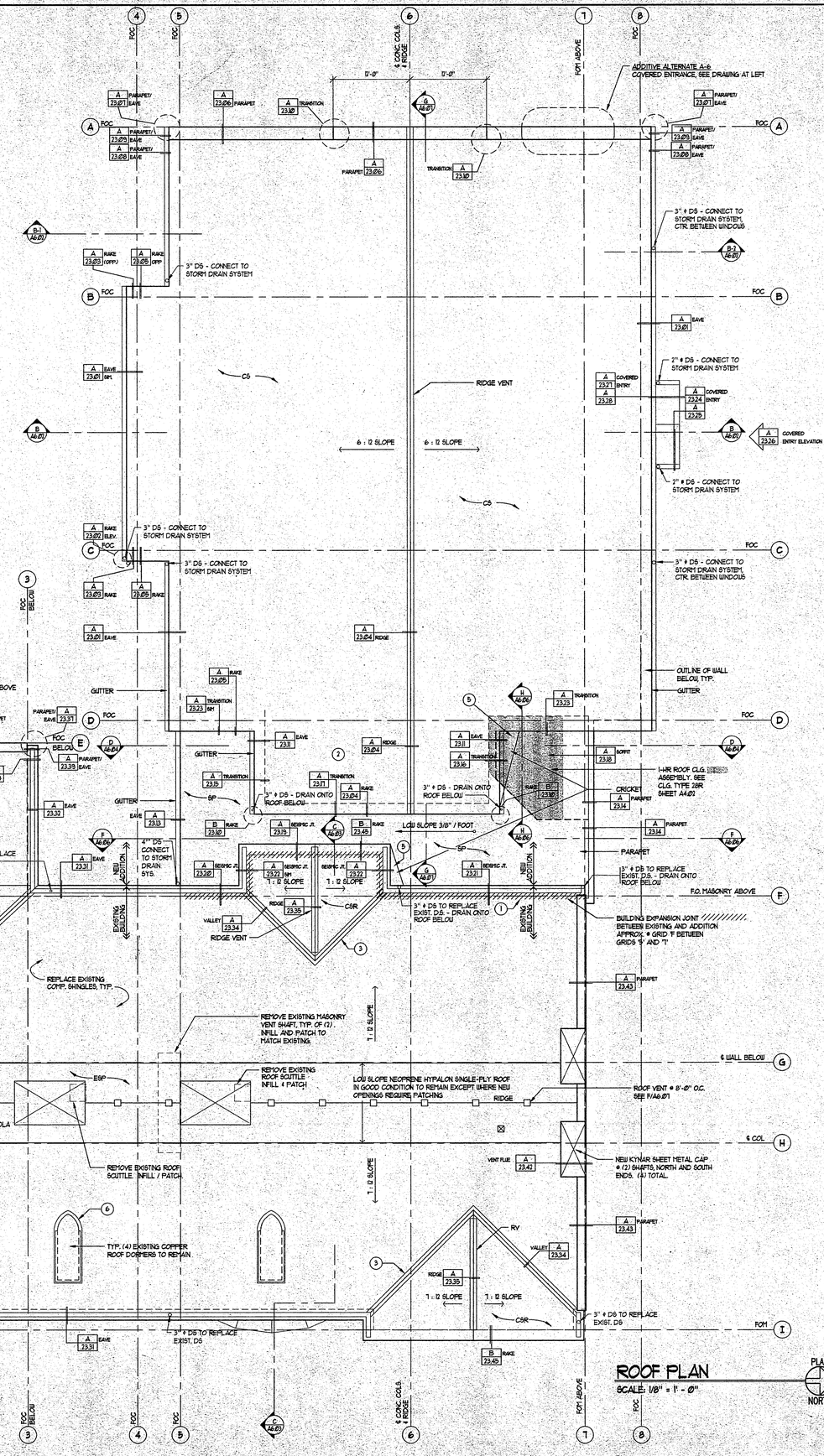

ROOF PLAN

SCALE: 1/8" = 1' - 0"

PLAN NORTH

The BJSS GROUP
ARCHITECTS & PLANNERS, AIA
320 WEST 4TH DRIVE, SUITE 212, OLYMPIA, WA 98502 (360) 943-4650

REGISTERED ARCHITECT — JOSEPH L. SCHMIDT — STATE OF WASHINGTON — 1988

DATE 9/23/97
REVISED
COMM. NO. 961413

Mc DERMOTH ELEMENTARY MODERNIZATION & ADDITIONS

ABERDEEN SCHOOL DISTRICT NO. 5 — ABERDEEN WASHINGTON

PHASE 3

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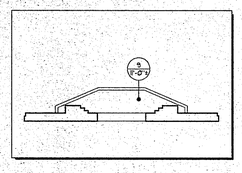
CEILING LEGEND

LLLLLLLLL WALLS FULL HEIGHT TO DECK ABOVE. 5/8" GWB BOTH SIDES UNLESS NOTED

GENERAL NOTES

1. LIGHTS LOCATED IN ROOMS 10, 14 - DINING/ MUSIC ROOMS ARE SURFACE MOUNTED.
2. CLG. HT. RMS 20, 22, 23 ARE TO FL. EL. 198. ACTUAL HEIGHT VARIES.
3. ROOMS 8, 10, 14 CEILINGS ARE USED AS RETURN AIR PLENUMS BY MECH.



CANOPY - ALTERNATE A6

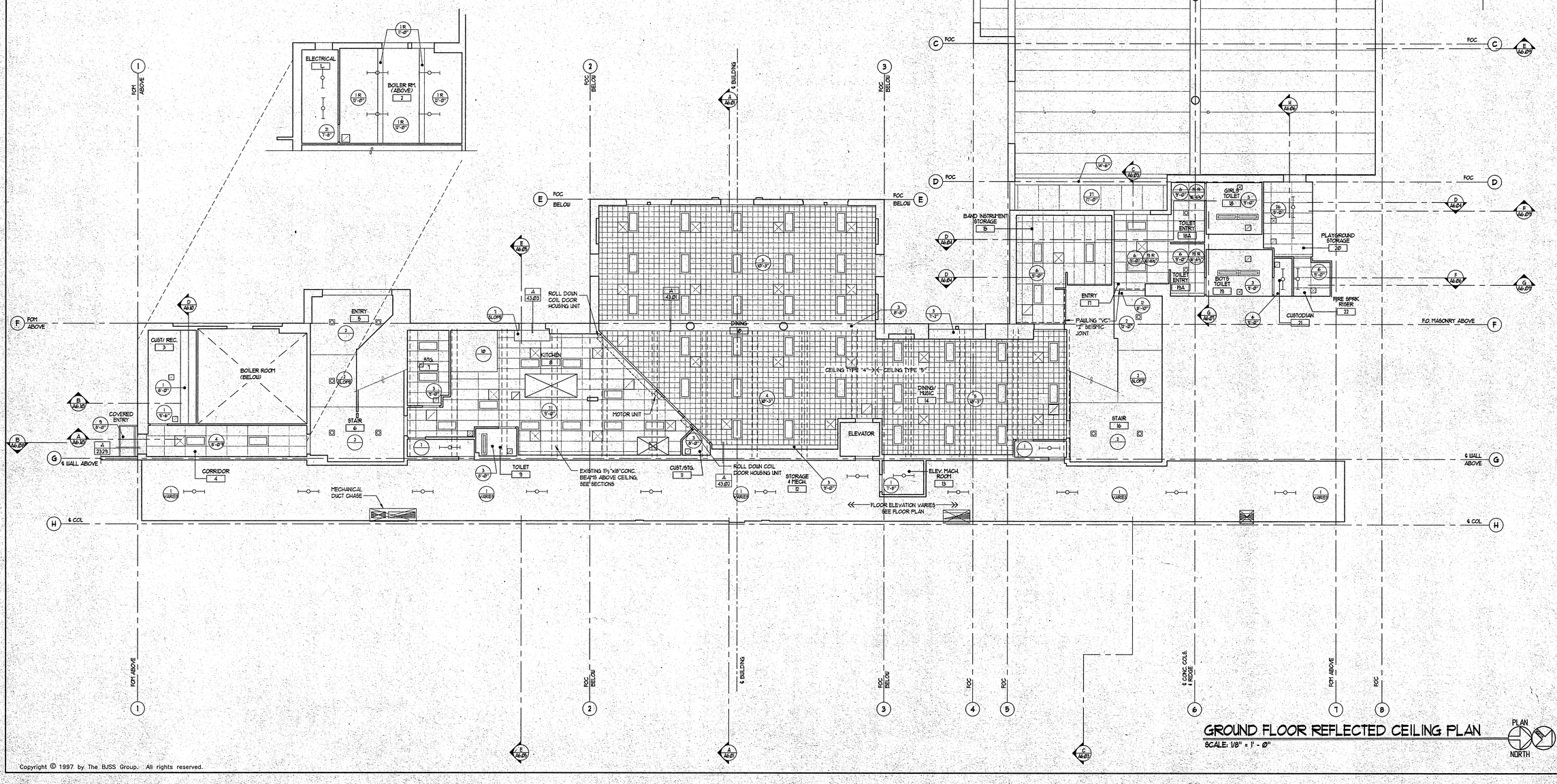
SCALE: 1/8" = 1' - 0"

CEILING TYPES

1. EXPOSED CONCRETE, NO FINISH
1 R. EXISTING CONCRETE SLAB & BEAMS, 1-HOUR RATED UBC ASSEMBLY TABLE 1C ITEM 1-1.1, NO FINISH
2. CONCRETE, PAINTED
3. 5/8" GWB, TEXT/PAINT ON SUSP. METAL CHANNEL
4. 12" ACOUSTICAL TILE. GLUE STAPLE TO 5/8" GWB ON SUSP. METAL CHANNELS 6" ACOUSTIC BATT ABOVE GWB
5. 12" ACOUSTICAL TILE. GLUE STAPLE TO 5/8" GWB ON SUSP. METAL CHANNELS WITH ISOLATION SUSP. WIRES 6" ACOUSTIC BATT ABOVE GWB
6. 2x4 ACOUSTICAL PANEL IN SUSP. EXPOSED T-BAR GRID
6A. TYPE '6' CEILING WITH 4" ACOUSTIC BLANKET INSULATION ON TOP OF GRID, 6'-0" WIDE AT PERIMETER OF ROOM. EXCEPT AT LIGHTS
7. 2x4 WASHABLE ACOUSTICAL PANEL IN SUSP. EXP. T-BAR GRID
8. CEMENT PLASTER ON MTL. LATH ON SUSP. MTL. CHANNELS, ARCH VAULT
9. PAINTED M.D.O. EXT. PLYWOOD T&G 1/2" ON 2x WOOD JOISTS @ 2'-0" O.C.
10. FACTORY FINISH/ MANUFACTURED COOLER
11. (2) LAYERS 1/2" GWB ON BOTTOM OF 12" TJI 16" O.C. 1-HOUR ASSEMBLY, I. / TRUSS JOISTS REPORT NER 2200
12. 5/8" GWB, TEXT/PAINT ON WOOD BEAM OR FURRING
13. EXPOSED STEEL STRUCT. TRUSS 8' O.C., PAINT. EXPOSED STEEL ACOUSTIDECK, PAINT. EXPOSED MECH. DUCTWORK, PAINT
14. SUSPENDED 2x4 T-BAR GRID WITH STAGGERED PATTERN OF LAY-IN PANELS OF 5/8" GWB AND ACOUSTIC PANELS - 50% EA.
15. 5/8" GWB ON 3/4" METAL HAT CHANNELS 12" O.C. ON 1/2" STEEL CHANNELS 4'-0" O.C. FORMED TO RADIUS AND SUSP. FROM STRUCTURE ABOVE.
16. 5/8" GWB TEXT/PAINT ON EXISTING PLASTER OVER EXIST. WOOD JOISTS @ 16" O.C.
17. 12x12 ACOUSTIC TILE GLUE STAPLE TO 1/2" PLYWOOD ON BOTTOM OF STEEL STRUCTURE
18 R. (2) LAYERS 5/8" GWB ON BOTTOM OF TJI ROOF JOISTS @ 2'-0" O.C. 1-HOUR ASSEMBLY, UBC ITEM 21-U.
19 R. "ULTRA SPAN" 12" HOLLOW CORE CONC. SLAB 1 HR. REPORT FFC-4833
20. 5/8" GWB ON EXIST. 2x6 JOISTS @ 16" O.C. TEXTURE, PAINT
21. EXPOSED STRUCTURE, NO FINISH
22. 5/8" GWB ON WOOD JOISTS 24" O.C. TEXTURE, PAINT
23. EXISTING BRICK ARCH, NO FINISH
24. EXISTING CEMENT PLASTER, PATCH AS REQUIRED, PAINT
24. EXISTING TERRA COTTA, NO FINISH
25 R. 1 HR. ASSEMBLY UBC 21-U, 1/2 PWD ON 2x6 @ 2'-0" O.C. W/ (2) 5/8" GWB ON BOTTOM.
26. SUSPENDED GRID W/ MOISTURE RESISTANT LAY-IN ACOUSTICAL PANELS.
27. 1/2" EXT. PWD/ AC/ TAG/ PAINTED ON 2x3 FURRING @ 2'-0" O.C. & 2 1/2" RIGID INSUL. ALL ON BOTTOM OF HOLLOW CORE PLANKS.
28 R. 1 HR. ASSEMBLY SINGLE PLY ROOF ON RIGID INSUL. ON 1/2" MTL. DECK ON STEEL FRAMING. SUSPENDED CLG: GYP. PLASTER ON MTL. LATH ON SUSP. MTL. CHANNELS.

GENERAL NOTES

1) CEILING HEIGHTS ARE TO EXISTING FLOOR ELEVATION NOT INCLUDING ADDITION OF 1/2" FLOOR PLYWOOD



GROUND FLOOR REFLECTED CEILING PLAN

SCALE: 1/8" = 1' - 0"

PLAN NORTH

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Mc DERMOTH ELEMENTARY MODERNIZATION & ADDITIONS

ABERDEEN SCHOOL DISTRICT NO. 5 ABERDEEN WASHINGTON

REGISTERED ARCHITECT FRANK L. SARGENT STATE OF WASHINGTON 1888

DATE 9/23/97

REVISED COMM. NO. 961413

The BJSS GROUP
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320 WEST BAY DRIVE SUITE 212, OLYMPIA WA 98502 (360) 943-4650

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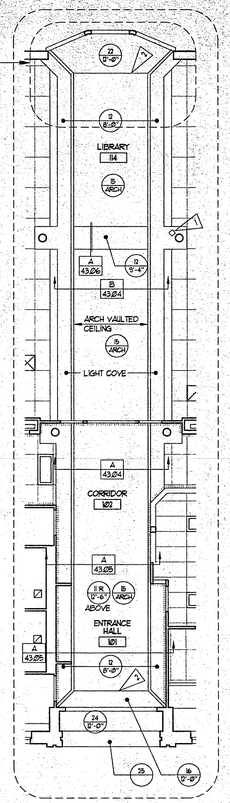
BAY WINDOW
ALTERNATE A-6
SCALE: 1/8" = 1' - 0"



CEILING TYPES

1 — EXPOSED CONCRETE, NO FINISH

1R — EXISTING CONCRETE SLAB & BEAMS, 1-HOUR RATED UBC ASSEMBLY TABLE TC ITEM 1-11, NO FINISH

2 — CONCRETE, PAINTED

3 — ⅝" GWB, TEXT/PAINT ON SUSP. METAL CHANNEL

4 — 12" ACOUSTICAL TILE. GLUE STAPLE TO ⅝" GWB ON SUSP. METAL CHANNELS 6" ACOUSTIC BATT ABOVE GWB

5 — 12" ACOUSTICAL TILE. GLUE STAPLE TO ⅝" GWB ON SUSP. METAL CHANNELS WITH ISOLATION SUSP. WIRES 6" ACOUSTIC BATT ABOVE GWB

6 — 2x4 ACOUSTICAL PANEL IN SUSP. EXPOSED T-BAR GRID

6A — TYPE '6' CEILING WITH 4" ACOUSTIC BLANKET INSULATION ON TOP OF GRID, 6'-0" WIDE AT PERIMETER OF ROOM EXCEPT AT LIGHTS

7 — 2x4 WASHABLE ACOUSTICAL PANEL IN SUSP. EXP. T-BAR GRID

8 — CEMENT PLASTER ON MTL. LATH ON SUSP. MTL. CHANNELS, ARCH VAULT

9 — PAINTED M.D.O. EXT. PLYWOOD T4G ½" ON 2x WOOD JOISTS @ 2'-0" O.C.

10 — FACTORY FINISH/ MANUFACTURED COOLER

11R — (2) LAYERS ⅝" GWB ON BOTTOM OF 12" TJI 16" O.C. 1-HOUR ASSEMBLY, I. J TRUSS JOISTS REPORT NER 2Ø0

12 — ⅝" GWB, TEXT/PAINT ON WOOD BEAM OR FURRING

13 — EXPOSED STEEL STRUCT. TRUSS @ O.C., PAINT. EXPOSED STEEL ACOUSTIDECK, PAINT. EXPOSED MECH. DUCTWORK, PAINT

14 — SUSPENDED 2x4 T-BAR GRID WITH STAGGERED PATTERN OF LAY-IN PANELS OF ⅝" GWB AND ACOUSTIC PANELS - 50% EA.

15 — ⅝" GWB ON ¾" METAL HAT CHANNELS 12" O.C. ON ½" STEEL CHANNELS 4'-0" O.C. FORMED TO RADIUS AND SUSP. FROM STRUCTURE ABOVE.

16 — ⅝" GWB TEXT/PAINT ON EXISTING PLASTER OVER EXIST. WOOD JOISTS @ 16" O.C.

17 — 12x12 ACOUSTIC TILE, GLUE STAPLE TO ½" PLYWOOD ON BOTTOM OF STEEL STRUCTURE

18R — (2) LAYERS ⅝" GWB ON BOTTOM OF TJI ROOF JOISTS @ 2'-0" O.C. 1-HOUR ASSEMBLY, UBC ITEM 21-1L

19R — "ULTRA SPAN" 12" HOLLOW CORE CONC. SLAB 1 HR. REPORT PFC-4833

20 — 5/8" GWB ON EXIST. 2x16 JOISTS @ 16" O.C. TEXTURE, PAINT

21 — EXPOSED STRUCTURE, NO FINISH

22 — 5/8" GWB ON WOOD JOISTS 24" O.C. TEXTURE, PAINT

23 — EXISTING BRICK ARCH, NO FINISH

24 — EXISTING CEMENT PLASTER, PATCH AS REQUIRED, PAINT

24 — EXISTING TERRA COTTA, NO FINISH

25R — 1 HR. ASSEMBLY UBC 21-1I, ½ PLYD ON 2x6 @ 2'-0" O.C. W/ (2) ⅝" GWB ON BOTTOM.

26 — SUSPENDED GRID W/ MOISTURE RESISTANT LAY-IN ACOUSTICAL PANELS.

27 — ½" EXT. PLYD/ AC/ TAS/ PAINTED ON 2x3 FURRING @ 2'-0" O.C. 4 2½" RIGID INSUL., ALL ON BOTTOM OF HOLLOW CORE PLANKS.

28R — 1 HR. ASSEMBLY SINGLE PLY ROOF ON RIGID INSUL. ON ½" MTL. DECK ON STEEL FRAMING. SUSPENDED CLG. GYP. PLASTER ON MTL. LATH ON SUSP. MTL. CHANNELS.

GENERAL NOTES

1) CEILING HEIGHTS ARE TO EXISTING FLOOR ELEVATION NOT INCLUDING ADDITION OF ½" FLOOR PLYWOOD

FLAG NOTES

1 — T.V. CEILING BRACKET MTD TO BTM OF FURRED GWB SOFFIT. PROVIDE STRUCT. SUPPORT TO FUR. ABOVE

2 — PROVIDE FINISHED GWB END OF ARCH CEILING FOR TRANSITION TO HIGHER FLAT CEILING.

3 — EXTEND WALL TO FLOOR ABOVE W/ GWB ONE SIDE ABOVE CEILING

CEILING LEGEND

WALLS FULL HEIGHT TO DECK ABOVE. 5/8" GWB BOTH SIDES UNLESS NOTED

SUB. ALTERNATE SA-2
SCALE: 1/8" = 1' - Ø"

FIRST FLOOR REFLECTED CEILING PLAN
SCALE: 1/8" = 1' - Ø"

PLAN NORTH

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Mc DERMOTH ELEMENTARY MODERNIZATION & ADDITIONS
ABERDEEN SCHOOL DISTRICT NO. 5 — ABERDEEN WASHINGTON

REGISTERED ARCHITECT — FRANK L. SMITH — STATE OF WASHINGTON — 1988

DATE 9/23/97
REVISED
COMM. NO. 96113

The BJSS GROUP
ARCHITECTS & PLANNERS, AIA
320 WEST BAY DRIVE, SUITE 212 OLYMPIA, WA. 98502 (360) 943-4650

PHASE 3

A4.02

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Mc DERMOTH ELEMENTARY
MODERNIZATION & ADDITIONS
ABERDEEN SCHOOL DISTRICT NO. 5 ABERDEEN WASHINGTON

REGISTERED ARCHITECT FRANK L. SMITH STATE OF WASHINGTON 1888

DATE 9/23/97
REVISED
COMM. NO. 961413

The BLISS GROUP
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A4.03

SECOND FLOOR REFLECTED CEILING PLAN
SCALE: 1/8" = 1'-0"

NORTH PLAN

CEILING LEGEND

WALLS FULL HEIGHT TO DECK ABOVE
5/8" GWB BOTH SIDES UNLESS NOTED

FLAG NOTES

1. T.V. CEILING BRACKET MTD TO BTM OF FURRED GWB SOFFIT, PROVIDE STRUCT. SUPPORT TO FDR ABOVE
2. PROVIDE FINISHED GWB END OF ARCH CEILING FOR TRANSITION TO HIGHER FLAT CEILING
3. EXTEND WALL TO FLOOR ABOVE W/ GWB ONE SIDE ABOVE CEILING

CEILING TYPES

1. EXPOSED CONCRETE, NO FINISH
1R. EXISTING CONCRETE SLAB & BEAMS, 1-HOUR RATED (ISO ASSEMBLY, TABLE 'C' ITEM 1-1.1), NO FINISH
2. CONCRETE, PAINTED
3. ¾" GWB, TEXT/PAINT ON SUSP. METAL CHANNEL
4. 12" ACOUSTICAL TILE GLUE STAPLE TO ⅝" GWB ON SUSP. METAL CHANNELS @ 4' ACOUSTIC BATT ABOVE GWB
5. 12" ACOUSTICAL TILE GLUE STAPLE TO ⅝" GWB ON SUSP. METAL CHANNELS WITH ISOLATION SUSP. WIRES @ 4' ACOUSTIC BATT ABOVE GWB
6. 2x4 ACOUSTICAL PANEL IN SUSP. EXPOSED T-BAR GRID
7. TYPE 'W' CEILING WITH 4" ACOUSTIC BLANKET INSULATION ON TOP OF GRID, 6'-0" WIDE AT PERIMETER OF ROOM EXCEPT AT LIGHTS
8. 2x4 WASHABLE ACOUSTICAL PANEL IN SUSP. EXP. T-BAR GRID
9. CEMENT PLASTER ON MTL. LATH ON SUSP. MTL. CHANNELS, ARCH VAULT
10. PAINTED M.D.O. EXT. PLYWOOD 1/4" x 1' ON 1x WOOD JOISTS @ 1'-0" O.C.
11. FACTORY FINISH MANUFACTURED COOLER
12. (2) LAYERS ⅝" GWB ON BOTTOM OF 12" TJI @ 16" O.C. 1-HOUR ASSEMBLY; L, 2 TRUSS JOISTS REPORT NER 2266
13. ⅝" GWB, TEXT/PAINT ON WOOD BEAM OR SOFFIT
14. EXPOSED STEEL STRUCT. TRUSS @ O.C., PAINT. EXPOSED STEEL ACOUSTIDECK, PAINT. EXPOSED MECH. DUCTWORK, PAINT
15. SUSPENDED 2x4 T-BAR GRID WITH STAGGERED ACOUSTICAL PANELS. 5 PER F.A. OF ⅝" GWB AND ACOUSTIC PANELS - 5 PER F.A.
16. ⅝" GWB ON ¾" METAL HAT CHANNELS @ 12" O.C. ON 1¼" STEEL CHANNELS @ 24" O.C. FOR RD. TO UNDER SIDE OF ROOF STRUCTURE ABOVE.
17. ⅝" GWB TEXT/PAINT ON EXISTING PLASTER OVER EXIST. WOOD JOISTS @ 16" O.C.
18. 12x12 ACOUSTIC TILE GLUE STAPLE TO ½" PLYWOOD ON BOTTOM OF STEEL STRUCTURE
19. (2) LAYERS ⅝" GWB ON BOTTOM OF TJI ROOF JOISTS @ 24" O.C. 1-HOUR ASSEMBLY, UBC TEST 21-1
19 R. "ULTRA SPAN" 12" HOLLOW CORE CONC. SLAB 1 HR. REPORT PFC-4833
20. 5/8" GWB ON EXIST. 2x8 JOISTS @ 16" O.C. TEXTURE, PAINT
21. EXPOSED STRUCTURE, NO FINISH
22. 5/8" GWB ON WOOD JOISTS 24" O.C. TEXTURE, PAINT
23. EXISTING BRICK ARCH, NO FINISH
24. EXISTING CEMENT PLASTER PATCH AS REQUIRED, PAINT
24. EXISTING TERRA COTTA, NO FINISH
26 R. 1 HR. ASSEMBLY, UBC 21-1, L, RSD ON 2x6 @ 2'-0" O.C. W/ 1" P.I.C. GWB ON BOTTOM.
26. SUSPENDED GRID W/ MOISTURE RESISTANT LAY-IN ACOUSTICAL PANELS.
27. ½" EXT. PLYD / AC / TAG / PAINTED ON 2x3 FURRING @ 2'-0" O.C. / 1½" RIGID INSUL. ALL ON BOTTOM OF ROLLING DOOR FLANKS.
28 R. 1 HR. ASSEMBLY, SINGLE PLY ROOF ON RIGID INSUL. ON ¾" PLYWOOD ON STEEL DECKING, SUSPENDED CLG. GYP. PLASTER ON MTL. LATH ON SUSP. MTL. CHANNELS.

GENERAL NOTES

1) CEILING HEIGHTS ARE TO EXISTING FLOOR ELEVATION NOT INCLUDING ADDITION OF ½" FLOOR PLYWOOD.

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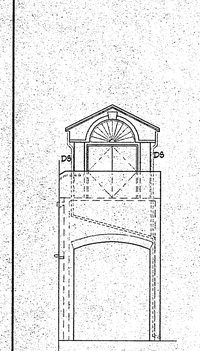

C ADD. ALT. A-6
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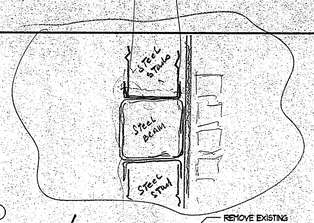

A WEST ELEVATION
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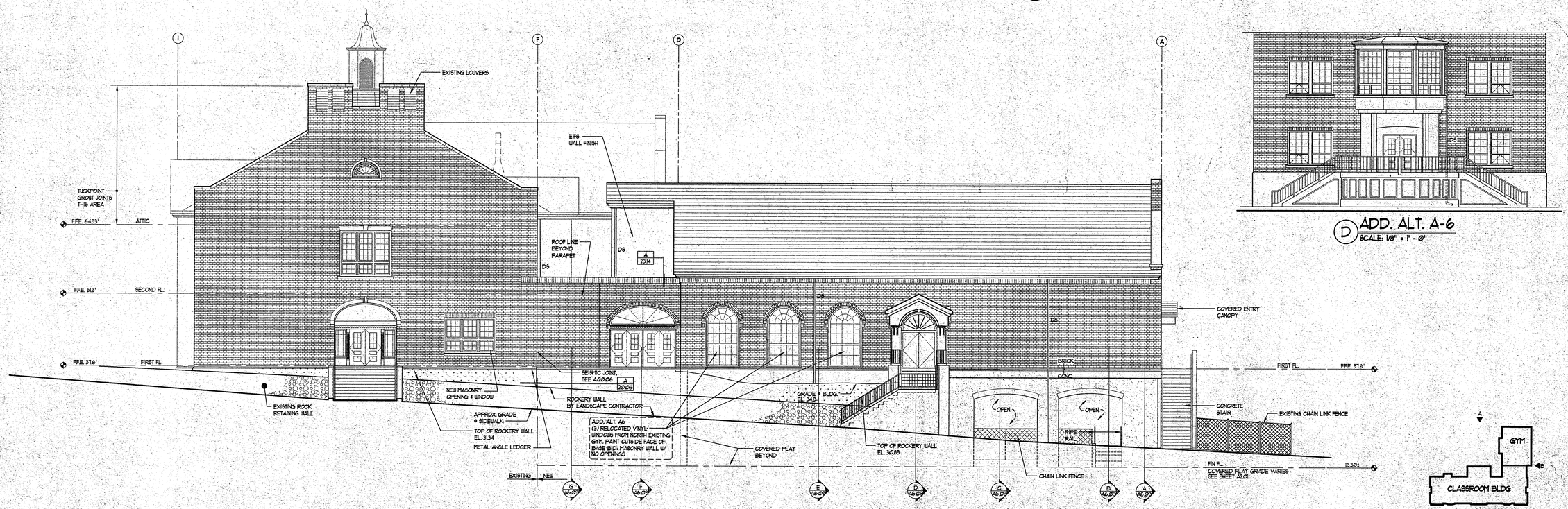

B NORTH ELEVATION
SCALE: 1/8" = 1' - 0"

D ADD. ALT. A-6
SCALE: 1/8" = 1' - 0"

KEY PLAN
SCALE: 1"= 100' - 0"
PLAN NORTH

Mc DERMOTH ELEMENTARY MODERNIZATION & ADDITIONS

ABERDEEN SCHOOL DISTRICT NO. 5 ABERDEEN WASHINGTON

REGISTERED ARCHITECT FRANK L. SMITH STATE OF WASHINGTON 1888

DATE 9/23/97
REVISED
COMM. NO. 951613

The BJSS GROUP
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PHASE 3

A5.01

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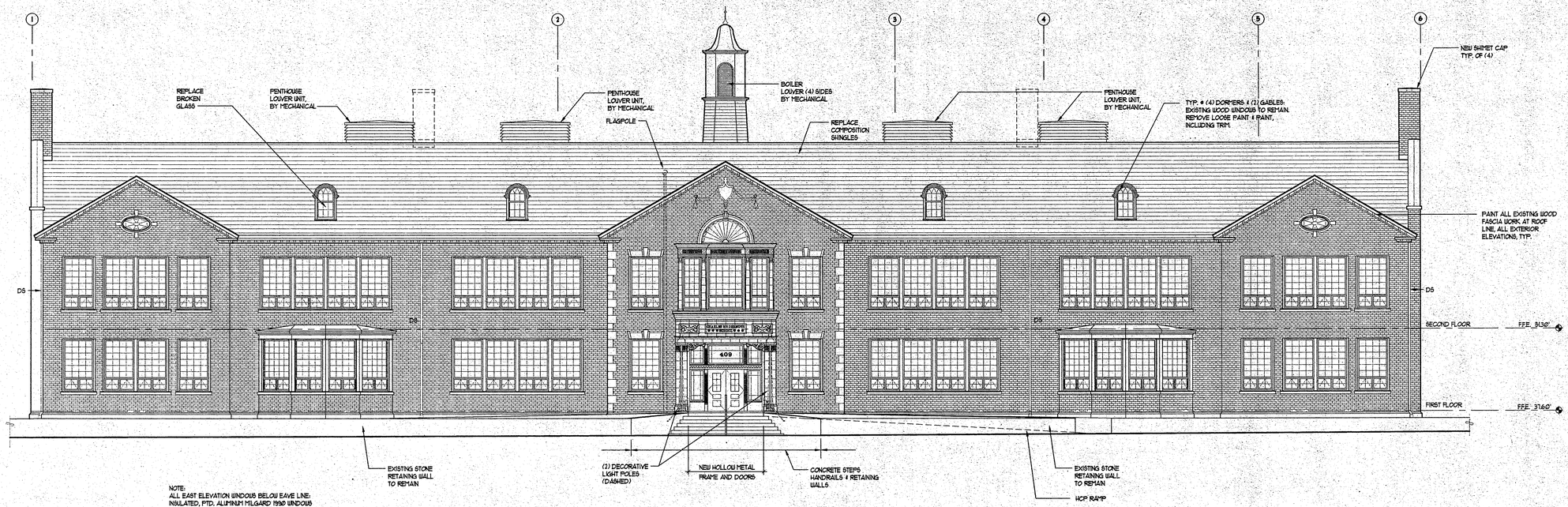
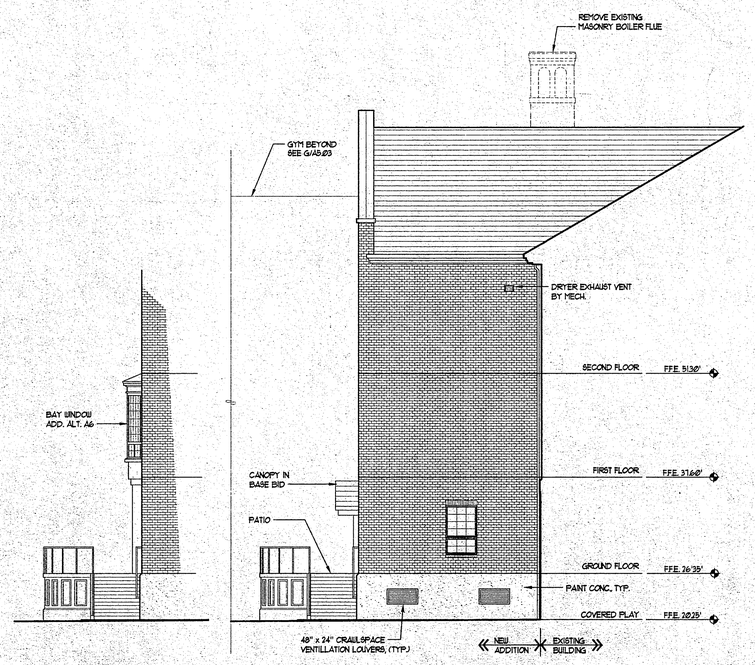


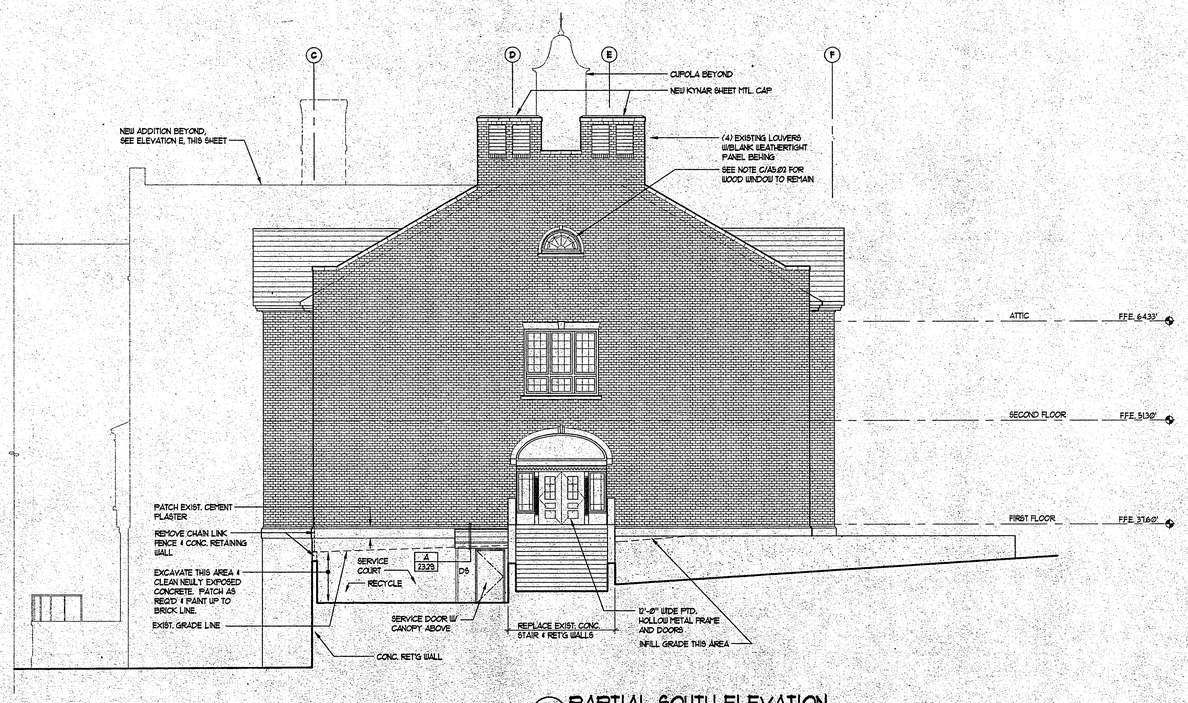
NOTE:
ALL EAST ELEVATION WINDOWS BELOW EAVE LINE: INSULATED, PTD. ALUMINUM MILGARD 9900 WINDOWS TO REMAIN. PAINT EXISTING EXTERIOR WOOD SURROUND TRIM. EXISTING SILLS ARE TERRACOTTA, NO FINISH REQUIRED.

C EAST ELEVATION
SCALE: 1/8" = 1' - 0"



E ADD. ALT A-6
SCALE: 1/8" = 1' - 0"

E PARTIAL SOUTH ELEVATION
SCALE: 1/8" = 1' - 0"



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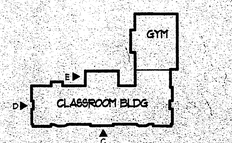

KEY PLAN
SCALE: 1"= 100' - 0"
PLAN NORTH

Mc DERMOTH ELEMENTARY MODERNIZATION & ADDITIONS
ABERDEEN SCHOOL DISTRICT NO. 5 ABERDEEN WASHINGTON

REGISTERED ARCHITECT FRANK L. SMITH STATE OF WASHINGTON 1886

DATE 9/23/97
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PHASE 3

A5.02

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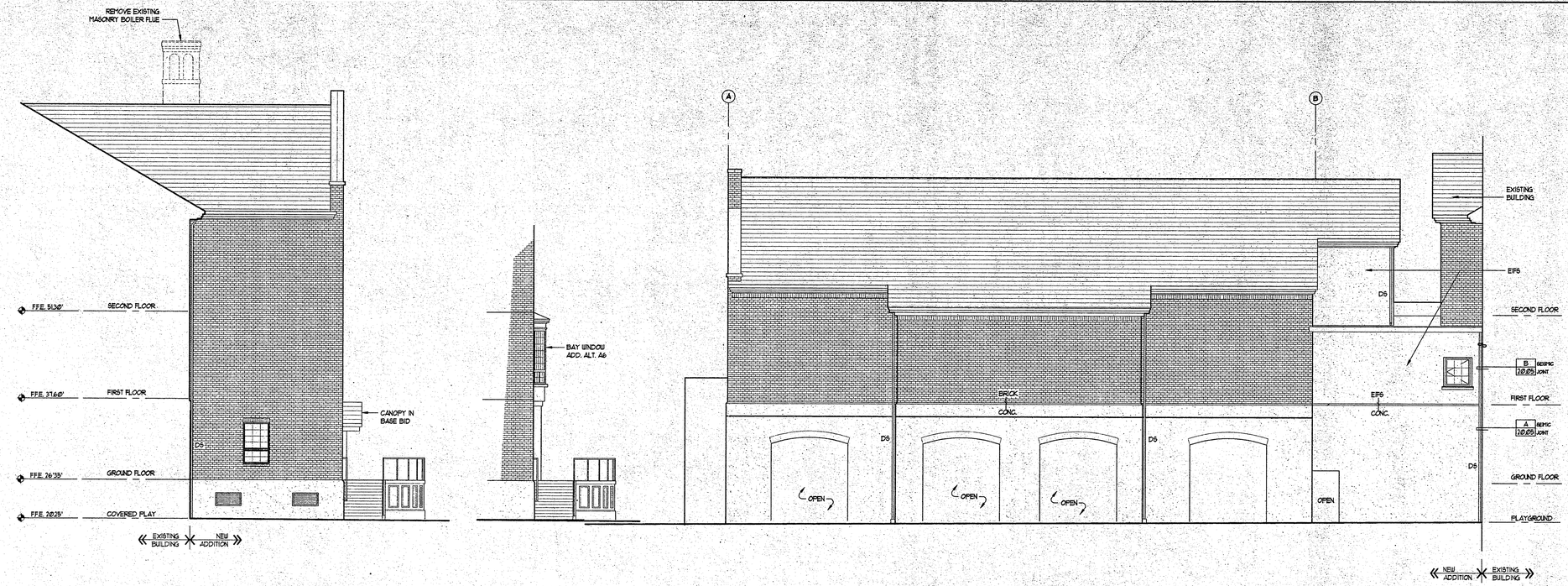
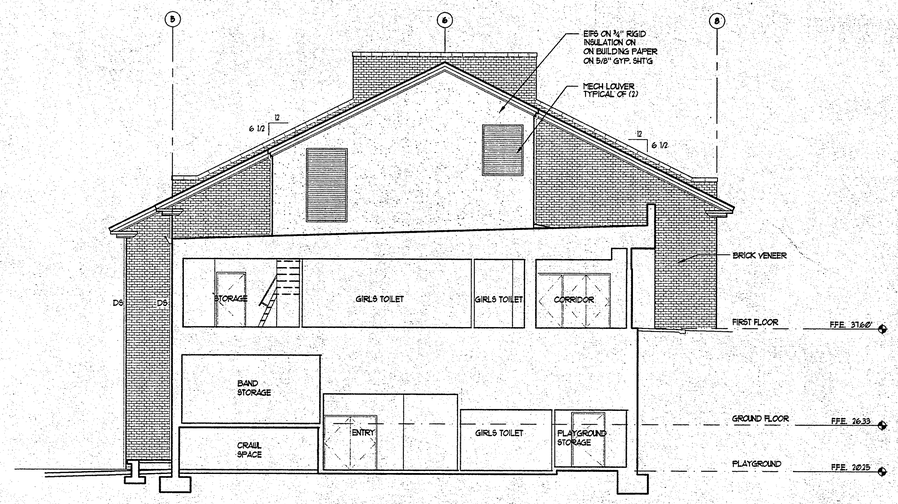
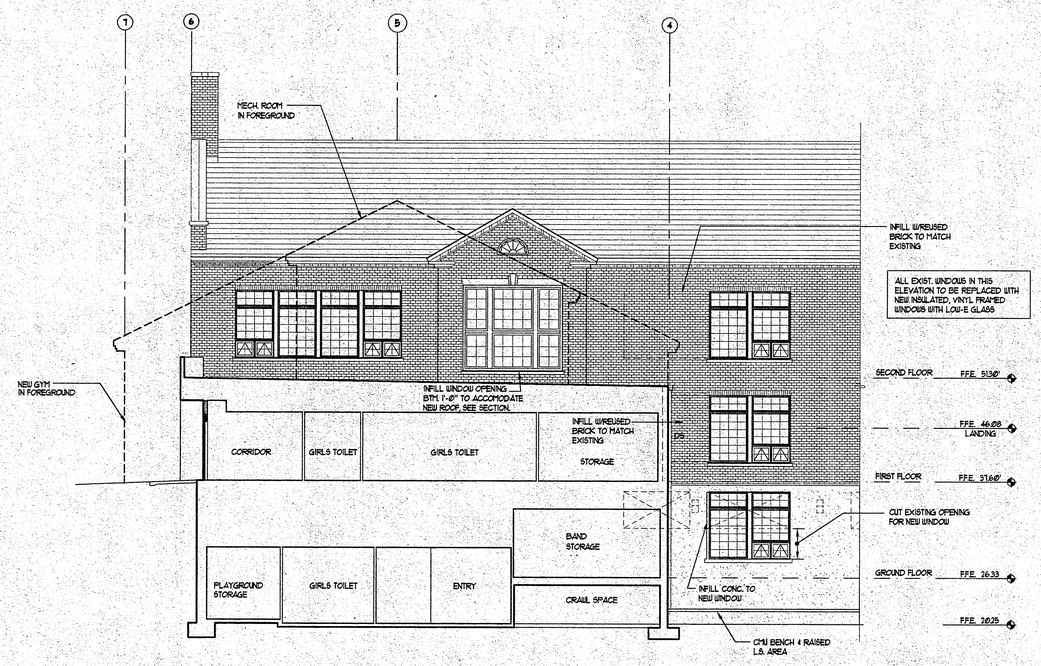


F PARTIAL NORTH ELEVATION
SCALE: 1/8" = 1' - 0"

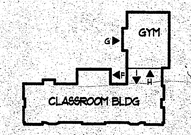
G PARTIAL SOUTH ELEVATION
SCALE: 1/8" = 1' - 0"



H EAST ELEVATION - AT GYM
SCALE: 1/8" = 1' - 0"



I WEST ELEVATION - BEHIND GYM
SCALE: 1/8" = 1' - 0"



KEY PLAN
SCALE: 1" = 100' - 0"
PLAN NORTH

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ABERDEEN SCHOOL DISTRICT NO. 5 ABERDEEN WASHINGTON

REGISTERED ARCHITECT FRANK L. SMITH STATE OF WASHINGTON 1888

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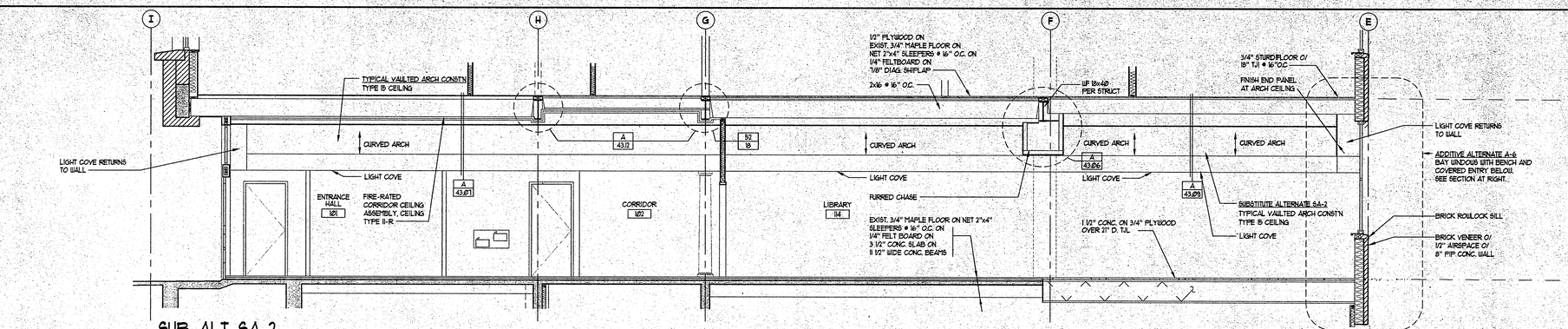
PHASE 3

A5.03



SUB. ALT. SA-2

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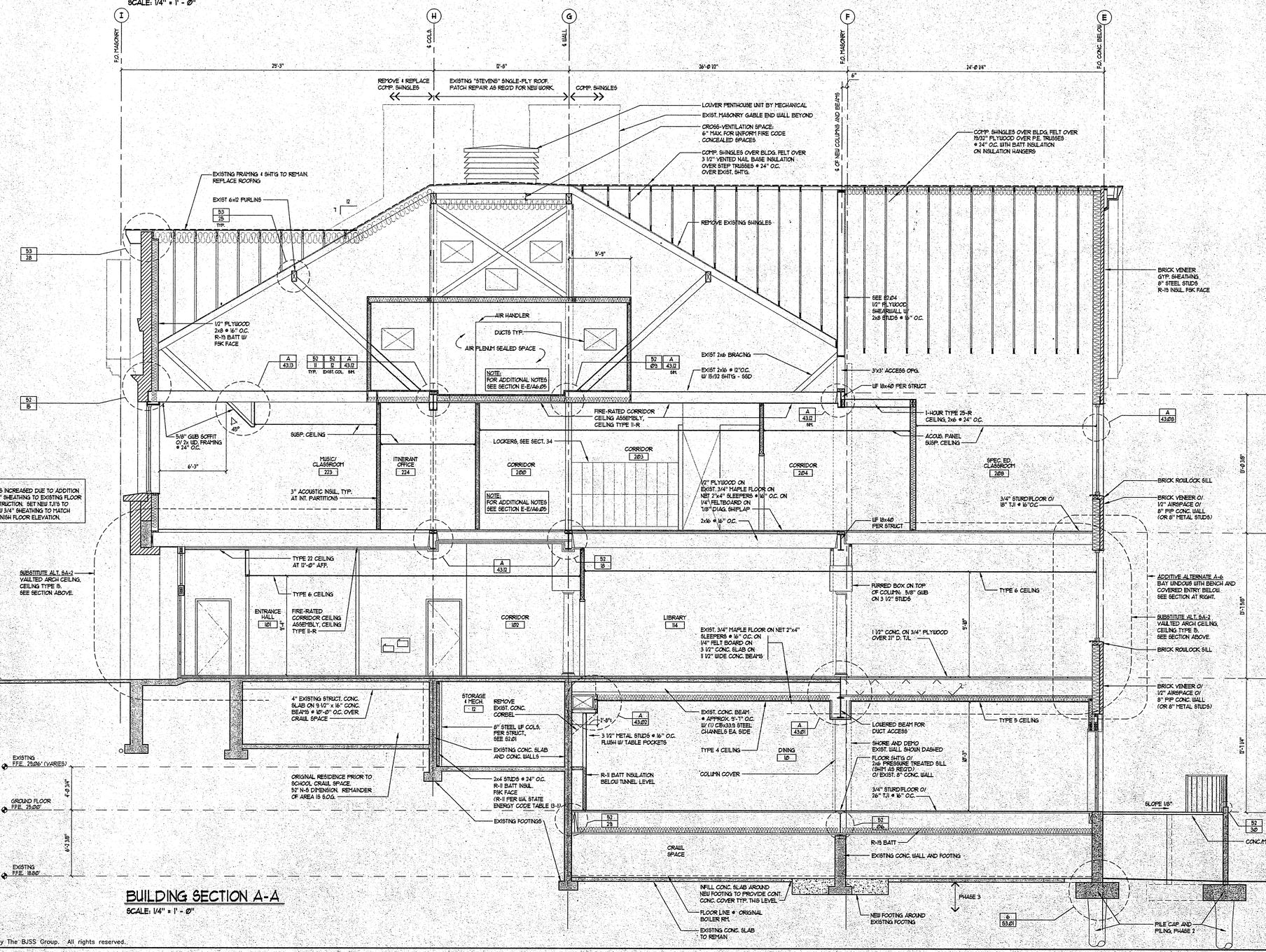
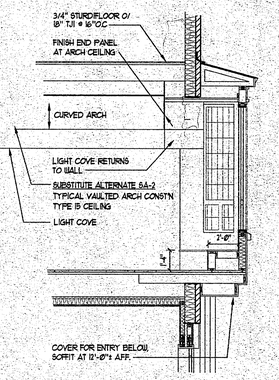


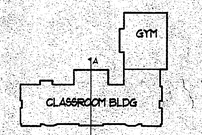
BUILDING SECTION A-A

SCALE: 1/4" = 1' - 0"



ADD. ALT. A-6

SCALE: 1/4" = 1' - 0"



KEY PLAN

SCALE: 1" = 100' - 0"

PLAN NORTH

Mc DERMOTH ELEMENTARY MODERNIZATION & ADDITIONS

ABERDEEN SCHOOL DISTRICT NO. 5 ABERDEEN WASHINGTON

REGISTERED ARCHITECT FRANK L. SMITH STATE OF WASHINGTON 1988

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PHASE 3

A6.01

LEGEND

- EXISTING CONCRETE
- CONCRETE INSTALLED IN PHASE 2
- CONCRETE INSTALLED IN PHASE 3 (THIS CONTRACT)

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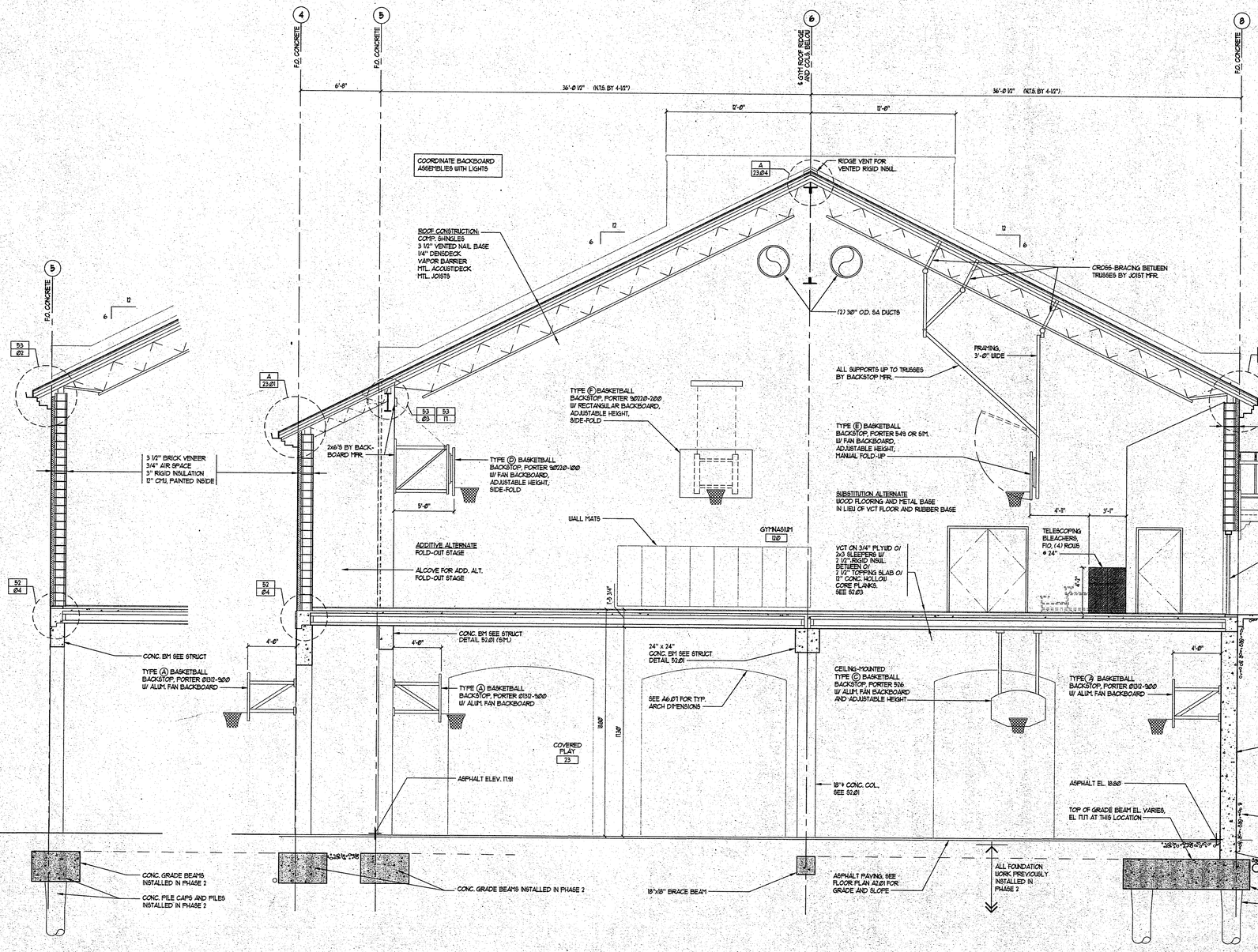
ABERDEEN SCHOOL DISTRICT NO. 5 ABERDEEN WASHINGTON

LEGEND

- EXISTING CONCRETE
- CONCRETE INSTALLED IN PHASE 2
- CONCRETE INSTALLED IN PHASE 3 (THIS CONTRACT)

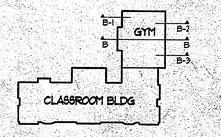


BUILDING SECTION B-1
SCALE: 1/4" = 1' - Ø"

BUILDING SECTION B-B
SCALE: 1/4" = 1' - Ø"

BUILDING SECTION B-2
SCALE: 1/4" = 1' - Ø"

BUILDING SECTION B-3
SCALE: 1/4" = 1' - Ø"



KEY PLAN
SCALE: 1"= Ø0' - Ø"
NORTH

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REGISTERED ARCHITECT BRIAN L. SMITH STATE OF WASHINGTON 1988

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PHASE 3

A6.02

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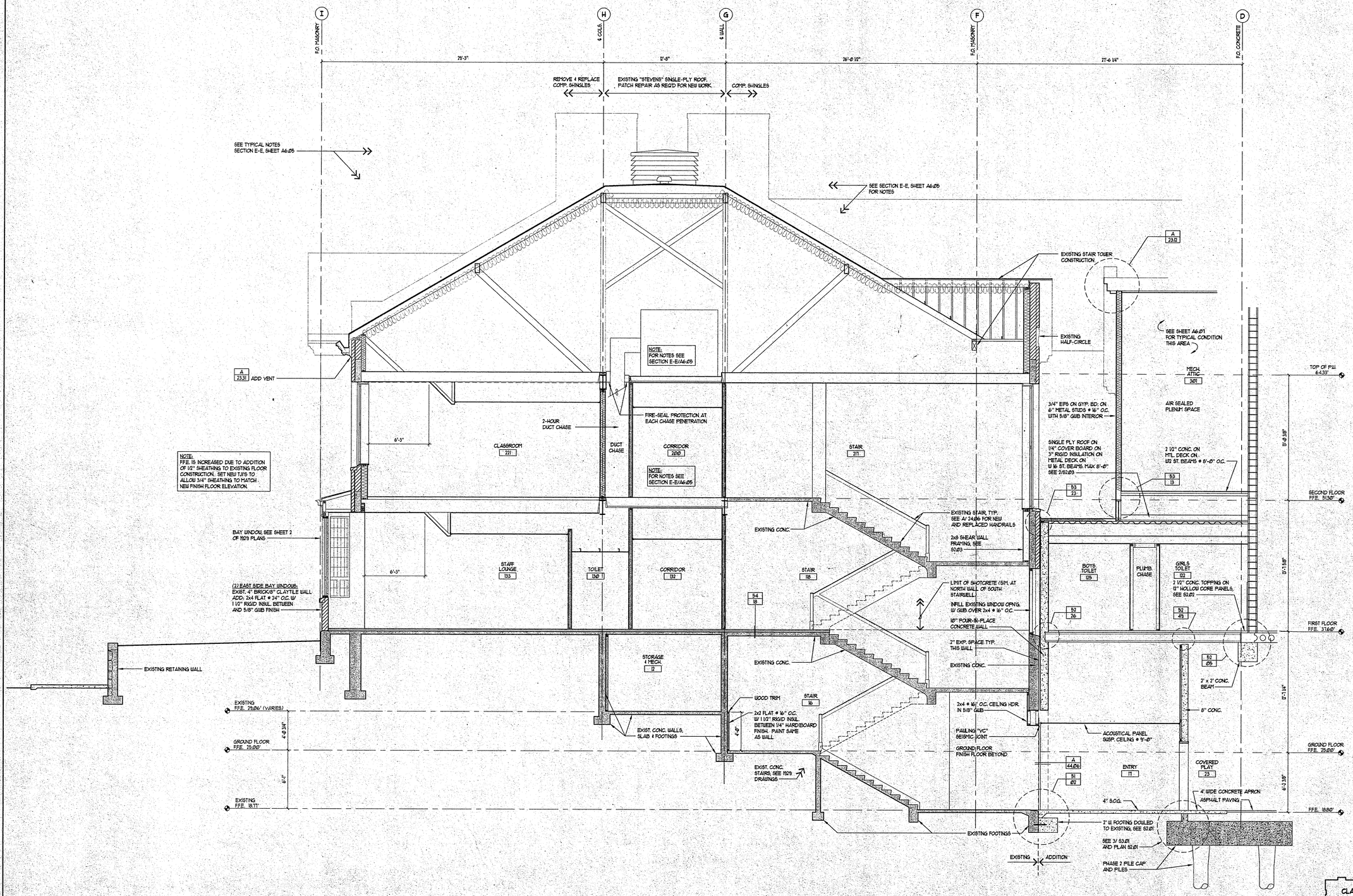
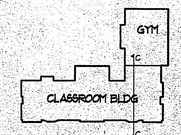
Mc DERMOTH ELEMENTARY
MODERNIZATION & ADDITIONS
ABERDEEN SCHOOL DISTRICT NO. 5 ABERDEEN WASHINGTON

LEGEND
- EXISTING CONCRETE
- CONCRETE INSTALLED IN PHASE 2
- CONCRETE INSTALLED IN PHASE 3 (THIS CONTRACT)



BUILDING SECTION C-C
SCALE: 1/4" = 1' - Ø"



KEY PLAN
SCALE: 1"= ØØ' - Ø"
PLAN NORTH

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REGISTERED ARCHITECT FRANK L. SMITH STATE OF WASHINGTON 1888

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PHASE 3

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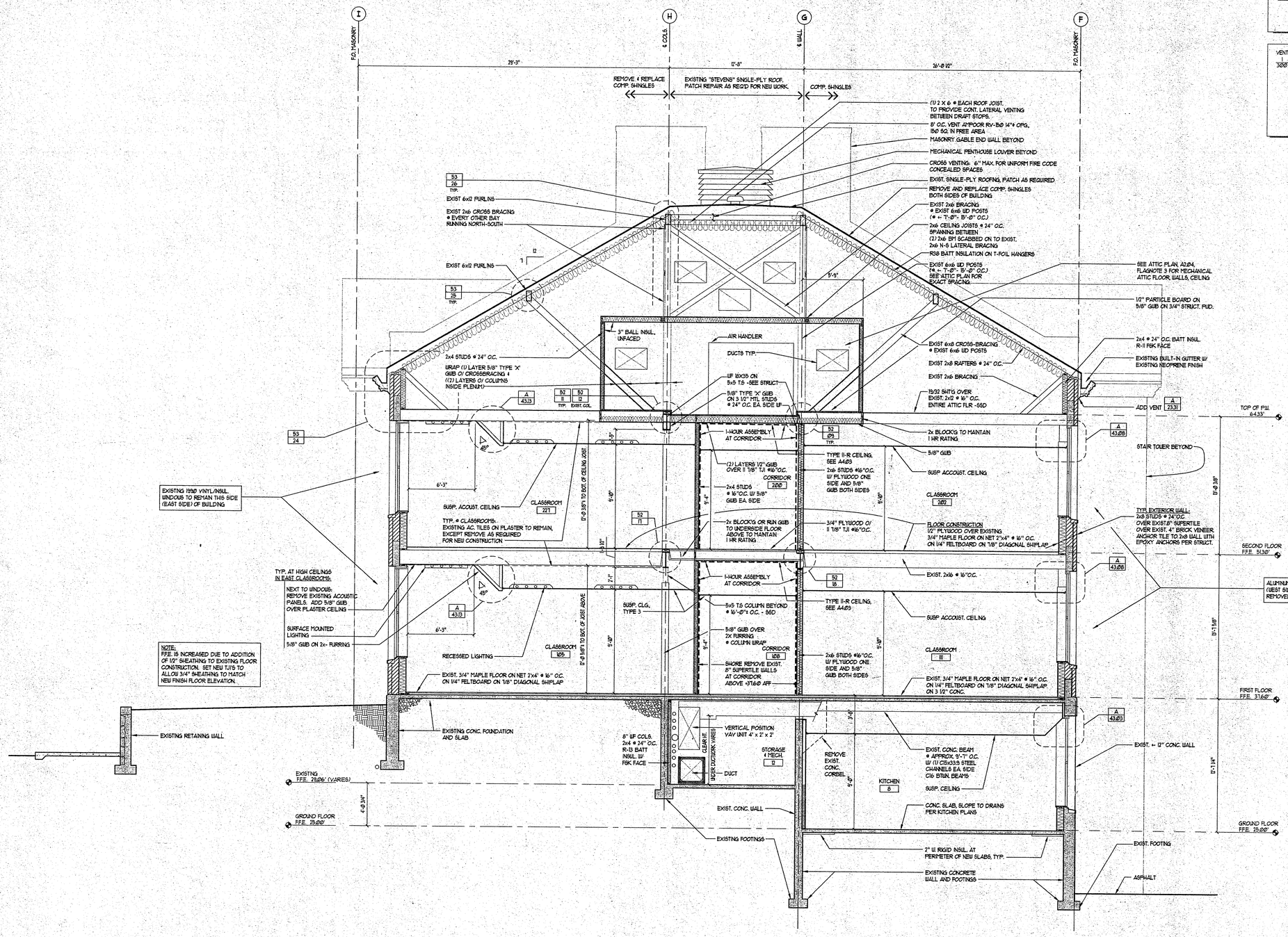
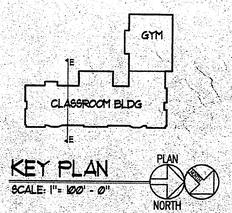


BUILDING SECTION E-E

SCALE: 1/4" = 1'-0"



LEGEND

- EXISTING CONCRETE
- CONCRETE INSTALLED IN PHASE 2
- CONCRETE INSTALLED IN PHASE 3 (THIS CONTRACT)

VENTING ABOVE INSULATION AT EAVES AND RIDGE

$\frac{1}{300} \times \text{AREA} = \frac{\text{SQ. IN.}}{300}$ + $\frac{\text{SQ. IN.}}{\text{LF.}}$ = TOTAL

18 SQ. IN / L.F.

9 SQ. IN / L.F.

Mc DERMOTH ELEMENTARY MODERNIZATION & ADDITIONS

ABERDEEN SCHOOL DISTRICT NO. 5 ABERDEEN WASHINGTON

REGISTERED ARCHITECT FRANK L. SMITH STATE OF WASHINGTON 1888

DATE 9/23/97

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PHASE 3

A6.05

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LEGEND

- EXISTING CONCRETE
- CONCRETE INSTALLED IN PHASE 2
- CONCRETE INSTALLED IN PHASE 3 (THIS CONTRACT)

F — F.O. MASONRY — 27'-6 1/4"
D — F.O. CONCRETE — 26'-8"
C — F.O. CONCRETE — 39'-3"
B — F.O. CONCRETE — 26'-8"
A — F.O. CONCRETE

ROOF CONSTRUCTION:
COMP. SHINGLES
3/4" COVER BOARD
3" RIGID INSULATION
VAPOR BARRIER
MTL. DECK
MTL. JOISTS

A 23/2

A 23/26

3/4" EPS ON GYP. BD. ON 6" METAL STUDS @ 16" O.C. WITH 5/8" GWB INTERIOR

SEE SHEET A6.05 FOR TYPICAL CONDITION THIS AREA

MECH. ATTIC 301

AIR SEALED PLENUM SPACE

SINGLE PLY ROOF ON 1/4" COVER BOARD ON 3" RIGID INSULATION ON METAL DECK ON W 16 ST. BEAMS, MAX 8'-0" SEE 2/S2.03

2 1/2" CONC. ON MTL. DECK ON W12 ST. BEAMS @ 8'-0" O.C.

A 23/8
B3 22 SIM.

B3 19

SECOND FLOOR FFE. 51.30'

EXIST. BEAM

2" CLEAR EXP. JOINT

SUSP. CLG. @ 9'-4"

FAILING "VC" 2" SEISMIC JOINT

REMOVE PHASE I TEMP. WEATHER ENCLOSURE

3/4" PLYWOOD ON 18" TJI @ 16" O.C.

SEE SHEET S2.07

BOTTOM OF BEAM VARIES FROM 7'-0" TO 8'-0" SEE SECT. D-D SHEET A6.04

CORRIDOR 123

BOYS TOILET 125

CUSTODIAN 124

GIRLS TOILET 122

GWB SUSP. CEILING AT 9'-0"

FIRST FLOOR FFE. 31.60'

B2 46 | B2 25 | A 40/25 — BEYOND AT CORRIDOR

2x6 @ 16" O.C.

EXIST. CONC. S.O.G. EL. 31.50'

FILL HEIGHT GWB ON 2x2 WITH 1 1/2" RIGID INSULATION BETWEEN

SUSP. GWB CEILING AT 9'-0"

8" P.I.P. CONC. WALL, INST. IN PHASE 2

PHASE I CONC. INFILL

BOYS TOILET 15

GIRLS TOILET 28

GROUND FLOOR FFE. 19.50'

EL. 18.00

C.T. IN 1 1/2" SETTING BED ON 4" CONC. SLAB SLOPE TO DRAIN

12" CMU

FFE 52.00

TYPE (F) BASKETBALL BACKSTOP, PORTER 90720-100 W/ RECTANGULAR BACKBOARD, ADJUSTABLE HEIGHT, SIDE-FOLD

TYPE (D) BASKETBALL BACKSTOP, PORTER 90720-100 W/ FAN BACKBOARD, ADJUSTABLE HEIGHT, SIDE-FOLD

18'-0" | 11'-0"

16'-8" FFE OF FLOOR, ROOF 38'

FFE. 37.6

WALL-MOUNTED TYPE (B) BASKETBALL BACKSTOP, PORTER B-518-H W/ ALUM. FAN BACKBOARD, ADJUSTABLE HEIGHT

8'-0"

16" P.I.P. CONCRETE WALL

2" ASPHALT PAVING GRADE VARIES, APPROX. 18.5 AT THIS SECTION

EL. 18.00

30"ø MECH. DUCT EACH SIDE OF TRUSS

STEEL GIRDER TRUSS AT RIDGE, SEE S2.03

EXPOSED PAINTED STEEL STRUCT. & DUCTWORK

ACOUSTI-DECK

STEEL JOISTS, TYP.

ADDITIVE ALTERNATE
FOLD-OUT STAGE THIS AREA.

GYMNASIUM 120

SUBSTITUTION ALTERNATE SA-1
WOOD FLOORING AND METAL BASE IN LIEU OF VCT FLOOR AND RUBBER BASE

3/4" PLYD ON 2 1/2" RIGID INSULATION BETWEEN 2x3 AT 16" O.C.
2 1/2" CONC. TOPPING ON 12" HOLLOW CORE CONC. PLANKS

CONC. BEAM @ CENTER

18'-0" CONC. COLS @ CENTER

ALL COVERED PLAY WALLS & CLG.: PAINT

SLOPE PAVING AS SHOWN ON A2.01

TYPE (A) BASKETBALL BACKSTOP, PORTER 2332-900 W/ ALUM. FAN BACKBOARD COVERED PLAY 23

TYPE (F) BASKETBALL BACKSTOP, PORTER 90720-100 W/ RECTANGULAR BACKBOARD, ADJUSTABLE HEIGHT, SIDE-FOLD

TYPE (D) BASKETBALL BACKSTOP, PORTER 90720-100 W/ FAN BACKBOARD, ADJUSTABLE HEIGHT, SIDE-FOLD

4" BRICK VENEER
3/4" AIR SPACE
3" RIGID INSULATION
12" CMU

FFE. 33.10' TOP OF ARCH

5 3/4"
3'-8"
11'

TYPE (A) BASKETBALL BACKSTOP, PORTER 2332-900 W/ ALUM. FAN BACKBOARD

CEILING-MOUNTED TYPE (C) BASKETBALL BACKSTOP, PORTER 92526-1400 W/ ALUM. FAN BACKBOARD, ADJUSTABLE HEIGHT

SLOPE PAVING AS SHOWN ON A2.01

FIRST FLOOR FFE. 31.60'

GRADE ELEVATION APPROX. 18.00

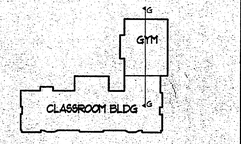
FFE. 17.29

6 S3.01

BUILDING SECTION G-G

SCALE: 1/4" = 1' - 0"

KEY PLAN
SCALE: 1" = 100' - 0"



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Mc DERMOTH ELEMENTARY MODERNIZATION & ADDITIONS

ABERDEEN SCHOOL DISTRICT NO. 5 ABERDEEN WASHINGTON

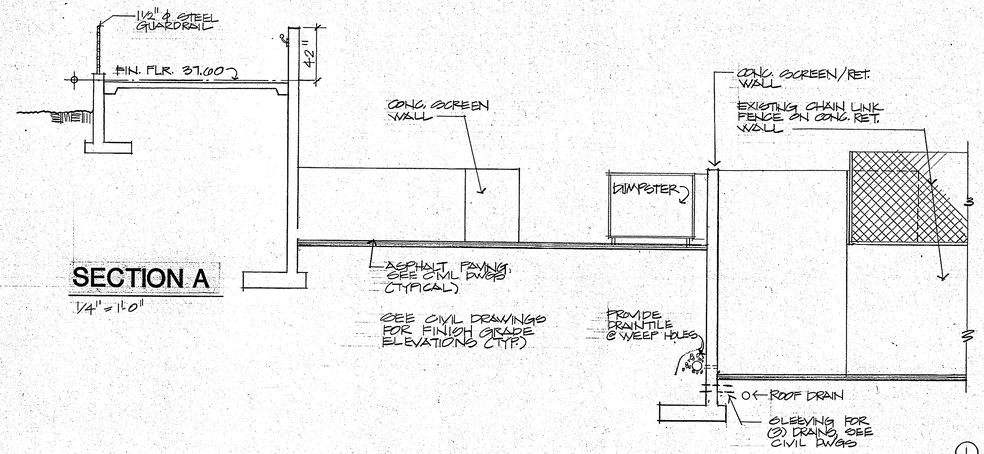
REGISTERED ARCHITECT FRANK L. SMITH STATE OF WASHINGTON 1888

DATE 9/23/97
REVISED
COMM. NO. 961413

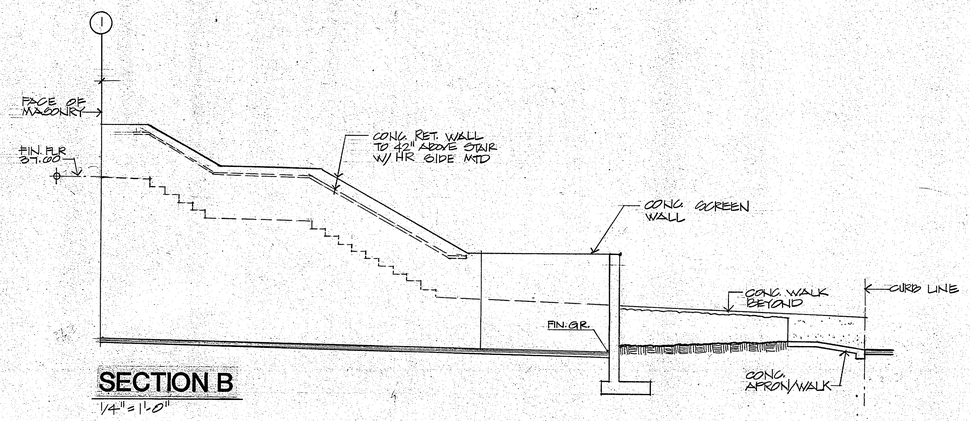
The BJSS GROUP
ARCHITECTS & PLANNERS, AIA
320 WEST BAY DRIVE SUITE 212 OLYMPIA WA. 98502 (360) 943-4650

PHASE 3

A6.07



SECTION A
1/4" = 1'-0"



SECTION B
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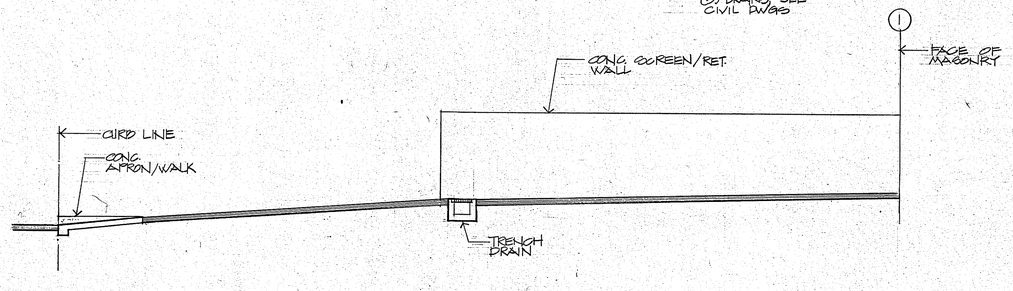

SECTION C
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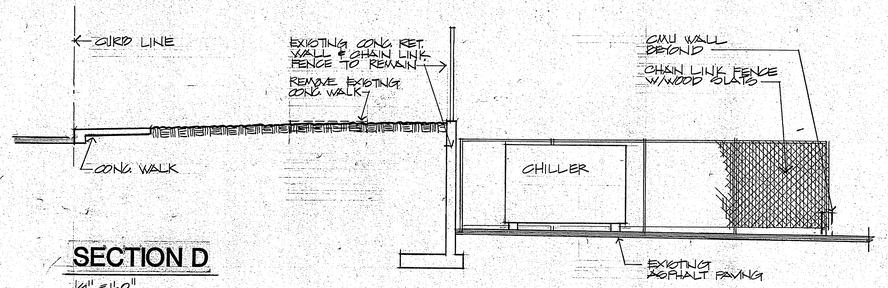
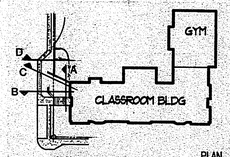


SECTION D
1/4" = 1'-0"



KEY PLAN
SCALE: 1" = 100' - 0"
PLAN
NORTH

Mc DERMOTH ELEMENTARY

ABERDEEN SCHOOL DISTRICT NO. 5 ABERDEEN WASHINGTON

REGISTERED ARCHITECT
FRANK L. SMITH
STATE OF WASHINGTON

DATE 9/16/97
REVISED
COMM. NO. 961413

The BJSS GROUP
ARCHITECTS & PLANNERS, AIA
320 WEST BAY DRIVE SUITE 212 OLYMPIA WA 98502 (360) 943-4650

A6.08

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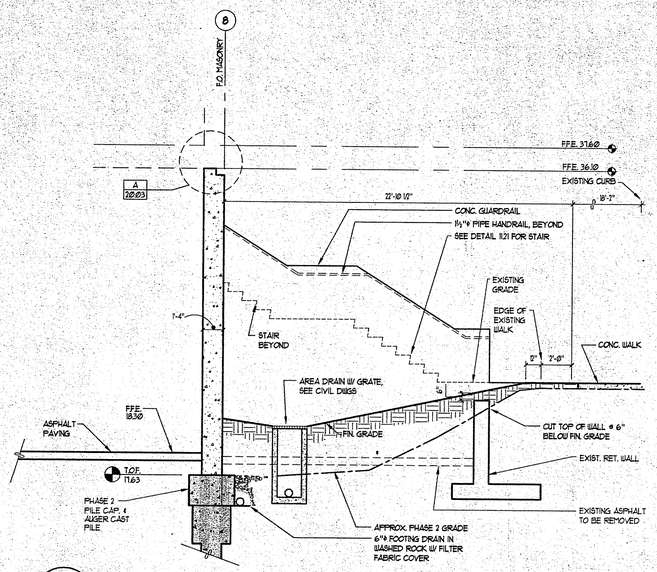
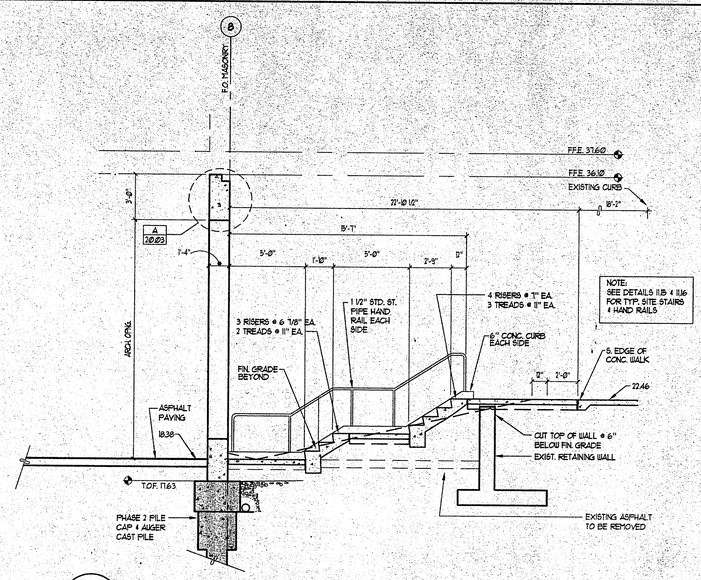


A SECTION
A6.09 SCALE: 1/4" = 1' - 0"



B SECTION
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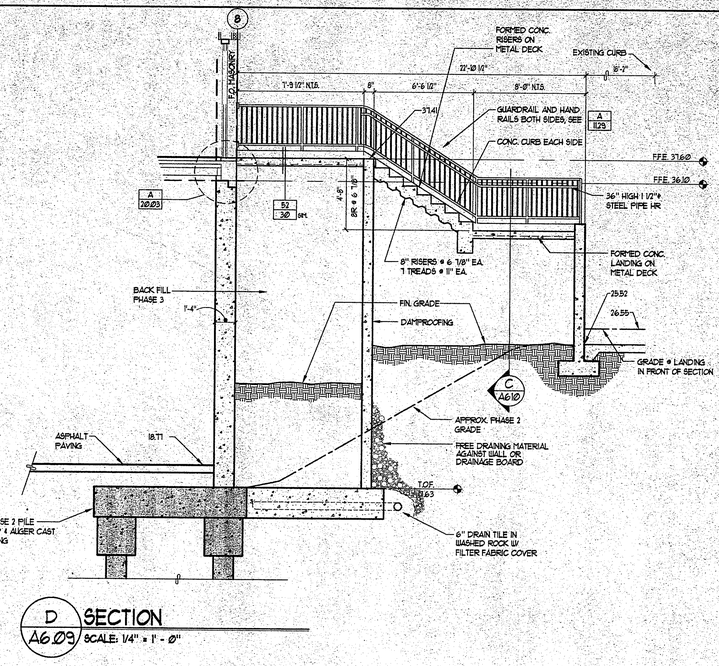

D SECTION
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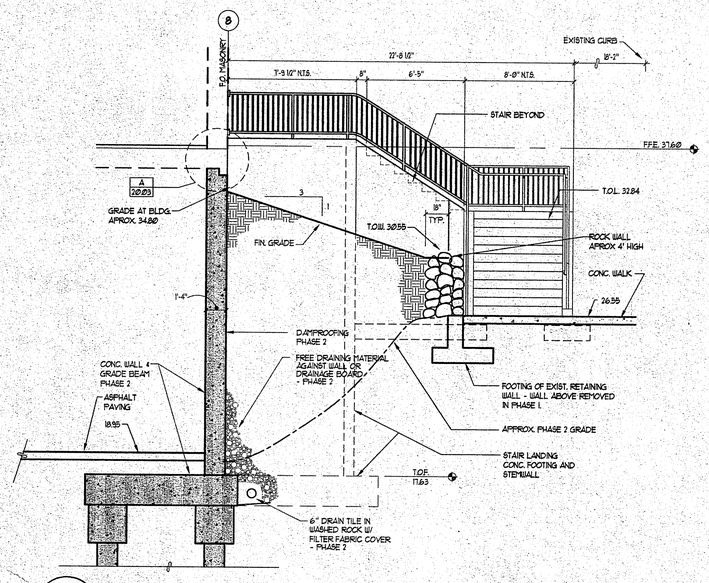

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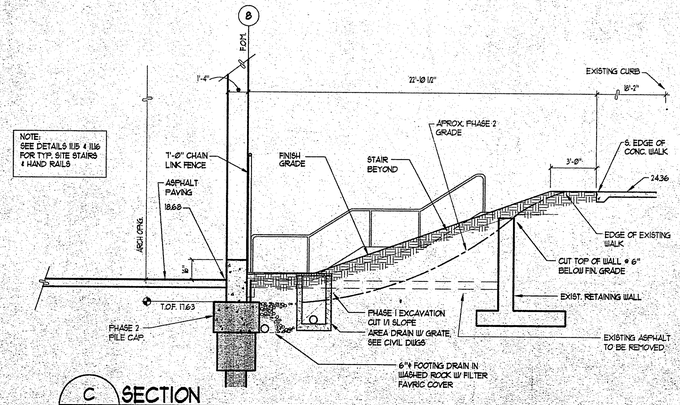

C SECTION
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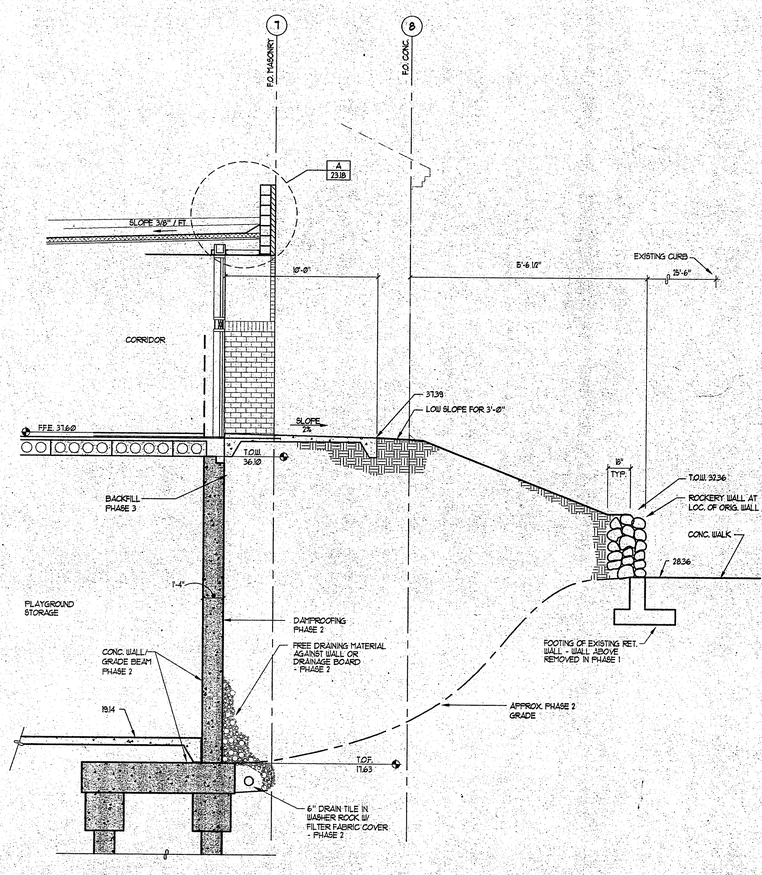

F SECTION
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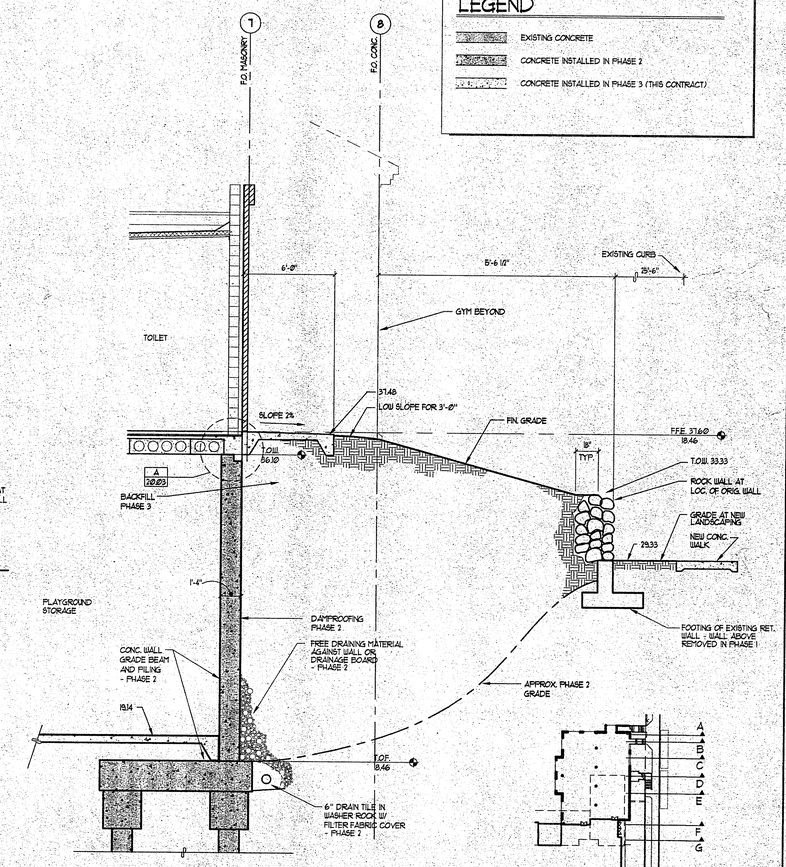

G SECTION
A6.09 SCALE: 1/4" = 1' - 0"

LEGEND

- EXISTING CONCRETE
- CONCRETE INSTALLED IN PHASE 2
- CONCRETE INSTALLED IN PHASE 3 (THIS CONTRACT)

KEY PLAN
SCALE: AS NOTED



Mc DERMOTH ELEMENTARY MODERNIZATION & ADDITIONS

ABERDEEN SCHOOL DISTRICT NO. 5 ABERDEEN WASHINGTON

DATE: 9/23/97
REVISED:
COMM.: NO. 961413

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ARCHITECTS & PLANNERS, AIA
320 WEST BAY DRIVE SUITE 212 OLYMPIA, WA 98502 (360) 943-4650

PHASE 3

A6.09

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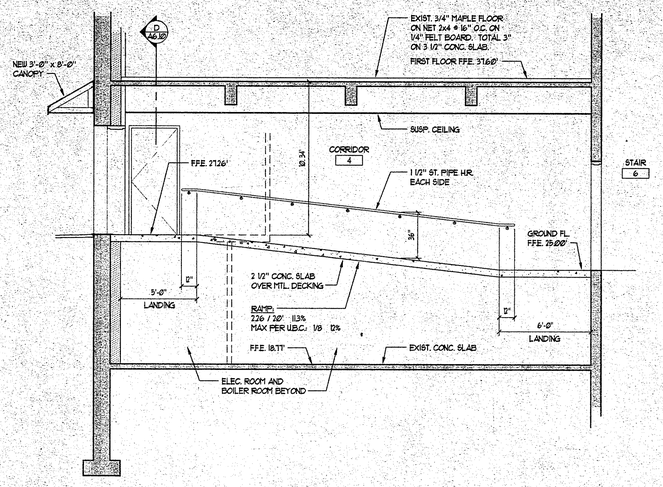
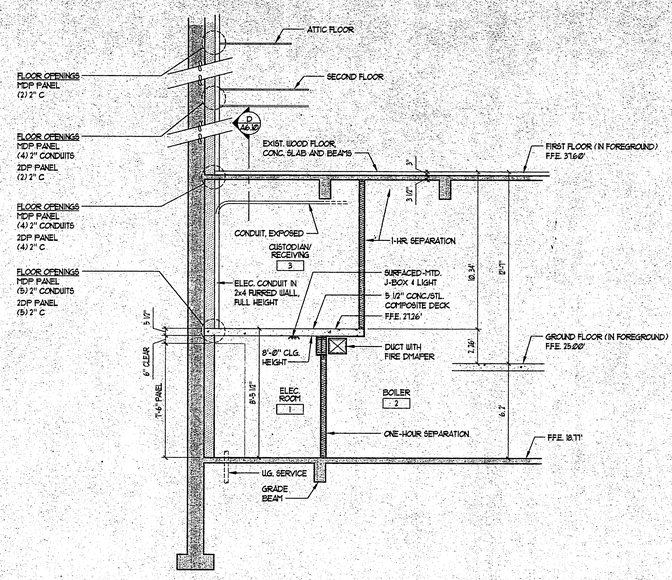


A SECTION
A6.10 SCALE: 1/4" = 1' - 0"



B SECTION
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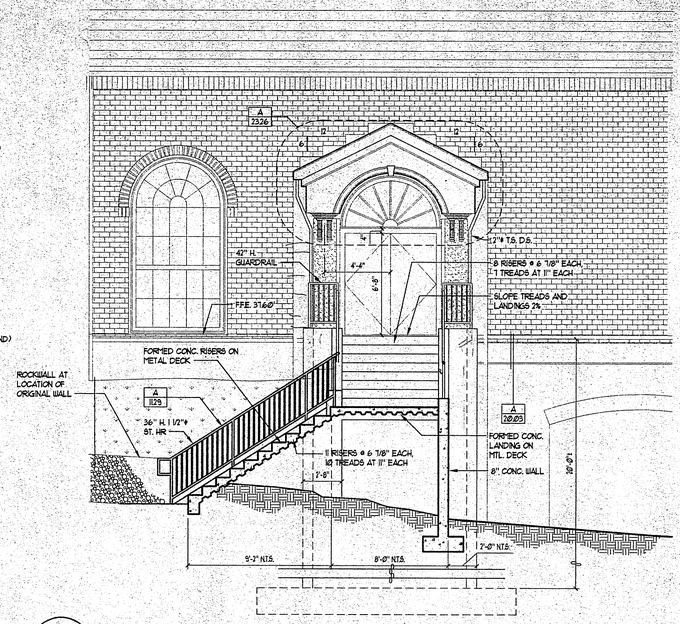
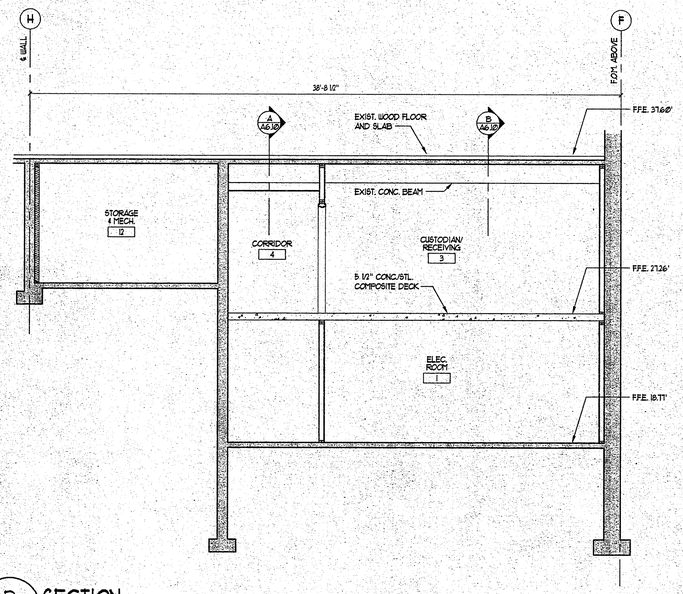


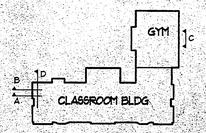
C SECTION
A6.10 SCALE: 1/4" = 1' - 0"



D SECTION
A6.10 SCALE: 1/4" = 1' - 0"

LEGEND

- EXISTING CONCRETE
- CONCRETE INSTALLED IN PHASE 2
- CONCRETE INSTALLED IN PHASE 3 (THIS CONTRACT)



KEY PLAN
SCALE: 1" = 100'-0"



Mc DERMOTH ELEMENTARY MODERNIZATION & ADDITIONS

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PHASE 3

A6.10

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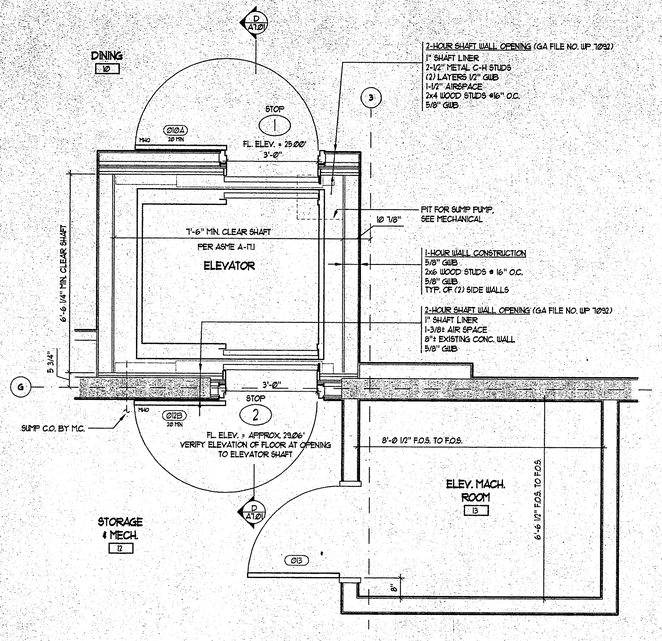
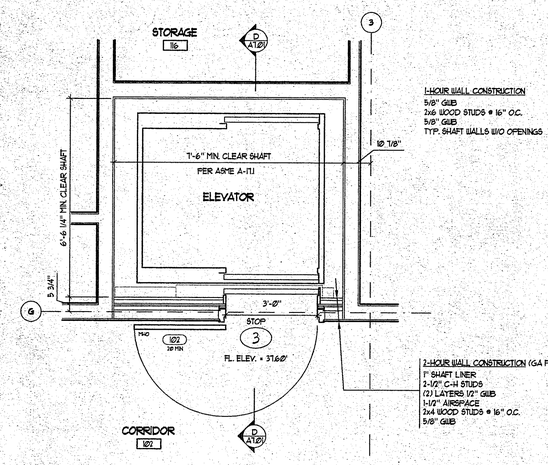


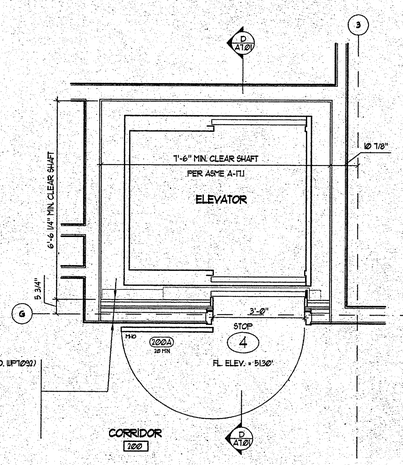
GROUND FLOOR ELEVATOR PLAN

SCALE: 1/2" = 1' - 0"



FIRST FLOOR ELEVATOR PLAN

SCALE: 1/2" = 1' - 0"



SECOND FLOOR ELEVATOR PLAN

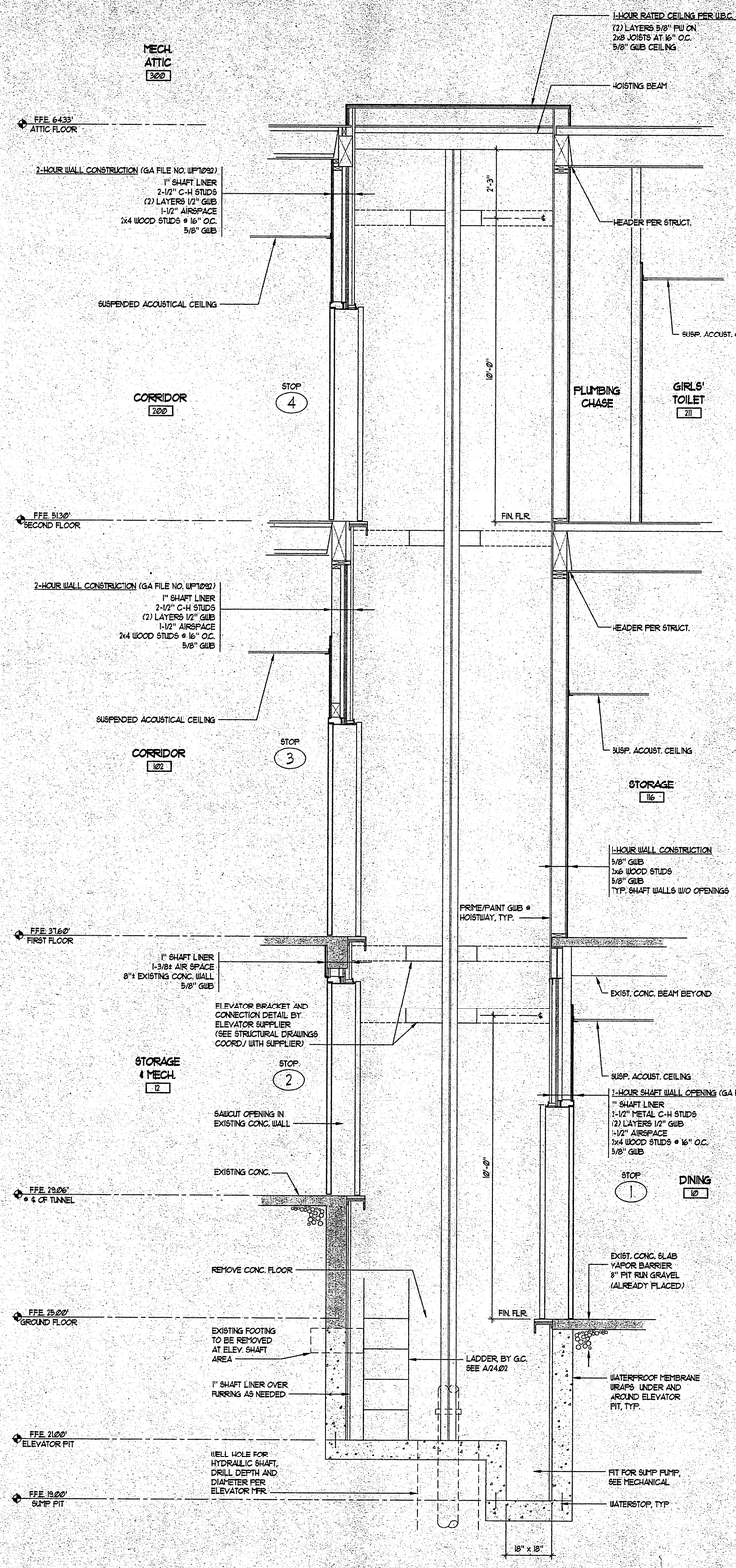
SCALE: 1/2" = 1' - 0"

GENERAL NOTES

1. GENERAL CONTRACTOR TO COORDINATE WITH ELEVATOR SUPPLIER AND PROVIDE BACKING FOR GUIDE RAILS AS NEEDED.
2. DIMENSIONS ARE BASED ON INFORMATION AVAILABLE FOR SIMILAR MODELS BY DIFFERENT MANUFACTURERS. GENERAL CONTRACTOR TO CONSULT ARCHITECT IN THE EVENT OF DIMENSION CHANGES, CONFLICT WITH STRUCTURE, ETC. NOT SHOWN ON THIS SHEET OR PLANS.

LEGEND

- EXISTING CONCRETE
- CONCRETE INSTALLED IN PHASE 2
- CONCRETE INSTALLED IN PHASE 3 (THIS CONTRACT)



ELEVATOR SECTION

SCALE: 1/2" = 1' - 0"

Mc DERMOTH ELEMENTARY MODERNIZATION & ADDITIONS

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DATE	REVISED	COMM. NO.
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ARCHITECTS & PLANNERS, AIA
320 WEST BAY DRIVE, SUITE 212, OLYMPIA, WA 98502 (360) 943-4650

PHASE 3

A7.01

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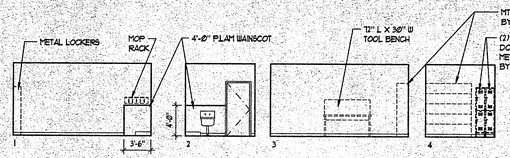
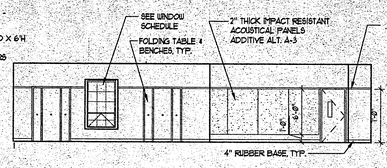


CUSTODIAN
3



DINING ROOM
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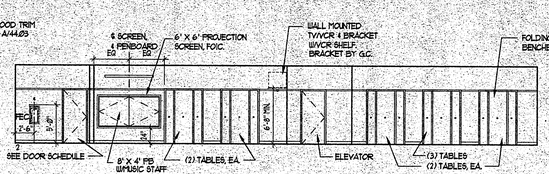

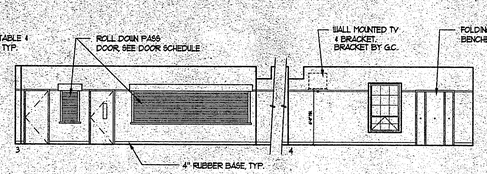

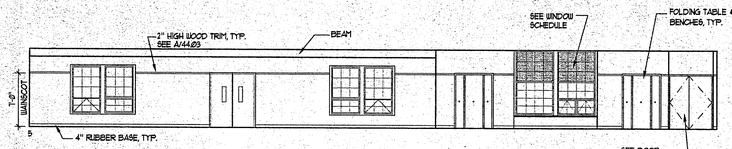

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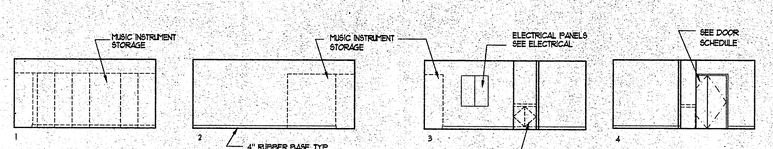

BAND STORAGE
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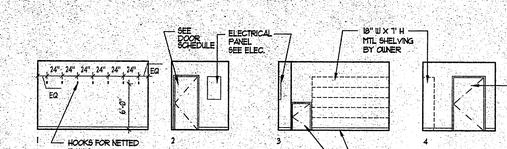

PLAYGROUND STORAGE
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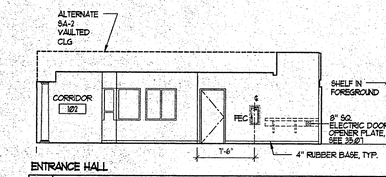

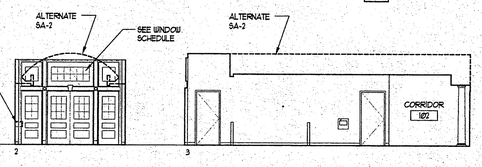

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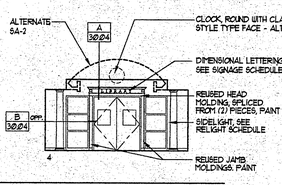

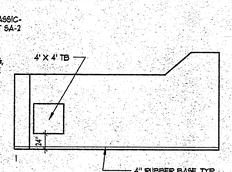

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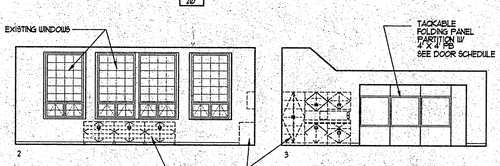

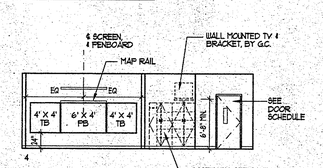

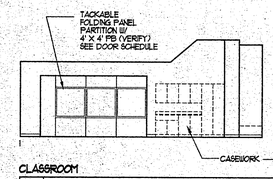

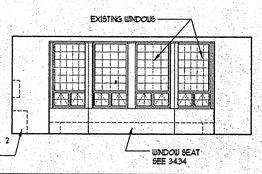

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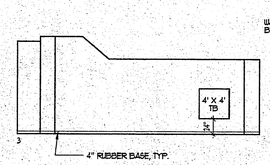

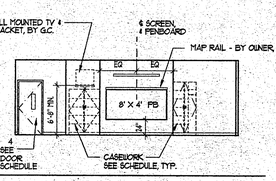

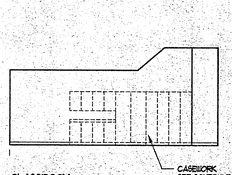

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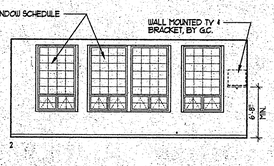

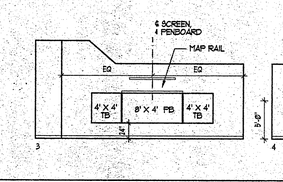

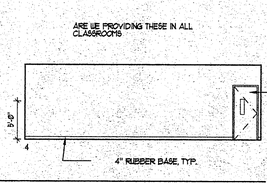

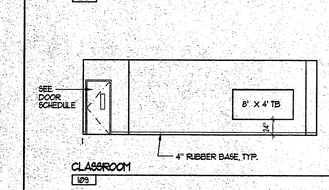

CLASSROOM
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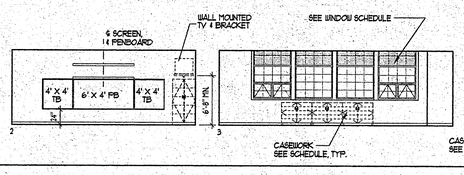

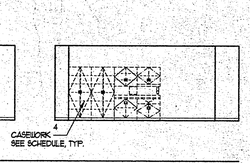

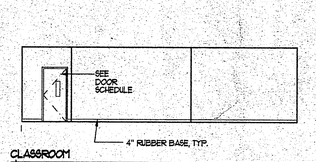

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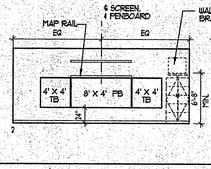

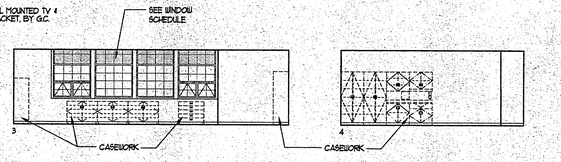

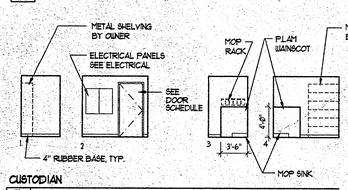

CUSTODIAN
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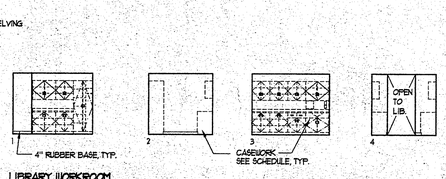
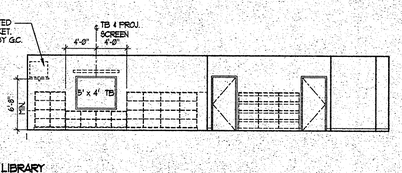
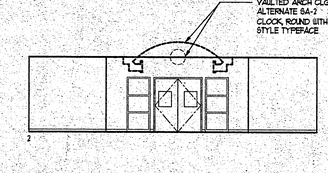
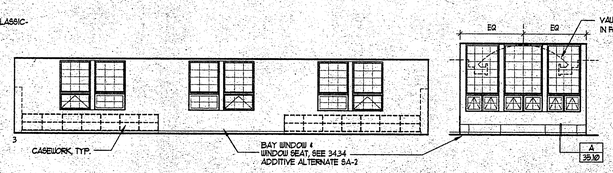


LIBRARY WORKROOM
113







LIBRARY
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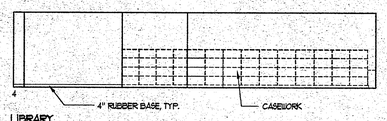

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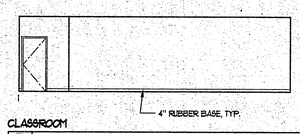

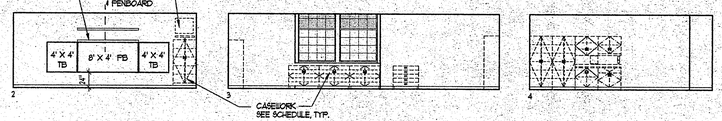

LIBRARY
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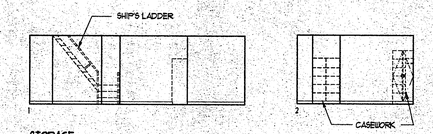

STORAGE
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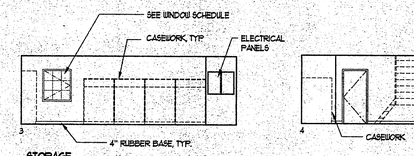

STORAGE
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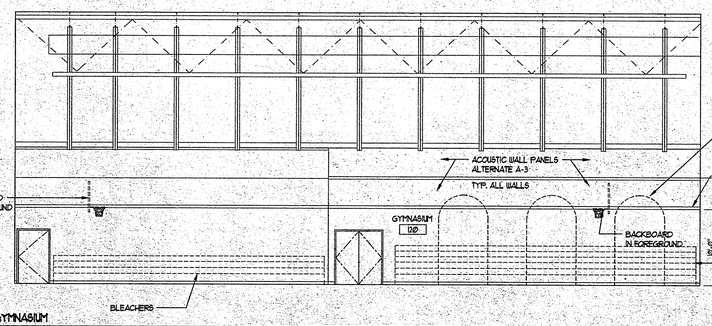

GYMNASIUM
120

ROOM 101 - CUSTODIAN/RECEIVING
ROOM 102 - DINING ROOM
ROOM 104 - DINING/MUSIC ROOM
ROOM 105 - BAND INSTRUMENT STORAGE
ROOM 101 - ENTRANCE HALL
ROOM 105 - CLASSROOM
ROOM 106 - CLASSROOM
ROOM 107 - CLASSROOM
ROOM 109 - CLASSROOM
ROOM 111 - CLASSROOM
ROOM 112 - CUSTODIAN
ROOM 113 - LIBRARY WORKROOM
ROOM 114 - LIBRARY
ROOM 102 - DINING ROOM
ROOM 111 - CLASSROOM
ROOM 115 - GYM STORAGE
ROOM 120 - GYMNASIUM

INTERIOR ELEVATIONS

SCALE: 1/8" = 1'-0"

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Mc DERMOTH ELEMENTARY MODERNIZATION & ADDITIONS

ABERDEEN SCHOOL DISTRICT NO. 5 ABERDEEN WASHINGTON

The BJSS GROUP
ARCHITECTS & PLANNERS, AIA
3201 WEST BAY DRIVE SUITE 212, OLYMPIA, WA. 98502 (360) 943-4650

REGISTERED ARCHITECT FRANK L. SMITH STATE OF WASHINGTON 1888

DATE: 9/23/97
REVISED:
COMM. NO. 361413

PHASE 3

A8.01

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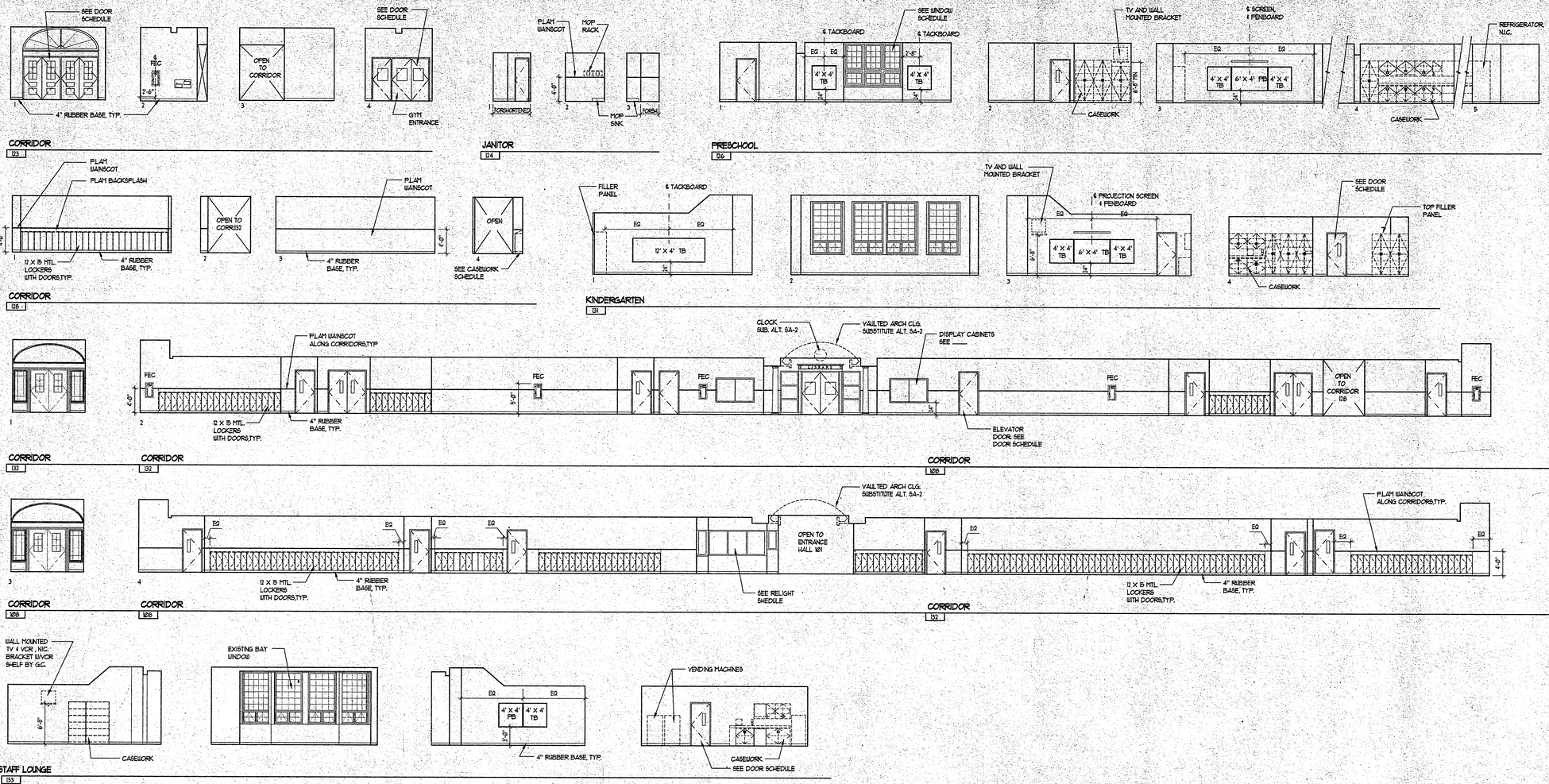

Mc DERMOTH ELEMENTARY
MODERNIZATION & ADDITIONS
ABERDEEN SCHOOL DISTRICT NO. 5 ABERDEEN WASHINGTON

REGISTERED ARCHITECT FRANK L. SMITH STATE OF WASHINGTON 1888

DATE: 9/23/97
REVISED
COMM. NO. 961413

The BJSS GROUP
ARCHITECTS & PLANNERS, AIA
320 WEST BAY DRIVE SUITE 212 OLYMPIA WA 98502 (360) 943-4650

PHASE 3

A8.02

INTERIOR ELEVATIONS
SCALE: 1/8" = 1' - 0"

ROOM 123 - CORRIDOR
ROOM 124 - JANITOR
ROOM 126 - PRESCHOOL
ROOM 128 - CORRIDOR
ROOM 129 - KINDERGARTEN
ROOM 132 - CORRIDOR
ROOM 108 - CORRIDOR
ROOM 133 - STAFF LOUNGE

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1.0 STRUCTURAL NOTES

ANY DISCREPANCY FOUND AMONG THE DRAWINGS, SPECIFICATIONS, THESE NOTES, AND THE SITE CONDITIONS SHALL BE REPORTED TO THE ARCHITECT, WHO SHALL CORRECT SUCH DISCREPANCY IN WRITING. ANY WORK DONE BY THE CONTRACTOR AFTER DISCOVERY OF SUCH DISCREPANCY SHALL BE DONE AT THE CONTRACTOR'S RISK. THE CONTRACTOR SHALL VERIFY AND COORDINATE THE DIMENSIONS AMONG ALL DRAWINGS PRIOR TO PROCEEDING WITH ANY WORK OR FABRICATION. THE CONTRACTOR IS RESPONSIBLE FOR ALL ERECTION BRACING, FORMWORK AND TEMPORARY CONSTRUCTION SHORING.

1.1 BIDDERS WARRANTY

BY THE ACT OF SUBMITTING A BID FOR THE PROPOSED CONTRACT, THE CONTRACTOR WARRANTS THAT:

1.1.1 THE CONTRACTOR AND ALL SUBCONTRACTORS HE INTENDS TO USE HAVE CAREFULLY AND THOROUGHLY REVIEWED THE DRAWINGS AND STRUCTURAL NOTES AND HAVE FOUND THEM COMPLETE AND FREE FROM AMBIGUITIES AND SUFFICIENT FOR THE PURPOSE INTENDED; FURTHER THAT,

1.1.2 THE CONTRACTOR HAS CAREFULLY EXAMINED THE SITE OF THE WORK AND THAT FROM HIS OWN INVESTIGATIONS, HE HAS SATISFIED HIMSELF AS TO THE NATURE AND LOCATION OF THE WORK, AS TO THE CHARACTER, QUALITY, QUANTITIES OF MATERIAL AND DIFFICULTIES TO BE ENCOUNTERED, AS TO THE EXTENT OF EQUIPMENT AND OTHER FACILITIES NEEDED FOR THE PERFORMANCE OF THE WORK AND AS TO THE GENERAL AND LOCAL CONDITIONS, AND OTHER ITEMS WHICH MAY IN ANY WAY AFFECT THE WORK OR ITS PERFORMANCE, FURTHER THAT,

1.1.3 THE CONTRACTOR AND ALL WORKMEN HE INTENDS TO USE ARE SKILLED AND EXPERIENCED IN THE TYPE OF CONSTRUCTION REPRESENTED BY THE DRAWINGS AND DOCUMENTS BID UPON; FURTHER THAT,

1.1.4 NEITHER THE CONTRACTOR NOR ANY OF HIS EMPLOYEES, AGENTS, INTENDED SUPPLIERS, OR SUBCONTRACTORS HAVE RELIED UPON ANY VERBAL REPRESENTATIONS ALLEGEDLY AUTHORIZED OR UNAUTHORIZED FROM THE OWNER OR HIS EMPLOYEES OR AGENTS, INCLUDING THE ARCHITECT OR ENGINEERS, IN ASSEMBLING THE BID FIGURES; FURTHER THAT,

1.1.5 THE CONTRACTOR AND ALL SUBCONTRACTORS HE INTENDS TO USE (INCLUDING AGENTS AND SUPPLIERS) ARE AWARE OF AND ACKNOWLEDGE THAT CLOSE COORDINATION AMONG ARCHITECTURAL, MECHANICAL/ELECTRICAL AND STRUCTURAL DRAWINGS ARE REQUIRED FOR THE FOLLOWING:

- DETERMINATION OF ALL COLUMN LOCATIONS AND SIZES.
- DETERMINATION OF TOP OF FLOOR, TOP OF STEEL, WALL PLATE, AND TOP OF BEAM ELEVATIONS.
- VERIFICATION OF ALL DIMENSIONS.

THE CONTRACTOR AND ALL SUB CONTRACTORS HE INTENDS TO USE (INCLUDING HIS AGENTS AND SUPPLIERS) SHALL MAKE CONSIDERATION FOR AND INCLUDE MONIES FOR THE ABOVE IN THE PREPARATION OF THEIR BIDS. THIS REQUIREMENT SHALL SUPERSEDE ANY CONTAINED IN THE AISC "MANUAL OF STEEL CONSTRUCTION;" FURTHER THAT,

1.1.6 NEITHER THE CONTRACTOR NOR ANY OF HIS EMPLOYEES, AGENTS, INTENDED SUPPLIERS, OR SUBCONTRACTORS HAVE SCALED THESE DRAWINGS TO OBTAIN REQUIRED DIMENSIONS; FURTHER THAT,

1.1.7 THE BID FIGURE IS BASED SOLELY UPON THE CONSTRUCTION CONTRACT DOCUMENTS AND PROPERLY ISSUED WRITTEN OR VERBAL REPRESENTATIONS.

1.2 CODES

1.2.1 ALL METHODS, MATERIALS AND WORKMANSHIP SHALL CONFORM TO THE 1994 UNIFORM BUILDING CODE (UBC) AS AMENDED AND ADOPTED BY THE LOCAL BUILDING AUTHORITY.

1.2.2 ALL REFERENCE TO OTHER CODES, STANDARDS AND SPECIFICATIONS, (ACI, ASTM, ETC.), SHALL BE FOR THE LATEST OR MOST CURRENT EDITION AVAILABLE.

1.3 DESIGN CRITERIA

1.3.1 UNIFORM LOADS:

LOCATION	LIVE LOAD	DEAD LOAD
ROOF	25 PSF	ACTUAL
CLASSROOM	40 PSF	ACTUAL
CORRIDOR & EXIT FACILITIES	100 PSF	ACTUAL
MECH ROOM	50 PSF	ACTUAL
LIBRARY	125 PSF	ACTUAL
GYMNASIUM AND ASSEMBLY AREA	100 PSF	ACTUAL

1.3.2 CONCENTRATED LOADS:

ALL MANUFACTURERS OF PRE-ENGINEERED COMPONENTS OR SYSTEMS SHALL LOCATE, COORDINATE, VERIFY WEIGHTS, ETC, OF MECHANICAL UNITS OR OTHER CONCENTRATED LOADS AND DESIGN THEIR SYSTEM FOR THESE LOADS.

1.3.3 LATERAL LOADS:

WIND: PER UBC SECTION 1613-1623

BASIC WIND SPEED: 100 MPH

EXPOSURE: B

IMPORTANCE FACTOR: 1.0

1.3.4 SEISMIC: PER UBC SECTION 1624-1633

ZONE: 3

IMPORTANCE FACTOR: 1.0

DUCTILITY FACTOR (Rw): 6

FOR PIPES, CONDUITS, DUCTS AND MECHANICAL EQUIPMENT SUPPORTED OR BRACED FROM STRUCTURE: CONFORM TO SHEET METAL AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION, INC., PUBLICATION "APPENDIX E: SEISMIC RESTRAINT MANUAL GUIDELINES FOR MECHANICAL SYSTEMS." ALL BRACING AND SUPPORTS SHALL BE DESIGNED FOR SEISMIC HAZARD LEVEL (SHL) B. SPRINKLER LINE ATTACHMENTS SHALL CONFORM TO NFPA PAMPHLET 13.

1.4 SOIL DATA

ALLOWABLE SOIL PRESSURE 1000 PSF FOR RETAINING WALLS. ALLOWABLE CAPACITY FOR 18-INCH DIAMETER AUGER CAST PILE OF 55 TONS. SEE GEOTECHNICAL ENGINEERING REPORT BY GILES ENGINEERING ASSOCIATES, INC.

1.5 INSPECTION/TESTING REQUIREMENTS

SEE DRAWINGS, SPECIFICATIONS AND UBC SECTIONS 108 AND 1701, AND AS OUTLINED BELOW.

1.5.1 FOUNDATION INSPECTION BY BUILDING OFFICIAL TO BE MADE AFTER EXCAVATIONS ARE COMPLETE AND FORMWORK AND REINFORCEMENT ARE IN PLACE.

1.5.2 CONCRETE SLAB OR UNDER FLOOR INSPECTION BY BUILDING OFFICIAL TO BE MADE AFTER ALL UNDER SLAB ACCESSORIES (INCLUDING REINFORCEMENT) ARE PLACED AND PRIOR TO CONCRETE SLAB POUR.

1.5.3 FRAME INSPECTIONS BY BUILDING OFFICIAL TO BE MADE AFTER ALL FRAMING IS COMPLETE AND ALL PIPES, DUCTS, ELECTRICAL, PLUMBING, ETC. ARE INSTALLED AND PRIOR TO COVER.

1.5.4 THE FOLLOWING ITEMS SHALL BE TESTED AND VERIFIED BY A TESTING AGENCY EMPLOYED BY THE BUILDING OWNER IN ACCORDANCE WITH THE UNIFORM BUILDING CODE.

1.5.4.1 CONCRETE STRENGTHS

1.5.4.2 ALL STRUCTURAL WELDING

1.5.4.3 REINFORCING PLACEMENT

1.5.4.4 AUGER CAST PILE DEPTH

1.5.4.5 CONCRETE MASONRY CONSTRUCTION WHERE INDICATED ON DRAWINGS.

1.5.4.6 SHOTCRETE CONSTRUCTION PER SECTION 3.11.11.

1.6 SHOP DRAWINGS

SUBMIT SHOP DRAWINGS TO ARCHITECT/ENGINEER FOR THE FOLLOWING:

1.6.1 REINFORCING STEEL
1.6.2 STRUCTURAL AND MISCELLANEOUS STEEL INCLUDING WELD INSERTS AND ANCHORS
1.6.3 GLUED-LAMINATED MEMBERS
1.6.4 PRE-ENGINEERED WOOD/STEEL TRUSSES
1.6.5 PRE-ENGINEERED WOOD I JOISTS

1.7 MISCELLANEOUS

1.7.1 VERIFY ALL DIMENSIONS AND CONDITIONS IN THE FIELD.

1.7.2 VERIFY SIZE AND LOCATION OF ALL OPENINGS IN THE FLOORS, ROOF AND WALLS WITH ARCHITECTURAL, MECHANICAL AND ELECTRICAL DRAWINGS.

1.7.3 CONSTRUCTION DETAILS NOT SPECIFICALLY SHOWN ON THE DRAWINGS SHALL FOLLOW SIMILAR DETAILS OF SECTIONS OF THIS PROJECT AS APPROVED BY THE ARCHITECT/ENGINEER.

1.7.4 SEE ARCHITECTURAL, MECHANICAL AND ELECTRICAL DRAWINGS FOR DIMENSIONS AND LOCATIONS OF OPENINGS NOT DIMENSIONED OR SHOWN ON STRUCTURAL PLANS.

1.7.5 THE STRUCTURE HAS BEEN DESIGNED TO RESIST CODE REQUIRED VERTICAL AND LATERAL FORCES AFTER THE CONSTRUCTION OF ALL STRUCTURAL ELEMENTS HAS BEEN COMPLETED. STABILITY OF THE STRUCTURE PRIOR TO COMPLETION IS THE SOLE RESPONSIBILITY OF THE GENERAL CONTRACTOR. THIS RESPONSIBILITY INCLUDES BUT IS NOT LIMITED TO JOB SITE SAFETY; ERECTION MEANS, METHODS, AND SEQUENCES; TEMPORARY SHORING, FORMWORK, AND BRACING; USE OF EQUIPMENT AND CONSTRUCTION PROCEDURES.

2.0 SITE WORK

2.1 EXCAVATION

INSTALL AUGER CAST PILES PER SPECIFICATIONS. EXCAVATE TO DEPTH SHOWN AND TO FIRM UNDISTURBED MATERIAL. OVER-EXCAVATIONS SHALL BE BACKFILLED WITH LEAN CONCRETE (f'_c=2,000 PSI) AT THE CONTRACTOR'S EXPENSE. EXERCISE EXTREME CARE DURING EXCAVATION TO AVOID DAMAGE TO BURIED LINES, TANKS, AND OTHER CONCEALED ITEMS. UPON DISCOVERY, DO NOT PROCEED WITH WORK UNTIL RECEIVING WRITTEN INSTRUCTIONS FROM ARCHITECT. A COMPETENT REPRESENTATIVE OF THE OWNER SHALL INSPECT ALL FOOTING EXCAVATIONS FOR SUITABILITY OF BEARING SURFACES PRIOR TO PLACEMENT OF REINFORCING STEEL. PROVIDE DRAINAGE AS NECESSARY TO AVOID WATER-SOFTENED SUBGRADE.

2.2 FILL, BACKFILL AND COMPACTION

BACKFILL AGAINST WALLS SHALL NOT BE PLACED UNTIL AFTER THE REMOVAL OF ALL MATERIAL SUBJECT TO ROT OR CORROSION. ALL FILL PLACED AGAINST RETAINING WALLS OR BASEMENT WALLS SHALL BE FREE DRAINING GRANULAR MATERIAL. STRUCTURAL FILL OTHER THAN PEA GRAVEL SHALL BE GRANULAR, PLACED IN 8 INCH LIFTS (LOOSE THICKNESS) AND COMPACTED TO AT LEAST 95% OF ITS MAXIMUM DRY DENSITY AS DETERMINED BY ASTM D-1557 (MOD PROCTOR) AND ASTM D-698 (STANDARD PROCTOR). PEA GRAVEL FILL SHALL HAVE A MAXIMUM PARTICLE SIZE OF 3/8" DIAMETER.

3.0 STRUCTURAL CONCRETE

3.1 GENERAL

ALL CONCRETE SHALL BE HARD ROCK CONCRETE MEETING REQUIREMENTS OF ACI-301, "SPECIFICATIONS FOR STRUCTURAL CONCRETE FOR BUILDINGS." PROPORTIONING OF INGREDIENTS FOR EACH CONCRETE MIX SHALL BE BY METHOD 2 OR THE ALTERNATE PROCEDURE GIVEN IN ACI-301. PLACE CONCRETE PER ACI-304 AND CONFORM TO ACI-604 (305) FOR WINTER CONCRETING AND ACI-605 (305) FOR HOT WEATHER CONCRETING. USE INTERIOR MECHANICAL VIBRATORS WITH 7,000 RPM MINIMUM FREQUENCY. DO NOT OVER-VIBRATE. CONCRETE SHALL BE PLACED MONOLITHICALLY BETWEEN CONSTRUCTION OR CONTROL JOINTS. PROTECT ALL CONCRETE FROM PREMATURE DRYING, EXCESSIVE HOT OR COLD TEMPERATURE FOR SEVEN DAYS AFTER PLACING.

3.2 STRENGTH

TWENTY-EIGHT DAY COMPRESSIVE STRENGTHS SHALL BE:

	PSI
SLABS	4000
BEAMS, COLUMNS, VERTICALLY FORMED WALLS	4000
FOOTINGS & GRADE BEAMS	4000
STRUCTURAL TOPPING SLABS	4000
AUGER CAST PILES	4000

THE WATER/CEMENT RATIO FOR CONCRETE SHALL BE LESS THAN THE MAXIMUM SHOWN IN THE TABLE BELOW.

MAXIMUM ABSOLUTE WATER-CEMENT RATIO BY WEIGHT

SPECIFIED COMPRESSIVE STRENGTH PSI	NON-AIR ENTRAINED CONCRETE	AIR-ENTRAINED CONCRETE
4000	0.44	0.35

THESE MAXIMUMS MAY BE EXCEEDED IF TEST RECORDS PER SECTION 5.3 OF ACI 318 (BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE) ARE SUBMITTED TO AND APPROVED BY THE ENGINEER.

3.3 MATERIALS

3.3.1 CEMENT: ASTM C150, TYPE I OR TYPE II. ENGINEER'S APPROVAL IS NEEDED FOR USE OF TYPE III CEMENT.

3.3.2 COARSE AND FINE AGGREGATE: ASTM C33.

3.3.3 WATER SHALL BE CLEAN AND POTABLE.

3.4 WATER REDUCING ADMIXTURES

3.4.1 WATER REDUCING ADMIXTURE: ASTM C494. ADMIXTURES SHALL BE USED IN EXACT ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.

3.4.2 SYNERGIZED PERFORMANCE SYSTEMS: CONCRETE USING ADMIXTURES TO PRODUCE FLOWABLE CONCRETE MAY BE USED SUBJECT TO ENGINEER'S APPROVAL.

3.4.3 AIR ENTRAINMENT: ASTM C260 AND ASTM C494, ENTRAIN 4% PLUS/MINUS 1% BY VOLUME IN ALL EXPOSED CONCRETE.

3.4.4 NO OTHER ADMIXTURES PERMITTED UNLESS APPROVED BY THE ENGINEER.

3.5 FORMWORK AND SHORING

3.5.1 FOLLOW RECOMMENDED PRACTICE FOR CONCRETE FORMWORK (ACI-347).

3.5.2 RESHORING FOR EARLY REMOVAL OF ORIGINAL SUPPORTS WILL NOT BE PERMITTED.

3.5.3 ALL SHORING SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR. FORMWORK SUPPORTS AND SHORING SHALL BE DESIGNED TO PROVIDE FINISHED CONCRETE SURFACES AT ALL FACES LEVEL, PLUMB, AND TRUE TO THE DIMENSIONS AND ELEVATIONS SHOWN. TOLERANCES AND VARIATIONS SHALL BE AS SPECIFIED.

3.6 REINFORCING STEEL

DETAIL, FABRICATE, AND PLACE PER ACI-315 AND ACI-318. SUPPORT REINFORCEMENT WITH APPROVED CHAIRS, SPACERS, OR TIES.

3.6.1 DEFORMED BAR REINFORCEMENT: ASTM A-615-GR 60

3.6.2 WELDED DEFORMED BAR REINFORCEMENT: ASTM A706 GR 60

3.6.3 WELDED WIRE FABRIC: ASTM A-185 & ASTM A-82 Fy=65 KSI

3.6.4 DEFORMED BAR ANCHORS: ASTM A-496

3.6.5 ALL REINFORCING SHALL BE LAP-SPLICED A MINIMUM LAP OF 48 X (THE BAR DIAMETER) EXCEPT AS NOTED SPECIFICALLY ON THE STRUCTURAL DRAWINGS. NO MORE THAN 50% OF HORIZONTAL OR VERTICAL BARS SHALL BE SPLICED AT ONE LOCATION.

3.6.6 PROVIDE ELBOW BARS TO LAP HORIZONTAL STEEL (A MINIMUM DISTANCE OF 48X THE BAR DIAMETER) AT CORNERS AND INTERSECTIONS IN FOOTINGS AND WALLS.

3.6.7 LAP WELDED FABRIC 12" OR ONE SPACING PLUS 2", WHICHEVER IS MORE.

3.7 CONCRETE COVER ON REINFORCING (UNLESS SHOWN OTHERWISE)

3.7.1 BOTTOM OF FOOTINGS	3"
3.7.2 FORMED EARTH FACE AND SLAB ON GRADE	2"
3.7.3 WALLS, WEATHER FACE	1-1/2"
3.7.4 COLUMNS AND BEAMS TO STIRRUPS	1-1/2"
3.7.5 WALLS, INSIDE FACE	1"

3.8 CONSTRUCTION JOINTS

3.8.1 CONSTRUCTION JOINT SPACING IN WALLS SHALL NOT EXCEED 50' ON CENTER EXCEPT AS DIRECTED BY THE ENGINEER.

3.8.2 HORIZONTAL CONSTRUCTION JOINTS IN BEAMS AND GIRDERS ARE NOT PERMITTED EXCEPT WHERE INDICATED. VERTICAL CONSTRUCTION JOINTS IN BEAMS AND SLABS SHALL BE LOCATED BETWEEN THE MIDPOINT AND THE THIRD POINT OF THE SPAN. UNLESS NOTED OTHERWISE, LOCATION OF THE CONSTRUCTION OR CONTROL JOINTS IN SLAB ON GRADE SHALL BE ON COLUMN GRIDS OR UNDER PERMANENT PARTITIONS AND SHALL NOT EXCEED 16'-0" C/C EACH WAY.

3.8.3 NO JOISTS, BEAMS OR GIRDERS SHALL BE SLEEVED FOR PIPING OR CONDUIT EXCEPT AS NOTED ON THE STRUCTURAL DRAWINGS OR AS APPROVED BY THE ARCHITECT/ENGINEER.

3.8.4 ELECTRICAL CONDUIT SHALL NOT BE PLACED WITHIN A SLAB ON GRADE, BUT PLACED BELOW THE SLAB IN THE SUB-BASE.

3.8.5 PROVIDE CONTROL JOINTS IN EXPOSED HOLLOW CORE TOPPING AT EACH END OF EACH HOLLOW CORE PLANK. PROVIDE ADDITIONAL JOINTS PARALLEL TO PLANKS AT 16' O.C. MAXIMUM.

3.9 GROUT FOR BEARING PLATE

GROUT FOR BEARING PLATES AND EQUIPMENT UP TO 25 HP:

THE GROUT SHALL BE MASTERFLOW 928 BY MASTER BUILDERS TECHNOLOGIES, OR EQUIVALENT, AND A PREPACKAGED NATURAL AGGREGATE GROUT, MIXED, PLACED, AND CURED AS RECOMMENDED BY THE MANUFACTURER. THE MANUFACTURER'S WARRANTY SHALL NOT CONTAIN A DISCLAIMER OR LIMIT THE RESPONSIBILITY TO ONLY REPLACEMENT OF PRODUCT OR PURCHASE PRICE. GROUT SHALL CONFORM TO CRD-C621-89 AND ASTM 1107-89A GRADE B WHEN TESTED AT A FLUID CONSISTENCY (20 TO 30 SECONDS) PER CRD-C611-85 FOR 30 MINUTES, AT 45° F, 70° F AND 90° F. GROUT MANUFACTURER SHALL CERTIFY WITH INDEPENDENT TEST DATA THAT THE EXPANSION AT 3 OR 14 DAYS DOES NOT EXCEED THE 28 DAY EXPANSION AND THAT ITS NON SHRINK PROPERTY IS NOT BASED ON GAS EXPANSION. FLUID GROUT SHALL PASS THROUGH THE FLOW CONE 1 HOUR AFTER BATCHING AT A 60 SECOND FLOW MAXIMUM, AND HAVE A MINIMUM STRENGTH OF 2,500 PSI AT 1 DAY, 4,500 PSI AT 3 DAYS AND 7,000 PSI AT 28 DAYS. THE CONTRACTOR SHALL PAY AN INDEPENDENT TESTING LABORATORY TO RUN A 24 HOUR EVALUATION OF ANY GROUT SUBMITTED FOR APPROVAL. THE CONTRACTOR SHALL RECEIVE APPROVAL FROM THE ENGINEER BEFORE USING THE GROUT.

3.10 PRECAST, PREMANUFACTURED HOLLOW CORE PLANKS

SHALL BE MANUFACTURED BY CONCRETE TECHNOLOGY CORPORATION, TACOMA, WASHINGTON OR APPROVED EQUIVALENT. SPECIFICATIONS FOR HOLLOW CORE PRECAST, PRESTRESSED UNITS AS GIVEN BY CONCRETE TECHNOLOGY CORPORATION SHALL BECOME PART OF THESE NOTES. THE SPECIFICATIONS NOTED INCLUDE NOTES CONCERNING TYPE OF UNITS, MATERIAL, FABRICATION PROCEDURES AND RECOMMENDED ERECTION AND INSTALLATION PROCEDURES. MANUFACTURER SHALL DESIGN THE UNITS TO SAFELY CARRY THE LOADS LISTED IN THE DESIGN CRITERIA AND ANY ADDITIONAL LOADS INDICATED ON THE FRAMING PLANS. MANUFACTURER SHALL PROVIDE SHOP DRAWINGS BEARING THE STAMP OF A STRUCTURAL ENGINEER LICENSED IN THE STATE OF THE PROJECT. GROUT FOR EDGE JOINT BETWEEN PANELS SHALL BE ONE PART CEMENT TO 2-1/2 PARTS SAND WITH 3" TO 5" SLUMP. ADD 1# OF INTERPLAST "N" PER 94# SACK OF CEMENT.

3.11 SHOTCRETE

3.11.1 GENERAL. SHOTCRETE SHALL BE DEFINED AS MORTAR OR CONCRETE PNEUMATICALLY PROJECTED AT HIGH VELOCITY ONTO A SURFACE, EXCEPT AS SPECIFIED IN THIS SECTION, SHOTCRETE SHALL CONFORM TO THE REGULATIONS OF THIS CHAPTER FOR PLAIN CONCRETE OR REINFORCED CONCRETE.

3.11.2 PROPORTIONS AND MATERIALS. SHOTCRETE PROPORTIONS SHALL BE SELECTED THAT ALLOW SUITABLE PLACEMENT PROCEDURES USING THE DELIVERY EQUIPMENT SELECTED AND SHALL RESULT IN FINISHED IN-PLACE HARDENED SHOTCRETE MEETING THE STRENGTH REQUIREMENTS OF THIS CODE.

3.11.3 AGGREGATE. COARSE AGGREGATE, IF USED, SHALL NOT EXCEED 3/4 INCH (19 MM).

3.11.4 REINFORCEMENT. LAP SPLICES IN REINFORCING BARS SHALL BE BY THE NON-CONTACT LAP SPLICE METHOD WITH AT LEAST 2 INCHES (51 MM) CLEARANCE BETWEEN BARS. THE BUILDING OFFICIAL MAY PERMIT THE USE OF CONTACT LAP SPLICES WHEN NECESSARY FOR THE SUPPORT OF THE REINFORCING PROVIDED IT CAN BE DEMONSTRATED BY MEANS OF PRE-CONSTRUCTION TESTING, THAT ADEQUATE ENCASEMENT OF THE BARS AT THE SPLICE CAN BE ACHIEVED, AND PROVIDED THAT THE SPLICES ARE PLACED SO THAT A LINE THROUGH THE CENTER OF THE TWO SPLICED BARS IS PERPENDICULAR TO THE SURFACE OF THE SHOTCRETE WORK.

3.11.5 PRE-CONSTRUCTION TESTS. WHEN REQUIRED BY THE BUILDING OFFICIAL A TEST PANEL SHALL BE SHOT, CURED, CORED OR SAWN, EXAMINED AND TESTED PRIOR TO COMMENCEMENT OF THE PROJECT. THE SAMPLE PANEL SHALL BE REPRESENTATIVE OF THE PROJECT AND SIMULATE JOB CONDITIONS AS CLOSELY AS POSSIBLE. THE PANEL THICKNESS AND REINFORCING SHALL REPRODUCE THE THICKEST AND MOST CONGESTED AREA SPECIFIED IN THE STRUCTURAL DESIGN. IT SHALL BE SHOT AT THE SAME ANGLE, USING THE SAME NOZZLEMAN AND WITH THE SAME CONCRETE MIX DESIGN THAT WILL BE USED ON THE PROJECT.

3.11.6 REBOUND. ANY REBOUND OR ACCUMULATED LOOSE AGGREGATE SHALL BE REMOVED FROM THE SURFACES TO BE COVERED PRIOR TO PLACING THE INITIAL OR ANY SUCCEEDING LAYERS OF SHOTCRETE. REBOUND SHALL NOT BE RE-USED AS AGGREGATE.

3.11.7 JOINTS. EXCEPT WHERE PERMITTED HEREIN, UNFINISHED WORK SHALL NOT BE ALLOWED TO STAND FOR MORE THAN 30 MINUTES UNLESS ALL EDGES ARE SLOPED TO A THIN EDGE. BEFORE PLACING ADDITIONAL MATERIAL ADJACENT TO PREVIOUSLY APPLIED WORK, SLOPING AND SQUARE EDGES SHALL BE CLEANED AND WETTED.

3.11.8 DAMAGE. IN-PLACE SHOTCRETE WHICH EXHIBITS SAGS OR SLOUGHS, SEGREGATION, HONEYCOMBING, SAND POCKETS OR OTHER OBVIOUS DEFECTS SHALL BE REMOVED AND REPLACED. SHOTCRETE ABOVE SAGS AND SLOUGHS SHALL BE REMOVED AND REPLACED WHILE STILL PLASTIC.

3.11.9 CURING. DURING THE CURING PERIODS SPECIFIED HEREIN, SHOTCRETE SHALL BE MANTAINED ABOVE 40 DEGREES F (4.4 DEGREES C) AND IN MOIST CONDITION. IN INITIAL CURING, SHOTCRETE SHALL BE KEPT CONTINUOUSLY MOIST FOR 24 HOURS AFTER PLACEMENT IS COMPLETE. FINAL CURING SHALL CONTINUE FOR SEVEN DAYS AFTER SHOTCRETING, FOR THREE DAYS IF HIGH-EARLY-STRENGTH CEMENT IS USED, OR UNTIL THE SPECIFIED STRENGTH IS OBTAINED. FINAL CURING SHALL CONSIST OF A FOG SPRAY OR AN APPROVED MOISTURE-RETAINING COVER OR MEMBRANE. IN SECTIONS OF A DEPTH IN EXCESS OF 12 INCHES (305 MM), FINAL CURING SHALL BE THE SAME AS THAT FOR INITIAL CURING.

3.11.10 STRENGTH TEST. STRENGTH TEST FOR SHOTCRETE SHALL BE MADE BY AN APPROVED AGENCY ON SPECIMENS WHICH ARE REPRESENTATIVE OF WORK AND WHICH HAVE BEEN WATER SOAKED FOR AT LEAST 24 HOURS PRIOR TO TESTING. WHEN THE MAXIMUM SIZE AGGREGATE IS LARGER THAN 3/8 INCH (9.5 MM), SPECIMENS SHALL CONSIST OF NOT LESS THAN THREE 3-INCH-DIAMETER (76 MM) CORES OR 3-INCH (76 MM) CUBES. WHEN THE MAXIMUM SIZE AGGREGATE IS 3/8 INCH (9.5 MM) OR SMALLER, SPECIMENS SHALL CONSIST OF NOT LESS THAN THREE 2-INCH-DIAMETER (51 MM) CORES OF 2-INCH (51 MM) CUBES. SPECIMENS SHALL BE TAKEN IN ACCORDANCE WITH ONE OF THE FOLLOWING:

3.11.10.1 FROM THE IN-PLACE WORK: TAKEN AT LEAST ONCE EACH SHIFT OR LESS THAN ONE FOR EACH 50 CUBIC YARDS (38.2 m3) OF SHOTCRETE; OR

3.11.10.2 FROM TEST PANELS: MADE NOT LESS THAN ONCE EACH SHIFT OR NOT LESS THAN ONE FOR EACH 50 CUBIC YARDS (38.2 m3) OF SHOTCRETE PLACED. WHEN THE MAXIMUM SIZE AGGREGATE IS LARGER THAN 3/8 INCH (9.5 MM), THE TEST PANELS SHALL HAVE A MINIMUM DIMENSION OF 18 INCHES BY 18 INCHES (457 MM BY 457 MM). WHEN THE MAXIMUM SIZE AGGREGATE IS 3/8 INCH OR SMALLER, THE TEST PANELS SHALL HAVE A MINIMUM DIMENSION OF 12 INCHES BY 12 INCHES (305 MM BY 305 MM). PANELS SHALL BE GUNNED IN THE SAME POSITION AS THE WORK, DURING THE COURSE OF THE WORK AND BY NOZZLEMEN DOING THE WORK. THE CONDITION UNDER WHICH THE PANELS ARE CURED SHALL BE THE SAME AS THE WORK.

THE AVERAGE OF THREE CORES FROM A SINGLE PANEL SHALL BE EQUAL TO OR EXCEED 0.85 f'_c WITH NO SINGLE CORE LESS THAN 0.75 f'_c. THE AVERAGE OF THREE CUBES TAKEN FROM A SINGLE PANEL MUST EQUAL OR EXCEED f'_c WITH NO INDIVIDUAL CUBE LESS THAN 0.88 f'_c. TO CHECK TESTING ACCURACY, LOCATIONS REPRESENTED BY ERRATIC CORE STRENGTHS MAY BE RE-TESTED.

3.11.11 INSPECTIONS

3.11.11.1 DURING PLACEMENT. WHEN SHOTCRETE IS USED FOR STRUCTURAL MEMBERS, A SPECIAL INSPECTOR IS REQUIRED BY UBC SECTION 1701.5, ITEM 12. THE SPECIAL INSPECTOR SHALL PROVIDE CONTINUOUS INSPECTION OF THE PLACEMENT OF THE REINFORCEMENT AND SHOTCRETING AND SHALL SUBMIT A STATEMENT INDICATING COMPLIANCE WITH THE PLANS AND SPECIFICATIONS.

3.11.11.2 VISUAL EXAMINATION FOR STRUCTURAL SOUNDNESS OF IN-PLACE SHOTCRETE. COMPLETED SHOTCRETE WORK SHALL BE CHECKED VISUALLY FOR REINFORCING BAR EMBEDMENT, VOIDS, ROCK POCKETS, SAND STREAKS AND SIMILAR DEFICIENCIES BY EXAMINING A MINIMUM OF THREE, 3-INCH (76 MM) CORES TAKEN FROM THREE AREAS CHOSEN BY THE DESIGN ENGINEER WHICH REPRESENT THE WORST CONGESTION OF REINFORCING BARS OCCURRING IN THE PROJECT. EXTRA REINFORCING BARS MAY BE ADDED TO NON-CONGESTED AREAS AND CORES MAY BE TAKEN FROM THESE AREAS. THE CORES SHALL BE EXAMINED BY THE SPECIAL INSPECTOR AND A REPORT SUBMITTED TO THE BUILDING OFFICIAL PRIOR TO FINAL APPROVAL OF THE SHOTCRETE.

3.11.11.3 EQUIPMENT. THE EQUIPMENT USED IN PRE-CONSTRUCTION TESTING SHALL BE THE SAME EQUIPMENT USED IN THE WORK REQUIRING SUCH TESTING, UNLESS SUBSTITUTE EQUIPMENT IS APPROVED BY THE BUILDING OFFICIAL.

4.0 MASONRY

4.1 MORTAR AND GROUT

MORTAR: ASTM C-270, TYPE S, f'_c - 1800 PSI AT 28 DAYS

GROUT: ASTM C-476 f'_c - 2500 PSI AT 28 DAYS
5-1/2 SACK MIX, MINIMUM, 3/8" SIZE AGGREGATE
SLUMP 5" - 8"

4.2 REINFORCEMENT - SEE 3.6.1.

4.3 CONCRETE MASONRY UNITS (CMU)

CONFORM TO ASTM C-90, MINIMUM FACE SHELL THICKNESS OF 1-1/4" GRADE N-1. MINIMUM COMPRESSIVE STRENGTH OF MASONRY (f'_m) SHALL BE 1500 PSI.

4.4 INSTALLATION OF HOLLOW UNIT MASONRY

PER THE UBC SECTION 2104 FOR REINFORCED HOLLOW UNIT MASONRY.

4.5 SPECIAL INSPECTION

SPECIAL INSPECTION SHALL ONLY BE REQUIRED IN AREAS DESIGNATED ON THE DRAWINGS OR AS REQUIRED BY UBC SECTION 1701.

4.6 BRICK VENEER (MASONRY OR STONE UNITS)

4.6.1 MATERIALS: SEE ARCHITECTURAL.

4.6.2 INSTALLATION: INSTALL PER UBC SECTION 3006. ANCHOR TIES FOR ANCHORED MASONRY AND STONE UNITS (5 INCHES MAXIMUM IN THICKNESS AND 2-1/2 INCHES MINIMUM IN THICKNESS) SHALL BE AS FOLLOWS:

FOR ANCHORAGE TO WOOD OR STEEL STUDS, USE DUR-O-WALL D/A 2135 OR EQUIVALENT. FOR ANCHORAGE TO EXISTING CONCRETE OR MASONRY, USE DUR-O-WALL D/A 5213/S OR EQUIVALENT. FOR ANCHORAGE TO NEW CONCRETE, USE DUR-O-WALL D/A 131 DOVETAIL ANCHORS IN DOVETAIL SLOTS OR EQUIVALENT. FOR ANCHORAGE TO NEW CMU, USE DUR-O-WALL D/A 370S SEISMIC DUR-O-EYE OR EQUIVALENT.

TIES SHALL BE SPACED SO AS TO SUPPORT NO MORE THAN TWO SQUARE FEET OF WALL BUT NOT MORE THAN 24" O.C. HORIZONTAL OR 18" O.C. VERTICALLY. ANCHORS (OR WIRE) SHALL BE HOOKED AROUND THE HORIZONTAL JOINT REINFORCEMENT WHICH CONSISTS OF NO. 9 GAGE WIRE OR EQUIVALENT. THE JOINT REINFORCEMENT SHALL BE CONTINUOUS WITH BUTT SPLICES BETWEEN TIES PERMITTED.

ATTACHMENT TO WOOD STUD SHALL BE BY TWO GALVANIZED #10 X 1 1/2-INCH WOOD SCREWS PER TIE. STUD SPACING SHALL NOT EXCEED 16 INCHES ON CENTER. ATTACHMENT TO METAL STUDS SHALL BE BY TWO NUMBER 10 TYPE S PANHEAD SELF-DRILLING, SELF-TAPPING GALVANIZED OR CADMIUM PLATED METAL SCREWS. LENGTH SHALL BE SUCH THAT THE SCREW PENETRATES 1/2 INCH PAST THE FACE OF THE METAL STUD. METAL STUDS SHALL BE A MINIMUM OF 16 GAUGE. ATTACHMENT TO MASONRY OR STONE UNITS SHALL BE BY EMBEDMENT IN MORTAR.

ATTACHMENT TO EXISTING CONCRETE SHALL BE WITH 1/4-INCH-DIAMETER HILTI KWIK BOLT II EXPANSION BOLTS EMBEDDED 2-INCH MINIMUM. ATTACHMENT SHALL BE MADE IN MANNER SUCH THAT DAMAGE TO EXISTING CONCRETE IS PREVENTED.

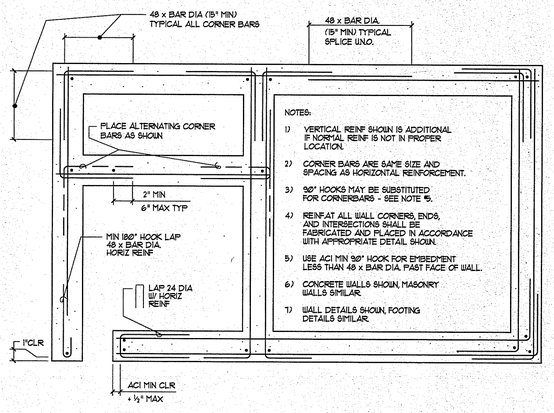
ATTACH TO EXISTING MASONRY IN THE SAME MANNER EXCEPT EXPANSION BOLTS SHALL BE EMBEDDED 3" MINIMUM.

5.0 METALS

5.1 WELDING

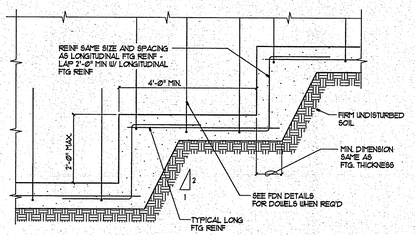
5.1.1 ALL WELDING SHALL BE IN ACCORDANCE WITH THE "STRUCTURAL WELDING CODE," ANSI/AWS D1.1.

5.1.2 ALL WELDING



TYPICAL REINFORCEMENT PLACING DETAIL — 1

NO SCALE



TYPICAL STEPPED FOOTING — 2

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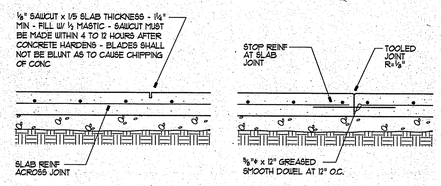

SECTION — 3

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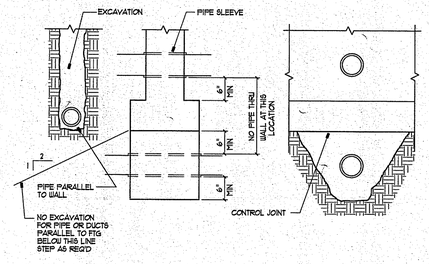
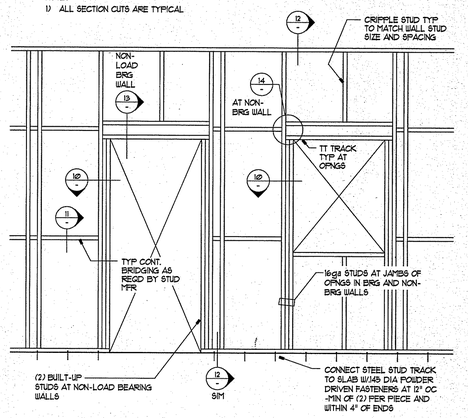


TYP DETAIL OF PIPE AT CONCRETE GRADE BM — 4

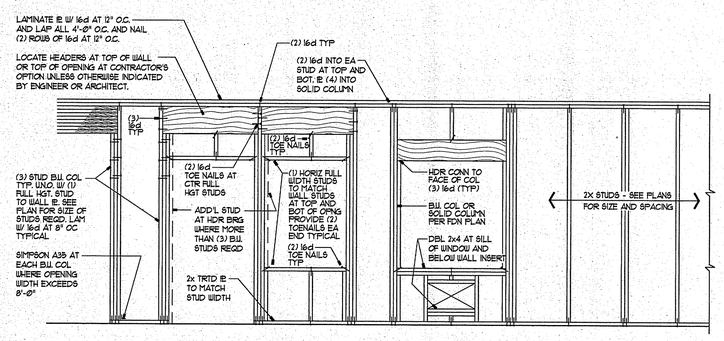
NO SCALE

NOTES:
1) ALL SECTION CUTS ARE TYPICAL



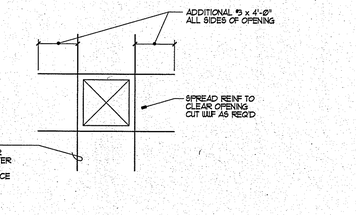
FRAMING ELEVATION — 5

NO SCALE



TYP. BEARING WALL ELEV. — 6

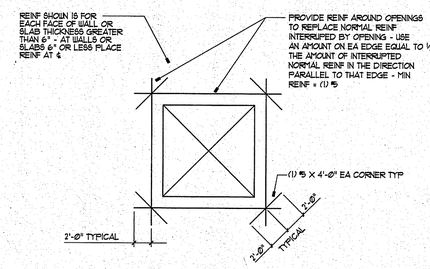
NO SCALE



TYPICAL AT OPENINGS LESS THAN 12" IN CONC. WALL OR SLAB

DETAIL — 7

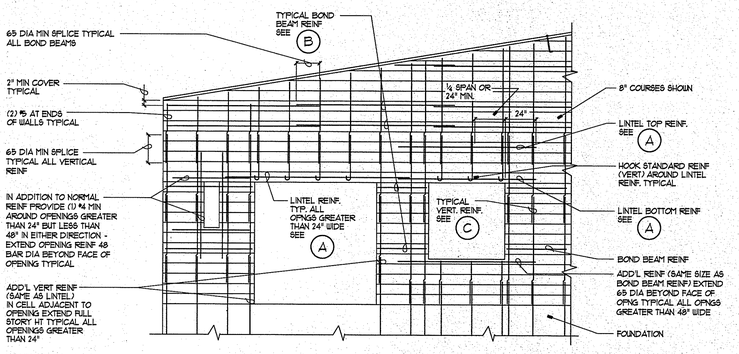
NO SCALE

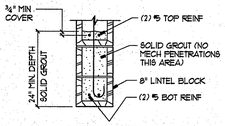


TYPICAL AT OPENINGS GREATER THAN 12" IN CONC WALL OR SLAB

DETAIL — 8

NO SCALE

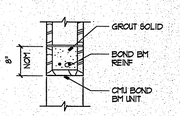




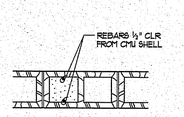
TYPICAL LINTEL DETAIL — A

FOR LINTELS OVER 48" DEEP - PROVIDE (2) ADD'L 15 AT 24" O.C. HORIZ

TOP REINF MAY BE OMITTED IF BOND BM REINF IS LESS THAN 12" ABOVE LINTEL BOTTOM REINF



TYPICAL BOND BEAM — B

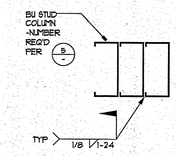


TYP PLACEMENT OF VERT REINF WHEN (2) BARS REQ'D — C

NOTES:
1. TYPICAL REINFORCEMENT SHOWN. USE MORE IF REQUIRED BY SPECIAL DETAIL
2. FOR CORNER BAR USE 30" 15@12" SAME SIZE AND SPACING AS TYP HORIZ REINF
3. HOOK ALL REINF THAT CANNOT BE EXTENDED
4. GROUT ALL CELLS CONTAINING REINF ANCHOR BOLTS OR OTHER EMBEDDED ITEMS

TYPICAL MASONRY WALL ELEVATION — 9

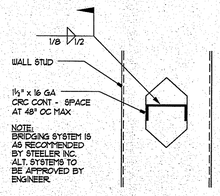
NO SCALE



TYP JAMB AT OPNGS

SECTION — 10

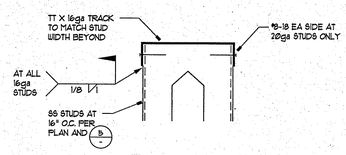
NO SCALE



TYP WALL BRIDGING

SECTION — 11

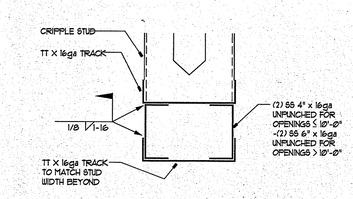
NO SCALE



TOP OF WALL SHOWN, BOTTOM SIM

SECTION — 12

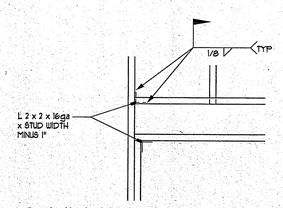
NO SCALE



TYPICAL NON-LOAD BEARING HEADER

SECTION — 13

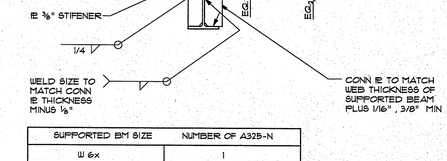
NO SCALE



TYPICAL NON-LOAD BEARING HEADER

ELEVATION — 14

NO SCALE



SUPPORTED BM SIZE	NUMBER OF A325-N
W 6x	1
W 8x	2
W 12x	3
W 14x	3
W 16x	4
W 18x	5
W 21x	6
W 24x	7

NOTE: A325-N BOLTS DO NOT REQUIRE PRETENSION AND MAY BE USED WITH THREADS INCLUDED IN THE SHEAR PLANE

SECTION — 15

NO SCALE

Mc DERMOTH ELEMENTARY
ABERDEEN, WASHINGTON

REGISTERED ARCHITECT
STATE OF WASHINGTON

DATE	REVISED	COMM. NO.
23 SEPT 97		960409

The BJSS GROUP
ARCHITECTS & PLANNERS, AIA
320 WEST BAY DRIVE SUITE 212 OLYMPIA WA 98502 (360) 943-4650

STANDARD DETAILS

S1.02

GEOFFREY HODGSON — STATE OF WASHINGTON — 1206 — REGISTERED PROFESSIONAL ENGINEER

EXPIRES 4/6/99

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FILENAME T:\JOBS\9638DW\9638DW02.DWG
CREATED SEP 25 1996 11:21:58
UPDATED SEP 13 1997 08:35:15
PLOTTED SEP 23 1997 04:30:22

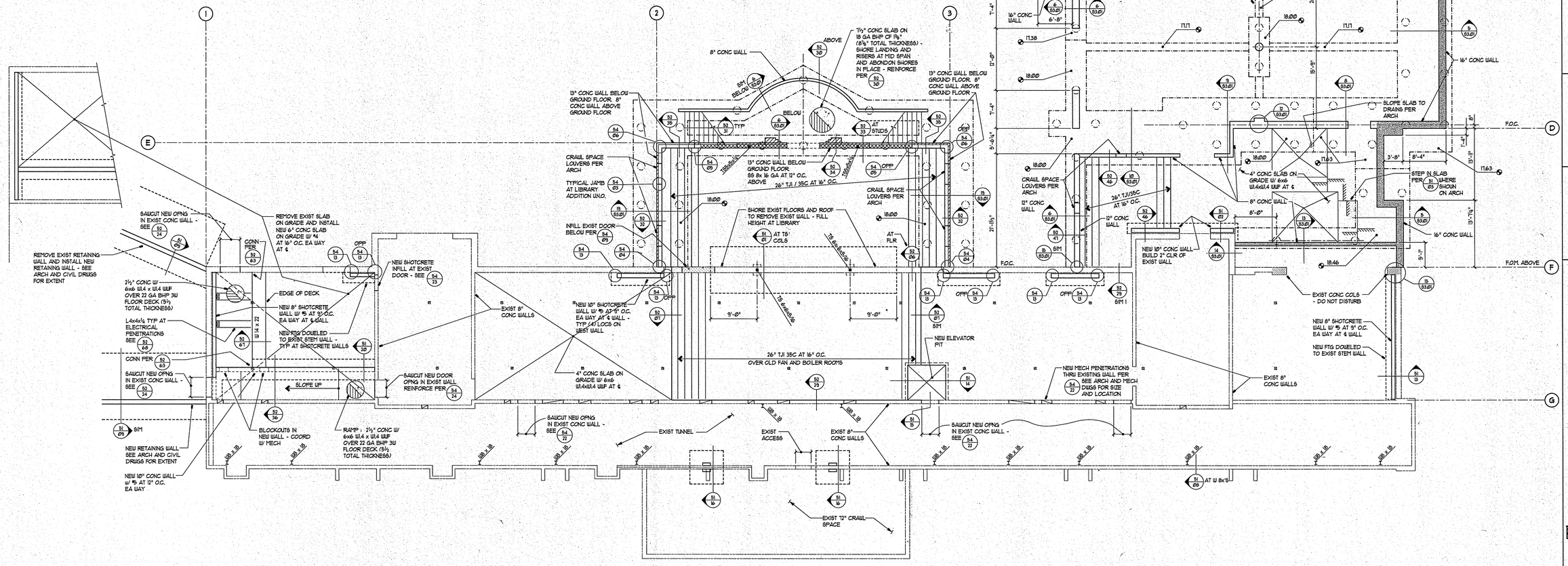
MASONRY VENEER LINTEL SCHEDULE — 2

MASONRY OPENING WIDTH	LINTEL ANGLE SIZE	REMARKS
W ≤ 6'-Ø"	L 4 x 3 x 3/8	--
6'-Ø" < W ≤ 7'-Ø"	L 5 x 3 x 3/8	SEE NOTE #5
7'-Ø" < W ≤ 9'-Ø"	L 6 x 3½ x 3/8	--

1. LINTELS SHOWN ABOVE APPLY TO ALL OPENINGS IN MASONRY WALLS UNLESS SHOWN OTHERWISE ON DETAILS.
2. ALL LINTEL ANGLES SHALL BE ORIENTED WITH THE LONG LEG VERTICAL.
3. ALL LINTELS SHALL EXTEND A MINIMUM OF 6" INTO THE VENEER AT EACH SIDE OF THE OPENING.
4. ALL LINTEL ANGLES SHALL BE GALVANIZED PER THE STRUCTURAL NOTES.
5. LINTEL SIZE SHOWN SHALL ALSO APPLY AT ARCHED OPENINGS. FOR ADDITIONAL REQUIREMENTS, SEE S4/25
6. FOR RELIEVING ANGLES AT LIBRARY AND GYMNASIUM ADDITIONS, SEE S4/10

FOUNDATION NOTES:

1) ALL FOUNDATIONS INDICATED AS ⋮⋮⋮⋮⋮ HAVE BEEN CONSTRUCTED BY THE PHASE 2 CONTRACTOR AND ARE SHOWN FOR REFERENCE ONLY
2) THOSE WALLS SHOWN AS ▨ ON THIS SHEET WERE CONSTRUCTED BY THE PHASE 2 CONTRACTOR. THE REMAINDER OF THE WALLS AND COLUMNS HAVE NOT BEEN CONSTRUCTED.
3) ◯ - INDICATES APPROXIMATE LOCATION OF AUGER-CAST PILES FOR CONTRACTOR REFERENCES.
4) ELEVATIONS SHOWN ARE TO TOP OF GRADE BEAM. VERIFY ALL ELEVATIONS WITH ARCHITECTURAL DRAWINGS AND AS-BUILT CONDITIONS.
5) SEE SHEET S1.01 AND S1.02 FOR STRUCTURAL NOTES AND TYPICAL DETAILS.
6) FOR CONSTRUCTION JOINT AT ENDS OF PARTIALLY CONSTRUCTED WALLS, SEE S3/S3.01
7) FOR RELIEVING ANGLES AT LIBRARY AND GYMNASIUM ADDITIONS SEE S4/10
8) UNLESS NOTED OTHERWISE, DOWEL ALL HORIZONTAL GRADE BEAM AND WALL REINFORCEMENT 8" INTO EXISTING CONCRETE USING HILTI HIT HY-150 EPOXY.
9) SEE ARCHITECTURAL DRAWINGS FOR ALL DIMENSIONS AND ELEVATIONS NOT SHOWN.
10) SEE S4/23 FOR SHOTCRETE WALL INFILL. SEE ARCH DRAWINGS FOR INFILL LOCATIONS NOT SHOWN ON THIS DRAWING.
11) FOR MASONRY VENEER LINTELS, SEE SCHEDULE.



FOUNDATION AND GROUND FLOOR FRAMING PLAN

1/8" = 1'-Ø" — 1

Mc DERMOTH ELEMENTARY

ABERDEEN, WASHINGTON

REGISTERED ARCHITECT — STATE OF WASHINGTON

DATE: 23 SEPT 97 — REVISED — COMM. NO. 960409

The BJSS GROUP
ARCHITECTS & PLANNERS, AIA
320 WEST BAY DRIVE SUITE 212 OLYMPIA WA 98502 (360) 943-4650

GROUND FLR. FOUNDATION AND FRAMING PLAN

S2.01

GEOFFREY HOBSON — STATE OF WASHINGTON — 1999 — REGISTERED PROFESSIONAL ENGINEER

EXPIRES 4/6/99

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FILENAME: T:\EV\96388\96388S01.DWG CREATED: NOV 22 1996 15:01:08
UPDATED: SEP 23 1997 06:10:59 PLOTTED: SEP 23 1997 06:11:04

SHEAR WALL SCHEDULE — 2

MARK (3) (10)	SHEATHING (2) (7)	NAILING		BLKG (5)	A.B. SIZE (4) AND SPACING	REMARKS
		SIZE (1)	SPACING (6)(10)			
1	15/32" APA RATED SHTG	10d COMMON OR Ø.148" DIA x 2½"	6" O.C. EDGES 12" O.C. FIELD	YES	¾"ø AT 16"O.C.	GLUE PER NOTE (8) 4x FRAMING PER NOTE (12)
2	15/32" APA RATED SHTG	10d COMMON OR Ø.148" DIA x 2½"	4" O.C. EDGES 12" O.C. FIELD	YES	¾"ø AT 32"O.C.	GLUE PER NOTE (8)
3	15/32" APA RATED SHTG	10d COMMON OR Ø.148" DIA x 2½"	6" O.C. EDGES 12" O.C. FIELD	YES	¾"ø AT 32"O.C.	--

1. NAILS SHALL BE COMMON FROM AN AMERICAN OR CANADIAN MFR ONLY. NAIL PENETRATION INTO WOOD FRAMING SHALL BE 1 5/8" FOR 10d NAILS. NAIL DIAMETERS SHALL BE Ø.148" FOR 10d NAILS.
2. SHEATHING MATERIAL MAY BE EITHER PLYWOOD OR ORIENTED STRAND BOARD.
3. ◇ INDICATES SIDE OF WALL TO RECEIVE SHEATHING.
4. ANCHOR BOLTS SHALL HAVE 6" MIN. EMBED UNO. PROVIDE A MINIMUM OF (2) ANCHOR BOLTS PER PIECE.
5. PANEL BLOCKING SHALL BE A 2x4 PLACED FLAT CENTERED ON THE JOINT.
6. PROVIDE PANEL EDGE NAILING OF SHEATHING TO ALL COLUMNS WITH HOLDOWNS.
7. SHEARWALLS SHALL RUN CONTINUOUS THROUGH BREAKS CAUSED BY INTERSECTING WALLS.
8. GLUE SHTG TO ALL FRAMING MEMBERS W/3M SCOTCH GRIP #5230 CONTSTRUCTION ADHESIVE WHERE NOTED. APPLY ⅜"ø CONTINUOUS BEAD TO ALL FRAMING MEMBERS AND TWO ⅜"ø CONTINUOUS BEADS TO BLOCKING AND FRAMING WHERE PANELS BUTT.
9. UNLESS NOTED OTHERWISE, THE SHEARWALL DESIGNATION APPLIES TO FULL EXTENT OF WALL BETWEEN CORNERS OF WALLS.
10. NAIL SPACING APPLIES TO ALL STUDS, TOP AND BOTTOM PLATES AND BLOCKING.
11. MINIMUM SHEATHING DIMENSION SHALL BE 24" AT BOUNDARIES AND CHANGES IN FRAMING UNLESS ALL EDGES ARE BLOCKED.
12. INSTALL 4x STUDS AT ALL VERTICAL PANEL EDGES WHERE NOTED.

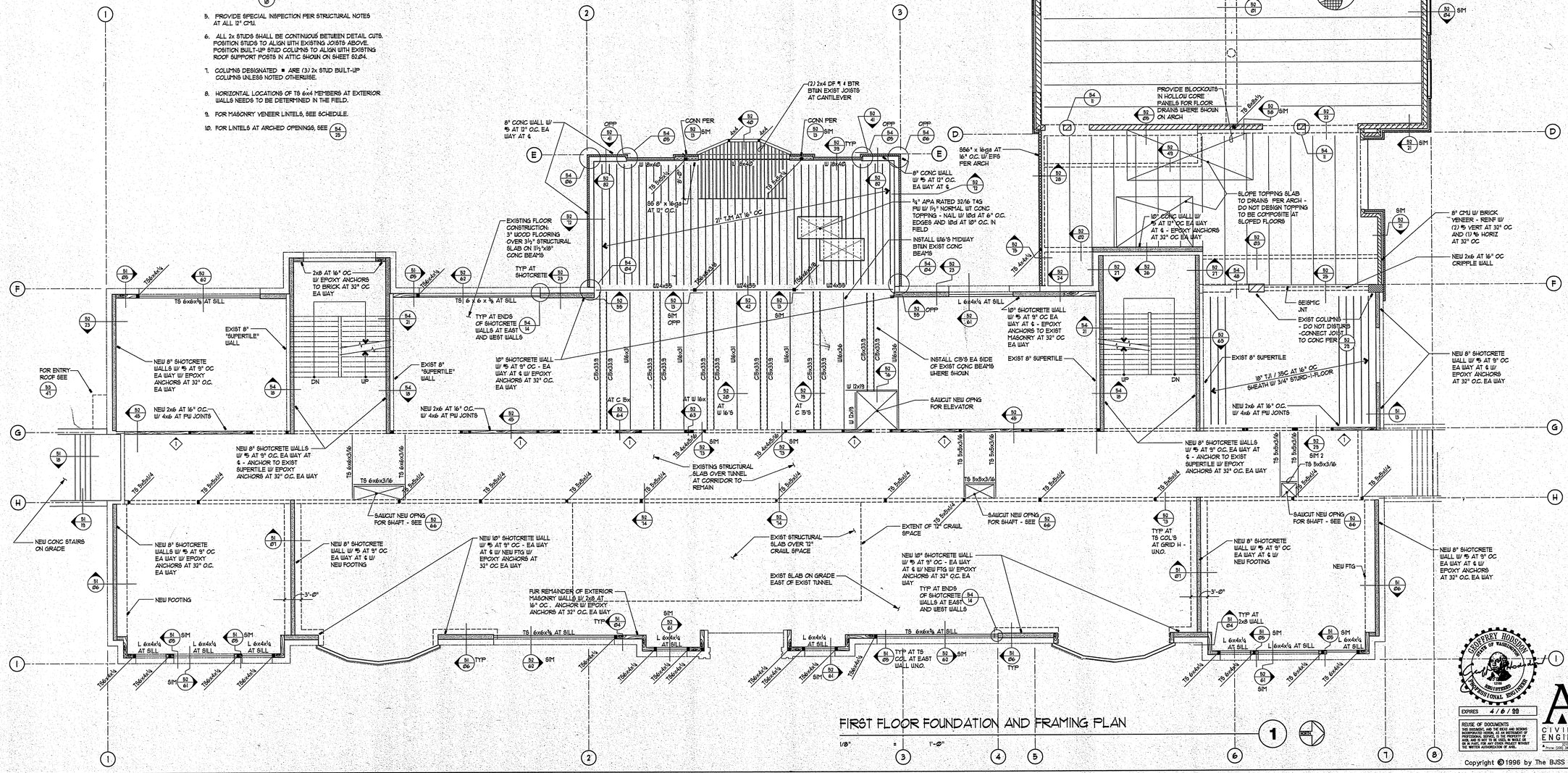
MASONRY VENEER LINTEL SCHEDULE — 3

MASONRY OPENING WIDTH	LINTEL ANGLE SIZE	REMARKS
W ≤ 6'-0"	L 4 x 3 x 3/8	--
6'-0" < W ≤ 7'-0"	L 5 x 3 x 3/8	SEE NOTE 5
7'-0" < W ≤ 9'-0"	L 6 x 3½ x 3/8	--

1. LINTELS SHOWN ABOVE APPLY TO ALL OPENINGS IN MASONRY WALLS UNLESS SHOWN OTHERWISE ON DETAILS.
2. ALL LINTEL ANGLES SHALL BE ORIENTED WITH THE LONG LEG VERTICAL.
3. ALL LINTELS SHALL EXTEND A MINIMUM OF 6" INTO THE VENEER AT EACH SIDE OF THE OPENING.
4. ALL LINTEL ANGLES SHALL BE GALVANIZED PER THE STRUCTURAL NOTES.
5. LINTEL SIZE SHOWN SHALL ALSO APPLY AT ARCHED OPENINGS. FOR ADDITIONAL REQUIREMENTS, SEE S4/20.
6. FOR RELIEVING ANGLES AT LIBRARY AND GYMNASIUM ADDITIONS, SEE S4/10.

FOUNDATION AND FLOOR FRAMING NOTES:

1. SEE SHEET S1.01 AND S1.02 FOR STRUCTURAL NOTES AND TYPICAL DETAILS.
2. SEE ARCHITECTURAL DRAWINGS FOR ALL DIMENSIONS AND ELEVATIONS NOT SHOWN.
3. ◇ INDICATES SHEARWALL. SEE 3/- FOR SHEARWALL SCHEDULE.
4. FOR RELIEVING ANGLES AT LIBRARY AND GYMNASIUM ADDITIONS SEE S4/10
5. PROVIDE SPECIAL INSPECTION PER STRUCTURAL NOTES AT ALL 12" CMU.
6. ALL 2x STUDS SHALL BE CONTINUOUS BETWEEN DETAIL CUTS. POSITION STUDS TO ALIGN WITH EXISTING JOISTS ABOVE. POSITION BUILT-UP STUD COLUMNS TO ALIGN WITH EXISTING ROOF SUPPORT POSTS IN ATTIC SHOWN ON SHEET S2.04.
7. COLUMNS DESIGNATED ■ ARE (3) 2x STUD BUILT-UP COLUMNS UNLESS NOTED OTHERWISE.
8. HORIZONTAL LOCATIONS OF TS 6x4 MEMBERS AT EXTERIOR WALLS NEEDS TO BE DETERMINED IN THE FIELD.
9. FOR MASONRY VENEER LINTELS, SEE SCHEDULE.
10. FOR LINTELS AT ARCHED OPENINGS, SEE S4/20



Mc DERMOTH ELEMENTARY
ABERDEEN, WASHINGTON

REGISTERED ARCHITECT — STATE OF WASHINGTON

DATE 23 SEPT 97 — REVISED — COMM. NO. 9604.09

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FIRST FLOOR FOUNDATION AND FRAMING PLAN

S2.02

GEOFFREY HOUDON — STATE OF WASHINGTON — 10788 — 100TH ANNIVERSARY — PROFESSIONAL ENGINEER

EXPIRES 4/6/98

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CREATED: NOV 22 1996 15:01:08
UPDATED: SEP 15 1997 08:39:24
PLOTTED: SEP 23 1997 07:16:28

ROOF FRAMING NOTES:

1. JOIST DESIGNATION IS SHOWN AS TOTAL LOAD IN POUNDS PER FOOT OVER THE LIVE LOAD IN POUNDS PER FOOT.
2. AT EACH COLUMN SUPPORTING JOIST GIRDERS, JOIST MANUFACTURER SHALL MATCH THE BEARING DEPTH OF ALL JOIST GIRDERS FRAMING INTO COLUMN.
3. AT EACH JOIST GIRDER/WIDE FLANGE BEAM SUPPORTING BAR JOIST, JOIST MANUFACTURER SHALL MATCH THE BEARING DEPTHS OF ALL BAR JOISTS FRAMING INTO JOIST GIRDER/WIDE FLANGE BEAM.
4. JOIST AND JOIST GIRDER MAY HAVE NON-STANDARD BEARING HEIGHTS, STEEL DETAILER TO COORDINATE HEIGHT OF BEARING SEAT WITH JOIST MANUFACTURER.
5. ROOF JOIST SUPPLIER TO PROVIDE BRIDGING FOR JOIST PER STEEL JOIST INSTITUTE AND MANUFACTURERS RECOMMENDATIONS. IN ADDITION TO LOADS SHOWN, BOTH JOIST AND BRIDGING SHALL ALSO BE DESIGNED FOR A NET UPLIFT OF 10# psf.
6. JOIST MANUFACTURER TO DESIGN BAR JOIST AND JOIST GIRDERS FOR LOADS DUE TO SPRINKLER SYSTEM. CONTRACTOR TO COORDINATE AND PROVIDE JOIST MANUFACTURER WITH MAGNITUDE AND LOCATION OF LOADS.
7. JOIST MANUFACTURER TO LOCATE, SIZE AND PROVIDE ERECTION BOLTS AS REQUIRED. STEEL DETAILER SHALL COORDINATE LOCATION OF BOLT HOLES IN ALL CAP PL, EMBEDS, ETC...
8. ◇ INDICATES SHEARWALL. SEE 3/- FOR SHEARWALL SCHEDULE.
9. REMOVE EXISTING 6" STRUCTURAL FLOOR SLAB AT CORRIDOR.
10. SEE S2/10 FOR FLOOR CONSTRUCTION.
11. FOR RELIEVING ANGLES AT LIBRARY AND GYMNASIUM ADDITIONS SEE S4/10
12. ALL 2x STUDS SHALL BE CONTINUOUS BETWEEN DETAIL CUTS. POSITION STUDS TO ALIGN WITH EXISTING JOISTS ABOVE. POSITION BUILT-UP STUD COLUMNS TO ALIGN WITH EXISTING ROOF SUPPORT POSTS IN ATTIC SHOWN ON SHEET S2.04.
13. COLUMNS DESIGNATED ■ ARE (3) 2x STUD BUILT-UP COLUMNS UNLESS NOTED OTHERWISE.
14. HORIZONTAL LOCATIONS OF T5 6x4 MEMBERS AT EXTERIOR WALLS NEEDS TO BE DETERMINED IN THE FIELD.
15. FOR MASONRY VENEER LINTELS SEE SCHEDULE.
16. FOR LINTELS AT ARCHED OPENINGS SEE S4/20

SHEARWALL SCHEDULE — 3

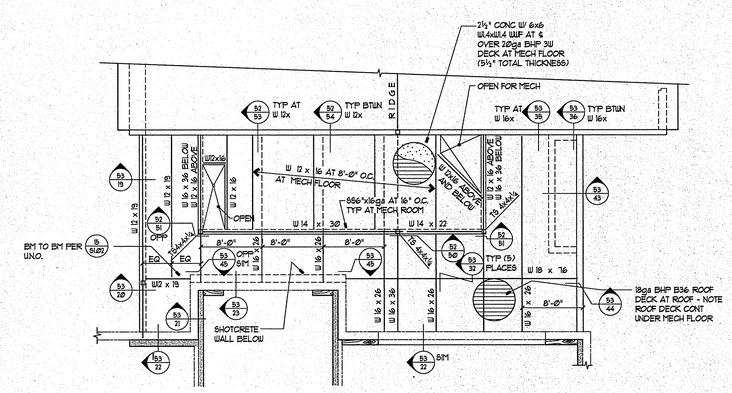
MARK (3) (10)	SHEATHING (2) (7)	NAILING SIZE (1)	NAILING SPACING (6)(10)	BLKG (5)	A.B. SIZE (4) AND SPACING	REMARKS
1	15/32" APA RATED SHTG	10d COMMON OR Ø.148" DIA x 2½"	6" O.C. EDGES 12" O.C. FIELD	YES	¾"ø AT 16"O.C.	GLUE PER NOTE (8) 4x FRAMING PER NOTE (12)
2	15/32" APA RATED SHTG	10d COMMON OR Ø.148" DIA x 2½"	4" O.C. EDGES 12" O.C. FIELD	YES	¾"ø AT 32"O.C.	GLUE PER NOTE (8)
3	15/32" APA RATED SHTG	10d COMMON OR Ø.148" DIA x 2½"	6" O.C. EDGES 12" O.C. FIELD	YES	¾"ø AT 32"O.C.	--

1. NAILS SHALL BE COMMON FROM AN AMERICAN OR CANADIAN MFR ONLY. NAIL PENETRATION INTO WOOD FRAMING SHALL BE 1 5/8" FOR 10d NAILS. NAIL DIAMETERS SHALL BE Ø.148" FOR 10d NAILS.
2. SHEATHING MATERIAL MAY BE EITHER PLYWOOD OR ORIENTED STRAND BOARD.
3. ◇ INDICATES SIDE OF WALL TO RECEIVE SHEATHING.
4. ANCHOR BOLTS SHALL HAVE 6" MIN. EMBED U.N.O. PROVIDE A MINIMUM OF (2) ANCHOR BOLTS PER PIECE.
5. PANEL BLOCKING SHALL BE A 2X4 PLACED FLAT CENTERED ON THE JOINT.
6. PROVIDE PANEL EDGE NAILING OF SHEATHING TO ALL COLUMNS WITH HOLDOWNS.
7. SHEARWALLS SHALL RUN CONTINUOUS THROUGH BREAKS CAUSED BY INTERSECTING WALLS.
8. GLUE SHTG TO ALL FRAMING MEMBERS W/3M SCOTCH GRIP #5230 CONSTRUCTION ADHESIVE WHERE NOTED. APPLY ⅜"ø CONTINUOUS BEAD TO ALL FRAMING MEMBERS AND TWO ⅜"ø CONTINUOUS BEADS TO BLOCKING AND FRAMING WHERE PANELS BUTT.
9. UNLESS NOTED OTHERWISE, THE SHEARWALL DESIGNATION APPLIES TO FULL EXTENT OF WALL BETWEEN CORNERS OF WALLS.
10. NAIL SPACING APPLIES TO ALL STUDS, TOP AND BOTTOM PLATES AND BLOCKING.
11. MINIMUM SHEATHING DIMENSION SHALL BE 24" AT BOUNDARIES AND CHANGES IN FRAMING UNLESS ALL EDGES ARE BLOCKED.
12. INSTALL 4x STUDS AT ALL VERTICAL PANEL EDGES WHERE NOTED.

