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5.22.2024

TO:
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Subject: Tacoma Public Schools – Lowell Elementary School
Traffic Analysis Memorandum

This traffic analysis memorandum was prepared for the Lowell Elementary School Replacement Project. The project site is located at 810 Mr Dahl Dr, Tacoma, Washington, bounded by N I St, N 12th St, N Yakima Ave, and Mr Dahl Dr, as shown in **Figure 1**. The site is being re-developed to replace several existing buildings with a single school building. Under existing conditions there are school buildings on the north side of the site which fronts Yakima Ave, with play areas and play fields on the south side of the site. This memorandum evaluates traffic operations and circulation, safety, and parking for a typical school day.

Figure 1: Existing Site Layout

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Existing Traffic Conditions

The bell schedule of this school is 9:00 AM to 3:30 PM on Monday, Tuesday, Thursday, and Friday. On Wednesdays (late start) the bell schedule is 10:00 AM to 3:30 PM. The nearby St. Patrick Catholic School, located at 1112 N G St with frontage along the East side of N 12th St on the block north of Lowell Elementary, has earlier starting and ending times than Lowell Elementary.

Traffic circulation (school buses, parent pick-ups/drop-offs, and pedestrians), and parking conditions were observed on May 2nd, 2024, between the hours of 8:15 AM to 9:15 AM.

Parking

There are 16 perpendicular parking spaces on the east side of Mr Dahl Dr, which appear to be used as a mixture of parking for employees and parent loading. At one point during morning observations, these spaces were full but there were generally open spaces for much of the period. PH observed that there were plenty of parking spaces available on adjacent streets, indicating that many employees likely walk or bike to work.

Circulation

People were observed to access the school from all sides, with many pedestrians observed. Parent drop-offs were observed occurring primarily along N I St, N 12th St, and Mr Dahl Dr with some occurring on along the south side of Yakima Ave.

Some cars pulled into the perpendicular parking spaces on Mr Dahl Dr for drop-off. The south side of Yakima Ave is reserved for loading operations and PH observed that while some loading occurred here, there were always spaces available for more cars. Many parents use N 12th St for loading, and during the peak loading time, parking spots filled up on the school side of N 12th St.

**Figure 2: School Bus Drop-Off on N I St (left)
& View of N 13th St Intersection/Roadway Curvature on N I St (right)**

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N I St was used heavily for loading, with parents parking up to about 150 feet west of N 13th St on the north side. Parents also parked on the south side of N I St, with several groups observed crossing N I St at N 13th St or at midblock locations. Sight distance along N I St is limited in this area due to horizontal and vertical curvature of the road. There is a pullout loading zone on the north side of N I St, and part of this area is reserved for buses using traffic cones. The two buses that serve the school drop off two students at this location. PH observed that parents pull all the way up to the cones and space for buses to maneuver is limited. There is a flashing beacon to draw attention to the 20mph school zone on N I St.

Early in the observation period, PH observed minor queuing on N 12th St that was related to St Patrick Catholic School. However, due to the staggered bell times, traffic for St Patrick Catholic School had cleared by the time the morning rush for Lowell Elementary School started.

PH observed no problems with traffic operations at adjacent intersections, circulation issues, roadway blockages, or long queues occurring.

Future Traffic Conditions

PH evaluated the anticipated future traffic conditions.

Parking

Per City of Tacoma Municipal Code, 1.2 parking spaces are required to be provided for each classroom in an Elementary School. The existing school has 16 classrooms. The proposed school is planned to have 20 classrooms. Therefore, under existing conditions 20 parking spaces would be required. Under the proposed plan for the school, 24 parking spaces would be required. This is an increase of 4 parking spaces compared to what would be required for the existing school, and 8 more parking spaces than the current school has.

Trip Generation Rate Development

As PH observed that there seemed to be a significant number of students and employees choosing modes that didn't include a vehicle, it was logical to develop a trip generation rate based on data collected at this school rather than relying upon the ITE trip generation rate. On Thursday, May 9th, trips into and out of the school were collected on Mr Dahl Dr, Yakima Ave, N 12th St, and N I St for both the AM peak period and the PM peak period of the school. **Table 1** shows the calculated trip rates, and also compares this rate to the rate calculated using the *ITE Trip Generation manual*, 11th Edition. Note that the rate was developed using the current student enrollment, which is 350 students. ITE trip generation worksheets used for trip generation rate calculations as well as raw data from the trip generation data collection effort are included in **Appendix A.**

PH recommends using the rate developed for the AM period for trip generation for both the AM peak hour of the generator and the AM peak hour of the adjacent street. While the peak hour of the generator and the peak hour of the adjacent street likely do not perfectly align, they tend to overlap significantly in the morning.

The PM peak hour of the adjacent street typically doesn't overlap with the PM peak hour of the generator. For the PM Peak Hour of the adjacent street, the ITE trip generation rate is relatively low, so to be conservative PH used the ITE trip generation rate rather than applying an 18% reduction. PH recommends using the calculated rate for the PM peak hour of the generator.

Table 1: Trip Generation Rate Development

Trip Generation Rate					
Trip Generation Type	Independent Variable (IV)		Trips	Peak Rate Type	Peak Rate
Weekday - AM Peak Hour of Generator					
ITE LUC 520[1]	Students	350	263	Average Rate	0.75
Site Specific[2]	Students	350	183	Calculated Rate	0.52
Reduction in Trips Observed Compared to ITE Rate					30%
Weekday - PM Peak Hour of Generator					
ITE LUC 520[1]	Students	350	158	Average Rate	0.45
Site Specific[2]	Students	350	128	Calculated Rate	0.37
Reduction in Trips Observed Compared to ITE Rate					18%

1. Based on 11th Edition ITE Trip Generation Manual
2. Based on field observations of in/out traffic

<u>Trip Generation Analysis</u>

For the trip generation analysis, PH utilized the *ITE Trip Generation manual*, 11th Edition as well as the trip generation rates developed in the previous section of the report. **Table 2** shows the estimated trip generation for the weekday AM peak hour of adjacent street, PM Peak hour of the generator, and PM peak hour of adjacent street for both the current capacity of the school and the proposed capacity of the school. Note that the existing capacity of the school is 445 students, per the school district, and the proposed capacity of the school is 500 students. ITE trip generation worksheets for the PM peak hour of the adjacent street are shown in **Appendix B**.

Due to the increase in student capacity, trip generation is expected to be higher for proposed conditions than for existing conditions. The project is expected to generate 29 more trips during the AM peak hour, 20 more trips during the PM peak hour of the school, and 9 more trips during the PM peak hour of adjacent streets compared to existing conditions.

The increase in trips is expected to be modest. Based on the current lack of observed operational and circulation issues, PH does not anticipate any significant operational impacts to the transportation network.

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Table 2: Project Trip Generation Analysis

Trip Generation Analysis					
Scenario	Independent Variable (IV)		Rate Type	Peak Rate	Trips
Weekday - AM Peak Hour of Adjacent Street					
Existing	Students	445	Site Specific[2]	0.52	231
Proposed	Students	500	Site Specific[2]	0.52	260
				New Trips	29
Weekday - PM Peak Hour of Generator					
Existing	Students	445	Site Specific[2]	0.37	165
Proposed	Students	500	Site Specific[2]	0.37	185
				New Trips	20
Weekday - PM Peak Hour of Adjacent Street					
Existing	Students	445	ITE LUC 520[1]	0.16	71
Proposed	Students	500	ITE LUC 520[1]	0.16	80
				New Trips	9

1. Based on 11th Edition ITE Trip Generation Manual
2. Based on field observations of in/out traffic

Conclusion and Recommendations

The Lowell Elementary School Replacement Project is projected to generate 29 more trips during the AM peak hour, 20 more trips during the PM peak hour of the school, and 9 more trips during the PM peak hour of adjacent streets. 24 parking spaces would be required for the new school per City of Tacoma Municipal Code, which is 8 mor spaces than the school currently has. PH observed no problems with traffic operations at adjacent intersections, or circulation issues on adjacent streets and therefore doesn't expect new issues to arise with such a modest increase in trips. **PH does not anticipate a significant impact to traffic operations.**

Based on observations of the school site, PH developed several recommendations for maintaining ideal traffic operations, circulation and for enhancing safety. PH recommends the following:

1. Maintain staggered bell times for Lowell Elementary School and St Patrick Catholic School.
2. Consider formalizing loading operations for parent pickup/drop-off on Yakima Ave rather than N I St to move these operations away from the busier arterial. The ideal way to accomplish this is to make this entrance more desirable through school design.

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3. Consider dedicating a permanent loading zone on N I St for buses to allow for easier bus maneuvering.
    a. One option would be to have the pullout area for buses only, perhaps with a reduced length than the current pullout has, to allow for parent loading outside of the pullout area.
    b. Another option would be to formalize the bus area at the beginning of the pullout rather than the end of the pullout so that buses enter directly after the bus stop to the east of the pullout, avoiding the need to maneuver around parent vehicles to drop off students. In this situation, the curb would be painted to indicate that it is for bus parking only. This will likely get more compliance than traffic cones and will have a consistent, correct length every day.
    c. If it is not acceptable to have a permanent bus loading zone, coning out the beginning of the loading zone may be more desirable for bus operations, but bus operators should be consulted for their perspective.
4. PH observed several groups of parents/students crossing N I St at N 13th St as well as midblock locations, rather than at the signalized and marked crosswalk at N 12th St. As sight distance is a potential concern at N 13th St, PH recommends modifications that discourage crossing at this location.
    a. Item 2 listed above should help with reducing demand for this crossing.
    b. As some parents may still choose to park on the north side of N I St to access the school and some students may walk from this direction, PH recommends considering installation of a crossing approximately 50 feet east of N 13th St, around the location of the current pedestrian curb ramp on the north side. This location provides better stopping sight distance for eastbound vehicles. If a crossing were installed here, bulbouts and a flashing beacon would be ideal enhancements. The design process would confirm suitability of this location and proper design.
5. Formalizing the preferred loading area on Yakima Ave will increase the number of parents and students crossing this street. To facilitate more visibility and shorter crossing distances, bulbouts on Yakima Ave at Mr Dahl Dr and at the intersection of N 12th St would be ideal.

APPENDIX A

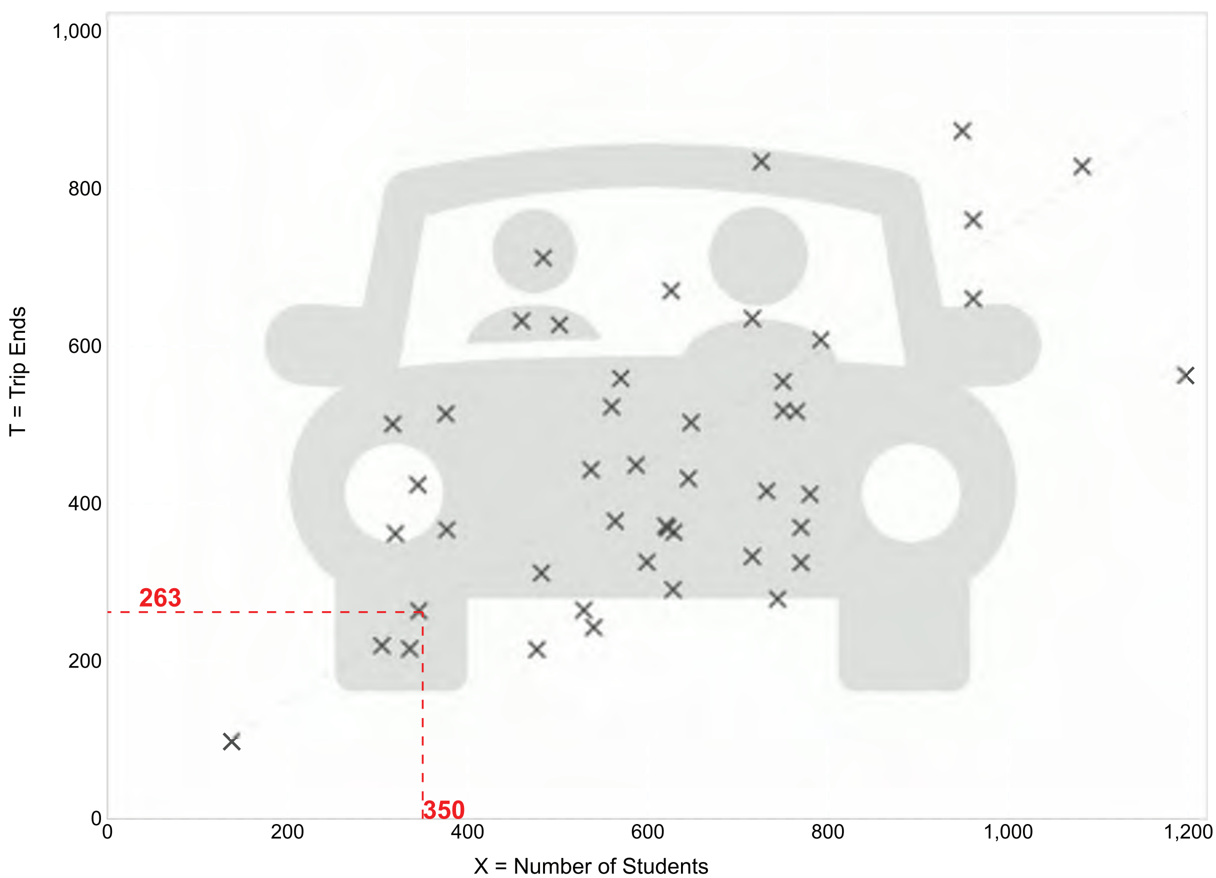
Elementary School
(520)

Vehicle Trip Ends vs:	**Students**
On a:	**Weekday,**
	AM Peak Hour of Generator
Setting/Location:	**General Urban/Suburban**
Number of Studies:	46
Avg. Num. of Students:	616
Directional Distribution:	54% entering, 46% exiting