MASONRY VENEER LINTEL SCHEDULE — 4

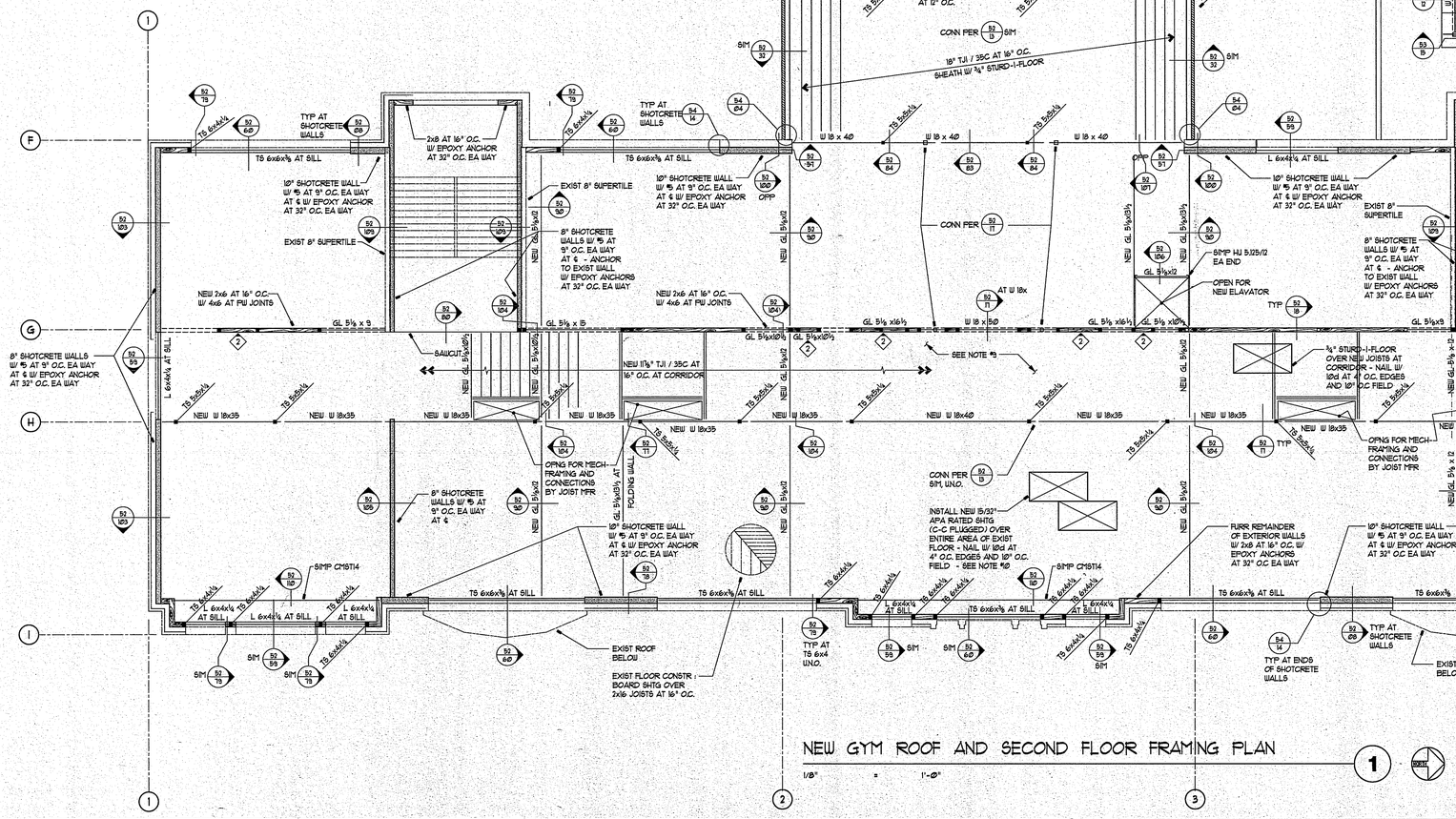
MASONRY OPENING WIDTH	LINTEL ANGLE SIZE	REMARKS
W ≤ 6'-0"	L 4 x 3 x 3/8	--
6'-0" < W ≤ 7'-0"	L 5 x 3 x 3/8	SEE NOTE #5
7'-0" < W ≤ 9'-0"	L 6 x 3½ x 3/8	--

1. LINTELS SHOWN ABOVE APPLY TO ALL OPENINGS IN MASONRY WALLS UNLESS SHOWN OTHERWISE ON DETAILS.
2. ALL LINTEL ANGLES SHALL BE ORIENTED WITH THE LONG LEG VERTICAL.
3. ALL LINTELS SHALL EXTEND A MINIMUM OF 6" INTO THE VENEER AT EACH SIDE OF THE OPENING.
4. ALL LINTEL ANGLES SHALL BE GALVANIZED PER THE STRUCTURAL NOTES.
5. LINTEL SIZE SHOWN SHALL ALSO APPLY AT ARCHED OPENINGS. FOR ADDITIONAL REQUIREMENTS, SEE S4/20
6. FOR RELIEVING ANGLES AT LIBRARY AND GYMNASIUM ADDITIONS, SEE S4/10



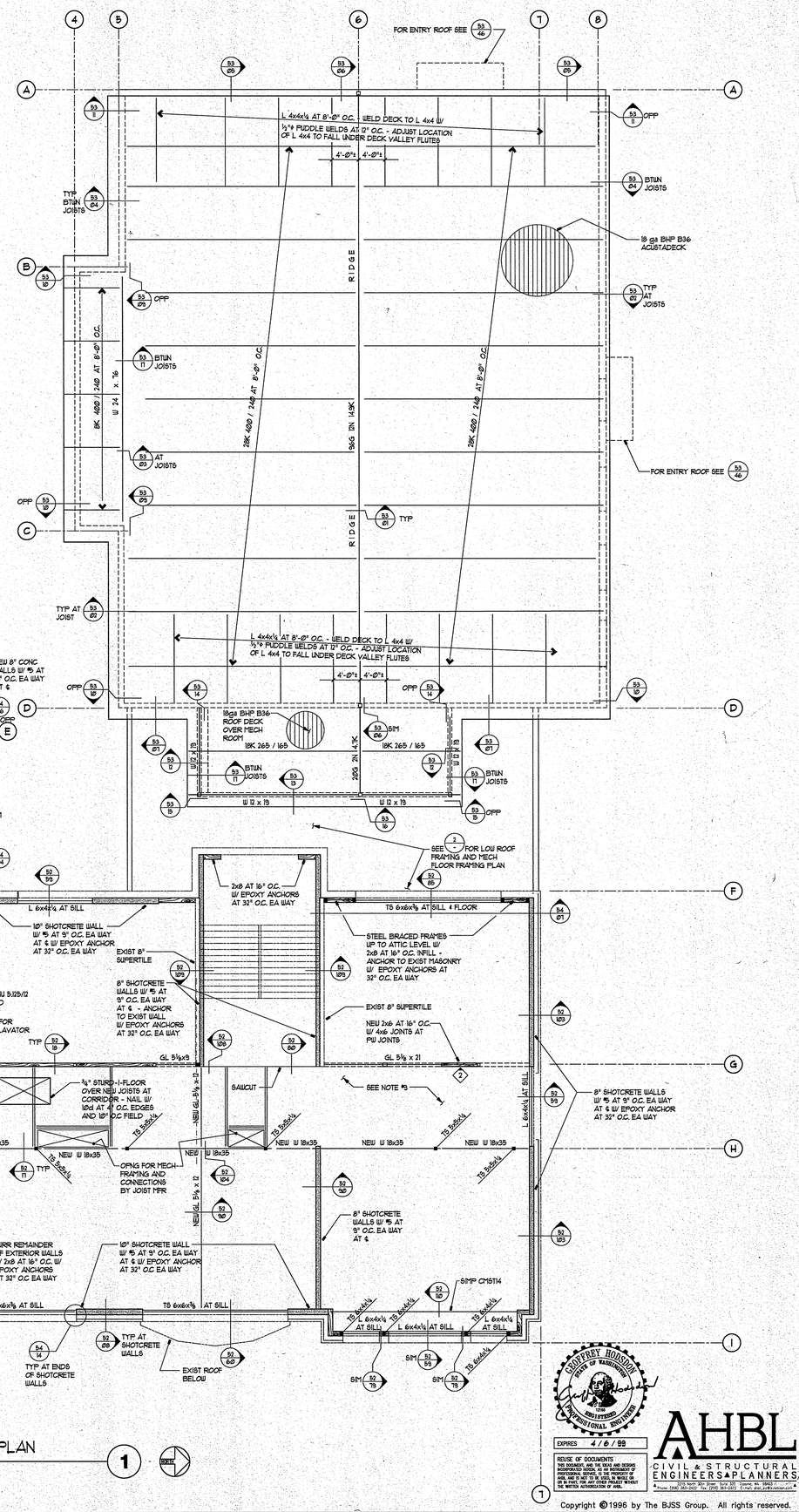
LOW ROOF / MECHANICAL FLOOR FRAMING PLAN — 2

1/8" = 1'-0"



NEW GYM ROOF AND SECOND FLOOR FRAMING PLAN — 1

1/8" = 1'-0"



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Mc DERMOTH ELEMENTARY
ABERDEEN, WASHINGTON

REGISTERED ARCHITECT
STATE OF WASHINGTON

DATE	REVISED	COMM. NO.
23 SEPT 97		980409

GYM, ROOF AND SECOND FLOOR FRMG. PLAN

S2.03

GEOFFREY HOSKIN — STATE OF WASHINGTON — 11996 REGISTERED PROFESSIONAL ENGINEER

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UPDATED SEP 13 1997 16:13:11 PLOTTED SEP 15 1997 08:41:24

SHEARWALL SCHEDULE — 2

MARK (3) (10)	SHEATHING (2) (7)	NAILING		BLKG (5)	A.B. SIZE (4) AND SPACING	REMARKS
		SIZE (1)	SPACING (6)(10)			
◇1	15/32" APA RATED SHTG	10d COMMON OR Ø.148" DIA x 2¾"	6" O.C. EDGES 12" O.C. FIELD	YES	¾"ø AT 16"O.C.	GLUE PER NOTE (8) 4x FRAMING PER NOTE (11)
◇2	15/32" APA RATED SHTG	10d COMMON OR Ø.148" DIA x 2¾"	4" O.C. EDGES 12" O.C. FIELD	YES	¾"ø AT 32"O.C.	GLUE PER NOTE (8)
◇3	15/32" APA RATED SHTG	10d COMMON OR Ø.148" DIA x 2¾"	6" O.C. EDGES 12" O.C. FIELD	YES	¾"ø AT 32"O.C.	GLUE PER NOTE (8)

1. NAILS SHALL BE COMMON FROM AN AMERICAN OR CANADIAN MFR ONLY. NAIL PENETRATION INTO WOOD FRAMING SHALL BE 1 5/8" FOR 10d NAILS. NAIL DIAMETERS SHALL BE Ø.148" FOR 10d NAILS.
2. SHEATHING MATERIAL MAY BE EITHER PLYWOOD OR ORIENTED STRAND BOARD.
3. ◇ INDICATES SIDE OF WALL TO RECEIVE SHEATHING.
4. ANCHOR BOLTS SHALL HAVE 6" MIN. EMBED UNO. PROVIDE A MINIMUM OF (2) ANCHOR BOLTS PER PIECE.
5. PANEL BLOCKING SHALL BE A 2x4 PLACED FLAT CENTERED ON THE JOINT.
6. PROVIDE PANEL EDGE NAILING OF SHEATHING TO ALL COLUMNS WITH HOLDOWNS.
7. SHEARWALLS SHALL RUN CONTINUOUS THROUGH BREAKS CAUSED BY INTERSECTING WALLS.
8. GLUE SHTG TO ALL FRAMING MEMBERS W/3M SCOTCH GRIP #5230 CONTSTRUCTION ADHESIVE WHERE NOTED. APPLY ⅜"ø CONTINUOUS BEAD TO ALL FRAMING MEMBERS AND TWO ⅜"ø CONTINUOS BEADS TO BLOCKING AND FRAMING WHERE PANELS BUTT.
9. UNLESS NOTED OTHERWISE, THE SHEARWALL DESIGNATION APPLIES TO FULL EXTENT OF WALL BETWEEN CORNERS OF WALLS.
10. NAIL SPACING APPLIES TO ALL STUDS, TOP AND BOTTOM PLATES AND BLOCKING.
11. MINIMUM SHEATHING DIMENSION SHALL BE 24" AT BOUNDARIES AND CHANGES IN FRAMING UNLESS ALL EDGES ARE BLOCKED.
12. INSTALL 4x STUDS AT ALL VERTICAL PANEL EDGES WHERE NOTED.

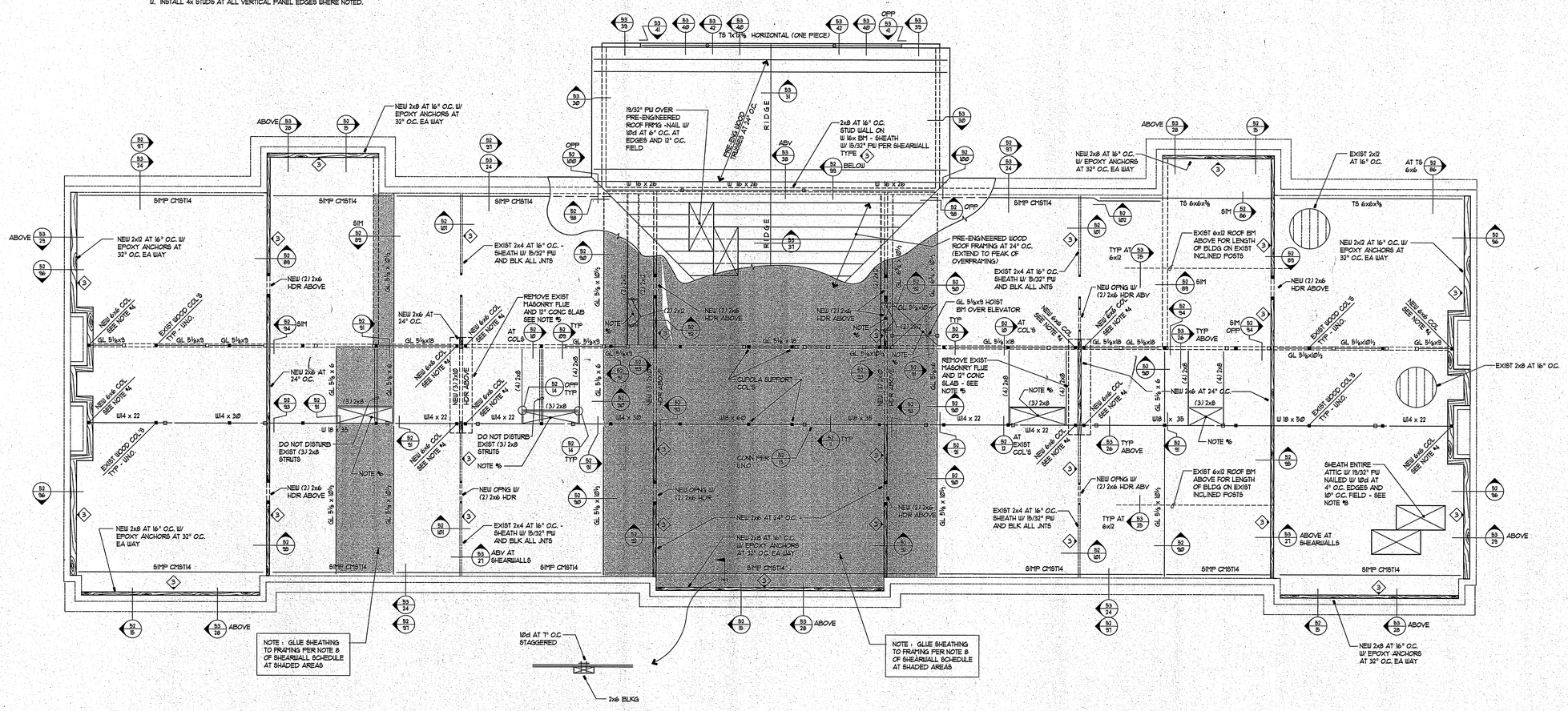
MASONRY VENEER LINTEL SCHEDULE — 3

MASONRY OPENING WIDTH	LINTEL ANGLE SIZE	REMARKS
W ≤ 6'-0"	L 4 x 3 x 3/8	--
6'-0" < W ≤ 7'-0"	L 5 x 3 x 3/8	SEE NOTE #5
7'-0" < W ≤ 9'-0"	L 6 x 3½ x 3/8	--

1. LINTELS SHOWN ABOVE APPLY TO ALL OPENINGS IN MASONRY WALLS UNLESS SHOWN OTHERWISE ON DETAILS.
2. ALL LINTEL ANGLES SHALL BE ORIENTED WITH THE LONG LEG VERTICAL.
3. ALL LINTELS SHALL EXTEND A MINIMUM OF 6" INTO THE VENEER AT EACH SIDE OF THE OPENING.
4. ALL LINTEL ANGLES SHALL BE GALVANIZED PER THE STRUCTURAL NOTES.
5. LINTEL SIZE SHOWN SHALL ALSO APPLY AT ARCHED OPENINGS. FOR ADDITIONAL REQUIREMENTS, SEE S4 / 29
6. FOR RELIEVING ANGLES AT LIBRARY AND GYMNASIUM ADDITIONS, SEE S4 / 10

ROOF AND ATTIC FRAMING NOTES

1. AT BAR JOISTS: JOIST DESIGNATION IS SHOWN AS TOTAL LOAD OVER THE LIVE LOAD IN POUNDS PER FOOT.
2. JOISTS MAY HAVE NON-STANDARD BEARING HEIGHTS. STEEL DETAILER TO COORDINATE HEIGHT OF BEARING SEAT WITH JOIST MANUFACTURER.
3. JOISTS SUPPLIER TO PROVIDE BRIDGING FOR JOISTS PER STEEL JOIST INSTITUTE AND MANUFACTURERS RECOMMENDATIONS. IN ADDITION TO LOADS SHOWN, BOTH JOISTS AND BRIDGING SHALL ALSO BE DESIGNED FOR A NET UPLIFT OF 10 PSF.
4. SHORE EXISTING 6x12 ROOF BEAMS PRIOR TO REMOVING EXISTING MASONRY FLUE. ATTACH NEW 6x6 POSTS TO EXIST 6x12 BEAMS PER S3/26.
5. WHERE EXISTING MASONRY FLUES ARE REMOVED, INFILL ATTIC FLOOR WITH NEW 2x8 AT 12" O.C.
6. FRAME NEW MECHANICAL PENETRATIONS AS INDICATED. VERIFY LOCATIONS WITH ARCHITECTURAL AND MECHANICAL DRAWINGS.
7. ◇ INDICATES SHEARWALL. SEE 2 / - FOR SHEARWALL SCHEDULE.
8. ENTIRE ATTIC FLOOR FRAMING IS TO BE SHEATHED AS NOTED. BLOCK ALL PANEL EDGES WITH 2x4 FLAT CENTERED ON JOINT. PRIOR TO SHEATHING ATTIC, REMOVE EXISTING BOARDWALK. SEE ARCHITECTURAL AND MECHANICAL FOR OTHER ITEMS TO BE REMOVED.



ROOF / ATTIC FRAMING PLAN — 1

1/8" = 1'-0"

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The BJSS GROUP
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ROOF AND ATTIC FRAMING PLAN

S2.04

GEOFFREY HOUSDEN — STATE OF WASHINGTON — 10388 — REGISTERED PROFESSIONAL ENGINEER

EXPIRES 4 / 6 / 98

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UPDATED: SEP 23 1997 24:20:06
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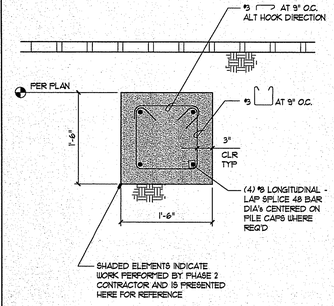
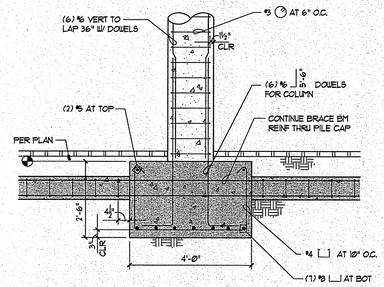
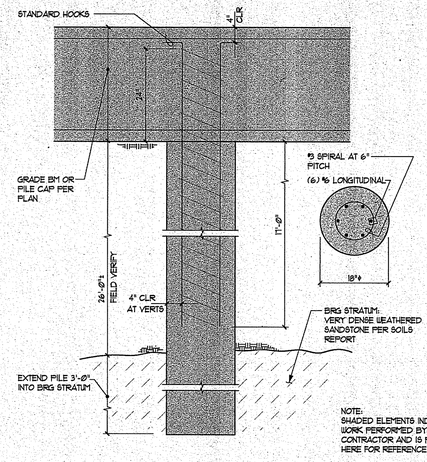


SECTION 1
1" = 1'-0"

NOTE:
SHADED ELEMENTS INDICATE WORK PERFORMED BY PHASE 2 CONTRACTOR AND IS PRESENTED HERE FOR REFERENCE

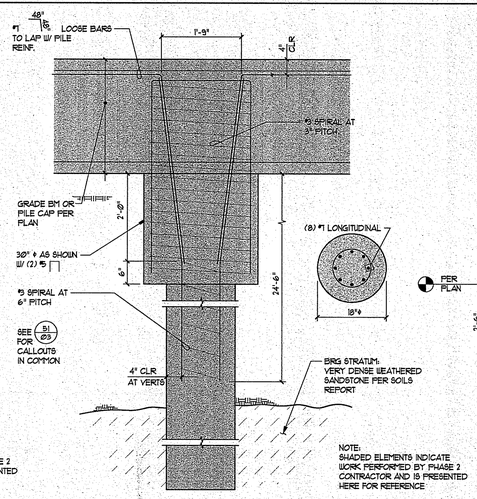


SECTION 2
1/2" = 1'-0"



PILE TYPE P1

SECTION 3
3/4" = 1'-0"



PILE TYPE P2

SECTION 4
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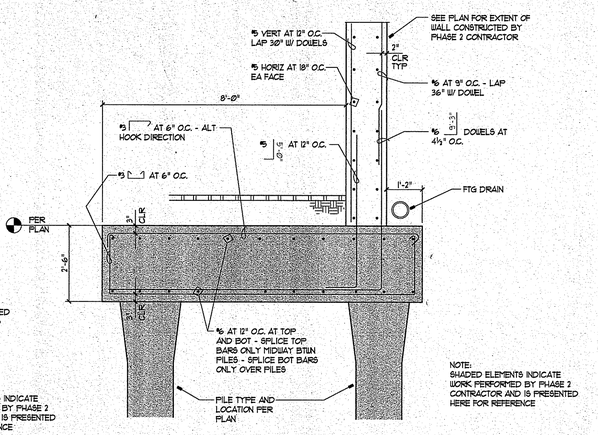
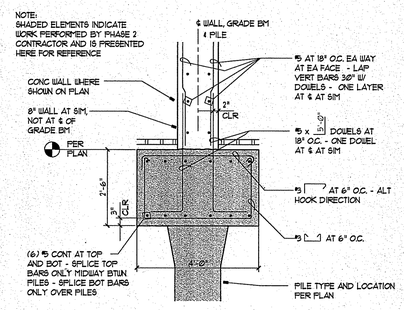


SECTION 5
1/2" = 1'-0"



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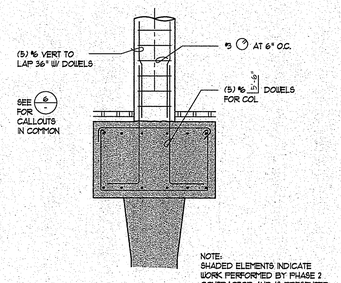
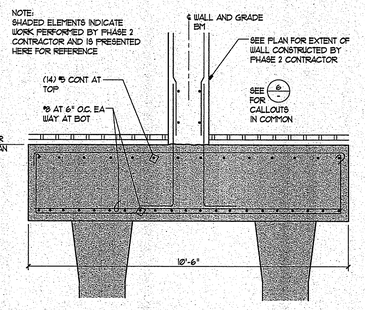


NOTE:
SHADED ELEMENTS INDICATE WORK PERFORMED BY PHASE 2 CONTRACTOR AND IS PRESENTED HERE FOR REFERENCE

SECTION 7
1/2" = 1'-0"



SECTION 8
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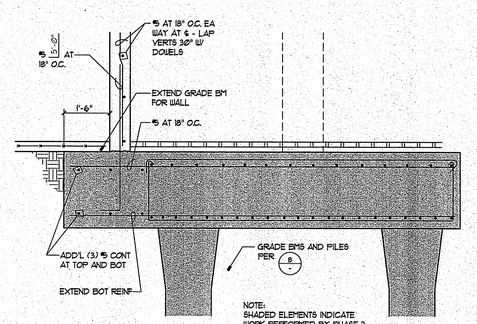

SECTION 9
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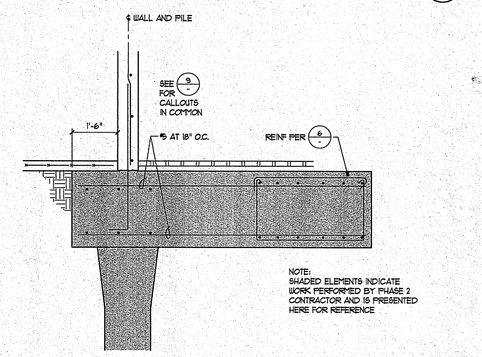
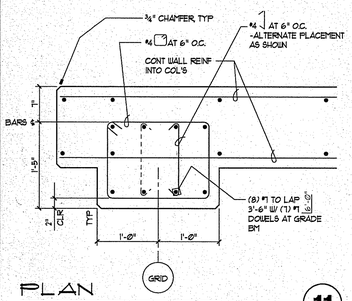
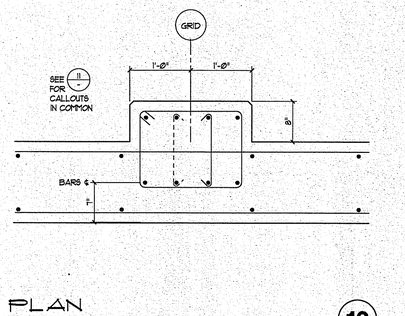


NOTE:
SHADED ELEMENTS INDICATE WORK PERFORMED BY PHASE 2 CONTRACTOR AND IS PRESENTED HERE FOR REFERENCE

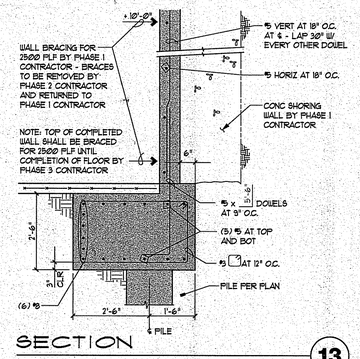
SECTION 10
1/2" = 1'-0"



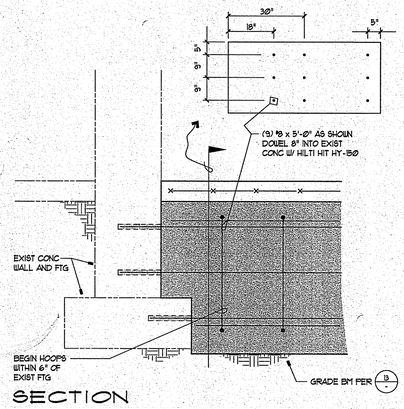
PLAN 11
1" = 1'-0"



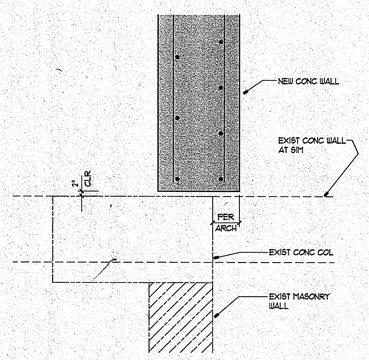
PLAN 12
1" = 1'-0"



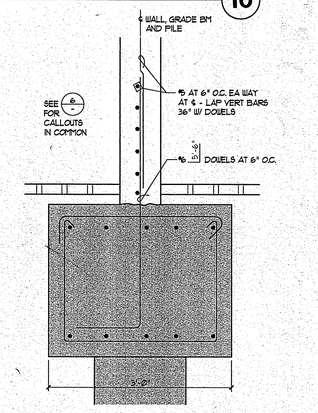
SECTION 13
1/2" = 1'-0"



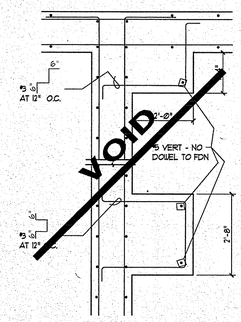
SECTION 14
1" = 1'-0"



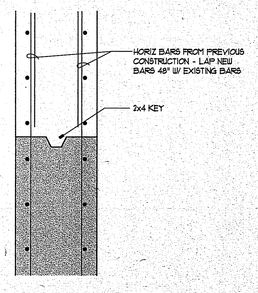
PLAN 15
1" = 1'-0"



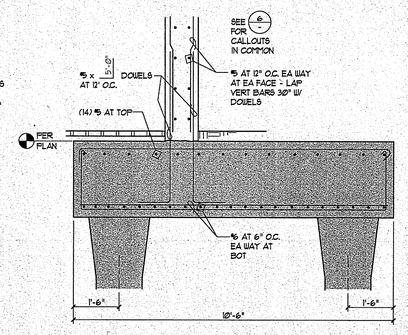
SECTION 16
1" = 1'-0"



PLAN 17
1/2" = 1'-0"



PLAN 18
1" = 1'-0"



SECTION 19
1/2" = 1'-0"

Mc DERMOTH ELEMENTARY
ABERDEEN, WASHINGTON

REGISTERED ARCHITECT
STATE OF WASHINGTON

DATE 23 SEPT 97
REVISED
COMM. NO. 960409

The BJSS GROUP
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FOUNDATION DETAILS

S3.01

GEOFFREY HORLICK STATE OF WASHINGTON REGISTERED PROFESSIONAL ENGINEER
EXPIRES 4/6/99

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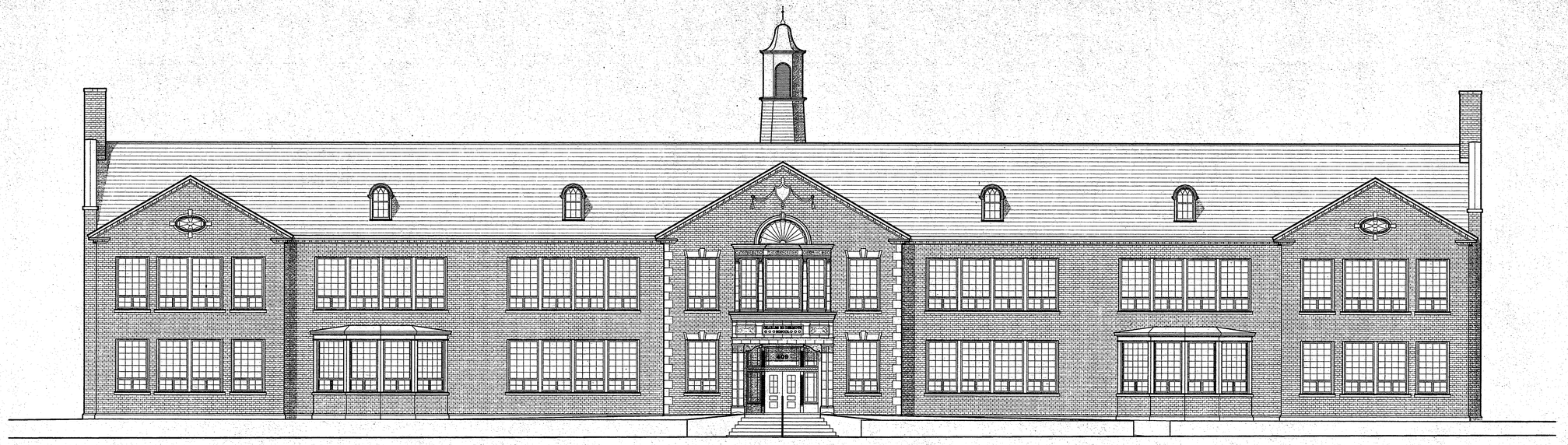

Mc DERMOTH ELEMENTARY

The BJSS GROUP
architecture | technology

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KENT, WA 98032
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FAX: 253-854-1151

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GILES ENGINEERING ASSOCIATES
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LYNNWOOD, WA 98036
425-482-2020
FAX: 425-482-6300

SHEET INDEX

SHEET INDEX
T1.01 COVER SHEET & INDEX

SURVEY
G1 SURVEY

CIVIL
C1 SITE PLAN
C2 STORM DRAINAGE PLAN
C3 SANITARY SEWER & WATER PLAN
C4 GENERAL CONSTRUCTION NOTES
C5 DETAILS
C6 DETAILS
C7 DETAILS

ARCHITECTURAL
A1.00 SITE PLAN
D1.01 DEMOLITION PLAN-GROUND FLOOR
D1.02 DEMOLITION PLAN FIRST FLOOR
D1.03 DEMOLITION PLAN SECOND FLOOR
D.1.04 DEMOLITION PLAN ATTIC FLOOR
A1.01 GROUND FLOOR PLAN
A1.01d GROUND FLOOR - DIM. PLAN & WALL TYPES
A1.02 FIRST FLOOR PLAN
A1.02d FIRST FLOOR - DIM. PLAN & WALL TYPES
A1.03 SECOND FLOOR PLAN
A1.03d SECOND FLOOR - DIM. PLAN & WALL TYPES
A1.04 ATTIC PLAN
A1.05 ENLARGED PLAN - TOILET ROOMS
A1.06 ENLARGED PLAN - TOILET ROOMS
A2.01 FIRE PROTECTION PLAN
A3.01 ROOF PLAN
A4.01 REFLECTED CEILING PLAN - GROUND FLOOR
A4.02 REFLECTED CEILING PLAN - FIRST FLOOR
A4.03 REFLECTED CEILING PLAN - SECOND FLOOR
A5.01 EXTERIOR ELEVATIONS
A5.02 EXTERIOR ELEVATIONS
A5.03 EXTERIOR ELEVATIONS
A6.01 BUILDING SECTIONS
A6.02 BUILDING SECTIONS
A6.03 BUILDING SECTIONS
A6.04 BUILDING SECTIONS
A6.05 BUILDING SECTIONS
A6.06 BUILDING SECTIONS
A6.07 BUILDING SECTIONS
A6.08 WALL/SITE SECTIONS
A6.09 WALL/SITE SECTIONS
A6.10 WALL/SITE SECTIONS
A7.01 ELEVATOR DRAWINGS
A8.01 INTERIOR ELEVATIONS
A8.02 INTERIOR ELEVATIONS

STRUCTURAL
S1.01 GENERAL NOTES
S1.02 STANDARD DETAILS
S2.01 GROUND FLOOR FOUNDATION & FRAMING PLAN
S2.02 FIRST FLOOR FOUNDATION & FRAMING PLAN
S2.03 GYM ROOF & SECOND FLOOR FRAMING PLAN
S2.04 ROOF & ATTIC FRAMING PLAN
S3.01 FOUNDATION DETAILS

MECHANICAL
M1.01 COVER SHEET & INDEX
M1.02 SCHEDULES
M2.01 HVAC GROUND FLOOR PLAN
M2.02 HVAC FIRST FLOOR PLAN
M2.03 HVAC SECOND FLOOR PLAN
M2.04 HVAC ATTIC FLOOR PLAN
M4.01 MECHANICAL ROOM PLANS
M4.02 MECHANICAL SECTIONS
M8.01 MECHANICAL DETAILS
M8.02 LINE DIAGRAMS
FP2.01 FIRE PROTECTION PLANS

PLUMBING
P1.01 PLUMBING DETAILS & SCHEDULES
P2.01 PLUMBING GROUND FLOOR PLAN
P2.02 PLUMBING FIRST FLOOR PLAN
P2.03 PLUMBING SECOND FLOOR PLAN
P2.04 ENLARGED PLUMBING PLANS
P4.01 KITCHEN PLUMBING PLAN
P4.02 ONE-LINE DIAGRAM

ELECTRICAL
E1.00 SITE PLAN
E1.01 LEGEND & SCHEDULES
E1.02 ONE-LINE DIAGRAMS
E1.03 PANEL SCHEDULE
E2.01. LIGHTING GROUND FIRST FLOOR PLAN
E2.02 LIGHTING FIRST FLOOR PLAN
E2.03 LIGHTING SECOND FLOOR PLAN
E3.01 POWER & SIGNAL GROUND FLOOR PLAN
E3.02 POWER & SIGNAL FIRST FLOOR PLAN
E3.03 POWER & SIGNAL SECOND FLOOR PLAN
E4.01 ELECTRICAL PLANS - MECHANICAL ROOMS
E4.02 POWER & SIGNAL KITCHEN PLAN
E5.01 ELECTRICAL DIAGRAMS
E5.02 ELECTRICAL DIAGRAMS

FOOD SERVICE & EQUIPMENT
K1.1 KITCHEN FLOOR PLAN & SCHEDULE
K1.2 KITCHEN DIAGRAMS
R1.1 KITCHEN EQUIPMENT ROUGH-IN PLAN

LANDSCAPE
L1.01 LANDSCAPE SITE PLAN
L2.01 LANDSCAPE IRRIGATION PLAN

PHASING

PHASE 1 (COMPLETED)

A) DEMOLITION: REMOVAL OF COVERED PLAY & GYM/CAFETERIA STRUCTURES
B) INTERIOR NON-STRUCTURAL DEMOLITION

PHASE 2 (UNDERWAY AT TIME OF PHASE 3 BIDDING)

FOUNDATIONS FOR NEW ADDITIONS: CONCRETE PILING, PILE CAPS, GRADE BEAMS & SELECTED CONCRETE FOUNDATION/RETAINING WALLS

PHASE 3 : THIS CONTRACT
MODERNIZATIONS & ADDITIONS

BID PROPOSALS

BASE BID A: MODERNIZATION OF EXISTING AREAS.
BASE BID B: ADDITIONS.
BASE BID C: OFF-SITE WORK.

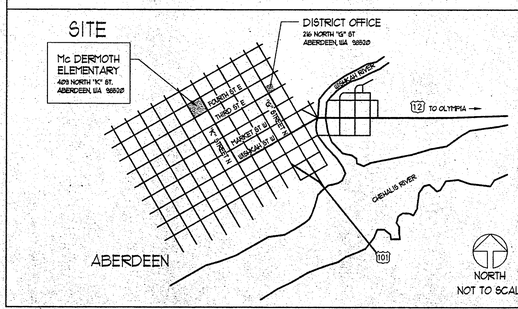
NOTE: BASE BID A, B, AND C BREAKDOWN IS FOR SPI REQUIREMENTS ONLY. ALL (3) WILL BE TAKEN TOGETHER

ADDITIVE ALTERNATES:
- **A1:** FOLD-OUT STAGE.
- **A2:** MOBIL CASEWORK.
- **A3:** ACOUSTIC WALL PANELS.
- **A4:** SECURITY SYSTEM, GYM SOUND SYSTEM, AND HVAC COMPUTER.
- **A5:** SELECTED PLANTERS, BENCHES, AND LANDSCAPING.
- **A6:** GYM WINDOWS, ROOF CANOPY, AND LIBRARY BAY WINDOW.

SUBSTITUTION ALTERNATES:
- **SA1:** GYM WOOD FLOOR.
- **SA2:** VAULTED CEILING AND LIGHT FIXTURES AT ENTRY AND LIBRARY.

DEDUCTIVE ALTERNATES:
- **D1:** CARPET BY OWNER.

VICINITY MAP



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Mc DERMOTH ELEMENTARY
MODERNIZATION & ADDITIONS
ABERDEEN SCHOOL DISTRICT NO. 5 ABERDEEN WASHINGTON

REGISTERED ARCHITECT FRANK SMITH STATE OF WASHINGTON 1888

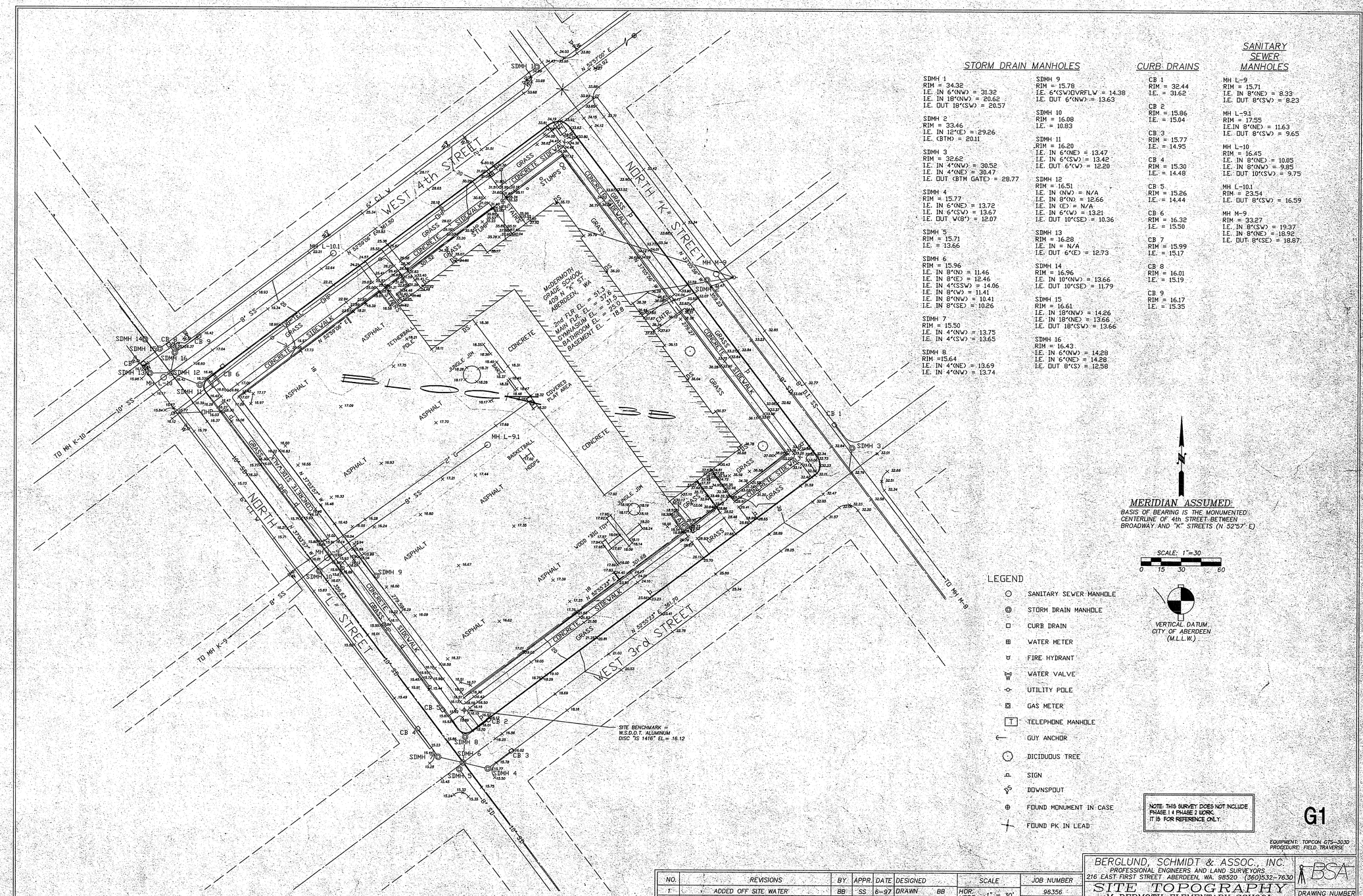
DATE 9/23/97
REVISED
COMM. NO. 961413

The BJSS GROUP
ARCHITECTS & PLANNERS, AIA
320 WEST BAY DRIVE SUITE 212 OLYMPIA WA 98502 (360) 943-4650

10

PHASE 3

T1.01



STORM DRAIN MANHOLES

SDMH 1
RIM = 34.32
I.E. IN 6"(NW) = 31.32
I.E. IN 18"(NW) = 20.62
I.E. OUT 18"(SW) = 20.57

SDMH 2
RIM = 33.46
I.E. IN 12"(E) = 29.26
I.E. (BTM) = 20.11

SDMH 3
RIM = 32.62
I.E. IN 4"(NW) = 30.52
I.E. IN 4"(NE) = 30.47
I.E. OUT (BTM GATE) = 28.77

SDMH 4
RIM = 15.77
I.E. IN 6"(NE) = 13.72
I.E. IN 6"(SW) = 13.67
I.E. OUT W(8") = 12.07

SDMH 5
RIM = 15.71
I.E. = 13.66

SDMH 6
RIM = 15.96
I.E. IN 8"(N) = 11.46
I.E. IN 8"(E) = 12.46
I.E. IN 4"(SSW) = 14.06
I.E. IN 8"(W) = 11.41
I.E. IN 8"(NW) = 10.41
I.E. IN 8"(SE) = 10.26

SDMH 7
RIM = 15.50
I.E. IN 4"(NW) = 13.75
I.E. IN 4"(SW) = 13.65

SDMH 8
RIM =15.64
I.E. IN 4"(NE) = 13.69
I.E. IN 4"(NW) = 13.74

SDMH 9
RIM = 15.78
I.E. 6"(SW)DVRFLW = 14.38
I.E. OUT 6"(NW) = 13.63

SDMH 10
RIM = 16.08
I.E. = 10.83

SDMH 11
RIM = 16.20
I.E. IN 6"(NE) = 13.47
I.E. IN 6"(SW) = 13.42
I.E. OUT 6"(W) = 12.20

SDMH 12
RIM = 16.51
I.E. IN (NW) = N/A
I.E. IN 8"(N) = 12.66
I.E. IN (E) = N/A
I.E. IN 6"(W) = 13.21
I.E. OUT 10"(SE) = 10.36

SDMH 13
RIM = 16.28
I.E. IN = N/A
I.E. OUT 6"(E) = 12.73

SDMH 14
RIM = 16.96
I.E. IN 10"(NW) = 13.66
I.E. OUT 10"(SE) = 11.79

SDMH 15
RIM = 16.61
I.E. IN 18"(NW) = 14.26
I.E. IN 18"(NE) = 13.66
I.E. OUT 18"(SW) = 13.66

SDMH 16
RIM = 16.43
I.E. IN 6"(NW) = 14.28
I.E. IN 6"(NE) = 14.28
I.E. OUT 8"(S) = 12.58

CURB DRAINS

CB 1
RIM = 32.44
I.E. = 31.62

CB 2
RIM = 15.86
I.E. = 15.04

CB 3
RIM = 15.77
I.E. = 14.95

CB 4
RIM = 15.30
I.E. = 14.48

CB 5
RIM = 15.26
I.E. = 14.44

CB 6
RIM = 16.32
I.E. = 15.50

CB 7
RIM = 15.99
I.E. = 15.17

CB 8
RIM = 16.01
I.E. = 15.19

CB 9
RIM = 16.17
I.E. = 15.35

SANITARY SEWER MANHOLES

MH L-9
RIM = 15.71
I.E. IN 8"(NE) = 8.33
I.E. OUT 8"(SW) = 8.23

MH L-9.1
RIM = 17.55
I.E.IN 8"(NE) = 11.63
I.E. OUT 8"(SW) = 9.65

MH L-10
RIM = 16.45
I.E. IN 8"(NE) = 10.05
I.E. IN 8"(NW) = 9.85
I.E. OUT 10"(SW) = 9.75

MH L-10.1
RIM = 23.54
I.E. OUT 8"(SW) = 16.59

MH M-9
RIM = 33.27
I.E. IN 8"(SW) = 19.37
I.E. IN 8"(NE) = 18.92
I.E. OUT 8"(SE) = 18.87

MERIDIAN ASSUMED:

BASIS OF BEARING IS THE MONUMENTED CENTERLINE OF 4th STREET BETWEEN BROADWAY AND "K" STREETS (N 52°57' E)

SCALE: 1"=30
0 15 30 60

VERTICAL DATUM: CITY OF ABERDEEN (M.L.L.W.)

LEGEND

- SANITARY SEWER MANHOLE
- STORM DRAIN MANHOLE
- CURB DRAIN
- WATER METER
- FIRE HYDRANT
- WATER VALVE
- UTILITY POLE
- GAS METER
- TELEPHONE MANHOLE
- GUY ANCHOR
- DICIDUOUS TREE
- SIGN
- DOWNSPOUT
- FOUND MONUMENT IN CASE
- FOUND PK IN LEAD

NOTE: THIS SURVEY DOES NOT INCLUDE PHASE I & PHASE 2 WORK. IT IS FOR REFERENCE ONLY.

G1

EQUIPMENT: TOPCON GTS-303D
PROCEDURE: FIELD TRAVERSE

NO.	REVISIONS	BY	APPR	DATE
1	ADDED OFF SITE WATER	BB	SS	6-97

DESIGNED
DRAWN BB
CHECKED SAS
APPROVED

SCALE
HOR. 1" = 30'
VERT.
FIELD BOOK 3-E & D.C.

JOB NUMBER 96356
DATE 10-22-96

BERGLUND, SCHMIDT & ASSOC., INC.
PROFESSIONAL ENGINEERS AND LAND SURVEYORS
216 EAST FIRST STREET ABERDEEN, WA. 98520 (360)532-7630

SITE TOPOGRAPHY
McDERMOTH ELEMENTARY SCHOOL

FOR: ABERDEEN SCHOOL DISTRICT
ABERDEEN, WA. 98520

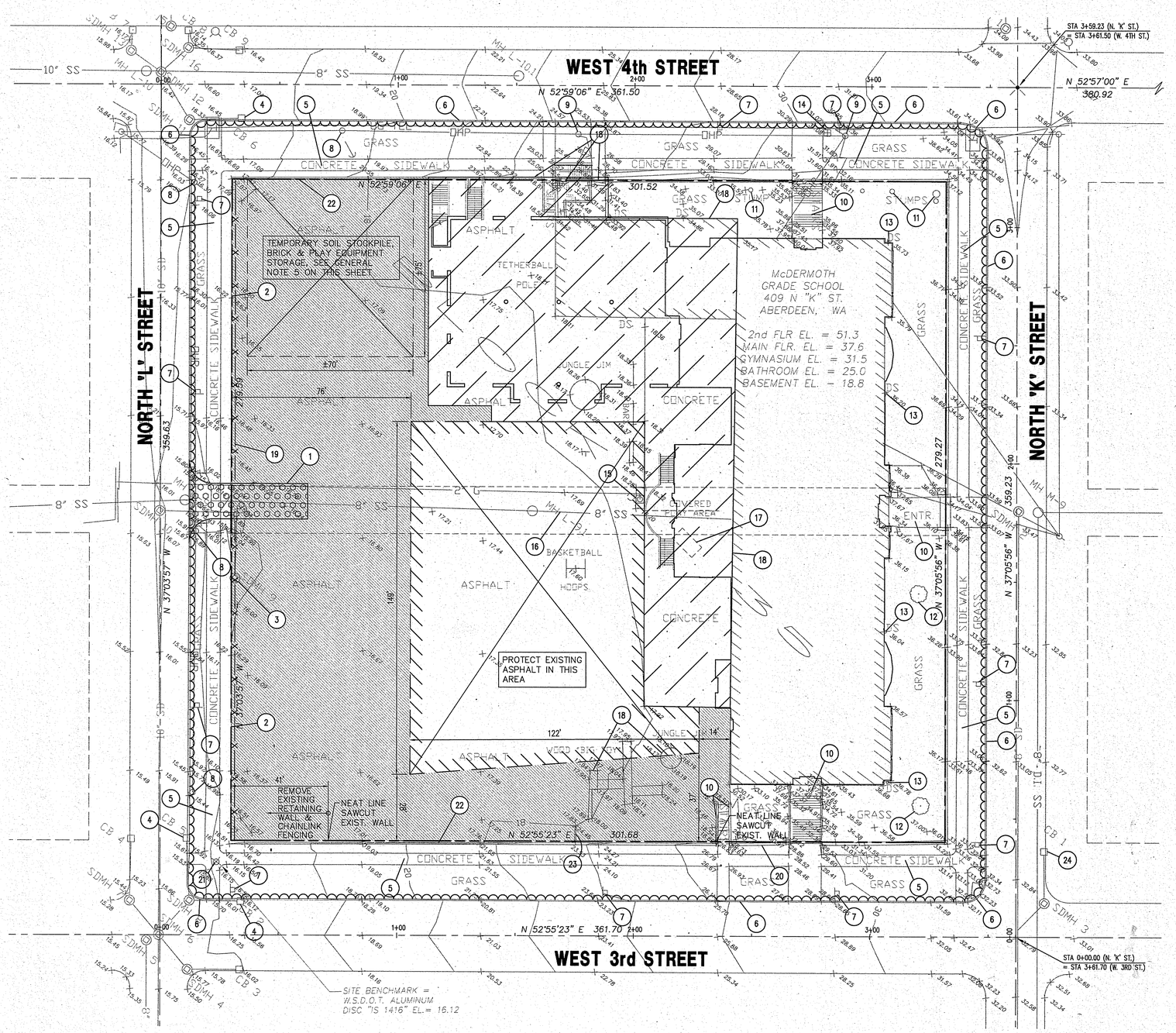
BSA

DRAWING NUMBER

SHEET 1 OF 1

D:\AD\Mcdermoth\consult\survey\96356 10:53:45 08/28/97

A PORTION OF SECTION 8, TOWNSHIP 17, N., RANGE 9, W., W.M.
ABERDEEN, WASHINGTON



GRAPHIC SCALE

20 0 10 20 40 60

(IN FEET)
1 inch = 20 ft.

BASIS OF BEARING:
BASIS OF BEARING IS THE MONUMENTED CENTERLINE OF W. 4TH STREET BETWEEN BROADWAY AND N. "K" STREETS (N 52° 57' 00" E)

BENCH MARK
WSDOT ALUMINUM DISK
"IS 1416" EL=16.12
LOCATED IN SIDEWALK AT N.E. CORNER OF N. "L" ST. AND W. 3RD ST. INTERSECTION.

SURVEY BY:
BERGLUND, SCHMIDT & ASSOC., INC,
216 EAST FIRST STREET
ABERDEEN, WA 98520
PHONE: (360) 532-7630

DATUM:
CITY OF ABERDEEN M.L.L.W.

GEOTECHNICAL REPORT BY:
GILES ENGINEERING ASSOC., INC,
19019 36TH AVENUE WEST, SUITE G
LYNNWOOD, WA 98036
PHONE (206) 771-5775
FAX (206) 771-5557
PROJECT NO. 6G-9701013

TESC & DEMOLITION KEYNOTES:

1. TEMPORARY CONSTRUCTION ENTRANCE AS PER DETAIL 3/C5 LOCATE AT EXISTING SITE ENTRANCE.
2. DEMOLISH EXISTING FENCING AT WEST PROPERTY LINE.
3. DEMOLISH EXISTING MANHOLE. REMOVE INLET AND OUTLET PIPES TO PROPERTY LINE. PLUG REMAINING PIPES WITH GROUT. REMOVE EXISTING MANHOLE TO 2' MIN. BELOW PROPOSED GRADES AND FILL REMAINING PORTION WITH GENERAL SITE FILL.
4. PROVIDE INLET SEDIMENT BARRIER AS PER DETAIL 9/C5
5. DEMOLISH EXISTING OFFSITE SIDEWALKS ON ALL FOUR SIDES OF BUILDING.
6. DEMOLISH EXISTING OFFSITE CONCRETE CURBING. REFERENCE SHEET C2 FOR LIMITS OF CURBING REMOVAL.
7. REMOVE AND RELOCATE EXISTING SIGN AS REQUIRED TO PERFORM WORK. SIGN LOCATION SHALL CONFORM TO CITY OF ABERDEEN STANDARDS AND MUTCD. IF EXISTING POST IS WOOD THEN REPLACE AS PER CITY STANDARDS.
8. PRESERVE AND PROTECT EXISTING POWER POLE AND DEAD MAN WIRE.
9. RELOCATE EXISTING POWER POLE. WORK DONE BY UTILITY CO. CONTRACTOR SHALL COORDINATE WORK WITH UTILITY CO. PROVIDE 10 WORKING DAYS ADVANCED NOTICE TO UTILITY CO. OF RELOCATION REQUIREMENT. CONTACT WALLY WEIDMAN (360) 538-6324 FOR ASSISTANCE.
10. DEMOLISH EXISTING CONCRETE/WOOD STAIRS/RETAINING WALL, REF. ARCH. CAUTION: DO NOT DEMOLISH/DISTURB TUNNEL BELOW STAIRS AT NORTH AND SOUTH ENTRIES. CONTRACTOR SHALL PROVIDE TEMPORARY SHORING OF EARTH EMBANKMENT AND ANY ADJACENT IMPROVEMENTS AS REQUIRED WHEN REMOVING RETAINING WALLS AND STAIRWAYS.
11. REMOVE EXISTING TREE STUMPS. REF. ARCH.
12. PRESERVE AND PROTECT EXISTING TREE. REFERENCE PROJECT SPEC. SEC. 02065-3.1, D.
13. DISCONNECT (4) EXISTING ROOF DRAINS FROM EXISTING DOWNSPOUT. REMOVE ROOF DRAIN LINE TO 10' FROM BUILDING. PLUG REMAINING PIPE WITH MORTAR. PRESERVE AND PROTECT EXISTING DOWNSPOUT.
14. EXISTING WATER METER TO BE RELOCATED PER C3. WORK DONE BY CITY OF ABERDEEN WATER DEPT. CONTRACTOR SHALL STAKE NEW LOCATION. REFERENCE SHEET C3 FOR NEW LOCATION. PROVIDE 10 WORKING DAYS ADVANCED NOTICE TO WATER DEPT. OF METER RELOCATION REQUIREMENT. CONTACT PAT DYER 1-360-533-4100 EXT. 273 FOR ASSISTANCE.
15. GAS METER TO BE RELOCATED. WORK DONE BY CASCADE NATURAL GAS CO. CONTRACTOR SHALL COORDINATE WORK WITH GAS CO. PROVIDE 10 WORKING DAYS ADVANCED NOTICE TO GAS CO. OF RELOCATION REQUIREMENT. CONTACT JOHN HUBLER AT 1-360-532-2540.
16. ABANDON EXISTING SANITARY SEWER STUB IN PLACE. PLUG PIPE AT MANHOLE (MH#L-9.1).
17. APPROXIMATE LOCATION OF PREVIOUSLY ABANDONED UNDERGROUND TANK. TOP OF TANK IS APPROXIMATELY 30" BELOW GRADE. UNDERGROUND DIESEL "STARTER TANK" MAYBE PRESENT IN SAME VICINITY BELOW GRADE. IF ENCOUNTERED, THE STARTER TANK SHALL BE REMOVED.
18. BUILDINGS, RETAINING WALLS, STAIRWAYS, PLAYGROUND EQUIPMENT, AND PAVEMENT IN THESE AREAS REMOVED BY OTHERS UNDER PHASE 1&2. REFERENCE ARCH. PLAN SHEET A6.09 FOR ADDITIONAL RETAINING WALL DEMO UNDER THIS CONTRACT.
19. PROVIDE ±277LF FILTER FABRIC FENCING. 7/C5 SEE GENERAL NOTE 4 ON THIS SHEET.
20. DEMOLISH ±25LF OF EXISTING ROCK/CONCRETE WALL TO 30" BELOW PROPOSED FINISH GRADE. SALVAGE ROCK FACING TO BE UTILIZED IN REPAIRS OF ROCK WALL AT OTHER LOCATIONS (REF. ARCH.).
21. PRESERVE AND PROTECT EXISTING MONUMENT. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO OBTAIN ANY AND ALL REQUIRED PERMITS FOR THE TEMPORARY REMOVAL AND REPLACEMENT OF EXISTING MONUMENTS IN ACCORDANCE WITH WAC 332-120. CONTACT TED SMITH, DNR PUBLIC LAND SURVEY OFFICE, 1-360-902-1190 FOR ASSISTANCE.
22. PRESERVE AND PROTECT EXISTING RETAINING WALL AND CHAINLINK FENCING AT NORTH AND SOUTH SIDES OF PLAYGROUND.
23. PRESERVE AND PROTECT EXISTING CONCRETE WALL BUTTRESS.

GENERAL NOTES

1. REFERENCE SHEET C4 AND C5 FOR EROSION CONTROL NOTES, DETAILS AND LEGEND.
2. REFERENCE SHEET C2 FOR FINISH GRADES AND LIMITS OF WORK IN RIGHT-OF-WAY.
3. A PERMIT IS REQUIRED FOR ALL WORK WITHIN THE RIGHT-OF-WAY.
4. CONTRACTOR SHALL REMOVE AND RELOCATE FILTER FABRIC FENCING PLACED DURING PHASE 2. RELOCATE TO WEST PROPERTY LINE.
5. ALL SOIL STOCKPILES SHALL BE COVERED WITH PLASTIC SHEETING AND ANCHORED IN PLACE TO PREVENT EROSION.
6. CONTRACTOR SHALL UTILIZE A TEMPORARY SANDBAG BERM OR OTHER MEANS TO DIVERT SURFACE WATER FROM THE PAVED ROADWAY AWAY FROM EXCAVATED AREAS ON WEST 4TH ST. AND N. 'K' ST. ONCE THE EXISTING CURBING HAS BEEN REMOVED. DO NOT ALLOW RUNOFF FROM EXCAVATED OFFSITE AREAS TO ENTER THE ROADWAY WITHOUT FIRST PASSING THROUGH A SEDIMENT TRAP OR FILTER FABRIC FENCING.

ALL OFFSITE WORK UNDER BASE BID 'C' TO MEET SPI BIDDING REQUIREMENT

CALL 48 HOURS BEFORE YOU DIG 1-800-424-5555

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UPDATED SEP 22 1997 10:43:48 PLOTTED SEP 22 1997 10:45:59

Mc DERMOTH ELEMENTARY
ABERDEEN SCHOOL DISTRICT NO. 5 ABERDEEN WASHINGTON

GEORGE J. LINDAUER — STATE OF WASHINGTON — PROFESSIONAL ENGINEER
EXPIRES 7/23/99

DATE	REVISED	COMM. NO.
BID SET SEPT. 23, 1997		960409

The BJSS GROUP
ARCHITECTS & PLANNERS, AIA
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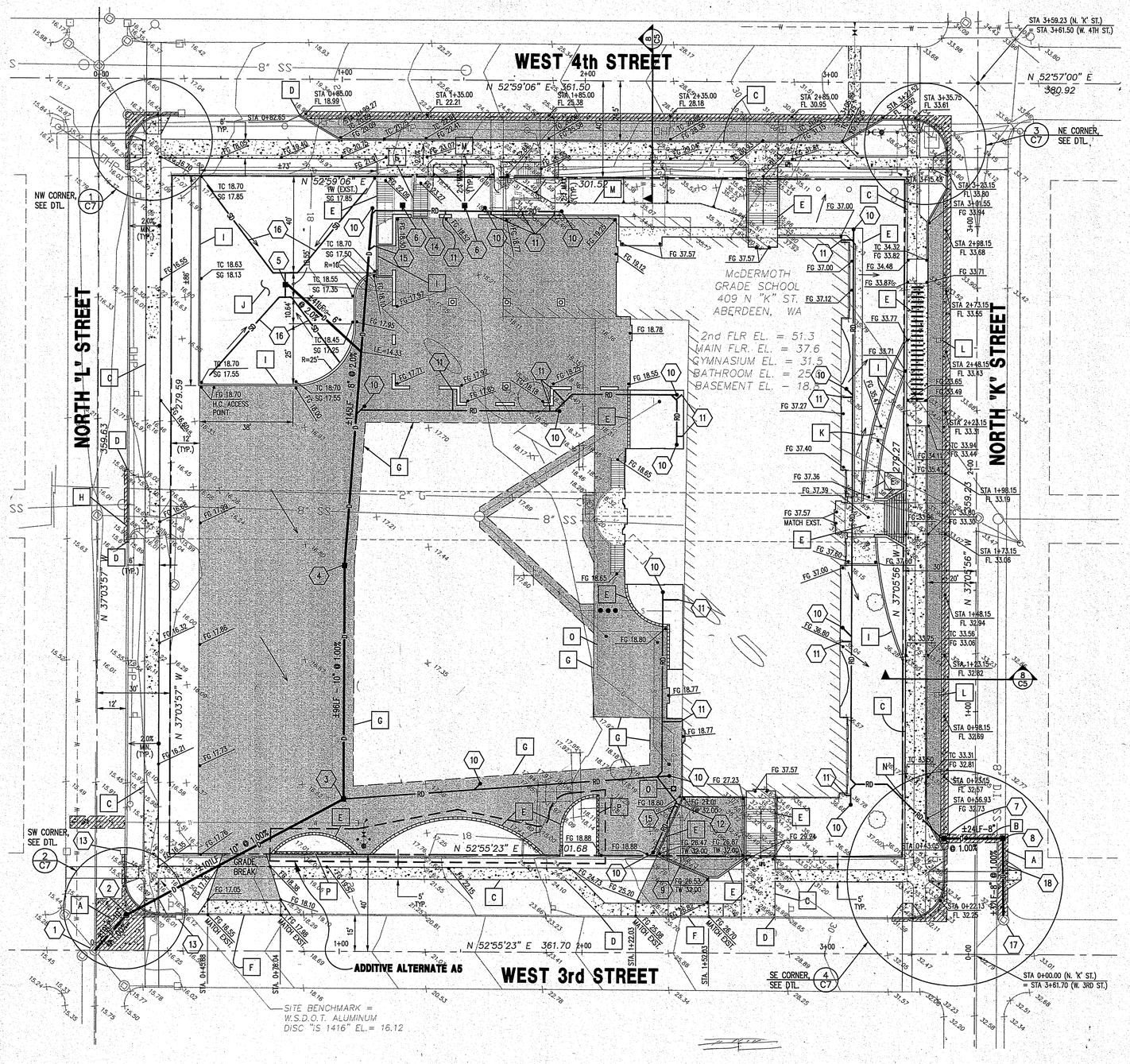
PHASE 3
T.E.S.C. AND SITE DEMOLITION PLAN

C1

A PORTION OF SECTION 8, TOWNSHIP 17 N., RANGE 9 W., W.M.
ABERDEEN, WASHINGTON



GRAPHIC SCALE
20 0 10 20 40 60
(IN FEET)
1 inch = 20 ft.

STORM DRAINAGE KEY NOTES

1. SDMH#1 (EXISTING–FIELD VERIFY RIM & INVERTS PRIOR TO CONST.)
   RIM = 15.96
   I.E. IN = 11.46 (8" N.–EXISTING TO BE REMOVED .AND REPLACED WITH 10"–I.E.= 10.41)
   I.E. IN = 12.46 (8" E., EXISTING)
   I.E. IN = 14.06 (4" SSW, EXISTING)
   I.E. IN = 11.41 (8" W., EXISTING)
   I.E. IN = 10.41 (10" NW, EXISTING)
   I.E. OUT = 10.26 (10" SE, EXISTING)
2. SDMH#2 (EXISTING–FIELD VERIFY RIM & INVERTS PRIOR TO CONST.)
   NOTE: REPLACE EXISTING MH WITH NEW TYPE–2, (48") CATCH BASIN–W/FRAME & GRATE
   RIM = 15.80
   I.E. IN = 13.69 (4"–NE, EXISTING)
   I.E. IN = 13.74 (4"–NW, EXISTING)
   I.E. IN = 10.60 (10"–NNE, NEW)
   I.E. OUT = 10.60 (10"–SSW, NEW, TO REPLACE EXISTING)
3. CB#3–TYPE I STA. 1+01.56 (W. 3RD ST.), 63' LT.
   RIM = 16.50
   I.E. IN = 11.61 (10", NW)
   I.E. IN = 11.61 (6", NE)
   I.E. OUT = 11.61 (10", SW)
4. CB#4–TYPE I STA. 1+01.56 (W. 3RD ST.), 158' LT.
   RIM = 16.75
   I.E. IN = 12.57 (8", NW)
   I.E. OUT = 12.57 (10", SE)
5. CB#5–TYPE 40 AREA DRAIN
   PROVIDE GRATED LID, WRAP LID WITH FILTER FABRIC
   RIM = 16.75
   I.E. IN = 15.15 (4", NW, SE)
   I.E. OUT = 15.15 (6", SE)
6. CB#6–TYPE 40 AREA DRAIN W/GRATED LID
   RIM = 18.00
   I.E. = 16.50 (6", SE)
7. CB#7–TYPE I STA. 0+47.70 (N. "K" ST.), 12.5' LT.
   RIM = 32.35 (DEPRESS RIM 0.1' BELOW SURROUNDING FINISHED GRADES)
   I.E. IN = 29.33 (6", W)
   I.E. OUT = 29.33 (8", E)
8. CB#8–TYPE I, STA. 0+47.70 (N. "K" ST.) 11.75' RT.
   (CENTER OF GRATE 0.75' FROM FACE OF CURB)
   RIM = ±32.54 (MATCH EXISTING GRADE)
   I.E. IN = 29.09 (8",SW)
   I.E. OUT = 29.09 (8", SE)
9. ±22 LF–TRENCH DRAIN PER SPECIFICATIONS
   SLOPE DRAIN FROM EAST TOWARD WEST AT 1.00% MIN. SLOPE.
   PROVIDE 6" MIN. DIAM. TIGHTLINE CONNECTION TO PROPOSED 6" DRAIN AT TOE OF RETAINING WALL. REFERENCE ARCH. (A6.08) FOR SLEEVING THRU WALL.
10. PROVIDE CLEAN–OUT AS PER DETAIL 2/C6
11. PROVIDE STUB–UP AND CONNECTION TO EXISTING/PROPOSED DOWNSPOUT. DIAMETER OF STUB–UP SHALL MATCH EXISTING/PROPOSED DOWNSPOUT DIAMETER. OFFSETS ARE NOT ALLOWED. SEE NOTES 4 AND 5 OF STORM DRAINAGE NOTES ON SHEET C4. REFERENCE ARCH. FOR EXACT DOWNSPOUT LOCATIONS.
12. PROVIDE CONNECTION OF RECYCLE CAN WASH DRAIN TO PROPOSED DRAIN AT TOE OF RETAINING WALL. 2.00% MIN. SLOPE. REFERENCE ARCH. (A6.08) FOR SLEEVING THRU WALL.
13. CLEAN EXISTING CATCH BASIN. FLUSH EXISTING OUTLET PIPES.
14. ±5 LF – TRENCH DRAIN PER SPECIFICATIONS, RIM = 18.37. CONNECT DRAIN OUTLET TO PROPOSED ROOF DRAIN.
15. CONNECT FOOTING DRAIN. APPROXIMATE FOOTING DRAIN I.E. = 17.63 AT GYMNASIUM. REFERENCE ARCH. (A6–08) FOR WALL SLEEVING AT RECYCLE AREA RETAINING WALL.
16. PROVIDE ±180 LF – 4" DIAM. PERFORATED RIGID PVC. WRAP PIPE WITH FILTER FABRIC (MIRAFI 100NS OR EQUAL). PIPE SHALL BE LAID ON TOP OF SUBGRADE. CONNECT PERFORATED PIPE TO CB#5 WITH 4" DIAM. TIGHTLINE STUBS.
17. CONNECT TO EXISTING CB.
    I.E. = 28.77 (FIELD VERIFY PROPOSED INVERT IS ATTAINABLE, NOTIFY ENGINEER IF CONFLICT EXISTS)
18. DEMOLISH EXISTING CB. REMOVE EXISTING 4" DIAM. PIPE TO EXISTING SDMH 3.

BENCH MARK

WSDOT ALUMINUM DISK
"IS 1416" EL=16.12
LOCATED IN SIDEWALK AT N.E. CORNER OF N. "L" ST. AND W. 3RD ST. INTERSECTION.

DATUM:

CITY OF ABERDEEN M.L.L.W.

BASIS OF BEARING:

BASIS OF BEARING IS THE MONUMENTED CENTERLINE OF W. 4TH STREET BETWEEN BROADWAY AND N. "K" STREETS (N 52°57'00" E)

SURVEY BY:

BERGLUND, SCHMIDT & ASSOC., INC,
216 EAST FIRST STREET
ABERDEEN, WA 98520
PHONE: (360) 532–7630

GEOTECHNICAL REPORT BY:

GILES ENGINEERING ASSOC., INC,
19019 36TH AVENUE WEST, SUITE G
LYNNWOOD, WA 98036
PHONE (206) 771–5775
FAX: (206) 771–5557
PROJECT NO. 6G–9701013

MISCELLANEOUS KEY NOTES

- A UTILITY TRENCH SHALL BE AS PER DETAIL 2/C5
- B SAWCUT CONCRETE PAVEMENT. PATCH PAVEMENT AS PER DETAIL 4/C5. LOCATE SAWCUT AT NEAREST EXISTING PAVEMENT JOINT.
- C NEW CEMENT CONCRETE WALKWAY. NEW WALKWAYS SHALL BE AS PER CITY OF ABERDEEN STANDARDS. SEE DETAIL 6 ON SHEET C5 ALSO. REFERENCE CITY OF ABERDEEN STD. DETAIL B13A. WIDTH AS INDICATED ON PLANS.
- D MATCH EXISTING TOP OF CURB ELEVATION.
- E REFERENCE ARCHITECTURAL PLANS & SPECIFICATIONS FOR ALL ON–SITE WALKWAYS, STAIRWAYS, RETAINING WALLS AND SEATWALLS.
- F PROVIDE 30' WIDE CEMENT CONCRETE DRIVEWAY AS PER CITY OF ABERDEEN STANDARDS. REFERENCE CITY OF ABERDEEN STANDARD DETAIL B15A. THICKNESS SHALL BE 8" MIN.
- G FINISHED GRADE OF NEW ASPHALT TO MATCH EXISTING. PROVIDE SEALER AT JOINT PER SPECIFICATIONS. REFERENCE SHEET C1 FOR SAWCUT AND REMOVAL LIMITS. SEE DETAIL 1 ON SHEET C5 FOR PAVING SECTION REQUIREMENTS.
- H ABANDON EXISTING DRIVEWAY. PROVIDE ±30LF OF NEW CEMENT CONCRETE CURBING AS PER DETAIL 5 ON SHEET C7 AND THE CITY OF ABERDEEN STANDARDS. MATCH EXISTING CURBING ELEVATIONS.
- I PROVIDE CEMENT CONCRETE CURB, REFERENCE ARCHITECTURAL PLANS FOR DETAIL.
- J 12" DEPTH WOODCHIPS IN PLAY AREA BY OWNER.
- K 5' X 5' LEVEL LANDING. REFERENCE ARCH. FOR DETAILS ON RAMP.
- L REMOVE AND RELOCATE EXISTING SIGNS AS REQUIRED. RELOCATED SIGNS SHALL CONFORM TO THE MUTCD AND THE CITY OF ABERDEEN STANDARDS.
- M APPROXIMATE LOCATION OF TOP OF FILL/CUT SLOPE. MAINTAIN 3' MIN. SETBACK FROM EDGE OF WALKWAY TO TOP OF SLOPE. ROUND TOP OF SLOPE SUFFICIENTLY TO PREVENT SLOPE RAVELING.
- N REMOVE AND REPLACE EXISTING ROCKWALL TO PLACE NEW STORM DRAIN OR BORE UNDER WALL.
- O APPROXIMATE LOCATION OF NEW GAS LINE AND METER. CONTRACTOR SHALL COORDINATE LOCATION WITH GAS CO.
- P PROVIDE 18" HIGH CMU INTERLOCKING TYPE WALL (ALLAN BLOCK JUNIOR OR APPROVED EQUAL.) FILL CMU VOIDS WITH PEA STONE AND PROVIDE CAP STONE AT TOP OF WALL.

GENERAL NOTES

1. REFERENCE SHEET C4 FOR LEGEND.
2. REFERENCE SHEET C4 FOR STORM DRAINAGE NOTES.
3. PROVIDE CB WATER QUALITY INSERTS 5/C5
   1–EACH AT CB#3 AND CB#4.

ALL OFFSITE WORK UNDER BASE BID 'C' TO MEET SPI BIDDING REQUIREMENT

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CREATED JUL 30 1997 09:51:36
UPDATED SEP 02 1997 11:05:49
PLOTTED SEP 02 1997 13:34:01

Mc DERMOTH ELEMENTARY
ABERDEEN SCHOOL DISTRICT NO. 5 ABERDEEN WASHINGTON

CHARLES J. FINDLEY
STATE OF WASHINGTON
REGISTERED PROFESSIONAL ENGINEER
EXPIRES 7/23/99

DATE	REVISED	COMM. NO.
BID SET SEPT 23, 1997		960409

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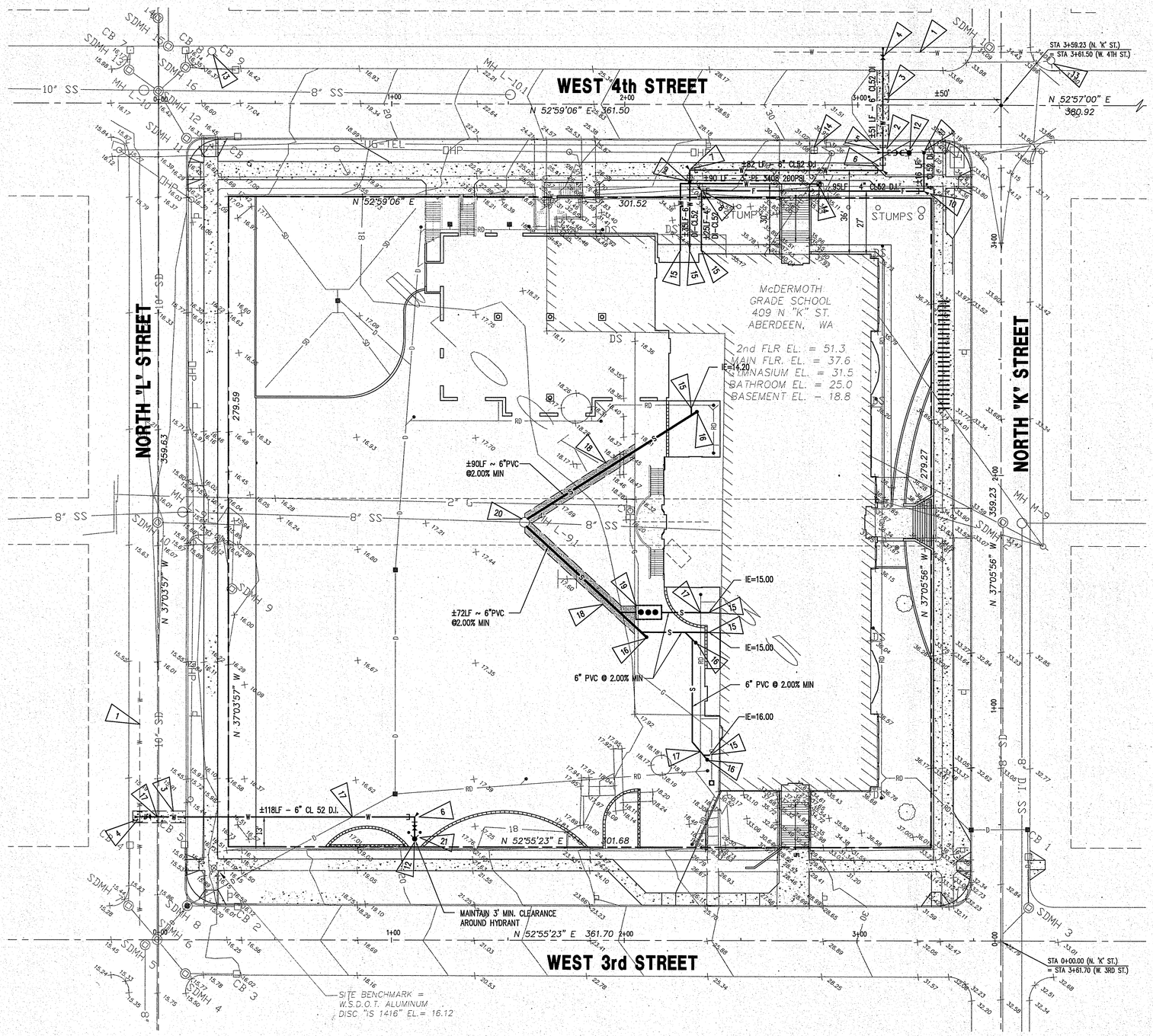
320 WEST BAY DRIVE SUITE 212 OLYMPIA WA 98502 (360) 943–4650

PHASE 3
STORM DRAINAGE GRADING & PAVING AND OFFSITE IMPROVEMENTS PLAN

C2

A PORTION OF SECTION 8, TOWNSHIP 17, N., RANGE 9, W., W.M.
ABERDEEN, WASHINGTON



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DATUM:

CITY OF ABERDEEN M.L.L.W.

GEOTECHNICAL REPORT BY:

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19019 36TH AVENUE WEST, SUITE G
LYNNWOOD, WA 98036
PHONE (206) 771-5775
FAX: (206) 771-5557
PROJECT NO. 60-9701013

SANITARY SEWER & WATER KEY NOTES:

1. APPROXIMATE LOCATION OF EXISTING 6"C.I WATER MAIN. FIELD VERIFY LOCATION PRIOR TO CONSTRUCTION.
2. APPROXIMATE LOCATION OF EXISTING TELEPHONE CONDUIT. FIELD VERIFY LOCATION PRIOR TO CONSTRUCTION. MAINTAIN 6" MIN. VERTICAL AND 3' MIN. HORIZONTAL SEPERATION BETWEEN WATER MAIN AND TELEPHONE CONDUIT. NOTIFY ARCHITECT IMMEDIATELY IF THESE CONDITIONS CANNOT BE ACHIEVED.
3. SAWCUT AND PATCH EXISTING CEMENT CONCRETE ROADWAY AS PER DETAIL. BACKFILL OF TRENCH SHALL CONFORM TO DETAIL 2 ON SHEET C5. SEE ALSO NOTE 12 OF GENERAL NOTES ON SHEET C4. (4/C5)
4. CONNECT TO EXISTING WATER MAIN:
   1 – 6" MJ TAPPING VALVE ASSEMBLY
   1 – CONCRETE THRUST BLOCK
   SEE NOTE 7 OF WATER SYSTEM NOTES ON SHEET C4. (6/C6)
5. 1 – 6"x6" TEE (MJxMJ)
   1 – 6" DI, CL52 SPOOL (LENGTH AS NEEDED)
   1 – CONCRETE THRUST BLOCK
6. 1 – 6", 90° ELL (MJxMJ)
   1 – CONCRETE THRUST BLOCK
7. 1 – 6", 90° ELL (MJxMJ)
   1 – CONCRETE THRUST BLOCK
8. 1 – 6"x4" TEE (FLxFL)
   1 – 6" MJ ADAPTOR
   1 – 4" MJ ADAPTOR
   1 – CONCRETE THRUST BLOCK
9. MONITORED P.I.V. (MJxMJ)
   1 – 6" DI, CL52 SPOOL (LENGTH AS NEEDED)
   NOTE:
   LOCATE VALVE 2–FEET SOUTH OF SOUTH EDGE OF PROPOSED SIDEWALK. PROVIDE 2' SQUARE CONCRETE PAD AROUND VALVE. COORD. LOCATION AND INSTALLATION WITH FIRE ALARM (ELEC.) PLANS.
10. 1 – 4" 90° ELL (MJxMJ)
    1 – CONCRETE THRUST BLOCK
11. 1 – F.D.C.
    (STA. 3+28.50, 20.5' RT.). MAINTAIN 3' MIN. RADIAL CLEARANCE FOR HOSE CONNECTIONS.
12. PROVIDE HYDRANT ASSEMBLY (5/C6) W. 4TH ST. – STA. 3+22.00, 20.5' RT.
    W. 3RD ST. – STA. 1+10.00, 43' LT.
13. PROVIDE 4" STORZ ADAPTOR ON EXISTING HYDRANT PUMPER PORT, (2 LOCATIONS).
14. RELOCATE EXISTING DOMESTIC WATER METER. WORK DONE BY CITY. CONTRACTOR SHALL STAKE NEW LOCATION STA. 2+83.00, 34' RT.
15. CONNECT TO BUILDING STUB-OUT. PROVIDE ADAPTOR AS REQUIRED TO MATCH BUILDING STUB-OUT SIZE. REFERENCE MECH. & ARCH. PLANS FOR EXACT LOCATION AND ELEVATION OF TIE-IN.
16. SEWER CLEAN OUT AS PER DETAIL (2/C6)
17. COORDINATE STORM/SEWER CROSSING. MAINTAIN 0.5' MIN. VERTICAL CLEARANCE.
18. SAW CUT AND PATCH EXISTING ASPHALT. PROVIDE 2" MIN. DEPTH CL-B ASPHALT. SEAL ALL PAVEMENT SEAMS AND AROUND MANHOLE RIM WITH EMULSIFIED ASPHALT SEALER.
19. PROVIDE GREASE INTERCEPTOR IN BELOW GRADE VAULT AS PER (3/C6).
    RIM = 18.60 (MAN HOLE ACCESS RIMS)
    IE OUT = 15.77 (MAX.)
    MAINTAIN A MINIMUM OF 1' DEPTH OF COVER OVER VAULT.
20. CORE DRILL EXISTING SSMH. CONNECT TWO NEW SEWER STUBS.
    IE IN =12.40(6", N&E)
    RECHANNEL MANHOLE AS REQUIRED. CONTRACTOR SHALL KEEP EXISTING PIPES CLEAN DURING CONSTRUCTION.
21. PROVIDE 2 HYDRANT BOLLARDS. REFERENCE ARCH. FOR BOLLARD DETAIL.

FIRE PROTECTION NOTES

THE FIRE PROTECTION SYSTEM INCLUDING MATERIALS, SIZING, AND CONFIGURATION IS SUBJECT TO A DESIGN BY A FIRE PROTECTION ENGINEER, AND AS SUCH, THE FINAL DESIGN OF THE FIRE PROTECTION SYSTEM, INCLUDING HYDRANT LOCATIONS, MAY DEVIATE FROM THE SYSTEM SHOWN. THE FINAL DESIGN SHALL BE SUBMITTED TO AND APPROVED BY THE FIRE MARSHALL. CONTRACTOR'S BID SHALL REFLECT THE CONDITIONS OF THE FIRE PROTECTION ENGINEER'S DESIGN. CONTRACTOR SHALL COMPLY WITH ALL NATIONAL FIRE PROTECTION ASSOCIATION REQUIREMENTS AS SET FORTH BY "NFPA 13", ITS AMENDMENTS, AND LOCAL REQUIREMENTS, INCLUDING BUT NOT LIMITED TO ACQUISITION OF ALL PERMITS.

GENERAL NOTES:

1. REFERENCE SHEET C4 FOR SANITARY SEWER AND WATER SYSTEM NOTES, DETAILS AND LEGEND.
2. A PERMIT IS REQUIRED FOR WORK WITHIN THE RIGHT OF WAY.
3. ALL UTILITY TRENCHING AND BACKFILL SHALL CONFORM TO DETAIL 2 ON SHEET C5.
4. BACKFLOW PREVENTOR SHALL BE PROVIDED INSIDE THE BUILDING – SEE MECH. PLANS.

ALL OFFSITE WORK UNDER BASE BID 'C' TO MEET SPI BIDDING REQUIREMENT

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Mc DERMOTH ELEMENTARY
ABERDEEN SCHOOL DISTRICT NO. 5 — ABERDEEN WASHINGTON

GEORGE J. LINDSAY — STATE OF WASHINGTON — REGISTERED PROFESSIONAL ENGINEER
EXPIRES 7/23/99

DATE	REVISED	CDMM. NO.
BID SET SEPT. 23, 1997		960409

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PHASE 3 WATER AND SEWER PLAN

C3

FILENAME N:\C\96388\96388-C3.DWG CREATED JUL 30 1997 09:51:36
UPDATED SEP 22 1997 10:53:09 PLOTTED SEP 22 1997 11:09:54

A PORTION OF SECTION 8, TOWNSHIP 17 N., RANGE 9 W., W.M.
ABERDEEN, WASHINGTON

GENERAL CONSTRUCTION NOTES:

1. UNLESS OTHERWISE SPECIFIED, ALL MATERIALS AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS, THE REQUIREMENTS OF THE LATEST ADOPTED EDITION OF THE WASHINGTON DEPARTMENT OF TRANSPORTATION (WSDOT) STANDARD PLANS AND SPECIFICATIONS FOR ROAD, BRIDGE, AND MUNICIPAL CONSTRUCTION, AND THE STANDARDS AND REQUIREMENTS OF THE LOCAL JURISDICTION.
2. A PRE-CONSTRUCTION MEETING WITH THE LOCAL JURISDICTION/PUBLIC WORKS DEPARTMENT, AHBL, AND THE CONTRACTOR SHALL BE HELD A MINIMUM OF ONE WEEK PRIOR TO COMMENCING CONSTRUCTION. CITY INSPECTOR SHALL BE GIVEN 48-HOURS NOTICE PRIOR TO THE START OF WORK.
3. THE CONTRACTOR SHALL CONTACT THE LOCAL JURISDICTION'S PUBLIC WORKS DEPARTMENT FOR INSPECTION OF ALL LOCAL UNDERGROUND UTILITY WORK BEFORE THE SYSTEM IS BACKFILLED, UNLESS OTHERWISE AGREED TO IN WRITING BY THE MUNICIPALITY.
4. A $_____ STREET CONSTRUCTION BOND IN FAVOR OF A LOCAL JURISDICTION SHALL BE PROVIDED BY THE CONTRACTOR PRIOR TO WORK WITHIN THE CITY RIGHT-OF-WAY . THE BOND SHALL REMAIN IN EFFECT FOR ONE YEAR FOLLOWING APPROVAL AND ACCEPTANCE OF WORK BY THE CITY.
5. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ADEQUATE SAFEGUARDS, SAFETY DEVICES, PROTECTIVE EQUIPMENT, FLAGGERS, AND ANY OTHER NEEDED ACTIONS TO PROTECT THE LIFE, HEALTH, AND SAFETY OF THE PUBLIC, AND TO PROTECT PROPERTY IN CONNECTION WITH THE PERFORMANCE OF WORK COVERED BY THE CONTRACT. ALL SECTIONS OF THE WSDOT STANDARD SPECIFICATIONS 1-07.23 TRAFFIC CONTROL, SHALL APPLY IF WORK WITHIN THE TRAVELED RIGHT-OF-WAY WILL INTERRUPT NORMAL TRAFFIC PATTERNS.
6. ALL SEDIMENTATION/EROSION CONTROL FACILITIES MUST BE IN OPERATION PRIOR TO CLEARING AND BUILDING CONSTRUCTION. THEY MUST BE SATISFACTORILY MAINTAINED UNTIL THE POTENTIAL FOR ON-SITE EROSION HAS PASSED.
7. THE CONTRACTOR SHALL MAINTAIN A SET OF DRAWINGS UPON WHICH THE CONTRACTOR SHALL RECORD THE HORIZONTAL AND VERTICAL LOCATION OF THE AS-CONSTRUCTED IMPROVEMENTS. ACTUAL LOCATION OF EXISTING UTILITIES SHALL ALSO BE RECORDED. THE CONTRACTOR SHALL DELIVER THESE RECORD DRAWINGS TO AHBL AT THE COMPLETION OF WORK.
8. IF WORKERS ENTER ANY TRENCH OR OTHER EXCAVATION FOUR FEET OR MORE IN DEPTH THAT DOES NOT MEET THE OPEN PIT REQUIREMENTS OF WSDOT SECTION 2-09.3(3)B, IT SHALL BE SHORED AND CRIBBED. THE CONTRACTOR ALONE SHALL BE RESPONSIBLE FOR WORKER SAFETY AND AHBL ASSUMES NO RESPONSIBILITY. ALL TRENCH SAFETY SYSTEMS SHALL MEET THE REQUIREMENTS OF THE WASHINGTON INDUSTRIAL SAFETY AND HEALTH ACT, CHAPTER 49.17 RCW.
9. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR WORKER SAFETY AND ANY AND ALL DAMAGE TO STRUCTURES AND IMPROVEMENTS RESULTING FROM HIS OPERATIONS. NEITHER AHBL NOR THE APPROVING AGENCIES ASSUME ANY RESPONSIBILITY.
10. AN APPROVED COPY OF THIS PLAN MUST BE ON THE SITE WHENEVER CONSTRUCTION IS IN PROGRESS.
11. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ANY AND ALL REQUIRED PERMITS PRIOR TO CONSTRUCTION.
12. UNDERGROUND UTILITY INSTALLATION OPEN CUTS:
    THE WSDOT STANDARD SPECIFICATIONS, PARTICULARLY SECTION 7-08 SHALL GENERALLY APPLY UNLESS OTHERWISE STATED BELOW. FOR OPEN CUTS ON EXISTING TRAVELED ROADWAYS, i.e., UTILITY CUTS:
    A. IN TRENCHING THROUGH EXISTING PAVEMENT, THE OPEN CUT SHALL BE A NEAT-LINE CUT MADE BY SAW CUTTING A CONTINUOUS LINE. TRENCH SIDES SHALL BE KEPT AS NEARLY VERTICAL AS POSSIBLE. COMPACTION AND RESTORATION MUST BE DONE AS DETAILED BELOW AND IMMEDIATELY AFTER THE TRENCH IS BACKFILLED SO AS TO CAUSE LEAST DISRUPTION TO TRAFFIC. CEMENT CONCRETE PAVEMENT SHALL BE CUT A MINIMUM OF EIGHTEEN INCHES OUTSIDE THE EDGE OF THE TRENCH ON EACH SIDE.
    B. IN CUTS PARALLEL TO ROAD ALIGNMENT:
        1. ALL TRENCH BACKFILL UNDER ROADWAY SHALL BE CRUSHED SURFACING TOP COURSE MEETING THE REQUIREMENTS OF SECTION 9-03.9(3) OF THE STANDARD SPECIFICATIONS, MECHANICALLY COMPACTED TO 95% OF MAXIMUM DENSITY. FOR TRENCHES MORE THAN EIGHT-FEET IN DEPTH, THROUGHOUT THE LENGTH OF ANY PIPE RUN, MANHOLE TO MANHOLE, IN WHICH ANY PART IS MORE THAN EIGHT-FEET DEEP, BACKFILL AT DEPTHS MORE THAN FOUR-FEET SHALL BE COMPACTED TO 90% MAXIMUM DENSITY BY EITHER WATER SETTLING OR MECHANICAL COMPACTION. THE TOP FOUR-FEET OF THE TRENCH LINE SHALL THEN BE MECHANICALLY COMPACTED TO 95%. ALL DENSITIES SHALL BE DETERMINED BY TESTING SPECIFIED IN SECTION 2-03.3(14)D OF WSDOT STANDARD SPECIFICATIONS.
    C. IN CUTS TRANSVERSE TO ROAD ALIGNMENT:
        1. WITHOUT EXCEPTION, THE ENTIRE TRENCH SHALL BE BACKFILLED WITH GRAVEL BACKFILL FOR PIPE BEDDING (PEA GRAVEL) OR CRUSHED SURFACING TOP COURSE MEETING THE REQUIREMENTS OF SECTIONS 9-03.12(3) AND 9-03.9(3) OF THE WSDOT STANDARD SPECIFICATIONS RESPECTIVELY. BACKFILL SHALL BE PLACED AND COMPACTED MECHANICALLY IN EIGHT-INCH LIFTS WITH A LOCAL JURISDICTION INSPECTOR PRESENT. AFTER BACKFILL AND COMPACTION, AN IMMEDIATE COLD MIX PATCH SHALL BE PLACED AND MAINTAINED IN A MANNER ACCEPTABLE TO THE LOCAL JURISDICTION OR AHBL. ON ASPHALT PAVEMENT, A PERMANENT HOT MIX PATCH THE SAME THICKNESS AS THE ORIGINAL ASPHALT OR A MINIMUM OF TWO-INCHES, WHICHEVER IS THE GREATER, SHALL BE PLACED AND SEALED WITH A PAVING GRADE ASPHALT WITHIN 30 CALENDAR DAYS. CEMENT CONCRETE PAVEMENT SHALL BE RESTORED WITH AN EIGHT-SACK MIX, USING EITHER TYPE II OR TYPE III CEMENT, WITHIN 30 CALENDAR DAYS.
13. ALL PIPE SHALL BE LAID ON A PROPERLY PREPARED FOUNDATION ACCORDING TO WSDOT STANDARD SPECIFICATIONS 7-08.3(1). THIS SHALL INCLUDE NECESSARY LEVELING OF THE TRENCH BOTTOM OR THE TOP OF THE FOUNDATION MATERIAL AND PLACEMENT AND COMPACTION OF REQUIRED BEDDING MATERIAL TO UNIFORM GRADE SO THAT THE ENTIRE LENGTH OF THE PIPE SHALL BE SUPPORTED ON A UNIFORMLY DENSE, UNYIELDING BASE. IF THE NATIVE MATERIAL IN THE BOTTOM OF THE TRENCH MEETS THE REQUIREMENTS FOR "GRAVEL BACKFILL FOR PIPE BEDDING", THE FIRST LIFT OF PIPE BEDDING MAY BE OMITTED PROVIDED THE MATERIAL IN THE BOTTOM OF THE TRENCH IS LOOSENED, REGRADED, AND COMPACTED TO FORM A DENSE, UNYIELDING BASE.
14. AFTER THE COMPLETION OF CONSTRUCTION, ALL DISTURBED AREAS SHALL BE SEEDED AND MULCHED OR OTHERWISE STABILIZED TO THE SATISFACTION OF THE LOCAL JURISDICTION FOR THE PREVENTION OF ON-SITE EROSION.

STORM DRAINAGE NOTES

1. MATERIALS FOR THE STORM DRAINAGE SYSTEM AND THEIR INSTALLATION SHALL BE IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS AND THE REQUIREMENTS OF THE LATEST ADOPTED EDITION OF THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION (WSDOT) STANDARD SPECIFICATIONS. TESTING OF THE STORM DRAINAGE SYSTEM MAY BE REQUIRED BY THE LOCAL JURISDICTION OR AHBL.
2. PIPE MATERIALS SHALL BE AS SPECIFIED ON THE PLANS OR FROM THE FOLLOWING LIST. THE CONTRACTOR SHALL UTILIZE ONLY ONE PIPE MATERIAL TYPE FOR THE SAME SIZE PIPE BETWEEN STRUCTURES. PIPE JOINTS MUST BE OF THE SAME MATERIAL AS THE PIPE AND PIPE GASKETS ARE TO BE PROVIDED.
    A. PVC CONFORMING TO ASTM D 3034, SDR 35.
    B. 12-INCH AND SMALLER, PLAIN CONCRETE STORM SEWER PIPE CONFORMING TO WSDOT 7-04.2, CLASS III.
    C. CORRUGATED DOUBLE WALL, HIGH DENSITY POLYETHELENE DRAIN PIPE (8"-36") AASHTO M294. (ON-SITE ONLY)
3. CATCH BASINS SHALL CONFORM TO THE FOLLOWING WSDOT STANDARD
    A. TYPE 1 - PLAN B-1.
    B. TYPE 2, 48 INCH - PLAN B-1e.
4. UNLESS OTHERWISE SPECIFIED ON PLANS, ALL ROOF DRAINS SHALL BE RIGID 6-INCH PVC OR LARGER CONFORMING TO ASTM D 3034, SDR 35. SUFFICIENT CLEANOUTS SHALL BE INSTALLED SO THE SYSTEM IS EASILY MAINTAINED. THE CONTRACTOR SHALL KEEP A DIMENSIONED RECORD OF ALL PIPES AND CLEANOUTS AND SUBMIT IT TO THE OWNER AND/OR AHBL UPON COMPLETION OF THE WORK.
5. ALL BUILDING ROOF DRAIN DOWNSPOUTS, UNLESS OTHERWISE SPECIFIED, SHALL BE CONNECTED DIRECTLY TO THE MAIN STORM DRAINAGE CONVEYANCE SYSTEM THROUGH AN UNDERGROUND PIPE SYSTEM. THE SYSTEM SHOWN HERE IS A RECOMMENDED SOLUTION.
6. CONSTRUCTION OF GROUNDWATER DEWATERING SYSTEM SHALL BE IN ACCORDANCE WITH THE WSDOT STANDARD SPECIFICATION 6-02.3(6)C.
7. ISSUANCE OF THIS BUILDING PERMIT BY THE LOCAL JURISDICTION DOES NOT RELIEVE THE OWNER OF THE CONTINUING LEGAL OBLIGATION AND/OR LIABILITY CONNECTED WITH STORM AND SURFACE WATER DISPOSITION. THE LOCAL JURISDICTION DOES NOT ACCEPT ANY OBLIGATION FOR THE PROPER FUNCTIONING AND MAINTENANCE OF THE SYSTEM PROVIDED.

WATER SYSTEM NOTES

1. UNLESS OTHERWISE SPECIFIED, MATERIALS AND WORKMANSHIP FOR THE WATER SYSTEM AND THEIR INSTALLATION SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE LATEST ADOPTED EDITION OF THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION (WSDOT) STANDARD SPECIFICATIONS, DIVISION 7, THE PROJECT SPECIFICATIONS, AND REQUIREMENTS OF THE APPLICABLE PURVEYOR.
2. UNLESS OTHERWISE SPECIFIED, PIPE FOR THE WATER MAINS SHALL BE CLASS 52 DUCTILE IRON PIPE. JOINTS SHALL BE RUBBER GASKET, PUSH-ON TYPE.
3. THRUST BLOCKS SHALL BE SIZED TO RESIST TEST PRESSURES AND SHALL MEET REQUIREMENTS OF THE APPLICABLE AGENCY.
4. WATER MAINS SHALL BE FLUSHED, DISINFECTED, AND TESTED CONFORMING TO REQUIREMENTS OF THE APPLICABLE AGENCY AND PROVISIONS OF WSDOT.
5. UNLESS OTHERWISE SPECIFIED BY THE WATER PURVEYOR, INSTALL PIPE FOR A MINIMUM 42 INCHES OF COVER. WATER MAINS SHALL PASS UNDER STORM SEWER WHEN REQUIRED TO MAINTAIN 42 INCHES MINIMUM COVER. THERE SHALL BE NOT LESS THAN A SIX-INCH SEPARATION BETWEEN THE WATER MAIN AND THE STORM SEWER.
6. UNLESS OTHERWISE SHOWN ON PLANS, SERVICES SHALL BE LOCATED BY MUTUAL AGREEMENT BETWEEN OWNER, DISTRICT AND OTHER UTILITY COMPANIES.
7. UNLESS OTHERWISE SHOWN, PROVIDE FOUR-INCH THICK BY TWO FEET WIDE CONCRETE AROUND VALVE COVER LOCATED IN UNIMPROVED AND LANDSCAPE AREAS. VALVE COVER SHALL BE MARKED "W" OR "WATER".
8. ALL WORK ON THE UNDERGROUND PORTIONS OF FIRE PROTECTION SPRINKLER SYSTEMS AND/OR FIRE MAIN FOR HYDRANT PLACEMENT MUST BE INSTALLED AND CERTIFIED BY A LICENSED CONTRACTOR WHO HAS ACHIEVED A STATE LEVEL "U" CERTIFICATION. SUBCONTRACTING OF SUCH WORK TO PERSONS OR FIRMS NOT CURRENTLY LICENSED AS A FIRE PROTECTION SPRINKLER SYSTEM CONTRACTOR IS PROHIBITED UNDER WAC 212-80.

SANITARY SEWER NOTES

1. UNLESS OTHERWISE SPECIFIED, ALL MATERIALS AND WORKMANSHIP FOR THE SANITARY SEWER SYSTEM AND THEIR INSTALLATION SHALL CONFORM TO REQUIREMENTS OF THE LATEST ADOPTED EDITION OF THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION (WSDOT) STANDARD PLANS AND SPECIFICATIONS FOR ROAD, BRIDGE, AND MUNICIPAL CONSTRUCTION DIVISION 7, THE PROJECT SPECIFICATIONS, AND THE LOCAL JURISDICTION'S STANDARDS AND REQUIREMENTS.
2. UNLESS OTHERWISE SHOWN ON THE PLANS, PIPE MATERIAL FOR SEWER MAIN AND SIDE SEWER SHALL BE PVC CONFORMING TO ASTM D 3034, SDR 35. SIDE SEWER SHALL BE INSTALLED AT A 2% MINIMUM SLOPE.
4. THE SEWER SYSTEM SHALL BE CLEANED AND TESTED CONFORMING TO REQUIREMENTS OF THE APPLICABLE AGENCY AND PROVISIONS OF WSDOT 7-17.
5. BUILDING SEWER CLEANOUT SHALL BE INSTALLED TO THE REQUIREMENT OF THE LOCAL JURISDICTION AND ACCORDING TO THE LATEST ADOPTED EDITION OF THE UNIFORM PLUMBING CODE. A CLEANOUT RISER SHALL EXTEND FROM A WYE CONNECTION LINE AT A 45-DEGREE ANGLE. A PVC SCREW PLUG SHALL BE INSTALLED AT SIX TO NINE-INCHES BELOW FINISHED GRADE. A TRAFFIC BEARING RING WITH A CONCRETE COLLAR AND COVER MARKED "SEWER" SHALL BE INSTALLED OVER THE TOP AND SHALL NOT REST ON THE RISER.
7. BACKFILLING TRENCHES AND COMPACTION OF BACKFILL SHALL BE IN ACCORDANCE WITH THESE PLANS.

EROSION CONTROL NOTES

1. ON-SITE AND OFFSITE EROSION CONTROL MEASURES SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR. ANY PROBLEMS OCCURRING BWFORE FINAL ACCEPTANCE OF THE STORM SYSTEM BY THE ENGINEER SHALL BE CORRECTED BY THE CONTRACTOR.
2. IN CASE EROSION OR SEDIMENTATION OCCURS TO ADJACENT PROPERTY OWNERS, ALL CONSTRUCTION WORK WITHIN THE DEVELOPMENT THAT WILL AGGRAVATE THE SITUATION IN THE FUTURE, SHALL CEASE AND THE CONTRACTOR WILL IMMEDIATELY COMMENCE RESTORATION METHODS. RESTORATION ACTIVITY SHALL CONTINUE UNTIL SUCH TIME AS THE AFFECTED PROPERTY OWNER IS SATISFIED.
3. ALL EROSION AND SEDIMENTATION CONTROL DEVICES SHOWN ON THIS DRAWING SHALL BE INSTALLED PRIOR TO OR AS THE FIRST STAGE OF SITE PREPARATION.
4. SHOULD THE TEMPORARY EROSION AND SEDIMENTATION CONTROL MEASURES AS SHOWN ON THIS DRAWING NOT PROVE ADEQUATE TO CONTROL EROSION AND SEDIMENTATION, THE CONTRACTOR SHALL INSTALL ADDITIONAL FACILITIES AS NECESSARY TO PROTECT ADJACENT PROPERTIES, SENSITIVE AREAS, NATURAL WATER COURSES, AND/OR STORM DRAINAGE SYSTEMS.
5. IN ANY AREA WHICH HAS BEEN STRIPPED OF VEGETATION AND WHERE NO FURTHER WORK IS ANTICIPATED FOR A PERIOD OF 30 DAYS OR MORE, ALL DISTURBED AREAS SHALL BE IMMEDIATELY STABILIZED WITH MULCHING, GRASS PLANTING, OR OTHER APPROVED EROSION CONTROL TREATMENT APPLICABLE TO THE TIME OF YEAR IN QUESTION. GRASS SEEDING ALONE WILL BE ACCEPTABLE ONLY DURING THE MONTHS OF APRIL THROUGH SEPTEMBER, INCLUSIVE. SEEDING MAY PROCEED, HOWEVER, WHENEVER IT IS IN THE INTEREST OF THE CONTRACTOR, BUT SHALL BE AUGMENTED WITH MULCHING, NETTING, OR OTHER TREATMENT.

TRENCH NOTE

IF WORKERS ENTER ANY TRENCH OR OTHER EXCAVATION FOUR OR MORE FEET IN DEPTH THAT DOES NOT MEET THE OPEN PIT REQUIREMENTS OF WSDOT SECTION 2-09.3(3)B, IT SHALL BE SHORED AND CRIBBED. THE CONTRACTOR ALONE SHALL BE RESPONSIBLE FOR WORKER SAFETY AND AHBL ASSUMES NO RESPONSIBILITY. ALL TRENCH SAFETY SYSTEMS SHALL MEET THE REQUIREMENTS OF THE WASHINGTON INDUSTRIAL SAFETY AND HEALTH ACT, CHAPTER 49.17 RCW.

UTILITY NOTE

THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE APPROXIMATE ONLY AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR ITS REPRESENTATIVE. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK AND AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES THAT HAPPEN DUE TO THE CONTRACTOR'S FAILURE TO LOCATE EXACTLY AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES. AHBL ASSUMES NO LIABILITY FOR THE LOCATION OF UNDERGROUND UTILITIES.

TOPOGRAPHIC NOTE

THE EXISTING CULTURAL AND TOPOGRAPHIC DATA SHOWN ON THESE DRAWINGS HAS BEEN PREPARED, IN PART, BASED UPON INFORMATION FURNISHED BY OTHERS. WHILE THIS INFORMATION IS BELIEVED TO BE RELIABLE, AHBL CANNOT ENSURE ITS ACCURACY AND THUS IS NOT RESPONSIBLE FOR THE ACCURACY OF THAT INFORMATION OR FOR ANY ERRORS OR OMISSIONS WHICH MAY HAVE BEEN INCORPORATED INTO THESE DRAWINGS AS A RESULT.

FILL SPECIFICATION

FILL MATERIAL SHALL NOT CONTAIN PETROLEUM PRODUCTS, OR SUBSTANCES WHICH ARE HAZARDOUS, DANGEROUS, TOXIC, OR WHICH OTHERWISE VIOLATE ANY STATE, FEDERAL, OR LOCAL LAW, ORDINANCE, CODE, REGULATION, RULE, ORDER, OR STANDARD.

AS-BUILT REQUIREMENTS

THE CONTRACTOR SHALL MAINTAIN RECORD DRAWING(S) OF ALL UTILITIES SHOWN ON THE PLANS AND EXISTING UTILITIES ENCOUNTERED AS CONSTRUCTION PROGRESSES. THESE DRAWINGS SHALL INDICATE DEVIATIONS FROM THE DESIGN PLAN. REFERENCE DISTANCES BETWEEN THE RELATIVE LOCATION OF THE NEWLY CONSTRUCTED IMPROVEMENTS AND A PERMANENT MARKER SHALL BE OBTAINED. THE LOCATION OF STRUCTURES, VALVES, BENDS, TEES, AND RELATED APPURTENANCES SHALL BE INCLUDED. THESE RECORDS SHALL BE AVAILABLE FOR REVIEW BY THE ENGINEER AT ANY TIME DURING CONSTRUCTION. THE CONTRACTOR SHALL GIVE THESE RECORD DRAWINGS TO THE ENGINEER IMMEDIATELY UPON COMPLETION OF ALL UTILITY INSTALLATION.

LEGEND

DESCRIPTION	PROPOSED
CATCH BASIN	■
DRAIN MH	◉
CLEANOUT	•
HYDRANT	
FIRE DEP'T CONNECTION	
WATER VALVE	⋈
WATER METER	◪
TRENCH DRAIN	
STORM DRAIN LINE	——D——
WATER LINE	——W——
FIRE SERVICE	——F——
SANITARY SEWER LINE	——S——
ROOF DRAIN LINE	——RD——
PERFORATED SUB-DRAIN PIPE	——SD——
GAS LINE	—— G ——
ASPHALT	
CEMENT CONCRETE PATCH	
CEMENT CONCRETE SIDEWALK	
CLEARING LIMITS	
TEMPORARY SILTATION FENCE	X——X——X
EXISTING ASPHALT TO REMAIN	
EXISTING ASPHALT TO BE DEMOLISHED	
PREVIOUSLY DEMOLISHED AREAS UNDER PHASES 1&2 (N.I.C.)	

ALL OFFSITE WORK UNDER BASE BID 'C' TO MEET SPI BIDDING REQUIREMENT

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UPDATED: SEP 23 1997 10:31:50
PLOTTED: SEP 23 1997 10:39:18

Mc DERMOTH ELEMENTARY
ABERDEEN SCHOOL DISTRICT NO. 5 ABERDEEN WASHINGTON

CHARLES J. LINDSEY — STATE OF WASHINGTON — REGISTERED PROFESSIONAL ENGINEER
EXPIRES 7/23/99

DATE	REVISED	COMM. NO.
BID SET SEPT. 23, 1997		960409

The BJSS GROUP
ARCHITECTS & PLANNERS, AIA
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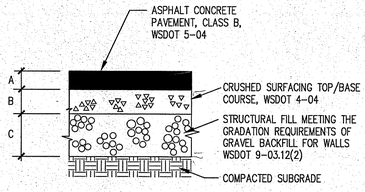
PHASE 3 GENERAL NOTES

C4

A PORTION OF SECTION 8, TOWNSHIP 17 N., RANGE 9 W., W.M.
ABERDEEN, WASHINGTON



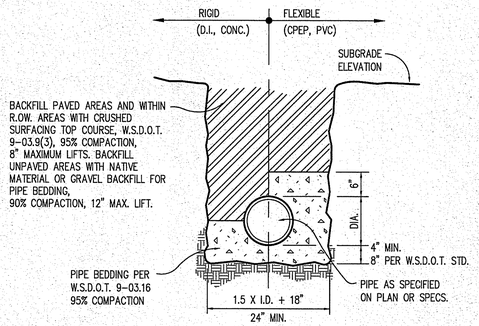
NOTE: THE CONTRACTOR SHALL REFERENCE THE PROJECT GEOTECHNICAL REPORT FOR ADDITIONAL PAVING AND SUBGRADE PREPARATION REQUIREMENTS.

REQUIRED MATERIAL DEPTHS (INCHES)

NOTE: DEPTHS ARE COMPACTED THICKNESS				
LOCATION	A	B	C	ATB* SUBSTITUTE
W. 4TH ST. & RECYCLE/ DELIVERY AREA	4	8	18	6
N "K" ST.	3	6	12	4
ON-SITE ONLY	2	4	6	3

*ATB: ASPHALT TREATED BASE MAY BE SUBSTITUTED FOR CRUSHED SURFACING TOP/BASE COURSE BENEATH CL-B ASPHALT. CONTRACTOR SHALL MAKE APPROPRIATE ADJUSTMENTS TO SUBGRADE ELEVATION WHEN UTILIZING ATB SUBSTITUTE (SEE SPECIFICATIONS)

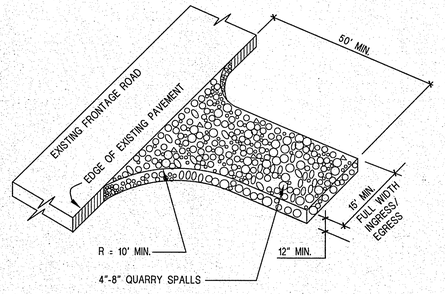
1 ASPHALTIC CONCRETE PAVEMENT STRUCTURE
NOT TO SCALE



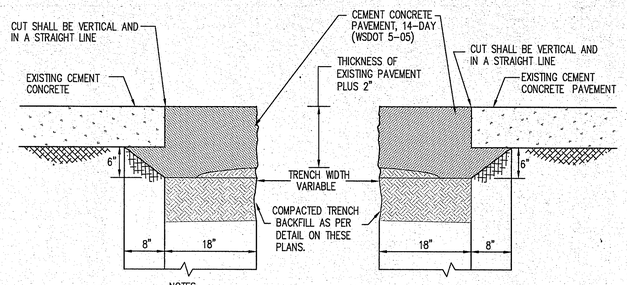
NOTES:

1. NATIVE BACKFILL MATERIAL MAY BE USED IN UNPAVED AREAS ONLY. MATERIAL SHALL NOT HAVE PARTICLE SIZE GREATER THAN 1" WITHIN 6" OF THE PIPE OR THE CONTRACTOR HAS THE OPTION TO USE GRAVEL BACKFILL PIPE BEDDING CONFORMING TO WSDOT 9-03.12(3).

2 BEDDING & BACKFILL PIPE IN TRENCHES
NOT TO SCALE



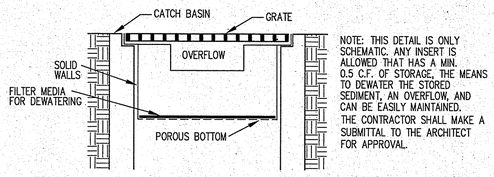
3 CONSTRUCTION ENTRANCE
NOT TO SCALE



NOTES:

1. SEE ALSO GENERAL CONSTRUCTION NOTE 12 ON SHEET C4.
2. THE MAXIMUM ROAD CLOSURE PERIOD IS 7 DAYS.

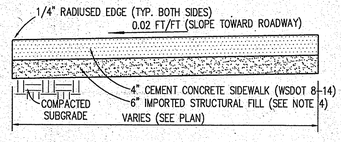
4 CEMENT CONCRETE PAVEMENT PATCH
NOT TO SCALE



CATCH BASIN INSERT

1. CATCH BASIN INSERT SHALL BE THE TWO TRAY UNIT AS MANUFACTURED BY ENVIRO-DRAIN, INC. 13226 97TH AVE. N.E., SUITE 208 KIRKLAND, WA 98034, PHONE: (206) 820-1953, FAX: (206) 820-8364. OR APPROVED EQUIVALENT.
2. INSERT, RACK, DIVERTER, SHELVES, AND TRAYS SHALL BE STAINLESS STEEL. CELULOSE FIBER FILTER MEDIA SHALL BE PROVIDED, OR EQUIVALENT.
3. TOP TRAY SHALL BE A NUMBER 8 MESH, BOTTOM TRAY SHALL BE A NUMBER 8 MESH ON TOP AND A NUMBER 12 MESH ON BOTTOM.

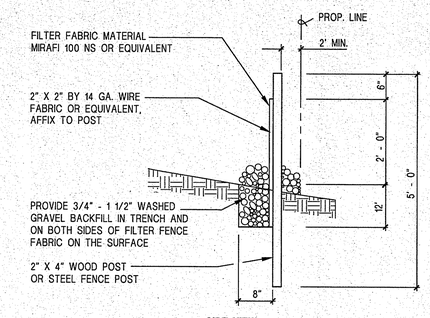
5 CB WATER QUALITY INSERT
NOT TO SCALE



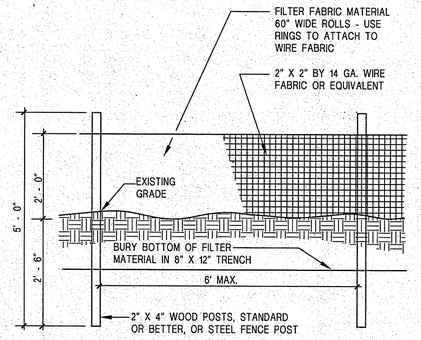
NOTES:

1. CEMENT CONCRETE SHALL BE CLASS 3000.
2. DUMMY JOINTS CONSISTING OF 3/16" BY 2" PREMOLDED JOINT MATERIAL SHALL BE PLACED AT 15' FOOT INTERVALS.
3. SCORE OR "V" GROOVE-1/2" DEEP TRANSVERSLY AT 5' ON CENTER
4. 4" DEPTH GRAVEL BASE (WSDOT 9-03.10) MAY BE SUBSTITUTED FOR STRUCTURAL FILL WHERE THE SUBGRADE CAN BE COMPACTED TO AT LEAST 90" MAX DD(ASTM D1557)

6 CEMENT CONCRETE SIDEWALK (OFFSITE ONLY)
NOT TO SCALE



SIDE VIEW

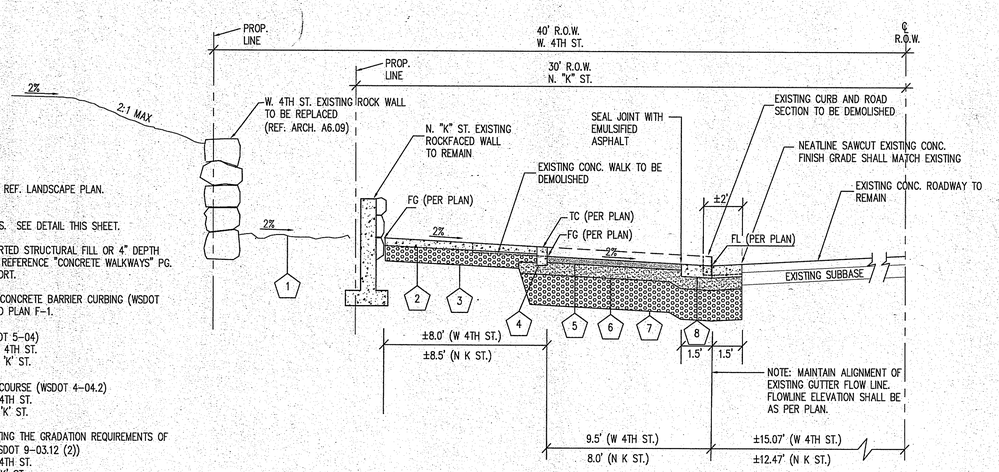


FRONT VIEW

NOTES:

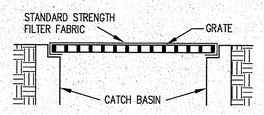
1. THE FILTER FABRIC SHALL BE PURCHASED IN A CONTINUOUS ROLL CUT TO THE LENGTH OF THE BARRIER TO AVOID USE OF JOINTS. WHEN JOINTS ARE NECESSARY, FILTER CLOTH SHALL BE SPLICED TOGETHER ONLY AT A SUPPORT POST, WITH A MINIMUM SIX-INCH OVERLAP, AND BOTH ENDS SECURELY FASTENED TO THE POST.
2. THE FILTER FABRIC FENCE SHALL BE INSTALLED TO FOLLOW THE CONTOURS (WHERE FEASIBLE). THE FENCE POSTS SHALL BE SPACED A MAXIMUM OF SIX FEET APART AND DRIVEN SECURELY INTO THE GROUND (MINIMUM OF 30 INCHES).
3. A TRENCH SHALL BE EXCAVATED, ROUGHLY EIGHT INCHES WIDE AND TWELVE INCHES DEEP, UPSLOPE AND ADJACENT TO THE WOOD POST TO ALLOW THE FILTER FABRIC TO BE BURIED.
4. WHEN STANDARD STRENGTH FILTER FABRIC IS USED, A WIRE MESH SUPPORT FENCE SHALL BE FASTENED SECURELY TO THE UPSLOPE SIDE OF THE POSTS USING HEAVY-DUTY WIRE STAPLES AT LEAST ONE INCH LONG, TIE WIRES, OR HOG RINGS. THE WIRE SHALL EXTEND INTO THE TRENCH A MINIMUM OF FOUR INCHES AND SHALL NOT EXTEND MORE THAN THIRTY SIX INCHES ABOVE THE ORIGINAL GROUND SURFACE.
5. THE STANDARD STRENGTH FILTER FABRIC SHALL BE STAPLED OR WIRED TO THE FENCE, AND TWENTY INCHES OF THE FABRIC SHALL BE EXTENDED INTO THE TRENCH. THE FABRIC SHALL NOT EXTEND MORE THAN THIRTY SIX INCHES ABOVE THE ORIGINAL GROUND SURFACE. FILTER FABRIC SHALL NOT BE STAPLED TO EXISTING TREES.
6. WHEN EXTRA-STRENGTH FILTER FABRIC AND CLOSER POST SPACING ARE USED, THE WIRE MESH SUPPORT FENCE MAY BE ELIMINATED. IN SUCH A CASE, THE FILTER FABRIC IS STAPLED OR WIRED DIRECTLY TO THE POSTS WITH ALL OTHER PROVISIONS OF STANDARD NOTE (5) APPLYING.
7. THE TRENCH SHALL BE BACKFILL WITH 3/4 INCH MINIMUM DIAMETER WASHED GRAVEL.
8. FILTER FABRIC FENCES SHALL BE REMOVED WHEN THEY HAVE SERVED THEIR USEFUL PURPOSE, BUT NOT BEFORE THE UPSLOPE AREA HAS BEEN PERMANENTLY STABILIZED.
9. FILTER FABRIC FENCES SHALL BE INSPECTED IMMEDIATELY AFTER EACH RAINFALL AND AT LEAST DAILY DURING PROLONGED RAINFALL. ANY REQUIRED REPAIRS SHALL BE MADE IMMEDIATELY.

7 FILTER FABRIC FENCE
NOT TO SCALE



1. W. 4TH ST. – LANDSCAPE AREA, REF. LANDSCAPE PLAN.
2. CEMENT CONCRETE SIDEWALK (WSDOT 8-14) 4" MIN. THICKNESS. SEE DETAIL THIS SHEET.
3. 6" MIN. COMPACTED DEPTH IMPORTED STRUCTURAL FILL OR 4" DEPTH GRAVEL BASE (WSDOT 9-03.10). REFERENCE "CONCRETE WALKWAYS" PG. 20, PROJECT GEOTECHNICAL REPORT.
4. 6"x16" CAST-IN-PLACE CEMENT CONCRETE BARRIER CURBING (WSDOT 8-04), AS PER WSDOT STANDARD PLAN F-1.
5. ASPHALT CONCRETE CL.-B (WSDOT 5-04)
   4" MIN. COMPACTED DEPTH – W. 4TH ST.
   3" MIN. COMPACTED DEPTH – N. 'K' ST.
6. CRUSHED SURFACING BASE/TOP COURSE (WSDOT 4-04.2)
   8" MIN. COMPACTED DEPTH– W. 4TH ST.
   6" MIN. COMPACTED DEPTH– N. 'K' ST.
7. IMPORTED STRUCTURAL FILL MEETING THE GRADATION REQUIREMENTS OF GRAVEL BACKFILL FOR WALLS (WSDOT 9-03.12 (2))
   18" MIN. COMPACTED DEPTH, W. 4TH ST.
   12" MIN. COMPACTED DEPTH, N. 'K' ST.
8. CEMENT CONCRETE GUTTER (WSDOT 8-04)
   8" MIN. THICKNESS – W. 4TH ST.
   6" MIN. THICKNESS – N. 'K' ST.

8 OFFSITE ROADWAY DETAIL
TYPICAL FOR: STA. 0+56.93 TO STA. 3+01.55 (NORTH 'K' ST.)
TYPICAL FOR: STA. 0+99.27 TO STA. 3+05.89 (WEST 4TH ST.)
NOT TO SCALE



9 INLET SEDIMENT BARRIER DETAIL
NOT TO SCALE

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Mc DERMOTH ELEMENTARY
ABERDEEN SCHOOL DISTRICT NO. 5 ABERDEEN WASHINGTON

DANIEL J. LINDAY — STATE OF WASHINGTON — REGISTERED PROFESSIONAL ENGINEER
EXPIRES 7/23/99

DATE	REVISED	COMM. NO.
BID SET: SEPT 23, 1997		960409

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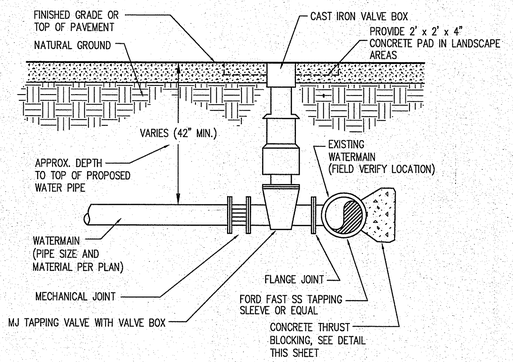
PHASE 3 NOTES AND DETAILS

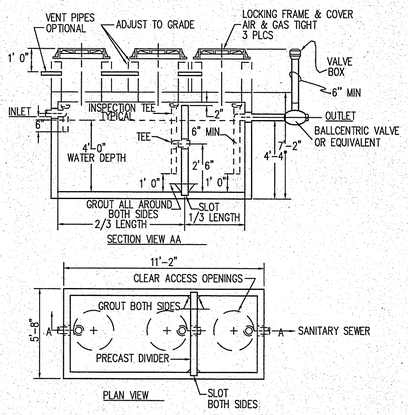
C5

FILENAME: N:\C\960389\960389-CS.DWG
CREATED: SEP 23 1997 11:33:02
UPDATED: SEP 22 1997 10:26:18
PLOTTED: SEP 22 1997 10:26:26

A PORTION OF SECTION 8, TOWNSHIP 17 N., RANGE 9 W., W.M.
ABERDEEN, WASHINGTON

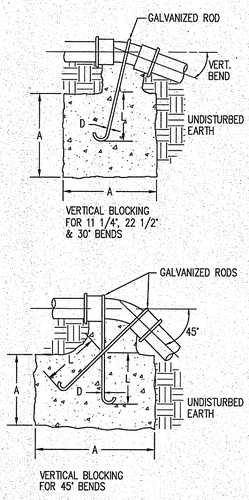


1 WATERMAIN CONNECTION DETAIL
NOT TO SCALE

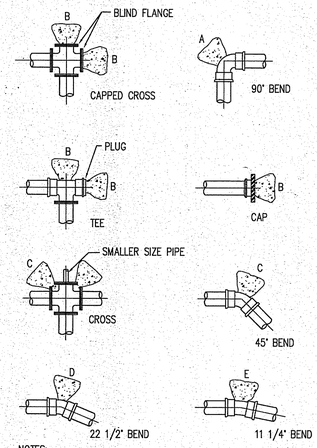


VERTICAL BLOCKING FOR 11 1/4 , 22 1/2 , 30 BENDS				
PIPE SIZE	V B	CU FT	A	D L
4"	11 1/4 22 1/2 30	8 11 17	2.0' 2.2' 2.6'	3/4" 1.5" 2.0"
6"	11 1/4 22 1/2 30	11 25 41	2.2' 2.9' 3.5'	3/4" 2.0"
VERTICAL BLOCKING FOR 45 BENDS				
4"	45	30	3.1'	3/4" 2.0"
6"		68	4.1'	

NOTE: CONCRETE BLOCKING BASED ON 200 PSI WATER PRESSURE AND 2500 PSI CONCRETE



4 VERTICAL CONCRETE BLOCKING
NOT TO SCALE



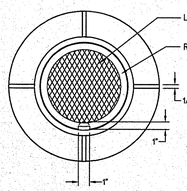
NOTES:
SEE THRUST BLOCK TABLE
PROVIDE POLYETHYLENE SHEETING TO COVER BOLTS AND JOINTS FOR FUTURE DISMANTLING.

THRUST BLOCK – TABLE
MIN. BEARING AREA AGAINST UNDISTURBED SOIL
SQUARE FEET

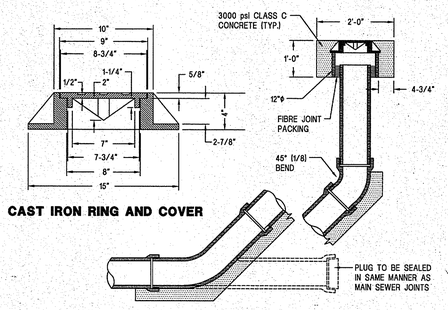
PIPE SIZE	A (FT²)	B (FT²)	C (FT²)	D (FT²)	E (FT²)
3"	3	2	2	2	2
4"	4	4	2	2	2
6"	7	6	4	2	2
8"					

NOTES:
1. BEARING AREA OF CONC. THRUST–BLOCK BASED ON 200 PSI WATER PRESSURE AND SAFE SOIL BEARING LOAD OF 2,000 POUNDS PER SQUARE FOOT.
2. AREAS MUST BE ADJUSTED FOR OTHER PIPE SIZES, PRESSURES AND SOIL CONDITIONS.
3. CONCRETE BLOCKING SHALL BE CAST IN PLACE AND HAVE A MINIMUM OF 1/4 SQUARE FOOT BEARING AGAINST THE FITTING.
4. BLOCK SHALL BEAR AGAINST FITTINGS ONLY AND SHALL BE CLEAR OF JOINTS TO PERMIT TAKING UP OR DISMANTLING OF JOINT.
5. CONTRACTOR SHALL INSTALL BLOCKING ADEQUATE TO WITHSTAND FULL TEST PRESSURE AS WELL AS TO CONTINUOUSLY WITHSTAND OPERATION PRESSURE UNDER ALL CONDITIONS OF SERVICE.

6 CONCRETE THRUST BLOCKING
NOT TO SCALE



NOTES:
1. PIPE MATERIAL AS SPECIFIED
2. PIPE DIAMETER AS SHOWN PER PLAN.



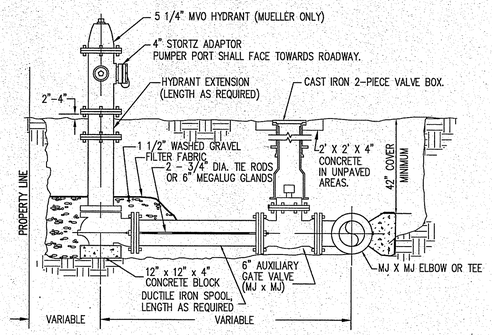
CAST IRON RING AND COVER

2 STORM/SEWER CLEAN-OUT DETAIL
NOT TO SCALE

NOTES FOR GREASE INTERCEPTORS

1. NO. OF MEALS/PEAK HOUR X WASTE FLOW RATE X RETENTION TIME X STORAGE FACTOR = CAPACITY IN GALLONS (300/HR x 2 GAL/HR. x 1.5HRS x 1.5 = 1350 GAL.)
2. THE GREASE INTERCEPTOR SHALL BE UTILITY VAULT MODEL 5106–GA OR APPROVED EQUAL, 1500 GAL. MIN CAPACITY.
3. THE GREASE INTERCEPTOR SHALL BE INSTALLED AND CONNECTED SUCH THAT IT SHALL BE EASILY ACCESSIBLE FOR INSPECTION, CLEANING AND REMOVAL AT ALL TIMES. NO SANITARY WASTEWATER SHALL BE CONVEYED TO THE SEPARATOR. A SEPARATE SIDE SEWER SHALL BE REQUIRED TO CARRY SANITARY WASTEWATER TO THE SEWER MAIN. IT SHALL BE PLACED AS CLOSE TO THE SERVICE AREA AS PRACTICAL. MANHOLE COVERS SHALL BE GAS TIGHT AND HAVE A MINIMUM OPENING OF 20 INCHES IN DIAMETER.
4. PLUMBING/PIPING SHALL BE CONSTRUCTED TO ESTABLISH "PARALLEL FLOW" (90° TO THE TANK BAFFLE) THROUGH THE GREASE INTERCEPTOR. NO RADIUS, BEND OR ELBOW SHALL BE ALLOWED IN THE INLET PIPE, FOR A MINIMUM OF 10 FEET OR 20 PIPE DIAMETERS, WHICHEVER IS GREATER, UPSTREAM OF THE INTERCEPTOR.
5. VENTING OF THE INTERCEPTOR SHALL BE IN ACCORDANCE WITH CHAPTER 4, 5 AND 7 OF THE UNIFORM PLUMBING CODE–1988 OR AS ADOPTED BY THE CITY OF ABERDEEN.
6. A BALLCENTRIC VALVE SHALL BE LOCATED IN THE DISCHARGE PIPING, A MAXIMUM OF 10 FEET FROM THE GREASE INTERCEPTOR. THIS VALVE SHALL BE CLOSED WHEN CLEANING OR SERVICING THE DEVICE.
7. ALL GREASE INTERCEPTORS SHALL BE FILLED WITH CLEAN WATER BEFORE USE.
8. FINAL INSPECTION IS REQUIRED BY THE CITY ENGINEER OR HIS REPRESENTATIVE PRIOR TO CONNECTION TO THE SANITARY SEWER.
9. THE PROPERTY OWNER SHALL RETAIN OWNERSHIP OF THE GREASE INTERCEPTOR AND SIDE SEWER LINES AND SHALL BE RESPONSIBLE FOR THEIR OPERATION AND MAINTENANCE. A SERVICE/MAINTENANCE RECORD SHALL BE KEPT ON THE PREMISES AT ALL TIMES AND SHALL BE IMMEDIATELY AVALABLE TO THE CITY ENGINEER OR HIS REPRESENTATIVE UPON REQUEST.
10. THE PROPERTY OWNER SHALL REPORT IMMEDIATELY TO THE CITY ENGINEER OR HIS REPRESENTATIVE, ANY SPILL, SURCHARGE, BYPASS OR MECHANICAL FAULT OR FAILURE WHICH INTERRUPTS OR OTHERWISE REDUCES THE CAPACITY OR REMOVAL EFFICEINCY OF THE GREASE INTERCEPTOR.

3 GREASE INTERCEPTOR
NOT TO SCALE



NOTES:
1. PAINT HYDRANT WITH TRAFFIC YELLOW #1071 AS MANUFACTURED BY FARWEST PAINT MFG. CO. OR SAFETY YELLOW MARATHON #1063 BY PARKER PAINT CO..
2. STAR TIE BOLTS, DUC–LUGS, MEG–A–LUGS, OR OTHER APPROVED JOINT RESTRAINT SYSTEM.
3. PAINT TIE RODS WITH BITUMINOUS PAINT ACCORDING TO APWA STANDARDS (SPECIFICATION #77–3.02A) OR USE STAINLESS STEEL RODS AND NUTS.
4. INSTALL BLUE PAVEMENT MARKER IF HYDRANT IS IN RIGHT–OF–WAY.

5 HYDRANT ASSEMBLY DETAIL
NOT TO SCALE

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FILENAME: P:\CV\96388\96388-C6.DWG CREATED: SEP 23 1997 11:30:02
UPDATED: SEP 22 1997 10:34:38 PLOTTED: SEP 22 1997 10:34:54

Mc DERMOTH ELEMENTARY
ABERDEEN SCHOOL DISTRICT NO. 5 ABERDEEN WASHINGTON

CHARLES J. LINDSAY — STATE OF WASHINGTON — REGISTERED PROFESSIONAL ENGINEER
EXPIRES 7 / 23 / 99

BID SET	SEPT 23, 1997
DATE	REVISED
CDMM. NO.	960409

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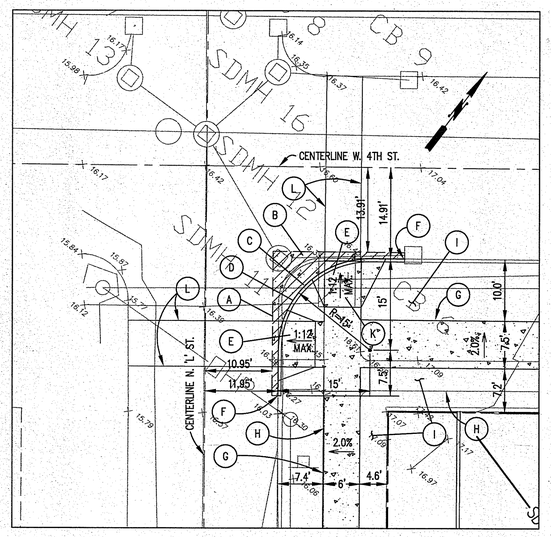
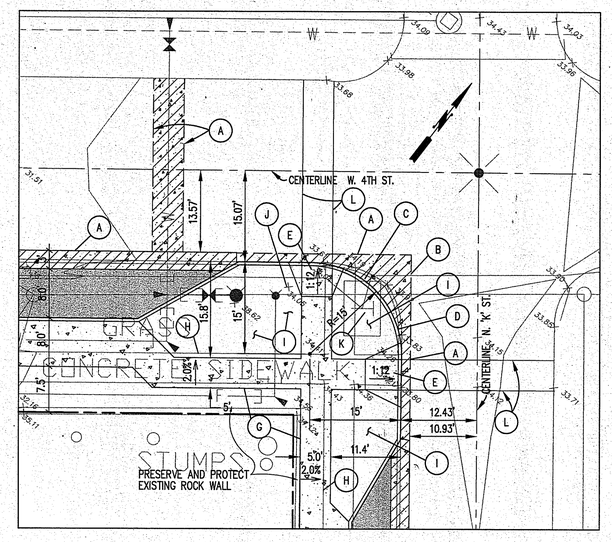
PHASE 3 NOTES AND DETAILS

C6

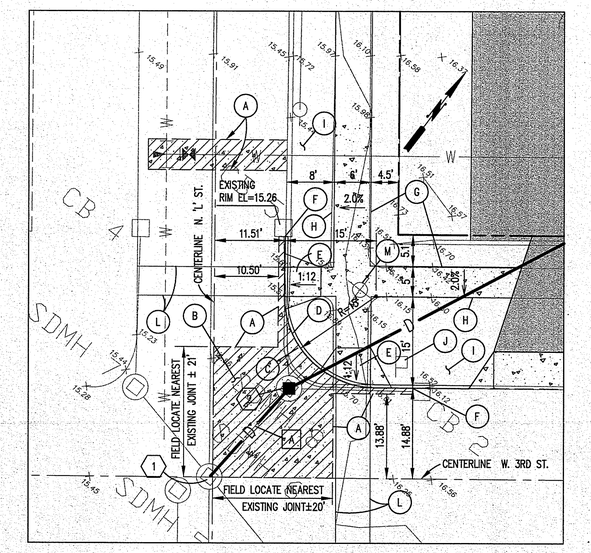
A PORTION OF SECTION 8, TOWNSHIP 17 N., RANGE 9 W., W.M.
ABERDEEN, WASHINGTON



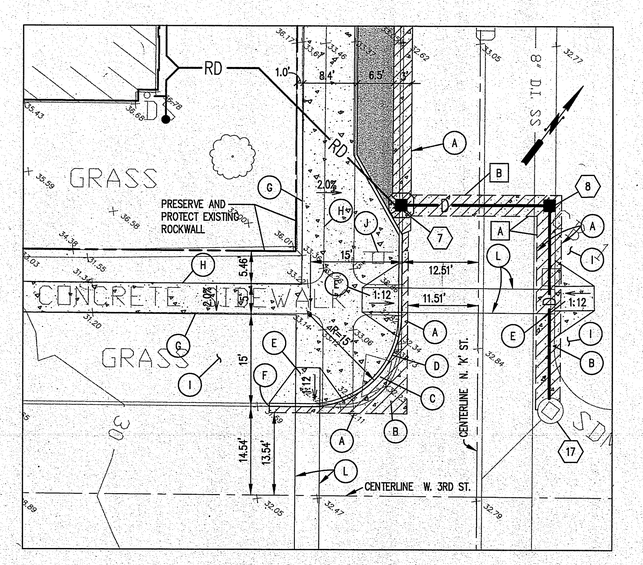
1 **N.W. CORNER DETAIL**
1" = 10'



3 **N.E. CORNER DETAIL**
1" = 10'



2 **S.W. CORNER DETAIL**
1" = 10'



4 **S.E. CORNER DETAIL**
1" = 10'

CORNER DETAIL
KEY NOTES

(A) PROVIDE SAWCUT AT MEETLINE. REMOVE AND DISPOSE OF EXISTING CONCRETE CURBING AND PAVEMENT.

(B) PROVIDE 8" MIN. THICKNESS CEMENT CONCRETE PAVEMENT AS PER SPECIFICATIONS AND DETAIL (5/C7). MATCH EXISTING PAVEMENT AT MEETLINE. MAINTAIN EXISTING PAVEMENT CROSS-SLOPE.

(C) MAINTAIN POSITIVE DRAINAGE AT NEW GUTTER FLOWLINE WITH NO PONDING.

(D) PROVIDE VERTICAL CEMENT CONCRETE CURBING INTEGRAL WITH ROAD PAVING AS PER CITY OF ABERDEEN STANDARDS, AND DETAIL (5/C7).

(E) PROVIDE CEMENT CONCRETE CURB RAMPS AS PER WSDOT STANDARD PLAN F-3.

(F) MATCH EXISTING TOP OF CURB. SAWCUT EXISTING CURB AND PROVIDE 1/2" THICKNESS ASPHALT IMPREGRATED FILLER MATERIAL AT JOINT.

(G) PROVIDE NEW CEMENT CONCRETE SIDEWALK AS PER SPECIFICATIONS. WIDTHS AS INDICATED ON PLAN, 4" MINIMUM THICKNESS. CONSTRUCT SIDEWALKS WITH A 2.00% MINIMUM CROSS-SLOPE TOWARD ADJACENT PUBLIC ROADWAY.

(H) DEMOLISH EXISTING SIDEWALKS (TYP.).

(I) REFERENCE LANDSCAPING PLANS FOR RESTORATION AND REVEGETATION OF RIGHT-OF-WAY LANDSCAPE AREAS.

(J) RELOCATE EXISTING TRAFFIC SIGN AS REQUIRED TO ACCOMODATE IMPROVEMENTS. NEW LOCATION SHALL MEET THE REQUIREMENTS OF THE MUTCD AND THE CITY OF ABERDEEN STANDARDS.

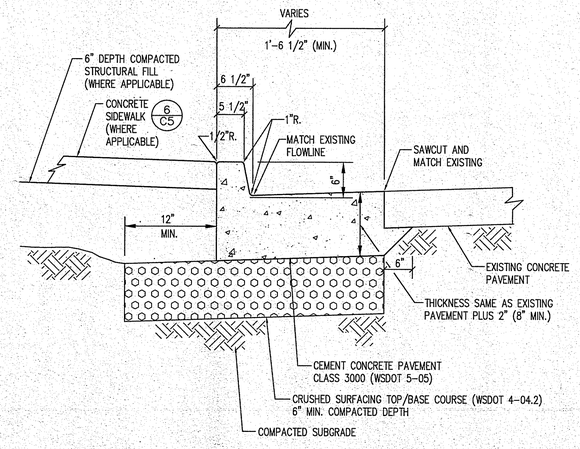
(K) ADJUST RIM OF EXISTING UTILITY TO NEW FINISHED GRADE AS REQUIRED.

(L) RESTRIPE CROSSWALK AS DIRECTED BY CITY OF ABERDEEN AND MEETING THE REQUIREMENTS OF MUTCD.

(M) PRESERVE AND PROTECT EXISTING MONUMENT. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO OBTAIN ANY AND ALL REQUIRED PERMITS FOR THE TEMPORARY REMOVAL AND REPLACEMENT OF EXISTING MONUMENTS IN ACCORDANCE WITH WAC 332-120. CONTACT TED SMITH, DNR PUBLIC LAND SURVEY OFFICE, 1-360-902-1190 FOR ASSISTANCE.

(#) SEE SHEET C2 FOR THESE KEY NOTES

[A] SEE SHEET C2 FOR THESE KEY NOTES.



5 **CEMENT CONCRETE CURB & GUTTER DETAIL**
N.T.S.

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Mc DERMOTH ELEMENTARY
ABERDEEN SCHOOL DISTRICT NO. 5 — ABERDEEN WASHINGTON



EXPIRES 7 / 23 / 99

DATE	REVISED	COMM. NO.
BID SET SEPT 23, 1997		960409

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PHASE 3 NOTES AND DETAILS

C7

Mc DERMOTH ELEMENTARY MODERNIZATION & ADDITIONS

ABERDEEN SCHOOL DISTRICT NO. 5 — ABERDEEN WASHINGTON

SITE DATA

1. SITE ADDRESS: 409 NORTH "K" STREET, ABERDEEN
2. SITE AREA: 1.93 ACRES
3. PROPOSED PARKING: HC: 2
   VISITOR: 4
   SCHOOL VANS: 3
   BUSSES: 2

GENERAL NOTES

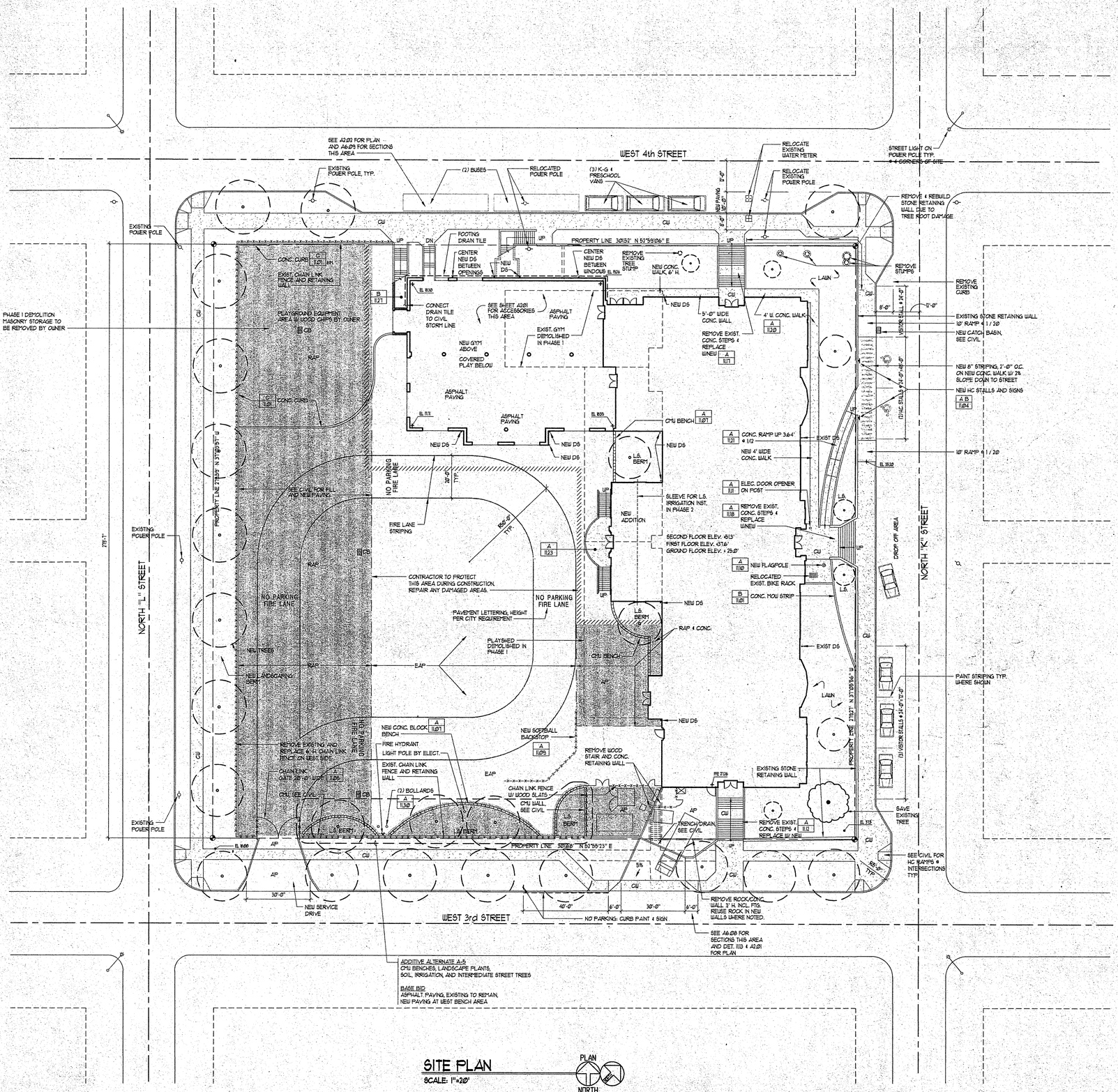
1. REMOVE ALL CONCRETE WALKS AT PERIMETER OF SITE, AND REPLACE WITH NEW, TYPICAL. SEE CIVIL.
2. SEE CIVIL AND LANDSCAPE PLANS.
3. GRADE AT NEW ADDITION FOUNDATION AREAS AT THE CONCLUSION OF PHASE 2 SHALL BE COMPACTED STRUCT. FILL, LEVEL WITH TOP OF GRADE BEAMS.
4. AREA BEHIND CMU BENCHES IS RAISED LANDSCAPE BED. IMPORT TOPSOIL AS REQUIRED. SEE CMU BENCH DETAIL FOR GRADE.
5. SEE CIVIL DEMOLITION PLAN FOR SITE DEMOLITION.
6. PROVIDE 6'-0" HIGH CONSTRUCTION FENCING ADJACENT TO CITY SIDEWALK AROUND PERIMETER OF BUILDING AND CONNECTED TO EXISTING PLAYGROUND FENCE. INFILL EXISTING PLAYGROUND FENCE OPENINGS. COORDINATE FENCING LOCATION WITH CITY AT TYPE OF FRONTAGE IMPROVEMENTS.

DETAILS

- CMU BENCH — A 11/A01
- FLAG POLE — A 11/A10
- HANDICAP SIGN — A 11/A04
- ROCKERY WALL

LEGEND

- SEDIMENT FENCE INSTALLED IN PHASE 1 TO BE MAINTAINED UNTIL CITY APPROVES REMOVAL. REMOVE AND REINSTALL AS REQUIRED FOR NEW CONSTRUCTION ACCESS. ALL PAVING NORTH AND EAST OF THIS LINE HAS BEEN REMOVED IN PHASE 1.
- RAP — REMOVE EXISTING ASPHALT PAVING.
- AP — ASPHALT PAVING.
- CB — CATCH BASIN, SEE CIVIL.
- CU — CONCRETE WALK.
- EAP — EXISTING ASPHALT PAVING TO REMAIN. PATCH AT TRENCHED AREAS FOR NEW UTILITY LINES AND AT FOUNDATIONS FOR CONCRETE CURBS, CMU BENCHES, RETAINING WALLS, AND OTHER NEW WORK.



SITE PLAN

SCALE: 1"=20'

NORTH: PLAN

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REGISTERED ARCHITECT — 1888 — STATE OF WASHINGTON

DATE 9/23/97 — REVISED

COMM. NO. 961413

The BJSS GROUP
ARCHITECTS & PLANNERS, AIA
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PHASE 3

A1.00

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FLAG NOTES

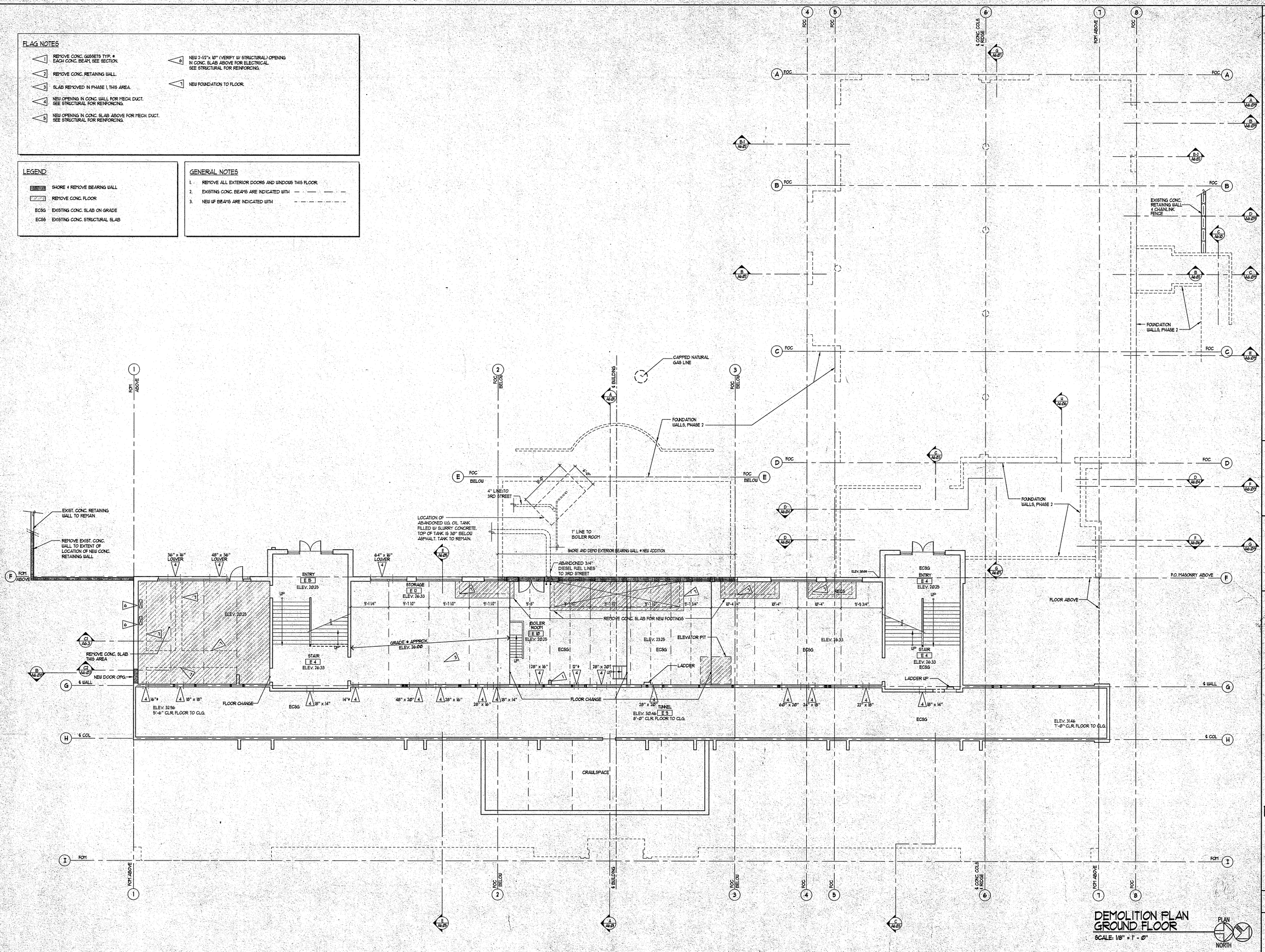
1. REMOVE CONC. GUSSETS TYP. @ EACH CONC. BEAM, SEE SECTION.
2. REMOVE CONC. RETAINING WALL.
3. SLAB REMOVED IN PHASE 1, THIS AREA.
4. NEW OPENING IN CONC. WALL FOR MECH. DUCT. SEE STRUCTURAL FOR REINFORCING.
5. NEW OPENING IN CONC. SLAB ABOVE FOR MECH. DUCT. SEE STRUCTURAL FOR REINFORCING.
6. NEW 2-1/2"± 10" (VERIFY W/ STRUCTURAL) OPENING IN CONC. SLAB ABOVE FOR ELECTRICAL SEE STRUCTURAL FOR REINFORCING.
7. NEW FOUNDATION TO FLOOR.

LEGEND

- SHORE & REMOVE BEARING WALL
- REMOVE CONC. FLOOR
- EC5G EXISTING CONC. SLAB ON GRADE
- EC5S EXISTING CONC. STRUCTURAL SLAB

GENERAL NOTES

1. REMOVE ALL EXTERIOR DOORS AND WINDOWS THIS FLOOR.
2. EXISTING CONC. BEAMS ARE INDICATED WITH — · — — · —
3. NEW LF BEAMS ARE INDICATED WITH — · · — · · —



DEMOLITION PLAN GROUND FLOOR

SCALE: 1/8" = 1' - 0"

NORTH

Mc DERMOTH ELEMENTARY MODERNIZATION & ADDITIONS

ABERDEEN SCHOOL DISTRICT NO. 5 ABERDEEN WASHINGTON

REGISTERED ARCHITECT STATE OF WASHINGTON 1888

DATE: 9/23/97
REVISED
COMM. NO. 961413

The BJSS GROUP
ARCHITECTS & PLANNERS, AIA
320 WEST BAY DRIVE SUITE 212 OLYMPIA, WA 98502 (360) 943-4650

PHASE 3

D2.01

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FLAG NOTES

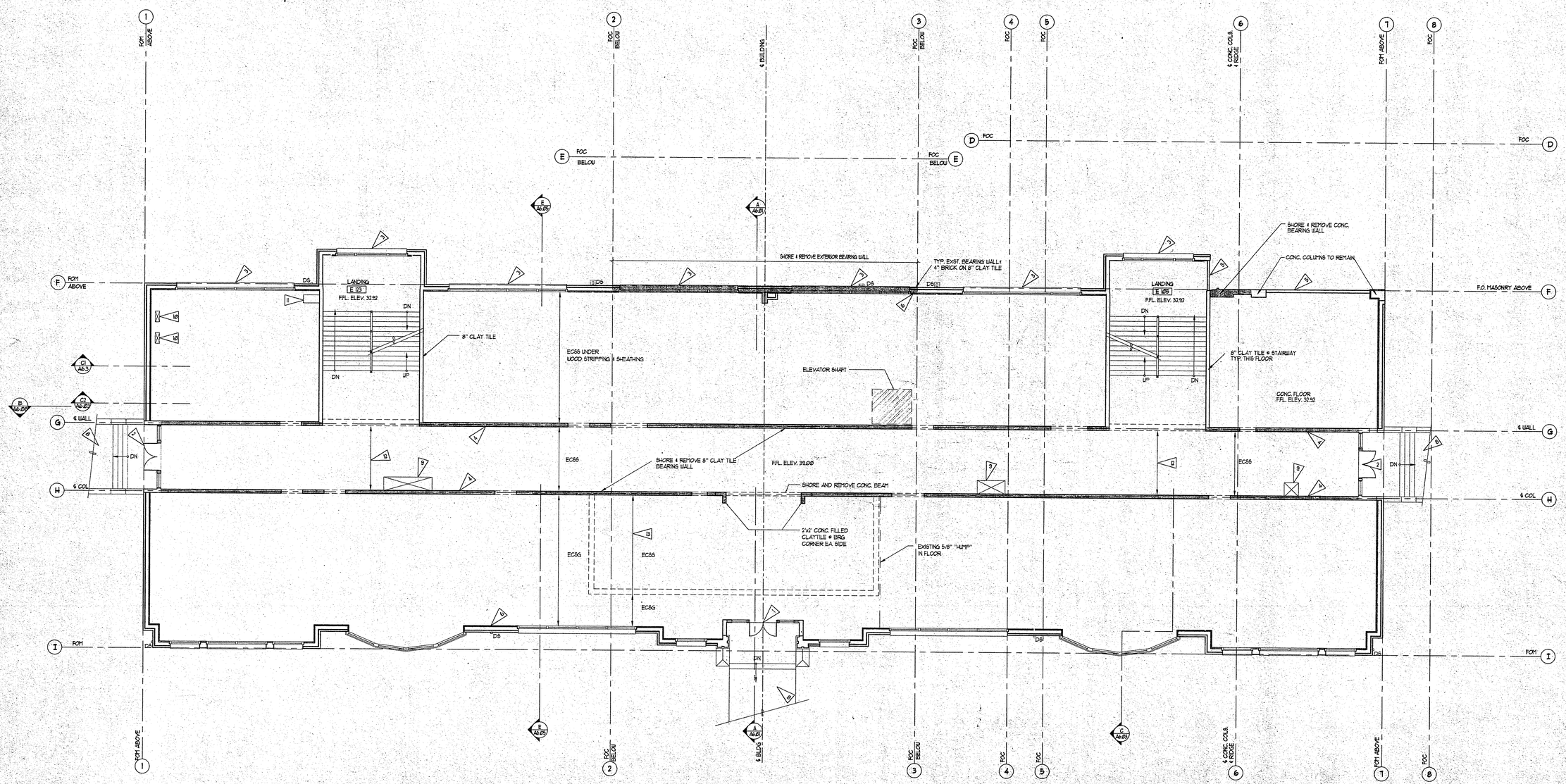
1. REMOVE ALUM. STOREFRONT & TRANSOM GLASS ABOVE.
2. REMOVE ALUM. STOREFRONT, TRANSOM GLASS ABOVE TO REMAIN.
3. REMOVE ALUM. WINDOWS. SEE GENERAL NOTE NO. 1 FOR ASBESTOS.
4. SHORE & REMOVE 8" BEARING CLAY TILE WALL WITH LATH & PLASTER FINISH.
5. TEMPORY CLOSURE BY PHASE I.
6. LATH & PLASTER FINISH ON EXIST. WALLS REMOVED IN PHASE I.
7. NOT USED
8. REMOVE CONC. WALKS, & STEPS TYPICAL.
9. NEW FLOOR OPENINGS FOR MECH. DUCT WORK. SEE STRUCTURAL FOR REINFORCING.
10. 18"X 2-1/2" FLOOR OPENING FOR ELECTRICAL.
11. FLOOR & CEILING OPENING FOR BOILER AND HU FLUE.
12. CEILING ABOVE: REMOVE 6-1/2" CONC. SLAB WITH ACOUSTIC TILES.
13. CRAWL SPACE BELOW THIS AREA.

LEGEND

- SHORE & REMOVE BEARING WALL
- REMOVE CONC. FLOOR
- EC5G EXISTING CONC. SLAB ON GRADE
- EC5S EXISTING CONC. STRUCTURAL SLAB

GENERAL NOTES

1. REPLACEMENT OF WEST WINDOWS IS SUGGESTED TO OCCUR NEAR END OF PROJECT DURING SUMMER WEATHER TO AVOID EXPOSING THE INTERIOR TO WEATHER. UPPER PANEL OF WINDOWS APPROX. 2' HIGH IS 1/4" CEMENT ASBESTOS BOARD TO BE REMOVED AND DISPOSED OF PER CODE.
2. REMOVE FLOOR SHEATHING STRUCT. AT NEW SHOTCRETE CONC. WALLS. SEE STRUCTURAL DRAWINGS & DETAILS. EXISTING FLOOR JOISTS RUN THROUGH.
3. REMOVE CEILING ACOUSTIC TILE ON WOOD STRIPPING ON PLASTER AS REQUIRED FOR NEW FRAMING AROUND NEW DUCT CHASE OPENINGS AND NEW CEILING TREATMENTS.
4. ALL ASBESTOS REMOVED IN PHASE I, EXCEPT AS NOTED ABOVE.


FOM ABOVE
FOC BELOW
℄ BUILDING
FOC
℄ CONC COLS & RIDGE
FOM ABOVE
FOC
FOC
FOC BELOW
FOC BELOW
FOC
FOC
FOC

FLAG NOTES

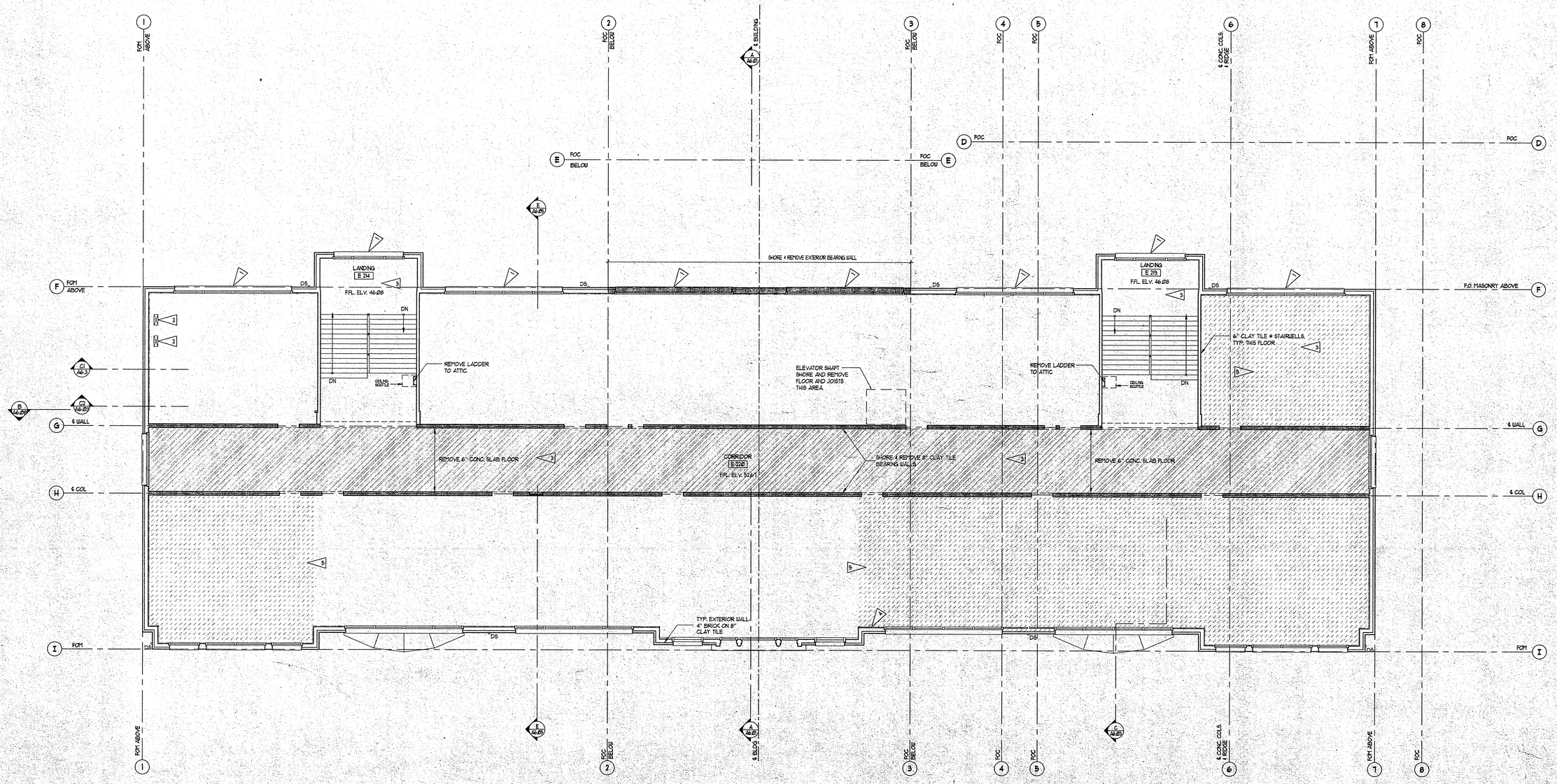
1. REMOVE EXISTING ALUM. WINDOWS.
2. OPENING FOR ELECTRICAL IN FLOOR & CEILING. VERIFY SIZE & LOCATION WITH ELECTRICAL.
3. CEILING FINISH REMOVED PHASE 1. OTHER FINISHES REMAIN U.N.O.
4. LATH/ PLASTER ON EXTERIOR WALLS REMOVED PHASE 1.
5. REMOVE 5/8" OSB FUD SUBFLOORING

GENERAL NOTES

1. REPLACEMENT OF WEST WINDOWS IS SUGGESTED TO OCCUR NEAR END OF PROJECT DURING SUMMER WEATHER TO AVOID EXPOSING THE INTERIOR TO WEATHER. UPPER PANEL OF WINDOWS APPROX. 7' HIGH IS 1/4" CEMENT ASBESTOS BOARD TO BE REMOVED AND DISPOSED OF PER CODE.
2. REMOVE FLOOR SHEATHING STRUCT. AT NEW SHOTCRETE CONC. WALLS. SEE STRUCTURAL DRAWINGS & DETAILS. EXISTING FLOOR JOISTS RUN THROUGH.
3. REMOVE CEILING ACOUSTIC TILE ON WOOD STRIPPING ON PLASTER AS REQUIRED FOR NEW FRAMING AROUND NEW DUCT CHASE OPENINGS AND NEW CEILING TREATMENTS.
4. ALL ASBESTOS REMOVED IN PHASE 1, EXCEPT AS NOTED ABOVE.

LEGEND

- SHORE & REMOVE BEARING WALL
- REMOVE CONC. FLOOR
- ECSG EXISTING CONC. SLAB ON GRADE
- ECSS EXISTING CONC. STRUCTURAL SLAB



DEMOLITION PLAN SECOND FLOOR

SCALE: 1/8" = 1' - 0"

PLAN NORTH

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Mc DERMOTH ELEMENTARY MODERNIZATION & ADDITIONS

ABERDEEN SCHOOL DISTRICT NO. 5 ABERDEEN WASHINGTON

REGISTERED ARCHITECT Frank Lee Smith STATE OF WASHINGTON 1888

DATE 9/23/97

REVISED

COMM. NO. 961413

The BJSS GROUP
ARCHITECTS & PLANNERS AIA
320 WEST 4TH DRIVE SUITE 212 OLYMPIA, WA 98502 (360) 943-4656

PHASE 3

D2.03

HALEY ALDRICH

www.haleyaldrich.com

REPORT OF PRELIMINARY GEOTECHNICAL ENGINEERING FINDINGS
ABERDEEN SCHOOL DISTRICT NO. 5 SEISMIC SAFETY RETROFITS
CENTRAL PARK ELEMENTARY SCHOOL
ABERDEEN, WASHINGTON



by
Haley & Aldrich, Inc.
Vancouver, Washington

for
TCF Architecture PLLC
Tacoma, Washington

File No. 0210746-000
September 2024

HALEY & ALDRICH, INC.
300 W 15th S
Vancouver, WA 98660
360.448.4189

12 September 2024
File No. 0210746-000

TCF Architecture PLLC
902 N 2nd Street
Tacoma, Washington 98403

Attention: Steve Wachtler, AIA, Principal

Subject: Report of Preliminary Geotechnical Engineering Findings
Aberdeen School District No. 5 Seismic Safety Retrofits
Central Park Elementary School
601 School Road
Aberdeen, Washington 98520

Dear Steve Wachtler:

Haley & Aldrich, Inc. (Haley & Aldrich) is pleased to submit this report to TCF Architecture PLLC (TCF) and Aberdeen School District No. 5 (District) summarizing our preliminary geotechnical engineering services for the seismic retrofit of Central Park Elementary School in Aberdeen, Washington. Our work was completed in general accordance with our agreement executed 24 April 2024. In completing our services, we collaborated with Degenkolb Engineers, Inc. (Degenkolb) and Educational Service District 112 - Construction Services Group.

The project involves preliminary evaluation of the Central Park Elementary School in Aberdeen, Washington, per *American Society of Civil Engineers/Structural Engineering Institute (ASCE/SEI) 41-17 - Seismic Evaluation and Retrofit of Existing Buildings* (ASCE 41-17; ASCE, 2017b). The study was funded by the Office of Superintendent of Public Instruction's (OPSI's) School Seismic Grant Program. The findings from this preliminary evaluation will inform the District's and OPSI's decision-making to either advance full design efforts for seismic retrofit improvements at the existing campus or to explore re-siting the school to a new location.

This preliminary report provides a discussion of the site setting, surface and subsurface conditions, the seismic basis of design, and a preliminary geotechnical analysis of seismicity and seismic hazards that may impact plans for retrofit of the subject school. Our current scope of services does not include developing recommendations for design and construction of retrofit improvements, such as modification of existing foundations or installation of ground improvement elements. Preliminary recommendations for retrofit improvements may be provided using currently available subsurface data under a supplemental authorization.

Scope of Services

The purpose of our services was to preliminarily characterize subsurface conditions at the site and to provide geotechnical engineering guidance and recommendations that conform in a preliminary sense to the geotechnical requirements of ASCE 41-17. These services included conducting geologic research, limited field explorations, limited laboratory testing, preliminary seismic ground motion assessments, seismic hazard evaluations, and preliminary engineering analyses.

We completed the following tasks in general accordance with *Part 1 – Geotechnical Field Services and Limited Seismic Hazard Evaluation* included in our proposal for Geotechnical Engineering Services, dated 10 April 2024 and executed 24 April 2024.

- Reviewed readily available geologic and geologic hazard maps and geotechnical reports and construction plans provided by others for general information regarding subsurface soil and groundwater conditions and geologic hazards.
- Drilled two borings to depths of approximately 51 feet below ground surface (bgs).
- Performed two multi-channel analysis of surface waves (MASW) geophysical tests.
- Observed the explorations, logged the subsurface conditions, collected representative soil samples, and transported the samples to our laboratory for further visual review and testing.
- Completed laboratory tests on select soil samples to evaluate soil engineering properties. Our specific tests included moisture content, Atterberg Limits, grain size distribution determinations, and a suite of corrosion potential tests in accordance with current ASTM International or other applicable standards.
- Developed code-based seismic design values in conformance with ASCE 41 Section 2.4 and ASCE 7 Section 11.4, not including site-specific seismic or ground response analyses per ASCE 7 Chapter 21 (ASCE, 2017a).
- Conducted limited seismic hazard analyses including:
  - Assessing liquefaction potential analysis per the method presented by Idriss and Boulanger (2008); and
  - Assessing lateral spreading at the site, including an evaluation of local and regional topography and nearby bathymetry.
- Prepared this report summarizing our preliminary findings.

Site Conditions

SURFACE CONDITIONS

The Central Park Elementary School campus encompasses an approximately 4.7-acre site located at 601 School Road in Aberdeen, Washington, as shown on Figure 1 – Project Locus. The site is bounded by Manor Road to the north, School Road to the east, and single-family residences to the south and west. There school consists of several single-story structures interconnected by a covered patio/walkway into

an L-shaped facility. The area southwest of the school structure is occupied by an asphalt-paved play court. Asphalt-paved parking lots and driveways are present to the northwest, north, east, and south of the school structure. Grass-covered playfields are present throughout much of the western half of the site.

The site topography is generally flat with an average surface elevation at approximately 108 feet (World Geodetic System 84).

The Chehalis River is located approximately 0.6 miles to the south of the school. The Pacific Ocean is about 23 miles to the west of the school, beyond the northern peninsula of Grays Harbor.

Our understanding of the existing structure foundations is based on our review of a plan sheet titled, "Central Park Elementary School, Foundation Plan", prepared by E.L. Mills & Associates Architects, and dated December 1957. The plan sheet only depicts the northern wing of the structure. According to the plan, this portion of the structure is supported by shallow, isolated spread footings measuring 14 to 36 inches in width. The school floors consist of concrete slabs-on-grade with thickened sections under partition walls. This plan sheet is included in Appendix D.

GEOLOGIC AND SOIL MAPPING

The site is mapped in Logan (1987) as Quaternary Pre-Vashon drift, undifferentiated, (Qdp) which includes "Pleistocene till, outwash sand and gravel, and loess." The deposits that form terraces along the Chehalis River are assigned to the "Helm Creek" deposits of Carson (1970) and are described by Logan (1987) as "moderately oxidized but otherwise unweathered, horizontally stratified, crossbedded and well-sorted gravels" with a "thick loess cover" and glacial till that is "mottled orange and yellowish gray". Gower and Pease (1965) previously mapped the site as Quaternary terrace deposits (Qt) that are described as "gravel and sand with minor silt and clay" with "gravel commonly iron stained." Logan (1987) maps Quaternary terrace deposits between Aberdeen and Raymond, Washington, and describes them as "a variety of sediments at various elevations, ranging from iron-stained pebble gravel, to laminated fine sand and clay with cross-bedded gravel and local peat layers" which represent "uplifted coastal marine and estuarine deposits." South-southwest of and 40 to 50 feet lower in elevation to the site, Logan (1987) maps Vashon-age recessional outwash which is described as "stratified, unweathered sand and gravel" that "locally contains silt and clay."

The near surface soils at the site are mapped by the U.S. Department of Agriculture (USDA) in the *Soil Survey of Grays Harbor County Area, Pacific County, and Wahkiakum County* (Pringle, 1986), as compiled in the Web Soil Survey (USDA, 2024), as Hoquiam silt loam, 1 to 8 percent slopes, with Wishkah silty clay loam mapped at the southeastern corner of the property but not beneath the building. Hoquiam soils are described as deep, well drained soils derived from old alluvium deposited over glacial drift (Pringle, 1986). The typical soil profile generally comprises 18 inches of medial silt loam (United Soil Classification System [USCS] ML, MH, OL, OH) overlying gravelly medial silt loam (USCS ML, SM, GM, MH) that grades to gravelly medial sandy loam (USCS SM, ML, GM) at 46 inches. Dense glacial drift, described as cemented extremely gravelly loamy sand (USCS GP-GM), is typically at a depth of about 54 inches but can range from approximately 40 to 54 inches.

Depth to water in the Hoquiam soil is typically greater than 80 inches and the soil is assigned to hydrologic soil group B, which are soils that generally have moderate infiltration and water transmission rates. The risk of corrosion is rated as “high” for uncoated steel and “moderate” for concrete with typical effective cation-exchange capacity ranging between 25 and 50 milliequivalents per 100 grams of soil.

Based on our explorations, the soils identified as “native” soils in our exploration logs are generally similar to those described in the geologic and soil mapping, with alluvial soils that resemble the description of Quaternary terrace deposits by Gower and Pease (1965) and Logan (1987) overlying glacial outwash deposits.

SUBSURFACE CONDITIONS

Subsurface conditions interpreted from the explorations advanced at the site as part of our current study, in conjunction with soil properties inferred from field and laboratory tests, formed the basis for the conclusions and recommendations in this report. The locations and depths of our explorations were selected considering the site features, under the constraints of surface access, time, and budget.

We explored subsurface soil and groundwater conditions at the site on 4 and 5 June 2024, by drilling two borings (designated CPB-1 and CPB-2) to a depth of approximately 51 feet bgs, using the mud-rotary drilling method. The borings were located southeast and northwest of the school structure at the locations shown on Figure 2. Additionally, we performed two MASW geophysical tests to estimate the shear wave velocity profile of soils within the upper 100 feet bgs, at locations shown on Figure 2. Our field exploration procedures and exploration logs are in Appendix A. Laboratory soil testing procedures and results are in Appendix B. The report of MASW findings is presented in Appendix C.

The explorations indicate the site is blanketed by approximately 2 to 3 feet of fill consisting of silty sand and poorly graded sand with silt and gravel. Asphalt pavement penetrated at CPB-2 consisted of 3 inches of asphalt concrete over 6 inches of aggregate base over approximately 15 inches of an aggregate subbase consisting of poorly graded gravel with sand.

The fill is underlain by approximately 25 to 39 feet of alluvial soils consisting of very soft to soft fat clay, lean clay with sand, elastic silt with sand, and sandy silt, interbedded with strata of very loose to very dense silty sand, silty sand with gravel, silty gravel with sand, poorly graded sand with silt and gravel, and poorly graded gravel with silt and sand. At CPB-1 and CPB-2, the lower alluvial soils consist of an approximately 10-foot-thick layer of soft elastic silt and sandy silt with frequent organic and woody debris.

Glacial outwash deposits are present beneath the alluvium at 42 feet bgs in CPB-1 and 38 feet bgs in CPB-2 and extend to the bottom of each boring. These soils consist of medium dense to very dense poorly graded sand with silt, poorly graded sand with silt and gravel, silty sand, and silty gravel with sand.

Groundwater was identified at a depth of 3 feet bgs in boring CPB-1 during hand augering within the upper 5 feet bgs. Groundwater was not encountered within the upper 5 feet bgs in boring CPB-2 before mud rotary drilling was initiated, obscuring the location of the water table. However, wet soils were observed at about 6 feet bgs which could infer the presence of groundwater. For our engineering analyses, we conservatively assumed groundwater to be present at the ground surface.