Vehicle Trip Generation per Student

Average Rate	Range of Rates	Standard Deviation
0.75	0.38 - 1.58	0.27

Data Plot and Equation



Fitted Curve Equation: Not Given

R^2= ****

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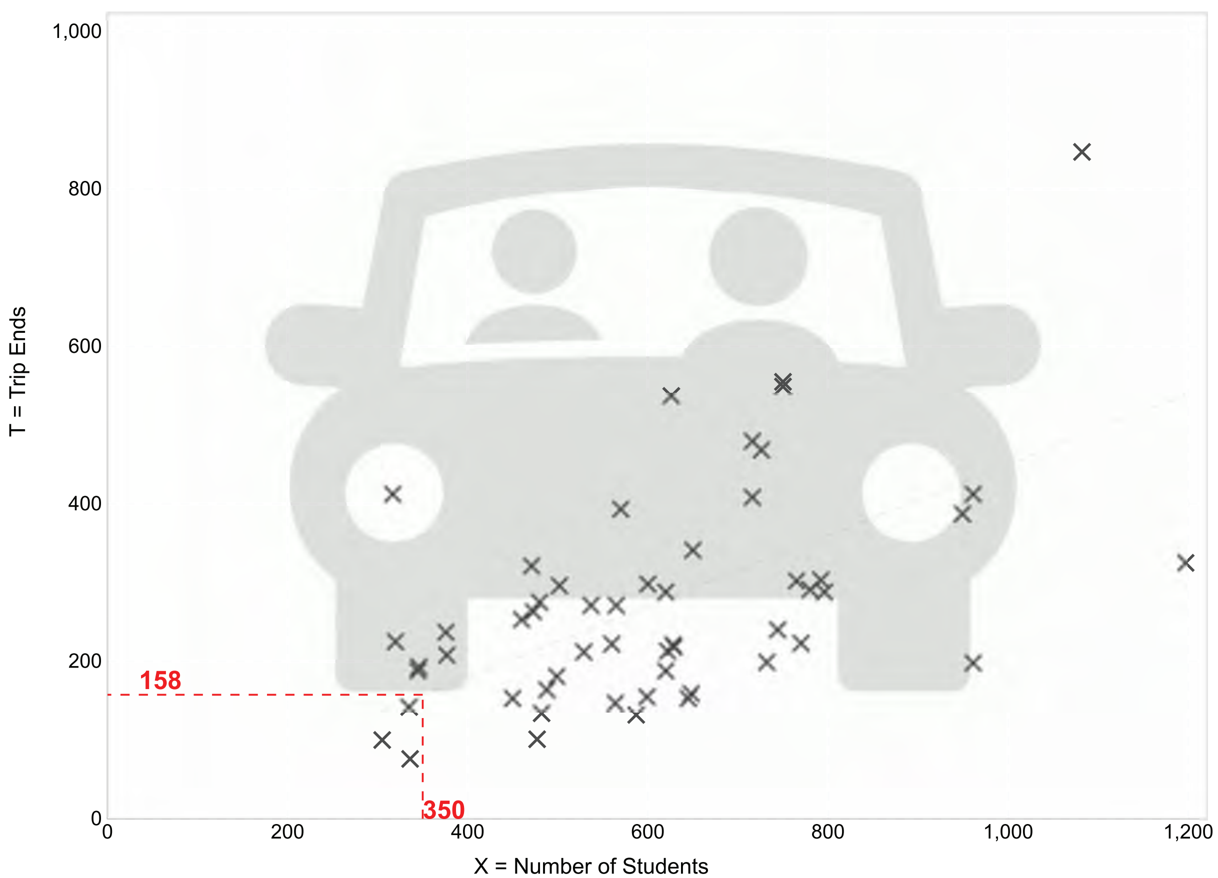
Elementary School
(520)

Vehicle Trip Ends vs:	**Students**
On a:	**Weekday,**
	PM Peak Hour of Generator
Setting/Location:	**General Urban/Suburban**
Number of Studies:	54
Avg. Num. of Students:	608
Directional Distribution:	46% entering, 54% exiting

Vehicle Trip Generation per Student

Average Rate	Range of Rates	Standard Deviation
0.45	0.21 - 1.30	0.19

Data Plot and Equation



× **Study Site** — — — **Average Rate**

Fitted Curve Equation: Not Given **R^2= ******

Trip Gen Manual, 11th Edition ● Institute of Transportation Engineers

Tacoma, Washington
Lowell Elementary School
Thursday May 9th, 2024
Trip Generation

Note: Bus #'s are represented as total IN/OUT and are included in the other vehicle IN/OUT totals, per interval

01 - Mr. Dahl Dr

TIME	IN	OUT
8:00:00 AM	6	5
8:15:00 AM	6	4
8:30:00 AM	0	0
8:45:00 AM	6	1
9:00:00 AM	6	9
Totals	**24**	**19**

6 vehicles parked @ 8:00AM

02 - N Yakima Ave btwn Mr. Dahl Dr & N 12th St

TIME	IN	OUT
8:00:00 AM	2	0
8:15:00 AM	0	0
8:30:00 AM	1	2
8:45:00 AM	4	2
9:00:00 AM	2	5
Totals	**9**	**9**

10 vehicles parked @ 8:00AM

03 - N 12th St btwn N Yakima Ave & N I St

TIME	IN	OUT
8:00:00 AM	3	0
8:15:00 AM	3	0
8:30:00 AM	4	3
8:45:00 AM	20	17
9:00:00 AM	1	4
Totals	**31**	**24**

1 vehicle parked @ 8:00AM

04 - N I St btwn N 12th St & N 13th St

TIME	IN	OUT	BUS
8:00:00 AM	0	0	0
8:15:00 AM	3	0	0
8:30:00 AM	9	8	0
8:45:00 AM	21	26	0
9:00:00 AM	3	1	1
Totals	**36**	**35**	**1**

8 vehicles parked @ 8:00AM

05 - N I St btwn N 13th St & N Steele St

TIME	IN	OUT
8:00:00 AM	1	0
8:15:00 AM	1	0
8:30:00 AM	1	1
8:45:00 AM	3	2
9:00:00 AM	1	3
Totals	**7**	**6**

5 vehicles parked @ 8:00AM

Trip Generation Total

TIME	IN	OUT
8:00:00 AM	12	5
8:15:00 AM	13	4
8:30:00 AM	15	14
8:45:00 AM	54	48
9:00:00 AM	13	22
Totals	**107**	**93**

01 - Mr. Dahl Dr

TIME	IN	OUT
3:00:00 PM	2	2
3:15:00 PM	3	2
3:30:00 PM	4	2
3:45:00 PM	3	5
4:00:00 PM	2	2
4:15:00 PM	3	2
Totals	**17**	**15**

12 vehicles parked @ 15:00

02 - N Yakima Ave btwn Mr. Dahl Dr & N 12th St

TIME	IN	OUT
3:00:00 PM	3	0
3:15:00 PM	2	4
3:30:00 PM	0	0
3:45:00 PM	3	3
4:00:00 PM	0	1
4:15:00 PM	1	2
Totals	**9**	**10**

19 vehicles parked @ 15:00

03 - N 12th St btwn N Yakima Ave & N I St

TIME	IN	OUT
3:00:00 PM	5	0
3:15:00 PM	6	0
3:30:00 PM	2	11
3:45:00 PM	1	4
4:00:00 PM	0	1
4:15:00 PM	5	0
Totals	**19**	**16**

8 vehicles parked @ 15:00

04 - N I St btwn N 12th St & N 13th St

TIME	IN	OUT	BUS
3:00:00 PM	3	0	0
3:15:00 PM	8	1	1
3:30:00 PM	4	12	3
3:45:00 PM	0	4	0
4:00:00 PM	4	1	0
4:15:00 PM	12	4	0
Totals	**31**	**22**	**4**

10 vehicles parked @ 15:00

05 - N I St btwn N 13th St & N Steele St

TIME	IN	OUT
3:00:00 PM	3	0
3:15:00 PM	14	1
3:30:00 PM	1	8
3:45:00 PM	1	1
4:00:00 PM	1	4
4:15:00 PM	5	2
Totals	**25**	**16**

6 vehicles parked @ 15:00

Trip Generation Total

TIME	IN	OUT
3:00:00 PM	16	2
3:15:00 PM	33	8
3:30:00 PM	11	33
3:45:00 PM	8	17
4:00:00 PM	7	9
4:15:00 PM	26	10
Totals	**101**	**79**

APPENDIX B

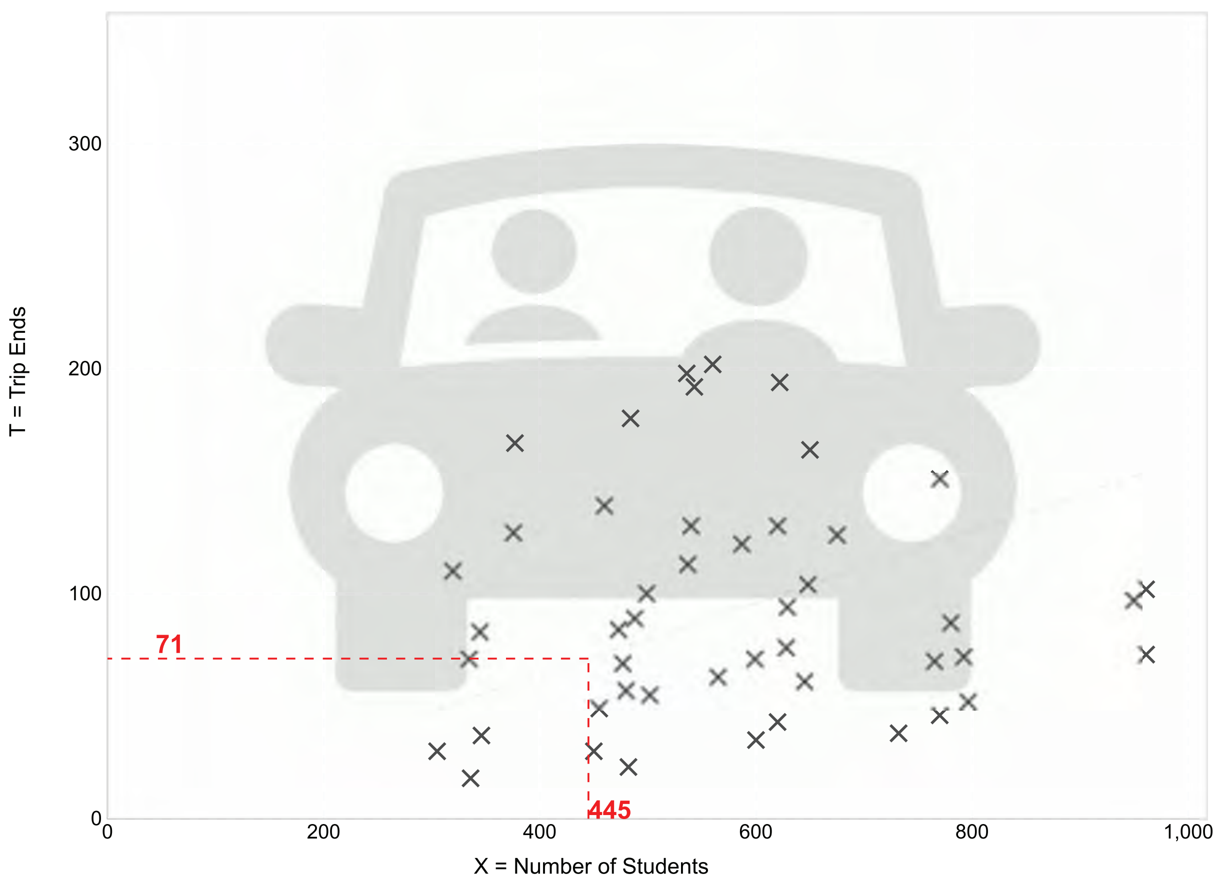
Elementary School
(520)

Vehicle Trip Ends vs:	**Students**
On a:	**Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m.**
Setting/Location:	**General Urban/Suburban**
Number of Studies:	47
Avg. Num. of Students:	576
Directional Distribution:	46% entering, 54% exiting

Vehicle Trip Generation per Student

Average Rate	Range of Rates	Standard Deviation
0.16	0.05 - 0.44	0.10

Data Plot and Equation



× **Study Site** **Average Rate**

Fitted Curve Equation: Not Given **R^2= ******

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Elementary School
(520)

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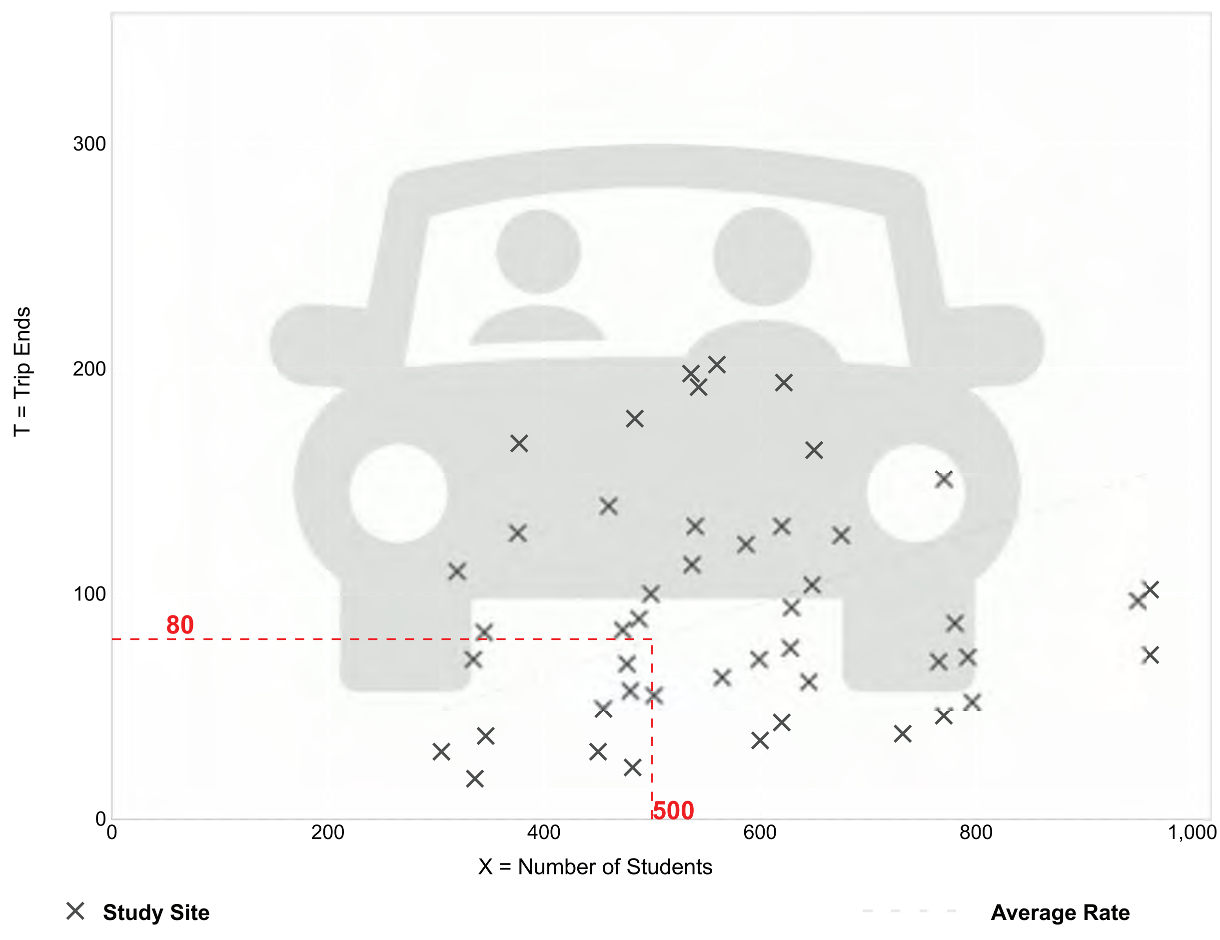
Vehicle Trip Generation per Student

Average Rate	Range of Rates	Standard Deviation
0.16	0.05 - 0.44	0.10

Data Plot and Equation



Fitted Curve Equation: Not Given

R^2= ****

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Cultural Resource Site Assessment and Management Plan

Lowell Elementary School

June 2024

Prepared for the Tacoma School District

And

City of Tacoma Landmarks Office

Cultural Reconnaissance

Russell Holter, MAH

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Figure 1: Main entrance of Lowell Elementary School. Bell from the original school building in the foreground. View to the east. All photos and captions are by Holter unless otherwise stated.