Seismic Basis of Design

SEISMIC SETTING

The site is in a seismically active area. In this section, we describe the seismic setting, identify the seismic basis of design, provide code-based design values, and discuss the seismic hazards at the site. Geologic hazards mapped near the project site are all related to seismicity and include tsunami inundation, very strong earthquake shaking, and a moderate to high liquefaction hazard (Washington Department of Natural Resources [WADNR], 2024).

Regional Seismicity

Western Washington sits at the contact between two large crustal tectonic plates. The Juan de Fuca Plate forms the floor of the Pacific Ocean off the coast of the northwestern United States and moves northeastward from its spreading ridge boundary with the Pacific Plate at an average rate of approximately 1.5 inches per year. As it converges with the continental North American Plate, the Juan de Fuca Plate dips below (or “subducts”) beneath the North American Plate forming a shallow, eastward-dipping contact interface. This boundary is known as the Cascadia Subduction Zone (CSZ) and is responsible for the seismicity in the western Washington regions, producing earthquakes associated with three types of source zones: subduction interface, subduction intraslab, and crustal. The CSZ is located offshore approximately 115 miles west of the site.

Subduction Interface Sources. The displacement caused by the subduction of the Juan de Fuca Plate below the North American Plate does not generally manifest as slip between the two plates; rather, it is absorbed by compression of the North American Plate at the interface at relatively shallow depths. This compression, based on geologic and historical evidence, is released every 300 to 600 years, on average, in the form of magnitude 8 to 9 or larger earthquakes, the last such event occurring in 1700. Characteristics of this type of earthquake may include very large ground accelerations, shaking durations in excess of 2 minutes, and particularly strong long-period ground motions that may affect tall or long-period structures.

Subduction Intraslab Sources. A deeper zone of seismicity is associated with a steeper bending of the Juan de Fuca Plate and the breaking of the plate under its own weight below the Pacific Northwest region. This region, termed the Benioff Zone, produces intraslab earthquakes at depths of 40 to 70 kilometers. Such past events in western Washington include the 1949 Puget Sound, 1965 Olympia, and 2001 Nisqually earthquakes. Deep, intraslab earthquakes tend to be felt over larger areas than shallower crustal events, and generally lack significant aftershocks.

Crustal Sources. Shallow crustal faults are caused by cracking of the continental crust, resulting from the stress that builds as the subduction zone plates remain locked together. Many small crustal faults are mapped near the site that are a part of the greater Cascadia Fold and Thrust Belt (U.S. Geologic Survey [USGS], 2024). However, due to the size of these faults, their contribution to the site seismic hazard is relatively small. The closest mapped fault is a strand of the Cascadia Fold and Fault Belt located more than 22 miles to the west of the site.

SEISMIC BASIS OF DESIGN AND ANALYSIS METHODOLOGY

Preliminary site-specific seismic hazard analysis was conducted for the project site following the guidelines in ASCE 41-17 Section 2.4.1 *General Procedure for Hazard Caused by Ground Shaking*. The seismic hazard levels evaluated per this approach are as follows.

- **BSE-1E:** Basic Safety Earthquake-1 for use with the Basic Performance Objective for Existing Buildings, taken as a seismic hazard with a 20 percent probability of exceedance in 50 years (225-year return period), but not greater than the BSE-1N, at a site. The design earthquake magnitude for this level is 7.54 with an associated PGAM value of 0.25g.
- **BSE-1N:** Basic Safety Earthquake-1 for use with the Basic Performance Objective Equivalent to New Building Standards taken as two-thirds of the BSE-2N at a site.
- **BSE-2E:** Basic Safety Earthquake-2 for use with the Basic Performance Objective for Existing Buildings, taken as a seismic hazard with a 5 percent probability of exceedance in 50 years (975-year return period), but not greater than the BSE-2N, at a site. The design earthquake magnitude for this level is 8.28 with an associated PGAM value of 0.51g.
- **BSE-2N:** Basic Safety Earthquake-2 for use with the Basic Performance Objective Equivalent to New Building Standards, taken as the ground shaking based on the Risk-Targeted Maximum Considered Earthquake (MCE_R) per ASCE 7 at a site. The design earthquake magnitude for this level is 8.52 with an associated PGAM value of 0.76g.

The BSE-2N hazard level is analogous to the maximum considered earthquake hazard level (MCE) in ASCE 7-16 (with a 2 percent probability of exceedance in 50 years or a 2,475-year return period), and the BSE-1N hazard level is consistent with a design-level event in ASCE 7-16.

Seismic Site Class

Thick sequences of unconsolidated, soft sediments typically amplify the shaking of long-period ground motions, such as those associated with subduction zone earthquakes, whereas areas underlain by shallow soil profiles are not likely to amplify seismic waves.

The “Site Class” is a designation used by ASCE 7-16, as referenced by ASCE 41-17, to quantify ground motion amplification. The classification is based on the stiffness in the upper 100 feet (roughly 30 meters) of soil and bedrock materials at a site.

Site class determination was based on two MASW geophysical tests performed to the north and south of the school structure. The tests resulted in weighted-average shear wave velocity values of 1,105 to

1,165 feet per second for a 100-foot-deep profile. These shear wave velocities put the site within the limits of Site Class D, as defined in ASCE 7-16, as referenced by ASCE 41-17. However, due to liquefaction hazard at this project site (discussed in the following section), the site is classified as Site Class F.

Per ASCE 41-17, a Site Class F designation requires a site-specific analysis including a seismic hazard analysis and a site response analysis; however, buildings with structural periods of less than 0.5 seconds may be designed using seismic parameters developed considering Site Class D conditions.

Preliminary Spectral Design Parameters

Acceleration response spectra for use in preliminary design have been developed following the procedures in ASCE 41-17 Section 2.4.1 *General Procedure for Hazard Caused by Ground Shaking*. These values are presented in Table 1.

Table 1. General Procedure Spectral Design Parameters

Design Parameters	Hazard Level			
	BSE-2N	BSE-1N	BSE-2E	BSE-1E
Site Class	D			
S_s	1.49	-	1.09	0.43
F_a (Site Class E)[1]	1.0	-	1.07	1.45
S_{xs}	1.49	0.99	1.16	0.63
S_1	0.66	-	0.45	0.13
F_v (Site Class E)[1]	1.7	-	1.85	2.34
S_{x1}	1.13	0.75	0.83	0.31
T_L	16 s	16 s	16 s	16 s

Notes:

1. *F_a and F_V are the ASCE 7-16 Chapter 21 site factors for Site Class D.*
2. *Site coordinates are Latitude/Longitude 46.967313°N / 123.697846°W.*
3. *Values presented in this table are for Site Class D conditions. This site falls under Site Class F categorization; however, these values are provided assuming that the structures have a fundamental period of less than 0.5 seconds, in which case Site Class D may be used for design.*
4. *s = seconds*

LIQUEFACTION

General

When cyclic loading occurs during an earthquake, the shaking can increase the pore pressure in loose to medium dense saturated sand and cause liquefaction. The rapid increase in pore water pressure reduces the effective normal stress between soil particles, resulting in the sudden loss of shear strength in the soil. Granular soils, which rely on interparticle friction for strength, are susceptible to liquefaction until the excess pore pressures can dissipate. Sand boils and flows observed at the ground surface after an earthquake are the result of excess pore pressures dissipating upward, carrying soil particles with the

draining water. In general, loose, saturated sand soils with low silt and clay contents are the most susceptible to liquefaction. Silty soils with low plasticity are moderately susceptible to liquefaction under relatively higher levels of ground shaking. For any soil type, the soil must be saturated for liquefaction to occur.

We performed liquefaction potential analysis on soils logged at the site using the procedures outlined in Idriss and Boulanger (2008), and updated Magnitude Scaling Factor as outlined in Boulanger and Idriss (2014).

We note the term liquefaction is defined very specifically by the simplified method that we used to evaluate the liquefaction hazard. Liquefaction is defined as when a soil under repeated cyclic loading exhibits the generation of increasing excess pore pressures until the pore pressure equals the total overburden stress. When this condition is reached, the normal stress acting between adjacent soil particles is effectively lost, and the soil, which derives its shear strength from interparticle friction, can lose much of its available shear strength. However, it is well documented that not all soils exhibit the same behavior after the initiation of liquefaction.

Loose sandy soils that achieve the condition of liquefaction during earthquake shaking can subsequently collapse and exhibit large shear strains under continued cyclic or static loading. This type of behavior is a well-documented result of numerous earthquakes, where structures underlain by shallow, liquefiable hydraulically placed fills have been observed to experience bearing capacity failures and collapse. Conversely, medium dense to dense sandy soils that achieve the condition of liquefaction will typically not collapse and can exhibit strain hardening behavior due to dilation effects. Therefore, despite the soil achieving the condition of liquefaction, there is little to no shear strength loss and only moderate shear strains under continued cyclic and static loading. This condition is termed “cyclic mobility.”

Analysis

In accordance with ASCE 7-16, as referenced by ASCE 41-17, we completed the liquefaction hazard analysis using the site-class-adjusted acceleration coefficient PGA_M for Site Class D. We performed our liquefaction analysis for three different hazard levels, including events with 225-year (corresponding to BSE-1E), 975-year (corresponding to BSE-2E), and 2475-year (corresponding to BSE-2N) return periods. We performed liquefaction analyses using PGA_M values of 0.25g and 0.51g and associated earthquake magnitudes of 7.54 and 8.28 for BSE-1E and BSE-2E, respectively. We used a PGA_M of 0.76g and associated earthquake magnitude of 8.52 in our analysis for the BSE-2N event. We assumed a design groundwater depth at the ground surface for our liquefaction analyses.

Our analyses conclude that potential for liquefaction to occur at the site for all seismic hazard levels is high (but limited to discrete layers). The layers subject to liquefaction include the sandy silt layer present between about 3.5 and 7.5 feet bgs at boring CPB-2 and the poorly graded gravel with silt and sand layer between about 10 and 13 feet bgs at boring CPB-2. Silty sand and sandy silt layers at depths of greater than 37 feet bgs also have potential to liquefy, with a relatively diminished potential of manifesting settlement at the ground surface. Layers of dense soil and/or glacial outwash were not considered liquefiable due to density or age.

Settlement

Post-liquefaction settlement results from densification of liquefiable sandy soils following an earthquake. The permanent ground surface settlement is not typically uniform across the area and can result in significant differential settlement. Differential settlement will have the most significant effect on structures supported by shallow foundations. Based on our analysis, we estimate settlements on the order of 1 1/2 inches due to liquefaction could occur throughout the site. Differential settlements can preliminarily be assumed as one-half of the total settlements occurring over a lateral distance of 50 feet.

We note that the settlement estimates provided above do not account for movements of foundations which may occur due to bearing capacity failure due to seismic strength loss or localized ground deformations that may result due to surface effects of shallow liquefaction, such as sand boils. (Both conditions are described below in more detail.) Therefore, actual ground and building settlements may be greater than the values noted above.

Seismic Strength Loss

We anticipate considerable reductions in the strength of the liquefiable layers of the site soil profile. The shear strength loss was determined by using the recommendations of Idriss and Boulanger (2008), and Bray and Sancio (2006). Simplistically, the liquefied shear strength directly correlates to the soil's pre-liquefied relative density. The relative density is estimated based on the standard penetration test (SPT) blow counts. The higher the relative density, the higher the liquefied shear strength. The typical residual strength of liquefiable soils at the site is expected to be less than 20 percent of the static strength (e.g., 80 percent or more strength loss).

Additionally, some strength loss due to cyclic shear stresses is expected to occur in the fine-grained elastic silt soils within the upper approximately 8 to 10 feet bgs. Full cyclic softening and development of lowered residual strengths within these materials are likely to occur. Supplemental exploration including performance of cyclic direct simple shear testing would be required to accurately estimate residual strength ratios for these soils. For preliminary design, we recommend usage of a softened bearing capacity of no greater than 1,000 pounds per square foot.

As a result of the high expected soil strength loss, the shallow foundation system may undergo significant seismic settlement or bearing capacity failure if not subjected to retrofits.

Surface Effects

We evaluated the potential for liquefaction-related surface manifestations (such as sand boils) to occur using the procedures presented by Ishihara (1985).

The Ishihara (1985) procedure compares the thickness of a given liquefiable soil layer to the thickness of the overlying non-liquefiable soil mantle to determine if surface manifestations are possible at a given peak ground acceleration. This approach has several limitations and may overestimate potential for surface manifestations to occur in silty sands and sandy silts, as the relatively low permeability of these

materials has potential to prevent pore water from flowing quickly enough to produce sand boils (Kramer, 1996). The Ishihara (1985) analyses indicate that there is potential for surface manifestations to occur locally throughout the site. The potential for surface manifestations appears low near CPB-2 and high near CPB-1, though the layer potentially subject to producing surface manifestations contains a significant percentage of silt that may impede manifestations from forming.

We preliminarily conclude that the probability of direct surface effects of liquefaction is moderate, due to subsurface conditions at CPB-1.

LATERAL SPREADING

Lateral spreading occurs when large blocks of ground are displaced down gentle slopes or toward the free face of river channels, ditches, etc. as a result of earthquake-induced inertial forces acting on the soil mass. Initiation of lateral spreading is often made worse when the soils within and beneath the soil mass liquefy or soften as a result of the shaking. Lateral spreading deformations can be experienced relatively far from a free face. Similar to lateral spread, flow failures result when large volumes of soil near the free face of river channels or lake bottoms displace vertically and laterally during or after earthquakes. As the ground begins to shake and the shearing resistance of liquefied soils decreases, ground displacement occurs in response to mainly static shear forces present within the soil mass and, to a lesser extent, earthquake-induced inertial forces. Flow failures typically manifest larger deformations than lateral spreading; however, the extent of the deformations is typically localized to the area behind the free face of the channel. Both lateral spreading and flow failures can be destructive and pose a significant risk to structures.

Due to the distance between the site and a significant free face towards which lateral spreading could occur, as well as the lack of continuous liquefiable layers of significant thickness underlying the site, we conclude that the potential for widespread lateral spreading is low.

FAULT SURFACE RUPTURE

We used the USGS Quaternary faults web application (USGS, 2024) to identify earthquake-producing faults near the project site. No mapped earthquake-producing crustal faults are present at the site. Based on known fault locations, we consider the potential for fault rupture to occur at the site to be low unless occurring on an unmapped or otherwise unknown fault.

TSUNAMI HAZARD

The site is beyond the limits of tsunami mapping by the WADNR and ASCE. The site is located at a mean elevation greater than 100 feet and is over 7 miles east of the mouth of Grays Harbor.

For these reasons, we consider the potential for tsunami inundation to occur at the site to be nil.

Corrosivity

One soil sample was collected and tested for corrosivity characteristics by CERCO of Concord, California. The tested sample consisted of near-surface soils and was tested for resistivity, redox potential, sulfate and chloride ion concentrations, and pH. The test results indicate that near-surface soils should be considered mildly corrosive to buried iron and steel improvements based on laboratory resistivity measurements. Chloride ion concentrations were not detected and insufficient to attack steel embedded in concrete mortar coating. Sulfate ion concentration results were not detected and insufficient to be detrimental to reinforced concrete. The pH level was measured as about 5.4 and is considered a corrosion concern for buried iron, steel, mortar-coated steel, and reinforced concrete structures.

The results of our corrosion testing and a copy of CERCO's brief evaluation are presented in Appendix B.

Conclusions

Based on our explorations, testing, and analyses, we have formulated preliminary conclusions in this report for use in assessment of the seismic retrofit project's viability. We offer the following general summary.

- The site soil profile generally features a thin layer of granular fill, underlain by alluvial soils consisting of very loose to very dense granular soils and very soft to soft fine-grained soils. These soils are underlain by glacial outwash beginning at a depth of about 38 to 42 feet bgs. The groundwater table at the site is shallow at near or just a few feet below the ground surface.
  - Soft, cohesive soils present within layers in the upper 8 to 10 feet bgs are considered to be weak, compressible, and susceptible to seismically induced strength loss, though are not considered to be liquefiable.
  - Medium dense granular soils and soft non-plastic silt within the upper 15 feet bgs, as identified at boring CPB-2, is subject to liquefaction and could cause total seismic settlements of about 1 1/2 inches. Additional settlement could occur as a result of surface manifestations.
- Due to the presence of liquefaction and related hazards, there is a likelihood for vertical movements of existing building foundations during an earthquake. Therefore, the existing and any proposed new or upgraded foundations will need to be analyzed for ability to tolerate or resist these seismically induced ground movements.
- Conceptually, we conclude the following regarding potential foundation retrofit and hazard mitigation alternatives:
  - Deep foundations: The structure could feasibly be underpinned to transfer building loads under seismic conditions through the upper liquefiable and cyclic softening-susceptible soils into deeper, competent materials. The use of micropiles, helical augers, pin piles, or similar systems can considered if needed.
  - Shallow foundations: The building is currently supported by shallow spread footing foundations with unreinforced slabs-on-grade. Structural evaluation may indicate that

the existing foundation system is suitable for tolerating estimated ground movements and seismic bearing pressures. Should the foundations require improvements, this could be achieved by retrofitting the structure to feature a thickened structural mat, structurally interconnecting the existing foundations, and/or widening the existing foundations to accommodate a lower seismic bearing capacity.

- Final design of geotechnical elements may require additional site characterization to verify subsurface conditions around the school building. Additional explorations around the building perimeter may allow for better delineation of liquefiable soil layer extents and an improved estimation of probable settlements and seismic bearing capacities.

Closing

Thank you for the opportunity to perform these services for you. Please do not hesitate to contact us if you have any questions or comments.

Sincerely yours,
HALEY & ALDRICH, INC.



Daniel J. Trisler, P.E.
Principal Geotechnical Engineer

Micah D. Hintz, P.E.
Geotechnical Engineer

Attachments:
References

Figure 1 – Project Locus
Figure 2 – Site and Exploration Plan

Appendix A – Exploration Logs
Appendix B – Laboratory Test Results
Appendix C – MASW Report
Appendix D – Historical Plans

References

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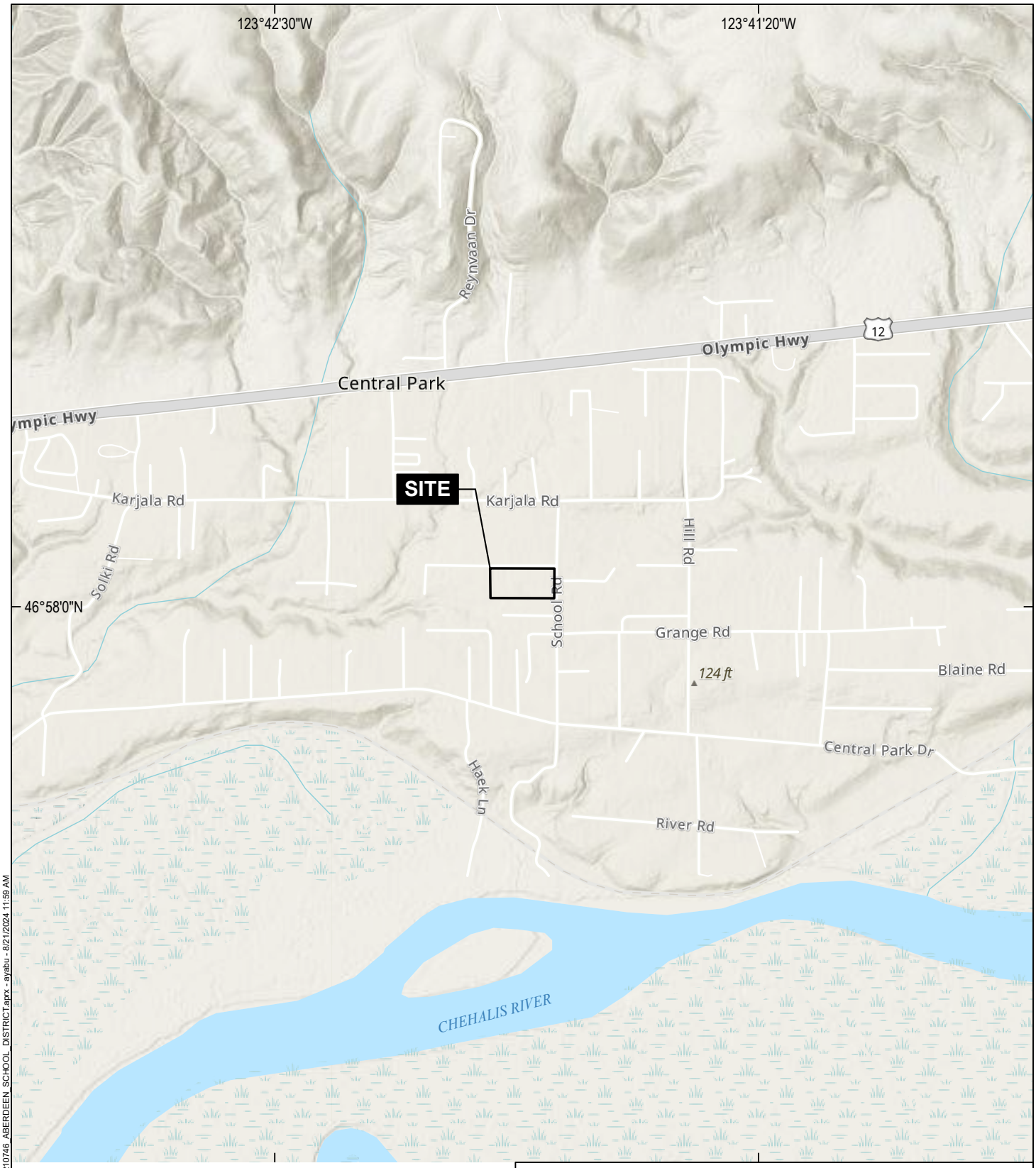
FIGURES







MAP SOURCE: ESRI
SITE COORDINATES: 46°58'02"N, 123°41'54"W

HALEY ALDRICH

CENTRAL PARK ELEMENTARY SCHOOL
SEISMIC SAFETY RETROFIT
CENTRAL PARK, WASHINGTON

PROJECT LOCUS

APPROXIMATE SCALE: 1 IN = 2000 FT
SEPTEMBER 2024

FIGURE 1

GIS: \\haleyaldrich\share\CF\Projects\021074\6\GIS\210746_ABERDEEN_SCHOOL_DISTRICT.aprx - ayabu - 8/21/2024 11:59 AM



LEGEND

- MUD ROTARY BORING
- MULTI-CHANNEL ANALYSIS OF SURFACE WAVES (MASW) LOCATION
- MASW ARRAY
- SITE BOUNDARY

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. AERIAL IMAGERY SOURCE: NEARMAP, 14 AUGUST 2023

N

0 70 140
SCALE IN FEET

HALEY ALDRICH

CENTRAL PARK ELEMENTARY SCHOOL
SEISMIC SAFETY RETROFIT
CENTRAL PARK, WASHINGTON

SITE AND EXPLORATION PLAN

AUGUST 2024

FIGURE 2

GIS FILE PATH: \\haleyaldrich\share\CF\Projects\0210746\GIS\210746_ABERDEEN_SCHOOL_DISTRICT.aprx - USER: ayabu - LAST SAVED: 8/15/2024 12:14 PM

APPENDIX A
Exploration Logs

APPENDIX A

Exploration Logs

We evaluated subsurface conditions at the site by completing two drilled borings on 4 and 5 June 2024. The field explorations were coordinated and overseen by geotechnical staff from Haley & Aldrich, Inc., who classified the various soil units encountered, obtained representative soil samples for geotechnical testing, and maintained a detailed log of the boring. Exploration logs are included in this appendix. Figure 2 of the report shows the approximate locations of the explorations. Explorations were located in the field using landmarks on site. Results of the laboratory testing are indicated on the exploration logs and are included in Appendix B.

The borings were advanced using mud rotary methods using a track-mounted GeoProbe 7822DT drill rig operated by Western States Soil Conservation, Inc., of Hubbard, Oregon. The boring created a hole approximately 5 inches in diameter.

Materials encountered in the explorations were classified in the field in general accordance with ASTM International (ASTM) Standard Practice D 2488 “Standard Practice for the Classification of Soils (Visual-Manual Procedure).” The exploration logs in this appendix show our interpretation of the exploration, sampling, and testing data. The logs indicate the depth where the soils change. Note that the change may be gradual. In the field, we classified the samples taken from the explorations according to the methods presented on the *Figure A-1, Key to Exploration Logs*. This figure also provides a legend explaining the symbols and abbreviations used in the logs.

Sampling of soils was completed at regular intervals throughout the depth of each boring. The samples were collected with a Standard Penetration Test (SPT) sampler used in general conformance with ASTM Test Method D 1586 “Standard Method for Penetration Test and Split-Barrel Sampling of Soils.” The sampler was driven by a 140-pound auto-trip hammer falling 30 inches. The *N* value, or number of blows required to drive the sampler 1 foot, or as otherwise indicated into the soils, is shown adjacent to the sample symbols on the boring logs. Disturbed samples were obtained from the SPT sampler. A piston sampler was used to collect relatively undisturbed Shelby tube samples. Samples were used for classification and laboratory testing purposes.

Sample Description

Identification of soils in this report is based on visual field and laboratory observations which include density/consistency, moisture condition, grain size, and plasticity estimates and should not be construed to imply field nor laboratory testing unless presented herein. ASTM D 2488 visual-manual identification methods were used as a guide. Where laboratory testing confirmed visual-manual identifications, then ASTM D 2487 was used to classify the soils.

Relative Density/Consistency

Soil density/consistency in borings is related primarily to the standard penetration resistance (N). Soil density/consistency in test pits and probes is estimated based on visual observation and is presented parenthetically on the logs.

SAND or GRAVEL Relative Density	N (Blows/Foot)	SILT or CLAY Consistency	N (Blows/Foot)
Very loose	0 to 4	Very soft	0 to 1
Loose	5 to 10	Soft	2 to 4
Medium dense	11 to 30	Medium stiff	5 to 8
Dense	31 to 50	Stiff	9 to 15
Very dense	>50	Very stiff	16 to 30
		Hard	>30

Moisture

Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

USCS Soil Classification Chart (ASTM D 2487)

Major Divisions			Symbols: Graph	Symbols: USCS	Typical Descriptions
Coarse Grained Soils: More than 50% of Material Retained on No. 200 Sieve	Gravel and Gravelly Soils: More than 50% of Coarse Fraction Retained on No. 4 Sieve	Clean Gravels (<5% fines)		GW	Well-Graded Gravel; Well-Graded Gravel with Sand
				GP	Poorly Graded Gravel; Poorly Graded Gravel with Sand
		Gravels (5-12% fines)		GW-GM	Well-Graded Gravel with Silt; Well-Graded Gravel with Silt and Sand
				GW-GC	Well-Graded Gravel with Clay; Well-Graded Gravel with Clay and Sand
				GP-GM	Poorly Graded Gravel with Silt; Poorly Graded Gravel with Silt and Sand
				GP-GC	Poorly Graded Gravel with Clay; Poorly Graded Gravel with Clay and Sand
		Gravels with Fines (>12% fines)		GM	Silty Gravel; Silty Gravel with Sand
				GC	Clayey Gravel; Clayey Gravel with Sand
	Sand and Sandy Soils: More than 50% of Coarse Fraction Passing No. 4 Sieve	Sands with few Fines (<5% fines)		SW	Well-Graded Sand; Well-Graded Sand with Gravel
				SP	Poorly Graded Sand; Poorly Graded Sand with Gravel
		Sands (5-12% fines)		SW-SM	Well-Graded Sand with Silt Well-Graded Sand with Silt and Gravel
				SW-SC	Well-Graded Sand with Clay; Well-Graded Sand with Clay and Gravel
				SP-SM	Poorly Graded Sand with Silt; Poorly Graded Sand with Silt and Gravel
				SP-SC	Poorly Graded Sand with Clay; Poorly Graded Sand with Clay and Gravel
		Sands with Fines (>12% fines)		SM	Silty Sand; Silty Sand with Gravel
				SC	Clayey Sand; Clayey Sand with Gravel
Fine Grained Soils: More than 50% of Material Passing No. 200 Sieve	Silts			ML	Silt; Silt with Sand or Gravel; Sandy or Gravelly Silt
				MH	Elastic Silt; Elastic Silt with Sand or Gravel; Sandy or Gravelly Elastic Silt
	Silty Clay (based on Atterberg Limits)			CL-ML	Silty Clay; Silty Clay with Sand or Gravel; Gravelly or Sandy Silty Clay
	Clays			CL	Lean Clay; Lean Clay with Sand or Gravel; Sandy or Gravelly Lean Clay
				CH	Fat Clay; Fat Clay with Sand or Gravel; Sandy or Gravelly Fat Clay
	Organics			OL/OH	Organic Soil; Organic Soil with Sand or Gravel; Sandy or Gravelly Organic Soil
Highly Organic (>50% organic material)				PT	Peat - Decomposing Vegetation - Fibrous to Amorphous Texture

Minor Constituents

	Estimated Percentage
Sand, Gravel	
Trace	<5
Few	5 - 15
Cobbles, Boulders	
Trace	<5
Few	5 - 10
Little	15 - 25
Some	30 - 45

Soil Test Symbols

%F	Percent Passing No. 200 Sieve
AL	Atterberg Limits (%)
	Liquid Limit (LL)
	Water Content (WC)
	Plastic Limit (PL)
CA	Chemical Analysis
CAUC	Consolidated Anisotropic Undrained Compression
CAUE	Consolidated Anisotropic Undrained Extension
CBR	California Bearing Ratio
CIDC	Consolidated Drained Isotropic Triaxial Compression
CIUC	Consolidated Isotropic Undrained Compression
CK0DC	Consolidated Drained k0 Triaxial Compression
CK0DSS	Consolidated k0 Undrained Direct Simple Shear
CK0UC	Consolidated k0 Undrained Compression
CK0UE	Consolidated k0 Undrained Extension
CRSCN	Constant Rate of Strain Consolidation
DS	Direct Shear
DSS	Direct Simple Shear
DT	In Situ Density
GS	Grain Size Classification
HYD	Hydrometer
ILCN	Incremental Load Consolidation
K0CN	k0 Consolidation
kc	Constant Head Permeability
kf	Falling Head Permeability
MD	Moisture Density Relationship
OC	Organic Content
OT	Tests by Others
P	Pressuremeter
PID	Photoionization Detector Reading
PP	Pocket Penetrometer
SG	Specific Gravity
TRS	Torsional Ring Shear
TV	Torvane
UC	Unconfined Compression
UUC	Unconsolidated Undrained Triaxial Compression
VS	Vane Shear
WC	Water Content (%)

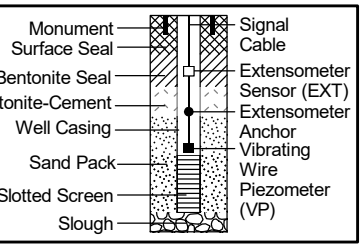
Groundwater Indicators

- Groundwater Level on Date or At Time of Drilling (ATD)
- Groundwater Level on Date Measured in Piezometer
- Groundwater Seepage (Test Pits)

Sample Symbols

- 1.5" I.D. Split Spoon
- 3.0" I.D. Split Spoon
- Modified California Sampler
- Rock Core Run
- Sonic Core
- Thin-walled Sampler
- Grab
- Cuttings
- Push Probe

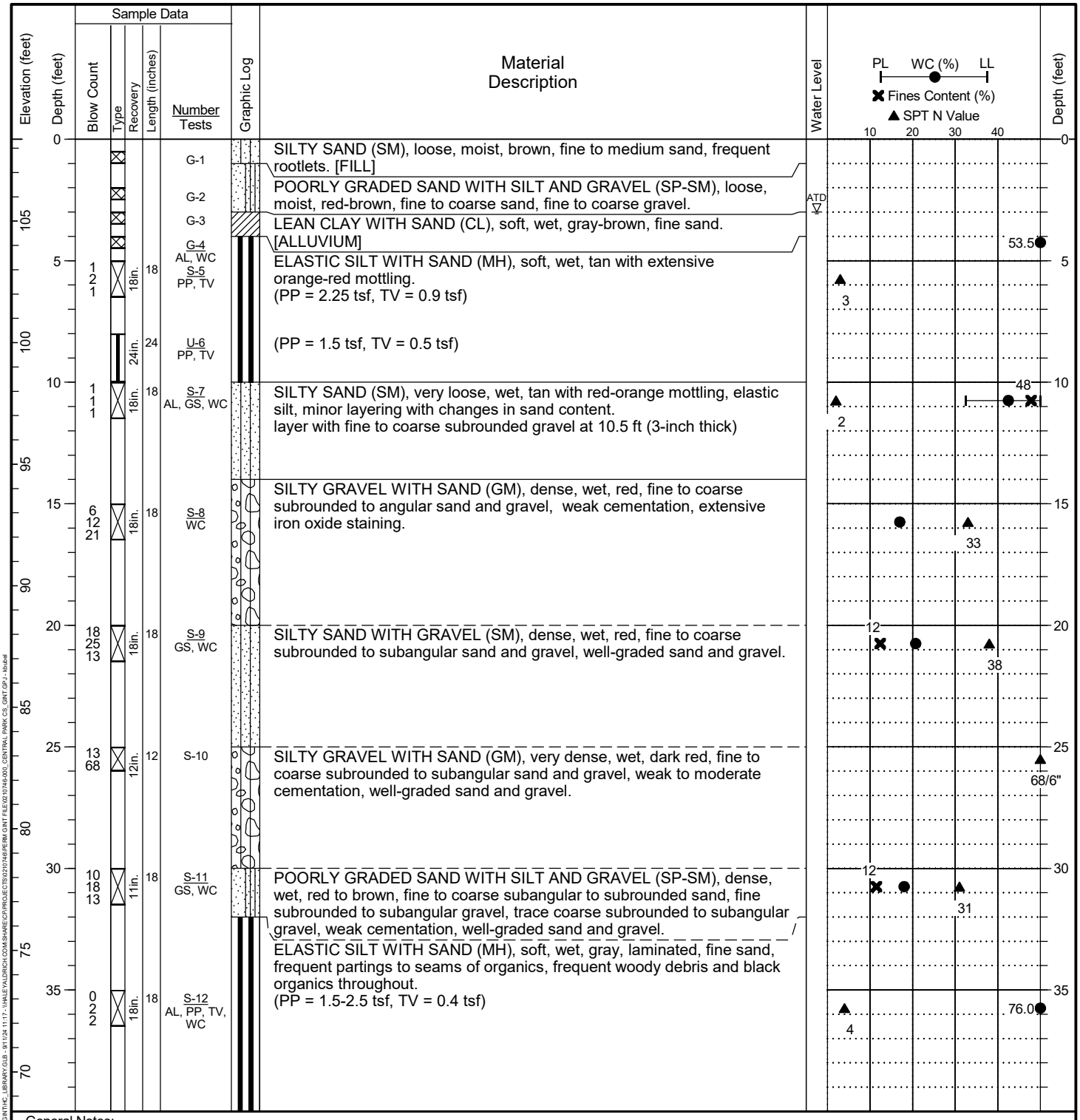
Well Symbols



HALEY ALDRICH	Project: Aberdeen School District - Central Park Elementary Location: Aberdeen, Washington Project No.: 0210746-000	**Key to Exploration Logs**	Figure **A-1** Sheet **1 of 1**

HA KEY TO EXP LOGS SOIL ONLY - I:\HALEYALDRICH.COM\SHARES\EA_DATA\GINT\HC_LIBRARY\GLB - 8/31/24 13:41 - I:\HALEYALDRICH.COM\SHARES\CP\PROJECTS\0210746\GINT\PERMANENT\GINT FILES\0210746-000_ABERDEEN SCHOOL DISTRICT-HARBOR LEARNING CENTER_GINT.GPJ - kfuller

Date Started: 06/04/2024	Date Completed: 06/04/2024	Drilling Contractor/Crew: Western States Soil Conservation, Inc. / Ty/Juan	
Logged by: D. Knapp	Checked by: M. Hintz	Drilling Method: Mud Rotary	
Location: Lat: 46.967690 Long: -123.698375 (WGS 84)		Rig Model/Type: GeoProbe® 7822DT / Track-mounted drill rig	
Ground Surface Elevation: 108.37 feet (NAVD 88)		Hammer Type: Auto-hammer	
Comments: Hand augered to 5 ft bgs. Groundwater observed in hand augered hole at 3 ft.		Hammer Weight (pounds): 140	Hammer Drop Height (inches): 30
		Measured Hammer Efficiency (%): 74.6	
		Hole Diameter: 4.875 inches	Well Casing Diameter: NA
		Total Depth: 51.0 feet	Depth to Groundwater: 3 feet



General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HALEY ALDRICH	Project: Aberdeen School District - Central Park Elementary Location: Aberdeen, Washington Project No.: 0210746-000	Boring Log **CPB-1**	Figure **A** Sheet **1 of 2**

HA BORING LOG - \\HALEYALDRICH.COM\SHARE\SEA_DATA\GINT\HC_LIBRARY.GLB - 9/11/24 11:17 - \\HALEYALDRICH.COM\SHARE\CORPROJECTS\210746\PERM\GINT FILE\210746-000_CENTRAL PARK_CS_GINT.GPJ - khubel

Date Started: 06/04/2024	Date Completed: 06/04/2024	Drilling Contractor/Crew: Western States Soil Conservation, Inc. / Ty/Juan	
Logged by: D. Knapp	Checked by: M. Hintz	Drilling Method: Mud Rotary	
Location: Lat: 46.967690 Long: -123.698375 (WGS 84)		Rig Model/Type: GeoProbe® 7822DT / Track-mounted drill rig	
Ground Surface Elevation: 108.37 feet (NAVD 88)		Hammer Type: Auto-hammer	
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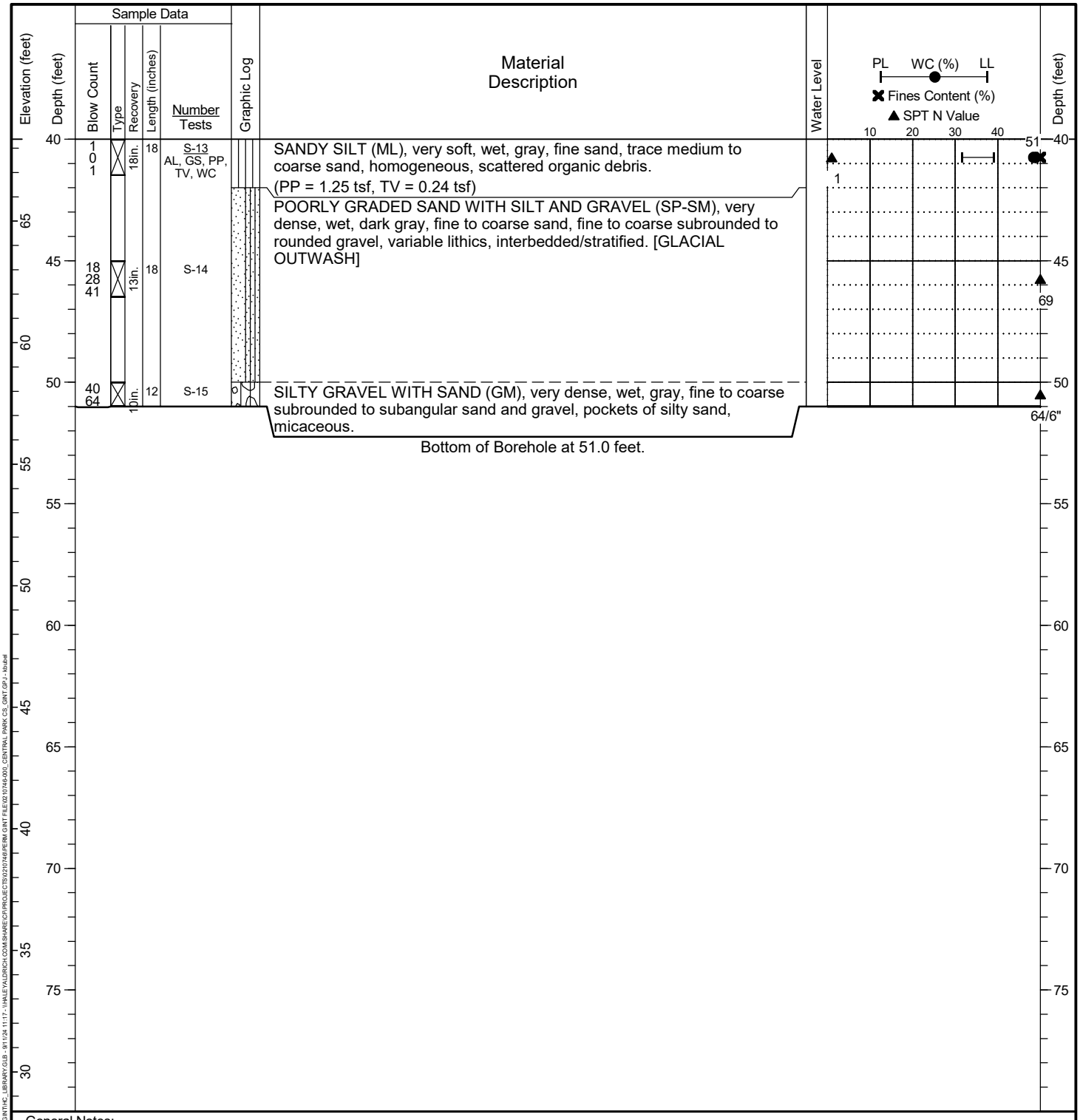

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5. Location and ground surface elevations are approximate.

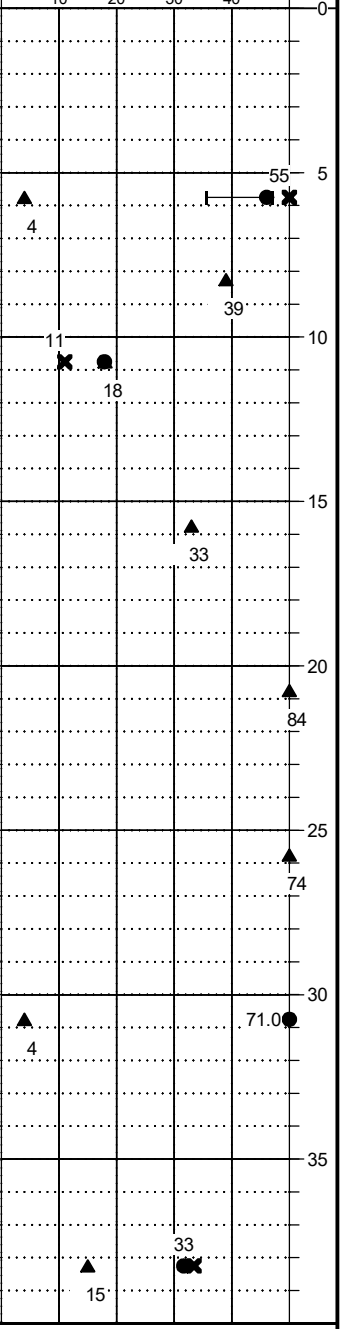
HALEY ALDRICH	Project: Aberdeen School District - Central Park Elementary Location: Aberdeen, Washington Project No.: 0210746-000	Boring Log **CPB-1**	Figure **A** Sheet **2 of 2**

HA BORING LOG - \\HALEYALDRICH.COM\SHARE\SEA_DATA\GINT\HC_LIBRARY.GLB - 9\1\24 11:17 - \\HALEYALDRICH.COM\SHARE\CORPROJECTS\210746\PERM\GINT FILE\210746-000_CENTRAL PARK_CS_GINT.GPJ - khubel

Date Started: 06/05/2024	Date Completed: 06/05/2024	Drilling Contractor/Crew: Western States Soil Conservation, Inc. / Ty/Juan	
Logged by: D. Knapp	Checked by: M. Hintz	Drilling Method: Mud Rotary	
Location: Lat: 46.966995 Long: -123.697301 (WGS 84)		Rig Model/Type: GeoProbe® 7822DT / Track-mounted drill rig	
Ground Surface Elevation: 105.55 feet (NAVD 88)		Hammer Type: Auto-hammer	
Comments: Hand augered to 5 ft bgs. No groundwater observed in hand augered hole.		Hammer Weight (pounds): 140	Hammer Drop Height (inches): 30
		Measured Hammer Efficiency (%): 74.6	
		Hole Diameter: 4.875 inches	Well Casing Diameter: NA
		Total Depth: 51.5 feet	Depth to Groundwater: 3 feet

Elevation (feet)	Depth (feet)	Sample Data: Blow Count	Type	Recovery	Length (inches)	Number / Tests	Graphic Log	Material Description	Water Level
105	0					G-1		Asphalt concrete (3-inches thick).	
								Base aggregate (6-inches thick).	
								Subbase aggregate composed of POORLY GRADED GRAVE WITH SAND (GP) [FILL].	ATD
						G-2		FAT CLAY (CH), trace fine sand, soft, moist, light brown with extensive orange mottling. [ALLUVIUM]	
100	5	2 2 2		9in.	18	S-3 AL, GS, PP, TV, WC		SANDY SILT (ML), soft, moist, light brown with orange mottling, fine sand. grades to wet (PP = 1.25 tsf, TV = 0.2 tsf)	
		16 20 19		18in.	18	S-4		POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), dense, moist, red, fine to coarse subrounded to subangular sand and gravel, clast-supported, weak to moderate cementation, extensive iron oxide staining.	
95	10	9 12 6		13in.	18	S-5 GS, WC		grades to medium dense, layering with variable sand to gravel ratio	
90	15	10 16 17		17in.	18	S-6		grades to dense, stratified with frequent layers of silty sand (2- to 3-inches thick), moderately cemented layers of coarse sand and fine gravel	
85	20	27 50 34		18in.	18	S-7		SILTY SAND WITH GRAVEL (SM), very dense, moist, red, fine to coarse subrounded to subangular sand, fine gravel, trace coarse gravel, moderately cemented, weathered coarse sand and fine gravel, extensive iron oxide staining.	
80	25	11 34 40		18in.	18	S-8		grades to very dense, well-graded, increased gravel content	
75	30	1 2 2		7in.	18	S-9 AL, PP, TV, WC		ELASTIC SILT (MH), soft, moist, gray, stratified to laminated, frequent partings of woody organic debris, numerous organic debris throughout, layer of woody organic debris (1-inch thick). (PP = 0.5 tsf, TV = 0.15 tsf)	
				0in.	24	U-10			
70	35			0in.	21	U-11			
		5 6 9		14in.	18	S-12 GS, WC			

PL WC (%) LL
✖ Fines Content (%)
▲ SPT N Value
10 20 30 40



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5. Location and ground surface elevations are approximate.

HALEY ALDRICH

Project: Aberdeen School District - Central Park Elementary
Location: Aberdeen, Washington
Project No.: 0210746-000

Boring Log
CPB-2

Figure **A**
Sheet **1 of 2**

HA BORING LOG - \\HALEYALDRICH.COM\SHARE\SEA_DATA\GINT\HC_LIBRARY\GLB - 9\1\24 11:17 - \\HALEYALDRICH.COM\SHARE\CORPROJECTS\210746\PERM\GINT FILE\210746-000_CENTRAL PARK CS_GINT.GPJ - kbubel

Date Started: 06/05/2024	Date Completed: 06/05/2024	Drilling Contractor/Crew: Western States Soil Conservation, Inc. / Ty/Juan	
Logged by: D. Knapp	Checked by: M. Hintz	Drilling Method: Mud Rotary	
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		Measured Hammer Efficiency (%): 74.6	
		Hole Diameter: 4.875 inches	Well Casing Diameter: NA
		Total Depth: 51.5 feet	Depth to Groundwater: 3 feet

Elevation (feet)	Depth (feet)	Sample Data: Blow Count	Type	Recovery	Length (inches)	Number / Tests	Graphic Log	Material Description	Water Level	PL WC (%) LL; ✖ Fines Content (%); ▲ SPT N Value (10 20 30 40)	Depth (feet)
65	40	4 15 13		18in.	18	PP, TV S-13a S-13b GS, WC		(PP = 1.0 tsf, TV = 0.35 tsf) SILTY SAND (SM), medium dense, wet, gray, fine to medium stand, stratified with frequent alternating layers of poorly graded sand with silt, silty sand and sandy silt, lithics of red, white and black. [GLACIAL OUTWASH] *(continued)*		✖ 5; ▲ 28	40
60	45	19 29 36		18in.	18	S-14		POORLY GRADED SAND WITH SILT (SP-SM), medium dense, wet, dark gray, fine to medium sand, stratified, red and black lithics.		▲ 65	45
55	50	20 45 23		13in.	18	S-15		SILTY GRAVEL WITH SAND (GM), very dense, wet, gray, fine to coarse subrounded to subangular gravel, clast-supported, predominantly coarse sand to fine gravel, well-graded.		▲ 68	50
								Bottom of Borehole at 51.5 feet.			
50	55										55
45	60										60
40	65										65
35	70										70
30	75										75

General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HALEY ALDRICH

Project: Aberdeen School District - Central Park Elementary
Location: Aberdeen, Washington
Project No.: 0210746-000

Boring Log
CPB-2

Figure **A**
Sheet **2 of 2**

HA BORING LOG - \\HALEYALDRICH.COM\SHARE\SEA_DATA\GINT\HC_LIBRARY.GLB - 8/1/24 11:17 - \\HALEYALDRICH.COM\SHARE\CORPROJECTS\210746\PERM\GINT FILE\210746-000_CENTRAL PARK CS_GINT.GPJ - kbubel

APPENDIX B
Laboratory Test Results

APPENDIX B

Laboratory Testing

Soil samples obtained from the explorations were transported to Haley & Aldrich, Inc.'s laboratory and evaluated to confirm or modify field classifications, as well as to assess engineering properties of the soils encountered. Representative samples were selected for laboratory testing and transported to our geotechnical laboratory in Portland, Oregon. The tests were performed in general accordance with the test methods of ASTM International (ASTM) or other applicable procedures. One sample was submitted to CERCO Analytical, Inc. for corrosivity testing. A summary of the test results is included as Figure B-1.

Visual Classifications

Soil samples obtained from the explorations were visually classified in the field and in our geotechnical laboratory based on the Unified Soil Classification System and ASTM classification methods. ASTM Test Method D 2488 was used to classify soils using visual and manual methods. ASTM Test Method D 2487 was used to classify soils based on laboratory test results.

Laboratory Test Results

Moisture Content

Moisture contents of samples were obtained in general accordance with ASTM Test Method D 2216. The results of the moisture content tests completed on samples from the explorations are presented on the exploration logs included in Appendix A and on Figure B-1 in this appendix.

Atterberg Limits Testing

Atterberg limits (liquid limit, plastic limit, and plasticity index) of fine-grained soil samples were obtained in general accordance with ASTM Test Method D 4318. The results of the Atterberg Limits tests are presented on the exploration logs included in Appendix A, summarized on Figure B-1 in this appendix, and shown in detail on Figure B-2 in this appendix.

Particle Size Distribution

Sieve analysis tests were performed to determine the quantitative distribution of particle sizes in the sample. The tests were performed in general accordance with ASTM Test Method D 6913. The "percent fines" portions of the test results are indicated on the appropriate exploration logs included in Appendix A and on Figure B-1 in this appendix. The full test results are shown on Figure B-3 in this appendix.

Corrosivity Testing

One corrosivity test suite was performed on a sample collected from boring CPB-1. The test suites included testing for pH, redox, chloride, sulfate, and electrical resistivity. The results of the test are presented on the final sheet of this appendix.

Exploration	Sample ID	Depth	Gravel (%)	Sand (%)	Fines (%)	Liquid Limit	Plastic Limit	Water Content (%)	USCS Group Symbol	Soil Description
CPB-1	G-1	0.5								
CPB-1	G-2	2.0								
CPB-1	G-3	3.0								
CPB-1	G-4	4.0				84	43	54		
CPB-1	S-5	5.0								
CPB-1	U-6	8.0								
CPB-1	S-7	10.0	2.9	49.3	47.8	52	33	42		
CPB-1	S-8	15.0						17		
CPB-1	S-9	20.0	26.5	61.1	12.4			21		
CPB-1	S-10	25.0								
CPB-1	S-11	30.0	32.9	55.6	11.5			18		
CPB-1	S-12	35.0				80	54	76		
CPB-1	S-13	40.0	0.2	48.5	51.2	39	32	48		
CPB-1	S-14	45.0								
CPB-1	S-15	50.0								
CPB-2	G-1	2.0								
CPB-2	G-2	3.5								
CPB-2	S-3	5.0	0.0	45.3	54.7	47	35	46		
CPB-2	S-4	7.5								
CPB-2	S-5	10.0	53.3	35.7	11.0			18		
CPB-2	S-6	15.0								
CPB-2	S-7	20.0								
CPB-2	S-8	25.0								
CPB-2	S-9	30.0				74	55	71		
CPB-2	U-10	33.0								
CPB-2	U-11	35.0								
CPB-2	S-12	37.5	0.0	66.6	33.4			32		
CPB-2	S-13a	40.0								
CPB-2	S-13b	40.3	0.0	94.9	5.1			26		
CPB-2	S-14	45.0								
CPB-2	S-15	50.0								

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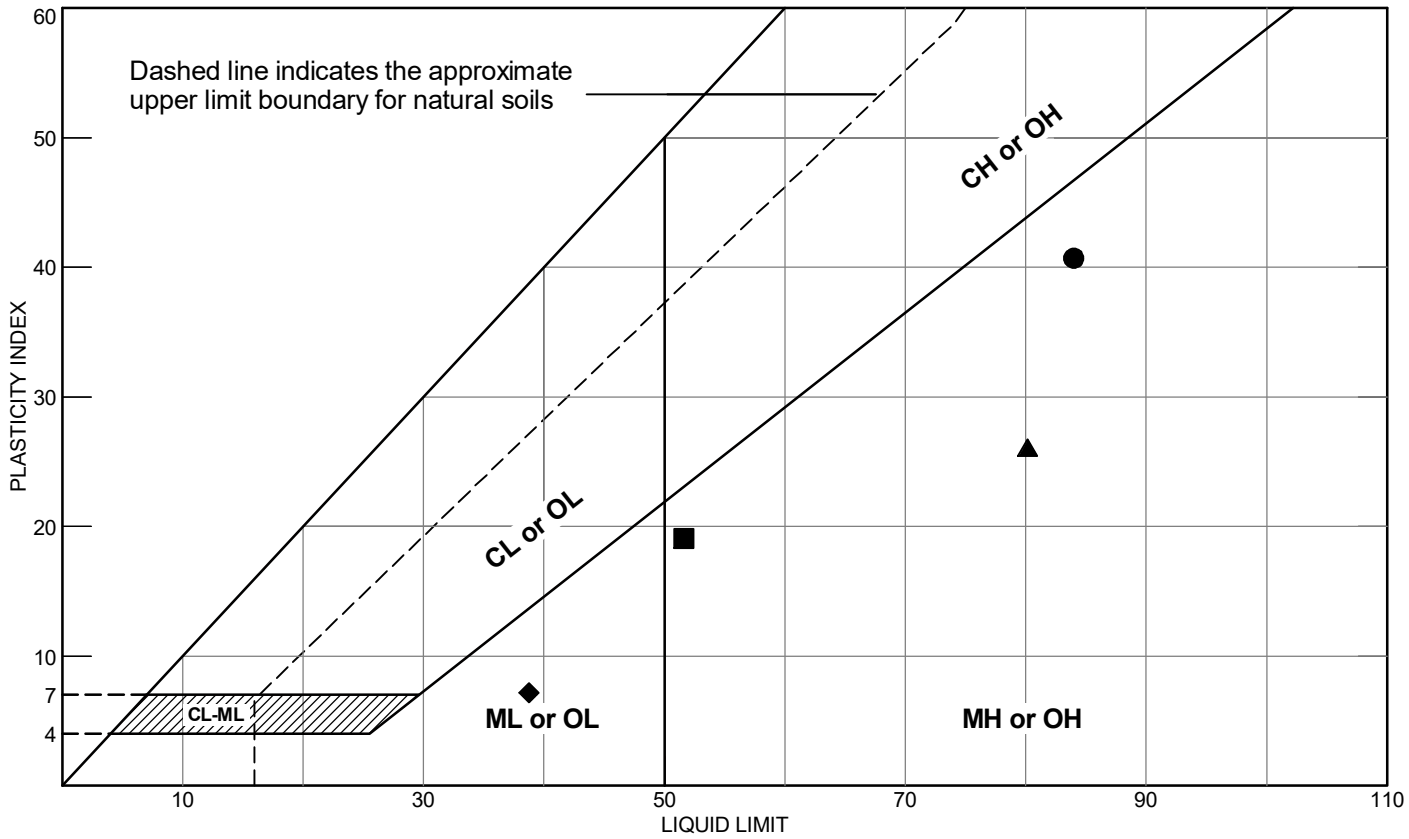

Location and Description	LL	PL	PI	-#200	MC%	USCS
● **Source:** CPB-1 **Sample No.:** G-4 **Depth:** 4.0 to 4.5 ELASTIC SILT	84	43	41	NT	54	MH
■ **Source:** CPB-1 **Sample No.:** S-7 **Depth:** 10.0 to 11.5 SILTY SAND	52	33	19	48	42	SM
▲ **Source:** CPB-1 **Sample No.:** S-12 **Depth:** 35.0 to 36.5 ELASTIC SILT WITH SAND	80	54	26	NT	76	MH
◆ **Source:** CPB-1 **Sample No.:** S-13 **Depth:** 40.0 to 41.5 SANDY SILT	39	32	7	51	48	ML

Remarks:

● ■ ▲ ◆

HALEY ALDRICH

Project: Aberdeen School District - Central Park Elementary
Location: Aberdeen, Washington
Project No.: 0210746-000

Liquid Limit, Plastic Limit, and Plasticity Index

Figure **B-2**
Sheet **1 of 2**

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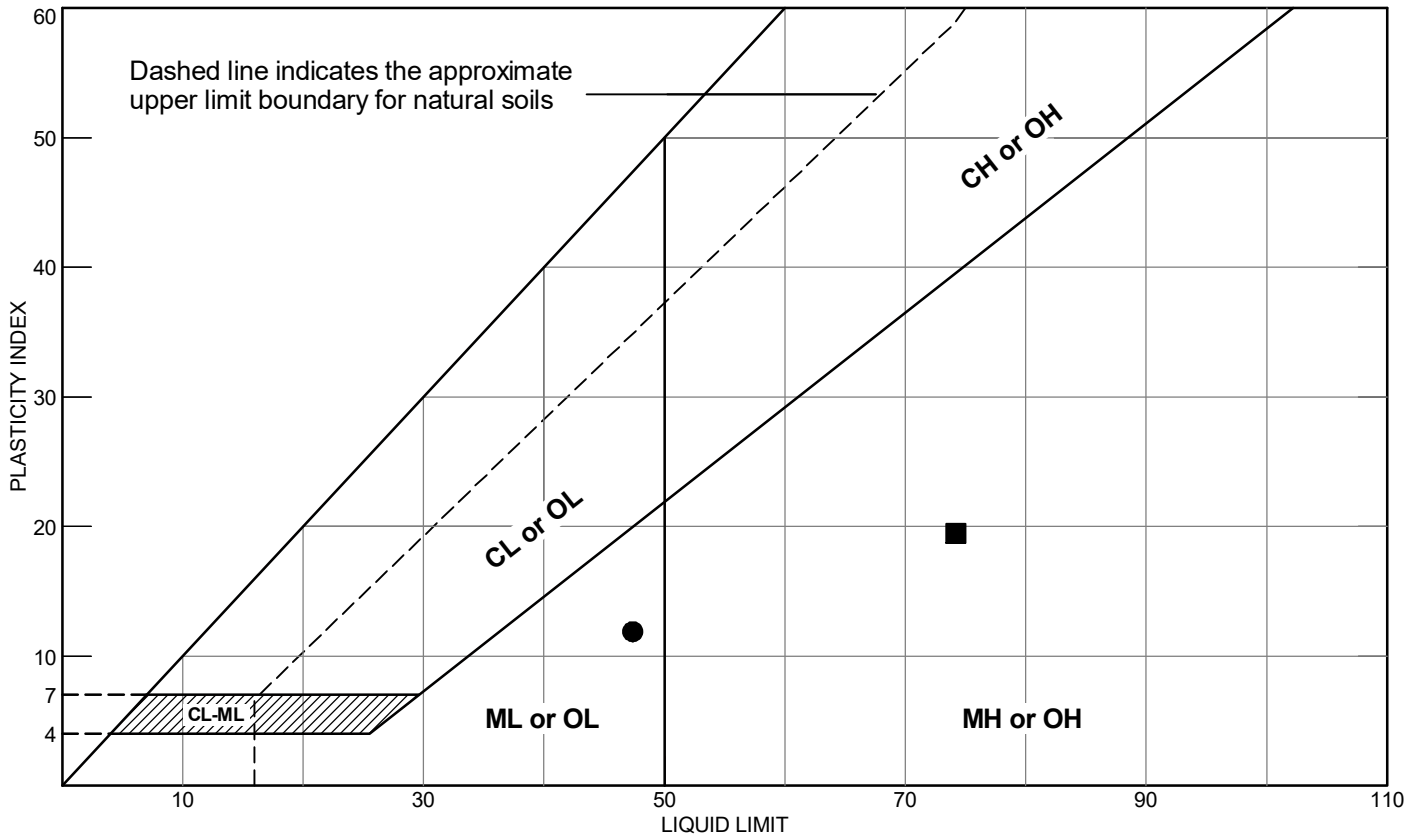

Location and Description			LL	PL	PI	-#200	MC%	USCS
● **Source:** CPB-2 SANDY SILT	**Sample No.:** S-3	**Depth:** 5.0 to 6.5	47	35	12	55	46	ML
■ **Source:** CPB-2 ELASTIC SILT	**Sample No.:** S-9	**Depth:** 30.0 to 31.5	74	55	19	NT	71	MH

Remarks:

●

■

HALEY ALDRICH	Project: Aberdeen School District - Central Park Elementary Location: Aberdeen, Washington Project No.: 0210746-000	**Liquid Limit, Plastic Limit, and Plasticity Index**	Figure **B-2** Sheet **2 of 2**

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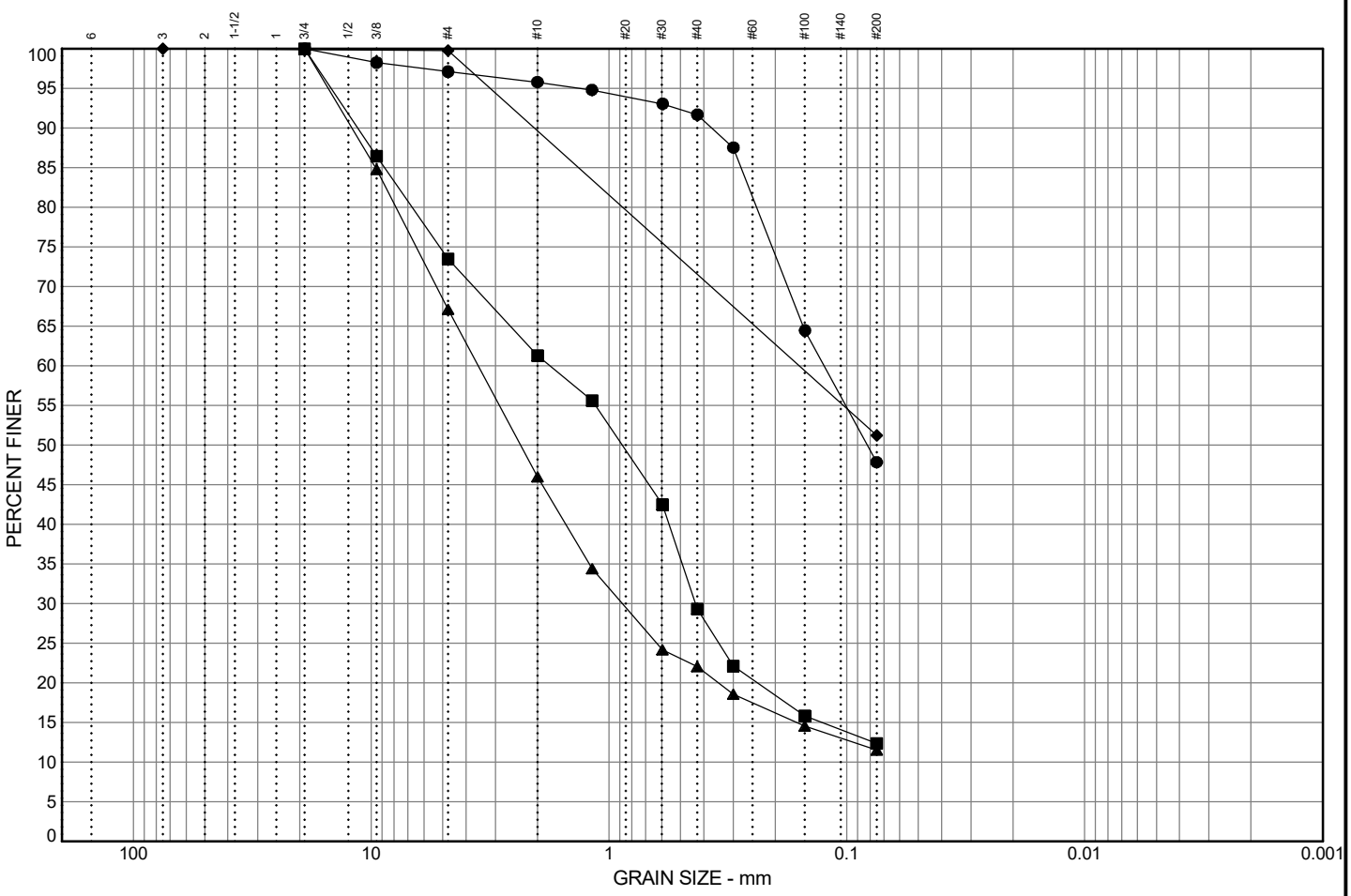

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Location and Description	% Cobbles	% Gravel	% Sand	% Silt	% Clay	MC%	USCS
● **Source:** CPB-1 **Sample No.:** S-7 **Depth:** 10.0 to 11.5 SILTY SAND	0.0	2.9	49.3	47.8		42	SM
■ **Source:** CPB-1 **Sample No.:** S-9 **Depth:** 20.0 to 21.5 SILTY SAND WITH SILT AND GRAVEL	0.0	26.5	61.1	12.4		21	SM
▲ **Source:** CPB-1 **Sample No.:** S-11 **Depth:** 30.0 to 31.5 POORLY GRADED SAND WITH SILT AND GRAVEL	0.0	32.9	55.6	11.5		18	GP-GM
◆ **Source:** CPB-1 **Sample No.:** S-13 **Depth:** 40.0 to 41.5 SANDY SILT	0.0	0.2	48.5	51.2		48	ML

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	52	19	0.278	0.125	0.082					
■			8.810	1.777	0.881	0.432	0.127		2.27	38.39
▲			9.595	3.549	2.357	0.878	0.162		4.08	66.65
◆	39	7	1.346	0.159						

Remarks:

● ■ ▲ ◆

HALEY ALDRICH

Project: Aberdeen School District - Central Park Elementary
Location: Aberdeen, Washington
Project No.: 0210746-000

Particle-Size Analysis

Figure **B-3**
Sheet **1 of 2**

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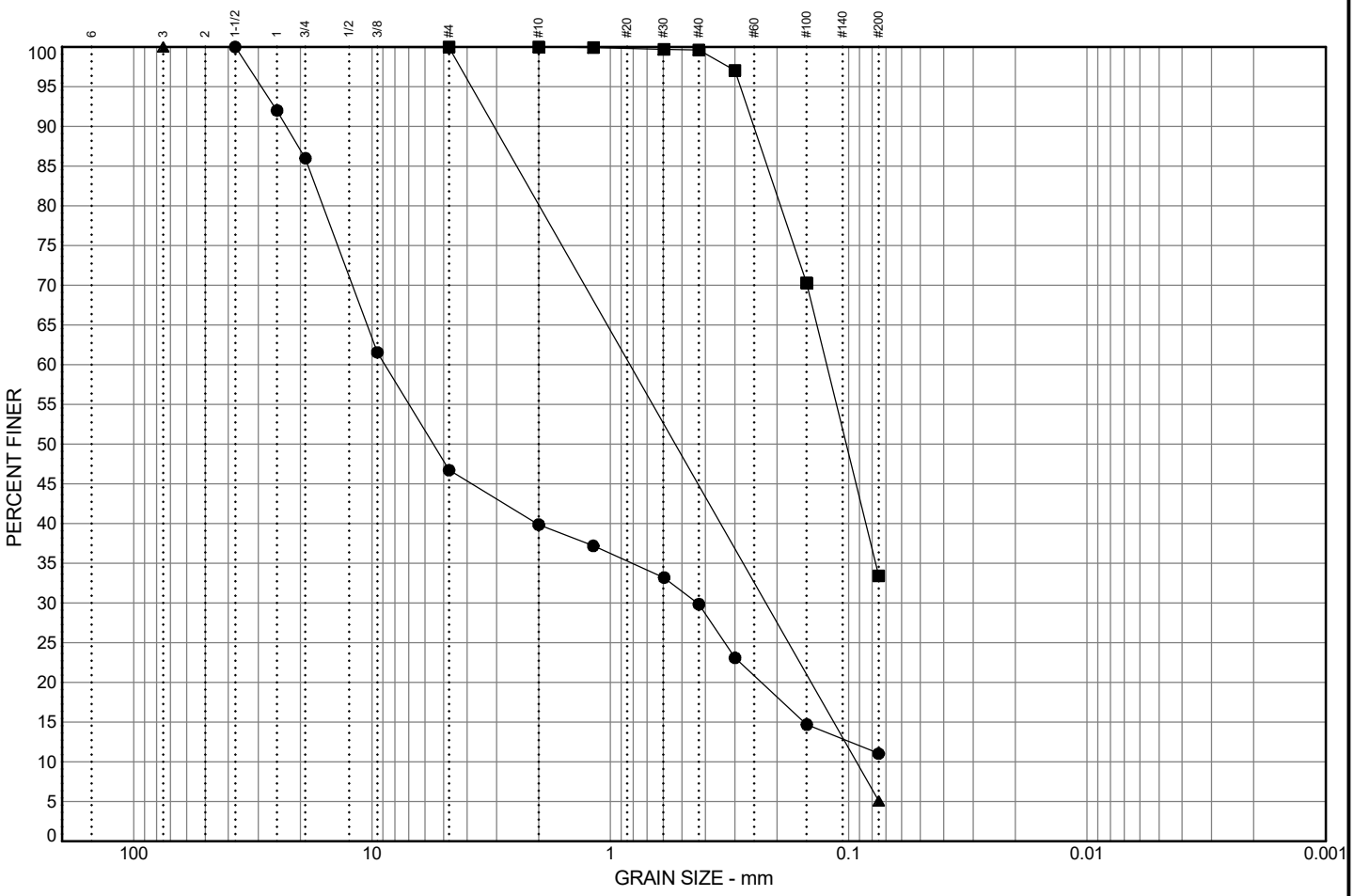

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Location and Description	% Cobbles	% Gravel	% Sand	% Silt	% Clay	MC%	USCS
● **Source:** CPB-2 **Sample No.:** S-5 **Depth:** 10.0 to 11.5 POORLY GRADED GRAVEL WITH SILT AND SAND	0.0	53.3	35.7	11.0		18	GP-GM
■ **Source:** CPB-2 **Sample No.:** S-12 **Depth:** 37.5 to 39.0 SILTY SAND	0.0	0.0	66.6	33.4		32	SM
▲ **Source:** CPB-2 **Sample No.:** S-13b **Depth:** 40.3 to 41.5 POORLY GRADED SAND WITH SILT	0.0	0.0	94.9	5.1		26	SP-SM

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			18.477	8.835	5.538	0.432	0.154		0.34	143.01
■			0.220	0.124	0.102					
▲			2.470	0.828	0.535	0.223	0.116	0.093	0.65	8.90

Remarks:

● ■ ▲

HALEY ALDRICH

Project: Aberdeen School District - Central Park Elementary
Location: Aberdeen, Washington
Project No.: 0210746-000

Particle-Size Analysis

Figure **B-3**
Sheet **2 of 2**

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CERCO analytical
1100 Willow Pass Court, Suite A
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15 July, 2024

Job No. 2407012
Cust. No. 13349

Mr. Micah Hintz
Haley & Aldrich
6420 S. Macadam Avenue, Suite 100
Portland, OR 97239

Subject: Project No.: 0210746-000
Project Name: Aberdeen School District
Corrosivity Analysis –ASTM Test Methods

Dear Mr. Hintz:

Pursuant to your request, CERCO Analytical has analyzed the soil samples submitted on July 08, 2024. Based on the analytical results, this brief corrosivity evaluation is enclosed for your consideration.

Based upon the resistivity measurements, Sample No.003 is classified as "moderately corrosive". Samples No. 001 and No. 002 are classified as "mildly corrosive". All buried iron, steel, cast iron, ductile iron, galvanized steel and dielectric coated steel or iron should be properly protected against corrosion depending upon the critical nature of the structure. All buried metallic pressure piping such as ductile iron firewater pipelines should be protected against corrosion.

The chloride ion concentrations reflect none detected with a reporting limit of 15 mg/kg.

The sulfate ion concentrations reflect none detected with a reporting limit of 15 mg/kg.

The pH of the soils ranged from 5.36 to 6.29, which does present corrosion problems for buried iron, steel, mortar-coated steel and reinforced concrete structures. Therefore, corrosion prevention measures need to be considered for structures to be placed in this acidic soil.

The redox potentials range from 310-mV to 320-mV and are indicative of potentially "slightly corrosive" soils resulting from anaerobic soil conditions.

This corrosivity evaluation is based on general corrosion engineering standards and is non-specific in nature. For specific long-term corrosion control design recommendations or consultation, please call *JDH Corrosion Consultants, Inc. at (925) 927-6630.*

We appreciate the opportunity of working with you on this project. If you have any questions, or if you require further information, please do not hesitate to contact us.

Very truly yours,
CERCO ANALYTICAL, INC.

J. Darby Howard, Jr., P.E.
President

JDH/jdl
Enclosure

CERCO analytical
1100 Willow Pass Court, Suite A
Concord, CA 94520-1006
925 462 2771 Fax. 925 462 2775
www.cercoanalytical.com

Client: Haley & Aldrich, Inc.
Client's Project No.: 0210746-000
Client's Project Name: Aberdeen School District
Date Sampled: 4-Jun-24, 6-Jun-24, & 7-Jun-24
Date Received: 8-Jul-24
Matrix: Soil
Authorization: Signed Chain of Custody

Date of Report: 15-Jul-2024

Job/Sample No.	Sample I.D.	Redox (mV)	pH	Conductivity (umhos/cm)*	Resistivity (100% Saturation) (ohms-cm)	Sulfide (mg/kg)*	Chloride (mg/kg)*	Sulfate (mg/kg)*
2407012-001	CPB-1 / S-5 / 5.0-6.5'	320	5.36	-	9,600	-	N.D.	N.D.
[redacted]								
[redacted]								

Method:	ASTM D1498	ASTM D4972	ASTM D1125M	ASTM G57	ASTM D4658M	ASTM D4327	ASTM D4327
Reporting Limit:	-	-	10	-	50	15	15
Date Analyzed:	9-Jul-2024	9-Jul-2024		9-Jul-2024		9-Jul-2024	9-Jul-2024

* Results Reported on "As Received" Basis
N.D. - None Detected

Julia Clauson
Chemist

Quality Control Summary - All laboratory quality control parameters were found to be within established limits

APPENDIX C
MASW Report

PRESENTATION OF SITE INVESTIGATION RESULTS

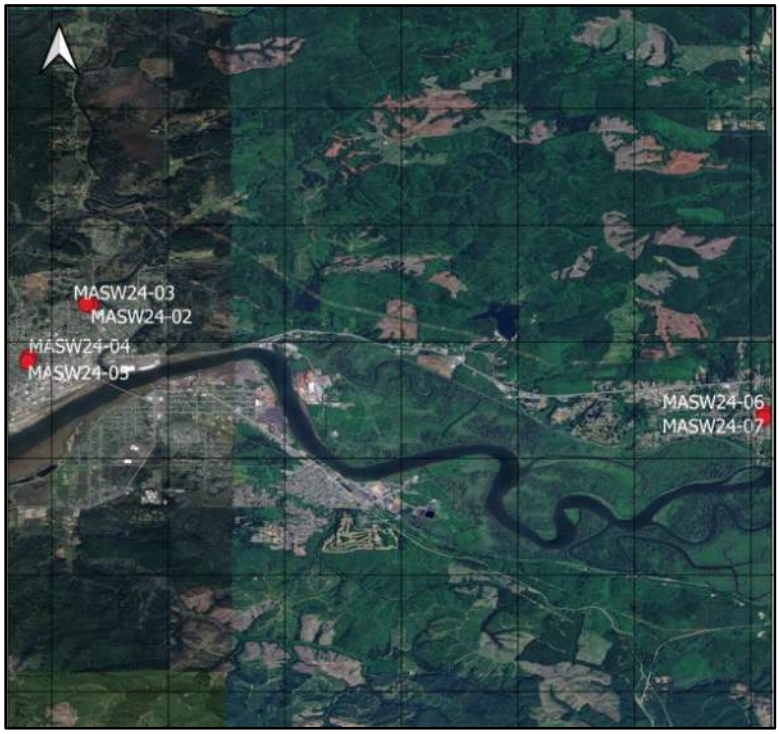
Aberdeen MASW

Prepared for:

Haley & Aldrich, Inc.

ConeTec Job No: 24-59-27777

Project Start Date: 06-June-2024
Project End Date: 07-June-2024
Report Date: 20-June-2024



Prepared by:

ConeTec Inc.
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Seattle, WA 98108
Tel: (253) 397-4861

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Introduction

The enclosed report presents the results of the geophysical site investigation program conducted by ConeTec, Inc. for Haley & Aldrich, Inc. at the Aberdeen MASW project in Aberdeen, Washington. The program consisted of six one-dimensional (1D) Multichannel Analysis of Surface Waves (MASW) tests to provide shear wave velocity (Vs) sounding and calculate time weighted average Vs of the upper 100 feet (Vs100) below grade. Please note that this report, which also includes all accompanying data, are subject to the 3rd Party Disclaimer and Client Disclaimer that follow in the 'Limitations' section of this report.

Project Information

Project	
Client	Haley & Aldrich, Inc.
Project	Aberdeen MASW
ConeTec project number	24-59-27777

Coordinates		
Test Type	Collection Method	Coordinate Reference System
MASW	Handheld GPS	WGS84 Lat long

MASW Equipment Used for this Project				
Seismograph(s)	Geophones	Coupling Mechanism	Trigger Style	Seismic Sources
Summit X One	25 x 4.5 Hz vertical	PVC pucks or spikes	Piezoelectric	Sledgehammer and plate, passive sources

MASW Data and Results

The data quality for this project was good. The main source of seismic noise was wind and was mitigated by taking multiple stacks to help improve signal to noise ratio. Co-centered arrays with 3-foot and 10-foot geophone spacing were used to provide a better resolved frequency spectrum. Dispersion curves from each array size were combined in post processing to create one dispersion curve for further analysis. In addition, passive seismic readings were collected to take advantage of low frequency seismic signals to increase the depth of investigation. Coherent surface wave energy in the 5 – 45 Hz band allowed the determination of 1D Vs models up to 110 feet deep.

Despite their proximity, MASW24-02 and MASW24-03 had significantly different Vs100 results. The thicker deposits of slow Vs material measured for MASW24-02 compared to MASW24-03 caused this discrepancy and could be the result of the survey area being located on more variable fluvial deposits. Slow velocity material with no coherent surface wave energy less than 7 Hz was observed on MASW24-05 resulting in a depth of investigation insufficient to calculate Vs100. This contrasted with the results collected for MASW24-04 which again suggest variable deposits in the survey area. A future 2D MASW survey would be recommended to delineate the Vs variations of the soil. The shear wave velocity results and Vs100 calculation tables are included in the appendices and digital release of this report. Examples of the raw time domain traces and overtone images are also included in the appendices of this report.

Closure

Thank you for the opportunity to work on this project. The equipment used and the field procedures followed complied with current accepted practice standards.

ConeTec Inc.

Limitations

3rd Party Disclaimer

This report titled “Aberdeen MASW”, referred to as the (“Report”), was prepared by ConeTec for Haley & Aldrich, Inc.. The Report is confidential and may not be distributed to or relied upon by any third parties without the express written consent of ConeTec. Any third parties gaining access to the Report do not acquire any rights as a result of such access. Any use which a third party makes of the Report, or any reliance on or decisions made based on it, are the responsibility of such third parties. ConeTec accepts no responsibility for loss, damage and/or expense, if any, suffered by any third parties as a result of decisions made, or actions taken or not taken, which are in any way based on, or related to, the Report or any portion(s) thereof.

Client Disclaimer

ConeTec was retained by Haley & Aldrich, Inc. to collect MASW readings (“Data”) for the purpose of measuring 1D Vs soundings and to calculate Vs100. The Data is included in this report titled “Aberdeen MASW” which is referred to as the (“Report”). ConeTec has collected and reported the Data in accordance with current industry standards. No other warranty, express or implied, with respect to the Data is made by ConeTec. In order to properly understand the Data included in the Report, reference must be made to the documents accompanying and other sources referenced in the Report in their entirety. Other than the Data, the contents of the Report should not be relied upon in any fashion without independent verification and ConeTec is in no way responsible for any loss, damage or expense resulting from the use of, and/or reliance on, such material by any party.

Multichannel analysis of surface waves (MASW) is a non-intrusive in-situ test that uses the principles of elasticity and surface wave dispersion to determine the variation of shear wave velocity with depth at a site. The observation that surface waves (Rayleigh waves) of different wavelengths propagate at different phase velocities in non-ideal media, is called dispersion. This is a direct result of the fact that surface waves of different wavelengths propagate along the surface to varying depths, and hence, if material stiffness changes with depth (as is the case with most non-ideal materials), then an appropriately selected wavelength band will reflect such changes in the velocity of propagation.

The field methods for surface wave testing are very similar to other surface seismic data collection methods. Surface geophones are placed in a linear array along a survey line at a known separation (typically one metre). A series of recordings (shots) are collected with a known in-line source offset from the array. Each shot gather is represented in the time-offset domain and shows the amplitude of wave propagation through the array (refer to Figure MASW-1). For detailed frequency analysis, multiple records with different shot offset distances are collected to help better define the broad spectrum frequency-phase velocity response of the medium. Two-dimensional cross sections can be collected by moving the geophone array a small distance (typically two meters) along the line and repeating the shots at set offsets.

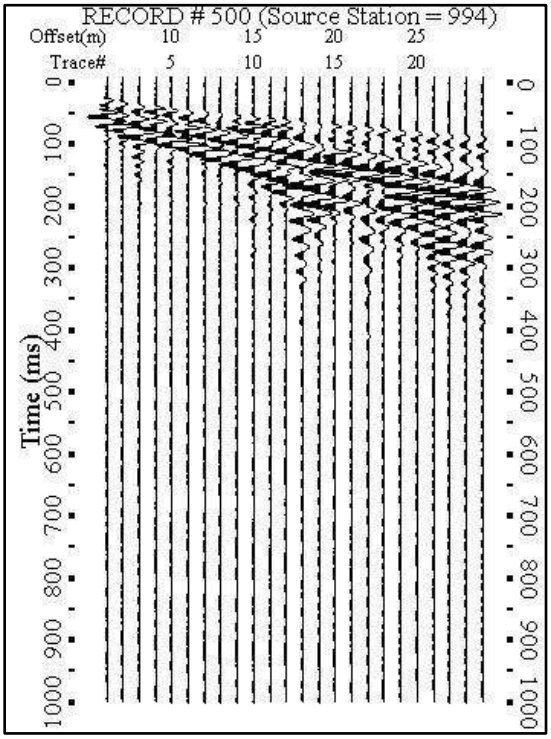


Figure MASW-1. Typical MASW time domain record (shot gather)

Given that surface wave velocity is closely related to the shear wave velocity and the wavelength related to depth, the surface wave results can be used to develop a profile of shear wave velocity versus depth through a process referred to as inversion. The program used to perform the inversion is SurfSeis 4.0, developed by the Kansas Geological Survey. In SurfSeis, the raw time domain traces are transformed to the frequency domain to create what is referred to as an overtone image as shown in Figure MASW-2. The overtone image displays the amplitude of the primary surface wave mode and any potential higher modes. A dispersion curve is fitted to the overtone image, and the inversion process is then used to

determine the most appropriate shear wave velocity profile. The parameters used for the inversion of the dispersion data are provided in the data release folder in an Excel table.

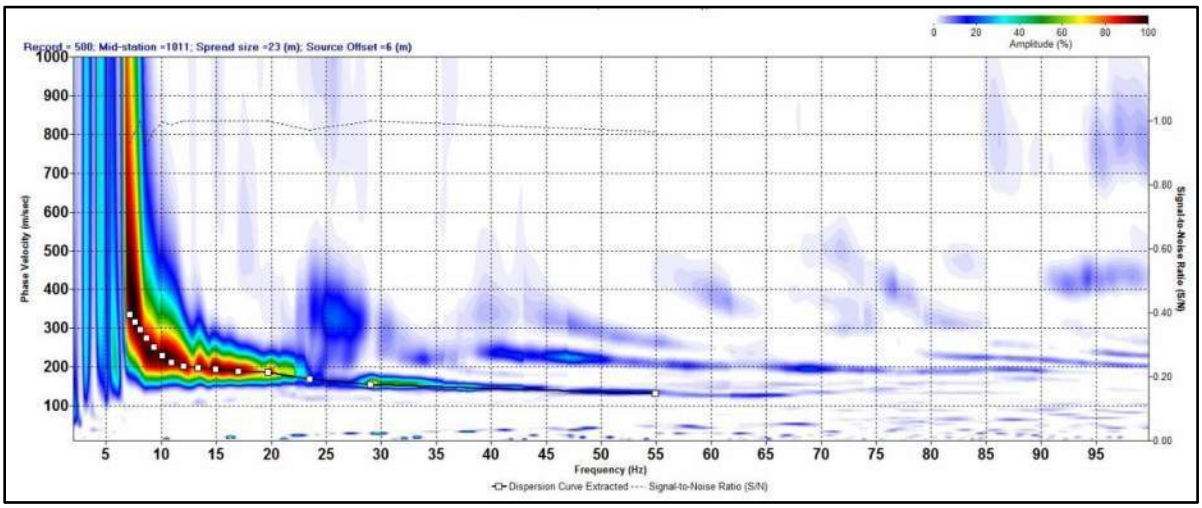


Figure MASW-2. Overtone image and a picked dispersion curve

For each test location, a 1D shear wave velocity profile comprising of a number of velocity layers of variable thickness (refer to Figure MASW-3) is provided . For 2D testing a series of 1D tests are combined to produce a shear wave velocity cross section.

The depth of investigation is related to the ground conditions and the amount of energy delivered by the surface wave source. The surface wave method uses Rayleigh waves that travel horizontally along the ground surface to a depth of about one wavelength. The actual depth of sampling of the ground is considered to be one-half to one-third of the Rayleigh (surface) wave wavelength. The wavelengths measured by the equipment will be a function of the frequency of the source and the velocity of the surface waves through the ground. As the depth of investigation increases, there will be less certainty in terms of layer boundaries and velocity values.

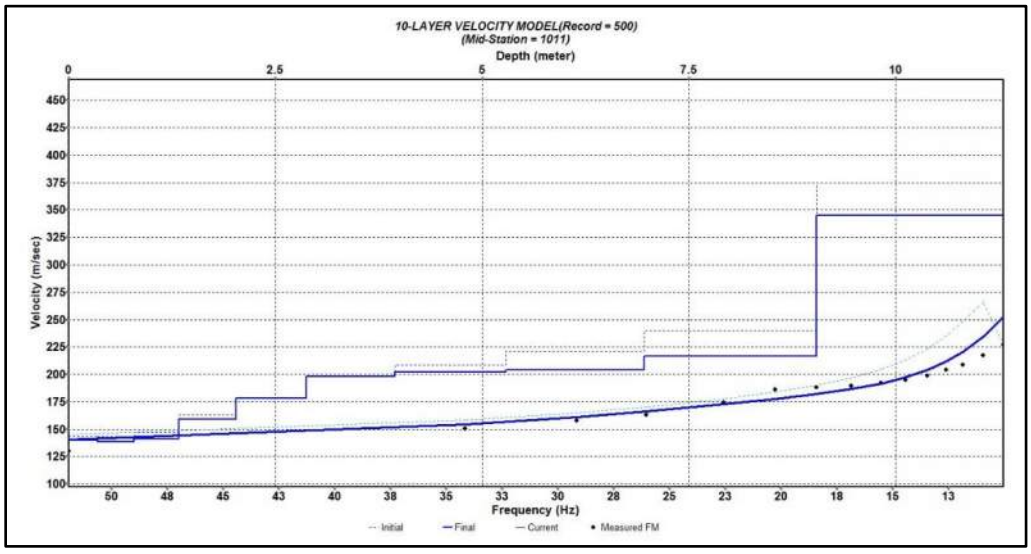


Figure MASW-3. 1D inversion result with fitted dispersion curve

The equipment, field procedures, and analysis software used by ConeTec all conform to the currently accepted best practices for MASW testing. The results of geophysical testing are always interpretative to a certain extent and should be confirmed by drilling or other intrusive testing.

References

Miller, R.D., Xia, J., Park, C.B., and Ivanov, J.M., 1999, Multichannel analysis of surface waves to map bedrock, Kansas Geological Survey, The Leading Edge, December, p. 1392-1396.

Park, C.B., Miller, R.D., and Xia, J., 1998b, Ground roll as a tool to image near-surface anomaly: 68th Ann. Internat. Mtg. Soc. Expl.Geophys., Expanded Abstracts, p. 874-877.

Park, C.B., Miller, R.D., and Xia, J., 1999, Multichannel analysis of surface waves: Geophysics, v. 64, n. 3, pp. 800-808.

Park, C.B., Miller, R.D., Xia, J., and Ivanov, J., 2007, Multichannel analysis of surface waves (MASW)-active and passive methods: The Leading Edge, January.

SurfSeis website: http://www.kgs.ku.edu/software/surfseis/index.html

Xia, J., R.D. Miller, and C.B. Park, 2000a, Advantages of calculating shear-wave velocity from surface waves with higher modes: [Exp. Abs.]: Soc. Expl. Geophys., p. 1295-1298.

Xia, J., Miller, R.D., Park, C.B., and Ivanov, J., 2000b, Construction of 2-D vertical shear-wave velocity field by the Multichannel Analysis of Surface Wave technique, Proceedings of the Symposium on the Application of Geophysics to Engineering and Environmental Problems (SAGEEP 2000), Washington D.C, February 20-24, p. 1197-1206.

The following appendices listed below are included in the report:

- 1D MASW Summary and Maps
- 1D MASW Results
- Vs100 Calculation Tables
- MASW Time Domain Traces and Overtone Images

1D MASW Summary and Maps

CONETEC

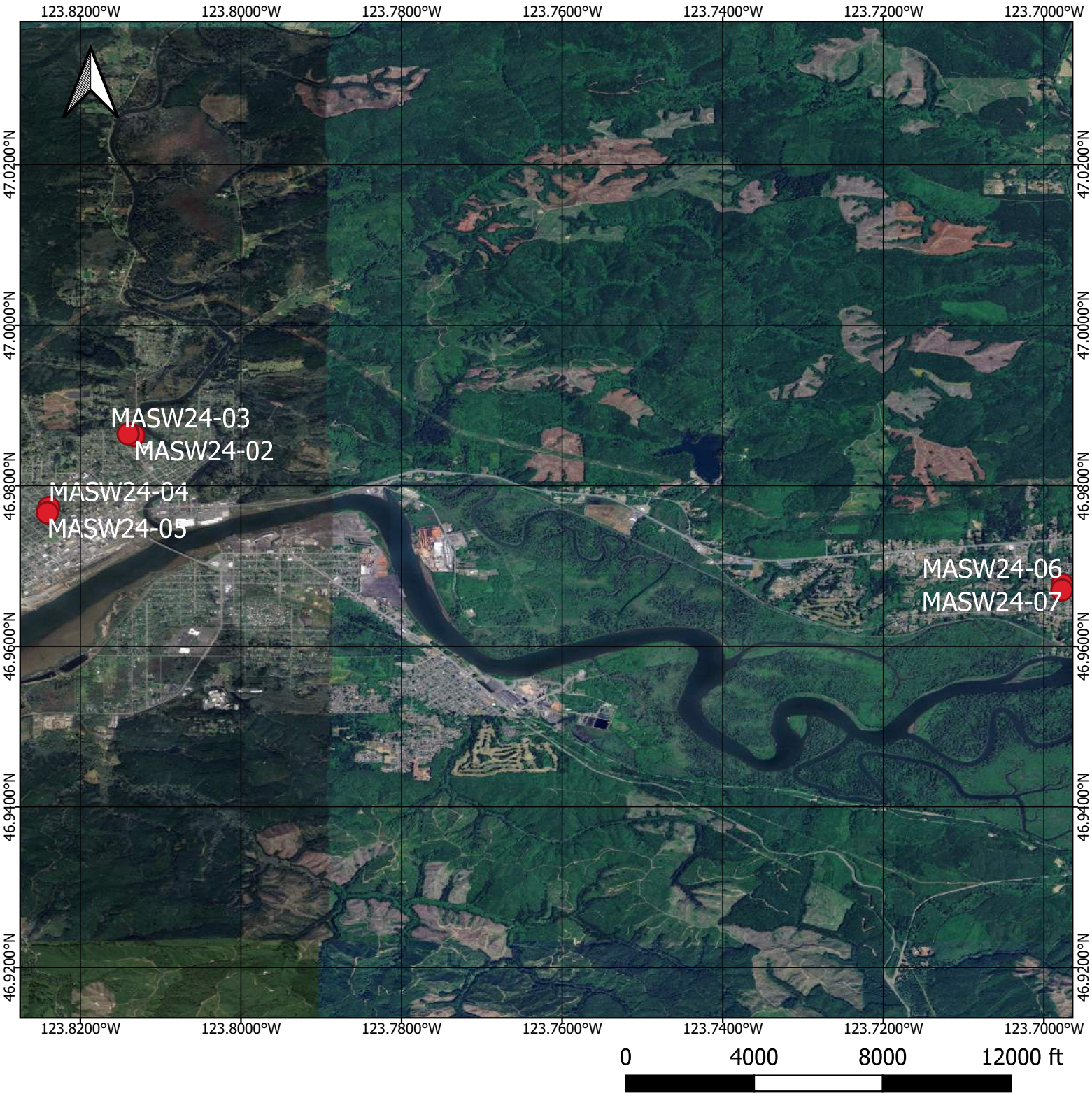
Job No:	24-59-27777
Client:	Haley & Aldrich, Inc.
Project:	Aberdeen MASW
Start Date:	06-Jun-2024
End Date:	07-Jun-2024

1D MASW TEST SUMMARY

Sounding ID	Date	Seismic Source	Geophone Spacing (ft)	Array Length (ft)	Northing[1] (decimal deg)	Easting (decimal deg)	Refer to Notation Number
MASW24-02	06-Jun-2024	Sledgehammer	10, 3	240, 72	46.9863	-123.8133	
MASW24-03	06-Jun-2024	Sledgehammer	10, 3	240, 72	46.9865	-123.8141	
MASW24-04	06-Jun-2024	Sledgehammer	10, 3	240, 72	46.9773	-123.8239	
MASW24-05	07-Jun-2024	Sledgehammer	10, 3	240, 72	46.9766	-123.8241	
MASW24-06	07-Jun-2024	Sledgehammer	10, 3	240, 72	46.9677	-123.6977	
MASW24-07	07-Jun-2024	Sledgehammer	10, 3	240, 72	46.9670	-123.6978	

1. Coordinates were recorded with a handheld GPS in WGS84 lat/long

Aberdeen MASW - MASW Survey Overview Map



Legend

- MASW Location
- MASW Arrays

ConeTec Job Number: 24-59-27777
Survey Date(s): 06-June-2024- 07-June-2024
Coordinate Reference System: WGS84 Lat Long
Map Scale: 1:35000
Units: Decimal degrees
Imagery Source: Google Earth

CONETEC

Aberdeen MASW - Robert Gray Elementary Map



Legend

- MASW Location
- MASW Arrays

ConeTec Job Number: 24-59-27777
Survey Date(s): 06-June-2024- 07-June-2024
Coordinate Reference System: WGS84 Lat Long
Map Scale: 1:1000
Units: Decimal degrees
Imagery Source: Google Earth

CONETEC

Aberdeen MASW - Mc Dermoth Elementary Map



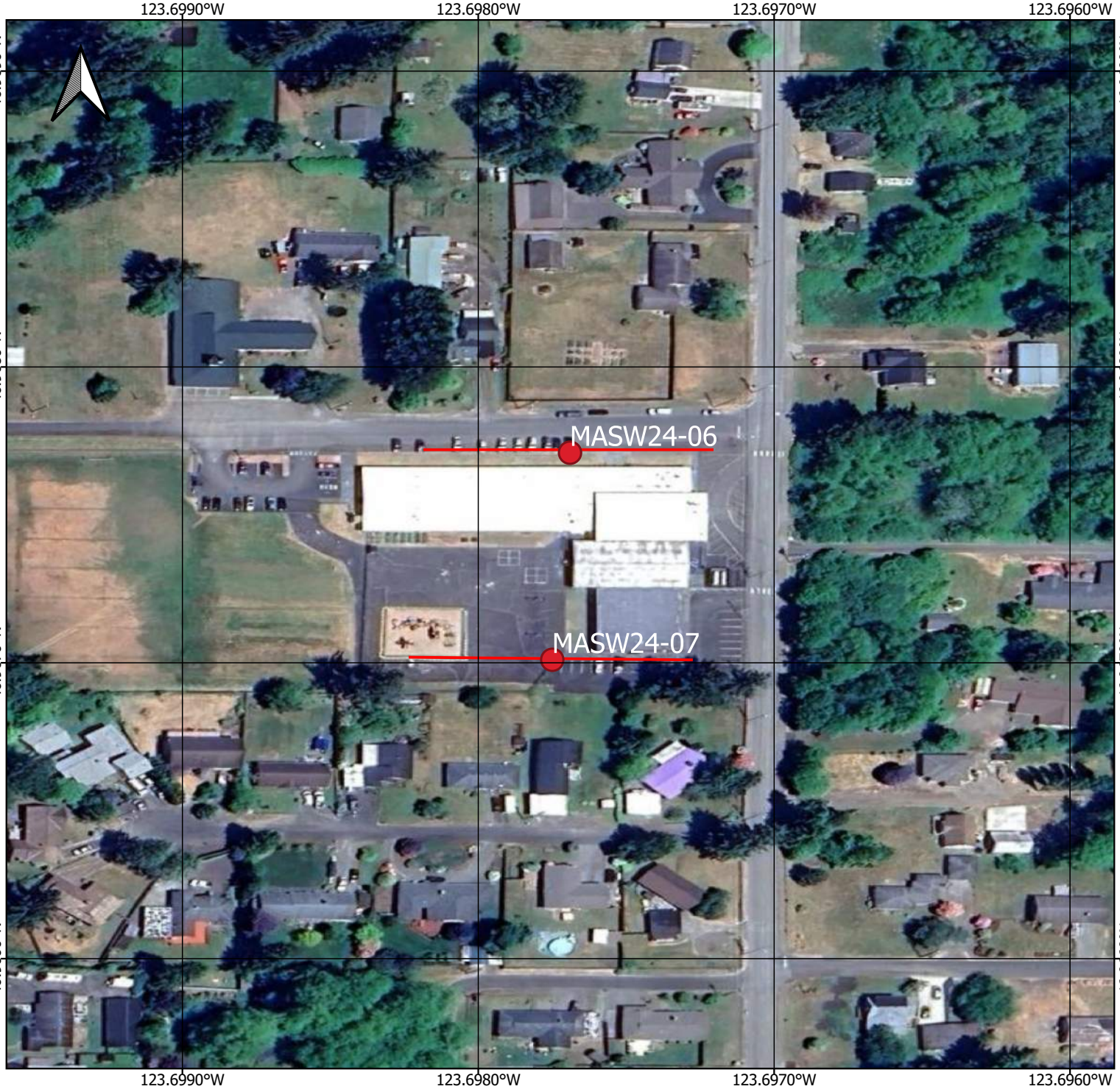
Legend

- MASW Location
- MASW Arrays

ConeTec Job Number: 24-59-27777
Survey Date(s): 06-June-2024- 07-June-2024
Coordinate Reference System: WGS84 Lat Long
Map Scale: 1:1000
Units: Decimal degrees
Imagery Source: Google Earth

CONETEC

Aberdeen MASW - Central Park Elementary Map



Legend

- MASW Location
- MASW Arrays

ConeTec Job Number: 24-59-27777
Survey Date(s): 06-June-2024- 07-June-2024
Coordinate Reference System: WGS84 Lat Long
Map Scale: 1:1000
Units: Decimal degrees
Imagery Source: Google Earth

CONETEC

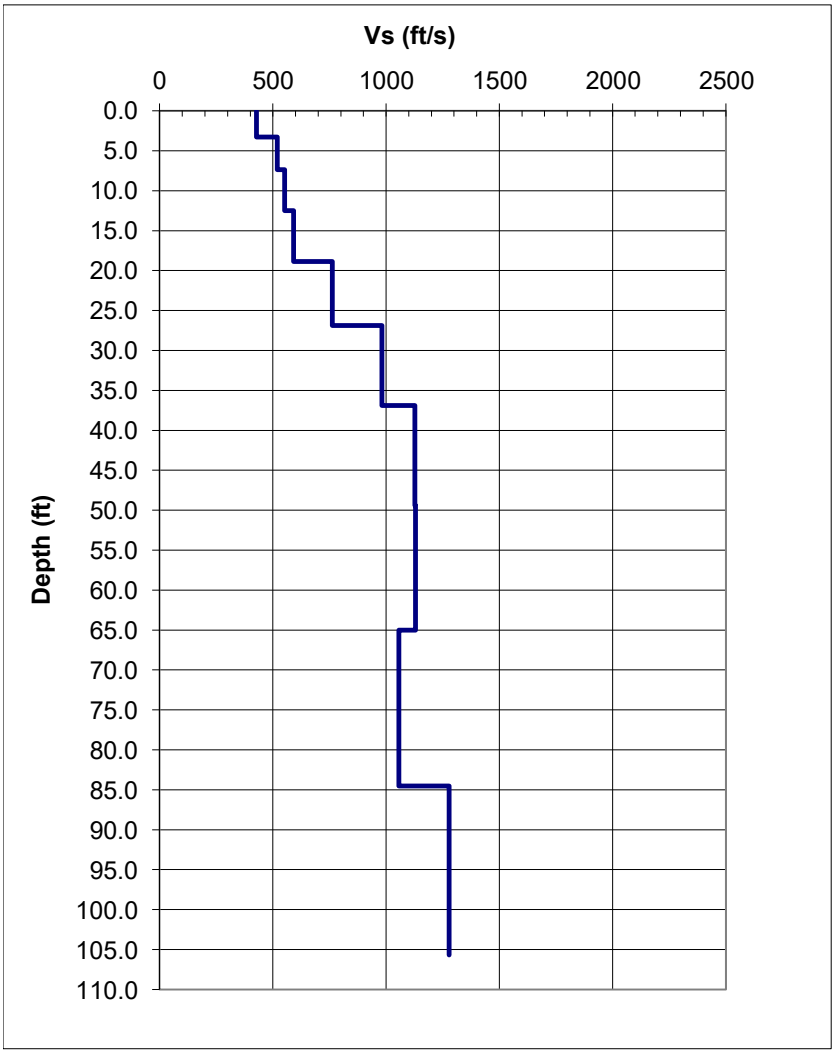
1D MASW Results

CONETEC

Job No:	24-59-27777
Client:	Haley & Aldrich, Inc.
Project:	Aberdeen MASW
Sounding ID:	MASW24-02
Date:	06-Jun-2024

1D MASW SHEAR WAVE VELOCITY TEST RESULTS

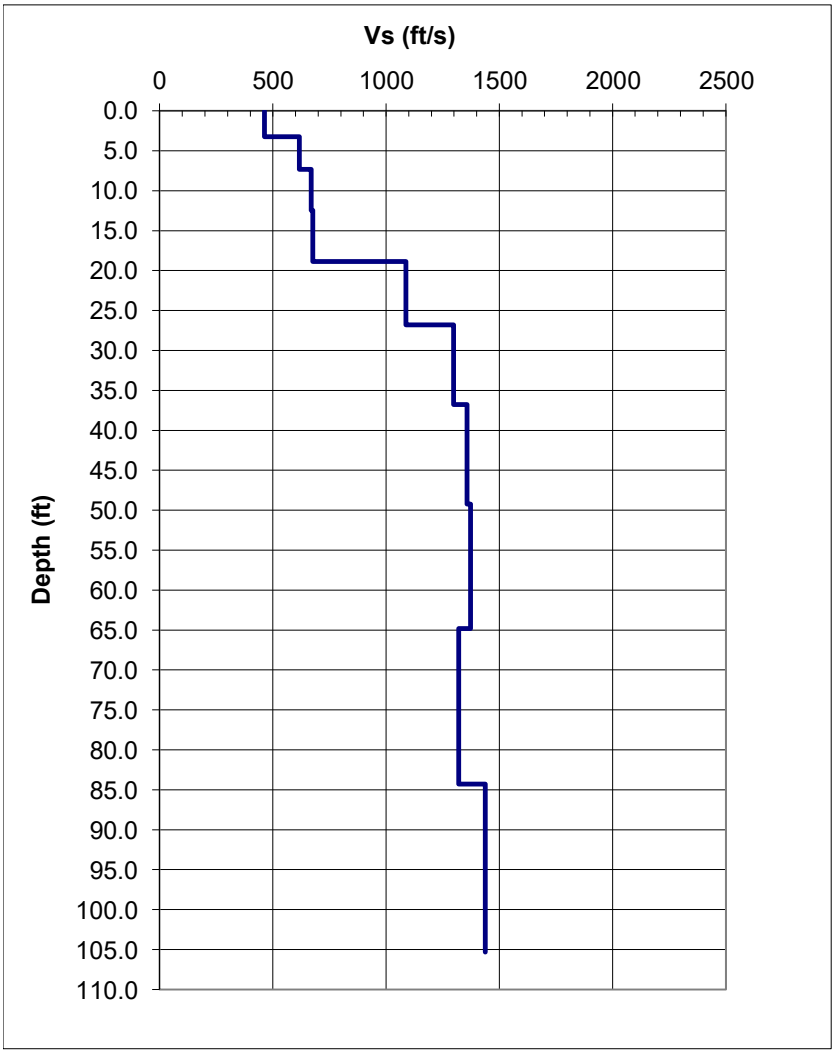
Layer	Layer Thickness (ft)	Depth of Bottom of Layer (ft)	Vs (ft/s)
1	3.3	3.3	428
2	4.1	7.4	520
3	5.1	12.5	553
4	6.4	18.9	591
5	8.0	26.9	763
6	10.0	36.9	981
7	12.5	49.4	1127
8	15.6	65.0	1130
9	19.5	84.5	1056
10	21.1	105.7	1278



Job No:	24-59-27777
Client:	Haley & Aldrich, Inc.
Project:	Aberdeen MASW
Sounding ID:	MASW24-03
Date:	06-Jun-2024

1D MASW SHEAR WAVE VELOCITY TEST RESULTS

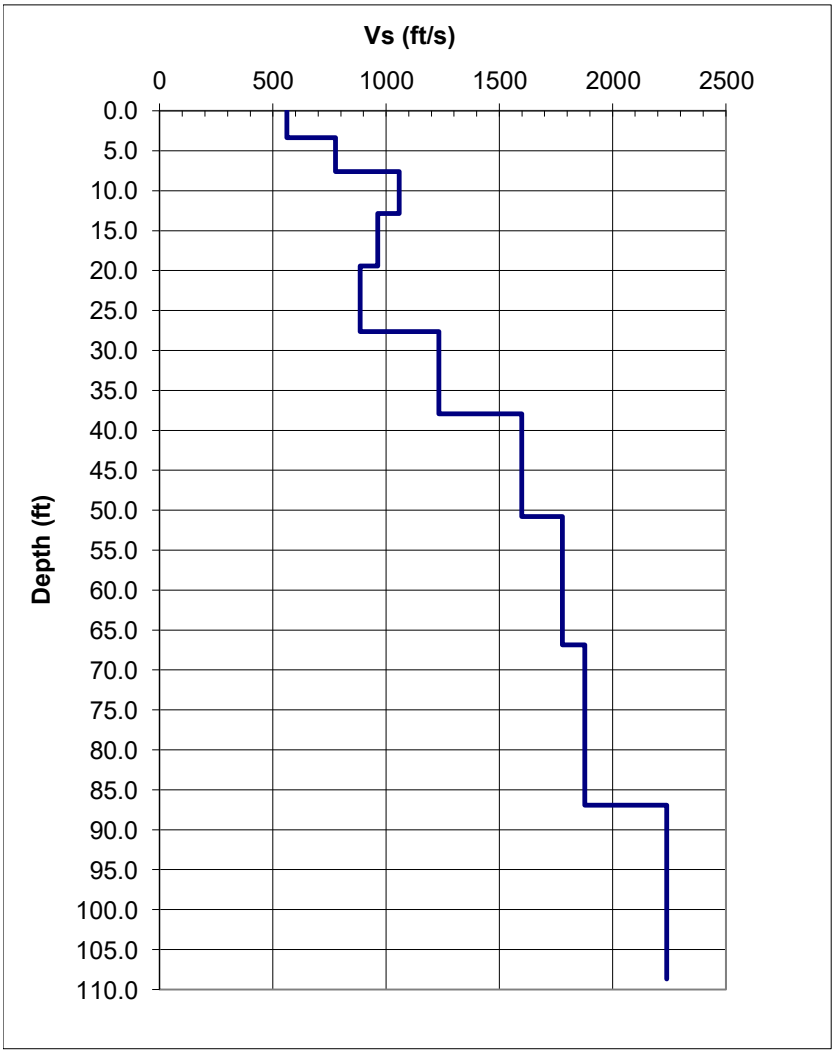
Layer	Layer Thickness (ft)	Depth of Bottom of Layer (ft)	Vs (ft/s)
1	3.3	3.3	463
2	4.1	7.3	616
3	5.1	12.5	669
4	6.4	18.8	676
5	8.0	26.8	1088
6	10.0	36.8	1298
7	12.5	49.2	1358
8	15.6	64.8	1374
9	19.5	84.3	1320
10	21.1	105.3	1438



Job No:	24-59-27777
Client:	Haley & Aldrich, Inc.
Project:	Aberdeen MASW
Sounding ID:	MASW24-04
Date:	06-Jun-2024

1D MASW SHEAR WAVE VELOCITY TEST RESULTS

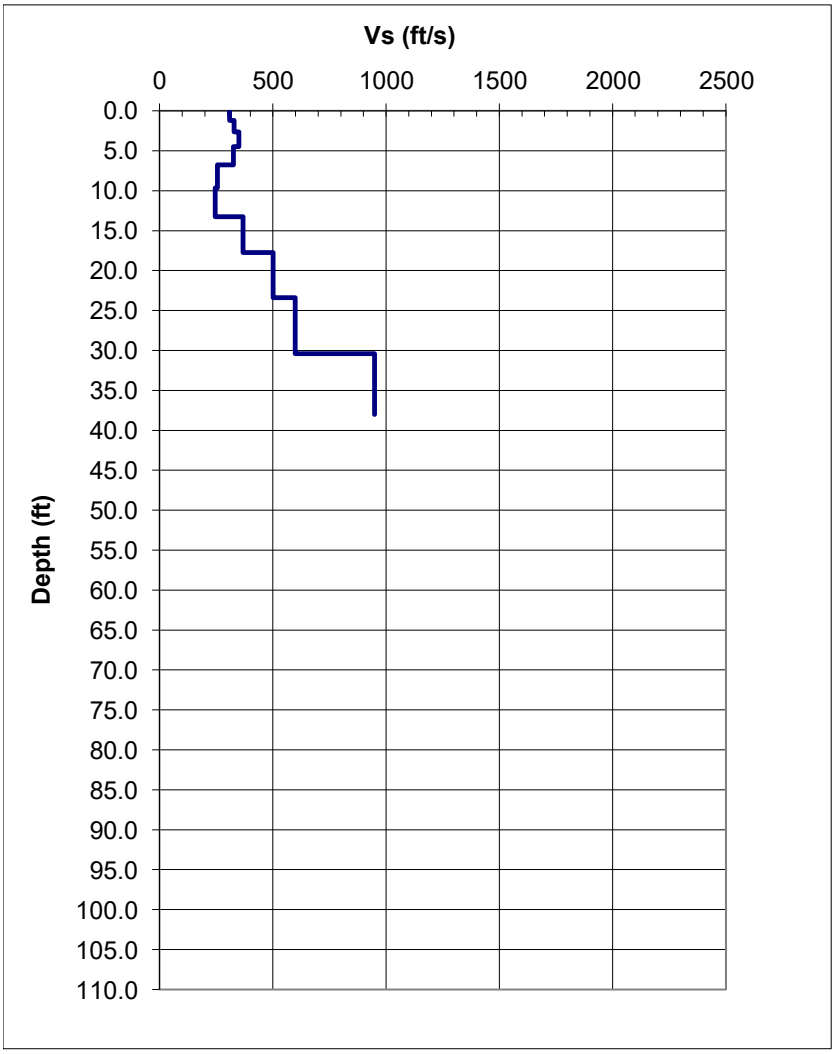
Layer	Layer Thickness (ft)	Depth of Bottom of Layer (ft)	Vs (ft/s)
1	3.4	3.4	562
2	4.2	7.6	777
3	5.3	12.8	1059
4	6.6	19.4	963
5	8.2	27.7	885
6	10.3	37.9	1232
7	12.9	50.8	1599
8	16.1	66.9	1778
9	20.1	86.9	1877
10	21.7	108.7	2238



Job No:	24-59-27777
Client:	Haley & Aldrich, Inc.
Project:	Aberdeen MASW
Sounding ID:	MASW24-05
Date:	07-Jun-2024

1D MASW SHEAR WAVE VELOCITY TEST RESULTS

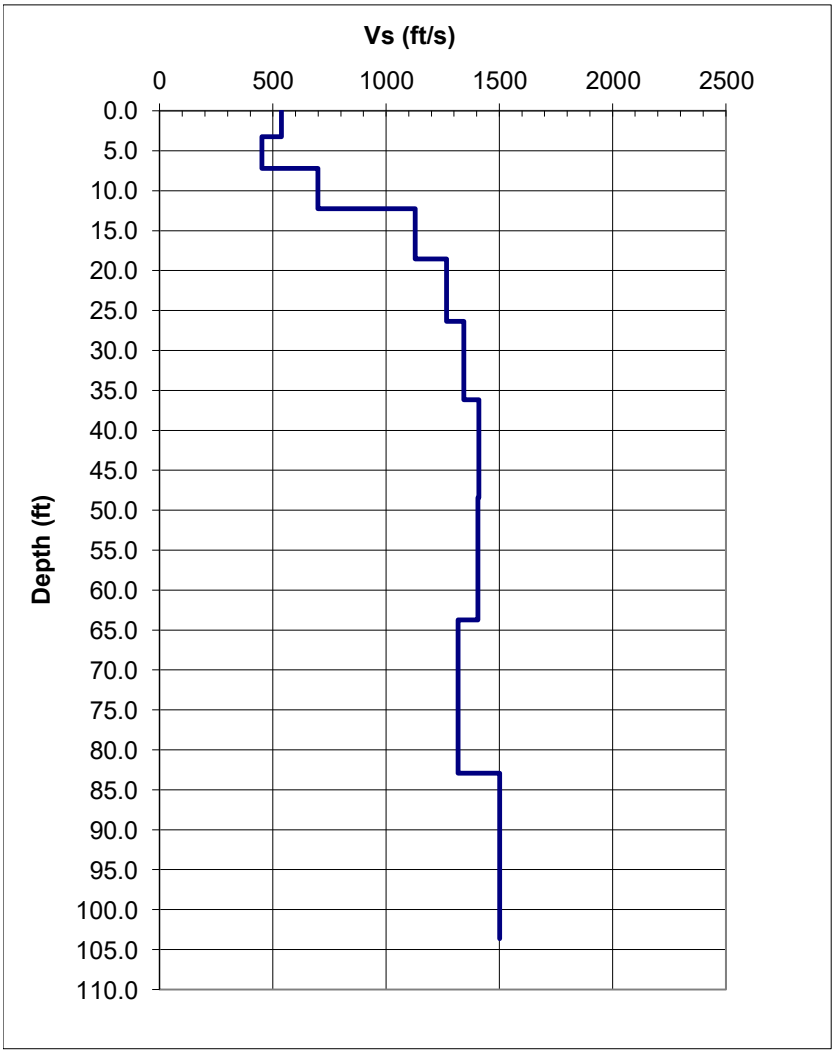
Layer	Layer Thickness (ft)	Depth of Bottom of Layer (ft)	Vs (ft/s)
1	1.2	1.2	309
2	1.5	2.7	329
3	1.8	4.5	350
4	2.3	6.8	326
5	2.9	9.7	256
6	3.6	13.3	245
7	4.5	17.8	369
8	5.6	23.4	500
9	7.0	30.4	599
10	7.6	38.0	949



Job No:	24-59-27777
Client:	Haley & Aldrich, Inc.
Project:	Aberdeen MASW
Sounding ID:	MASW24-06
Date:	07-Jun-2024

1D MASW SHEAR WAVE VELOCITY TEST RESULTS

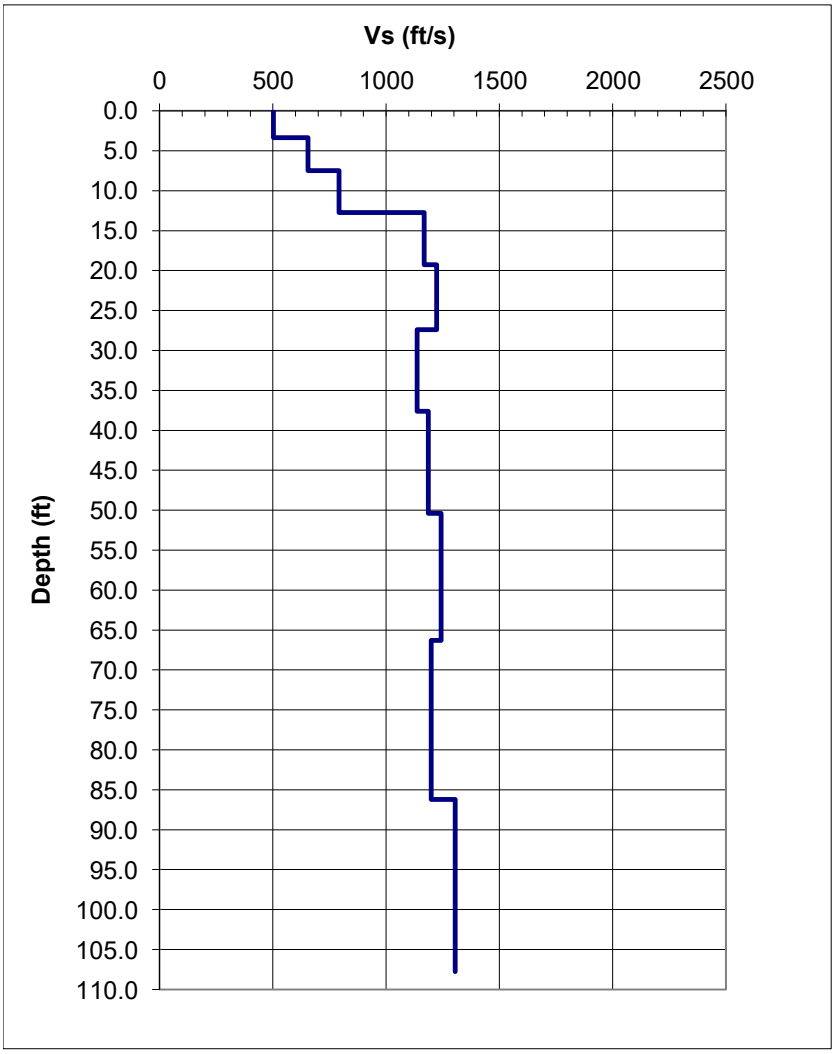
Layer	Layer Thickness (ft)	Depth of Bottom of Layer (ft)	Vs (ft/s)
1	3.2	3.2	538
2	4.0	7.2	452
3	5.0	12.3	699
4	6.3	18.5	1128
5	7.8	26.4	1267
6	9.8	36.2	1343
7	12.3	48.4	1409
8	15.3	63.8	1405
9	19.2	82.9	1319
10	20.7	103.7	1502



Job No:	24-59-27777
Client:	Haley & Aldrich, Inc.
Project:	Aberdeen MASW
Sounding ID:	MASW24-07
Date:	07-Jun-2024

1D MASW SHEAR WAVE VELOCITY TEST RESULTS

Layer	Layer Thickness (ft)	Depth of Bottom of Layer (ft)	Vs (ft/s)
1	3.3	3.3	502
2	4.2	7.5	655
3	5.2	12.7	792
4	6.5	19.3	1167
5	8.2	27.4	1224
6	10.2	37.6	1137
7	12.7	50.4	1186
8	15.9	66.3	1242
9	19.9	86.2	1199
10	21.6	107.8	1305



Vs100 Calculation Tables

CONETEC

Job No:	24-59-27777
Client:	Haley & Aldrich, Inc.
Project:	Aberdeen MASW
Sounding:	MASW24-02
Date:	06-Jun-2024

VS100 CALCULATION

Layer Number	Layer Thickness (ft)	Layer Bottom (ft)	Vs (ft/s)	Equivalent Vertical Travel Time (s)
1	3.3	3.3	428	0.00766
2	4.1	7.4	520	0.00788
3	5.1	12.5	553	0.00926
4	6.4	18.9	591	0.01082
5	8.0	26.9	763	0.01049
6	10.0	36.9	981	0.01020
7	12.5	49.4	1127	0.01109
8	15.6	65.0	1130	0.01383
9	19.5	84.5	1056	0.01849
10	15.5	100.0	1278	0.01210
Total Vertical Travel Time for 100ft (s)				0.11181
Average Travel Time Weighted Shear Wave Velocity (ft/s)				894

Notes: Yellow Highlighted Cells Indicate Projected Vs

Job No:	24-59-27777
Client:	Haley & Aldrich, Inc.
Project:	Aberdeen MASW
Sounding:	MASW24-03
Date:	06-Jun-2024

VS100 CALCULATION

Layer Number	Layer Thickness (ft)	Layer Bottom (ft)	Vs (ft/s)	Equivalent Vertical Travel Time (s)
1	3.3	3.3	463	0.00705
2	4.1	7.3	616	0.00662
3	5.1	12.5	669	0.00763
4	6.4	18.8	676	0.00944
5	8.0	26.8	1088	0.00733
6	10.0	36.8	1298	0.00768
7	12.5	49.2	1358	0.00917
8	15.6	64.8	1374	0.01134
9	19.5	84.3	1320	0.01474
10	15.7	100.0	1438	0.01094
Total Vertical Travel Time for 100ft (s)				0.09193
Average Travel Time Weighted Shear Wave Velocity (ft/s)				1088

Notes: Yellow Highlighted Cells Indicate Projected Vs

Job No:	24-59-27777
Client:	Haley & Aldrich, Inc.
Project:	Aberdeen MASW
Sounding:	MASW24-04
Date:	06-Jun-2024

VS100 CALCULATION

Layer Number	Layer Thickness (ft)	Layer Bottom (ft)	Vs (ft/s)	Equivalent Vertical Travel Time (s)
1	3.4	3.4	562	0.00600
2	4.2	7.6	777	0.00542
3	5.3	12.8	1059	0.00497
4	6.6	19.4	963	0.00683
5	8.2	27.7	885	0.00930
6	10.3	37.9	1232	0.00835
7	12.9	50.8	1599	0.00804
8	16.1	66.9	1778	0.00904
9	20.1	86.9	1877	0.01070
10	13.1	100.0	2238	0.00583
Total Vertical Travel Time for 100ft (s)				0.07447
Average Travel Time Weighted Shear Wave Velocity (ft/s)				1343

Notes: Yellow Highlighted Cells Indicate Projected Vs

Job No:	24-59-27777
Client:	Haley & Aldrich, Inc.
Project:	Aberdeen MASW
Sounding:	MASW24-06
Date:	07-Jun-2024

VS100 CALCULATION

Layer Number	Layer Thickness (ft)	Layer Bottom (ft)	Vs (ft/s)	Equivalent Vertical Travel Time (s)
1	3.2	3.2	538	0.00597
2	4.0	7.2	452	0.00889
3	5.0	12.3	699	0.00718
4	6.3	18.5	1128	0.00556
5	7.8	26.4	1267	0.00619
6	9.8	36.2	1343	0.00730
7	12.3	48.4	1409	0.00870
8	15.3	63.8	1405	0.01090
9	19.2	82.9	1319	0.01453
10	17.1	100.0	1502	0.01137
Total Vertical Travel Time for 100ft (s)				0.08660
Average Travel Time Weighted Shear Wave Velocity (ft/s)				1155

Notes: Yellow Highlighted Cells Indicate Projected Vs

Job No:	24-59-27777
Client:	Haley & Aldrich, Inc.
Project:	Aberdeen MASW
Sounding:	MASW24-07
Date:	07-Jun-2024

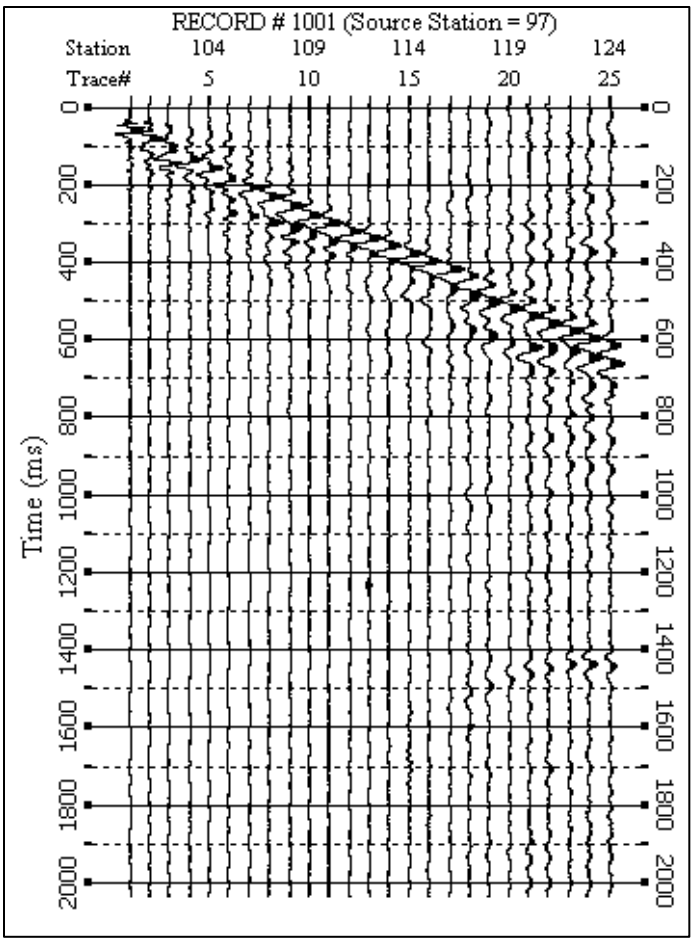
VS100 CALCULATION

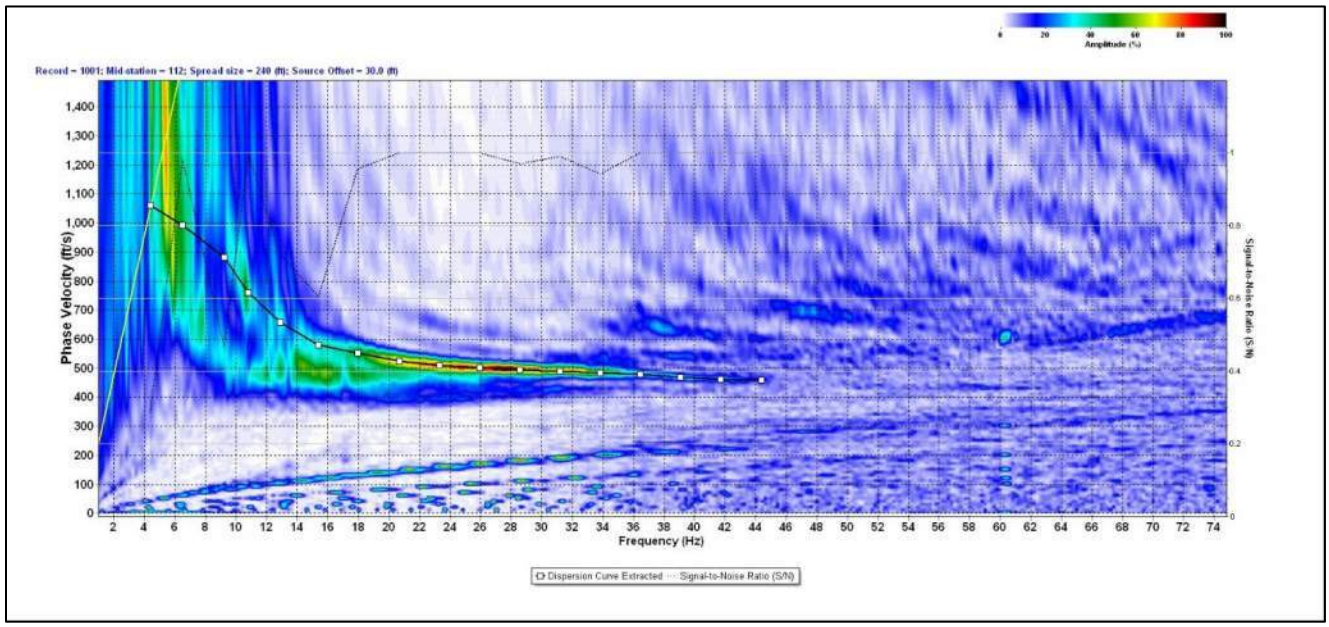
Layer Number	Layer Thickness (ft)	Layer Bottom (ft)	Vs (ft/s)	Equivalent Vertical Travel Time (s)
1	3.3	3.3	502	0.00666
2	4.2	7.5	655	0.00637
3	5.2	12.7	792	0.00659
4	6.5	19.3	1167	0.00559
5	8.2	27.4	1224	0.00667
6	10.2	37.6	1137	0.00897
7	12.7	50.4	1186	0.01075
8	15.9	66.3	1242	0.01282
9	19.9	86.2	1199	0.01660
10	13.8	100.0	1305	0.01057
Total Vertical Travel Time for 100ft (s)				0.09159
Average Travel Time Weighted Shear Wave Velocity (ft/s)				1092

Notes: Yellow Highlighted Cells Indicate Projected Vs

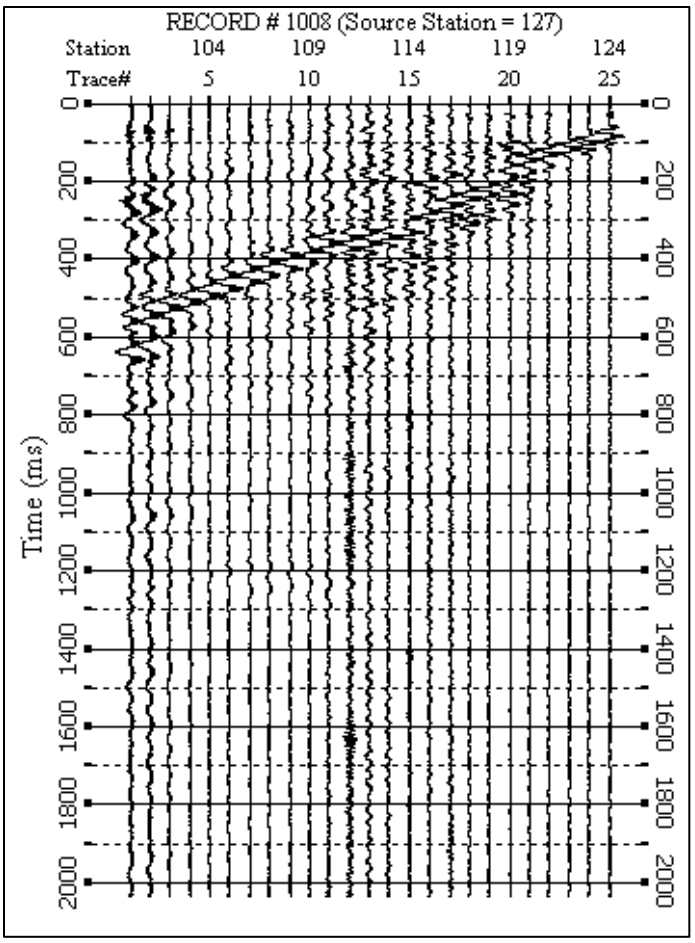
MASW Time Domain Traces and Overtone Images

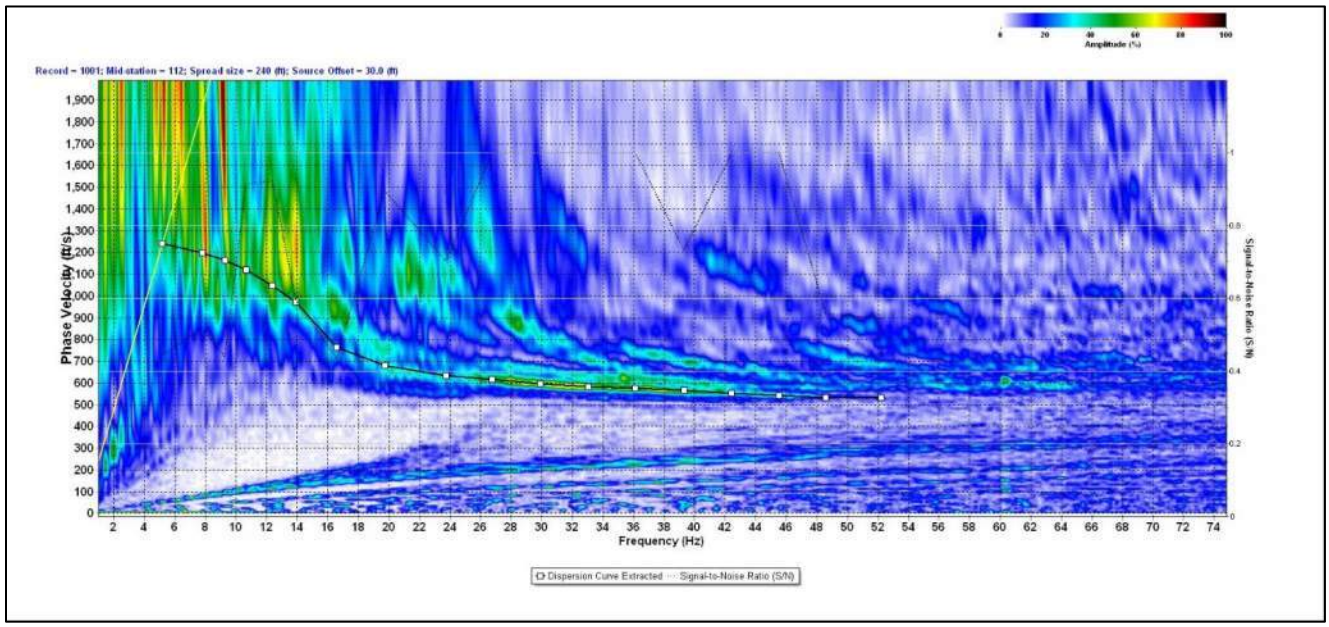
CONETEC



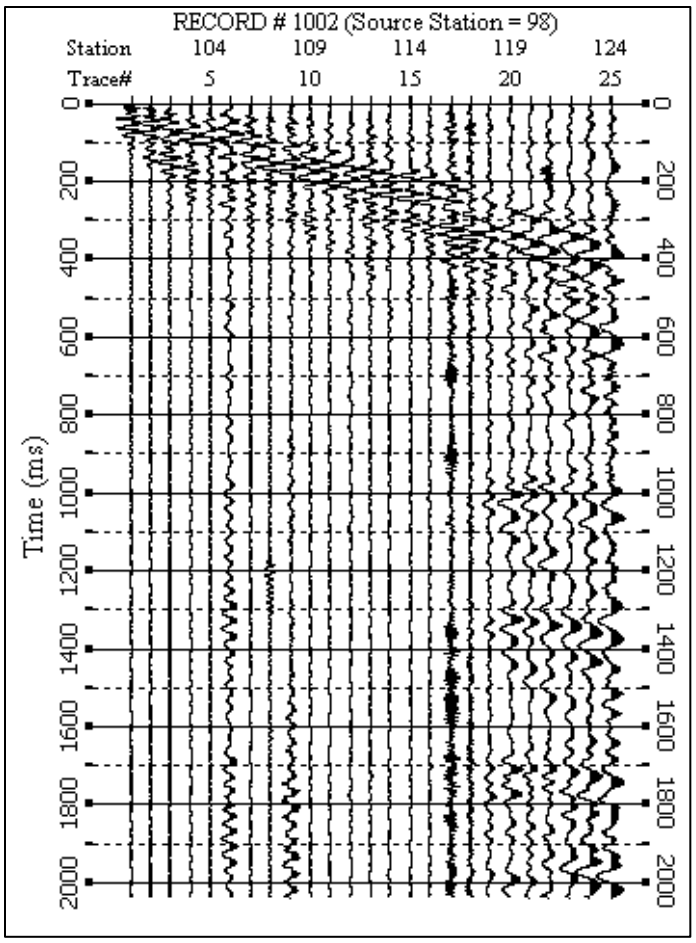


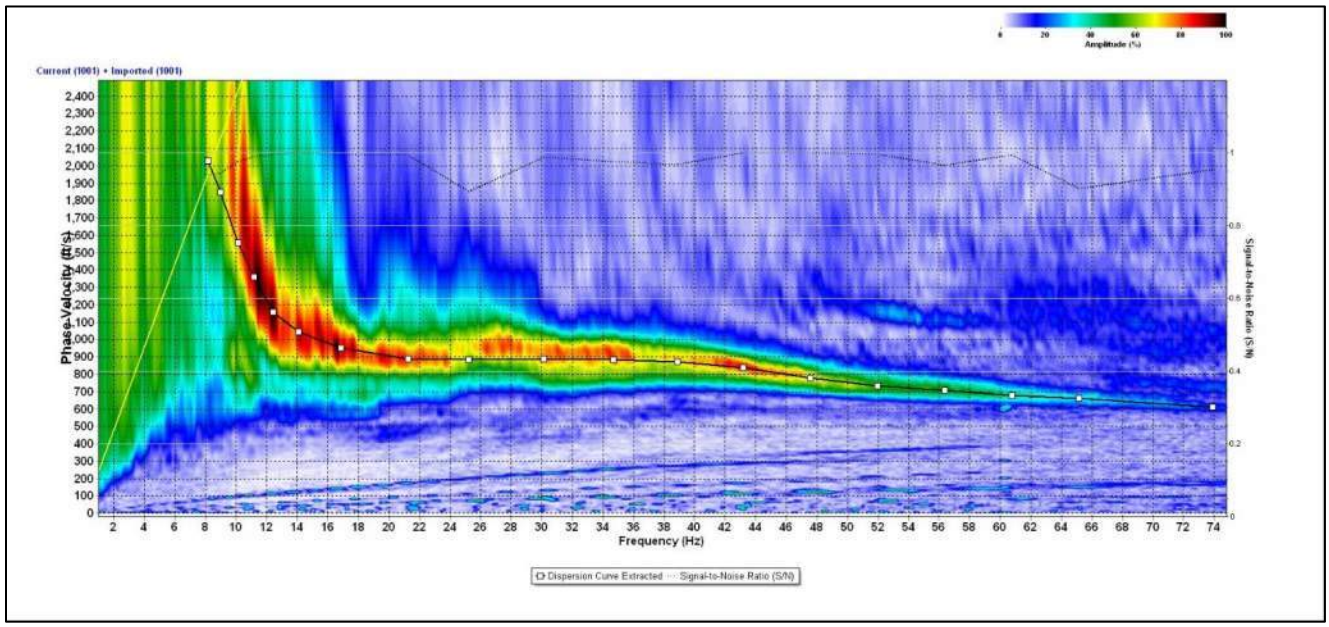
MASW24-02: Example time domain trace (top) and overtone image with picked dispersion curve (bottom).



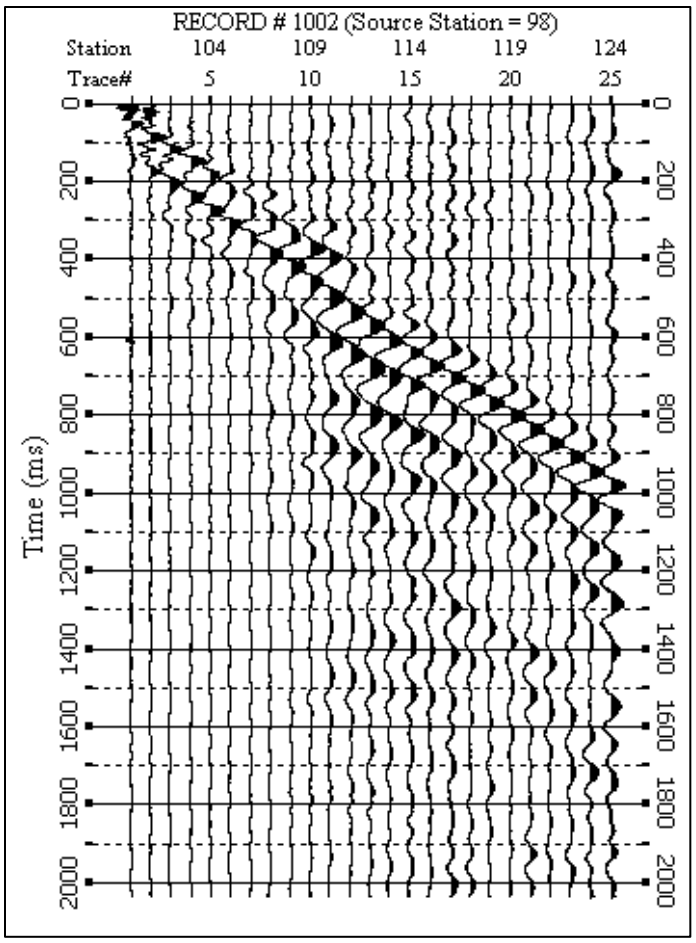


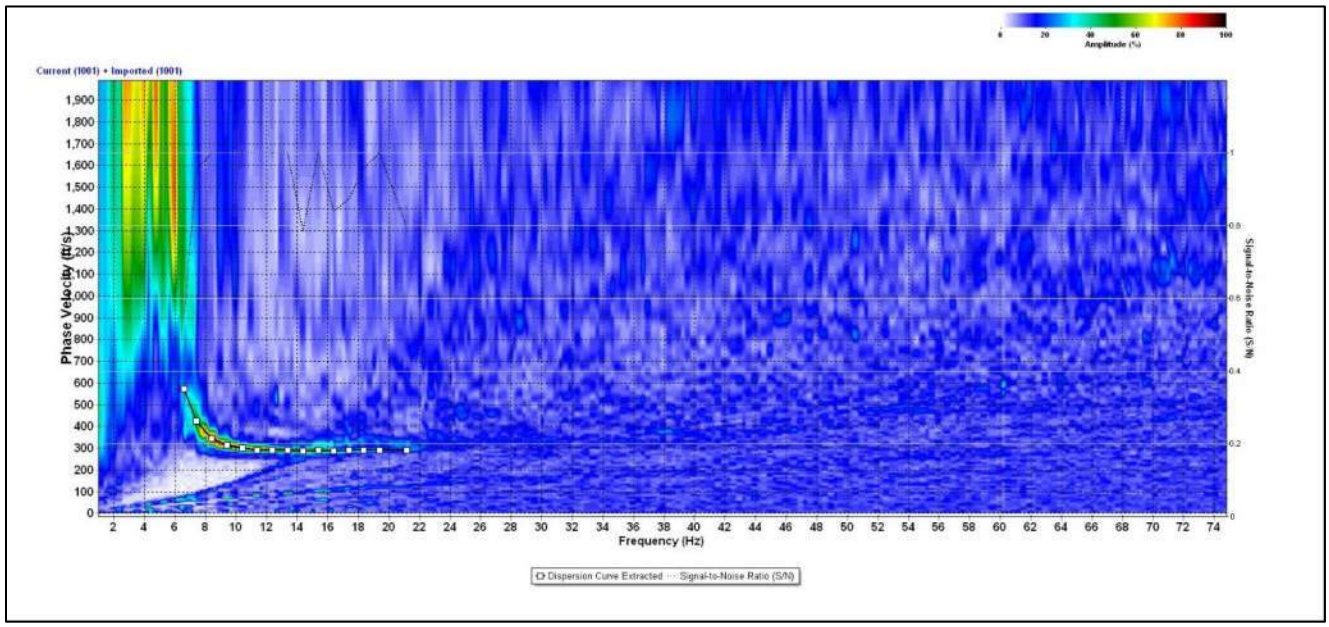
MASW24-03: Example time domain trace (top) and overtone image with picked dispersion curve (bottom).



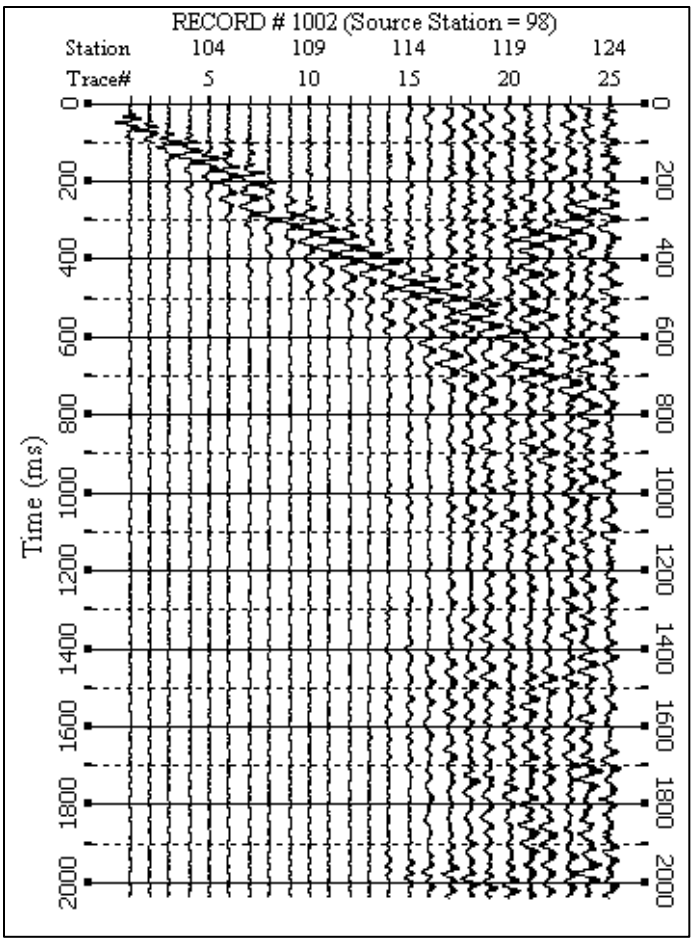


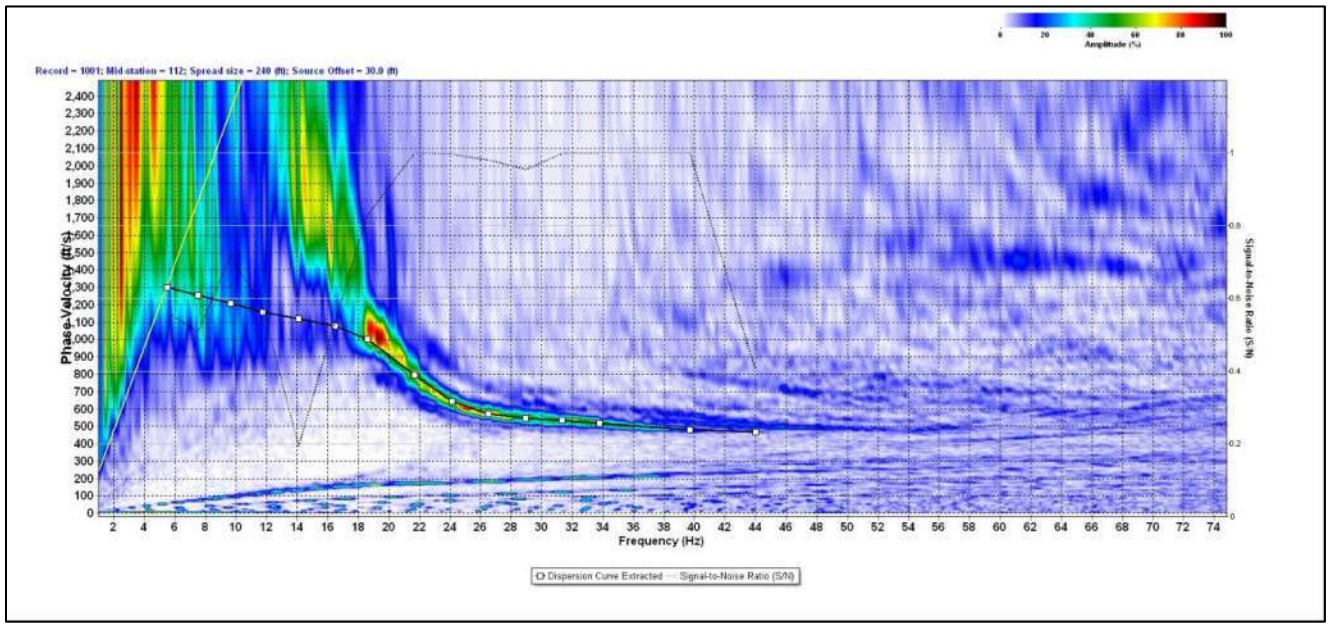
MASW24-04: Example time domain trace (top) and overtone image with picked dispersion curve (bottom).



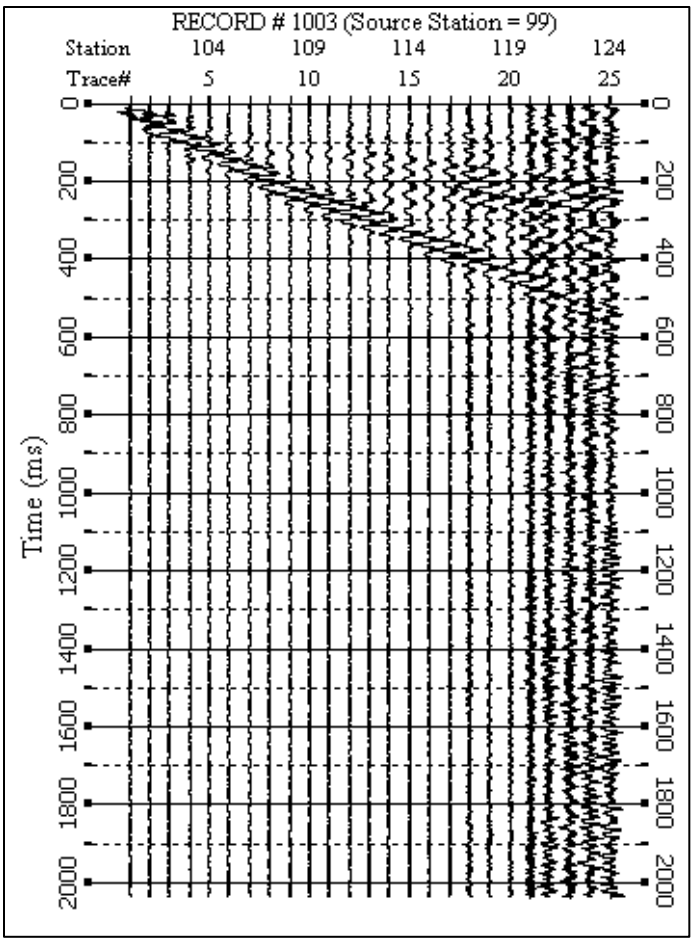


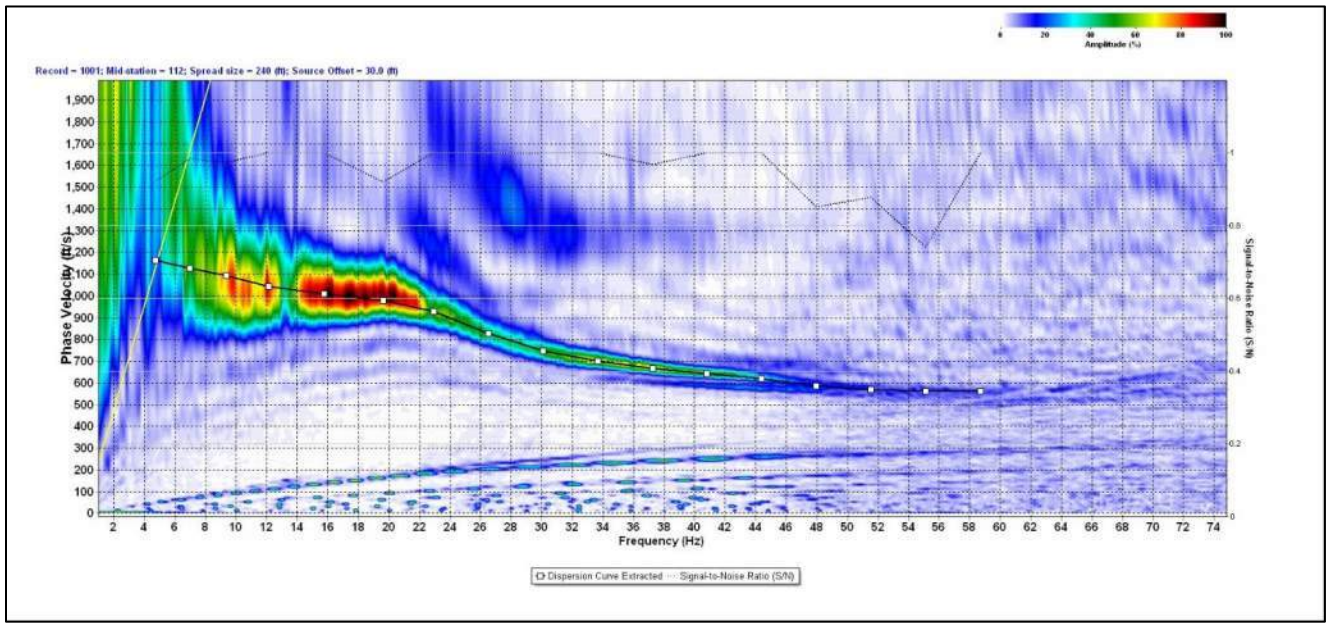
MASW24-05: Example time domain trace (top) and overtone image with picked dispersion curve (bottom).





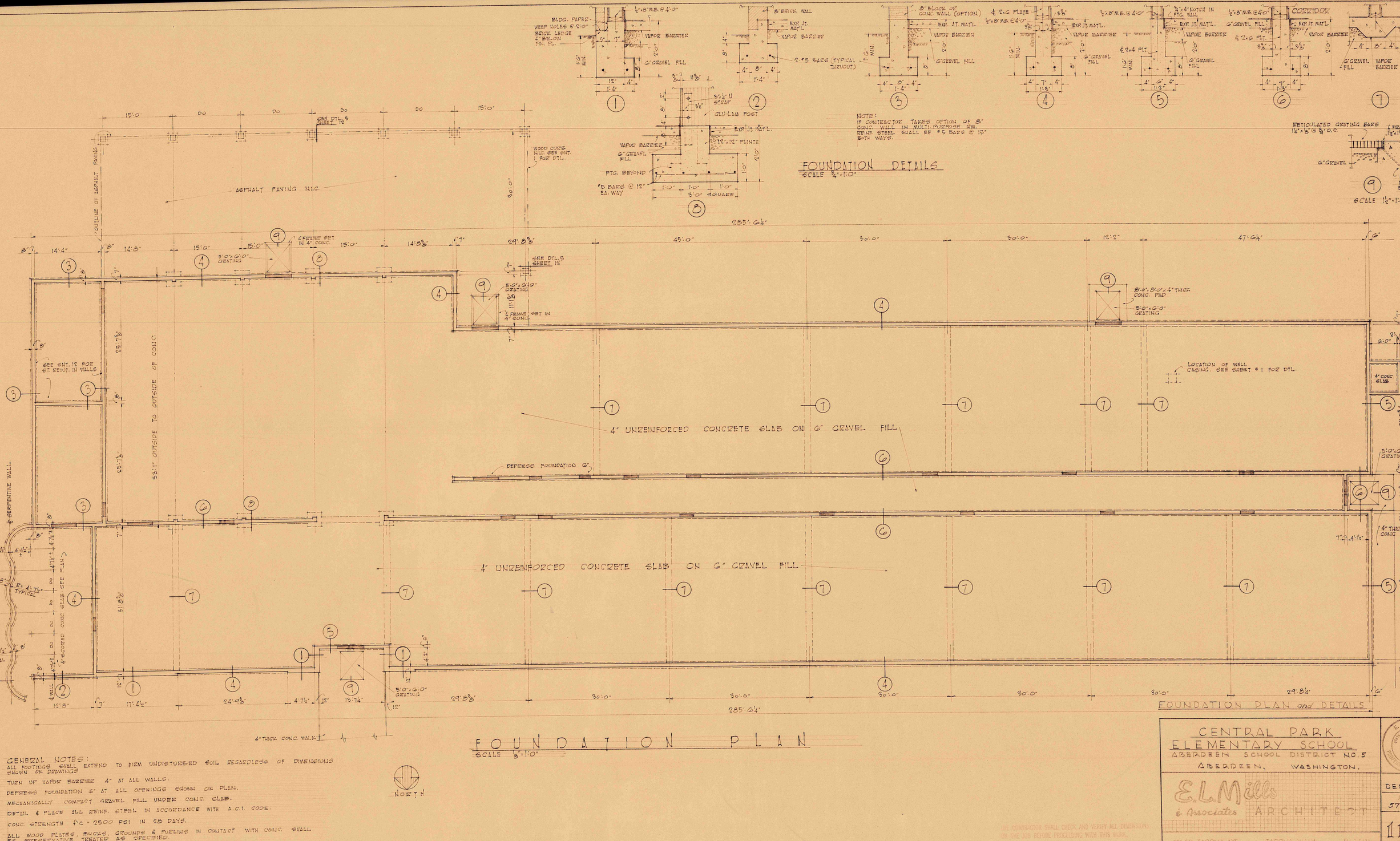
MASW24-06: Example time domain trace (top) and overtone image with picked dispersion curve (bottom).





MASW24-07: Example time domain trace (top) and overtone image with picked dispersion curve (bottom).

APPENDIX D
Historical Plans



GENERAL NOTES:
ALL FOOTINGS SHALL EXTEND TO FIRM UNDISTURBED SOIL REGARDLESS OF DIMENSIONS SHOWN ON DRAWINGS

TURN UP VAPOR BARRIER 4" AT ALL WALLS.

DEPRESS FOUNDATION 6" AT ALL OPENINGS SHOWN ON PLAN.

MECHANICALLY COMPACT GRAVEL FILL UNDER CONC. SLAB.

DETAIL & PLACE ALL REINF. STEEL IN ACCORDANCE WITH A.C.I. CODE.

CONC. STRENGTH $f'c = 2500$ PSI IN 28 DAYS.

ALL WOOD PLATES, SUCKS, GROUNDS & FURRING IN CONTACT WITH CONC. SHALL BE PRESERVATIVE TREATED AS SPECIFIED.

PROVIDE 4" SAND FUN GRAVEL & ¾" WASHED GRAVEL FILL UNDER ALL CONC. SLABS.

CENTRAL PARK ELEMENTARY SCHOOL
ABERDEEN SCHOOL DISTRICT NO. 5
ABERDEEN, WASHINGTON.

E.L. MILLS
STATE OF WASHINGTON REGISTERED PROFESSIONAL ARCHITECT

E.L. Mills & Associates ARCHITECT
308 SO. TACOMA AVE. TACOMA, WASH. FU 3-5421

THE CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS ON THE JOB BEFORE PROCEEDING WITH THIS WORK.

DATE DEC. 1957
JOB NO. 5704
SHEET 11 OF 12

HALEY ALDRICH

www.haleyaldrich.com

REPORT OF PRELIMINARY GEOTECHNICAL ENGINEERING FINDINGS
ABERDEEN SCHOOL DISTRICT NO. 5 SEISMIC SAFETY RETROFITS
ROBERT GRAY ELEMENTARY SCHOOL
ABERDEEN, WASHINGTON



by
Haley & Aldrich, Inc.
Vancouver, Washington

for
TCF Architecture PLLC
Tacoma, Washington

File No. 0210747-000
September 2024

HALEY & ALDRICH, INC.
300 W 15th S
Vancouver, WA 98660
360.448.4189

18 September 2024
File No. 0210747-000

TCF Architecture PLLC
902 N 2nd Street
Tacoma, Washington 98403

Attention: Steve Wachtler, AIA, Principal

Subject: Report of Preliminary Geotechnical Engineering Findings
Aberdeen School District No. 5 Seismic Safety Retrofits
Robert Gray Elementary School
1516 N B Street
Aberdeen, Washington 98520

Dear Steve Wachtler:

Haley & Aldrich, Inc. (Haley & Aldrich) is pleased to submit this report to TCF Architecture PLLC and Aberdeen School District No. 5 (District) summarizing our preliminary geotechnical engineering services for the seismic retrofit of Robert Gray Elementary School in Aberdeen, Washington. Our work was completed in general accordance with our agreement executed 24 April 2024. In completing our services, we collaborated with Degenkolb Engineers, Inc. and Educational Service District 112 - Construction Services Group.

The project involves preliminary evaluation of the Robert Gray Elementary School in Aberdeen, Washington per *American Society of Civil Engineers/Structural Engineering Institute (ASCE/SEI) 41-17 - Seismic Evaluation and Retrofit of Existing Buildings* (ASCE 41-17; ASCE 2017b). The study was funded by the Office of Superintendent of Public Instruction's (OPSI's) School Seismic Grant Program. The findings from this preliminary evaluation will inform the District's and OPSI's decision-making to either advance full design efforts for seismic retrofit improvements at the existing campus or to explore re-siting the school to a new location.

This preliminary report provides a discussion of the site setting, surface and subsurface conditions, the seismic basis of design, and a preliminary geotechnical analysis of seismicity and seismic hazards that may impact plans for retrofit of the subject school. Our current scope of services does not include developing recommendations for design and construction of retrofit improvements, such as modification of existing foundations or installation of ground improvement elements. Preliminary recommendations for retrofit improvements may be provided using currently available subsurface data under a supplemental authorization.

Scope of Services

The purpose of our services was to preliminarily characterize subsurface conditions at the site and to provide geotechnical engineering guidance and recommendations that conform in a preliminary sense to the geotechnical requirements of ASCE 41-17. These services included conducting geologic research, limited field explorations, limited laboratory testing, preliminary seismic ground motion assessments, seismic hazard evaluations, and preliminary engineering analyses.

We completed the following tasks in general accordance with *Part 1 – Geotechnical Field Services and Limited Seismic Hazard Evaluation* included in our proposal for Geotechnical Engineering Services dated 10 April 2024 and executed 24 April 2024.

- Reviewed readily available geologic and geologic hazard maps and geotechnical reports and construction plans provided by others for general information regarding subsurface soil and groundwater conditions and geologic hazards.
- Drilled two borings to depths of approximately 30 to 76 feet below ground surface (bgs).
- Performed two multi-channel analyses of surface waves (MASW) geophysical tests.
- Observed the explorations, logged the subsurface conditions, collected representative soil samples, and transported the samples to our laboratory for further visual review and testing.
- Completed laboratory tests on select soil samples to evaluate soil engineering properties. Our specific tests included moisture content, Atterberg Limits, grain size distribution determinations, and a suite of corrosion potential tests in accordance with current ASTM International or other applicable standards.
- Developed code-based seismic design values in conformance with ASCE 41 Section 2.4 and ASCE 7 Section 11.4, not including site-specific seismic or ground response analyses per ASCE 7 Chapter 21 (ASCE 2017a).
- Conducted limited seismic hazard analyses including:
  - Assessing liquefaction potential analysis per the method presented by Idriss & Boulanger (2008); and
  - Assessing lateral spreading at the site, including an evaluation of local and regional topography and nearby bathymetry.
- Prepared this report summarizing our preliminary findings.

Site Conditions

SURFACE CONDITIONS

The Robert Gray Elementary School campus encompasses an approximately 9.86-acre site located at 1516 N B Street in Aberdeen, Washington. The site is bounded by 4th Avenue to the north, the Wishkah River to the northeast and east, playfields to the east, Cleveland Street and Willard Street to the south, and Holmes Street and N B Street to the west. The elementary school building is located in the northern

portion of the campus and consists of a one- to two-story building with a gymnasium to the east. The remainder of the campus is occupied by an athletic field and stadium to the southeast of the school building, asphalt-paved parking lots to the north and south of the school building, and playfields to the east of the school building.

The site topography is generally flat with an average surface elevation at approximately Elevation 26 feet (World Geodetic System [WGS] 84). Grades in the far eastern portion of the site slope downward towards the Chehalis River, east of the playfields. Grades in the far western portion of the site descend towards the east at a 2-horizontal-to-1-vertical inclination or more gradual, starting from a maximum elevation of about 37 feet (WGS 84) at N B Street.

The Wishkah River is located less than 200 feet east of the school building, and the Chehalis River is located approximately 0.85 miles to the southeast of the school. The bay of Grays Harbor begins approximately 2 miles southwest of the site at the mouth of the Chehalis River. The Pacific Ocean is about 17 miles to the west of the school, beyond the northern peninsula of Grays Harbor.

Our understanding of the existing structure foundations is based on our review of select plan sheets from a plan set titled, “Robert Gray Elementary Phase 2A”, prepared by AHBL Civil & Structural Engineers & Planners, dated 9 May 2001. The plan sheets include Sheet S0.01 – General Notes, Sheet S1.00A – Partial Pile Placement Plan, S1.00B – Partial Pile Placement Plan, and S1.01 – First Floor Structural Plan. According to the plan, the building is supported by driven timber piles with a capacity of 15 tons each. (The plans also indicate that 16-inch diameter concrete auger-cast piles could be used as an alternative pile type. It is unknown which pile type was used, though we expect the timber piles were chosen.) Plans indicate that timber piles should have a minimum tip circumference of 25 inches. Timber piles shorter than 40 feet should have a minimum butt diameter of 12 inches and those longer than 40 feet should have a minimum butt diameter of 14 inches. Plans indicate that piles are interconnected via grade beams and that the floor slab is a structural slab supported by the piles and grade beams.

A subsurface exploration and geotechnical engineering report for the site prepared in 1999 by Associated Earth Sciences, Inc. (AESI) describes site surface and subsurface conditions as of 1999. The version of the report supplied to us for this study did not include logs or locations for the seven mud rotary borings that were reportedly performed for this study. A supplemental letter report, titled “Timber Pile Capacity Recommendations,” prepared by AESI and dated 19 January 2001 recommends that timber piles supporting the school building be driven to refusal and support an allowable vertical compression capacity of at least 25 tons each.

Excerpts from the historical plans and geotechnical documents are included in Appendix D.

GEOLOGIC AND SOIL MAPPING

The site is mapped in Logan (1987) as Quaternary alluvium (Qal) described as “silt, sand, and gravel deposited in streambeds and fans,” the surface of which is “relatively undissected” while Rau (1986) maps the site as Quaternary deposits (Qd) that are described as “alluvium and glacial drift,” that latter of which is described as “outwash and gravel deposits” (Rau, 1986). Immediately north of the site, Logan

(2003) describes Quaternary alluvium (Qa) along the Wishkah River as locally containing peat and lacustrine deposits. The mapping also indicates that at depth, the alluvium is likely underlain by marine sedimentary rocks assigned to the Miocene Montesano Formation. This formation is described as predominantly silty "coarse- to fine-grained" sandstone with "local to widespread conglomerate, siltstone, and mudstone" that is generally blue gray where fresh and orange-brown where weathered (Logan, 1987; Logan, 2003). Our explorations encountered dense materials at approximately 20 to 75 feet bgs, which are likely part of this sedimentary rock formation.

The near-surface soils at the site are mapped by the U.S. Department of Agriculture (USDA) in the *Soil Survey of Grays Harbor County Area, Pacific County, and Wahkiakum County* (Pringle, 1986), as compiled in the Web Soil Survey (USDA 2024), as Elochoman silt loam, 1 to 8 percent slopes. Elochoman soils are described as very deep, well drained soils derived from sandstone along shoulders of uplands (Pringle, 1986). The typical soil profile generally comprises 60 inches of medial loam (United Soil Classification System [USCS] ML, MH). Depth to water in this soil type is typically greater than 80 inches and the soil is assigned to hydrologic soil group B, which are soils that generally have moderate infiltration and water transmission rates. The risk of corrosion is rated as "high" for both uncoated steel and concrete with typical effective cation-exchange capacity ranging of 45 to 70 milliequivalents per 100 grams of soil.

Based on our explorations, the soils identified as "native" soils in our exploration logs are generally similar to those described in the geologic and soil mapping.

SUBSURFACE CONDITIONS

Subsurface conditions interpreted from the explorations advanced at the site as part of our current study, in conjunction with soil properties inferred from field and laboratory tests, formed the basis for the conclusions and recommendations in this report. The locations and depths of our explorations were selected considering the site features, under the constraints of surface access, time, and budget.

We explored subsurface soil and groundwater conditions at the site on 5 and 6 June 2024 by drilling two borings (designated RGB-1 and RGB-2) to depths of approximately 30 and 76 feet bgs using the mud-rotary drilling method. The borings were located southwest and southeast of the school structure at the locations shown on Figure 2. Additionally, we performed two MASW geophysical tests to estimate the shear wave velocity profile of soils within the upper 100 feet bgs, at locations shown on Figure 2. Our field exploration procedures and exploration logs are in Appendix A. Laboratory soil testing procedures and results are in Appendix B. The report of MASW findings is presented in Appendix C.

The explorations indicate the site is blanketed by approximately 3 feet of fill consisting of a thin layer of topsoil overlying sandy silt, silty sand, and silty gravel with sand. In the western portion of this site near RGB-2, the fill is underlain by an approximately 7-foot-thick layer of residual soil consisting of soft, moist elastic silt with sand, underneath which lies a weathered sandstone unit. In the eastern portion of the site near RGB-1, the fill is underlain by a thick zone of alluvium that extends to a depth of about 60 feet bgs. This alluvium is composed of very soft to stiff sandy silt, lean clay with sand, organic silt, organic silt with sand, and sandy elastic silt as well as layers of very loose silty sand and silty sand with gravel. An approximately 3-foot-thick layer of stiff peat soils was encountered beginning at a depth of 45 feet bgs.

Weathered sandstone underlies the alluvium beginning at a depth of 60 feet bgs in this eastern area of the site. In general, the weathered sandstone contact dips across the site from west to east towards the Wishkah River.

Groundwater was not encountered within the upper 5 feet bgs in borings RGB-1 and RGB-2 before mud rotary drilling was initiated, obscuring the location of the water table. The nearby Wishkah River is tidally influenced and generally features a water surface elevation several feet above sea level. For our engineering analyses, we conservatively assumed groundwater to be present at a depth of 3 feet bgs.

Seismic Basis of Design

SEISMIC SETTING

The site is in a seismically active area. In this section, we describe the seismic setting, identify the seismic basis of design, provide code-based design values, and discuss the seismic hazards at the site. Geologic hazards mapped near the project site are all related to seismicity and include tsunami inundation, very strong earthquake shaking, and a moderate to high liquefaction hazard (Washington Department of Natural Resources [WADNR], 2024.

Regional Seismicity

Western Washington sits at the contact between two large crustal tectonic plates. The Juan de Fuca Plate forms the floor of the Pacific Ocean off the coast of the northwestern United States and moves northeastward from its spreading ridge boundary with the Pacific Plate at an average rate of approximately 1.5 inches per year. As it converges with the continental North American Plate, the Juan de Fuca Plate dips below (or "subducts") beneath the North American Plate forming a shallow, eastward-dipping contact interface. This boundary is known as the Cascadia Subduction Zone (CSZ) and is responsible for the seismicity in the western Washington regions, producing earthquakes associated with three types of source zones: subduction interface, subduction intraslab, and crustal. The CSZ is located offshore approximately 102 miles west of the site.

Subduction Interface Sources. The displacement caused by the subduction of the Juan de Fuca Plate below the North American Plate does not generally manifest as slip between the two plates; rather, it is absorbed by compression of the North American Plate at the interface at relatively shallow depths. This compression, based on geologic and historical evidence, is released every 300 to 600 years, on average, in the form of magnitude 8 to 9 or larger earthquakes, the last such event occurring in 1700. Characteristics of this type of earthquake may include very large ground accelerations, shaking durations in excess of 2 minutes, and particularly strong long-period ground motions that may affect tall or long-period structures.

Subduction Intraslab Sources. A deeper zone of seismicity is associated with a steeper bending of the Juan de Fuca Plate and the breaking of the plate under its own weight below the Pacific Northwest region. This region, termed the Benioff Zone, produces intraslab earthquakes at depths of 40 to 70 kilometers. Such past events in western Washington include the 1949 Puget Sound, 1965 Olympia,

and 2001 Nisqually earthquakes. Deep, intraslab earthquakes tend to be felt over larger areas than shallower crustal events, and generally lack significant aftershocks.

Crustal Sources. Shallow crustal faults are caused by cracking of the continental crust, resulting from the stress that builds as the subduction zone plates remain locked together. Many small crustal faults are mapped near the site that are a part of the greater Cascadia Fold and Thrust Belt (U.S. Geologic Survey [USGS], 2024). However, due to the size of these faults, their contribution to the site seismic hazard is relatively small. The closest mapped fault is a strand of the Cascadia Fold and Fault Belt located more than 12 miles to the west of the site.

SEISMIC BASIS OF DESIGN AND ANALYSIS METHODOLOGY

Preliminary site-specific seismic hazard analysis was conducted for the project site following the guidelines in ASCE 41-17 Section 2.4.1 *General Procedure for Hazard Caused by Ground Shaking*. The seismic hazard levels evaluated per this approach are as follows.

- **BSE-1E:** Basic Safety Earthquake-1 for use with the Basic Performance Objective for Existing Buildings, taken as a seismic hazard with a 20 percent probability of exceedance in 50 years (225-year return period), but not greater than the BSE-1N, at a site. This seismic design level corresponds to a design earthquake magnitude of 7.6 and design peak ground acceleration (PGA_M) of 0.33g.
- **BSE-1N:** Basic Safety Earthquake-1 for use with the Basic Performance Objective Equivalent to New Building Standards taken as two-thirds of the BSE-2N at a site.
- **BSE-2E:** Basic Safety Earthquake-2 for use with the Basic Performance Objective for Existing Buildings, taken as a seismic hazard with a 5 percent probability of exceedance in 50 years (975-year return period), but not greater than the BSE-2N, at a site. This seismic design level corresponds to a design earthquake magnitude of 8.4 and design PGA_M of 0.72g.
- **BSE-2N:** Basic Safety Earthquake-2 for use with the Basic Performance Objective Equivalent to New Building Standards, taken as the ground shaking based on the Risk-Targeted Maximum Considered Earthquake per ASCE 7 at a site. This seismic design level corresponds to a design earthquake magnitude of 8.6 and design PGA_M of 1.10g.

The BSE-2N hazard level is analogous to the maximum considered earthquake hazard level in ASCE 7-16 (with a 2 percent probability of exceedance in 50 years or a 2,475-year return period), and the BSE-1N hazard level is consistent with a design-level event in ASCE 7-16.

Seismic Site Class

Thick sequences of unconsolidated, soft sediments typically amplify the shaking of long-period ground motions, such as those associated with subduction zone earthquakes, whereas areas underlain by shallow soil profiles are not likely to amplify seismic waves.

The "Site Class" is a designation used by ASCE 7-16, as referenced by ASCE 41-17, to quantify ground motion amplification. The classification is based on the stiffness in the upper 100 feet (roughly 30 meters) of soil and bedrock materials at a site.

Site class determination was based on two MASW geophysical tests performed to the west and south of the school structure. The tests resulted in weighted-average shear wave velocity values of 894 to 1,088 feet per second for a 100-foot-deep profile. These shear wave velocities put the site within the limits of Site Class D, as defined in ASCE 7-16, as referenced by ASCE 41-17. An evaluation of blow counts at boring RGB-1 suggests that Site Class E could be applicable in the eastern portions of the site where the depth to bedrock is greater. However, due to liquefaction hazard at this project site (discussed in the following section), the site is classified as Site Class F.

Per ASCE 41-17, a Site Class F designation requires a site-specific analysis including a seismic hazard analysis and a site response analysis; however, buildings with structural periods of less than 0.5 seconds may be designed using seismic parameters developed considering Site Class D conditions.

Preliminary Spectral Design Parameters

Acceleration response spectra for use in preliminary design have been developed following the procedures in ASCE 41-17 Section 2.4.1 *General Procedure for Hazard Caused by Ground Shaking*. These values are presented in Table 1.

Table 1. General Procedure Spectral Design Parameters

Design Parameters	Hazard Level			
	BSE-2N	BSE-1N	BSE-2E	BSE-1E
Site Class	D			
S_s	1.52	-	1.10	0.42
F_a (Site Class E)[1]	1.00	-	1.06	1.47
S_{xs}	1.52	1.01	1.16	0.61
S_1	0.69	-	0.46	0.13
F_v (Site Class E)[1]	1.70	-	1.84	2.35
S_{x1}	1.18	0.78	0.85	0.30
T_L	16 s	16 s	16 s	16 s

Notes:

1) *F_a and F_V are the ASCE 7-16 Chapter 21 site factors for Site Class D.*
2) *Site coordinates are Latitude/Longitude 46.986622°N / 123.812621°W.*
3) *Values presented in this table are for Site Class D conditions. This site falls under Site Class F categorization; however, these values are provided assuming that the structures have a fundamental period of less than 0.5 seconds, in which case Site Class D may be used for design.*
4) *s = seconds*

LIQUEFACTION

General

When cyclic loading occurs during an earthquake, the shaking can increase the pore pressure in loose to medium dense saturated sand and cause liquefaction. The rapid increase in pore water pressure reduces the effective normal stress between soil particles, resulting in the sudden loss of shear strength in the soil. Granular soils, which rely on interparticle friction for strength, are susceptible to liquefaction until the excess pore pressures can dissipate. Sand boils and flows observed at the ground surface after an earthquake are the result of excess pore pressures dissipating upward, carrying soil particles with the draining water. In general, loose, saturated sand soils with low silt and clay contents are the most susceptible to liquefaction. Silty soils with low plasticity are moderately susceptible to liquefaction under relatively higher levels of ground shaking. For any soil type, the soil must be saturated for liquefaction to occur.

We performed liquefaction potential analysis on soils logged at the site using the procedures outlined in Idriss and Boulanger (2008) and updated Magnitude Scaling Factor as outlined in Boulanger and Idriss (2014).

We note the term liquefaction is defined very specifically by the simplified method that we used to evaluate the liquefaction hazard. Liquefaction is defined as when a soil under repeated cyclic loading exhibits the generation of increasing excess pore pressures until the pore pressure equals the total overburden stress. When this condition is reached, the normal stress acting between adjacent soil particles is effectively lost, and the soil, which derives its shear strength from interparticle friction, can lose much of its available shear strength. However, it is well documented that not all soils exhibit the same behavior after the initiation of liquefaction.

Loose sandy soils that achieve the condition of liquefaction during earthquake shaking can subsequently collapse and exhibit large shear strains under continued cyclic or static loading. This type of behavior is a well-documented result of numerous earthquakes, where structures underlain by shallow, liquefiable hydraulically placed fills have been observed to experience bearing capacity failures and collapse. Conversely, medium dense to dense sandy soils that achieve the condition of liquefaction will typically not collapse and can exhibit strain hardening behavior due to dilation effects. Therefore, despite the soil achieving the condition of liquefaction, there is little to no shear strength loss and only moderate shear strains under continued cyclic and static loading. This condition is termed “cyclic mobility.”

Analysis

In accordance with ASCE 7-16, as referenced by ASCE 41-17, we completed the liquefaction hazard analysis using the site-class-adjusted acceleration coefficient PGA_M for Site Class D. We performed our liquefaction analysis for three different hazard levels, including events with 225-year (corresponding to BSE-1E), 975-year (corresponding to BSE-2E), and 2475-year (corresponding to BSE-2N) return periods. We performed liquefaction analysis using PGA_M values of 0.33g and 0.72g and associated earthquake magnitudes of 7.6 and 8.4 for BSE-1E and BSE-2E, respectively. We used a PGA_M of 1.10g and associated

earthquake magnitude of 8.6 in our analysis for the BSE-2N event. We assumed a design groundwater depth at the ground surface for our liquefaction analyses.

Analyses show that liquefaction is most likely to occur within the silty sand layer between about 20 and 40 feet bgs at boring RGB-1, and within the silty sand and elastic silt with sand layers in the upper approximately 15 feet bgs at boring RGB-2. Several very soft to soft layers of organic silt and elastic silt are present within these borings; however, plasticity index testing on some of these layers generally indicated that most of these materials will resist liquefaction.

Our analyses conclude that potential for liquefaction to occur at the site for all seismic hazard levels is high, due to the relatively shallow groundwater table and subsurface profile featuring thick deposits feet of loose sands.

Settlement

Post-liquefaction settlement results from densification of liquefiable sandy soils following an earthquake. The permanent ground surface settlement is not typically uniform across the area and can result in significant differential settlement. Differential settlement will have the most significant effect on structures supported by shallow foundations. Based on our analysis, we estimate settlements on the order of 3 to 9 inches due to liquefaction could occur throughout the site, with more severe liquefaction expected to occur with proximity to the Wishkah River to the east of the school building. Differential settlements can preliminarily be assumed as one-half of the total settlements occurring over a lateral distance of 50 feet.

The existing structure is supported on piles that bear on bedrock; therefore, liquefaction-induced settlement is not expected to significantly impact the performance of the foundations. Settlement may induce downdrag on the piles, possibly affecting their structural performance, which should be evaluated by the project structural engineer.

Seismic Strength Loss

We anticipate considerable reductions in the strength of the liquefiable layers of the site soil profile. The shear strength loss was determined by using the recommendations of Idriss and Boulanger (2008) and Bray and Sancio (2006). Simplistically, the liquefied shear strength directly correlates to the soil's pre-liquefied relative density. The relative density is estimated based on the SPT blow counts. The higher the relative density, the higher the liquefied shear strength. The typical residual strength of liquefiable soils at the site is expected to be less than 20 percent of the static strength (e.g., 80 percent or more strength loss).

Additionally, some strength loss due to cyclic shear stresses is expected to occur in the fine-grained elastic silt and organic silt soils overlying bedrock. Full cyclic softening and development of lowered residual strengths within these materials are likely to occur. Supplemental exploration including performance of cyclic direct simple shear testing would be required to accurately estimate residual strength ratios for these soils.

The pile foundation system at the site is reportedly driven into weathered sandstone bedrock, limiting the probability and severity of bearing shear failure. However, because the piles are expected to be timber, they may need to evaluated to verify that their structural capacity is sufficient to withstand downdrag induced by soils which settle due to liquefaction.

Surface Effects

We evaluated the potential for liquefaction-related surface manifestations (such as sand boils) to occur using the procedures presented by Ishihara (1985). The Ishihara (1985) procedure compares the thickness of a given liquefiable soil layer to the thickness of the overlying non-liquefiable soil mantle to determine if surface manifestations are possible at a given peak ground acceleration. This approach has several limitations and may overestimate potential for surface manifestations to occur in silty sands and sandy silts, as the relatively low permeability of these materials has potential to prevent pore water from flowing quickly enough to produce sand boils (Kramer, 1996). The Ishihara (1985) analyses indicate that there is potential for surface manifestations to occur locally throughout the site. The potential for surface manifestations appears high near RGB-2 and marginal near RGB-1. Based on these findings, we assume that potential for surface manifestations will be variable across the site.

We preliminarily conclude that the probability of direct surface effects of liquefaction is high, due to subsurface conditions at our two borings.

LATERAL SPREADING

Lateral spreading occurs when large blocks of ground are displaced down gentle slopes or toward the free face of river channels, ditches, etc. as a result of earthquake-induced inertial forces acting on the soil mass. Initiation of lateral spreading is often made worse when the soils within and beneath the soil mass liquefy or soften as a result of the shaking. Lateral spreading deformations can be experienced relatively far from a free face. Similar to lateral spread, flow failures result when large volumes of soil near the free face of river channels or lake bottoms displace vertically and laterally during or after earthquakes. As the ground begins to shake and the shearing resistance of liquefied soils decreases, ground displacement occurs in response to mainly static shear forces present within the soil mass and, to a lesser extent, earthquake-induced inertial forces. Flow failures typically manifest larger deformations than lateral spreading; however, the extent of the deformations is typically localized to the area behind the free face of the channel. Both lateral spreading and flow failures can be destructive and pose a significant risk to structures.

We performed lateral spread analyses using the commercial code Slide2 by RocScience to evaluate the stability of the site once liquefaction-susceptible layers had liquefied, using a generalized subsurface soil profile extrapolating site conditions outwards to the nearby Wishkah River. The Slide program performs two-dimensional limit equilibrium analysis to analyze slope stability and to determine a factor of safety against global failure.

Our preliminary analyses indicate that the site and surrounding area are susceptible to lateral spread toward the river under post-seismic liquefied conditions, as well as under all considered seismic events.

FAULT SURFACE RUPTURE

We used the USGS U.S. Quaternary faults web application (USGS, 2024) to identify earthquake-producing faults near the project site. No mapped earthquake-producing crustal faults are present at the site. Based on known fault locations, we consider the potential for fault rupture to occur at the site to be low unless occurring on an unmapped or otherwise unknown fault.

TSUNAMI HAZARD

The tsunami hazard at the site is mapped in the *Tsunami Hazard Maps of Southwest Washington - Model Results from a ~2,500-Year Cascadia Subduction Zone Earthquake Scenario* by the WADNR (Eungard et al., 2018). Based on this reference, the school building is not located within an area expected to be inundated from a CSZ-induced tsunami, though mapping indicates that the shoreline along the Wishkah River may become inundated.

The ASCE Tsunami Hazard Tool (https://asce7tsunami.online/) maps probabilistic inundation hazards for all potential tsunami sources, not just a CSZ-related event, and indicates the school site is not within a tsunami inundation zone; however, the Wishkah River is modeled as rising to nearly Elevation 11 (North American Vertical Datum 88) under this scenario, just east of the school site (ASCE, 2022).

Based on the findings presented by WADNR and ASCE, we consider the potential for tsunami inundation to occur at the site to be low.

Corrosivity

One soil sample was collected and tested for corrosivity characteristics by CERCO of Concord, California. The tested sample consisted of near-surface soils and was tested for resistivity, redox potential, sulfate and chloride ion concentrations, and pH. The test results indicate that near-surface soils should be considered mildly corrosive to buried iron and steel improvements based on laboratory resistivity measurements. Chloride ion concentrations were not detected and insufficient to attack steel embedded in concrete mortar coating. Sulfate ion concentration results were not detected and insufficient to be detrimental to reinforced concrete. The pH level was measured as about 5.8 and is considered a corrosion concern for buried iron, steel, mortar-coated steel, and reinforced concrete structures.

The results of our corrosion testing and a copy of CERCO's brief evaluation are presented in Appendix B.

Conclusions

Based on our explorations, testing, and analyses, we have formulated preliminary conclusions in this report for use in assessment of the seismic retrofit project's viability. We offer the following general summary.

- The site subsurface profile generally consists of a thin layer of surficial fill overlying deposits of liquefaction-susceptible alluvium and residual soil that increase in thickness from approximately 10 feet on the west side of the school to 60 feet on the east side. They are expected to continue increasing in thickness towards the Wishkah River to the east of the site. These materials are underlain by non-liquefiable weathered sandstone that serves as a bearing layer for the existing building's timber pile foundations.
- There is a high potential for lateral spreading to occur within the building footprint, with soil movement occurring in the direction towards the Wishkah River. Lateral displacements on the order of tens of feet are estimated for preliminary planning.
- Due to the presence of liquefaction and lateral spread hazards, there is a likelihood for excessive vertical and/or lateral movements underneath the building footprint, affecting existing building foundations. Existing timber pile foundations are reportedly driven into the weathered sandstone layer, which limits potential for excessive seismic vertical settlements or compressive capacity failures to occur, though piles should be evaluated for structural capacity under the effects of downdrag loading. However, ground displacements due to lateral spreading are expected to be large and the existing pile foundations are unlikely to be capable of accommodating or resisting such movements.
- Conceptually, we conclude that ground improvement will be necessary to mitigate lateral spread hazard and improve seismic performance of the existing school. Ground improvement will need to extend to significant depth to cut off spreading, necessitating methods such as deep soil mixing. Preliminarily, we estimate that deep soil mix ground improvement would need to improve a 60-foot-deep zone of soils across a footprint area of 60 feet by 250 feet, spanning an area between the school and the Wishkah River to the east.
- Final design of geotechnical elements may require additional site characterization to verify subsurface conditions around the school building.

Closing

Thank you for the opportunity to perform these services for you. Please do not hesitate to contact us if you have any questions or comments.

Sincerely yours,
HALEY & ALDRICH, INC.



Daniel J. Trisler, P.E.
Principal Geotechnical Engineer

Micah D. Hintz, P.E.
Geotechnical Engineer

Attachments:

Figure 1: Project Locus
Figure 2: Site and Exploration Plan

Appendix A – Exploration Logs
Appendix B – Laboratory Test Results
Appendix C – MASW Report
Appendix D – Historical Plans

https://haleyaldrich.sharepoint.com/sites/AberdeenSchoolDistrictNo.5/Shared Documents/0210747.Aberdeen SD Robert Gray ES/Deliverables/Prelim Findings Report/Final/2024_0918_HAI_0210747-000_RobertGray_Prelim_Findings_F.docx

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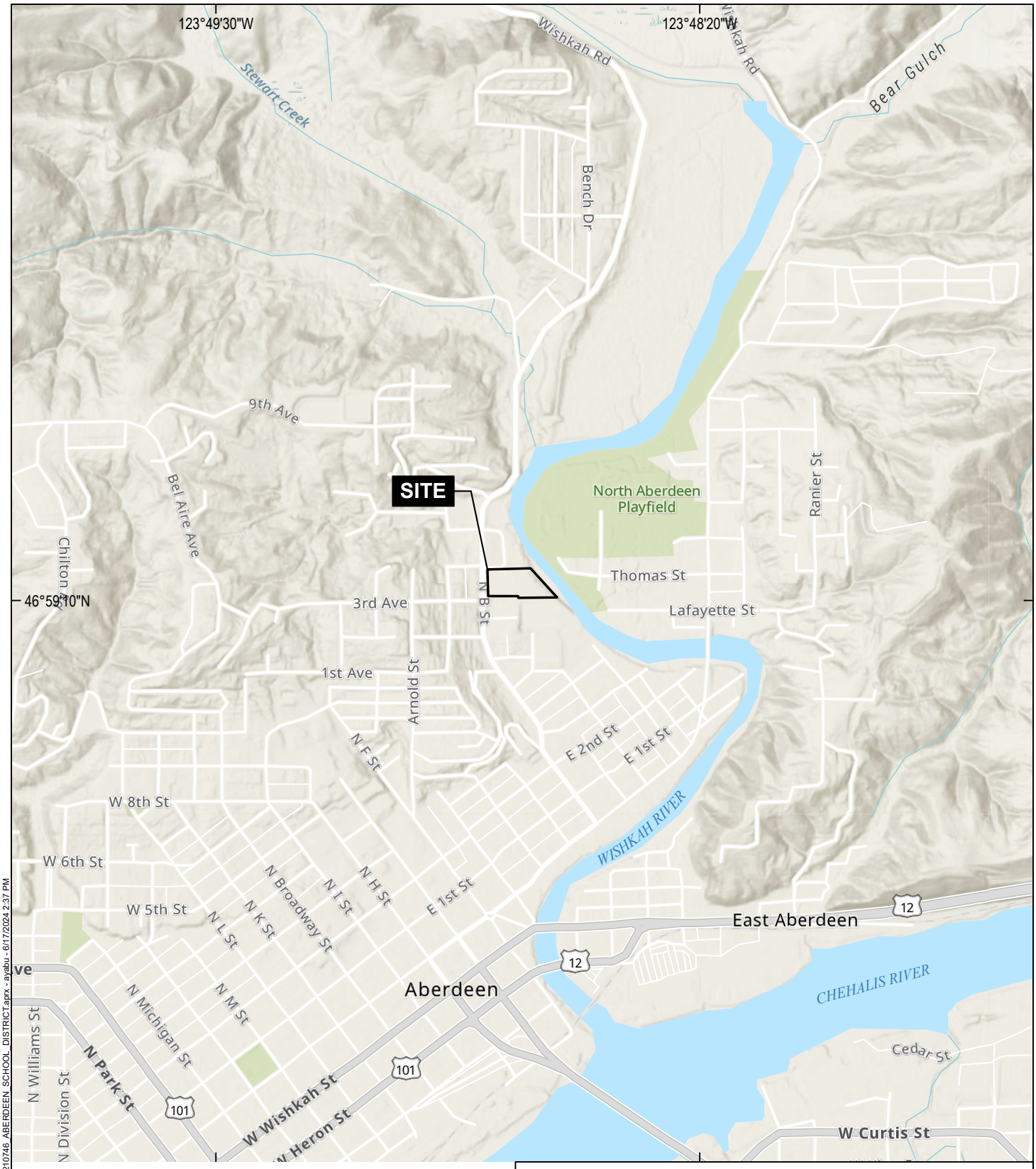
FIGURES



MAP SOURCE: ESRI
SITE COORDINATES: 46°59'12"N, 123°48'47"W

HALEY ALDRICH

ROBERT GRAY ELEMENTARY SCHOOL
SEISMIC SAFETY RETROFIT
ABERDEEN, WASHINGTON

PROJECT LOCUS

APPROXIMATE SCALE: 1 IN = 2000 FT
JUNE 2024

FIGURE 1

GIS: \\haleyaldrich\share\CF\Projects\021046\GIS\210746_ABERDEEN_SCHOOL_DISTRICT.aprx - ayabu - 6/17/2024 2:37 PM



LEGEND

MUD ROTARY BORING

SITE BOUNDARY

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. AERIAL IMAGERY SOURCE: NEARMAP, 14 AUGUST 2023

N

0 70 140

SCALE IN FEET

HALEY ALDRICH

ROBERT GRAY ELEMENTARY SCHOOL
SEISMIC SAFETY RETROFIT
ABERDEEN, WASHINGTON

SITE AND EXPLORATION PLAN

JUNE 2024

FIGURE 2

GIS FILE PATH: \\haleyaldrich\share\CF\Projects\0210746\GIS\210746_ABERDEEN_SCHOOL_DISTRICT.aprx - USER: ayabu - LAST SAVED: 6/18/2024 10:10 AM

APPENDIX A
Exploration Logs

APPENDIX A

Exploration Logs

Haley & Aldrich, Inc. (Haley & Aldrich) evaluated subsurface conditions at the site by completing two drilled borings on 6 and 7 June 2024. The field explorations were coordinated and overseen by geotechnical staff from Haley & Aldrich, who classified the various soil units encountered, obtained representative soil samples for geotechnical testing, and maintained a detailed log of the boring. Exploration logs are included in this appendix. Figure 2 of the report shows the approximate locations of the explorations. Explorations were located in the field using landmarks on site. Results of the laboratory testing are indicated on the exploration logs and are included in Appendix B.

The borings were advanced using mud rotary methods using a track-mounted GeoProbe 7822DT drill rig operated by Western States Soil Conservation, Inc., of Hubbard, Oregon. The boring created a hole approximately 5 inches in diameter.

Materials encountered in the explorations were classified in the field in general accordance with ASTM International (ASTM) Standard Practice D 2488 “Standard Practice for the Classification of Soils (Visual-Manual Procedure).” The exploration logs in this appendix show our interpretation of the exploration, sampling, and testing data. The logs indicate the depth where the soils change. Note that the change may be gradual. In the field, we classified the samples taken from the explorations according to the methods presented on the *Figure A-1, Key to Exploration Logs*. This figure also provides a legend explaining the symbols and abbreviations used in the logs.

Sampling of soils was completed at regular intervals throughout the depth of each boring. The samples were collected with a Standard Penetration Test sampler used in general conformance with ASTM Test Method D 1586 “Standard Method for Penetration Test and Split-Barrel Sampling of Soils.” The sampler was driven by a 140-pound auto-trip hammer falling 30 inches. The *N* value, or number of blows required to drive the sampler 1 foot, or as otherwise indicated into the soils, is shown adjacent to the sample symbols on the boring logs. Disturbed samples were obtained from the SPT sampler. A piston sampler was used to collect relatively undisturbed Shelby tube samples. Samples were used for classification and laboratory testing purposes.

Sample Description

Identification of soils in this report is based on visual field and laboratory observations which include density/consistency, moisture condition, grain size, and plasticity estimates and should not be construed to imply field nor laboratory testing unless presented herein. ASTM D 2488 visual-manual identification methods were used as a guide. Where laboratory testing confirmed visual-manual identifications, then ASTM D 2487 was used to classify the soils.

Relative Density/Consistency

Soil density/consistency in borings is related primarily to the standard penetration resistance (N). Soil density/consistency in test pits and probes is estimated based on visual observation and is presented parenthetically on the logs.

SAND or GRAVEL Relative Density	N (Blows/Foot)	SILT or CLAY Consistency	N (Blows/Foot)
Very loose	0 to 4	Very soft	0 to 1
Loose	5 to 10	Soft	2 to 4
Medium dense	11 to 30	Medium stiff	5 to 8
Dense	31 to 50	Stiff	9 to 15
Very dense	>50	Very stiff	16 to 30
		Hard	>30

Moisture

Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

USCS Soil Classification Chart (ASTM D 2487)

Major Divisions			Symbols: Graph	Symbols: USCS	Typical Descriptions
Coarse Grained Soils — More than 50% of Material Retained on No. 200 Sieve	Gravel and Gravelly Soils — More than 50% of Coarse Fraction Retained on No. 4 Sieve	Clean Gravels (<5% fines)		GW	Well-Graded Gravel; Well-Graded Gravel with Sand
				GP	Poorly Graded Gravel; Poorly Graded Gravel with Sand
		Gravels (5-12% fines)		GW-GM	Well-Graded Gravel with Silt; Well-Graded Gravel with Silt and Sand
				GW-GC	Well-Graded Gravel with Clay; Well-Graded Gravel with Clay and Sand
				GP-GM	Poorly Graded Gravel with Silt; Poorly Graded Gravel with Silt and Sand
				GP-GC	Poorly Graded Gravel with Clay; Poorly Graded Gravel with Clay and Sand
		Gravels with Fines (>12% fines)		GM	Silty Gravel; Silty Gravel with Sand
				GC	Clayey Gravel; Clayey Gravel with Sand
	Sand and Sandy Soils — More than 50% of Coarse Fraction Passing No. 4 Sieve	Sands with few Fines (<5% fines)		SW	Well-Graded Sand; Well-Graded Sand with Gravel
				SP	Poorly Graded Sand; Poorly Graded Sand with Gravel
		Sands (5-12% fines)		SW-SM	Well-Graded Sand with Silt Well-Graded Sand with Silt and Gravel
				SW-SC	Well-Graded Sand with Clay; Well-Graded Sand with Clay and Gravel
				SP-SM	Poorly Graded Sand with Silt; Poorly Graded Sand with Silt and Gravel
				SP-SC	Poorly Graded Sand with Clay; Poorly Graded Sand with Clay and Gravel
		Sands with Fines (>12% fines)		SM	Silty Sand; Silty Sand with Gravel
				SC	Clayey Sand; Clayey Sand with Gravel
Fine Grained Soils — More than 50% of Material Passing No. 200 Sieve	Silts			ML	Silt; Silt with Sand or Gravel; Sandy or Gravelly Silt
				MH	Elastic Silt; Elastic Silt with Sand or Gravel; Sandy or Gravelly Elastic Silt
	Silty Clay (based on Atterberg Limits)			CL-ML	Silty Clay; Silty Clay with Sand or Gravel; Gravelly or Sandy Silty Clay
	Clays			CL	Lean Clay; Lean Clay with Sand or Gravel; Sandy or Gravelly Lean Clay
				CH	Fat Clay; Fat Clay with Sand or Gravel; Sandy or Gravelly Fat Clay
	Organics			OL/OH	Organic Soil; Organic Soil with Sand or Gravel; Sandy or Gravelly Organic Soil
Highly Organic (>50% organic material)				PT	Peat - Decomposing Vegetation - Fibrous to Amorphous Texture

Minor Constituents

	Estimated Percentage
Sand, Gravel	
Trace	<5
Few	5 - 15
Cobbles, Boulders	
Trace	<5
Few	5 - 10
Little	15 - 25
Some	30 - 45

Soil Test Symbols

%F	Percent Passing No. 200 Sieve
AL	Atterberg Limits (%)
	Liquid Limit (LL)
	Water Content (WC)
	Plastic Limit (PL)
CA	Chemical Analysis
CAUC	Consolidated Anisotropic Undrained Compression
CAUE	Consolidated Anisotropic Undrained Extension
CBR	California Bearing Ratio
CIDC	Consolidated Drained Isotropic Triaxial Compression
CIUC	Consolidated Isotropic Undrained Compression
CK0DC	Consolidated Drained k0 Triaxial Compression
CK0DSS	Consolidated k0 Undrained Direct Simple Shear
CK0UC	Consolidated k0 Undrained Compression
CK0UE	Consolidated k0 Undrained Extension
CRSCN	Constant Rate of Strain Consolidation
DS	Direct Shear
DSS	Direct Simple Shear
DT	In Situ Density
GS	Grain Size Classification
HYD	Hydrometer
ILCN	Incremental Load Consolidation
K0CN	k0 Consolidation
kc	Constant Head Permeability
kf	Falling Head Permeability
MD	Moisture Density Relationship
OC	Organic Content
OT	Tests by Others
P	Pressuremeter
PID	Photoionization Detector Reading
PP	Pocket Penetrometer
SG	Specific Gravity
TRS	Torsional Ring Shear
TV	Torvane
UC	Unconfined Compression
UUC	Unconsolidated Undrained Triaxial Compression
VS	Vane Shear
WC	Water Content (%)

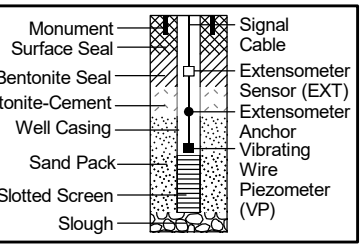
Groundwater Indicators

- Groundwater Level on Date or At Time of Drilling (ATD)
- Groundwater Level on Date Measured in Piezometer
- Groundwater Seepage (Test Pits)

Sample Symbols

- 1.5" I.D. Split Spoon
- 3.0" I.D. Split Spoon
- Modified California Sampler
- Rock Core Run
- Sonic Core
- Thin-walled Sampler
- Grab
- Cuttings
- Push Probe

Well Symbols



HA KEY TO EXP LOGS (SOIL ONLY) - I:\HALEYALDRICH.COM\SHARES\EA_DATA\GINT\HC_LIBRARY\GLB - 8/31/24 13:41 - I:\HALEYALDRICH.COM\SHARES\PROJECTS\0210\365\000_ABERDEEN SCHOOL DISTRICT-HARBOR LEARNING CENTER_GINT FILE\02 10365-000_ABERDEEN SCHOOL DISTRICT-HARBOR LEARNING CENTER_GINT.GPJ - kfuller

HALEY ALDRICH

Project: Aberdeen School District - Robert Gray Elementary
Location: Aberdeen, Washington
Project No.: 0210747-000

Key to Exploration Logs

Figure **A-1**
Sheet **1 of 1**

Date Started: 06/05/2024	Date Completed: 06/06/2024	Drilling Contractor/Crew: Western States Soil Conservation, Inc. / Ty/Juan	
Logged by: D. Knapp	Checked by: M. Hintz	Drilling Method: Mud Rotary	
Location: Lat: 46.986332 Long: -123.812891 (WGS 84)		Rig Model/Type: GeoProbe® 7822DT / Track-mounted drill rig	
Ground Surface Elevation: 26.20 feet (NAVD 88)		Hammer Type: Auto-hammer	
Comments: Hand augered to 5 ft bgs.		Hammer Weight (pounds): 140	Hammer Drop Height (inches): 30
		Measured Hammer Efficiency (%): Not Available	
		Hole Diameter: 4.875 inches	Well Casing Diameter: NA
		Total Depth: 76.5 feet	Depth to Groundwater: Not Identified

Elevation (feet)	Depth (feet)	Sample Data: Blow Count	Type	Recovery	Length (inches)	Number / Tests	Graphic Log	Material Description	PL WC (%) LL / Fines Content (%) / SPT N Value (10 20 30 40)	Depth (feet)
25	0					G-1 G-2		Topsoil (6-inches thick). SANDY SILT (ML), trace fine to coarse angular gravel, soft, moist, brown, fine to medium sand, numerous organics (rootlets). [FILL]		0
						G-3		SILTY GRAVEL WITH SAND (GM), medium dense, moist, dark brown, fine to coarse angular sand and gravel.		
						G-4		filter fabric at 2 ft		
20	5	1 0 2		6in.	18	G-5 WC S-6a S-6b		SANDY SILT (ML), soft, moist, brown-gray mottled, fine to medium sand. [ALLUVIUM]	▲ 2	5
								LEAN CLAY WITH SAND (CL), soft, moist, gray-blue to gray, fine to medium sand, micaceous, scattered wood debris.		
		0 1 0		18in.	18	S-7 AL, PP, TV, WC		SANDY SILT (ML), soft, moist, yellow-brown, fine with trace medium sand, low plasticity.	▲ 1 — 59.9	
15	10			24in.	24	U-8		SILTY SAND WITH GRAVEL (SM), very loose, moist, gray, fine to coarse sand, fine rounded gravel, micaceous.		10
								ORGANIC SILT WITH SAND (OH), very soft, moist, dark brown, laminated with frequent partings, organic odor.		
		0 0 0		18in.	18	S-9 S-9a PP, TV, WC S-9b		(PP = 0.5 tsf, TV = 0.1 tsf) (PP = <0.5 tsf, TV = 0.0 tsf)	▲ 0 — 64.5	
10	15	1 1 1		18in.	18	S-10 AL, PP, TV, WC		ORGANIC SILT (OH), trace fine sand and coarse rounded gravel, very soft, moist, gray-green to light brown, layered. grades to soft, blue-gray to yellow-brown, micaceous (PP = 1.0 tsf, TV = 0.65 tsf)	▲ 2	15
5	20	0 1 2		18in.	18	S-11 GS, WC		SILTY SAND (SM), very loose, moist to wet, blue-gray, fine to medium sand, micaceous, scattered to frequent organics.	▲ 3 — ✖ 28 — ●	20
				24in.	24	U-12				
0	25	0 1 0		18in.	24	S-13			▲ 1	25
-5	30	0 2 3		16in.	18	S-14 GS, WC		grades to loose, stratified with frequent layering, occasional organic debris	▲ 5 — ● 35	30
-10	35	0 2 1		18in.	18	S-15a S-15b AL, GS, WC		grades to very loose, wet, frequent layers of brown organic debris (peat) (2- to 3-inches thick).	▲ 3 — ✖ 31 — ● 66.5	35

General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HALEY ALDRICH

Project: Aberdeen School District - Robert Gray Elementary
Location: Aberdeen, Washington
Project No.: 0210747-000

Boring Log
RGB-1

Figure **A-2**
Sheet **1 of 2**

HA BORING LOG - \\HALEYALDRICH.COM\SHARE\SEA_DATA\GINT\HC_LIBRARY.GLB - 9/1/24 11:19 - \\HALEYALDRICH.COM\SHARE\CORPROJECTS\0210747\PERM\GINT FILE\0210747-000_ROBERT GRAY ES_GINT.GPJ - kbutel

Date Started: 06/05/2024	Date Completed: 06/06/2024	Drilling Contractor/Crew: Western States Soil Conservation, Inc. / Ty/Juan	
Logged by: D. Knapp	Checked by: M. Hintz	Drilling Method: Mud Rotary	
Location: Lat: 46.986332 Long: -123.812891 (WGS 84)		Rig Model/Type: GeoProbe® 7822DT / Track-mounted drill rig	
Ground Surface Elevation: 26.20 feet (NAVD 88)		Hammer Type: Auto-hammer	
Comments: Hand augered to 5 ft bgs.		Hammer Weight (pounds): 140	Hammer Drop Height (inches): 30
		Measured Hammer Efficiency (%): Not Available	
		Hole Diameter: 4.875 inches	Well Casing Diameter: NA
		Total Depth: 76.5 feet	Depth to Groundwater: Not Identified

Elevation (feet)	Depth (feet)	Blow Count	Type	Recovery	Length (inches)	Number / Tests	Graphic Log	Material Description	PL WC (%) LL / Fines Content (%) / SPT N Value	Depth (feet)
40	40	1 3 4		18in.	18	S-16 PP, TV		SANDY ELASTIC SILT (MH), medium stiff, moist, light gray, fine micaceous sand, stratified with frequent layers of silt and sand, weathered coarse sand. (PP = 2.75 tsf, TV = 0.45 tsf)	7	40
-15										
45	45	2 5 6		18in.	18	S-17a AL, PP, TV, WC S-17b WC		(PP = 1.0 tsf, TV = 0.2 tsf) PEAT (PT), stiff, wet, brown to dark brown, wood debris.	11 54.7 290.7	45
-20										
50	50	3 4 6		18in.	18	S-18 PP, TV		SANDY ELASTIC SILT (MH), stiff, moist, blue-gray to gray-green, fine to medium sand, trace coarse sand, stratified frequent seams and layers of lean clay and sand, micaceous. (PP = 4.25 tsf, TV = 0.3-0.5 tsf)	10	50
-25										
55	55	3 5 5		18in.	18	S-19 AL, PP, TV, WC		ORGANIC SILT WITH SAND (OH), stiff, moist, brown to olive, fine to medium sand, trace coarse sand, stratified with frequent seams to layers of sand and silt, micaceous, scattered wood and organics debris. (PP = 2.75 tsf, TV = >1.0 tsf)	10	55
-30										
60	60	5 5 7		18in.	18	S-20		SILTY SAND (SM), medium dense, moist, orange, fine to medium sand, stratified with frequent seams to partings of sandy silt, micaceous. [WEATHERED SANDSTONE]	12	60
-35										
65	65	4 5 8		18in.	18	S-21			13	65
-40										
70	70	7 11 13		18in.	18	S-22		grades to trace fine rounded gravel, weakly to moderately cemented	24	70
-45										
75	75	15 27 32		18in.	18	S-23		grades to very dense, moderately cemented	59	75
-50								Bottom of Borehole at 76.5 feet.		

General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HALEY ALDRICH

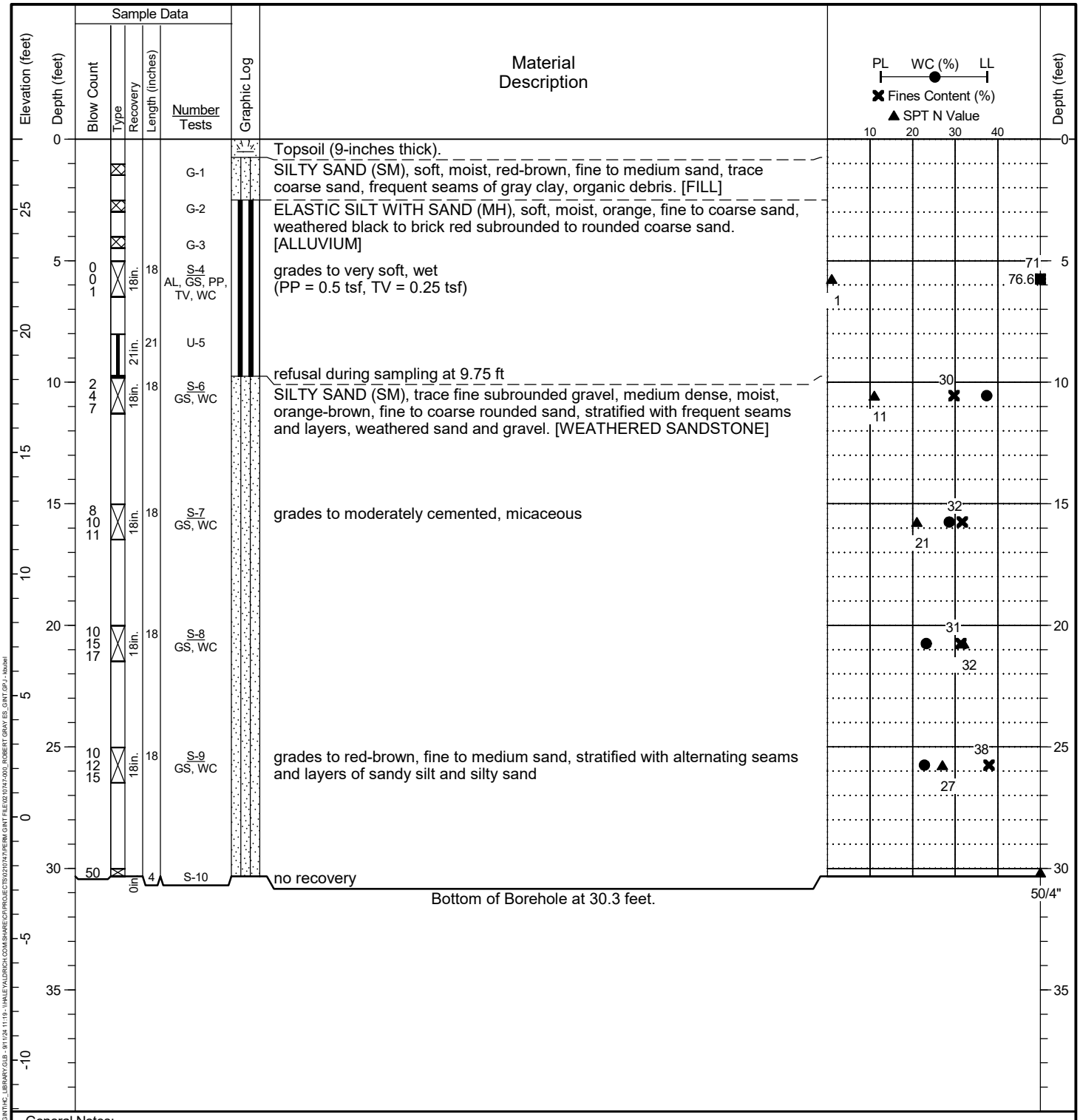
Project: Aberdeen School District - Robert Gray Elementary
Location: Aberdeen, Washington
Project No.: 0210747-000

Boring Log
RGB-1

Figure **A-2**
Sheet **2 of 2**

HA BORING LOG - \\HALEYALDRICH.COM\SHARE\SEA_DATA\GINT\HC_LIBRARY.GLB - 9/1/24 11:19 - \\HALEYALDRICH.COM\SHARE\SEA_DATA\GINT\PROJECTS\0210747\PERM\GINT FILE\0210747-000_ROBERT GRAY ES_GINT.GPJ - kbutler

Date Started: 06/06/2024	Date Completed: 06/06/2024	Drilling Contractor/Crew: Western States Soil Conservation, Inc. / Ty/Juan	
Logged by: D. Knapp	Checked by: M. Hintz	Drilling Method: Mud Rotary	
Location: Lat: 46.986321 Long: -123.813955 (WGS 84)		Rig Model/Type: GeoProbe® 7822DT / Track-mounted drill rig	
Ground Surface Elevation: 27.89 feet (NAVD 88)		Hammer Type: Auto-hammer	
Comments: Hand augered to 5 ft bgs.		Hammer Weight (pounds): 140	Hammer Drop Height (inches): 30
		Measured Hammer Efficiency (%): Not Available	
		Hole Diameter: 4.875 inches	Well Casing Diameter: NA
		Total Depth: 30.3 feet	Depth to Groundwater: Not Identified



General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Material stratum lines are interpretive and actual changes may be gradual. Solid lines indicate distinct contacts and dashed lines indicate gradual or approximate contacts.
3. USCS designations are based on visual-manual identification (ASTM D 2488), unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.
5. Location and ground surface elevations are approximate.

HALEY ALDRICH	Project: Aberdeen School District - Robert Gray Elementary Location: Aberdeen, Washington Project No.: 0210747-000	Boring Log **RGB-2**	Figure **A-3** Sheet **1 of 1**

HA BORING LOG - \\HALEYALDRICH.COM\SHARE\SEA_DATA\GINT\HC_LIBRARY.GLB - 8\1/24 11:19 - \\HALEYALDRICH.COM\SHARE\CORPROJECTS\0210747\PERM\GINT FILE\0210747-000_ROBERT GRAY ES_GINT.GPJ - kbutler

APPENDIX B
Laboratory Test Results

APPENDIX B

Laboratory Testing

Soil samples obtained from the explorations were transported to Haley & Aldrich, Inc.'s laboratory and evaluated to confirm or modify field classifications, as well as to assess engineering properties of the soils encountered. Representative samples were selected for laboratory testing and transported to our geotechnical laboratory in Portland, Oregon. The tests were performed in general accordance with the test methods of ASTM International (ASTM) or other applicable procedures. One sample was submitted to CERCO Analytical, Inc. for corrosivity testing. A summary of the test results is included as Figure B-1.

Visual Classifications

Soil samples obtained from the explorations were visually classified in the field and in our geotechnical laboratory based on the Unified Soil Classification System and ASTM classification methods. ASTM Test Method D 2488 was used to classify soils using visual and manual methods. ASTM Test Method D 2487 was used to classify soils based on laboratory test results.

Laboratory Test Results

MOISTURE CONTENT

Moisture contents of samples were obtained in general accordance with ASTM Test Method D 2216. The results of the moisture content tests completed on samples from the explorations are presented on the exploration logs included in Appendix A and on Figure B-1 in this appendix.

ATTERBERG LIMITS TESTING

Atterberg limits (liquid limit, plastic limit, and plasticity index) of fine-grained soil samples were obtained in general accordance with ASTM Test Method D 4318. The results of the Atterberg Limits tests are presented on the exploration logs included in Appendix A, summarized on Figure B-1 in this appendix, and shown in detail on Figure B-2 in this appendix.

PARTICLE SIZE DISTRIBUTION

Sieve analysis tests were performed to determine the quantitative distribution of particle sizes in the sample. The tests were performed in general accordance with ASTM Test Method D 6913. The "percent fines" portions of the test results are indicated on the appropriate exploration logs included in Appendix A and on Figure B-1 in this appendix. The full test results are shown on Figure B-3 in this appendix.

CONSOLIDATION ANALYSIS

Controlled rate of strain consolidation testing was performed on one undisturbed sample to determine the compressibility characteristics of near-surface soils at the site. The tests were performed in general accordance with ASTM Test Method D 4186. The test results plotted in terms of axial strain versus load (effective normal stress) are presented on Figure B-4.

CORROSIVITY TESTING

One corrosivity test suite was performed on a sample collected from boring RGB-2. The test suites included testing for pH, redox, chloride, sulfate, and electrical resistivity. The results of the test are presented on the final sheet of this appendix.

Exploration	Sample ID	Depth	Gravel (%)	Sand (%)	Fines (%)	Liquid Limit	Plastic Limit	Water Content (%)	USCS Group Symbol	Soil Description
RGB-1	G-1	0.5								
RGB-1	G-2	1.0								
RGB-1	G-3	2.0								
RGB-1	G-4	3.5								
RGB-1	G-5	4.5						35		
RGB-1	S-6a	5.0								
RGB-1	S-6b	5.3								
RGB-1	S-7	7.5				65	35	60	OH	ORGANIC SILT WITH SAND
RGB-1	U-8	10.0								
RGB-1	S-9	12.0								
RGB-1	S-9a	12.0						64		
RGB-1	S-9b	12.8								
RGB-1	S-10	15.0				57	32	40	OH	ORGANIC SILT
RGB-1	S-11	20.0	0.0	71.8	28.2			43	SM	SILTY SAND
RGB-1	U-12	22.0								
RGB-1	S-13	24.0								
RGB-1	S-14	30.0	0.0	64.7	35.3			36	SM	SILTY SAND
RGB-1	S-15a	35.0								
RGB-1	S-15b	35.6	0.0	68.8	30.6			67	SM	SILTY SAND
RGB-1	S-16	40.0								
RGB-1	S-17a	45.0				70	34	55	MH	ELASTIC SILT
RGB-1	S-17b	45.2						291		
RGB-1	S-18	50.0								
RGB-1	S-19	55.0				74	35	44	OH	ORGANIC SILT WITH SAND
RGB-1	S-20	60.0								
RGB-1	S-21	65.0								
RGB-1	S-22	70.0								
RGB-1	S-23	75.0								
RGB-2	G-1	1.0								
RGB-2	G-2	2.5								
RGB-2	G-3	4.0								
RGB-2	S-4	5.0	0.0	28.9	71.1	82	53	77	MH	ELASTIC SILT WITH SAND
RGB-2	U-5	8.0								
RGB-2	S-6	9.8	15.2	55.1	29.7			37	SM	SILTY SAND WITH GRAVEL
RGB-2	S-7	15.0	1.7	66.7	31.7			29	SM	SILTY SAND
RGB-2	S-8	20.0	0.0	68.7	31.3			23	SM	SILTY SAND
RGB-2	S-9	25.0	0.0	62.1	37.9			23	SM	SILTY SAND
RGB-2	S-10	30.0								

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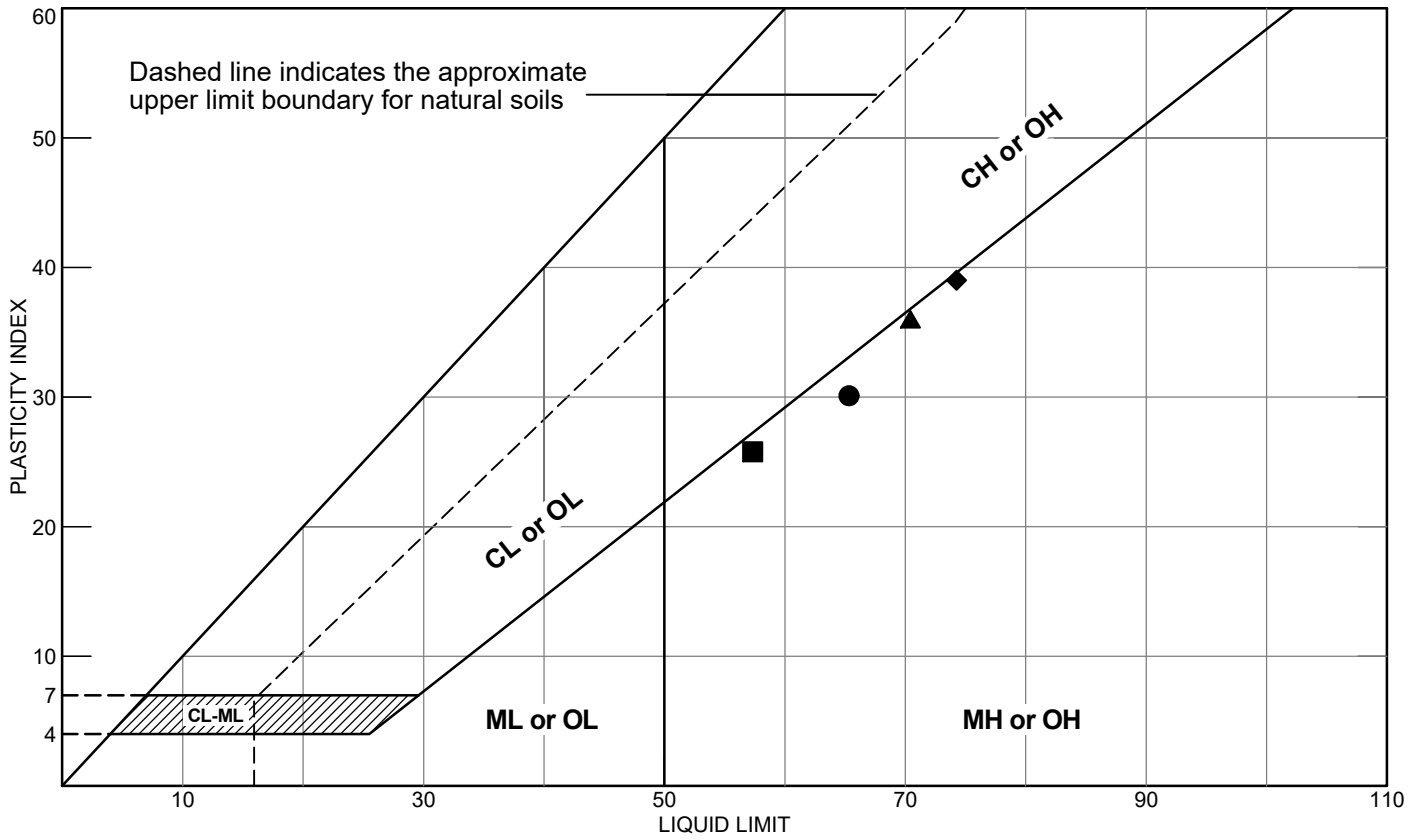

Location and Description	LL	PL	PI	-#200	MC%	USCS
● **Source:** RGB-1 **Sample No.:** S-7 **Depth:** 7.5 to 9.0 ORGANIC SILT WITH SAND	65	35	30	NT	60	OH
■ **Source:** RGB-1 **Sample No.:** S-10 **Depth:** 15.0 to 16.5 ORGANIC SILT	57	32	25	NT	40	OH
▲ **Source:** RGB-1 **Sample No.:** S-17a **Depth:** 45.0 to 45.2 ELASTIC SILT	70	34	36	NT	55	MH
◆ **Source:** RGB-1 **Sample No.:** S-19 **Depth:** 55.0 to 56.5 ORGANIC SILT WITH SAND	74	35	39	NT	44	OH

Remarks:

●
■
▲
◆

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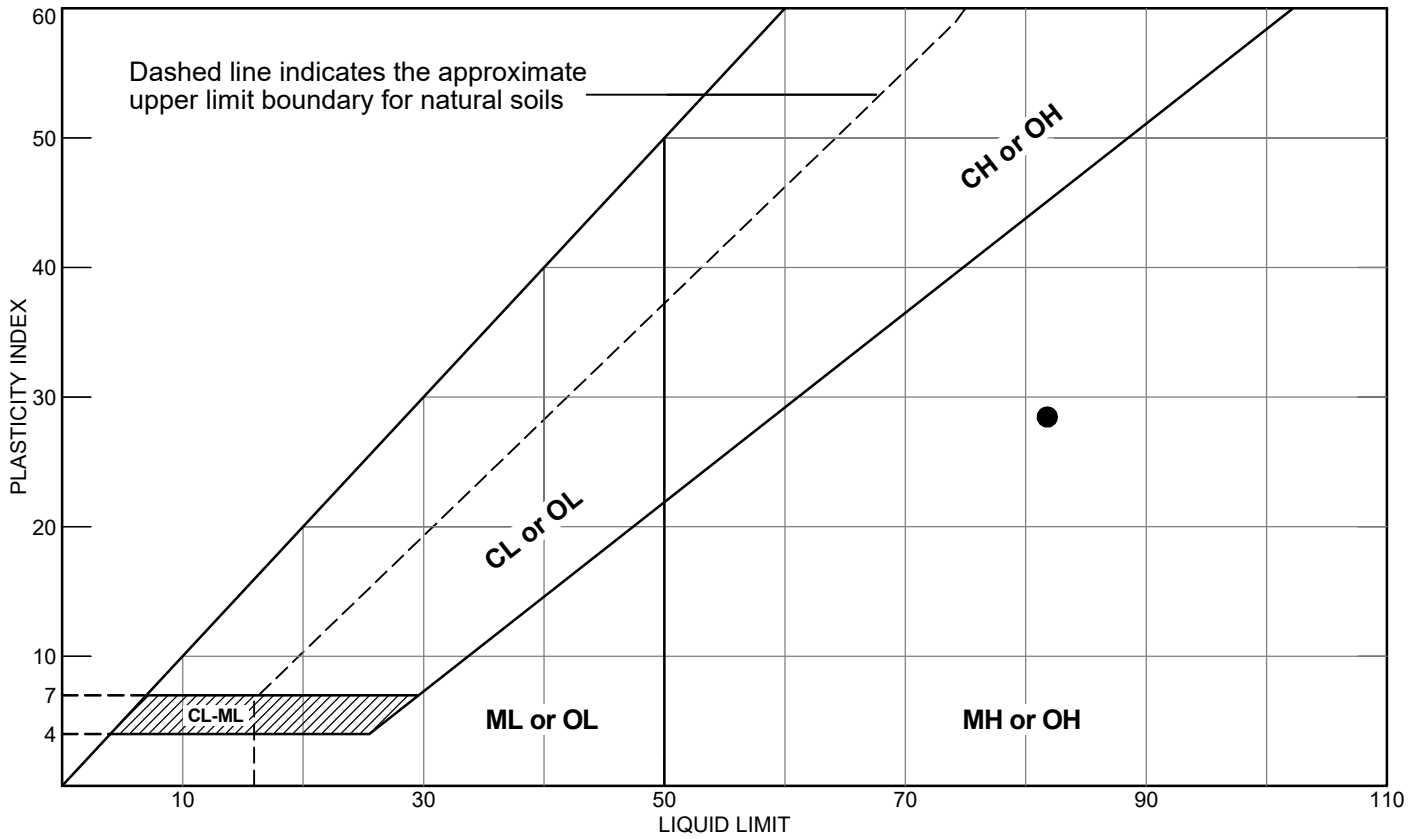
HALEY ALDRICH

Project: Aberdeen School District - Robert Gray
Location: Aberdeen, Washington
Project No.: 0210747-000

Liquid Limit, Plastic Limit, and Plasticity Index

Figure **B-2**
Sheet **1 of 2**



Location and Description	LL	PL	PI	-#200	MC%	USCS
● **Source:** RGB-2 **Sample No.:** S-4 **Depth:** 5.0 to 6.5 ELASTIC SILT WITH SAND	82	53	29	71	77	MH

Remarks:

●

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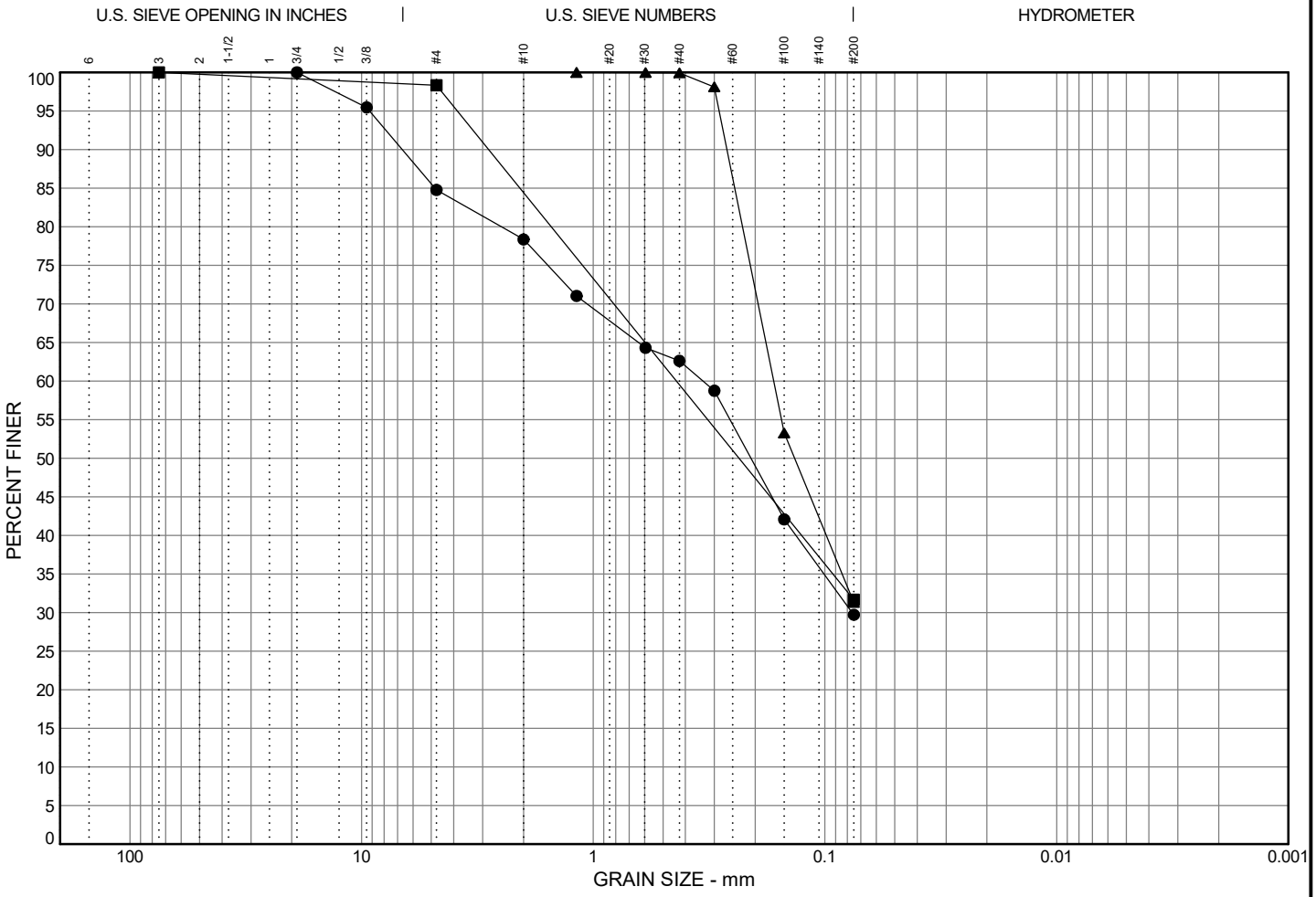
HALEY ALDRICH	Project: Aberdeen School District - Robert Gray Location: Aberdeen, Washington Project No.: 0210747-000	**Liquid Limit, Plastic Limit, and Plasticity Index**	Figure **B-2** Sheet **2 of 2**



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Location and Description	% Cobbles	% Gravel	% Sand	% Silt	% Clay	MC%	USCS
● **Source:** RGB-2 **Sample No.:** S-6 **Depth:** 9.8 to 11.3 SILTY SAND WITH GRAVEL	0.0	15.2	55.1	29.7		37	SM
■ **Source:** RGB-2 **Sample No.:** S-7 **Depth:** 15.0 to 16.5 SILTY SAND	0.0	1.7	66.7	31.7		29	SM
▲ **Source:** RGB-2 **Sample No.:** S-8 **Depth:** 20.0 to 21.5 SILTY SAND	0.0	0.0	68.7	31.3		23	SM

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			4.822	0.336	0.209	0.076				
■			2.073	0.438	0.235					
▲			0.245	0.166	0.135					

Remarks:

●

■

▲

HALEY ALDRICH

Project: Aberdeen School District - Robert Gray
Location: Aberdeen, Washington
Project No.: 0210747-000

Particle-Size Analysis

Figure **B-3**
Sheet **1 of 1**

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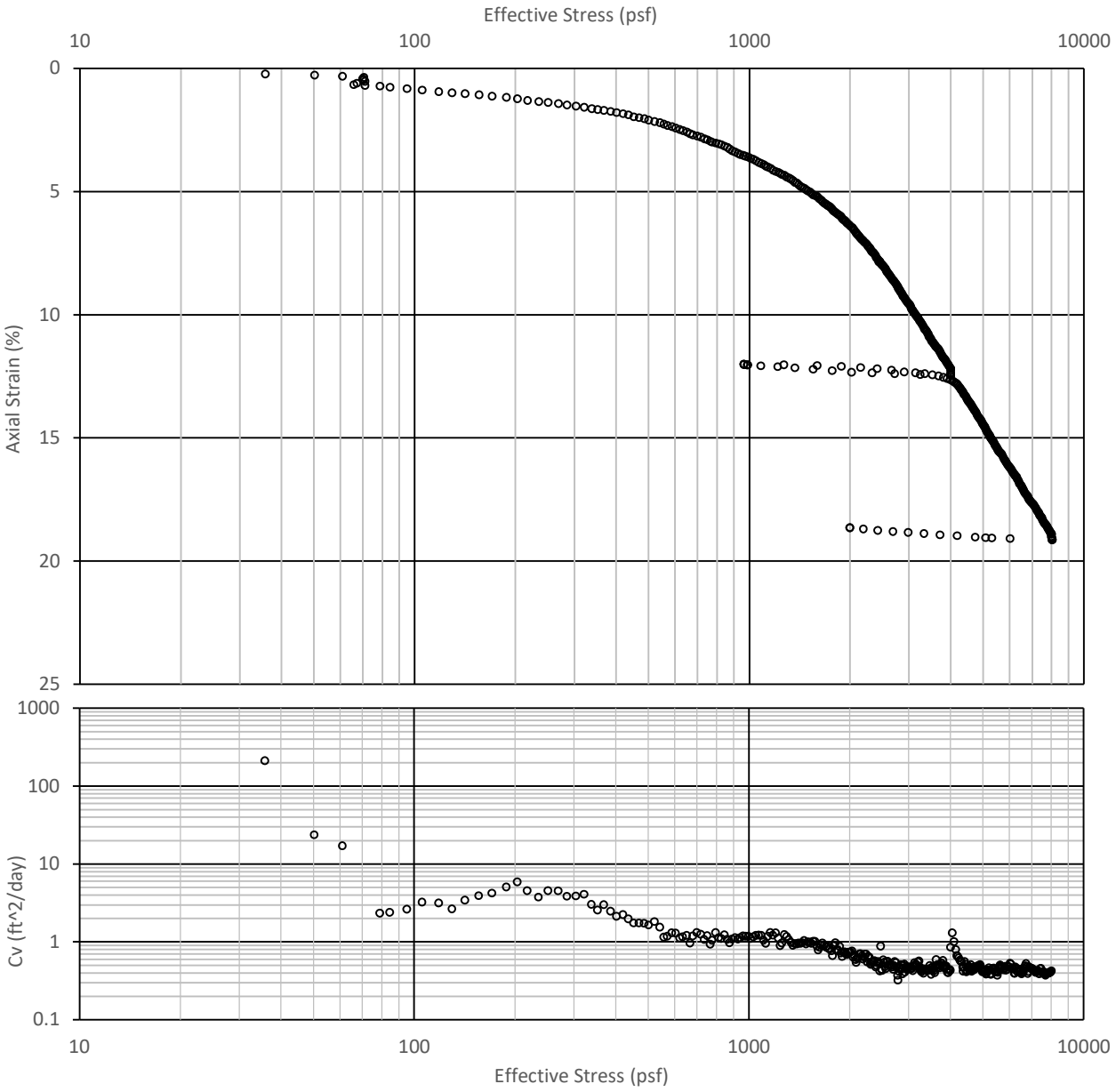

Depth	W.C. (%)		Atterberg Limits			Description	USCS
(ft)	Before	After	LL	PL	PI		
10	69	55	NT	NT	NT	Organic Silt with Sand	OL/OH

$\sigma'v_o$	Preconsolidation Pressure (psf)	
(psf)	Strain Energy	Casagrande
600	1750	1660
Sample Quality Designation		
Terzaghi et al. (1996)	Lunne et al. (1997)	
C	Very poor	

Initial Specimen Properties	
Height (inches)	1.00
Diameter (inches)	2.50
Weight (ounces)	4.22
Total Unit Weight (pcf)	92.90
Degree of Saturation (%)	95.20
Void Ratio (e0)	1.780

Sample Preparation and Comments:
The specimen test was an intact soil sample which was extracted from the sampling tube by cutting and delaminating a section of the sample tube. The test was run with a room temperature between 71 and 73 degrees Farenheit.

Robert Gray ES
Aberdeen, WA

Axial strain and coefficient of consolidation versus logarithm of vertical effective stress for RGB-1 U-8 CRS Consolidation

Job Number: 210747 8/2/2024

HALEY ALDRICH

Figure
B-4
1 of 4

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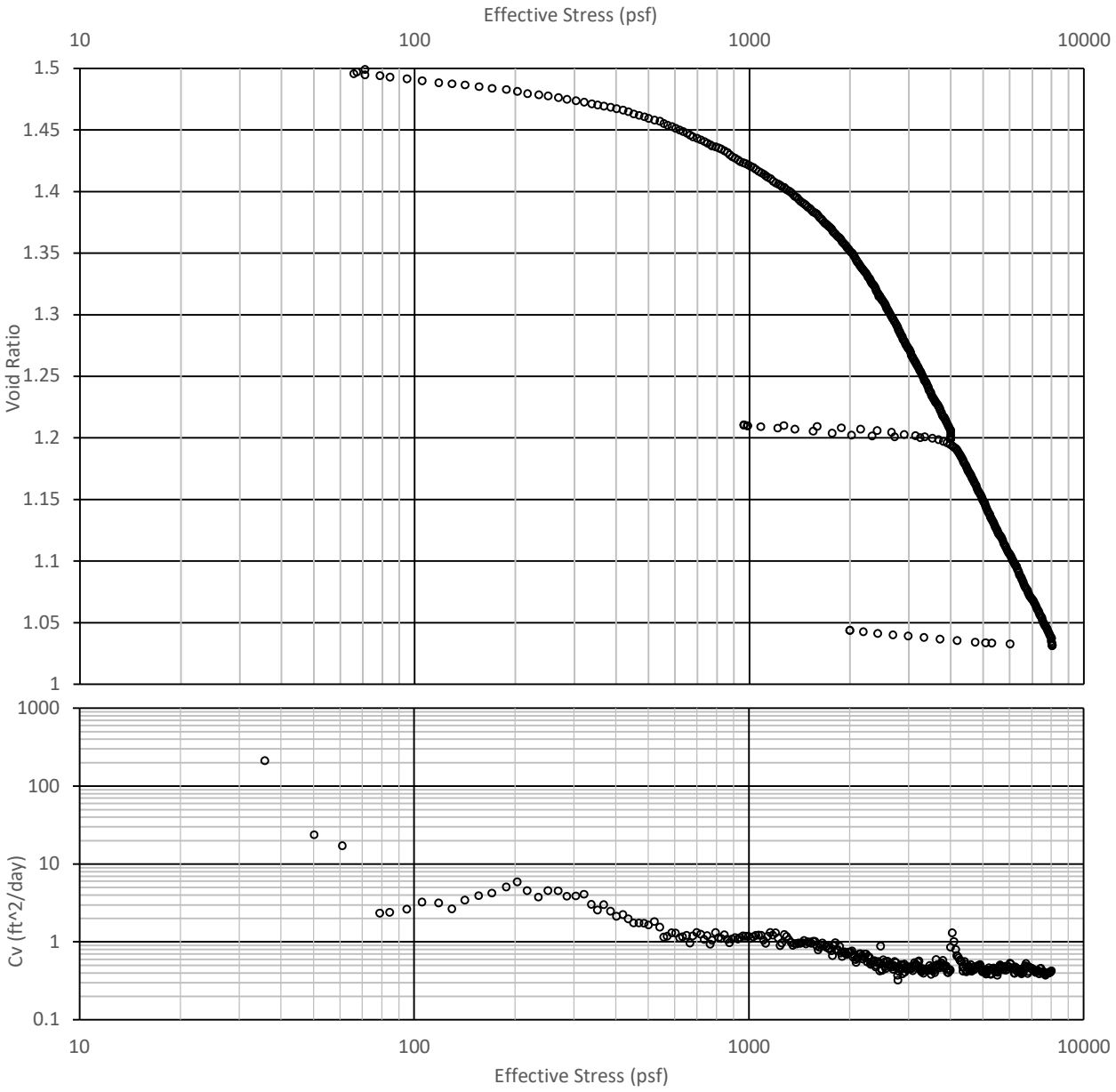

Depth	W.C. (%)		Atterberg Limits			Description	USCS
(ft)	Before	After	LL	PL	PI		
10	69	55	NT	NT	NT	Organic Silt with Sand	OL/OH

σ'_{v_o}	Preconsolidation Pressure (psf)	
(psf)	Strain Energy	Casagrande
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Robert Gray ES
Aberdeen, WA

Void ratio and coefficient of consolidation versus logarithm of vertical effective stress for RGB-1 U-8 CRS Consolidation

Job Number: 210747 8/2/2024

HALEY ALDRICH

Figure
B-4
2 of 4

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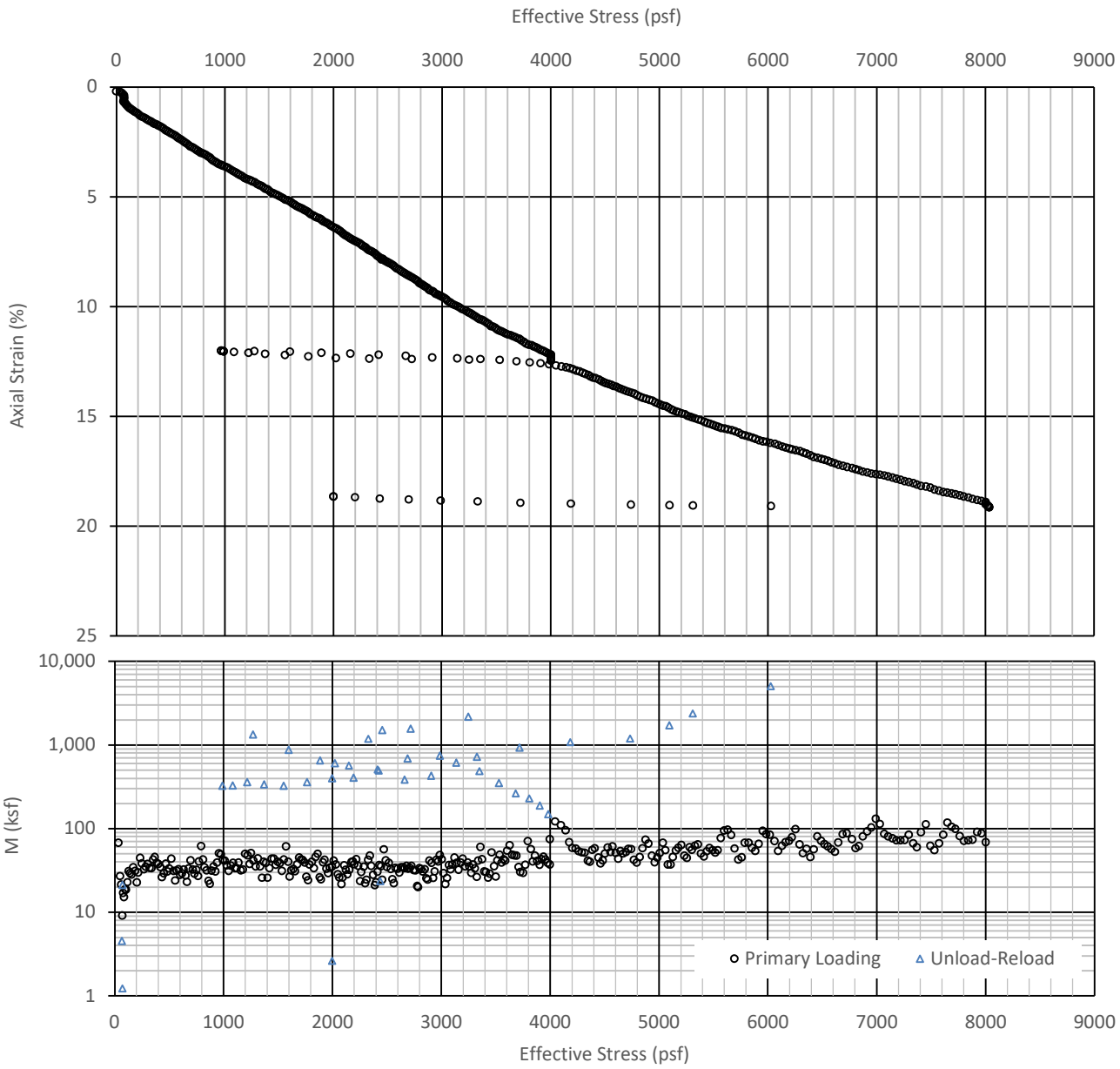

Depth	W.C. (%)		Atterberg Limits			Description	USCS
(ft)	Before	After	LL	PL	PI		
10	69	55	NT	NT	NT	Organic Silt with Sand	OL/OH

σ'_{v_o}	Preconsolidation Pressure (psf)	
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Robert Gray ES
Aberdeen, WA

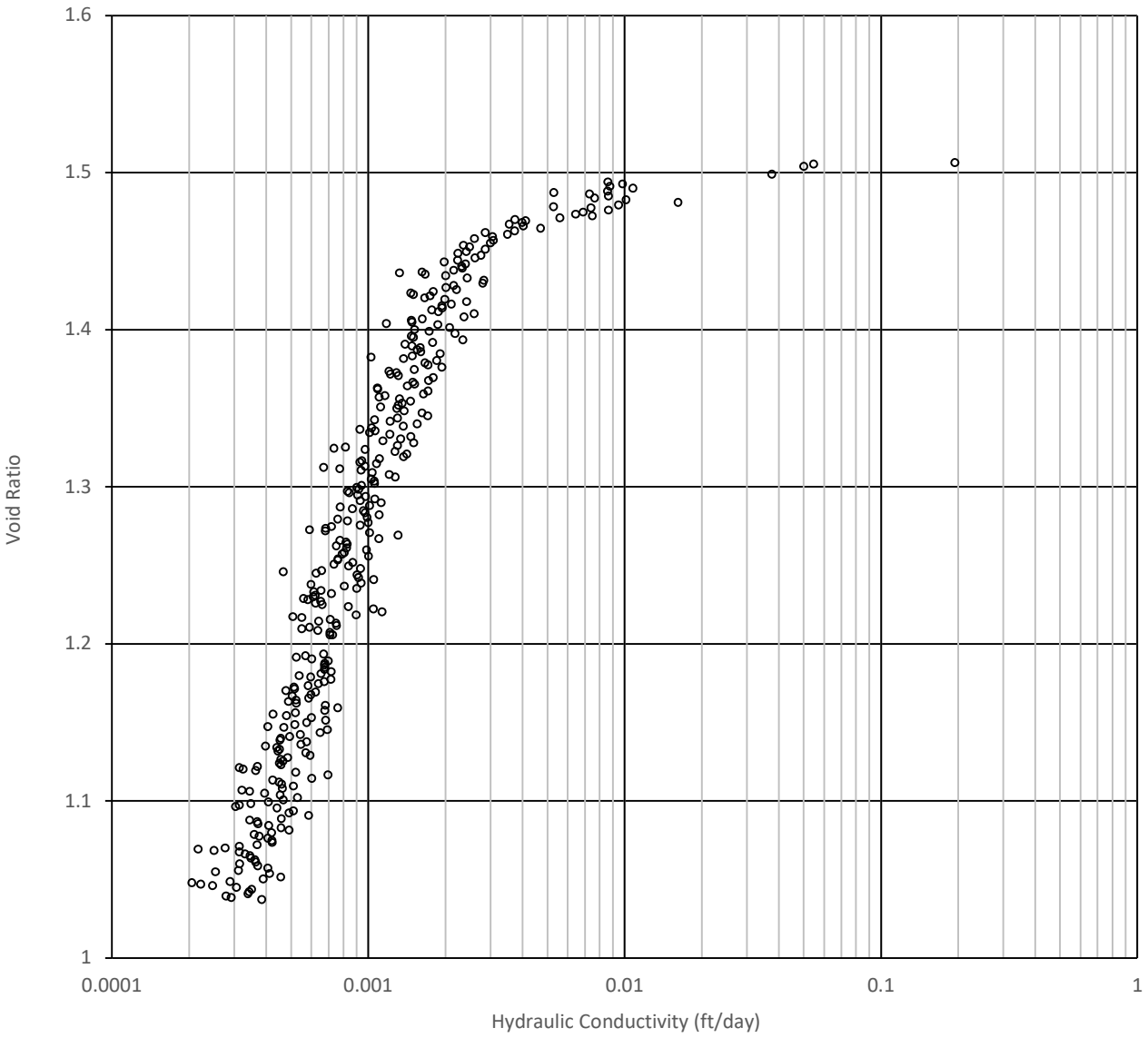
Axial strain versus vertical effective stress for RGB-1 U-8 CRS Consolidation

Job Number: 210747 8/2/2024

HALEY ALDRICH

Figure
B-4
3 of 4

initials MM/DD/YY location\filename.xls



Depth	W.C. (%)		Atterberg Limits			Description	USCS
(ft)	Before	After	LL	PL	PI		
10	69	55	NT	NT	NT	Organic Silt with Sand	OL/OH

$\sigma'v_o$	Preconsolidation Pressure (psf)	
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Robert Gray ES
Aberdeen, WA

Void ratio versus logarithm of hydraulic conductivity RGB-1
U-8 CRS Consolidation

Job Number: 210747 8/2/2024

HALEY ALDRICH

Figure
B-4
4 of 4

initials MM/DD/YY location\filename.xls

CERCO analytical
1100 Willow Pass Court, Suite A
Concord, CA 94520-1006
925 462 2771 Fax. 925 462 2775
www.cercoanalytical.com

15 July, 2024

Job No. 2407012
Cust. No. 13349

Mr. Micah Hintz
Haley & Aldrich
6420 S. Macadam Avenue, Suite 100
Portland, OR 97239

Subject: Project No.: 0210746-000
Project Name: Aberdeen School District
Corrosivity Analysis –ASTM Test Methods

Dear Mr. Hintz:

Pursuant to your request, CERCO Analytical has analyzed the soil samples submitted on July 08, 2024. Based on the analytical results, this brief corrosivity evaluation is enclosed for your consideration.

Based upon the resistivity measurements, Sample No.003 is classified as "moderately corrosive". Samples No. 001 and No. 002 are classified as "mildly corrosive". All buried iron, steel, cast iron, ductile iron, galvanized steel and dielectric coated steel or iron should be properly protected against corrosion depending upon the critical nature of the structure. All buried metallic pressure piping such as ductile iron firewater pipelines should be protected against corrosion.

The chloride ion concentrations reflect none detected with a reporting limit of 15 mg/kg.

The sulfate ion concentrations reflect none detected with a reporting limit of 15 mg/kg.

The pH of the soils ranged from 5.36 to 6.29, which does present corrosion problems for buried iron, steel, mortar-coated steel and reinforced concrete structures. Therefore, corrosion prevention measures need to be considered for structures to be placed in this acidic soil.

The redox potentials range from 310-mV to 320-mV and are indicative of potentially "slightly corrosive" soils resulting from anaerobic soil conditions.

This corrosivity evaluation is based on general corrosion engineering standards and is non-specific in nature. For specific long-term corrosion control design recommendations or consultation, please call *JDH Corrosion Consultants, Inc. at (925) 927-6630.*

We appreciate the opportunity of working with you on this project. If you have any questions, or if you require further information, please do not hesitate to contact us.

Very truly yours,
CERCO ANALYTICAL, INC.

J. Darby Howard, Jr., P.E.
President

JDH/jdl
Enclosure

CERCO analytical
1100 Willow Pass Court, Suite A
Concord, CA 94520-1006
925 462 2771 Fax. 925 462 2775
www.cercoanalytical.com

Client: Haley & Aldrich, Inc.
Client's Project No.: 0210746-000
Client's Project Name: Aberdeen School District
Date Sampled: 4-Jun-24, 6-Jun-24, & 7-Jun-24
Date Received: 8-Jul-24
Matrix: Soil
Authorization: Signed Chain of Custody

Date of Report: 15-Jul-2024

Job/Sample No.	Sample I.D.	Redox (mV)	pH	Conductivity (umhos/cm)*	Resistivity (100% Saturation) (ohms-cm)	Sulfide (mg/kg)*	Chloride (mg/kg)*	Sulfate (mg/kg)*
[redacted]								
2407012-002	RGB-2 / G-3 / 4-4.5'	320	5.84	-	16,000	-	N.D.	N.D.
[redacted]								

Method:	ASTM D1498	ASTM D4972	ASTM D1125M	ASTM G57	ASTM D4658M	ASTM D4327	ASTM D4327
Reporting Limit:	-	-	10	-	50	15	15
Date Analyzed:	9-Jul-2024	9-Jul-2024		9-Jul-2024		9-Jul-2024	9-Jul-2024

Julia Clauson
Chemist

* Results Reported on "As Received" Basis
N.D. - None Detected

Quality Control Summary - All laboratory quality control parameters were found to be within established limits

APPENDIX C
MASW Report

PRESENTATION OF SITE INVESTIGATION RESULTS

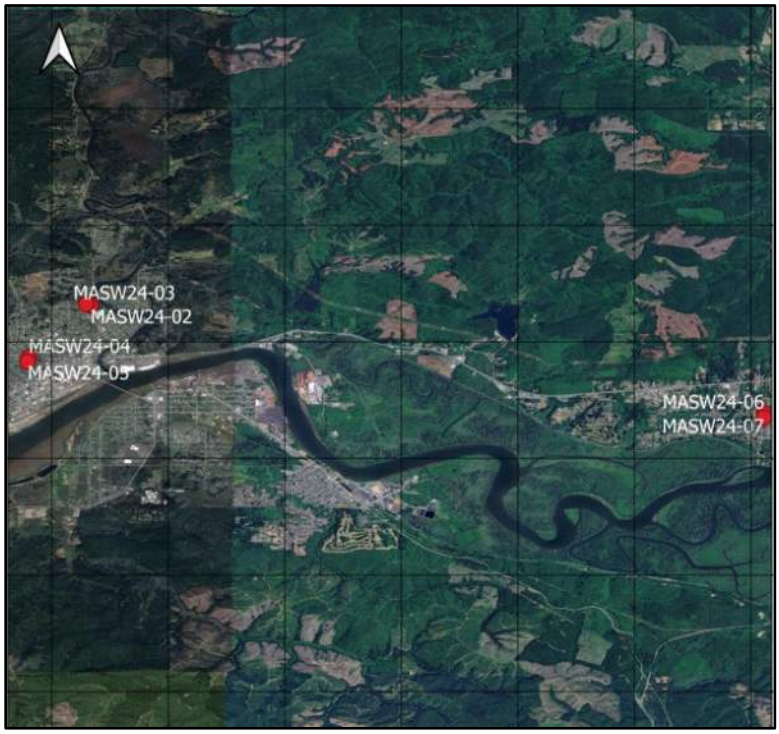
Aberdeen MASW

Prepared for:

Haley & Aldrich, Inc.

ConeTec Job No: 24-59-27777

Project Start Date: 06-June-2024
Project End Date: 07-June-2024
Report Date: 20-June-2024



Prepared by:

ConeTec Inc.
1237 S Director St.
Seattle, WA 98108
Tel: (253) 397-4861

ConeTecWA@conetec.com
www.conetec.com
www.conetecdataservices.com

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Introduction

The enclosed report presents the results of the geophysical site investigation program conducted by ConeTec, Inc. for Haley & Aldrich, Inc. at the Aberdeen MASW project in Aberdeen, Washington. The program consisted of six one-dimensional (1D) Multichannel Analysis of Surface Waves (MASW) tests to provide shear wave velocity (Vs) sounding and calculate time weighted average Vs of the upper 100 feet (Vs100) below grade. Please note that this report, which also includes all accompanying data, are subject to the 3rd Party Disclaimer and Client Disclaimer that follow in the 'Limitations' section of this report.

Project Information

Project	
Client	Haley & Aldrich, Inc.
Project	Aberdeen MASW
ConeTec project number	24-59-27777

Coordinates		
Test Type	Collection Method	Coordinate Reference System
MASW	Handheld GPS	WGS84 Lat long

MASW Equipment Used for this Project				
Seismograph(s)	Geophones	Coupling Mechanism	Trigger Style	Seismic Sources
Summit X One	25 x 4.5 Hz vertical	PVC pucks or spikes	Piezoelectric	Sledgehammer and plate, passive sources

MASW Data and Results

The data quality for this project was good. The main source of seismic noise was wind and was mitigated by taking multiple stacks to help improve signal to noise ratio. Co-centered arrays with 3-foot and 10-foot geophone spacing were used to provide a better resolved frequency spectrum. Dispersion curves from each array size were combined in post processing to create one dispersion curve for further analysis. In addition, passive seismic readings were collected to take advantage of low frequency seismic signals to increase the depth of investigation. Coherent surface wave energy in the 5 – 45 Hz band allowed the determination of 1D Vs models up to 110 feet deep.

Despite their proximity, MASW24-02 and MASW24-03 had significantly different Vs100 results. The thicker deposits of slow Vs material measured for MASW24-02 compared to MASW24-03 caused this discrepancy and could be the result of the survey area being located on more variable fluvial deposits. Slow velocity material with no coherent surface wave energy less than 7 Hz was observed on MASW24-05 resulting in a depth of investigation insufficient to calculate Vs100. This contrasted with the results collected for MASW24-04 which again suggest variable deposits in the survey area. A future 2D MASW survey would be recommended to delineate the Vs variations of the soil. The shear wave velocity results and Vs100 calculation tables are included in the appendices and digital release of this report. Examples of the raw time domain traces and overtone images are also included in the appendices of this report.

Closure

Thank you for the opportunity to work on this project. The equipment used and the field procedures followed complied with current accepted practice standards.

ConeTec Inc.

Limitations

3rd Party Disclaimer

This report titled “Aberdeen MASW”, referred to as the (“Report”), was prepared by ConeTec for Haley & Aldrich, Inc.. The Report is confidential and may not be distributed to or relied upon by any third parties without the express written consent of ConeTec. Any third parties gaining access to the Report do not acquire any rights as a result of such access. Any use which a third party makes of the Report, or any reliance on or decisions made based on it, are the responsibility of such third parties. ConeTec accepts no responsibility for loss, damage and/or expense, if any, suffered by any third parties as a result of decisions made, or actions taken or not taken, which are in any way based on, or related to, the Report or any portion(s) thereof.

Client Disclaimer

ConeTec was retained by Haley & Aldrich, Inc. to collect MASW readings (“Data”) for the purpose of measuring 1D Vs soundings and to calculate Vs100. The Data is included in this report titled “Aberdeen MASW” which is referred to as the (“Report”). ConeTec has collected and reported the Data in accordance with current industry standards. No other warranty, express or implied, with respect to the Data is made by ConeTec. In order to properly understand the Data included in the Report, reference must be made to the documents accompanying and other sources referenced in the Report in their entirety. Other than the Data, the contents of the Report should not be relied upon in any fashion without independent verification and ConeTec is in no way responsible for any loss, damage or expense resulting from the use of, and/or reliance on, such material by any party.

Multichannel analysis of surface waves (MASW) is a non-intrusive in-situ test that uses the principles of elasticity and surface wave dispersion to determine the variation of shear wave velocity with depth at a site. The observation that surface waves (Rayleigh waves) of different wavelengths propagate at different phase velocities in non-ideal media, is called dispersion. This is a direct result of the fact that surface waves of different wavelengths propagate along the surface to varying depths, and hence, if material stiffness changes with depth (as is the case with most non-ideal materials), then an appropriately selected wavelength band will reflect such changes in the velocity of propagation.

The field methods for surface wave testing are very similar to other surface seismic data collection methods. Surface geophones are placed in a linear array along a survey line at a known separation (typically one metre). A series of recordings (shots) are collected with a known in-line source offset from the array. Each shot gather is represented in the time-offset domain and shows the amplitude of wave propagation through the array (refer to Figure MASW-1). For detailed frequency analysis, multiple records with different shot offset distances are collected to help better define the broad spectrum frequency-phase velocity response of the medium. Two-dimensional cross sections can be collected by moving the geophone array a small distance (typically two meters) along the line and repeating the shots at set offsets.

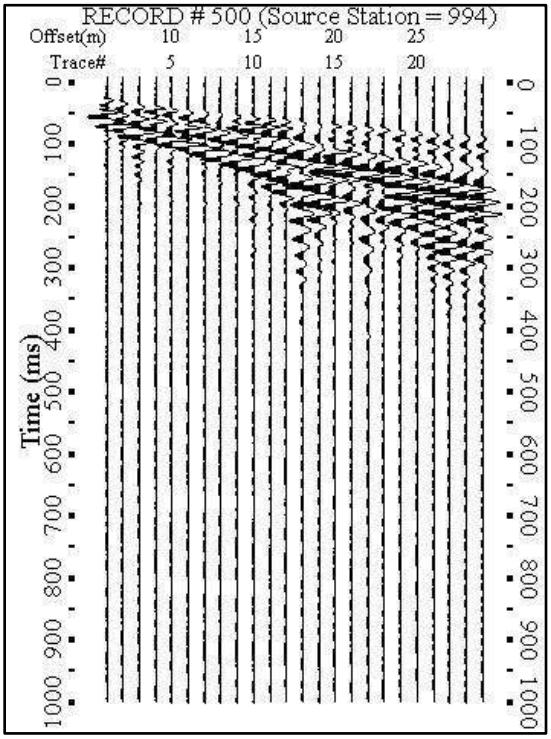


Figure MASW-1. Typical MASW time domain record (shot gather)

Given that surface wave velocity is closely related to the shear wave velocity and the wavelength related to depth, the surface wave results can be used to develop a profile of shear wave velocity versus depth through a process referred to as inversion. The program used to perform the inversion is SurfSeis 4.0, developed by the Kansas Geological Survey. In SurfSeis, the raw time domain traces are transformed to the frequency domain to create what is referred to as an overtone image as shown in Figure MASW-2. The overtone image displays the amplitude of the primary surface wave mode and any potential higher modes. A dispersion curve is fitted to the overtone image, and the inversion process is then used to

determine the most appropriate shear wave velocity profile. The parameters used for the inversion of the dispersion data are provided in the data release folder in an Excel table.

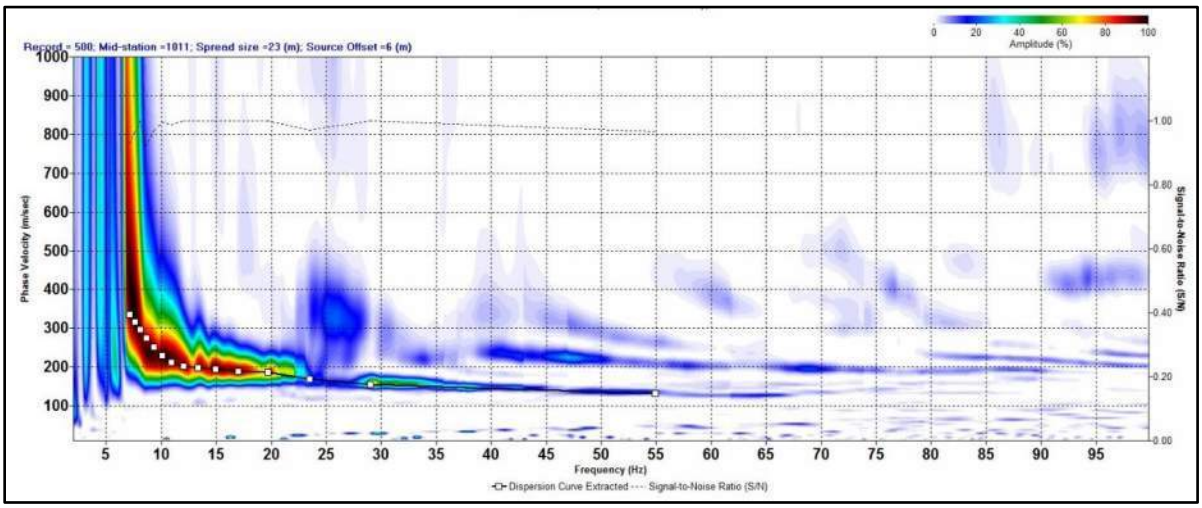


Figure MASW-2. Overtone image and a picked dispersion curve

For each test location, a 1D shear wave velocity profile comprising of a number of velocity layers of variable thickness (refer to Figure MASW-3) is provided . For 2D testing a series of 1D tests are combined to produce a shear wave velocity cross section.

The depth of investigation is related to the ground conditions and the amount of energy delivered by the surface wave source. The surface wave method uses Rayleigh waves that travel horizontally along the ground surface to a depth of about one wavelength. The actual depth of sampling of the ground is considered to be one-half to one-third of the Rayleigh (surface) wave wavelength. The wavelengths measured by the equipment will be a function of the frequency of the source and the velocity of the surface waves through the ground. As the depth of investigation increases, there will be less certainty in terms of layer boundaries and velocity values.

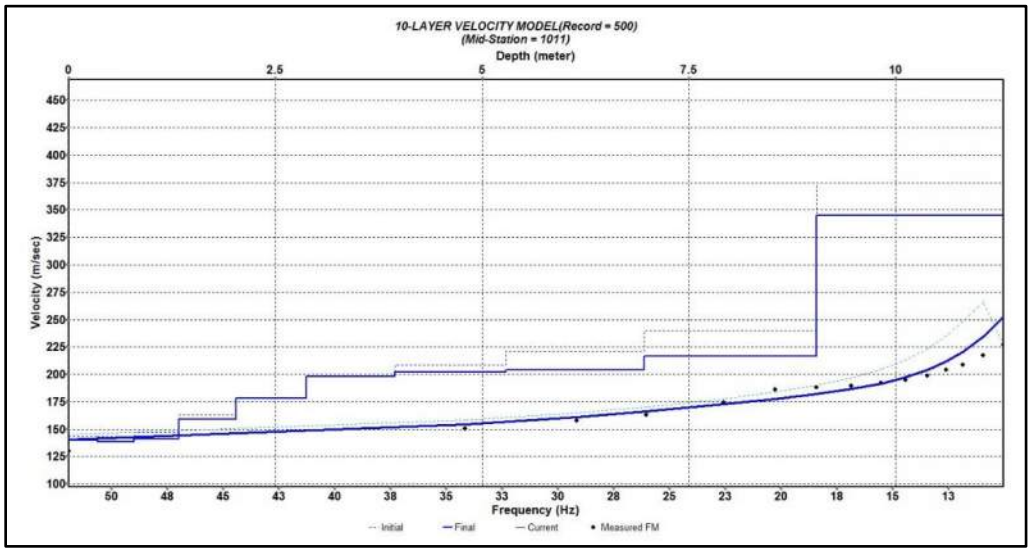


Figure MASW-3. 1D inversion result with fitted dispersion curve

The equipment, field procedures, and analysis software used by ConeTec all conform to the currently accepted best practices for MASW testing. The results of geophysical testing are always interpretative to a certain extent and should be confirmed by drilling or other intrusive testing.

References

Miller, R.D., Xia, J., Park, C.B., and Ivanov, J.M., 1999, Multichannel analysis of surface waves to map bedrock, Kansas Geological Survey, The Leading Edge, December, p. 1392-1396.

Park, C.B., Miller, R.D., and Xia, J., 1998b, Ground roll as a tool to image near-surface anomaly: 68th Ann. Internat. Mtg. Soc. Expl.Geophys., Expanded Abstracts, p. 874-877.

Park, C.B., Miller, R.D., and Xia, J., 1999, Multichannel analysis of surface waves: Geophysics, v. 64, n. 3, pp. 800-808.

Park, C.B., Miller, R.D., Xia, J., and Ivanov, J., 2007, Multichannel analysis of surface waves (MASW)-active and passive methods: The Leading Edge, January.

SurfSeis website: http://www.kgs.ku.edu/software/surfseis/index.html

Xia, J., R.D. Miller, and C.B. Park, 2000a, Advantages of calculating shear-wave velocity from surface waves with higher modes: [Exp. Abs.]: Soc. Expl. Geophys., p. 1295-1298.

Xia, J., Miller, R.D., Park, C.B., and Ivanov, J., 2000b, Construction of 2-D vertical shear-wave velocity field by the Multichannel Analysis of Surface Wave technique, Proceedings of the Symposium on the Application of Geophysics to Engineering and Environmental Problems (SAGEEP 2000), Washington D.C, February 20-24, p. 1197-1206.

The following appendices listed below are included in the report:

- 1D MASW Summary and Maps
- 1D MASW Results
- Vs100 Calculation Tables
- MASW Time Domain Traces and Overtone Images

1D MASW Summary and Maps

CONETEC

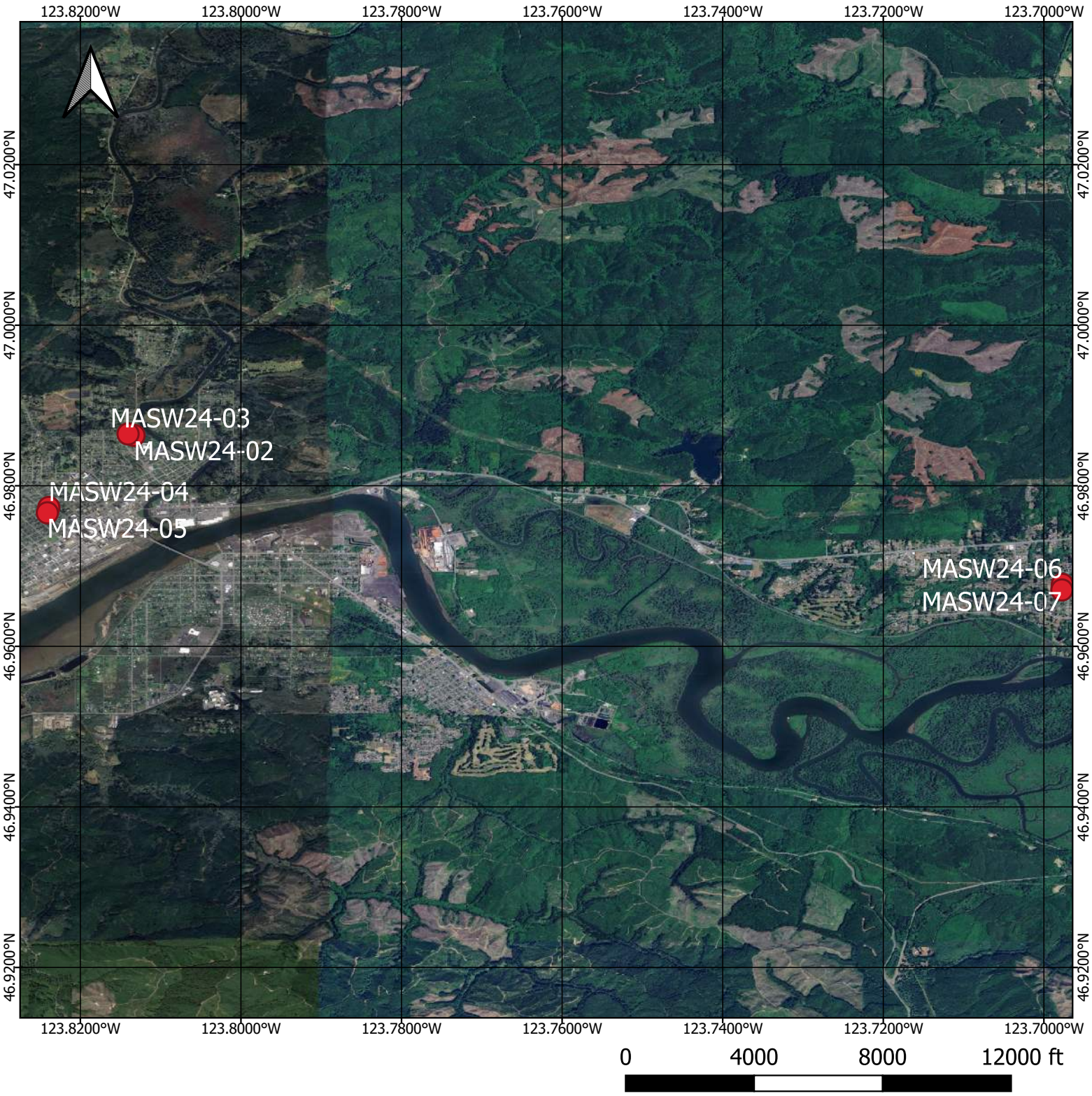
Job No:	24-59-27777
Client:	Haley & Aldrich, Inc.
Project:	Aberdeen MASW
Start Date:	06-Jun-2024
End Date:	07-Jun-2024

1D MASW TEST SUMMARY

Sounding ID	Date	Seismic Source	Geophone Spacing (ft)	Array Length (ft)	Northing[1] (decimal deg)	Easting (decimal deg)	Refer to Notation Number
MASW24-02	06-Jun-2024	Sledgehammer	10, 3	240, 72	46.9863	-123.8133	
MASW24-03	06-Jun-2024	Sledgehammer	10, 3	240, 72	46.9865	-123.8141	
MASW24-04	06-Jun-2024	Sledgehammer	10, 3	240, 72	46.9773	-123.8239	
MASW24-05	07-Jun-2024	Sledgehammer	10, 3	240, 72	46.9766	-123.8241	
MASW24-06	07-Jun-2024	Sledgehammer	10, 3	240, 72	46.9677	-123.6977	
MASW24-07	07-Jun-2024	Sledgehammer	10, 3	240, 72	46.9670	-123.6978	

1. Coordinates were recorded with a handheld GPS in WGS84 lat/long

Aberdeen MASW - MASW Survey Overview Map



Legend

- MASW Location
- MASW Arrays

ConeTec Job Number: 24-59-27777
Survey Date(s): 06-June-2024- 07-June-2024
Coordinate Reference System: WGS84 Lat Long
Map Scale: 1:35000
Units: Decimal degrees
Imagery Source: Google Earth

CONETEC

Aberdeen MASW - Robert Gray Elementary Map



Legend

- MASW Location
- MASW Arrays

ConeTec Job Number: 24-59-27777
Survey Date(s): 06-June-2024- 07-June-2024
Coordinate Reference System: WGS84 Lat Long
Map Scale: 1:1000
Units: Decimal degrees
Imagery Source: Google Earth

CONETEC

Aberdeen MASW - Mc Dermoth Elementary Map



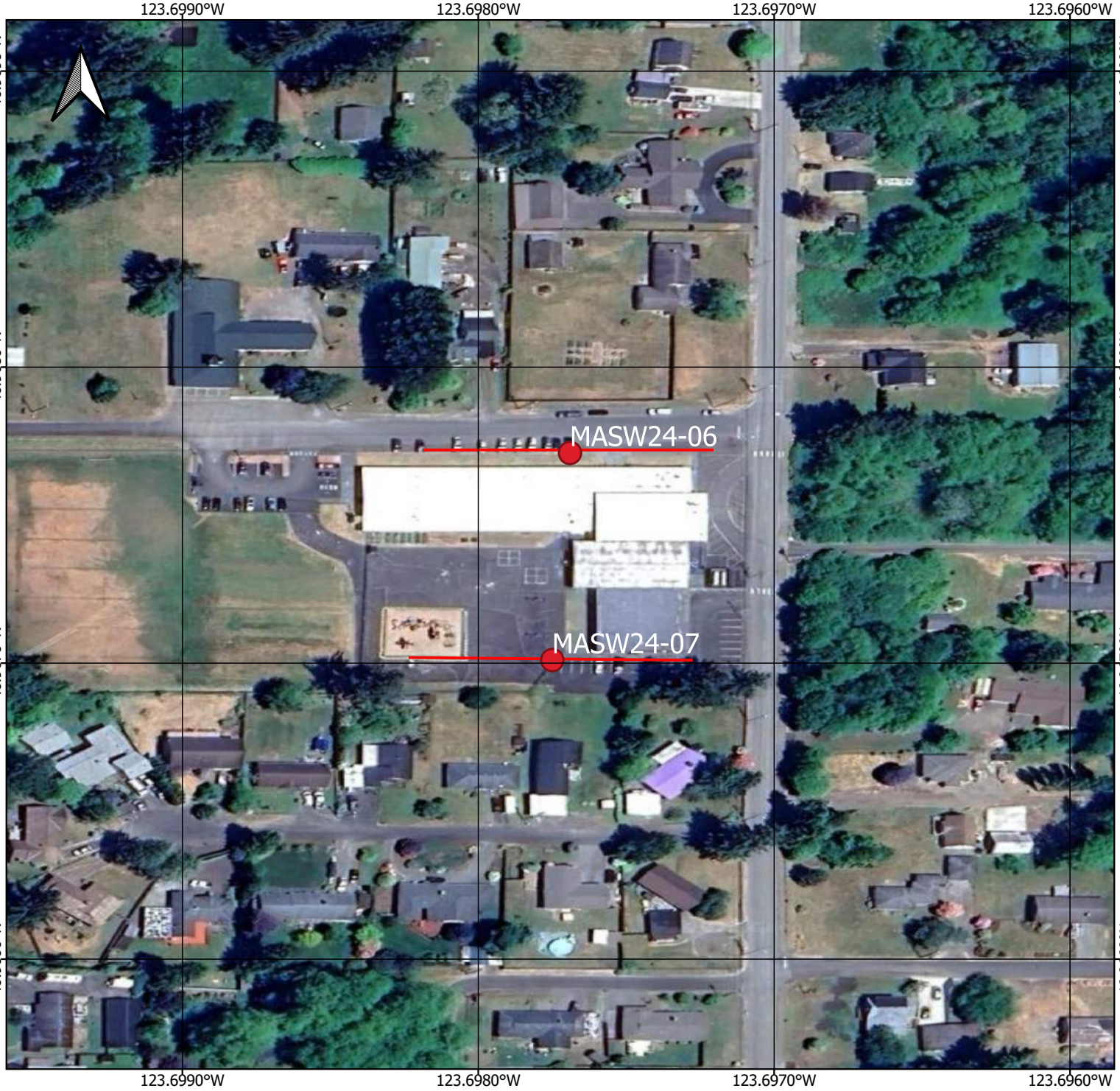
Legend

- MASW Location
- MASW Arrays

ConeTec Job Number: 24-59-27777
Survey Date(s): 06-June-2024- 07-June-2024
Coordinate Reference System: WGS84 Lat Long
Map Scale: 1:1000
Units: Decimal degrees
Imagery Source: Google Earth

CONETEC

Aberdeen MASW - Central Park Elementary Map



Legend

- MASW Location
- MASW Arrays

ConeTec Job Number: 24-59-27777
Survey Date(s): 06-June-2024- 07-June-2024
Coordinate Reference System: WGS84 Lat Long
Map Scale: 1:1000
Units: Decimal degrees
Imagery Source: Google Earth

CONETEC

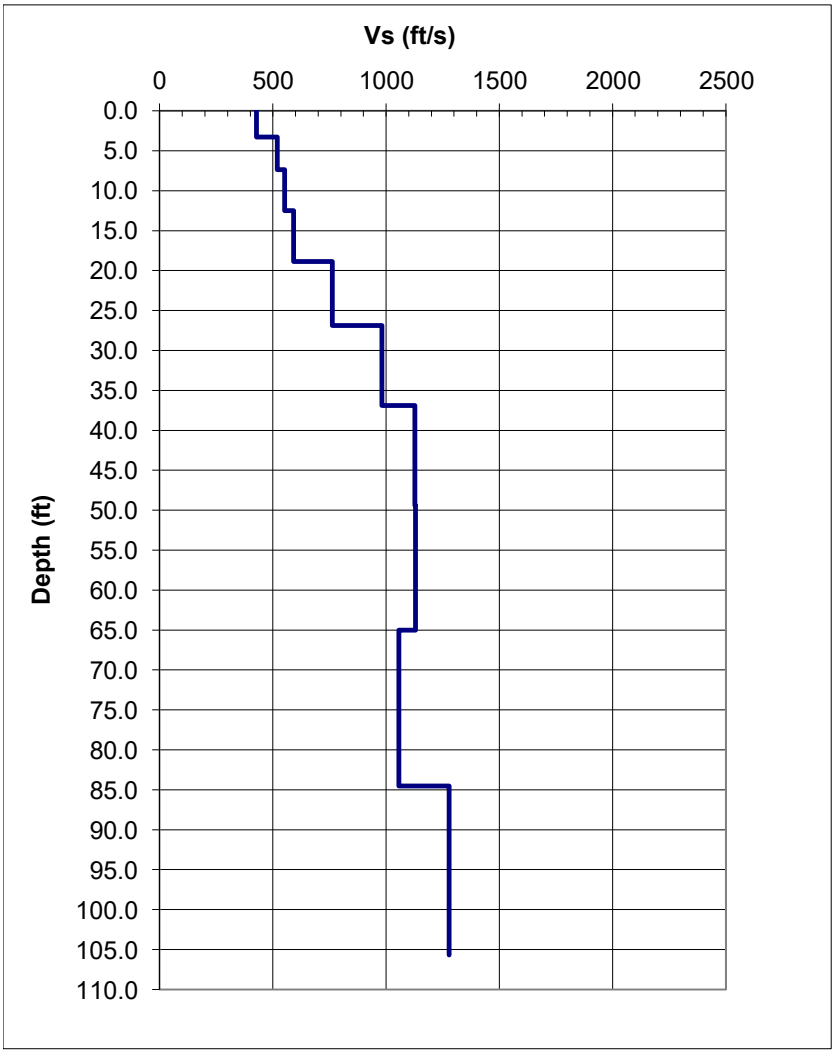
1D MASW Results

CONETEC

Job No:	24-59-27777
Client:	Haley & Aldrich, Inc.
Project:	Aberdeen MASW
Sounding ID:	MASW24-02
Date:	06-Jun-2024

1D MASW SHEAR WAVE VELOCITY TEST RESULTS

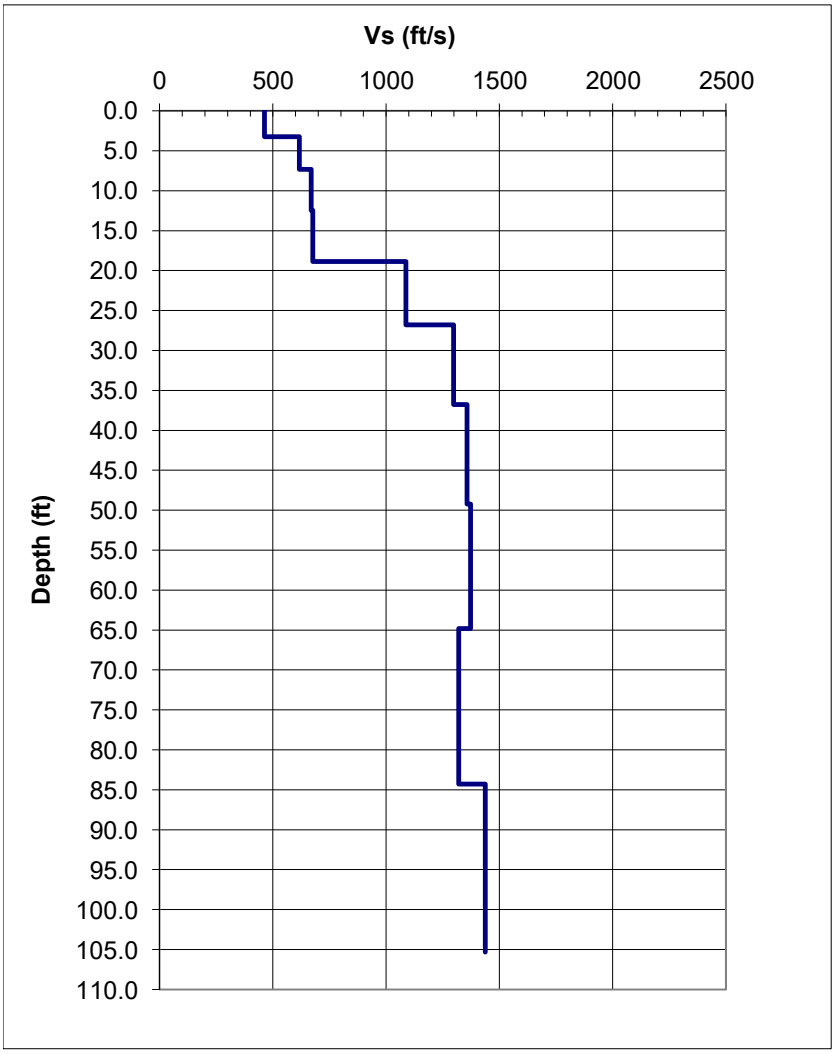
Layer	Layer Thickness (ft)	Depth of Bottom of Layer (ft)	Vs (ft/s)
1	3.3	3.3	428
2	4.1	7.4	520
3	5.1	12.5	553
4	6.4	18.9	591
5	8.0	26.9	763
6	10.0	36.9	981
7	12.5	49.4	1127
8	15.6	65.0	1130
9	19.5	84.5	1056
10	21.1	105.7	1278



Job No:	24-59-27777
Client:	Haley & Aldrich, Inc.
Project:	Aberdeen MASW
Sounding ID:	MASW24-03
Date:	06-Jun-2024

1D MASW SHEAR WAVE VELOCITY TEST RESULTS

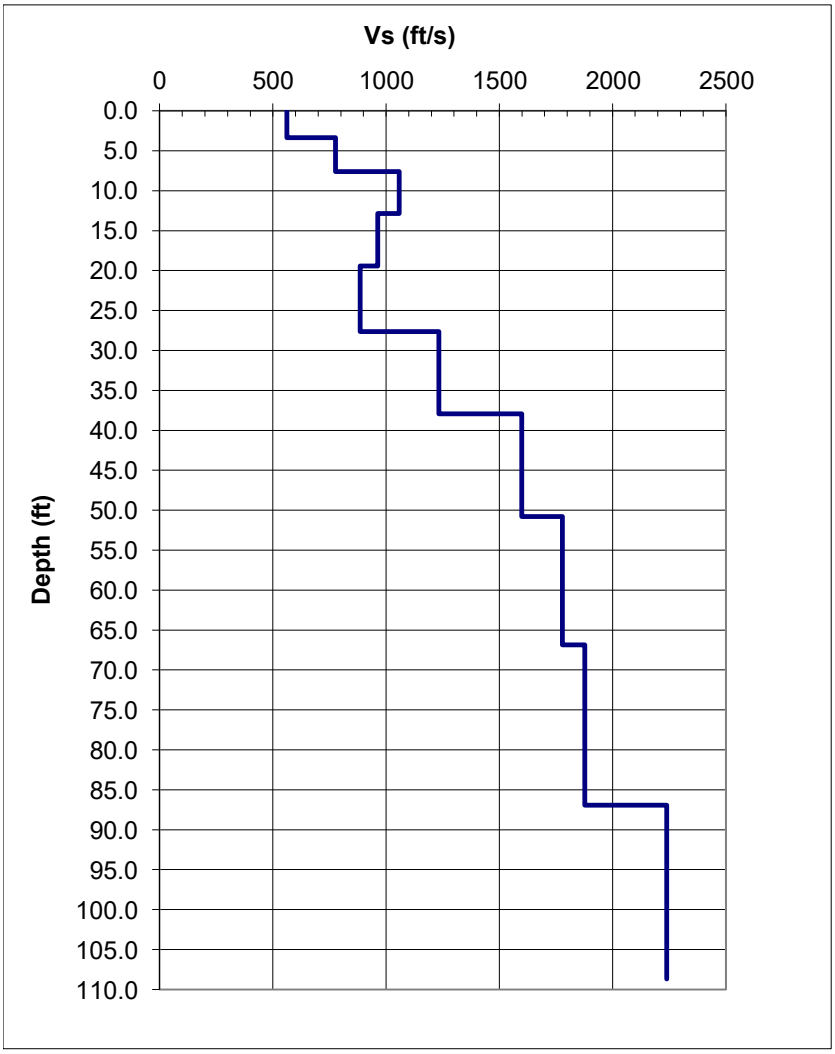
Layer	Layer Thickness (ft)	Depth of Bottom of Layer (ft)	Vs (ft/s)
1	3.3	3.3	463
2	4.1	7.3	616
3	5.1	12.5	669
4	6.4	18.8	676
5	8.0	26.8	1088
6	10.0	36.8	1298
7	12.5	49.2	1358
8	15.6	64.8	1374
9	19.5	84.3	1320
10	21.1	105.3	1438



Job No:	24-59-27777
Client:	Haley & Aldrich, Inc.
Project:	Aberdeen MASW
Sounding ID:	MASW24-04
Date:	06-Jun-2024

1D MASW SHEAR WAVE VELOCITY TEST RESULTS

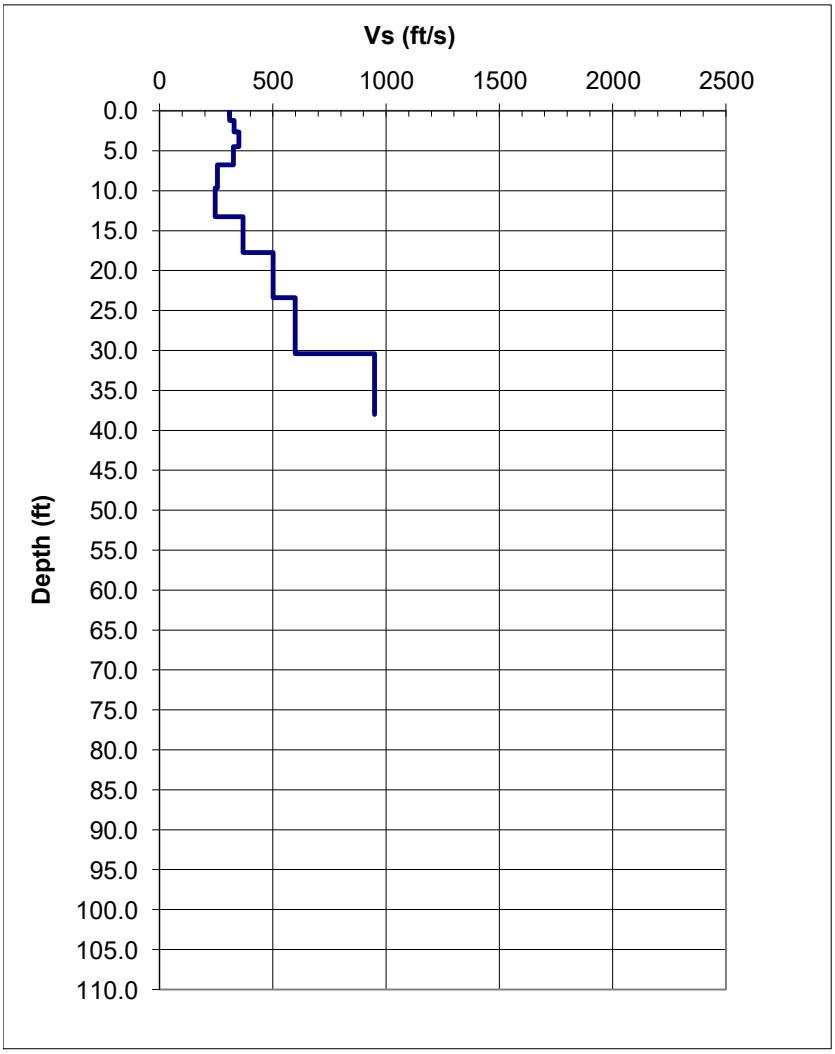
Layer	Layer Thickness (ft)	Depth of Bottom of Layer (ft)	Vs (ft/s)
1	3.4	3.4	562
2	4.2	7.6	777
3	5.3	12.8	1059
4	6.6	19.4	963
5	8.2	27.7	885
6	10.3	37.9	1232
7	12.9	50.8	1599
8	16.1	66.9	1778
9	20.1	86.9	1877
10	21.7	108.7	2238



Job No:	24-59-27777
Client:	Haley & Aldrich, Inc.
Project:	Aberdeen MASW
Sounding ID:	MASW24-05
Date:	07-Jun-2024

1D MASW SHEAR WAVE VELOCITY TEST RESULTS

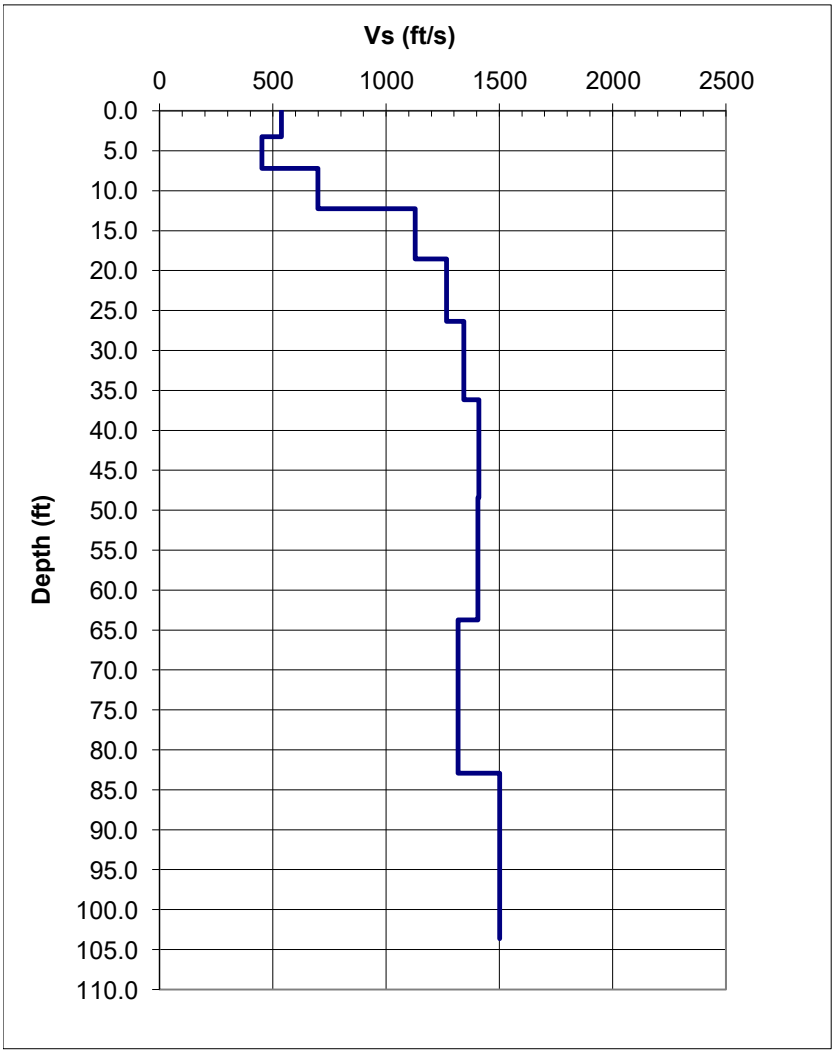
Layer	Layer Thickness (ft)	Depth of Bottom of Layer (ft)	Vs (ft/s)
1	1.2	1.2	309
2	1.5	2.7	329
3	1.8	4.5	350
4	2.3	6.8	326
5	2.9	9.7	256
6	3.6	13.3	245
7	4.5	17.8	369
8	5.6	23.4	500
9	7.0	30.4	599
10	7.6	38.0	949



Job No:	24-59-27777
Client:	Haley & Aldrich, Inc.
Project:	Aberdeen MASW
Sounding ID:	MASW24-06
Date:	07-Jun-2024

1D MASW SHEAR WAVE VELOCITY TEST RESULTS

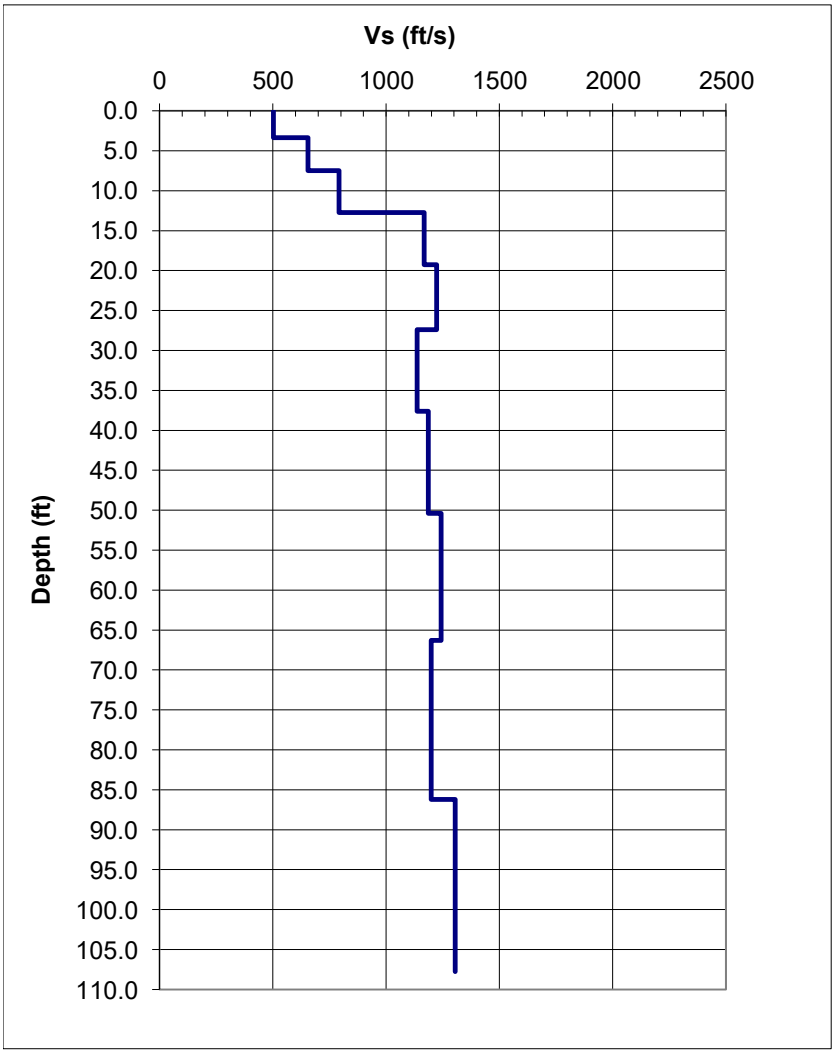
Layer	Layer Thickness (ft)	Depth of Bottom of Layer (ft)	Vs (ft/s)
1	3.2	3.2	538
2	4.0	7.2	452
3	5.0	12.3	699
4	6.3	18.5	1128
5	7.8	26.4	1267
6	9.8	36.2	1343
7	12.3	48.4	1409
8	15.3	63.8	1405
9	19.2	82.9	1319
10	20.7	103.7	1502



Job No:	24-59-27777
Client:	Haley & Aldrich, Inc.
Project:	Aberdeen MASW
Sounding ID:	MASW24-07
Date:	07-Jun-2024

1D MASW SHEAR WAVE VELOCITY TEST RESULTS

Layer	Layer Thickness (ft)	Depth of Bottom of Layer (ft)	Vs (ft/s)
1	3.3	3.3	502
2	4.2	7.5	655
3	5.2	12.7	792
4	6.5	19.3	1167
5	8.2	27.4	1224
6	10.2	37.6	1137
7	12.7	50.4	1186
8	15.9	66.3	1242
9	19.9	86.2	1199
10	21.6	107.8	1305



Vs100 Calculation Tables

CONETEC

Job No:	24-59-27777
Client:	Haley & Aldrich, Inc.
Project:	Aberdeen MASW
Sounding:	MASW24-02
Date:	06-Jun-2024

VS100 CALCULATION

Layer Number	Layer Thickness (ft)	Layer Bottom (ft)	Vs (ft/s)	Equivalent Vertical Travel Time (s)
1	3.3	3.3	428	0.00766
2	4.1	7.4	520	0.00788
3	5.1	12.5	553	0.00926
4	6.4	18.9	591	0.01082
5	8.0	26.9	763	0.01049
6	10.0	36.9	981	0.01020
7	12.5	49.4	1127	0.01109
8	15.6	65.0	1130	0.01383
9	19.5	84.5	1056	0.01849
10	15.5	100.0	1278	0.01210
Total Vertical Travel Time for 100ft (s)				0.11181
Average Travel Time Weighted Shear Wave Velocity (ft/s)				894

Notes: Yellow Highlighted Cells Indicate Projected Vs

Job No:	24-59-27777
Client:	Haley & Aldrich, Inc.
Project:	Aberdeen MASW
Sounding:	MASW24-03
Date:	06-Jun-2024

VS100 CALCULATION

Layer Number	Layer Thickness (ft)	Layer Bottom (ft)	Vs (ft/s)	Equivalent Vertical Travel Time (s)
1	3.3	3.3	463	0.00705
2	4.1	7.3	616	0.00662
3	5.1	12.5	669	0.00763
4	6.4	18.8	676	0.00944
5	8.0	26.8	1088	0.00733
6	10.0	36.8	1298	0.00768
7	12.5	49.2	1358	0.00917
8	15.6	64.8	1374	0.01134
9	19.5	84.3	1320	0.01474
10	15.7	100.0	1438	0.01094
Total Vertical Travel Time for 100ft (s)				0.09193
Average Travel Time Weighted Shear Wave Velocity (ft/s)				1088

Notes: Yellow Highlighted Cells Indicate Projected Vs

Job No:	24-59-27777
Client:	Haley & Aldrich, Inc.
Project:	Aberdeen MASW
Sounding:	MASW24-04
Date:	06-Jun-2024

VS100 CALCULATION

Layer Number	Layer Thickness (ft)	Layer Bottom (ft)	Vs (ft/s)	Equivalent Vertical Travel Time (s)
1	3.4	3.4	562	0.00600
2	4.2	7.6	777	0.00542
3	5.3	12.8	1059	0.00497
4	6.6	19.4	963	0.00683
5	8.2	27.7	885	0.00930
6	10.3	37.9	1232	0.00835
7	12.9	50.8	1599	0.00804
8	16.1	66.9	1778	0.00904
9	20.1	86.9	1877	0.01070
10	13.1	100.0	2238	0.00583
Total Vertical Travel Time for 100ft (s)				0.07447
Average Travel Time Weighted Shear Wave Velocity (ft/s)				1343

Notes: Yellow Highlighted Cells Indicate Projected Vs

Job No:	24-59-27777
Client:	Haley & Aldrich, Inc.
Project:	Aberdeen MASW
Sounding:	MASW24-06
Date:	07-Jun-2024

VS100 CALCULATION

Layer Number	Layer Thickness (ft)	Layer Bottom (ft)	Vs (ft/s)	Equivalent Vertical Travel Time (s)
1	3.2	3.2	538	0.00597
2	4.0	7.2	452	0.00889
3	5.0	12.3	699	0.00718
4	6.3	18.5	1128	0.00556
5	7.8	26.4	1267	0.00619
6	9.8	36.2	1343	0.00730
7	12.3	48.4	1409	0.00870
8	15.3	63.8	1405	0.01090
9	19.2	82.9	1319	0.01453
10	17.1	100.0	1502	0.01137
Total Vertical Travel Time for 100ft (s)				0.08660
Average Travel Time Weighted Shear Wave Velocity (ft/s)				1155

Notes: Yellow Highlighted Cells Indicate Projected Vs

Job No:	24-59-27777
Client:	Haley & Aldrich, Inc.
Project:	Aberdeen MASW
Sounding:	MASW24-07
Date:	07-Jun-2024

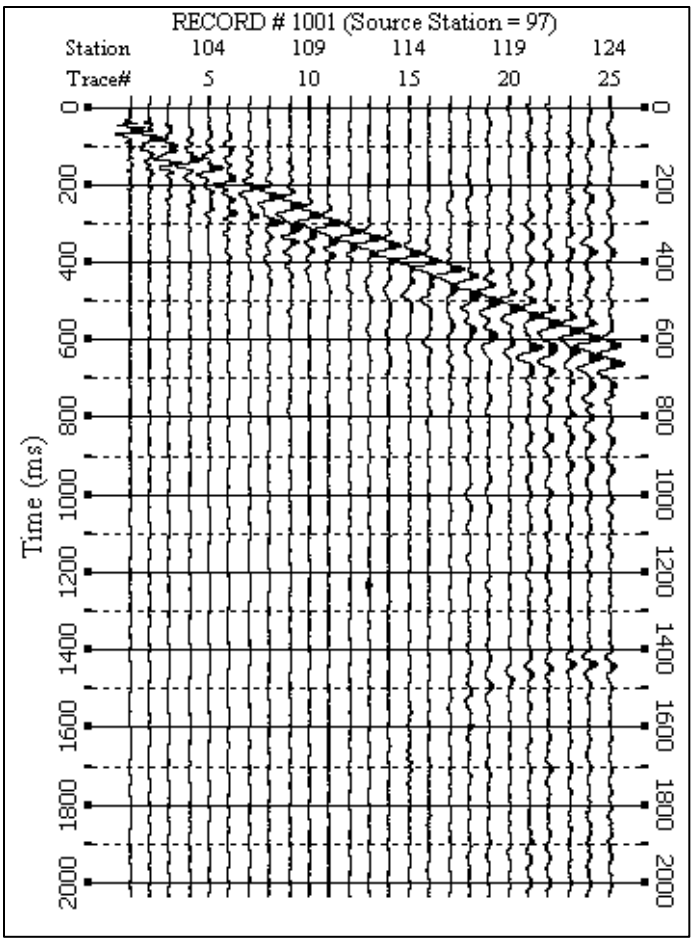
VS100 CALCULATION

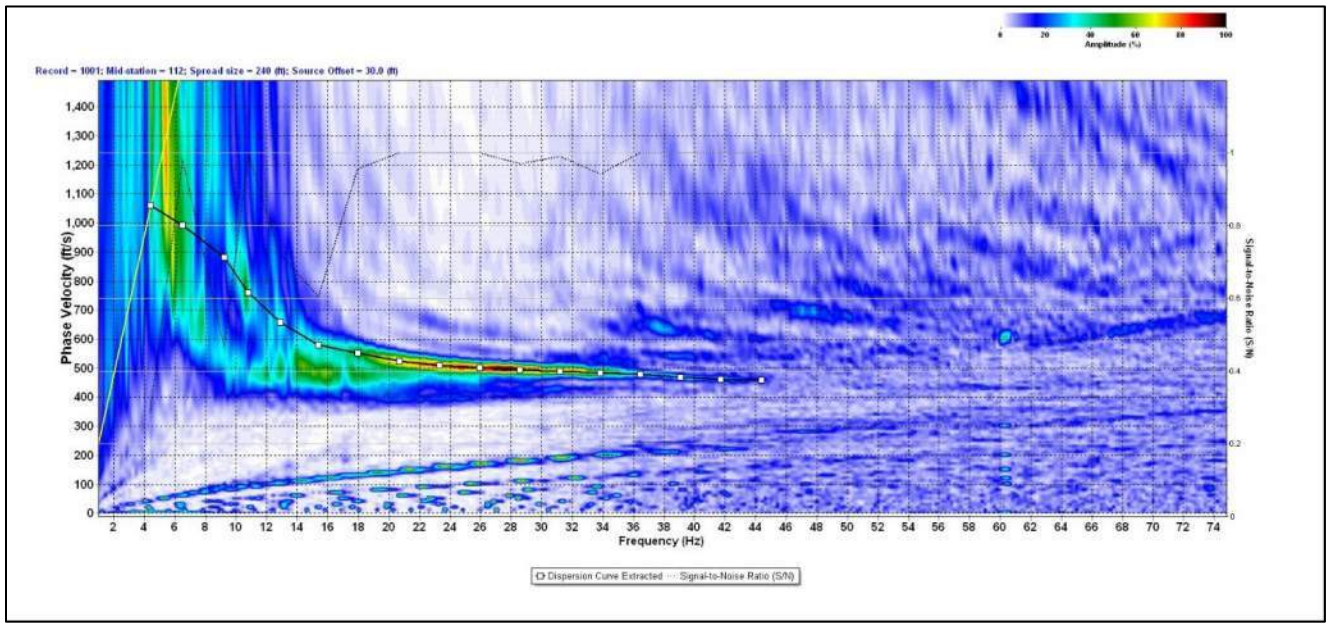
Layer Number	Layer Thickness (ft)	Layer Bottom (ft)	Vs (ft/s)	Equivalent Vertical Travel Time (s)
1	3.3	3.3	502	0.00666
2	4.2	7.5	655	0.00637
3	5.2	12.7	792	0.00659
4	6.5	19.3	1167	0.00559
5	8.2	27.4	1224	0.00667
6	10.2	37.6	1137	0.00897
7	12.7	50.4	1186	0.01075
8	15.9	66.3	1242	0.01282
9	19.9	86.2	1199	0.01660
10	13.8	100.0	1305	0.01057
Total Vertical Travel Time for 100ft (s)				0.09159
Average Travel Time Weighted Shear Wave Velocity (ft/s)				1092

Notes: Yellow Highlighted Cells Indicate Projected Vs

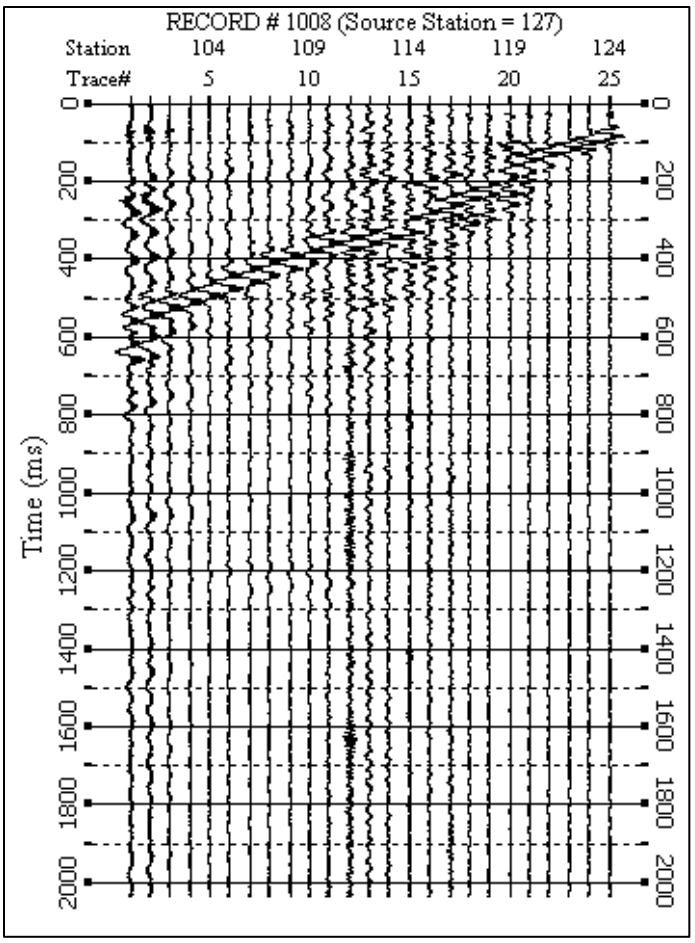
MASW Time Domain Traces and Overtone Images

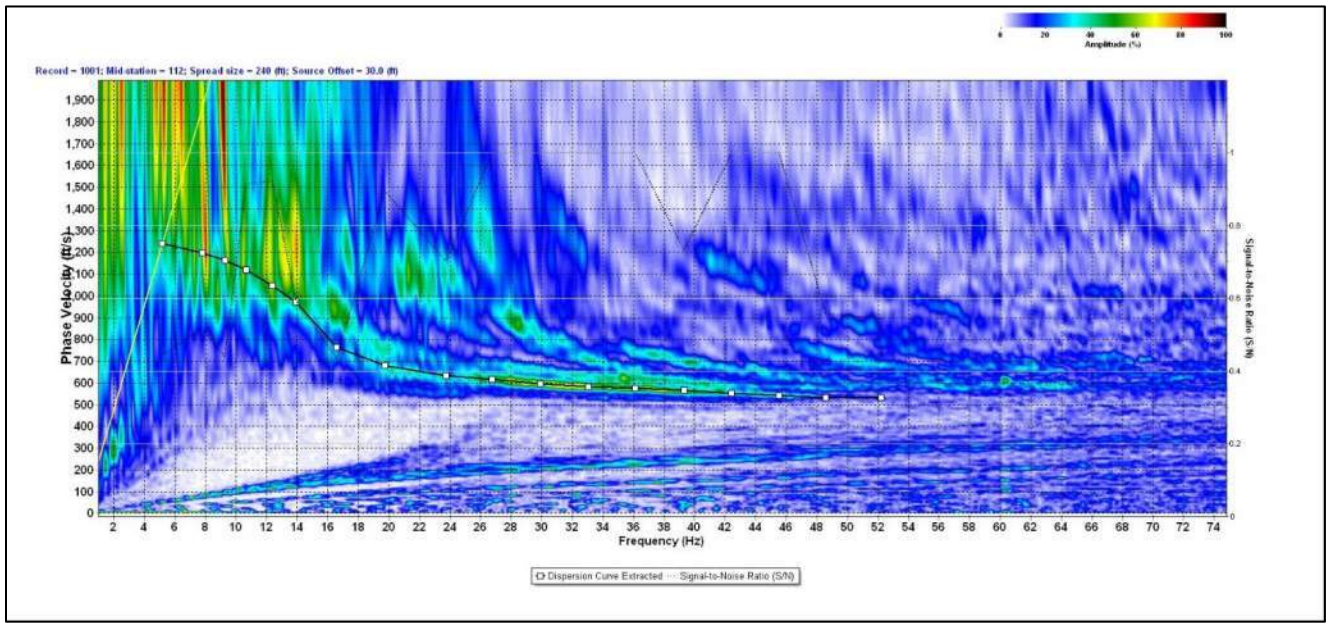
CONETEC



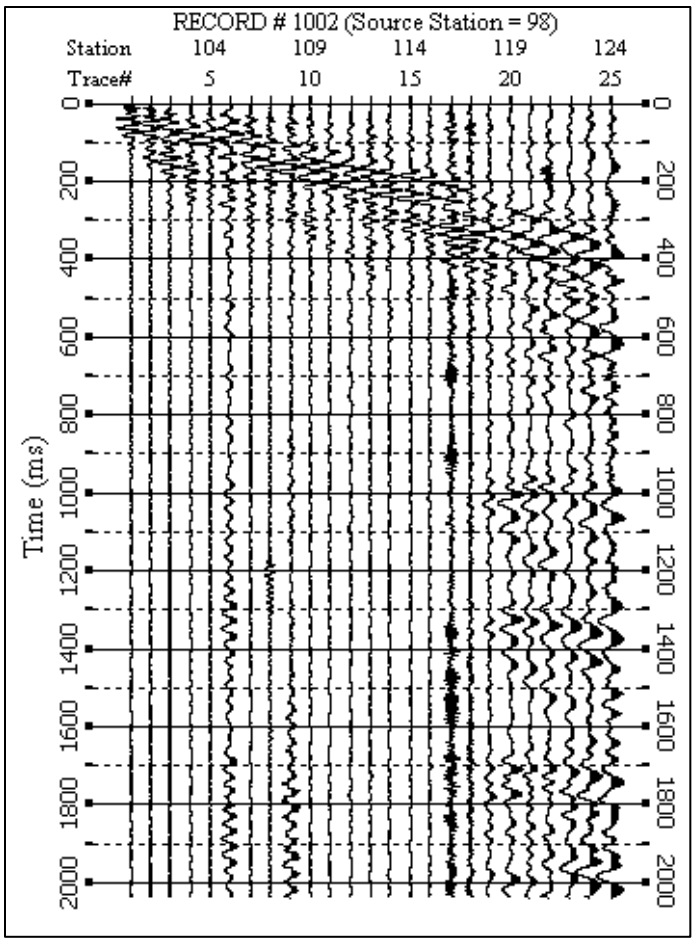


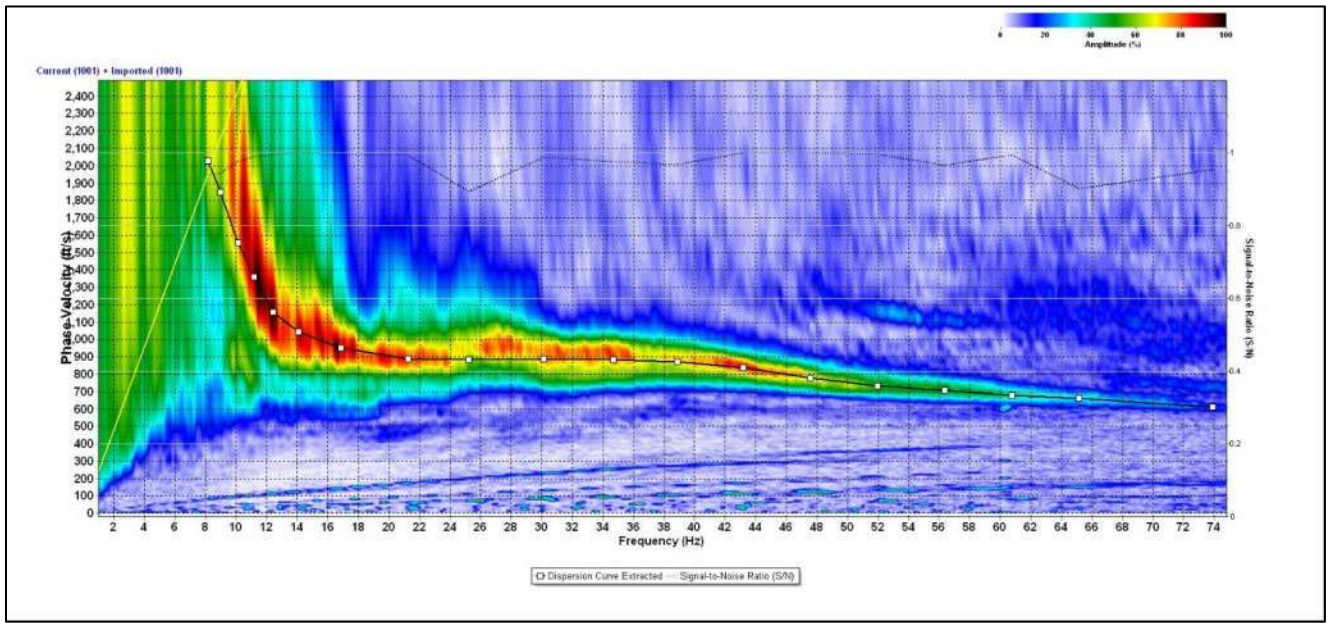
MASW24-02: Example time domain trace (top) and overtone image with picked dispersion curve (bottom).



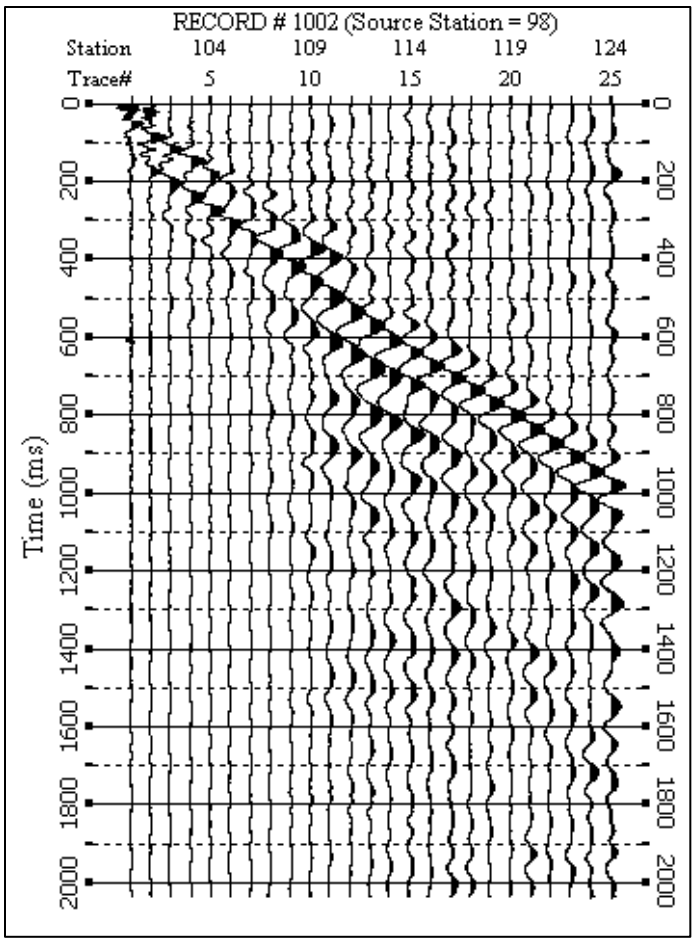


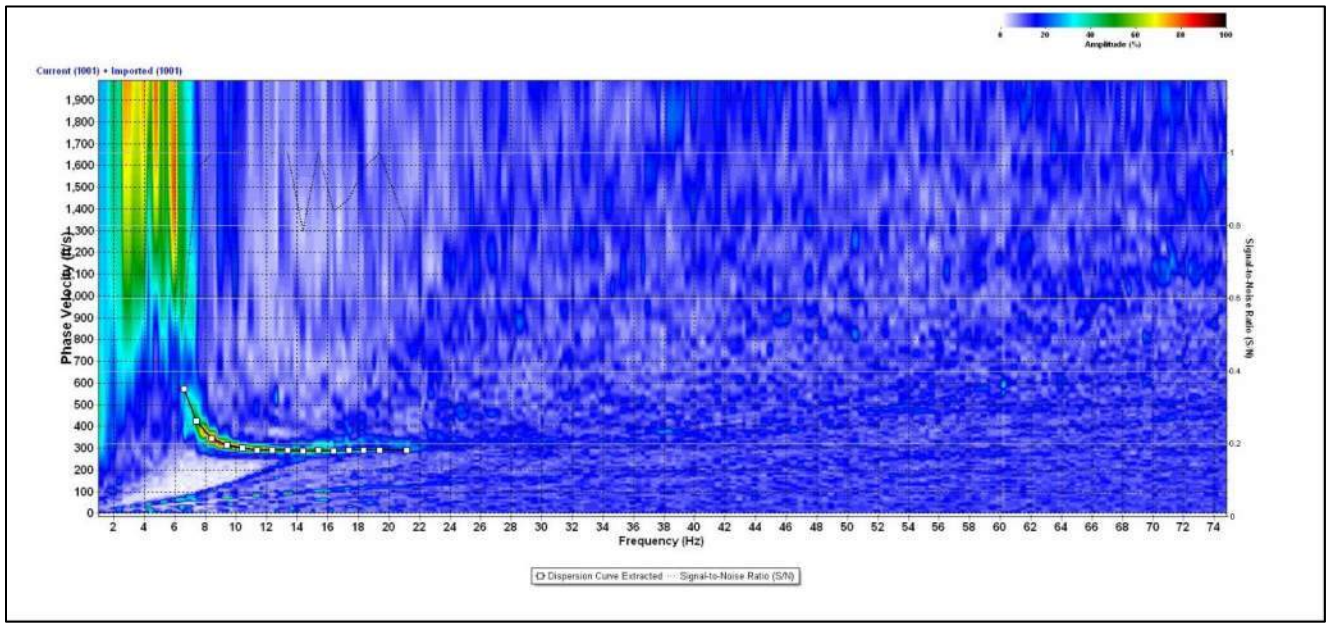
MASW24-03: Example time domain trace (top) and overtone image with picked dispersion curve (bottom).



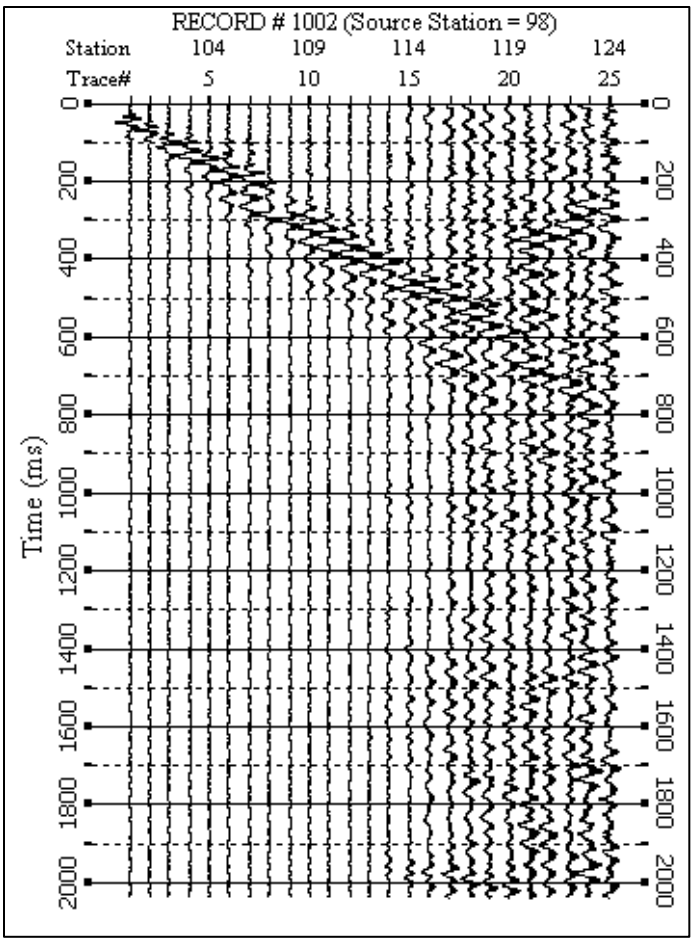


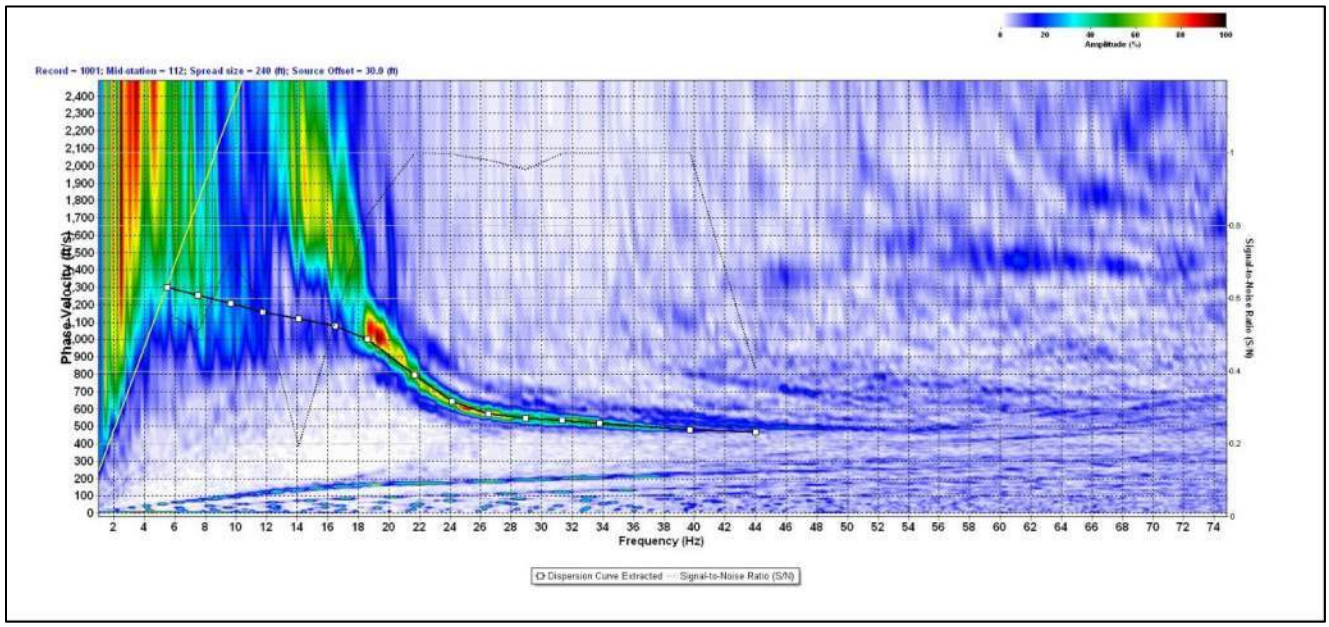
MASW24-04: Example time domain trace (top) and overtone image with picked dispersion curve (bottom).



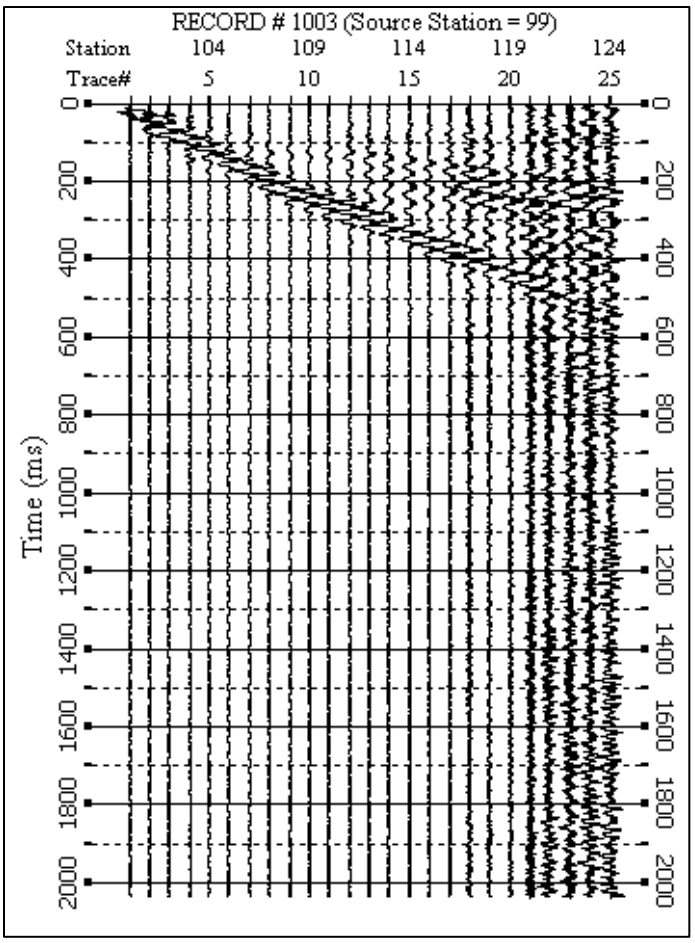


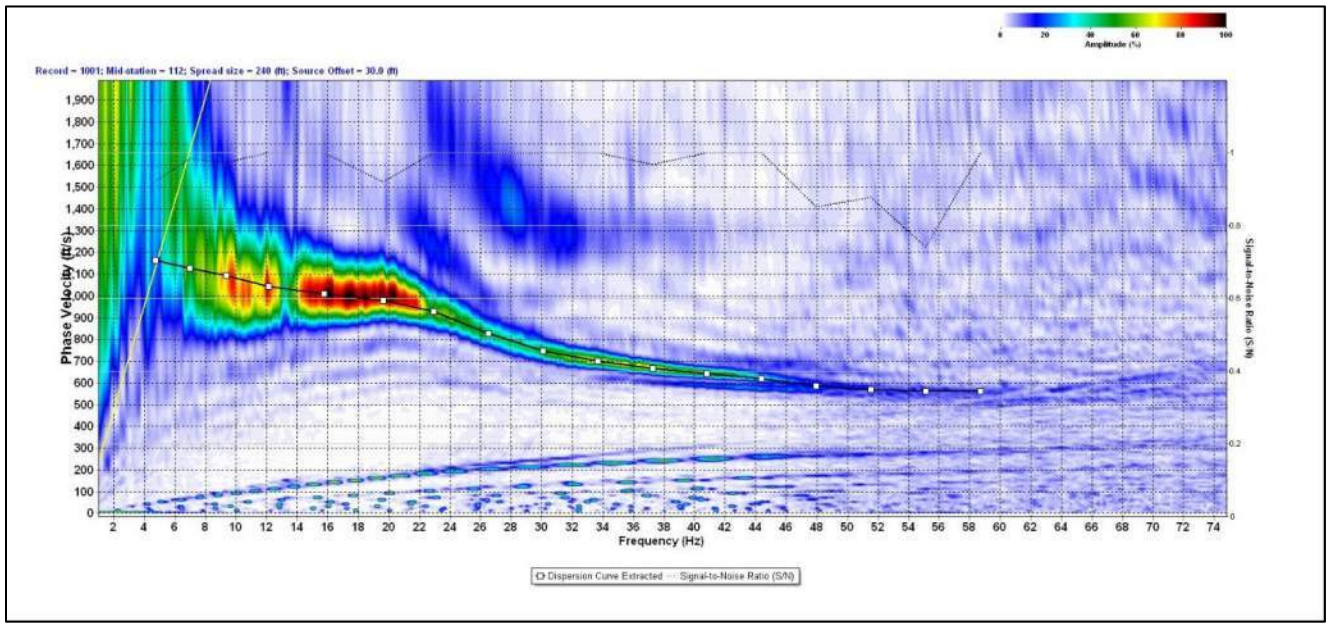
MASW24-05: Example time domain trace (top) and overtone image with picked dispersion curve (bottom).





MASW24-06: Example time domain trace (top) and overtone image with picked dispersion curve (bottom).





MASW24-07: Example time domain trace (top) and overtone image with picked dispersion curve (bottom).

APPENDIX D
Historical Plans

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1. STRUCTURAL NOTES

ANY DISCREPANCY FOUND AMONG THE DRAWINGS, SPECIFICATIONS, THESE NOTES, AND THE SITE CONDITIONS SHALL BE REPORTED TO THE ARCHITECT, WHO SHALL CORRECT SUCH DISCREPANCY IN WRITING. ANY WORK DONE BY THE CONTRACTOR AFTER DISCOVERY OF SUCH DISCREPANCY SHALL BE DONE AT THE CONTRACTOR'S RISK. THE CONTRACTOR SHALL VERIFY AND COORDINATE THE DIMENSIONS AMONG ALL DRAWINGS PRIOR TO PROCEEDING WITH ANY WORK OR FABRICATION. THE CONTRACTOR IS RESPONSIBLE FOR ALL ERECTION BRACING, FORMWORK AND TEMPORARY CONSTRUCTION SHORING.

1.1 BIDDERS WARRANTY

BY THE ACT OF SUBMITTING A BID FOR THE PROPOSED CONTRACT, THE CONTRACTOR WARRANTS THAT:

1.1.1 THE CONTRACTOR AND ALL SUBCONTRACTORS HE INTENDS TO USE HAVE CAREFULLY AND THOROUGHLY REVIEWED THE DRAWINGS AND STRUCTURAL NOTES AND HAVE FOUND THEM COMPLETE AND FREE FROM AMBIGUITIES AND SUFFICIENT FOR THE PURPOSE INTENDED; FURTHER THAT,

1.1.2 THE CONTRACTOR HAS CAREFULLY EXAMINED THE SITE OF THE WORK AND THAT FROM HIS OWN INVESTIGATIONS, HE HAS SATISFIED HIMSELF AS TO THE NATURE AND LOCATION OF THE WORK, AS TO THE CHARACTER, QUALITY, QUANTITIES OF MATERIAL AND DIFFICULTIES TO BE ENCOUNTERED, AS TO THE EXTENT OF EQUIPMENT AND OTHER FACILITIES NEEDED FOR THE PERFORMANCE OF THE WORK AND AS TO THE GENERAL AND LOCAL CONDITIONS, AND OTHER ITEMS WHICH MAY IN ANY WAY AFFECT THE WORK OR ITS PERFORMANCE, FURTHER THAT,

1.1.3 THE CONTRACTOR AND ALL WORKERS HE INTENDS TO USE ARE SKILLED AND EXPERIENCED IN THE TYPE OF CONSTRUCTION REPRESENTED BY THE DRAWINGS AND DOCUMENTS BID UPON; FURTHER THAT,

1.1.4 NEITHER THE CONTRACTOR NOR ANY OF HIS EMPLOYEES, AGENTS, INTENDED SUPPLIERS, OR SUBCONTRACTORS HAVE RELIED UPON ANY VERBAL REPRESENTATIONS ALLEGEDLY AUTHORIZED OR UNAUTHORIZED FROM THE OWNER OR HIS EMPLOYEES OR AGENTS, INCLUDING THE ARCHITECT OR ENGINEERS, IN ASSEMBLING THE BID FIGURES; FURTHER THAT,

1.1.5 THE CONTRACTOR AND ALL SUBCONTRACTORS HE INTENDS TO USE (INCLUDES AGENTS AND SUPPLIERS) ARE AWARE OF AND ACKNOWLEDGE THAT CLOSE COORDINATION AMONG ARCHITECTURAL, MECHANICAL/ELECTRICAL AND STRUCTURAL DRAWINGS ARE REQUIRED FOR THE FOLLOWING:

* DETERMINATION OF ALL COLUMN LOCATIONS AND SIZES.

* DETERMINATION OF TOP OF FLOOR, TOP OF STEEL, WALL PLATE, AND TOP OF BEAM ELEVATIONS.

* VERIFICATION OF ALL DIMENSIONS.

THE CONTRACTOR AND ALL SUB CONTRACTORS HE INTENDS TO USE (INCLUDING HIS AGENTS AND SUPPLIERS) SHALL MAKE CONSIDERATION FOR, AND INCLUDE MONIES FOR THE ABOVE IN THE PREPARATION OF THEIR BIDS. THIS REQUIREMENTS SHALL SUPERSEDE ANY CONTAINED IN THE AISC "MANUAL OF STEEL CONSTRUCTION"; FURTHER THAT,

1.1.6 NEITHER THE CONTRACTOR NOR ANY OF HIS EMPLOYEES, AGENTS, INTENDED SUPPLIERS, OR SUBCONTRACTORS HAVE SCALED THESE DRAWINGS TO OBTAIN REQUIRED DIMENSIONS; FURTHER THAT,

1.1.7 THE BID FIGURE IS BASED SOLELY UPON THE CONSTRUCTION CONTRACT DOCUMENTS AND PROPERLY ISSUED WRITTEN OR VERBAL REPRESENTATIONS.

1.2 CODES

1.2.1 ALL METHODS, MATERIALS AND WORKMANSHIP SHALL CONFORM TO THE 1997 UNIFORM BUILDING CODE (UBC) AS AMENDED AND ADOPTED BY THE LOCAL BUILDING AUTHORITY.

1.2.2 ALL REFERENCES TO OTHER CODES, STANDARDS AND SPECIFICATION, (ACI, ASTM, ETC.), SHALL BE FOR THE LATEST OR MOST CURRENT EDITION AVAILABLE.

1.3 DESIGN CRITERIA

1.3.1 UNIFORM LOADS:

LOCATION	LIVE LOAD	DEAD LOAD
ROOF	25 PSF (SNOW)	ACTUAL
MEZZANINE	50 PSF	ACTUAL
OFFICE LOADS	50 PSF	ACTUAL+ 20 PSF (PART)
CLASSROOM	40 PSF	ACTUAL
CORR. & EXITS	100 PSF	ACTUAL
MECH. ROOM	50 PSF	ACTUAL
SLAB ON GRADE	100 PSF	ACTUAL
LIBRARY	120 PSF	ACTUAL

*THIS IS NOT A GROUND SNOW LOAD, DRIFT AND SLIDING LOADS ARE ADDITIONAL.

1.3.2 CONCENTRATED LOADS:

ALL MANUFACTURERS OF PRE-ENGINEERED COMPONENTS OR SYSTEMS SHALL LOCATE, COORDINATE, VERIFY WEIGHTS, ETC, OF MECHANICAL UNITS OR OTHER CONCENTRATED LOADS AND DESIGN THEIR SYSTEM FOR THESE LOADS.

1.3.4 LATERAL LOADS:

WIND: PER UBC SECTION 1615-1625

BASIC WIND SPEED: 100 MPH

EXPOSURE: B

IMPORTANCE FACTOR: I = 1.0

PARTIALLY ENCLOSED OR UNENCLOSED STRUCTURE.

1.3.5 SEISMIC: PER UBC SECTION 1626-1635

ZONE: 3

OCCUPANCY FACTOR: I = 1.0

SOIL PROFILE TYPE: S_E

DUCTILITY FACTOR (R): R = 5.5 (4.5 AT COVERED PLAY)

AMPLIFICATION FACTOR (C_a) : 2.8

FOR PIPES, CONDUITS, DUCTS AND MECHANICAL EQUIPMENT SUPPORTED OR BRACED FROM STRUCTURE: CONFORM TO SHEET METAL AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION, INC., PUBLICATION "APPENDIX E: SEISMIC RESTRAINT MANUAL GUIDELINES FOR MECHANICAL SYSTEMS." ALL BRACING AND SUPPORTS SHALL BE DESIGNED FOR SEISMIC HAZARD LEVEL (SHL) B. SPRINKLER LINE ATTACHMENTS SHALL CONFORM TO NFPA PAMPHLET 13.

1.4 SOIL DATA

12 AND 14 INCH DIAMETER TIMBER PILES HAVE AN ALLOWABLE VERTICAL CAPACITY OF 25 TONS. 10 INCH DIAMETER AUGER CAST CONCRETE PILES (SI SUBSTITUTE ALT 1) HAVE AN ALLOWABLE VERTICAL CAPACITY OF 20 TONS. ALLOW 33-1/3% INCREASE FOR LOADS FROM WIND OR SEISMIC ORIGIN. TIMBER PILES WILL PROVIDE A LATERAL RESISTANCE TO WIND AND SEISMIC LOADS OF 3.5 TONS PER FIXED PILE TOP DEFLECTION. TIMBER PILES PROVIDE AN ALLOWABLE UPLIFT RESISTANCE OF 0.2 TONS/FOOT OF EMBEDMENT OVER 20 FEET. AUGER CAST CONCRETE PILES (SI SUBSTITUTE ALT 1) PROVIDE A LATERAL CAPACITY OF 10 TONS AND 5 TONS FOR 'FIXED' AND 'FREE-PILE HEAD' CONDITIONS RESPECTIVELY, AND AN ALLOWABLE UPLIFT RESISTANCE OF 0.5 TONS/FOOT AT EMBEDMENT. SEE GEOTECHNICAL ENGINEERING REPORT BY ASSOCIATED EARTH SCIENCES, INC. DATED FEBRUARY 1999, AND AMENDED BY LETTER DATED JANUARY 19, 2001.

1.5 INSPECTION/TESTING REQUIREMENTS

SEE DRAWINGS, SPECIFICATION, AND UBC SECTIONS 108, 1701, 1702, 1703, AND 1704, AS OUTLINED BELOW.

1.5.1 FOUNDATION INSPECTION BY BUILDING OFFICIAL TO BE MADE AFTER EXCAVATIONS ARE COMPLETE AND FORMWORK AND REINFORCEMENT ARE IN PLACE.

1.5.2 CONCRETE SLAB OR UNDER FLOOR INSPECTION BY BUILDING OFFICIAL TO BE MADE AFTER ALL UNDER SLAB ACCESSORIES (INCLUDING REINFORCEMENT) ARE PLACED AND PRIOR TO CONCRETE SLAB POUR.

1.5.3 FRAME INSPECTIONS BY BUILDING OFFICIAL TO BE MADE AFTER ALL FRAMING IS COMPLETE AND ALL PIPES, DUCTS, ELECTRICAL PLUMBING, ETC., ARE INSTALLED AND PRIOR TO COVER.

1.5.4 THE FOLLOWING ITEMS SHALL BE TESTED AND VERIFIED BY A TESTING AGENCY EMPLOYED BY THE BUILDING OWNER IN ACCORDANCE WITH THE UNIFORM BUILDING CODE.

1.5.4.1 CONCRETE STRENGTHS

1.5.4.5 STRUCTURAL WELDING INCLUDING SPECIAL MOMENT RESISTING STEEL FRAMES AND WELDING OF REINFORCING STEEL. VERIFY THAT THE WELDER IS CERTIFIED BY WABO, THAT THE PROPER ELECTRODES IN OVEN-DRY CONDITIONS ARE BEING USED, AND THAT PROPER METHODS AND PREPARATIONS ARE USED.

A. ALL WELDS SHALL BE CHECKED VISUALLY.

B. ALL SHOP AND FIELD WELDING SHALL BE SUBJECT TO INSPECTION BY A WABO REGISTERED WELDING INSPECTOR ENGAGED BY THE OWNER. THE INSPECTOR SHALL UTILIZE X-RAY TEST, ULTRASONIC TESTING, MAGNETIC PARTICLE INSPECTION, AND ANY OTHER AID TO VISUAL INSPECTION THAT MAY BE DEEMED NECESSARY TO ASSURE THE ADEQUACY OF THE WELDING. TESTING AND INTERPRETATION WILL BE CARRIED OUT BY THE OWNER AT ANY STAGE AFTER WELDING.

C. OF ALL FILLET WELDS, 10% SHALL BE CHECKED BY MAGNETIC PARTICLE TESTING.

D. ALL COMPLETE PENETRATION WELDS SHALL BE CHECKED 100% BY RADIOGRAPHIC OR ULTRASONIC TESTING.

E. ALL WELDS FOUND DEFECTIVE AND REPAIRED SHALL BE REINSPECTED BY SAME METHOD ORIGINALLY USED — COST OF REPAIR AND REINSPECTION TO BE BORNE BY CONTRACTOR.

F. STANDARDS FOR ACCEPTANCE SHALL BE AS GIVEN IN AWS D1.1.

1.6 SHOP DRAWINGS

SUBMIT SHOP DRAWINGS TO ARCHITECT/ENGINEER FOR THE FOLLOWING:

1.6.1 REINFORCING STEEL

1.6.2 STRUCTURAL AND MISCELLANEOUS STEEL INCLUDING WELD INSERTS AND ANCHORS

1.6.3 GLUED-LAMINATED/PARALAMS/LSL MEMBERS

1.6.4 PRE-ENGINEERED WOOD/STEEL TRUSSES

1.6.5 PRE-ENGINEERED WOOD I JOISTS

1.6.7 PRECAST CONCRETE PRODUCTS

1.7 MISCELLANEOUS

1.7.1 VERIFY ALL DIMENSIONS AND CONDITIONS IN THE FIELD.

1.7.2 VERIFY SIZE AND LOCATION OF ALL OPENINGS IN THE FLOORS, ROOF AND WALLS WITH ARCHITECTURAL, MECHANICAL AND ELECTRICAL DRAWINGS.

1.7.3 CONSTRUCTION DETAILS NOT SPECIFICALLY SHOWN ON THE DRAWINGS SHALL FOLLOW SIMILAR DETAILS OF SECTIONS OF THIS PROJECT AS APPROVED BY THE ARCHITECT/ENGINEER.

1.7.4 SEE ARCHITECTURAL, MECHANICAL AND ELECTRICAL DRAWINGS FOR DIMENSIONS AND LOCATIONS OF OPENINGS NOT DIMENSIONED OR SHOWN ON STRUCTURAL PLANS.

1.7.5 THE STRUCTURE HAS BEEN DESIGNED TO RESIST CODE REQUIRED VERTICAL AND LATERAL FORCES AFTER THE CONSTRUCTION OF ALL STRUCTURAL ELEMENTS HAS BEEN COMPLETED. STABILITY OF THE STRUCTURE PRIOR TO COMPLETION IS THE SOLE RESPONSIBILITY OF THE GENERAL CONTRACTOR. THIS RESPONSIBILITY INCLUDES BUT IS NOT LIMITED TO JOB SITE SAFETY; ERECTION MEANS, METHODS, AND SEQUENCES; TEMPORARY SHORING, FORMWORK, AND BRACING; USE OF EQUIPMENT AND CONSTRUCTION PROCEDURES. A SHORING PLAN, STAMPED BY A LICENSED STRUCTURAL ENGINEER SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.

SITE WORK

2.1 EXCAVATION

EXCAVATE TO DEPTH SHOWN AND TO FIRM UNDISTURBED MATERIAL. OVER-EXCAVATIONS SHALL BE BACKFILLED WITH LEAN CONCRETE (2,000 PSI) AT THE CONTRACTOR'S EXPENSE. EXERCISE EXTREME CARE DURING EXCAVATION TO AVOID DAMAGE TO BURIED LINES, TANKS, AND OTHER CONCEALED ITEMS. UPON DISCOVERY, DO NOT PROCEED WITH WORK UNTIL RECEIVING WRITTEN INSTRUCTIONS FROM THE ARCHITECT. A COMPETENT REPRESENTATIVE OF THE OWNER SHALL INSPECT ALL FOOTING EXCAVATIONS FOR SUITABILITY OF BEARING SURFACES PRIOR TO PLACEMENT OF REINFORCING STEEL. PROVIDE DRAINAGE AS NECESSARY TO AVOID WATER-SOFTENED SUBGRADE.

2.2 FILL, BACKFILL AND COMPACTION

BACKFILL AGAINST WALLS SHALL NOT BE PLACED UNTIL AFTER THE REMOVAL OF ALL MATERIAL SUBJECT TO ROT OR CORROSION. ALL FILL PLACED AGAINST RETAINING WALLS OR BASEMENT WALLS SHALL BE FREE DRAINING GRANULAR MATERIAL. STRUCTURAL FILL OTHER THAN PEA GRAVEL SHALL BE GRANULAR PLACED IN 6-INCH LIFTS AND COMPACTED TO AT LEAST 95% OF ITS MAXIMUM DRY DENSITY AS DETERMINED BY ASTM D-1557 (MOD PROCTOR) AND ASTM D-698 (STANDARD PROCTOR) OR AS DIRECTED BY SOILS REPORT OF GEOTECH ENGINEER. PEA GRAVEL FILL SHALL HAVE A MAXIMUM PARTICLE SIZE OF 3/8" DIAMETER.

STRUCTURAL CONCRETE

3.1 GENERAL

ALL CONCRETE SHALL BE HARD ROCK CONCRETE MEETING THE REQUIREMENTS OF ACI-301, "SPECIFICATIONS FOR STRUCTURAL CONCRETE FOR BUILDINGS." PROPORTIONING OF INGREDIENTS FOR EACH CONCRETE MIX SHALL BE METHOD 2 OR THE ALTERNATE PROCEDURE GIVEN IN ACI-301. PLACE CONCRETE PER ACI-304 AND CONFORM TO ACI-604 (306) FOR WINTER CONCRETING AND ACI-605 (305) FOR HOT WEATHER CONCRETING. USE INTERIOR MECHANICAL VIBRATORS WITH 7,000 RPM MINIMUM FREQUENCY. DO NOT OVER-VIBRATE. CONCRETE SHALL BE PLACED MONOLITHICALLY BETWEEN CONSTRUCTION OR CONTROL JOINTS. PROTECT ALL CONCRETE FROM PREMATURE DRYING, EXCESSIVE HOT OR COLD TEMPERATURE FOR SEVEN DAYS AFTER PLACING.

3.2 STRENGTH

TWENTY-EIGHT DAY COMPRESSIVE STRENGTHS SHALL BE:

	PSI
SLABS	4000
COLUMNS,* VERTICALLY FORMED WALLS	4000
FOOTINGS / GRADE BEAMS AND PILE CAP	3000
AUGER CAST PILES	4000
STRUCTURAL TOPPING SLABS	4000

* CONTRACTOR TO SUBMIT MIX DESIGN FOR CONCRETE COLUMNS USING 1/4" MAXIMUM SIZE AGGREGATE.

CONCRETE SUPPLIER TO PROVIDE TEST RECORDS PER SECTION 5.3 OF ACI 318.

WHEN NO PRIOR EXPERIENCE OR TRIAL MIXTURE DATA ARE AVAILABLE, ONE WATER/CEMENT RATIO FROM THE TABLE BELOW MAY BE USED, BUT ONLY WHEN SPECIAL PERMISSION IS GIVEN BY ENGINEER.

MAXIMUM ABSOLUTE WATER-CEMENT RATIO BY WEIGHT

SPECIFIED COMPRESSIVE STRENGTH	NON-AIR ENTRAINED CONCRETE	AIR-ENTRAINED CONCRETE
3000	0.58	0.46
4000	0.44	0.35

THESE MAXIMUMS MAY BE EXCEEDED IF TEST RECORDS PER SECTION 5.3 OF ACI 318 (BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE) ARE SUBMITTED TO AND APPROVED BY THE ENGINEER.

3.3 MATERIALS

3.3.1 CEMENT: ASTM C150, TYPE I OR TYPE II. ENGINEER'S APPROVAL IS NEEDED FOR USE OF TYPE III CEMENT.

3.3.2 COARSE AND FINE AGGREGATE: ASTM C33.

3.3.3 WATER SHALL BE CLEAN AND POTABLE.

3.4 WATER REDUCING ADMIXTURES

3.4.1 WATER REDUCING ADMIXTURE: ASTM C494. ADMIXTURES SHALL BE USED IN EXACT ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.

3.4.2 SYNERGIZED PERFORMANCE SYSTEMS: CONCRETE USING ADMIXTURES TO PRODUCE FLOWABLE CONCRETE MAY BE USED SUBJECT TO ENGINEER'S APPROVAL.

3.4.3 AIR ENTRAINMENT: ASTM C260 AND ASTM C494 ENTRAIN 5% PLUS/MINUS 1.5% BY VOLUME IN ALL EXPOSED CONCRETE

3.4.4 NO OTHER ADMIXTURES PERMITTED UNLESS APPROVED BY THE ENGINEER.

3.5. FIBROUS CONCRETE REINFORCEMENT

FIBROUS REINFORCEMENT SHALL BE 100 % VIRGIN POLYPROPYLENE, FIBRILLATED FIBERS CONTAINING NO REPROCESSED OLEFIN MATERIALS AND SPECIFICALLY MANUFACTURED FOR USE AS CONCRETE SECONDARY REINFORCEMENT. VOLUME PER CUBIC YARD SHALL EQUAL A MINIMUM OF 0.1% (1.5 POUNDS). FIBERS ARE FOR THE CONTROL OF CRACKING DUE TO DRYING SHRINKAGE AND THERMAL EXPANSION/CONTRACTION, REDUCTION OF PERMEABILITY, INCREASED IMPACT CAPACITY, SHATTER RESISTANCE, ABRASION RESISTANCE, AND ADDED TOUGHNESS. FIBER MANUFACTURER MUST DOCUMENT EVIDENCE OF 5 YEAR SATISFACTORY PERFORMANCE HISTORY, COMPLIANCE WITH APPLICABLE BUILDING CODES AND ASTM C-1116 TYPE III 4.1.3 AND ASTM C-1116 PERFORMANCE LEVEL I OUTLINED INSECTION 21 NOTE 17. FIBROUS CONCRETE REINFORCEMENT SHALL BE MANUFACTURED BY FIBERMESH COMPANY, 4019 INDUSTRY DRIVE, CHATTANOOGA, TENNESSEE, USA, 37416 OR EQUAL.

3.9 FORMWORK AND SHORING

3.9.1 FOLLOW RECOMMENDED PRACTICE FOR CONCRETE FORMWORK (ACI-347).

3.9.2 RESHORING FOR EARLY REMOVAL OF ORIGINAL SUPPORTS WILL NOT BE PERMITTED.

3.9.3 WHILE RESHORING OPERATIONS ARE UNDERWAY, NO CONSTRUCTION LOADS WILL BE PERMITTED ON THE NEW CONSTRUCTION.

3.9.4 ALL SHORING SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR. CONTRACTORS ARE SHORING SHALL BE DESIGNED TO PROVIDE FINISHED CONCRETE SURFACES AT ALL FACES LEVEL, PLUMB, AND TRUE TO THE DIMENSIONS AND ELEVATIONS SHOWN. TOLERANCES AND VARIATIONS SHALL BE AS SPECIFIED.

3.10 REINFORCING STEEL

DETAIL, FABRICATE, AND PLACE PER ACI-315 AND ACI-318. SUPPORT REINFORCEMENT WITH APPROVED CHAIRS, SPACERS, OR TIES.

3.10.1 DEFORMED BAR REINFORCEMENT: ASTM A-615-GR 60

3.10.2 WELDABLE DEFORMED BAR REINFORCEMENT: ASTM A706 GR 60 OR ASTM A615 GR 40

3.10.3 WELDED WIRE FABRIC: ASTM A-185 & ASTM A-82 Fy=65 KSI

3.10.4 DEFORMED BAR ANCHORS: ASTM A-496

3.10.5 PRE-STRESSED TENDONS: SEE SECTION 3.6.1 FOR REQUIREMENTS.

3.10.6 EXCEPT AS NOTED SPECIFICALLY ON THE DRAWINGS, ALL REINFORCEMENT SHALL BE LAP-SPLICED AS FOLLOWS:

#5 AND SMALLER	48 X BAR DIAMETER
#7 AND LARGER	56 X BAR DIAMETER

NO MORE THAN 50% OF HORIZONTAL OR VERTICAL BARS SHALL BE SPLICED AT ONE LOCATION

3.10.7 EXCEPT AS NOTED SPECIFICALLY ON THE DRAWINGS, PROVIDE CORNER BARS TO MATCH DIAMETER AND LAP HORIZONTAL REINFORCEMENT AS FOLLOWS:

#5 AND SMALLER	48 X BAR DIAMETER
#7 AND LARGER	56 X BAR DIAMETER

THESE CORNER BARS SHALL BE PLACED AT ALL CORNERS AND INTERSECTIONS IN FOOTINGS AND WALLS.

3.10.8 LAP WELDED FABRIC 12" OR ONE SPACING PLUS 2", WHICHEVER IS MORE.

3.11 CONCRETE COVER ON REINFORCING (UNLESS SHOWN OTHERWISE)

3.11.1 BOTTOM OF FOOTINGS 3"

3.11.2 FORMED EARTH FACE AND SLAB ON GRADE 2"

3.11.3 WALLS, WEATHER FACE 1-1/2"

3.11.4 COLUMNS AND BEAMS TO STIRRUPS 1-1/2"

3.11.5 BOTTOM OF INTERIOR SLAB 3/4"

3.11.6 WALLS, INSIDE FACE 1"

3.12 CONSTRUCTION JOINTS

3.12.1 CONSTRUCTION JOINT SPACING IN WALLS SHALL NOT EXCEED 50' ON CENTER EXCEPT AS DIRECTED BY THE ARCHITECT/ENGINEER.

3.12.2 HORIZONTAL CONSTRUCTION JOINTS IN BEAMS AND GIRDERS ARE NOT PERMITTED EXCEPT WHERE INDICATED. VERTICAL CONSTRUCTION JOINTS IN BEAMS AND SLABS SHALL BE LOCATED BETWEEN THE MIDPOINT AND THE THIRD POINT OF THE SPAN.
UNLESS NOTED OTHERWISE, LOCATION OF THE CONSTRUCTION OR CONTROL JOINTS IN SLAB ON GRADE SHALL BE ON COLUMN GRIDS OR ON GRADE BEAMS AS SHOWN ON PLAN AND SHALL NOT EXCEED 15'-0" C/C EACH WAY.

3.12.3 NO JOISTS, BEAMS OR GIRDERS SHALL BE SLEEVED FOR PIPING OR CONDUIT EXCEPT AS NOTED ON THE STRUCTURAL DRAWINGS OR AS APPROVED BY THE ARCHITECT/ENGINEER.

3.12.4 ELECTRICAL CONDUIT IN SLABS, SHALL BE PLACED AT THE MID-DEPTH OF THE SLAB AT A MINIMUM SPACING OF THREE TIMES THE CONDUIT DIAMETER. CONDUIT OUTSIDE DIAMETER SHALL NOT EXCEED ONE-THIRD OF THE SLAB THICKNESS. ELECTRICAL CONDUIT SHALL NOT BE PLACED WITHIN A SLAB ON GRADE, BUT PLACED BELOW THE SLAB IN THE SUB-BASE.

3.13 GROUT FOR BEARING PLATE

GROUT FOR BEARING PLATES AND EQUIPMENT UP TO 25 HP:

THE GROUT SHALL BE MASTERFLOW 928 BY MASTER BUILDERS TECHNOLOGIES, OR EQUIVALENT, AND A PRE-PACKAGED NATURAL AGGREGATE GROUT, MIXED PLACED, AND CURED AS RECOMMENDED BY THE MANUFACTURER. THE MANUFACTURER'S WARRANTY SHALL NOT CONTAIN A DISCLAIMER OR LIMIT THE RESPONSIBILITY TO ONLY REPLACEMENT OF PRODUCT OR PURCHASE PRICE. GROUT SHALL CONFORM TO CRD-C621-89 AND ASTM 1107-89A GRADE B WHEN TESTED AT A FLUID CONSISTENCY (20 DROPS NO SHAKING) PER CRD-C611-85 FOR 30 MINUTES, AT 45°F, 70°F AND 90°F. GROUT MANUFACTURER SHALL CERTIFY WITH INDEPENDENT TEST DATA THAT THE EXPANSION AT 3 OR 14 DAYS DOES NOT EXCEED THE 28 DAY EXPANSION AND THAT ITS NON SHRINK PROPERTY IS NOT BASED ON GAS EXPANSION. FLUID GROUT SHALL PASS THROUGH THE FLOW CONE 1 HOUR AFTER BATCHING AT A 60 SECOND FLOW MAXIMUM, AND HAVE A MINIMUM STRENGTH OF 2,500 PSI AT 1 DAY, 4,500 PSI AT 3 DAYS AND 7,000 PSI AT 28 DAYS. THE CONTRACTOR SHALL PAY AN INDEPENDENT TESTING LABORATORY TO RUN A 24 HOUR EVALUATION OF ANY GROUT SUBMITTED FOR APPROVAL. THE CONTRACTOR SHALL RECEIVE APPROVAL FROM THE ENGINEER BEFORE USING THE GROUT.

3.14 ARCHITECTURAL PRECAST CONCRETE

3.14.1 CONSTRUCTION TOLERANCES, TRANSPORTATION, STORAGE AND ERECTION SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS.

3.14.2 PROVIDE SHOP DRAWINGS AND COMPLETE DESIGN CALCULATIONS SEALED BY A STRUCTURAL ENGINEER LICENSED IN THE STATE OF THE PROJECT. SPECIAL ATTENTION SHALL BE GIVEN TO UBC SECTION 1633.2.4.2, EXTERIOR ELEMENTS.

3.14.3 ADDITIONAL REINFORCING AND INSERTS REQUIRED FOR HANDLING, ERECTION, AND TEMPORARY BRACING SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.

3.14.4 ANY PANELS THAT RECEIVE DAMAGE OR CRACKS DURING THE INSTALLATION PROCESS SHALL BE REPLACED OR REPAIRED. ACCEPTABILITY OF PRECAST ELEMENTS SHALL BE IN ACCORDANCE WITH ACI-533-1R.

3.18 AUGER CAST PILES (SI SUBSTITUTE ALT 1)

3.18.1 GENERAL

THIS SECTION COVERS THE FURNISHING AND INSTALLATION OF A PILE FOUNDATION SYSTEM CONSISTING OF AUGER CAST CONCRETE PILES AT THE LOCATIONS AND TO THE ELEVATIONS SHOWN ON THE PLANS.

TERMS USED IN THIS SECTION ARE DEFINED AS FOLLOWS:

3.18.1.1 AUGER CAST CONCRETE PILES SHALL BE A MINIMUM OF 16" IN DIAMETER OR AS NOTED ON PLANS. THEY ARE CAST IN PLACE CONCRETE OR GROUT PILES INSTALLED BY USING A CONTINUOUS FLIGHT HOLLOW STEM AUGER AND A TWO STROKE GROUT PUMP. CONCRETE GROUT IS PUMPED, UNDER PRESSURE, THROUGH THE AUGER STEM AS THE AUGER IS SLOWLY WITHDRAWN AT A CONSTANT RATE FROM THE HOLE.

3.18.1.2 CONCRETE OR GROUT SHALL BE ORDINARY OR RAPID HARDENING PORTLAND CEMENT HAVING A MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS OF 4,000 PSI. THE USE OF CEMENTS OTHER THAN THESE SHALL COMPLY WITH RELEVANT STANDARDS AND BE TO THE APPROVAL OF THE ENGINEER.

3.18.1.3 GROUT MIX SHALL BE MADE WITH CLEAN WATER FREE OF ACIDS OR OTHER IMPURITIES, SHALL BE READILY PUMPABLE AND CEMENT CONTENT SHALL BE NOT LESS THAN 0.5 OF THE TOTAL AGGREGATE WEIGHT PER UNIT VOLUME UNLESS OTHERWISE APPROVED.

3.18.1.4 REINFORCING FOR ALL AUGER CAST PILES SHALL BE A REINFORCING CAGE OF REBAR, AS NOTED ON DRAWINGS, PLACED IN THE PILE HOLE. THIS REINFORCING CAGE MUST BE HAND PLACED IMMEDIATELY AFTER AUGER WITHDRAWAL AND GROUT PLACEMENT.

3.18.2 CONTRACTOR'S RESPONSIBILITY

ALL PILING SHALL BE FURNISHED AND INSTALLED BY A CONTRACTOR EXPERIENCED IN SIMILAR WORK AND QUALIFIED TO INSTALL PILES IN ACCORDANCE WITH THE PLANS AND SPECIFICATIONS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ALL NECESSARY LABOR, SUPERVISION, MATERIALS, TOOLS AND EQUIPMENT TO LOCATE, INSTALL, AND CUT OFF OR BUILD UP PILES IN ACCORDANCE WITH THE PLANS AND SPECIFICATIONS. HE SHALL ALSO BE RESPONSIBLE FOR USING ALL AVAILABLE DATA, INCLUDING BUT NOT LIMITED TO, THE PROJECT GEOTECHNICAL REPORT, THE PLANS, AND SPECIFICATIONS.

THE CONTRACTOR SHALL ALSO BE RESPONSIBLE FOR INSTALLING THE PILES, FOR PROVIDING EQUIPMENT AND PILING MATERIALS THAT ANTICIPATE VARIATIONS IN THE STRENGTH OF THE SUBSURFACE SOILS THAT COULD REASONABLY BE EXPECTED BASED ON ALL THE INFORMATION AVAILABLE. HE SHALL ALSO BE RESPONSIBLE FOR INSTALLING DRILLED IN-PLACE PILES OF THE SIZE AND TO THE ELEVATIONS SHOWN ON THE PROJECT PLANS.

3.18.3 QUALITY CONTROL AND MONITORING OF INSTALLATION

THE CONTRACTOR'S WORK SHALL BE PERFORMED UNDER THE FULL-TIME OBSERVATION OF THE GEOTECHNICAL ENGINEER WHO WILL BE PRESENT DURING THE DRILLING OPERATIONS TO OBSERVE THE WORK AND CORRELATE DRILLING BEHAVIOR WITH SUBSURFACE DATA.

THE GEOTECHNICAL ENGINEER SHALL AT ALL TIMES HAVE ACCESS TO THE WORK, AND THE CONTRACTOR SHALL FURNISH THE GEOTECHNICAL ENGINEER WITH EVERY REASONABLE FACILITY FOR THE PROPER PERFORMANCE OF HIS DUTIES AND FOR CONFORMANCE WITH THE GEOTECHNICAL ASPECTS OF THE PLANS AND SPECIFICATIONS.

FOR DRILLED IN-PLACE AUGER CAST CONCRETE PILES, THE CONTRACTOR SHALL BE RESPONSIBLE FOR MARKING THE LEADS IN ONE INCREMENTS, BEGINNING AT THE TOP OF THE LEADS, AND SHALL USE ENLARGED NUMERALS TO INDICATE THE DEPTH OF PENETRATION AT FIVE-FOOT INTERVALS. THE MARKINGS SHALL BE SUCH THAT THEY ARE NOT OBLITERATED OR MADE UNREADABLE DURING DRILLING.

THE GEOTECHNICAL ENGINEER WILL KEEP A COMPLETE WRITTEN RECORD OF EACH PILE DRILLED, NOTING THE DATE, TIME, TYPE, LOCATIONS, DIAMETER, SIZE, VERTICALITY, DRILLING RATE. THE RECORD SHALL ALSO REFLECT ANY WORK STOPPAGES DURING DRILLING, AND DETAILS OF THE ANCILLARY EQUIPMENT BEING USED. HE SHALL ALSO RECORD HOLE VOLUMES, GROUT PUMP PRESSURES, NUMBER OF PUMP STROKES, AND CONCRETE VOLUMES PUMPED. COPIES OF THESE RECORDS SHALL BE PROVIDED TO THE STRUCTURAL ENGINEER AND THE CONTRACTOR.

THE CONTRACTOR SHALL BE RESPONSIBLE FOR NOTIFYING THE GEOTECHNICAL ENGINEER AT LEAST 48 HOURS IN ADVANCE OF STARTING OR RESTARTING ANY PILE DRILLING WORK; HE SHALL NOT PROCEED WITH THE WORK UNLESS THE GEOTECHNICAL ENGINEER IS PRESENT ON THE SITE.

3.18.4 SUBMITTALS

THE CONTRACTOR SHALL SUBMIT THE FOLLOWING INFORMATION BEFORE BEGINNING WORK ON THE SITE:

3.18.4.1 BEFORE ANY CONCRETE IS PLACED IN AUGER CAST PILES, THE CONTRACTOR SHALL FURNISH FOR APPROVAL A CONCRETE MIX DESIGN FOR EACH TYPE OF CONCRETE TO BE USED AND A CURVE INDICATING FLOW RATE PER STROKE FOR THE GROUT PIPE.