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Executive Summary

Whereas the Tacoma Public School District proposes the replacement of Lowell Elementary School, a historic-era structure; the District is required by law (through the SEPA process) to assess all environmental disciplines for potential project impacts. As Lowell Elementary is a historic-era structure and adjacent to at least one designated historic district, project impacts to cultural resources must be considered, per code, as a condition of the demolition permit.

The design team for the new Lowell Elementary School contracted with Cultural Reconnaissance: a firm meeting the qualifications for documentation and assessing the effects of the proposed scope of work. In its due diligence, the subcontractor looked at all aspects of the cultural environment pertaining to the proposed action. The subcontractor researched multiple secondary sources of information and conducted some first-person interviews prior to reaching the conclusions documented in this study.

The area of the proposed action is rich in history and is surrounded by individually listed structures, and cohesive collections of properties comprising historically significant districts. However, Lowell Elementary School was not considered a contributing resource to these districts. In addition, Tacoma Public Schools conducted a thematic survey of their historic resources in 2009. At that time, Lowell Elementary met the minimum age requirement as a Tacoma Landmark, and as a National Register property. The evaluators concluded that Lowell Elementary School was a Tier II resource meaning that with the passage of time, it could be considered significant.

Schools, by their very purpose, make contributions to patterns of local history. Honorable individuals have graced the hallways of Lowell Elementary School but none truly transcend history. And the history of Lowell is irreparably marred by the great quake of 1949. The original Lowell school was condemned, making it impossible to properly interpret. The replacement school was not designed to the scale and grandeur of its predecessor. Nor does it symbolize what had been lost.

Table of Contents:

Introduction

Tacoma Public Schools, to keep pace with the growing demands of their students, and the community at-large, have identified a critical infrastructure need in the North Slope neighborhood. To meet these projected needs, Lowell Elementary School (Lowell ES) has been identified as a district priority for expansion (tacomaschools.org). This perceived need precludes the use of the current structure which has served the district well for nearly seventy-five years. It is anticipated that the replacement of Lowell Elementary School will result in a determination of adverse impact by the members of the Tacoma Landmarks Office. A Cultural Resource Management Plan is required to provide staff of the Tacoma Landmarks Office, the facts necessary to arrive at a decision on mitigation, if any.

Locational information and Area of Potential Impact

Lowell Elementary School is located at 810 Mr. Dahl Drive (formerly North 13th Street), Tacoma, Pierce County, Washington, 98403. The school is in Township 21 north, Range 03 east, Section 31. Pierce County Assessor-Treasurer Information Portal (ATIP) identifies the site with Parcel numbers 2042160010; 2043170020 and 2043170030. These three parcels comprise the Area of Potential Impact (API) for the district's proposed activities. The size of the district parcels is approximately 2.8 acres in total. The API is further expanded to include a 500-foot buffer around the previously defined parcels. This buffer is defined by the Tacoma Municipal Code.

Figure 2: Pierce County Assessor Parcel Map

Regulatory Framework and Applicability

This Cultural Resource Management Plan supplements Tacoma Public Schools (the District) their State Environmental Policy Act (SEPA) checklist. The plan was prepared in accordance with the Tacoma Municipal Code (TMC 13.12.570). The purpose of the plan is to provide the City of Tacoma and the Department of Archaeology and Historic Preservation (DAHP), the opportunity to make comments regarding implications of the District's proposed actions. Tribal entities expressing a desire to review the project, as proposed, were notified of the plan and were afforded an opportunity to review and comment on the actions in the district's scope of work through the SEPA process.

A Cultural Resource Review of Lowell Elementary School is necessary to identify historic properties and cultural resources that are likely to be impacted by the scope of work as proposed by the District. Impacts to historic properties and other cultural resources are likely to result in determining a strategy for mitigation through consultation with regulatory agencies. The purpose of mitigation is to limit impacts or provide a public benefit in the case of cultural resource losses. According to the City of Tacoma's guidance on Cultural Resource Reviews, "Projects located within the Downtown Tacoma and Tacoma Mall Regional Growth Areas, for which Subarea Plans and Non-project Environmental Impact Statements have been adopted, must complete this process." This includes all areas of downtown and development actions taken by the Tacoma Public School District.

Tacoma Landmarks Criterion

Buildings nominated to the Tacoma Historic Register must be at least 50 years old, or older, and retain integrity of design, setting, materials, and association that convey their significance. The criterion used to evaluate historic structures in Tacoma are:

Criteria A: Associated with broad patterns of our history,

Criteria B: Associated with significant local historical figures,

Criteria C: Embodies distinctive characteristic of an architectural type/form,

Criteria D: Has or may yield pre-historical information,

Criteria E: Is a part of or adjacent to an existing or proposed historic district,

Criteria F: Is a visual landmark in the neighborhood or city.

Methodology

The City of Tacoma prescribes three levels of review to determine the extent of impacts to cultural resources. As the proposed scope of work at Lowell ES involves the demolition of a historic-era structure, the most stringent of the three review processes is the one that must be followed for the district to remain in compliance. As part of this review, an evaluation must be made regarding the potential direct and indirect impacts of the work as proposed. Direct effects would include the demolition of Lowell Elementary School. However, indirect impacts might affect other significant structures or historic districts that exist within 500-feet of the proposed project.

Locating cultural resources potentially impacted by the proposed scope of work involves investigating the DAHP's Washington Information System for Architectural and Archaeological Records Database known as *WISAARD*. This state database contains information regarding known prehistoric and historic sites and their relative significance. The City of Tacoma also maintains a database of sites of significance to Tacoma history. These databases were accessed, and the data evaluated for this report.

The City of Tacoma recommends using the state standards for recordation when the proposed scope of work includes the demolition of historic-era structures. To achieve this, DAHP recommends a written physical description of the property, a statement of significance, and photographs of the structure, be submitted for review and comment. A qualified individual must state whether the project as proposed will have direct or indirect impacts upon cultural resources within 500-feet of the worksite.

Criteria A: Associated with broad patterns of our history

All schools in the district contribute to broader patterns of Tacoma's social history. Lowell ES is no exception to that rule. However, Lowell ES does not rise above the fold the way schools like Stadium or Lincoln High School would.

Criteria B: Associated with significant local historical figures

Dahl, Robert (1952-2012)

Robert "Bob" Dahl was the longest tenured school principal in the history of Lowell ES. Serving from 1997 until his untimely death in 2012, he was a much loved and respected leader in primary education. Until his death from pulmonary fibrosis, Principal Dahl had the unique ability to enfranchise students and grant each a measure of self-actualization. Fifth graders from Lowell ES circulated petitions and collected signatures of over 150 individuals expressing a desire to rename that portion of North 13th Street, Mr. Dahl Drive. Student leaders attended civic functions and provided testimony to city committee members and to the City Council until, finally, their request was granted.

Plan moves forward to rename street in honor of late Tacoma principal

Figure 3: Principal Robert Dahl. Photo courtesy of *Tacoma Daily Index*.

Klegman, Marvin Allan (1937-1949)

Described as a highly motivated and ambitious young man, Marvin Klegman was born into the Jewish family of Samuel Klegman and his wife Thelma Korklin on December 11, 1937. The husband and wife were married in 1936 and several years later their youngest son Kerry was added to the young family (findagrave). Tragically, oldest son Marvin was killed during the Earthquake that rocked Western Washington in 1949. The Earthquake struck just moments before noon on Wednesday. The magnitude 6.7 trembler was felt 500 miles from the epicenter near Roy, WA. Straddled by Olympia to the south and Tacoma to the north, both communities were especially affected by the quake (USGS).

In Tacoma, Marvin Klegman had just donned his patrol guard vest. It was his job to ensure vehicle traffic yielded at the crosswalk for half-day kindergarten students who were released around noon. Out in the open, Klegman was safe when the earthquake jarred him and his fellow students. In a panic, students ran from the building in every direction. Not Klegman. With the ground still quivering at his feet, Klegman ran into the unreinforced masonry structure. Bounding down the stairs, Klegman found a terrified first grader named Kelcy Allan in the school basement. Grabbing Allan by the arm, Klegman said, "Hey, we got to get out of here!" The two boys ran upstairs to the main hallway and attempted to exit the front doors of the school. The brick parapet of the school broke free from the roof and collapsed. Using his body for protection, Klegman shielded his charge from the hail of pelting bricks (findagrave).

Lowell ES Principal Clarence Monson and school nurse Myra Carr left the assembly area after the dust settled to survey the damage. In the rubble of the steps of the school the two could hear the crying of a battered Kelcy Allan. The rescuers pulled the broken and lifeless body of Klegman from the ruins to find Kelcy underneath. Next to Klegman was his tattered patrol boy's flag (Dugovich).

PTA president Evelyn Dryden expressed her indignant regarding the school district's lack of action regarding the crumbling school. The building had been identified for replacement following survey in 1944. Furthermore, city building inspectors had condemned the fourth floor the year before the earthquake. Despite these warnings, nothing had been done to ensure the safety of the students in the event of a structural failure (Dugovich). The School Board, in turn, blamed the Legislature for failing to appropriate construction funding in the previous biennium. With the death of Klegman, the district wasted no time in shifting students to safer accommodations and demolishing the damaged structure (TNT, April 16, 1949:1).

Klegman was laid to rest at the Home of Peace cemetery in Lakewood after a well-attended service officiated by Rabbi Bernard Rosenberg. The City of Tacoma Police Honor Guard was dispatched to Klegman's services, and his casket was carried by sixth-grade Patrol boys from various schools throughout the District (TNT, April 18, 1949:1).

The semi-collapsed structure was condemned and torn down. According to Tacoma Historian Bill Baarsma (a student of Lowell ES at that time) students were shifted to Grant Elementary to finish off the school year. While the new school was under construction, Lowell students were then shifted to Bryant until the fall of 1950 when the new school was finally ready (Baarsma).

Concern for rapid evacuation plans in large and often crowded urban schools was a serious matter debated by many school boards. The highly publicized death of young Lowell Elementary School student Marvin Klegman emphasized a rising concern regarding masonry school construction. Several brick school buildings were damaged beyond repair, and other students were hurt from flying debris. While the bias towards masonry still existed, school boards were interested in hearing about other alternatives, particularly those that were deemed more cost-effective (Swope, 35).

Figure 4: Monument to Patrol boy and hero Marvin Klegman.

Lowell, James Russell (School's namesake)

James Russell Lowell was an abolitionist, published poet, professor of languages at Harvard University, and served as an ambassador to both Spain and Great Britian. Lowell's writing style attracted the attention of Ralph Waldo Emerson, and Henry Wadsworth Longfellow, with whom he was associated. Lowell helped to advance the career of Edgar Allen Poe by publishing some of his earliest works. And Lowell's writings are said to have influenced the writings of Mark Twain and Dr. Martin Luther King Jr.

Figure 5: Sketch of James Russell Lowell

Reynolds, Robert Herndon (1906-1922)

Robert "Bob" Reynolds was a standout scholar, musician, and athlete. When it came to academics, he was considered a brilliant honor student. Up until his death, Reynolds was a Boy Scout who belonged to Troop 15 headquartered at Immanuel Presbyterian Church, where his family attended weekly services (TDL February 26, 1922:48). As a freshman at Stadium High School, Reynolds excelled at baseball, basketball, soccer, and track. In track, Reynolds took awards in sprints, the high jump, and team relays (TDL, May 22, 1920:15) However, Reynolds consecutive tennis tournaments made him a notable star athlete. As a member of the Tacoma Lawn and Tennis Club, Reynolds began consistently winning tournaments by the age of 12. In 1921 Reynolds hoisted four championship trophies in one year. The fourth championship that year was an international invitational held in Victoria, British Columbia. In his spare time, Reynolds also hosted piano recitals where he played music composed by Johan Bach and Hector Berlioz (TDL, May 19, 1921:5). Bob Reynolds died in his parent's stately home located at Rosemount Way of pneumonia on Sunday, February 15, 1922. He was only sixteen years of age.

Figure 6: Boyhood home of Robert Reynolds. Photographer unknown.

Bob Reynolds was honored the year following his death by having the Junior Tacoma Lawn and Tennis Club championship cup named in his honor (NT, August 6, 1923:10). Lowell School principal Garrett commissioned a statue of Reynolds to inspire a new generation of scholars and athletes. The statue was part of a larger monument and drinking fountain. The statue and fountain were the work of Tacoma sculptor, Allan Clark, and was mounted on the grounds of the Lowell School (NT, August 28, 1923:10). It is likely that the fountain feature was removed during the demolition of Lowell. However, the Reynolds statue remains.

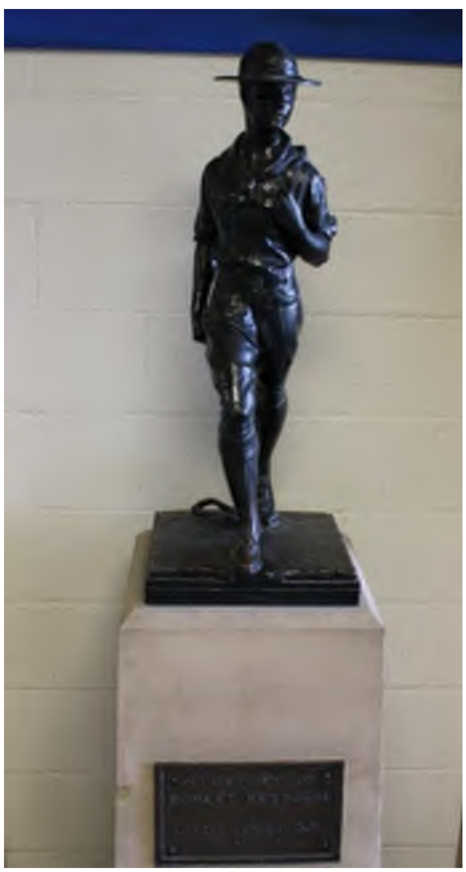

Figure 7: Memorial for talented honors student and star athlete Robert Reynolds

Criteria C: Embodies distinctive characteristic of an architectural type/form

For the first century of Washington's early history, schools were built almost entirely of wood, due to economics and the ready availability of the local material. However, after several great conflagrations swept major cities like Seattle, Spokane, and Ellensburg, concerns over fire safety pushed districts in urban areas to make the shift to masonry construction in the 1890s. According to Swope, masonry construction was preferred for its relatively low cost of ongoing maintenance and its superiority in fire survivability. But with the deaths of Klegman, and others from falling bricks, the 1949 earthquake immediately changed District priorities for new school construction. "[S]chool boards were interested in hearing about other alternatives, particularly those that were deemed more cost-effective" (Swope, 35).