3.18.4.2 LIST OF EQUIPMENT INTENDED TO BE UTILIZED IN AUGERING, LEAD LENGTHS, AND CRANE CAPACITIES.

3.18.5 AUGERING EQUIPMENT

AUGERING EQUIPMENT SHALL HAVE A MOTOR OF SUFFICIENT SIZE AND POWER TO AUGER THROUGH ANTICIPATED SUBSURFACE STRATA.

3.18.5.1 LEADS: DURING AUGERING OPERATIONS, THE HOLLOW STEM AUGER SHALL BE HELD FIRMLY IN PROPER ALIGNMENT BY FIXED LEADS. FOR AUGER CAST PILES, THE LEADS AND AUGER MUST BE LONG ENOUGH TO AUGER THE PILE HOLE IN ONE CONTINUOUS MOTION TO THE DESIGN DEPTH.
UNLESS NOTED OTHERWISE, LOCATION OF THE CONSTRUCTION OR CONTROL JOINTS IN SLAB ON GRADE SHALL BE ON COLUMN GRIDS OR ON GRADE BEAMS AS SHOWN ON PLAN AND SHALL NOT EXCEED 15'-0" C/C EACH WAY.

3.18.5.2 GROUT PUMP: FOR AUGER CAST PILES, THE GROUT PUMP SHALL BE OF SUFFICIENT SIZE TO CONTINUOUSLY PUMP GROUT AT SUFFICIENT PRESSURE AND VOLUME TO PREVENT THE HOLE FROM SLOUGHING OR HEAVING AS THE AUGER IS WITHDRAWN.

3.18.6 PILE INSTALLATION

3.18.6.1 PILE PENERATION: THE TOP OF

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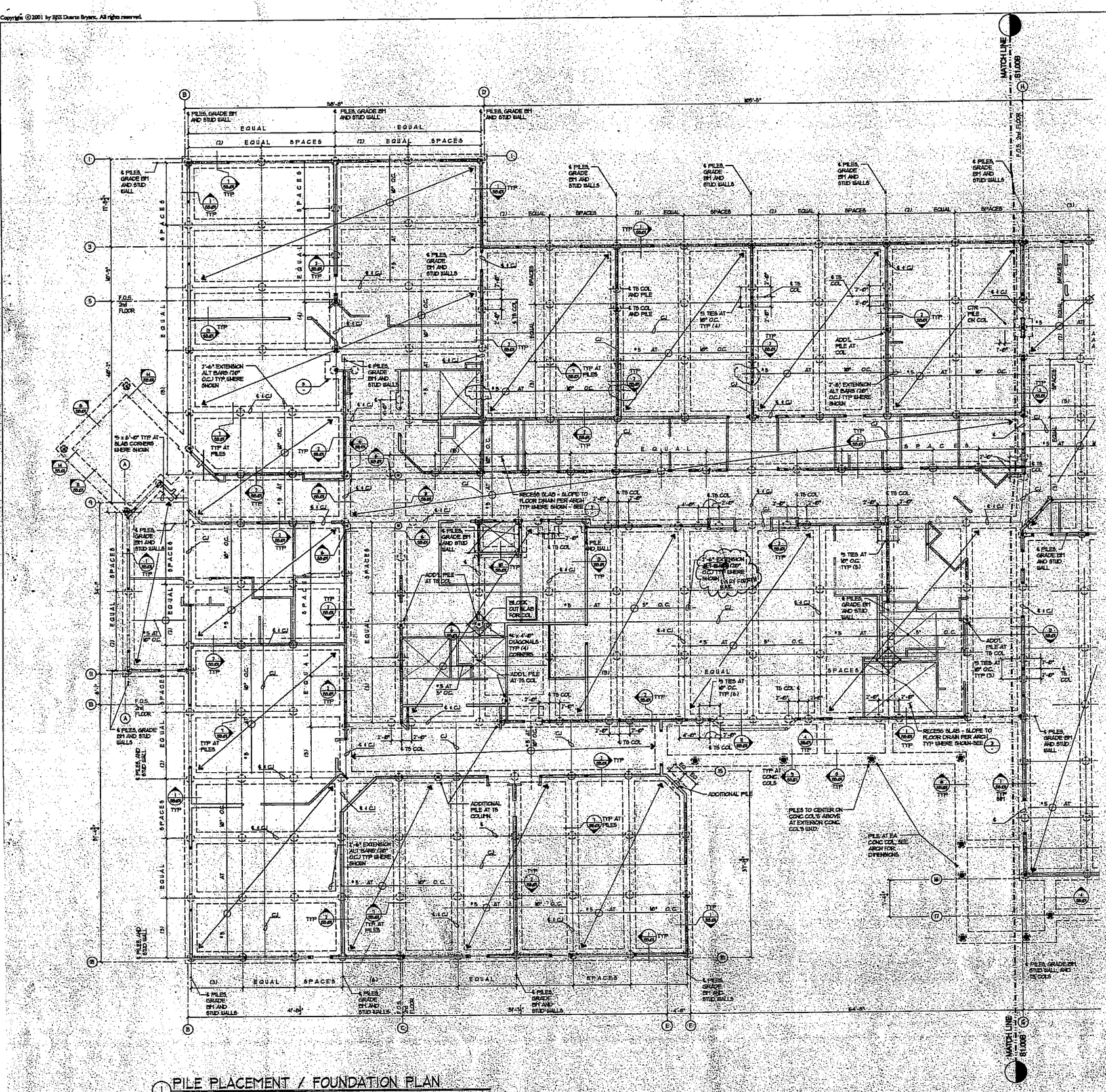
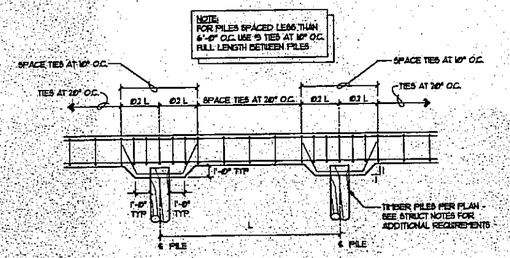
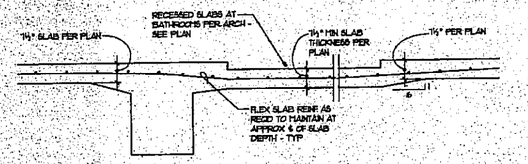


1 PILE PLACEMENT / FOUNDATION PLAN
SCALE: 1/8" = 1'-0"

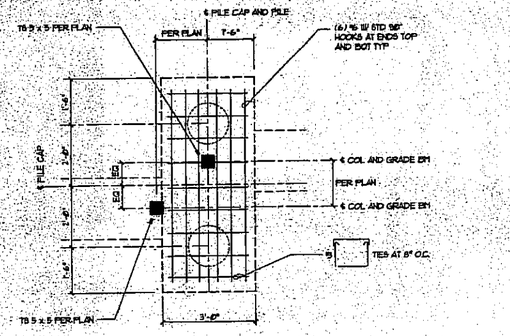


TYPICAL GRADE BEAM STIRRUP LAYOUT WHERE PILES SPACED GREATER THAN 6'-0"

SECTION 2
3" = 1'-0"



SECTION 3
3" = 1'-0"

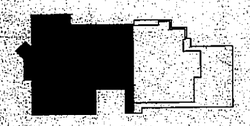


PC-1 2'-6" THICK PILE CAP

PLAN 4
3/4" = 1'-0"

PILE/FOUNDATION NOTES:

1) ALL SLABS TO BE 12½" THICK U.N.O. FINISHED FLOOR = 0'-0" FOR REFERENCE
2) SLAB REINFORCEMENT CALLED OUT ON THIS PLAN IS FLEXURAL REINFORCEMENT REQUIRED FOR THE SLAB TO SPAN BETWEEN GRADE BEAM SUPPORTS.
3) UNLESS OTHERWISE NOTED, PROVIDE #5 AT 18" O.C. PERPENDICULAR TO FLEXURAL REINFORCEMENT CALLED OUT ON PLAN.
4) LOCATE FLEXURAL REINFORCEMENT AT ¼ SLAB. LOCATE TRANSVERSE REINFORCEMENT OVER FLEXURAL REINFORCEMENT. STAGGER SPLICE LOCATIONS.
5) ⓒ DESIGNATES CONSTRUCTION OR CONTROL JOINTS PER 1/S1.00 AND 6/A2.00
6) (6"ø) INDICATES PILE LOCATION. PROVIDE TIMBER PILES PER GEOTECHNICAL REPORT AND STRUCTURAL NOTES, SECTION 5.5. PROVIDE 8IN. AUGERCAST CONC PILES PER GEOTECHNICAL REPORT AND SECTION 5.5.2.2.2 FOR ALTERNATE BID #1 ON A ONE-FOR-ONE SUBSTITUTION FOR TIMBER PILES AT THE LOCATIONS SHOWN ON THIS PLAN.
7) SEE SHEET "S0.01" FOR ADDITIONAL FOUNDATION WALL BRACING NOTES AND WALL SCHEDULE



KEY PLAN
SCALE: 1" = 100'

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Robert Gray Elementary Phase 2A

ABERDEEN, WASHINGTON
PROJECT NO. 20039.01

EXPIRES: 5/3/2003
DRAWN BY: LAW
CHECKED BY: JS
DATE: 3/02/2001
REVISED: ADDENDUM #1 5/03/2001

CONSTRUCTION DOCUMENTS

PARTIAL PILE PLACEMENT PLAN

S1.00A

AHBL
CIVIL & STRUCTURAL ENGINEERS & PLANNERS

FILENAME: T:\20039\DWG\ARCH\S1002A.DWG
UPDATED: MAR 01, 2001 10:25:38

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PILE/FOUNDATION NOTES:

1) ALL SLABS TO BE 7½" THICK U.N.O. FINISHED FLOOR = 0'-0" FOR REFERENCE

2) SLAB REINFORCMENT CALLED OUT ON THIS PLAN IS FLEXURAL REINFORCMENT REQUIRED FOR THE SLAB TO SPAN BETWEEN GRADE BEAM SUPPORTS.

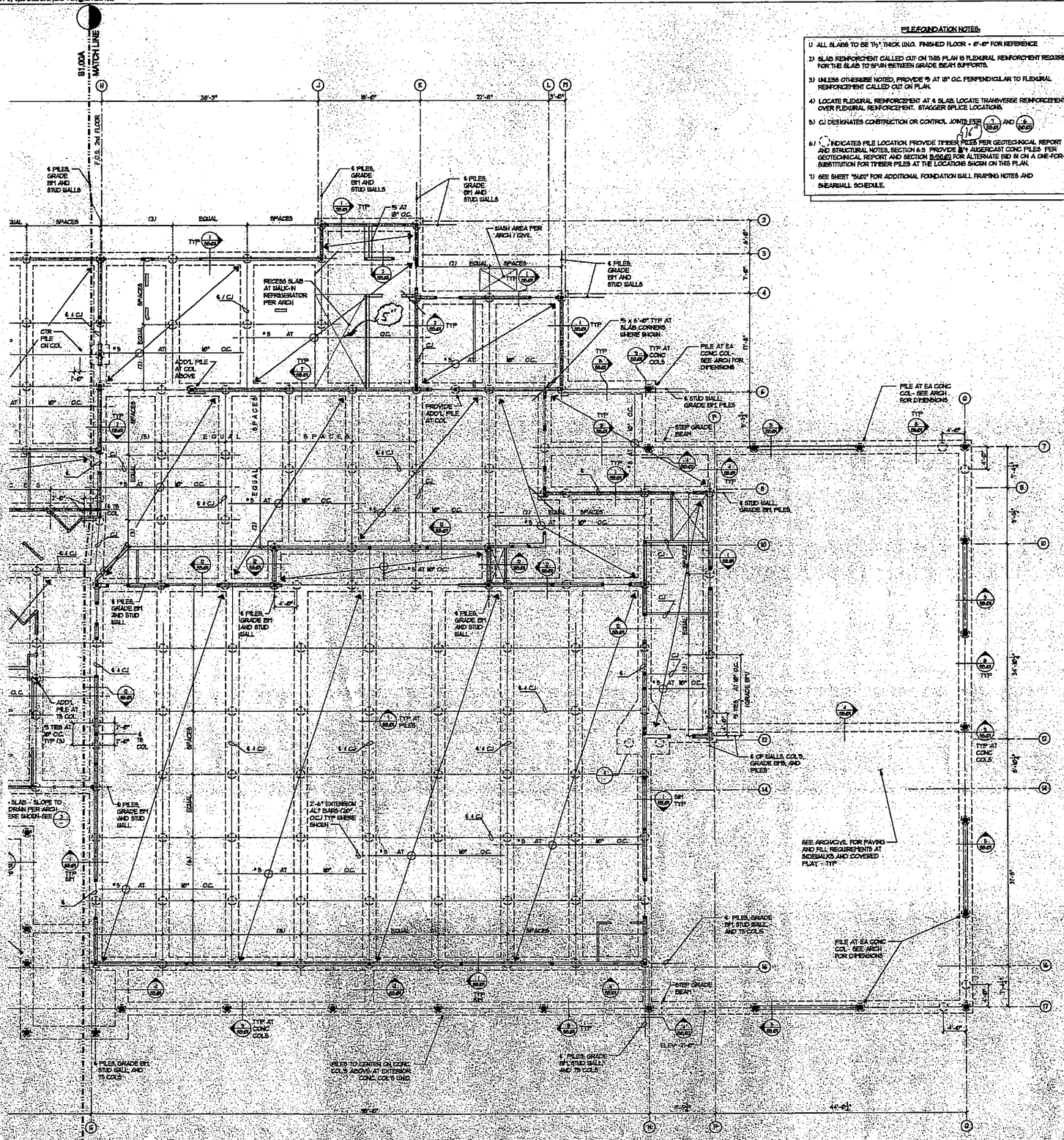
3) UNLESS OTHERWISE NOTED, PROVIDE #5 AT 18" O.C. PERPENDICULAR TO FLEXURAL REINFORCEMENT CALLED OUT ON PLAN.

4) LOCATE FLEXURAL REINFORCEMENT AT ¢ SLAB. LOCATE TRANSVERSE REINFORCEMENT OVER FLEXURAL REINFORCEMENT. STAGGER SPLICE LOCATIONS.

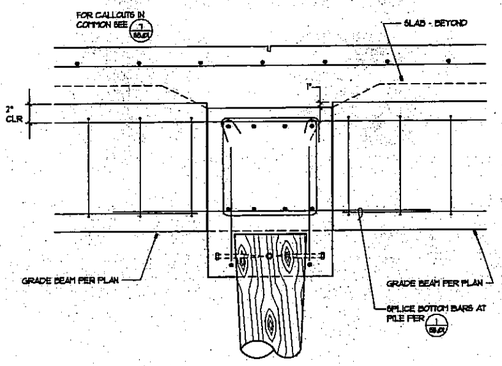
5) CJ DESIGNATES CONSTRUCTION OR CONTROL JOINTS PER 1/S0.01 AND 6/S0.01

6) ○ INDICATES PILE LOCATION. PROVIDE TIMBER PILES PER GEOTECHNICAL REPORT AND STRUCTURAL NOTES, SECTION 6.3. PROVIDE 12"ø AUGERCAST CONC PILES PER GEOTECHNICAL REPORT AND SECTION 3/S0.02 FOR ALTERNATE BID #1 ON A ONE-FOR-ONE SUBSTITUTION FOR TIMBER PILES AT THE LOCATIONS SHOWN ON THIS PLAN.

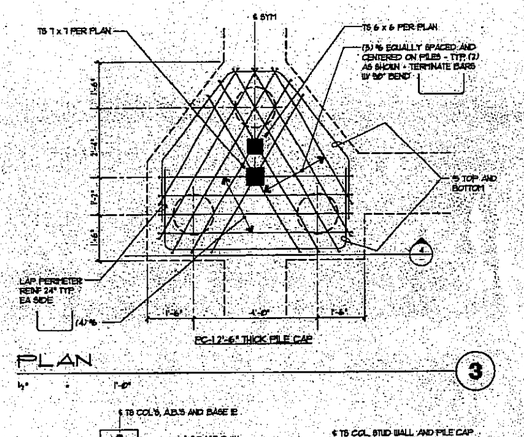
7) SEE SHEET "S0.01" FOR ADDITIONAL FOUNDATION WALL FRAMING NOTES AND SHEARWALL SCHEDULE.



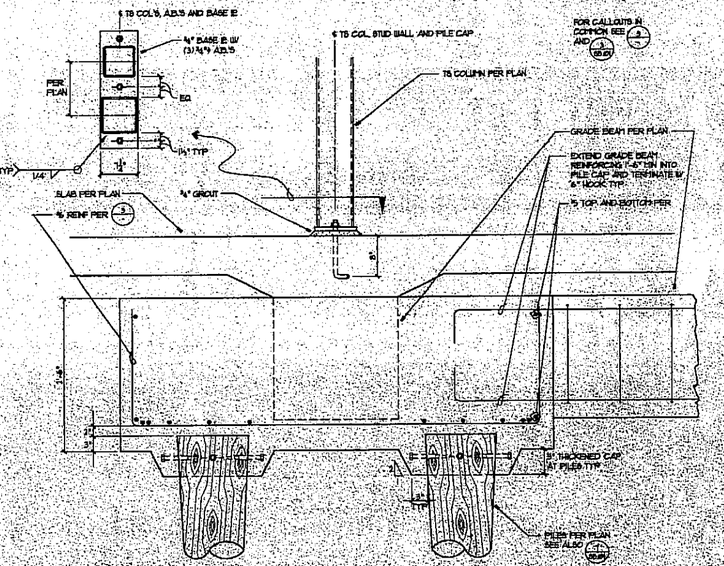
1 PILE PLACEMENT / FOUNDATION PLAN
SCALE: 1/8" = 1'-0"



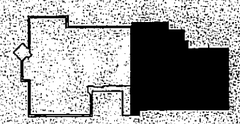
TYPICAL GRADE BEAM INTERSECTION 2
1" = 1'-0"



PLAN 3
¼" = 1'-0"



SECTION 4
¾" = 1'-0"



KEY PLAN
SCALE: 1" = 100'

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Robert Gray Elementary
Phase 2A

ABERDEEN, WASHINGTON
PROJECT NO: 200339.01

DRAWN BY	CHECKED BY
LAW	JS

DATE 3/22/2001

ISSUED
ADDENDA PACKET SUBMITTAL

CONSTRUCTION DOCUMENTS

PARTIAL PILE PLACEMENT PLAN

S1.00B

AHBL
CIVIL & STRUCTURAL ENGINEERS & PLANNERS

FILENAME: J:\200339\CAD\S1.00B.DWG
UPDATED: MAR 22, 2001 1:10 PM PST

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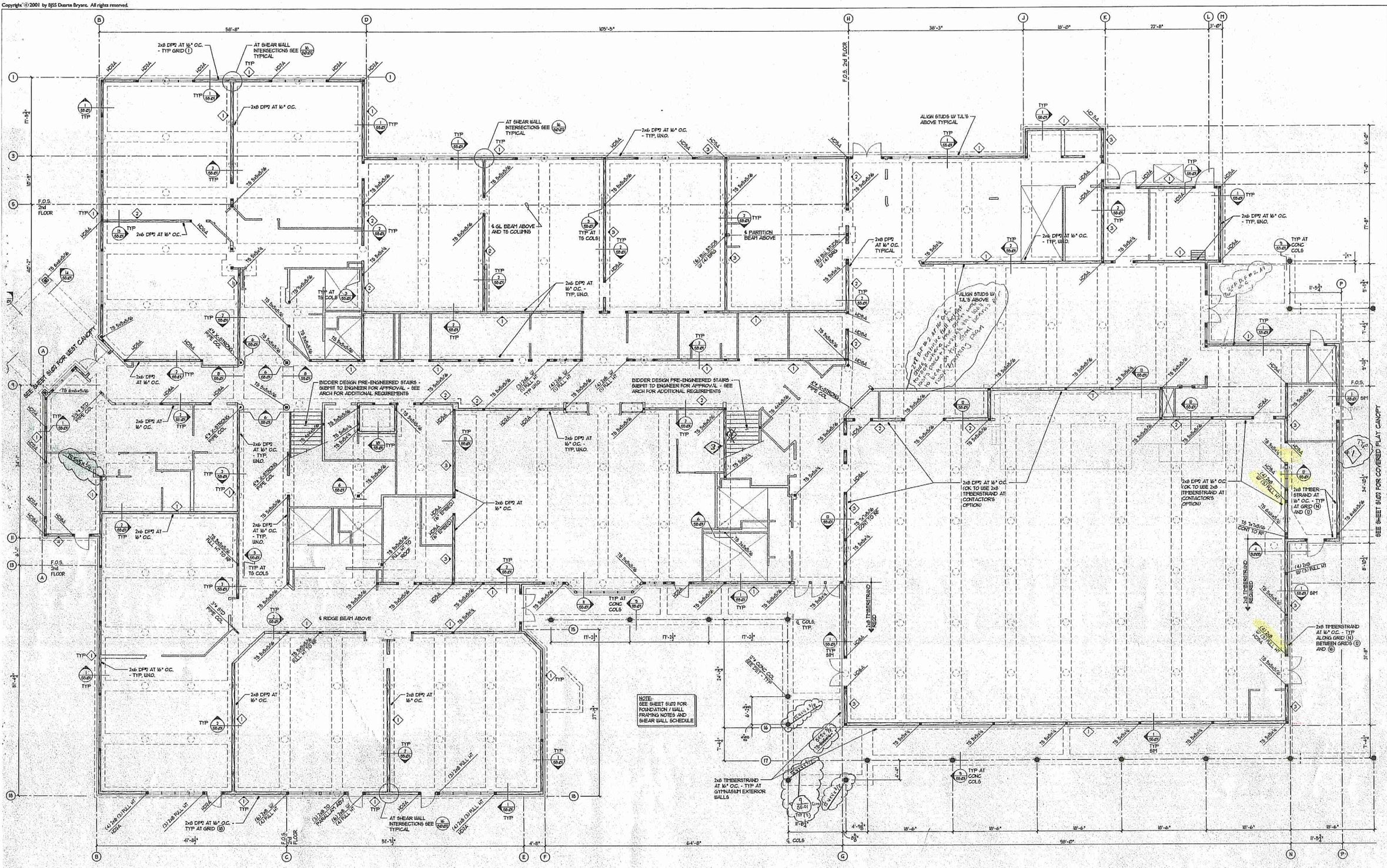
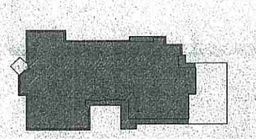


(1) FIRST FLOOR STRUCTURAL PLAN
SCALE: 1/8" = 1'-0"



KEY PLAN
SCALE: 1" = 100'

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Robert Gray Elementary Phase 2A

ABERDEEN, WASHINGTON
PROJECT NO. 20039.01

THOMAS R. HICKS
STATE OF WASHINGTON
REGISTERED PROFESSIONAL ENGINEER

EXPIRES 5/9/2001

DRAWN BY	CHECKED BY
LAW	JS

DATE 3/02/2001

REVISED
ADDENDA POSTED 5/02/2001

CONSTRUCTION DOCUMENTS

FIRST FLOOR STRUCTURAL PLAN

S1.01

AHBL
CIVIL & STRUCTURAL ENGINEERS & PLANNERS

FILENAME: I:\S\2000\20029\00229S11.DWG
UPDATED: MAR 01 2001 10:25:43

SUBSURFACE EXPLORATION AND GEOTECHNICAL ENGINEERING REPORT
ROBERT GRAY ELEMENTARY SCHOOL
3RD AVENUE AND B STREET
ABERDEEN, WASHINGTON

February 16, 1999
Project No. KE98531G

I. PROJECT AND SITE CONDITIONS

1.0 INTRODUCTION

This report presents the results of our subsurface exploration, geologic hazard, and geotechnical engineering study for the proposed new Robert Gray Elementary School. Our recommendations are preliminary in that the building location and/or construction details have not been finalized at the time of this report. The building location proposed at the time of our study and the approximate locations of the explorations accomplished for this study are presented on the Site and Exploration Plan, Figure 1. In the event that any changes in the nature, design, or location of the structure is planned, the conclusions and recommendations contained in this report should be reviewed and modified, or verified, as necessary.

1.1 Purpose and Scope

The purpose of this study was to provide subsurface data to be used in the design and development of the above-mentioned project. The study included a review of available geologic literature, drilling test borings, and performing geologic studies to assess the type, thickness, distribution, and physical properties of the subsurface sediments and shallow ground water conditions. Engineering studies were also conducted to determine the type of suitable foundation, pile capacities, anticipated settlements, retaining wall lateral pressures, floor support recommendations, drainage considerations, and pavement recommendations. This report summarizes our current field work, and offers development recommendations based on our present understanding of the project.

1.2 Authorization

Written authorization to proceed with this study was granted by Mr. Kenneth Hoover of Aberdeen School District No. 5. Our study was accomplished in general accordance with our scope of work letters, dated November 20, 1998 (revised November 24, 1998), and December 15, 1998. This report has been prepared for the exclusive use of Aberdeen School District No. 5 and their agents, for specific application to this project. Within the limitations of scope, schedule, and budget, our services have been performed in accordance with generally accepted geotechnical engineering and engineering geology practices in effect in this area at the time that our report was prepared. No other warranty, expressed or implied, is made.

2.0 PROJECT AND SITE DESCRIPTION

This report was completed with an understanding of the project based on review of a site sketch provided by the BJSS Group, dated December 1, 1998, review of a topographic plot plan of the site, dated October 5, 1998, and on discussions of Mr. Curtis Clarke of the BJSS Group. Present plans call for the construction of a new school building, with associated fire lanes, bus lanes, and parking area. The proposed building will likely utilize conventional wood frame construction, with slab-on-grade floors, and an exterior brick veneer. A portion of the building will be two stories in height, with the remainder of the building comprised of one story. The finish floor elevation of the lower level of the building is planned at an approximate elevation of 28.5 feet.

The proposed school site is located on the east side of B Street near its intersection with 3rd Avenue, in Aberdeen, Washington. The proposed building location currently consists of a grass-covered play field (hereafter referred to as "north play field"). The property is bound on the north by the 4th Avenue right-of-way, beyond which there is a residence, and some recently logged, undeveloped property. The site is bound to the east by a grass-covered play field, beyond which lies the Wishkah River. The area south of the proposed building consists of a single-family residence, and a large building that houses a basketball court and public swimming pool (the natatorium). We understand that present plans call for demolition of the natatorium, and replacing the structure with a parking lot for the adjacent stadium.

The topography of the proposed parking lot is relatively flat-lying, but is elevated approximately 8 to 10 feet above the existing grades in the area of the proposed building. The topography of the area of the proposed building slopes gently toward the east-northeast, with a total relief of approximately 5 to 7 feet. Along the southern margin of the site, beyond the proposed building footprint, the topography slopes upward toward the south at a gradient of approximately 30 to 40 percent. The total relief along this embankment ranges from approximately 8 to 10 feet. The embankment continues along the southern portion of the western site margin, where it gradually decreases in height toward the north (Figure 1). Our site visit was preceded by several days of heavy rain, and at the time of our exploration, portions of the proposed building area was covered with ponded water.

Our subsurface exploration of the north play field, conducted on December 3 and 4, 1998, indicated that the proposed building area is underlain by up to 60 feet of soft, compressible, alluvial sediments. Due to the poor quality of these sediments for foundation support, Mr. Kenneth Hoover of Aberdeen School District No. 5 requested that additional exploration of two potential alternative building sites be conducted. The alternative building locations included the area of the existing natatorium and the area east of the existing north school building (Figure 1). AESI drilled one soil boring in each of these areas on December 28, 1998. A summary of the results of additional exploration was presented in our Technical Memorandum of January 6, 1999. It is our understanding that upon consideration of our findings in these areas, the school district has elected to continue with the original plan to construct the new school building in the north play field area. Descriptions of the subsurface conditions encountered in the two alternative building locations are provided in the *Subsurface Conditions* section of this report. The exploration logs of these two borings (EB-6 and EB-7) are included in this report for completeness.

3.0 SUBSURFACE EXPLORATION

Our field study included drilling a series of exploration borings to gain information about the site. The various types of sediments, as well as the depths where characteristics of the sediments changed, are indicated on the exploration logs presented in the Appendix. The depths indicated on the logs where conditions changed may represent gradational variation between sediment types in the field. If changes occurred between sample intervals in our borings, they were interpreted. Our explorations were approximately located in the field by measuring from known site features, shown on the previously-referenced topographic plot plan.

The conclusions and recommendations presented in this report are based, in part, on the exploration borings completed for this study. The number, location, and depth of the explorations were completed within site and budgetary constraints. Because of the nature of exploratory work below ground, extrapolation of subsurface conditions between field explorations is necessary. It should be noted that differing subsurface conditions may sometimes be present due to the random nature of deposition and the alteration of topography by past grading and/or filling. The nature and extent of any variations between the field explorations may not become fully evident until construction. If variations are observed at that time, it may be necessary to re-evaluate specific recommendations in this report and make appropriate changes.

3.1 Exploration Borings

The exploration borings were completed by advancing a 4¼-inch, inside-diameter, hollow-stem auger with a truck-mounted drill rig. During the drilling process, samples were generally obtained at 5-foot depth intervals. The borings were continuously observed and logged by an engineering geologist from our firm. The exploration logs presented in the Appendix are based on the field logs, drilling action, and inspection and laboratory testing of the samples secured.

Disturbed but representative samples were obtained by using the Standard Penetration Test (SPT) procedure in accordance with ASTM:D 1586. This test and sampling method consists of driving a standard, 2-inch, outside-diameter, split-barrel sampler a distance of 18 inches into the soil with a 140-pound hammer free-falling a distance of 30 inches. The number of blows for each 6-inch interval is recorded, and the number of blows required to drive the sampler the final 12 inches is known as the Standard Penetration Resistance ("N") or blow count. If a total of 50 is recorded within one 6-inch interval, the blow count is recorded as 50 blows for the number of inches of penetration. The resistance, or N-value, provides a measure of the relative density of granular soils or the relative consistency of cohesive soils; these values are plotted on the attached boring logs.

The samples obtained from the split barrel samplers were classified in the field and representative portions placed in water-tight containers. The samples were then transported to our laboratory for further visual classification and laboratory testing, as necessary.

Undisturbed samples were obtained from selected locations by pushing a 3-inch, outside-diameter, seamless, steel Shelby tube into the soil using the hydraulic system on the drill rig in accordance with ASTM:D 1577. Since the thin-walled tube is pushed rather than driven, the sample obtained is considered relatively undisturbed. The sample was classified in the field by examining each end prior to sealing with plastic caps. The samples were then transported to our laboratory for additional testing, as necessary.

4.0 SUBSURFACE CONDITIONS

Subsurface conditions at the project site were inferred from the exploration borings accomplished for this study, and review of applicable geologic literature. A total of seven exploration borings were advanced for our study. Borings EB-1 through EB-5 were drilled within the proposed building area in the north play field. Borings EB-6 and EB-7 were drilled in the two potential alternative building locations: the area north of the existing east school building (EB-6), and the area of the natatorium (EB-7). The locations of the borings advanced for our study are shown on the Site and Exploration Plan, Figure 1. As shown on the field logs, the exploration borings generally encountered alluvial sands and silts, overlying weathered sandstone. Minor amounts of fill were also encountered in some locations. The following section presents more detailed subsurface information, organized from the upper (youngest) to the lower (oldest) sediment types.

4.1 Stratigraphy

Fill

Fill soils (those not naturally placed) were encountered at the locations of exploration borings EB-2 through EB-6. The fill generally consisted of moist to wet, brown to orange-brown sandy silt, and silty, fine to medium sand with minor amounts of pebble gravel. The fill ranged in thickness from approximately 3 to 5 feet.

Alluvium

Sediments encountered below the fill at the locations of borings EB-2 through EB-6, and directly below the ground surface at the location of EB-7, generally consisted of very soft to stiff silt, with variable amounts of clay and sand, interbedded with peat and very loose to medium dense, silty, fine to medium sand, with minor amounts of pebble gravel. These sediments were typically dark grayish-brown to greenish-gray in color, and contained moderate to substantial quantities of organic debris. These sediments were interpreted to be representative of quaternary alluvium, deposited by the adjacent Wishkah River. Due to the soft to loose condition of much of the sediments in this unit, as well as the presence of compressible silts and peat, we do not recommend that the sediments of this unit be used for foundation support. At the locations of borings EB-2 and EB-5, the quaternary alluvium was observed to extend to depths of approximately 60 feet and 53 feet, respectively. At the locations of borings EB-3 and EB-4, the alluvium was observed to extend to a depth of approximately 21 feet.

At the locations of borings EB-6 and EB-7, the alluvium extended to a depth of approximately 35 feet. The contact between the alluvium and the underlying sandstone at these locations was somewhat indistinct. For this reason, it appears that sediment comprising the lower portion of the alluvium at these locations was likely derived from the older sandstone.

Weathered Sandstone

Sediments encountered immediately below the surficial sod layer at the location of boring EB-1, and below the quaternary alluvium at the other boring locations, generally consisted of medium dense to very dense, tan to orange-brown, silty, fine to medium sand, with minor amounts of pebble gravel and scattered interbeds of sandy silt. This unit was interpreted to be representative of a highly weathered sandstone. Although this unit became very dense in the lower portions of each of the borings, they generally remained highly weathered and possessed physical characteristics more similar to that of a sediment than bedrock. One exception was in the lower 3 feet of boring EB-5 (55 feet to 58 feet), where the sandstone was observed to be gray and relatively unweathered.

Based on our review of a geologic map of the area, entitled, *Geologic Map of the Humptulips Quadrangle and Adjacent Areas, Gray's Harbor County, Washington,* by Weldon Rau (1986), we interpret this unit to be representative of the Montesano Formation. According to the geologic map, the Montesano Formation is exposed at the surface along the western surface of the site, and in the upland areas to the west. The Montesano Formation was deposited in a marine environment, during the late Miocene period. The Montesano Formation extended to the full depths explored of 19 to 64 feet.

4.1 Hydrology

Ground water seepage was encountered in all of our exploration borings at the time of our field study. At the locations of borings EB-2 through EB-5 ground water seepage was encountered within the alluvial sediments below depths ranging from approximately 5 to 7 feet. The alluvial sediments encountered below these depths did not appear to be uniformly saturated, but rather, appeared to be restricted to the more granular interbeds. At the location of boring EB-1, ground water seepage was encountered during drilling, below a depth of approximately 5 feet within the

upper, medium dense, weathered sandstone. However, upon completion of this boring and removal of the auger, we observed that ground water seepage in the open boring had accumulated to within approximately 1 foot of the ground surface. The ground water encountered in boring EB-1 appeared to be perched atop the relatively impermeable, very dense, weathered sandstone encountered below a depth of approximately 12 feet.

It should be noted that the nearby lower Wishkah River is tidally influenced, and that ground water levels at the site may fluctuate in response to changes in river levels, and other factors, such as changes in season, rainfall, and irrigation.

II. GEOLOGIC HAZARDS AND MITIGATIONS

The following discussion of potential geologic hazards is based on the geologic, slope, and ground water conditions as observed and discussed herein.

5.0 SEISMIC HAZARDS AND RECOMMENDED MITIGATION

Earthquakes occur in western Washington with great regularity. Fortunately, the vast majority of these events are small, and are not usually felt by people. However, large earthquakes do periodically occur, and have the potential to impact the area of the subject site. Recent studies have indicated that coastal Washington has been subjected to repeated, large (M>8), subduction-related seismic events in the past. These events have generated tsunamis and have resulted in subsidence and flooding of coastal areas. Radiocarbon and tree-ring dating of buried plant materials have indicated that one of these events occurred as recently as approximately 300 years ago. The recurrence interval is believed to be on the order of hundreds of years (Nelson, et al, 1994). To date, building codes have not been revised in response to these findings, and therefore, neither have the recommendations presented herein.

Generally, there are 4 types of potential geologic hazards associated with large seismic events: 1) surficial ground rupture; 2) seismically induced landslides; 3) liquefaction; and 4) ground motion. The potential for each of these hazards to adversely impact the proposed project is discussed below.

5.1 Surficial Ground Rupture

Generally, the largest earthquakes that have occurred in western Washington are subcrustal events, with epicenters ranging from 40 to 70 kilometers in depth. For this reason, no surficial faulting, or earth rupture, as a result of deep seismic activity has been documented, to date, in the region.

Rau (1986) mapped an east- to west-trending, normal fault that passes just to the north of the subject site. The fault, which juxtaposes rocks of the Astoria Formation against those of the younger, Montesano Formation, is down-dropped to the south. Movement on the fault would have occurred sometime after the deposition of the younger, Montesano Formation, during late Miocene time (approximately 12 million years ago). According to Rau, the fault does not displace the quaternary alluvium that underlies the subject site. Additionally, no evidence of faulting of the alluvium was observed during our study. Consequently, it does not appear that movement along this fault has occurred for at least several thousand years. Therefore, it is our opinion, based on the existing geologic data, that the risk of surface rupture impacting the proposed project is low.

5.2 Seismically Induced Landslides

It is our opinion that the potential risk of a seismically-induced landslide causing structural damage to the proposed building is low, due to the lack of steep slopes in the project area.

5.3 Liquefaction

Sediments that are most vulnerable to liquefaction during strong seismic events consist of loose, saturated, fine-grained sands and silts. Portions of the alluvial sediments encountered in our explorations appear to be susceptible to liquefaction under seismic conditions. We recommend that the liquefaction hazard be mitigated by utilizing a foundation that transfers building loads to the medium dense to very dense, weathered sandstone sediments that underlie the alluvium. Specific recommendations for foundation support suitable for mitigation of liquefaction hazards at the subject site are provided in the *Foundations* section of this report.

5.4 Ground Motion

Based on the encountered stratigraphy and our visual reconnaissance of the site, it is our opinion that any earthquake damage to the proposed structure, founded in accordance with the recommendations presented in this report, would be caused by the intensity and acceleration associated with the event, and not any of the above-discussed impacts. Structural design of the building should follow Uniform Building Code (UBC) standards for Seismic Zone 3 (Z=0.3)(1997 UBC Table 16-I), and a seismic coefficient (C_a) of 0.36 (1997 UBC Table 16-Q), corresponding to an S_e soil type (1997 UBC Table 16-J).

6.0 EROSION HAZARDS AND MITIGATION

The on-site soils contain significant amounts of silt and fine sand-sized particles and will be sensitive to erosion. To reduce the amount of sediment transport off the site during construction, the following recommendations should be followed:

1. Construction should proceed during the drier periods of the year

2. Silt fencing should be placed along the lower elevations of the cleared areas and be properly maintained throughout the construction time period.

3. Surface runoff should be controlled during and following development. Surface runoff must not be directed onto or above the more steeply sloping areas of the site. All devices used to collect surface runoff should be directed into a tightline or swale system designed to convey the collected discharge into an approved

storm drain. Uncontrolled discharge on the sloping areas may promote erosion and earth movement.

4. Soils that are to be reused around the site should be stored in such a manner as to reduce erosion. Protective measures may include, but are not necessarily limited to, covering with plastic sheeting, the use of low stock-piles in flatter areas, or the use of hay bales/silt fences. Areas stripped of vegetation during construction should be replanted as soon as possible, or otherwise protected. During winter construction, any bare or thinly vegetated slopes should be covered with clear plastic to facilitate new growth. Straw mulch may also be effective in reducing erosion if placed with sufficient thickness and replaced, as necessary.

III. DESIGN RECOMMENDATIONS

7.0 INTRODUCTION

Our exploration indicates that, from a geotechnical standpoint, the site is suitable for the proposed development provided the recommendations contained herein are properly followed. The site is underlain by up to 60 feet of very soft to stiff silt and peat interbedded with very loose to medium dense silty sand. Consequently, to reduce post-construction settlements to acceptable levels and to mitigate potential liquefaction hazards, we recommend that a deep foundation be utilized to transfer building loads to the underlying weathered sandstone. Selective overexcavation and replacement will be required to support parking lot and access driveway pavements.

8.0 SITE PREPARATION

Following demolition of the natatorium, site preparation of the planned building, driveway, and parking areas should include removal of all sod, brush, debris, and any other deleterious materials. Any remaining areas of organic topsoil should be removed, and the remaining roots, grubbed. Any remaining foundation elements of the natatorium that are under the planned parking area, or are not part of future plans, should be removed. Any buried utilities should be removed or relocated if they are under the proposed building area. The resulting depressions should be backfilled with structural fill as discussed under the *Structural Fill* section of this report.

Achieving the proposed finished floor elevation for the building will require a cut of approximately 1½ feet below the existing grades at the west end of the building, and a fill of approximately 3 to 4 feet above the existing grades at the east end of the building. Recommendations for structural fill placement are provided in the *Structural Fill* section of this report. Once the desired building subgrades have been achieved, additional site preparation requirements in the building area will be dependent upon the type of floor support utilized. Specific recommendations for floor support options are provided in the *Floor Support* section of this report. Specific recommendations regarding site preparation for the driveway and parking areas are presented in the *Pavement Recommendations* section of this report.

In our opinion, stable construction slopes should be the responsibility of the contractor, and should be determined during construction. For estimating purposes, however, we anticipate that temporary, unsupported cut slopes in the existing fill soils and alluvial sediments can be made at a maximum slope of 2H:1V (Horizontal:Vertical). Temporary, unsupported cut slopes in the weathered sandstone can be made at a maximum slope of 1.5H:1V. As is typical with earthwork operations, some sloughing and raveling may occur, and cut slopes may have to be adjusted in the field. In addition, WISHA/OSHA regulations should be followed at all times.

The on-site soils contain a high percentage of fine-grained material, which makes them moisture-sensitive, and subject to disturbance when wet. At the time of our field exploration, the surficial soils at the site were wet, and generally became saturated below a depth of approximately 5 to 7 feet. Therefore, the contractor must use care during site preparation and excavation operations so that the underlying soils are not softened. Consideration should be given to protecting access and staging areas with an appropriate section of crushed rock or asphalt treated base (ATB). If crushed rock is considered for the access and staging areas, it should be underlain by engineering stabilization fabric to reduce the potential of fine-grained materials pumping up through the rock, and turning the area into mud. The fabric will also aid in supporting construction equipment, thus reducing the amount of crushed rock required. We recommend that at least 12 inches of rock be placed over the fabric; however, due to the variable nature of the near-surface soils and differences in wheel loads, this thickness may have to be adjusted by the contractor in the field.

9.0 STRUCTURAL FILL

Structural fill will be necessary to establish desired grades at the site. All references to structural fill in this report refer to subgrade preparation, fill type, placement, and compaction of materials as discussed in this section.

If fill is to be placed on slopes steeper than 5H:1V, the base of the fill should be tied to firm, stable subsoil by appropriate keying and benching that would be established in the field to suit the particular soil conditions at the time of grading. The keyway will act as a shear key to embed the toe of the new fill into the hillside. Generally, the keyway for hillside fills should be at least 8 feet wide. Level benches would then be cut horizontally across the hill, following the contours of the slope. No specific width is required for the benches, although they are usually a few feet wider than the dozer being used to cut them. All fills proposed over a slope should be reviewed by our office prior to construction.

After overexcavation/stripping has been performed to the satisfaction of the geotechnical engineer/engineering geologist, the upper 12 inches of exposed ground should be recompacted to a minimum of 90 percent of the modified Proctor maximum density using ASTM:D 1557 as the standard. Most or all of the soils encountered at the proposed subgrade elevations during our exploration of the site were wet to saturated. If similar conditions are encountered at the time of construction, adequate recompaction may be difficult or impossible to obtain and should probably not be attempted. In lieu of recompaction, the area to receive fill should be blanketed with washed rock or quarry spalls to act as a capillary break between the new fill and the wet subgrade. Where the exposed ground remains soft and further overexcavation is impractical, placement of an engineering stabilization fabric (such as AMOCO 2002, or equivalent) may be necessary to prevent contamination of the free-draining layer by silt migration from below.

After recompaction of the exposed ground is tested and approved, or a free-draining rock course is laid, or engineering stabilization fabric is placed, structural fill may be placed to attain desired grades. Structural fill is defined as non-organic soil, acceptable to the geotechnical engineer, placed in maximum 8-inch, loose lifts with each lift being compacted to at least 92 percent of the modified Proctor maximum density using ASTM:D 1557 as the standard. In the case of roadway and utility trench filling, the backfill should be placed and compacted in accordance with current local or county codes and standards. The top of the compacted fill should extend horizontally

outward a minimum distance of 3 feet beyond the location of the perimeter footings, grade beams, or roadway edges before sloping down at an angle of 2H:1V.

The contractor should note that any proposed fill soils must be evaluated by Associated Earth Sciences, Inc. prior to their use in fills. This would require that we have a sample of the material 48 hours in advance to perform a Proctor test and determine its field compaction standard. Soils in which the amount of fine-grained material (smaller than No. 200 sieve) is greater than approximately 5 percent (measured on the minus No. 4 sieve size) should be considered moisture-sensitive. Use of moisture-sensitive soil in structural fills should be limited to favorable dry weather conditions. In general, the on-site weathered sandstone sediments are suitable for use as structural fill, but generally contained significant amounts of silt and are considered moisture-sensitive. Additionally, this material was generally too wet for optimum compaction in its natural state, and therefore, will likely require moisture conditioning prior to its use as structural fill. The on-site alluvial sediments are wet to saturated, and generally contain substantial quantities of organic debris. For these reasons, they are not considered suitable for use as structural fill. Construction equipment traversing the site when the soils are wet can cause considerable disturbance. If fill is placed during wet weather or if proper compaction cannot be obtained, a select import material consisting of a clean, free-draining gravel and/or sand should be used. Free-draining fill consists of non-organic soil with the amount of fine-grained material limited to 5 percent by weight when measured on the minus No. 4 sieve fraction.

Less than select fill materials, such as stripped topsoils, the native alluvium, or over-optimum (wet) weathered sandstone may be used for fill in play field areas. However, use of these materials will likely result in some settlement and development of uneven play field surfaces. If non-select fill soils are used in play field areas, they should be compacted to a minimum of 90 percent of the modified Proctor maximum dry density (ASTM:D 1557). If 90 percent compaction cannot be achieved, we should be further consulted for additional recommendations and opinions. Non-select fill soils should not be used in play field areas if the fields will be provided with a subdrain system, as the significant settlements likely to result from the use of these materials may prevent proper function of the drain.

A representative from our firm should inspect the stripped subgrade and be present during placement of structural fill to observe the work and perform a representative number of in-place density tests. In this way, the adequacy of the earthwork may be evaluated as filling progresses and any problem areas may be corrected at that time. It is important to understand that taking random compaction tests on a part-time basis will not assure uniformity or acceptable performance of a fill. As such, we are available to aid the owner in developing a suitable monitoring and testing program.

10.0 FOUNDATIONS

The area of the proposed new school building is underlain by substantial thicknesses of very soft to soft silt and peat, very loose to loose, liquefaction-prone sand, and areas of uncontrolled fill. Consequently, we recommend that foundation support for the proposed building be provided by a deep foundation that extends through these materials to the underlying, dense to very dense, weathered sandstone.

A deep foundation system, consisting of cast-in-place concrete piles (augercast) is recommended for foundation support. Augercast piles are formed by drilling to the required depth with a continuous flight, hollow-stem auger. Liquid grout is then pumped down the hollow stem, under pressure, as the auger is withdrawn. Appropriately designed, reinforcing steel cages are then lowered into the unset grout. A single, reinforcing bar is often installed for the full length of the pile, for transfer of uplift loads. Since the grout is placed under pressure, actual grout volumes used are typically 15 to 50 percent greater than the theoretical volume of the pile. The pile contractor should be required to provide a pressure gauge and a calibrated pump-stroke counter, so that the actual grout volume for each pile can be determined.

The proposed augercast piles would gain support primarily from end bearing, with some contribution from skin friction. Recommended allowable vertical and uplift capacities for an 18-inch-diameter augercast pile are provided below in Table 1.

Table 1. Augercast Pile Recommendations

Pile Diameter (in.)	Estimated Range of Total Pile Length (ft.)	Recommended Minimum Embedment into Bearing (ft.)	Vertical Capacity (tons)	Uplift Capacity (tons, per foot of embedment)
18	18 to 65	3	50	0.5

Allowable design loads may be increased by one-third for short-term wind or seismic loading. Anticipated settlements of pile supported structures will generally be on the order of ½ inch.

Assuming a modulus of subgrade reaction of 10 pci, and lateral capacities of 5 and 10 tons per pile for free and fixed-headed conditions, respectively, 1 inch of deflection at the ground surface can be assumed. Greater lateral capacities are possible for greater allowable deflections. With a 10 pci modulus of subgrade reaction, a stiffness factor of 4.6 feet can be assumed for an 18-inch diameter pile. The depth of fixity can be assumed at 3½ times the stiffness factor, or approximately 16 feet for the 18-inch diameter piles.

Augercast piles should be a minimum of 18 feet in length, and should penetrate a minimum of 3 feet into the dense sandstone to develop the capacities shown above, in Table 1. Based on the borings completed for this project, the depth to bearing soils in the area of the proposed building addition varies from approximately 10 feet (EB-1) to 60 feet (EB-2). For this reason, pile lengths should be expected to vary, depending upon location. Since completion of the piles takes place below ground, the judgement and experience of the geotechnical engineer or his field representative must be used as a basis for determining required penetration and the acceptability of each pile. Consequently, the use of the presented pile capacities in the design requires that all piles be inspected by a qualified geotechnical engineer or engineering geologist from our firm, who can collect and interpret the information data and examine the contractor's operation. Associated Earth Sciences, Inc. (AESI), acting as the owner's field representative, will determine the required pile lengths, and keep records of pertinent installation data. A final summary report would then be distributed, following the completion of pile installation.

Secondary structures, such as stairways, sidewalks, and planters, can be founded on the medium dense to very dense, weathered sandstone, on structural fill placed over the weathered sandstone, or on a minimum of 24 inches of structural fill placed over the existing fill soils or natural alluvial sediments. An allowable bearing pressure of 1,000 psf can be used for secondary structures bearing on these materials in accordance with the recommendations presented in this report. Anticipated settlement of secondary structures founded in accordance with these recommendations should be less than 1 inch.

10.0 LATERAL WALL PRESSURES

All backfill behind walls or around foundation units should be placed as per our recommendations for structural fill, and as described in this section of the report. Horizontally backfilled walls, which are free to yield laterally at least 0.1 percent of their height, may be designed using an active equivalent fluid equal to 35 pounds per cubic foot (pcf). Fully restrained, horizontally backfilled rigid walls, which cannot yield, should be designed for an at-rest equivalent fluid of 50 pcf. Where driveway or parking areas are adjacent to walls, a surcharge equivalent to 2 feet of soil should be added to the wall height in determining lateral design forces.

The lateral pressures presented above are based on the condition for a uniform backfill consisting of imported sand and gravel compacted to 90 percent of ASTM:D 1557. A higher degree of compaction is not recommended, as this will increase the pressure acting on the wall. A lower compaction may result in settlement of sidewalks, planters, etc. Surcharges from adjacent footings, heavy construction equipment, or sloping ground must be added to the above values. Footing drains should be provided for all retaining walls, as discussed under the section on drainage considerations.

It is imperative that proper drainage be provided, so that hydrostatic pressures do not develop against the wall. This would involve installation of a minimum 2-foot-wide blanket drain to within 1 foot of ground surface. The drain should consist of imported, washed gravel placed against the walls and continuous with the perimeter footing drain.

Parameters provided under the *Foundations* section of this report for vertical and lateral augercast pile capacities should be used to design retaining walls for resistance against overturning and lateral translation.

11.0 FLOOR SUPPORT

As previously discussed, substantial thicknesses of soft silt, peat, loose alluvial sands, and uncontrolled fill soils were encountered in the explorations completed for our study. Two options are presented below for providing support for the proposed slab-on-grade floor of the school building. Option 1 fully mitigates the potential for total and differential settlements caused by the presence of the alluvial sediments and uncontrolled fill soils that underlie the site. Option 2 will provide some partial mitigation, but the owner should expect that some settlement, cracking and differential movement could occur. For each option, a capillary break layer consisting of 4 inches of washed pea gravel overlain by a plastic vapor barrier should be

provided beneath the slab to control moisture migration through the slab. Additionally, a minimum of 2 inches of clean sand should be placed over the vapor barrier in accordance with American Concrete Institute recommendations to protect the vapor barrier and to aid in the curing of the concrete.

Option 1: Support of the Floor Atop Augercast Piles.

Support of the slab-on-grade floor could be provided by augercast piles constructed as discussed under the *Foundations* section of this report. The spacing of the augercast piles would be determined by a structural engineer, based on the amount of reinforcement included in the floor slab design and the amount of acceptable deflection of the slab. If a pile-supported floor is utilized, the compaction requirement for structural fill placed under the slab can be reduced to a minimum 90 percent of the modified Proctor maximum dry density (ASTM:D 1557).

Option 2: Floating Floors

Another alternative would be to "float" the slab on a structural fill mat. For this option, we recommend that the area below the floor slab be overexcavated sufficiently to allow placement of a minimum of 3 feet of structural fill. After overexcavation has been completed, the underlying soils should be recompacted to a firm and unyielding condition, and a structural fill mat with a minimum thickness of 3 feet, placed. Near surface soils encountered in our explorations contained substantial quantities of silt and were wet to saturated. If similar conditions are encountered during construction, recompaction of these materials will likely be unfeasible, and probably should not be attempted. In this case, the area should be overlain by an engineering stabilization fabric prior to placement of the structural fill. After the fill is completed and approved, the capillary break material, moisture barrier, and sand layer may be placed, and the floor slab, cast. The floor slab should not be tied into the building's foundation, but should be free to settle independently. Floating floor slabs should contain bar reinforcement to reduce differential movement across any cracks that might develop. Given the condition of the alluvial sediments underlying the building area and the anticipated fill to raise site grades, we estimate that total and differential settlements of 1 to 3 inches could occur for a floating floor slab placed over a structural fill mat with a minimum thickness of 3 feet. The magnitude of settlement would be the result of the combination of the variable thickness of new fill placed, and the thicknesses of the underlying, compressible, alluvial sediments.

12.0 DRAINAGE CONSIDERATIONS

All retaining and perimeter foundation walls should be provided with a drain at the grade beam elevation. Drains should consist of rigid, perforated, PVC pipe surrounded by washed pea gravel. The level of the perforations in the pipe should be set approximately 2 inches below the bottom of the grade beam cast atop the augercast pile foundation. In addition, retaining walls should be lined with a minimum 2-foot-thick washed gravel blanket, placed to within 1 foot of the ground surface, which ties into the drainage system. Roof and surface runoff should not discharge into the footing drain system, but should be handled by a separate, rigid, tightlined drain. In planning, exterior grades adjacent to the building should be sloped downward away from the structure to achieve surface drainage. All runoff should be tightlined to a City approved location away from steep slopes.

13.0 PAVEMENT RECOMMENDATIONS

Initial preparation of those areas that are to receive pavement should be conducted as described in the *Site Preparation* section of this report. Additional site preparation requirements for pavement areas will be dependent upon the quality of the subgrade soils present.

For those pavement areas where weathered sandstone is exposed at the surface, surficial soils should be excavated to a firm, non-yielding subgrade. In driveway areas the subgrade should be excavated a minimum of 9 inches below the final pavement grade. In parking areas the subgrade should be excavated at least 6 inches below the final pavement grade. Since the density of the underlying soils is variable, random loose/soft areas may exist and the depth and extent of stripping can best be determined in the field by the geotechnical engineer. In addition, the subgrade should be slightly crowned to allow drainage toward the edges of the paved area or to the catch basins for the storm water collection system. The backhoe used to prepare the subgrade should be equipped with a digging plate that covers the teeth on the bucket to minimize disturbance of the underlying soils and provide a smooth excavation surface. The exposed subgrade should be recompacted to at least 92 percent of the modified Proctor maximum dry density (ASTM:D 1557) and to a firm, non-yielding condition.

For those areas of the site underlain by uncontrolled fill or alluvium, or where the weathered sandstone subgrade remains soft and further overexcavation or recompaction is impractical, an engineering stabilization fabric, such as AMOCO 2002 (or equivalent), should be placed over the subgrade with the edges overlapped in accordance with the manufacturer's recommendations. A minimum of 18 inches of 1¼-inch crushed rock, or clean, imported pit-run sand and gravel compacted to a minimum of 92 percent of ASTM:D 1557, should be placed between the fabric and the overlying pavement section, as presented below. Spreading of the crushed rock or pit-run over the fabric should be performed such that the dozer remains on the aggregate and not over the uncovered fabric. For any areas where fill will be placed above final, adjacent grades, it should extend a minimum of 3 feet beyond the edge of the overlying pavement before sloping downward at a maximum slope of 2H:1V (Horizontal:Vertical). The pit run and 1¼-inch crushed rock should meet the minimum specification for base course defined under Washington Department of Transportation (WSDOT) Standard Specifications 9-03.14 (1) (Gravel Barrow) and 9-03.9(3) (1¼-inch crushed rock), respectively.

Prior to placement of the new pavement section, the exposed subgrade should be proofrolled with a fully loaded, tandem axle dump truck. AESI, acting as the owner's representative, should monitor the proofroll and evaluate the performance of the subgrade. Any areas of subgrade that flex or pump should be further excavated to expose firm soil and backfilled with compacted, 1¼-inch crushed rock base course or with compacted pit-run sand and gravel. All fill materials should be compacted to a minimum of 95 percent of the maximum dry density as defined by ASTM:D 1557.

Upon completion and approval of subgrade preparation as described above, the crushed top course and surface pavement may be placed. We recommend the following minimum pavement section for the driveway areas at the site:

3 inches – Washington State Class "B" Asphalt Concrete Pavement (ACP)

6 inches – Compacted, 5/8-inch minus crushed surfacing top course
(per WSDOT Standard Specification 9-03.9(3))

We recommend the following minimum pavement section for the parking areas at the site:

2 inches – Washington State Class "B" Asphalt Concrete Pavement

4 inches – Compacted, 5/8-inch minus crushed surfacing top course
(per WSDOT Standard Specification 9-03.9(3))

The top course material should be compacted to at least 95 percent of the maximum dry density as defined by ASTM:D 1557. An asphalt joint sealer should be placed over any joints where the new ACP abuts any existing ACP.

The finished pavement surface should be slightly crowned to direct surface runoff toward the edges of the pavement or toward the catch basins for the storm water collection system. Ditches or interceptor drains should be used along the edges of driveways to maintain a positive flow of water away from the pavement subgrade

14.0 PROJECT DESIGN AND CONSTRUCTION MONITORING

We are available to provide additional geotechnical consultation as the project design develops and possibly changes from that upon which this report is based. We recommend that AESI perform a geotechnical review of the plans and specifications prior to final design completion. In this way, our earthwork and foundation recommendations may be properly interpreted and implemented in the design. AESI can also assist in the preparation of bidding documents as they relate to quantity estimates, unit costs, and base bid assumptions.

We are also available to provide geotechnical engineering and monitoring services during construction. The integrity of the pile foundation depends on adequate embedment and construction procedures. In addition, engineering decisions may have to be made in the field in the event that variations in subsurface conditions become apparent.

We have enjoyed working with you on this study, and are confident that these recommendations will aid in the successful completion of your project. If you should have any questions, or require further assistance, please do not hesitate to call.

Sincerely,
ASSOCIATED EARTH SCIENCES, INC.
Kirkland, Washington

Timothy J. Peter, P.G.
Project Geologist

Kurt D. Merriman, P.E.
Senior Geotechnical Engineer

Gary A. Flowers, P.G.
Principal

TJP/mb - KE98531G2 - 12/1/98 mb – W97

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Nelson, A.R., Atwater, B.F., Bradley, L., and Stafford, T.W., 1994. "AMS ^{14}C Correlation of Subsided Wetland Soils Using Rooted-Herb and Detrital Samples in the Cascadia Subduction Zone." Geological Society of America – Abstracts with Programs, p. A523.

February 16, 1999
Project No. KE98531G

Aberdeen School District No. 5
216 North G Street
Aberdeen, Washington 98520

Attention: Mr. Kenneth Hoover

Subject: Subsurface Exploration, Geologic Hazard, and Geotechnical Engineering Study
New Robert Gray Elementary School
3rd Avenue and B Street
Aberdeen, Washington

Dear Mr. Hoover:

Associated Earth Sciences, Inc. (AESI) is pleased to present one copy of the above-referenced report. We have also provided three copies of the report to Mr. Curtis Clarke of the BJSS Group, and one copy to Mr. Geoff Hodson of AHBL. This report summarizes the results of our subsurface exploration, geologic hazard, and geotechnical engineering studies, and offers recommendations for design and development of the proposed project.

We have enjoyed working with you on this study, and are confident that the recommendations presented in this report will aid in the successful completion of your project. If you have any questions, or if we can be of additional help to you, please do not hesitate to call.

Sincerely,
ASSOCIATED EARTH SCIENCES, INC.
Kirkland, Washington

_____
Kurt D. Merriman, P.E.
Senior Geotechnical Engineer

cc: Mr. Curtis Clarke
The BJSS Group
320 West Bay Drive, Suite 212
Olympia, Washington 98502

Mr. Geoff Hodson
AHBL
2215 North 30th Street, Suite 300
Tacoma, Washington 98403

TJP/mb – KE98531G2 – 12/1/98 mb – W97

APPENDIX

Exploration Logs
and
Laboratory Testing Results

January 19, 2001
Project No. KE98531G

Aberdeen School District No. 5
216 North G Street
Aberdeen, Washington 98520

Attention: Mr. Ken Hoover

Subject: Timber Pile Capacity Recommendations
Robert Gray Elementary School
Aberdeen, Washington

Dear Mr. Hoover,

We understand the school district is considering the installation of used timber piles for the foundation at the new Robert Gray Elementary School. As requested by Mr. Curtis Clark of the BJSS Duarte Bryant, this letter presents recommendations for timber pile capacities and installation to be used by the structural engineer in design.

The recommendations presented below are predicated on the piles being of sound quality and treated with some type of preservative. The capacities given below do not guarantee the integrity of used piles. Used timber piles often crack or break during installation. Broken or cracked piles would require replacement with sound, undamaged piles as required by the district or their construction representative observing installation of the piles. Our services have been performed in accordance with generally accepted geotechnical engineering and engineering geology practices in effect in this area at the time this letter was prepared. No other warranty, express or implied, is made. Our recommendations are a means to identify and reduce the inherent risks to the owner.

Full-depth treated, used timber piles, when driven to refusal at a bearing depth ranging from 15 to 65 feet across the building pad, should be capable of supporting an allowable vertical compressing capacity of 25 tons each. The specified capacities assumed no pile shorter than 15 feet will be installed. The piles should have a tip diameter of at least 8 inches and a minimum

butt diameter of 12 inches (14-inch butts for piles greater than 40 feet in length). Maximum tip diameters should not exceed 14 inches. The piles should be of sound quality, straight, and free of significant cracks. Driving should be performed with an air, steam, or diesel hammer developing a minimum of 15,000 and a maximum of 45,000 foot-pounds of energy per blow. A drop hammer would not be appropriate for pile driving at this site since the energy is too low to develop the design capacity in the piles. All piles should be driven to refusal on sandstone, but should not be overdriven, as this would damage the pile. Consideration might be given to driving a series of test piles on the site to estimate driving criteria for production piles. Allowable design loads may be increased by one-third for short-term wind or seismic loading. Anticipated settlement of pile-supported structures will generally be on the order of ½ inch.

A potential concern that always exists when driving piles in developed areas is that vibrations induced into the subsurface soils can cause settlement of nearby foundations or cracking of plaster walls. We recommend monitoring adjacent buildings for vibration and settlement during pile driving. A photo survey of the adjacent structures prior to pile driving would also be appropriate.

The grade beams and pile caps will generate the majority of lateral resistance to wind and seismic loading. However, the piles will provide an additional capacity of 3½ tons (applied at the pile top) for fixed pile head conditions. Piles that are free to yield at their cap provide a lateral capacity of 1.75 tons. These capacities are calculated based on a maximum of 1 inch of deflection at the ground surface. Piles within 5 diameters of another pile along the direction of force should be considered to be in the zone of influence and the lateral capacity of only one of these piles should be used in design. If the lateral contribution of the piles is more critical to the practical design of the structure, we can provide a comprehensive lateral pile analysis. Such an analysis would present lateral pile capacities taking into account the interaction between piles. Allowable uplift capacities of piles can be determined based on an allowable skin friction foundation of 0.2 tons per foot of pile penetration neglecting the first 20 of embedment below the ground surface.

Since completion of the pile takes place below ground, the judgment and experience of the geotechnical engineer or his field representative must be used as a basis for determining the required penetration and acceptability of each pile. Consequently, use of the presented pile capacities in the design requires that all piles be inspected by a qualified geotechnical engineer or engineering geologist from our firm who can interpret and collect the installation data and examine the contractors operations. Acting as the owner's field representative, would determine the required lengths of the piles and keep records of pertinent installation data. A final summary report would then be distributed, following completion of pile installation.

We trust that this letter meets your current project needs. Should you have any questions or require additional information, please contact us at your earliest convenience.

Sincerely,
ASSOCIATED EARTH SCIENCES, INC.

Kirkland, Washington

Kurt D. Merriman, P.E.
Associate Engineer

cc: Mr. Curtis Clarke
BJSS Duarte Bryant
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Mr. Ken Leland
AHBL
2215 North 30th Street, Suite 300
Tacoma, Washington 98403

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Seismic Study Evaluation Reports

MILLER JUNIOR HIGH SCHOOL
SEISMIC EVALUATION REPORT

Miller Junior High
100 East Lindstrom
Aberdeen, WA 98520

December 11, 2024
Degenkolb Job Number: C3860012.00



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Table of Contents

1. Introduction 2

2. Building Description 2

3. Sources and Standards 11

4. Site Visit and Investigation 11

5. Site Description and Geologic Site Hazards 16

6. Evaluation Methodology 17

7. Evaluation Results 18

8. Seismic Retrofit Concepts 20

9. Next Steps and Recommendations 21

Appendix A: Seismic Retrofit Concept Drawings 22

Appendix B: ASCE 41-17 Tier 1 Checklists 23

1. Introduction

The objective of this study is to complete a seismic evaluation and provide preliminary retrofit recommendations for Miller Junior High School in Aberdeen, WA. The school has been selected for evaluation by OSPI under the School Seismic Safety Grant Program. The seismic evaluation and retrofit feasibility study was performed to characterize the expected seismic performance of the building in its existing condition. This report summarizes the results of this seismic analysis.

2. Building Description

Miller Junior High School is a one-story structure (with mezzanines) originally constructed in 1977. The building has four parts (denoted units A through D in the drawings), with outside-to-outside dimensions of approximately 290 feet by 650 feet. The west wing (units A-C) is a parallelogram zigzag shaped structure that houses the reading lab, science labs, learning resource center, student center, administrative offices, kitchen, music room, cooking room, sewing room, art rooms, and classrooms. The east part of the building (unit D) is rectangular and houses the gymnasium and locker rooms. Figure 2-1 shows a plan view of the building, taken from the 1977 drawings.

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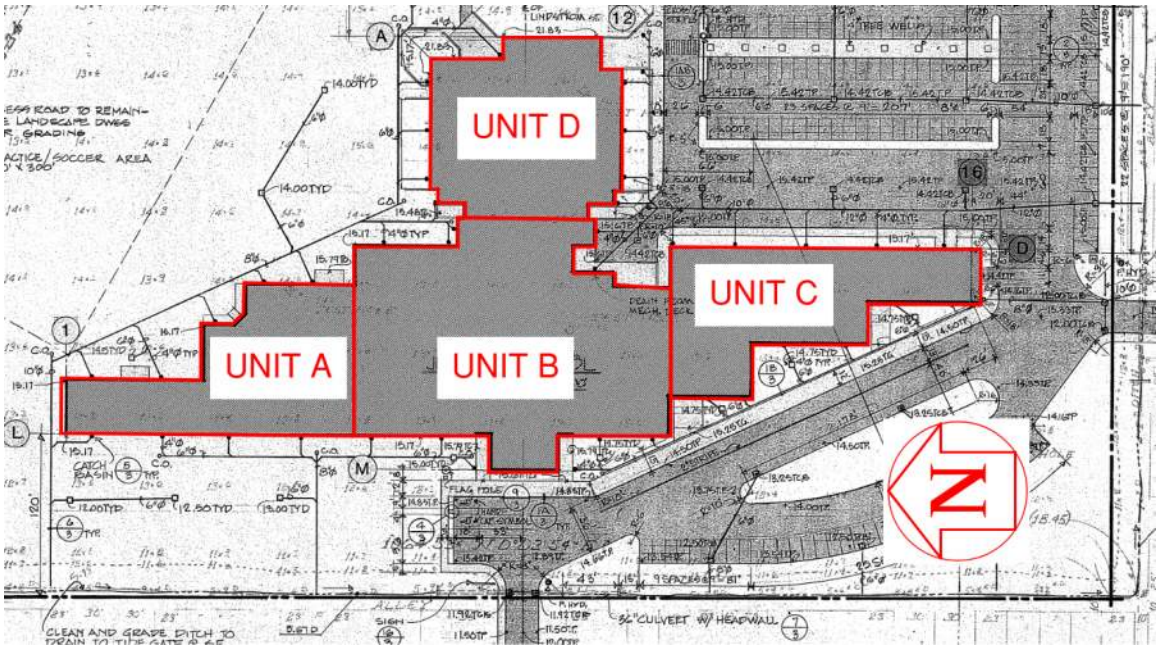

Figure 2-1 – Miller Junior High School Plan

1. **West Wing (Units A/B/C):** The west wing is a parallelogram zigzag shaped structure, with dimensions of approximately 200 feet by 650 feet. Its long dimension is oriented north-south. In unit B, there are three mechanical mezzanines.
    i. Foundation System:
        a. Exterior wall lines: Wood or wood/concrete composite pile foundation with pile caps and grade beams.
        b. Interior: Wood or wood/concrete composite pile foundation supporting reinforced concrete slab on grade and grade beams in select locations.
    ii. Floor System:
        a. Reinforced concrete slab on grade.
    iii. Wall System:
        a. 2x wood stud walls with plywood sheathing at shear walls
    iv. Roof System:
        a. Plywood diaphragm supported by glulam beams and girders spanning to tube steel columns and exterior walls

2. **East Wing (Unit D):** The east wing is rectangular in plan, with dimensions of approximately 110 feet by 140 feet. Its long dimension is oriented north-south. There are two mezzanines – one to the north and one to the south. The north mezzanine is enclosed on all four sides and houses the weight room. The south mezzanine is open on one side and houses the auxiliary gymnasium. The mezzanine floors are supported by concrete walls on all four sides. The boy's and girl's locker rooms are located directly below the north and south mezzanines, respectively.
    i. Foundation System:
        a. Wood or wood/concrete composite pile foundation supporting reinforced concrete slab on grade.
        b. Grade beams at interior and exterior wall lines.
    ii. Floor System:
        a. Mezzanine floors: Precast, prestressed, hollow concrete planks with a concrete topping slab.
    iii. Wall System:
        a. Concrete walls below mezzanines.
        b. 2x wood stud walls with plywood sheathing above mezzanines.
    iv. Roof System:
        a. Plywood diaphragm supported by glulam beams spanning to tube steel columns to the north and a steel truss to the south (over auxiliary gymnasium mezzanine).

Exterior elevations are shown in Figures 2-2 through 2-9.



Figure 2-2 – West Elevation – Unit B



Figure 2-3 – West Elevation – Unit A



Figure 2-4 – North Elevation – Unit A



Figure 2-5 – East Elevation – Unit A



Figure 2-6 – North Elevation – Unit A



Figure 2-7 – East/North Elevation – Unit A



Figure 2-8 – East Elevation – Unit A



Figure 2-8 – North Elevation – Unit A



Figure 2-9 – East Elevation – Unit A



Figure 2-10 – North Elevation – Unit A



Figure 2-11 – East Elevation – Unit A



Figure 2-12 – North Elevation – Unit B



Figure 2-13 – North Elevation – Unit D



Figure 2-14 – East Elevation – Unit D



Figure 2-15 – South Elevation – Unit D



Figure 2-16 – East Elevation – Unit C



Figure 2-17 – South Elevation – Unit C



Figure 2-18 – West Elevation – Unit C



Figure 2-19 – West Elevation – Unit C



Figure 2-20 – West Elevation – Unit C



Figure 2-21 – West Elevation – Unit C

3. Sources and Standards

The following documents were reviewed in preparing this report:

- Architectural and Structural Drawings titled “Miller Junior High School” dated 04/12/1977.

Throughout this report, the following reference codes and standards are used:

- ASCE 41-17: Seismic Evaluation and Retrofit of Existing Buildings. American Society of Civil Engineers, 2017.
- ASCE 7-16: Minimum Design Loads for Buildings and Other Structures. American Society of Civil Engineers, 2016.
- 2021 International Existing Building Code as Amended and Adopted by the Washington State Building Code. International Code Council 2021.

4. Site Visit and Investigation

A site visit was conducted on April 03, 2024, to observe the existing construction and overall condition. Figures 4-1 through 4-8 show existing conditions observed during the site visit. Select observations in this investigation are summarized here.

- The buildings were in good condition with no noticeable signs of deterioration. Significant soil settlement was observed surrounding the building.
- Typical construction observed generally matches existing drawings.
- Figure 4-1 shows the auxiliary gymnasium. There is a steel truss supporting the roof over the opening for the risers.
- Figure 4-2 shows the typical gymnasium roof framing and glulam tie beams.
- Figure 4-3 shows the gymnasium east lobby. The elevation has no solid wall.
- Figure 4-4 shows a typical split-level diaphragm connection at grid 15. There is no load path at the intersection of the wall and lower roof.
- Figure 4-5 shows a typical diaphragm to wood shear wall connection. There are no clips or nailing visible to deliver shear from the diaphragm to the shear wall.
- Figure 4-6 shows a typical shear wall with discontinuous studs. There is no connection visible to transfer overturning uplift forces through the interface.
- Figure 4-7 shows a typical glulam beam splice at the ridge.
- Figure 4-8 shows the music room masonry walls covered with acoustical board.

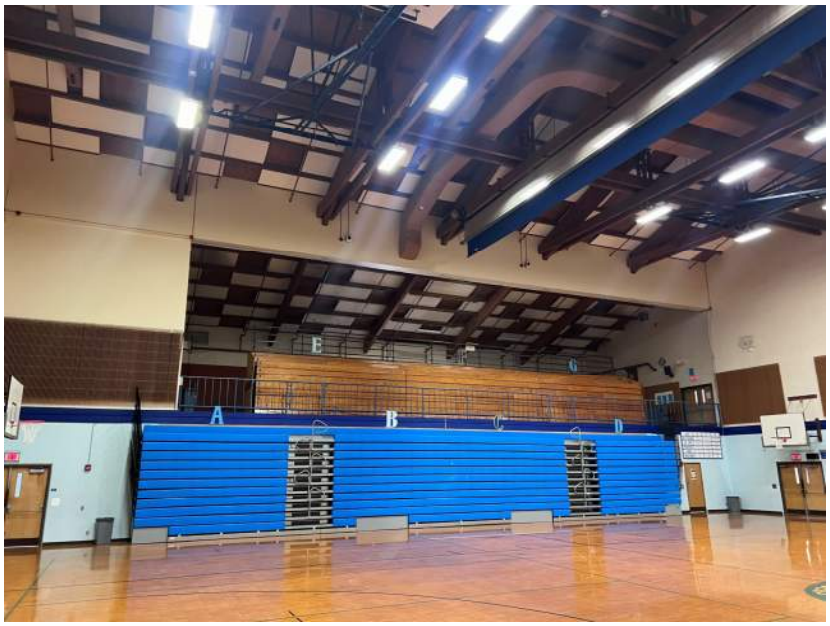

Figure 4-1 – Auxiliary Gymnasium



Figure 4-2 – Gymnasium Roof Framing



Figure 4-3 – Gymnasium East Lobby Exterior Wall Openings



Figure 4-4 – Typical Connection at Split Level Diaphragm (Grid 15 Shown)

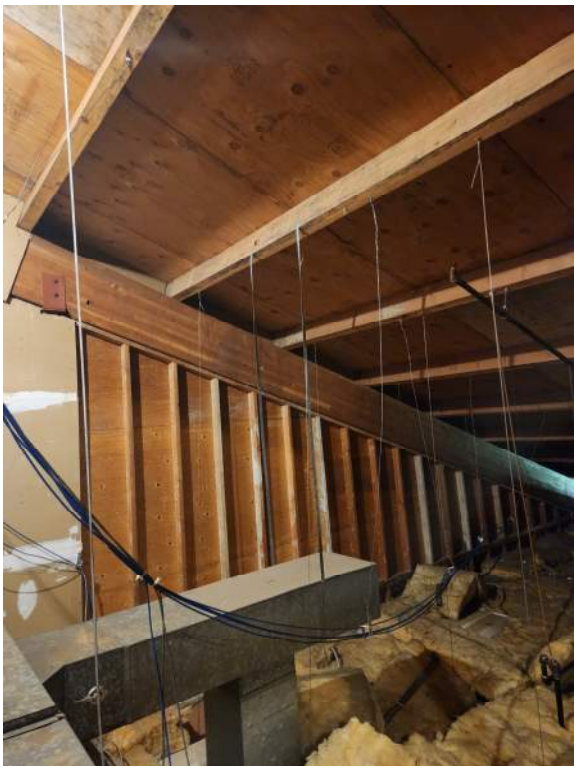

Figure 4-5 – Typical Diaphragm to Shear Wall Connection

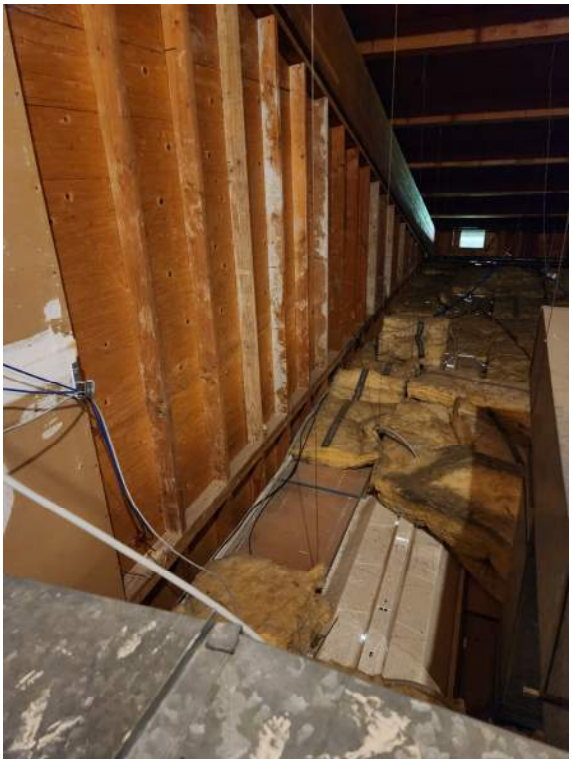

Figure 4-6 – Discontinuous Studs at Shear Wall



Figure 4-7 – Glulam Chord Splice



Figure 4-8 – Music Room West Wall

5. Site Description and Geologic Site Hazards

A geotechnical evaluation was performed by Haley & Aldrich, with their final report dated July 5th, 2024. Revised spectral design parameters were provided as a supplement on December 13th, 2024. The site was analyzed for the BSE-1E and BSE-2E seismic hazard level. The BSE-1E hazard corresponds to a 20% in 50-year seismic event or a 225-year return period, and the BSE-2E hazard corresponds to a 5% in 50-year seismic event or a 975-year return period. Per the geotechnical supplement, the short-period spectral acceleration, S_{xs}, and long-period spectral acceleration, S_{x1}, for the BSE-1E hazard level using the most current hazard maps from USGS are 0.80g and 0.50g, respectively. For the BSE-2E hazard level, S_{xs} and S_{x1} are 1.31g and 1.05g, respectively.

Note that the S_{x1} value for the BSE-2E hazard level provided in the geotechnical supplement includes a factor of 1.5 to adhere to ASCE 7-16 Supplement 3, Section 11.4.8, Item 2, Exception 2. However, the analysis performed shows that Exception 1 is met; thus, the S_{x1} value for the BSE-2E hazard level presented above includes a reduction factor of 1.5.

The report highlights several seismic hazards present at Miller Junior High School, summarized below:

1. Cyclic Softening
    - Saturated fine-grained soils have a potential to experience strength loss because of strong seismic shaking; such loss is likely to occur at the site.
2. Lateral Spreading
    - Lateral spreading related to seismic activity typically involves lateral displacement of large blocks of non-liquefied soil when an underlying soil layer loses strength during seismic shaking. It is expected to occur at the site.
    - Movement will generally occur in the direction of the Chehalis River and is expected to range from 1 ½ feet to 20 + feet.

The report classifies the soil as Site Class F due to the cyclic softening hazard. The site is in a region of high seismicity, with the Cascadia Subduction Zone contributing significantly to the overall seismic hazard at the site.

The Cascadia Subduction Zone is capable of generating large tsunamis with the potential to inundate the Washington coastline. The site is within the Washington Tsunami Design Zone, which leads to additional requirements for the design and construction of new RC III and IV buildings. Per the hazard maps developed by the WA Department of Natural Resources, the tsunami inundation depth at Miller Junior High School is estimated to be 9 feet.

6. Evaluation Methodology

An ASCE 41-17 Tier 1 evaluation was performed for Miller Junior High School with a Limited Safety structural performance objective for the BSE-2E hazard. Based on the occupancy, the building is classified as Risk Category III. The following Tier 1 checklists were completed as part of this evaluation and are presented in Appendix B:

- Basic Collapse Prevention Configuration Checklist (Modified for Limited Safety)
- Collapse Prevention Structural Checklist for Wood Frame, Commercial and Industrial Buildings (W2)
    - Two checklists were completed; one was used for units A, B, and C and the other was used for the upper portion of the unit D gymnasium (see building description).
- Collapse Prevention Structural Checklist for Reinforced Concrete Shear Wall Buildings with Flexible Diaphragms (C2A).
    - This checklist was completed to evaluate the concrete walls in the unit D gymnasium (see building description).
- Collapse Prevention Structural Checklist for Reinforced Masonry Bearing Wall Buildings with Flexible Diaphragms (RM1)
    - This checklist was completed to evaluate the music room (part of unit B).

The Collapse Prevention checklists were used with modified m-factors as required by ASCE 41-17 Table 2-2 footnote c. These checklists are intended to screen for common building deficiencies with limited structural calculations. These deficiencies have been identified as potential collapse hazards when buildings of similar age and construction are subjected to large ground motions.

ASCE 41-17 does not explicitly define evaluation procedures for buildings located within the tsunami inundation zone.

7. Evaluation Results

This section outlines the results of the ASCE 41-17 Tier 1 evaluation. The evaluation indicates that Miller Junior High School does not comply with the Limited Safety performance objective due to several significant deficiencies typical of older wood framed buildings. The deficiencies are described in Table 7-1.

Table 7-1 – Structural Deficiency Summary

Category	Deficiency	Description*
Lateral Seismic-Force-Resisting System	Load Path	NC – (1) Split level diaphragms do not have a clear load path to transfer shear force from the upper diaphragm, through the wall, and into the lower diaphragm (see Figure 4-4). (2) There are no clips or nailing present to deliver shear forces from the diaphragm into the shear wall (see Figure 4-5).
	Adjacent Buildings	NC – There is no seismic gap between the gym and main building. This prevents independent movement of the two structures.
	Shear Stress Check	NC – The shear stress in the plywood shear walls is greater than 1000 plf in units A/B/C.
	Narrow Wood Shear Walls	NC – In units A/B/C, there are several 3’ long exterior shear walls between window openings. During an earthquake, these walls would be highly stressed and subject to severe deformations that reduce their capacity.
	Walls Connected Through Floors	NC – Shear walls continue up through attic to roof but have discontinuous studs with no connection to transfer overturning uplift forces through the interface (see Figure 4-6).
Diaphragms	Diaphragm Continuity	NC – There are multiple split-level diaphragms across units A/B/C (e.g. see Figure 2-7). In addition, the hallway between the gym and music room is a split level with no line of resistance on the north side due to full length window openings (see Figure 2-12). Also, the entry foyer splits off the main gym building and creates a diaphragm offset (see Figure 2-14). These discontinuities may lead to instabilities due to lack of diaphragm support.
	Roof Chord Continuity	NC – Glulam beams at edges of diaphragms are not spliced to transfer chord forces.

Connections	Uplift at Pile Caps	U – It is unknown if composite or treated wood piles were used. If treated wood piles were used, there is likely no uplift resistance.
Foundation Configuration	Ties Between Foundation Elements	U – The wood pile foundation is tied together by the slab on grade and grade beams. However, a significant settlement was observed at the site. It is unknown if the soils below the slab on grade have settled similarly. If they have, the shear wall forces cannot be resisted substantially by the soil; the piles will likely act as lateral resisting elements.

* NC = Non-Compliant; U = Unknown

Based on our experience with tsunami resistant design, wood framed buildings such as Miller Junior High School would not resist the extreme forces due to tsunami inundation. The building would likely sustain significant damage and may not be useable or repairable. We recommend that all building occupants be evacuated after an earthquake if there is risk of tsunami.

8. Seismic Retrofit Concepts

The Tier 1 Procedure in ASCE 41-17 is not intended to be used for the retrofit of structures; rather, it provides a quick screening evaluation to identify areas for further study. Designing retrofit measures based on a Tier 1 screening alone may result in an overly conservative and costly retrofit. We have provided retrofit concepts in Appendix A; however, they are preliminary and additional analysis should be performed if the building retrofit moves forward.

Several of the major deficiencies and their corresponding retrofits are described below. These retrofit measures are not intended to provide significant resistance to tsunami loading, but to provide safe evacuation after an earthquake.

- Deficiency – Site Geologic Hazards
    - As discussed in Section 5, cyclic softening and lateral spread will cause significant settlement, strength loss in soils, and lateral displacement.
    - A 2-foot-thick concrete slab supported by perimeter drilled shafts is proposed. The slab will act to tie the building together, providing stability and continuity throughout.
    - Perimeter shafts, drilled to a depth of 95 to 130 feet below grade, will maintain vertical support in the event of soil softening and lateral displacement.
- Deficiency – Load Path
    - Nails and clips should be installed to resolve load path discontinuity at diaphragm elevation changes.
    - The existing shear walls have no connection to deliver diaphragm forces into shear walls – for these walls, clips and nails should be added to improve the connection of the top plate to the roof.
- Deficiency – Shear Stress Check
    - To decrease the average shear stress in the walls, the total length of shear wall in each direction should be increased. Plywood sheathing should be installed on select existing wood stud walls. New sheathing and framing should extend to the underside of the roof, and holdowns should be installed on each end.

9. Next Steps and Recommendations

ASCE 41 lists Tier 2 and Tier 3 as the two procedures available for the retrofit design of an existing building. A Tier 2 evaluation and retrofit is deficiency-based and is used in conjunction with the results of a Tier 1 evaluation. A Tier 3 evaluation and retrofit is a systematic study of the building and all its components.

As a next step, we recommend that each of the checklist items marked Noncompliant or Unknown should be evaluated using the Tier 2 procedure. The Tier 2 evaluation will better inform the items that need to be retrofitted. This should be coupled with a destructive investigation program to reveal unknown conditions behind finishes.

Additionally, although a nonstructural evaluation was not performed in this phase, it is common for buildings of this type and age to require bracing of various nonstructural elements (e.g. pipes and conduits). We recommend that these items be evaluated as part of the Tier 2 analysis.

If the retrofit moves forward, Aberdeen School District should plan for safe tsunami evacuation. This evacuation could consist of horizontal evacuation to high ground, or design and construction of a vertical evacuation structure.

Appendix A: Seismic Retrofit Concept Drawings

Appendix B: ASCE 41-17 Tier 1 Checklists

The following checklists are included within this appendix:

1. Basic Collapse Prevention Configuration Checklist (Modified for Limited Safety)
2. Collapse Prevention Structural Checklist for Wood Frame, Commercial and Industrial Buildings (W2) – Units A, B, and C
3. Collapse Prevention Structural Checklist for Wood Frame, Commercial and Industrial Buildings (W2) – Unit D
4. Collapse Prevention Structural Checklist for Reinforced Concrete Shear Wall Buildings with Flexible Diaphragms (C2A) – Unit D
5. Collapse Prevention Structural Checklist for Reinforced Masonry Bearing Wall Buildings with Flexible Diaphragms (RM1) – Unit B

STEVENS ELEMENTARY SCHOOL
SEISMIC EVALUATION REPORT

Stevens Elementary School
301 S Farragut St.
Aberdeen, WA 98520

December 11, 2024
Degenkolb Job Number: C3860012.00



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Table of Contents

1. Introduction 2

2. Building Description 2

3. Sources and Standards 10

4. Site Visit and Investigation 11

5. Site Description and Geologic Site Hazards 16

6. Evaluation Methodology 17

7. Evaluation Results 17

8. Seismic Retrofit Concepts 20

9. Next Steps and Recommendations 21

Appendix A: Seismic Retrofit Concept Drawings 22

Appendix B: ASCE 41-17 Tier 1 Checklists 23

1. Introduction

The objective of this study is to complete a seismic evaluation and provide preliminary retrofit recommendations for Stevens Elementary School in Aberdeen, WA. The school has been selected for evaluation by OSPI under the School Seismic Safety Grant Program. The seismic evaluation and retrofit feasibility study was performed to characterize the expected seismic performance of the building in its existing condition. This report summarizes the results of this seismic analysis.

2. Building Description

Stevens Elementary School is a one-story structure of varying construction types and dates. The multipurpose room, office area, and east/west classroom wings were constructed in 1953; a classroom addition (connecting to the east classroom wing of the 1953 building) was constructed in 1974; the gymnasium, library, and additional classrooms (connecting to the south and west sides of the 1953 building) were added in 1976. The complete building footprint has outside-to-outside dimensions of approximately 215 feet by 405 feet.

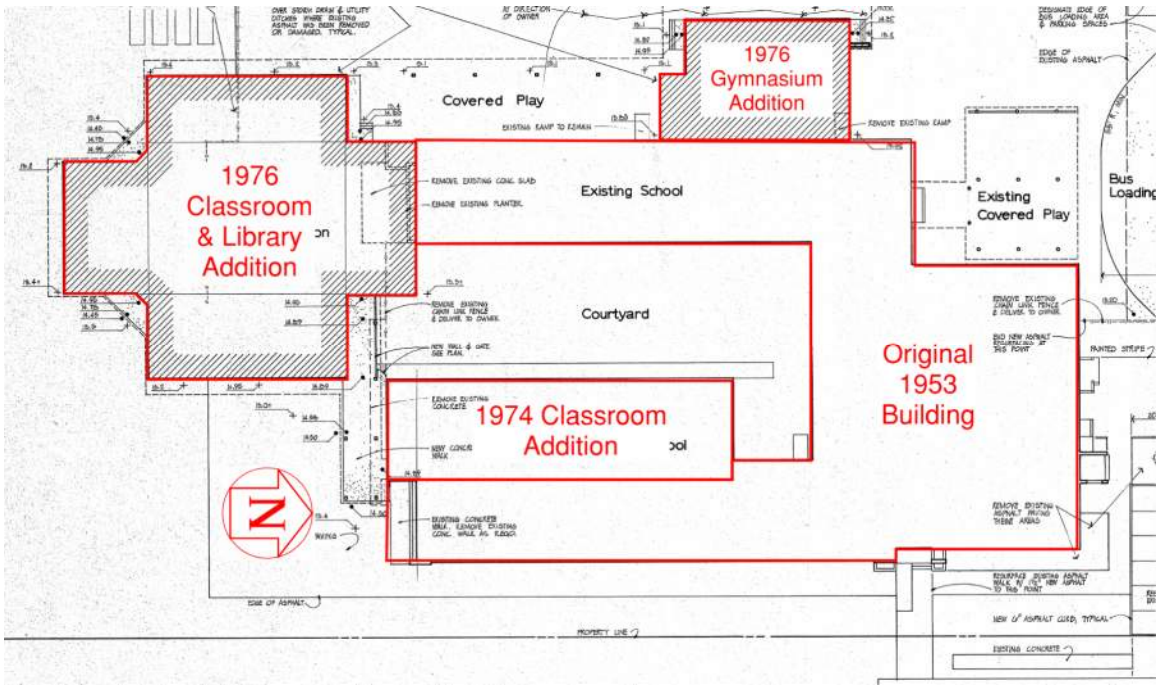

Figure 2-1 – Stevens Elementary School Building Areas

1. **Original Building (1953):** The building is a one-story structure over a crawl space with wood-framed floors and roofs. It houses the school's offices, multi-purpose room, kitchen, boiler room and classrooms. The building is h-shaped in plan with dimensions of approximately 170 feet by 270 feet, and its long dimension is oriented north-south. The west classroom wing has a 2.5:12 sloped roof with an eave height of approximately 9 feet on the exterior corridor side and 11 feet on the exterior classroom side. The east classroom wing is similar but has a double pitched roof due to the 1974 addition. The multi-purpose room sloped roof has an eave height of approximately 17'-6".
    i. Foundation System:
        a. Grade beams on wood piles supporting a concrete masonry block wall grid below the floor system.
        b. Precast concrete posts on the grade beams supporting the floor system, placed intermittently in the masonry block walls.
    ii. Floor System:
        a. Elevated concrete floor slab supported by precast I joists, spanning to the concrete masonry block walls.
    iii. Wall System:
        a. 2x stud walls with diagonal sheathing.
    iv. Roof System:
        a. Tongue & groove wood diaphragms supported by timber joists spanning to bearing walls

2. **Classroom Addition (1974):** The building is a one-story wood framed structure, housing classrooms. The building has a rectangular plan with dimensions of approximately 32 feet by 140 feet, and its long dimension is oriented north-south. The original 1953 exterior corridor wall was retrofitted – a new 2x stud wall was added on top of the original wall to support the new roof trusses, and doors were added into the new classrooms. At this location, the existing skylights in the hallways were covered with plywood, and piping was added as part of a mechanical and heating upgrade. The building has a 2.5:12 sloped roof with an approximate eave height of 9 feet.
    i. Foundation System:
        a. Untreated wood pile foundation with concrete pedestals and grade beams.
    ii. Floor System:
        a. Reinforced concrete slab on grade over compacted fill.
    iii. Wall System:
        a. 2x gypsum sheathed stud walls with wood posts.
    iv. Roof System:
        a. Plywood diaphragm supported by roof trusses spanning from the original exterior wall to the new exterior wall.

3. **Classroom Addition (1976):** The gymnasium and library/classroom additions are both one-story buildings. The gymnasium is rectangular in plan with dimensions of approximately 50 feet by 75 feet and has a 4:12 sloped roof. The east wall of the gymnasium was originally an exterior wall in the 1953 building – in 1976, exterior finishes were replaced with gypsum board. The library/classroom building is cruciform shaped in plan with dimensions of approximately 120 feet by 140 feet and has a 4:12 sloped roof. To accommodate the addition, the original 1953 building entryway was removed, and the existing corridor was extended.

    i. Foundation System:
        a. Treated wood pile foundation with concrete grade beams and pile caps.
    ii. Floor System:
        a. Reinforced concrete slab on grade.
    iii. Wall System:
        a. 2x stud walls sheathed with plywood; exterior walls have brick veneer.
    iv. Roof System:
        a. Gymnasium: Plywood diaphragm supported by glulam beams and purlins spanning to the new exterior walls on the north, south, and west sides and to the original exterior wall on the east side.
        b. Library: Plywood diaphragm supported by glulam beams and glulam columns spanning to the exterior walls.

Exterior elevations are shown in Figures 2-2 through 2-13.



Figure 2-2 – 1953 Building North Elevation



Figure 2-3 – 1953 Building North Elevation at Covered Play Area



Figure 2-4 – 1953 Building East Elevation



Figure 2-5 – 1953 Building West Elevation at Covered Play Area



Figure 2-6 – 1953 Building East Court Elevation



Figure 2-7 – 1974 Building West Court Elevation



Figure 2-8 – 1953 & 1974 Buildings South Elevation



Figure 2-9 – 1976 Library South Elevation



Figure 2-10 – 1976 Library East Elevation



Figure 2-11 – 1976 Library West Elevation



Figure 2-12 – 1976 Gymnasium West Elevation



Figure 2-13 – 1976 Gymnasium South Elevation



Figure 2-14 – 1976 Gymnasium North Elevation

3. Sources and Standards

The following documents were reviewed in preparing this report:

- Architectural and Structural Drawings titled “Pioneer Park School” dated 01/05/1953.
- Architectural Drawings titled “Special Services Addition Stevens School” dated 05/24/1974.
- Architectural and Structural Drawings titled “Stevens Elementary School Addition” dated 05/03/1976.

Throughout this report, the following reference codes and standards are used:

- ASCE 41-17: Seismic Evaluation and Retrofit of Existing Buildings. American Society of Civil Engineers, 2017.
- ASCE 7-16: Minimum Design Loads for Buildings and Other Structures. American Society of Civil Engineers, 2016.
- 2021 International Existing Building Code as Amended and Adopted by the Washington State Building Code. International Code Council 2021.

4. Site Visit and Investigation

A site visit was conducted on April 02, 2024 to observe the existing construction and overall condition. Figures 4-1 through 4-7 show existing conditions observed during the site visits. Select observations in this investigation are summarized here.

- The 1974 & 1976 buildings were in good condition with no noticeable signs of deterioration; the 1953 building was in fair condition, with noticeable deterioration at the roof.
- Typical construction observed generally matches existing drawings.
- Figure 4-1 shows the connection from roof to exterior wall in the 1953 building. There is a gap between the roof and wall and no shear connection between them.
- Figure 4-2 shows a mechanical mezzanine above the classrooms in the 1976 building. The platform is hanging from the roof glulam beams; however, it is not braced in the transverse direction.
- Figure 4-3 shows the infilled skylights in the 1953 building.
- Figure 4-4 shows the west wall of the multi-purpose room. As shown, there are numerous openings near the top of wall, preventing shear transfer through the wall.
- Figure 4-5 shows the cupola in the library which acts as an opening in the diaphragm.
- Figure 4-6 shows the typical diagonal sheathing on the exterior walls of the 1953 building.
- Figure 4-7 shows a typical glulam beam to column connection in the 1953 building.
- Figure 4-8 shows the crawl space below the 1953 building.



Figure 4-1 – Roof to Exterior Wall Connection (1953 Building)

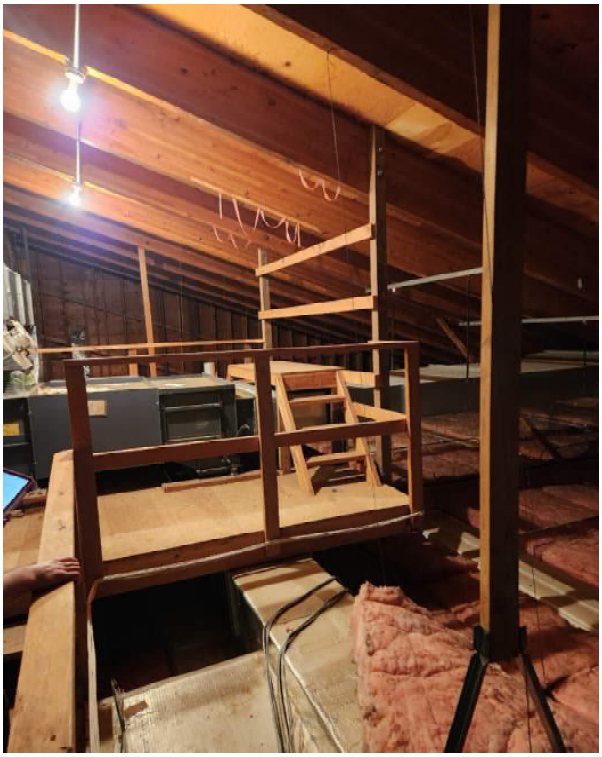

Figure 4-2 – Mechanical Mezzanine Above Classroom (1976 Building)



Figure 4-3 – Infilled Skylights in Corridor (1953 Building)

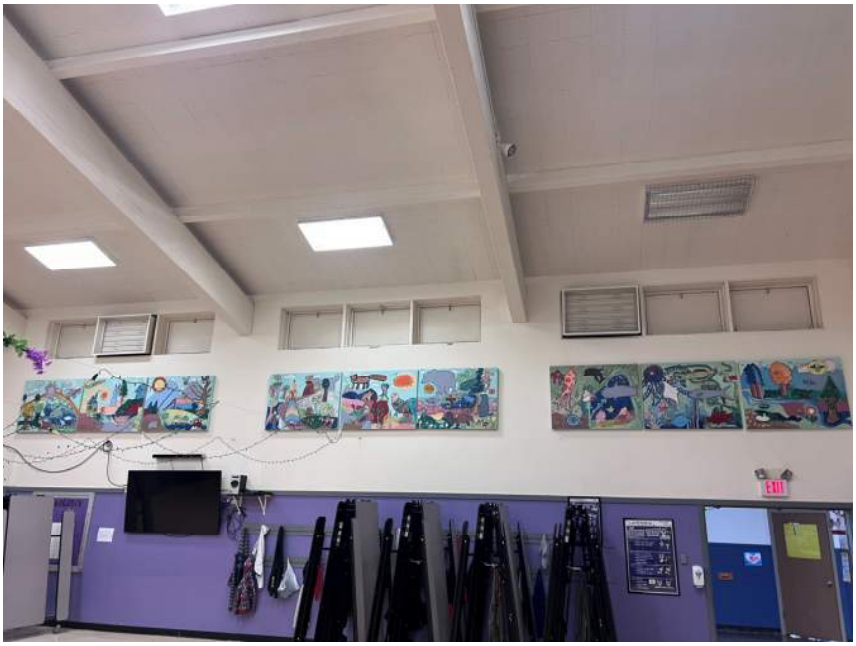

Figure 4-4 – West Wall of Multi-Purpose Room (1953 Building)



Figure 4-5 – Cupola in Library (1976 Building)



Figure 4-6 – Exterior Wall Diagonal Sheathing (1953 Building)



Figure 4-7 – Glulam Beam-Column Connection (1953 Building)



Figure 4-8 – Crawl Space (1953 Building)

5. Site Description and Geologic Site Hazards

A geotechnical evaluation was performed by Haley & Aldrich, with their final report dated July 5th, 2024. Revised spectral design parameters were provided as a supplement on December 13th, 2024. The site was analyzed for the BSE-1E and BSE-2E seismic hazard level. The BSE-1E hazard corresponds to a 20% in 50-year seismic event or a 225-year return period, and the BSE-2E hazard corresponds to a 5% in 50-year seismic event or a 975-year return period. Per the geotechnical supplement, the short-period spectral acceleration, S_{xs}, and long-period spectral acceleration, S_{x1}, for the BSE-1E hazard level using the most current hazard maps from USGS are 0.80g and 0.50g, respectively. For the BSE-2E hazard level, S_{xs} and S_{x1} are 1.31g and 1.05g, respectively.

Note that the S_{x1} value for the BSE-2E hazard level provided in the geotechnical supplement includes a factor of 1.5 to adhere to ASCE 7-16 Supplement 3, Section 11.4.8, Item 2, Exception 2. However, the analysis performed shows that Exception 1 is met; thus, the S_{x1} value for the BSE-2E hazard level presented above includes a reduction factor of 1.5.

The report highlights several seismic hazards present at Stevens Elementary School, summarized below:

1. Liquefaction
    - There is high potential for liquefaction at the site, which may induce significant strength loss in the soil and result in reduced support for foundations and large ground settlements.
    - Vertical settlement is estimated to be between 11 and 13 inches.
    - Liquefiable conditions are typically expected to begin at a depth of 20 to 30 feet below ground surface and persist to depths of 85 to 120 feet below ground surface.
2. Cyclic Softening
    - Saturated fine-grained soils have a potential to experience strength loss because of strong seismic shaking; such loss is likely to occur at the site.
    - Soils susceptible to cyclic softening are limited to a depth of 25 feet below ground surface.
3. Lateral Spreading
    - Lateral spreading related to seismic activity typically involves lateral displacement of large blocks of non-liquefied soil when an underlying soil layer loses strength during seismic shaking. It is expected to occur at the site.
    - Movement will generally occur in the direction of the Chehalis River and is expected to range from 6 feet to 20 + feet.

The report classifies the soil as Site Class F due to the severe liquefaction hazard. The site is in a region of high seismicity, with the Cascadia Subduction Zone contributing significantly to the overall seismic hazard at the site.

The Cascadia Subduction Zone is capable of generating large tsunamis with the potential to inundate the Washington coastline. The site is within the Washington Tsunami Design Zone, which leads to additional requirements for the design and construction of new RC III and IV buildings. Per the hazard maps developed by the WA Department of Natural Resources, the tsunami inundation depth at Stevens Elementary School is estimated to be 8 feet.

6. Evaluation Methodology

An ASCE 41-17 Tier 1 evaluation was performed for Stevens Elementary School with a Limited Safety structural performance objective for the BSE-2E hazard. Based on the occupancy, the building is classified as Risk Category III. The following Tier 1 checklists were completed as part of this evaluation and are presented in Appendix B:

- Basic Collapse Prevention Configuration Checklist (Modified for Limited Safety)
- Collapse Prevention Structural Checklist for Wood Frame, Commercial and Industrial Buildings (W2)

The Collapse Prevention checklists were used with modified m-factors as required by ASCE 41-17 Table 2-2 footnote c. These checklists are intended to screen for common building deficiencies with limited structural calculations. These deficiencies have been identified as potential collapse hazards when buildings of similar age and construction are subjected to large ground motions.

ASCE 41-17 does not explicitly define evaluation procedures for buildings located within the tsunami inundation zone.

7. Evaluation Results

This section outlines the results of the ASCE 41-17 Tier 1 evaluation. The evaluation indicates that Stevens Elementary School does not comply with the Limited Safety performance objective due to several significant deficiencies typical of older wood framed buildings. The deficiencies are described in Table 7-1.

Table 7-1 – Structural Deficiency Summary

Category	Deficiency	Description*
Building System: General	Redundancy	NC – The 1953 building has no shear walls on east & west elevations (no line of resistance in N-S direction). The 1974 drawings show three shear walls in the E-W direction and no shear walls in the N-S direction; however, the sheathing for these walls could not be verified.
	Load Path	NC – (1) There is no shear connection between the roof and exterior wall in 1953 building.

<table>
<tr><td></td><td></td><td>(2) There are no clips to transfer shear force across the roof joint at the valley where the 1953 and 1974 roofs meet.</td></tr>
<tr><td></td><td>Mezzanines</td><td>NC – The mechanical mezzanines above the classrooms in the 1976 building are hanging from roof glulam beams with 4x4 posts, but there is no bracing for lateral movement in the transverse direction.</td></tr>
<tr><td>Geologic Site Hazard</td><td>Liquefaction</td><td>NC – There is very high potential for liquefaction to occur during an earthquake. This would result in a significant strength loss in the soil, resulting in reduced support for foundations and large ground settlements.</td></tr>
<tr><td rowspan="4">Lateral Seismic-Force-Resisting System</td><td>Shear Stress Check</td><td>
<table>
<tr><th>Area</th><th>Controlling Direction</th><th>Wall Type (Capacity)</th><th>Shear Demand</th><th>Result</th></tr>
<tr><td>1953 Multipurpose Room</td><td>N-S</td><td>Diag. sheathing (700 plf)</td><td>3569 plf</td><td>NC</td></tr>
<tr><td>1953 West Classrooms</td><td>N-S</td><td>Diag. sheathing (700 plf)</td><td>1360 plf</td><td>NC</td></tr>
<tr><td>1953 & 1974 East Classrooms</td><td>N-S</td><td>Diag. sheathing (700 plf)</td><td>4115 plf</td><td>NC</td></tr>
<tr><td>1976 Library & Classrooms</td><td>E-W</td><td>Plywood (1000 plf)</td><td>1085 plf</td><td>NC</td></tr>
<tr><td>1976 Gymnasium</td><td>N-S</td><td>Plywood (1000 plf)</td><td>1009 plf</td><td>NC</td></tr>
</table>
</td></tr>
<tr><td>Narrow Wood Shear Walls</td><td>NC – There are 4 ft long by 11 ft tall shear walls along the interior corridor wall on the east side of the building. During an earthquake, these walls would be highly stressed and subject to severe deformations that reduce their capacity.</td></tr>
<tr><td>Walls Connected Through Floors</td><td>NC – In the 1953 building, the shear walls have no connection to transfer uplift forces through the slab into the concrete masonry block walls below.</td></tr>
<tr><td>Openings</td><td>NC – In the 1953 building, the east elevation walls have many windows. These walls may have little to no resistance to shear and overturning forces.</td></tr>
<tr><td>Connections</td><td>Wood Sill Bolts</td><td>U – The 1953 & 1974 drawings don’t show sill bolts. The absence of a connection limits the ability of the shear walls to resist seismic forces.</td></tr>
<tr><td>Diaphragms</td><td>Diaphragm Continuity</td><td>NC – There are split level diaphragms at the 1953 multi-</td></tr>
</table>

		purpose room and the 1976 gymnasium. This is a type of discontinuity which may lead to instability due to lack of support.
	Diaphragm Reinforcement at Openings	NC – There is no reinforcement at the infilled skylights in the 1953 building corridor. These openings could substantially reduce the stiffness of the diaphragm, and large forces around them could be induced.
	Straight Sheathing	NC – The 1953 building has a straight sheathed tongue & groove diaphragm that spans two classrooms (64 feet), which results in an aspect ratio greater than 2:1. Straight sheathed diaphragms are flexible and weak relative to other types of wood diaphragms and are not suitable for large aspect ratios.
	Spans	NC – The 1953 building has a straight sheathed tongue & groove diaphragm that spans two classrooms (64 feet). A span this large has the potential to cause large deflections in the diaphragm which can cause increased damage.
	Diagonally Sheathed and Unblocked Diaphragms	NC – The plywood diaphragm in the 1974 building is unblocked and spans greater than 40 feet. Without blocking, the diaphragm is subject to large deflections and damage.

* NC = Non-Compliant; U = Unknown

Based on our experience with tsunami resistant design, wood framed buildings such as Stevens Elementary School would not resist the extreme forces due to tsunami inundation. The building would likely sustain significant damage and may not be useable or repairable. We recommend that all building occupants be evacuated after an earthquake if there is risk of tsunami.

8. Seismic Retrofit Concepts

The Tier 1 Procedure in ASCE 41-17 is not intended to be used for the retrofit of structures; rather, it provides a quick screening evaluation to identify areas for further study. Designing retrofit measures based on a Tier 1 screening alone may result in an overly conservative and costly retrofit. We have provided retrofit concepts in Appendix A; however, they are preliminary and additional analysis should be performed if the building retrofit moves forward.

Several of the major deficiencies and their corresponding retrofits are described below. These retrofit measures are not intended to provide significant resistance to tsunami loading, but to provide safe evacuation after an earthquake.

- Deficiency – Site Geologic Hazards
    - As discussed in Section 5, liquefaction, cyclic softening, and lateral spread will cause significant settlement, strength loss in soils, and lateral displacement.
    - A 2-foot-thick concrete slab supported by perimeter drilled shafts is proposed. The slab will act to tie the building together, providing stability and continuity throughout.
    - Perimeter shafts, drilled to a depth of 95 to 130 feet below grade, will maintain vertical support in the event of soil softening and lateral displacement.
- Deficiency – Load Path
    - In the 1953 building, blocking and nailing should be installed to complete the shear connection between roof and exterior walls.
    - Clips should be installed at the valley between the 1953 and 1974 roof sheathing to transfer shear force across the joint between.
- Deficiency – Redundancy, Shear Stress Check, and Openings
    - To decrease the average shear stress in the 1953, 1974, and 1976 building walls, the total length of shear wall in each direction needs to be increased. Plywood sheathing should be installed on select existing wood stud walls. New sheathing and framing should extend to the underside of the roof, and holdowns should be installed on each end.
    - Where existing solid wall length is not sufficient, a select number of windows should be removed and infilled with plywood wall.
- Deficiency – Diaphragms
    - In the 1953 building, plywood should be installed over the existing tongue and groove sheathing to strengthen the diaphragm.
    - In the 1974 building, blocking should be installed below the existing plywood sheathing to strengthen the diaphragm.

9. Next Steps and Recommendations

ASCE 41 lists Tier 2 and Tier 3 as the two procedures available for the retrofit design of an existing building. A Tier 2 evaluation and retrofit is deficiency-based and is used in conjunction with the results of a Tier 1 evaluation. A Tier 3 evaluation and retrofit is a systematic study of the building and all its components.

As a next step, we recommend that each of the checklist items marked Noncompliant or Unknown should be evaluated using the Tier 2 procedure. The Tier 2 evaluation will better inform the items that need to be retrofitted. This should be coupled with a destructive investigation program to reveal unknown conditions behind finishes.

Additionally, although a nonstructural evaluation was not performed in this phase, it is common for buildings of this type and age to require bracing of various nonstructural elements (e.g. pipes and conduits). We recommend that these items be evaluated as part of the Tier 2 analysis.

If the retrofit moves forward, Aberdeen School District should plan for safe tsunami evacuation. This evacuation could consist of horizontal evacuation to high ground, or design and construction of a vertical evacuation structure.

Appendix A: Seismic Retrofit Concept Drawings

Appendix B: ASCE 41-17 Tier 1 Checklists

The following checklists are included within this appendix:

1. Basic Collapse Prevention Configuration Checklist (Modified for Limited Safety)
2. Collapse Prevention Structural Checklist for Wood Frame, Commercial and Industrial Buildings (W2)

AJ WEST ELEMENTARY SCHOOL
SEISMIC EVALUATION REPORT

AJ West Elementary School
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December 11, 2024
Degenkolb Job Number: C3860012.00



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Table of Contents

1. Introduction 2
2. Building Description 2
3. Sources and Standards 6
4. Site Visit and Investigation 7
5. Site Description and Geologic Site Hazards 12
6. Evaluation Methodology 13
7. Evaluation Results 14
8. Seismic Retrofit Concepts 17
9. Next Steps and Recommendations 18
Appendix A: Seismic Retrofit Concept Drawings 19
Appendix B: ASCE 41-17 Tier 1 Checklists 20

1. Introduction

The objective of this study is to complete a seismic evaluation and provide preliminary retrofit recommendations for AJ West Elementary School in Aberdeen, WA. The school has been selected for evaluation by OSPI under the School Seismic Safety Grant Program. The seismic evaluation and retrofit feasibility study was performed to characterize the expected seismic performance of the building in its existing condition and provide conceptual-level retrofit measures for use in estimating the scale and impact of a seismic retrofit. This report summarizes the results of this seismic analysis.

2. Building Description

AJ West Elementary School is a one-story structure of varying construction types and dates. The original building was constructed in 1952. In 1966, an annex building with additional classrooms was added to the West side of the original building.

The campus underwent a modernization in 1994. Areas with flat roofs on the 1952 and 1966 buildings were overbuilt with sloping roofs. Also, clerestory windows were added to the interior spaces of the 1966 building and windows and siding were replaced in the 1952 building.

The complete building footprint is L-shaped in plan, with outside-to-outside dimensions of approximately 230 feet by 305 feet. The 1994 drawings indicate a partial seismic upgrade of the original and annex buildings.

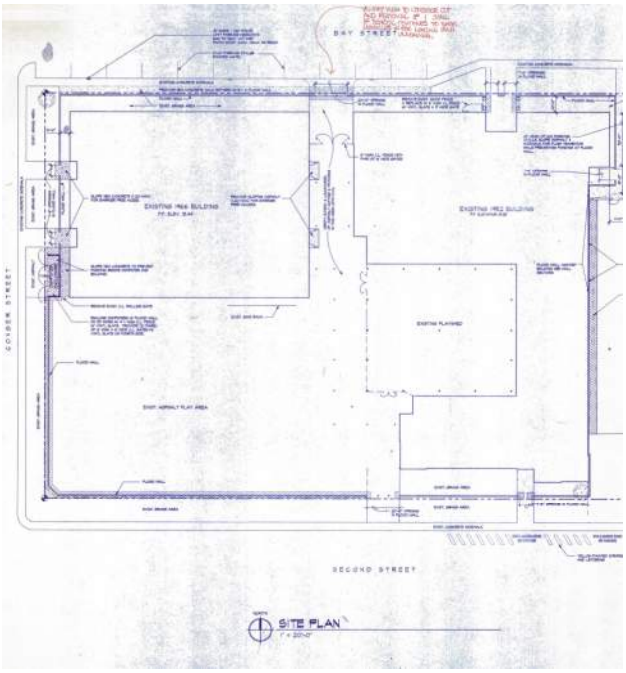

Figure 2-1 – AJ West Elementary School Building Areas (from 1994 Modernization)

1. **Original Building (1952):** The building is a one-story structure with wood-framed floors and roofs. It houses the school offices, staff lounge, workroom, gymnasium, kitchen, and seven classrooms. The building is C-shaped in plan with dimensions of approximately 160 feet by 230 feet, and its long dimension is oriented north-south. The low-sloped roof has an eave height of approximately 10 feet. The gymnasium sloped roof has an eave height of approximately 15 feet.
    i. Foundation System:
        a. Shallow foundations with concrete strip footings at exterior and interior wall lines
    ii. Floor System:
        a. Slab on grade
    iii. Wall System:
        a. Corridor walls: 2x stud walls with diagonal sheathing (plywood sheathing at infilled clerestory)
        b. Exterior classroom walls: 2x stud walls with diagonal sheathing; combination of aluminum and brick veneer siding
    iv. Roof System:
        a. Classroom roof: diagonal sheathing over 2x10 roof joists and 2x4 ceiling joists
        b. Corridor roof: unblocked plywood over 2x8 framing (overbuilt over 1952 flat roof)
        c. Gymnasium roof: plywood sheathing (added in 1994) over original diagonal sheathing and 2x12 purlins spanning to shaped glulam beam arches (original 1952)
2. **Annex Building (1966):** The building is a one-story structure with wood-framed floors and roofs. It houses 10 classrooms, the music room, and library. The building has a rectangular plan with dimensions of approximately 145 feet by 115 feet, with its long dimension oriented east-west. The building has a 3:12 sloped roof with an approximate eave height of 9 feet.
    i. Foundation System:
        a. Grade beams supported by driven wood piles
    ii. Floor System:
        a. Slab on grade
    iii. Wall System:
        a. 2x stud walls with plywood sheathing
        b. Several walls were converted to shear walls in 1994 modernization
    iv. Roof System:
        a. Plywood sheathing
        b. Roof trusses at 32” on center over original trussed joist roof

Exterior elevations are shown in Figures 2-2 through 2-8.



Figure 2-2 – 1952 Building South Elevation



Figure 2-3 – 1952 Building East Elevation



Figure 2-4 – 1952 Building North Elevation



Figure 2-5 – Annex Building West Elevation



Figure 2-6 – Annex Building South Elevation



Figure 2-7 – Annex Building North Elevation



Figure 2-8 – Play Shed South Elevation

3. Sources and Standards

The following documents were reviewed in preparing this report:

- Architectural Drawings titled "AJ West Elementary School" dated 12/31/1951.
- Architectural Drawings titled "Twelve Classroom Addition to AJ West Elementary School" dated 11/21/1966.
- Architectural and Structural Drawings titled "AJ West Elementary School Modernization" dated 04/11/1994.

Throughout this report, the following reference codes and standards are used:

- ASCE 41-17: Seismic Evaluation and Retrofit of Existing Buildings. American Society of Civil Engineers, 2017.
- ASCE 7-16: Minimum Design Loads for Buildings and Other Structures. American Society of Civil Engineers, 2016.
- 2021 International Existing Building Code as Amended and Adopted by the Washington State Building Code. International Code Council 2021.

4. Site Visit and Investigation

A site visit was conducted on April 02, 2024, to observe the existing construction and overall condition. Figures 4-1 through 4-8 show existing conditions observed during the site visits. Select observations in this investigation are summarized here.

- The buildings were in good condition with no noticeable signs of deterioration.
- Typical construction observed generally matches the available existing drawings.
- Figure 4-1 shows the classroom roof to transverse exterior wall connection in the 1952 building.
- Figure 4-2 shows diagonal sheathing at the exterior wall in the kindergarten room in the 1952 building.
- Figure 4-3 shows the 1994 plywood diaphragm adjacent to the office space. The plywood diaphragm was overbuilt over the original 1952 diagonally sheathed flat roof.
- Figure 4-4 shows the exterior roof-to-wall connection in the 1952 building.
- Figure 4-5 shows the gymnasium roof framing in the 1952 building.
- Figure 4-6 shows the library clerestory in the 1966 annex building.
- Figure 4-7 shows the typical gap between the play shed and the 1952 building.
- Figure 4-8 shows the connection from the play shed to the 1952 building, at the SW corner of the play shed. There is no seismic gap at this location.

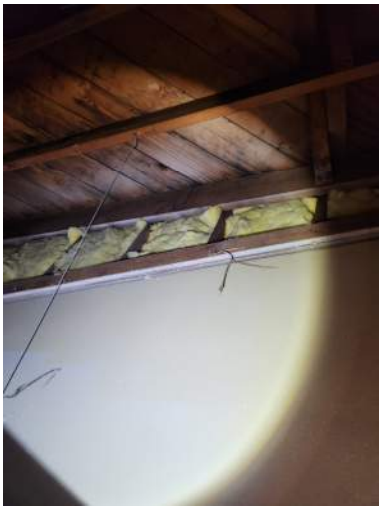

Figure 4-1 – Classroom Roof to Transverse Exterior Wall (1952 Building)



Figure 4-2 – Diagonal Sheathing at Exterior Wall in Kindergarten Room (1952 Building)



Figure 4-3 – 1994 Plywood Diaphragm Adjacent to Office Space



Figure 4-4 – Exterior Wall to Roof Connection (1952 Building)



Figure 4-5 – Gymnasium Roof (1952 Building)



Figure 4-6 – Library Clerestory (1966 Annex Building)



Figure 4-7 – Typical Gap Between Play Shed and 1952 Building



Figure 4-8 – Play Shed SW Corner Roof to 1952 Building

5. Site Description and Geologic Site Hazards

A geotechnical evaluation was performed by Haley & Aldrich, with their final report dated July 5th, 2024. Revised spectral design parameters were provided as a supplement on December 13th, 2024. The site was analyzed for the BSE-1E and BSE-2E seismic hazard level. The BSE-1E hazard corresponds to a 20% in 50-year seismic event or a 225-year return period, and the BSE-2E hazard corresponds to a 5% in 50-year seismic event or a 975-year return period. Per the geotechnical supplement, the short-period spectral acceleration, S_{xs}, and long-period spectral acceleration, S_{x1}, for the BSE-1E hazard level using the most current hazard maps from USGS are 0.79g and 0.49g, respectively. For the BSE-2E hazard level, S_{xs} and S_{x1} are 1.31g and 1.06g, respectively.

Note that the S_{x1} value for the BSE-2E hazard level provided in the geotechnical supplement includes a factor of 1.5 to adhere to ASCE 7-16 Supplement 3, Section 11.4.8, Item 2, Exception 2. However, the analysis performed shows that Exception 1 is met; thus, the S_{x1} value for the BSE-2E hazard level presented above includes a reduction factor of 1.5.

The report highlights several seismic hazards present at AJ West Elementary School, summarized below:

1. Liquefaction
    - There is high potential for liquefaction at the site, which may induce significant strength loss in the soil and result in reduced support for foundations and large ground settlements.
    - Vertical settlement is estimated to be between 13 and 17 inches.
    - Liquefiable conditions are typically expected to begin at a depth of 20 to 30 feet below ground surface and persist to depths of 85 to 120 feet below ground surface.
2. Cyclic Softening
    - Saturated fine-grained soils have a potential to experience strength loss because of strong seismic shaking; such loss is likely to occur at the site.
    - Soils susceptible to cyclic softening are limited to a depth of 40 feet below ground surface.
3. Lateral Spreading
    - Lateral spreading related to seismic activity typically involves lateral displacement of large blocks of non-liquefied soil when an underlying soil layer loses strength during seismic shaking. It is expected to occur at the site.
    - Movement will generally occur in the direction of the Chehalis River and is expected to range from 1 ½ feet to 20 + feet.

The report classifies the soil as Site Class E due to the severe liquefaction hazard. The site is in a region of high seismicity, with the Cascadia Subduction Zone contributing significantly to the overall seismic hazard at the site.

The Cascadia Subduction Zone is capable of generating large tsunamis with the potential to inundate the Washington coastline. The site is within the Washington Tsunami Design Zone, which leads to additional requirements for the design and construction of new RC III and IV buildings. Per the hazard maps developed by the WA Department of Natural Resources, the tsunami inundation depth at AJ West Elementary School is estimated to be 9 feet.

6. Evaluation Methodology

An ASCE 41-17 Tier 1 evaluation was performed for AJ West Elementary School with a Limited Safety structural performance objective for the BSE-2E hazard. Based on the occupancy, the building is classified as Risk Category III. The buildings evaluated include the Original 1952 Building and 1966 Annex Building. The following Tier 1 checklists were completed as part of this evaluation and are presented in Appendix B:

- Basic Collapse Prevention Configuration Checklist (Modified for Limited Safety)
- Collapse Prevention Structural Checklist for Wood Frame, Commercial and Industrial Buildings (W2)

The Collapse Prevention checklists were used with modified m-factors as required by ASCE 41-17 Table 2-2 footnote c. These checklists are intended to screen for common building deficiencies with limited structural calculations. These deficiencies have been identified as potential collapse hazards when buildings of similar age and construction are subjected to large ground motions.

ASCE 41-17 does not explicitly define evaluation procedures for buildings located within the tsunami inundation zone.

7. Evaluation Results

This section outlines the results of the ASCE 41-17 Tier 1 evaluation. The evaluation indicates that AJ West Elementary School does not comply with the Limited Safety performance objective due to several significant deficiencies typical of older wood framed buildings. The deficiencies for the 1952 building and 1966 annex building are described in Tables 7-1 and Table 7-2, respectively.

Table 7-1 – Structural Deficiency Summary (1952 Building)

Category	Deficiency	Description*
Building System: General	Load Path	NC – (1) Due to infilled clerestory, wall studs at interior & exterior corridor walls are not continuous through upper and lower portions. This causes a weak point in the wall. (2) The roof-to-wall connection at the exterior classroom walls has a gap currently filled with insulation. There is no load path for seismic forces to get from the roof into the wall in this configuration (see Figure 4-4)
Building System: General	Adjacent Buildings	NC – The gap between the play shed and 1952 building is enclosed with sheet metal in many locations (see Figure 4-7) but is framed into the classroom building at some locations (see Figure 4-8). This prevents independent movement of the two structures.
Geologic Site Hazard	Liquefaction	NC – There is very high potential for liquefaction to occur during an earthquake. This would result in a significant strength loss in the soil, resulting in reduced support for foundations and large ground settlements.
Lateral Seismic-Force-Resisting System	Shear Stress Check	NC – The average shear stress in the shear walls is greater than the limit in the E-W direction.
	Narrow Wood Shear Walls	NC – The exterior classroom walls at the East elevation have several 3 ft long shear walls. During an earthquake, these walls would be highly stressed and subject to severe deformations that reduce their capacity.

Diaphragms	Diaphragm Continuity	NC – The gymnasium diaphragm is offset from the main building on the South, West, and East sides (see Figure 2-4). This is a type of discontinuity which may lead to instability due to lack of support.
	Diagonally Sheathed and Unblocked Diaphragms	NC – The diaphragm above the original construction is diagonally sheathed and spans multiple classrooms; the overframed roof diaphragm is plywood sheathed, unblocked, and spans up to 160 ft; these diaphragms have large spans that would result in large shear demands.

* NC = Non-Compliant; U = Unknown

Table 7-2 – Structural Deficiency Summary (1966 Annex Building)

Category	Deficiency	Description*
Building System: General	Load Path	NC – (1) Inner corridor walls are used as shear walls; however, the wall is discontinuous at the original roof trussed joists and doesn't have a load path. (2) N-S shear walls between classrooms added during the 1994 modernization stop at the ceiling; cripple walls were added in the truss space, but there is no shear connection from the cripple wall to the lower wall.
Lateral Seismic-Force-Resisting System	Shear Stress Check	NC – The library clerestory does not have any solid wall due to windows and mechanical openings. Shear stress in this area exceeds the limit by inspection.
	Narrow Wood Shear Walls	NC – At the exterior classroom walls, there are 4 ft walls used to resist shear. During an earthquake, these walls would be highly stressed and subject to severe deformations that reduce their capacity.
	Openings	NC – The library clerestory wall is nearly 100% openings. These walls may have little to no resistance to shear and overturning forces.

Diaphragms	Diaphragm Continuity	NC – The library clerestory is a split level. This is a type of discontinuity which may lead to instability due to lack of support.
	Diagonally Sheathed and Unblocked Diaphragms	NC – The diaphragm is sheathed with plywood but appears to be unblocked. For the N-S loading direction, the diaphragm spans 88 ft (3 classrooms). This large span would result in high shear demands.

* NC = Non-Compliant; U = Unknown

Based on our experience with tsunami-resistant design, wood-framed buildings such as AJ West Elementary School would not resist the extreme forces due to tsunami inundation. The building would likely sustain significant damage and may not be useable or repairable. We recommend that all building occupants be evacuated after an earthquake if there is risk of tsunami.

8. Seismic Retrofit Concepts

The Tier 1 Procedure in ASCE 41-17 is not intended to be used for the retrofit of structures; rather, it provides a quick screening evaluation to identify areas for further study. Designing retrofit measures based on a Tier 1 screening alone may result in an overly conservative and costly retrofit. We have provided retrofit concepts in Appendix A; however, they are preliminary and additional analysis should be performed if the building retrofit moves forward.

Several of the major deficiencies and their corresponding retrofits are described below. These retrofit measures are not intended to provide significant resistance to tsunami loading, but to provide safe evacuation after an earthquake.

- Deficiency – Site Geologic Hazards
    - As discussed in Section 5, liquefaction, cyclic softening, and lateral spread will cause significant settlement, strength loss in soils, and lateral displacement.
    - A 2-foot-thick concrete slab supported by perimeter drilled shafts is proposed. The slab will act to tie the building together, providing stability and continuity throughout.
    - Perimeter shafts, drilled to a depth of 95 to 130 feet below grade, will maintain vertical support in the event of soil softening and lateral displacement.
- Deficiency – Load Path (1952 Building)
    - For walls with previously infilled clerestory openings, diagonal sheathing on the lower portion of wall should be removed and replaced with plywood sheathing. The new plywood should be connected to the original plywood with clips.
    - Where roof joists frame perpendicular to existing shear walls, full height blocking should be installed above the wall top plate. The blocking should be nailed to the wall top plate and roof sheathing, completing the load path from roof to shear wall.
- Deficiency – Shear Stress Check
    - To decrease the average shear stress in the 1952 building walls, the total length of shear wall in each direction needs to be increased. Plywood sheathing should be installed on select existing wood stud walls. New sheathing and framing should extend through the flat roof to the underside of the over-framed roof. Coiled straps should be installed above and below mechanical vent penetrations.
    - The library and music room clerestory has many window openings, leaving it vulnerable to large shear forces.
    - In the 1966 annex building, the length of solid wall in the library clerestory needs to be increased. Four window openings should be

removed – two in the library and two in the music room. The openings should be infilled with plywood sheathing and attached to the roof and wall below.

9. Next Steps and Recommendations

ASCE 41 lists Tier 2 and Tier 3 as the two procedures available for the retrofit design of an existing building. A Tier 2 evaluation and retrofit is deficiency-based and is used in conjunction with the results of a Tier 1 evaluation. A Tier 3 evaluation and retrofit is a systematic study of the building and all its components.

As a next step, we recommend that each of the checklist items marked Noncompliant or Unknown should be evaluated using the Tier 2 procedure. The Tier 2 evaluation will better inform the items that need to be retrofitted. This should be coupled with a destructive investigation program to reveal unknown conditions behind finishes.

Additionally, although a nonstructural evaluation was not performed in this phase, it is common for buildings of this type and age to require bracing of various nonstructural elements (e.g. pipes and conduits). We recommend that these items be evaluated as part of the Tier 2 analysis.

If the retrofit moves forward, Aberdeen School District should plan for safe tsunami evacuation. This evacuation could consist of horizontal evacuation to high ground, or design and construction of a vertical evacuation structure.

Appendix A: Seismic Retrofit Concept Drawings

Appendix B: ASCE 41-17 Tier 1 Checklists

The following checklists are included within this appendix:

1. Basic Collapse Prevention Configuration Checklist (Modified for Limited Safety) – 1952 Building
2. Collapse Prevention Structural Checklist for Wood Frame, Commercial and Industrial Buildings (W2) – 1952 Building
3. Basic Collapse Prevention Configuration Checklist (Modified for Limited Safety) – 1966 Annex Building
4. Collapse Prevention Structural Checklist for Wood Frame, Commercial and Industrial Buildings (W2) – 1966 Annex Building

HARBOR HIGH SCHOOL
SEISMIC EVALUATION REPORT

Harbor High School
300 N Williams St.
Aberdeen, WA 98520

December 11, 2024
Degenkolb Job Number: C3860012.00



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Table of Contents

1. Introduction 2
2. Building Description 2
3. Sources and Standards 6
4. Site Visit and Investigation 6
5. Site Description and Geologic Site Hazards 11
6. Evaluation Methodology 12
7. Evaluation Results 13
8. Seismic Retrofit Concepts 15
9. Next Steps and Recommendations 16
Appendix A: Seismic Retrofit Concept Drawings 17
Appendix B: ASCE 41-17 Tier 1 Checklists 18

1. Introduction

The objective of this study is to complete a seismic evaluation and provide preliminary retrofit recommendations for Harbor High School in Aberdeen, WA. The school has been selected for evaluation by OSPI under the School Seismic Safety Grant Program. The seismic evaluation and retrofit feasibility study was performed to characterize the expected seismic performance of the building in its existing condition. This report summarizes the results of this seismic analysis.

2. Building Description

Harbor High School is a one-story structure originally constructed in 1956. The building has two parts, with outside-to-outside dimensions of approximately 240 feet by 370 feet. The west E-shaped structure has a low-sloped roof with eave height of approximately 10 feet and houses classrooms, activity rooms, and the library. The east part of the building is rectangular and houses the multipurpose room, locker rooms, shop, music room, kitchen, boiler room, and administrative offices. The multipurpose room has an eave height of approximately 25 feet due to its clerestory. Figure 2-1 shows a plan view of the building, taken from the 1956 drawings.

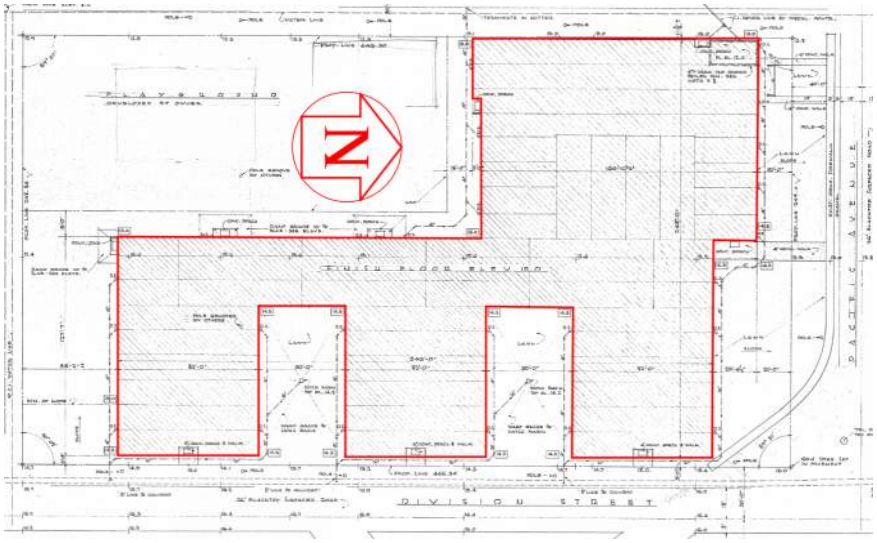

Figure 2-1 – Harbor High School Plan

1. **Classroom Wing:** The classroom wing is E-shaped in plan, with dimensions of approximately 345 feet by 130 feet. Its long dimension is oriented north-south.
    i. Foundation System:
        a. Exterior wall lines: Untreated wood pile foundation with pile caps and grade beams.
    ii. Floor System:
        a. Reinforced concrete slab on grade.
    iii. Wall System:
        a. Reinforced concrete walls.
    iv. Roof System:
        a. Built-up roof with 2" thick tectum panels supported by wood purlins and glulam girders.

2. **Multipurpose Room Wing:** The multipurpose room wing is rectangular in plan, with dimensions of approximately 115 feet by 160 feet. Its long dimension is oriented north-south.
    i. Foundation System:
        a. Untreated wood pile foundation with pile caps and grade beams.
    ii. Floor System:
        a. Reinforced concrete slab on grade.
    iii. Wall System:
        a. West multipurpose room wall: 2x plywood sheathed stud wall with wood posts.
        b. North and south multipurpose room walls: Upper corrugated fiberglass walls with wood posts supported by a 2x plywood sheathed stud wall below.
        c. East multipurpose room wall: Concrete wall with concrete pilasters.
    iv. Roof System:
        a. Built-up roof with 2" thick tectum panels supported by steel purlins and glulam girders, spanning to each wall.

Exterior elevations are shown in Figures 2-2 through 2-9.



Figure 2-2 – West Elevation - South



Figure 2-3 – South Elevation - West



Figure 2-4 – West Elevation - North



Figure 2-5 – North Elevation - West



Figure 2-6 – North Elevation - East



Figure 2-7 – East Elevation – Typical Wall (3 Total)



Figure 2-8 – East Elevation – Typical Courtyard (2 Total)



Figure 2-9 – South Elevation - East

3. Sources and Standards

The following documents were reviewed in preparing this report:

- Architectural Drawings titled “West Aberdeen Jr. High School” dated 10/1956.

Throughout this report, the following reference codes and standards are used:

- ASCE 41-17: Seismic Evaluation and Retrofit of Existing Buildings. American Society of Civil Engineers, 2017.
- ASCE 7-16: Minimum Design Loads for Buildings and Other Structures. American Society of Civil Engineers, 2016.
- 2021 International Existing Building Code as Amended and Adopted by the Washington State Building Code. International Code Council 2021.

4. Site Visit and Investigation

A site visit was conducted on April 01, 2024 to observe the existing construction and overall condition. Figures 4-1 through 4-7 show existing conditions observed during the site visit. Select observations in this investigation are summarized here.

- The buildings were in poor condition. There were noticeable signs of deterioration at the roof, and the slab on grade has settled significantly.
- Typical construction observed generally matches existing drawings.
- Figures 4-1 & 4-2 show a typical N-S and E-W concrete wall with openings over the corridor.
- Figure 4-3 shows the typical multipurpose room fiberglass clerestory, located on the north and south walls.
- Figure 4-4 shows a typical skylight. As shown, these were infilled with plywood at some point.
- Figure 4-5 shows the typical classroom roof framing, with wood purlins spanning between glulam beams.
- Figure 4-6 shows the skylight popups over each classroom wing (large diaphragm openings).
- Figure 4-7 shows the multipurpose room roof framing.



Figure 4-1 – N-S Concrete Wall at Corridor

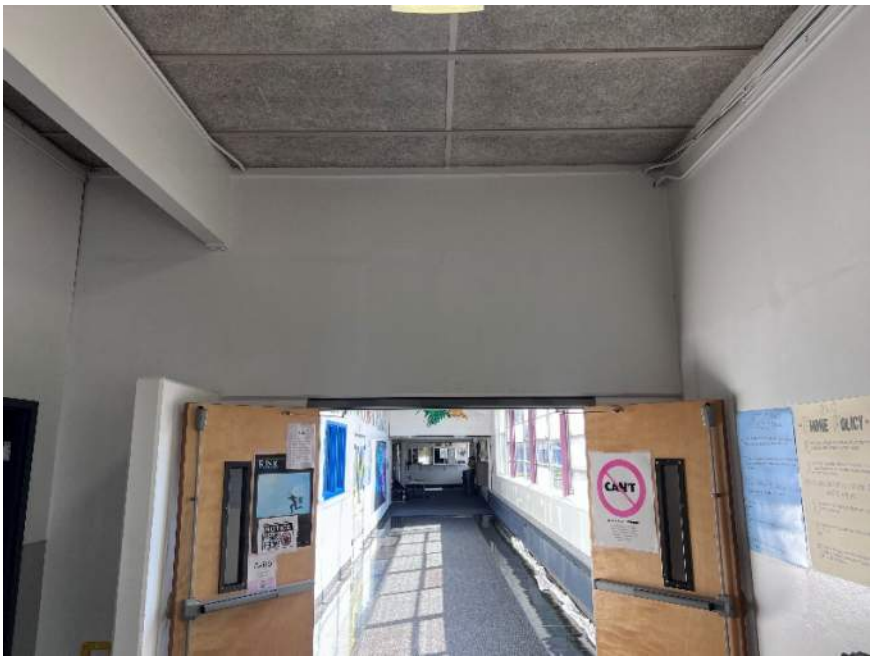

Figure 4-2 – E-W Concrete Wall at Corridor



Figure 4-3 – Multipurpose Room Fiberglass Clerestory



Figure 4-4 – Typical Infilled Skylight



Figure 4-5 – Typical Classroom Roof Framing

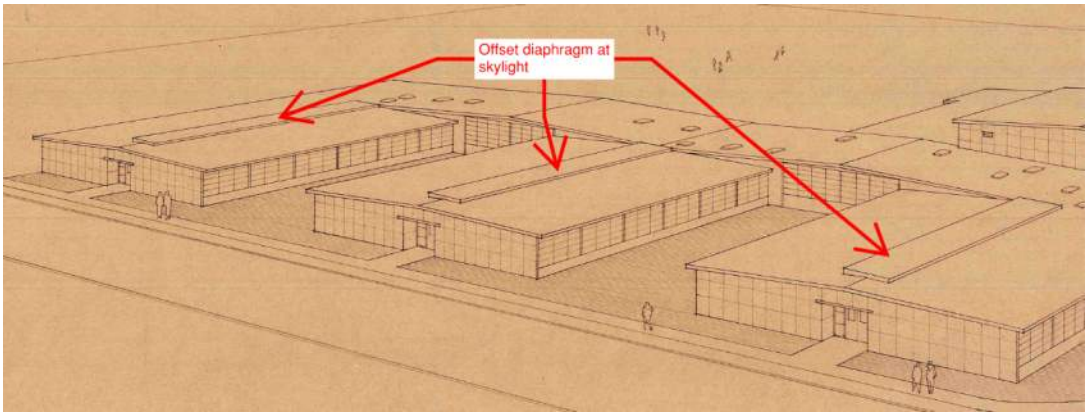

Figure 4-6 – Offset Diaphragm at Skylight (from 1956 Drawings)



Figure 4-7 –Multipurpose Room Roof Framing

5. Site Description and Geologic Site Hazards

A geotechnical evaluation was performed by Haley & Aldrich, with their final report dated July 5th, 2024. Revised spectral design parameters were provided as a supplement on December 13th, 2024. The site was analyzed for the BSE-1E and BSE-2E seismic hazard level. The BSE-1E hazard corresponds to a 20% in 50-year seismic event or a 225-year return period, and the BSE-2E hazard corresponds to a 5% in 50-year seismic event or a 975-year return period. Per the geotechnical supplement, the short-period spectral acceleration, S_{xs}, and long-period spectral acceleration, S_{x1}, for the BSE-1E hazard level using the most current hazard maps from USGS are 0.79g and 0.49g, respectively. For the BSE-2E hazard level, S_{xs} and S_{x1} are 1.31g and 1.05g, respectively.

Note that the S_{x1} value for the BSE-2E hazard level provided in the geotechnical supplement includes a factor of 1.5 to adhere to ASCE 7-16 Supplement 3, Section 11.4.8, Item 2, Exception 2. However, the analysis performed shows that Exception 1 is met; thus, the S_{x1} value for the BSE-2E hazard level presented above includes a reduction factor of 1.5.

The report highlights several seismic hazards present at Harbor High School, summarized below:

1. Liquefaction
    - There is high potential for liquefaction at the site, which may induce significant strength loss in the soil and result in reduced support for foundations and large ground settlements.
    - Vertical settlement is estimated to be between 11 and 25 inches.
    - Liquefiable conditions are typically expected to begin at a depth of 20 to 30 feet below ground surface and persist to depths of 85 to 120 feet below ground surface.
2. Cyclic Softening
    - Saturated fine-grained soils have a potential to experience strength loss because of strong seismic shaking; such loss is likely to occur at the site.
    - Soils susceptible to cyclic softening are limited to a depth of 20 feet below ground surface.
3. Lateral Spreading
    - Lateral spreading related to seismic activity typically involves lateral displacement of large blocks of non-liquefied soil when an underlying soil layer loses strength during seismic shaking. It is expected to occur at the site.
    - Movement will generally occur in the direction of the Chehalis River and is expected to range from 1 ½ feet to 20 + feet.

The report classifies the soil as Site Class F due to the severe liquefaction hazard. The site is in a region of high seismicity, with the Cascadia Subduction Zone contributing significantly to the overall seismic hazard at the site.

The Cascadia Subduction Zone is capable of generating large tsunamis with the potential to inundate the Washington coastline. The site is within the Washington Tsunami Design Zone, which leads to additional requirements for the design and construction of new RC III and IV buildings. Per the hazard maps developed by the WA Department of Natural Resources, the tsunami inundation depth at Harbor High School is estimated to be 9 feet.

6. Evaluation Methodology

An ASCE 41-17 Tier 1 evaluation was performed for Harbor High School with a Limited Safety structural performance objective for the BSE-2E hazard. Based on the occupancy, the building is classified as Risk Category III. The following Tier 1 checklists were completed as part of this evaluation and are presented in Appendix B:

- Basic Collapse Prevention Configuration Checklist (Modified for Limited Safety)
- Collapse Prevention Structural Checklist for Reinforced Concrete Shear Wall Buildings with Flexible Diaphragms (C2A)
- Collapse Prevention Structural Checklist for Wood Frame, Commercial and Industrial Buildings (W2)

The Collapse Prevention checklists were used with modified m-factors as required by ASCE 41-17 Table 2-2 footnote c. These checklists are intended to screen for common building deficiencies with limited structural calculations. These deficiencies have been identified as potential collapse hazards when buildings of similar age and construction are subjected to large ground motions.

ASCE 41-17 does not explicitly define evaluation procedures for buildings located within the tsunami inundation zone.

7. Evaluation Results

This section outlines the results of the ASCE 41-17 Tier 1 evaluation. The evaluation indicates that Harbor High School does not comply with the Limited Safety performance objective due to several significant deficiencies typical of older concrete buildings. The deficiencies are described in Table 7-1.

Table 7-1 – Structural Deficiency Summary

Category	Deficiency	Description*
Lateral Seismic-Force-Resisting System	Load Path	NC – The north & south multipurpose room clerestory consists of 4x6 posts @ 7.5 feet on center, sheathed with corrugated fiberglass. There is not a shear load path through the fiberglass into the 2x6 plywood sheathed stud wall below the clerestory.
	Shear Stress Check	NC – While the building's concrete shear walls pass the quick check, the average shear stress through the north & south multipurpose room upper clerestory walls is 850 plf, which is greater than the assumed 100 plf strength.
Connections	Wall Anchorage at Flexible Diaphragms	NC – There are no steel anchors or straps that develop the Tectum roofing into the concrete walls, increasing the likelihood that the walls separate from the roof during an earthquake.
	Transfer to Shear Walls	NC – There are no shear connections or collectors present to transfer the diaphragm force into the concrete shear walls.
	Uplift at Pile Caps	NC – The wood piles are not anchored into pile caps or the slab on grade. The absence of anchorage means that the pile cap or slab on grade cannot deliver the uplift forces (induced during an earthquake) to the piles.
Diaphragms	Diaphragm Continuity	NC – The multipurpose room roof diaphragm is offset from the classroom diaphragm. This is a type of discontinuity which may lead to instability due to lack of support.
	Openings at Shear Walls	NC – The wire glass skylights over the corridors are diaphragm openings that are greater than 25% of the wall length. These openings significantly limit the ability of the diaphragm to transfer shear force to the walls.
	Cross Ties	NC – There are no connections anchoring any of the concrete walls to the diaphragm for out of plane forces. Due to this, the

		walls will tend to separate from the roof when subject to earthquake forces.
	Spans	NC – The multipurpose room tectum panel diaphragm spans 81 feet in the E-W direction and 61 feet in the N-S direction. Also, the tectum panel diaphragms over the 3 classroom wings span to the exterior concrete walls (the support provided by the corridor walls is neglected since these walls are not shear walls). Long span diaphragms such as these often experience large lateral deflections and diaphragm shear demands, resulting in increased damage during an earthquake.
	Other Diaphragms	NC – The diaphragm consists of tectum panels; however, it is understood that these may have the ability to resist shear force – further investigation is recommended.

* NC = Non-Compliant; U = Unknown

While slab settlement is not an item on the ASCE 41-17 Tier 1 checklist, significant slab settlement has already occurred, and further settlement during ground shaking is possible. This additional settlement may cause doors to get stuck and may introduce more tripping hazards, both inhibiting safe egress from the building after shaking stops. Safe and efficient egress is a necessary requirement for tsunami evacuation.

Based on our experience with tsunami resistant design, buildings with poor interconnections such as Harbor High School would not resist the extreme forces due to tsunami inundation. The building would likely sustain significant damage and may not be useable or repairable. We recommend that all building occupants be evacuated after an earthquake if there is risk of tsunami.

8. Seismic Retrofit Concepts

The Tier 1 Procedure in ASCE 41-17 is not intended to be used for the retrofit of structures; rather, it provides a quick screening evaluation to identify areas for further study. Designing retrofit measures based on a Tier 1 screening alone may result in an overly conservative and costly retrofit. We have provided retrofit concepts in Appendix A; however, they are preliminary and additional analysis should be performed if the building retrofit moves forward.

Several of the major deficiencies and their corresponding retrofits are described below. These retrofit measures are not intended to provide significant resistance to tsunami loading, but to provide safe evacuation after an earthquake.

- Deficiency – Site Geologic Hazards
    - As discussed in Section 5, liquefaction, cyclic softening, and lateral spread will cause significant settlement, strength loss in soils, and lateral displacement.
    - A 2-foot-thick concrete slab supported by perimeter drilled shafts is proposed. The slab will act to tie the building together, providing stability and continuity throughout.
    - Perimeter shafts, drilled to a depth of 95 to 130 feet below grade, will maintain vertical support in the event of soil softening and lateral displacement.
- Deficiency – Load Path & Shear Stress Check
    - At the north and south multipurpose wall clerestory, the existing fiberglass panels should be removed and replaced with plywood panels to increase shear strength and resolve wall discontinuity. Nailing and blocking should be installed as required.
- Deficiency – Other Diaphragms & Transfer to Shear Walls
    - Further analysis is required to determine if the existing Tectum panel roof is adequate. If the roof has sufficient strength, it does not need to be replaced; however, anchors into the concrete shear walls should be installed. If it is not adequate, the roof should be removed and replaced with a wood-framed plywood roof, and the new roof should be connected to the existing concrete and wood walls.
- Deficiency – Cross Ties
    - Straps (extending under the roof) and collectors should be installed and anchored to concrete walls – these elements prevent separation of the concrete walls from the roof.

9. Next Steps and Recommendations

ASCE 41 lists Tier 2 and Tier 3 as the two procedures available for the retrofit design of an existing building. A Tier 2 evaluation and retrofit is deficiency-based and is used in conjunction with the results of a Tier 1 evaluation. A Tier 3 evaluation and retrofit is a systematic study of the building and all its components.

As a next step, we recommend that each of the checklist items marked Noncompliant or Unknown should be evaluated using the Tier 2 procedure. The Tier 2 evaluation will better inform the items that need to be retrofitted. For example, the "Other Diaphragms" item is marked as unknown because further analysis is required to determine the shear strength of the Tectum roof panels. If this analysis shows the Tectum panels have sufficient diaphragm strength, a new plywood roof is not required. Conversely, a new plywood roof would be required if the analysis shows that the existing roof is not adequate.

Additionally, although a nonstructural evaluation was not performed in this phase, it is common for buildings of this type and age to require bracing of various nonstructural elements (e.g. pipes and conduits). We recommend that these items be evaluated as part of the Tier 2 analysis.

If the retrofit moves forward, Aberdeen School District should plan for safe tsunami evacuation. This evacuation could consist of horizontal evacuation to high ground, or design and construction of a vertical evacuation structure.

Appendix A: Seismic Retrofit Concept Drawings

Appendix B: ASCE 41-17 Tier 1 Checklists

The following checklists are included within this appendix:

1. Basic Collapse Prevention Configuration Checklist (Modified for Limited Safety)
2. Collapse Prevention Structural Checklist for Reinforced Concrete Shear Wall Buildings with Flexible Diaphragms (C2A)
3. Collapse Prevention Structural Checklist for Wood Frame, Commercial and Industrial Buildings (W2)

MCDERMOTH ELEMENTARY SCHOOL
SEISMIC EVALUATION REPORT

McDermoth Elementary School
409 N K St
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December 18, 2024
Degenkolb Job Number: C3860012.00



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Table of Contents

1. Introduction 2

2. Building Description 2

3. Sources and Standards 6

4. Site Visit and Investigation 8

5. Site Description and Geologic Site Hazards 14

6. Evaluation Methodology 14

7. Evaluation Results 16

8. Seismic Retrofit Concepts 17

9. Next Steps and Recommendations 18

Appendix A: Seismic Retrofit Concept Drawings 19

Appendix B: ASCE 41-17 Tier 1 Checklists 20

1. Introduction

The objective of this study is to complete a seismic evaluation and provide preliminary retrofit recommendations for McDermoth Elementary School in Aberdeen, WA. The school has been selected for evaluation by OSPI under the School Seismic Safety Grant Program. The seismic evaluation and retrofit feasibility study was performed to characterize the expected seismic performance of the building in its existing condition and provide conceptual-level retrofit measures for use in estimating the scale and impact of a seismic retrofit. This report summarizes the results of this seismic analysis.

2. Building Description

McDermoth Elementary School is a multi-story structure of varying construction types, stories, and dates. The original building was constructed in 1930, and is three stories tall. In 1997, a two-story annex building with a gymnasium was added to the Northeast corner of the original building, and the north side of the building expanded to enlarge the library and second story classrooms.

The campus underwent a partial seismic upgrade in 1997 as well. Masonry walls were backed by shotcrete or new wood framed walls, with anchors to the existing masonry walls. The attic was sheathed with plywood and straps were added running East-West along the length of the building. Interior tile partitions were demolished and replaced with wood framed partition walls, steel gravity elements, and shotcrete walls.

The complete building footprint is L-shaped in plan, with outside-to-outside dimensions of approximately 230 feet by 189 feet.

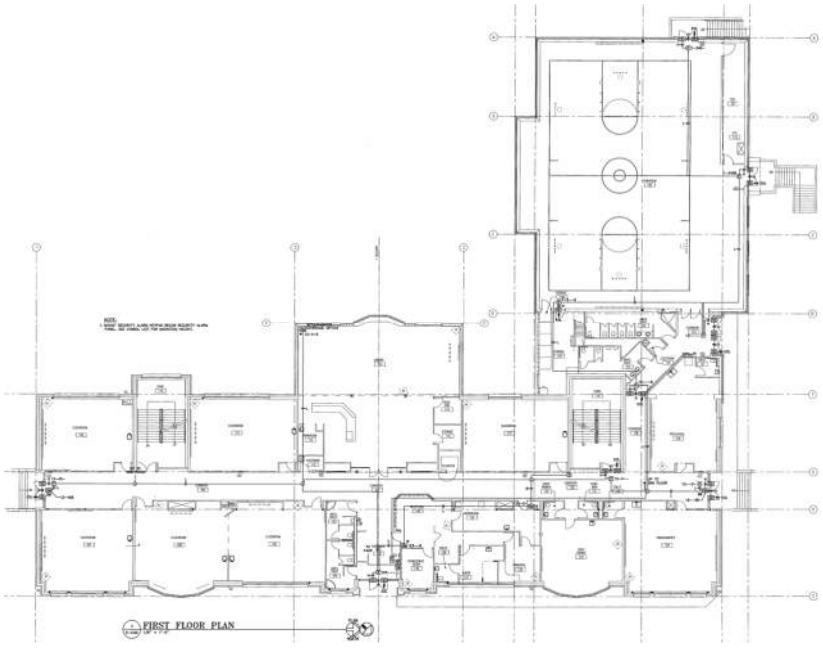


Figure 2-1 – McDermoth Elementary School Level 1 Plan (from 1997 Modernization)

1. **Original Building (1930):** The building is a three-story structure with wood-framed floors and roofs. It houses the school offices, staff lounge, workroom, gymnasium, kitchen, library, and twenty-one classrooms. The building is rectangular in plan with dimensions of approximately 231 feet by 68 feet, and its long dimension is oriented east-west. The roof has a 7:12 sloped roof with an eave height of approximately 47 feet.
    i. Foundation System:
        a. Shallow foundations with concrete strip footings at exterior and interior wall lines
    ii. Floor System:
        a. Ground Floor: Concrete slab on grade, plywood on TJI Joists at expansion of (E) Building.
        b. First Floor: 3 ½" concrete slab spanning to concrete beams. ½" concrete over plywood supported by TJL on expansion of (E) building at Library.
        c. Second Floor: ½" Plywood over 2x wood joists and TJI joists, spanning to interior steel beams and exterior walls
        d. Attic Floor: Partially-sheathed with plywood, supported by 2x wood joists spanning to interior steel beams and exterior walls.
    iii. Wall System:
        a. Corridor walls: 2x wood stud walls with diagonal sheathing (plywood sheathing at infilled clerestory) or metal stud framed walls.
        b. Exterior walls: Shotcrete over masonry walls, or wood framed walls anchored to masonry.
    iv. Roof System:
        a. Plywood over straight sheathing, spanning to 2x roof joists

2. **Gymnasium Building (1997):** The building is a two-story structure with pre-tensioned floors and a metal deck over steel trussed roof. It houses a gymnasium which covers an open-air play area on the first story. The building is rectangular plan with dimensions of approximately 120 feet by 90 feet, with its long dimension oriented north-south. The building has a 6:12 sloped roof with an approximate eave height of 32 feet.
    i. Foundation System:
        a. Grade beams supported by concrete piles
    ii. Floor System:
        a. Precast hollow-core concrete panels
    iii. Wall System:
        a. First Story: 16” Concrete walls
        b. Second Story: CMU Walls
    iv. Roof System:
        a. Un-topped metal decking
        b. Roof trusses at 8 feet on center

Exterior elevations are shown in Figures 2-2 through 2-5.



Figure 2-2 –North Elevation



Figure 2-3 – 1930 Building West Elevation



Figure 2-4 – Southwest Elevation



Figure 2-5 – 1930 Building East Elevation

3. Sources and Standards

The following documents were reviewed in preparing this report:

- Architectural and Structural Drawings titled “New Franklin Grade School” dated 5/11/1929.
- Architectural and Structural Drawings titled “McDermoth Elementary School Modernization” dated 12/31/1997.
- Geotechnical Report titled “Report of Preliminary Geotechnical Engineering Findings, Aberdeen School District No. 5 Seismic Safety Retrofits; McDermoth Elementary School” by Haley & Aldrich Inc., Dated September 2024.

Throughout this report, the following reference codes and standards are used:

- ASCE 41-17: Seismic Evaluation and Retrofit of Existing Buildings. American Society of Civil Engineers, 2017.
- ASCE 7-16: Minimum Design Loads for Buildings and Other Structures. American Society of Civil Engineers, 2016.
- 2021 International Existing Building Code as Amended and Adopted by the

Washington State Building Code. International Code Council 2021.

4. Site Visit and Investigation

A site visit was conducted on June 18, 2024, to observe the existing construction and overall condition. Figures 4-1 through 4-10 show existing conditions observed during the site visits. Select observations in this investigation are summarized here.

- The buildings were in good condition with no noticeable signs of deterioration.
- Typical construction observed generally matches the available existing drawings.
- Figure 4-1 shows the floor, roof, and exterior wall in the western corner of the attic. A step in the floor diaphragm exists, and kicker braces brace the top of the wall back to the floor.
- Figure 4-2 shows the attic of the 1930 building with a step in the floor, and unsheathed attic floor. Tube steel spans across the step.
- Figure 4-3 shows the gap between a 1997 sheathed wall and the original 1930 URM wall, with anchors connecting the two walls.
- Figure 4-4 shows the anchorage of tube steel to the original URM wall in the Western corner of the attic.
- Figure 4-5 shows the roof framing from the 1997 Modernization, which lands on the original roof from the 1930s above the attic.
- Figure 4-6 shows the gymnasium in the 1997 expansion gymnasium building.
- Figure 4-7 shows the connection of the roof trusses to the walls of the 1997 gymnasium building.
- Figure 4-8 shows the connection from the metal roof to the transverse masonry walls at the gymnasium, and the angle straps that connect the diaphragm to the wall.
- Figure 4-9 shows the Southeast elevation of the gymnasium building and covered play area.
- Figure 4-10 shows the interior of the covered play area in the 1997 expansion.



Figure 4-1 – Western Corner of Attic with Step (1930 Building)



Figure 4-2 – Stepped Attic Floor at Shear Wall Without Plywood Sheathing (1930 Building)



Figure 4-3 – Anchorage of 1997 Wood Walls to URM Walls in Attic



Figure 4-4 – Anchorage of Tube Steel to URM Wall in Attic (1930 Building)



Figure 4-5 – Overbuilt Roof from 1997 Modernization (1930 Building)



Figure 4-6 – Gymnasium Structure (1997 Gymnasium Building)



Figure 4-7 – Attachment of Trusses to Wall at Gymnasium



Figure 4-8 – Anchorage and L Straps to Diaphragm at Gymnasium



Figure 4-9 – Elevation of Covered Play Area Beneath Gymnasium



Figure 4-10 – Covered Play Area Beneath Gymnasium

5. Site Description and Geologic Site Hazards

A geotechnical evaluation was performed by Haley & Aldrich. The site was analyzed for the BSE-1E and BSE-2E seismic hazard level. The BSE-1E hazard corresponds to a 20% in 50-year seismic event or a 225-year return period, and the BSE-2E hazard corresponds to a 5% in 50-year seismic event or a 975-year return period. The short-period spectral acceleration, S_{xs}, and long-period spectral acceleration, S_{x1}, for the BSE-1E hazard level using the most current hazard maps from USGS are 0.61g and 0.29g, respectively. For the BSE-2E hazard level, S_{xs} and S_{x1} are 1.16g and 0.85g, respectively.

The report highlights several seismic hazards present at McDermoth Elementary School, summarized below:

1. Liquefaction
    - There is high potential for liquefaction at the site, which may induce significant strength loss in the soil and result in reduced support for foundations and large ground settlements. The Northeastern portion of the school is on non-liquefiable soil, however the subsurface conditions become liquefiable toward the Southwest.
    - Vertical settlement is estimated to be up to 13 inches.
    - Cyclic softening is expected to occur in the soils overlying bedrock at the Southern end of the school, and shallow foundations in that area are expected to experience a reduced bearing capacity of no more than 1,000 pounds per square foot.

The report classifies the soil as Site Class D. The site is in a region of high seismicity, with the Cascadia Subduction Zone contributing significantly to the overall seismic hazard at the site.

The Cascadia Subduction Zone is capable of generating large tsunamis with the potential to inundate the Washington coastline, and portions of the site is located within the Washington Tsunami Design Zone. The school structure appears to be just beyond the mapped tsunami inundation limits, however the tsunami hazard is still being investigated for impact to the structures on site.

6. Evaluation Methodology

An ASCE 41-17 Tier 1 evaluation was performed for McDermoth Elementary School with a Limited Safety structural performance objective for the BSE-2E hazard. Based on the occupancy, the building is classified as Risk Category III. The buildings evaluated include the Original 1930 Building and 1997 Gymnasium Building. The following Tier 1 checklists were completed as part of this evaluation and are presented in Appendix B:

- Basic Collapse Prevention Configuration Checklist (Modified for Limited Safety)
- Collapse Prevention Structural Checklist for Wood Frame, Commercial and Industrial Buildings (W2)

- Collapse Prevention Structural Checklist for Concrete Buildings with Rigid Diaphragms (C2A)
- Collapse Prevention Structural Checklist for Reinforced Masonry Bearing Wall Buildings (RM1/RM2)

The Collapse Prevention checklists were used with modified m-factors as required by ASCE 41-17 Table 2-2 footnote c. These checklists are intended to screen for common building deficiencies with limited structural calculations. These deficiencies have been identified as potential collapse hazards when buildings of similar age and construction are subjected to large ground motions.

7. Evaluation Results

This section outlines the results of the ASCE 41-17 Tier 1 evaluation. The evaluation indicates that McDermoth Elementary School does not comply with the Limited Safety performance objective due to several significant deficiencies in the attic as well as the geotechnical complications on site. The deficiencies for the 1930 building are described in Table 7-1. As the Gymnasium addition does not have any deficiencies, there is no summary for that building.

Table 7-1 – Structural Deficiency Summary (1930 Building)

Category	Deficiency	Description*
Building System: General	Load Path	NC – (1) Shear walls in the attic do not have a continuous load path, as there is no wall below to transfer shear or overturning demands. (2) The diaphragm at the attic floor has many discontinuities, and is not fully sheathed.
Building System: General	Adjacent Buildings	NC – The gap between the gymnasium and original building is not large enough to accommodate the building drift.
Building System: Building Configuration	Vertical Irregularities	NC – Shear walls in the attic are not continuous to the foundation.
Geologic Site Hazard	Liquefaction	NC – There is high potential for liquefaction to occur during an earthquake. This would result in a significant strength loss in the soil, resulting in reduced support for foundations and large ground settlements.
Diaphragms	Diaphragm Continuity	NC – The attic floor has many steps in it, and is not fully sheathed.
	Roof Chord Continuity	NC – The roof chord at the Southwest side of the building is discontinuous in the attic, where the expansion occurred.

* NC = Non-Compliant; U = Unknown

8. Seismic Retrofit Concepts

The Tier 1 Procedure in ASCE 41-17 is not intended to be used for the retrofit of structures; rather, it provides a quick screening evaluation to identify areas for further study. Designing retrofit measures based on a Tier 1 screening alone may result in an overly conservative and costly retrofit. We have provided retrofit concepts in Appendix A; however, they are preliminary and additional analysis should be performed if the building retrofit moves forward.

Several of the major deficiencies and their corresponding retrofits are described below. These retrofit measures are not intended to provide significant resistance to tsunami loading, but to provide safe evacuation after an earthquake.

- Deficiency – Site Geologic Hazards
    - As discussed in Section 5, liquefaction will cause significant settlement and strength loss in soils.
    - At exterior and tunnel walls of 1930 structure, provide micropiles beneath existing concrete with new pile caps.
- Deficiency – Adjacent Buildings
    - Provide new 6” seismic joint, and re-support existing structure with new gravity elements where joint occurs.
- Deficiency – Load Path (1930 Building)
    - For interior shear walls in the attic, provide new glulam beams beneath each wall with holdowns at each end of wall.
    - Fully sheath the floor of the attic. Where steps occur, provide A35 clips between upper and lower diaphragms.
- Deficiency – Roof Chord Continuity (1930 Building)
    - At the Southern side of the building, provide a strap across the diaphragm where the library expansion occurred. Where steps occur, nail ripped 2x boards to sheathing and secure strap to the 2x.

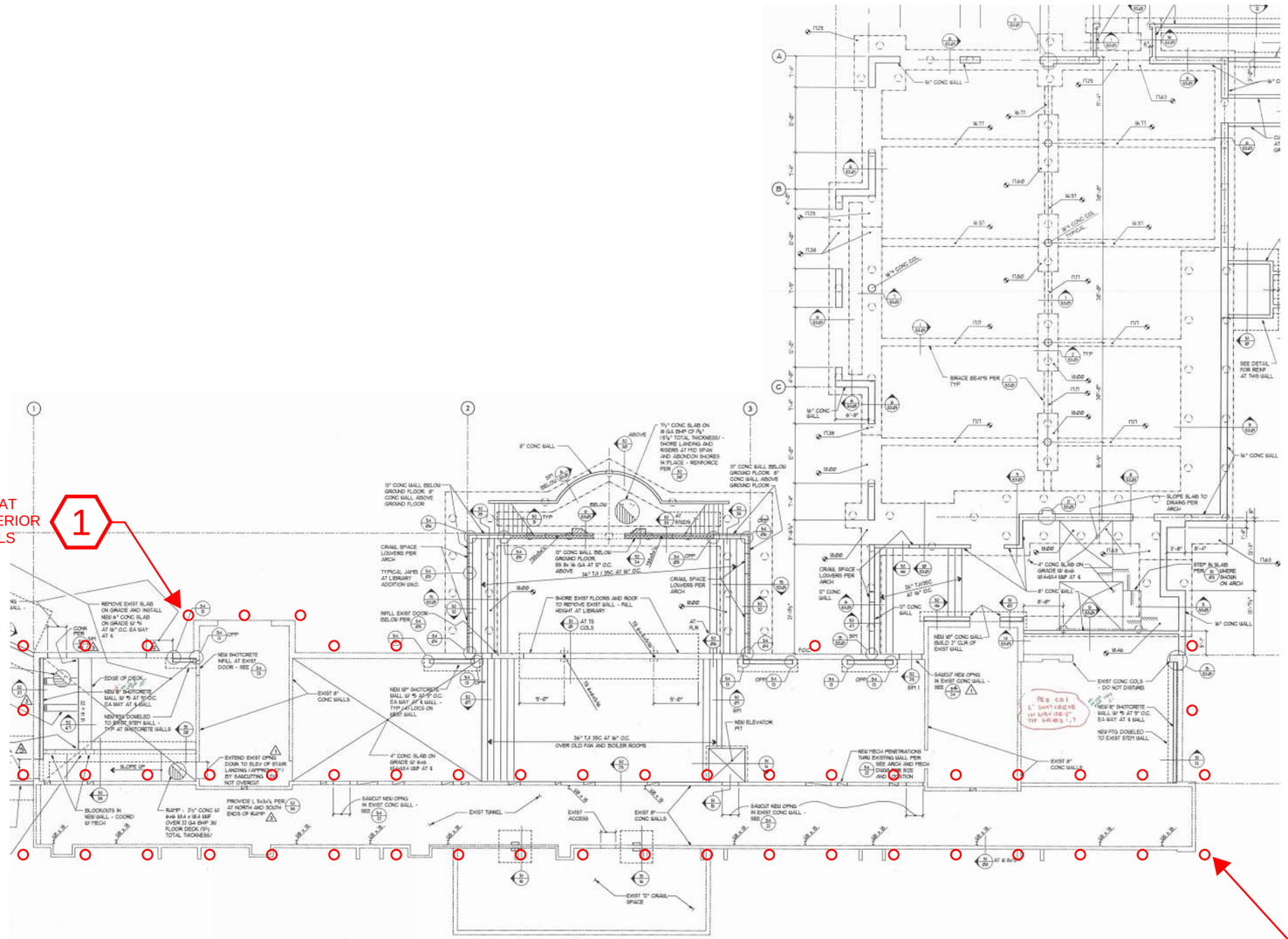
9. Next Steps and Recommendations

ASCE 41 lists Tier 2 and Tier 3 as the two procedures available for the retrofit design of an existing building. A Tier 2 evaluation and retrofit is deficiency-based and is used in conjunction with the results of a Tier 1 evaluation. A Tier 3 evaluation and retrofit is a systematic study of the building and all its components.

As a next step, we recommend that each of the checklist items marked Noncompliant or Unknown should be evaluated using the Tier 2 procedure. The Tier 2 evaluation will better inform the items that need to be retrofitted. This should be coupled with a destructive investigation program to reveal unknown conditions behind finishes.

Additionally, although a nonstructural evaluation was not performed in this phase, it is common for buildings of this type and age to require bracing of various nonstructural elements (e.g. pipes and conduits). We recommend that these items be evaluated as part of the Tier 2 analysis.

Appendix A: Seismic Retrofit Concept Drawings



FOUNDATION AND GROUND FLOOR FRAMING PLAN 1

SCALE: NTS

1 INSTALL MICROPILES AT APPROXIMATELY 6'-0" OC. DEMO CONCRETE SLAB AS NEEDED, AND POUR 24"x24" CONTINUOUS GRADE BEAMS BETWEEN PILES. ALIGN BOTTOM OF GRADE BEAM W/ BOTTOM OF (E) FOOTING AND DOWEL INTO EXISTING CONCRETE STEM WALLS. AT PILES, PROVIDE (2) #4 DOWELS T&B. BETWEEN PILES, PROVIDE #4 DOWELS @ 24" OC. PATCH SLAB WITH DOWELS TO EXISTING SLAB.

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Sheet Title: FOUNDATION PLAN

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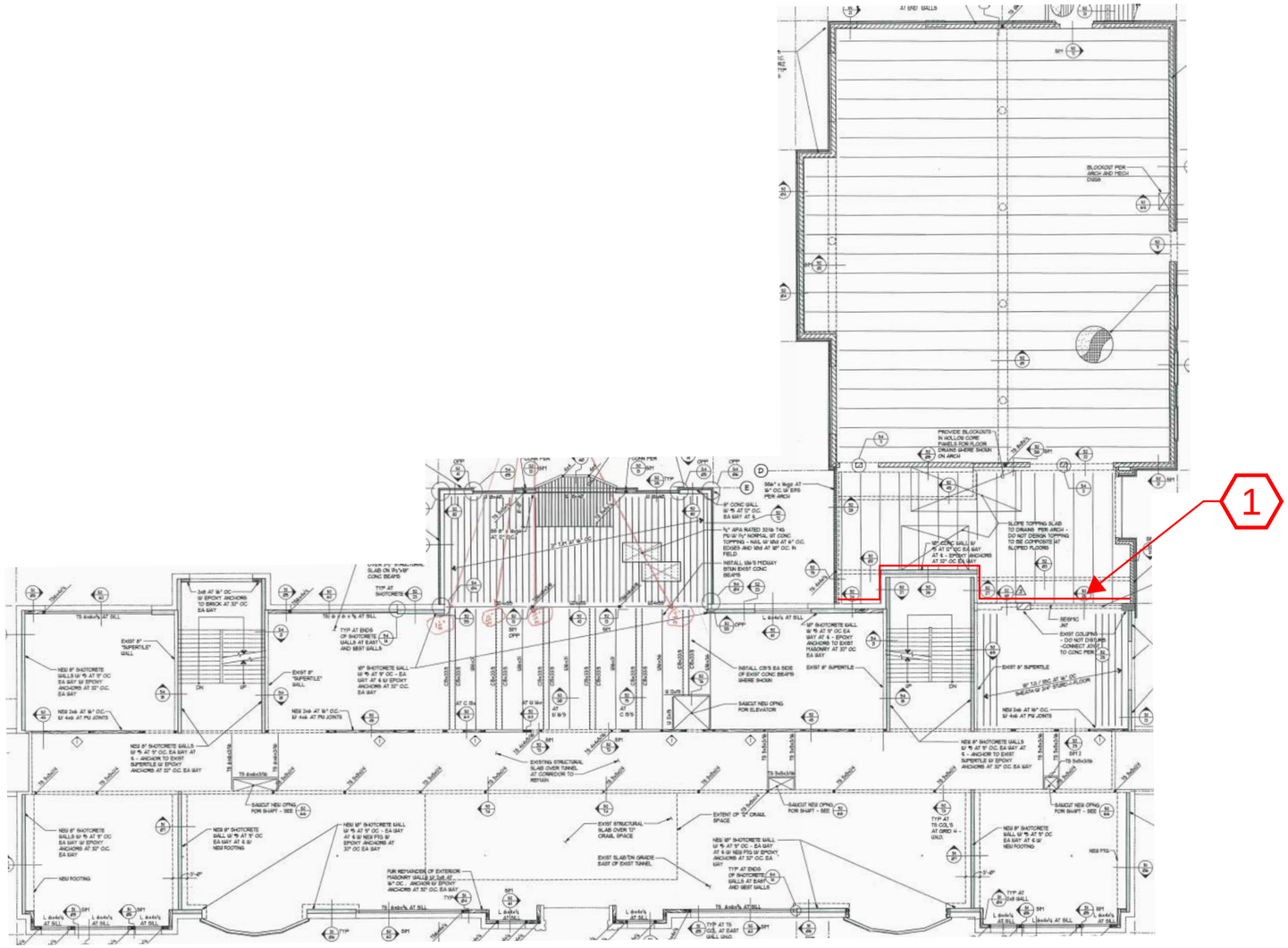
1
BLOCKOUT PER ARCH AND MECH DWGS
PROVIDE BLOCKOUTS IN HOLLOW CORE PANELS FOR FLOOR DRAINS WHERE SHOWN ON ARCH
SLOPE TOPPING SLAB TO DRAINS PER ARCH - DO NOT DESIGN TOPPING TO BE COMPOSITE W/ SLOPED FLOORS
INSTALL CB'S EA SIDE OF EXIST CONC BEAMS WHERE SHOWN
SAWCUT NEW OPNG FOR ELEVATOR
EXIST 8" SUPERTILE
EXISTING STRUCTURAL SLAB OVER TUNNEL AT CONNECTION TO - REMAIN
EXIST STRUCTURAL SLAB OVER 12" CRAWL SPACE
EXIST SLAB ON GRADE EAST OF EXIST TUNNEL
EXTENT OF 12" CRAWL SPACE
SAWCUT NEW OPNG FOR SHAFT - SEE
NEW FTG
NEW FOOTING
EXIST 8" "SUPERTILE" WALL
NEW 8" SHOTCRETE WALLS W/ #5 AT 9" OC EA BAY W/ EPOXY ANCHORS AT 32" OC EA BAY
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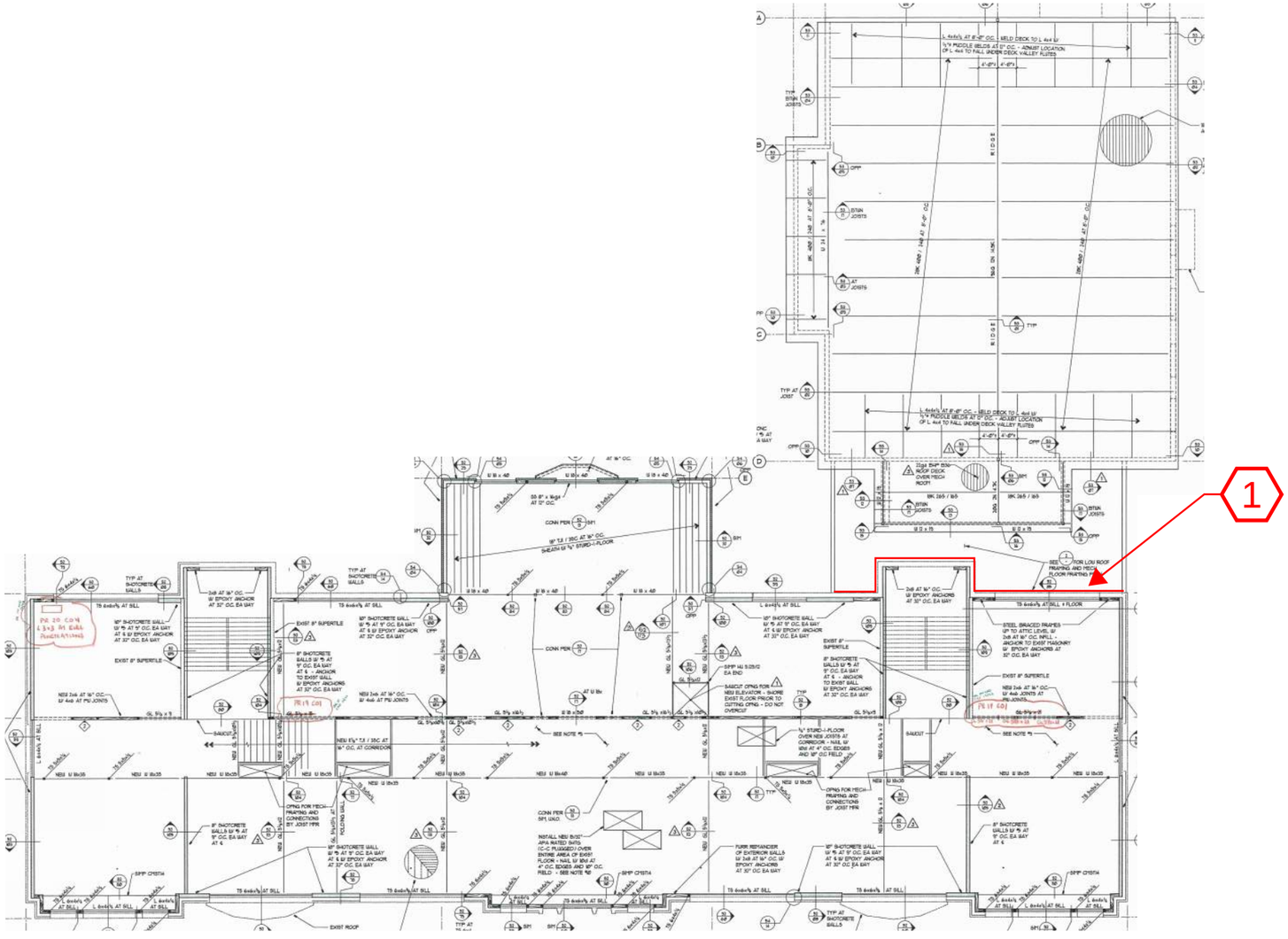
FOR REMAINDER OF EXTERIOR MASONRY WALLS W/ 3x8 AT 16" OC - ANCHOR W/ EPOXY ANCHORS AT 32" OC EA BAY
NEW 2x6 AT 16" OC W/ 4x6 AT PIU JOINTS
NEW 2x6 AT 16" OC - W/ 4x6 AT PIU JOINTS
NEW 2x6 AT 16" OC W/ EPOXY ANCHORS TO BRICK AT 32" OC EA BAY
NEW 3/4" APA RATED 32/16 TAS PW-W PLY NORMAL WT CONC TOPPING - NAIL W/ 10d AT 6" O.C. EDGES AND 10d AT 12" O.C. IN FIELD
INSTALL UNI-5 MIDWAY BTWN EXIST CONC BEAMS
EXIST 8" SUPERTILE
EXIST 8" "SUPERTILE" WALL
NEW 8" SHOTCRETE WALL W/ #5 AT 9" OC - EA BAY AT 4 W EPOXY ANCHORS AT 32" OC EA BAY
NEW 8" SHOTCRETE WALL W/ #5 AT 9" OC - EA BAY AT 4 W EPOXY ANCHORS AT 32" OC EA BAY
NEW 8" SHOTCRETE WALLS W/ #5 AT 9" OC EA BAY W/ EPOXY ANCHORS AT 32" OC EA BAY
NEW 8" SHOTCRETE WALLS W/ #5 AT 9" OC EA BAY AT 4 - ANCHOR TO EXIST SUPERTILE W/ EPOXY ANCHORS AT 32" OC EA BAY
NEW 8" SHOTCRETE WALL W/ #5 AT 9" OC - EA BAY AT 4 W NEW FTG W/ EPOXY ANCHORS AT 32" OC EA BAY
NEW 8" SHOTCRETE WALL W/ #5 AT 9" OC EA BAY AT 4 W NEW FTG
NEW 8" SHOTCRETE WALL W/ #5 AT 9" OC EA BAY AT 4 W NEW FTG
NEW 8" SHOTCRETE WALLS W/ #5 AT 9" OC EA BAY AT 4 W NEW FTG
NEW 8" SHOTCRETE WALL



1 EXISTING SEISMIC GAP 2". WIDEN TO ATLEAST 6" AT SECOND FLOOR

NEW GYM ROOF AND SECOND FLOOR FRAMING PLAN 1

SCALE: NTS

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Sheet Title: SECOND FLOOR PLAN

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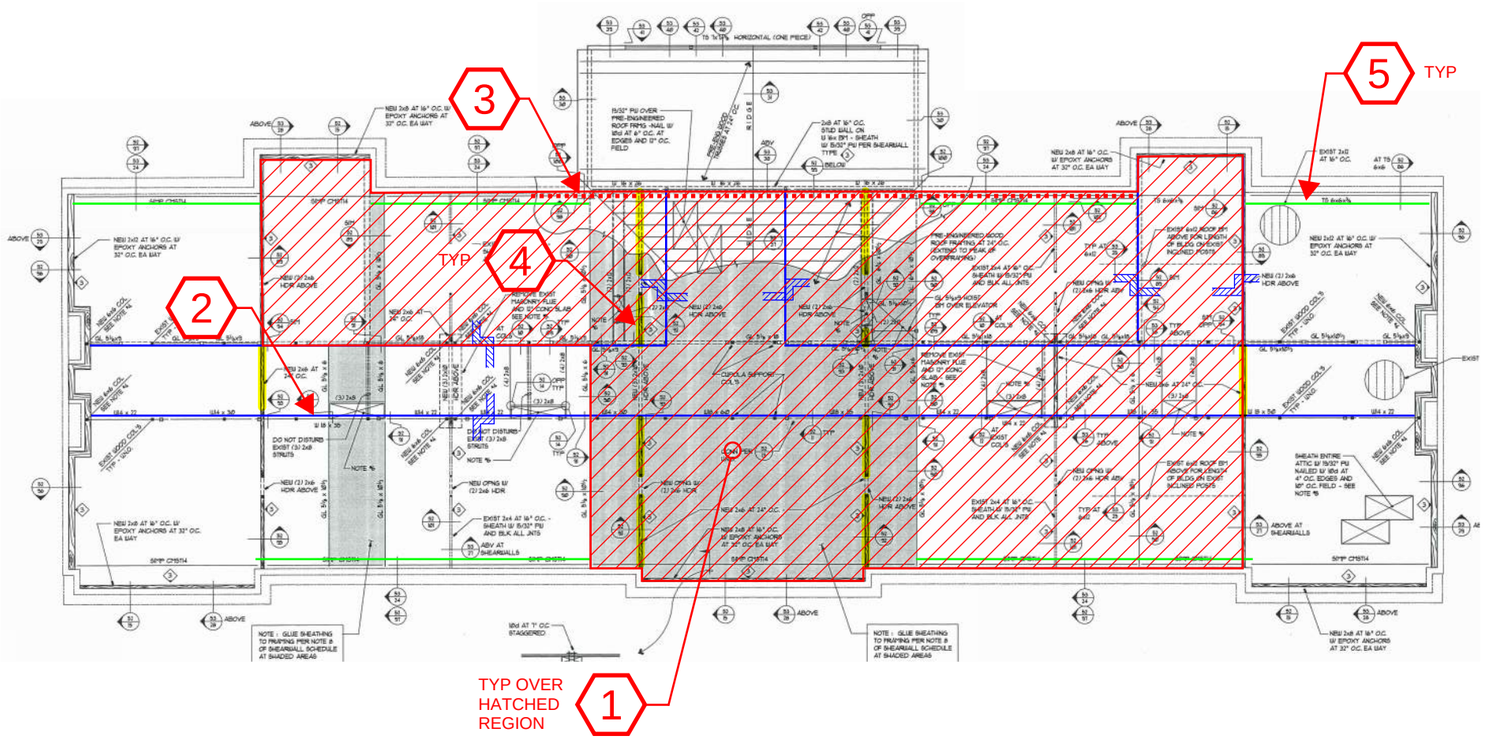
Date: 07/30/2024	
Drawn by: ARA	
	Scale: NTS



ROOF / ATTIC FRAMING PLAN

SCALE: NTS

EXISTING PLYWOOD OR OSB SHEAR WALL IN SCOPE

EXTENT OF STEP IN FLOOR

NEW STRAP

EXTENT OF KICKER BRACE LOCATIONS

1 INSTALL NEW PLYWOOD SHEATHING TO EXISTING FRAMING WHERE MISSING.

2 INSTALL A35 CLIPS AT 12" O.C. ALONG LENGTH OF STEP.

3 INSTALL STRAP NAILED TO PLYWOOD. SPLICE 8' LENGTH BEYOND EXISTING STRAP. IF EXISTING STRAP IS NOT PRESENT AT NORTH END OF NEW STRAP, EXTEND 8' PAST TUBE STEEL. AT STEP IN FLOOR INSTALL 2x4 BETWEEN STEPS TO NAIL NEW STRAP TO.