The 1949 earthquake helped raise awareness of the relative safety of unreinforced masonry construction, not only in Tacoma, but throughout the Puget Sound basin. By the mid-twentieth century several advancements had been made in the field of construction technology. The war effort had brought about industrial expediencies to hasten production of materials, supplies, and equipment. Some of these techniques were advanced right here in Washington. Kaiser Shipyards were early innovators in modular construction of Liberty Ships at Vancouver. Significant advancements were also made in plywood manufacturing, pre-tensioned concrete, and in the field of metal fabrication--specifically welding (French, 154).

With the war now over, the construction trades eagerly capitalized on these advancements by applying them to domestic trades. The earthquake created a stage to showcase many of these newly applied construction techniques. Swope and Winters agree that Lowell ES benefited directly from these advancements. Surplus materials, an eager workforce, and labor-saving techniques helped drive down construction prices. "Cost, more so than in any previous era, became one of the single greatest factors in new school construction" (Winters, 14).

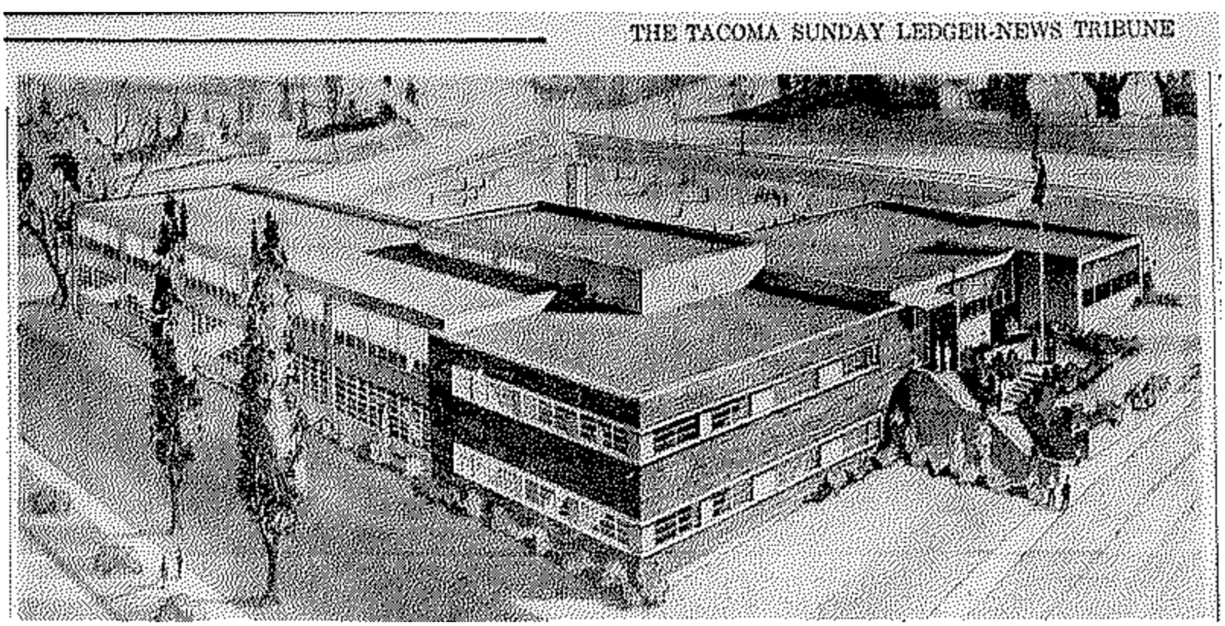

Figure 8: Newspaper clipping with artist's rendering of the new Lowell ES.

By December of 1949, while crews were still removing the rubble from the old school, construction contractors were punching foundations for the new school. Despite the use of poured concrete, plywood, and some prefabricated wall panels, by September of 1950, Lowell ES was not ready to receive students. Again, Lowell students were shifted to other schools. Some classes met in homes on District-owned property where the Lowell annex now stands. But wide-eyed students got a taste of their new facilities by the first of December. However, only seven of the twelve classrooms were substantially finished.

Ten years later, three or four single family residences were demolished to make way for the annex structure. The buildings were necessary to expand the school's program needs and brought the total number of classrooms at Lowell ES up to 16. The annex was constructed of similar materials and style as the 1950 structure.

Figures 9 & 10: Side-by-side aerial photographs showing the building footprints of the old and new school buildings. Photos courtesy of NETRO.

Figure 11: Site plan that includes the Lowell ES annex. Pierce County Assessor's record.

Criteria D: Has or may yield pre-historical information

According to Hedlund, the area upland of Old Tacoma may have been used for domestic or economic purposes by ancestors of the Puyallup Tribe. However, previous archaeological investigations and a literature search seems to indicate that tribal members were most active closer to the shores of Commencement Bay (Hedlund). It is unlikely that precontact cultural materials will be found at the site of Lowell ES considering the profound changes to the landscape over the course of the past 130 years. However, an Unanticipated Discovery Plan has been written and is included in this report.

Criteria E: Is a part of or adjacent to an existing or proposed historic district

Lowell ES was studied and evaluated as part of the larger thematic analysis of historic-era properties owned by the District. Dr. Caroline Swope suggested that as a replacement school, for the school damaged by the earthquake, Lowell's significance had been interrupted by this change. The replacement school certainly could take on significance, however, Swope considered the replacement school to be a Tier II resource. As a Tier II resource, the replacement school would continue to gain significance over its lifespan.

It should also be noted that Lowell ES is within one mile of, and borders, two designated districts. Those conducting surveys of these districts failed to include Lowell ES as a significant resource. In each case, Lowell ES was left off each district's list of structures.

Criteria F: Is a visual landmark in the neighborhood or city

Although the urban landscape of the North Slope is interrupted by the presence of Lowell ES and its associated playgrounds, the criteria is best applied to open spaces where the landscaping or natural spaces predominates, or defines the cultural resource.

Due Diligence and Probable Impacts

Traditional Cultural and Cultural Sites

According to WISAARD, the closest documented archaeological site is located on the banks of Commencement Bay and is well outside of the API. No Traditional Cultural Properties have been identified within one mile of the proposed action.

Burials and Cemeteries

There is one burial and the Episcopal Church Columbarium, located in the North Slope Neighborhood, are both less than mile from Lowell Elementary School. Neither are within the API.

Tribal Consultation

Seven tribes have expressed an interest in having an opportunity to review and comment upon land altering activities taking place in the vicinity of the proposed action. These tribes are, in alphabetical order:

- The Muckleshoot Tribe
- The Nisqually Tribe
- The Puyallup Tribe
- The Snoqualmie Tribe
- The Squaxin Island Tribe
- The Suquamish Tribe
- The Yakama Nation

The lands upon which Lowell ES is located are lands ceded by The Puyallup Tribe of Indians in exchange for US Treaty Rights in 1855. As such, The Puyallup Tribe will likely take the lead on behalf of tribal entities on this project. Other tribal governments will likely yield to the Puyallup so long as the Puyallup Cultural Resource Management office is aware of the pending action.

Archaeological Predictive Model

The Archaeological Predictive Model indicates that the area under development has a "High" to "Very High" probability of an unanticipated discovery of previously unknown archaeological resources. Due to the "Very High" probability, the state recommends that a cultural resources survey (like this one) be undertaken at this location prior to the commencement of construction activities. A UDP has been prepared for excavation contractors doing work at this location. Contractors digging on site are likely to find a midden of industrial cast off materials left behind from the demolition of the original school now located under the playgrounds. (See: Unanticipated Discovery Protocol)

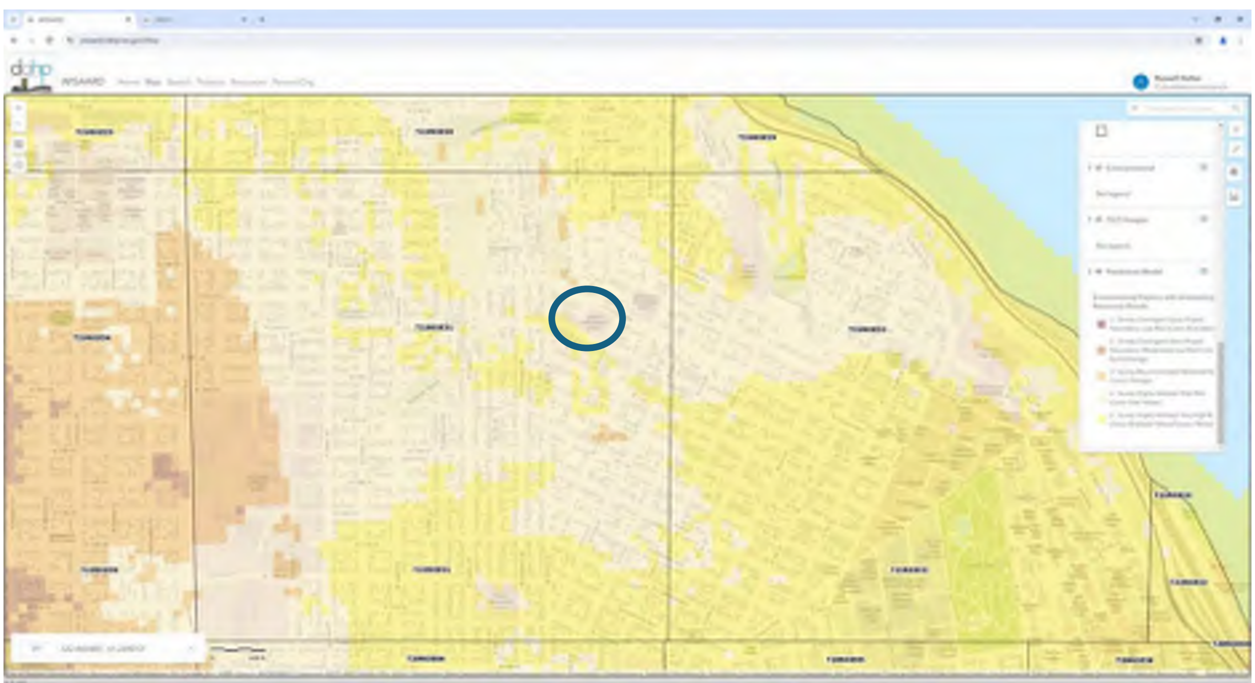

Figure 12: Archaeological Predictive Model for Lowell Elementary School Site.

Historic Structures (within 500-feet of project area)

There are 11 historic-era structures potentially impacted by the work associated with the demolition and construction proposed by the District. Of these, one is considered eligible for the National Register of Historic Places. Another has been evaluated and determined to be not eligible for inclusion. The other nine historic-era structures have yet to be evaluated.

Register and Heritage Properties

The area surrounding the school is historically significant given the presence of six individual Register listed historic districts. These districts include:

- Buckley Addition
- College Park
- North Slope
- Stadium-Seminary
- Wedge Neighborhood, and
- Wright Park

Although adjacent to the North Slope District and within three blocks of two others, cultural resource professionals proposing those district boundaries excluded Lowell Elementary from their respective districts. Of the eleven properties previously mentioned (not associated with historic districts) one (1) was determined individually eligible for listing, while one was determined not to be eligible. The remaining nine (9) properties have not undergone evaluation for inclusion.

Besides the six historic districts, there are 18 significant properties located within one mile of the elementary school. These structures not only contribute to the districts they are located, but are individual landmarks in their own right:

- Annobee Apartments
- Conrad and Annie Beutel House
- The Blue Mouse Theater
- Central Lutheran Church
- Cushman Substation
- Henry Drum House
- Engine House #13
- Lord-Heuston House
- Fredrick Murray House
- North 21st Street Bridge
- North 23rd Street Bridge
- Osgood-Anderson House
- Henry and Birdella Rhodes House
- William R. Rust House
- Slavonian Hall
- St. Peter's Episcopal Church

- Tacoma Masonic Temple, and
- Washington Elementary School

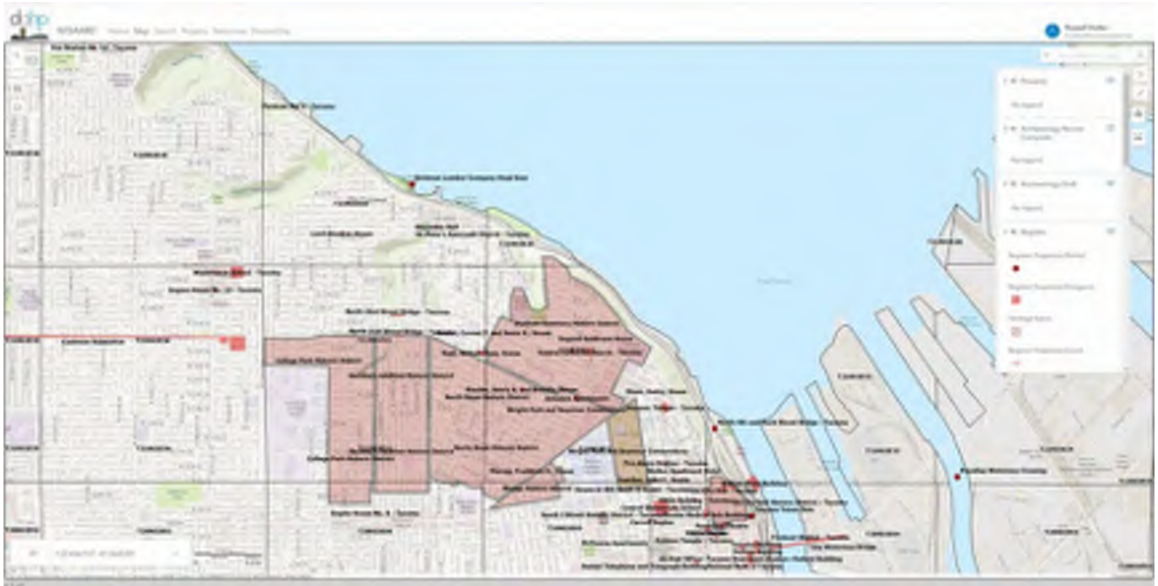

Figure 13: Historic Sites and Structures within one mile of Lowell ES.

Government Land Office Surveys and Notations

Township 21 north, Range 03 east, was first surveyed under a territorial contract awarded to Ezra Meeker of Puyallup in 1868. Only the location of Job Carr's cabin is indicated in the survey (approximately one-half mile to the north). No other features were noted in the data layers for the API in this locality.

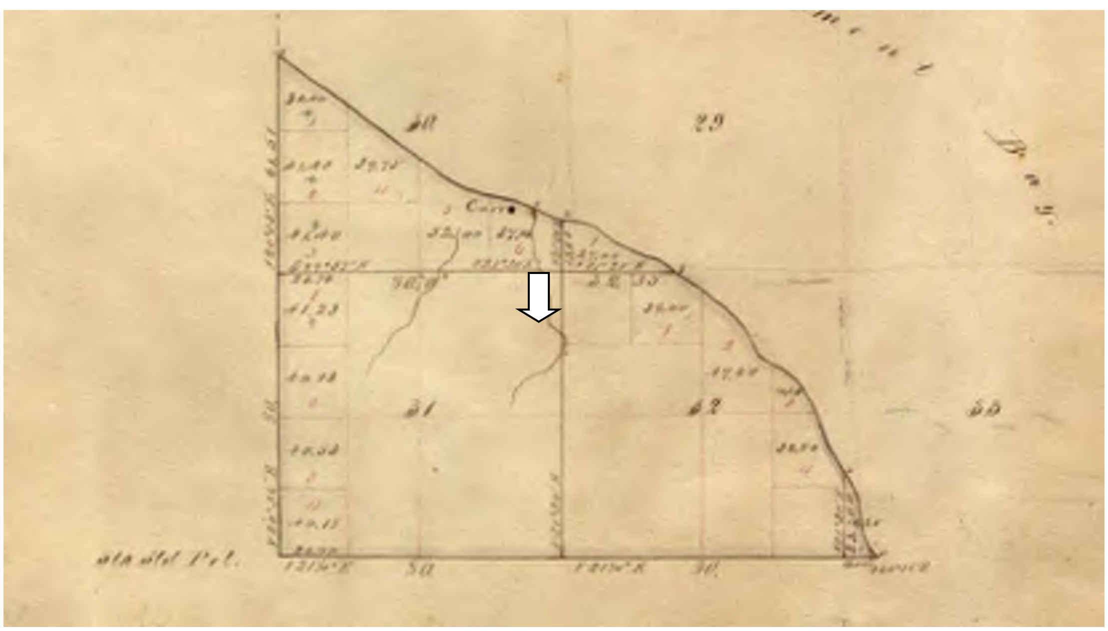

Figure 14: Ezra Meeker's Government Land Office Survey of 1868. Note location of Carr cabin. Arrow indicates the current location of Lowell ES.

Maritime Heritage Study Area

The district's proposed action takes place less than a mile from the Washington Maritime Heritage Study Area. No maritime heritage sites were identified within one mile of Lowell ES.

Historic Property Inventory of Lowell Elementary School

Lowell Elementary School is included in DAHP database of historic-era structures as HPI#105117. At that time, Michael Sullivan of Artifacts Consulting, believed this resource was eligible for listing to the National Register. However, the surveyor's opinion was not concurred upon by a regulatory authority (Sullivan).

Physical Description:

This sprawling, two-story, Mid-century structure with ribbons of windows, was designed in an "L" shape to accommodate the demolition of the old Lowell School that preceded it. Local architects from the firm of Lance, McGuire & Muri, envisioned a low-profile structure of the International Style. Due to significant resource losses from the April 13, 1949, earthquake, the District expeditiously entered into a construction contract with Bonnel Construction, who set the plan in motion.

The contractor using board-formed, steel-reinforced, concrete created a permanent foundation for the new structure. The foundations are banked into the hillside above Old Tacoma. Upon this foundation rested a CMU block wall building with ribbon window fenestration. CMU blocks are favored for their strength, durability, and ease of placement in a cladding plane. However, CMU blocks are stereotypically unappealing aesthetically. The designers attempted to overcome this monotonous appearance by adding in decorative block elements, and they applied a thin set of stucco material on the primary facade. Similar decorative CMU elements were reincorporated into the quad of annex buildings when they were constructed in 1960.

The primary façade of the structure faces west towards Mr. Dahl Drive (formerly North 13th Street. A series of poured concrete stairs rises from the sidewalk to meet the entryway on top floor. School offices and many of the classrooms are located on this floor to accommodate access to the playgrounds located adjacent to North "I" Street. Aside from the ribbon windows mentioned above, the designers included glass block elements to break up the monotony of the cladding plane and provide additional ambient light. Visitors to the school access the school offices through a vestibule parged in stucco. A set of double doors leads to an interior staircase to which the halls of the school are accessed. Evidence suggests that the original asbestos tiles are still present in the main circulation areas of the school.

The structure is protected from the elements by a flat roof. The roof material comprises rolled asphalt sheets torched to the surface to create a weatherproof bond. Rainwater is channeled away from the structure through a series of scuppers.

East of the main building is the Lowell ES annex. Construction of the annex began in 1960 after a portion of North 13th Street was abandoned at the request of the District. The annex is a rectangular shaped quad of mid-century structures surrounding an open space containing a rather sizeable glacial erratic. The annex helped to keep the kindergarten children separate from their grade school colleagues.

Statement of Significance:

All schools in the district contribute to broader patterns of Tacoma's social history. Lowell ES is no exception to that rule. However, Lowell ES does not rise above the fold the way schools like Stadium or Lincoln High School would. In the history of Lowell ES, four individuals stand out. The first being Lowell's namesake, Ambassador James R. Lowell. However, it does not appear that Lowell ever ventured west, and certainly not to Tacoma. Therefore, his influence is rather transitory. Those physically here in Tacoma and made significant contributions to Lowell history include Principal Bob Dahl, Patrol boy Marvin Klegman, and rising tennis ace, Robert Reynolds. The contributions made by these individuals are not transcendent to our history. Reynolds has been completely forgotten. Klegman was on the verge of irrelevancy when in 1999, his young charge, Kelcy Allan, retold the heroic story which led to the commission of his monument. Dahl's contribution to local history, though laudable, only spanned fifteen years.

The highly publicized death of young Lowell Elementary School student Marvin Klegman emphasized a growing concern regarding masonry school construction. Several brick school buildings were damaged beyond repair, and other students were hurt from flying debris. While the bias towards masonry still existed, school boards were interested in hearing about other alternatives, particularly those that were deemed more cost-effective. The earthquake created a stage to showcase many of these newly applied construction techniques. Swope and Winters agree that Lowell ES benefited directly from these advancements.

Lowell ES was studied and evaluated as part of the larger thematic analysis of historic-era properties owned by the District. Dr. Caroline Swope suggested that as a replacement school, for the school damaged by the earthquake, Lowell's significance had been interrupted by this change. The replacement school certainly could take on significance, however, Swope considered the replacement school to be a Tier II resource. As a Tier II resource, the replacement school would continue to gain significance over its lifespan.

It is in the opinion of the evaluator that Lowell ES does not rise to a level of significance that warrants inclusion to National, State or Local registers. Although the structure retains good integrity, it is not exceptional under any of the City's stated criteria. It should also be noted that Lowell ES is within one mile of, and borders, two designated districts. Those conducting surveys of these districts failed to include Lowell ES as a significant resource. In each case, Lowell ES was left off each district's list of structures.

Probable Impacts

As the District's scope of work for this proposed action includes the demolition of a historic-era resource that some have considered eligible for listing, it is possible that the district's proposed actions may require some level of mitigation through consultation with regulatory agencies. Furthermore, an evaluation of historic resources carried out by the district determined that Lowell ES was a secondary, or Tier II, resource with only a modest significance to the larger thematic appraisal of all historic schools in the District.

Unanticipated Discovery Protocol

PLAN AND PROCEDURES FOR THE UNANTICIPATED DISCOVERY OF CULTURAL RESOURCES AND HUMAN SKELETAL REMAINS

Tacoma Public Schools Property, Lowell Elementary School, 810 Mr. Dahl Dr., (formerly North 13th Street), Tacoma, Pierce County.

1. INTRODUCTION

The following Unanticipated Discovery Plan (UDP) outlines procedures to follow, in accordance with state and federal laws, if archaeological materials or human remains are discovered.

2. RECOGNIZING CULTURAL RESOURCES

A cultural resource discovery could be any item made or used by people. Examples include:

- An accumulation of shell, burned rocks, or other food related materials,
- Bones or small pieces of bone,
- An area of charcoal or very dark stained soil with artifacts or fire-cracked rocks,
- Stone tools (arrowheads, spear points) or waste flakes (stone chips),
- Clusters of tin cans or bottles, broken dishes or household items, or logging or agricultural equipment that appears to be older than 50 years,
- Buried railroad tracks, decking, or other industrial materials, including concrete foundations.

When in doubt, assume the material is a cultural resource and stop and call the cultural resource specialist listed below.

3. ON-SITE RESPONSIBILITIES

STEP 1: STOP WORK. If any employee, contractor or subcontractor believes that he or she has uncovered a cultural resource at any point in the project, all work adjacent to the discovery must stop. The discovery location should be secured at all times.

STEP 2: NOTIFY THE CONSULTANT (contact below). Contact the consult:

<u>Cultural Resource Specialist:</u>

Name: Russell Holter

Number: 253-905-1381

Email: russell@culturalreconn.com

The Consultant will make all other calls and notifications, including to the Puyallup Tribe and the Department of Archaeology and Historic Preservation (DAHP), after determining if the find is an archaeological or cultural site.

If human remains are encountered, treat them with dignity and respect at all times. Cover the remains with a tarp or other materials (not soil or rocks) for temporary protection in place and to shield them from being photographed. Call the County Coroner or local law enforcement (contact info below). DISTURBING HUMAN REMAINS IS A FELONY under Washington law, you MUST notify the coroner or law enforcement if you think you have encountered any human skeletal material.

4. FURTHER CONTACTS AND CONSULTATION

A. Project Manager/Construction Crew Responsibilities:

- <u>Protect Find</u>: Construction personnel are responsible for taking appropriate steps to protect the discovery site. All work will stop in an area adequate to provide for the total security, protection, and integrity of the resource. Vehicles, equipment, and unauthorized personnel will not be permitted to traverse the discovery site. Work in the immediate area will not resume until treatment of the discovery has been completed following provisions for treating archaeological/cultural material as set forth in this document.
- <u>Direct Construction Elsewhere On-site</u>: The Project Manager may direct construction away from cultural resources to work in other areas prior to contacting the concerned parties.
- <u>Contact Consulting Archaeologist</u>: If the Consulting Archaeologist has not yet been contacted, the Project Manager will do so.

B. Consulting Archaeologist's Responsibilities:

- <u>Identify Find</u>: The Consulting Archaeologist will ensure that a qualified professional archaeologist examines the find to determine if it is archaeological.

  - If it is determined not archaeological the Archaeologist will notify the Project Manager and construction crew and work may proceed with no further delay.
  - If it is determined to be archaeological, the Archaeologist will notify the Puyallup Tribe Cultural Resources Program and the DAHP, and arrange for field visits if requested.
  - If the find may be human remains or funerary objects, the Archaeologist will notify the Puyallup Tribe Cultural Resources Program, State Physical Anthropologist, and law enforcement (if they have not been notified) of the find. If it is determined to be human remains, the procedure described in Section 5 below will be followed.
- Notify DAHP: The Consulting Archaeologist will contact the Department of Archaeology and Historic Preservation (DAHP).
- Notify Tribes: If the discovery may relate to Native American interests, the Consulting Archaeologist will notify the Puyallup Tribe's Cultural Resources Program.

Department of Archaeology and Historic Preservation:

Dr. Allyson Brooks
State Historic Preservation Officer
(360) 480-6922

Stephanie Jolivette
Local Government Archaeologist
(360) 628-2755

Tribes consulted on this project are:

Tribe: Puyallup Tribe
Name: Brandon Reynon
Title: Tribal Historic Preservation Officer
Number: 253-573-7986
Email: brandon.reynon@puyalluptribe-nsn.gov

Tribe: Puyallup Tribe
Name: Jennifer Keating
Title: Assistant THPO
Number: 253-549-5397
Email: Jennifer.M.Keating@PuyallupTribe-nsn.gov

C. Further Activities

- Archaeological discoveries will be documented as described in Section 6.
- Construction in the discovery area may resume as described in Section 7.

5. SPECIAL PROCEDURES FOR THE DISCOVERY OF HUMAN SKELETAL MATERIAL

Any human skeletal remains, regardless of antiquity or ethnic origin, will at all times be treated with dignity and respect.

A. Notify Law Enforcement Agency or Coroner's Office:

In addition to the actions described in Sections 3 and 4, the Project Manager or Consulting Archaeologist will immediately notify the local law enforcement agency or coroner's office.

The coroner (with assistance of law enforcement personnel) will determine if the remains are human and whether or not the discovery site constitutes a crime scene, and will notify DAHP.

Law Enforcement (non-emergency number preferred over 911)

Business phone, Pierce County Sheriff: (253) 287-4455

B. Participate in Consultation:

Per RCW 27.44.055, RCW 68.50, and RCW 68.60, DAHP will have jurisdiction over non-forensic human remains. Tribal Cultural Resources personnel will be allowed an opportunity to participate in consultation.

C. Further Activities:

- Documentation of human skeletal remains and funerary objects will be agreed upon through the consultation process described in RCW 27.44.055, RCW 68.50, and RCW 68.60.
- When consultation and documentation activities are complete, construction in the discovery area may resume as described in Section 7.

6. DOCUMENTATION OF ARCHAEOLOGICAL MATERIALS

Archaeological deposits discovered during construction will be assumed eligible for inclusion in the National Register of Historic Places under Criterion D until a formal Determination of Eligibility is made.

The Consulting Archaeologist will ensure the proper documentation and assessment of any discovered cultural resources in cooperation with DAHP, affected tribes, and a contracted consultant (if any).

All prehistoric and historic cultural material discovered during project construction will be recorded by a professional archaeologist using a State of Washington cultural resource site, or the isolate form, using standard techniques. Site overviews, features, and artifacts will be photographed; stratigraphic profiles and soil/sediment descriptions will be prepared for subsurface exposures. Discovery locations will be documented on scaled site plans and site location maps.

Cultural features, horizons and artifacts detected in buried sediments may require further evaluation using hand-dug test units. Units may be dug in controlled fashion to expose features, collect samples from undisturbed contexts, or interpret complex stratigraphy. A test excavation unit or small trench might also be used to determine if an intact occupation surface is present. Test units will be used only when necessary to gather information on the nature, extent, and integrity of subsurface cultural deposits to evaluate the site's significance. Excavations will be conducted using state-of-the-art techniques for controlling provenience.

Spatial information, depth of excavation levels, natural and cultural stratigraphy, presence or absence of cultural material, and depth to sterile soil, regolith, or bedrock will be recorded for each probe on the standard form. Test excavation units will be recorded on unit-level forms, which include plan maps for each excavated level, and material type, number, and vertical provenience (depth below surface and stratum association where applicable) for all artifacts recovered from the level. A stratigraphic profile will be drawn for at least one wall of each test excavation unit.

Sediments excavated for purposes of cultural resources investigation will be screened through 1/8-inch mesh, unless soil conditions warrant ¼-inch mesh.

All prehistoric and historic artifacts collected from the surface and from probes and excavation units will be analyzed, catalogued, and temporarily curated. Ultimate disposition of cultural materials will be determined in consultation with the landowner, DAHP, and the affected tribes.