4 INSTALL NEW GLULAM BEAMS BELOW HIGHLIGHTED SHEAR WALLS. PROVIDE HOLDOWN AT EACH END OF WALL. INSTALL SILL BOLTS AS REQUIRED.

5 INSTALL KICKER BRACES ALONG EXTERIOR WALL OMIT WHERE EXISTING KICKERS ARE PRESENT. MATCH EXISTING SPACING.

Degenkolb

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Sheet Title: ATTIC FRAMING PLAN

Job Number: C3860012.00	SSK-4
Date: 07/30/2024	
Drawn by: ARA	
	Scale: NTS

Appendix B: ASCE 41-17 Tier 1 Checklists

The following checklists are included within this appendix:

1. Basic Collapse Prevention Configuration Checklist (Modified for Limited Safety) – 1930 Building
2. Collapse Prevention Structural Checklist for Wood Frame, Commercial and Industrial Buildings (W2) – 1930 Building
3. Basic Collapse Prevention Configuration Checklist (Modified for Limited Safety) – 1997 Gymnasium Building
4. Collapse Prevention Structural Checklist for Concrete Buildings with Rigid Diaphragms (C2A) (Modified for Limited Safety) – 1997 Gymnasium Building
5. Collapse Prevention Structural Checklist for Reinforced Masonry Bearing Wall Buildings (RM1/RM2) (Modified for Limited Safety) – 1997 Gymnasium Building

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Subject:	BASIC CONFIGURATION CHECKLIST	**Job Number:**	TBD	**Date:**	07/24/24
Job:	McDermoth Elementary	**By:**	JMR	**Section:**	
		Checked By:		**Page:**	

BASIC CONFIGURATION CHECKLIST

ASCE 41-17 SEISMIC EVALUATION AND RETROFIT OF EXISTING BUILDINGS

LIFE SAFETY PERFORMANCE LEVEL

BSE-2E SEISMIC HAZARD

1930 Building

EVALUATION CATEGORY	STATUS				EVALUATION STATEMENT	TIER 2 REFERENCE	COMMENTARY REFERENCE	ASCE 41-17 TABLE	COMMENTS
	C	NC	NA	U					
Structural Components		x			LOAD PATH: The structure contains a complete, well-defined load path, including structural elements and connections, that serves to transfer the inertial forces associated with the mass of all elements of the building to the foundation.	5.4.1.1	A.2.1.1	17-1	See below for details.
	x				WALL ANCHORAGE: Exterior concrete or masonry walls that are dependent on the diaphragm for lateral support are anchored for out-of-plane forces at each diaphragm level with steel anchors, reinforcing dowels, or straps that are developed into the diaphragm. Connections have adequate strength to resist the connection force calculated in the Quick Check procedure of Section 4.4.3.7.	5.7.1.1	A.5.1.1	17-1	
Building System: General		x			LOAD PATH: The structure contains a complete, well-defined load path, including structural elements and connections, that serves to transfer the inertial forces associated with the mass of all elements of the building to the foundation.	5.4.1.1	A.2.1.1	17-2	Shear walls in attic above library do not have a continuous load path, no wall below for shear transfer. No diaphragm at ceiling above library in attic to connect with attic diaphragm. Diaphragm in attic has many discontinuities due to stepping.
		x			ADJACENT BUILDINGS: The clear distance between the building being evaluated and any adjacent building is greater than 0.25% of the height of the shorter building in low seismicity, 0.5% in moderate seismicity, and 1.5% in high seismicity.	5.4.1.2	A.2.1.2	17-2	2" Seismic joint - 30.5 ft * 12" * .015 = 5.49". Noncompliant.
			x		MEZZANINES: Interior mezzanine levels are braced independently from the main structure or are anchored to the seismic-force-resisting elements of the main structure.	5.4.1.3	A.2.1.3	17-2	
Building System: Building Configuration	x				WEAK STORY: The sum of the shear strengths of the seismic-force-resisting system in any story in each direction is not less than 80% of the strength in the adjacent story above.	5.4.2.1	A.2.2.2	17-2	
	x				SOFT STORY: The stiffness of the seismic-force-resisting system in any story is not less than 70% of the seismic-force-resisting system stiffness in an adjacent story above or less than 80% of the average seismic-force-resisting system stiffness of the three stories above.	5.4.2.2	A.2.2.3	17-2	
		x			VERTICAL IRREGULARITIES: All vertical elements in the seismic-force-resisting system are continuous to the foundation.	5.4.2.3	A.2.2.4	17-2	Many walls not cts to foundation - see building sections. See above about shear walls in attic. Shear walls do not continue down the building.
	x				GEOMETRY: There are no changes in the net horizontal dimension of the seismic-force-resisting system of more than 30% in a story relative to adjacent stories, excluding one-story penthouses and mezzanines.	5.4.2.4	A.2.2.5	17-2	
	x				MASS: There is no change in effective mass more than 50% from one story to the next. Light roofs, penthouses, and mezzanines need not be considered.	5.4.2.5	A.2.2.6	17-2	
	x				TORSION: The estimated distance between the story center of mass and the story center of rigidity is less than 20% of the building width in either plan dimension.	5.4.2.6	A.2.2.7	17-2	

Geological Site Hazards		x			LIQUEFACTION: Liquefaction-susceptible, saturated, loose granular soils that could jeopardize the building's seismic performance do not exist in the foundation soils at depths within 50 ft (15.2 m) under the building.	5.4.3.1	A.6.1.1	17-2	Liquifiable soils exist. Structure is supported by deep foundations at the gym, but original structure has shallow foundations.
	x				SLOPE FAILURE: The building site is located away from potential earthquake-induced slope failures or rockfalls so that it is unaffected by such failures or is capable of accommodating any predicted movements without failure.	5.4.3.1	A.6.1.2	17-2	
	x				SURFACE FAULT RUPTURE: Surface fault rupture and surface displacement at the building site are not anticipated.	5.4.3.1	A.6.1.3	17-2	
Foundation Configuration	x				OVERTURNING: The ratio of the least horizontal dimension of the seismic-force-resisting system at the foundation level to the building height (base/height) is greater than $0.6S_a$.	5.4.3.3	A.6.2.1	17-2	
	x				TIES BETWEEN FOUNDATION ELEMENTS: The foundation has ties adequate to resist seismic forces where footings, piles, and piers are not restrained by beams, slabs, or soils classified as Site Class A, B, or C.	5.4.3.4	A.6.2.2	17-2	

Subject:	STRUCTURAL CHECKLIST	**Job Number:**	TBD	**Date:**	07/24/24
Job:	McDermoth Elementary	**By:**	JMR	**Section:**	
		Checked By:		**Page:**	

STRUCTURAL CHECKLIST

ASCE 41-17 SEISMIC EVALUATION AND RETROFIT OF EXISTING BUILDINGS
LIFE SAFETY PERFORMANCE LEVEL
BSE-2E SEISMIC HAZARD
WOOD FRAMES, COMMERCIAL & INDUSTRIAL (W2)

1930 Building

EVALUATION CATEGORY	STATUS				EVALUATION STATEMENT	TIER 2 REFERENCE	COMMENTARY REFERENCE	ASCE 41-17 TABLE	COMMENTS
	C	NC	NA	U					
Seismic Force Resisting System	x				REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2.	5.5.1.1	A.3.2.1.1	17-6	
	x				SHEAR STRESS CHECK: The shear stress in the shear walls, calculated using the Quick Check procedure of Section 4.4.3.3, is less than the following values: Structural Panel Sheathing……1000 lb/ft Diagonal Sheathing……700 lb/ft Straight Sheathing……..100 lb/ft All Other Conditions.....100 lb/ft	5.5.3.1.1	A.3.2.7.1	17-6	
			x		STUCCO (EXTERIOR PLASTER) SHEAR WALLS: Multi-story buildings do not rely on exterior stucco walls as the primary seismic-force-resisting system.	5.5.3.6.1	A.3.2.7.2	17-6	
	x				GYPSUM WALLBOARD OR PLASTER SHEAR WALLS: Interior plaster or gypsum wallboard is not used for shear walls on buildings more than one story high with the exception of the uppermost level of a multi-story building.	5.5.3.6.1	A.3.2.7.3	17-6	
	x				NARROW WOOD SHEAR WALLS: Narrow wood shear walls with an aspect ratio greater than 2-to-1 are not used to resist seismic forces.	5.5.3.6.1	A.3.2.7.4	17-6	
	X				WALLS CONNECTED THROUGH FLOORS: Shear walls have an interconnection between stories to transfer overturning and shear forces through the floor.	5.5.3.6.2	A.3.2.7.5	17-6	Wall Sills appear to have nailing between shear walls below and above - overturning not a concern at those long walls.
	x				HILLSIDE SITE: For structures that are taller on at least one side by more than one-half story because of a sloping site, all shear walls on the downhill slope have an aspect ratio less than 1-to-1.	5.5.3.6.3	A.3.2.7.6	17-6	
			x		CRIPPLE WALLS: Cripple walls below first-floor-level shear walls are braced to the foundation with wood structural panels.	5.5.3.6.4	A.3.2.7.7	17-6	
			X		OPENINGS: Walls with openings greater than 80% of the length are braced with wood structural panel shear walls with aspect ratios of not more than 1.5-to-1 or are supported by adjacent construction through positive ties capable of transferring the seismic forces.	5.5.3.6.5	A.3.2.7.8	17-6	

Connections			x		WOOD POSTS: There is a positive connection of wood posts to the foundation.	5.7.3.3	A.5.3.3	17-6	
	x				WOOD SILLS: All wood sills are bolted to the foundation.	5.7.3.3	A.5.3.4	17-6	Anchor Bolts at 32" OC Max
	X				GIRDER–COLUMN CONNECTION: There is a positive connection using plates, connection hardware, or straps between the girder and the column support.	5.7.4.1	A.5.4.1	17-6	
	x				WOOD SILL BOLTS: Sill bolts are spaced at 6 ft or less with acceptable edge and end distance provided for wood and concrete.	5.7.3.3	A.5.3.7	17-6	Anchor Bolts at 32" OC Max
Diaphragms		X			DIAPHRAGM CONTINUITY: The diaphragms are not composed of split-level floors and do not have expansion joints.	5.6.1.1	A.4.1.1	17-6	Attic floor has vertical steps across the diaphragm
		X			ROOF CHORD CONTINUITY: All chord elements are continuous, regardless of changes in roof elevation.	5.6.1.1	A.4.1.3	17-6	Roof chord in attic is discontinuous where library expansion occurs.
			x		DIAPHRAGM REINFORCEMENT AT OPENINGS: There is reinforcing around all diaphragm openings larger than 50% of the building width in either major plan dimension.	5.6.1.5	A.4.1.8	17-6	
			x		STRAIGHT SHEATHING: All straight-sheathed diaphragms have aspect ratios less than 2-to-1 in the direction being considered.	5.6.2	A.4.2.1	17-6	
	x				SPANS: All wood diaphragms with spans greater than 24 ft consist of wood structural panels or diagonal sheathing.	5.6.2	A.4.2.2	17-6	
	x				DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 40 ft and have aspect ratios less than or equal to 4-to-1.	5.6.2	A.4.2.3	17-6	
	x				OTHER DIAPHRAGMS: The diaphragms do not consist of a system other than wood, metal deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1	17-6	

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Subject:	BASIC CONFIGURATION CHECKLIST	**Job Number:**	TBD	**Date:**	07/24/24
Job:	McDermoth Elementary	**By:**	JMR	**Section:**	
		Checked By:		**Page:**	

BASIC CONFIGURATION CHECKLIST

ASCE 41-17 SEISMIC EVALUATION AND RETROFIT OF EXISTING BUILDINGS

LIFE SAFETY PERFORMANCE LEVEL

BSE-2E SEISMIC HAZARD

1997 Gymnasium Building

EVALUATION CATEGORY	STATUS				EVALUATION STATEMENT	TIER 2 REFERENCE	COMMENTARY REFERENCE	ASCE 41-17 TABLE	COMMENTS
	C	NC	NA	U					
Structural Components	x				LOAD PATH: The structure contains a complete, well-defined load path, including structural elements and connections, that serves to transfer the inertial forces associated with the mass of all elements of the building to the foundation.	5.4.1.1	A.2.1.1	17-1	See below for details.
	x				WALL ANCHORAGE: Exterior concrete or masonry walls that are dependent on the diaphragm for lateral support are anchored for out-of-plane forces at each diaphragm level with steel anchors, reinforcing dowels, or straps that are developed into the diaphragm. Connections have adequate strength to resist the connection force calculated in the Quick Check procedure of Section 4.4.3.7.	5.7.1.1	A.5.1.1	17-1	
Building System: General	x				LOAD PATH: The structure contains a complete, well-defined load path, including structural elements and connections, that serves to transfer the inertial forces associated with the mass of all elements of the building to the foundation.	5.4.1.1	A.2.1.1	17-2	
		x			ADJACENT BUILDINGS: The clear distance between the building being evaluated and any adjacent building is greater than 0.25% of the height of the shorter building in low seismicity, 0.5% in moderate seismicity, and 1.5% in high seismicity.	5.4.1.2	A.2.1.2	17-2	2" Seismic joint - 30.5 ft * 12" * .015 = 5.49". Noncompliant.
			x		MEZZANINES: Interior mezzanine levels are braced independently from the main structure or are anchored to the seismic-force-resisting elements of the main structure.	5.4.1.3	A.2.1.3	17-2	
Building System: Building Configuration	x				WEAK STORY: The sum of the shear strengths of the seismic-force-resisting system in any story in each direction is not less than 80% of the strength in the adjacent story above.	5.4.2.1	A.2.2.2	17-2	
	x				SOFT STORY: The stiffness of the seismic-force-resisting system in any story is not less than 70% of the seismic-force-resisting system stiffness in an adjacent story above or less than 80% of the average seismic-force-resisting system stiffness of the three stories above.	5.4.2.2	A.2.2.3	17-2	
	x				VERTICAL IRREGULARITIES: All vertical elements in the seismic-force-resisting system are continuous to the foundation.	5.4.2.3	A.2.2.4	17-2	
	x				GEOMETRY: There are no changes in the net horizontal dimension of the seismic-force-resisting system of more than 30% in a story relative to adjacent stories, excluding one-story penthouses and mezzanines.	5.4.2.4	A.2.2.5	17-2	
	x				MASS: There is no change in effective mass more than 50% from one story to the next. Light roofs, penthouses, and mezzanines need not be considered.	5.4.2.5	A.2.2.6	17-2	
	x				TORSION: The estimated distance between the story center of mass and the story center of rigidity is less than 20% of the building width in either plan dimension.	5.4.2.6	A.2.2.7	17-2	

Geological Site Hazards	x				LIQUEFACTION: Liquefaction-susceptible, saturated, loose granular soils that could jeopardize the building's seismic performance do not exist in the foundation soils at depths within 50 ft (15.2 m) under the building.	5.4.3.1	A.6.1.1	17-2	Liquifiable soils exist. Structure is supported by deep foundations at the gym.
	x				SLOPE FAILURE: The building site is located away from potential earthquake-induced slope failures or rockfalls so that it is unaffected by such failures or is capable of accommodating any predicted movements without failure.	5.4.3.1	A.6.1.2	17-2	
	x				SURFACE FAULT RUPTURE: Surface fault rupture and surface displacement at the building site are not anticipated.	5.4.3.1	A.6.1.3	17-2	
Foundation Configuration	x				OVERTURNING: The ratio of the least horizontal dimension of the seismic-force-resisting system at the foundation level to the building height (base/height) is greater than $0.6S_a$.	5.4.3.3	A.6.2.1	17-2	
	x				TIES BETWEEN FOUNDATION ELEMENTS: The foundation has ties adequate to resist seismic forces where footings, piles, and piers are not restrained by beams, slabs, or soils classified as Site Class A, B, or C.	5.4.3.4	A.6.2.2	17-2	

Subject:	STRUCTURAL CHECKLIST	**Job Number:**	TBD	**Date:**	07/24/24
Job:	McDermoth Elementary	**By:**	JMR	**Section:**	
		Checked By:		**Page:**	

STRUCTURAL CHECKLIST

ASCE 41-17 SEISMIC EVALUATION AND RETROFIT OF EXISTING BUILDINGS

LIFE SAFETY PERFORMANCE LEVEL

BSE-2E SEISMIC HAZARD

CONCRETE SHEAR WALLS WITH STIFF DIAPHRAGMS (C2) & FLEXIBLE DIAPHRAGMS (C2A)

1997 Gymnasium Building

EVALUATION CATEGORY	STATUS				EVALUATION STATEMENT	TIER 2 REFERENCE	COMMENTARY REFERENCE	ASCE 41-17 TABLE	COMMENTS
	C	NC	NA	U					
Seismic Force Resisting System	x				COMPLETE FRAMES: Steel or concrete frames classified as secondary components form a complete vertical-load-carrying system.	5.5.2.5.1	A.3.1.6.1	17-24	
	x				REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2.	5.5.1.1	A.3.2.1.1	17-24	
	x				SHEAR STRESS CHECK: The shear stress in the concrete shear walls, calculated using the Quick Check procedure of Section 4.4.3.3, is less than the greater of 100 lb/in^2 or 2 $\sqrt{f'_c}$	5.5.3.1.1	A.3.2.2.1	17-24	
	x				REINFORCING STEEL: The ratio of reinforcing steel area to gross concrete area is not less than 0.0012 in the vertical direction and 0.0020 in the horizontal direction.	5.5.3.1.3	A.3.2.2.2	17-24	Assumed OK due to age of construction and reinforcing shown in details
	x				DEFLECTION COMPATIBILITY: Secondary components have the shear capacity to develop the flexural strength of the components.	5.5.2.5.2	A.3.1.6.2	17-24	
	x				FLAT SLABS: Flat slabs or plates not part of the seismic-force-resisting system have continuous bottom steel through the column joints.	5.5.2.5.3	A.3.1.6.3	17-24	Assumed OK due to age of construction
	x				COUPLING BEAMS: The ends of both walls to which the coupling beam is attached are supported at each end to resist vertical loads caused by overturning.	5.5.3.2.1	A.3.2.2.3	17-24	
Connections			x		WALL ANCHORAGE AT FLEXIBLE DIAPHRAGMS: Exterior concrete or masonry walls that are dependent on flexible diaphragms for lateral support are anchored for out-of-plane forces at each diaphragm level with steel anchors, reinforcing dowels, or straps that are developed into the diaphragm. Connections have strength to resist the connection force calculated in the Quick Check procedure of Section 4.4.3.7.	5.7.1.1	A.5.1.1	17-24	
	x				TRANSFER TO SHEAR WALLS: Diaphragms are connected for transfer of seismic forces to the shear walls.	5.7.2	A.5.2.1	17-24	
	x				FOUNDATION DOWELS: Wall reinforcement is doweled into the foundation with vertical bars equal in size and spacing to the vertical wall reinforcing directly above the foundation.	5.7.3.4	A.5.3.5	17-24	
	x				UPLIFT AT PILE CAPS: Pile caps have top reinforcement, and piles are anchored to the pile caps.	5.7.3.5	A.5.3.8	17-24	Reinforcement present per details, typ.

Diaphragms (Stiff or Flexible)	x				DIAPHRAGM CONTINUITY: The diaphragms are not composed of split-level floors and do not have expansion joints.	5.6.1.1	A.4.1.1	17-24	Flat Slab, no steps
			x		OPENINGS AT SHEAR WALLS: Diaphragm openings immediately adjacent to the shear walls are less than 25% of the wall length.	5.6.1.3	A.4.1.4	17-24	No openings in floor are present
Flexible Diaphragms			x		CROSS TIES: There are continuous cross ties between diaphragm chords.	5.6.1.2	A.4.1.2	17-24	
			x		STRAIGHT SHEATHING: All straight-sheathed diaphragms have aspect ratios less than 2-to-1 in the direction being considered.	5.6.2	A.4.2.1	17-24	
			x		SPANS: All wood diaphragms with spans greater than 24 ft consist of wood structural panels or diagonal sheathing.	5.6.2	A.4.2.2	17-24	
			x		DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 40 ft and aspect ratios less than or equal to 4 to-1.	5.6.2	A.4.2.3	17-24	
			x		OTHER DIAPHRAGMS: Diaphragms do not consist of a system other than wood, metal deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1	17-24	

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Subject:	STRUCTURAL CHECKLIST	**Job Number:**	TBD	**Date:**	07/24/24
Job:	McDermoth Elementary	**By:**	JMR	**Section:**	
		Checked By:		**Page:**	

STRUCTURAL CHECKLIST

ASCE 41-17 SEISMIC EVALUATION AND RETROFIT OF EXISTING BUILDINGS

LIFE SAFETY PERFORMANCE LEVEL

BSE-2E SEISMIC HAZARD

REINFORCED MASONRY BEARING WALLS W/ FLEXIBLE DIAPHRAGMS (RM1) & STIFF DIAPHRAGMS (RM2)

1997 Gymnasium Building

EVALUATION CATEGORY	STATUS				EVALUATION STATEMENT	TIER 2 REFERENCE	COMMENTARY REFERENCE	ASCE 41-17 TABLE	COMMENTS
	C	NC	NA	U					
Seismic Force Resisting System	X				REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2.	5.5.1.1	A.3.2.1.1	17-34	
	X				SHEAR STRESS CHECK: The shear stress in the reinforced masonry shear walls, calculated using the Quick Check procedure of Section 4.4.3.3, is less than 70 lb/in.^{2}	5.5.3.1.1	A.3.2.4.1	17-34	
	X				REINFORCING STEEL: The total vertical and horizontal reinforcing steel ratio in reinforced masonry walls is greater than 0.002 of the wall with the minimum of 0.0007 in either of the two directions; the spacing of reinforcing steel is less than 48 in., and all vertical bars extend to the top of the walls.	5.5.3.1.3	A.3.2.4.2	17-34	Min .01 Typ, spacing is 32" vert, 48" horiz.
Connections	X				WALL ANCHORAGE: Exterior concrete or masonry walls that are dependent on the diaphragm for lateral support are anchored for out-of-plane forces at each diaphragm level with steel anchors, reinforcing dowels, or straps that are developed into the diaphragm. Connections have strength to resist the connection force calculated in the Quick Check procedure of Section 4.4.3.7.	5.7.1.1	A.5.1.1	17-34	
	X				WOOD LEDGERS: The connection between the wall panels and the diaphragm does not induce cross-grain bending or tension in the wood ledgers.	5.7.1.3	A.5.1.2	17-34	No wood ledger present
	X				TRANSFER TO SHEAR WALLS: Diaphragms are connected for transfer of seismic forces to the shear walls.	5.7.2	A.5.2.1	17-34	
	X				TOPPING SLAB TO WALLS OR FRAMES: Reinforced concrete topping slabs that interconnect the precast concrete diaphragm elements are doweled for transfer of forces into the shear wall or frame elements.	5.7.2	A.5.2.3	17-34	
	X				FOUNDATION DOWELS: Wall reinforcement is doweled into the foundation.	5.7.3.4	A.5.3.5	17-34	
			X		GIRDER–COLUMN CONNECTION: There is a positive connection using plates, connection hardware, or straps between the girder and the column support.	5.7.4.1	A.5.4.1	17-34	
			X		STIFFNESS OF WALL ANCHORS: Anchors of concrete or masonry walls to wood structural elements are installed taut and are stiff enough to limit the relative movement between the wall and the diaphragm to no greater than 1/8 in. before engagement of the anchors.	5.7.1.2	A.5.1.4	17-34	

Stiff Diaphragms	X				TOPPING SLAB: Precast concrete diaphragm elements are interconnected by a continuous reinforced concrete topping slab.	5.6.4	A.4.5.1	17-34	
			X		OPENINGS AT SHEAR WALLS: Diaphragm openings immediately adjacent to the shear walls are less than 25% of the wall length.	5.6.1.3	A.4.1.4	17-34	
			X		OPENINGS AT EXTERIOR MASONRY SHEAR WALLS: Diaphragm openings immediately adjacent to exterior masonry shear walls are not greater than 8 ft long.	5.6.1.3	A.4.1.6	17-34	
Flexible Diaphragms	X				CROSS TIES: There are continuous cross ties between diaphragm chords.	5.6.1.2	A.4.1.2	17-34	
			X		OPENINGS AT SHEAR WALLS: Diaphragm openings immediately adjacent to the shear walls are less than 25% of the wall length.	5.6.1.3	A.4.1.4	17-34	
			X		OPENINGS AT EXTERIOR MASONRY SHEAR WALLS: Diaphragm openings immediately adjacent to exterior masonry shear walls are not greater than 8 ft long.	5.6.1.3	A.4.1.6	17-34	
			X		STRAIGHT SHEATHING: All straight-sheathed diaphragms have aspect ratios less than 2-to-1 in the direction being considered.	5.6.2	A.4.2.1	17-34	Can't tell if it is straight sheathed
			X		SPANS: All wood diaphragms with spans greater than 24 ft consist of wood structural panels or diagonal sheathing.	5.6.2	A.4.2.2	17-34	
			X		DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 40 ft and aspect ratios less than or equal to 4 to-1.	5.6.2	A.4.2.3	17-34	Can't tell if it is diagonally sheathed
	X				OTHER DIAPHRAGMS: Diaphragms do not consist of a system other than wood, metal deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1	17-34	

ROBERT GRAY ELEMENTARY SCHOOL
SEISMIC EVALUATION REPORT

Robert Gray Elementary School
1516 N B St
Aberdeen, WA 98520

December 18, 2024
Degenkolb Job Number: C3860012.00



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SUITE 1001

Table of Contents

1. Introduction 2
2. Building Description 2
3. Sources and Standards 4
4. Site Visit and Investigation 4
5. Site Description and Geologic Site Hazards 8
6. Evaluation Methodology 8
7. Evaluation Results 10
8. Seismic Retrofit Concepts 10
9. Next Steps and Recommendations 11
Appendix A: Seismic Retrofit Concept Drawings 12
Appendix B: ASCE 41-17 Tier 1 Checklists 13

1. Introduction

The objective of this study is to complete a seismic evaluation and provide preliminary retrofit recommendations for Robert Gray Elementary School in Aberdeen, WA. The school has been selected for evaluation by OSPI under the School Seismic Safety Grant Program. The seismic evaluation and retrofit feasibility study was performed to characterize the expected seismic performance of the building in its existing condition and provide conceptual-level retrofit measures for use in estimating the scale and impact of a seismic retrofit. This report summarizes the results of this seismic analysis.

2. Building Description

Robert Gray Elementary School is a two-story structure with wood-framed walls, floors, and roofs, and was built in 2002. The first story houses the school offices, library, gymnasium, kitchen, and eleven classrooms, and the second story houses six classrooms and a staff lounge. The building is rectangular in plan with dimensions of approximately 273 feet by 160 feet, and its long dimension is oriented east-west. The first-story roof has an eave height of approximately 9 feet. The upper sloped roof has an eave height of approximately 32 feet. At the outdoor play area, the wood-framed roof spans to concrete columns. CMU walls infill between some of the columns on each elevation to provide lateral bracing to the play area.

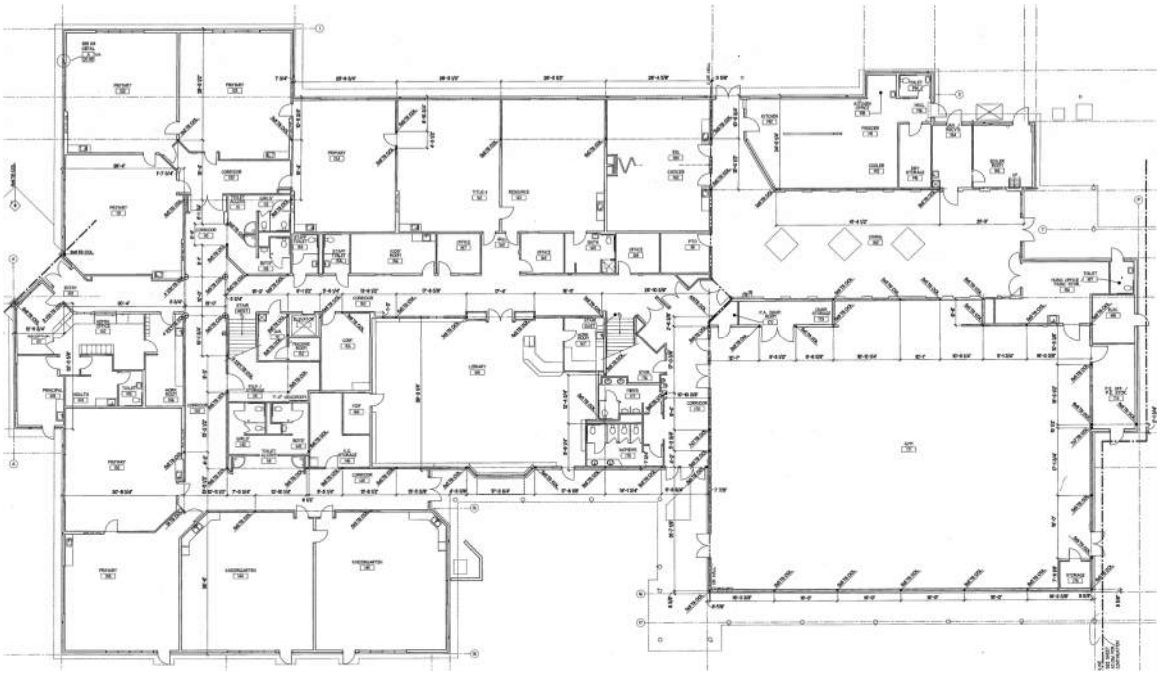


Figure 2-1 – Robert Gray Elementary School Building Area

a. Foundation System:

i. Pile foundations with concrete grade beams at exterior and interior wall lines.

b. Floor System:
   i. First floor: Slab on grade
   ii. Second floor: 1 ½" concrete on plywood sheathing over TJI roof joists framing to either wood-framed bearing walls or glulam and wide flange beams.

c. Wall System:
   i. Corridor walls: 2x stud walls with plywood sheathing
   ii. Exterior walls: 2x stud walls with plywood sheathing; hardi-panel lap siding

d. Roof System:
   i. First story roof: plywood sheathing over TJI roof joists
   ii. Second story roof: plywood sheathing over TJI roof joists
   iii. Gymnasium roof: 22 gauge steel roof deck spanning to open web steel joists supported by steel joist girder trusses and wide flange beams

Exterior elevations are shown in Figures 2-2 through 2-4.



Figure 2-2 – North Elevation



Figure 2-3 – West Elevation



Figure 2-4 –South-West Elevation

3. Sources and Standards

The following documents were reviewed in preparing this report:

- Architectural Drawings titled "Robert Gray Elementary Phase 2A" dated 5/2/2001.
- Structural Drawings titled "Robert Gray Elementary Phase 2A" dated 5/2/2001.
- Geotechnical Report titled "Report of Preliminary Geotechnical Engineering Findings, Aberdeen School District No. 5 Seismic Safety Retrofits; Robert Gray Elementary School" by Haley & Aldrich Inc., Dated September 2024.

Throughout this report, the following reference codes and standards are used:

- ASCE 41-17: Seismic Evaluation and Retrofit of Existing Buildings. American Society of Civil Engineers, 2017.
- ASCE 7-16: Minimum Design Loads for Buildings and Other Structures. American Society of Civil Engineers, 2016.
- 2021 International Existing Building Code as Amended and Adopted by the Washington State Building Code. International Code Council 2021.

4. Site Visit and Investigation

A site visit was conducted on June 18, 2024, to observe the existing construction and overall condition of the building. Figures 4-1 through 4-6 show existing conditions observed during the site visits. Select observations in this investigation are summarized here.

- The building was in good condition with no noticeable signs of deterioration.
- Typical construction observed generally matches the available existing drawings.
- Figure 4-1 shows the outlooker framing where the Level 1 roof connects to the Level 2 glulam beams.

- Figure 4-2 shows connection of the Level 2 floor TJI joists to the glulam beams.
- Figure 4-3 shows the gymnasium roof framing.
- Figure 4-4 shows the covered play area roof and masonry walls.



Figure 4-1 – Outlooker Framing at Low Roof



Figure 4-2 – Connection of TJI to Glulam Beam



Figure 4-3 – Gymnasium Roof



Figure 4-4 – Covered Play Area

5. Site Description and Geologic Site Hazards

A geotechnical evaluation was performed by Haley & Aldrich, with their preliminary report dated September 2024. The site was analyzed for the BSE-1E and BSE-2E seismic hazard levels. The BSE-1E hazard corresponds to a 20% in 50-year seismic event or a 225-year return period, and the BSE-2E hazard corresponds to a 5% in 50-year seismic event or a 975-year return period. The short-period spectral acceleration, S_{xs}, and long-period spectral acceleration, S_{x1}, for the BSE-1E hazard level using the most current hazard maps from USGS are 0.61g and 0.30g, respectively. For the BSE-2E hazard level, S_{xs} and S_{x1} are 1.16g and 0.85g, respectively.

The report highlights several seismic hazards present at Robert Gray Elementary School, summarized below:

1. Liquefaction
    - There is high potential for liquefaction at the site, which may induce significant strength loss in the soil and result in reduced support for foundations and large ground settlements.
    - Vertical settlement is estimated to be approximately 3 to 9 inches.
    - Liquefiable conditions are expected to persist to varying depths of up to 60 feet below ground surface.
2. Lateral Spreading
    - Lateral spreading related to seismic activity typically involves lateral displacement of large blocks of non-liquefied soil when an underlying soil layer loses strength during seismic shaking. It is expected to occur at the site.
    - Movement will generally occur in the direction of the Wishkah River. Lateral displacements are estimated to be on the order of tens of feet..

The report classifies the soil as Site Class D. The site is in a region of high seismicity, with the Cascadia Subduction Zone contributing significantly to the overall seismic hazard at the site.

The Cascadia Subduction Zone is capable of generating large tsunamis with the potential to inundate the Washington coastline. The Wishkah River may become inundated just east of the school site, however the potential for tsunami inundation to occur at the school is low.

6. Evaluation Methodology

An ASCE 41-17 Tier 1 evaluation was performed for Robert Gray Elementary School with a Limited Safety structural performance objective for the BSE-2E hazard. Based on the occupancy, the building is classified as Risk Category III. The following Tier 1 checklists were completed as part of this evaluation and are presented in Appendix B:

- Basic Collapse Prevention Configuration Checklist (Modified for Limited Safety)
- Collapse Prevention Structural Checklist for Wood Frame, Commercial and

Industrial Buildings (W2) (Modified for Limited Safety)

The Collapse Prevention checklists were used with modified m-factors as required by ASCE 41-17 Table 2-2 footnote c. These checklists are intended to screen for common building deficiencies with limited structural calculations. These deficiencies have been identified as potential collapse hazards when buildings of similar age and construction are subjected to large ground motions.

ASCE 41-17 does not explicitly define evaluation procedures for buildings located within the tsunami inundation zone.

7. Evaluation Results

This section outlines the results of the ASCE 41-17 Tier 1 evaluation. The evaluation identified very few deficiencies at Robert Gray Elementary School. The deficiencies are described in Table 7-1. Due to the age and type of construction, ASCE 41-17 benchmark provisions would indicate that the building meets Life Safety performance in the BSE-1E hazard with no evaluation. Benchmark provisions do not apply to the Limited Safety performance objective. However, if the only deficiency is connections between walls at the second story, the majority of the school building could still be used while these repairs are taking place, which would appear to meet the Limited Safety performance objective.

Table 7-1 – Structural Deficiency Summary

Category	Deficiency	Description*
Geologic Site Hazard	Liquefaction	U – There is very high potential for liquefaction to occur during an earthquake. This would result in a significant strength loss in the soil, resulting in reduced support for foundations and large ground settlements. Lateral spread due to liquefaction may also result in large lateral movements. It is unclear if these hazards were fully mitigated in the design and construction of the school.
Lateral Seismic-Force-Resisting System	Walls Connected Through Floors	NC – Shear walls do not have interconnection between the first and second stories to transfer overturning and shear forces through the floor.

* NC = Non-Compliant; U = Unknown

8. Seismic Retrofit Concepts

The Tier 1 Procedure in ASCE 41-17 is not intended to be used for the retrofit of structures; rather, it provides a quick screening evaluation to identify areas for further study. Designing retrofit measures based on a Tier 1 screening alone may result in an overly conservative and costly retrofit. We have provided retrofit concepts in Appendix A; however, they are preliminary and additional analysis should be performed if the building retrofit moves forward.

Several of the major deficiencies and their corresponding retrofits are described below. These retrofit measures are not intended to provide significant resistance to tsunami loading, but to provide safe evacuation after an earthquake.

- Deficiency – Site Geologic Hazards
    - As discussed in Section 5, liquefaction and lateral spread may cause significant settlement and lateral displacement.
    - Pile foundations already exist beneath the floor plan of this structure. Ground improvements outside of the building footprint would likely prevent lateral spreading and increase the stability of the soils. No additional foundation work within the building footprint is required.
- Deficiency – Wall Connection Through Floors
    - For shear walls on the second story, straps or holdowns should be used to connect the walls to beams or shear walls at the first story.

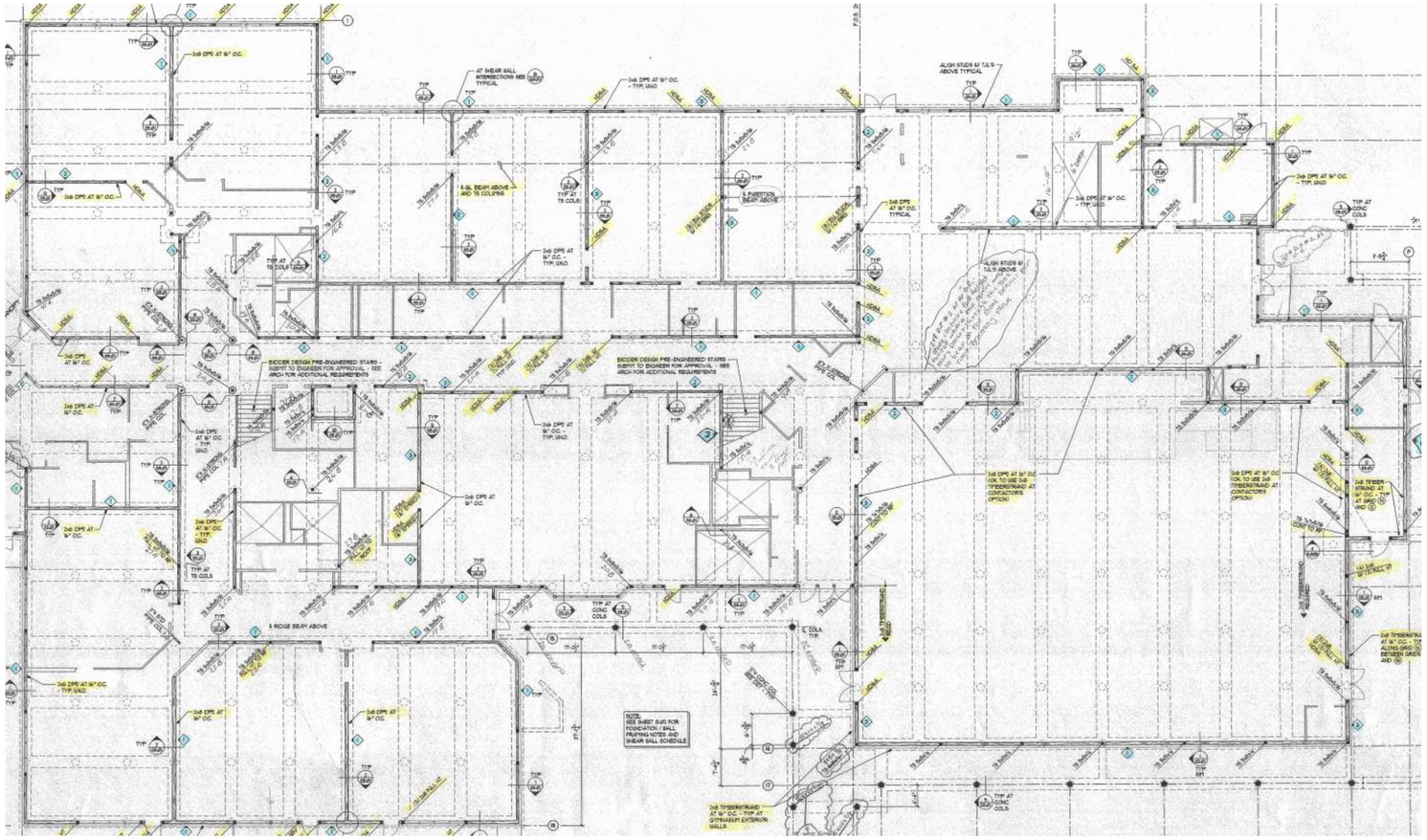
9. Next Steps and Recommendations

Due to the age of construction of this building, the results of the Tier 1 Evaluation, and the fact that this is a benchmark building, we do not recommend Tier 2 and Tier 3 evaluations nor a retrofit be performed at Robert Gray Elementary. We believe that the structure already meets the performance objective in its current condition. The retrofit concepts provided to mitigate the deficiencies identified can be further developed if the School District wishes to proceed into the design of a retrofit.

Appendix A: Seismic Retrofit Concept Drawings

WESTERN PORTION OF SCHOOL
SEVERAL FT TO BEDROCK

EASTERN PORTION 60FT TO
BEDROCK



1 GROUND IMPROVEMENT TO EAST OF SCHOOL.
REFERENCE GEOTECH REPORT.

1

1 FIRST FLOOR STRUCTURAL PLAN
SCALE: SCALE: NTS

N

Degenkolb

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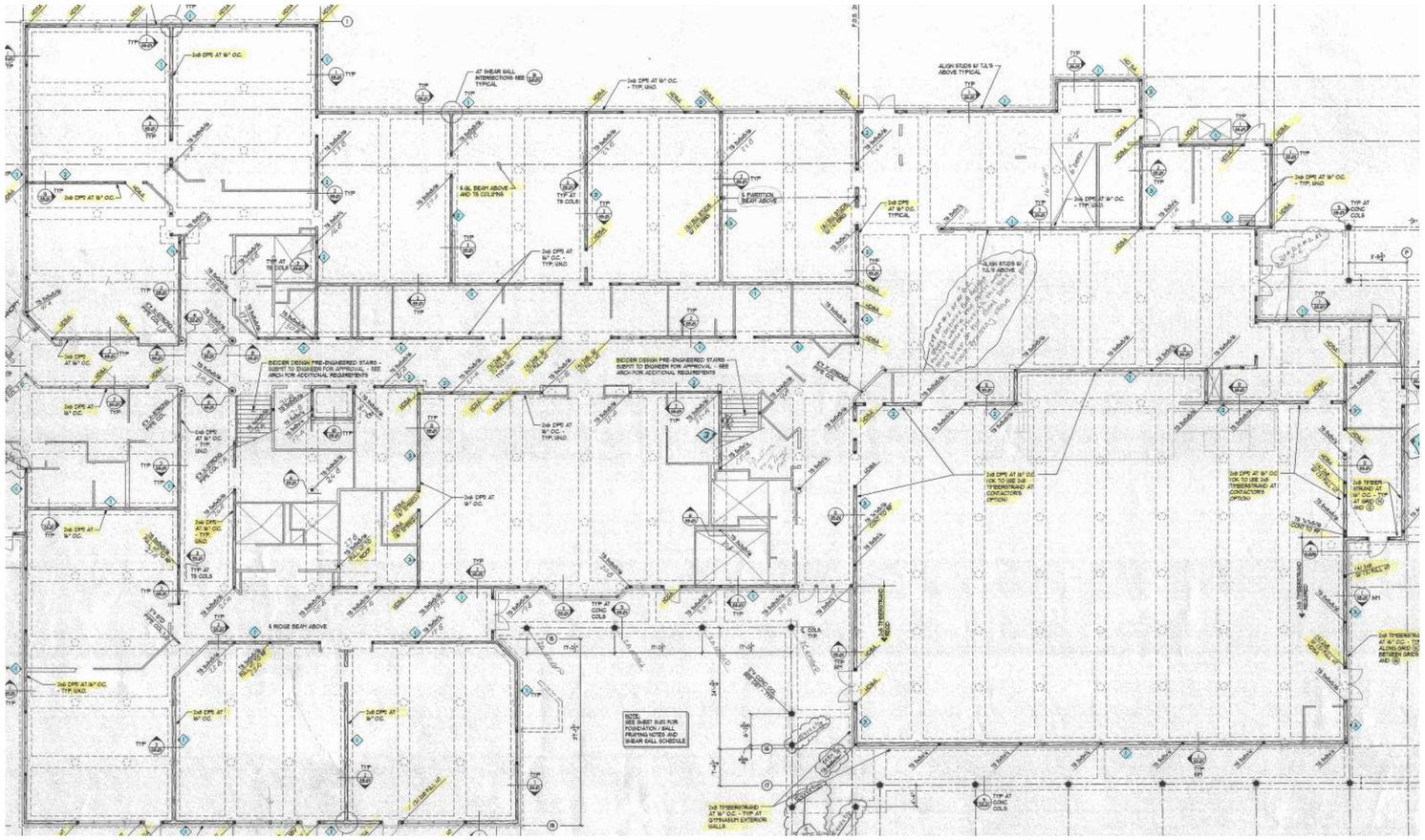
Sheet Title: FOUNDATION PLAN

Job Number: C3860012.00	SSK-1
Date: 07/17/2024	
Drawn by: ARA	
	Scale: NTS



NO WORK NEEDED
THIS SPACE

1 FIRST FLOOR STRUCTURAL PLAN
SCALE: SCALE: NTS

N

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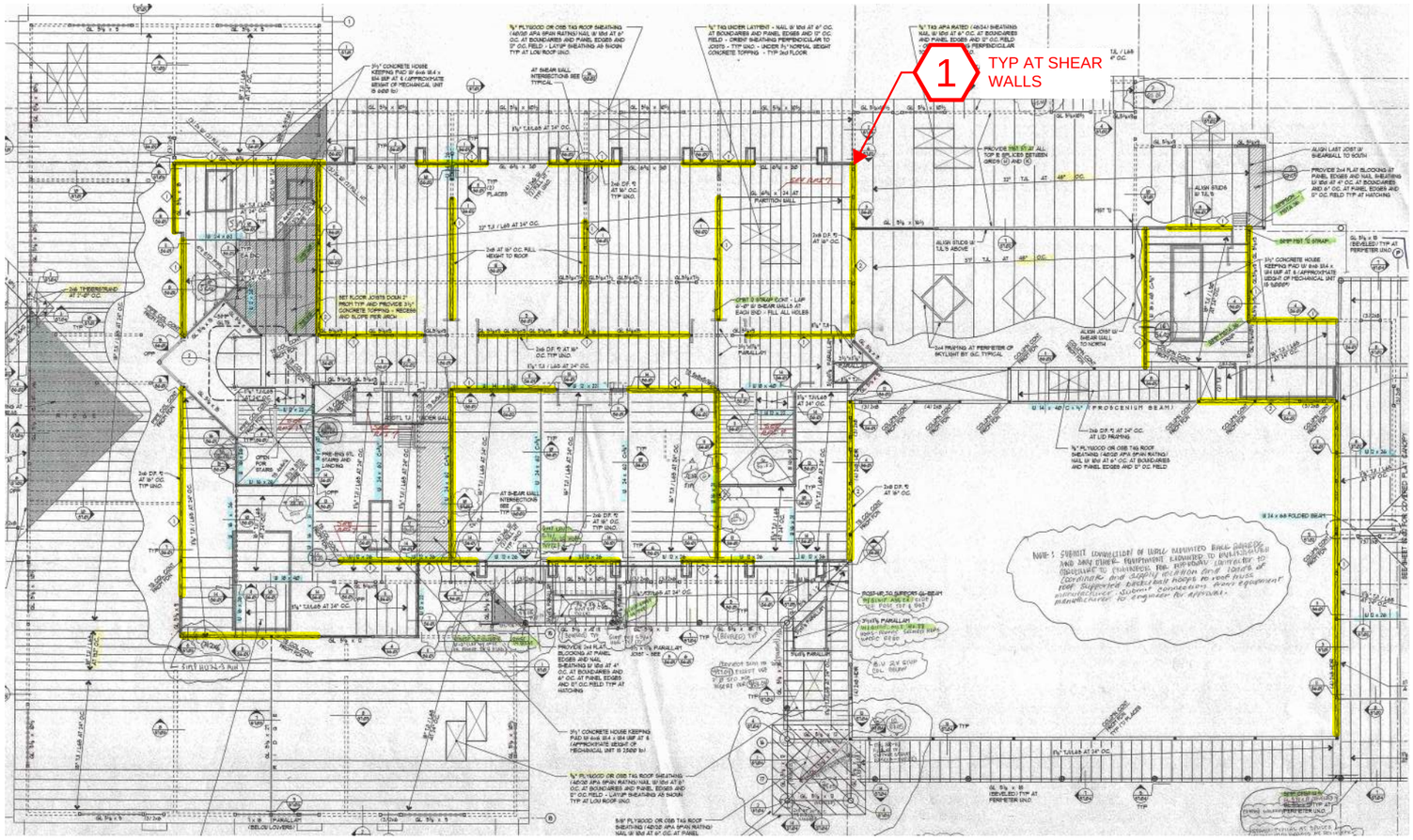
Sheet Title: FIRST FLOOR PLAN		
Job Number:	C3860012.00	SSK-2
Date:	07/18/2024	
Drawn by:	ARA	
		Scale: NTS



EXISTING PLYWOOD OR OSB SHEAR WALL

1 LIGHT GAGE STRAP SIMILAR TO CMST OR HOLDOWN ON EACH END OF SHEAR WALL. STRAP THROUGH FLOOR AND SECURE TO WALL OR BEAMS BELOW.

1 2ND FLOOR/LOW ROOF FRAMING PLAN

SCALE: SCALE: NTS

N

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Sheet Title: SECOND FLOOR PLAN

Job Number: C3860012.00	SSK-3
Date: 07/18/2024	
Drawn by: ARA	
	Scale: NTS

Appendix B: ASCE 41-17 Tier 1 Checklists

The following checklists are included within this appendix:

1. Basic Collapse Prevention Configuration Checklist (Modified for Limited Safety)
2. Collapse Prevention Structural Checklist for Wood Frame, Commercial and Industrial Buildings (W2) (Modified for Limited Safety)

Degenkolb

Subject:	BASIC CONFIGURATION CHECKLIST	**Job Number:**	TBD	**Date:**	07/19/24
Job:	TBD	**By:**	TBD	**Section:**	
		Checked By:		**Page:**	

BASIC CONFIGURATION CHECKLIST

ASCE 41-17 SEISMIC EVALUATION AND RETROFIT OF EXISTING BUILDINGS

IMMEDIATE OCCUPANCY PERFORMANCE LEVEL

BSE-2E SEISMIC HAZARD

EVALUATION CATEGORY	STATUS				EVALUATION STATEMENT	TIER 2 REFERENCE	COMMENTARY REFERENCE	ASCE 41-17 TABLE	COMMENTS
	C	NC	NA	U					
Structural Components	x				LOAD PATH: The structure contains a complete, well-defined load path, including structural elements and connections, that serves to transfer the inertial forces associated with the mass of all elements of the building to the foundation.	5.4.1.1	A.2.1.1	17-1	
	x				WALL ANCHORAGE: Exterior concrete or masonry walls that are dependent on the diaphragm for lateral support are anchored for out-of-plane forces at each diaphragm level with steel anchors, reinforcing dowels, or straps that are developed into the diaphragm. Connections have adequate strength to resist the connection force calculated in the Quick Check procedure of Section 4.4.3.7.	5.7.1.1	A.5.1.1	17-1	
Building System: General	x				LOAD PATH: The structure contains a complete, well-defined load path, including structural elements and connections, that serves to transfer the inertial forces associated with the mass of all elements of the building to the foundation.	5.4.1.1	A.2.1.1	17-2	
	x				ADJACENT BUILDINGS: The clear distance between the building being evaluated and any adjacent building is greater than 0.25% of the height of the shorter building in low seismicity, 0.5% in moderate seismicity, and 1.5% in high seismicity.	5.4.1.2	A.2.1.2	17-2	
	x				MEZZANINES: Interior mezzanine levels are braced independently from the main structure or are anchored to the seismic-force-resisting elements of the main structure.	5.4.1.3	A.2.1.3	17-2	
Building System: Building Configuration	x				WEAK STORY: The sum of the shear strengths of the seismic-force-resisting system in any story in each direction is not less than 80% of the strength in the adjacent story above.	5.4.2.1	A.2.2.2	17-2	
	x				SOFT STORY: The stiffness of the seismic-force-resisting system in any story is not less than 70% of the seismic-force-resisting system stiffness in an adjacent story above or less than 80% of the average seismic-force-resisting system stiffness of the three stories above.	5.4.2.2	A.2.2.3	17-2	
	x				VERTICAL IRREGULARITIES: All vertical elements in the seismic-force-resisting system are continuous to the foundation.	5.4.2.3	A.2.2.4	17-2	
	x				GEOMETRY: There are no changes in the net horizontal dimension of the seismic-force-resisting system of more than 30% in a story relative to adjacent stories, excluding one-story penthouses and mezzanines.	5.4.2.4	A.2.2.5	17-2	

	x				MASS: There is no change in effective mass more than 50% from one story to the next. Light roofs, penthouses, and mezzanines need not be considered.	5.4.2.5	A.2.2.6	17-2	
	x				TORSION: The estimated distance between the story center of mass and the story center of rigidity is less than 20% of the building width in either plan dimension.	5.4.2.6	A.2.2.7	17-2	
Geological Site Hazards		x			LIQUEFACTION: Liquefaction-susceptible, saturated, loose granular soils that could jeopardize the building's seismic performance do not exist in the foundation soils at depths within 50 ft (15.2 m) under the building.	5.4.3.1	A.6.1.1	17-2	Liquifiable soils exist, but structure is supported by deep foundations.
	x				SLOPE FAILURE: The building site is located away from potential earthquake-induced slope failures or rockfalls so that it is unaffected by such failures or is capable of accommodating any predicted movements without failure.	5.4.3.1	A.6.1.2	17-2	
	x				SURFACE FAULT RUPTURE: Surface fault rupture and surface displacement at the building site are not anticipated.	5.4.3.1	A.6.1.3	17-2	
Foundation Configuration	x				OVERTURNING: The ratio of the least horizontal dimension of the seismic-force-resisting system at the foundation level to the building height (base/height) is greater than $0.6S_a$.	5.4.3.3	A.6.2.1	17-2	
	x				TIES BETWEEN FOUNDATION ELEMENTS: The foundation has ties adequate to resist seismic forces where footings, piles, and piers are not restrained by beams, slabs, or soils classified as Site Class A, B, or C.	5.4.3.4	A.6.2.2	17-2	Grade beams present between piles

Subject:	STRUCTURAL CHECKLIST	**Job Number:**	TBD	**Date:**	07/19/24
Job:	TBD	**By:**	TBD	**Section:**	
		Checked By:		**Page:**	

STRUCTURAL CHECKLIST

ASCE 41-17 SEISMIC EVALUATION AND RETROFIT OF EXISTING BUILDINGS
IMMEDIATE OCCUPANCY PERFORMANCE LEVEL
BSE-2E SEISMIC HAZARD
WOOD FRAMES, COMMERCIAL & INDUSTRIAL (W2)

EVALUATION CATEGORY	STATUS				EVALUATION STATEMENT	TIER 2 REFERENCE	COMMENTARY REFERENCE	ASCE 41-17 TABLE	COMMENTS
	C	NC	NA	U					
Seismic Force Resisting System	x				REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2.	5.5.1.1	A.3.2.1.1	17-6	
	x				SHEAR STRESS CHECK: The shear stress in the shear walls, calculated using the Quick Check procedure of Section 4.4.3.3, is less than the following values: Structural Panel Sheathing……1000 lb/ft Diagonal Sheathing……700 lb/ft Straight Sheathing……..100 lb/ft All Other Conditions.....100 lb/ft	5.5.3.1.1	A.3.2.7.1	17-6	Compliant. DCR < 0.9
			x		STUCCO (EXTERIOR PLASTER) SHEAR WALLS: Multi-story buildings do not rely on exterior stucco walls as the primary seismic-force-resisting system.	5.5.3.6.1	A.3.2.7.2	17-6	
	x				GYPSUM WALLBOARD OR PLASTER SHEAR WALLS: Interior plaster or gypsum wallboard is not used for shear walls on buildings more than one story high with the exception of the uppermost level of a multi-story building.	5.5.3.6.1	A.3.2.7.3	17-6	
	x				NARROW WOOD SHEAR WALLS: Narrow wood shear walls with an aspect ratio greater than 2-to-1 are not used to resist seismic forces.	5.5.3.6.1	A.3.2.7.4	17-6	
		x			WALLS CONNECTED THROUGH FLOORS: Shear walls have an interconnection between stories to transfer overturning and shear forces through the floor.	5.5.3.6.2	A.3.2.7.5	17-6	Details show that walls do not have straps to connect walls through floor for overturning forces.
			x		HILLSIDE SITE: For structures that are taller on at least one side by more than one-half story because of a sloping site, all shear walls on the downhill slope have an aspect ratio less than 1-to-1.	5.5.3.6.3	A.3.2.7.6	17-6	
			x		CRIPPLE WALLS: Cripple walls below first-floor-level shear walls are braced to the foundation with wood structural panels.	5.5.3.6.4	A.3.2.7.7	17-6	
			x		OPENINGS: Walls with openings greater than 80% of the length are braced with wood structural panel shear walls with aspect ratios of not more than 1.5-to-1 or are supported by adjacent construction through positive ties capable of transferring the seismic forces.	5.5.3.6.5	A.3.2.7.8	17-6	

Connections	x				WOOD POSTS: There is a positive connection of wood posts to the foundation.	5.7.3.3	A.5.3.3	17-6	Great connection details present, connections visible during site visit as well
	x				WOOD SILLS: All wood sills are bolted to the foundation.	5.7.3.3	A.5.3.4	17-6	
	x				GIRDER–COLUMN CONNECTION: There is a positive connection using plates, connection hardware, or straps between the girder and the column support.	5.7.4.1	A.5.4.1	17-6	
	x				WOOD SILL BOLTS: Sill bolts are spaced at 6 ft or less with acceptable edge and end distance provided for wood and concrete.	5.7.3.3	A.5.3.7	17-6	48" max spacing per shear wall schedule
Diaphragms	x				DIAPHRAGM CONTINUITY: The diaphragms are not composed of split-level floors and do not have expansion joints.	5.6.1.1	A.4.1.1	17-6	
	x				ROOF CHORD CONTINUITY: All chord elements are continuous, regardless of changes in roof elevation.	5.6.1.1	A.4.1.3	17-6	
			x		DIAPHRAGM REINFORCEMENT AT OPENINGS: There is reinforcing around all diaphragm openings larger than 50% of the building width in either major plan dimension.	5.6.1.5	A.4.1.8	17-6	
			x		STRAIGHT SHEATHING: All straight-sheathed diaphragms have aspect ratios less than 2-to-1 in the direction being considered.	5.6.2	A.4.2.1	17-6	
	x				SPANS: All wood diaphragms with spans greater than 24 ft consist of wood structural panels or diagonal sheathing.	5.6.2	A.4.2.2	17-6	
	x				DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 40 ft and have aspect ratios less than or equal to 4-to-1.	5.6.2	A.4.2.3	17-6	
	x				OTHER DIAPHRAGMS: The diaphragms do not consist of a system other than wood, metal deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1	17-6	

CENTRAL PARK ELEMENTARY SCHOOL
SEISMIC EVALUATION REPORT

Central Park Elementary School
601 School Rd
Aberdeen, WA 98520

December 18, 2024
Degenkolb Job Number: C3860012.00



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Table of Contents

1. Introduction 2

2. Building Description 2

3. Sources and Standards 7

4. Site Visit and Investigation 8

5. Site Description and Geologic Site Hazards 12

6. Evaluation Methodology 12

7. Evaluation Results 14

8. Seismic Retrofit Concepts 15

9. Next Steps and Recommendations 16

Appendix A: Seismic Retrofit Concept Drawings 17

Appendix B: ASCE 41-17 Tier 1 Checklists 18

1. Introduction

The objective of this study is to complete a seismic evaluation and provide preliminary retrofit recommendations for Central Park Elementary School in Aberdeen, WA. The school has been selected for evaluation by OSPI under the School Seismic Safety Grant Program. The seismic evaluation and retrofit feasibility study was performed to characterize the expected seismic performance of the building in its existing condition and provide conceptual-level retrofit measures for use in estimating the scale and impact of a seismic retrofit. This report summarizes the results of this seismic analysis.

2. Building Description

Central Park Elementary School is a one-story structure of varying construction types and dates. The original building was constructed in 1957. In 1966, an annex building with additional classrooms was added to the North side of the original building.

The campus underwent a modernization in 1994. Roof areas with skylights on the 1957 buildings were infilled with plywood framing. Also, a mezzanine was added to the West side of the interior space of the 1957 building gymnasium.

The complete building footprint is L-shaped in plan, with outside-to-outside dimensions of approximately 290 feet by 200 feet.

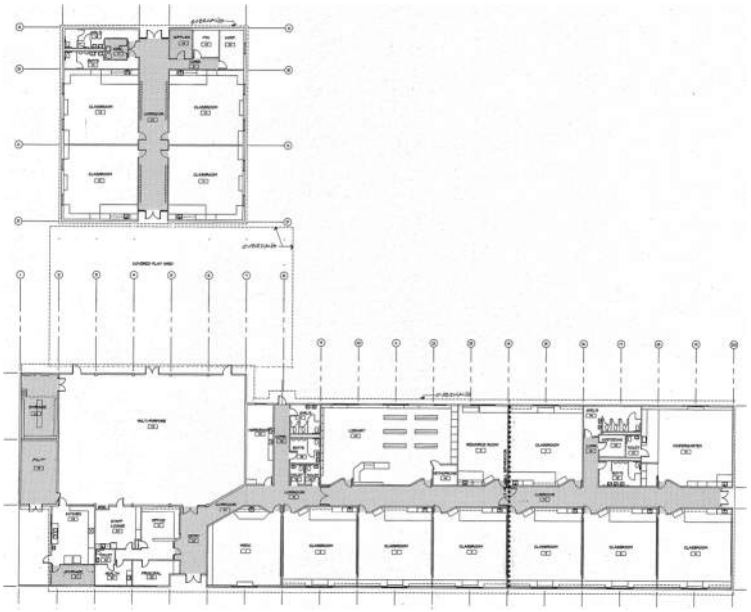


Figure 2-1 – Central Park Elementary School Building Areas (from 1994 Modernization)

1. **Original Building (1957):** The building is a one-story structure with wood-framed floors and roofs. It houses the school offices, library, staff lounge, workroom, gymnasium, kitchen, and ten classrooms. The building is L-shaped in plan with dimensions of approximately 290 feet by 123 feet, and its long

dimension is oriented east-west. The low-sloped roof has an eave height of approximately 10 feet. The gymnasium sloped roof has an eave height of approximately 15 feet. At the north-west corner of the building there is a covered play area which attaches into the north gymnasium wall. The covered play area is approximately 34 ft deep by 98 ft wide.

i. Foundation System:
    a. Shallow foundations with concrete strip footings at exterior and interior wall lines
ii. Floor System:
    a. Slab on grade
iii. Wall System:
    a. Corridor walls: 2x stud walls with plywood sheathing
    b. Exterior classroom walls: 2x stud walls with plywood sheathing; combination of aluminum and brick veneer siding
    c. Gymnasium storage room: combination of reinforced concrete and CMU walls.
iv. Roof System:
    a. Classroom roof: stress skin panel roofing over glulam beams
    b. Corridor roof: unblocked plywood over 2x8 framing to glulam beams (reframed from removal of skylights)
    c. Gymnasium roof: tectum roofing spanning to glulam beams

2. **Annex Building (1966):** The building is a one-story structure with wood-framed floors and roofs. It houses four classrooms and a teachers lounge. The building has a rectangular plan with dimensions of approximately 73 feet by 77 feet, with its long dimension oriented north-south. The building has an approximate eave height of 9 feet.
    i. Foundation System:
        a. Shallow foundations with concrete strip footings at exterior and interior wall lines
    ii. Floor System:
        a. Slab on grade
    iii. Wall System:
        a. 2x stud walls with plywood sheathing
        b. Brick veneer at exterior walls
    iv. Roof System:
        a. Plywood sheathing
        b. Roof trusses at 48” on center spanning to glulam beams and exterior walls

Exterior elevations are shown in Figures 2-2 through 2-7.



Figure 2-2 – 1957 Building South Elevation



Figure 2-3 – 1957 Building East Elevation



Figure 2-4 – 1957 Building North Elevation



Figure 2-5 – Annex Building South Elevation



Figure 2-6 – Annex Building North Elevation



Figure 2-7 – Annex and Covered Play East Elevation

3. Sources and Standards

The following documents were reviewed in preparing this report:

- Architectural and Structural Drawings titled "Central Park Elementary School" dated December, 1957.
- Architectural Drawings titled "Addition to Central Park Elementary School" dated 6/15/1966.
- Architectural and Structural Drawings titled "Central Park Elementary Modernization" dated 01/28/1994.
- Geotechnical Report titled "Report of Preliminary Geotechnical Engineering Findings, Aberdeen School District No. 5 Seismic Safety Retrofits; Central Park Elementary School" by Haley & Aldrich Inc., Dated September 2024.

Throughout this report, the following reference codes and standards are used:

- ASCE 41-17: Seismic Evaluation and Retrofit of Existing Buildings. American Society of Civil Engineers, 2017.
- ASCE 7-16: Minimum Design Loads for Buildings and Other Structures. American Society of Civil Engineers, 2016.
- 2021 International Existing Building Code as Amended and Adopted by the Washington State Building Code. International Code Council 2021.

4. Site Visit and Investigation

A site visit was conducted on June 18, 2024, to observe the existing construction and overall condition. Figures 4-1 through 4-6 show existing conditions observed during the site visits. Select observations in this investigation are summarized here.

- The buildings were in good condition with no noticeable signs of deterioration.
- Typical construction observed generally matches the available existing drawings.
- Figure 4-1 shows where the gymnasium roof to transverse exterior wall connects to the 1957 building. No connection hardware is visible from below.
- Figure 4-2 shows the connection of the gymnasium mezzanine at the exterior wall in the 1957 building.
- Figure 4-3 shows the typical gap between the play shed and the 1966 building
- Figure 4-4 shows the play area roof-to-gymnasium wall connection at the 1957 building.
- Figure 4-5 shows the gymnasium roof framing in the 1957 building.
- Figure 4-6 shows the underside of the roof framing in the attic of the 1957 building, which is drywalled over.



Figure 4-1 – Gymnasium Roof to Transverse Exterior Wall (1957 Building)



Figure 4-2 – Mezzanine Connection to Transverse Exterior Wall



Figure 4-3 – Seismic Gap at Play Area to 1966 Building



Figure 4-4 – Connection of Play Area Beams to Gymnasium Wall (1957 Building)



Figure 4-5 – Gymnasium Building with Tectum Roofing



Figure 4-6 – Typical Drywall Covered Framing above Ceiling In 1957 Building

5. Site Description and Geologic Site Hazards

A geotechnical evaluation was performed by Haley & Aldrich, with their final report dated September 2024. The site was analyzed for the BSE-1E and BSE-2E seismic hazard level. The BSE-1E hazard corresponds to a 20% in 50-year seismic event or a 225-year return period, and the BSE-2E hazard corresponds to a 5% in 50-year seismic event or a 975-year return period. The short-period spectral acceleration, S_{xs}, and long-period spectral acceleration, S_{x1}, for the BSE-1E hazard level using the most current hazard maps from USGS are 0.63g and 0.31g, respectively. For the BSE-2E hazard level, S_{xs} and S_{x1} are 1.16g and 0.83g, respectively.

The report highlights the seismic hazard of liquefaction present at Central Park Elementary School, summarized below:

1. Liquefaction
    - There is moderate potential for liquefaction at the site, which may induce strength loss in the soil and result in reduced support for foundations and large ground settlements.
    - Vertical settlement is estimated to be approximately 1.5 inches.

The report classifies the soil as Site Class D due to the moderate liquefaction hazard. The site is in a region of high seismicity, with the Cascadia Subduction Zone contributing significantly to the overall seismic hazard at the site.

The Cascadia Subduction Zone is capable of generating large tsunamis with the potential to inundate the Washington coastline, however the site is not within the Washington Tsunami Design Zone.

6. Evaluation Methodology

An ASCE 41-17 Tier 1 evaluation was performed for Central Park Elementary School with a Limited Safety structural performance objective for the BSE-2E hazard. Based on the occupancy, the building is classified as Risk Category III. The buildings evaluated include the Original 1957 Building and 1966 Annex Building. The following Tier 1 checklists were completed as part of this evaluation and are presented in Appendix B:

- Basic Collapse Prevention Configuration Checklist (Modified for Limited Safety)
- Collapse Prevention Structural Checklist for Wood Frame, Commercial and Industrial Buildings (W2) (Modified for Limited Safety)
- Collapse Prevention Structural Checklist for Concrete Shear Walls with Flexible Diaphragms (C2A) (Modified for Limited Safety)

The Collapse Prevention checklists were used with modified m-factors as required by ASCE 41-17 Table 2-2 footnote c. These checklists are intended to screen for common building deficiencies with limited structural calculations. These deficiencies have been identified as potential collapse hazards when buildings of similar age and construction are subjected to large ground motions.

ASCE 41-17 does not explicitly define evaluation procedures for buildings located within the tsunami inundation zone.

7. Evaluation Results

This section outlines the results of the ASCE 41-17 Tier 1 evaluation. The evaluation indicates that Central Park Elementary School does not comply with the Limited Safety performance objective due to several significant deficiencies typical of older wood framed buildings. The deficiencies for the 1957 building and 1966 annex building are described in Tables 7-1 and Table 7-2, respectively.

Table 7-1 – Structural Deficiency Summary (1957 Building)

Category	Deficiency	Description*
Structural Components	Load Path	U – (1) Connection between tectum panels is unclear at the gymnasium. This may limit the load path for seismic forces to transfer along the roof diaphragm. NC - (2) The roof-to-wall connection at the exterior walls is unclear and appears not to have a positive connection. There is no load path for seismic forces to get from the roof into the wall in this configuration (see Figure 4-4) NC - (3) No lateral system exists at the north side of the covered play area.
	Wall Anchorage	NC – No anchorage exists from the roof diaphragm to the walls at the gymnasium
Building System: General	Mezzanines	NC – The mezzanine at the gymnasium does not have independent bracing or anchorage to the main structure in the north-south direction, which prevents transfer of the lateral forces from the mezzanine floor.
Diaphragms	Diaphragm Continuity	NC – The gymnasium diaphragm is offset from the main building on the South, and East sides This is a type of discontinuity which may lead to instability due to lack of support.
	Roof Chord Continuity	NC – Chord elements are discontinuous at the stepped gymnasium diaphragm.
	Spans	NC – Diaphragms at the gymnasium roof span greater than 24 feet and do not consist of wood structural panels.
	Other Diaphragms	NC – Gymnasium diaphragm consists of a material (Tectum) other than wood, metal deck, concrete, or horizontal bracing. The tectum roof has unknown capacity and connections.
	Diagonally Sheathed and Unblocked Diaphragms	NC – The diaphragm the gymnasium is composed of tectum roofing.

Connections	Wall Anchorage at Flexible Diaphragms	NC - No out of plane connections exist for force transfer from the gymnasium diaphragm to the exterior concrete wall. This may allow the roof to pull away from the wall in a seismic event.
	Transfer to Shear Walls	NC – No out of plane connections exist for force transfer from the gymnasium diaphragm to the exterior concrete wall. This may allow the roof to pull away from the wall in a seismic event.

* NC = Non-Compliant; U = Unknown

8. Seismic Retrofit Concepts

The Tier 1 Procedure in ASCE 41-17 is not intended to be used for the retrofit of structures; rather, it provides a quick screening evaluation to identify areas for further study. Designing retrofit measures based on a Tier 1 screening alone may result in an overly conservative and costly retrofit. We have provided retrofit concepts in Appendix A; however, they are preliminary and additional analysis should be performed if the building retrofit moves forward.

Several of the major deficiencies and their corresponding retrofits are described below.

- Deficiency – Load Path (1957 Building) and Connections
    - Braced frames or tension-only bracing should infill columns at the northern end of the play area, creating a lateral force resisting system for the area.
    - At roof-to-wall connections in the gymnasium, straps should be installed at 8 ft on center on east and west walls.
    - At the main building, connections should be installed where panel edges connect to shear walls.
    - Provide inter-panel connections at all stress skin panels.
    - At the gymnasium, tectum roofing should be removed. See below for re-roofing recommendations.
- Deficiency – Mezzanines
    - The northernmost mezzanine wall should be sheathed with plywood, and clips should be installed from diaphragm to wall. At the southernmost mezzanine wall, provide clips from diaphragm to wall with anchors to CMU.
- Deficiency – Diaphragms
    - Remove all tectum roofing from the gymnasium. Re-roof with plywood sheathing, and provide connections to all exterior walls for transfer of in-plane shear. At East and West walls, provide straps back into the diaphragm for out of plane loads.

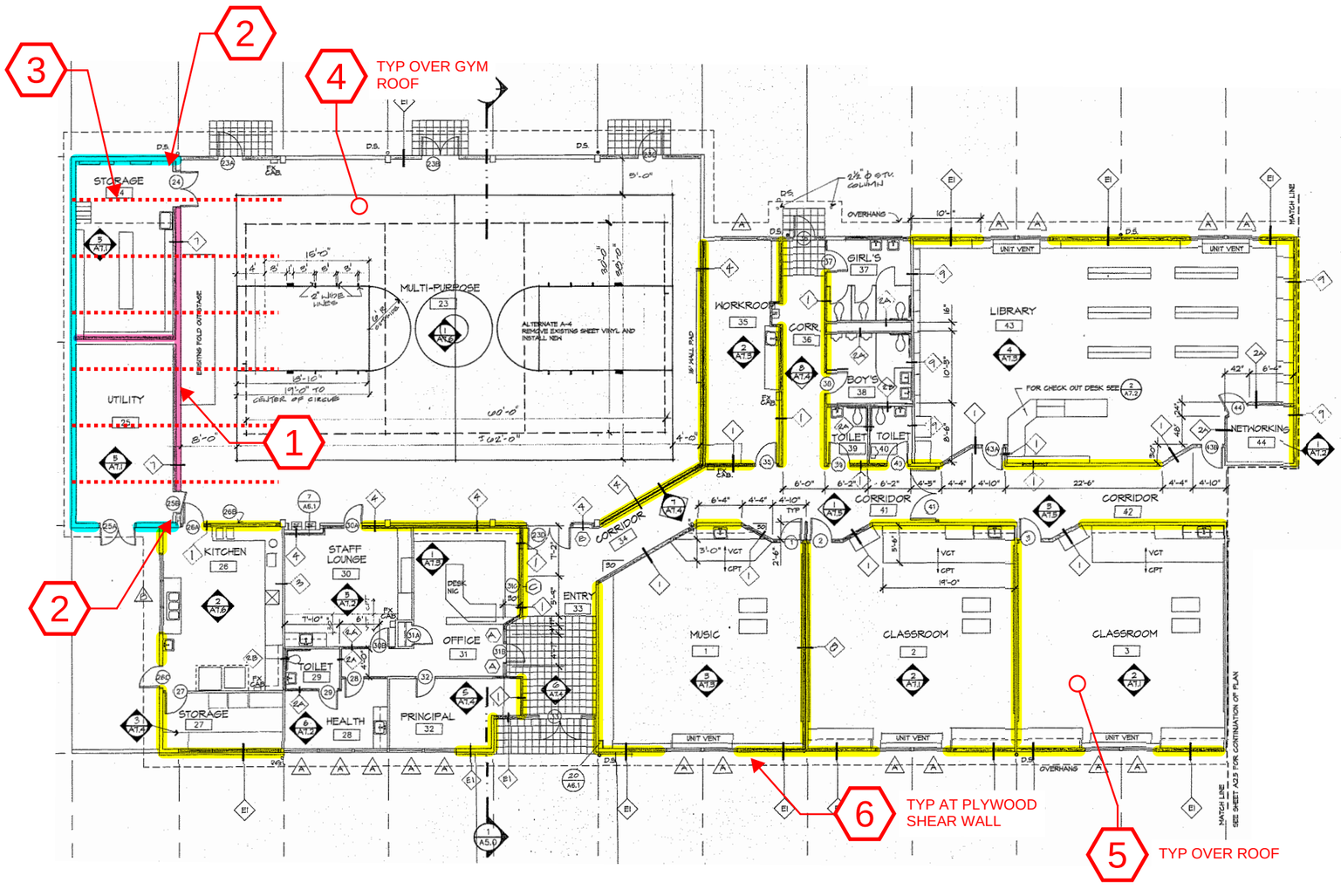
9. Next Steps and Recommendations

ASCE 41 lists Tier 2 and Tier 3 as the two procedures available for the retrofit design of an existing building. A Tier 2 evaluation and retrofit is deficiency-based and is used in conjunction with the results of a Tier 1 evaluation. A Tier 3 evaluation and retrofit is a systematic study of the building and all its components.

As a next step, we recommend that each of the checklist items marked Noncompliant or Unknown should be evaluated using the Tier 2 procedure. The Tier 2 evaluation will better inform the items that need to be retrofitted. This should be coupled with a destructive investigation program to reveal unknown conditions behind finishes.

Additionally, although a nonstructural evaluation was not performed in this phase, it is common for buildings of this type and age to require bracing of various nonstructural elements (e.g. pipes and conduits). We recommend that these items be evaluated as part of the Tier 2 analysis.

Appendix A: Seismic Retrofit Concept Drawings



FLOOR PLAN AREA " A "

SCALE: NTS

NORTH

EXISTING CMU SHEAR WALL

EXISTING CONCRETE SHEAR WALL

EXISTING PLYWOOD SHEAR WALL

1 VERIFY TOP PLATE AT WALL. IF NOT PRESENT ADD PRESSURE TREATED 3x8 TOP PLATE WITH ADDHESIVE ANCHORS TO CMU AT 24" O.C.

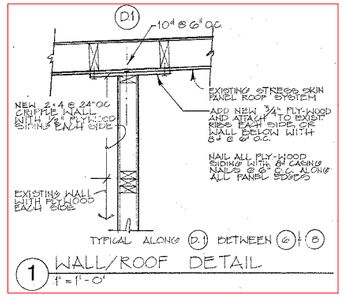
2 INSTALL 8x8 ANGLE WITH BOLTS INTO EACH WALL

3 INSTALL STRAPS WITH ANCHORS TO CONCRETE AND CMU WALLS. EXTEND 16'-0" INTO GYMNASIUM. SPACED AT 8'-0" O.C.

4 REMOVE EXISTING TECTUM ROOF AND REPLACE WITH PLYWOOD WITH RAFTERS SPANNING BETWEEN EXISTING GLULAM BEAMS. CONNECT NEW ROOF TO EXISTING CONCRETE AND WOOD WALLS.

5 REMOVE EXISTING ROOFING. ADD LTP4 CLIPS AT 12" ALONG ALL PANEL EDGES.

6 CONNECT ALL SHEAR WALLS TO ROOF SIMILAR TO DETAIL BELOW. ADD HOLDOWN AT EACH END OF WALL



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Sheet Title: AREA "A" FLOOR PLAN

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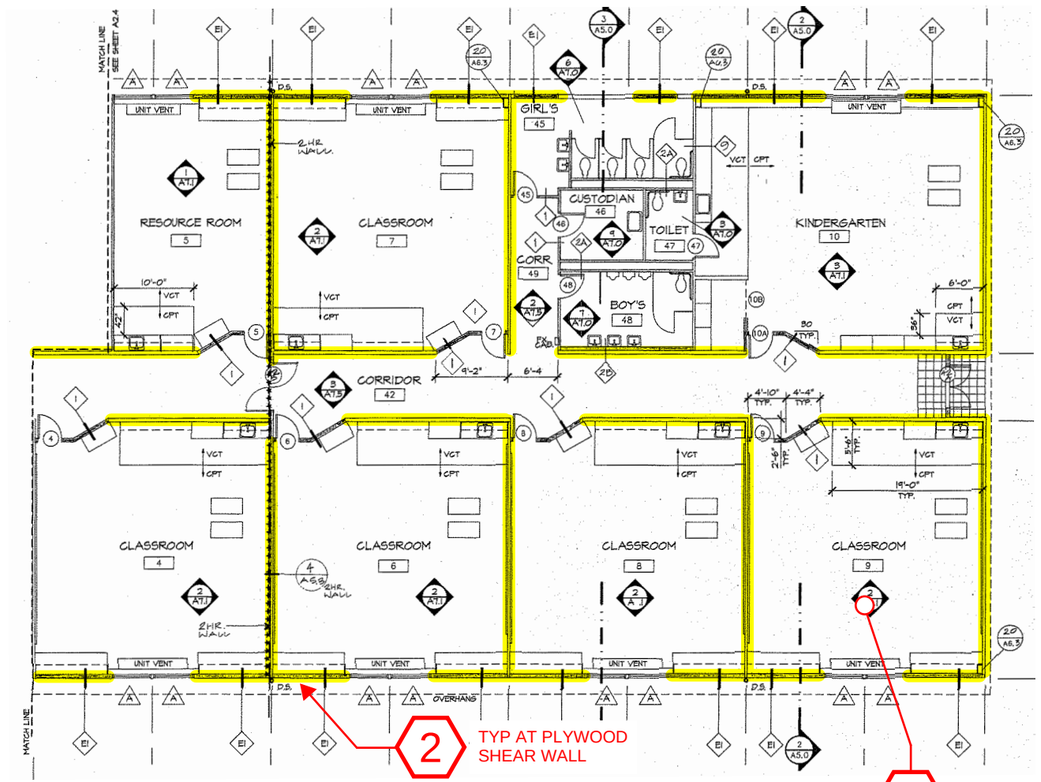
Drawn by: ARA	
	Scale: NTS



NORTH

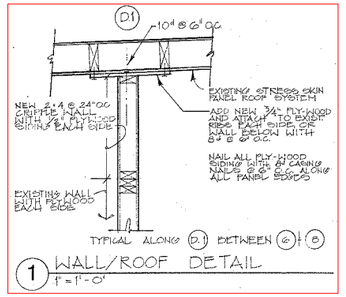
FLOOR PLANS - AREA " B "

SCALE: NTS

EXISTING PLYWOOD SHEAR WALL

1 REMOVE EXISTING ROOFING. ADD LTP4 CLIPS AT 12" ALONG ALL PANEL EDGES

2 CONNECT ALL SHEAR WALLS TO ROOF SIMILAR TO DETAIL BELOW. ADD HOLDOWN AT EACH END OF WALL



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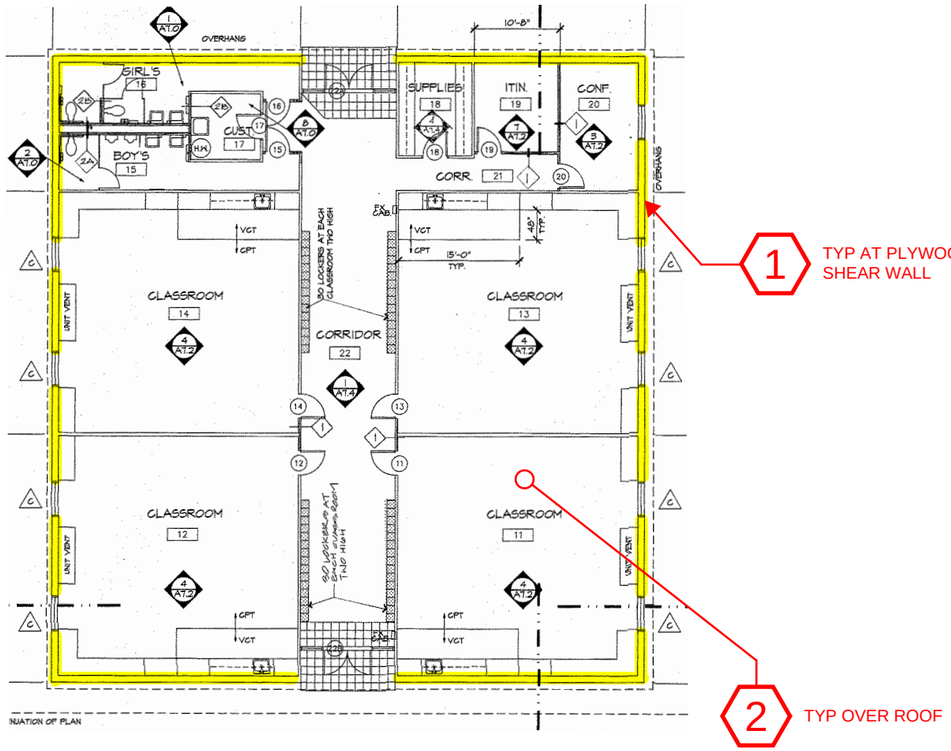

EXISTING PLYWOOD SHEAR WALL

1 VERIFY PLYWOOD SHEATHING AND FRAMING EXTENDS TO UNDERSIDE OF EXISTING ROOF. PROVIDE HOLDOWN AT EACH END OF WALL. INSTALL SILL BOLTS AS REQUIRED.

2 INSTALL BLOCKING AT ROOF TO WALL CONNECTION. NAIL BLOCKING TO WALL TOP PLATE. NAIL ROOF TO BLOCKING.

FLOOR PLANS - AREA " C "

SCALE: NTS

NORTH

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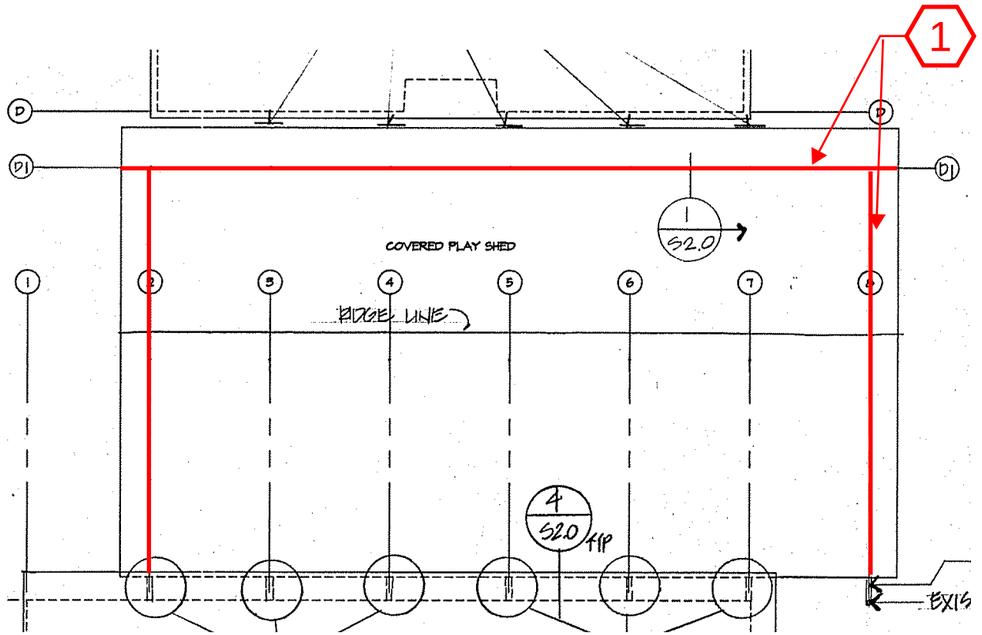
	SSK-3
	Scale: NTS

1 INSTALL ONE BAY OF CROSS BRACES IN EACH DIRECTION OF COVER PLAY SHED BETWEEN STEEL PIPES.



COVERED PLAY AREA

SCALE: NTS

NORTH

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	Scale: NTS

Appendix B: ASCE 41-17 Tier 1 Checklists

The following checklists are included within this appendix:

1. Basic Collapse Prevention Configuration Checklist (Modified for Limited Safety) – 1957 Building
2. Collapse Prevention Structural Checklist for Wood Frame, Commercial and Industrial Buildings (W2) – 1957 Building
3. Collapse Prevention Structural Checklist for Concrete Shear Wall Buildings with Flexible Diaphragms (C2A) – 1957 Building
4. Basic Collapse Prevention Configuration Checklist (Modified for Limited Safety) – 1966 Annex Building
5. Collapse Prevention Structural Checklist for Wood Frame, Commercial and Industrial Buildings (W2) – 1966 Annex Building

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Subject:	BASIC CONFIGURATION CHECKLIST	**Job Number:**	TBD	**Date:**	07/22/24
Job:	1957 Building	**By:**	TBD	**Section:**	
		Checked By:		**Page:**	

BASIC CONFIGURATION CHECKLIST

ASCE 41-17 SEISMIC EVALUATION AND RETROFIT OF EXISTING BUILDINGS

IMMEDIATE OCCUPANCY PERFORMANCE LEVEL

BSE-2E SEISMIC HAZARD

EVALUATION CATEGORY	STATUS				EVALUATION STATEMENT	TIER 2 REFERENCE	COMMENTARY REFERENCE	ASCE 41-17 TABLE	COMMENTS
	C	NC	NA	U					
Structural Components		x			LOAD PATH: The structure contains a complete, well-defined load path, including structural elements and connections, that serves to transfer the inertial forces associated with the mass of all elements of the building to the foundation.	5.4.1.1	A.2.1.1	17-1	Connection between tectum panels is unclear. Anchorage to walls from roof not present. At covered play, no lateral system exists at the north side.
		x			WALL ANCHORAGE: Exterior concrete or masonry walls that are dependent on the diaphragm for lateral support are anchored for out-of-plane forces at each diaphragm level with steel anchors, reinforcing dowels, or straps that are developed into the diaphragm. Connections have adequate strength to resist the connection force calculated in the Quick Check procedure of Section 4.4.3.7.	5.7.1.1	A.5.1.1	17-1	No roof straps to walls present
Building System: General	x				LOAD PATH: The structure contains a complete, well-defined load path, including structural elements and connections, that serves to transfer the inertial forces associated with the mass of all elements of the building to the foundation.	5.4.1.1	A.2.1.1	17-2	
	x			p	ADJACENT BUILDINGS: The clear distance between the building being evaluated and any adjacent building is greater than 0.25% of the height of the shorter building in low seismicity, 0.5% in moderate seismicity, and 1.5% in high seismicity.	5.4.1.2	A.2.1.2	17-2	
		x			MEZZANINES: Interior mezzanine levels are braced independently from the main structure or are anchored to the seismic-force-resisting elements of the main structure.	5.4.1.3	A.2.1.3	17-2	In N-S direction, Mezzanine does not have indipendent bracing or anchorage to the main structure. OK in EW Direction
Building System: Building Configuration			x		WEAK STORY: The sum of the shear strengths of the seismic-force-resisting system in any story in each direction is not less than 80% of the strength in the adjacent story above.	5.4.2.1	A.2.2.2	17-2	
			x		SOFT STORY: The stiffness of the seismic-force-resisting system in any story is not less than 70% of the seismic-force-resisting system stiffness in an adjacent story above or less than 80% of the average seismic-force-resisting system stiffness of the three stories above.	5.4.2.2	A.2.2.3	17-2	
	x				VERTICAL IRREGULARITIES: All vertical elements in the seismic-force-resisting system are continuous to the foundation.	5.4.2.3	A.2.2.4	17-2	
			x		GEOMETRY: There are no changes in the net horizontal dimension of the seismic-force-resisting system of more than 30% in a story relative to adjacent stories, excluding one-story penthouses and mezzanines.	5.4.2.4	A.2.2.5	17-2	

Building System: Building Configuration			x		MASS: There is no change in effective mass more than 50% from one story to the next. Light roofs, penthouses, and mezzanines need not be considered.	5.4.2.5	A.2.2.6	17-2	
	x				TORSION: The estimated distance between the story center of mass and the story center of rigidity is less than 20% of the building width in either plan dimension.	5.4.2.6	A.2.2.7	17-2	
Geological Site Hazards	x				LIQUEFACTION: Liquefaction-susceptible, saturated, loose granular soils that could jeopardize the building's seismic performance do not exist in the foundation soils at depths within 50 ft (15.2 m) under the building.	5.4.3.1	A.6.1.1	17-2	
	x				SLOPE FAILURE: The building site is located away from potential earthquake-induced slope failures or rockfalls so that it is unaffected by such failures or is capable of accommodating any predicted movements without failure.	5.4.3.1	A.6.1.2	17-2	
	x				SURFACE FAULT RUPTURE: Surface fault rupture and surface displacement at the building site are not anticipated.	5.4.3.1	A.6.1.3	17-2	
Foundation Configuration	x				OVERTURNING: The ratio of the least horizontal dimension of the seismic-force-resisting system at the foundation level to the building height (base/height) is greater than $0.6S_a$.	5.4.3.3	A.6.2.1	17-2	
				x	TIES BETWEEN FOUNDATION ELEMENTS: The foundation has ties adequate to resist seismic forces where footings, piles, and piers are not restrained by beams, slabs, or soils classified as Site Class A, B, or C.	5.4.3.4	A.6.2.2	17-2	

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Subject:	STRUCTURAL CHECKLIST	**Job Number:**	TBD	**Date:**	07/22/24
Job:	1957 Building	**By:**	TBD	**Section:**	
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STRUCTURAL CHECKLIST

ASCE 41-17 SEISMIC EVALUATION AND RETROFIT OF EXISTING BUILDINGS
IMMEDIATE OCCUPANCY PERFORMANCE LEVEL
BSE-2E SEISMIC HAZARD
WOOD FRAMES, COMMERCIAL & INDUSTRIAL (W2)

EVALUATION CATEGORY	STATUS				EVALUATION STATEMENT	TIER 2 REFERENCE	COMMENTARY REFERENCE	ASCE 41-17 TABLE	COMMENTS
	C	NC	NA	U					
Seismic Force Resisting System	x				REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2.	5.5.1.1	A.3.2.1.1	17-6	
	x				SHEAR STRESS CHECK: The shear stress in the shear walls, calculated using the Quick Check procedure of Section 4.4.3.3, is less than the following values: Structural Panel Sheathing……1000 lb/ft Diagonal Sheathing……700 lb/ft Straight Sheathing……..100 lb/ft All Other Conditions.....100 lb/ft	5.5.3.1.1	A.3.2.7.1	17-6	DCR = 0.95
			x		STUCCO (EXTERIOR PLASTER) SHEAR WALLS: Multi-story buildings do not rely on exterior stucco walls as the primary seismic-force-resisting system.	5.5.3.6.1	A.3.2.7.2	17-6	
			x		GYPSUM WALLBOARD OR PLASTER SHEAR WALLS: Interior plaster or gypsum wallboard is not used for shear walls on buildings more than one story high with the exception of the uppermost level of a multi-story building.	5.5.3.6.1	A.3.2.7.3	17-6	
	x				NARROW WOOD SHEAR WALLS: Narrow wood shear walls with an aspect ratio greater than 2-to-1 are not used to resist seismic forces.	5.5.3.6.1	A.3.2.7.4	17-6	
			x		WALLS CONNECTED THROUGH FLOORS: Shear walls have an interconnection between stories to transfer overturning and shear forces through the floor.	5.5.3.6.2	A.3.2.7.5	17-6	Single story structure.
			x		HILLSIDE SITE: For structures that are taller on at least one side by more than one-half story because of a sloping site, all shear walls on the downhill slope have an aspect ratio less than 1-to-1.	5.5.3.6.3	A.3.2.7.6	17-6	
			x		CRIPPLE WALLS: Cripple walls below first-floor-level shear walls are braced to the foundation with wood structural panels.	5.5.3.6.4	A.3.2.7.7	17-6	
	x				OPENINGS: Walls with openings greater than 80% of the length are braced with wood structural panel shear walls with aspect ratios of not more than 1.5-to-1 or are supported by adjacent construction through positive ties capable of transferring the seismic forces.	5.5.3.6.5	A.3.2.7.8	17-6	

Connections	x				WOOD POSTS: There is a positive connection of wood posts to the foundation.	5.7.3.3	A.5.3.3	17-6	
	x				WOOD SILLS: All wood sills are bolted to the foundation.	5.7.3.3	A.5.3.4	17-6	
	x				GIRDER–COLUMN CONNECTION: There is a positive connection using plates, connection hardware, or straps between the girder and the column support.	5.7.4.1	A.5.4.1	17-6	
	x				WOOD SILL BOLTS: Sill bolts are spaced at 6 ft or less with acceptable edge and end distance provided for wood and concrete.	5.7.3.3	A.5.3.7	17-6	
Diaphragms		x			DIAPHRAGM CONTINUITY: The diaphragms are not composed of split-level floors and do not have expansion joints.	5.6.1.1	A.4.1.1	17-6	Gymnasium roof steps up and creates discontinuity
		x			ROOF CHORD CONTINUITY: All chord elements are continuous, regardless of changes in roof elevation.	5.6.1.1	A.4.1.3	17-6	Roof chords at stepped roof are not continuous
			x		DIAPHRAGM REINFORCEMENT AT OPENINGS: There is reinforcing around all diaphragm openings larger than 50% of the building width in either major plan dimension.	5.6.1.5	A.4.1.8	17-6	
			x		STRAIGHT SHEATHING: All straight-sheathed diaphragms have aspect ratios less than 2-to-1 in the direction being considered.	5.6.2	A.4.2.1	17-6	No true straight sheathing exists
		x			SPANS: All wood diaphragms with spans greater than 24 ft consist of wood structural panels or diagonal sheathing.	5.6.2	A.4.2.2	17-6	Diaphragms made out of original 3 1/2" straight sheathing
		x			DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 40 ft and have aspect ratios less than or equal to 4-to-1.	5.6.2	A.4.2.3	17-6	Diaphragms are unblocked.
		x			OTHER DIAPHRAGMS: The diaphragms do not consist of a system other than wood, metal deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1	17-6	Tectum roofing at the gymnasium.

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Subject:	STRUCTURAL CHECKLIST	**Job Number:**	TBD	**Date:**	07/22/24
Job:	1957 Building	**By:**	TBD	**Section:**	
		Checked By:		**Page:**	

STRUCTURAL CHECKLIST

ASCE 41-17 SEISMIC EVALUATION AND RETROFIT OF EXISTING BUILDINGS

IMMEDIATE OCCUPANCY PERFORMANCE LEVEL

BSE-2E SEISMIC HAZARD

CONCRETE SHEAR WALLS WITH STIFF DIAPHRAGMS (C2) & FLEXIBLE DIAPHRAGMS (C2A)

EVALUATION CATEGORY	STATUS				EVALUATION STATEMENT	TIER 2 REFERENCE	COMMENTARY REFERENCE	ASCE 41-17 TABLE	COMMENTS
	C	NC	NA	U					
Seismic Force Resisting System			x		COMPLETE FRAMES: Steel or concrete frames classified as secondary components form a complete vertical-load-carrying system.	5.5.2.5.1	A.3.1.6.1	17-24	No frames exist
	x				REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2.	5.5.1.1	A.3.2.1.1	17-24	
	x				SHEAR STRESS CHECK: The shear stress in the concrete shear walls, calculated using the Quick Check procedure of Section 4.4.3.3, is less than the greater of 100 lb/in^2 or 2 $\sqrt{f'_c}$	5.5.3.1.1	A.3.2.2.1	17-24	Ok by inspection
	x				REINFORCING STEEL: The ratio of reinforcing steel area to gross concrete area is not less than 0.0012 in the vertical direction and 0.0020 in the horizontal direction.	5.5.3.1.3	A.3.2.2.2	17-24	.00258.
				x	DEFLECTION COMPATIBILITY: Secondary components have the shear capacity to develop the flexural strength of the components.	5.5.2.5.2	A.3.1.6.2	17-24	Not evaluated yet.
			x		FLAT SLABS: Flat slabs or plates not part of the seismic-force-resisting system have continuous bottom steel through the column joints.	5.5.2.5.3	A.3.1.6.3	17-24	
			x		COUPLING BEAMS: The ends of both walls to which the coupling beam is attached are supported at each end to resist vertical loads caused by overturning.	5.5.3.2.1	A.3.2.2.3	17-24	
Connections		x			WALL ANCHORAGE AT FLEXIBLE DIAPHRAGMS: Exterior concrete or masonry walls that are dependent on flexible diaphragms for lateral support are anchored for out-of-plane forces at each diaphragm level with steel anchors, reinforcing dowels, or straps that are developed into the diaphragm. Connections have strength to resist the connection force calculated in the Quick Check procedure of Section 4.4.3.7.	5.7.1.1	A.5.1.1	17-24	No wall anchorage present.
		x			TRANSFER TO SHEAR WALLS: Diaphragms are connected for transfer of seismic forces to the shear walls.	5.7.2	A.5.2.1	17-24	Nailing to diaphragm exists, but no OOP force transfer exists
	x				FOUNDATION DOWELS: Wall reinforcement is doweled into the foundation with vertical bars equal in size and spacing to the vertical wall reinforcing directly above the foundation.	5.7.3.4	A.5.3.5	17-24	
			x		UPLIFT AT PILE CAPS: Pile caps have top reinforcement, and piles are anchored to the pile caps.	5.7.3.5	A.5.3.8	17-24	

Diaphragms (Stiff or Flexible)		x			DIAPHRAGM CONTINUITY: The diaphragms are not composed of split-level floors and do not have expansion joints.	5.6.1.1	A.4.1.1	17-24	Diaphragm at gym steps down to main building
			x		OPENINGS AT SHEAR WALLS: Diaphragm openings immediately adjacent to the shear walls are less than 25% of the wall length.	5.6.1.3	A.4.1.4	17-24	
Flexible Diaphragms		x			CROSS TIES: There are continuous cross ties between diaphragm chords.	5.6.1.2	A.4.1.2	17-24	
			x		STRAIGHT SHEATHING: All straight-sheathed diaphragms have aspect ratios less than 2-to-1 in the direction being considered.	5.6.2	A.4.2.1	17-24	
			x		SPANS: All wood diaphragms with spans greater than 24 ft consist of wood structural panels or diagonal sheathing.	5.6.2	A.4.2.2	17-24	
			x		DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 40 ft and aspect ratios less than or equal to 4 to-1.	5.6.2	A.4.2.3	17-24	
		x			OTHER DIAPHRAGMS: Diaphragms do not consist of a system other than wood, metal deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1	17-24	Tectum roofing exists at Gymnasium.

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Subject:	BASIC CONFIGURATION CHECKLIST	**Job Number:**	TBD	**Date:**	07/22/24
Job:	1966 Addt'l Classroom Building	**By:**	TBD	**Section:**	
		Checked By:		**Page:**	

BASIC CONFIGURATION CHECKLIST

ASCE 41-17 SEISMIC EVALUATION AND RETROFIT OF EXISTING BUILDINGS

IMMEDIATE OCCUPANCY PERFORMANCE LEVEL

BSE-2E SEISMIC HAZARD

EVALUATION CATEGORY	STATUS				EVALUATION STATEMENT	TIER 2 REFERENCE	COMMENTARY REFERENCE	ASCE 41-17 TABLE	COMMENTS
	C	NC	NA	U					
Structural Components	x				LOAD PATH: The structure contains a complete, well-defined load path, including structural elements and connections, that serves to transfer the inertial forces associated with the mass of all elements of the building to the foundation.	5.4.1.1	A.2.1.1	17-1	Anchorage to walls from roof not clear.
			x		WALL ANCHORAGE: Exterior concrete or masonry walls that are dependent on the diaphragm for lateral support are anchored for out-of-plane forces at each diaphragm level with steel anchors, reinforcing dowels, or straps that are developed into the diaphragm. Connections have adequate strength to resist the connection force calculated in the Quick Check procedure of Section 4.4.3.7.	5.7.1.1	A.5.1.1	17-1	
Building System: General	x				LOAD PATH: The structure contains a complete, well-defined load path, including structural elements and connections, that serves to transfer the inertial forces associated with the mass of all elements of the building to the foundation.	5.4.1.1	A.2.1.1	17-2	
	x				ADJACENT BUILDINGS: The clear distance between the building being evaluated and any adjacent building is greater than 0.25% of the height of the shorter building in low seismicity, 0.5% in moderate seismicity, and 1.5% in high seismicity.	5.4.1.2	A.2.1.2	17-2	
			x		MEZZANINES: Interior mezzanine levels are braced independently from the main structure or are anchored to the seismic-force-resisting elements of the main structure.	5.4.1.3	A.2.1.3	17-2	
Building System: Building Configuration			x		WEAK STORY: The sum of the shear strengths of the seismic-force-resisting system in any story in each direction is not less than 80% of the strength in the adjacent story above.	5.4.2.1	A.2.2.2	17-2	
			x		SOFT STORY: The stiffness of the seismic-force-resisting system in any story is not less than 70% of the seismic-force-resisting system stiffness in an adjacent story above or less than 80% of the average seismic-force-resisting system stiffness of the three stories above.	5.4.2.2	A.2.2.3	17-2	
	x				VERTICAL IRREGULARITIES: All vertical elements in the seismic-force-resisting system are continuous to the foundation.	5.4.2.3	A.2.2.4	17-2	
			x		GEOMETRY: There are no changes in the net horizontal dimension of the seismic-force-resisting system of more than 30% in a story relative to adjacent stories, excluding one-story penthouses and mezzanines.	5.4.2.4	A.2.2.5	17-2	

Building System: Building Configuration			x		MASS: There is no change in effective mass more than 50% from one story to the next. Light roofs, penthouses, and mezzanines need not be considered.	5.4.2.5	A.2.2.6	17-2	
	x				TORSION: The estimated distance between the story center of mass and the story center of rigidity is less than 20% of the building width in either plan dimension.	5.4.2.6	A.2.2.7	17-2	
Geological Site Hazards	x				LIQUEFACTION: Liquefaction-susceptible, saturated, loose granular soils that could jeopardize the building's seismic performance do not exist in the foundation soils at depths within 50 ft (15.2 m) under the building.	5.4.3.1	A.6.1.1	17-2	
	x				SLOPE FAILURE: The building site is located away from potential earthquake-induced slope failures or rockfalls so that it is unaffected by such failures or is capable of accommodating any predicted movements without failure.	5.4.3.1	A.6.1.2	17-2	
	x				SURFACE FAULT RUPTURE: Surface fault rupture and surface displacement at the building site are not anticipated.	5.4.3.1	A.6.1.3	17-2	
Foundation Configuration	x				OVERTURNING: The ratio of the least horizontal dimension of the seismic-force-resisting system at the foundation level to the building height (base/height) is greater than $0.6S_a$.	5.4.3.3	A.6.2.1	17-2	
				x	TIES BETWEEN FOUNDATION ELEMENTS: The foundation has ties adequate to resist seismic forces where footings, piles, and piers are not restrained by beams, slabs, or soils classified as Site Class A, B, or C.	5.4.3.4	A.6.2.2	17-2	

Subject:	STRUCTURAL CHECKLIST	**Job Number:**	TBD	**Date:**	07/22/24
Job:	1966 Addt'l Classroom Building	**By:**	TBD	**Section:**	
		Checked By:		**Page:**	

STRUCTURAL CHECKLIST

ASCE 41-17 SEISMIC EVALUATION AND RETROFIT OF EXISTING BUILDINGS
IMMEDIATE OCCUPANCY PERFORMANCE LEVEL
BSE-2E SEISMIC HAZARD
WOOD FRAMES, COMMERCIAL & INDUSTRIAL (W2)

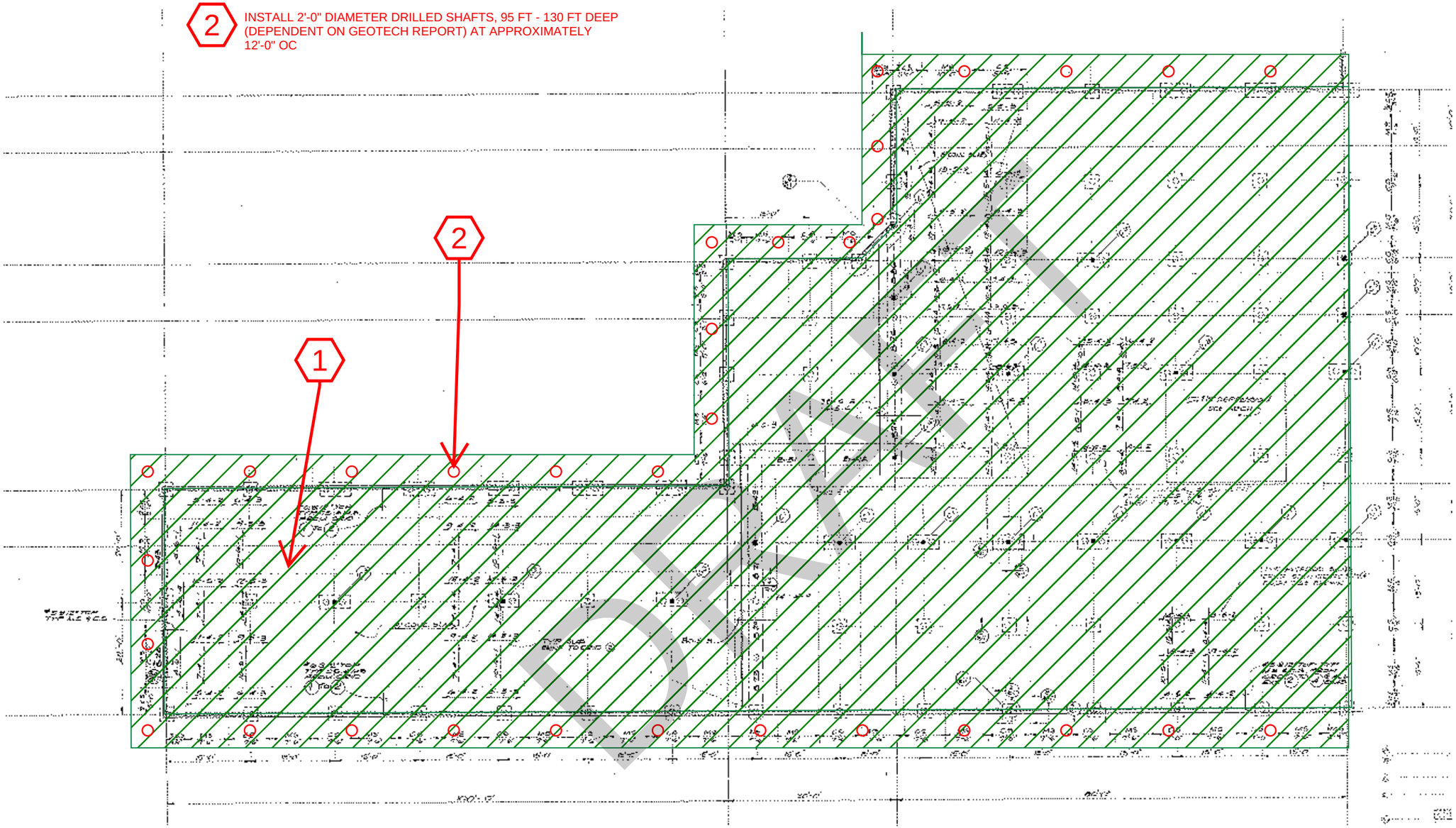
EVALUATION CATEGORY	STATUS				EVALUATION STATEMENT	TIER 2 REFERENCE	COMMENTARY REFERENCE	ASCE 41-17 TABLE	COMMENTS
	C	NC	NA	U					
Seismic Force Resisting System	x				REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2.	5.5.1.1	A.3.2.1.1	17-6	
	x				SHEAR STRESS CHECK: The shear stress in the shear walls, calculated using the Quick Check procedure of Section 4.4.3.3, is less than the following values: Structural Panel Sheathing……1000 lb/ft Diagonal Sheathing……700 lb/ft Straight Sheathing……..100 lb/ft All Other Conditions.....100 lb/ft	5.5.3.1.1	A.3.2.7.1	17-6	
			x		STUCCO (EXTERIOR PLASTER) SHEAR WALLS: Multi-story buildings do not rely on exterior stucco walls as the primary seismic-force-resisting system.	5.5.3.6.1	A.3.2.7.2	17-6	
			x		GYPSUM WALLBOARD OR PLASTER SHEAR WALLS: Interior plaster or gypsum wallboard is not used for shear walls on buildings more than one story high with the exception of the uppermost level of a multi-story building.	5.5.3.6.1	A.3.2.7.3	17-6	
	x				NARROW WOOD SHEAR WALLS: Narrow wood shear walls with an aspect ratio greater than 2-to-1 are not used to resist seismic forces.	5.5.3.6.1	A.3.2.7.4	17-6	
			x		WALLS CONNECTED THROUGH FLOORS: Shear walls have an interconnection between stories to transfer overturning and shear forces through the floor.	5.5.3.6.2	A.3.2.7.5	17-6	Single story structure.
			x		HILLSIDE SITE: For structures that are taller on at least one side by more than one-half story because of a sloping site, all shear walls on the downhill slope have an aspect ratio less than 1-to-1.	5.5.3.6.3	A.3.2.7.6	17-6	
			x		CRIPPLE WALLS: Cripple walls below first-floor-level shear walls are braced to the foundation with wood structural panels.	5.5.3.6.4	A.3.2.7.7	17-6	
	x				OPENINGS: Walls with openings greater than 80% of the length are braced with wood structural panel shear walls with aspect ratios of not more than 1.5-to-1 or are supported by adjacent construction through positive ties capable of transferring the seismic forces.	5.5.3.6.5	A.3.2.7.8	17-6	

Connections	x				WOOD POSTS: There is a positive connection of wood posts to the foundation.	5.7.3.3	A.5.3.3	17-6	
	x				WOOD SILLS: All wood sills are bolted to the foundation.	5.7.3.3	A.5.3.4	17-6	
	x				GIRDER–COLUMN CONNECTION: There is a positive connection using plates, connection hardware, or straps between the girder and the column support.	5.7.4.1	A.5.4.1	17-6	
	x				WOOD SILL BOLTS: Sill bolts are spaced at 6 ft or less with acceptable edge and end distance provided for wood and concrete.	5.7.3.3	A.5.3.7	17-6	bolts @ 32" cc per 1966 dwgs
Diaphragms	x				DIAPHRAGM CONTINUITY: The diaphragms are not composed of split-level floors and do not have expansion joints.	5.6.1.1	A.4.1.1	17-6	
	x				ROOF CHORD CONTINUITY: All chord elements are continuous, regardless of changes in roof elevation.	5.6.1.1	A.4.1.3	17-6	
			x		DIAPHRAGM REINFORCEMENT AT OPENINGS: There is reinforcing around all diaphragm openings larger than 50% of the building width in either major plan dimension.	5.6.1.5	A.4.1.8	17-6	
			x		STRAIGHT SHEATHING: All straight-sheathed diaphragms have aspect ratios less than 2-to-1 in the direction being considered.	5.6.2	A.4.2.1	17-6	
	x				SPANS: All wood diaphragms with spans greater than 24 ft consist of wood structural panels or diagonal sheathing.	5.6.2	A.4.2.2	17-6	
		x			DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 40 ft and have aspect ratios less than or equal to 4-to-1.	5.6.2	A.4.2.3	17-6	Diaphragms are unblocked.
	x				OTHER DIAPHRAGMS: The diaphragms do not consist of a system other than wood, metal deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1	17-6	

Seismic Study Preliminary Drawings

1 DEMO EXISTING CONCRETE SLAB. INSTALL NEW 2'-0" THICK MAT FOUNDATION. DOWEL THROUGH EXISTING GRADE BEAMS WITH 3" DIAMETER HOLES. EXTEND MAT SLAB 5'-0" OR MORE BEYOND EXTERIOR WALL FOR PILE INSTALLATION

2 INSTALL 2'-0" DIAMETER DRILLED SHAFTS, 95 FT - 130 FT DEEP (DEPENDENT ON GEOTECH REPORT) AT APPROXIMATELY 12'-0" OC



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Sheet Title: UNIT A FOUNDATION PLAN

Job Number: C3860012.00	SSK-1
Date: 06/05/2024	
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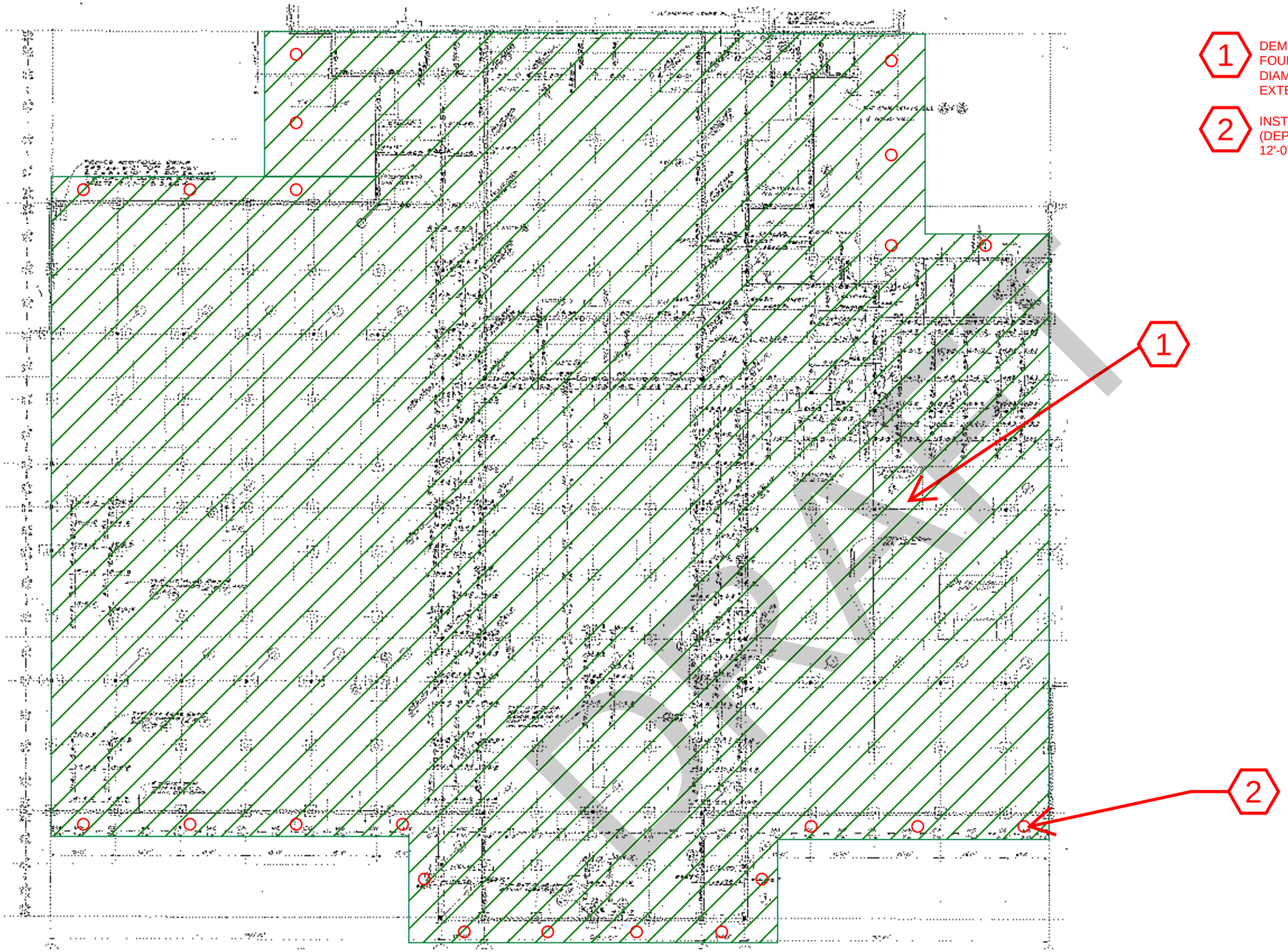

1. DEMO EXISTING CONCRETE SLAB. INSTALL NEW 2'-0" THICK MAT FOUNDATION. DOWEL THROUGH EXISTING GRADE BEAMS WITH 3" DIAMETER HOLES. EXTEND MAT SLAB 5'-0" OR MORE BEYOND EXTERIOR WALL FOR PILE INSTALLATION

2. INSTALL 2'-0" DIAMETER DRILLED SHAFTS, 95 FT - 130 FT DEEP (DEPENDENT ON GEOTECH REPORT) AT APPROXIMATELY 12'-0" OC

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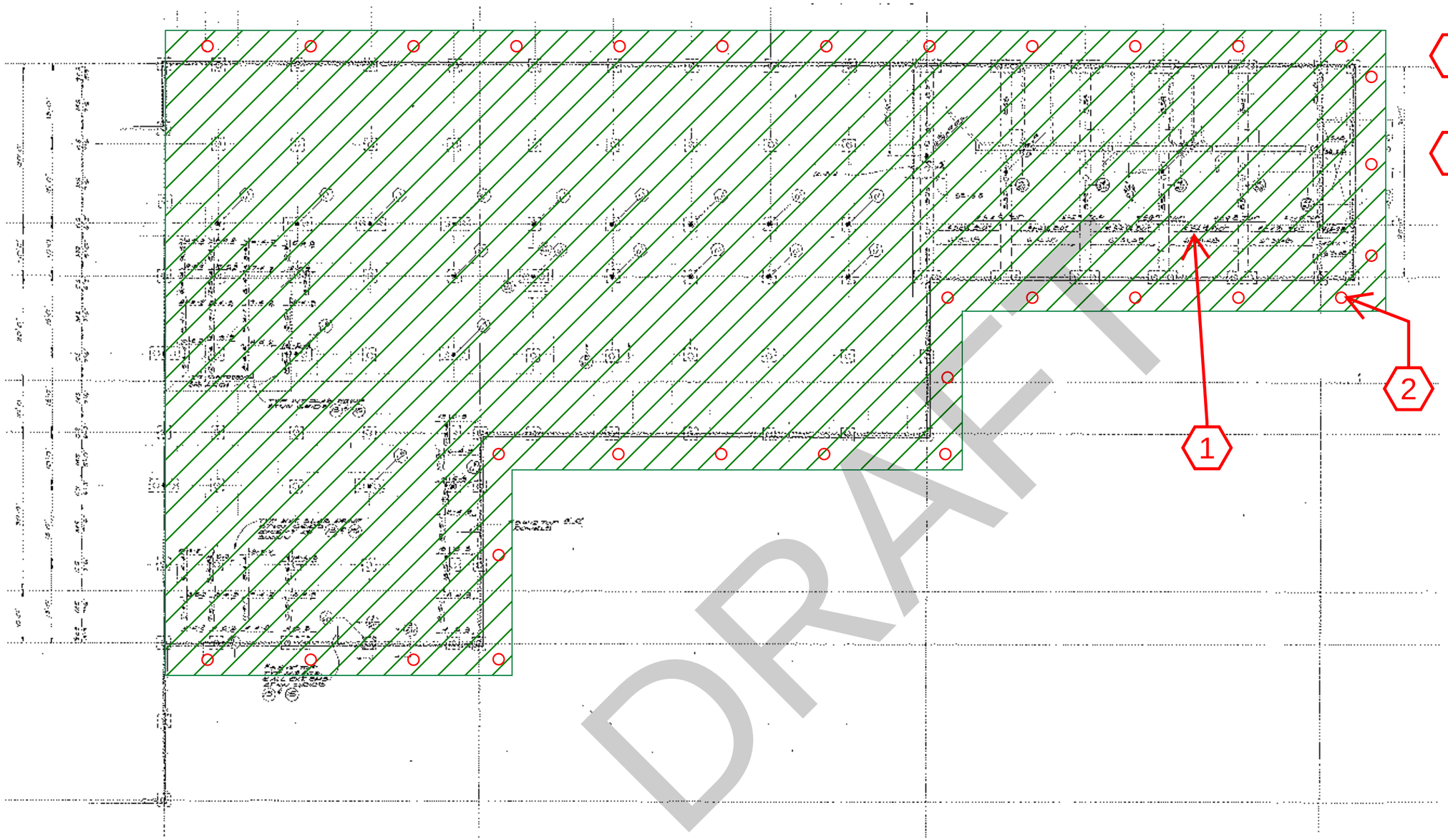

1 DEMO EXISTING CONCRETE SLAB. INSTALL NEW 2'-0" THICK MAT FOUNDATION. DOWEL THROUGH EXISTING GRADE BEAMS WITH 3" DIAMETER HOLES. EXTEND MAT SLAB 5'-0" OR MORE BEYOND EXTERIOR WALL FOR PILE INSTALLATION

2 INSTALL 2'-0" DIAMETER DRILLED SHAFTS, 95 FT - 130 FT DEEP (DEPENDENT ON GEOTECH REPORT) AT APPROXIMATELY 12'-0" OC

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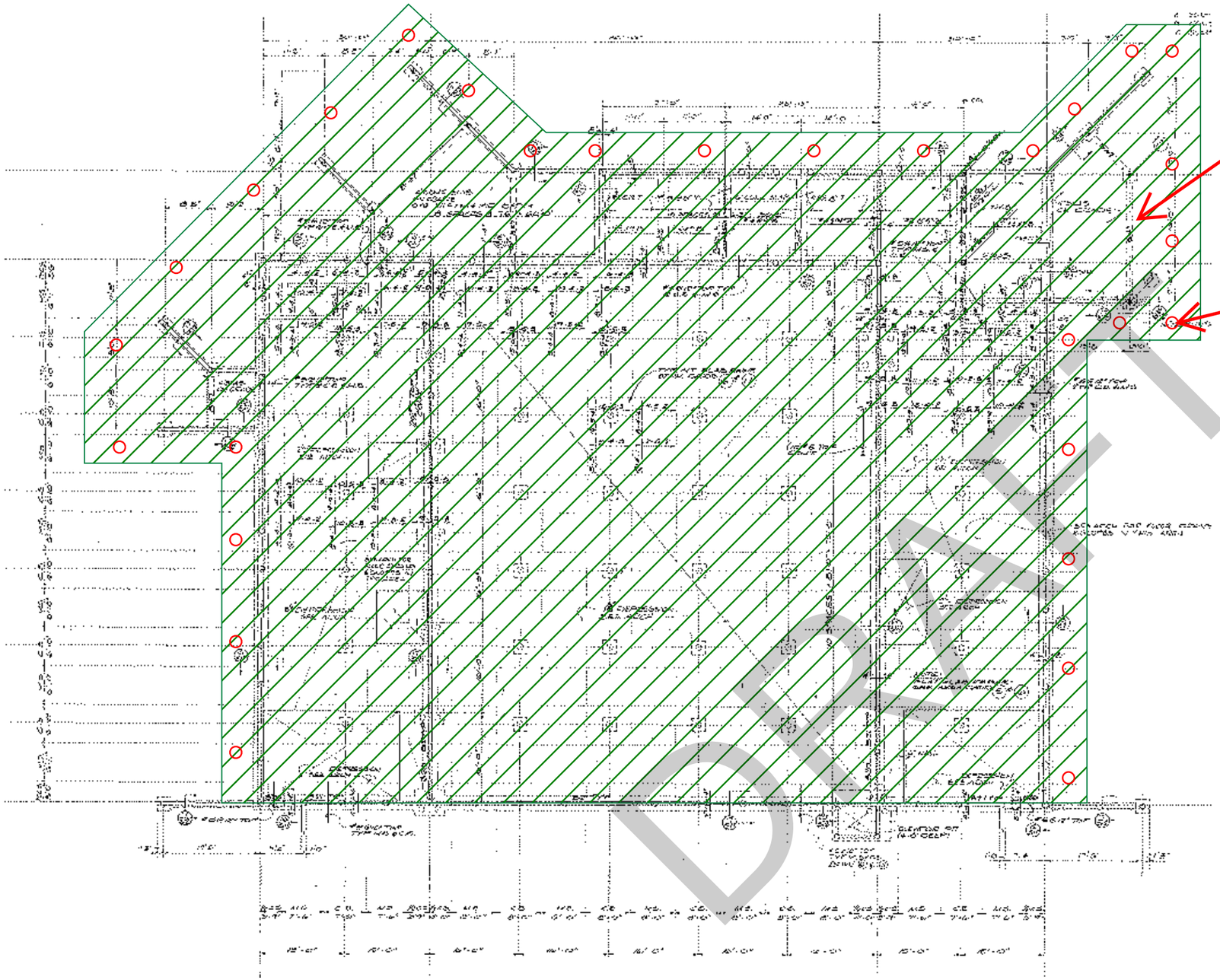

1 DEMO EXISTING CONCRETE SLAB. INSTALL NEW 2'-0" THICK MAT FOUNDATION. DOWEL THROUGH EXISTING GRADE BEAMS WITH 3" DIAMETER HOLES. EXTEND MAT SLAB 5'-0" OR MORE BEYOND EXTERIOR WALL FOR PILE INSTALLATION

2 INSTALL 2'-0" DIAMETER DRILLED SHAFTS, 95 FT - 130 FT DEEP (DEPENDENT ON GEOTECH REPORT) AT APPROXIMATELY 12'-0" OC

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Sheet Title: UNIT D FOUNDATION PLAN

Job Number: C3860012.00	SSK-4
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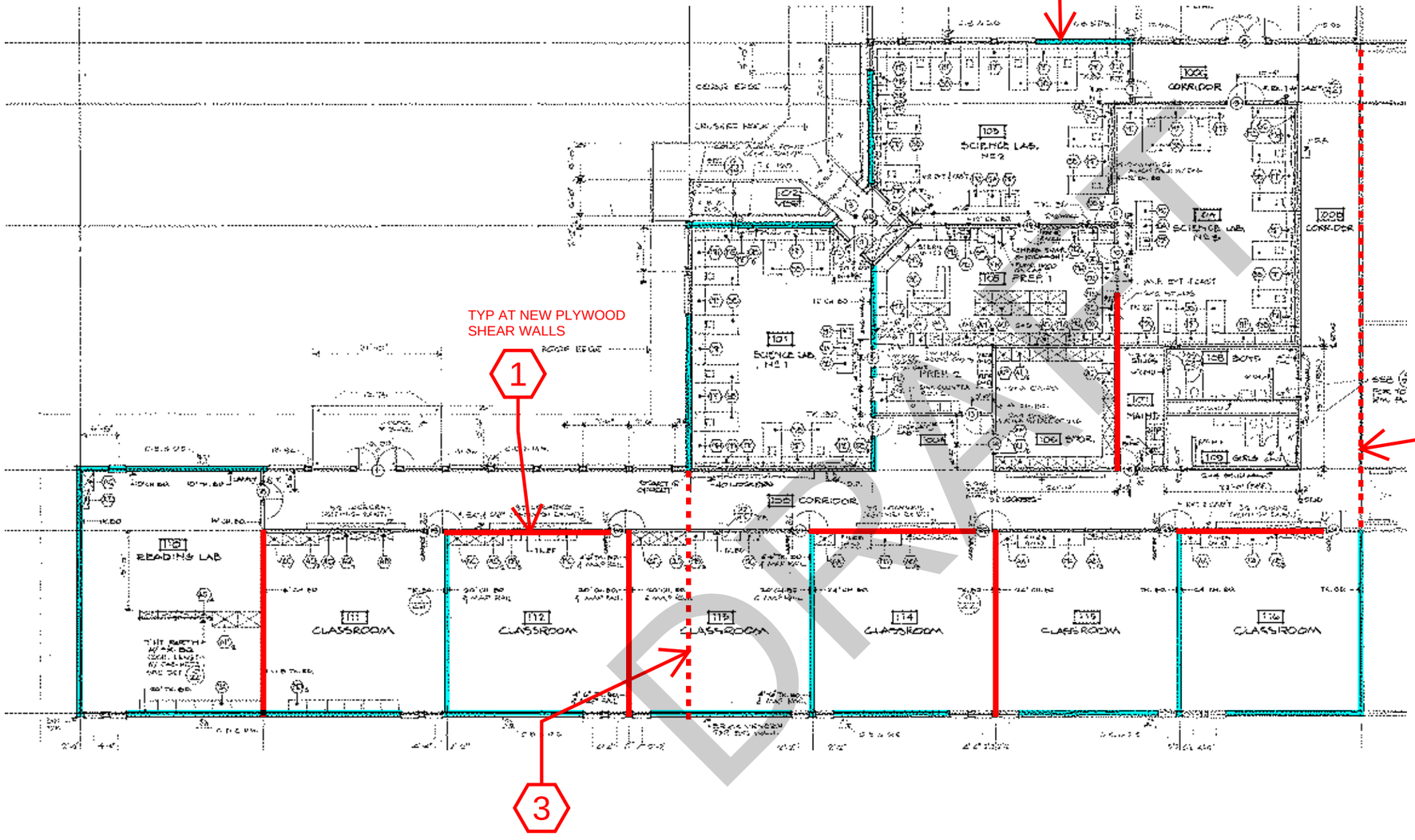

EXISTING PLYWOOD SHEAR WALL

NEW PLYWOOD SHEAR WALL

EXISTING CMU SHEAR WALL

EXISTING CONCRETE SHEAR WALL

EXISTING DIAPHRAGM ELEVATION CHANGE

1. APPLY 1/2" PLYWOOD SHEATHING ON EXISTING WOOD STUD WALL. EXTEND SHEATHING AND FRAMING TO UNDERSIDE OF EXISTING ROOF. ATTACH TOP PLATE TO ROOF. PROVIDE SILL BOLTS. PROVIDE HOLDOWN AT EACH END OF WALL.

2. IMPROVE CONNECTION OF EXISTING SHEAR WALL TOP PLATE TO ROOF IN ATTIC SPACE. PROVIDE HOLDOWN AT EACH END OF WALL.

3. IMPROVE CONNECTION BETWEEN ROOF DIAPHRAGM AT ELEVATION CHANGES WITH NAILS AND CLIPS

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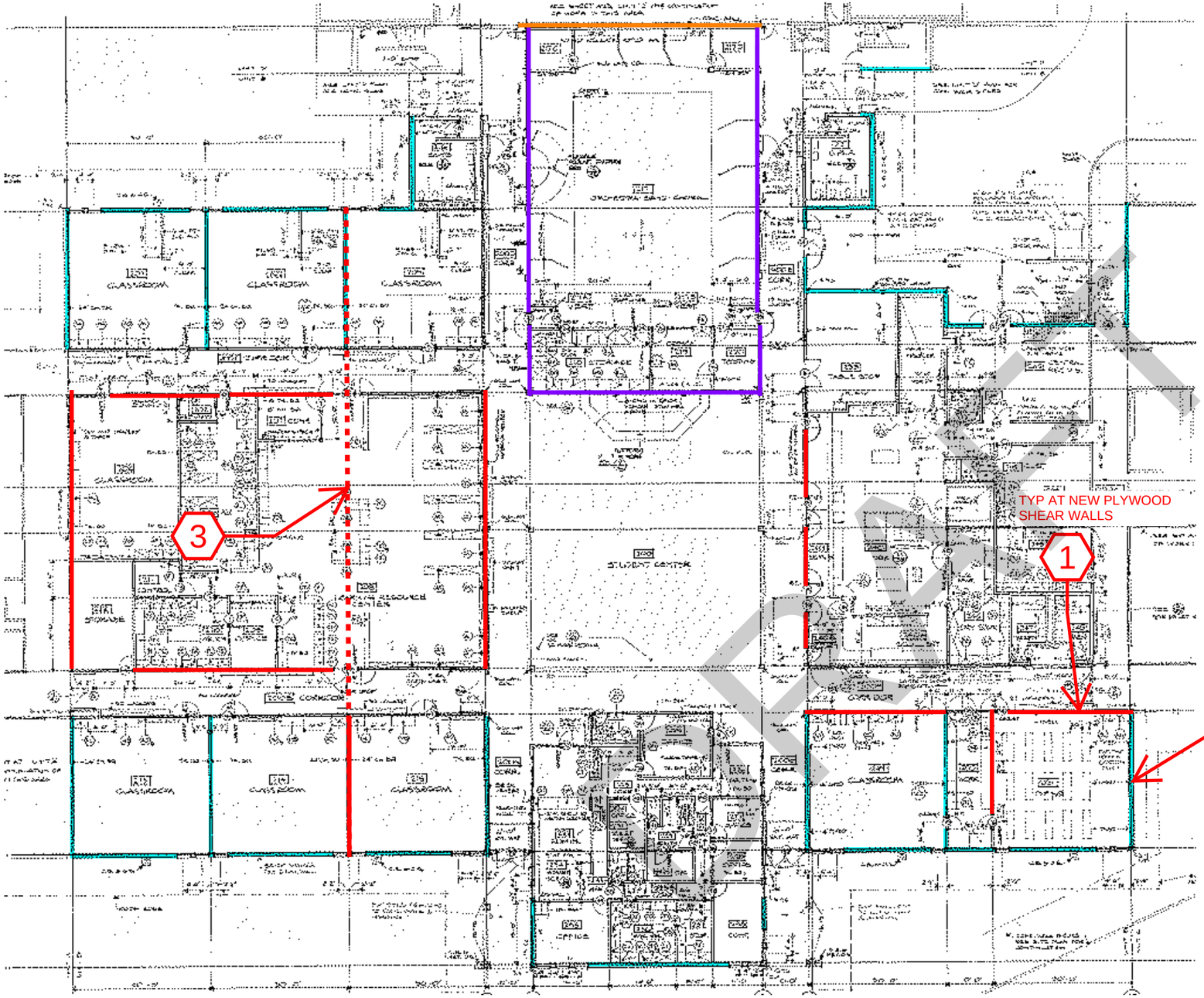

EXISTING PLYWOOD SHEAR WALL

NEW PLYWOOD SHEAR WALL

EXISTING CMU SHEAR WALL

EXISTING CONCRETE SHEAR WALL

EXISTING DIAPHRAGM ELEVATION CHANGE

1. APPLY 1/2" PLYWOOD SHEATHING ON EXISTING WOOD STUD WALL. EXTEND SHEATHING AND FRAMING TO UNDERSIDE OF EXISTING ROOF. ATTACH TOP PLATE TO ROOF. PROVIDE SILL BOLTS. PROVIDE HOLDOWN AT EACH END OF WALL.

2. IMPROVE CONNECTION OF EXISTING SHEAR WALL TOP PLATE TO ROOF IN ATTIC SPACE. PROVIDE HOLDOWN AT EACH END OF WALL.

3. IMPROVE CONNECTION BETWEEN ROOF DIAPHRAGM AT ELEVATION CHANGES WITH NAILS AND CLIPS

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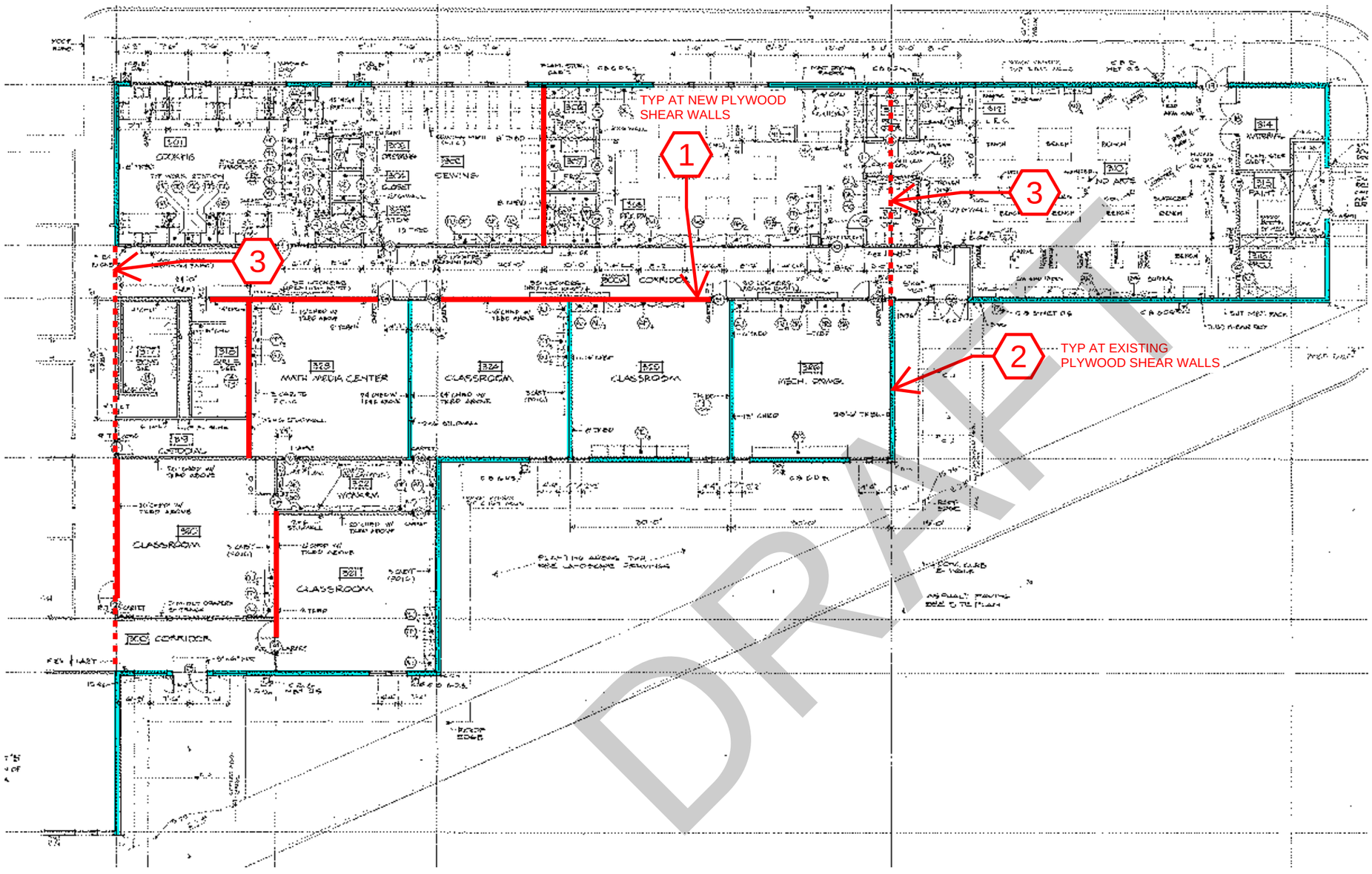

EXISTING PLYWOOD SHEAR WALL

NEW PLYWOOD SHEAR WALL

EXISTING CMU SHEAR WALL

EXISTING CONCRETE SHEAR WALL

EXISTING DIAPHRAGM ELEVATION CHANGE

1 APPLY 1/2" PLYWOOD SHEATHING ON EXISTING WOOD STUD WALL. EXTEND SHEATHING AND FRAMING TO UNDERSIDE OF EXISTING ROOF. ATTACH TOP PLATE TO ROOF. PROVIDE SILL BOLTS. PROVIDE HOLDOWN AT EACH END OF WALL.

2 IMPROVE CONNECTION OF EXISTING SHEAR WALL TOP PLATE TO ROOF IN ATTIC SPACE. PROVIDE HOLDOWN AT EACH END OF WALL.

3 IMPROVE CONNECTION BETWEEN ROOF DIAPHRAGM AT ELEVATION CHANGES WITH NAILS AND CLIPS

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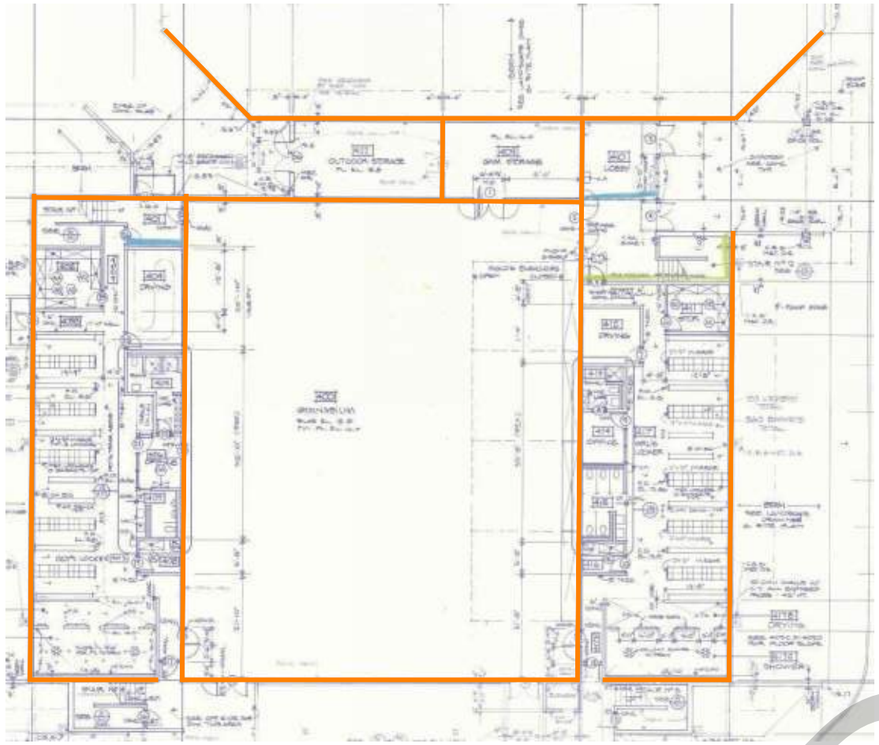
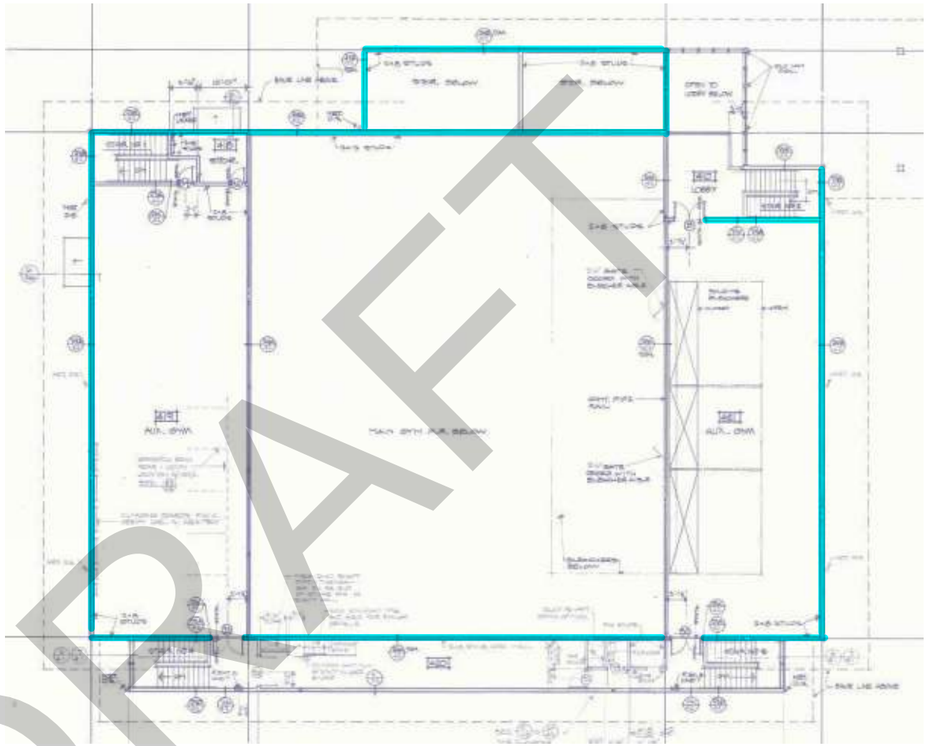
EXISTING PLYWOOD SHEAR WALL
NEW PLYWOOD SHEAR WALL
EXISTING CMU SHEAR WALL
EXISTING CONCRETE SHEAR WALL
EXISTING DIAPHRAGM ELEVATION CHANGE





NO WORK NEEDED
THIS SPACE

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Sheet Title: UNIT D UPPER & LOWER FLOOR PLAN

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Date: 06/05/2024	
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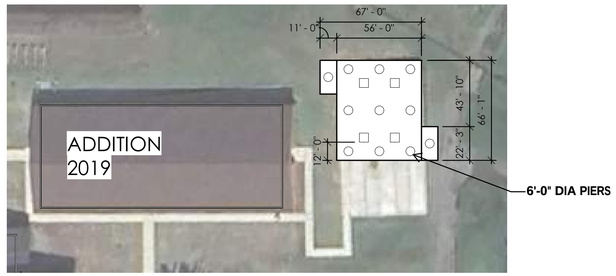

TSUNAMI TOWER

NOTE: ADDITIONAL VERTICAL EVACUATION TOWER COST INFORMATION DRAWINGS AND DESIGN CRITERIA COMING IN A SEPARATE PACKAGE

DRAFT

LEGEND

- ASPHALT
- CONCRETE
- SOFTSCAPE

NOTE: ANTICIPATED DISTURBANCE ALONG PERIMETER OF BUILDING = 10' - 0"

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www.tcfarchitecture.com

Aberdeen School District

Project Title
SEISMIC STUDY

ABERDEEN SCHOOL DISTRICT
ABERDEEN, WA 98520

Project Numbers
2024-002

Issue & Revision Dates
20 JUNE 2024 PD COST ESTIMATE

PROGRAMMING DESIGN
NOT FOR CONSTRUCTION

Sheet Title
MILLER - SITE PLAN

Drawn By MM
Checked By SW

Sheet Number
A4.00

Sheet Number Of

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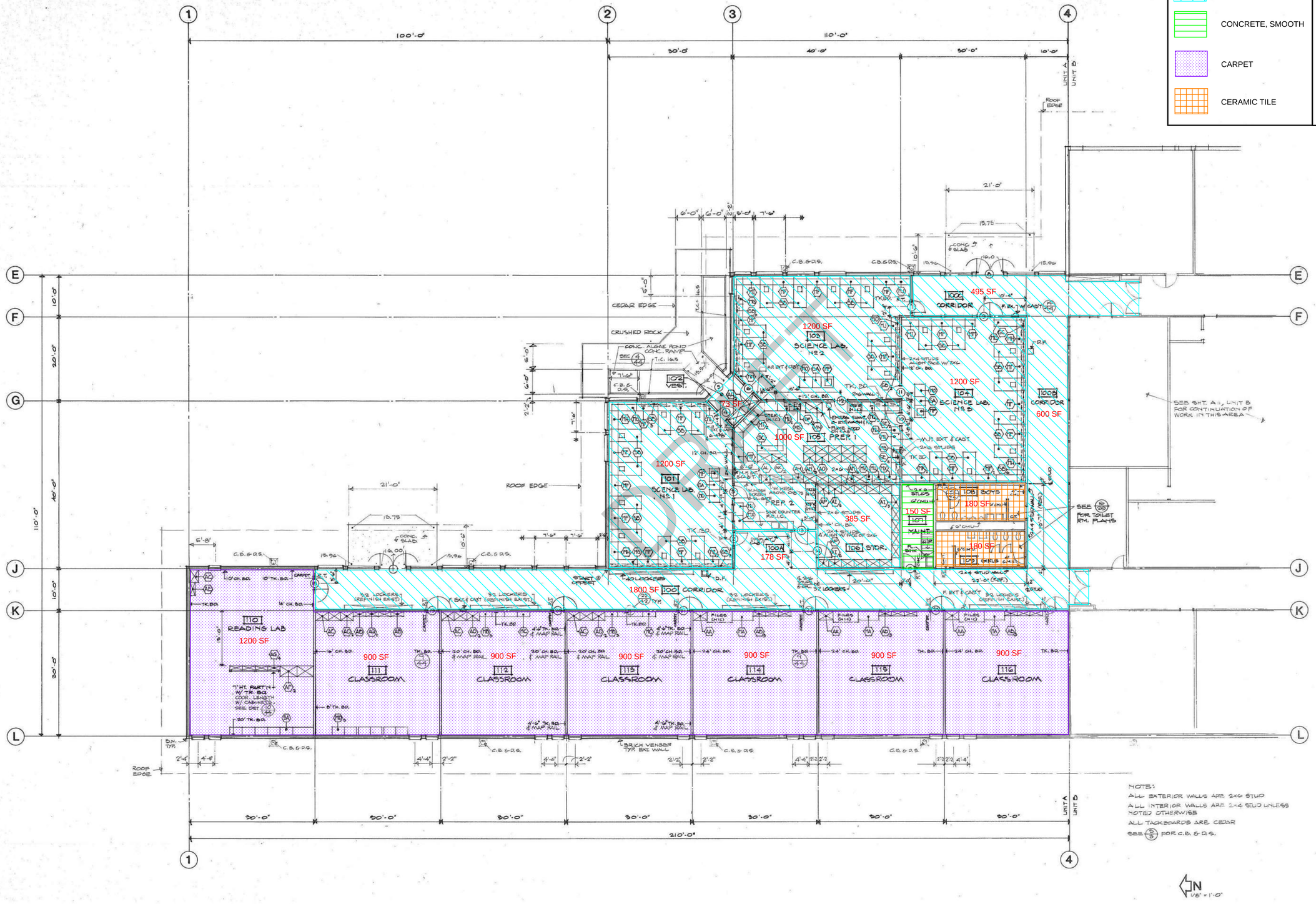
6/20/2024 8:20:24 AM C:\Revit2023\ASD Study - Miller_mishs@tcfarchitecture.com.rvt

LEGEND	TOTAL (SF)
RESILIENT TILE	8,131 SF
CONCRETE, SMOOTH	150 SF
CARPET	6,600 SF
CERAMIC TILE	360 SF



NOTE:
ALL EXTERIOR WALLS ARE 2x6 STUD
ALL INTERIOR WALLS ARE 2x4 STUD UNLESS NOTED OTHERWISE
ALL TACKBOARDS ARE CEDAR
SEE 5/S5 FOR C.B. & D.G.

N
1/8" = 1'-0"

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Tacoma, Washington, 98403
www.tcfarchitecture.com

Aberdeen School District

Project Title
SEISMIC STUDY

ABERDEEN SCHOOL DISTRICT
ABERDEEN, WA 98520

Project Numbers
2024-002

Issue & Revision Dates
20 JUNE 2024 PD COST ESTIMATE

PROGRAMMING DESIGN
NOT FOR CONSTRUCTION

Sheet Title
MILLER - FLOOR PLAN - FLOORS

Drawn By MM
Checked By SW

Sheet Number
A4.01a

Sheet Number Of

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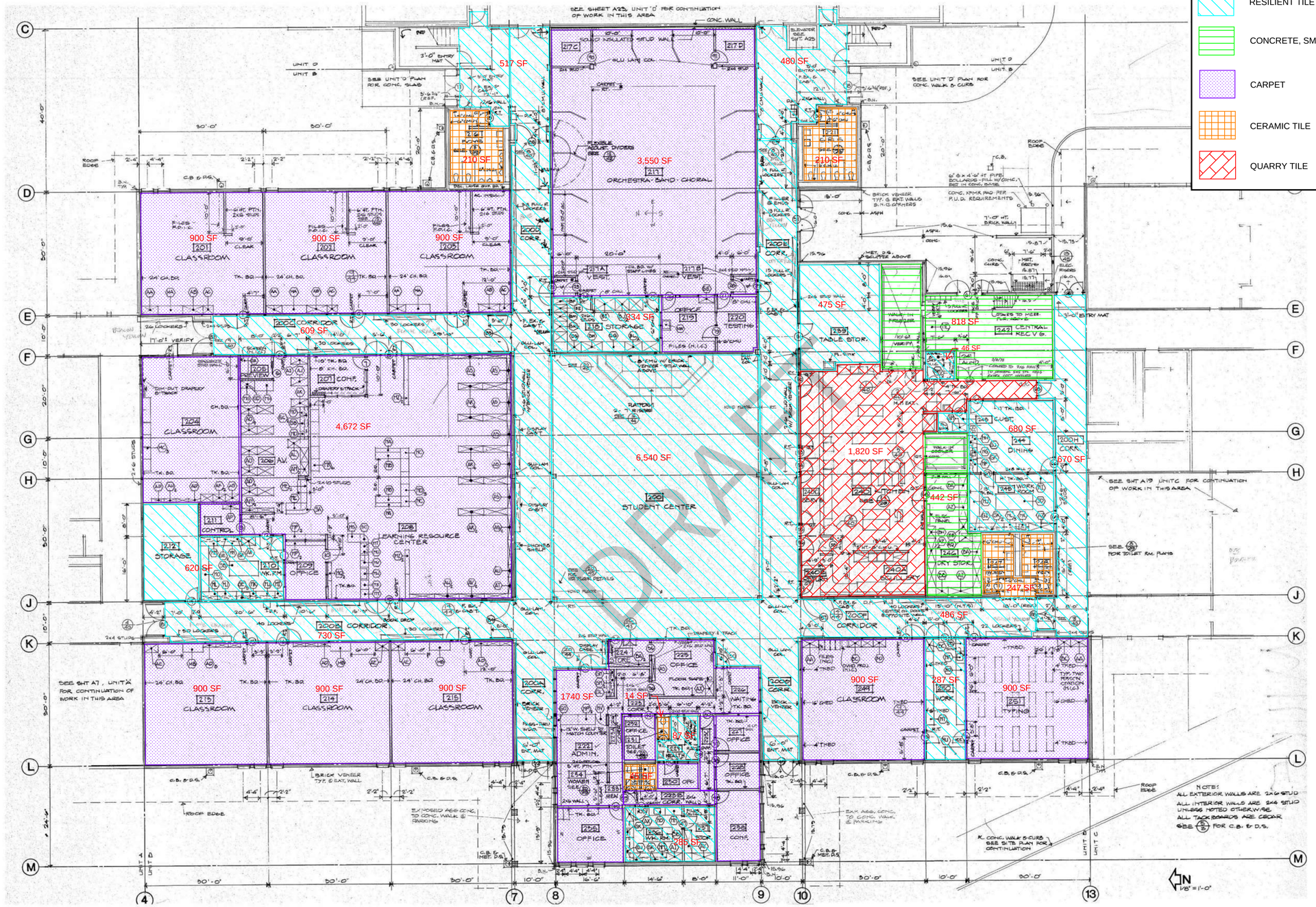

LEGEND	TOTAL (SF)
RESILIENT TILE	12,846 SF
CONCRETE, SMOOTH	1260 SF
CARPET	17,162 SF
CERAMIC TILE	726 SF
QUARRY TILE	1820 SF

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MILLER - FLOOR PLAN - FLOORS

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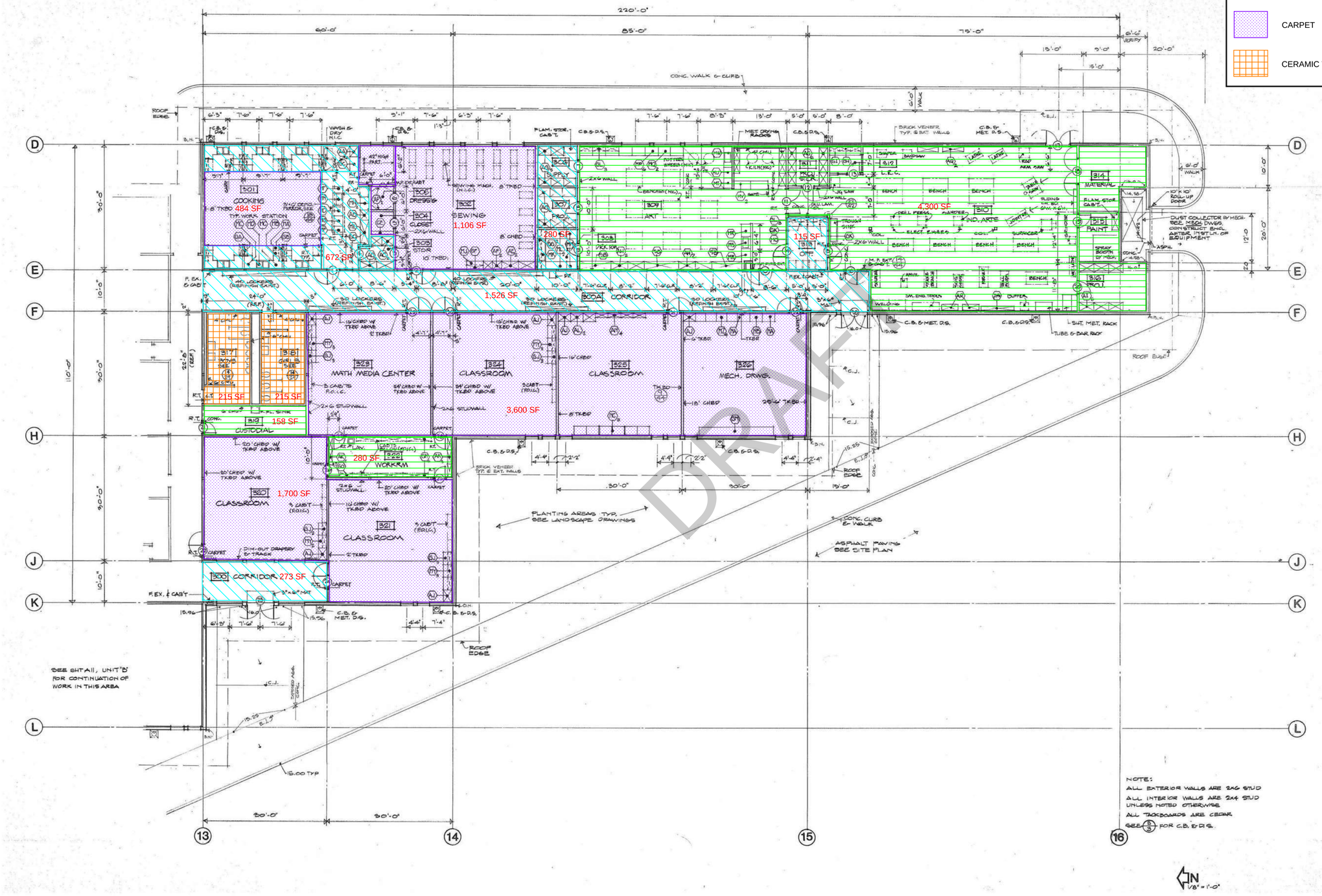
LEGEND	TOTAL (SF)
RESILIENT TILE	2,866 SF
CONCRETE, SMOOTH	4,738 SF
CARPET	6,890 SF
CERAMIC TILE	430 SF



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Sheet Title
MILLER - FLOOR PLAN - FLOORS

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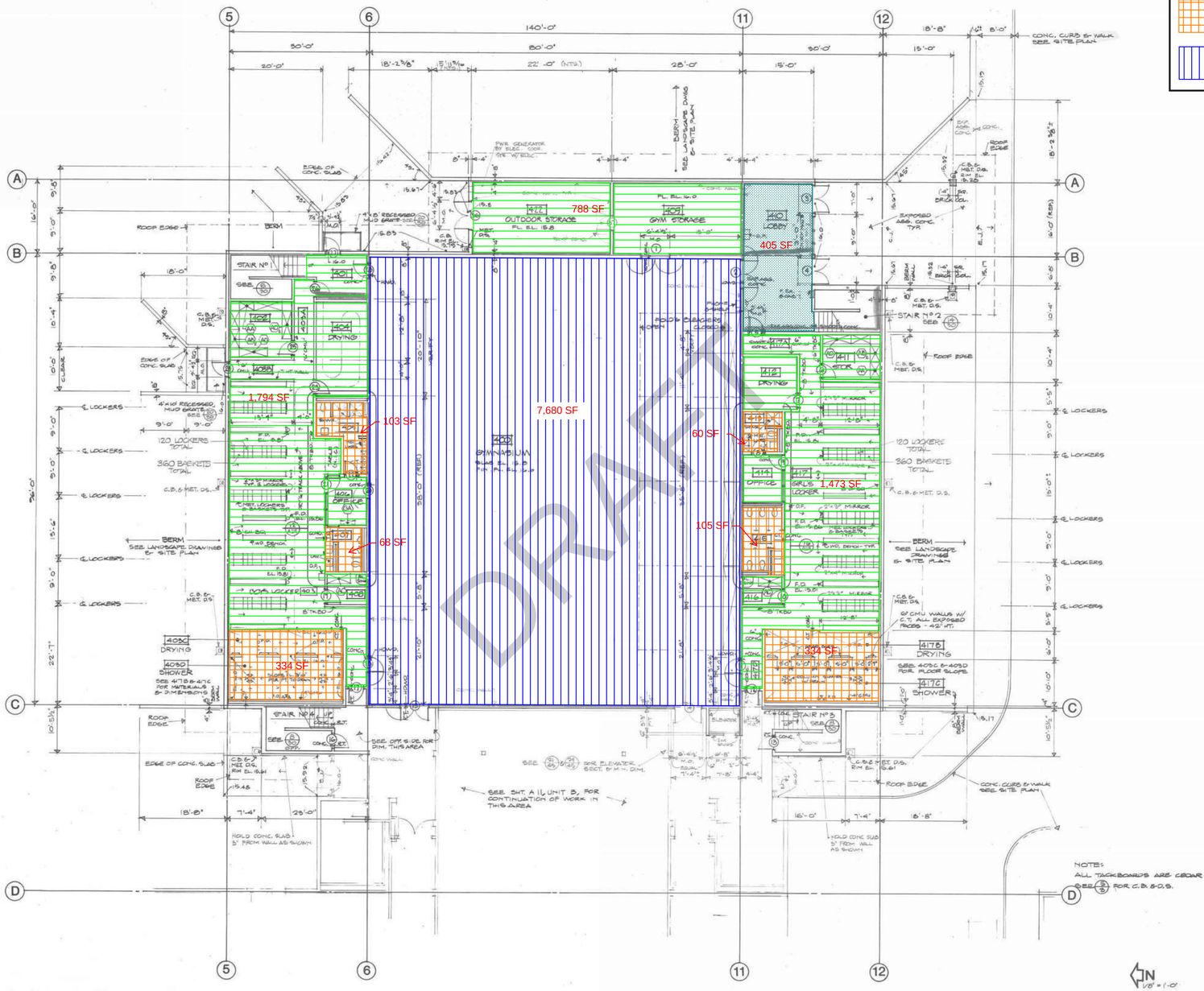
LEGEND		TOTAL (SF)
	CONCRETE, SMOOTH	4,055 SF
	CONCRETE, EXPOSED AGGREGATE	405 SF
	CERAMIC TILE	1,004 SF
	ATHLETIC WOOD FLOOR	7,680 SF



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Where structural drawings indicate hex note 3 work will need to occur within the attic space.

Assume that 4-6' of existing ceiling adjacent to these walls will need to be removed and replaced in order to accommdate access and installation of structural work. Insulation is located atop 2x4 ceilings and will likewise need to be replaced with code compliant R-47 batt insulation where impacted by construction.

At existing shear walls (hex note 2) to receive connection improvements to roof diaphagm, assume that 4-6' of existing ceiling adjacent to shear walls will need to be removed and replaced in order to accommdate installation of structural upgrades. Note that insulation is located atop 2x4 ceilings and will likewise need to be replaced with code compliant R-47 batt insulation where impacted by construction.

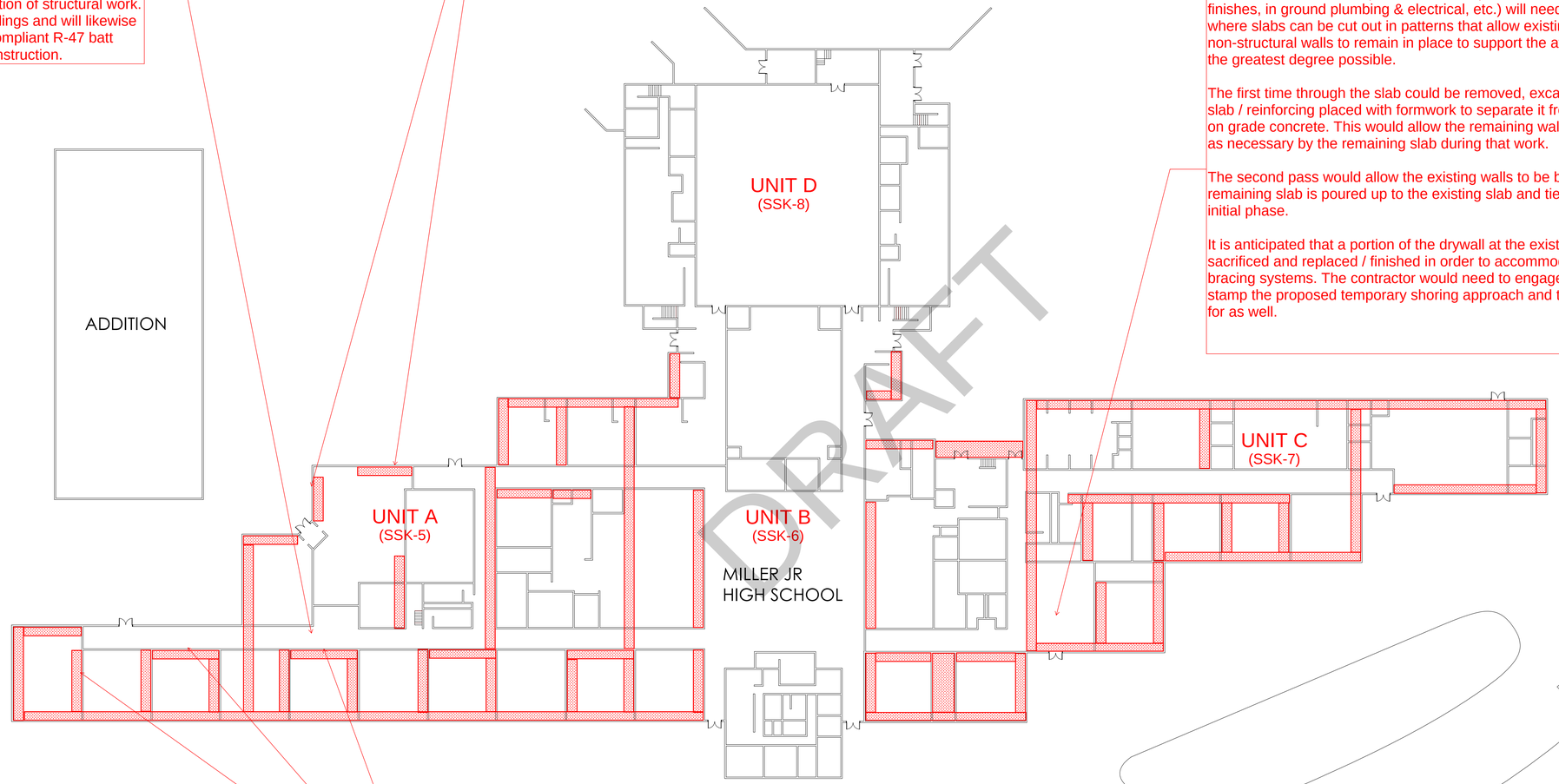
Note: At all locations of ceiling work, assume that lighting will need to be disconnected, removed and re-installed to accommodate work.

To accommodate slab replacement, anticipate that slab demolition (including floor finishes, in ground plumbing & electrical, etc.) will need to occur in 2 or 3 phases where slabs can be cut out in patterns that allow existing structural and non-structural walls to remain in place to support the attic and roof structure above o the greatest degree possible.

The first time through the slab could be removed, excavation completed and new slab / reinforcing placed with formwork to separate it from the remaining existing slab on grade concrete. This would allow the remaining walls to be supported and braced as necessary by the remaining slab during that work.

The second pass would allow the existing walls to be braced by the new slab as the remaining slab is poured up to the existing slab and tied into the reinforcing from the initial phase.

It is anticipated that a portion of the drywall at the existing walls would need to be sacrificed and replaced / finished in order to accommodate temporary support and bracing systems. The contractor would need to engage a structural engineer to stamp the proposed temporary shoring approach and that cost should be accounted for as well.



At all new plywood shear wall locations (hex note 1) identified on structural drawings, assume that existing drywall will need to be removed entirely on one side of wall to accommodate plywood installation, hold downs, additional blocking, etc. Casework would need to be removed / reinstalled and all countertops replaced. See structural drawings for locations of existing casework impacting shear walls. Additionally all wall mounted items would need to be removed, stored, re-installed and all mechanical, plumbing and electrical rough-in modified to accommodate additional wall thickness.

Note: At corridor shear walls, assume that work will occur at classroom side or stud wall, at demising walls between classrooms assume that plywood will occur at side opposite casework to greatest degree possible.

At all locations, assume that 4-6' of existing ceiling adjaent to shear walls will need to be removed and replaced in order to accommdate installation of plywood up to roof deck / attic. Insulation is located atop 2x4 ceilings and will likewise need to be replaced with code compliant R-47 batt insulation where impacted by construction.

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PROGRAMMING DESIGN
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Sheet Title
MILLER - FLOOR PLAN - WALLS

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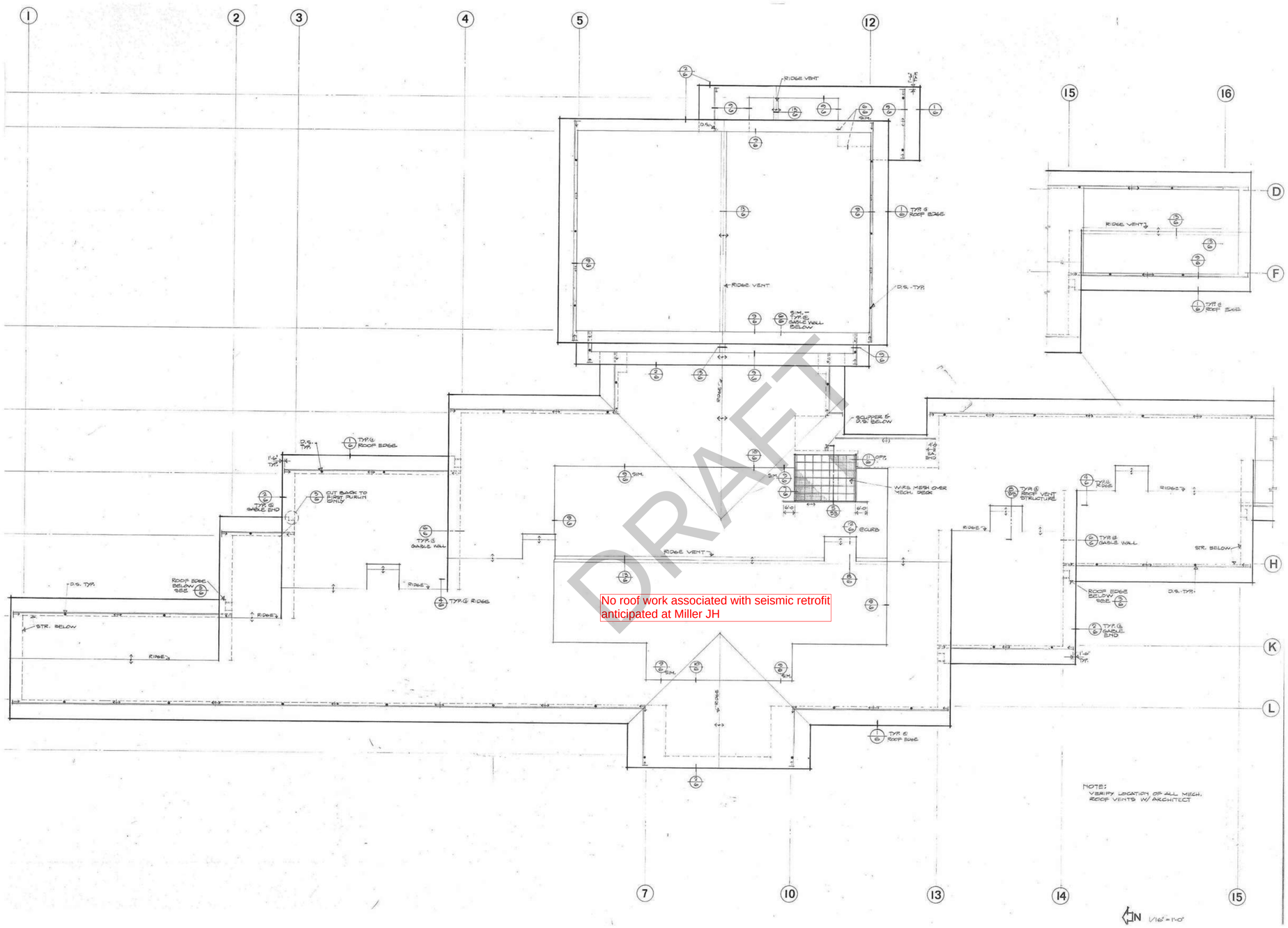

No roof work associated with seismic retrofit anticipated at Miller JH

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MILLER - ROOF PLAN

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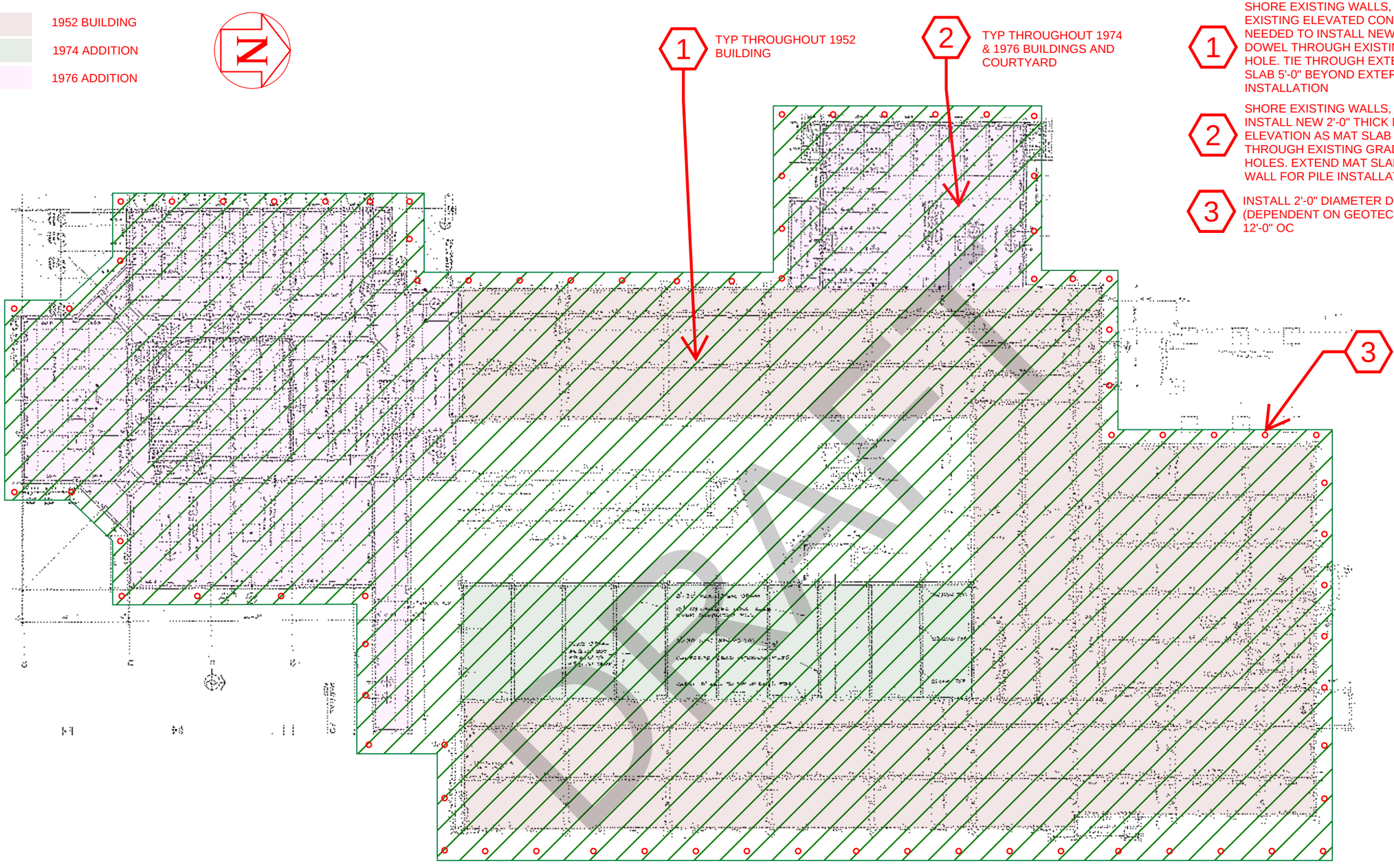
1952 BUILDING

1974 ADDITION

1976 ADDITION



1 SHORE EXISTING WALLS, DEMO ACCESS HOLES THROUGH EXISTING ELEVATED CONCRETE SLAB. EXCAVATE AS NEEDED TO INSTALL NEW 2'-0" THICK MAT FOUNDATION. DOWEL THROUGH EXISTING CMU WALLS WITH 3" DIAMETER HOLE. TIE THROUGH EXTERIOR WALLS AND EXTEND MAT SLAB 5'-0" BEYOND EXTERIOR WALLS OR MORE FOR PILE INSTALLATION

2 SHORE EXISTING WALLS, DEMO EXISTING SLAB ON GRADE. INSTALL NEW 2'-0" THICK MAT FOUNDATION AT SAME ELEVATION AS MAT SLAB FROM KEYNOTE 1. DOWEL THROUGH EXISTING GRADE BEAMS WITH 3" DIAMETER HOLES. EXTEND MAT SLAB 5'-0" OR MORE BEYOND EXTERIOR WALL FOR PILE INSTALLATION

3 INSTALL 2'-0" DIAMETER DRILLED SHAFTS, 95 FT - 130 FT DEEP (DEPENDENT ON GEOTECH REPORT) AT APPROXIMATELY 12'-0" OC

Degenkolb

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Sheet Title: FOUNDATION PLAN

Job Number: C3860012.00	SSK-1
Date: 06/05/2024	
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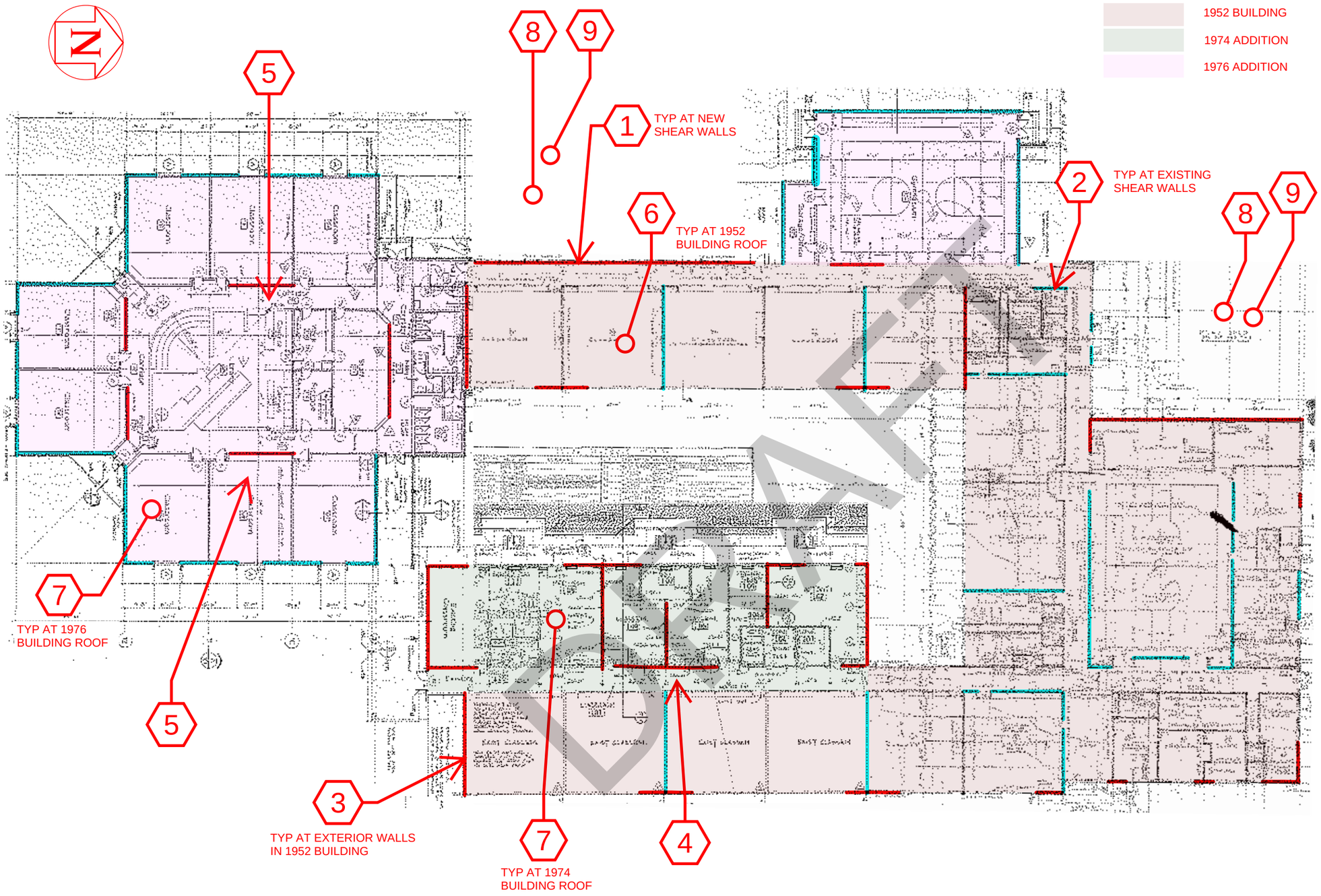
	Scale: NTS



1. SHEATHE EXISTING WOOD STUD WALL WITH 1/2" PLYWOOD SHEATHING. EXTEND SHEATHING AND FRAMING TO UNDERSIDE OF EXISTING ROOF. ATTACH TOP PLATE TO ROOF. INSTALL SILL BOLTS AS REQUIRED. PROVIDE HOLDOWN AT EACH END OF WALL.
2. AT 1952 CONSTRUCTION, EXTEND PLYWOOD SHEATHING AND FRAMING TO UNDERSIDE OF EXISTING ROOF. ATTACH TOP PLATE TO ROOF. PROVIDE HOLDOWN AT EACH END OF WALL EXTENDING DOWN TO NEW MAT SLAB. INSTALL SILL BOLTS AS REQUIRED.
3. INSTALL BLOCKING AT ROOF TO WALL CONNECTION. NAIL BLOCKING TO WALL TOP PLATE. NAIL ROOF TO BLOCKING.
4. INSTALL CLIPS TO ATTACH ROOF SHEATHING FROM 1974 ADDITION TO ORIGINAL ROOF SHEATHING.
5. INSTALL TRANSVERSE BRACING FOR MECHANICAL MEZZANINES IN ATTIC.
6. INSTALL 1/2" PLYWOOD OVER EXISTING TONGUE AND GROOVE DIAPHRAGM.
7. INSTALL BLOCKING BELOW EXISTING PLYWOOD DIAPHRAGM.
8. WHERE PLAYSHED ROOF FRAMES INTO MAIN BUILDING, INSTALL COLUMNS TO RESUPPORT GRAVITY LOADS. PROVIDE GAP TO ACCOMMODATE INDEPENDENT MOVEMENT OF BOTH STRUCTURES.
9. INSTALL CROSS BRACES IN EACH DIRECTION ON EACH SIDE BETWEEN PLAYSHED STEEL POSTS.