Within 90 days of concluding fieldwork, a technical report describing any and all monitoring and resultant archaeological excavations will be provided to the Project Manager, DAHP, and the affected tribe(s).

If assessment activity exposes human remains (burials, isolated teeth, or bones), the process described in Section 5 above will be followed.

7. PROCEEDING WITH CONSTRUCTION

Project construction outside the discovery location may continue while documentation and assessment of the cultural resources proceed. The Consulting Archaeologist will determine the boundaries of the discovery location. In consultation with DAHP and affected tribes, the Project Manager and the Consulting Archaeologist will determine the appropriate level of documentation and treatment of the resource.

Construction may continue at the discovery location only after the process outlined in this plan is followed and the Consulting Archaeologist determines that compliance with state and federal laws is complete, in consultation with affected Tribes.

Timeline for Lowell Elementary School

YYYYMMDD

186412xx	Job Carr established a land claim at Old Tacoma.
18680720	Ezra Meeker surveys the Carr claim.
1869xxxx	Carr sells a significant portion of his land claim to Matthew McCarver who then plots a townsite at Old Tacoma. The first elementary school is constructed in Tacoma. It was referred to as the First Ward School.
18741216	The Northern Pacific arrives at Commencement Bay, bypassing Old Tacoma.
1875xxxx	The First Ward School burns to the ground.
1880sxxx	Edward Fuller established a domestic waterworks by building a weir in Buckley Gulch. Having been bypassed as a potential central business district, the Carr family plat a residential neighborhood adjacent to McCarver's plat. Many lots were sold for single family homes.
1890xxxx	Tacoma Schools are consolidated into one district. A replacement for the First Ward School is named after abolitionist, James Russell Lowell.
1892xxxx	Lowell School, a handsome and sturdy unreinforced masonry structure is completed.
1906xxxx	Robert "Bob" Herndon Reynolds is born to Verona Herndon and Elliot K. Reynolds.
19060317	Cornerstone laid for St. Patrick's Church across "I" Street from Lowell.
1918xxxx	Bob Reynolds wins his first tennis tournament at the age of 12.
1921xxxx	Bob Reynolds wins four consecutive tournaments, including an international invitational in Victoria, British Columbia.
19220215	Honor student and star athlete Bob Reynolds succumbs to pneumonia at the age of 16.
192308xx	Tacoma Lawn and Tennis Club names Junior Tennis Tournament award, "The Robert Reynolds Cup."
19230828	Lowell School principal Garrett dedicates Reynold's statue and drinking fountain in front of the school.
19371211	Marvin Klegman is born to Thelma Korklin and Samuel Klegman.
1944xxxx	Tacoma Schools hires architect E. T. Mock, to conduct a survey of facilities needs for the district's planning purposes.
1948xxxx	The fourth floor of Lowell School is condemned as unsafe.

19490413	Just minutes before noon, a massive earthquake shudders throughout the Puget Sound basin. The parapet of Lowell Elementary collapses, killing student Marvin Klegman.
19501202	Rushed to open, the new Lowell ES accepts its first students. However, only seven of the twelve classrooms are complete according to the News Tribune.
196109xx	Lowell ES Annex is completed.
1997xxxx	Bob Dahl is hired as the new principal of Lowell ES.
20120318	Principal Bob Dahl passes away from idiopathic pulmonary fibrosis. With fifteen years at Lowell ES, he was the longest tenured principal in the history of the school.
20130625	North 13th Street is renamed Mr. Dahl Drive.
202310xx	Tacoma Schools posts legal notices for contractors to provide design build services for a replacement of Lowell ES.

Abbreviations

AI	Artificial Intelligence
API	Area of Potential Impact
City	The City of Tacoma
CMU	Concrete Masonry Units
DAHP	Department of Archaeology and Historic Preservation
District	Tacoma Public Schools
ES	Elementary School
IDP/UDP	Inadvertent Discovery Plan/Unintended Discovery Protocol
SEPA	State Environmental Policy Act

Attestation

Russell Holter, MAH, is a Cultural Resource Specialist meeting all applicable local, state, and federal professional standards. This report meets the Department of Archaeology and Historic Preservation report guidelines. To the best of his knowledge the report is accurate at the time of its authorship. No AI was used in the generation of this report.

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Geotechnical Engineering Services

Lowell Elementary School Replacement
Tacoma, Washington
for
Korsmo Construction

April 23, 2024

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Geotechnical Engineering Services

Lowell Elementary School Replacement
Tacoma, Washington

File No. 0522-043-00
April 23, 2024

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1.0 Introduction

This draft report summarizes the results of our geotechnical engineering services to support the Lowell Elementary School Replacement project, located at 810 Mr. Dahl Drive in Tacoma, Washington. The project location is shown in the attached Vicinity Map, Figure 1.

The project consists of replacing or demolition and full reconstruction of Lowell Elementary School. The project is being delivered as a Design-Build contract led by Korsmo Construction (Korsmo). Site layout and school building reconstruction designs are currently in pre-design phase. In addition to a new building structure, we anticipate that site development could also include reconstructed playground areas, new parking and bus driveway areas, and off-street improvements. Stormwater could require on-site management; however, AHBL (project civil engineer) is examining conveyance of stormwater off-site.

2.0 Purpose and Scope of Work

The purpose of our geotechnical engineering services is to review existing geological and geotechnical information at and near the site and complete subsurface explorations as a basis for developing an understanding of soil and groundwater conditions and providing geotechnical engineering recommendations during project planning, permitting and design. These services have been provided in general accordance with the scope of services described in our contract with Korsmo Construction dated March 21, 2024. Details of our scope can be reviewed in that document and provided upon request.

This Draft Geotechnical Engineering Services Report includes the results of our subsurface explorations and a cumulation of the conclusions and recommendations provided for baseline site planning and design. This report may be added or supplemented as design development progresses. GeoEngineers is also completing environmental services on this project. Our services consist of soil sampling for Tacoma Smelter Plume area wide contamination in accordance with the Washington State Department of Ecology (Ecology) Tacoma Smelter Plume Model Remedy Guidance (TSPMRG). This study is being completed as another phase and will be provided under a separate cover.

3.0 Site Conditions

3.1. VERTICAL DATUM

A topographic survey of the site was completed by Apex Engineering and the survey basemap was incorporated into the Site and Exploration Plan, Figure 2. Elevations referenced throughout this report are based on the provided survey which reference the North American Vertical Datum of 1988 (NAVD88) and should be considered approximate.

3.2. VICINITY AND SURFACE CONDITIONS

The Elementary School campus is located in predominantly residential areas in the North End of Tacoma approximately ½-mile south of the center of the Old Town neighborhood as shown on Figure 1. The school campus encompasses one and a one-half city blocks over three parcels (parcel numbers 2042160010, 2043170030 and 2043170020); the main, 1950 school building and playground are bounded by North

Yakima Avenue to the north, North 12th Street to the east, North I Street to the South and the Mr. Dahl Drive/vacated North 13th Street right-of-way to the west. Additional ancillary buildings and open space occupy the southwest portion of the site which are bounded by an alley to the north, an existing sidewalk leading down toward North 13th Street, the school playground area to the east, North I Street to the south and residential properties to the west. The surrounding area includes single-family residences and low-density commercial property and commercial/industrial businesses (east and south). The school property totals about 2.9 acres.

The existing main building (two stories with the lowest level partially daylighting to the north) is located in the north central to northeast areas of the site. Ancillary buildings are present in the west and southwest areas of the site. Outdoor play areas, including covered play areas, encompass the south central and southeast corners of the site. Landscaped areas are present on the north side of the main building, and limited larger trees are present on site concentrated near Mr. Dahl Drive and the southwest corner of the site.

The site slopes roughly south to north, ranging from about Elevation 290 to 307 feet along North I Street (North I street slopes downward going east to west) grade to Elevation 266 to 265 feet at the North Yakima Avenue grade. A segmental retaining wall with an exposed height of about 10 feet tall is present at the southeast corner of the site. Most of the playground area slopes gradually south to north where the grade is bracketed by the southeast segmental retaining wall and slopes to the south and to the main building to the north. Slopes of about 2H:1V (horizontal to vertical) are present on the north side of the building extending to the North Yakima Avenue grade. Steeper slopes are also present for short distances near the southwest corner of the site, which are intercepted by the ancillary buildings and other concrete retaining structures.

3.3. GEOLOGIC SETTING

Our understanding of the site geology is based, in part, on review of published geologic maps of the area. We reviewed the geologic map by Shuster et al (2015) and information provided by the Washington State Department of Natural Resources (DNR) Geologic Portal. A summary of mapped geologic units near the property and typical stratigraphy (from top to bottom) is provided below:

Glacial Till (Qvt): Glacial till is mapped over the entirety of the school campus site. Typically described as a highly compact mixture of sand, gravel, silt and clay with scattered cobbles and boulders in a cemented soil matrix. This unit was deposited below glacial ice and has been glacially overridden (glacially consolidated); densities typically range from dense to very dense. Till deposits typically provide high bearing resistance, low liquefaction risk and low infiltration potential. The upper few feet can be weathered and in a relatively looser condition.

Advance Outwash (Qva): Advance glacial outwash is mapped to the northwest of the site (northwest of the North Yakima Avenue and North Carr Street intersection). This unit was deposited by meltwater of an advancing glacier and is typically described as sand and gravel with a relatively low percentage of silt- and clay-sized particles. Advance outwash has been glacially consolidated and is typically dense to very dense. Advance outwash deposits typically provide high bearing resistance, low liquefaction risk and moderate infiltration potential.

Soil survey mapping in the area provided by the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) classifies the site as Urban land-Alerwood complex, which consists of gravelly sandy loam. This description is generally consistent with mapped glacial till deposits.

3.4. SUBSURFACE CONDITIONS

3.4.1. Subsurface Explorations

We explored subsurface conditions at the site by advancing seven geotechnical borings (B-1 through B-7) to depths ranging from approximately 11.5 to 61.5 feet below the ground surface (bgs), corresponding to the bottom of borings between approximate Elevation 291 and Elevation 250 feet. Approximate locations of the borings are shown on Figure 2. We inferred subsurface conditions and developed three subsurface cross section profiles of the site which are presented in Figures 3 through 5. The locations of the cross sections (A-A', B-B' and C-C') are shown on Figure 2.

Selected samples from our explorations were tested to evaluate engineering properties and to confirm or modify field classifications. Our testing program consisted of moisture content determinations, grain-size analyses and percent fines determinations. Details regarding the subsurface exploration program, including summary logs of the explorations and laboratory testing results, are provided in Appendix A.

3.4.2. Soil Conditions

3.4.2.1. GENERAL

Soil conditions at the site generally consist of surfacing material and loose to medium dense fill soils overlying dense to very dense advance glacial outwash with limited amounts of undifferentiated glacial soils. A brief description of soil types encountered in the borings is provided in the sections below.

3.4.2.2. SURFACE CONDITIONS

Borings B-1 and B-2 were advanced in grass areas and encountered a thin layer of sod. A thin layer of crushed rock was encountered at the surface of boring B-3. Borings B-3 through B-7 were advanced through asphalt concrete pavement. Pavement sections encountered consisted of about 3 to 4 inches of asphalt concrete. A thin crushed rock layer was observed underlying the asphalt estimated to be 1 to 2 inches thick.

3.4.2.3. FILL

Fill determination was based on observations of soil type, layering between explorations and/or relative density of materials. Fill soils were encountered in all borings to depths of approximately 4 to 12 feet bgs. This unit was highly variable in composition and consisted of very loose to medium dense silt with sand (SP-SM), silty sand (SM), gravel with variable sand and silt content (GP and GP-GM) and very soft to soft silt with sand (ML). Organics, including rootlets and organic matter, were frequently observed in the fill soils. Brick debris was also encountered within the fill, particularly in boring B-5.

3.4.2.4. UNDIFFERENTIATED GLACIAL DEPOSITS

Soils we interpret to be undifferentiated glacial deposits were observed below fill soils in boring B-3. This unit was encountered between approximately 7 and 13 feet bgs and consisted of medium dense to dense silty sand (SM). This unit was observed to have higher fines (silt) content than that of the underlying glacial outwash and is expected to be the surface weathered zone of the glacial outwash unit.

3.4.2.5. ADVANCE GLACIAL OUTWASH

Soils we interpret to be advanced outwash were observed below the glacial deposits or fill soils. Advance outwash consisted of medium dense to very dense "clean" sand (SP), sand with silt (SP-SM) and silty sand (SM) with variable gravel content with layers of dense to very dense gravel with sand (GP and GP-GM). We observed that the upper portion of this unit typically had higher silt content (SM and SP-SM), with reduced fines content deeper in the unit. Advance outwash was encountered to the full depth explored in all borings, including the maximum explored depth of 61.5 feet (Elevation 232.5 feet) in boring B-5.

3.4.3. Groundwater Conditions

Groundwater seepage and/or wet soils were not observed in the borings at the time of drilling. Borings were completed April 1 and 2, 2024, within the typical wet season for western Washington. Groundwater conditions observed during drilling represent a short-term condition and may not be representative of the long-term groundwater conditions at the site and therefore, should be considered approximate. Occasional soil coloring and iron oxide staining was observed in some of the explorations (as noted in the logs). In our opinion, these observations could indicate intermittent perched groundwater conditions. Groundwater conditions should be expected to vary as a function of season, precipitation and other factors.

4.0 Critical Areas Evaluation

4.1. INTRODUCTION

Geologically hazardous areas defined by the Tacoma Municipal Code (TMC) Chapter 13.11 consist of erosion, landslide, seismic, mine, volcanic and tsunami hazard areas. Additional, but similar information on definitions of geologic hazards is also contained in Title 19, Chapter 19.06 of the TMC as it relates to erosion and landslide hazards. Both chapters were consulted for this study.

Based on our interpretation of the TMC, the site is not subject to the following geologic hazards:

- Mine hazard: Underground mines do not presently exist within City of Tacoma (City) limits.
- Tsunami hazard: The site is located over ½-mile from the nearest shoreline (Commencement Bay) and is located above Elevation 250 feet.
- Volcanic hazard: The site is located outside of mapped volcanic hazard areas within City limits.

The site may be subject to erosion, landslide and seismic hazards, which are discussed in the following subsections.

4.2. EROSION HAZARD ASSESSMENT AND MITIGATION

4.2.1. Erosion Hazard Definition and Assessment

Erosion hazard areas exist where the combination of slope and soil type makes the area susceptible to particle removal/migration by wind and/or water flow (either by precipitation or water runoff). Concentrated stormwater runoff is a major cause of erosion and soil loss. Erosion hazard critical areas defined by the TMC include the following:

- Any area characterized by slopes greater than 15 percent (6.7H:1V) and the presence of Holocene era soil deposits or glacial recessional deposits; and
- Slopes steeper than 25 percent (4H:1V) and a vertical relief of 10 or more feet.

Reviewed site topographic survey indicates portions of the site feature slopes taller than 10 feet and steeper than 25 percent, including the northeast and southwest areas of the site.