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Sheet Title: FLOOR PLAN

Job Number: C3860012.00	SSK-2
Date: 06/05/2024	
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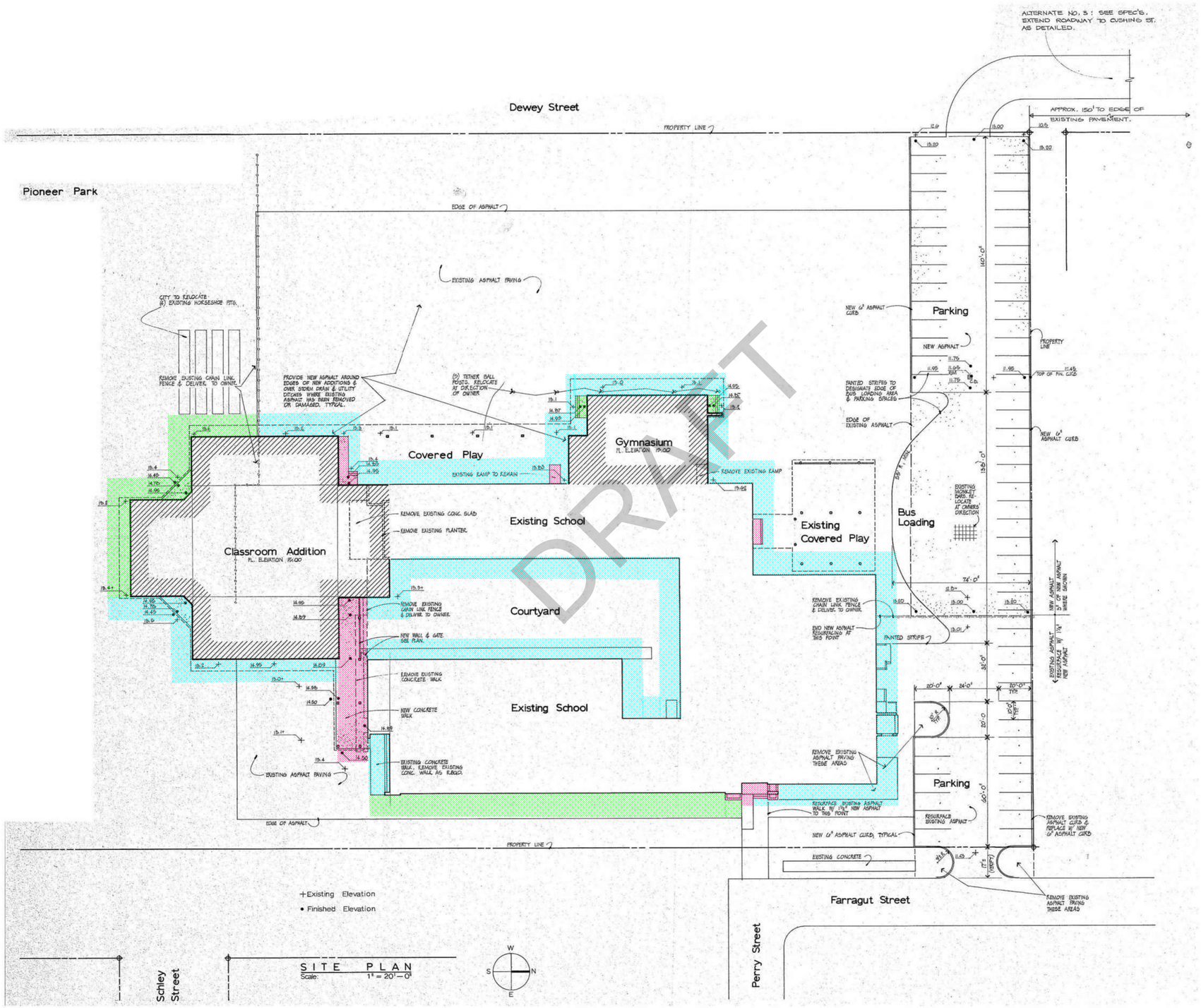

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LEGEND

- ASPHALT
- CONCRETE
- SOFTSCAPE

NOTE: ANTICIPATED DISTURBANCE ALONG PERIMETER OF BUILDING = 10' - 0"

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Sheet Title

STEVENS - SITE PLAN

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LEGEND	TOTAL (SF)
RESILIENT TILE	26,547 SF
RESILIENT SHEET	1,475 SF
SLIP RESISTANT RESILIENT TILE	536 SF
CARPET	9,778 SF
CERAMIC TILE	1,592 SF
CONCRETE	3,035 SF
ATHLETIC WOOD FLOOR	3,073 SF

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STEVENS - FLOOR PLAN - FLOORS

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At existing shear walls (blue lines) identified on structural drawings to receive connection improvements, assume that 4-6' of existing ceiling adjacent to shear walls will need to be removed and replaced in order to accommdate installation of structural upgrades.

At 1982 addition remove entire ceiling and all associated electrical, HVAC, plumbing, fire sprinkler, telecom, etc. required to install blocking per hex note 4. Install new 2x4 ceilings, new LED lighting and new diffusers as required. Replace components of fire sprinkler system as necessary to complete structural work.

To accommodate slab replacement, anticipate that slab demolition (including floor finishes, in ground plumbing & electrical, etc.) will need to occur in 2 or 3 phases where slabs can be cut out in patterns that allow existing structural and non-structural walls to remain in place to support the attic and roof structure above o the greatest degree possible.

The first time through the slab could be removed, excavation completed and new slab / reinforcing placed with formwork to separate it from the remaining existing slab on grade concrete. This would allow the remaining walls to be supported and braced as necessary by the remaining slab during that work.

The second pass would allow the existing walls to be braced by the new slab as the remaining slab is poured up to the existing slab and tied into the reinforcing from the initial phase.

It is anticipated that a portion of the drywall at the existing walls would need to be sacrificed and replaced / finished in order to accommodate temporary support and bracing systems. The contractor would need to engage a structural engineer to stamp the proposed temporary shoring approach and that cost should be accounted for as well.

Note: At all locations of ceiling work, assume that lighting will need to be disconnected, removed and re-installed to accommodate work.

At 1952 Building new exterior shear walls work will include removing existing window system, installation of new 2x6 wood framed walls w/ plywood at exterior, GWB at interior and cavities filled with batt insulation. Clad building exterior with WRB and metal siding panels

At 1974 addition remove entire ceiling and all associated electrical, HVAC, plumbing, fire sprinkler, telecom, etc. required to install blocking per hex note 4. Install new 2x4 ceilings, new LED lighting and new diffusers as required. Replace components of fire sprinkler system as necessary to complete structural work.

At all new plywood interior shear wall locations (red lines) identified on structural drawings, assume that existing drywall will need to be removed entirely on one side of wall to accommodate plywood installation, hold downs, additional blocking, etc. Casework would need to be removed / reinstalled and all countertops replaced. See structural drawings for locations of existing casework impacting shear walls. Additionally all wall mounted items would need to be removed, stored, re-installed and all mechanical, plumbing and electrical rough-in modified to accommodate additional wall thickness.

Note: At corridor shear walls, assume that work will occur at classroom side or stud wall, at demising walls between classrooms assume that plywood will occur at side opposite casework to greatest degree possible.

At all locations, assume that 4-6' of existing ceiling adjaent to shear walls will need to be removed and replaced in order to accommdate installation of plywood up to roof deck.

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Sheet Title
STEVENS - FLOOR PLAN 2

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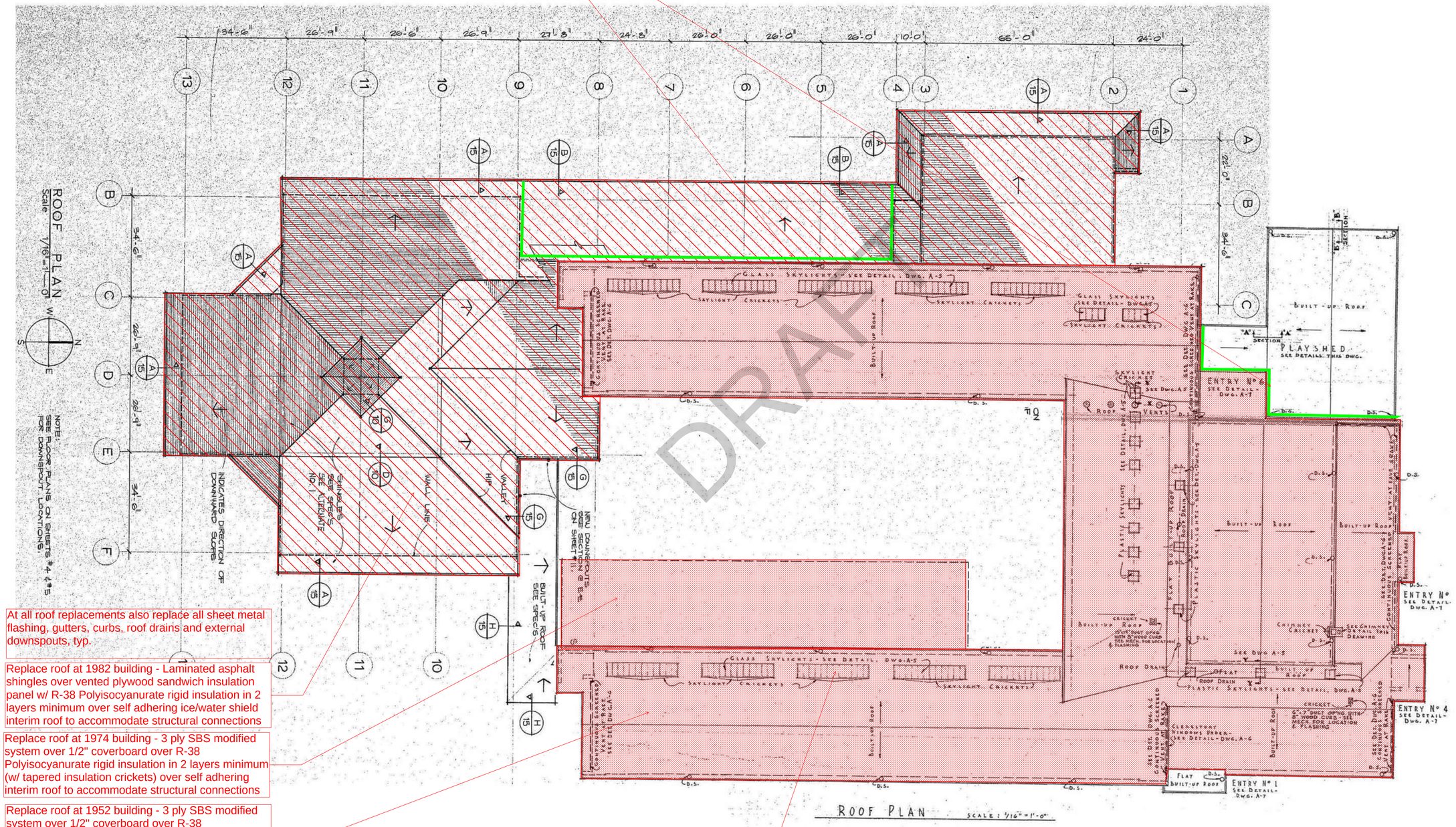
Seismic Joint and tie in to existing roof



ROOF PLAN SCALE: 1/16"=1'-0"

DRAFT

At all roof replacements also replace all sheet metal flashing, gutters, curbs, roof drains and external downspouts, typ.

Replace roof at 1982 building - Laminated asphalt shingles over vented plywood sandwich insulation panel w/ R-38 Polyisocyanurate rigid insulation in 2 layers minimum over self adhering ice/water shield interim roof to accommodate structural connections

Replace roof at 1974 building - 3 ply SBS modified system over 1/2" coverboard over R-38 Polyisocyanurate rigid insulation in 2 layers minimum (w/ tapered insulation crickets) over self adhering interim roof to accommodate structural connections

Replace roof at 1952 building - 3 ply SBS modified system over 1/2" coverboard over R-38 Polyisocyanurate rigid insulation in 2 layers minimum (w/ tapered insulation crickets) over self adhering interim roof over plywood to accommodate structural connections

Note: Skylights were removed previously

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Sheet Title
STEVENS - ROOF PLAN

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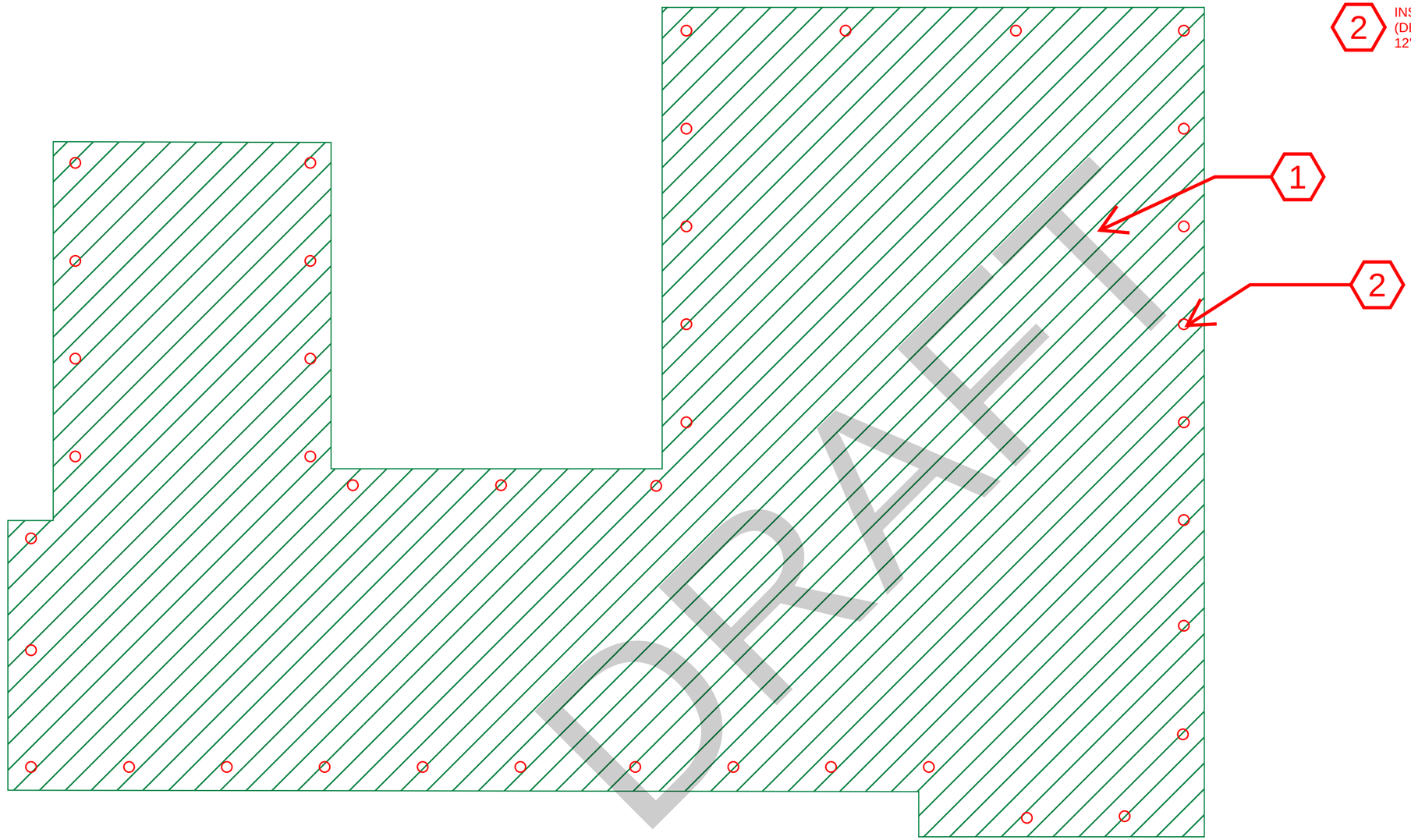
1 REMOVE EXISTING CONCRETE SLAB. INSTALL NEW 2'-0" THICK MAT FOUNDATION. DOWEL THROUGH EXISTING FOUNDATIONS WITH 3" DIAMETER HOLES. EXTEND MAT SLAB 5'-0" OR MORE BEYOND EXTERIOR WALL FOR PILE INSTALLATION

2 INSTALL 2'-0" DIAMETER DRILLED SHAFTS, 95 FT - 130 FT DEEP (DEPENDENT ON GEOTECH REPORT) AT APPROXIMATELY 12'-0" OC



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Sheet Title: FOUNDATION PLAN - 1952 BUILDING

Job Number: C3860012.00	SSK-1
Date: 06/05/2024	
Drawn by: CWN	
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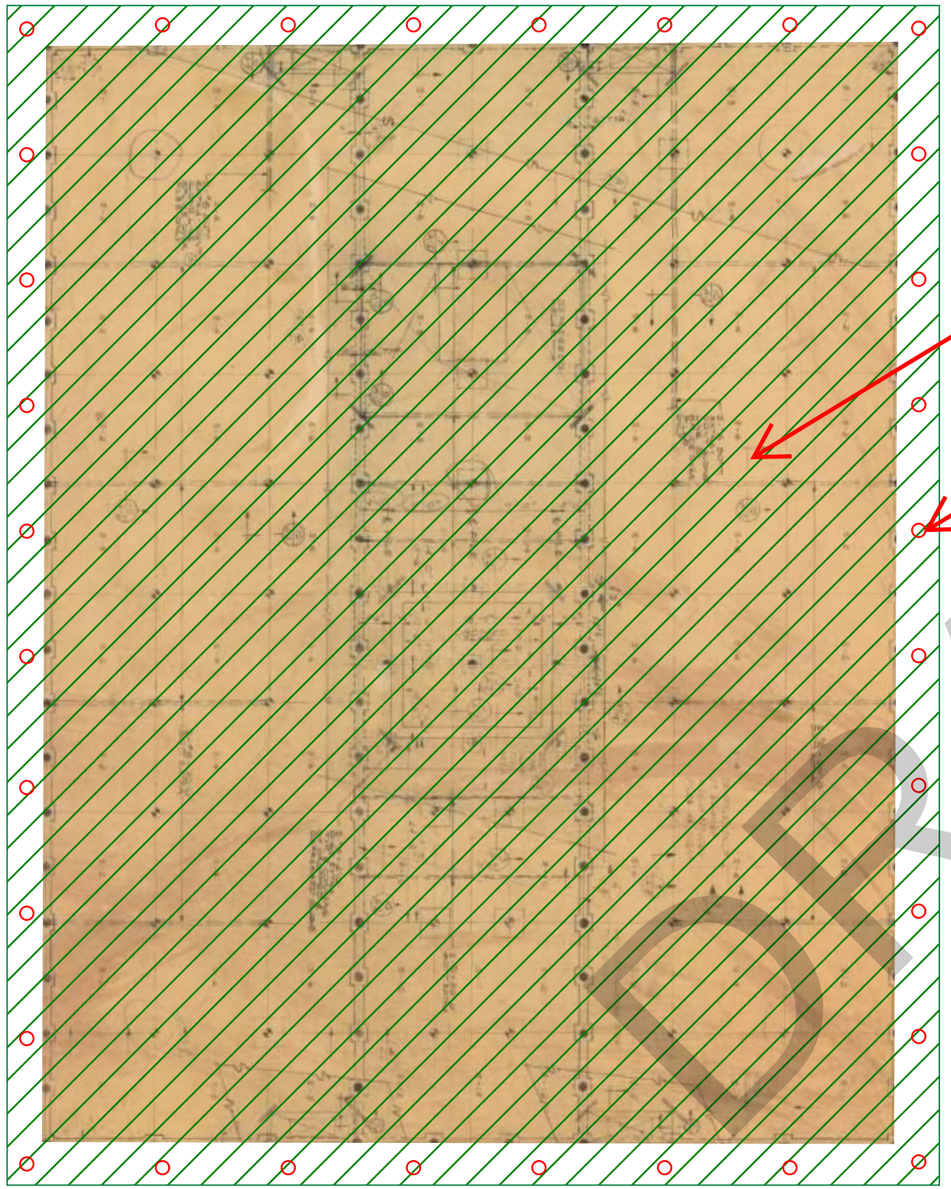

1. REMOVE EXISTING CONCRETE SLAB. INSTALL NEW 2'-0" THICK MAT FOUNDATION. DOWEL THROUGH EXISTING FOUNDATIONS WITH 3" DIAMETER HOLES. EXTEND MAT SLAB 5'-0" OR MORE BEYOND EXTERIOR WALL FOR PILE INSTALLATION

2. INSTALL 2'-0" DIAMETER DRILLED SHAFTS, 95 FT - 130 FT DEEP (DEPENDENT ON GEOTECH REPORT) AT APPROXIMATELY 12'-0" OC

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Sheet Title: FOUNDATION PLAN - ANNEX BUILDING

Job Number: C3860012.00	SSK-1
Date: 06/05/2024	
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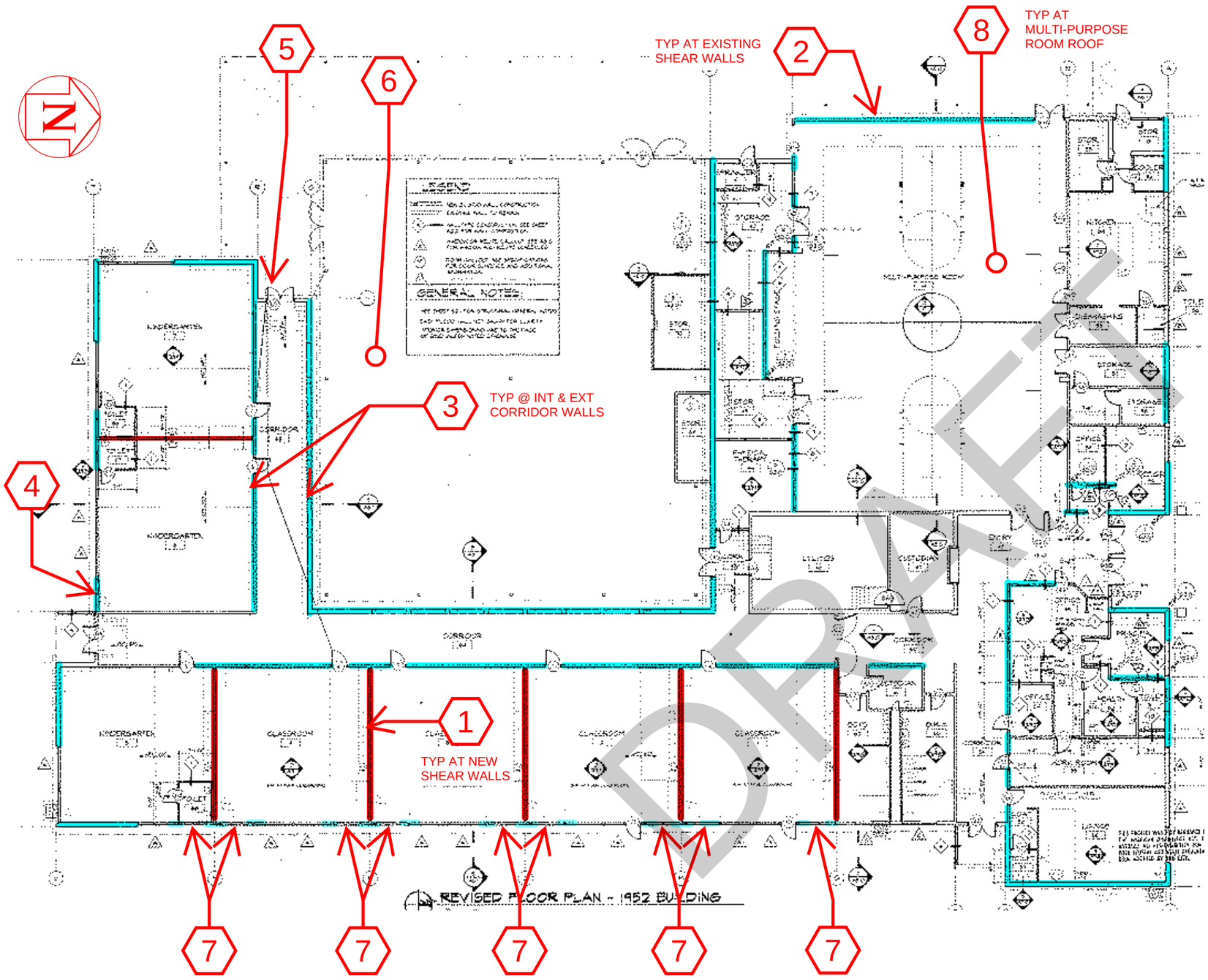

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EXISTING DIAGONALLY SHEATHED SHEAR WALL

NEW PLYWOOD SHEAR WALL

1 APPLY 1/2" PLYWOOD SHEATHING ON EXISTING WOOD STUD WALL. EXTEND NEW SHEAR WALL UP BETWEEN FLAT AND OVERFRAMED ROOF. ATTACH TOP PLATE TO OVERFRAMED ROOF. INSTALL SILL BOLTS AS REQUIRED. PROVIDE HOLDOWN AT EACH END OF WALL.

2 VERIFY PLYWOOD SHEATHING AND FRAMING EXTENDS TO UNDERSIDE OF EXISTING ROOF. PROVIDE HOLDOWN AT EACH END OF WALL. INSTALL SILL BOLTS AS REQUIRED.

3 AT LOCATIONS WITH PREVIOUSLY INFILLED CLERESTORY OPENINGS, REMOVE DIAGONAL SHEATHING ON LOWER WALL AND REPLACE WITH 1/2" PLYWOOD SHEATHING. CONNECT UPPER AND LOWER PORTIONS OF WALL WITH LTTP4 CLIPS.

4 WHERE ROOF JOISTS FRAME PERPENDICULAR TO EXISTING SHEAR WALL, PROVIDE BLOCKING ABOVE WALL TOP PLATE. NAIL BLOCKING TO DIAGONAL ROOF SHEATHING AND WALL FRAMING.

5 WHERE PLAYSHED ROOF FRAMES INTO MAIN BUILDING, INSTALL COLUMNS TO RESUPPORT GRAVITY LOADS. PROVIDE GAP TO ACCOMMODATE INDEPENDENT MOVEMENT OF BOTH STRUCTURES.

6 INSTALL CROSS BRACES IN EACH DIRECTION ON EACH SIDE BETWEEN PLAYSHED STEEL POSTS.

7 INSTALL HORIZONTAL COILED STRAPS TO EXTERIOR SHEATHING ABOVE AND BELOW MECHANICAL VENT.

~~8 INSTALL 1/2" PLYWOOD OVER EXISTING ROOF DIAGONAL SHEATHING.~~

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Sheet Title: FLOOR PLAN - 1952 BUILDING

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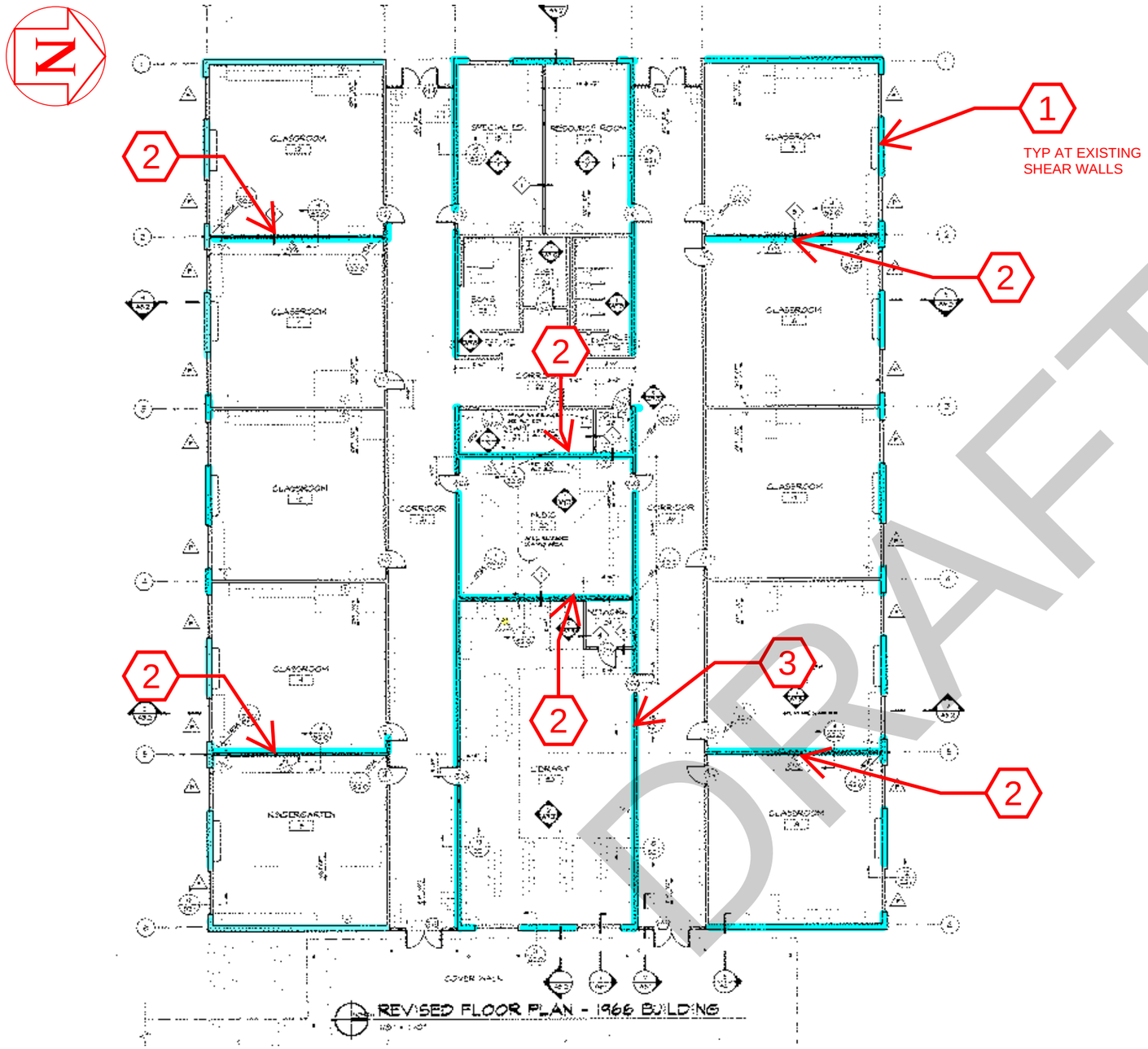
Drawn by: CWN	
	Scale: NTS



EXISTING DIAGONALLY SHEATHED SHEAR WALL

NEW PLYWOOD SHEAR WALL

1 VERIFY PLYWOOD SHEATHING AND FRAMING EXTENDS TO UNDERSIDE OF EXISTING ROOF. PROVIDE HOLDOWN AT EACH END OF WALL. INSTALL SILL BOLTS AS REQUIRED.

2 SHEATHE ATTIC CRIPPLE WALLS ABOVE EXISTING SHEAR WALLS. PROVIDE SHEAR CONNECTOR CLIPS TO SHEAR WALL AND ROOF FRAMING.

3 REMOVE (2) CLERESTORY WINDOWS IN LIBRARY AND (2) CLERESTORY WINDOWS IN MUSIC ROOM. INFILL WITH 2X STUD WALL. INSTALL 1/2" PLYWOOD SHEATHING WITH CLIPS TO ROOF AND WALL FRAMING BELOW.

DRAFT

Degenkolb

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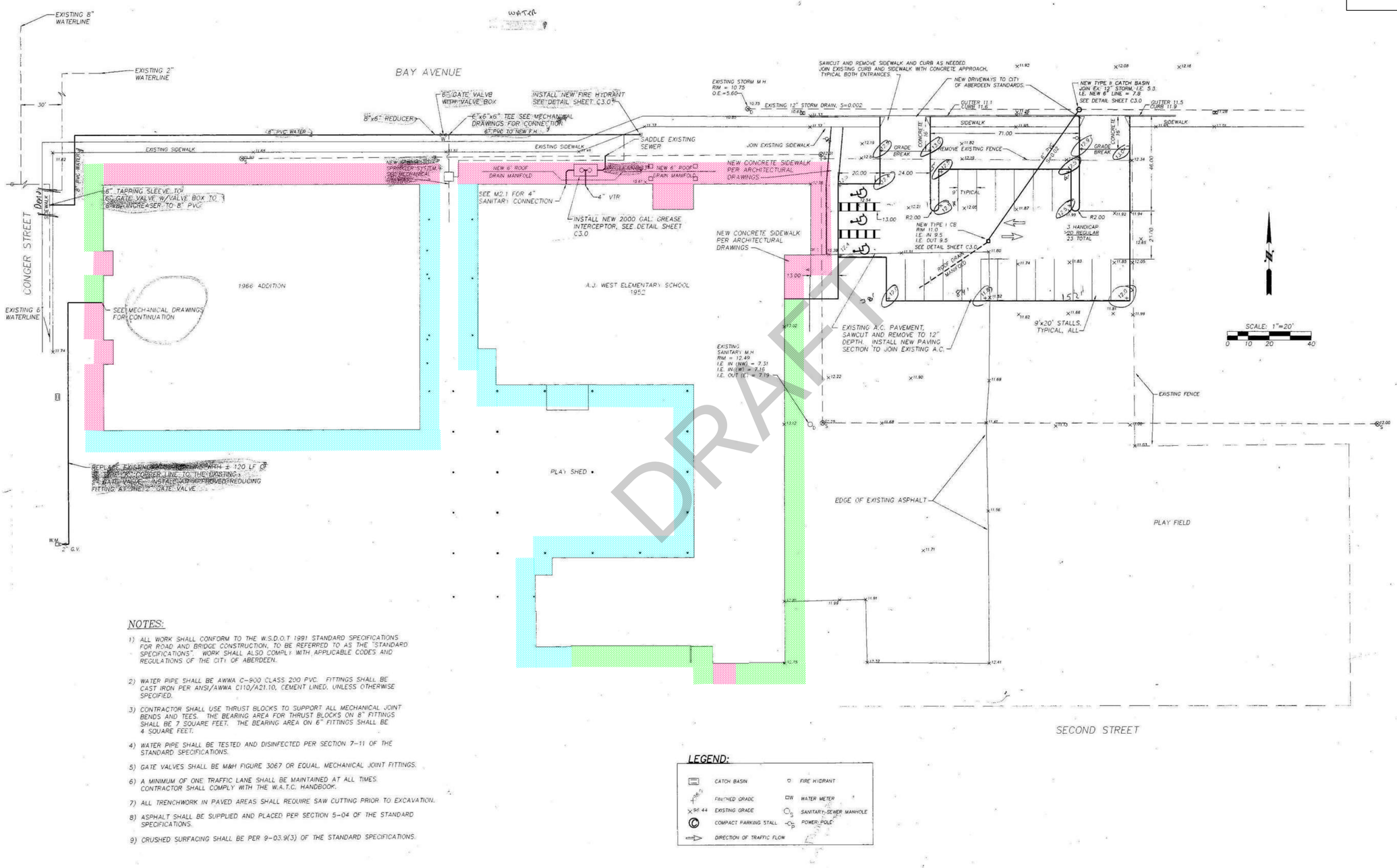
Sheet Title: FLOOR PLAN - ANNEX BUILDING

Job Number: C3860012.00	SSK-3
Date: 06/05/2024	
Drawn by: CWN	
	Scale: NTS



DRAFT

NOTES:

1) ALL WORK SHALL CONFORM TO THE W.S.D.O.T 1991 STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, TO BE REFERRED TO AS THE "STANDARD SPECIFICATIONS". WORK SHALL ALSO COMPLY WITH APPLICABLE CODES AND REGULATIONS OF THE CITY OF ABERDEEN.

2) WATER PIPE SHALL BE AWWA C-900 CLASS 200 PVC. FITTINGS SHALL BE CAST IRON PER ANSI/AWWA C110/A21.10, CEMENT LINED, UNLESS OTHERWISE SPECIFIED.

3) CONTRACTOR SHALL USE THRUST BLOCKS TO SUPPORT ALL MECHANICAL JOINT BENDS AND TEES. THE BEARING AREA FOR THRUST BLOCKS ON 8" FITTINGS SHALL BE 7 SQUARE FEET. THE BEARING AREA ON 6" FITTINGS SHALL BE 4 SQUARE FEET.

4) WATER PIPE SHALL BE TESTED AND DISINFECTED PER SECTION 7-11 OF THE STANDARD SPECIFICATIONS.

5) GATE VALVES SHALL BE M&H FIGURE 3067 OR EQUAL, MECHANICAL JOINT FITTINGS.

6) A MINIMUM OF ONE TRAFFIC LANE SHALL BE MAINTAINED AT ALL TIMES. CONTRACTOR SHALL COMPLY WITH THE W.A.T.C. HANDBOOK.

7) ALL TRENCHWORK IN PAVED AREAS SHALL REQUIRE SAW CUTTING PRIOR TO EXCAVATION.

8) ASPHALT SHALL BE SUPPLIED AND PLACED PER SECTION 5-04 OF THE STANDARD SPECIFICATIONS.

9) CRUSHED SURFACING SHALL BE PER 9-03.9(3) OF THE STANDARD SPECIFICATIONS.

LEGEND:

	CATCH BASIN		FIRE HYDRANT
	FINISHED GRADE	CW	WATER METER
x 96.44	EXISTING GRADE		SANITARY SEWER MANHOLE
C	COMPACT PARKING STALL		POWER POLE
	DIRECTION OF TRAFFIC FLOW		

LEGEND

- ASPHALT
- CONCRETE
- SOFTSCAPE

NOTE: ANTICIPATED DISTURBANCE ALONG PERIMETER OF BUILDING = 10' - 0"

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Aberdeen School District

Project Title
SEISMIC STUDY

ABERDEEN SCHOOL DISTRICT
ABERDEEN, WA 98520

Project Numbers
2024-002

Issue & Revision Dates
20 JUNE 2024 PD COST ESTIMATE

PROGRAMMING DESIGN
NOT FOR CONSTRUCTION

Sheet Title
AJ WEST - SITE PLAN

Drawn By MM
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Sheet Number
A1.00

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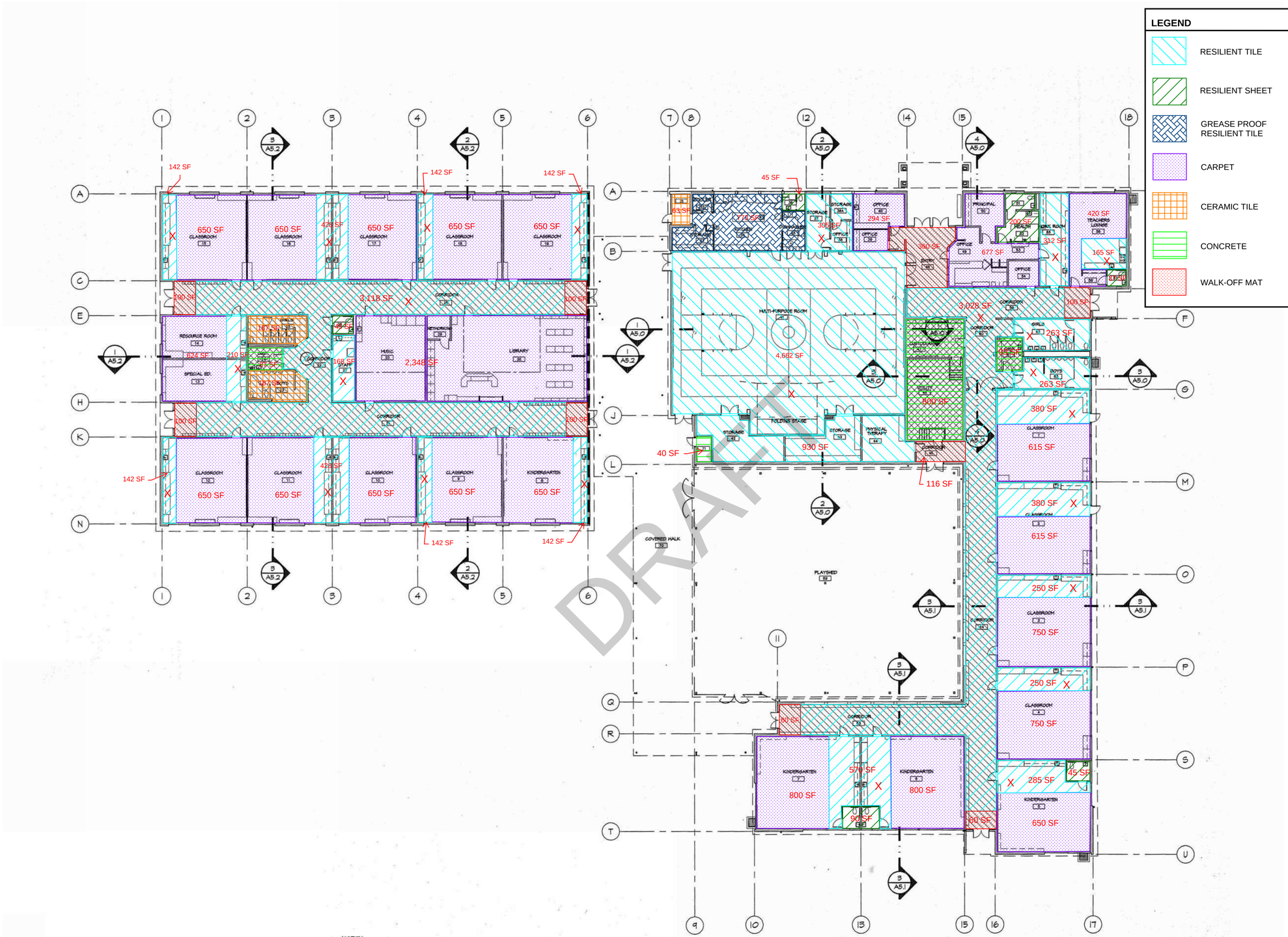

NORTH

REVISED FLOOR PLAN - OVERALL

1/16" = 1'-0"

LEGEND	TOTAL (SF)
RESILIENT TILE	17,247 SF
RESILIENT SHEET	425 SF
GREASE PROOF RESILIENT TILE	773 SF
CARPET	15,843 SF
CERAMIC TILE	437 SF
CONCRETE	1,020 SF
WALK-OFF MAT	1,096 SF

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Sheet Title
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FLOOR PLAN 1

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To accommodate slab replacement, anticipate that slab demolition (including floor finishes, in ground plumbing & electrical, etc.) will need to occur in 2 or 3 phases where slabs can be cut out in patterns that allow existing structural and non-structural walls to remain in place to support the attic and roof structure above o the greatest degree possible.

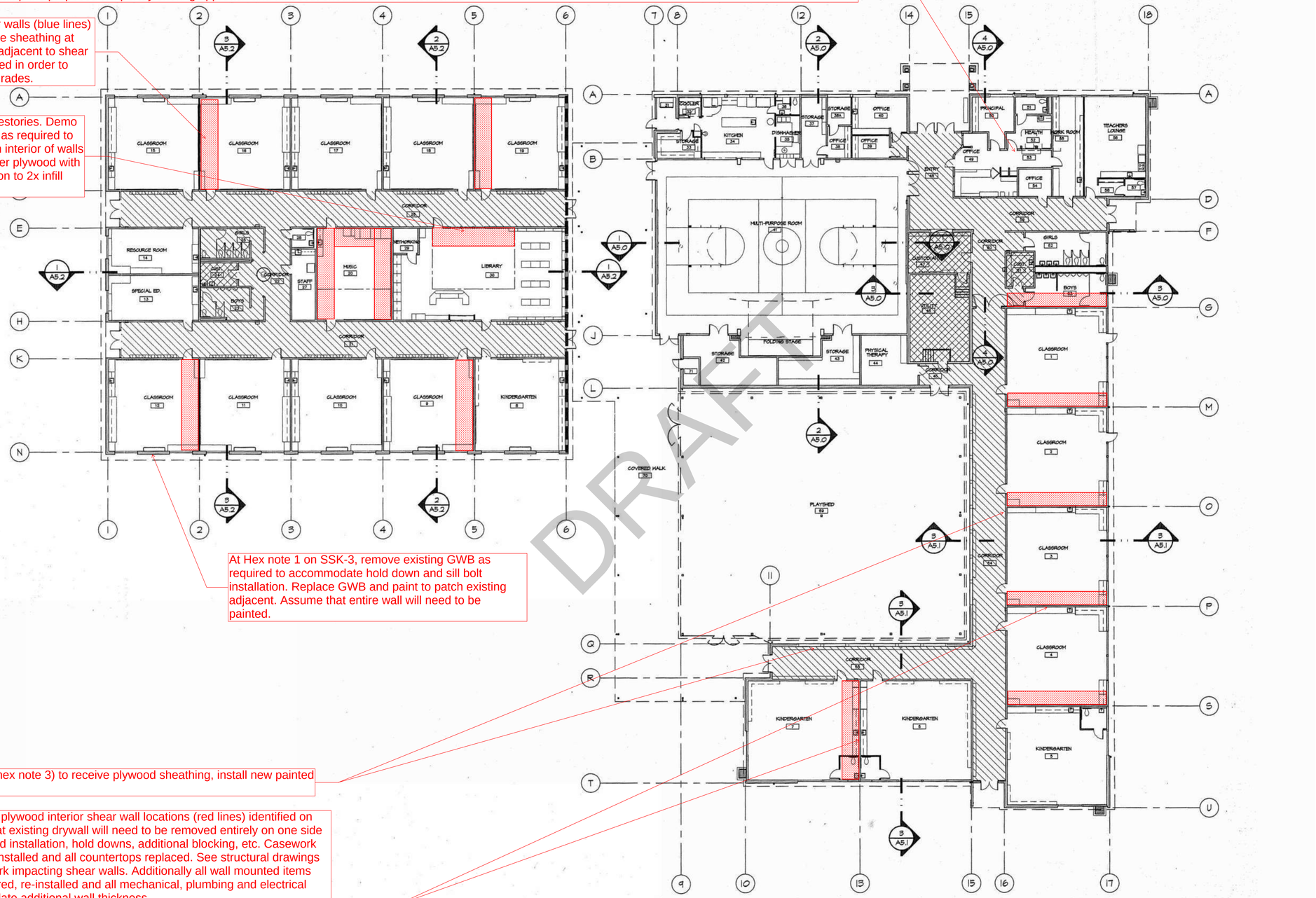
The first time through the slab could be removed, excavation completed and new slab / reinforcing placed with formwork to separate it from the remaining existing slab on grade concrete. This would allow the remaining walls to be supported and braced as necessary by the remaining slab during that work.

The second pass would allow the existing walls to be braced by the new slab as the remaining slab is poured up to the existing slab and tied into the reinforcing from the initial phase.

It is anticipated that a portion of the drywall at the existing walls would need to be sacrificed and replaced / finished in order to accommodate temporary support and bracing systems. The contractor would need to engage a structural engineer to stamp the proposed temporary shoring approach and that cost should be accounted for as well.

At Hex note 2 on SSK-3 at existing shear walls (blue lines) identified on structural drawings to receive sheathing at attic, assume that 4-6' of existing ceiling adjacent to shear walls will need to be removed and replaced in order to accommdate installation of structural upgrades.

At Hex note 3 on SSK-3 at removed clerestories. Demo wall finishes and existing ceiling finishes as required to accommodate infill work. For infills, finish interior of walls with painted GWB, exterior with WRB over plywood with metal wall panels. Add full depth insulation to 2x infill construction at entire infill wall.



At Hex note 1 on SSK-3, remove existing GWB as required to accommodate hold down and sill bolt installation. Replace GWB and paint to patch existing adjacent. Assume that entire wall will need to be painted.

At existing shear walls (SSK-2 hex note 3) to receive plywood sheathing, install new painted GWB over plywood.

At SSK-2 Hex note 1 at all new plywood interior shear wall locations (red lines) identified on structural drawings, assume that existing drywall will need to be removed entirely on one side of wall to accommodate plywood installation, hold downs, additional blocking, etc. Casework would need to be removed / reinstalled and all countertops replaced. See structural drawings for locations of existing casework impacting shear walls. Additionally all wall mounted items would need to be removed, stored, re-installed and all mechanical, plumbing and electrical rough-in modified to accommodate additional wall thickness.

Note: At corridor shear walls, assume that work will occur at classroom side or stud wall, at demising walls between classrooms assume that plywood will occur at side opposite casework to greatest degree possible.

At all locations, assume that 4-6' of existing ceiling adjaent to shear walls will need to be removed and replaced in order to accommdate installation of plywood up to roof deck.

REVISED FLOOR PLAN - OVERALL

1/16" = 1'-0"

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PROGRAMMING DESIGN
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Sheet Title
AJ WEST -
FLOOR PLAN 2

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Sheet Number
A1.02

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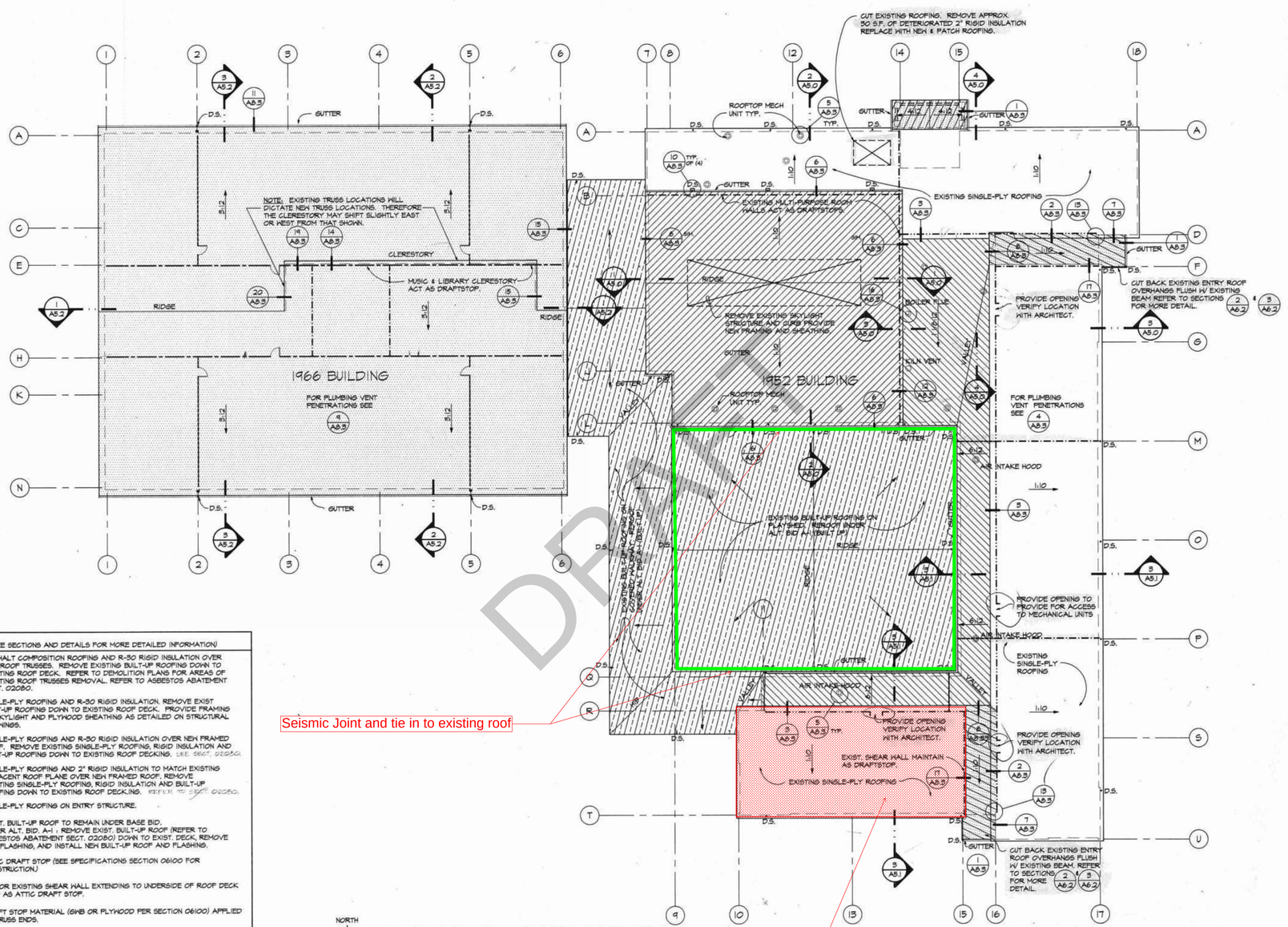

LEGEND (SEE SECTIONS AND DETAILS FOR MORE DETAILED INFORMATION)

- ASPHALT COMPOSITION ROOFING AND R-30 RIGID INSULATION OVER NEW ROOF TRUSSES. REMOVE EXISTING BUILT-UP ROOFING DOWN TO EXISTING ROOF DECK. REFER TO DEMOLITION PLANS FOR AREAS OF EXISTING ROOF TRUSSES REMOVAL. REFER TO ASBESTOS ABATEMENT SECT. 02080.
- SINGLE-PLY ROOFING AND R-30 RIGID INSULATION. REMOVE EXIST BUILT-UP ROOFING DOWN TO EXISTING ROOF DECK. PROVIDE FRAMING AT SKYLIGHT AND PLYWOOD SHEATHING AS DETAILED ON STRUCTURAL DRAWINGS.
- SINGLE-PLY ROOFING AND R-30 RIGID INSULATION OVER NEW FRAMED ROOF. REMOVE EXISTING SINGLE-PLY ROOFING, RIGID INSULATION AND BUILT-UP ROOFING DOWN TO EXISTING ROOF DECKING. SEE SECT. 02256.
- SINGLE-PLY ROOFING AND 2" RIGID INSULATION TO MATCH EXISTING ADJACENT ROOF PLANE OVER NEW FRAMED ROOF. REMOVE EXISTING SINGLE-PLY ROOFING, RIGID INSULATION AND BUILT-UP ROOFING DOWN TO EXISTING ROOF DECKING. REFER TO SECT. 02080.
- SINGLE-PLY ROOFING ON ENTRY STRUCTURE.
- EXIST. BUILT-UP ROOF TO REMAIN UNDER BASE BID. UNDER ALT. BID, A-1 : REMOVE EXIST. BUILT-UP ROOF (REFER TO ASBESTOS ABATEMENT SECT. 02080) DOWN TO EXIST. DECK, REMOVE ALL FLASHING, AND INSTALL NEW BUILT-UP ROOF AND FLASHING.
- ATTIC DRAFT STOP (SEE SPECIFICATIONS SECTION 06100 FOR CONSTRUCTION.)
- NEW OR EXISTING SHEAR WALL EXTENDING TO UNDERSIDE OF ROOF DECK USED AS ATTIC DRAFT STOP.
- DRAFT STOP MATERIAL (GWB OR PLYWOOD PER SECTION 06100) APPLIED AT TRUSS ENDS.
- ATTIC DRAFT STOP DOOR (SEE SPECIFICATIONS 06100 FOR CONSTRUCTION.)
- EXISTING CLERESTORY WINDOW WALL. REMOVE WINDOW FRAME, PLYWOOD INFILL, HOOD TRIM AND SIDING DOWN TO EXISTING SHEATHING. INFILL WITH 2x4 @ 24" O.C. & 1/2" PLYWOOD SHEATING ON THE OUTSIDE.

At last note of legend, add: "Clerestory windows and frames to be removed by asbestos contractor."

NORTH

ROOF / ATTIC DRAFT STOP PLAN

1/16" = 1'-0"

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A1.03

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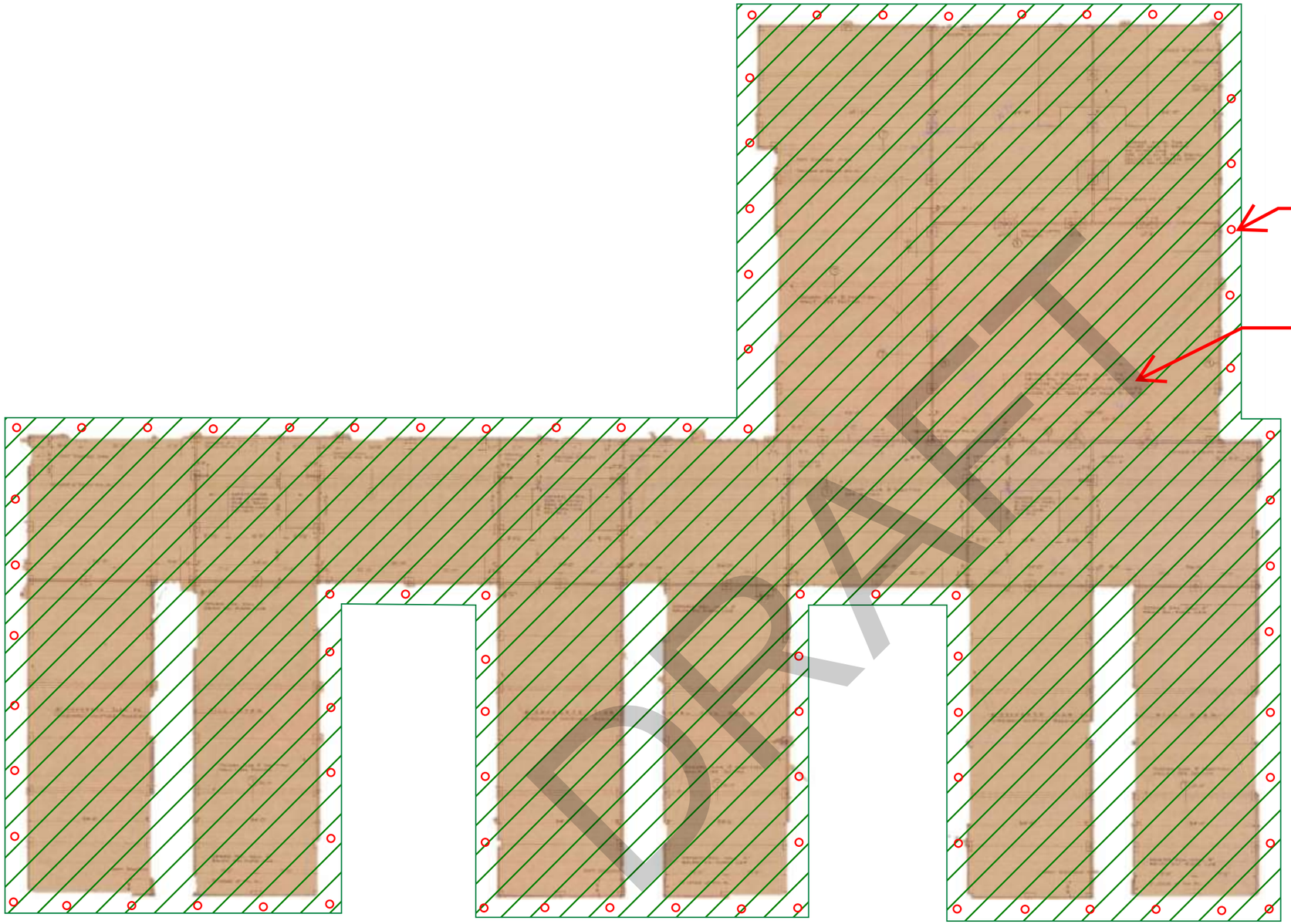

1 DEMO EXISTING CONCRETE SLAB. INSTALL NEW 2'-0" THICK MAT FOUNDATION. DOWEL THROUGH EXISTING GRADE BEAMS WITH 3" DIAMETER HOLES. EXTEND MAT SLAB 5'-0" OR MORE BEYOND EXTERIOR WALL FOR PILE INSTALLATION

2 INSTALL 2'-0" DIAMETER DRILLED SHAFTS, 95 FT - 130 FT DEEP (DEPENDENT ON GEOTECH REPORT) AT APPROXIMATELY 12'-0" OC

SAMPLE

Degenkolb

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Sheet Title: FOUNDATION PLAN

Job Number: C3860012.00	SSK-1
Date: 06/05/2024	
Drawn by: CWN	
	Scale: NTS

EXISTING CONCRETE SHEAR WALL

EXISTING PLYWOOD SHEAR WALL

EXISTING FIBERGLASS CLERESTORY WALL

NEW COLLECTOR BEAM

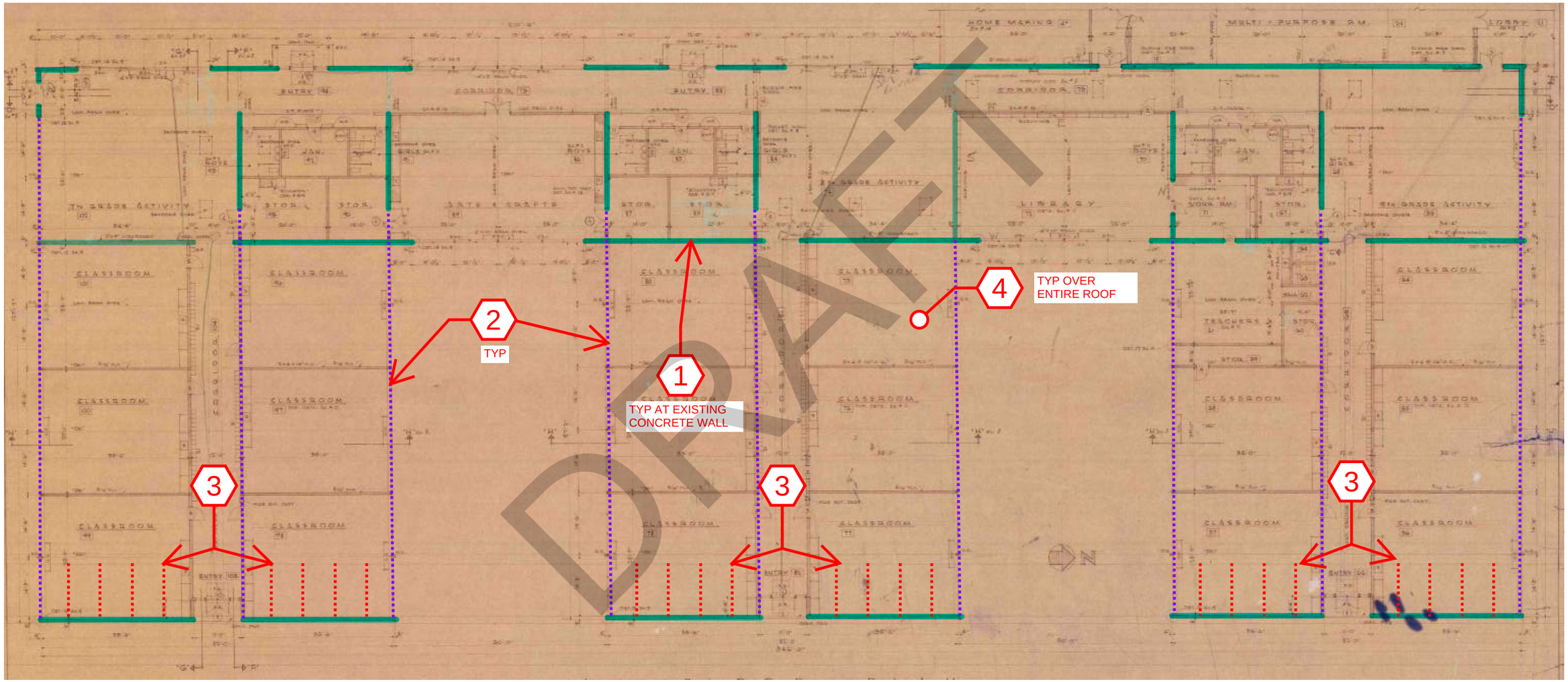
NEW OUT OF PLANE ANCHOR

1 INSTALL STEEL ANCHORS THROUGH NEW ROOF OR EXISTING TECTUM ROOFING INTO TOP OF CONCRETE WALLS.

2 INSTALL NEW COLLECTOR BEAMS OVER WOOD STUD WALLS. ANCHOR BEAMS INTO EXISTING CONCRETE WALLS.

3 INSTALL OUT OF PLANE ANCHORS AT TOP OF CONCRETE WALLS. EXTEND ANCHORS BELOW ROOF FOR 12'-0".

4 REMOVE EXISTING TECTUM ROOF AND REPLACE WITH WOOD FRAMED PLYWOOD ROOF. CONNECT NEW ROOF TO EXISTING CONCRETE AND WOOD WALLS. FURTHER ANALYSIS MAY NEGATE THE NEED FOR ROOF REPLACEMENT



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206.262.9346 FAX

Sheet Title: PARTIAL FLOOR PLAN

Job Number: C3860012.00	SSK-2
Date: 06/05/2024	
Drawn by: CWN	
	Scale: NTS

EXISTING CONCRETE SHEAR WALL

EXISTING PLYWOOD SHEAR WALL

EXISTING FIBERGLASS CLERESTORY WALL

NEW COLLECTOR BEAM

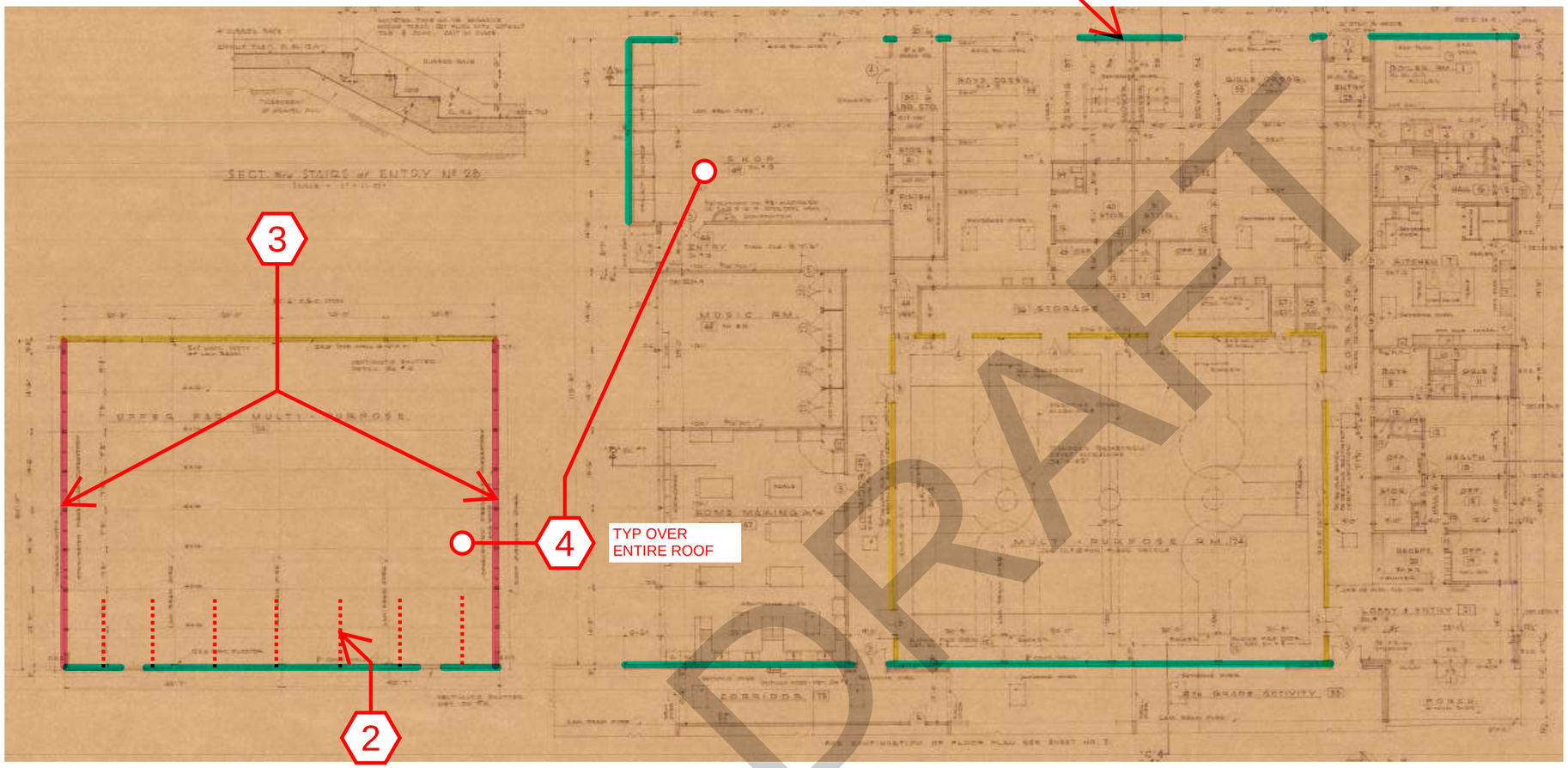
NEW OUT OF PLANE ANCHOR

1 INSTALL STEEL ANCHORS THROUGH NEW ROOF OR EXISTING TECTUM ROOFING INTO TOP OF CONCRETE WALLS.

2 INSTALL OUT OF PLANE ANCHORS AT TOP OF CONCRETE WALLS. EXTEND ANCHORS BELOW ROOF FOR 12'-0".

3 REMOVE EXISTING FIBERGLASS PANELS. INSTALL 1/2" PLYWOOD ON EXISTING STUD WALL. ADD BLOCKING AND NAILING AS REQUIRED.

4 REMOVE EXISTING TECTUM ROOF AND REPLACE WITH WOOD FRAMED PLYWOOD ROOF. CONNECT NEW ROOF TO EXISTING CONCRETE AND WOOD WALLS. FURTHER ANALYSIS MAY NEGATE THE NEED FOR ROOF REPLACEMENT



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Sheet Title: PARTIAL FLOOR PLAN

Job Number: C3860012.00	SSK-3
Date: 06/05/2024	
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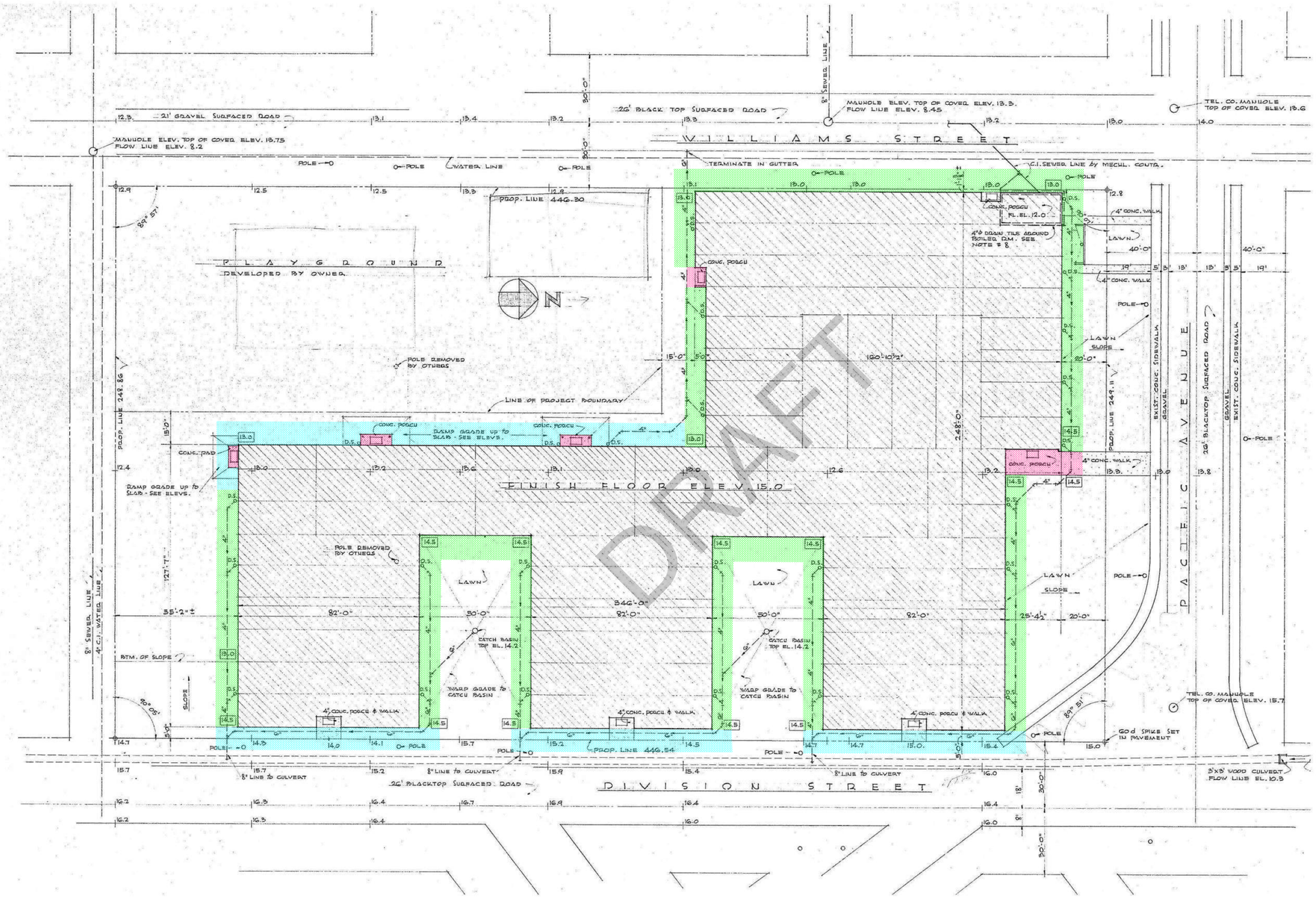

LEGEND

- ASPHALT
- CONCRETE
- SOFTSCAPE

NOTE: ANTICIPATED DISTURBANCE ALONG PERIMETER OF BUILDING = 10' - 0"

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Sheet Title

HOPKINS & HLC - SITE PLAN

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LEGEND	TOTAL (SF)		TOTAL (SF)
RESILIENT TILE	9,568 SF	CERAMIC TILE	828 SF
GREASEPROOF RESILIENT TILE	2,269 SF	CONCRETE	5,726 SF

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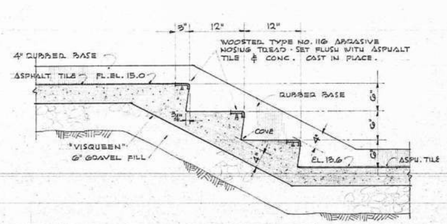
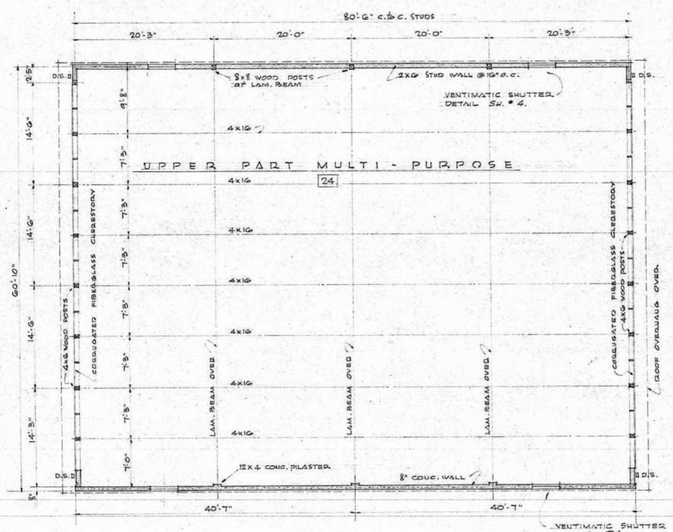
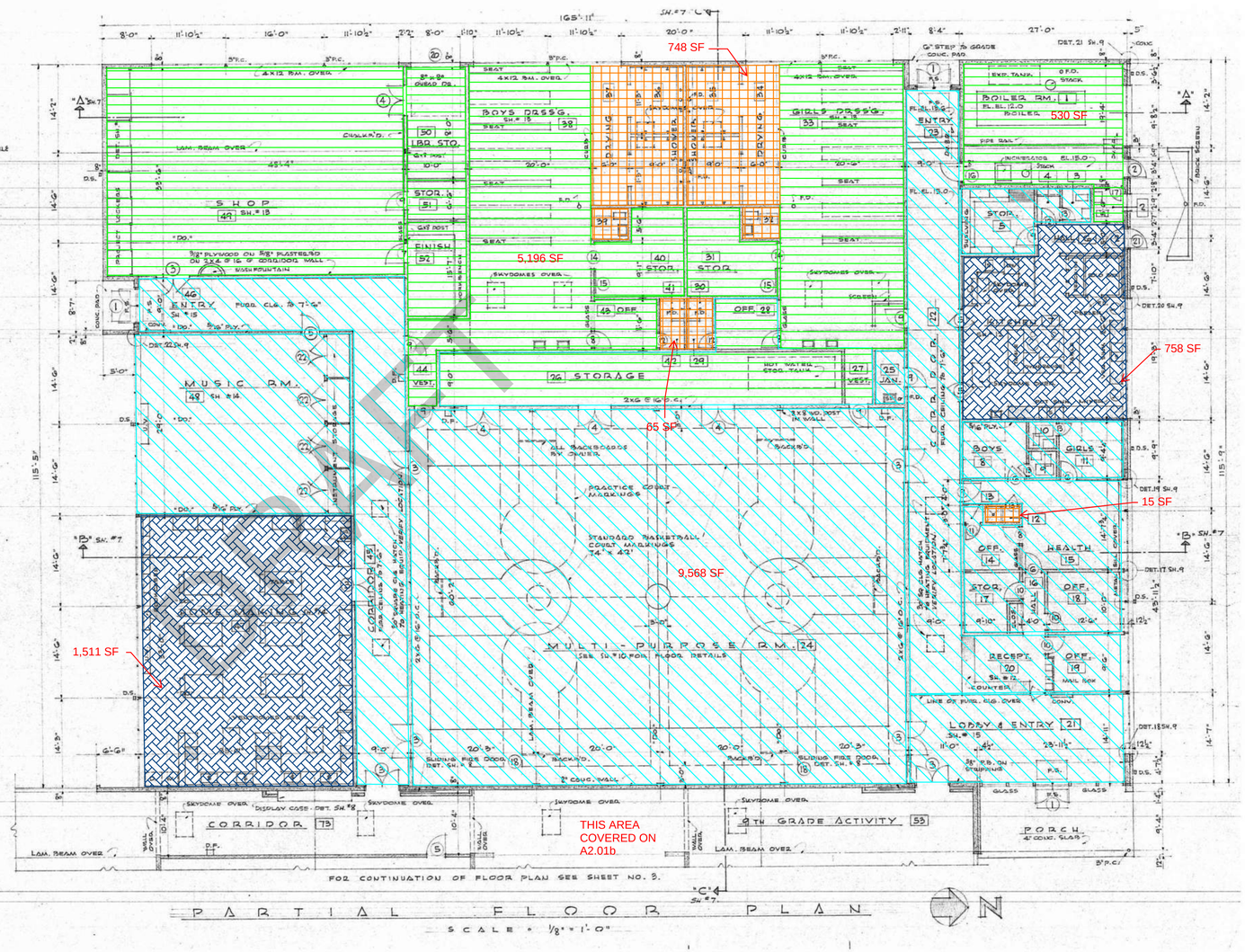


SECT. thru STAIRS at ENTRY Nº 23
SCALE = 1" = 1'-0"



PLAN AT CLERESTORY
SCALE = 1/8" = 1'-0"



PARTIAL FLOOR PLAN
SCALE = 1/8" = 1'-0"

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Sheet Title
HOPKINS & HLC - FLOOR PLAN 1

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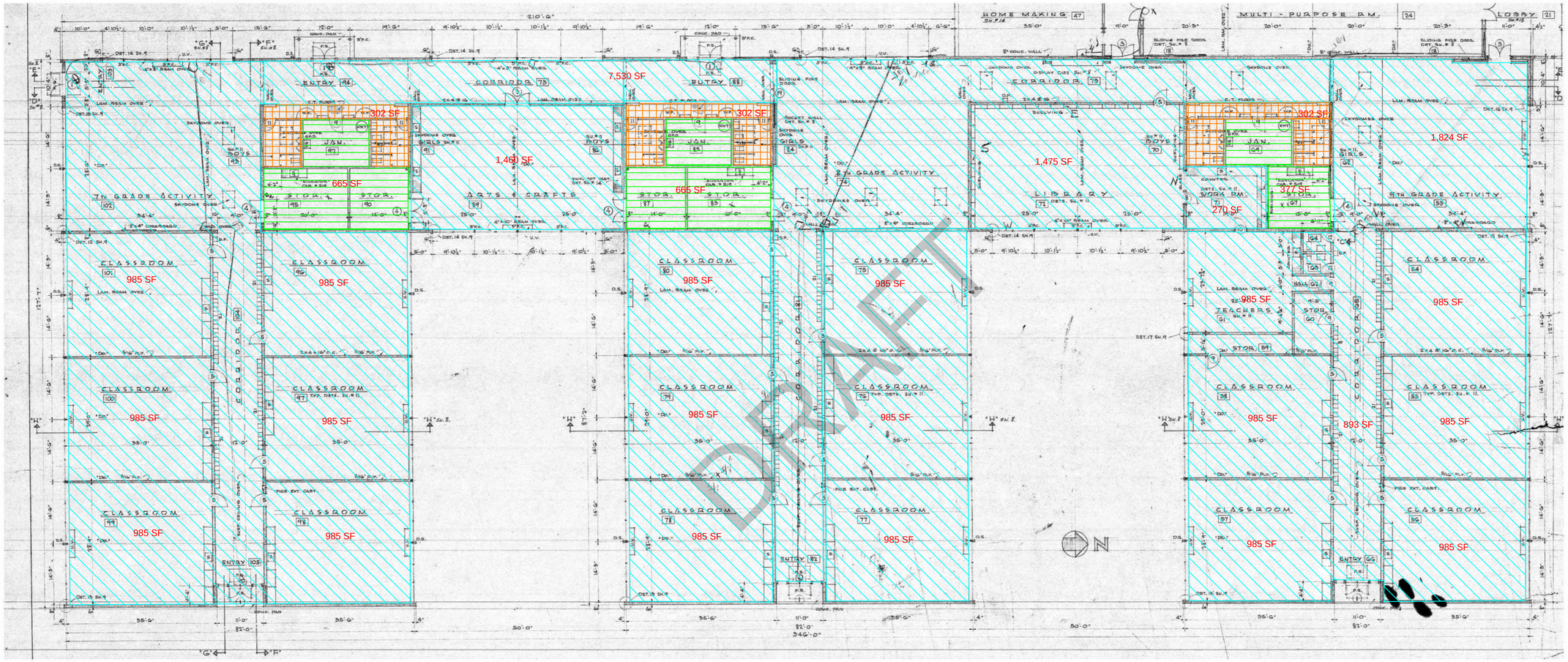
LEGEND	TOTAL (SF)
RESILIENT TILE	31,185 SF
CERAMIC TILE	906 SF
CONCRETE	1,707 SF



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Sheet Title
HOPKINS & HLC - FLOOR PLAN 1

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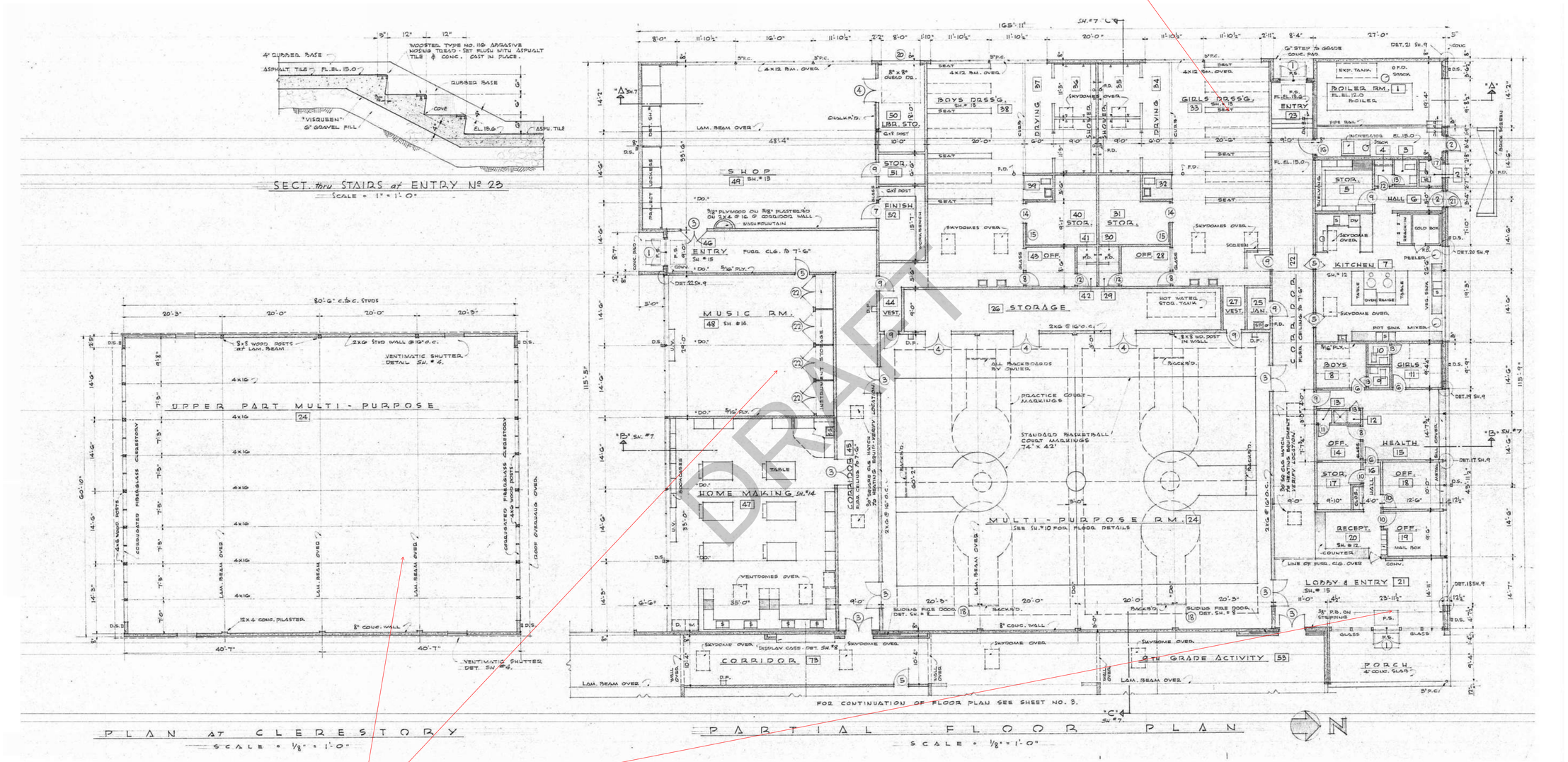
To accommodate slab replacement, anticipate that slab demolition (including floor finishes, in ground plumbing & electrical, etc.) will need to occur in 2 or 3 phases where slabs can be cut out in patterns that allow existing structural and non-structural walls to remain in place to support the attic and roof structure above o the greatest degree possible.

The first time through the slab could be removed, excavation completed and new slab / reinforcing placed with formwork to separate it from the remaining existing slab on grade concrete. This would allow the remaining walls to be supported and braced as necessary by the remaining slab during that work.

The second pass would allow the existing walls to be braced by the new slab as the remaining slab is poured up to the existing slab and tied into the reinforcing from the initial phase.

It is anticipated that a portion of the drywall at the existing walls would need to be sacrificed and replaced / finished in order to accommodate temporary support and bracing systems. The contractor would need to engage a structural engineer to stamp the proposed temporary shoring approach and that cost should be accounted for as well.



At entire building install new 2x4 ceilings (classrooms, corridors, gym, etc.) to conceal new exposed roof framing. Adjust fire sprinklers as required including additional heads to sprinkle above and below ceilings, typ.

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PROGRAMMING DESIGN
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Sheet Title
HOPKINS & HLC - FLOOR PLAN 2

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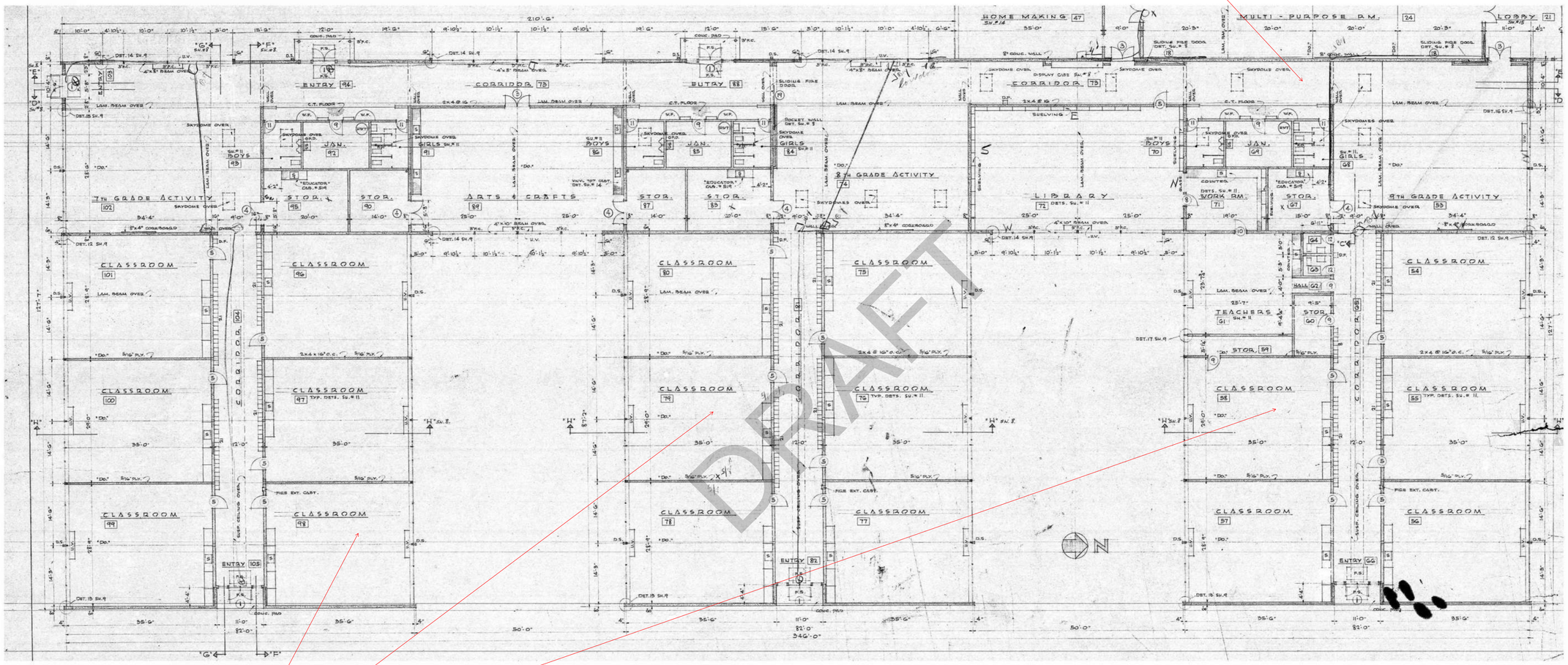
To accommodate slab replacement, anticipate that slab demolition (including floor finishes, in ground plumbing & electrical, etc.) will need to occur in 2 or 3 phases where slabs can be cut out in patterns that allow existing structural and non-structural walls to remain in place to support the attic and roof structure above o the greatest degree possible.

The first time through the slab could be removed, excavation completed and new slab / reinforcing placed with formwork to separate it from the remaining existing slab on grade concrete. This would allow the remaining walls to be supported and braced as necessary by the remaining slab during that work.

The second pass would allow the existing walls to be braced by the new slab as the remaining slab is poured up to the existing slab and tied into the reinforcing from the initial phase.

It is anticipated that a portion of the drywall at the existing walls would need to be sacrificed and replaced / finished in order to accommodate temporary support and bracing systems. The contractor would need to engage a structural engineer to stamp the proposed temporary shoring approach and that cost should be accounted for as well.



At entire building install new 2x4 ceilings (classrooms, corridors, gym, etc.) to conceal new exposed roof framing. Adjust fire sprinklers as required including additional heads to sprinkle above and below ceilings, typ.

TCF Architecture
P.253.572.3993
124 North I Street
Tacoma, Washington, 98403
www.tcfarchitecture.com

Aberdeen School District

Project Title
SEISMIC STUDY

ABERDEEN SCHOOL DISTRICT
ABERDEEN, WA 98520

Project Numbers
2024-002

Issue & Revision Dates
20 JUNE 2024 PD COST ESTIMATE

PROGRAMMING DESIGN
NOT FOR CONSTRUCTION

Sheet Title
HOPKINS & HLC - FLOOR PLAN 2

Drawn By MM
Checked By SW

Sheet Number
A2.02b

Sheet Number Of

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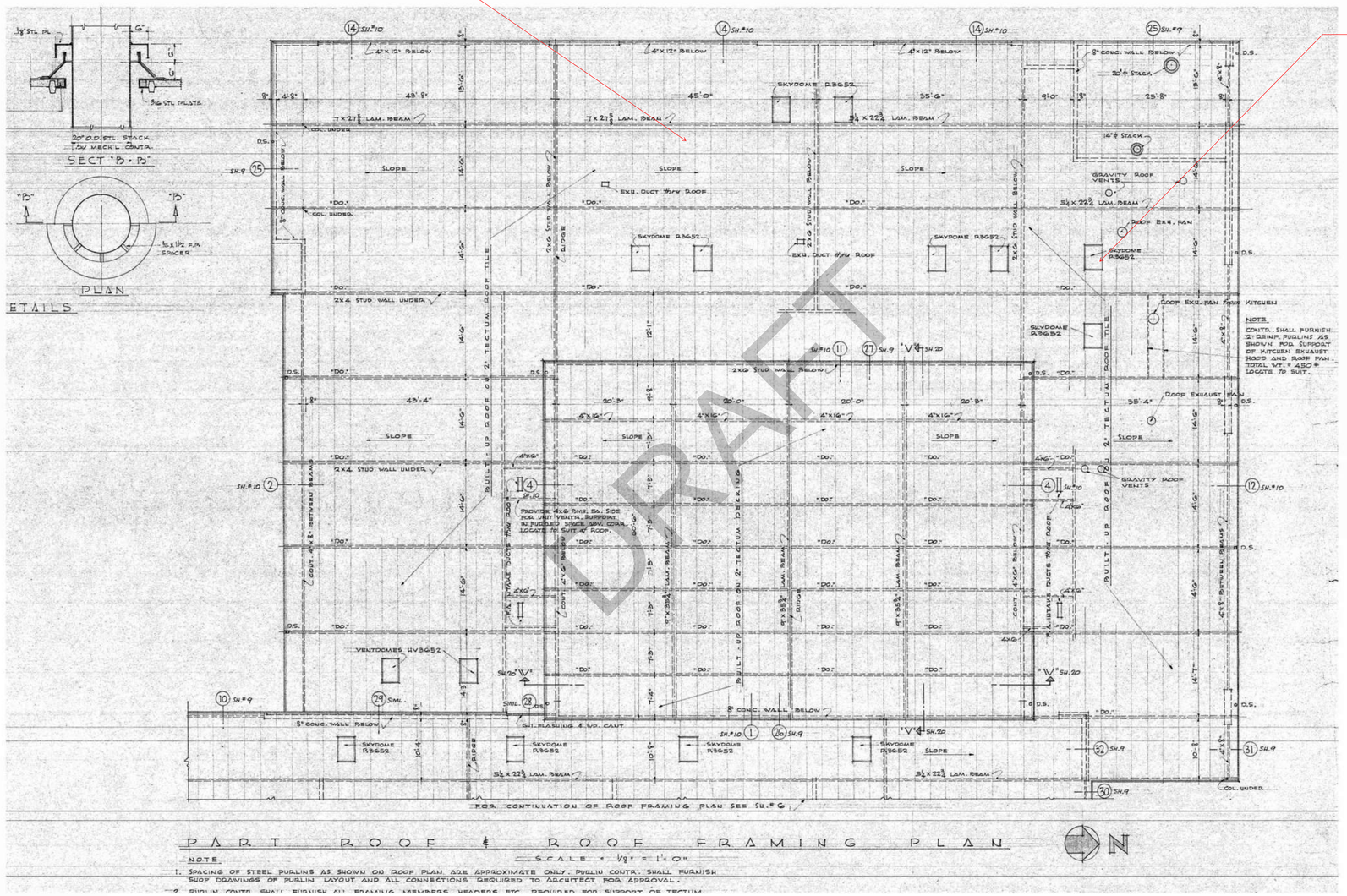
Replace entire roof - 3 ply SBS modified system over 1/2" coverboard over R-38 Polyisocyanurate rigid insulation in 2 layers minimum (w/ tapered insulation crickets) over self adhering interim roof over plywood. Additional roof framing at 24" o.c. between joists will need to be added to support plywood roof framing. throughout.

Note: Skylights were removed previously



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Sheet Title
HOPKINS & HLC - ROOF PLAN

Drawn By MM
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Sheet Number
A2.03a

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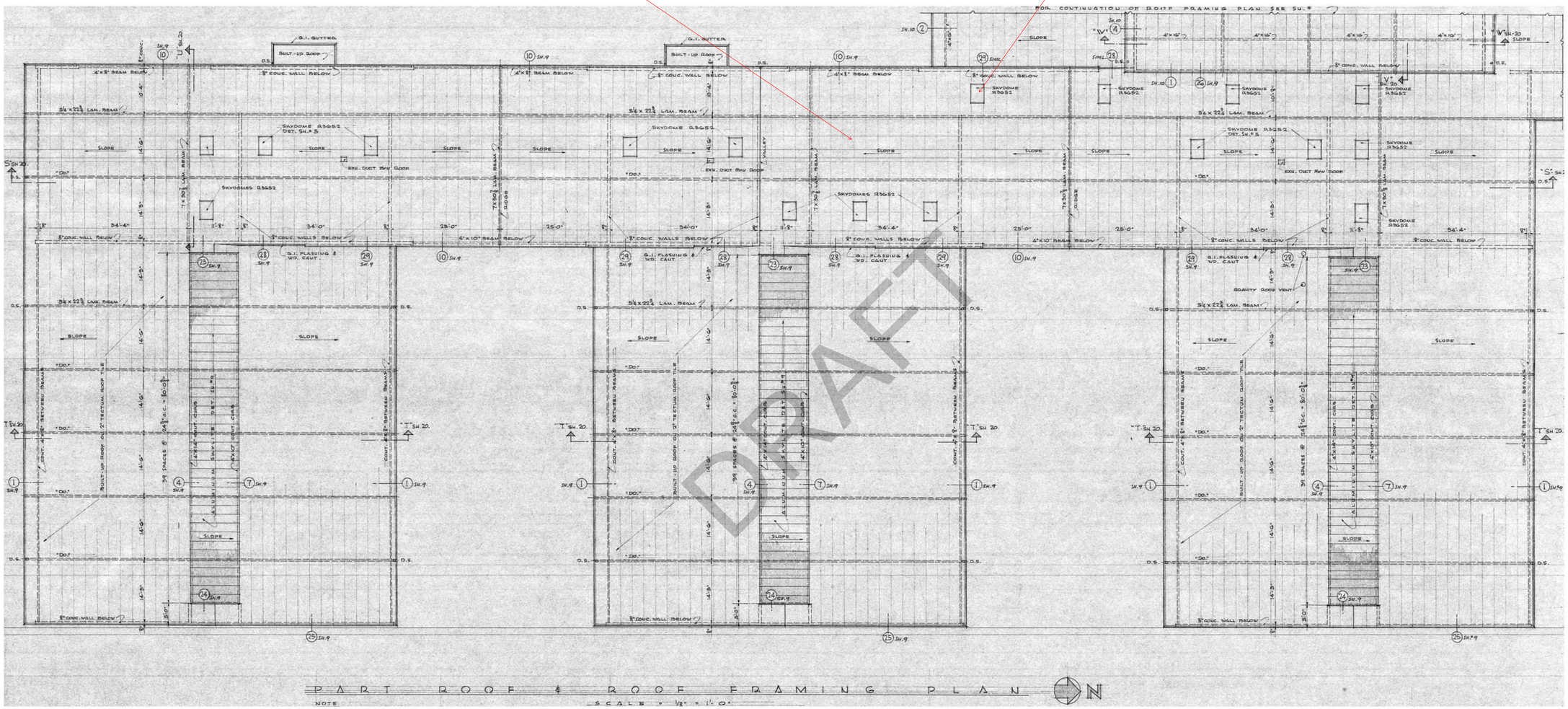
Replace entire roof - 3 ply SBS modified system over 1/2" coverboard over R-38 Polyisocyanurate rigid insulation in 2 layers minimum (w/ tapered insulation crickets) over self adhering interim roof over plywood. Additional roof framing at 24" o.c. between joists will need to be added to support plywood roof framing. throughout.

Note: Skylights were removed previously



PART ROOF & ROOF FRAMING PLAN

NOTE

SCALE : 1/8" = 1'-0"

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Sheet Title

HOPKINS & HLC - ROOF PLAN

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Sheet Number

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TCF Architecture

Tsunami Hazard Assessment Report

Tsunami Hazard Assessement for Aberdeen School District, Aberdeen, WA

Work in progress, 2024

This modeling project (in progress) by HyperNumerics LLC will be submitted to our project partners for use in assessing tsunami hazard at the Aberdeen school sites. This project was funded by The Aberdeen School District.

Study Region, Footprints, and Gauges

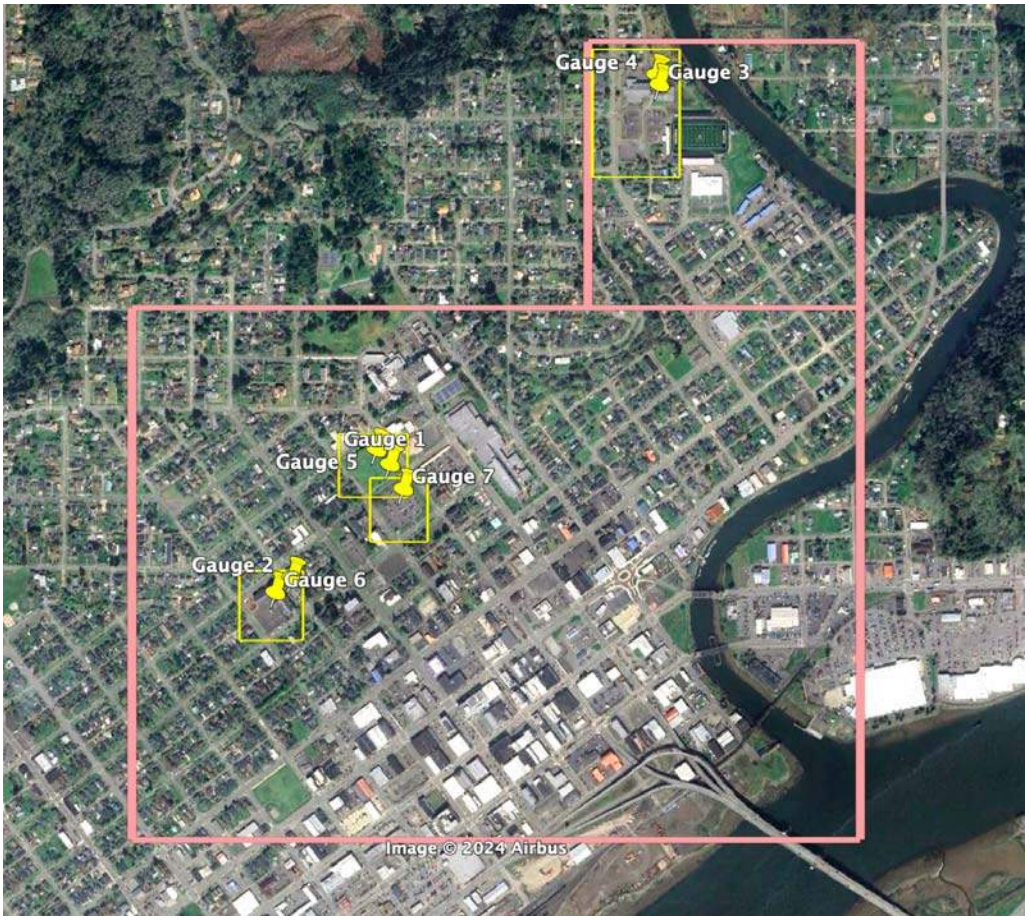
In the figure below, we show two study regions, each outlined as a pink rectangle. The large pink rectangle is the "fgmax region 1" where we collect maximum values at the 1/3" resolution of inundation depth, speed, momentum, momentum flux, arrival times, and times various maximum values were achieved. The small pink rectangle is the "fgmax region 2" where the same quantities are collected.

In fgmax region 1 there are yellow footprints around areas of interest. The K-Street footprint contains McDermoth Elementary School as well as gauges 2 and 6. The I-StreetVacant footprint contains the vacant lot on I-Street and gauges 1 and 5. The I-StreetParking footprint contains the parking lot on I-Street and gauge 7. In fgmax region 2 the yellow footprint contains Robert Gray Elementary School and gauges 3 and 4.

At gauges, we capture the time series (as well as the maximum value) of the inundation depth, momentum, and momentum flux. From the momentum, we can retrieve the West-East and South-North velocity components if useful. We also capture the arrival times at the gauges and times when various quantities achieved their maximum values.

In addition, we will give results along 7 West-East latitude transects. Each transect will be at the latitude of one of the 7 gauges and will start at the West edge of a pink rectangle and go through the gauge and end at the East edge of the same pink rectangle. For example, Transect G7 will correspond to the East-West latitude line through gauge 7.

Imagery here and below from Google Earth.



Project reports

- Final Project Report (Dec 1, 2024) (DRAFT)

Long-term post-seismic change in MHW: For M1 or L1 events

3D Animations of L1up with SLR=0.114m event:

- Grays Harbor (first 3 hours)
- Aberdeen (first 6 hours)

Jump down to...

- Pre- and Post-quake Bathymetry for the CSZ_L1-extended-pmel and the L1up_x1.117 sources
- Pre- and Post-quake Bathymetry for the CSZ_M1_noext source
- CSZ_L1-extended-pmel 6 hour results (SLR=0.0, Manning=0.025)
- CSZ_M1_noext 6 hour results (SLR=0.0, Manning=0.025)
- CSZ_L1-extended-pmel 10 hour results (SLR=0.114m, Manning=0.025)
- L1up_x1.117 10 hour results (SLR=0.114m, Manning=0.025)

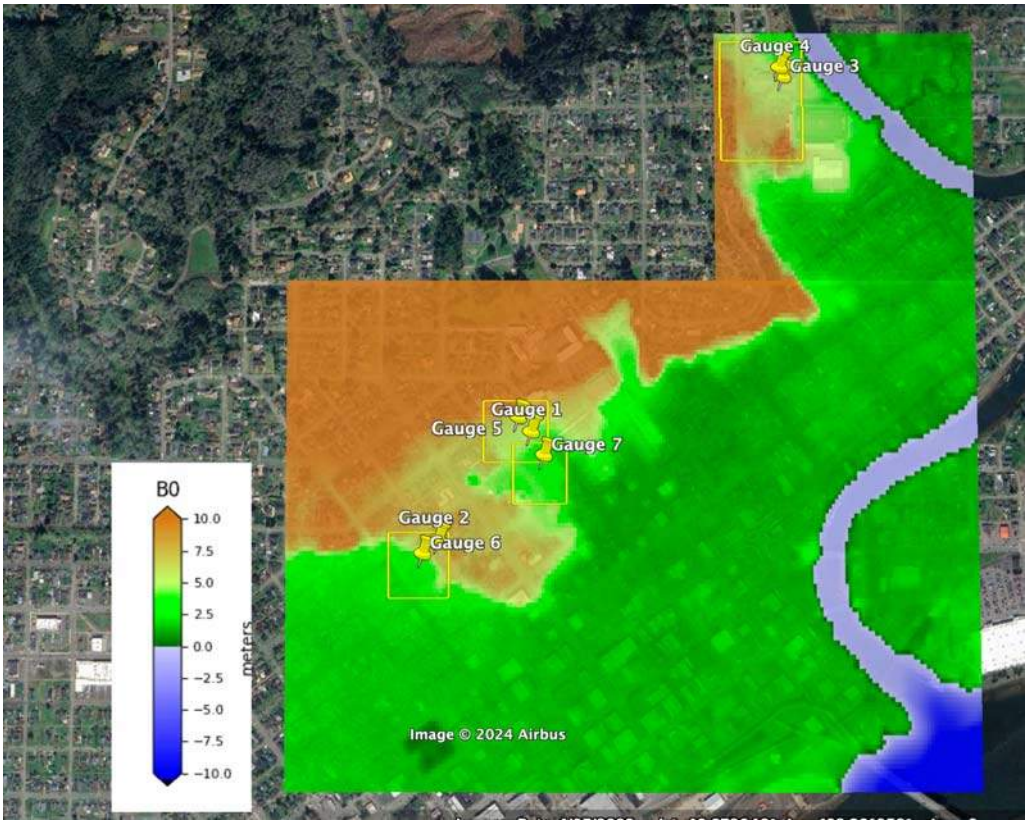
Pre- and Post- quake Bathymetry for CSZ_L1-extended-pmel and the L1up_x1.117 sources (meters)

The amount of subsidence of these two sources are the same. Notice that this subsidence places some of the study area at an elevation B<0. Since B=0 corresponds to MHW, these locations are below MHW. This will remain after the tsunami has ended. That is, at MHW each day after the quake, the depth of water above the subsided ground will be -B for those locations with a path to Grays Harbor for the tidal waters to reach. So, the subsidence caused by this earthquake leaves a daily threat to Aberdeen.

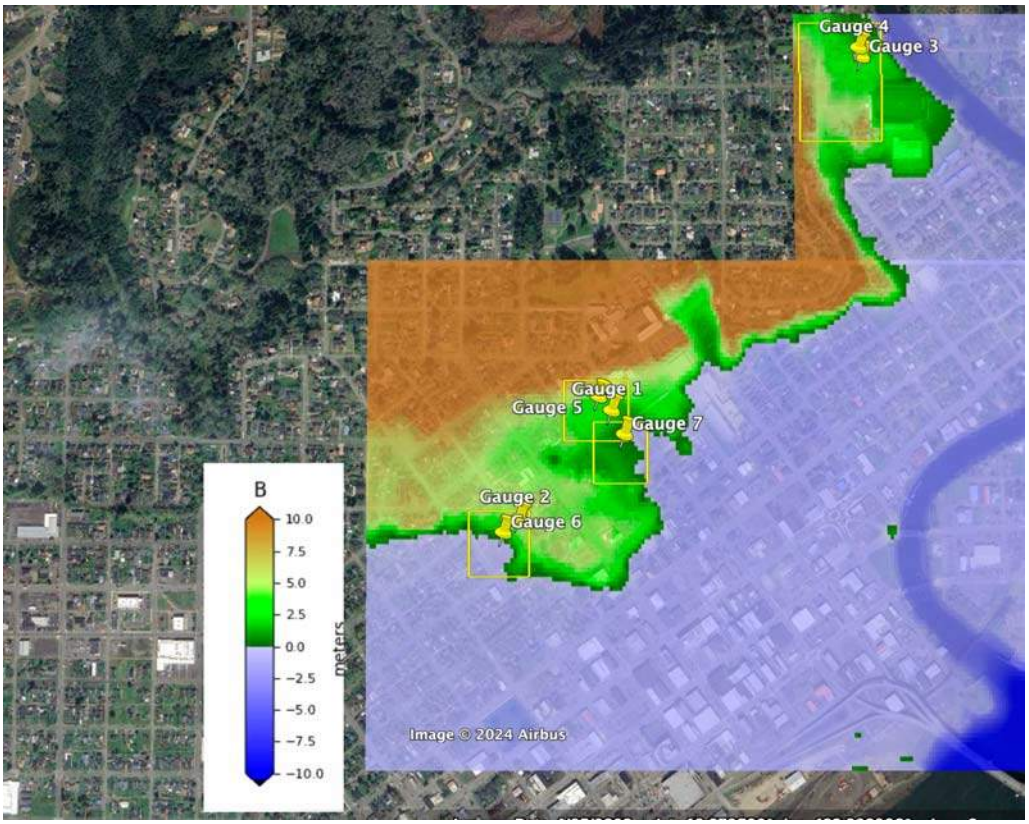
When we model for future sea-level rise (SLR), we start the ocean level at MHW+SLR where for the test run below, we used SLR=0.114 meters. This value was obtained by using the historical rise that is published for the tide station at Toke Point, WA, the closest such station where historical relative sea level rise data is available from NOAA. For this station, there was 95% confidence that the relative sea-level rise by 2125 was in the range 0.043 meters plus or minus 0.071 meters. This says there is only a 2.5% chance such a rise is greater than 0.114 meters. So, for Hoquiam with this increased ocean, after the tsunami has completed, we can expect the amount of water at a Gauge that has subsided to a B smaller than SLR to be -B+SLR meters.

Pre-quake Bathymetry

Imagery here and below from Google Earth.



Post-quake Bathymetry

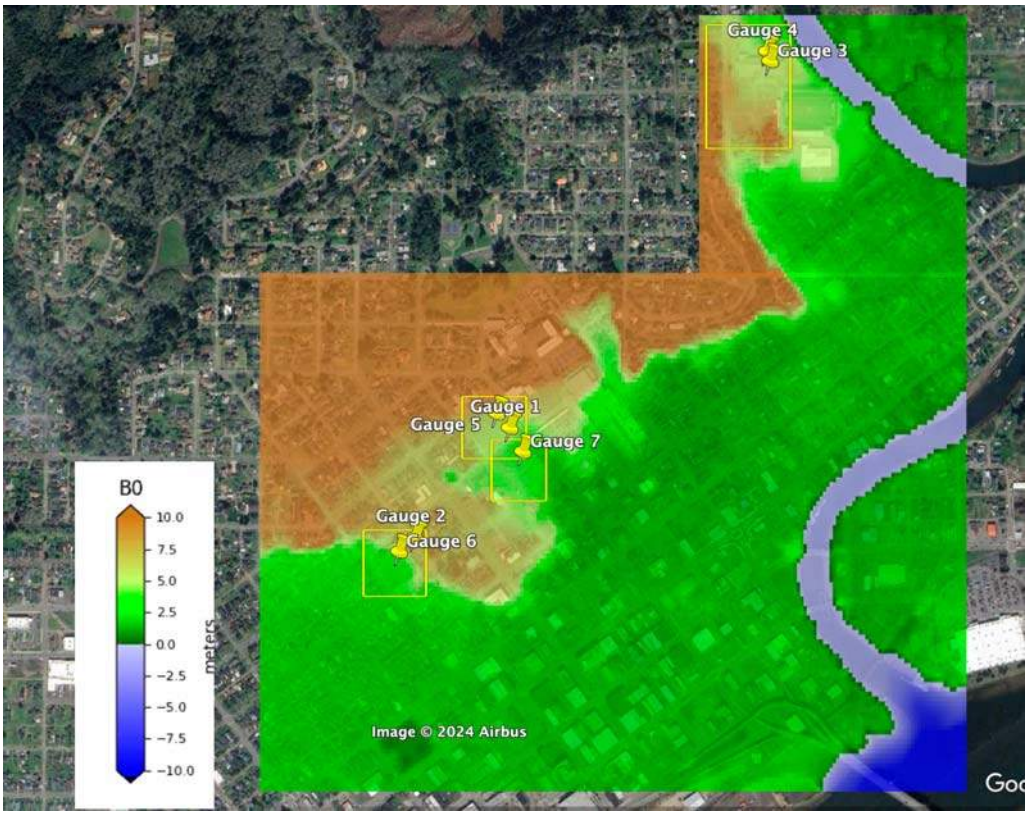


Pre- and Post- quake Bathymetry for CSZ_M1 source (meters)

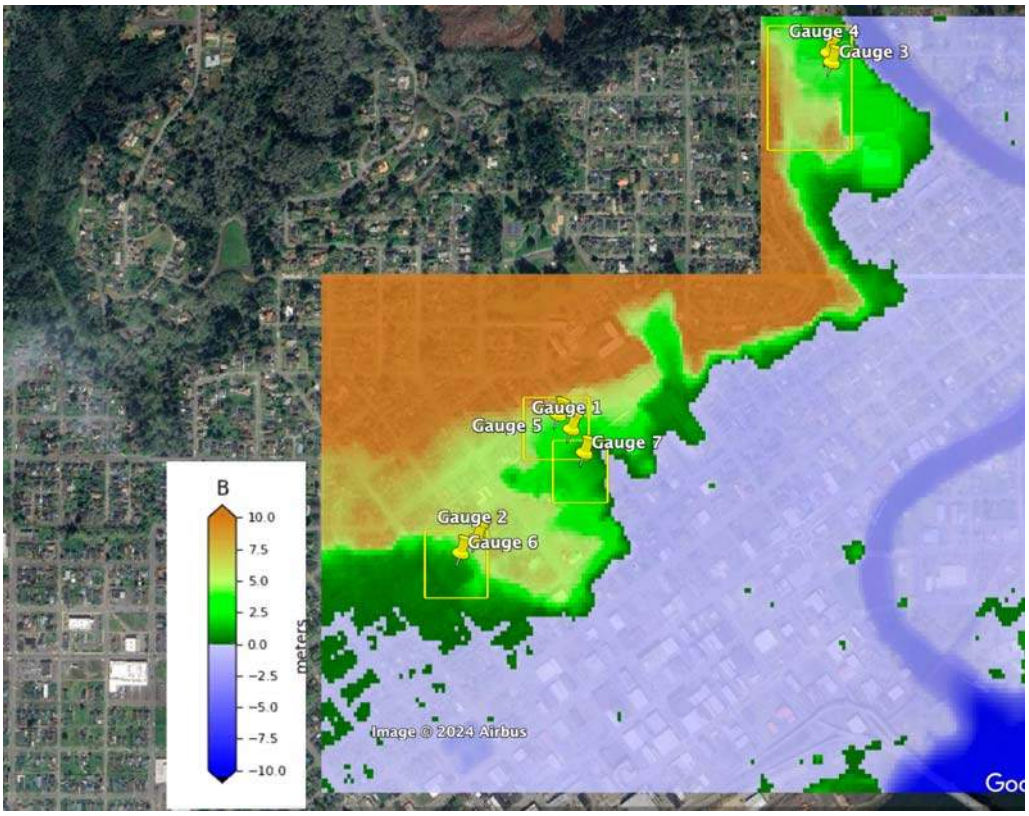
Notice that the amount of subsidence of CSZ_M1 places some of the study area at an elevation B<0. Since B=0 corresponds to MHW, these locations are below MHW. This will remain after the tsunami has ended. That is, at MHW each day after the quake, the depth of water above the subsided ground will be -B for those locations with a path to Grays Harbor for the tidal waters to reach. So, the subsidence caused by this earthquake leaves a daily threat to Aberdeen. However, there is much less of this hazard due to subsidence than was seen for CSZ_L1.

Pre-quake Bathymetry

Imagery here and below from Google Earth.



Post-quake Bathymetry



6-hr CSZ_L1-extended-pmel run with no sealevel rise (SLR) with Manning 0.025

The next set of figures show results for a six hour simulation for the CSZ_L1-extended-pmel source without any SLR. The CSZ_L1-extended-pmel source is not ASCE compatible, but is used by the building code of WA State to see if a region is in an inundation zone. This job run was at MHW and used Manning 0.025.

CSZ_L1-extended-pmel at MHW + 0.0cm

Plot index for time frames and gauges G6 depth and elevation plot G6 speed, momentum, mflux

Along Transect G1 G2 G3 G4 G5 G6 G7

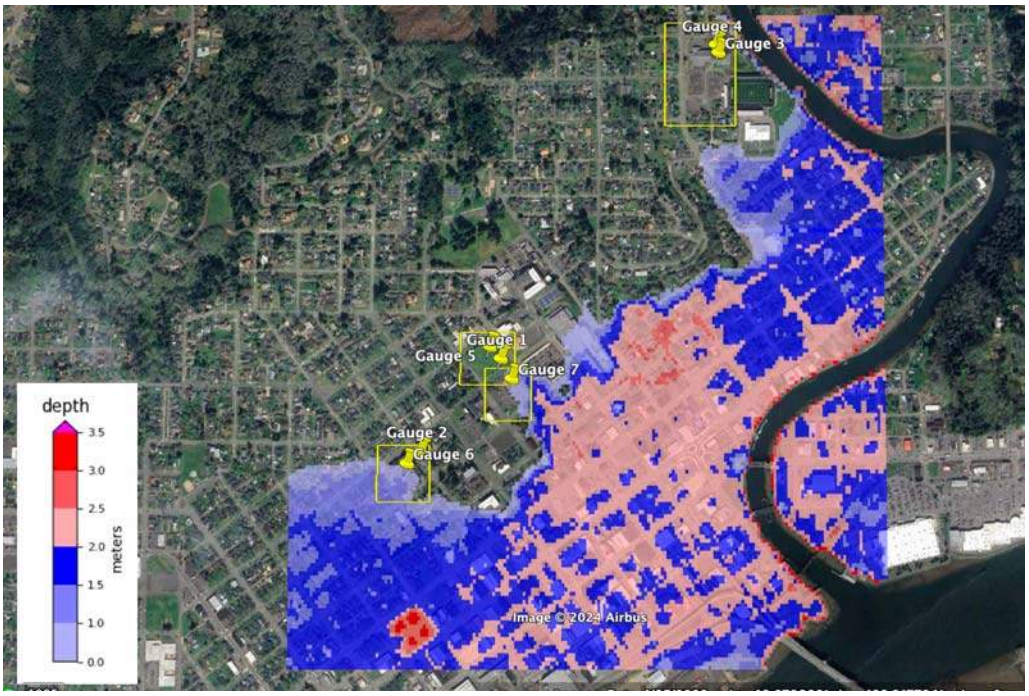
Animation from 1hr to 2hrs Animation from 0hr to 3hrs Gauges Report

B-Street kmlfiles K-Street kmlfiles I-StreetVacant kmlfiles I-StreetParking kmlfiles

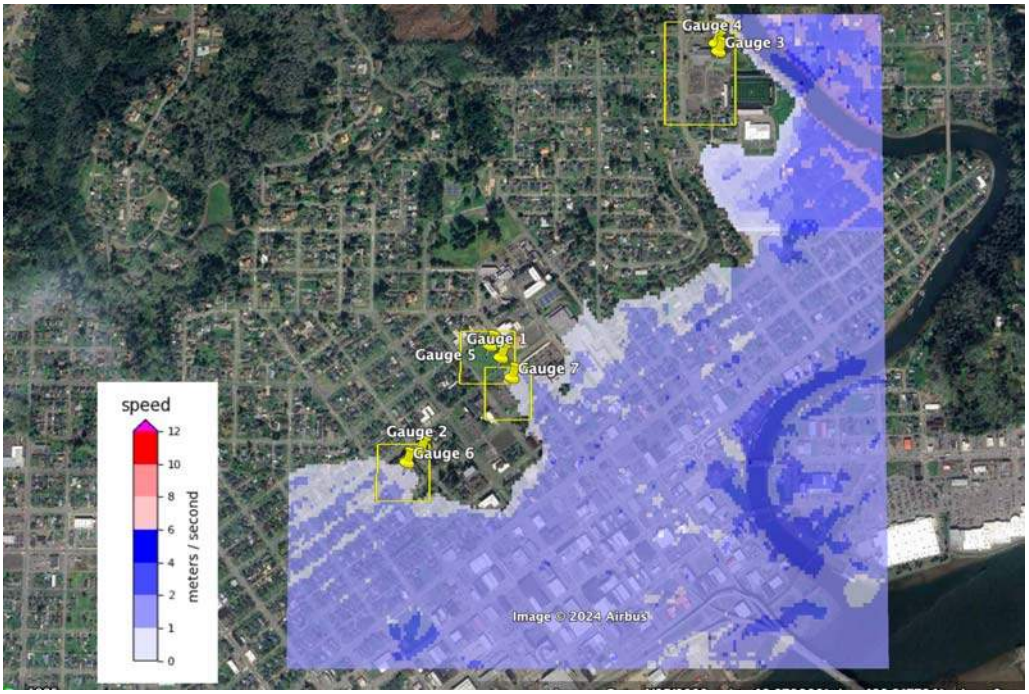
B-Street Analysis K-Street Analysis I-StreetVacant Analysis I-StreetParking Analysis

Inundation Depth

Imagery here and below from Google Earth.



Speed



CSZ_M1_noext 6 hour run with no sealevel rise (SLR) with Manning 0.025

The next set of figures show results for a six hour simulation for the CSZ_M1_noext source without any SLR. This source is not ASCE or Washington Building Code compatible, but is thought to be more likely to occur than the CSZ_L1 source. This job run was at MHW and used Manning 0.025.

CSZ_M1 at MHW + 0.0cm

Plot index for time frames and gauges Along Transect G1 G2 G3 G4 G5 G6 G7

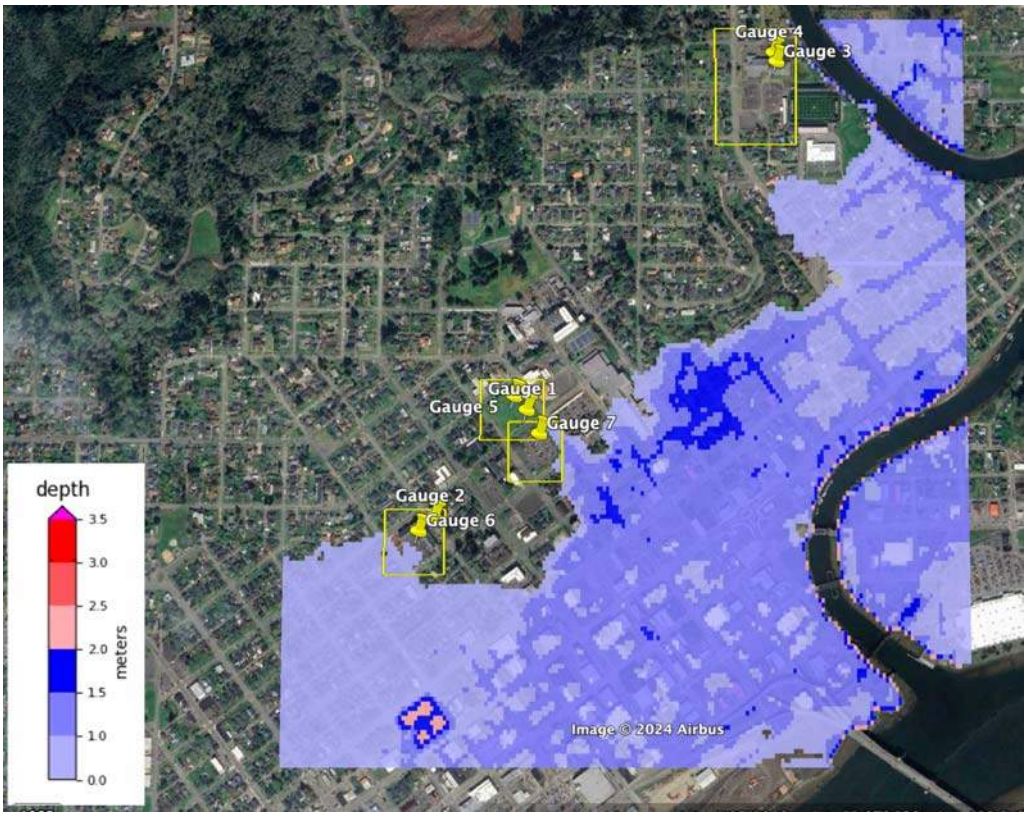
Animation from 1hr to 2hrs Animation from 0hr to 3hrs Gauges Report

B-Street kmlfiles K-Street kmlfiles I-StreetVacant kmlfiles I-StreetParking kmlfiles

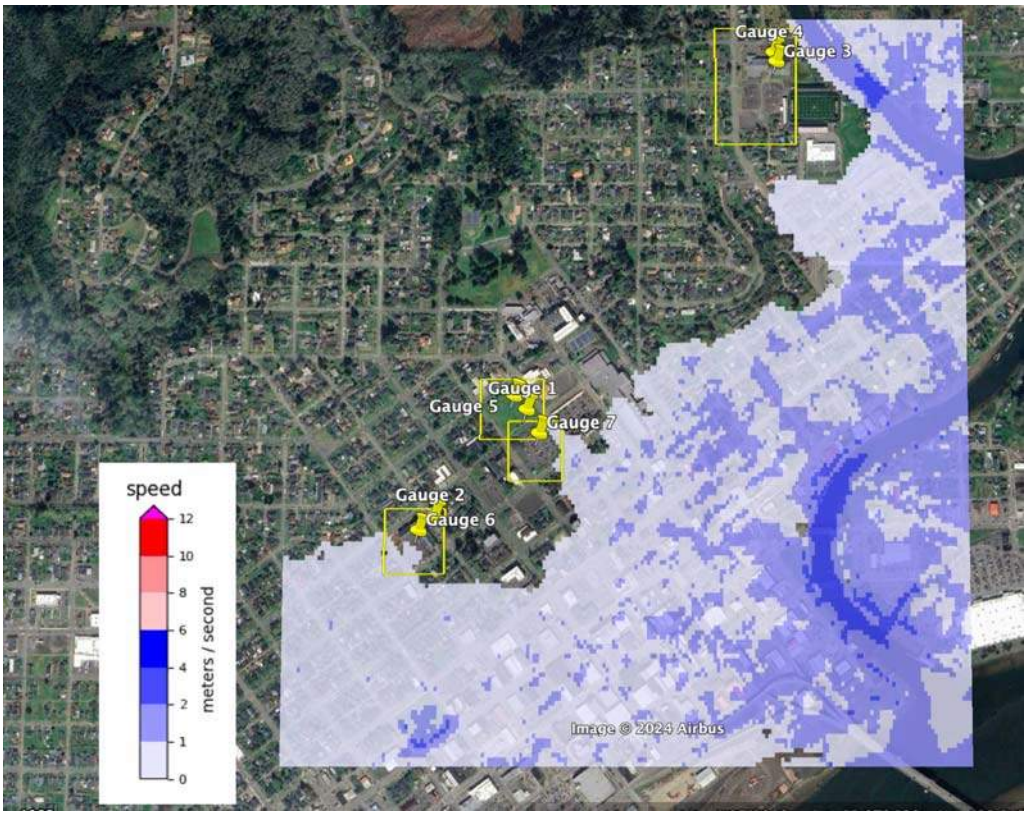
B-Street Analysis K-Street Analysis I-StreetVacant Analysis I-StreetParking Analysis

Inundation Depth

Imagery here and below from Google Earth.



Speed



CSZ_L1-extended-pmel 10hr run with sealevel rise (SLR=0.114m) with Manning 0.025

The next set of figures show results for a 10 hour simulation for the CSZ_L1-extended-pmel source using SLR=0.114 meters. The CSZ_L1-extended-pmel source is not ASCE compatible, but is used by the building code of WA State to see if a region is in an inundation zone. This job run was at MHW+0.114m and used Manning 0.025.

CSZ_L1-extended-pmel at MHW + 11.4cm

Plot index for time frames and gauges G6 depth and elevation plot G6 speed, momentum, mflux

Along Transect G1 G2 G3 G4 G5 G6 G7

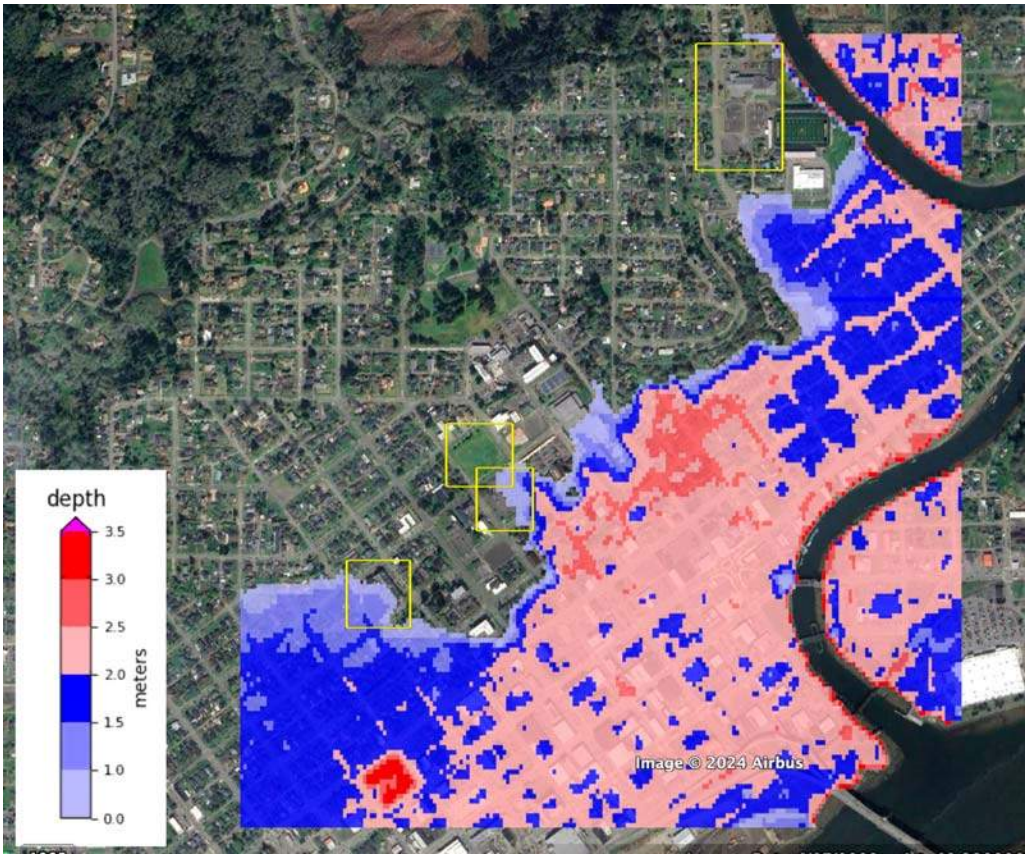
Animation from 1hr to 2hrs Animation from 0hr to 3hrs Gauges Report

B-Street kmlfiles K-Street kmlfiles I-StreetVacant kmlfiles I-StreetParking kmlfiles

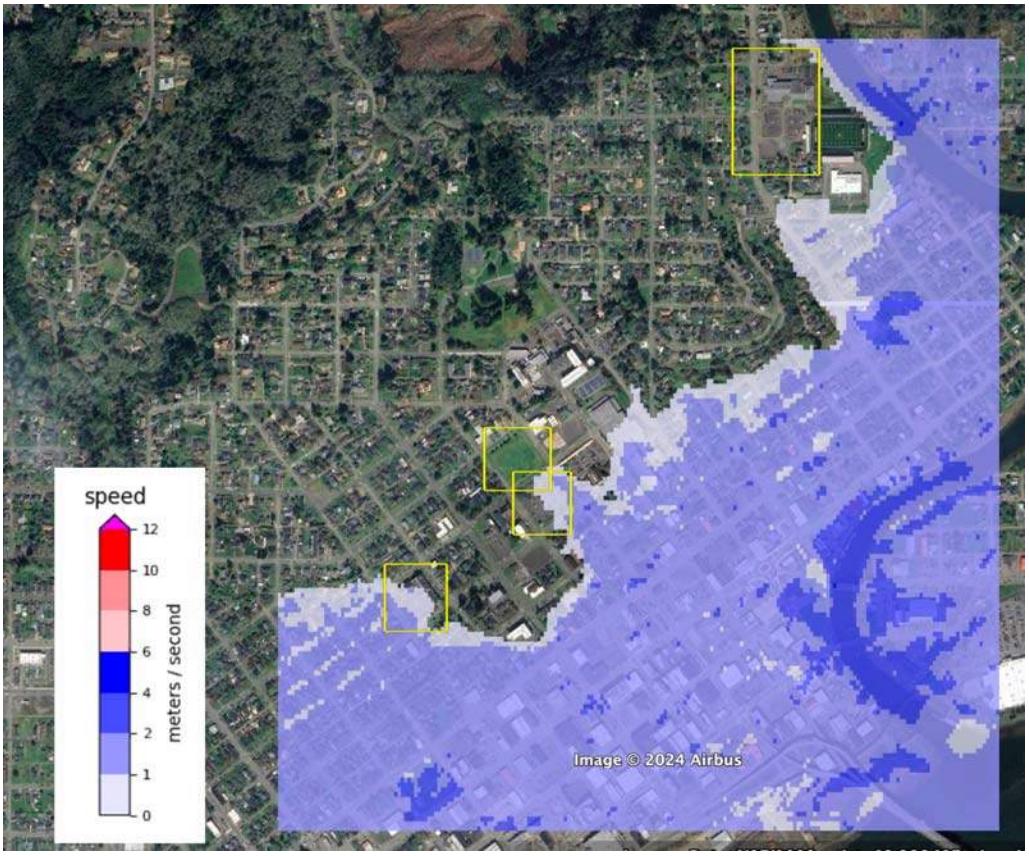
B-Street Analysis K-Street Analysis I-StreetVacant Analysis I-StreetParking Analysis

Inundation Depth

Imagery here and below from Google Earth.



Speed



L1up_x1.117 10hr run with sealevel rise (SLR=0.114m) with Manning 0.025

The next set of figures show results for a 10 hour simulation for the L1up_x1.117 source using SLR=0.114 meters. The L1up_x1.117 is both ASCE 7-22 and 2021 WA State Building Code compatible. This job was run at MHW+0.114m and used Manning 0.025.

L1up_x1.117 at MHW + 11.4cm

Plot index for time frames and gauges G6 depth and elevation plot G6 speed, momentum, mflux

Along Transect G1 G2 G3 G4 G5 G6 G7

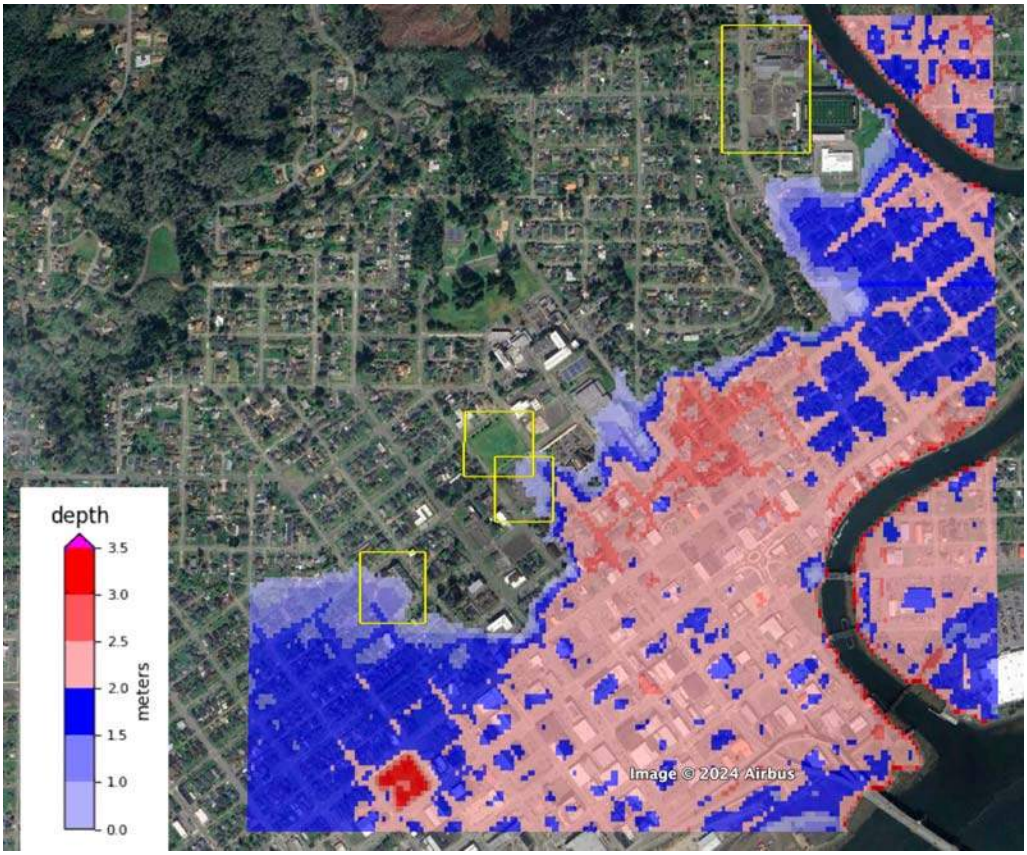
Animation from 1hr to 2hrs (Transect G1) Animation from 0hr to 3hrs (Transect G1) Animation from 1hr to 6hrs (Transect G6)
Gauges Report

B-Street kmlfiles K-Street kmlfiles I-StreetVacant kmlfiles I-StreetParking kmlfiles

B-Street Analysis K-Street Analysis I-StreetVacant Analysis I-StreetParking Analysis

Inundation Depth

Imagery here and below from Google Earth.



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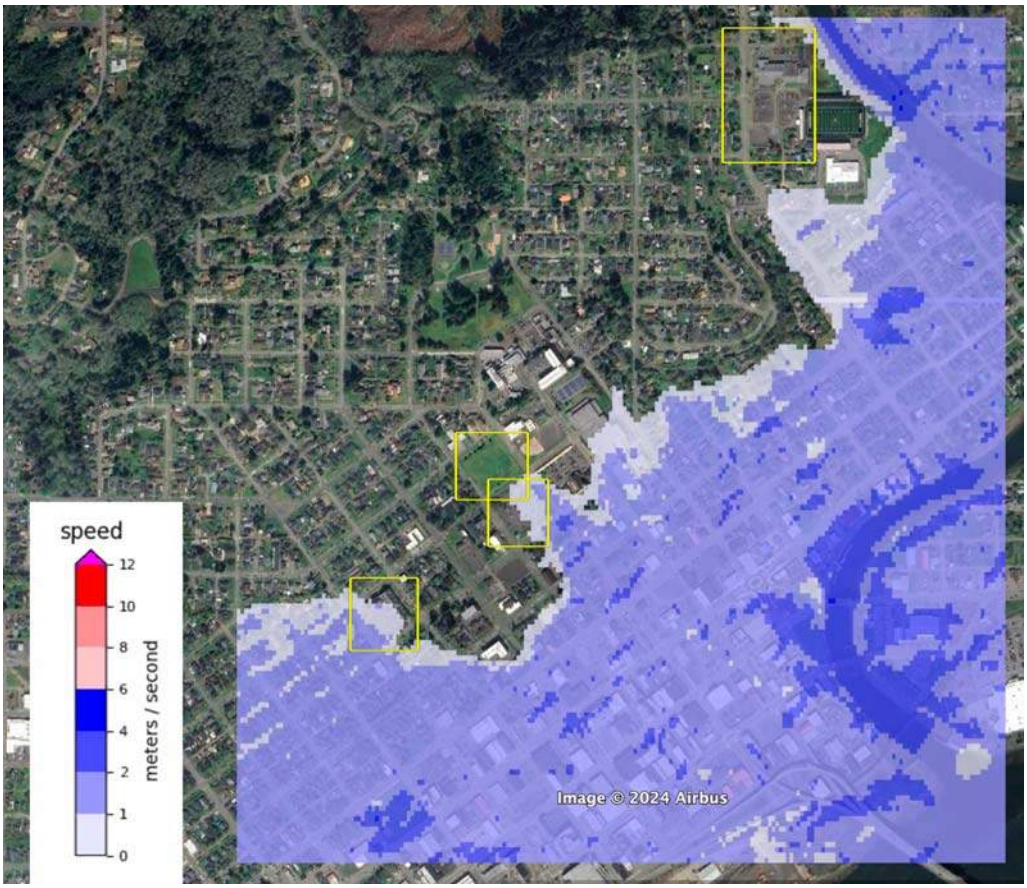
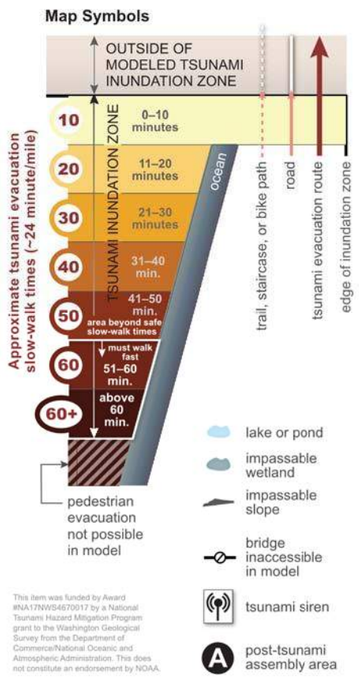
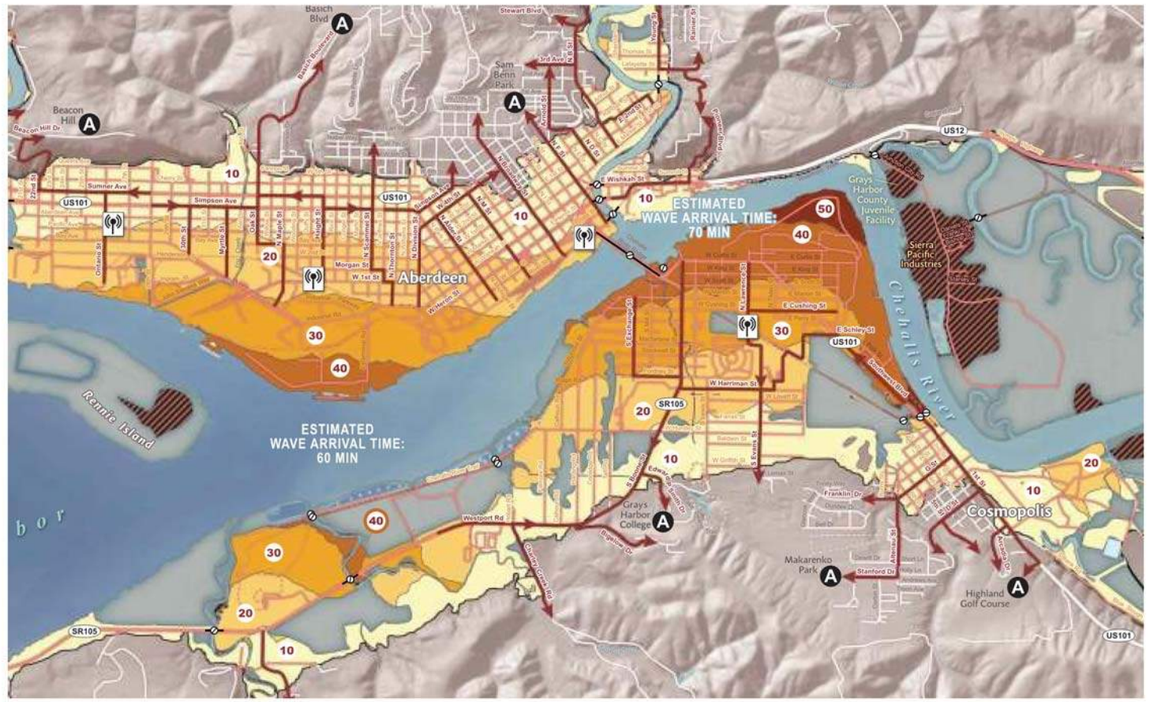

speed
12
10
8
6
4
2
1
0
meters / second
Image © 2024 Airbus

Tsunami Tower Infographics





Aberdeen School District
Phase 1 Tsunami Evacuation Planning

Background Resources

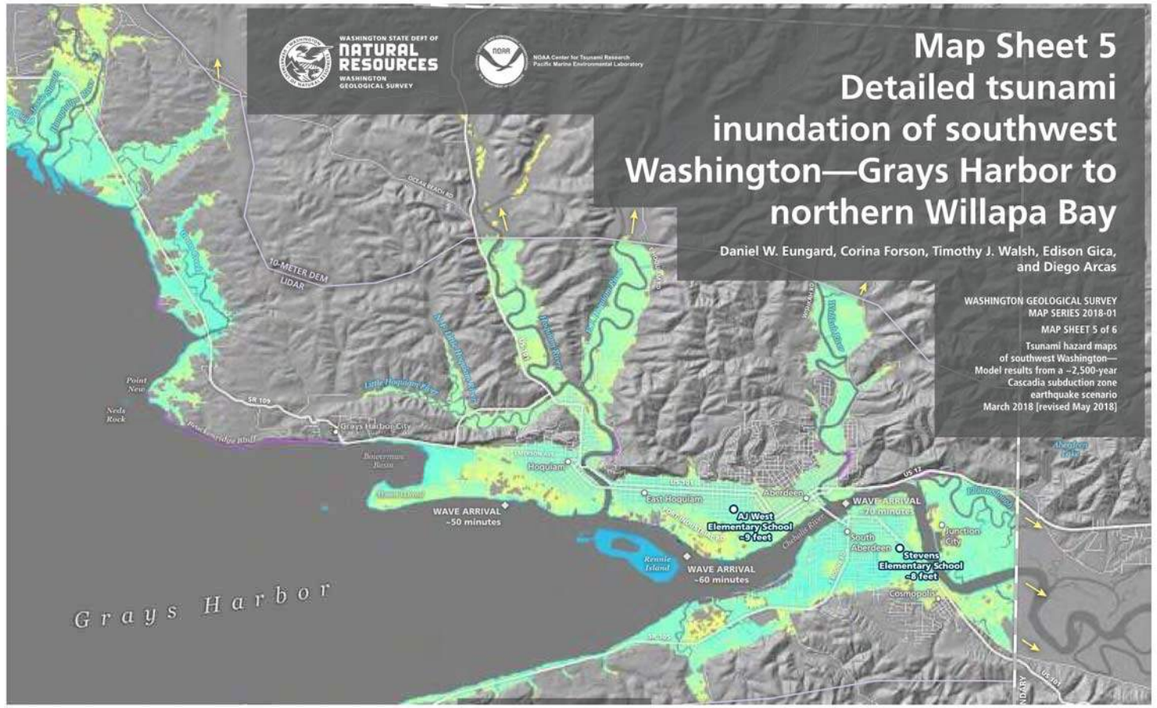
WA Department of Natural Resources (WA DNR)

Aberdeen, Hoquiam, and Cosmopolis Tsunami Evacuation Walk Times
(see upper left, assumes 2.5 MPH walk speed)
https://www.dnr.wa.gov/programs-and-services/geology/geologic-hazards/tsunamis#tsunami-evacuation-maps

https://fortress.wa.gov/dnr/geologydata/tsunami_walkmaps/ger_tsunami_walkmap_aberdeen_hoquiam_cosmopolis.pdf

Detailed Tsunami Inundation of Southwest Washington
(see lower left)
https://www.dnr.wa.gov/programs-and-services/geology/geologic-hazards/tsunamis#tsunami-hazard-maps

https://www.dnr.wa.gov/publications/ger_ms2018-01_tsunami_hazard_southwest_washington.zip
(download ZIP folder, see Sheet 5)



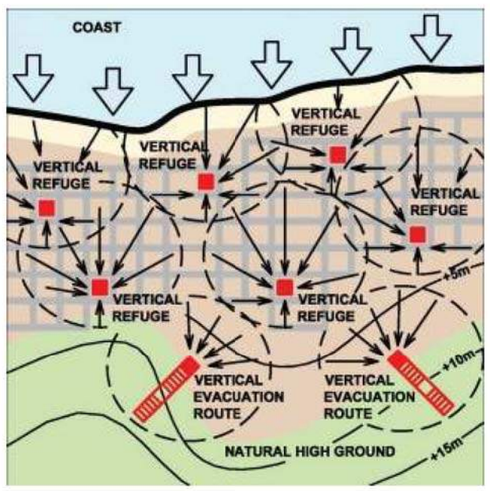


Figure 5-1 Vertical evacuation refuge locations considering travel distance, evacuation behavior, and naturally occurring high ground. Arrows show anticipated vertical evacuation routes.

FEMA

Guidelines for Design of Structures for Vertical Evacuation from Tsunamis
(siting consideration graphic at left)
Assume 2 MPH walking speed, 10 square foot per occupant

https://www.fema.gov/sites/default/files/2020-08/fema_earthquakes_guidelines-for-design-of-structures-for-vertical-evacuation-from-tsunamis-fema-p-646.pdf

Aberdeen SD - Phase 1
Tsunami Evacuation Planning
April 1, 2024

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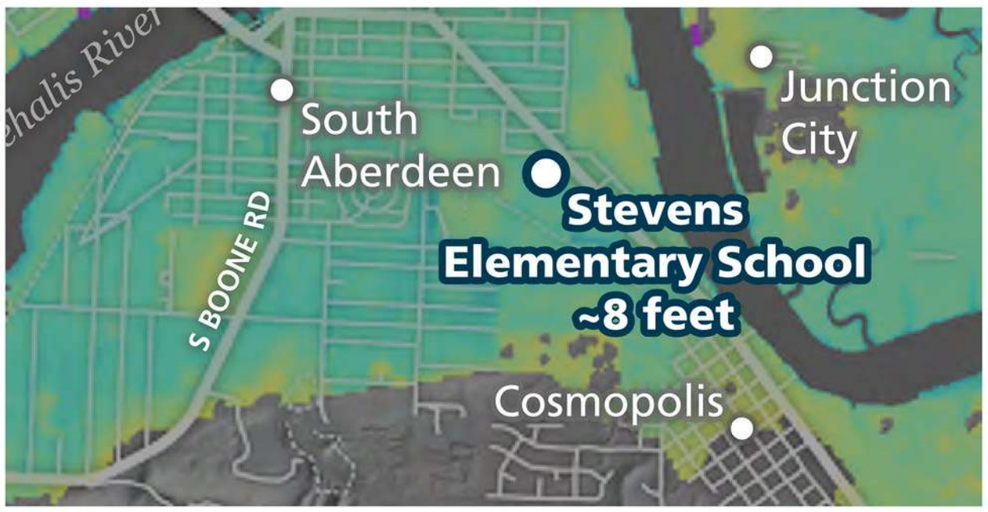
www.degenkolb.com







Stevens Elementary

Inundation Depth ~9 feet
Evacuation Tower Height ~25 feet

Arrival Time ~70 minutes
Evacuation Distance 1.02 miles
Travel Time ~40 minutes
(assume 10 min to evacuate building and 2 mph walk speed)

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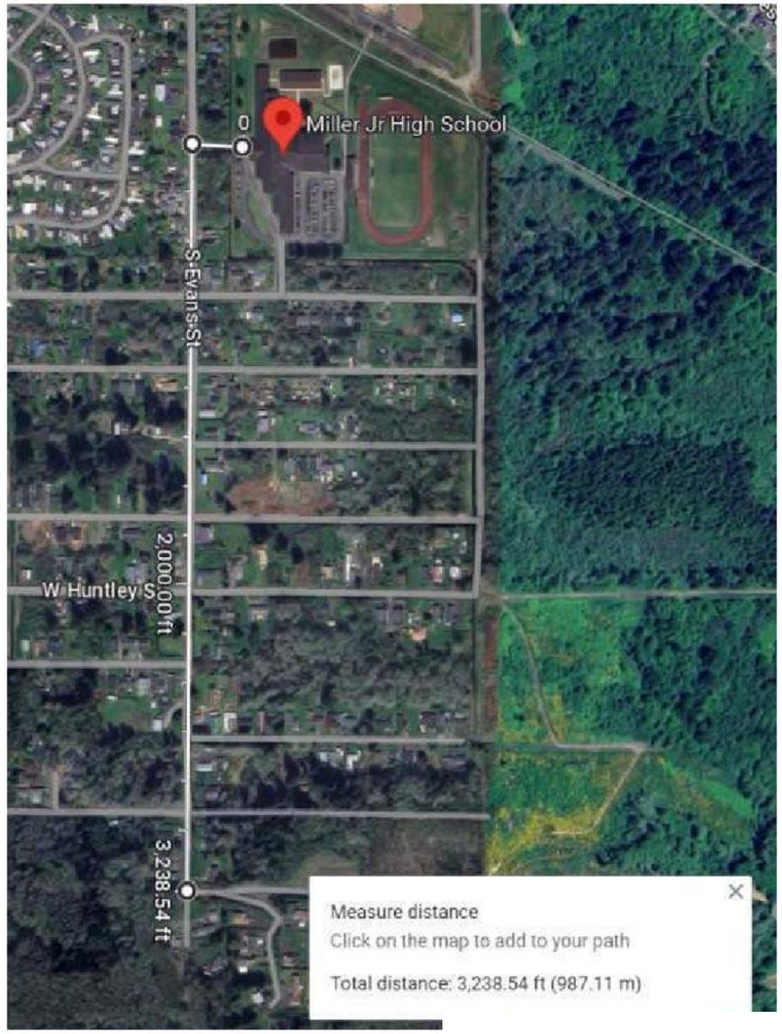

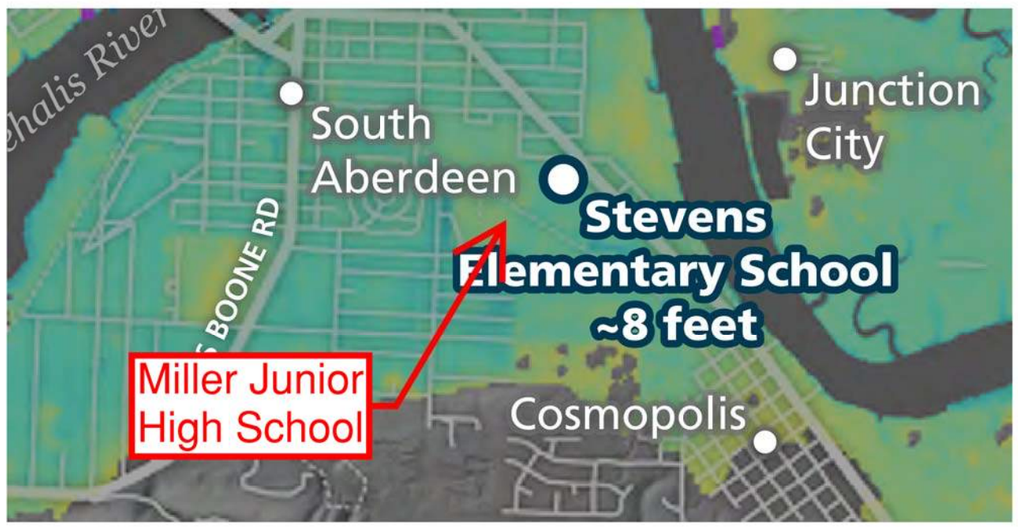

Miller Jr High School

Inundation Depth ~9 feet
Evacuation Tower Height ~25 feet

Arrival Time ~70 minutes
Evacuation Distance 0.61 miles
Travel Time ~30 minutes
(assume 10 min to evacuate building and 2 mph walk speed)

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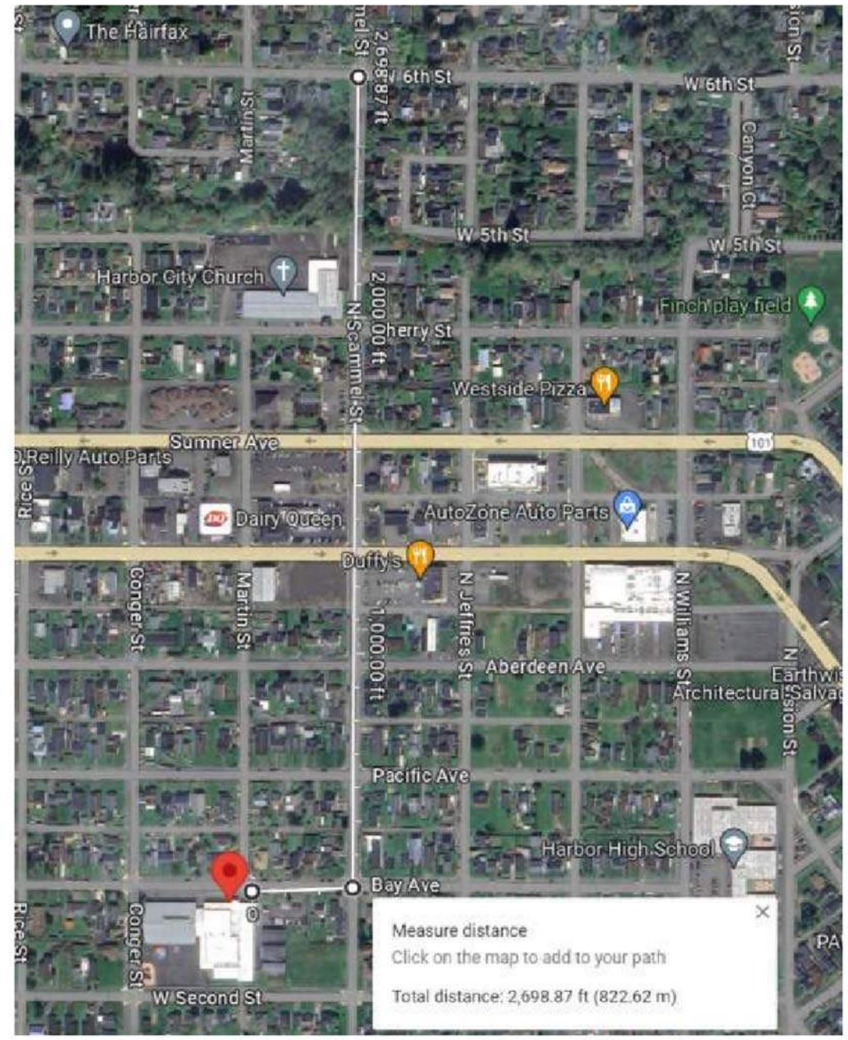

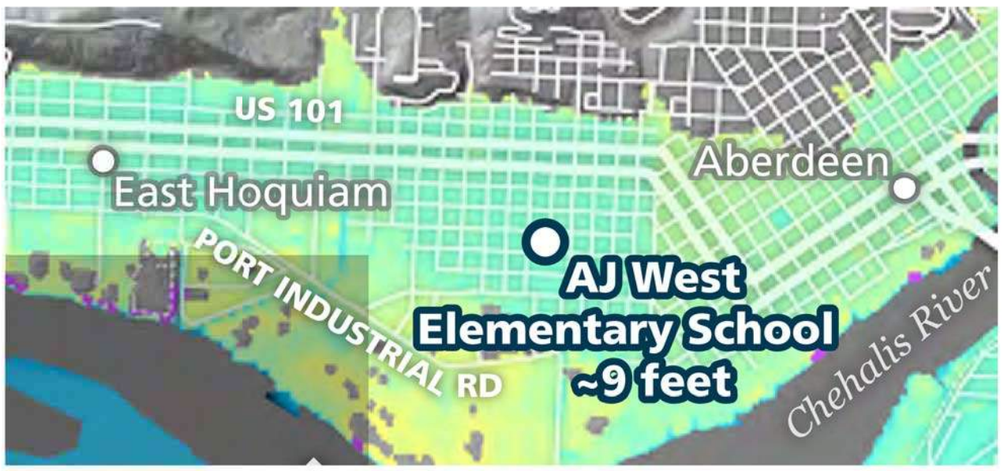

A J West Elementary School

Inundation Depth ~9 feet
Evacuation Tower Height ~25 feet

Arrival Time ~60 minutes
Evacuation Distance 0.51 miles
Travel Time ~25 minutes

(assume 10 min to evacuate building and 2 mph walk speed)

Aberdeen SD - Phase 1
Tsunami Evacuation Planning
April 1, 2024

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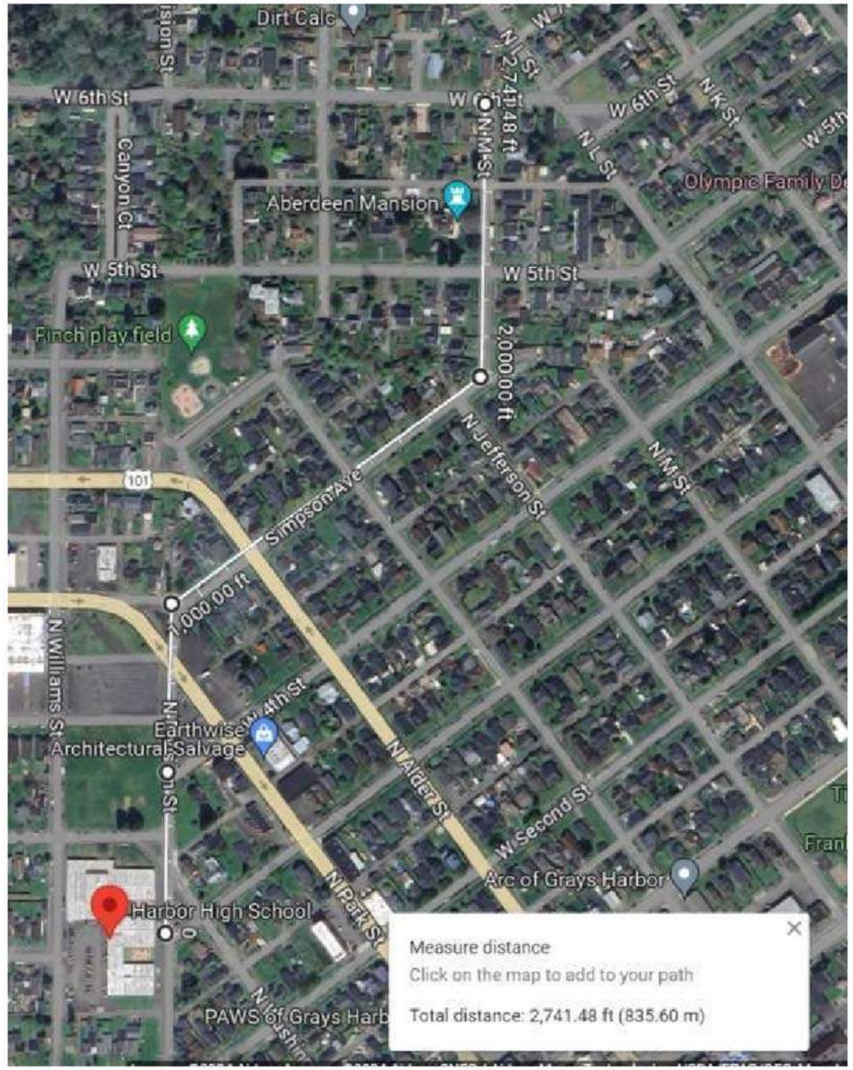

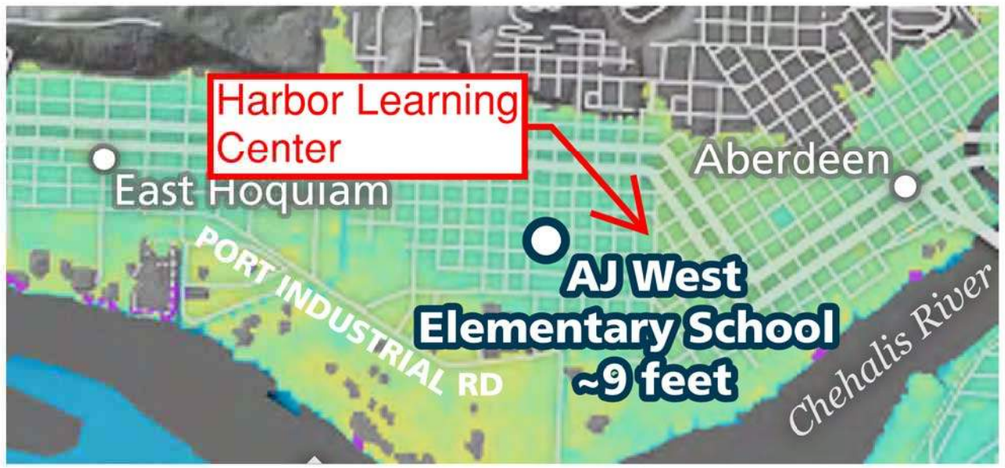

Harbor Learning Center

Inundation Depth ~9 feet
Evacuation Tower Height ~25 feet

Arrival Time ~60 minutes
Evacuation Distance 0.52 miles
Travel Time ~25 minutes

(assume 10 min to evacuate building and 2 mph walk speed)

Aberdeen SD - Phase 1
Tsunami Evacuation Planning
April 1, 2024

Degenkolb
DEGENKOLB ENGINEERS
600 University Street, Suite 1001
Seattle, WA 98101
206.262.9240 PHONE
www.degenkolb.com



Port Considerations - Debris Source

Applicable for all sites, particularly A J West and Harbor Learning Center

Aberdeen SD - Phase 1
Tsunami Evacuation Planning
April 1, 2024

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Capital Levy Master Planning

Aberdeen School District 5

2026-2029 Projects



20 November 2024

TCF Project No. 2024-002.01

Table of Contents

Executive Summary Section 1

Cost Estimate Section 2

A. Cost Summary
B. Miller Junior High School
C. Stevens Elementary School
D. AJ West Elementary School
E. Harbor Learning Center (Hopkins Building)
F. McDermoth Elementary School
G. Robert Gray Elementary School
H. Central Park Elementary School
I. Aberdeen High School
J. Administration Building
K. Maintenance Building
L. Stewart Building
M. Stewart Field

Prioritizations & Action Plan Section 3

A. Overview
B. Cost Estimate Prioritization Matrix
C. Miller Junior High School, Stevens Elementary School, AJ West Elementary School and Harbor Learning Center (Hopkins Building)
D. McDermoth Elementary School
E. Robert Gray Elementary School
F. Central Park Elementary School
G. Aberdeen High School
H. Administration Building
I. Maintenance Building
J. Stewart Building
K. Stewart Field
L. District Wide

Appendix

A. Additional Cost Item Information

1 | EXECUTIVE SUMMARY

Introduction

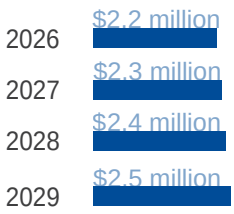
This Capital Levy Master Planning effort reviews Aberdeen School District facilities to establish cost-based priorities tandem to the OSPI School Seismic Safety Grant and Site Feasibility Report.

Findings include a cost list that covers safety & security; roofs & building envelope; accessibility; site features; mechanical, electrical, plumbing and telecommunications; and food service.

These costs are broken down per facility in a Cost Estimate Prioritization Matrix provided in Section 3 Prioritizations & Action Plan. Each cost is given a cost identification label and a priority range of low, medium or high priority. The breakdown was established by stakeholder input over a series of meetings, the timing of Washington State SCAP (School Construction Assistance Program), the Seismic Safety Grant, and Capital Levy funding. Available Levy Funds and the Yearly Project Budget are listed by year, in the matrix, from 2026 to 2029. In the facility summary cost list below, costs are arranged under High, Medium, or Low Priority, with the proposed year to budget for it.

Since the OSPI School Seismic Safety Grant funding is happening simultaneously with this effort, some costs are recommended to be deferred due to a facility's phased school replacement or seismic retrofit. Deferred cost items are not listed here, they are discussed in detail in Section 3. Additionally, there are cost items that are desired but do not fit into the current district levy funding budget. These are specific only to the Administration Building and Stewart Building and are discussed in Section 3.

CAPITAL LEVY FUNDING



See Cost Estimate Prioritization Matrix for exact cost totals.

Facility Priority Cost List

The highest priority projects are recommended to be addressed beginning in 2026. Additional priority projects are recommended to follow each consecutive year thereafter. There are some variations to this approach based on certain factors, see each list by facility for more information.

Miller Junior High, Stevens Elementary, AJ West Elementary, and Harbor Learning Center (Hopkins Building) are slated for school replacement, only the most urgent needs will be addressed at their current facility.

» High Priority:
- M-44.1, S-44.1, AJ-44.1, H-44.1 - Intercom Replacment

McDermoth Elementary – is likely to be converted to a district office/ district staff hub location, cost priorities are as follows:

» High Priority:
- MC-44.1 – Intercom Replacement is to be a 2026 cost.

» Medium Priority:
- MC-21.1B – Entry Camera/Intercom/Door Release is to be a 2026 cost.

» Low Priority:
- MC-25.1 – Elevator is to be a 2029 cost.

Robert Gray Elementary – is planned for seismic retrofit, cost priorities are as follows:

» High Priority:
- RG-21.1 – Vestibule is to be a 2026 cost.
- RG-44.1 – Intercom Replacement is to be a 2026 cost.

» Medium Priority:
- RG-43.1 – Access Control is to be a 2029 cost.

» Low Priority:
- RG-01 – Replace Ramp at portable to be a 2027 cost.

Central Park Elementary – is planned for seismic retrofit or replacement, cost priorities are as follows:

» High Priority:
- CP-01 – Replace playground equipment is to be a 2027 cost.
- CP-44.1 – Intercom Replacement is to be a 2026 cost.

Aberdeen High School – has no current recommended need for seismic retrofit or replacement, cost priorities are as follows:

» High Priority:
- HS-01 – Parking Lot – South lot is to be a 2026 cost.
- HS-02 – Ramp / Sidewalk repairs – South entry is to be a 2026 cost.
- HS-21.1 – Vestibule is to be a 2026 cost.
- HS-44.1 – Intercom Replacement is to be a 2026 cost.

» Medium Priority:
- HS-11B – Re-roof ¼ of building is to be a 2027 cost.
- HS-11C – Re-roof ¼ of building is to be a 2028 cost.
- HS-11D – Re-roof ¼ of building is to be a 2029 cost.
- HS-43.1 – Access Control is to be a 2029 cost.

» Low Priority:
- HS-03 – Resurface Tennis Courts is to be a 2029 cost.

Administration Building – has no current recommended need for seismic retrofit or replacement, cost priorities are as follows:

» High Priority:
- A-02 – Replace existing ramp is a 2026 cost.
- A-21.B – Entry Camera/Intercom/Door Release is to be a 2026 cost.

» Medium Priority:
- A-01 – Sidewalk repair is to be a 2028 cost.
- A-12 – Walls – Seal exterior brick/masonry/concrete walls and paint wood/doors and frames is a 2029 cost.

Should McDermoth Elementary be repurposed as a district administration building, these funds could be redistributed.

Maintenance Building – has no current recommended need for seismic retrofit or replacement, cost priorities are as follows:

» High Priority:
- MA-41 – HVAC is to be a 2028 cost.

Stewart Building – has no current recommended need for seismic retrofit or replacement, cost priorities are recommended to be deferred.

Stewart Field – cost priorities are as follows:

» Medium Priority:
- SF-02 – Parking Lot Repair is to be a 2029 cost.
- SF-11 – Replace All Roofs is to be a 2028 cost.

» Low Priority:
- SF-01 – Retaining Wall Repairs is to be a 2027 cost.
- SF-21 – Wood Structure Repairs is to be 2027 cost.

District Wide – A portion of funds have been budgeted for an annual district wide use in facility upgrades and replacement; these cost priorities are as follows:

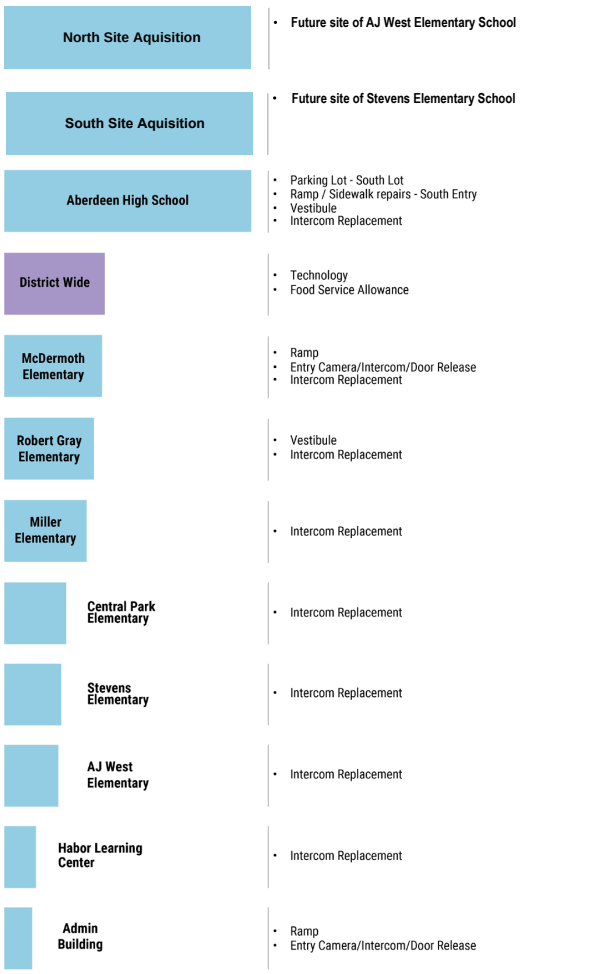
- ASD-00 – Technology at a $250,000 annual budget
- ASD-01 – Food Service Allowance at a $100,000 annual budget

Next Steps

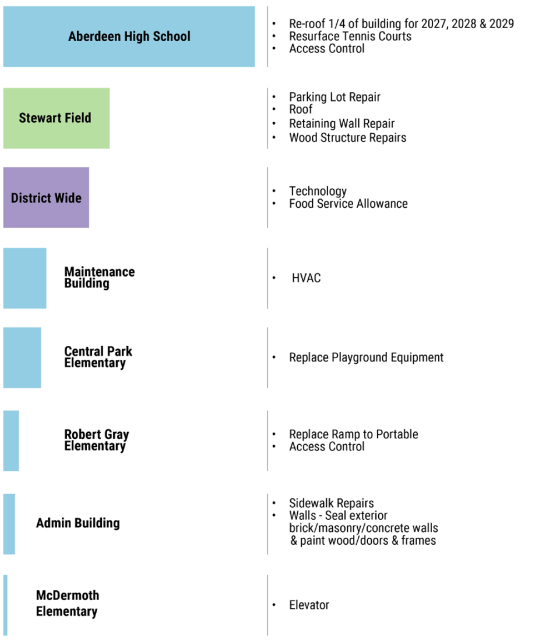
Upon completion of this Master Planning report next steps can be made regarding additional efforts for each facility including:

- Present information on study to stakeholders for input and buy in on planned improvements
- Establish a phasing and scheduling timeline for design and construction

HIGHEST PRIORITY PROJECTS 2026



2027 - 2029 PROJECTS



Note that the projects identified as HIGHEST PRIORITY PROJECTS 2026 and 2027-2029 PROJECTS are listed in descending order of potential magnitude of scope and cost.

SECTION 2: Cost Estimate

Cost Summary

A cost estimate has been done for each facility. Each cost is listed with a cost identification number. This estimate is established on the assumption that these are all 2026 costs, and that the construction start date is June 2026. It includes escalation, which is set to an annual rate of 4.5%. Further clarifications and assumptions are provided on page 2 of the Master Plan Cost Estimates report.

In Section 3 Prioritizations & Action Plan, a Cost Estimate Prioritization Matrix lists out these costs by year with escalation. See this section for the proposed approach to budget these within a 2026 to 2029 project timeframe.

COST GROUP

ABERDEEN SCHOOL DISTRICT
MASTERPLANNING
ABERDEEN, WA
MASTER PLAN COST ESTIMATES

ESTIMATE ISSUE DATE: August 13, 2024
ESTIMATE REVISION:

Submitted To:

ANDREW HICKMAN
TCF ARCHITECTURE
124 NORTH I STREET
98403

CLARIFICATIONS AND ASSUMPTIONS

RC Cost Group Estimating Team:

Lead Estimator: Mark Richardsin
Architectural: Mark Richardsin
Structural: Mark Richardson
Mechanical: Neil Watson
Electrical: Neil Watson
Civil: RC Cost Group
Landscape: RC Cost Group
QA/QC: Andy Cluness

Exclusions from Construction Cost:

Design fees
Owners administration costs
Hazardous material removal
Legal and accounting fees
Owner's furniture, furnishings and equipment
Owners supplied materials
Moving owners equipment and furniture
Compression of schedule, premium or shift work
Assessments, finance, legal and development charges
Builder's risk, project wrap-up and other owner provided insurance program
Washington State Sales Tax

Assumption used in establishing the estimate:

The project will be procured utilizing the Design, Bid, Build Delivery Method
Open and competitive bidding among all proportions of the work
Construction Start Date: June 2026
Escalation has been included to start of construction access June 2026
Annual Rates of Year 1: 4.5%/yr

Items that may affect the cost estimate:

Modifications to the scope of work included in this estimate.
Special phasing requirements other than mentioned above.
Restrictive technical specifications or excessive contract conditions.
Any non-competitive bid situations.
Bids delayed beyond the projected schedule.