4.2.2. Erosion Hazard Mitigation

Near surface soils encountered within planned excavation depths ranged from "clean" sands and gravels to silty sand. Summary logs, soil descriptions and results of our laboratory testing are included in Appendix A. In our opinion, these soil types are susceptible to erosion if left exposed. As such, erosion and sedimentation control will be required. Implementing an erosion and sedimentation control plan will reduce impacts to the project where erosion-prone areas are present. We present earthwork recommendations, including erosion control considerations, in Section 7.0 of this report.

In our opinion, the presence of erosion hazards at the site is not a limiting factor in determining feasibility of the proposed development. We anticipate erosion hazards can be mitigated through engineering controls and best management practices, such as limited ground disturbance, site grading, planting, surface water collection and control, horizontal offsets, and other measures. We anticipate hardscaping and permanent landscaping measures will be implemented to limit long-term soil erosion runoff potential.

4.3. LANDSLIDE HAZARDS

4.3.1. Landslide Hazard Definition and Assessment

Landslide hazard areas are potentially susceptible to mass ground movement down a slope. Landslide hazards are based on a combination of geologic, topographic, hydrologic and other factors. As defined by the TMC, landslide hazard is:

- Areas with all three of the following
  - Slopes steeper than 25 percent (4H:1V) and a vertical relief of 10 or more feet.
  - Hillsides with intersecting geologic contacts that feature permeable soil overlying relatively impermeable soil, or interbedded granular and fine-grained material.
  - Springs or groundwater seepage
- Areas mapped as landslide, mass wasting or alluvial fan deposits, or areas that have shown movement during the Holocene epoch.
- Areas potentially subject to rapid stream incision.
- Slopes that are steeper than the soil's angle of repose.
- Areas with a slope steeper 40 percent with a vertical relief of more than 10 feet.

During our subsurface investigation, we did not encounter static or perched groundwater condition. The southwest corner of the site features slopes steeper than 40 percent, but these slopes do not feature vertical relief of more than 10 feet. Based on the topographic survey, the slope at the northeast portion of the site is steeper than 40 percent and features a vertical relief of about 12 feet. The slopes at the northeast area of the site technically meet the landslide hazard definition.

4.3.2. Landslide Hazard Mitigation

We interpret the steep slope at the northeastern area of the site upslope from Yakima Avenue is likely a fill slope constructed to a common permanent fill slope angle (2H:1V, about 50 percent) during historical grading. Based on our field sampling, most of the fill material, with the exception of the upper few feet, appears to have been placed with some compaction efforts.

For preliminary planning, we recommend proposed structure foundations be set back at least 10 feet from the crest of this existing slope in accordance with TMC Chapter 13.11.730 regarding structures adjacent to previously engineered slopes. The setback could be further reduced if other engineered design practices are employed to reduce or eliminate the landslide hazard effect. Building design could incorporate the following measures, or other measures, as mitigation:

- The slope height is lowered, or alternative grading is completed such that the slope is removed,
- The slope is replaced with an engineered wall,
- The bottom of footing is placed at a sufficient depth below-grade to achieve adequate bearing and not impact slope stability below required factors of safety (this condition would likely require the reconstruction of the slope).

We anticipate this landslide hazard can be mitigated through engineering controls and best management practices, such as limited ground disturbance, site grading, horizontal offsets and other measures, and as such, we generally do not see this landslide hazard as an impediment to most design scenarios. GeoEngineers will review project plans to confirm appropriate landslide hazard mitigation strategies are incorporated for this part of the site.

4.4. SEISMIC HAZARDS

Seismic hazards include areas at risk to severe damage as a result of a seismic event. Seismic hazards include liquefaction induced settlement and bearing strength loss, lateral spreading, surface fault rupture and seismically induced slope failure. We anticipate project design will need to include seismic shaking effects and structural seismic and building design soil parameters are presented in Section 5.2 of this report. We anticipate the overall risk of associated seismic hazards is low due to dense native soil conditions and lack of groundwater that underly the site. Further discussion of specific seismic hazard considerations is discussed in the following sections.

4.4.1. Liquefaction and Lateral Spreading Potential

Liquefaction refers to the condition by which vibration or shaking of the ground, usually from earthquake forces, disturbs the soil structure (i.e., the arrangement of individual soil particles) within saturated and unconsolidated soils. In general, soils that are susceptible to liquefaction include very loose to medium dense, “clean” to silty sands below the water table. Ground settlement, lateral spreading and/or sand boils may result from soil liquefaction. Structures, such as buildings, supported on liquefied soils may suffer loss of bearing capacity, foundation settlement and/or lateral movement (i.e., lateral spread) that can be damaging to the structures.

Borings completed at the site as part of this study generally encountered dense to very dense glacial outwash and the static groundwater table was not encountered to the full depth explored of 61.5 feet bgs.

Based on these conditions, it is our opinion the potential for liquefaction and lateral spreading at the site is low.

4.4.2. Surface Fault Rupture Potential

We reviewed published geologic seismic feature maps of the project vicinity, including maps available online from the DNR Geologic Information Portal, United States Geologic Survey (USGS) and the Washington Department of Geology and Earth Sciences map “Faults and Earthquakes in Washington State” (Czajkowski and Bowman 2014). Based on our review, the nearest mapped fault feature is the southern extent of the Tacoma Fault zone, approximately ¾-mile north of the site near the Commencement Bay shoreline. Based on the completed explorations, our understanding of local geology, and bedrock at the site overlain by very thick glacial deposits, it is our opinion that the risk for seismic surface rupture at the site is low.

5.0 Conclusions and Recommendations

5.1. SUMMARY OF GEOTECHNICAL CONSIDERATIONS

Provided the recommendations in this report are included in design and construction, it is our opinion that the proposed Lowell Elementary School Replacement project is feasible from a geotechnical engineering standpoint. Subsurface conditions must be considered as part of project design and site development as described in this report; a summary of key geotechnical considerations is provided below. This summary is presented for introductory purposes only and should be used in conjunction with the complete recommendations presented in this report.

- Soil Conditions: Overall, we anticipate the site is underlain by medium dense to very dense advance glacial outwash. Fill soils are also present in areas as a result of previous site grading, building construction and underground utility installation.
- Groundwater Conditions: Groundwater was not encountered to the full depth explored of 61.5 feet bgs (Elevation 232.5 feet). However, we recommend perched groundwater conditions be considered during design and construction.
- Geologic Hazards: Geologically hazardous areas (erosion, steep slope, seismic, mine, volcanic and tsunami) are discussed in Section 4.0. Overall, we anticipate geologic hazards will not be a limiting factor in determining feasibility of the proposed development. We anticipate hazards (if present) can be mitigated with appropriate site planning/layout and engineering controls.
- Seismic Design: Recommended seismic site class and design parameters are provided in Section 5.2. Liquefaction and resulting liquefaction induced settlements are not anticipated for this site as discussed in Section 4.4.1.
- Foundation Support: It is our opinion proposed structures can be supported on shallow foundations and slabs-on-grade bearing on prepared surfaces as described in this report in Section 5.3. We recommend that building foundations be constructed on native glacial outwash or new structural fill extending to glacial outwash.
- Re-Use of On-Site Soils: We do not recommend on-site materials be considered for use during the wet season or periods of wet weather, as soils within typical excavation depths have elevated fines content and will be susceptible to rapidly exceeding the optimum moisture content (OMC) in wet weather. On-site soils should only be considered for use as structural fill during extended periods of dry weather,

and only if the material is adequately protected, moisture-conditioned and can be compacted as recommended in this report.

- Temporary Slopes: In general, we recommend temporary slopes be constructed at inclinations on the order of 1.5H:1V.

All materials herein are presented in accordance with the 2024 Washington State Department of Transportation (WSDOT) Standard Specifications for Road, Bridge, and Municipal Construction (WSDOT Standard Specifications) unless otherwise noted.

5.2. SEISMIC DESIGN PARAMETERS

The project will be designed utilizing the 2021 International Building Code (IBC). The 2021 IBC references the 2016 version of Minimum Design Loads for Buildings and Other Structures (American Society of Civil Engineers [ASCE] 7-16) for the Site Class determination and the development of seismic design parameters. Based on standard penetration test (SPT) blow counts in the completed borings, it is our opinion the design response spectrum for Site Class D is appropriate for seismic design and analysis at the site

Per ASCE 7-16 Section 11.4.8, a site-specific ground motion hazard analysis is required for structures on Site Class D with S_1 greater than or equal to 0.2 g (where g represents gravitational acceleration). The mapped S_1 value for this site is 0.474 g. An exception in Section 11.4.8 of ASCE 7-16 Supplement 3 allows the structural designer to use ground motions based on Site Class D if the maximum consider earthquake short period (1-Second) parameter (S_{M1}) is increased by 50%. Table 1 includes recommended seismic design criteria for seismic Site Class D with the Design Spectral Response Acceleration at 1-Second Periods (S_{S1} parameter) increased by 50% per the exception noted above.

TABLE 1. RECOMMENDED SEISMIC DESIGN CRITERIA

2021 IBC (ASCE 7-16) SEISMIC DESIGN PARAMETER	RECOMMENDED VALUE
Site Class	D
Mapped Spectral Response Acceleration at 0.2-Second (Short) Periods, S_S (g)	1.372
Mapped Spectral Response Acceleration at 1-Second Periods, S_1 (g)	0.474
Design Spectral Response Acceleration at 0.2-Second (Short) Periods, S_{DS} (g)	0.915
Design Spectral Response Acceleration at 1-Second Periods, S_{D1} (g)	0.866 (See Note 1)
Site Modified Peak Ground Acceleration, PGA_M (g)	0.552

Notes:

S_{D1} value is applicable assuming the maximum considered earthquake Design Spectral Response Acceleration at 1-Second Periods, S_{M1} (g) is increased by 50%. The S_{D1} of 0.866 includes this 50% increase.

5.3. FOUNDATION SUPPORT

5.3.1. General

In our opinion, the proposed new structural elements can be adequately supported on shallow foundations and slabs-on-grade bearing on prepared surfaces as described in the following subsections. The recommendations provided in this section assume foundations bear on native undifferentiated glacial deposits or glacial advance outwash. We generally do not recommend foundation bear on existing fill, as this material is highly variable and contains elevated organic material and debris.

5.3.2. Foundation Bearing Surface Preparation

We recommend all fill soils, pavements, hardscape, sod and organic rich materials be removed from footing areas and the foundations should bear on native glacial soils. Excavations should be performed using a smooth-edged bucket to limit bearing surface disturbance and thoroughly compacted and established into a uniform, firm and unyielding condition. Loose or disturbed materials present at the base of footing excavations must be removed, re-compacted or otherwise repaired. If soft or otherwise unsuitable areas are revealed during excavation and cannot be compacted to a stable and uniformly firm condition, unsuitable soils should be removed and replaced with an appropriate structural fill as described in Section 6.10 of this report. Where overexcavation is needed, it should be expected to extend laterally beyond the edges of the footings a distance equal to the thickness of the fill or 2 feet, whichever is less.

Foundation bearing surfaces must not be exposed to standing water, as wet surfaces can become easily disturbed. If water pools in the base of the excavation, it should be removed before placing structural fill or formwork and reinforcing steel. During periods of wet weather, structural fill and concrete should be placed as soon as practical after preparation of the footing excavations. If footing excavations will be exposed to extended wet weather conditions, a 3- to 4-inch-thick layer of lean mix concrete or controlled-density fill (CDF) should be considered for subgrade protection. Alternatively, 4 to 6 inches of crushed rock can also be considered as subgrade protection.

Prepared foundation bearing surfaces should be observed and evaluated by a member of our firm prior to placement of structural fill, formwork and/or steel reinforcement. We recommend that this be included as a part of the project specifications. Our representative will confirm that the bearing surfaces have been prepared in accordance with our recommendations and are suitable for supporting the design footing load. Our representative can also provide alternative options for bearing surface preparation, as described above, should it be necessary.

5.3.3. Foundation Design Parameters

5.3.3.1. MINIMUM FOOTING DIMENSIONS

Exterior footings should be established at least 18 inches below the lowest adjacent grade. Interior footings can be founded a minimum of 12 inches below the top of the floor slab. Isolated column and continuous wall footings should have minimum widths of 24 and 18 inches, respectively, or as needed, to meet allowable design bearing pressures for the design loads.

5.3.3.2. ALLOWABLE SOIL BEARING PRESSURE FOR PRIMARY STRUCTURES

Shallow foundations bearing on native glacial outwash soils prepared as recommended may be designed using an allowable soil bearing pressure of 5,000 pounds per square foot (psf). This bearing pressure applies to the total of dead and long-term live loads and may be increased by one-third for short term load conditions, including earthquake or wind loads. This bearing pressure is a net pressure. The weight of the footing and overlying backfill can be ignored in calculating footing sizes.

5.3.3.3. ALLOWABLE SOIL BEARING PRESSURE FOR ANCILLARY STRUCTURES

It may not be practical to remove all fill present at the site for smaller structures such as playground equipment and single, smaller outbuildings. Shallow foundations bearing on the existing fill is feasible depending on the structure, and with a reduced bearing capacity, and with bearing surface compaction improvements prepared as recommended. For preliminary planning, smaller structures founded within the existing fill may be designed using an allowable soil bearing pressure of 1,800 psf. This bearing pressure applies to the total of dead and long-term live loads and may be increased by one-third for short term load conditions, including earthquake or wind loads. This bearing pressure is a net pressure. The weight of the footing and overlying backfill can be ignored in calculating footing sizes. We should be given the opportunity to review structures that are considered within the fill materials.

5.3.3.4. FOUNDATION SETTLEMENT ESTIMATES

For structures founded in native soils, we estimate the settlement of footings under static loading will be less than 1-inch, with differential settlements on the order of ¼ to ½ inch between comparably loaded isolated column footings or along 50 feet of continuous footing. Settlement is expected to occur rapidly, essentially as loads are applied. Disturbed soil must be removed from the base of footing excavations and the bearing surface should be prepared as recommended. If these measures are not taken, settlement could be greater than estimated.

Settlement of ancillary structures founded in existing fill could be higher than described above for structures founded in native soils. GeoEngineers can evaluate settlement of ancillary structures on a case-by-case basis.

These estimates are based on footings proportioned using the recommended allowable bearing pressures above and maximum considered loading of about 5 kips per lineal foot or 250 kips per column. We should be notified if foundation loads exceed those presented above so we can review overall foundation sizes, loads, and revise our settlement estimates, if necessary.

5.3.3.5. LATERAL RESISTANCE

The ability of the soil to resist lateral loads is a function of the base friction, which develops on the base of foundations and slabs, and the passive resistance, which develops on the face of below-grade elements of the structure as these elements move into the soil. For cast-in-place foundations supported in accordance with the recommendations presented above, the allowable frictional resistance on the base of the foundation may be computed using a coefficient of friction of 0.45 applied to the vertical dead-load forces. The allowable passive resistance on the face of the foundation or other embedded foundation elements may be computed using an equivalent fluid density of 275 pounds per cubic foot (pcf).