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTALS
M-31 - iCOMBI PRO 20 OVEN				
iCombi Pro Oven	1	LS	47,500.00	47,500
Sub-Total Direct Cost				**47,500**
Estimating/Design Contingency	5.00%	$	2,375	
General Conditions/General Requirements	15.00%	$	7,481	
Phasing/Multiple Locations	5.00%	$	2,868	
General Contractor's Overhead and Profit	8.75%	$	5,270	
Sub-Total				**65,494**
Escalation-start of construction access June 2026	8.25%	$	5,400	
Construction Cost M-31				**70,894**
M-32 - IMMERSION BLENDER - ROBOT COUPE				
Immersion Blender - Robot Coupe	1	LS	1,000.00	1,000
Sub-Total Direct Cost				**1,000**
Estimating/Design Contingency	5.00%	$	50	
General Conditions/General Requirements	15.00%	$	158	
Phasing/Multiple Locations	5.00%	$	60	
General Contractor's Overhead and Profit	8.75%	$	111	
Sub-Total				**1,379**
Escalation-start of construction access June 2026	8.25%	$	114	
Construction Cost M-32				**1,493**

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTALS
S-11 - ROOF				
Demolish roof assembly to plywood deck	500	SF	1.55	775
Allow for minor plywood replacement-10%	50	SF	12.00	600
Coverboard	500	SF	4.82	2,410
R-38 rigid insulation	500	SF	7.90	3,950
Tapering insulation allow	1	LS	562.50	563
3-Ply SBS Modified Roof	500	SF	12.90	6,450
Seal/flash roof penetrations, curbs, vents	500	SFA	1.15	575
Sub-Total Direct Cost				**15,323**
Estimating/Design Contingency	5.00%	$	766	
General Conditions/General Requirements	15.00%	$	2,413	
Phasing/Multiple Locations	5.00%	$	925	
General Contractor's Overhead and Profit	8.75%	$	1,700	
Sub-Total				**21,127**
Escalation-start of construction access June 2026	8.25%	$	1,742	
Construction Cost S-11				**22,869**
S-31 - iCOMBI PRO 20 OVEN				
iCombi Pro Oven	1	LS	35,000.00	35,000
Sub-Total Direct Cost				**35,000**
Estimating/Design Contingency	5.00%	$	1,750	
General Conditions/General Requirements	15.00%	$	5,513	
Phasing/Multiple Locations	5.00%	$	2,113	
General Contractor's Overhead and Profit	8.75%	$	3,883	
Sub-Total				**48,258**
Escalation-start of construction access June 2026	8.25%	$	3,979	
Construction Cost S-31				**52,238**
S-32 - IMMERSION BLENDER - ROBOT COUPE				
Immersion Blender - Robot Coupe	1	LS	1,000.00	1,000
Sub-Total Direct Cost				**1,000**
Estimating/Design Contingency	5.00%	$	50	
General Conditions/General Requirements	15.00%	$	158	
Phasing/Multiple Locations	5.00%	$	60	
General Contractor's Overhead and Profit	8.75%	$	111	
Sub-Total				**1,379**
Escalation-start of construction access June 2026	8.25%	$	114	
Construction Cost S-32				**1,493**

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTALS
S-33 - FOOD PROCESSOR C50 - ROBOT COUPE				
Food Processor C50 - Robot Coupe	1	LS	4,500.00	4,500
Sub-Total Direct Cost				**4,500**
Estimating/Design Contingency	5.00%	$	225	
General Conditions/General Requirements	15.00%	$	709	
Phasing/Multiple Locations	5.00%	$	272	
General Contractor's Overhead and Profit	8.75%	$	499	
Sub-Total				**6,205**
Escalation-start of construction access June 2026	8.25%	$	512	
Construction Cost S-33				**6,716**
S-34 - WARMING OVEN - SERVOLIFT				
Warming Oven - Servolift	1	LS	5,000.00	5,000
Sub-Total Direct Cost				**5,000**
Estimating/Design Contingency	5.00%	$	250	
General Conditions/General Requirements	15.00%	$	788	
Phasing/Multiple Locations	5.00%	$	302	
General Contractor's Overhead and Profit	8.75%	$	555	
Sub-Total				**6,894**
Escalation-start of construction access June 2026	8.25%	$	568	
Construction Cost S-34				**7,463**

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTALS
AW-31 - IMMERSION BLENDER - ROBOT COUPE				
Immersion Blender - Robot Coupe	1	LS	1,000.00	1,000
Sub-Total Direct Cost				**1,000**
Estimating/Design Contingency	5.00%	$	50	
General Conditions/General Requirements	15.00%	$	158	
Phasing/Multiple Locations	5.00%	$	60	
General Contractor's Overhead and Profit	8.75%	$	111	
Sub-Total				**1,379**
Escalation-start of construction access June 2026	8.25%	$	114	
Construction Cost AW-31				**1,493**
AW-32 - FOOD PROCESSOR C50 - ROBOT COUPE				
Food Processor C50 - Robot Coupe	1	LS	4,500.00	4,500
Sub-Total Direct Cost				**4,500**
Estimating/Design Contingency	5.00%	$	225	
General Conditions/General Requirements	15.00%	$	709	
Phasing/Multiple Locations	5.00%	$	272	
General Contractor's Overhead and Profit	8.75%	$	499	
Sub-Total				**6,205**
Escalation-start of construction access June 2026	8.25%	$	512	
Construction Cost AW-32				**6,716**
AW-33 - WARMING OVEN - SERVOLIFT				
Warming Oven - Servolift	1	LS	5,000.00	5,000
Sub-Total Direct Cost				**5,000**
Estimating/Design Contingency	5.00%	$	250	
General Conditions/General Requirements	15.00%	$	788	
Phasing/Multiple Locations	5.00%	$	302	
General Contractor's Overhead and Profit	8.75%	$	555	
Sub-Total				**6,894**
Escalation-start of construction access June 2026	8.25%	$	568	
Construction Cost AW-33				**7,463**

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTALS
H-31 - iCOMBI PRO 20 OVEN				
iCombi Pro Oven	1	LS	35,000.00	35,000
Sub-Total Direct Cost				**35,000**
Estimating/Design Contingency	5.00%	$	1,750	
General Conditions/General Requirements	15.00%	$	5,513	
Phasing/Multiple Locations	5.00%	$	2,113	
General Contractor's Overhead and Profit	8.75%	$	3,883	
Sub-Total				**48,258**
Escalation-start of construction access June 2026	8.25%	$	3,979	
Construction Cost H-31				**52,238**

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTALS
MC-11 - ROOF- PARTIAL REPLACEMENT				
Demolish roof assembly to plywood deck	3,000	SF	4.92	14,760
Allow for minor plywood replacement-10%	300	SF	12.00	3,600
Coverboard	3,000	SF	4.82	14,460
R-38 rigid insulation	3,000	SF	7.90	23,700
Tapering insulation allow	1	LS	3,375.00	3,375
Fully adhered EPDM	3,000	SF	13.85	41,550
Raise rooftop mechanical curb, rooftop duct supports, including temp lift support of unit	1	LS	11,400.00	11,400
New roof hatch, wall ladder, safety guardrail, minor int. modifications	1	EA	12,200.00	12,200
Seal/flash roof penetrations, curbs, vents	3,000	SFA	1.15	3,450
Sub-Total Direct Cost				**128,495**
Estimating/Design Contingency	5.00%	$	6,425	
General Conditions/General Requirements	15.00%	$	20,238	
Phasing/Multiple Locations	5.00%	$	7,758	
General Contractor's Overhead and Profit	8.75%	$	14,255	
Sub-Total				**177,171**
Escalation-start of construction access June 2026	8.25%	$	14,608	
Construction Cost MC-11				**191,779**
MC-12 - WALLS - SEAL EXTERIOR BRICK WALLS				
Clean exterior brick walls	6,042	SF	1.00	6,042
Seal/anti graffiti coating exterior brick walls	6,042	SF	2.50	15,104
Sub-Total Direct Cost				**21,146**
Estimating/Design Contingency	5.00%	$	1,057	
General Conditions/General Requirements	15.00%	$	3,330	
Phasing/Multiple Locations	5.00%	$	1,277	
General Contractor's Overhead and Profit	8.75%	$	2,346	
Sub-Total				**29,156**
Escalation-start of construction access June 2026	8.25%	$	2,404	
Construction Cost MC-12				**31,560**
MC-13 - HOLLOW METAL DOORS & FRAMES				
Demo existing doors and frames	5	LOC	1,770.00	8,850
Install new doors, frames & hardware	5	LOC	11,500.00	57,500
Sub-Total Direct Cost				**66,350**
Estimating/Design Contingency	5.00%	$	3,318	
General Conditions/General Requirements	15.00%	$	10,450	
Phasing/Multiple Locations	5.00%	$	4,006	
General Contractor's Overhead and Profit	8.75%	$	7,361	
Sub-Total				**91,484**
Escalation-start of construction access June 2026	8.25%	$	7,543	
Construction Cost MC-13				**99,028**

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTALS
MC-21.1 VESTIBULE				
Protect area-allow remove/replace	1	LS	450.00	450
Demo exterior wall section for new doors	96	SF	20.00	1,920
Demo wall section for new door	21	SF	12.75	268
Demo existing doors and frames	1	LOC	1,770.00	1,770
Demo flooring, incl base	450	SF	1.65	743
Demo ceiling	450	SF	1.68	756
At demolished flooring, demo mastics, prep for new	450	SF	1.00	450
Demo & salvage fire extinguisher	1	LS	150.00	150
Demo seating alcove	1	LS	450.00	450
Misc. material management, dump fees	1	LS	1,182.56	1,183
Install new ext doors, frames & hardware	2	LOC	11,500.00	23,000
Misc patch at exterior wall	1	LS	5,000.00	5,000
Interior partition	448	SF	16.50	7,392
HM door, frame, hardware-per leaf	3	EA	3,216.00	9,648
Relites	1	ALLOW	4,000.00	4,000
Fire extinguisher, reinstall existing	1	EA	250.00	250
Paint	450	GFA	3.75	1,688
Flooring	450	SF	5.90	2,655
Base	1	LS	750.00	750
Ceiling	450	SF	9.50	4,275
HVAC, misc adjustments	1	ALLOW	7,500.00	7,500
Fire Protection, misc adjustments	1	ALLOW	2,500.00	2,500
Electrical				
Lighting	1	ALLOW	5,000.00	5,000
New ADA button	2	EA	510.00	1,020
New electrified exit device	3	EA	2,465.00	7,395
New REX	3	EA	685.00	2,055
New card reader	2	EA	2,432.00	4,864
New door position switch	3	EA	485.00	1,455
New door release	3	EA	492.00	1,476
New conduit, wiring, raceway, boxes, installation accessories	1	LS	4,653.00	4,653
Misc. accessories, testing, headend modifications	1	LS	4,187.70	4,188

Sub-Total Direct Cost				**106,264**
Estimating/Design Contingency	5.00%	$	5,313	
General Conditions/General Requirements	15.00%	$	16,737	
Phasing/Multiple Locations	5.00%	$	6,416	
General Contractor's Overhead and Profit	8.75%	$	11,789	
Sub-Total				**146,519**
Escalation-start of construction access June 2026	8.25%	$	12,081	
Construction Cost MC-21.1				**158,600**

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTALS
MC-25.1 - ELEVATOR CONTROLS REPLACEMENT				
Replace Elevator Controls	1	LS	20,000.00	20,000
Sub-Total Direct Cost				**20,000**
Estimating/Design Contingency	5.00%	$	1,000	
General Conditions/General Requirements	15.00%	$	3,150	
Phasing/Multiple Locations	5.00%	$	1,208	
General Contractor's Overhead and Profit	8.75%	$	2,219	
Sub-Total				**27,576**
Escalation-start of construction access June 2026	8.25%	$	2,274	
Construction Cost MC-25.1				**29,850**
MC-31 - iCOMBI PRO 20 OVEN				
iCombi Pro Oven	1	LS	35,000.00	35,000
Sub-Total Direct Cost				**35,000**
Estimating/Design Contingency	5.00%	$	1,750	
General Conditions/General Requirements	15.00%	$	5,513	
Phasing/Multiple Locations	5.00%	$	2,113	
General Contractor's Overhead and Profit	8.75%	$	3,883	
Sub-Total				**48,258**
Escalation-start of construction access June 2026	8.25%	$	3,979	
Construction Cost MC-31				**52,238**
MC-32 - IMMERSION BLENDER - ROBOT COUPE				
Immersion Blender - Robot Coupe	1	LS	1,000.00	1,000
Sub-Total Direct Cost				**1,000**
Estimating/Design Contingency	5.00%	$	50	
General Conditions/General Requirements	15.00%	$	158	
Phasing/Multiple Locations	5.00%	$	60	
General Contractor's Overhead and Profit	8.75%	$	111	
Sub-Total				**1,379**
Escalation-start of construction access June 2026	8.25%	$	114	
Construction Cost MC-32				**1,493**
MC-33 - FOOD PROCESSOR C50 - ROBOT COUPE				
Food Processor C50 - Robot Coupe	1	LS	4,500.00	4,500
Sub-Total Direct Cost				**4,500**
Estimating/Design Contingency	5.00%	$	225	
General Conditions/General Requirements	15.00%	$	709	
Phasing/Multiple Locations	5.00%	$	272	
General Contractor's Overhead and Profit	8.75%	$	499	
Sub-Total				**6,205**
Escalation-start of construction access June 2026	8.25%	$	512	
Construction Cost MC-33				**6,716**

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTALS
MC-34 - WARMING OVEN - SERVOLIFT				
Warming Oven - Servolift	1	LS	5,000.00	5,000
Sub-Total Direct Cost				**5,000**
Estimating/Design Contingency	5.00%	$	250	
General Conditions/General Requirements	15.00%	$	788	
Phasing/Multiple Locations	5.00%	$	302	
General Contractor's Overhead and Profit	8.75%	$	555	
Sub-Total				**6,894**
Escalation-start of construction access June 2026	8.25%	$	568	
Construction Cost MC-34				**7,463**
MC-43.1 - ACCESS CONTROLS				
Access Controls	4	LOC	17,500.00	70,000
Misc builderswork	61,278	SF	0.25	15,320
Sub-Total Direct Cost				**85,320**
Estimating/Design Contingency	5.00%	$	4,266	
General Conditions/General Requirements	15.00%	$	13,438	
Phasing/Multiple Locations	5.00%	$	5,151	
General Contractor's Overhead and Profit	8.75%	$	9,465	
Sub-Total				**117,640**
Escalation-start of construction access June 2026	8.25%	$	9,700	
Construction Cost MC-43.1				**127,340**
MC-44.1 - INTERCOM REPLACEMENT				
Intercom Replacement	61,278	SF	1.56	95,594
Misc builderswork	61,278	SF	0.75	45,959
Sub-Total Direct Cost				**141,552**
Estimating/Design Contingency	5.00%	$	7,078	
General Conditions/General Requirements	15.00%	$	22,294	
Phasing/Multiple Locations	5.00%	$	8,546	
General Contractor's Overhead and Profit	8.75%	$	15,704	
Sub-Total				**195,174**
Escalation-start of construction access June 2026	8.25%	$	16,093	
Construction Cost MC-44.1				**211,267**

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTALS
RG-01 - REPLACE RAMP TO PORTABLE				
Replace ramp	1	LS	4,500.00	4,500
Sub-Total Direct Cost				**4,500**
Estimating/Design Contingency	5.00%	$	225	
General Conditions/General Requirements	15.00%	$	709	
Phasing/Multiple Locations	5.00%	$	272	
General Contractor's Overhead and Profit	8.75%	$	499	
Sub-Total				**6,205**
Escalation-start of construction access June 2026	8.25%	$	512	
Construction Cost RG-02				**6,716**
RG-02 - REPLACE PLAYGROUND EQUIPMENT				
Replace Playground Equipment	1	LS	200,000.00	200,000
Sub-Total Direct Cost				**200,000**
Estimating/Design Contingency	5.00%	$	10,000	
General Conditions/General Requirements	15.00%	$	31,500	
Phasing/Multiple Locations	5.00%	$	12,075	
General Contractor's Overhead and Profit	8.75%	$	22,188	
Sub-Total				**275,763**
Escalation-start of construction access June 2026	8.25%	$	22,738	
Construction Cost RG-02				**298,500**
RG-11 - ROOF				
Demolish roof assembly to plywood deck	34,000	SF	1.55	52,700
Allow for minor plywood replacement-10%	3,400	SF	12.00	40,800
Laminated shingle roof w/ ice & water shield	34,000	SF	11.55	392,700
Seal/flash roof penetrations, curbs, vents	34,000	SFA	1.15	39,100
Sub-Total Direct Cost				**525,300**
Estimating/Design Contingency	5.00%	$	26,265	
General Conditions/General Requirements	15.00%	$	82,735	
Phasing/Multiple Locations	5.00%	$	31,715	
General Contractor's Overhead and Profit	8.75%	$	58,276	
Sub-Total				**724,291**
Escalation-start of construction access June 2026	8.25%	$	59,720	
Construction Cost RG-11				**784,011**

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTALS
RG-21.1 VESTIBULE				
Protect area-allow remove/replace	1	LS	450.00	450
Demo flooring, incl base	135	SF	1.65	223
Demo ceiling	135	SF	1.68	227
At demolished flooring, demo mastics, prep for new	135	SF	1.00	135
Misc. material management, dump fees	1	LS	175.87	176
Install new doors, frames & hardware	1	LOC	10,500.00	10,500
Misc patch at exterior wall	1	LS	5,000.00	5,000
Interior partition	126	SF	16.50	2,079
Paint	135	GFA	3.75	506
Flooring	135	SF	5.90	797
Base	1	LS	750.00	750
Ceiling	135	SF	9.50	1,283
HVAC, misc adjustments	1	ALLOW	2,500.00	2,500
Fire Protection, misc adjustments	1	ALLOW	1,500.00	1,500
Electrical				
Lighting	1	ALLOW	1,500.00	1,500
New ADA button	1	EA	510.00	510
New electrified exit device	1	EA	2,465.00	2,465
New camera	1	EA	2,750.00	2,750
New REX	1	EA	685.00	685
New card reader	1	EA	2,432.00	2,432
New door position switch	1	EA	485.00	485
New door release	1	EA	492.00	492
New conduit, wiring, raceway, boxes, installation accessories	1	LS	2,263.80	2,264
Misc. accessories, testing, headend modifications	1	LS	2,037.42	2,037

Sub-Total Direct Cost				**41,295**
Estimating/Design Contingency	5.00%	$	2,065	
General Conditions/General Requirements	15.00%	$	6,504	
Phasing/Multiple Locations	5.00%	$	2,493	
General Contractor's Overhead and Profit	8.75%	$	4,581	
Sub-Total				**56,938**
Escalation-start of construction access June 2026	8.25%	$	4,695	
Construction Cost RG-21.1				**61,633**

RG-31 - iCOMBI PRO 20 OVEN				
iCombi Pro Oven	1	LS	35,000.00	35,000

Sub-Total Direct Cost				**35,000**
Estimating/Design Contingency	5.00%	$	1,750	
General Conditions/General Requirements	15.00%	$	5,513	
Phasing/Multiple Locations	5.00%	$	2,113	
General Contractor's Overhead and Profit	8.75%	$	3,883	
Sub-Total				**48,258**
Escalation-start of construction access June 2026	8.25%	$	3,979	
Construction Cost RG-31				**52,238**

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTALS
RG-32 - IMMERSION BLENDER - ROBOT COUPE				
Immersion Blender - Robot Coupe	1	LS	1,000.00	1,000
Sub-Total Direct Cost				**1,000**
Estimating/Design Contingency	5.00%	$	50	
General Conditions/General Requirements	15.00%	$	158	
Phasing/Multiple Locations	5.00%	$	60	
General Contractor's Overhead and Profit	8.75%	$	111	
Sub-Total				**1,379**
Escalation-start of construction access June 2026	8.25%	$	114	
Construction Cost RG-32				**1,493**
RG-43.1 - ACCESS CONTROLS				
Access Controls	4	LOC	17,500.00	70,000
Misc builderswork	36,635	SF	0.25	9,159
Sub-Total Direct Cost				**79,159**
Estimating/Design Contingency	5.00%	$	3,958	
General Conditions/General Requirements	15.00%	$	12,468	
Phasing/Multiple Locations	5.00%	$	4,779	
General Contractor's Overhead and Profit	8.75%	$	8,782	
Sub-Total				**109,145**
Escalation-start of construction access June 2026	8.25%	$	8,999	
Construction Cost RG-43.1				**118,145**
RG-44.1 - INTERCOM REPLACEMENT				
Intercom Replacement	36,635	SF	1.56	57,151
Misc builderswork	36,635	SF	0.75	27,476
Sub-Total Direct Cost				**84,627**
Estimating/Design Contingency	5.00%	$	4,231	
General Conditions/General Requirements	15.00%	$	13,329	
Phasing/Multiple Locations	5.00%	$	5,109	
General Contractor's Overhead and Profit	8.75%	$	9,388	
Sub-Total				**116,685**
Escalation-start of construction access June 2026	8.25%	$	9,621	
Construction Cost RG-44.1				**126,306**

ITEM DESCRIPTION	QUANTITY	UNIT		UNIT COST	TOTALS
CP-01 - REPLACE PLAYGROUND EQUIPMENT					
Replace Playground Equipment	1	LS		200,000.00	200,000
Sub-Total Direct Cost					**200,000**
Estimating/Design Contingency	5.00%		$	10,000	
General Conditions/General Requirements	15.00%		$	31,500	
Phasing/Multiple Locations	5.00%		$	12,075	
General Contractor's Overhead and Profit	8.75%		$	22,188	
Sub-Total					**275,763**
Escalation-start of construction access June 2026	8.25%		$	22,738	
Construction Cost RG-02					**298,500**
CP-11 - ROOF					
Demolish roof assembly to plywood deck	35,025	SF		1.55	54,289
Allow for minor plywood replacement-10%	3,503	SF		12.00	42,030
Coverboard	35,025	SF		4.82	168,821
R-38 rigid insulation	35,025	SF		7.90	276,698
Tapering insulation allow	1	LS		39,403.13	39,403
3-Ply SBS Modified Roof	35,025	SF		12.90	451,823
Seal/flash roof penetrations, curbs, vents	35,025	SFA		1.15	40,279
Sub-Total Direct Cost					**1,073,341**
Estimating/Design Contingency	5.00%		$	53,667	
General Conditions/General Requirements	15.00%		$	169,051	
Phasing/Multiple Locations	5.00%		$	64,803	
General Contractor's Overhead and Profit	8.75%		$	119,075	
Sub-Total					**1,479,938**
Escalation-start of construction access June 2026	8.25%		$	122,026	
Construction Cost CP-11					**1,601,964**
CP-21.1 VESTIBULE					
Protect area-allow remove/replace	1	LS		450.00	450
Demo exterior wall section for new doors		SF		20.00	
Demo wall section for new door	21	SF		12.75	268
Demo wall	4	LF		35.00	140
Demo flooring, incl base	300	SF		1.65	495
Demo ceiling	300	SF		1.68	504
At demolished flooring, demo mastics, prep for new	300	SF		1.00	300
Demo & salvage fire extinguisher		LS		150.00	
Demo seating alcove		LS		450.00	
Misc. material management, dump fees	1	LS		366.65	367
Install new ext doors, frames & hardware		LOC		11,500.00	
Misc patch at exterior wall		LS		5,000.00	
Interior partition	280	SF		16.50	4,620
Install new doors, frames & hardware	1	LOC		10,500.00	10,500
HM door, frame, hardware-per leaf	1	EA		3,216.00	3,216
Relites	1	ALLOW		2,500.00	2,500
Fire extinguisher, reinstall existing		EA		250.00	

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTALS
Paint	300	GFA	3.75	1,125
Flooring	300	SF	5.90	1,770
Base	1	LS	750.00	750
Ceiling	300	SF	9.50	2,850
HVAC, misc adjustments	1	ALLOW	5,000.00	5,000
Fire Protection, misc adjustments	1	ALLOW	1,500.00	1,500
Electrical				
Lighting	1	ALLOW	2,500.00	2,500
New ADA button	1	EA	510.00	510
New electrified exit device	1	EA	2,465.00	2,465
New camera	1	EA	2,750.00	2,750
New REX	2	EA	685.00	1,370
New card reader	2	EA	2,432.00	4,864
New door position switch	2	EA	485.00	970
New door release	2	EA	492.00	984
New conduit, wiring, raceway, boxes, installation accessories	1	LS	3,282.60	3,283
Misc. accessories, testing, headend modifications	1	LS	2,954.34	2,954
Casework	25	LF	550.00	13,750

Sub-Total Direct Cost				**72,754**
Estimating/Design Contingency	5.00%	$	3,638	
General Conditions/General Requirements	15.00%	$	11,459	
Phasing/Multiple Locations	5.00%	$	4,393	
General Contractor's Overhead and Profit	8.75%	$	8,071	
Sub-Total				**100,315**
Escalation-start of construction access June 2026	8.25%	$	8,271	
Construction Cost CP-21.1				**108,586**

CP-31 - iCOMBI PRO 20 OVEN

iCombi Pro Oven	1	LS	35,000.00	35,000

Sub-Total Direct Cost				**35,000**
Estimating/Design Contingency	5.00%	$	1,750	
General Conditions/General Requirements	15.00%	$	5,513	
Phasing/Multiple Locations	5.00%	$	2,113	
General Contractor's Overhead and Profit	8.75%	$	3,883	
Sub-Total				**48,258**
Escalation-start of construction access June 2026	8.25%	$	3,979	
Construction Cost CP-31				**52,238**

ITEM DESCRIPTION	QUANTITY	UNIT		UNIT COST	TOTALS
CP-32 - WARMING OVEN - SERVOLIFT					
Warming Oven - Servolift	1	LS		5,000.00	5,000
Sub-Total Direct Cost					**5,000**
Estimating/Design Contingency	5.00%		$	250	
General Conditions/General Requirements	15.00%		$	788	
Phasing/Multiple Locations	5.00%		$	302	
General Contractor's Overhead and Profit	8.75%		$	555	
Sub-Total					**6,894**
Escalation-start of construction access June 2026	8.25%		$	568	
Construction Cost CP-32					**7,463**
CP-43.1 - ACCESS CONTROLS					
Access Controls	4	LOC		17,500.00	70,000
Misc builderswork	27,706	SF		0.25	6,927
Sub-Total Direct Cost					**76,927**
Estimating/Design Contingency	5.00%		$	3,846	
General Conditions/General Requirements	15.00%		$	12,116	
Phasing/Multiple Locations	5.00%		$	4,644	
General Contractor's Overhead and Profit	8.75%		$	8,534	
Sub-Total					**106,067**
Escalation-start of construction access June 2026	8.25%		$	8,746	
Construction Cost CP-43.1					**114,813**
CP-44.1 - INTERCOM REPLACEMENT					
Intercom Replacement	27,706	SF		1.56	43,221
Misc builderswork	27,706	SF		0.75	20,780
Sub-Total Direct Cost					**64,001**
Estimating/Design Contingency	5.00%		$	3,200	
General Conditions/General Requirements	15.00%		$	10,080	
Phasing/Multiple Locations	5.00%		$	3,864	
General Contractor's Overhead and Profit	8.75%		$	7,100	
Sub-Total					**88,245**
Escalation-start of construction access June 2026	8.25%		$	7,276	
Construction Cost CP-44.1					**95,521**

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTALS
CP-51 - AUTISM PROGRAM RELOCATION				
Door Hardware	1	ALLOW	20,000.00	20,000
Sub-Total Direct Cost				**20,000**
Estimating/Design Contingency	5.00%	$	1,000	
General Conditions/General Requirements	15.00%	$	3,150	
Phasing/Multiple Locations	5.00%	$	1,208	
General Contractor's Overhead and Profit	8.75%	$	2,219	
Sub-Total				**27,576**
Escalation-start of construction access June 2026	8.25%	$	2,274	
Construction Cost CP-51				**29,850**

ITEM DESCRIPTION	QUANTITY	UNIT		UNIT COST	TOTALS
HS-01 - PARKING LOT					
Parking lot replacement	3,000	SF		11.00	33,000
Landscape replacement	1,000	SF		15.00	15,000
Sub-Total Direct Cost					**48,000**
Estimating/Design Contingency	5.00%		$	2,400	
General Conditions/General Requirements	15.00%		$	7,560	
Phasing/Multiple Locations	5.00%		$	2,898	
General Contractor's Overhead and Profit	8.75%		$	5,325	
Sub-Total					**66,183**
Escalation-start of construction access June 2026	8.25%		$	5,457	
Construction Cost HS-01					**71,640**
HS-02 - RAMP/SIDEWALK REPAIRS					
Sidewalk replacement - prep	1,200	SF		1.50	1,800
Sidewalk replacement - concrete	1,200	SF		13.50	16,200
Curb	115	LF		38.50	4,428
Sub-Total Direct Cost					**22,428**
Estimating/Design Contingency	5.00%		$	1,121	
General Conditions/General Requirements	15.00%		$	3,532	
Phasing/Multiple Locations	5.00%		$	1,354	
General Contractor's Overhead and Profit	8.75%		$	2,488	
Sub-Total					**30,923**
Escalation-start of construction access June 2026	8.25%		$	2,550	
Construction Cost HS-02					**33,473**
HS-03 - RESURFACE TENNIS COURTS					
Resurface Tennis Courts	4	EA		12,300.00	49,200
Sub-Total Direct Cost					**49,200**
Estimating/Design Contingency	5.00%		$	2,460	
General Conditions/General Requirements	15.00%		$	7,749	
Phasing/Multiple Locations	5.00%		$	2,970	
General Contractor's Overhead and Profit	8.75%		$	5,458	
Sub-Total					**67,838**
Escalation-start of construction access June 2026	8.25%		$	5,593	
Construction Cost HS-03					**73,431**

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTALS
HS-11 - ROOF				
Demolish roof assembly to plywood deck	62,000	SF	1.55	96,100
Allow for minor plywood replacement-10%	6,200	SF	12.00	74,400
Coverboard	62,000	SF	4.82	298,840
R-38 rigid insulation	62,000	SF	7.90	489,800
Tapering insulation allow	1	LS	69,750.00	69,750
3-Ply SBS Modified Roof	62,000	SF	12.90	799,800
Seal/flash roof penetrations, curbs, vents	62,000	SFA	1.15	71,300
Sub-Total Direct Cost				**1,899,990**
Estimating/Design Contingency	5.00%	$	95,000	
General Conditions/General Requirements	15.00%	$	299,248	
Phasing/Multiple Locations	5.00%	$	114,712	
General Contractor's Overhead and Profit	8.75%	$	210,783	
Sub-Total				**2,619,733**
Escalation-start of construction access June 2026	8.25%	$	216,007	
Construction Cost HS-11				**2,835,740**
HS-21.1 VESTIBULE				
Protect area-allow remove/replace	1	LS	450.00	450
Demo exterior wall section for new doors	96	SF	20.00	1,920
Demo wall section for new door	21	SF	12.75	268
Demo existing doors and frames	1	LOC	1,770.00	1,770
Demo flooring, incl base	450	SF	1.65	743
Demo ceiling	450	SF	1.68	756
At demolished flooring, demo mastics, prep for new	450	SF	1.00	450
Demo & salvage fire extinguisher	1	LS	150.00	150
Demo seating alcove	1	LS	450.00	450
Misc. material management, dump fees	1	LS	1,182.56	1,183
Install new ext doors, frames & hardware	2	LOC	11,500.00	23,000
Misc patch at exterior wall	1	LS	5,000.00	5,000
Interior partition	448	SF	16.50	7,392
HM door, frame, hardware-per leaf	3	EA	3,216.00	9,648
Relites	1	ALLOW	4,000.00	4,000
Fire extinguisher, reinstall existing	1	EA	250.00	250
Paint	450	GFA	3.75	1,688
Flooring	450	SF	5.90	2,655
Base	1	LS	750.00	750
Ceiling	450	SF	9.50	4,275
HVAC, misc adjustments	1	ALLOW	7,500.00	7,500
Fire Protection, misc adjustments	1	ALLOW	2,500.00	2,500
Electrical				
Lighting	1	ALLOW	5,000.00	5,000
New ADA button	2	EA	510.00	1,020
New electrified exit device	3	EA	2,465.00	7,395
New REX	3	EA	685.00	2,055
New card reader	2	EA	2,432.00	4,864
New door position switch	3	EA	485.00	1,455
New door release	3	EA	492.00	1,476

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTALS
New conduit, wiring, raceway, boxes, installation accessories	1	LS	4,653.00	4,653
Misc. accessories, testing, headend modifications	1	LS	4,187.70	4,188
Casework	25	LF	550.00	13,750
Sub-Total Direct Cost				**122,652**
Estimating/Design Contingency	5.00%	$	6,133	
General Conditions/General Requirements	15.00%	$	19,318	
Phasing/Multiple Locations	5.00%	$	7,405	
General Contractor's Overhead and Profit	8.75%	$	13,607	
Sub-Total				**169,114**
Escalation-start of construction access June 2026	8.25%	$	13,944	
Construction Cost HS-21.1				**183,058**

HS-31 - iCOMBI PRO 20 OVEN

iCombi Pro Oven	1	LS	47,500.00	47,500
Sub-Total Direct Cost				**47,500**
Estimating/Design Contingency	5.00%	$	2,375	
General Conditions/General Requirements	15.00%	$	7,481	
Phasing/Multiple Locations	5.00%	$	2,868	
General Contractor's Overhead and Profit	8.75%	$	5,270	
Sub-Total				**65,494**
Escalation-start of construction access June 2026	8.25%	$	5,400	
Construction Cost HS-31				**70,894**

HS-32 - IMMERSION BLENDER - ROBOT COUPE

Immersion Blender - Robot Coupe	1	LS	1,000.00	1,000
Sub-Total Direct Cost				**1,000**
Estimating/Design Contingency	5.00%	$	50	
General Conditions/General Requirements	15.00%	$	158	
Phasing/Multiple Locations	5.00%	$	60	
General Contractor's Overhead and Profit	8.75%	$	111	
Sub-Total				**1,379**
Escalation-start of construction access June 2026	8.25%	$	114	
Construction Cost HS-32				**1,493**

HS-33 - FOOD PROCESSOR C50 - ROBOT COUPE

Food Processor C50 - Robot Coupe	1	LS	4,500.00	4,500
Sub-Total Direct Cost				**4,500**
Estimating/Design Contingency	5.00%	$	225	
General Conditions/General Requirements	15.00%	$	709	
Phasing/Multiple Locations	5.00%	$	272	
General Contractor's Overhead and Profit	8.75%	$	499	
Sub-Total				**6,205**
Escalation-start of construction access June 2026	8.25%	$	512	
Construction Cost HS-33				**6,716**

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTALS
HS-34 - WARMING OVEN - SERVOLIFT				
Warming Oven - Servolift	2	LS	5,000.00	10,000
Sub-Total Direct Cost				**10,000**
Estimating/Design Contingency	5.00%	$	500	
General Conditions/General Requirements	15.00%	$	1,575	
Phasing/Multiple Locations	5.00%	$	604	
General Contractor's Overhead and Profit	8.75%	$	1,109	
Sub-Total				**13,788**
Escalation-start of construction access June 2026	8.25%	$	1,137	
Construction Cost HS-34				**14,925**
HS-43.1 - ACCESS CONTROLS				
Access Controls	8	LOC	17,500.00	140,000
Misc builderswork	135,000	SF	0.25	33,750
Sub-Total Direct Cost				**173,750**
Estimating/Design Contingency	5.00%	$	8,688	
General Conditions/General Requirements	15.00%	$	27,366	
Phasing/Multiple Locations	5.00%	$	10,490	
General Contractor's Overhead and Profit	8.75%	$	19,276	
Sub-Total				**239,569**
Escalation-start of construction access June 2026	8.25%	$	19,753	
Construction Cost HS-43.1				**259,322**
HS-44.1 - INTERCOM REPLACEMENT				
Intercom Replacement	135,000	SF	1.56	210,600
Misc builderswork	135,000	SF	0.75	101,250
Sub-Total Direct Cost				**311,850**
Estimating/Design Contingency	5.00%	$	15,593	
General Conditions/General Requirements	15.00%	$	49,116	
Phasing/Multiple Locations	5.00%	$	18,828	
General Contractor's Overhead and Profit	8.75%	$	34,596	
Sub-Total				**429,983**
Escalation-start of construction access June 2026	8.25%	$	35,454	
Construction Cost HS-44.1				**465,437**

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTALS
A-01 - RAMP/SIDEWALK REPAIRS				
Sidewalk replacement - prep	3,500	SF	1.50	5,250
Sidewalk replacement - concrete	3,500	SF	13.50	47,250
Curb	120	LF	38.50	4,620
Sub-Total Direct Cost				**57,120**
Estimating/Design Contingency	5.00%	$	2,856	
General Conditions/General Requirements	15.00%	$	8,996	
Phasing/Multiple Locations	5.00%	$	3,449	
General Contractor's Overhead and Profit	8.75%	$	6,337	
Sub-Total				**78,758**
Escalation-start of construction access June 2026	8.25%	$	6,494	
Construction Cost A-01				**85,252**
A-02 - REPLACE RAMP TO PORTABLE				
Replace ramp	1	LS	7,500.00	7,500
Sub-Total Direct Cost				**7,500**
Estimating/Design Contingency	5.00%	$	375	
General Conditions/General Requirements	15.00%	$	1,181	
Phasing/Multiple Locations	5.00%	$	453	
General Contractor's Overhead and Profit	8.75%	$	832	
Sub-Total				**10,341**
Escalation-start of construction access June 2026	8.25%	$	853	
Construction Cost A-02				**11,194**
A-12 - WALLS - SEAL EXTERIOR BRICK WALLS				
Clean exterior brick walls	3,842	SF	1.00	3,842
Seal/anti graffiti coating exterior brick walls	3,842	SF	2.50	9,604
Paint wood/doors & frames	1	LS	8,000.00	8,000
Sub-Total Direct Cost				**21,446**
Estimating/Design Contingency	5.00%	$	1,072	
General Conditions/General Requirements	15.00%	$	3,378	
Phasing/Multiple Locations	5.00%	$	1,295	
General Contractor's Overhead and Profit	8.75%	$	2,379	
Sub-Total				**29,569**
Escalation-start of construction access June 2026	8.25%	$	2,438	
Construction Cost A-12				**32,008**

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTALS
A-21.1 VESTIBULE				
Protect area-allow remove/replace	1	LS	450.00	450
Misc. material management, dump fees	1	LS	76.50	77
Misc patch at interior walls	1	LS	1,000.00	1,000
4x10 Header wrapped in oak veneer	1	LS	2,750.00	2,750
Install new doors, frames & hardware	1	LOC	5,950.00	5,950
HM door, frame, hardware-per leaf	1	EA	3,216.00	3,216
Relites	48	SF	105.00	5,040
Paint	150	GFA	3.75	563
Flooring, misc patch & repair	1	LS	1,500.00	1,500
Electrical				
New electrified exit device	1	EA	2,465.00	2,465
New camera	1	EA	2,750.00	2,750
New REX	1	EA	685.00	685
New card reader	1	EA	2,432.00	2,432
New door position switch	1	EA	485.00	485
New door release	1	EA	492.00	492
New conduit, wiring, raceway, boxes, installation accessories	1	LS	1,861.80	1,862
Misc. accessories, testing, headend modifications	1	LS	1,675.62	1,676
Sub-Total Direct Cost				**34,816**
Estimating/Design Contingency	5.00%	$	1,741	
General Conditions/General Requirements	15.00%	$	5,484	
Phasing/Multiple Locations	5.00%	$	2,102	
General Contractor's Overhead and Profit	8.75%	$	3,863	
Sub-Total				**48,005**
Escalation-start of construction access June 2026	8.25%	$	3,958	
Construction Cost A-21.1				**51,964**
A-25.1 - ELEVATOR CONTROLS REPLACEMENT				
Replace Elevator Controls	1	LS	20,000.00	20,000
Sub-Total Direct Cost				**20,000**
Estimating/Design Contingency	5.00%	$	1,000	
General Conditions/General Requirements	15.00%	$	3,150	
Phasing/Multiple Locations	5.00%	$	1,208	
General Contractor's Overhead and Profit	8.75%	$	2,219	
Sub-Total				**27,576**
Escalation-start of construction access June 2026	8.25%	$	2,274	
Construction Cost -A-25.1				**29,850**

ITEM DESCRIPTION	QUANTITY	UNIT		UNIT COST	TOTALS
A-41 - HVAC					
Remove existing HVAC System	8,970	SF		1.55	13,904
New HVAC System	8,970	SF		85.00	762,450
Misc Builderswork	8,970	SF		4.50	40,365
Sub-Total Direct Cost					**816,719**
Estimating/Design Contingency	5.00%		$	40,836	
General Conditions/General Requirements	15.00%		$	128,633	
Phasing/Multiple Locations	5.00%		$	49,309	
General Contractor's Overhead and Profit	8.75%		$	90,606	
Sub-Total					**1,126,103**
Escalation-start of construction access June 2026	8.25%		$	92,851	
Construction Cost A-41					**1,218,954**
A-43.1 - ACCESS CONTROLS					
Access Controls	2	LOC		17,500.00	35,000
Misc builderswork	8,970	SF		0.25	2,243
Sub-Total Direct Cost					**37,243**
Estimating/Design Contingency	5.00%		$	1,862	
General Conditions/General Requirements	15.00%		$	5,866	
Phasing/Multiple Locations	5.00%		$	2,249	
General Contractor's Overhead and Profit	8.75%		$	4,132	
Sub-Total					**51,350**
Escalation-start of construction access June 2026	8.25%		$	4,234	
Construction Cost A-43.1					**55,585**

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTALS
MA-11 - WALLS - SEAL EXTERIOR BRICK WALLS				
Clean exterior walls	6,523	SF	1.00	6,523
Paint exterior walls	6,523	SF	2.75	17,939
Sub-Total Direct Cost				**24,462**
Estimating/Design Contingency	5.00%	$	1,223	
General Conditions/General Requirements	15.00%	$	3,853	
Phasing/Multiple Locations	5.00%	$	1,477	
General Contractor's Overhead and Profit	8.75%	$	2,714	
Sub-Total				**33,729**
Escalation-start of construction access June 2026	8.25%	$	2,781	
Construction Cost MA-11				**36,510**
MA-41 - HVAC				
Remove existing HVAC System	6,346	SF	1.55	9,836
New HVAC System	6,346	SF	85.00	539,410
Misc Builderswork	6,346	SF	4.50	28,557
Sub-Total Direct Cost				**577,803**
Estimating/Design Contingency	5.00%	$	28,890	
General Conditions/General Requirements	15.00%	$	91,004	
Phasing/Multiple Locations	5.00%	$	34,885	
General Contractor's Overhead and Profit	8.75%	$	64,101	
Sub-Total				**796,683**
Escalation-start of construction access June 2026	8.25%	$	65,689	
Construction Cost MA-41				**862,373**

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTALS
SB-11 - ROOF				
Demolish roof assembly to plywood deck	28,000	SF	1.55	43,400
Allow for minor plywood replacement-10%	2,800	SF	12.00	33,600
Coverboard	28,000	SF	4.82	134,960
R-38 rigid insulation	28,000	SF	7.90	221,200
Tapering insulation allow	1	LS	31,500.00	31,500
3-Ply SBS Modified Roof	28,000	SF	12.90	361,200
Seal/flash roof penetrations, curbs, vents	28,000	SFA	1.15	32,200
Sub-Total Direct Cost				**858,060**
Estimating/Design Contingency	5.00%	$	42,903	
General Conditions/General Requirements	15.00%	$	135,144	
Phasing/Multiple Locations	5.00%	$	51,805	
General Contractor's Overhead and Profit	8.75%	$	95,192	
Sub-Total				**1,183,105**
Escalation-start of construction access June 2026	8.25%	$	97,551	
Construction Cost SB-11				**1,280,657**
SB-41 - HVAC				
Remove existing HVAC System	28,000	SF	1.55	43,400
New HVAC System	28,000	SF	85.00	2,380,000
Misc Builderswork	28,000	SF	4.50	126,000
Sub-Total Direct Cost				**2,549,400**
Estimating/Design Contingency	5.00%	$	127,470	
General Conditions/General Requirements	15.00%	$	401,531	
Phasing/Multiple Locations	5.00%	$	153,920	
General Contractor's Overhead and Profit	8.75%	$	282,828	
Sub-Total				**3,515,149**
Escalation-start of construction access June 2026	8.25%	$	289,837	
Construction Cost SB-41				**3,804,986**

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTALS
SF-01 - RETAINING WALL REPAIR				
Temp relocate building	1	LS	100,000.00	100,000
Disconnect/Reconnect utilites	1	LS	25,000.00	25,000
Shoring	1	LS	50,000.00	50,000
Retaining Wall	1	LS	75,000.00	75,000
Sub-Total Direct Cost				**250,000**
Estimating/Design Contingency	5.00%	$	12,500	
General Conditions/General Requirements	15.00%	$	39,375	
Phasing/Multiple Locations	5.00%	$	15,094	
General Contractor's Overhead and Profit	8.75%	$	27,735	
Sub-Total				**344,704**
Escalation-start of construction access June 2026	8.25%	$	28,422	
Construction Cost SF-11				**373,126**
SF-02 - PARKING LOT REPAIR				
Grind & overlay	9,000	SF	3.15	28,350
Pavement markings	1	LS	5,500.00	5,500
Sub-Total Direct Cost				**33,850**
Estimating/Design Contingency	5.00%	$	1,693	
General Conditions/General Requirements	15.00%	$	5,331	
Phasing/Multiple Locations	5.00%	$	2,044	
General Contractor's Overhead and Profit	8.75%	$	3,755	
Sub-Total				**46,673**
Escalation-start of construction access June 2026	8.25%	$	3,848	
Construction Cost SF-02				**50,521**
SF-11 - ROOF				
Demolish roof assembly to plywood deck	22,700	SF	1.55	35,185
Allow for minor plywood replacement-10%	2,270	SF	12.00	27,240
Laminated shingle roof w/ ice & water shield	22,700	SF	11.55	262,185
Seal/flash roof penetrations, curbs, vents	22,700	SFA	1.15	26,105
Sub-Total Direct Cost				**350,715**
Estimating/Design Contingency	5.00%	$	17,536	
General Conditions/General Requirements	15.00%	$	55,238	
Phasing/Multiple Locations	5.00%	$	21,174	
General Contractor's Overhead and Profit	8.75%	$	38,908	
Sub-Total				**483,571**
Escalation-start of construction access June 2026	8.25%	$	39,872	
Construction Cost SF-11				**523,443**

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTALS
SF-21 - WOOD STRUCTURE REPAIRS				
Pressure treated 2x12	1,000	LF	4.50	4,500
3/4" plywood	1,600	SF	5.50	8,800
Paint	1	LS	20,000.00	20,000
Misc demo/repairs	1	LS	50,000.00	50,000
Sub-Total Direct Cost				**83,300**
Estimating/Design Contingency	5.00%	$	4,165	
General Conditions/General Requirements	15.00%	$	13,120	
Phasing/Multiple Locations	5.00%	$	5,029	
General Contractor's Overhead and Profit	8.75%	$	9,241	
Sub-Total				**114,855**
Escalation-start of construction access June 2026	8.25%	$	9,470	
Construction Cost SF-21				**124,325**

SECTION 3: Prioritizations & Action Plan

Overview

A review of Aberdeen School District's facilities has been done to establish cost-based priorities for Capital Levy funding. This is done in tandem with the OSPI School Seismic Safety Grant and the Site Feasibility Report. Cost items listed cover safety and security; roofs and building envelope; accessibility; site features; mechanical, electrical, plumbing and telecommunications; and food service.

In the Cost Estimate Prioritization Matrix, provided on the next page, each cost is given a cost identification label and a priority range on a 5-star based scale. Low priority is 1-2 stars, medium priority is 3 stars, and high priority is 4-5 stars. The priority given for each cost was established by stakeholder input over a series of meetings, the timing of Washington State SCAP (School Construction Assistance Program), the Seismic Safety Grant, and the timeline for qualifying costs to attain Capital Levy funds.

Each cost item is listed with a calculated sum, which includes GC Cost, anticipated soft costs and yearly projected escalation, under a column for each year from 2026 to 2029. Next to each of these is a column with a check box to add the item to that year's budgeted cost. Once the box is checked the matrix sheet highlights the cost with a colored background – 2026 cost is beige, 2027 cost is green, 2028 cost is orange and 2029 cost is red. At the bottom of the matrix, a row is set under each year's cost column to breakdown total levy collections and total levy spending (not that they do not align exactly as these are preliminary level cost estimates). Available annual levy funds and the yearly project budget are listed below each column followed by the percentage difference between the two. Further scope and estimate refinements will be generated as specific projects are developed for the proposed work. The last row provides a total sum of the costs of all identified items based on escalation for that year to illustrate how costs of work are anticipated to increase over time.

Additionally, since OSPI School Seismic Safety Grant funding is happening simultaneously with this effort, some costs are recommended to be deferred due to a facility's phased school replacement or seismic retrofit. Deferred cost items are listed under each facility narrative when applicable. In the matrix, these are represented as a grayed-out row. Two different columns are provided to separate out deferment options: "Defer – Include in Seismic / SCAP Project" and "Defer beyond 2029". The "Defer beyond 2029" addresses items that are desired but do not fit into the current levy funding budget. See each facility's narrative for more information. During meetings some items listed were clarified as not needed and were eliminated from further discussion and checked as "Delete – Not Required". The final column "Delete – Complete". Encompasses items identified but already complete.

ASD Cost Estimate - Master Planning

TCF Architecture

	Task Name	Cost ID	GC Cost	Soft Cost %	Soft Costs Total	2026 Cost	2026 Project	2027 Cost	2027 Project	2028 Cost	2028 Project	2029 Cost	2029 Project	Defer - Include in Seismic / SCAP Project	Delete - Complete	Defer beyond 2029	Delete - Not Required	Priority	Comments
1	**MILLER**						☐		☐		☐		☐	☐	☐	☐	☐		
2	Telecom						☐		☐		☐		☐	☐	☐	☐	☐		
3	Intercom Replacement	M-44.1	$147,540	35%	$51,639	$207,147	☑	$215,433	☐	$224,050	☐	$233,012	☐	☐	☐	☐	☐		This was deemed important for student and staff safety and was moved to 2026
4																			
5	**STEVENS**						☐		☐		☐		☐	☐	☐	☐	☐		
6	ENVELOPE						☐		☐		☐		☐	☐	☐	☐	☐		
7	Roof Repairs	S-11	$22,869	35%	$8,004	$32,108	☐	$33,393	☐	$34,728	☐	$36,118	☐	☐	☐	☐	☑		Assume replacement of 500 SF. Repair with General Fund
8	Telecom						☐		☐		☐		☐	☐	☐	☐	☐		
9	Intercom Replacement	S-44.1	$71,604	35%	$25,061	$100,532	☑	$104,554	☐	$108,736	☐	$113,085	☐	☐	☐	☐	☐		This was deemed important for student and staff safety and was moved to 2026
10																			
11	**AJ WEST**						☐		☐		☐		☐	☐	☐	☐	☐		
12	Telecom						☐		☐		☐		☐	☐	☐	☐	☐		
13	Intercom Replacement	AJ-44.1	$68,095	35%	$23,833	$95,606	☑	$99,431	☐	$103,408	☐	$107,544	☐	☐	☐	☐	☐		This was deemed important for student and staff safety and was moved to 2026
14																			
15	**HARBOR LEARING CENTER**						☐		☐		☐		☐	☐	☐	☐	☐		
16	Telecom						☐		☐		☐		☐	☐	☐	☐	☐		
17	Intercom Replacement	H-44.1	$39,473	35%	$13,815	$55,420	☑	$57,637	☐	$59,942	☐	$62,340	☐	☐	☐	☐	☐		This was deemed important for student and staff safety and was moved to 2026
18																			
19	**MCDERMOTH**						☐		☐		☐		☐	☐	☐	☐	☐		
20	ENVELOPE						☐		☐		☐		☐	☐	☐	☐	☐		
21	Roof - Partial Replacement	MC-11	$191,779	35%	$67,123	$269,258	☐	$280,028	☐	$291,230	☐	$302,879	☐	☐	☐	☑	☐		Replace single ply (EPDM) roof at top of steep slope roof at main building including new curbs for all hoods, hatch, etc. - Fully adhered EPDM over coverboard over R-38 polyiso insulation over self adhered interim roofing; replace all flashing, gutters and downspouts. Include in retrofit
22	Walls - Seal exterior brick walls	MC-12	$31,560	35%	$11,046	$44,311	☐	$46,083	☐	$47,926	☐	$49,843	☐	☐	☐	☑	☐	★★☆☆☆	Clean, seal and install anti-graffiti coating to +8'-0" at brick / masonry / concrete. Paint exterior doors & frames
23	Hollow Metal Doors & Frames	MC-13	$99,028	35%	$34,660	$139,036	☐	$144,597	☐	$150,381	☐	$156,396	☐	☐	☐	☑	☐		Replace HM doors & frames at (5) locations including sidelights & transoms with thermally broken HM frames (16 GA), insulated glazing and high R-value doors (14 GA) as well as new hardware
24	BUILDING						☐		☐		☐		☐	☐	☐	☐	☐		
25	Safety						☐		☐		☐		☐	☐	☐	☐	☐		
26	Vestibule	MC-21.1A	$127,392	35%	$44,587	$178,859	☐	$186,013	☐	$193,454	☐	$201,192	☐	☐	☐	☑	☐		
27	Entry Camera / Intercom/ Door Release	MC-21.1B	$31,208	35%	$10,923	$42,131	☑		☐		☐		☐	☐	☐	☐	☐	★★★☆☆	This was deemed important for student and staff safety and was moved to 2026
28	Vertical Circulation						☐		☐		☐		☐	☐	☐	☐	☐		
29	Elevator	MC-25.1	$29,850		$10,448	$41,909	☐	$43,586	☐	$45,329	☐	$47,142	☑	☐	☐	☐	☐		Electronic controls replacement allowance. Michael Pauley has a proposal - $117k + electrical; needs to check w/ L&I on timeline
30	MEP						☐		☐		☐		☐	☐	☐	☐	☐		
31	Electrical						☐		☐		☐		☐	☐	☐	☐	☐		
32	Access Control	MC-43.1	$127,340	35%	$44,569	$178,786	☐	$185,937	☐	$193,375	☐	$201,110	☐	☐	☐	☑	☐	★★★☆☆	Assume access control at (4) exterior doors. Improve ADA aspects of current system for hard of hearing
33	Telecom						☐		☐		☐		☐	☐	☐	☐	☐		
34	Intercom Replacement	MC-44.1	$211,267	35%	$73,943	$296,619	☑	$308,484	☐	$320,823	☐	$333,656	☐	☐	☐	☐	☐	★★★★★	This was deemed important for student and staff safety and was moved to 2026
35																			
36	**ROBERT GRAY**						☐		☐		☐		☐	☐	☐	☐	☐		
37	SITE						☐		☐		☐		☐	☐	☐	☐	☐		
38	Replace ramp to portable	RG-01	$6,716	35%	$2,351	$9,430	☐	$9,807	☑	$10,199	☐	$10,607	☐	☐	☐	☐	☐	★★☆☆☆	Replace existing ramp w/ new aluminum ramp and railings
39	Replace Playground Equipment	RG-02	$298,500	35%	$104,475	$419,094	☐	$435,858	☐	$453,292	☐	$471,424	☐	☐	☑	☐	☐		Completed
40	ENVELOPE						☐		☐		☐		☐	☐	☐	☐	☐		
41	Roof	RG-11	$784,011	35%	$274,404	$1,100,752	☐	$1,144,782	☐	$1,190,573	☐	$1,238,196	☐	☑	☐	☐	☐	★☆☆☆☆	
42	BUILDING						☐		☐		☐		☐	☐	☐	☐	☐		
43	Safety						☐		☐		☐		☐	☐	☐	☐	☐		
44	Vestibule	RG-21.1	$61,633	35%	$21,572	$86,533	☑	$89,994	☐	$93,594	☐	$97,338	☐	☐	☐	☐	☐	★★★★☆	Includes Front Entrance Camera / Intercom / Door Release
45	MEP						☐		☐		☐		☐	☐	☐	☐	☐		
46	Electrical						☐		☐		☐		☐	☐	☐	☐	☐		
47	Access Control	RG-43.1	$118,145	35%	$41,351	$165,876	☐	$172,511	☐	$179,411	☐	$186,588	☑	☐	☐	☐	☐	★★★☆☆	Assume access control at (4) exterior doors
48	Telecom						☐		☐		☐		☐	☐	☐	☐	☐		
49	Intercom Replacement	RG-44.1	$126,306	35%	$44,207	$177,334	☑	$184,427	☐	$191,804	☐	$199,477	☐	☐	☐	☐	☐	★★★★★	This was deemed important for student and staff safety and was moved to 2026
50																			
51	**CENTRAL PARK**						☐		☐		☐		☐	☐	☐	☐	☐		

	Task Name	Cost ID	GC Cost	Soft Cost %	Soft Costs Total	2026 Cost	2026 Project	2027 Cost	2027 Project	2028 Cost	2028 Project	2029 Cost	2029 Project	Defer - Include in Seismic / SCAP Project	Delete - Complete	Defer beyond 2029	Delete - Not Required	Priority	Comments
52	SITE						☐		☐		☐		☐	☐	☐	☐	☐		
53	Replace Playground Equipment	CP-01	$298,500	20%	$59,700	$372,528	☐	$387,429	☑	$402,927	☐	$419,044	☐	☐	☐	☐	☐	★★★★☆	
54	ENVELOPE						☐		☐		☐		☐	☐	☐	☐	☐		
55	Roof	CP-11	$1,601,964	35%	$560,687	$2,249,158	☐	$2,339,124	☐	$2,432,689	☐	$2,529,997	☐	☑	☐	☐	☐		Tear off and replace entire roof with 3-ply SBS modified roof over coverboard & R-38 insulation over self-adhered interim roof; replace all flashing, gutters and downspouts
56	BUILDING						☐		☐		☐		☐	☐	☐	☐	☐		
57	Safety						☐		☐		☐		☐	☐	☐	☐	☐		
58	Vestibule	CP-21.1	$108,586	35%	$38,005	$152,455	☐	$158,553	☐	$164,895	☐	$171,491	☐	☑	☐	☐	☐	★★☆☆☆	Includes Front Entrance Camera / Intercom / Door Release
59	MEP						☐		☐		☐		☐	☐	☐	☐	☐		
60	Electrical						☐		☐		☐		☐	☐	☐	☐	☐		
61	Access Control	CP-43.1	$114,813	35%	$40,185	$161,198	☐	$167,646	☐	$174,352	☐	$181,326	☐	☑	☐	☐	☐	★☆☆☆☆	Assume access control at (4) exterior doors
62	Telecom						☐		☐		☐		☐	☐	☐	☐	☐		
63	Intercom Replacement	CP-44.1	$95,521	35%	$33,432	$134,112	☑	$139,476	☐	$145,055	☐	$150,858	☐	☐	☐	☐	☐	★★★★★	This was deemed important for student and staff safety and was moved to 2026
64	MISC						☐		☐		☐		☐	☐	☐	☐	☐		
65	Autism Program Relocation	CP-51	$29,850	35%	$10,448	$41,910	☐	$43,586	☐	$45,330	☐	$47,143	☐	☑	☐	☐	☐		Complete
66																			
67	**ABERDEEN HIGH SCHOOL**						☐		☐		☐		☐	☐	☐	☐	☐		
68	SITE						☐		☐		☐		☐	☐	☐	☐	☐		
69	Parking Lot - South Lot	HS-01	$71,640	35%	$25,074	$100,583	☑	$104,606	☐	$108,790	☐	$113,142	☐	☐	☐	☐	☐	★★★★☆	
70	Ramp / Sidewalk repairs - South Entry	HS-02	$33,473	35%	$11,716	$46,996	☑	$48,876	☐	$50,831	☐	$52,865	☐	☐	☐	☐	☐	★★★★☆	
71	Resurface Tennis Courts	HS-03	$73,431	35%	$25,701	$103,097	☐	$107,221	☐	$111,510	☐	$115,971	☑	☐	☐	☐	☐	★★☆☆☆	Four courts
72	ENVELOPE						☐		☐		☐		☐	☐	☐	☐	☐		
73	Re-roof 1/4 of building	HS-11A	$708,935	35%	$248,127	$995,345	☐	$1,035,159	☑	$1,076,565	☐	$1,119,628	☐	☐	☐	☐	☐	★★★☆☆	Tear off and replace half of roof with 3-ply SBS modified roof over coverboard & R-38 insulation over self-adhered interim roof; replace all flashing
74	Re-roof 1/4 of building	HS-11A	$708,935	35%	$248,127	$995,345	☐	$1,035,159	☐	$1,076,565	☑	$1,119,628	☐	☐	☐	☐	☐	★★★☆☆	
75	Re-roof 1/4 of building	HS-11	$708,935	35%	$248,127	$995,345	☐	$1,035,159	☐	$1,076,565	☐	$1,119,628	☑	☐	☐	☐	☐	★★★☆☆	
76	Re-roof 1/4 of building	HS-11	$708,935	35%	$248,127	$995,345	☐	$1,035,159	☐	$1,076,565	☐	$1,119,628	☐	☑	☐	☐	☐	★★★☆☆	
77	BUILDING						☐		☐		☐		☐	☐	☐	☐	☐		
78	Safety						☐		☐		☐		☐	☐	☐	☐	☐		
79	Vestibule	HS-21.1	$183,058	35%	$64,070	$257,014	☑	$267,294	☐	$277,986	☐	$289,106	☐	☐	☐	☐	☐	★★★★★	Includes Front Entrance Camera / Intercom / Door Release
80	MEP						☐		☐		☐		☐	☐	☐	☐	☐		
81	Electrical						☐		☐		☐		☐	☐	☐	☐	☐		
82	Access Control	HS-43.1	$259,322	35%	$90,763	$364,088	☐	$378,652	☐	$393,798	☐	$409,550	☑	☐	☐	☐	☐	★★★☆☆	Assume access control at (8) exterior doors. (3) card readers already. Add zoning doors
83	Telecom						☐		☐		☐		☐	☐	☐	☐	☐		
84	Intercom Replacement	HS-44.1	$465,437	35%	$162,903	$653,474	☑	$679,613	☐	$706,797	☐	$735,069	☐	☐	☐	☐	☐	★★★★☆	This was deemed important for student and staff safety and was moved to 2026
85																			
86	**ADMIN BUILDING**						☐		☐		☐		☐	☐	☐	☐	☐		
87	SITE						☐		☐		☐		☐	☐	☐	☐	☐		
88	Sidewalk Repairs	A-01	$85,252	35%	$29,838	$119,694	☐	$124,482	☐	$129,461	☑	$134,640	☐	☐	☐	☐	☐	★★★☆☆	Front is more of an issue than north
89	Ramp	A-02	$11,194	35%	$3,918	$15,717	☑	$16,345	☐	$16,999	☐	$17,679	☐	☐	☐	☐	☐	★★★★★	Replace existing ramp w/ new aluminum ramp and railings
90	ENVELOPE						☐		☐		☐		☐	☐	☐	☐	☐		
91	Walls - Seal exterior brick / masonry / concrete walls & Paint wood / doors & frames	A-12	$32,008	35%	$11,203	$44,940	☐	$46,737	☐	$48,607	☐	$50,551	☑	☐	☐	☐	☐	★★★☆☆	
92	BUILDING						☐		☐		☐		☐	☐	☐	☐	☐		
93	Safety						☐		☐		☐		☐	☐	☐	☐	☐		
94	Vestibule	A-21.1A	$25,329	35%	$8,865	$35,562	☐	$36,985	☐	$38,464	☐	$40,003	☐	☐	☐	☑	☐	★☆☆☆☆	Includes Front Entrance Camera / Intercom / Door Release - camera door release more important at 2 locations
95	Entry Camera / Intercom/ Door Release	A-21.1B	$26,635	35%	$9,322	$37,396	☑	$38,892	☐	$40,447	☐	$42,065	☐	☐	☐	☐	☐	★★★★★	This was deemed important for student and staff safety and was moved to 2026
96	Vertical Circulation						☐		☐		☐		☐	☐	☐	☐	☐		
97	Elevator	A-25.1	$29,850	35%	$10,448	$41,910	☐	$43,586	☐	$45,330	☐	$47,143	☐	☐	☐	☐	☑		No current elevator - delete
98	MEP						☐		☐		☐		☐	☐	☐	☐	☐		
99	HVAC	A-41	$1,218,954	35%	$426,634	$1,711,412	☐	$1,779,868	☐	$1,851,063	☐	$1,925,106	☐	☐	☐	☑	☐	★★★☆☆	System replacement - currently electric radiators
100	Electrical						☐		☐		☐		☐	☐	☐	☐	☐		
101	Access Control	A-43.1	$55,585	35%	$19,455	$78,042	☐	$81,163	☐	$84,410	☐	$87,786	☐	☐	☐	☑	☐		Assume access control at (2) exterior doors - priced with vestibule
102																			
103	**MAINTENANCE BUILDING**						☐		☐		☐		☐	☐	☐	☐	☐		

	Task Name	Cost ID	GC Cost	Soft Cost %	Soft Costs Total	2026 Cost	2026 Project	2027 Cost	2027 Project	2028 Cost	2028 Project	2029 Cost	2029 Project	Defer - Include in Seismic / SCAP Project	Delete - Complete	Defer beyond 2029	Delete - Not Required	Priority	Comments
104	ENVELOPE						☐		☐		☐		☐	☐	☐	☐	☐		
105	Paint exterior walls	MA-11	$36,510	35%	$12,779	$51,260	☐	$53,311	☐	$55,443	☐	$57,661	☐	☐	☐	☐	☑	★☆☆☆☆	
106	MEP						☐		☐		☐		☐	☐	☐	☐	☐		
107	HVAC	MA-41	$301,831	35%	$105,641	$423,770	☐	$440,721	☐	$458,350	☑	$476,684	☐	☐	☐	☐	☐	★★★★☆	System replacement - limited coverage - Priced at 25%
108																			
109	**STEWART BUILDING**						☐		☐		☐		☐	☐	☐	☐	☐		
110	ENVELOPE						☐		☐		☐		☐	☐	☐	☐	☐		
111	Roof	SB-11	$1,280,657	35%	$448,230	$1,798,043	☐	$1,869,965	☐	$1,944,763	☐	$2,022,554	☐	☐	☑	☐	☐		Tear off and replace entire roof with 3-ply SBS modified roof over coverboard & R-38 insulation over self-adhered interim roof; replace all flashing - 5000 SF; Repair 22,000 SF w/ liquid applied roof membrane & mesh flood coat. Some work done last year
112	MEP						☐		☐		☐		☐	☐	☐	☐	☐		
113	HVAC - Wrestling (heat only)	SB-41A	$570,748	35%	$199,762	$801,330	☐	$833,384	☐	$866,719	☐	$901,388	☐	☐	☐	☑	☐	★★★★☆	System replacement - limited coverage; currently steam radiators, AHUs at roof of locker rooms. Priced at 25% of area
114	HVAC - Office Space System Replacement	SB-41B	$1,902,493	35%	$665,873	$2,671,101	☐	$2,777,945	☐	$2,889,062	☐	$3,004,625	☐	☐	☐	☑	☐	★★★★☆	System replacement - limited coverage; currently steam radiators, AHUs at roof of locker rooms. Priced at 25% of area
115																			
116																			
117	**STEWART FIELD**						☐		☐		☐		☐	☐	☐	☐	☐		
118	SITE						☐		☐		☐		☐	☐	☐	☐	☐		
119	Retaining Wall Repair	SF-01	$223,885	25%	$55,971	$291,051	☐	$302,693	☑	$314,800	☐	$327,392	☐	☐	☐	☐	☐	★★☆☆☆	
120	Parking Lot Repair	SF-02	$50,521	10%	$5,052	$57,796	☐	$60,108	☐	$62,512	☐	$65,013	☑	☐	☐	☐	☐	★★★☆☆	
121	ENVELOPE						☐		☐		☐		☐	☐	☐	☐	☐		
122	Roof	SF-11	$523,443	35%	$183,205	$734,914	☐	$764,311	☐	$794,883	☑	$826,679	☐	☐	☐	☐	☐	★★★☆☆	Replace asphalt shingle portion with new laminated asphalt shingles over ice & water shield; replace flashing - all roofs. Apply liquid applied roof membrane & mesh flood coat at single ply sections - end zone and north shingle roofs most urgent
123	BUILDING						☐		☐		☐		☐	☐	☐	☐	☐		
124	Wood Structure Repairs	SF-21	$124,325	10%	$12,433	$142,228	☐	$147,917	☑	$153,834	☐	$159,987	☐	☐	☐	☐	☐	★★☆☆☆	East wall of south stands, north restrooms
125	Replace North Restrooms	SF-22		35%	$0		☐		☐		☐		☐	☐	☐	☑	☐	★★★★☆	Upgrade north restrooms
126																			
127	**DISTRICT WIDE**						☐		☐		☐		☐	☐	☐	☐	☐		
128	TECHNOLOGY	ASD-00			$0	$250,000	☑	$250,000	☑	$250,000	☑	$250,000	☑	☐	☐	☐	☐		Assume $250,000 per year for device replacements
129	Food Service Alllowance	ASD-01			$0	$100,000	☑	$100,000	☑	$100,000	☑	$100,000	☑	☐	☐	☐	☐		Assume $100,000 per year for equipment replacements
130																			
131	Available Levy Funds	$9,295,444	Total Levy Collections			$2,188,984	☐	$2,276,544	☐	$2,367,606	☐	$2,462,310	☐	☐	☐	☐	☐		
132																			
133	Yearly Project Budget	$10,043,321	Total Levy Spending			$2,656,614	☐	$2,233,005	☐	$2,809,260	☐	$2,344,442	☐	☐	☐	☐	☐		
134																			
135		108%				121%	☐	98%	☐	119%	☐	95%	☐	☐	☐	☐	☐		
136																			
137					**TOTAL:**	**$21,564,900**	☐	**$22,427,497**	☐	**$23,324,596**	☐	**$24,257,580**	☐	☐	☐	☐	☐		
138																			
139																			
140																			
141																			
142																			
143																			
144																			
145																			

Prioritizations

The highest priority projects are recommended to be budgeted for the year 2026. Additional priority projects are recommended to follow each consecutive year thereafter, with some variations, until 2029. See each facility list for more information. Each cost item to be budgeted within the 2026 – 2029 timeframe is listed as High, Medium or Low Priority under each facility.

Miller Junior High School

Since Miller Junior High is slated for replacement only the most urgent needs and items associated with student and staff safety will be addressed at the current facility. Cost item M-44.1 Intercom Replacement is to be a 2026 cost. There is a need for replacing kitchen equipment, this is addressed under District Wide as a food service allowance.

Stevens Elementary

Since Stevens Elementary is slated for replacement only the most urgent needs and items associated with student and staff safety will be addressed at the current facility. Cost items S-11 Roof Repairs and S-44.1 Intercom Replacement is to be a 2026 cost. There is a need for replacing kitchen equipment, this is addressed under District Wide as a food service allowance.

AJ West Elementary

Since AJ West Elementary is slated for replacement only the most urgent needs and items associated with student and staff safety will be addressed at the current facility. Cost item AJ-44.1 Intercom Replacement is to be a 2026 cost. There is a need for replacing kitchen equipment, this is addressed under District Wide as a food service allowance.

Harbor Learning Center (Hopkins Building)

Since Harbor Leaning Center is slated for replacement only the most urgent needs and items associated with student and staff safety will be addressed at the current facility. Cost item H-44.1 I Intercom Replacement is to be a 2026 cost. There is a need for replacing kitchen equipment, this is addressed under District Wide as a food service allowance.

McDermoth Elementary

McDermoth Elementary, based on discussions subsequent to this estimate is most likely going to be converted from a school to a district office / staff hub location. With that change the building would no longer be eligible for OSPI funding. The below priorities pre-date that decision and are as follows:

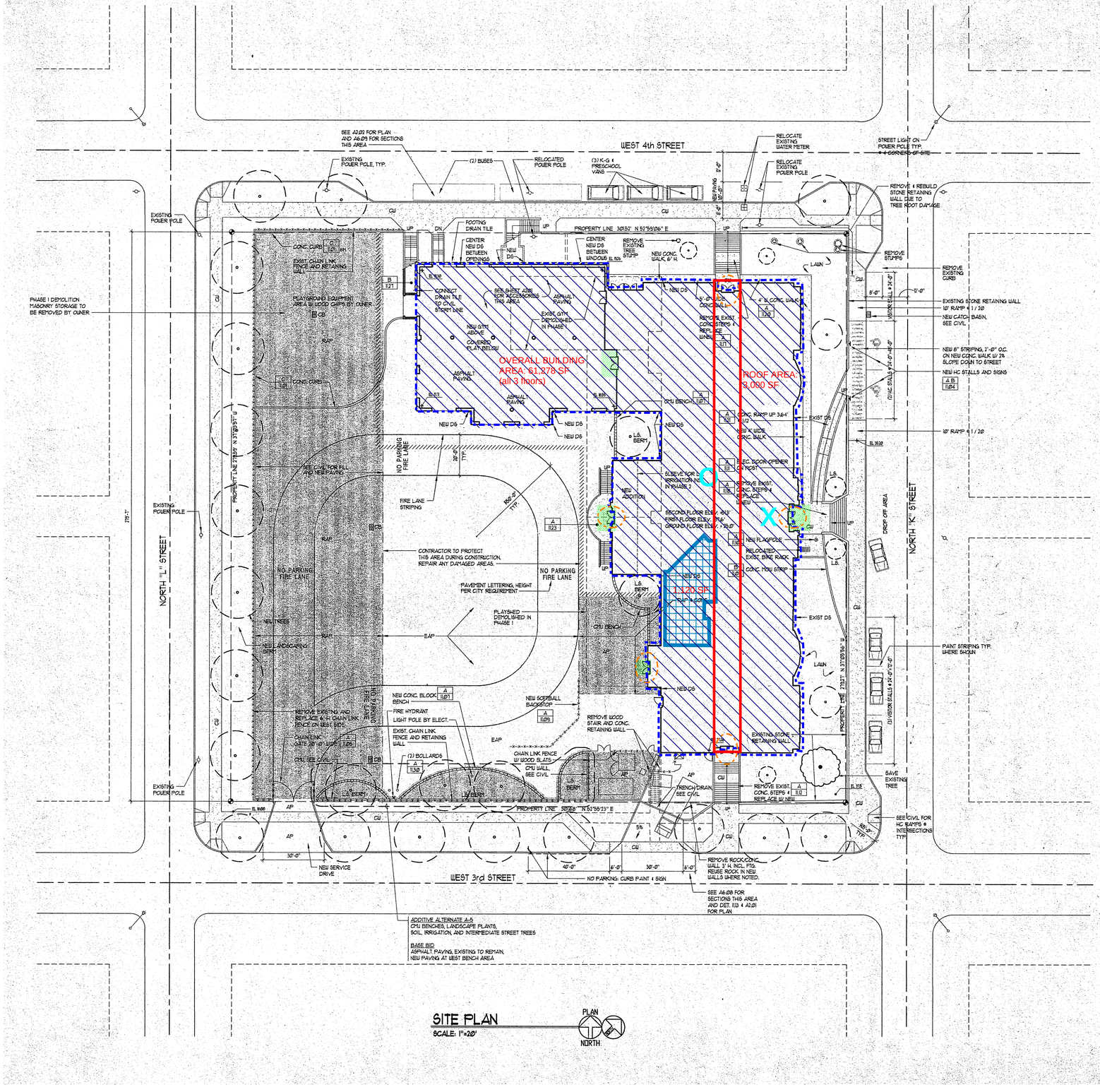
- High Priority:
    - MC-44.1 – Intercom Replacement at entire school is to be a 2026 cost.
- Medium Priority:
    - MC-21.1B – Entry Camera/Intercom/Door Release is to be a 2026 cost.
        - Work includes a camera at the front entrance, a 2-way intercom, and an electronic door release.
- Not prioritized:
    - MC-25.1 – Elevator
        - Replace electronic elevator controls

Cost items that are recommended to be deferred as Defer:

- MC-11 – Roof – Partial Replacement
    - Cost includes replacing single ply (EPDM) roof at top of steep slope roof at main building including new curbs for all hoods, hatch, etc. Fully adhered EPDM over coverboard over R-38 polyiso insulation over self-adhered interim roofing; replace all flashing, gutters and downspouts.
- MC-12 – Walls – Seal exterior brick walls
    - Cost includes cleaning, sealing and installing anti-graffiti coating to +8’-0” at brick / masonry / concrete and painting exterior doors and frames.
- MC-13 – Hollow Metal Doors & Frames
    - Cost includes replacing HM doors & frames at (5) locations including sidelights & transoms with thermally broken HM frames (16 GA), insulated glazing and high R-value doors (14 GA) as well as new hardware.
- MC-21.1A – Vestibule
    - See drawings.
- MC-43.1 – Access Control
    - Cost includes 4 exterior doors including card swipe, associated hardware and head-end.

There is a need for replacing kitchen equipment, this is addressed under District Wide as a food service allowance.

MCDERMOTH ELEMENTARY



SITE DATA

1. SITE ADDRESS: 409 NORTH "K" STREET, ABERDEEN
2. SITE AREA: 1.33 ACRES
3. PROPOSED PARKING: HC: 2
   VISITOR: 4
   SCHOOL VANS: 3
   BUSSES: 2

GENERAL NOTES

1. REMOVE ALL CONCRETE WALKS AT PERIMETER OF SITE, AND REPLACE WITH NEW, TYPICAL. SEE CIVIL.
2. SEE CIVIL AND LANDSCAPE PLANS.
3. GRADE AT NEW ADDITION FOUNDATION AREAS AT THE CONCLUSION OF PHASE 2 SHALL BE COMPACTED STRUCT. FILL, LEVEL WITH TOP OF GRADE BEAMS.
4. AREA BEHIND CMU BENCHES IS RAISED LANDSCAPE BED. IMPORT TOPSOIL AS REQUIRED. SEE CMU BENCH DETAIL FOR GRADE.
5. SEE CIVIL DEMOLITION PLAN FOR SITE DEMOLITION.
6. PROVIDE 6'-0" HIGH CONSTRUCTION FENCING ADJACENT TO CITY SIDEWALK, AROUND PERIMETER OF BUILDING AND CONNECTED TO EXISTING PLAYGROUND FENCE. INFILL EXISTING PLAYGROUND FENCE OPENINGS. COORDINATE FENCING LOCATION WITH CITY AT TIME OF FRONTAGE IMPROVEMENTS.

DETAILS

- CMU BENCH — A 11.01
- FLAG POLE — A 11.10
- HANDICAP SIGN — A 11.24
- ROCKERY WALL

LEGEND

- SEDIMENT FENCE INSTALLED IN PHASE 1 TO BE MAINTAINED UNTIL CITY APPROVES REMOVAL. REMOVE AND REINSTALL AS REQUIRED FOR NEW CONSTRUCTION ACCESS. ALL PAVING NORTH AND EAST OF THIS LINE HAS BEEN REMOVED IN PHASE 1.
- RAP — REMOVE EXISTING ASPHALT PAVING.
- AP — ASPHALT PAVING.
- CB — CATCH BASIN, SEE CIVIL.
- CU — CONCRETE WALK.
- EAP — EXISTING ASPHALT PAVING TO REMAIN. PATCH AT TRENCHED AREAS FOR NEW UTILITY LINES AND AT FOUNDATIONS FOR CONCRETE CURBS, CMU BENCHES, RETAINING WALLS, AND OTHER NEW WORK.

LEGEND

	ROOF REPLACEMENT (EPDM, flashing, gutters & roof drains)	MC-11
	EXTERIOR WALLS	MC-12
	HM DOORS & FRAMES REPLACEMENT (see Narrative)	MC-13
X	VESTIBULE (see next page for layout)	MC-21.1
O	ELEVATOR UPGRADE (electronics & controls)	MC-25.1
	KITCHEN EQUIPMENT REPLACEMENT	MC-31 - MC-34
	ACCESS CONTROL	MC-43.1
	INTERCOM REPLACEMENT	MC-44.1

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Aberdeen School District

Project Title

MASTER PLANNING

ABERDEEN SCHOOL DISTRICT
ABERDEEN, WA 98520

Project Numbers
2024-002.01

Issue & Revision Dates
2 AUG 2024 PD COST ESTIMATE

PROGRAMMING DESIGN NOT FOR CONSTRUCTION

Sheet Title

MCDERMOTH - SITE PLAN

Drawn By MM
Checked By SW

Sheet Number

A7.00

Sheet Number Of

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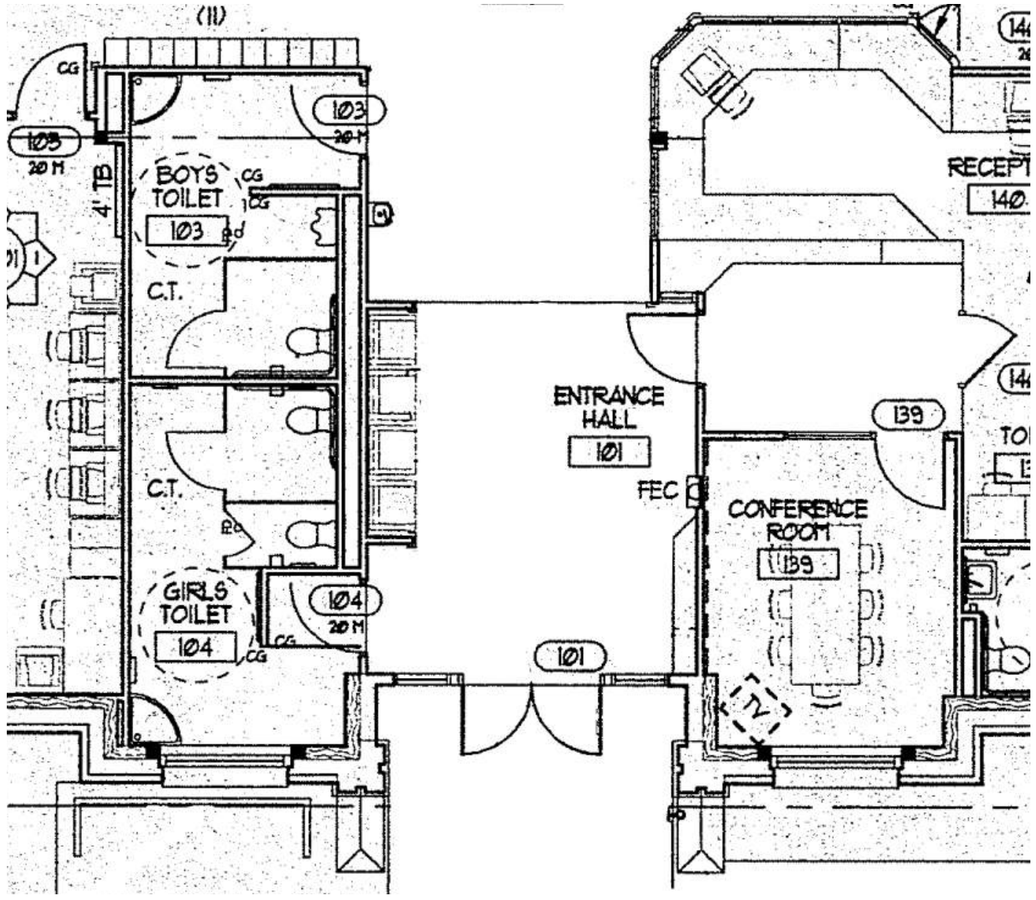
MCDERMOTH ELEMENTARY

BEFORE



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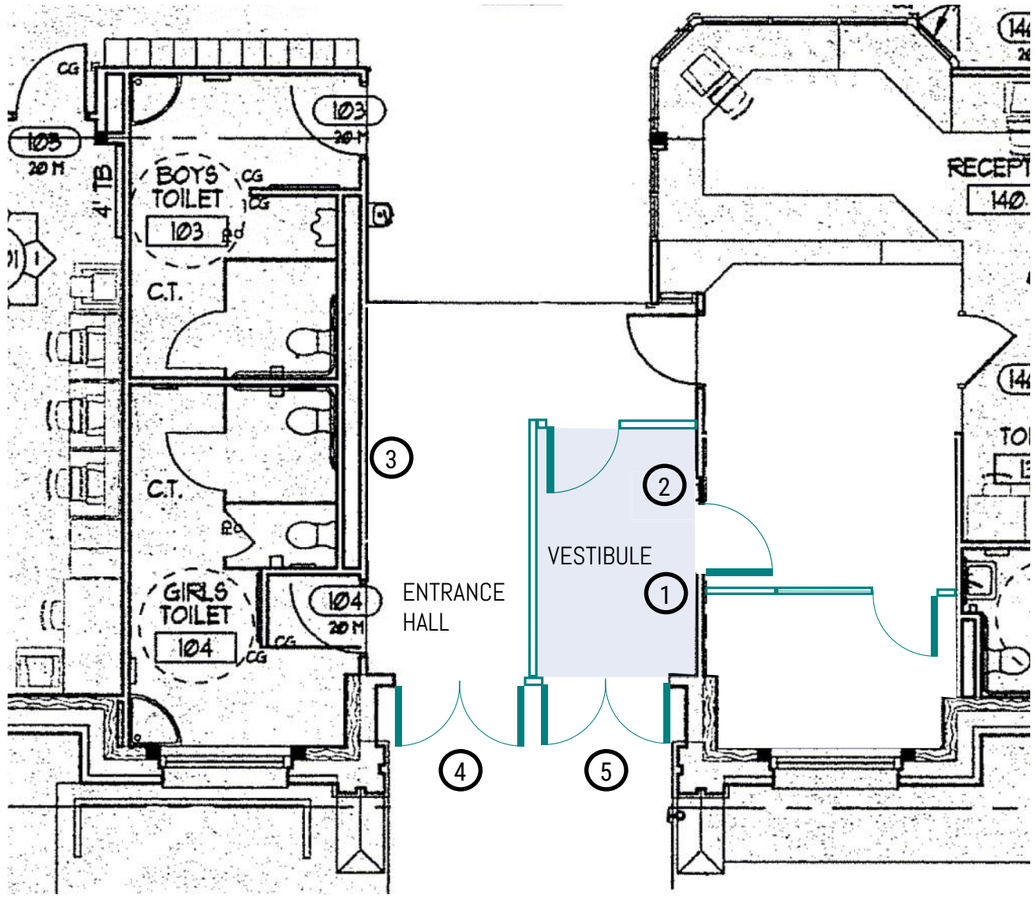


1. REMOVE COUNTER, ELECTRIC DOOR OPENER PLATE TO REMAIN
2. RELOCATE FIRE EXTINGUISHER
3. REMOVE SEATING ALCOVE
4. STUDENT, TEACHER & ADMINISTRATOR ENTRANCE
5. VISITOR ENTRANCE

Robert Gray Elementary

Robert Gray Elementary is planned for seismic retrofit, cost priorities are as follows:

- High Priority:
    - RG-21.1 – Vestibule is to be a 2026 cost.
        - It includes a camera at the front entrance, a 2-way intercom, and an electronic door release. See drawings.
    - RG-44.1 – Intercom Replacement at the entire school is to be a 2026 cost.
- Medium Priority:
    - RG-43.1 – Access Control is to be a 2029 cost.
        - It includes 4 exterior doors with a card swipe, associated hardware and head-end.
- Low Priority:
    - RG-01 – Replace Ramp at portable is to be a 2027 cost.
        - It includes an aluminum ramp and railings.

Cost items that are recommended to be deferred as Defer – Include in Seismic / SCAP Project:

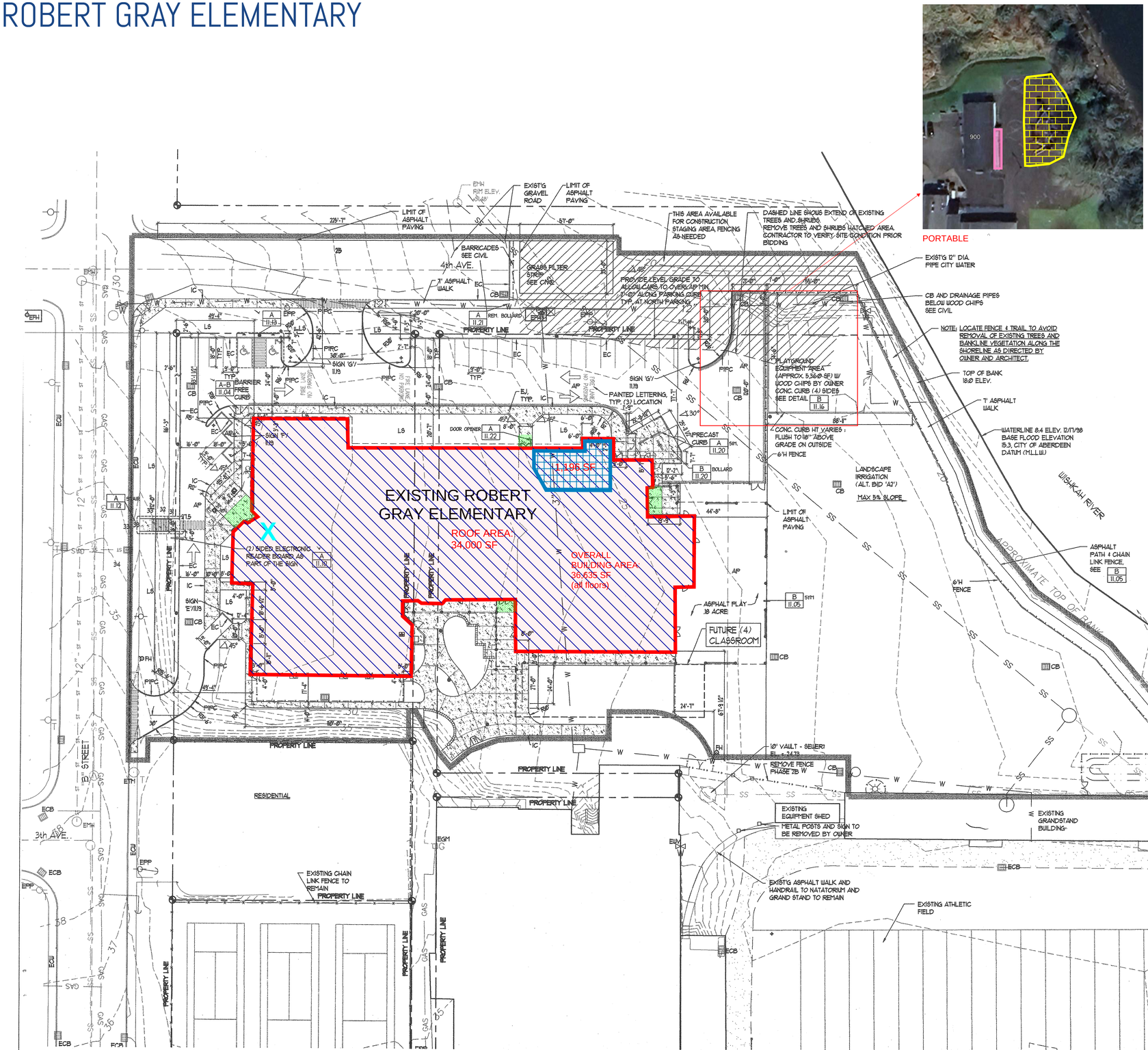
- RG-11 – Roof
    - Cost includes replacing the entire shingle roof to deck with a new laminated shingle roof over ice & water shield and replacing all flashing, gutters and downspouts.

Cost items that were in the cost estimate but have already been completed and are marked Delete – Complete in the matrix:

- RG-02 – Replace Playground Equipment

There is a need for replacing kitchen equipment, this is addressed under District Wide as a food service allowance.

ROBERT GRAY ELEMENTARY



PARTIAL SITE DIMENSION PLAN - PHASE 2A

SCALE: 1" = 30'-0"

LEGEND

	RAMP REPLACEMENT	RG-01
	PLAYGROUND REPLACEMENT	RG-02
	ROOF REPLACEMENT	RG-11
X	VESTIBULE (see next page for layout)	RG-21.1
	KITCHEN EQUIPMENT REPLACEMENT	RG-31 & RG-32
	ACCESS CONTROL	RG-43.1
	INTERCOM REPLACEMENT	RG-44.1

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Aberdeen School District

Project Title

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2024-002

Issue & Revision Dates
2 AUG 2024 PD COST ESTIMATE

PROGRAMMING DESIGN NOT FOR CONSTRUCTION

Sheet Title

ROBERT GRAY - SITE PLAN

Drawn By MM | Checked By SW

Sheet Number

A6.00

Sheet Number Of

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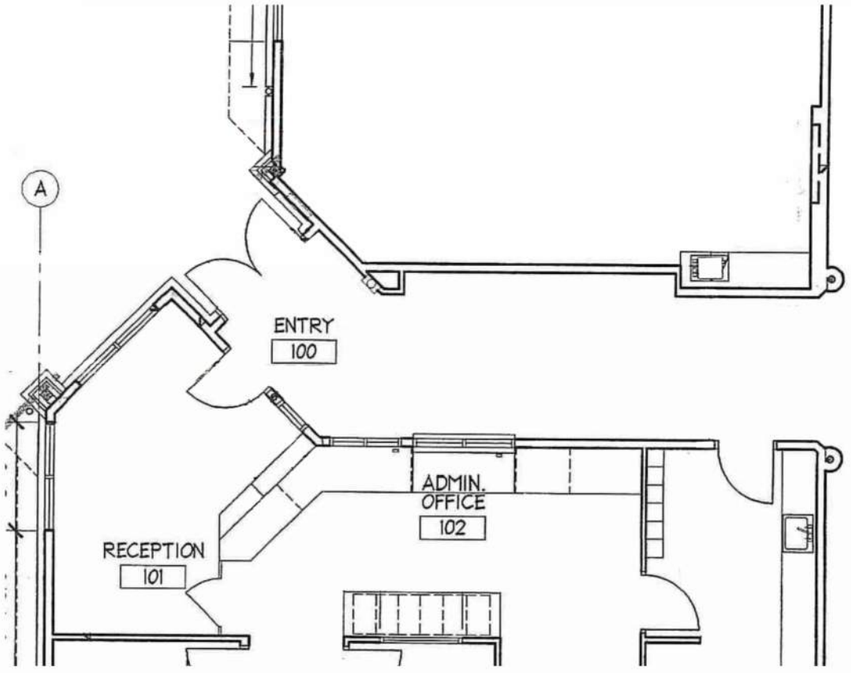
ROBERT GRAY ELEMENTARY

BEFORE



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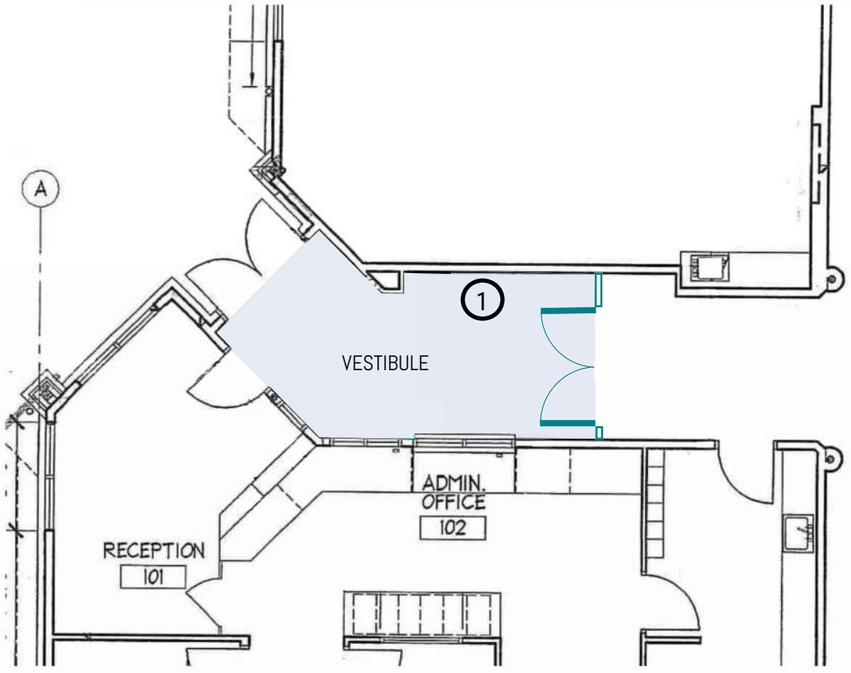


1 REMOVE OR RELOCATE LOCKERS

Central Park Elementary

Central Park Elementary is planned for seismic retrofit and modernization or replacement, cost priorities are based on seismic retrofit and modernization:

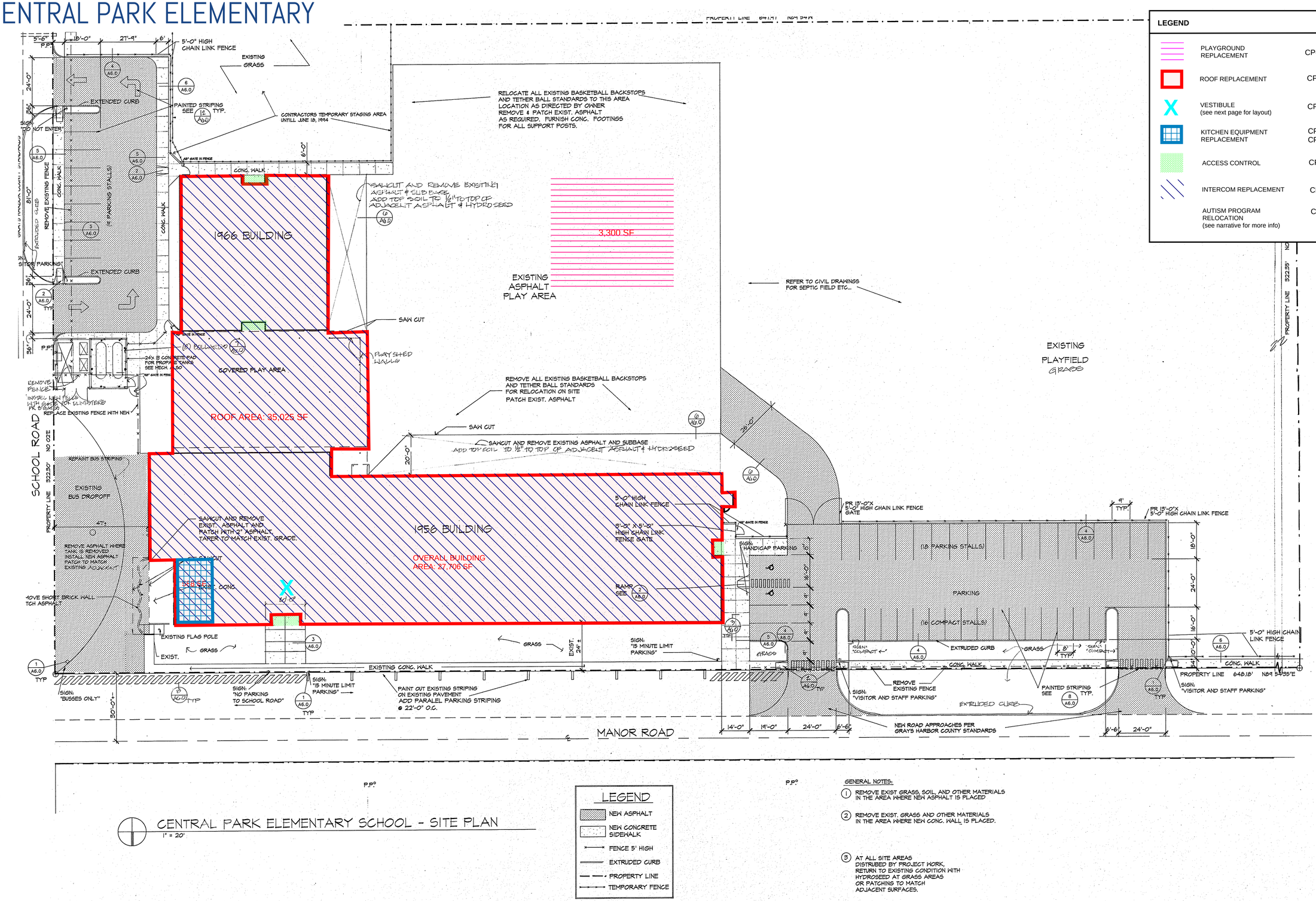
- High Priority:
    - CP-01 – Replace playground equipment is to be a 2027 cost.
        - The equipment should match McDermoth's.
    - CP-44.1 – Intercom Replacement at entire school is to be a 2026 cost.

Cost items that are recommended to be deferred as Defer – Include in Seismic / SCAP Project:

- CP-11 – Roof
    - Which includes tearing off and replacing the entire roof with 3-ply SBS modified roof over coverboard and R-38 insulation over self-adhered interim roof, replacing all flashing, gutters and downspouts.
- CP-21.1 – Vestibule
    - Work includes a camera at the front entrance, a 2-way intercom and electronic door release. See drawings.
- CP-43.1 – Access Control
    - It includes 4 exterior doors with a card swipe, associated hardware and head-end.
- CP-51 – Autism Program Relocation

There is a need for replacing kitchen equipment, this is addressed under District Wide as a food service allowance.

CENTRAL PARK ELEMENTARY



CENTRAL PARK ELEMENTARY SCHOOL - SITE PLAN

1" = 20'

LEGEND

- NEW ASPHALT
- NEW CONCRETE SIDEWALK
- FENCE 5' HIGH
- EXTRUDED CURB
- PROPERTY LINE
- TEMPORARY FENCE

GENERAL NOTES:

1. REMOVE EXIST GRASS, SOIL, AND OTHER MATERIALS IN THE AREA WHERE NEW ASPHALT IS PLACED
2. REMOVE EXIST. GRASS AND OTHER MATERIALS IN THE AREA WHERE NEW CONC. WALL IS PLACED.
3. AT ALL SITE AREAS DISTRUBED BY PROJECT WORK, RETURN TO EXISTING CONDITION WITH HYDROSEED AT GRASS AREAS OR PATCHING TO MATCH ADJACENT SURFACES.

LEGEND

	PLAYGROUND REPLACEMENT	CP-01
	ROOF REPLACEMENT	CP-11
X	VESTIBULE (see next page for layout)	CP-21.1
	KITCHEN EQUIPMENT REPLACEMENT	CP-31 & CP-32
	ACCESS CONTROL	CP-43.1
	INTERCOM REPLACEMENT	CP-44.1
	AUTISM PROGRAM RELOCATION (see narrative for more info)	CP-51

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124 North I Street
Tacoma, Washington, 98403
www.tcfarchitecture.com

Aberdeen School District

Project Title

MASTER PLANNING

ABERDEEN SCHOOL DISTRICT
ABERDEEN, WA 98520

Project Numbers
2024-002.01

Issue & Revision Dates
2 AUG 2024 PD COST ESTIMATE

PROGRAMMING DESIGN
NOT FOR CONSTRUCTION

Sheet Title

CENTRAL PARK - SITE PLAN

Drawn By MM
Checked By SW

Sheet Number

A5.00

Sheet Number Of

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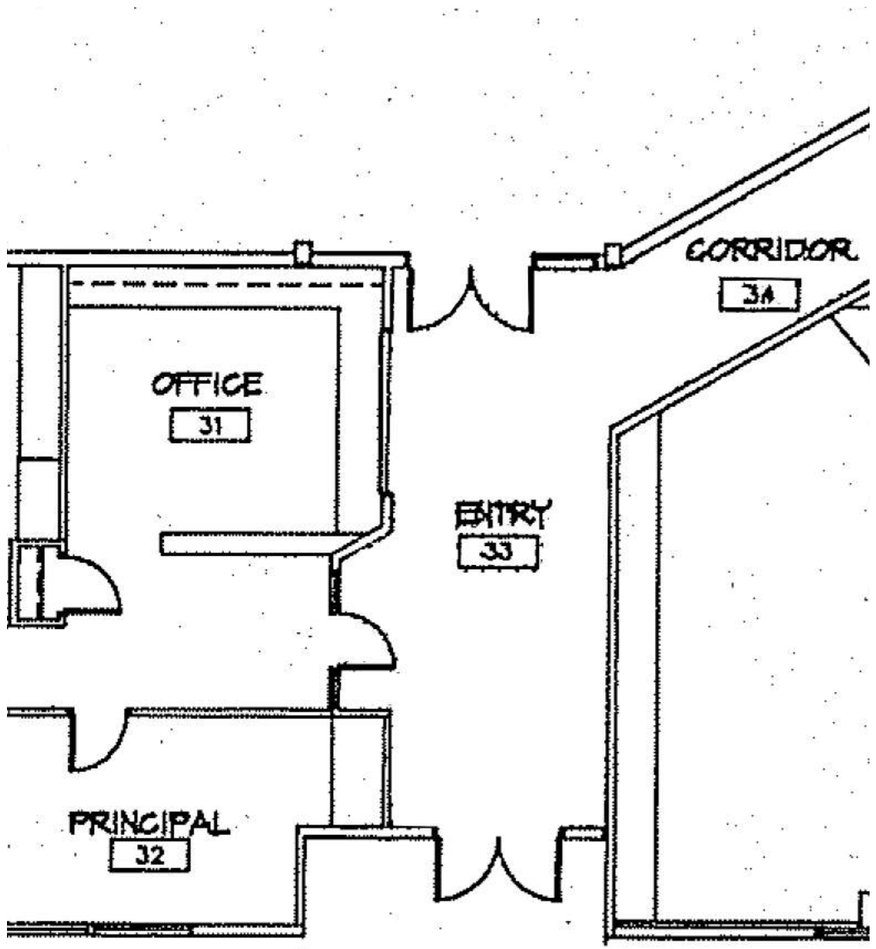
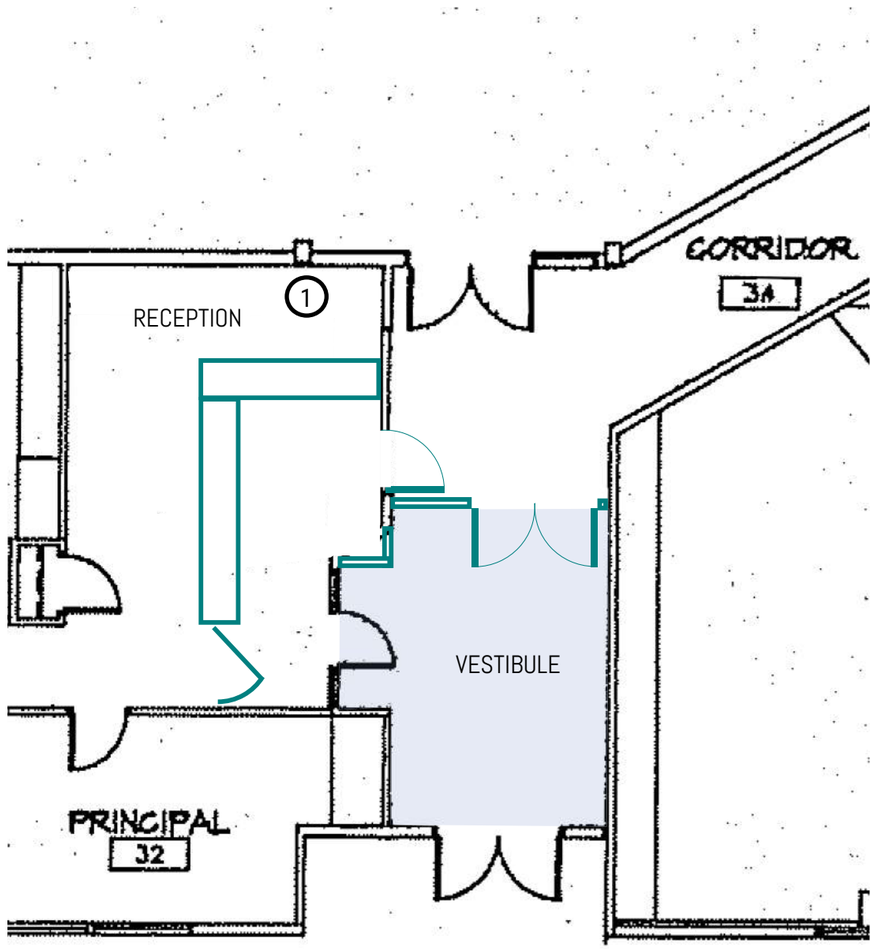
CENTRAL PARK ELEMENTARY

BEFORE



AFTER



1 REMOVE EXISTING CASEWORK

Aberdeen High School

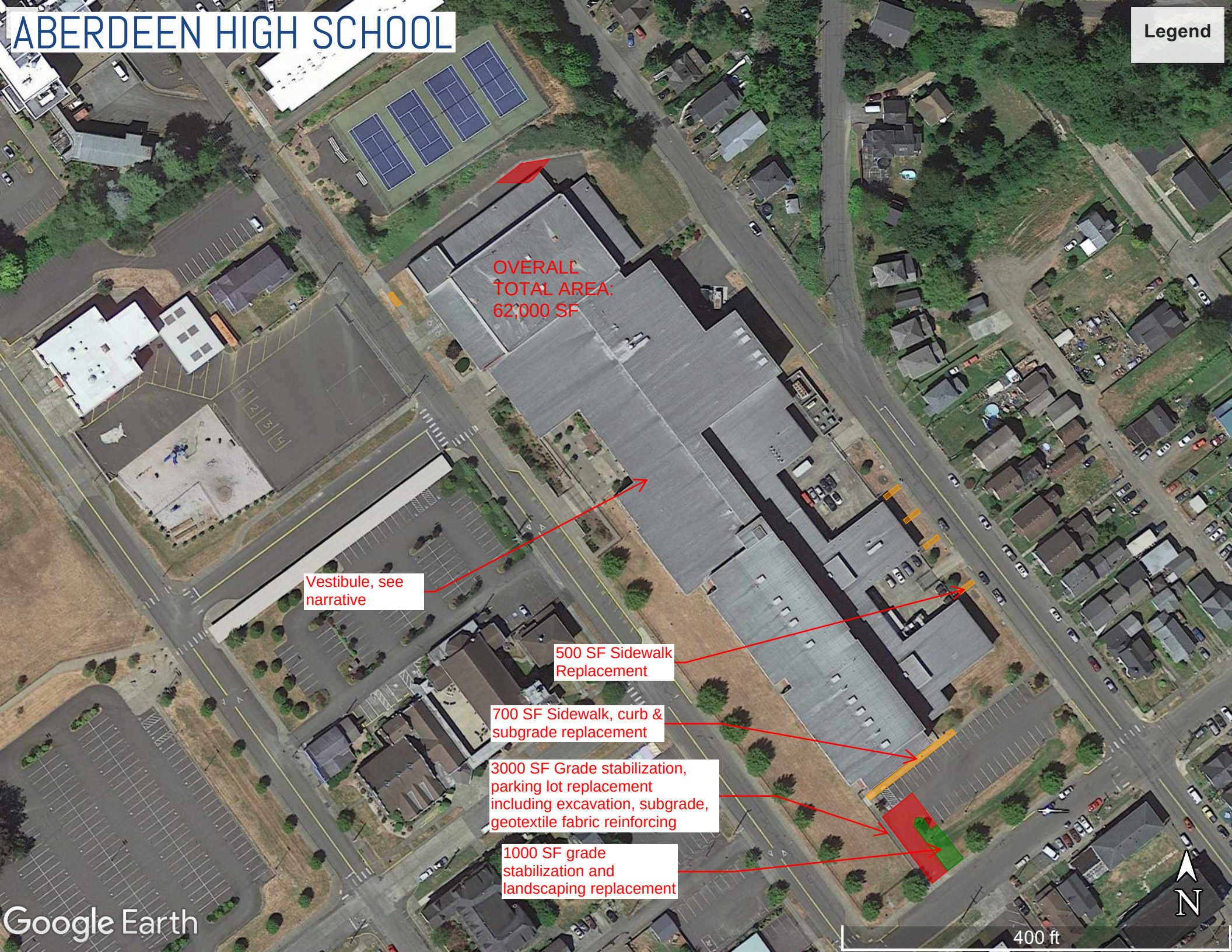
Aberdeen High School has no current recommended need for seismic retrofit or replacement, cost priorities are as follows:

- High Priority:
    - HS-01 – Parking Lot – South lot is to be a 2026 cost.
    - HS-02 – Ramp / Sidewalk repairs – South entry is to be a 2026 cost.
    - HS-21.1 – Vestibule is to be a 2026 cost.
        - Work will entail removing an existing window, modifying existing exterior wall & brick veneer to provide exterior HM door / frame & sidelight, new interior wall and wall revisions plus a new HM door & frame, flooring, ceiling revisions, etc. A camera at front entrance, a 2-way intercom, and electronic door release are also to be installed.
    - HS-44.1 – Intercom Replacement at entire school is to be a 2026 cost.
- Medium Priority:
    - HS-11A – Re-roof ¼ of building is to be a 2027 cost.
        - This cost includes tearing off and replacing the entire roof with a 3-ply SBS modified roof over coverboard and R-38 insulation over self-adhered interim roof and replacing all flashing.
    - HS-11B – Re-roof next ¼ of building is to be a 2028 cost.
    - HS-11C – Re-roof next ¼ of building is to be a 2029 cost.
- Low Priority:
    - HS-03 – Resurface Tennis Courts is to be a 2029 cost.
        - The cost is for (4) Tennis Courts.
    - HS-43.1 – Access Control is to be a 2029 cost.
        - This cost includes (8) exterior doors with a card swipe, associated hardware and head-end.

Cost items that are recommended to be deferred as Defer beyond 2029:

- HS-11D – Re-roof last ¼ of building.

There is a need for replacing kitchen equipment, this is addressed under District Wide as a food service allowance.


ABERDEEN HIGH SCHOOL
Legend
OVERALL
TOTAL AREA:
62,000 SF
Vestibule, see narrative
500 SF Sidewalk Replacement
700 SF Sidewalk, curb & subgrade replacement
3000 SF Grade stabilization, parking lot replacement including excavation, subgrade, geotextile fabric reinforcing
1000 SF grade stabilization and landscaping replacement
N
400 ft
Google Earth

Administration Building

The Administration Building has no current recommended need for seismic retrofit or replacement, cost priorities are as follows:

- High Priority:
    - A-02 – Replace existing ramp is to be a 2026 cost.
        - It includes a new aluminum ramp and railings.
    - A-21.1B – Entry Camera/Intercom/Door Release is to be a 2026 cost.
        - Work includes a camera at the front entrance, a 2-way intercom and electronic door release.
- Medium Priority:
    - A-01 – Sidewalk repair is to be a 2028 cost.
    - A-12 – Walls is to be a 2029 cost.
        - It includes sealing exterior brick/masonry/concrete walls and painting wood/doors and frames.

Cost items that are desired but due to budget constraints are recommended to be deferred as Defer beyond 2029:

- A-21.1B – Vestibule
    - The work will entail installation of a new tempered glass wall with a 4x10 header wrapped in oak veneer plywood with trim, tempered glass door and hardware.
- A-41 – HVAC
    - Work entails entire replacement of the entire system. Currently, the system in place is electric radiators.
- A-43.1 – Access Control
    - This cost includes (8) exterior doors with a card swipe, associated hardware and head-end.

Cost items that were addressed but are not part of the facility under Delete – Not Required:

- A-25.01 – Elevator
    - At present, there is no elevator in this facility.

ADMINISTRATION BUILDING



RAMP

See site plan

LEGEND

	SIDE WALK REPAIRS	A-01
	RAMP REPLACEMENT	A-02
X	VESTIBULE (see next page for layout)	A-21.1
O	ELEVATOR UPGRADE (electronics & controls)	A-25.1
	HVAC	A-41
	ACCESS CONTROL	A-43.1

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Aberdeen School District

Project Title

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ABERDEEN, WA 98520

Project Numbers
2024-002.01

Issue & Revision Dates

20 JUNE 2024 PD COST ESTIMATE GR 1

22 JULY 2024 PD COST ESTIMATE GR 2

PROGRAMMING DESIGN
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Sheet Title

ADMIN BUILDING - SITE PLAN

Drawn By MM

Checked By SW

Sheet Number

A9.00

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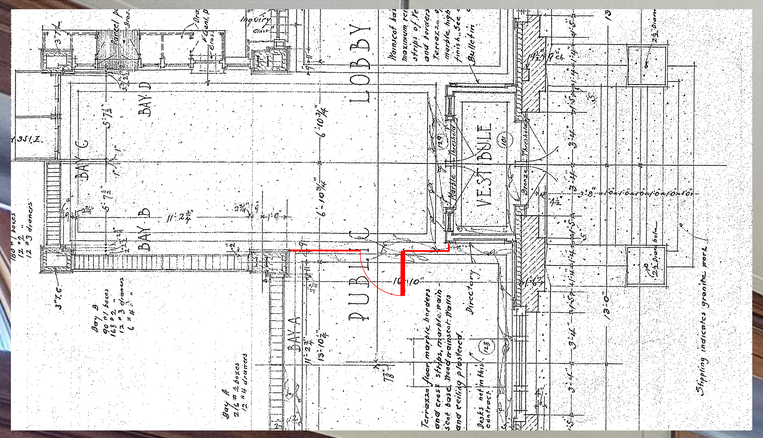
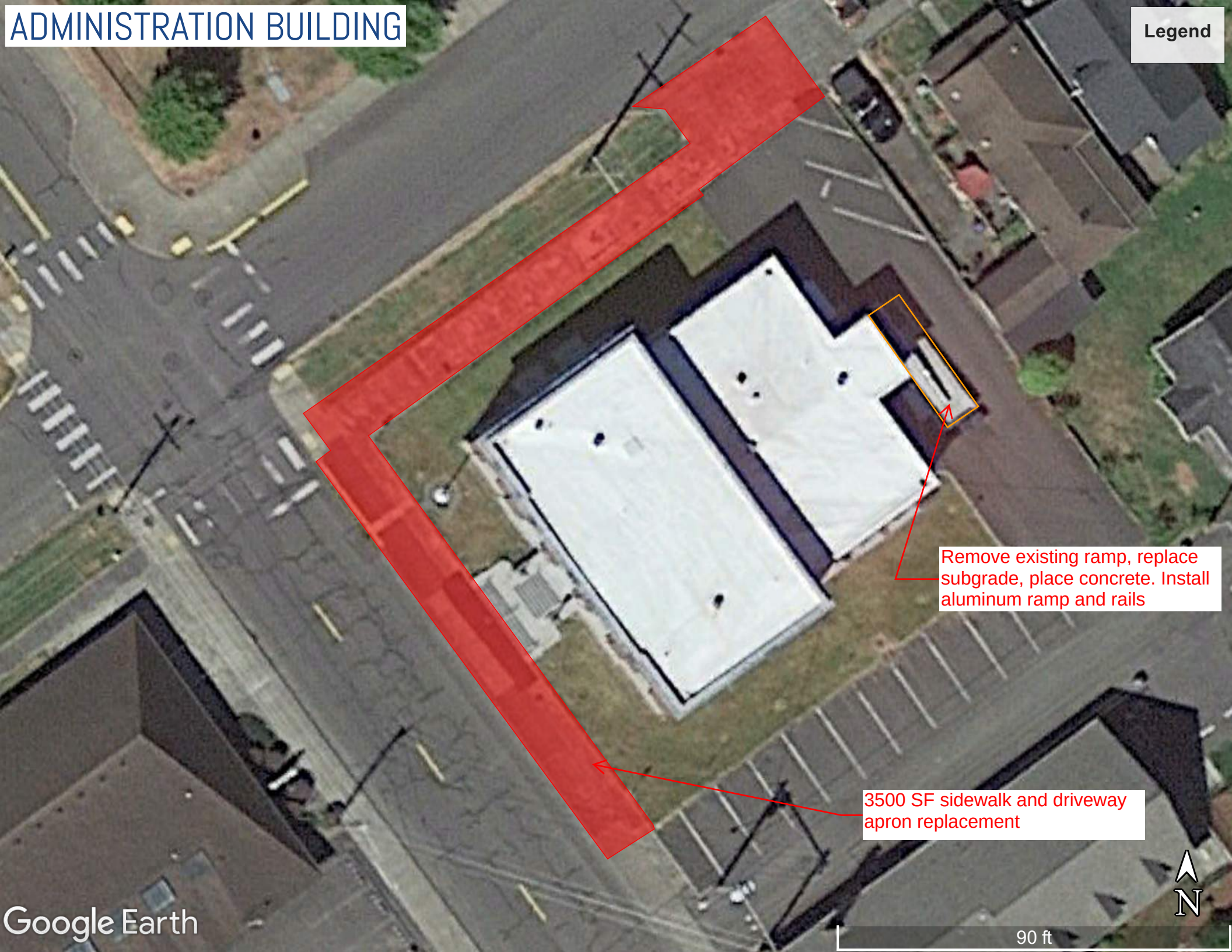
ADMINISTRATION BUILDING



VESTIBULE A-21.1

ADMINISTRATION BUILDING



Maintenance Building

The Maintenance Building has no current recommended need for seismic retrofit or replacement, cost priorities are as follows:

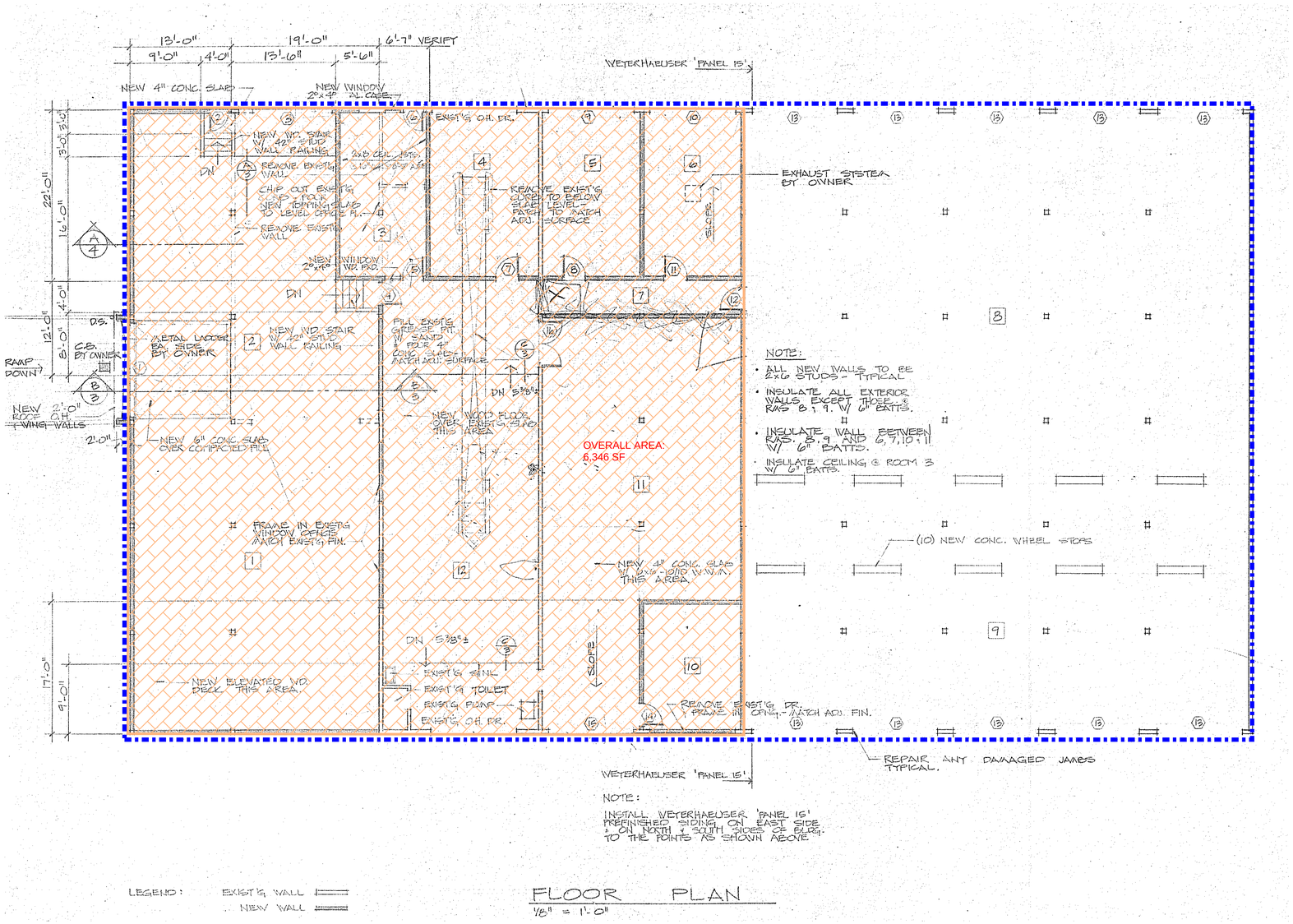
- High Priority:
    - MA-41 – HVAC is to be a 2028 cost.
        - The system replacement is for limited coverage priced at 25%.

Cost items that were addressed but are not needed under Delete – Not Required:

- MA-11 – Paint exterior walls

MAINTENANCE BUILDING

LEGEND		
	EXTERIOR WALLS	MA-11
	HVAC	MA-41



FLOOR PLAN

1/8" = 1'-0"

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Aberdeen School District

Project Title

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ABERDEEN SCHOOL DISTRICT
ABERDEEN, WA 98520

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20 JUNE 2024 PD COST ESTIMATE GR 1

22 JULY 2024 PD COST ESTIMATE GR 2

PROGRAMMING DESIGN
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Sheet Title

MAINTENANCE BUILDING - FLOOR PLAN

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A10.00

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Stewart Building

The Maintenance Building has no current recommended need for seismic retrofit or replacement, cost priorities are recommended to be deferred.

Cost items that are desired but due to budget constraints are recommended to be deferred as Defer beyond 2029:

- SB-41A – HVAC – Wrestling (heat only)
  - Includes system replacement that for limited coverage priced at 25% of area. Currently, the system is steam radiators with AHUs (air handling units) on the roof of locker rooms.
- SB-41B – HVAC – Office Space System Replacement
  - Includes same as SB-41A.

Cost items that are recommended to be deferred as Delete – Complete:

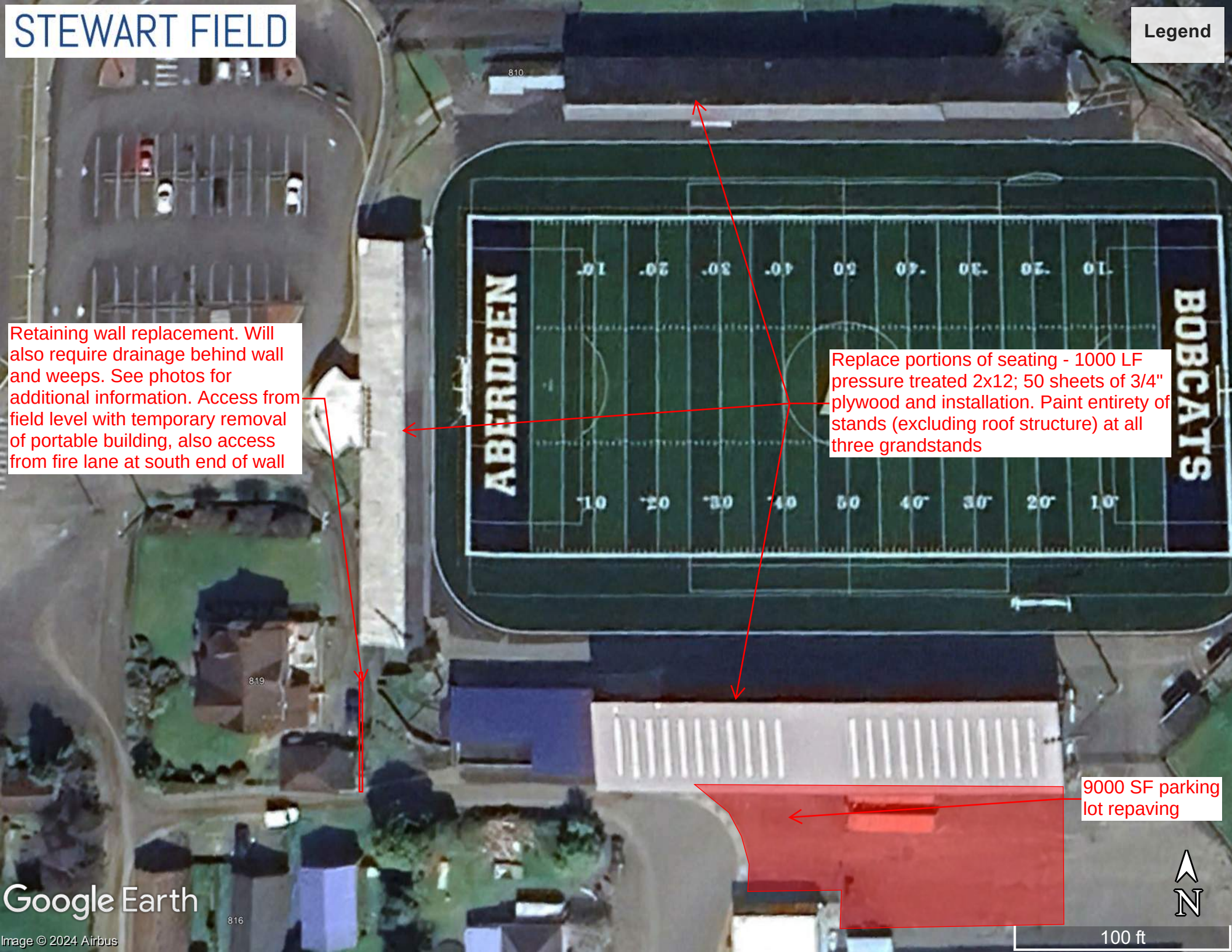
- SB-11 – Roof.


STEWART BUILDING
Legend
28,000 SF
RG B-3
N
100 ft
Google Earth

Stewart Field

Stewart Field cost priorities are as follows:

- High Priority:
    - SF-01 – Retaining Wall Repairs is to be a 2027 cost.
        - Temporarily relocate building including disconnect / reconnect power and water. Include costs for shoring
- Medium Priority:
    - SF-02 – Parking Lot Repair is to be a 2029 cost.
        - Repair parking lot south of stadium
    - SF-11 – Replace All Roofs is to be a 2028 cost.
        - asphalt shingle portion with new laminated asphalt shingles over ice & water shield; replace flashing at all roofs. Apply liquid applied roof membrane & mesh flood coat at single ply sections
- Low Priority:
    - SF-21 – Wood Structure Repairs is to be a 2027 cost
        - Home & away sides


STEWART FIELD
Legend
Retaining wall replacement. Will also require drainage behind wall and weeps. See photos for additional information. Access from field level with temporary removal of portable building, also access from fire lane at south end of wall
Replace portions of seating - 1000 LF pressure treated 2x12; 50 sheets of 3/4" plywood and installation. Paint entirety of stands (excluding roof structure) at all three grandstands
9000 SF parking lot repaving
ABERDEEN
BOBCATS
N
100 ft
Google Earth
Image © 2024 Airbus

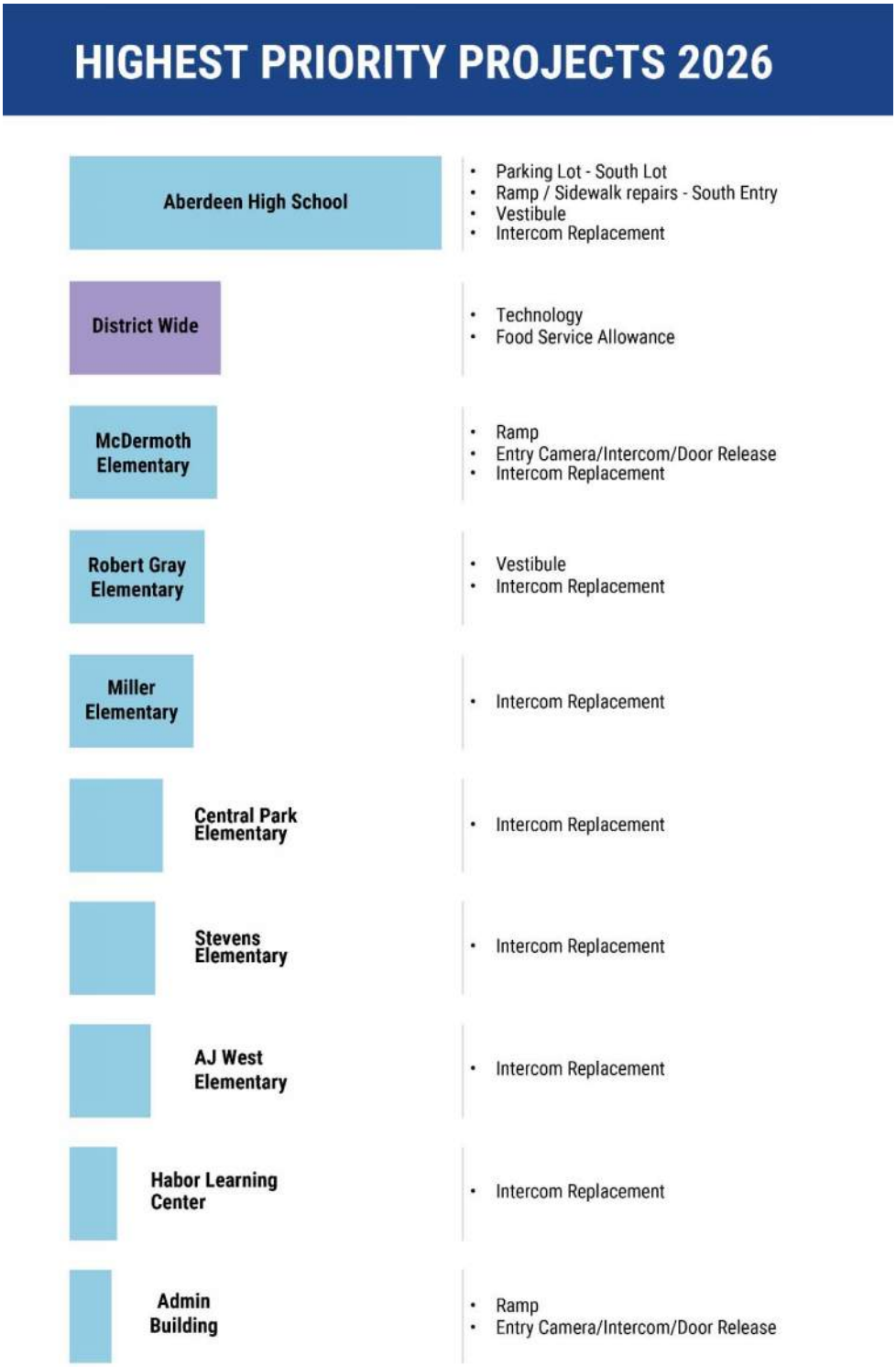
District Wide

A portion of funds have been budgeted for an annual district wide use in facility upgrades and replacement, these cost priorities are as follows:

- ASD-00 – Technology
    - Budget $250,000 per year for technology device replacements.
- Food Service Allowance
    - Budget $100,000 per year for kitchen equipment replacements.
    - See cost estimate in Section 2 for facility equipment needs list with pricing.
        - Miller JR High: Cost items M-31 & M-32
        - Stevens Elementary: Cost items S-31 through S-34
        - AJ West Elementary: Cost items AWS-31 through S-33
        - Harbor Learning Center (Hopkins Building): Cost item H-31
        - McDermoth Elementary: Cost items MC-31 through MC-34
        - Robert Gray Elementary: Cost items RG-31 & RG-32
        - Central Park Elementary: Cost items CP-31 & CP-32
        - Aberdeen High School: Cost items HS-31 through HS-34

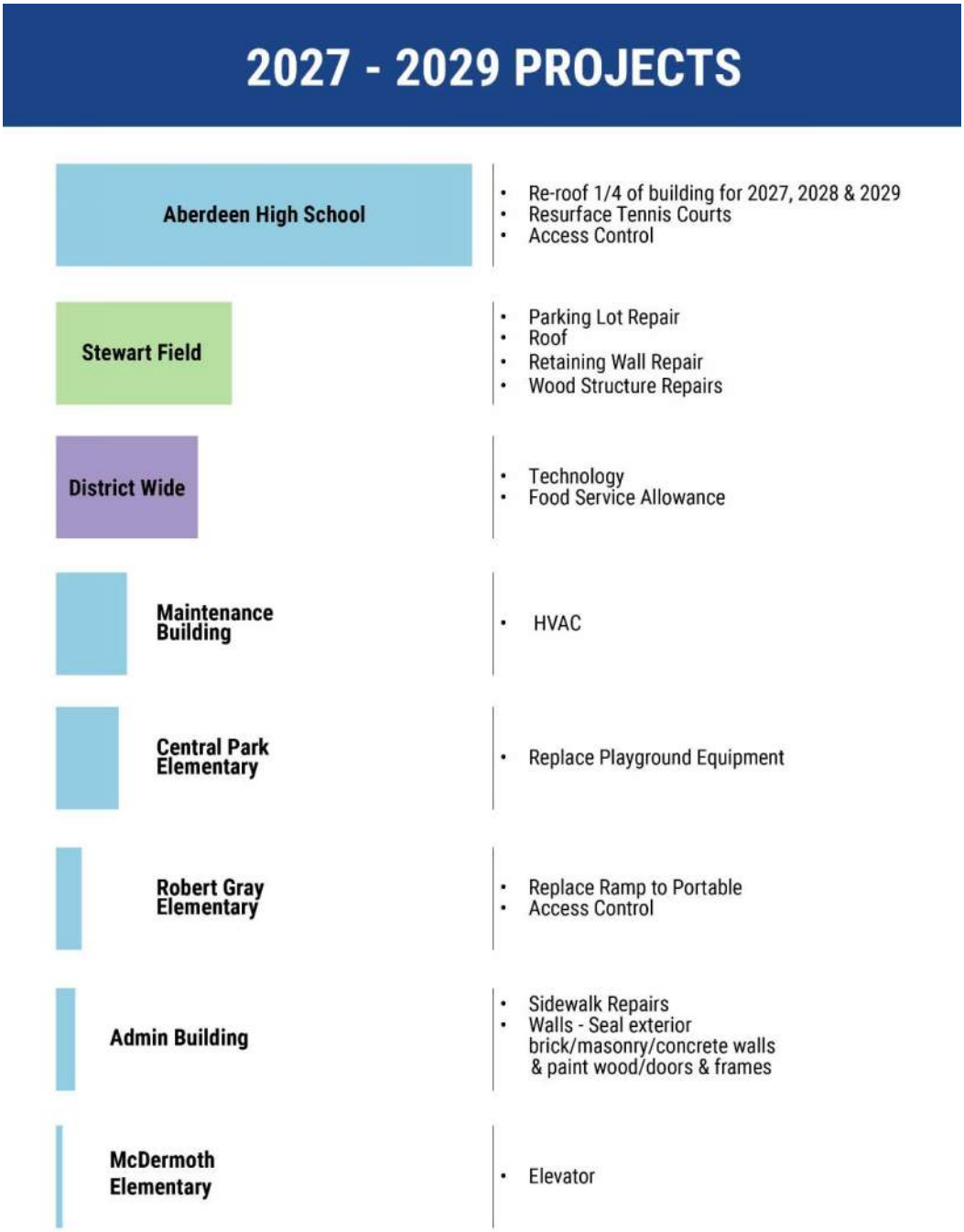
Action Plan

This is a recommended approach to assist the District in sequencing improvements once funding strategies are determined. Based on the established priorities from stakeholder input as listed in the Cost Estimate Prioritization Matrix the highest priority projects for 2026 are as identified in descending order of potential magnitude of scope and cost:



2026 Cost Total = $2,656,614

After the 2026 projects are completed, the next round budgeted for 2027 to 2029 are as identified in descending order of potential magnitude and cost:



Next Steps

Upon completion of this Master Planning report next steps can be made regarding additional efforts for each facility including:

- Present information on study to stakeholders for input and buy in on planned improvements
- Establish a phasing and scheduling timeline for design and construction

Appendix

- Additional Cost Item Information

Modernization Proposal

October 25, 2023

Mcdermoth Elementary School

Purchaser:	Aberdeen School District #5	Location:	Mcdermoth Elementary School
Address:	216 N G St Aberdeen, WA 98520-5228	Address:	409 N K St Aberdeen, WA 98520-3928

TK Elevator Corporation (hereinafter "TK Elevator") is dedicated to delivering Aberdeen School District #5 (hereinafter "Purchaser") the safest, highest quality vertical transportation solutions. I am pleased to present this customized Proposal (the "Proposal") in the amount of **$116,727.63** plus any applicable sales or excise tax to modernize the elevator equipment described in the pages that follow at the above-referenced location.

Our modernization package is engineered specifically for your elevator system and will include the elevator mechanical and electrical components being replaced, refurbished or retained.

Benefits of Modernization include:
- Increased durability and reliability
- Improved fire and life safety features
- Decreased waiting times
- Reduced energy consumption
- Reduced operational cost
- Reduced troubleshooting time

This Proposal shall remain in effect for the next thirty (30) days unless it is revoked earlier by TK Elevator in writing. The price above is subject to escalation - even after Purchaser's acceptance of this Proposal – under certain circumstances including TK Elevator being subjected to increased charges by its suppliers for any of the applicable materials and/or components due to supply chain issues; the imposition of new or increased taxes, tariffs, or other charges imposed by applicable governmental authorities; TK Elevator being subjected to increased charges from its shippers and/or freight forwarders; any material called for in this Proposal being released into production more than 6 months following the written acceptance of this Proposal; or any work described in this Proposal is not completed by December 31, 2025.

In the event you have any questions regarding the content of this Proposal, please do not hesitate to contact me. We appreciate your consideration.

Sincerely,

Sarah Collins
Account Manager
sarah.collins@tkelevator.com
+1 253 2097535

Modernization Proposal

SCOPE OF WORK

Grouping Name: Car 1

Equipment Type: Hydraulic	Speed: 125 fpm
4 Stops (3 Front /1 Rear)	Capacity: 2100 lbs.

Units Included

Building Address	Nickname	TKE Serial #
409 N K St	Car 1	US186709
Mcdermoth Elementary School	Car 1	US186709

Description of Work

Controller

- Controller Machine Room Box
- Remote BCC and Separate Machine Room Wiring for 2019 Code
- TAC 32 Controller (Includes Options listed below)
  - 24 VDC Signal Voltage
  - Auto Light and Fan Feature
  - Car Independent Service
  - Car Traveling Lantern Circuitry
  - Door Bypass Operation
  - Electronic Door Detector Interface
  - Hoistway Access and Enable
  - THY Board
- Seismic Features
- Solid State Starters (6 or 12 leads) 460 / 575 VAC
- Battery Lowering in Controller
- eMax Monitoring Device Provisions

Jack

- Pipe Stands

Car

- Crosshead data tag (for existing car slings)
- 5 Pin Lock with electric contact for Car Top Exit
- 2019 Two-way Communication Camera (dome), Ethernet Extender (kit), & Battery Backup
- Cab Wiring Material (200MK1)

Hoistway

- HN Boxes (per each 2 cars, grouped)
- Base Wiring Package for 2019 Code
- Steel Tape with Mounting hardware, Selector and magnets (terminal limits included)
- TAC 32 Field Friendly Wiring Package Includes single traveling cable, hoistway wiring, interlock wiring, interlock connectors, and serial wiring.

Pit

- Pit Ladder 16'' Wide

Cab

Door Equipment

- Micro Light 3D 2019 (Front)
- Micro Light 3D 2019 (Rear)
- Front Door Operator (SSSS) Additional Lead Time

Modernization Proposal

- LD-16 Plus Drive Only (FRONT)
  - includes Car Top Inspection station (w/ alarm signal)
- LD-16 Plus Drive Only (REAR)
- 3D Cabsafe Components Package (Front)
- 3D Cabsafe Components Package (Rear)

Car Fixtures

- Auxiliary Car Station Includes Options Below
- - Swing Return (Mini-Swing (Column type) for New/Existing Dover/tkE Cabs)
- Reuse Back Box
- Vandal Resistant Floor Buttons
- Cast Braille Plates for Car Features
- Emergency Light mounted in COP
- #4 Stainless Steel Finish (441)
- Door Open rear / Door Close rear
- TAC Serial Boards (Aux)
- Smart Rescue Phone 5 Standalone
- Main Car Station Includes Options Below
- - Swing Return (Mini-Swing (Column type) for New/Existing Dover/tkE Cabs)
- Reuse Back Box
- Vandal Resistant Floor Buttons
- Debranded Car Station (No Logo)
- Cast Braille Plates for Car Features
- Standard Key Switch Package
  - Fan
  - Light
  - Independent
  - Stop
  - Inspection/Hoistway Enable)
- Emergency Light mounted in COP
- 2004 and later Fire Service Phase II Features (includes instructions signage)
- Handicap Signal (Passing signal)
- Two-way Communication Position Indicator
- ADA Phone System integral with COP (Rath)
- Speaker Pattern for Intercom System/ADA Phone
- Locked Service Cabinet
- Certificate Window
- Default Engravings
- GFI Outlet
- #4 Stainless Steel Finish (441)
- Door Open rear / Door Close rear
- Emergency Light Test Button/Keyswitch
- TAC Serial Boards (Main)
- BCC Panel for Two-way Communication
- Two-way Communication Machine Room Equipment (Primary Box)
- Car Riding Lantern (Standard) #4 S/S (441)
- Car Riding Lantern (Standard) REAR #4 S/S (441)

Hall Fixtures

- Serial Boards for Hoistway Access
- Fire Service Phase I Key Switch
- Fire Service Phase I Engraved Instructions
- Hoistway Access Switch (in Hall Station)
- Terminal Hall Stations (Surface Mounted) with
  - Appendix O (Polycarbonate insert flame with engraved verbiage)
  - Fusion (#4 S/S (304))
- 2009 & 2010 Elevator Communications Failure add
- Serial Boards for Front Risers

Modernization Proposal

- Serial Boards for Rear Risers
- TAC Serial Boards, Base Charge
- Terminal Hall Stations (Surface Mounted) with
  - Appendix O (Polycarbonate insert flame with engraved verbiage)
  - Fusion (#4 S/S (304))
- Intermediate Hall Stations (Surface Mounted) with
  - Appendix O (Polycarbonate insert flame)
  - Fusion (#4 S/S (304))

1. Key Tasks and Approximate Lead Times

Key Tasks to be performed to be performed by Purchaser prior to equipment fabrication:

a. Execution of this Proposal
b. Payment for pre-production and engineering
c. Approval of layout (if applicable)
d. Execution of TK Elevator's Material Release Form

Approximate Durations/Lead Times

Contract execution (can run concurrently with layout drawing package preparation and approval)	Varies
Survey and Order of Materials (additional time required for cab, signal, entrance preparation and approval, if applicable)	4 - 6 Weeks
Fabrication time (from receipt of all approvals, fully executed contract, Material Release Form and initial progress payment)	18 Weeks
Modernization of elevator system (Per Unit): (Upon completion of all required preparatory work by others)	3 - 5 Weeks

The durations or lead times listed above are strictly approximations that can vary due to factors both within and outside of TK Elevator's control, are subject to change without notice to Purchaser and shall not be binding on TK Elevator.

2. Payment Terms

50% of the price set forth in this Proposal as modified by options selected from the section entitled “Value Engineering Opportunities & Alternates” (if applicable) will be due and payable as an initial progress payment within 30 days from TK Elevator's receipt of a fully executed copy of this Proposal. This initial progress payment will be applied to project management, permits, engineering and shop drawings, submittals, and drilling mobilizations (if required). The material will not be ordered until this payment is received, and the parties have both executed this Proposal and the Material Release Form.
25% of the price set forth in this Proposal as modified by options selected from the section entitled “Value Engineering Opportunities & Alternates” (if applicable) shall be due and payable when the material described above has been furnished. Material is considered furnished when it has been received at the jobsite or TK Elevator staging facility. Supporting documentation of materials stored shall be limited to stored materials certificates of insurance and bills of lading. Receipt of this payment is required prior to mobilization of labor.

25% of the price set forth in this Proposal shall be made as progress payments throughout the life of the project. In the event TK Elevator fails to receive payment within thirty (30) days of the date of a corresponding invoice, TK Elevator reserves the right to demobilize until such a time that the payments have been brought up to date, and TK Elevator has the available manpower.

It is agreed that there will be no withholding of retainage from any billing and by the customer from any payment.

The payment terms breakdown above shall be considered the Schedule of Values for the project as written. Billing shall be submitted on or before the 25th day of the month according to the payment schedule above and accompanied by a form of G702-703 pay application/schedule of values and a conditional waiver, the format of which is hereby acknowledged and accepted.

Modernization Proposal

The use of online Portals for the submission of billing shall follow the terms of the Proposal and Customer agrees to permit billing in accordance with the executed contract terms. Portal access and usage is to be provided free of additional charge to TK Elevator and any additional cost for such use is to be reimbursed to TK Elevator via a reimbursable change order immediately upon acceptance.

Purchaser agrees that TK Elevator shall have no obligation to complete any steps necessary to provide Purchaser with full use and operation of the installed equipment until such time as TK Elevator has been paid 100% both of the price reflected in this Proposal and for any other work performed by TK Elevator or its subcontractors in furtherance of this Proposal. Purchaser agrees to waive any and all claims to the turnover and/or use of that equipment until such time as those amounts are paid in full.

Proposal price:		$116,727.63
Estimated tax:	9.0800	$10,598.87
Estimated contract price:		$127,326.50
Initial progress payment:	(50%)	$63,663.25
Material furnished:	(25%)	$31,831.63
Total of remaining progress payments:	(25%)	$31,831.63

Any work that Purchaser may require prior to turnover of the equipment that is outside of the scope described in this Proposal - other than Temporary Use as described below - will be performed only after the full execution of a mutually agreeable change order and only at the following rates:

Mechanic (Standard) per hour	$365.00
Mechanic (OT) per hour	$675.00
Team (Standard) per hour	$657.00
Team (OT) per hour	$1,215.00

Rates are not inclusive of any per diem, mileage or other expenses which may be dependent on jobsite location.

3. Warranty

TK Elevator warrants any equipment it installs as described in this Proposal against defects in material and workmanship for a period of one (1) year from the date of Purchaser's execution of TK Elevator's "Final Acceptance Form" on the express conditions that all payments made under this Proposal and any mutually agreed-to change orders have been made in full and that such equipment is currently being serviced by TK Elevator. In the event that TK Elevator's work is delayed for a period greater than six (6) months, the warranty shall be reduced by the amount of the delay. This warranty is in lieu of any other warranty or liability for defects. TK Elevator makes no warranty of merchantability and no warranties which extend beyond the description in this Proposal, nor are there any other warranties, expressed or implied, by operation of law or otherwise. Like any piece of fine machinery, the equipment described in this Proposal should be periodically inspected, lubricated, and adjusted by competent personnel. This warranty is not intended to supplant normal maintenance service and shall not be construed to mean that TK Elevator will provide free service for periodic examination, lubrication, or adjustment, nor will TK Elevator correct, without a charge, breakage, maladjustments, or other trouble arising from normal wear and tear or abuse, misuse, improper or inadequate maintenance, or any other causes other than defective material or workmanship. In order to make a warranty claim, Purchaser must give TK Elevator prompt written notice at the address listed on the cover page of this Proposal and provided all payments due under the terms of this Proposal and any mutually agreed to written change orders have been made in full, TK Elevator shall, at its own expense, correct any proven defect by repair or replacement. TK Elevator will not, under any circumstances, reimburse Purchaser for cost of work done by others, nor shall TK Elevator be responsible for the performance of any equipment that has been the subject of service, repair, replacement, revisions or alterations by others. If there is more than one (1) unit which is the subject of work described in this Proposal, this section shall apply separately to each unit as accepted.

4. Preventative Maintenance Program

Modernization Proposal

This Proposal does not include any maintenance, service, repair or replacement of the equipment or any other work not expressly described herein. TK Elevator may submit a separate proposal to Purchaser covering the maintenance and repair of this equipment to be supplied to Purchaser at an additional cost. In the event the Purchaser and TK Elevator have a new or existing maintenance Agreement in effect at the time of the acceptance of this proposal and/or during the scope of this work, the terms of the Agreement shall remain in full force and effect throughout the performance of this scope of work and continue throughout the duration of the stated term in that Agreement.

5. Work Not Included

There are certain items that are not included in this Proposal, many of which must be completed by Purchaser prior to and as a condition precedent to TK Elevator's performance of its work as described in this Proposal. In order to ensure a successful completion of this project, it shall be solely Purchaser's responsibility to coordinate its own completion of those items with TK Elevator. The following is a list of those items that are not included in this Proposal:

A. Hoistways and Equipment Rooms

1. Purchaser shall provide the following:
   a. A dry legal hoistway, properly framed and enclosed, and including a pit of proper depth and overhead. This is to include steel safety beam, inspection or access platforms, access doors, sump pump, lights, waterproofing and venting as required; dewatering of pit(s) and required permanent screening/
   b. A dry legal machine/control room, with clear rollable access adequate for the elevator equipment, including floors, trap doors, properly sized legal machine room doors, gratings, machine room or roof access platforms, roof/loading protection, ladders, railings, foundations, all hoist beams, lighting, ventilation sized per the TK Elevator shop drawings and/or code requirements. Purchaser must maintain machine/control room (or machine/control space within the shaft for MRL equipment) temperature between 55 and 90 degrees Fahrenheit, with relative humidity less than 95% non-condensing at all times.
   c. Adequate bracing of entrance frames to prevent distortion during wall construction.
   d. All grouting, fire caulking, cutting, x-ray and removal of walls and floors, patching, coring, setting of sleeves/ knockouts, penetrations and painting (except as specified) and removal of obstructions required for elevator work; along with all proper trenching and backfilling for any underground piping and/or conduit.
   e. All labor and materials necessary to support the full width of the hoistway at each landing for anchoring or welding TK Elevator sill supports, steel angles, sill recesses;
   f. The furnishing, installing and maintaining of the required fire rating of elevator hoistway walls, including the penetration of firewall by elevator fixture boxes;
   g. Ensuring that the elevator hoistways and pits are dewatered, cleaned and properly waterproofed;

B. Electrical and Life Safety:

1. Purchaser shall provide a dedicated, analog telephone or data line to the elevator telephone or communication device; one additional data line per group of elevators for diagnostic capability wired to designated controller; This Proposal includes the installation of an in-car emergency elevator communication system for the benefit of the deaf, hard of hearing and speech impaired (the "Multimedia Equipment") in accordance with the current applicable requirements of both the International Building Code and ASME A17.1. Purchaser shall provide one permanent 110V 20 amp circuit with all piping and wiring to controller for the emergency elevator communication system. This Proposal does not, however, include the monitoring of any communications to and from that Multimedia Equipment and Purchaser (and any end user of the units) expressly acknowledge that it is solely their responsibility to ensure that any and all such communications are appropriately monitored in accordance with all applicable rules, codes, statutes and/or laws as a condition precedent to turnover of the units including but not limited to a modem and internet connection and a minimum of four (4) hours of battery backup for all communications.

2. Purchaser shall provide the following:
   a. suitable connections from the power main to each controller and signal equipment feeders as required, including necessary circuit breakers and fused mainline disconnect switches per N.E.C. prior to installation. Suitable power supply capable of operating the new elevator equipment under all conditions;
   b. piping and wiring to controller for mainline power, car lighting, and any other building systems that interface with the elevator controls per N.E.C. Articles 620-22 and 620-51;
   c. any required hoistway / wellway, machine room, pit lighting and/or 110v service outlets;
   d. conduit and wiring for remote panels to the elevator machine room(s) and between panels. Remote panels required by local jurisdictions are not included in this proposal;

e. a bonded ground wire, properly sized, from the elevator controller(s) to the primary building ground; and all remote wiring to the outside alarm bell as requested by all applicable code provisions;
f. installed sprinklers, smoke/heat detectors on each floor, machine room and hoistways / wellways, shunt trip devices (not self-resetting) and access panels as may be required as well as normally open dry contacts for smoke/heat sensors, which shall be terminated by Purchaser at a properly marked terminal in the elevator controller;
g. a means to automatically disconnect the main line and the emergency power supply to the elevator prior to the application of water in the elevator machine room that shall not be self-resetting;
h. emergency power supply including automatic time delay transfer switch and auxiliary contacts with wiring to the designated elevator controller and along with electrical cross connections between elevator machine rooms for emergency power purposes;
i. the following emergency power provisions are not included: interface in controller, pre-testing and testing, emergency power keyswitches;
j. emergency power operation is included as part of the design of the elevator control system and based on each car in the group only, to properly sequence, one at a time to the programmed landing, and park. The design requires that the generator, transfer switch, and related circuitry are sufficient to run this function or any other function for any building other system that is associated with this project. In the event that the generator, transfer switch, and related circuitry are not sufficient, TK Elevator will provide Purchaser with a written change order for Purchaser's execution.
k. a dry set of contacts which close 20 seconds prior to the transfer from normal power to emergency power or from emergency power to normal power whether in test mode or normal operating conditions in the event that an emergency power supply will be provided for the elevator;
l. confirmation that the emergency standby power generator and/or building can accept the power generated to and from the elevator during both Hi-Speed and Deceleration. In cases where the generator and/or building load is not electrically sized to handle the power return from the regen drive, additional separate chopper and resistor units are available for purchase but not included in this proposal. The additional chopper and resistor units allow regenerated power to be dissipated in the resistor bank and not sent back into the building grid.

C. Miscellaneous:

1. Purchaser shall provide all work relating to the finished cab flooring including, but not limited to, the provision of materials and its installation to comply with all applicable codes;
2. Hydraulic jack replacement:
   a. the excavation of the elevator cylinder well hole in the event drilling is necessary through soil that is not free from rock, sand, water, building construction members and obstructions. Should obstructions be encountered, TK Elevator will proceed only after written authorization has been received from the Purchaser. The contract price shall be increased by the amount of additional labor at TK Elevator's standard labor rates as per the local office along with any additional expenses and materials required;
   b. adequate ingress and egress, including ramping, for rail-mounted or truck-mounted drill rig;
   c. Purchaser is responsible for pumping truck contractor to remove and dispose of spoils from the site. In the event that unforeseen and unfavorable below ground conditions are encountered, including but not limited to concrete around the cylinder, construction debris, adverse water and/or soil conditions, erosion, cavitations, oil contamination, or circumstances necessitating increased hole depth, etc., which require the employment of specialized contractors, TK Elevator shall immediately advise the Purchaser and costs will be extra to the contract;
   d. in ground protection systems other than TK Elevator's standard HDPE or PVC protection system with bottomless corrugated steel casing;
   e. any required trenching and backfilling for underground piping or casings, and conduit as well as any compaction, grouting, and waterproofing of block-out;
   f. engineering, provision and installation of methane barriers or coordination/access;
   g. access to 2" pressurized water supply within 100'-0" of the jack hole location;
   h. a safe, accessible storage area for placement of D.O.T. 55 gallon containers for the purpose of spoils containment; obtaining of local environmental or disposal permits
   i. any spoils or water testing;

6. Working Hours, Logistics and Mobilization

a. All work described in this Proposal shall be performed during TK Elevator's regular working days – defined as Monday thru Friday and excluding IUEC recognized holidays – and regular working hours – defined as those hours regularly worked by TK Elevator modernization mechanics at the TK Elevator branch office that will provide labor associated with the performance of the work described in this Proposal - unless otherwise specified and agreed to in writing by both TK Elevator and Purchaser (hereinafter TK Elevator's regular working days and regular working hours shall be collectively defined as "normal working hours"). TK Elevator shall be provided with

uninterrupted access to the elevator hoistway and machine room areas to perform work during normal working hours.
b. Purchaser shall provide on-site parking to all TK Elevator personnel at no additional cost to TK Elevator.
c. Purchaser shall provide traffic control, lane closures, permits and flagmen to allow suitable access/unload of tractor trailer(s).
d. Purchaser agrees to provide unobstructed tractor-trailer access and roll-able access from the unloading area to the elevator or escalator hoistways or wellways (as applicable).
e. Purchaser will be required to sign off on the Material Release Form, which will indicate the requested delivery date of equipment to the site. If Purchaser is not ready to accept delivery of the equipment within ten (10) business days of the agreed upon date, Purchaser will immediately make payments due for equipment and designate an area adjacent to the elevator shaft where Purchaser will accept delivery. If Purchaser fails to provide this location or a mutually agreeable alternative, TK Elevator is authorized to warehouse the equipment at the TK Elevator warehouse or designated distribution facility at Purchaser's risk and expense. Purchaser shall reimburse TK Elevator for all costs due to extra handling and warehousing. Storage beyond ten (10) business days will be assessed at a rate of $100.00 per calendar day for each unit listed in this Proposal, which covers storage and insurance of the elevator equipment and is payable prior to delivery.
f. Purchaser agrees to provide a dry and secure area adjacent to the hoistway(s) at the ground level for storage of the elevator equipment and tools within ten (10) business days from receipt at the local TK Elevator warehouse. Any warranties provided by TK Elevator for vertical transportation equipment will become null and void if equipment is stored in any manner other than a dry, enclosed building structure. Any relocation of the equipment as directed by Purchaser after initial delivery will be at Purchaser's expense.
g. TK Elevator includes one mobilization to the jobsite. A mobilization fee of $5,000.00 per crew per occurrence will be charged for pulling off the job or for any delays caused by others once material has been delivered and TK Elevator's work has commenced.
h. Access for this project shall be free and clear of any obstructions. A forklift for unloading and staging material shall also be provided by Purchaser at no additional cost.
i. Purchaser shall provide an on-site dumpster. TK Elevator will be responsible for cleanup of elevator/ escalator packaging material; however, composite cleanup participation is not included in this Proposal.
j. The hiring of a disposal company which MUST be discussed prior to any material being ordered or work being scheduled. TK Elevator will provide environmental services ONLY if this is specifically included under the "Scope of Work" section above. TK Elevator assumes no responsibility and/or liability in any way whatsoever for spoils or other contamination that may be present as a result of the cylinder breach and/or other conditions present on the work site.
k. One or more of the units described in this Proposal will be out of service and unavailable to move passengers and/or property during entire duration of the performance of the work described in this Proposal until re-certified by the applicable authority(ies) having jurisdiction and in good standing with payment schedules.
l. If site specific rules and regulations classify the elevator pit as confined space, elevator pits will need to reclassify a permit-required space to a non-permit required space prior to mobilization.

7. Temporary Use, Inspection and Turnover

a. Unless required by specification, TK Elevator will not provide for “temporary use” of the elevator(s) described in this Proposal prior to completion and acceptance of the complete installation. Temporary use shall be agreed to via a change order to this Proposal which shall require Purchaser’s execution of TK Elevator's standard Temporary Use Agreement. Cost for temporary use of an elevator shall be $200.00 per calendar day per hydraulic elevator and $250.00 per calendar day for each traction elevator for rental use only, excluding personnel to operate. All labor and parts, including callbacks required during the temporary use period will be billed at TK Elevator's standard local billing rates. In the event that an elevator must be provided for temporary use, TK Elevator will require 30 days to perform final adjustments and re-inspection after the elevator has been returned to TK Elevator with all protection, intercoms and temporary signage removed. This duration does not include any provisions for finish work or for repairs of same, which shall be addressed on a project-by-project basis. Cost for preparation of controls for temporary use, refurbishment due to normal wear and tear, readjustment and re-inspection is $5,000.00 per elevator up to 10 floors. For projects above 10 stops, an additional cost of $1,500.00 / 10 floors shall apply. These costs are based on work performed during normal working hours. Temporary use excludes vandalism or misuse. Any required signage, communication devices, elevator operators, and protection are not included while temporary use is being provided. All overtime premiums for repairs during the temporary use period will be billed at TK Elevator's local service billing rates.
b. The Proposal price set forth above includes one (1) inspection per unit by the applicable authority having jurisdiction if required by the government of the locality where the equipment is located. In the event the equipment fails that inspection due to no fault of TK Elevator, TK Elevator will charge Purchaser for both the cost of each re-inspection which shall be $1,500.00 and a remobilization fee which shall be $5,000.00 via change order prior to scheduling a re-inspection.

c. Upon notice from TK Elevator that the installation and/or modernization of the equipment is complete, Purchaser will arrange to have present at the jobsite a person authorized to make the final inspection and to execute TK Elevator's "Final Acceptance Form." The date and time that such person will be present at the site shall be mutually agreed upon but shall not be more than ten (10) business days after the date of TK Elevator's notice of completion to Purchaser unless both TK Elevator and Purchaser agree to an extension of that ten (10) day period in writing. Such final inspection and execution of TK Elevator's "Final Acceptance Form" shall not be unreasonably delayed or withheld.
d. Should the Purchaser or the local authority having jurisdiction require TK Elevator's presence at the inspection of equipment installed by others in conjunction with the work described in this Proposal, Purchaser agrees to compensate TK Elevator for its time at TK Elevator's current billing rate as posted at its local office.
e. At the conclusion of its work, TK Elevator will remove all equipment and unused or removed materials from the project site and leave its work area in a condition that, in TK Elevator's sole opinion, is neat and clean.
f. Purchaser agrees to accept a live demonstration of equipment's owner-controlled features in lieu of any maintenance training required in the bid specifications.
g. Purchaser agrees to accept TK Elevator's standard owner's manual in lieu of any maintenance, or any other, manual(s) required in the bid specifications.

8. MAX

MAX is a cloud based Internet of Things (IoT) platform that we, at our election, may connect to your elevators and escalators by means of installation of a remote-monitoring device or modem (each a "device"). MAX will analyze the unique signal output of your equipment 24/7 and when existing or potential outages are identified, MAX will automatically communicate with our dispatch centers. When appropriate, the dispatch center will alert our technicians during normal working hours. These MAX alerts provide the technician with precise diagnostics detail, which greatly enhances our ability to fix your equipment right the first time, MAXimizing the equipment uptime.

a. Purchaser authorizes TK Elevator and its employees to access purchaser's premises to install, maintain and/or repair the devices and, upon termination of the service agreement, to remove the same from the premises if we elect to remove.
b. TK Elevator is and shall remain the sole owner of the devices and the data communicated to us by the devices. The devices shall not become fixtures and are intended to reside where they are installed. TK Elevator may remove the devices and cease all data collection and analysis at any time.
c. If the service agreement between TK Elevator and Purchaser is terminated for any reason, TK Elevator will automatically deactivate the data collection, terminate the device software and all raw data previously received from the device will be removed and/or expunged or destroyed.
d. Purchaser consents to the installation of the devices in your elevators and to the collection, maintenance, use, expungement and destruction of the daily elevator data as set forth in this agreement.
e. The devices installed by TK Elevator contain trade secrets belonging to us and are installed for the use and benefit of our personnel only.
f. Purchaser agrees not to permit purchaser personnel or any third parties to use, access, tamper with, relocate, copy, disclose, alter, destroy, disassemble or reverse engineer the device while it is located on purchaser's premises.
g. The installation of this equipment shall not confer any rights or operate as an assignment or license to you of any patents, copyrights or trade secrets with respect to the equipment and/or any software contained or imbedded therein or utilized in connection with the collection, monitoring and/or analysis of data.

9. Additional Terms and Conditions

a. In no event shall TK Elevator be responsible for liquidated, consequential, indirect, incidental, exemplary, and special damages associated with the work described in this Proposal.
b. This Proposal is made without regard to compliance with any special purchasing, manufacturing or construction/installation requirements including, but not limited to, any socio-economic programs, such as small business programs, minority or woman owned business enterprise programs, or local preferences, any restrictive sourcing programs, such as Buy American Act, or any other similar local, state or federal procurement regulations or laws that would affect the cost of performance. Should any such requirements be applicable to the work described in this Proposal, TK Elevator reserves the right to modify this Proposal or rescind it altogether.
c. TK Elevator is an equal opportunity employer.
d. TK Elevator's performance of the work described in this Proposal is contingent upon Purchaser furnishing TK Elevator with any and all necessary permission or priority required under the terms and conditions of government regulations affecting the acceptance of this Proposal or the manufacture, delivery or installation of the equipment. All applicable sales and use taxes, permit fees and licenses imposed upon TK Elevator as of the date of the Proposal are included in the price of the Proposal. Purchaser is responsible for any additional applicable

sales and use taxes, permit fees and licenses imposed upon TK Elevator after the date of the Proposal or as a result of any law enacted after the date of the Proposal.
e. All taxes, tariffs, duties, permit and/or license fees imposed upon TK Elevator as of the date of the execution of this Proposal are included in the price of the Proposal. After the date of acceptance of this Proposal and in addition to the Proposal price, Purchaser is also responsible to pay TK Elevator for any new (or any increase in): (1) applicable taxes, tariffs, duties, permit and/or license fees; (2) charges from its suppliers for any of the applicable materials and/or components: (A) due to supply chain issues, the imposition of new or increased taxes, tariffs, or other charges by applicable governmental authorities; (B) if the release of materials called for in this Proposal occurs after the mileston mentioned earlier in this Proposal; and/or (C) if the completion of work called for in this Proposal occurs after the milestone mentioned earlier in this Proposal; and/or (3) charges from TK Elevator's shippers and/or freight forwarders.
f. Purchaser agrees to provide TK Elevator's personnel with a safe place in which to work and TK Elevator reserves the right to discontinue work at the jobsite whenever, in TK Elevator's sole opinion, this provision is being violated.
g. The pricing set forth in this Proposal assumes that the elevator pits will not be classified as a confined space. TK Elevator will follow its standard safety policy and procedures. Any job specific safety requirements over and above TK Elevator's standard practices and policies may require additional costs.
h. TK Elevator will furnish and install all equipment in accordance with the terms, conditions, scope and equipment nomenclature as noted herein. Requested changes or modifications to such provisions will require a written change order issued on the Purchaser's letterhead and accepted by TK Elevator in writing prior to the execution of such work. This change order shall detail the current contract price, the amount of the change, and new contract value.
i. This Proposal does not include a schedule for the work described and any such schedule shall be mutually agreed upon by an authorized representative of both TK Elevator and Purchaser in writing before becoming effective.
j. In the event asbestos material is knowingly or unknowingly removed or disturbed in any manner at the jobsite, Purchaser shall monitor TK Elevator's work place and prior to and during TK Elevator's manning of the job, Purchaser shall certify that asbestos in the environment does not exceed .01 fibers per cc as tested by NIOSH 7400. In the event TK Elevator's employees or those of TK Elevator's subcontractors are exposed to an asbestos hazard, PCP's, lead or other hazardous substances, Purchaser agrees, to the fullest extent permitted by law, to indemnify, defend, and hold TK Elevator harmless from all damages, claims, suits, expenses, and payments resulting from such exposure. Identification, notification, removal and disposal of asbestos containing material, PCP's lead or other hazardous substances are the responsibility of the Purchaser.
k. TK Elevator retains title to and a security interest in all equipment it supplies – which TK Elevator and Purchaser agree can be removed without material injury to the real property – until all payments including deferred payments and any extensions thereof, are made. In the event of any default by Purchaser on any payment, or any other provision of this Proposal, TK Elevator may take immediate possession of the equipment and enter upon the premises where it is located – without legal process – and remove such equipment or portions thereof, irrespective of the matter of its attachment to the real estate or the sale, mortgage or lease of the real estate. Pursuant to the Uniform Commercial Code, and at TK Elevator's request, Purchaser agrees to execute any financial or continuation statements which may be necessary for TK Elevator to file in public offices in order to perfect TK Elevator's security interest in such equipment.
l. TK Elevator reserves the right to assign payments owed to TK Elevator under this Proposal.
m. TK Elevator shall not be liable for any loss, damage or delay caused by acts of government, labor troubles, strikes, lockouts, fire, explosion, theft, floods, riot, civil commotion, war, malicious mischief, acts of God or any cause beyond its control.
n. The rights of TK Elevator under this Proposal shall be cumulative and the failure on the part of the TK Elevator to exercise any rights hereunder shall not operate to forfeit or waive any of said rights. Any extension, indulgence or change by TK Elevator in the method, mode or manner or payment or any of its other rights shall not be construed as a waiver of any of its rights under this Proposal.
o. In the event TK Elevator engages a third party to enforce the terms of this Proposal, and/or to collect payment due hereunder, either with or without suit, Purchaser agrees to pay all costs thereof together with reasonable attorney's fees. Purchaser does hereby waive trial by jury and does hereby consent to the venue of any proceeding or lawsuit under this Proposal to be in the county where the work covered by this Proposal is located.
p. TK Elevator can furnish Certificate of Workers' Compensation, Bodily Injury and Property Damage Liability Insurance coverage to Purchaser upon written request.
q. Should loss of or damage to TK Elevator's material, tools or work occur at the project site, Purchaser shall compensate TK Elevator for such loss, unless such loss or damage results from TK Elevator's own acts or omissions.
r. Purchaser, in consideration of TK Elevator performing the services set forth in this Proposal, to the fullest extent permitted by law expressly agrees to indemnify, defend, save harmless, discharge, release and forever acquit TK Elevator Corporation, TK Elevator Manufacturing, Inc., their respective employees, officers, agents, insurers, affiliates, and subsidiaries (hereinafter singularly a "TK Elevator party" and collectively the "TK

Modernization Proposal

Elevator parties“) from and against any and all claims, demands, suits, and proceedings for loss, property damage (including damage to the equipment which is the subject matter of this Proposal), personal injury or death that are alleged to either have arisen out of or be connected with the sale, marketing, presence, use, misuse, maintenance, installation, removal, modernization, manufacture, design, operation or condition of the equipment that is the subject matter of this Proposal or the labor and materials furnished in connection with this Proposal. Purchaser’s duty to indemnify a TK Elevator party does not apply to the extent that the loss, property damage (including damage to the equipment which is the subject matter of this Proposal), personal injury or death is determined to be caused by or resulting from the negligence of that TK Elevator party. Purchaser recognizes that its obligation to defend the TK Elevator parties under this clause, which is separate and apart from its duty to indemnify the TK Elevator parties, includes payment of all attorneys’ fees, court costs, judgments, settlements, interest and any other expenses of litigation arising out of such claims, demands, suits or proceedings.

s. Purchaser further expressly agrees to name Tk Elevator Corporation and TK Elevator Manufacturing, Inc. along with their respective officers, agents, affiliates and subsidiaries as additional insureds in Purchaser’s liability and any excess (umbrella) liability insurance policy(ies). Such insurance must insure TK Elevator Corporation and TK Elevator Manufacturing, Inc. for those claims and/or losses referenced in the above paragraph and those claims and/or or losses arising from the negligence of TK Elevator Corporation and TK Elevator Manufacturing, Inc. Such insurance must specify that its coverage is primary and non-contributory. Purchaser hereby waives its right of subrogation.

t. TK Elevator's participation in any controlled insurance program is expressly conditioned upon review and approval of all controlled insurance program information and documentation prior to enrollment. Any insurance credits if applicable, will be provided at that time.

u. Unless so mutually agreed upon in a separate signed agreement, TK Elevator shall not be required to interact or correspond with any third party with whom Subcontractor is not in privity of contract concerning matters pertinent to this Agreement.

v. The Purchaser must inform TK Elevator if Purchaser is, or becomes, an individual or entity that is - or that is majority owned or controlled by a party that is - included on any list of restricted parties maintained by (i) the United States of America; (ii) the United Nations; (iii) the European Union or any EU member state; (iv) the UK; or (v) any other national authority binding the parties of this contract.

In case the Purchaser, or any other beneficiary of this transaction, e.g. the end-user, is or becomes an individual or entity that is - or that is majority owned or controlled by a party that is - included on any list of restricted parties, TK Elevator reserves the right to cancel this Proposal immediately.

If the goods subject to this Proposal would be exported, re-exported, resold, used, transferred or otherwise disposed of in violation of any sanctions applicable to TK Elevator, TK Elevator also reserves the right to cancel this Proposal immediately. In this respect, the Purchaser shall be obliged to disclose the final delivery address, end-user and end-use of the goods upon request - insofar as legally permissible - and to notify TK Elevator of all circumstances that indicate an aforementioned infringement.

"Sanctions" means here any economic, trade or financial sanctions, laws, regulations, embargoes or restrictive measures imposed, enacted, administered or enforced by any Sanctions Authority. "Sanctions Authority" means (i) the US;(ii) the UN Security Council;(iii) the EU and any EU member state;(iv) the UK; or(v) any governmental institutions of any of the foregoing which administer Sanctions, including HM Treasury, OFAC, the US State Department and the US Department of the Treasury.

Modernization Proposal

Acceptance

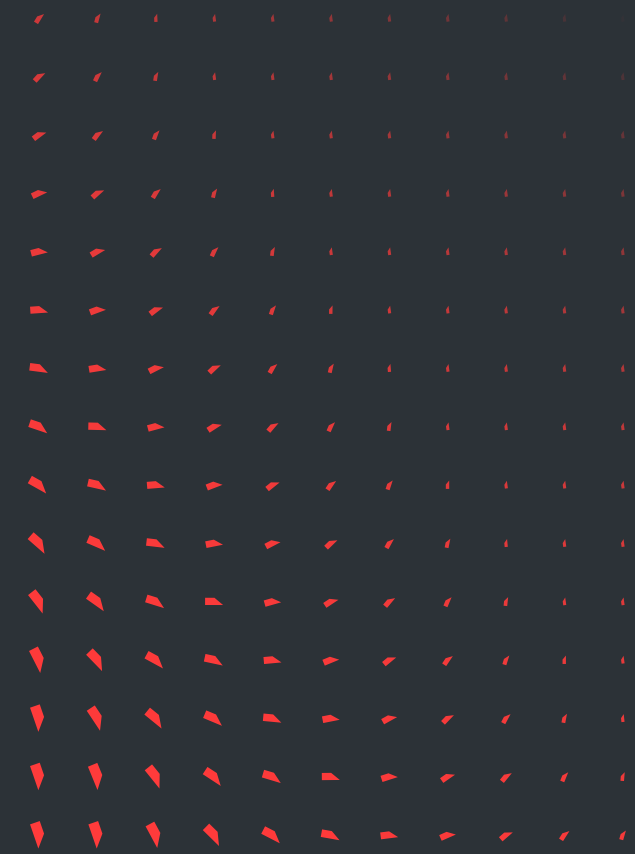
Purchaser's acceptance of this Proposal and its approval by an authorized manager of TK Elevator will constitute exclusively and entirely the agreement between the parties for the goods and services herein described and full payment of the sum of One Hundred Sixteen Thousand Seven Hundred Twenty Seven Dollars and Sixty Three Cents ($116,727.63) plus any applicable sales tax.

All other prior representations or regarding this work, whether written or verbal, will be deemed to be merged herein and no other changes in or additions to this Proposal will be recognized unless made in writing and properly executed by both parties as a change order. Should Purchaser's acceptance be in the form of a purchase order or other similar document, the provisions of this Proposal will exclusively govern the relationship of the parties with respect to this transaction. No agent or employee shall have the authority to waive or modify any of the terms of this Proposal without the prior written approval of an authorized TK Elevator manager.

Aberdeen School District #5 (Purchaser):	TK Elevator Corporation Management Approval
By:	By:
(Signature of Authorized Individual) Mike Pauley	(Signature of Branch Representative)
(Print or Type Name)	Tara Whitford Branch Manager
(Print or Type Title)	
(Date of Acceptance)	(Date of Execution)

TCF

III. Form 1066 Count of District Disabled Students



OFFICE OF SUPERINTENDENT OF PUBLIC INSTRUCTION
School Facilities and Organization
Old Capitol Building
PO BOX 47200
OLYMPIA WA 98504-7200
(360) 725-6265 TTY (360) 664-3631

ESD	CO	DIST
113	14	005

ENROLLMENT COUNT
2025

School District Aberdeen School District

1. ENROLLMENT REPORT AS OF LATEST OCTOBER 1 COUNT

Enter the number of students with developmental disabilities (as reported on actual October headcount enrollment) who are assigned to a specially designated self-contained classroom for at least 100 minutes per school day. Enter pre-kindergarten students with disabilities at 50 percent of the actual headcount enrollment. References: WAC 392-343-035, RCW 48.01.035.

Grade	October Enrollment per above definition
Pre-Kindergarten	4
Kindergarten	8
1	6
2	7
3	6
4	5
5	6
6	3
7	4
8	6
9	3
10	4
11	2
12	14
Total	78

Traci Sandstrom 9/11/25

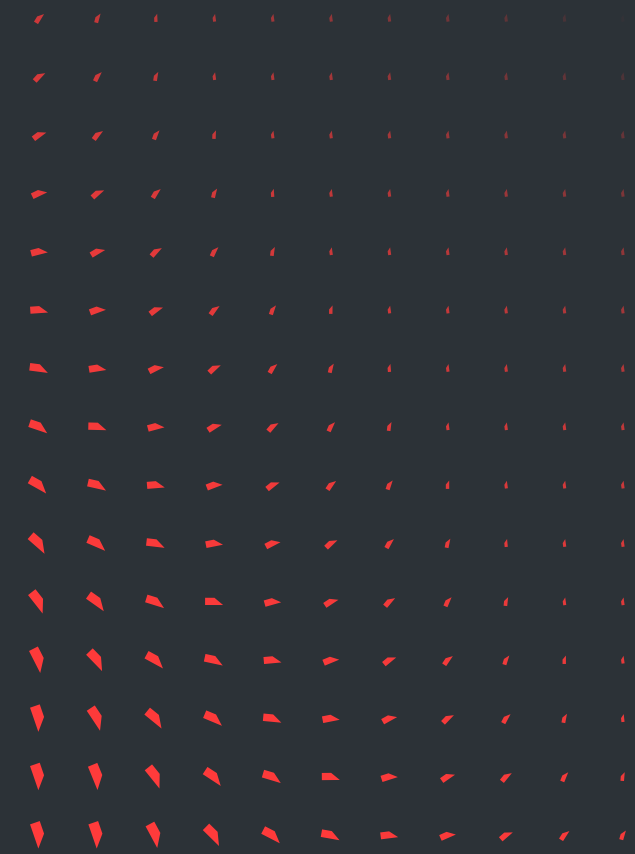
SIGNATURE OF SUPERINTENDENT/DESIGNEE DATE

Return to: School Facilities and Organization
Office of Superintendent of Public Instruction
Old Capitol Building
PO BOX 47200
OLYMPIA WA 98504-7200

Fax Number: (360) 586-3946

TCF

IV. "Tab2" Financial Status



OSPI

Study and Survey Workbook - Chapter 2 - Tab 2 - Financial Status

This table provides an overview of the District's ability to obtain capital funds to provide the local share required for state funding assistance. Listed below is the assessed valuation of the District, outstanding bonded indebtedness, current bonding capacity, information on current bond status, and information on capital levies and other non-debt sources of funds for proposed capital projects.

District: Aberdeen		**Date:**	8/26/2025	
Financial Summary				
Bond Assessed Value and Year:		$2,337,512,406	Collection Year:	2025
Total General Obligation Debt Capacity:		$116,875,620	% of Assessed Valuation:	5.000%
Less: Outstanding Unlimited Tax General Obligation Bonds:		$0	*Enter as positive value*	
Less: Anticipated Bonds and Year:		$0	Collection Year:	2025
Less: Outstanding Non-voter approved debt		$4,595,000	*Enter as positive value*	
Less: *Other*		$0	*Enter as positive value*	
Plus: Cash and Investments in Debt Service Fund			*Enter as positive value*	
Plus: *Other*		$0	*Enter as positive value*	
Plus: *Other*		$0	*Enter as positive value*	
Remaining Total Debt Capacity		$112,280,620		
Non-Voted General Obligation Debt Capacity:		$8,765,672	% of Assessed Valuation:	0.375%
Less: Outstanding Non-voter approved debt		$4,595,000	*Enter as positive value*	
Less: *Other*		$0	*Enter as positive value*	
Plus: *Other*		$0	*Enter as positive value*	
Remaining Non-Voted Debt Capacity		$4,170,672		

Notes: (e.g.: Basis of Bond Assessed Value, anticipated bond sales, exemptions)

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Bond Status Narrative

Brief Narrative: For bonds referred to in statement above, provide information in the space below on anticipated bond sales and total estimated cost of projects to be funded. If District is currently in bond planning status, provide information on anticipated election date and estimated amount of bond if known. (Expand row height as needed.)

Capital Levy Narrative

Brief Narrative: In some cases, Districts will opt not to use bonded indebtedness to fund projects and will instead rely on capital levies. If that is the case for the applicant District, then in the space below provide information on the capital levy strategy. Include date that capital levy passed or date of upcoming levy election, how many years levied (typically 1-6 years), anticipated total levy rate. (Expand row height as needed.)

The Capital Levy passed in Feb 2024 and we are using a portion of our Capital Levy funds to land acquisition for the new sites for several new schools.

Other Non-Bond Sources

Brief Narrative: Provide information in the space below on other anticipated funding sources such as impact fees, non-voted debt financing, and existing capital fund balance. (Expand row height as needed.)

TCF

IV. "Tab4" School Housing Emergency by District

- Aberdeen School District
- Elma School District
- Hoquiam School District
- Montesano School District
- Ocosta School District
- Wishkah School District

OSPI

Study and Survey Workbook - Chapter 2 - Tab 4 - School Housing Emergency

A school housing emergency is defined in RCW 28A.525.166(5)(a) as an emergency resulting from the destruction of a school building by fire or other natural disaster, the condemnation of a school building by properly constituted authorities, a sudden excessive projected increase in school population, or other conditions similarly emergent in nature.

District:	*Aberdeen School District*	**Date:**	**8/26/2025**
Does your district have a school housing emergency? (Yes/No) = =>		NO	

If the answer is yes, then in the space below please describe the emergency. Provide financial information to demonstrate that the district is unable to address the situation without significant assistance, referring as appropriate to the financial information in Tab 2. Upload into ICOS supporting documentation providing evidence of the emergency (photographs, newspapers articles, reports, etc.). (Expand row height as needed.)

OSPI

Study and Survey Workbook - Chapter 2 - Tab 4 - School Housing Emergency

A school housing emergency is defined in RCW 28A.525.166(5)(a) as an emergency resulting from the destruction of a school building by fire or other natural disaster, the condemnation of a school building by properly constituted authorities, a sudden excessive projected increase in school population, or other conditions similarly emergent in nature.

District:	Elma School District	**Date:**	**9/17/2025**
Does your district have a school housing emergency? (Yes/No) = =>		YES	

If the answer is yes, then in the space below please describe the emergency. Provide financial information to demonstrate that the district is unable to address the situation without significant assistance, referring as appropriate to the financial information in Tab 2. Upload into ICOS supporting documentation providing evidence of the emergency (photographs, newspapers articles, reports, etc.). (Expand row height as needed.)

We have closed off outside distict students for certain grade levels.

OSPI

Study and Survey Workbook - Chapter 2 - Tab 4 - School Housing Emergency

A school housing emergency is defined in RCW 28A.525.166(5)(a) as an emergency resulting from the destruction of a school building by fire or other natural disaster, the condemnation of a school building by properly constituted authorities, a sudden excessive projected increase in school population, or other conditions similarly emergent in nature.

District:	Hoquiam School District	**Date:**	**9/17/2025**
Does your district have a school housing emergency? (Yes/No) = =>		NO	

If the answer is yes, then in the space below please describe the emergency. Provide financial information to demonstrate that the district is unable to address the situation without significant assistance, referring as appropriate to the financial information in Tab 2. Upload into ICOS supporting documentation providing evidence of the emergency (photographs, newspapers articles, reports, etc.). (Expand row height as needed.)

OSPI

Study and Survey Workbook - Chapter 2 - Tab 4 - School Housing Emergency

A school housing emergency is defined in RCW 28A.525.166(5)(a) as an emergency resulting from the destruction of a school building by fire or other natural disaster, the condemnation of a school building by properly constituted authorities, a sudden excessive projected increase in school population, or other conditions similarly emergent in nature.

District:	Montesano School District	**Date:**	**9/3/2025**
Does your district have a school housing emergency? (Yes/No) = =>		NO	

If the answer is yes, then in the space below please describe the emergency. Provide financial information to demonstrate that the district is unable to address the situation without significant assistance, referring as appropriate to the financial information in Tab 2. Upload into ICOS supporting documentation providing evidence of the emergency (photographs, newspapers articles, reports, etc.). (Expand row height as needed.)

OSPI

Study and Survey Workbook - Chapter 2 - Tab 4 - School Housing Emergency

A school housing emergency is defined in RCW 28A.525.166(5)(a) as an emergency resulting from the destruction of a school building by fire or other natural disaster, the condemnation of a school building by properly constituted authorities, a sudden excessive projected increase in school population, or other conditions similarly emergent in nature.

District:	Ocosta School District	**Date:**	**Sept. 3, 2025**
Does your district have a school housing emergency? (Yes/No) = =>		NO	

If the answer is yes, then in the space below please describe the emergency. Provide financial information to demonstrate that the district is unable to address the situation without significant assistance, referring as appropriate to the financial information in Tab 2. Upload into ICOS supporting documentation providing evidence of the emergency (photographs, newspapers articles, reports, etc.). (Expand row height as needed.)

OSPI

Study and Survey Workbook - Chapter 2 - Tab 4 - School Housing Emergency

A school housing emergency is defined in RCW 28A.525.166(5)(a) as an emergency resulting from the destruction of a school building by fire or other natural disaster, the condemnation of a school building by properly constituted authorities, a sudden excessive projected increase in school population, or other conditions similarly emergent in nature.

District:	Wishkah School District	**Date:**	**9/26/2025**
Does your district have a school housing emergency? (Yes/No) = =>		NO	

If the answer is yes, then in the space below please describe the emergency. Provide financial information to demonstrate that the district is unable to address the situation without significant assistance, referring as appropriate to the financial information in Tab 2. Upload into ICOS supporting documentation providing evidence of the emergency (photographs, newspapers articles, reports, etc.). (Expand row height as needed.)



03 Chapter

I. Pre-Disaster Mitigation & Seismic Study by Building

TCF

I. Pre-Disaster Mitigation & Seismic Study by Building