These values include a factor of safety of about 1.5. The passive earth pressure and friction components may be combined, provided that the passive component does not exceed two-thirds of the total. The top foot of soil should be neglected when calculating passive lateral earth pressure unless the area adjacent to the foundation is covered with pavement or a slab-on-grade.

5.3.4. *Footing Drains*

It is our opinion footing drains are not necessary to maintain bearing support conditions as provided in this report. However, exterior perimeter footing drains are still recommended for new construction to maintain drier conditions around the structure and intercept water that could accumulate below slabs. Perimeter drains may also reduce the risk and potential impact of groundwater seepage and surface water infiltration on moisture sensitive flooring or specific floor types. Where buildings are designed as retaining structures, such as a basement, wall drainage systems will be required and may be considered as a substitute for perimeter foundation drains.

We expect the majority of standard civil design sections for foundation drains (i.e., perforated pipe surrounded by clean gravel wrapped in a geotextile fabric, installed at base of footing) will be adequate for these purposes, and some flexibility in this design may be considered. The perimeter drains should be provided with cleanouts and at minimum, should consist of a 4-inch-diameter perforated pipe surrounded by 6- to 12- inches of drain material enclosed in a non-woven geotextile fabric for underground drainage, to prevent fine soil from migrating into the drain material. We recommend that the drainpipe consist of either heavy-wall solid pipe or rigid corrugated smooth interior polyethylene pipe. We do not recommend using flexible tubing for footing drainpipes. The drain material should consist of "Gravel Backfill for Drains" per Washington State Department of Transportation (WSDOT) Standard Specifications Section 9 03.12(4). The perimeter drains should be sloped to drain by gravity, or by other appropriate means (i.e., direct discharge at weep holes or pumping) to a suitable discharge point. Water collected in roof downspout lines should not be routed to the perimeter footing drains.

5.4. SLAB-ON-GRADE FLOORS

Slab-on-grade floors may be founded on native glacial soils or structural fill extending to these soil units. Lightly-loaded slab-on-grade floors, supporting design loads of no more than 200 psf, may be constructed over the existing fill. In all cases, exposed structural subgrade soil should be proof compacted to dense, firm and unyielding condition. Soils that cannot be compacted to a firm and unyielding condition will require at least partial overexcavation and replacement with structural fill. For floor slabs with design loads greater than about 200 psf, we recommended we be contacted to review the proposed design and determine if additional or revised recommendations are required to manage settlements below the building slab.

We recommend the slab-on-grade floors be underlain by a minimum 6-inch-thick capillary break layer consisting of clean, well-graded sand and gravel or crushed rock. We do not recommend uniform rounded material, such as pea gravel, for use as capillary break material except in isolated cases. The capillary break material should contain less than 3 percent fine material based on the percent passing the ¾-inch sieve size. Provided that loose soil is removed, and the subgrade is prepared as recommended, we recommend slabs-on-grade be designed using a modulus of subgrade reaction of 250 pounds per cubic inch (pci). We estimate that settlement for slabs-on-grade constructed as recommended will be less than ¾-inch for a floor load of up to about 200 psf.

Based on our understanding of subsurface conditions at the site, it is our opinion that an underslab drain system is not necessary. If dry slabs are required (e.g., where adhesives are used to anchor carpet or tile to slab), a waterproof liner may be placed as a vapor barrier below the slab.

5.5. RETAINING WALLS AND BELOW-GRADE STRUCTURES

The proposed grading plan has not been established at the time of this report. Based on site topography, we anticipate retaining walls will be required to maintain desired site grades. For structurally designed exterior walls, like gravity cast-in-place concrete walls, and below-grade structures such as basements or utility vaults that are backfilled with structural fill, geotechnical design recommendations are provided below. Mechanically stabilized earth (MSE) and non-gravity cantilever or ground anchor wall may have differing soil property considerations and lateral earth pressure conditions. GeoEngineers can supply additional recommendations at a later time should these wall types become incorporated into the project.

Our recommendations include the following assumptions. If these assumptions are not appropriate, we should be contacted to provide revised recommendations, including determination if a more detailed global stability analysis is required.

- Total wall heights are determined based on a level front slope from the base of the wall.
- Exterior grading retaining walls will not support structure loads (i.e., will not be subject to structure surcharge loading).
- Walls will not be tiered.
- Walls will not be located within about 25 feet laterally above slopes steeper than about 4H:1V.
- Grades above the top of the walls (backslope) are no steeper than a 2H:1V slope.
- Drainage will be provided behind the wall to prevent buildup of hydrostatic pressures.
- Backfill placed within the drainage zone and a minimum distance 2 feet laterally from the back of wall will be compacted by hand-operated equipment to a density of 92 percent of the maximum dry density.

5.5.1. Recommended Lateral Earth Pressures

We anticipate retaining walls and below-grade structures at the site will retain existing fill and/or glacial soils as encountered in the borings or be backfilled with structural fill. We recommend walls and subsurface structures, as described above, be designed using the lateral earth pressures provided below.

- Active soil pressure may be estimated using an equivalent fluid density of 35 pcf for the level backfill condition (triangular distribution). For walls with backfill sloping upward behind the wall at 2H:1V, an equivalent fluid density of 52 pcf should be used. If the slope is shallower than 2H:1V, the active lateral earth pressures can be linearly interpolated between the two values above using the slope angle in degrees. The active soil pressure condition assumes the top of the wall is not structurally restrained and is free to rotate and deflect a distance of at least 0.001*H (where H is the wall height).
- At-rest soil pressure may be estimated using an equivalent fluid density of 55 pcf for the level backfill condition. For walls with backfill sloping upward behind the wall at 2H:1V, an equivalent fluid density of 80 pcf should be used. The at-rest condition is applicable where walls are restrained against deflection (not allowed to rotate).
- For seismic considerations, a uniform lateral surcharge pressure of 12*H psf (where H is the height of the retaining structure or the depth of a structure below ground surface) should be added to the lateral earth pressure.

Recommended design pressures above are based on drained conditions as discussed in the Wall Drainage section below. Undrained conditions will result in increased earth pressures. The above-recommended lateral soil pressures do not include surcharge loads such as vehicular traffic, structures, construction equipment, soil stockpiles, etc. We recommend surcharge effects be considered if loads are applied closer than one-half of the retaining structure height laterally from the wall face. We can provide recommendations for specific surcharge loading conditions upon request. Where standard traffic is present, these surcharge loads may be represented by assuming an additional two feet of retaining wall height in the design.

5.5.2. Wall Foundation Support

Wall foundations may be supported on shallow foundations designed and prepared in accordance with recommendations presented in Section 5.2 above. We estimate settlement of retaining structures will be similar to the values previously presented for structure foundations.

5.5.3. Wall Drainage

A positive drainage system behind walls and below-grade structures must be constructed to collect water and prevent the buildup of hydrostatic pressure against the wall or structure. We recommend a zone of free-draining material behind the retaining structure with perforated pipes to collect seepage water. The drainage material should consist of coarse sand and gravel containing less than 5 percent fines (material passing the U.S. No. 200 sieve) by weight. The drainage zone should extend horizontally at least 18 inches from the back of the retaining structure. Other systems and materials may also be considered, where appropriate, and as approved by the project engineer. Other systems, such as corrugated "waffle" drainage systems/strips and weep holes may also be options for management of water behind retaining structures and these systems could be considered on a case-by-case basis.

Some site soils encountered in the explorations contain a significant percentage of fine-grained (silt and clay) particles. Fine-grained soils are susceptible to particle migration, potentially clogging the drainage zone. A geotextile filter fabric designed for separation should be placed between the wall backfill and any native site soils or common borrow fill to prevent soil migration. A geotextile such as Marafi 140N or equivalent is appropriate for this application.

A perforated, rigid, smooth-walled drainpipe with a minimum diameter of 4 inches should be placed along the base of the structure within the free-draining backfill and extend for the entire wall length. The drainpipe should be metal or rigid polyvinyl chloride (PVC) pipe and be sloped to drain by gravity. Discharge should be routed to appropriate discharge areas and to reduce erosion potential. Cleanouts should be provided to allow routine maintenance. We recommend roof downspouts or other types of drainage systems not be connected to retaining wall drain systems.

5.6. PAVEMENT DESIGN

5.6.1. General Pavement Design Criteria

Paved areas are expected to include on-site parking areas, driveways and sidewalks, and playground areas, as well as off-site improvements along adjacent City streets (including Mr. Dahl Drive, North Yakima Avenue, North 12th Street and North I Street). We provide recommendations below for conventional asphalt concrete pavement (ACP) for on-site pavements. On-site light-duty pavement areas as described in this report are considered those accessed only by passenger automobile traffic (i.e., general automobile parking and driveway areas only). Heavy-duty pavement areas consist of areas within the drive path of occasional heavy vehicles such as garbage trucks and delivery vehicles.

Standard City pavement sections for asphalt and portland cement concrete (PCC) pavements are also presented based on City of Tacoma Pavement Design Standard Drawings PD-01 through PD-03.

5.6.2. Pavement Subgrade Preparation

Sod, organic-rich soils, existing pavements, hardscaping and/or other structural elements (if encountered) should be removed prior to placement of new pavement sections. Pavement subgrade should be thoroughly compacted and prepared to a uniformly firm, dense, and unyielding condition on completion of stripping and regrading, prior to placing structural fill or pavement base fill. If soft or otherwise unsuitable subgrade areas are revealed during evaluation that cannot be compacted to a stable and uniformly firm condition, we recommend unsuitable soils be removed and replaced with compacted structural fill, as needed. If subgrade soils are excessively loose or soft, a geotextile reinforcement layer can also be considered.

5.6.3. Pavement Materials

Crushed surfacing base course (CSBC) and crushed surfacing top course (CSTC) should conform to applicable sections of 4-04 and 9-03.9(3) of the WSDOT Standard Specifications. The top approximate 2 inches of CSBC may consist of CSTC as a leveling layer and for more precise grade development. Structural fill, pavement subbase and base course materials should consist of materials and be moisture-conditioned to near the OMC and compacted as recommended.

We recommend hot-mix asphalt (HMA) consist of Class ½-inch (maximum aggregate size), with binder performance grade (PG) appropriate for the anticipated climate temperatures the asphalt will be exposed. HMA should conform to applicable sections of 5-04, 9-02 and 9-03 of the WSDOT Standard Specifications. PCC mix design should conform with a minimum 14-day flexural strength of 650 pounds per square inch (psi).

Some areas of pavement may exhibit settlement and subsequent cracking over time; this can be a common part of the pavement lifecycle. Cracks in the pavement will allow water to infiltrate to the underlying base course, which could increase the amount of pavement damage caused by traffic loads. To prolong the effective life of the pavement, cracks should be sealed as soon as possible.

Construction traffic has not been considered in our pavement design and should not be allowed on new pavements. We assume pavement subgrade preparation and pavement construction will be completed at the end of the project after heavy construction vehicles (such as concrete trucks and construction material delivery trucks) will no longer access the site. If this is not the case and areas are to be paved as part of site construction with heavy traffic, additional pavement thickness may be necessary to prevent pavement damage during construction, or repairs should be anticipated.

5.6.4. Recommended On-Site Pavement Sections

We anticipate on-site subgrades will vary and could consist of existing fill, undifferentiated glacial deposits and advance glacial outwash. We recommend a subbase layer be included between existing subgrade soils and overlying base course to reduce rut potential of sand subgrades, provide separation from silt and fine-grained subgrade soil, provide a uniform grading surface, provide uniform pavement support and maintain drainage. Subbase should conform to applicable sections of 4-02 “Gravel Base” of the WSDOT Standard Specifications. Recommended subbase materials are presented in Section 6.10.3 of this report.

Recommended on-site pavement sections are presented in Table 2 below.

TABLE 2. RECOMMENDED PAVEMENT SECTION – ON-SITE PAVEMENTS

SECTION	MINIMUM PCC THICKNESS (INCHES)	MINIMUM HMA THICKNESS (INCHES)	MINIMUM CSBC/CSTC THICKNESS (INCHES)	MINIMUM SUBBASE THICKNESS (INCHES)
Sidewalk (Pedestrian areas, no vehicle loading)	4	-	2	-
Light Duty (General passenger automobile traffic only)	-	2	4	6
Heavy Duty and Residential Street (Occasional garbage trucks and delivery vehicles)	-	3	6	6

5.6.5. *Recommended City Right-of-Way Pavement Sections*

Tables 3 and 4 present ACP and PCC pavement sections, respectively for various City Street types. Pavement sections are based on City of Tacoma Pavement Design Standards, Standard Plan PD-01 for standard pavement design. The minimum pavement section could be reduced with an approved design using site traffic data. The project traffic study was in progress at the time of this report.

TABLE 3. ASPAHLT CONCRETE PAVEMENT SECTION – CITY OF TACOOMA STREETS

SECTION	MINIMUM HMA THICKNESS (INCHES)	MINIMUM CSTC THICKNESS (INCHES)	MINIMUM CSBC THICKNESS (INCHES)
Residential Alley	2	2	6
Residential Street	4	2	10
Minor Arterial	6	2	14

TABLE 4. PORTLAND CEMENT CONCRETE PAVEMENT SECTION – CITY OF TACOOMA STREETS

SECTION	MINIMUM PCC THICKNESS (INCHES)	MINIMUM CSBC THICKNESS (INCHES)
Residential Alley	8	2
Residential Street	8	2
Minor Arterial	10	2

5.7. STORMWATER INFILTRATION CONSIDERATIONS

Based on project team discussions, AHBL is evaluating stormwater management options for the site, including off-site conveyance or on-site management. We understand off-site conveyance may be feasible and is a preferred stormwater management option for the project team. Our stormwater infiltration recommendations in this section are conceptual and are provided as preliminary planning information only.

GeoEngineers can provide further guidance for stormwater infiltration upon request if infiltration becomes a desired stormwater management option.

The native glacial outwash soil is a moderate to highly permeable material and we anticipate stormwater infiltration into lower portions of this layer, which include sand with silt (SP-SM) and “clean” sand (SP), would be feasible. The glacial outwash has been glacially consolidated and therefore, on-site pilot infiltration testing would be required to evaluate the design infiltration rate for the soil unit, per the City of Tacoma Stormwater Management Manual. Infiltration in the existing fill is not recommended at this time, due to the fine-grained nature and variability of materials and expected very low rates. If infiltration into the fill is necessary, pilot infiltration testing at the proposed designed stormwater facility location would also be required.

6.0 Site Development and Earthwork Recommendations

6.1. GENERAL

We anticipate that site development and earthwork will include clearing and grubbing; site grading, excavating for shallow foundations, utilities, and other improvements; establishing subgrades for foundations, slabs-on-grade and pavements; and placing and compacting fill and backfill materials. We anticipate that site earthwork can be completed using conventional earthwork equipment. The following sections provide specific recommendations for site development and earthwork.

6.2. TEMPORARY EROSION AND SEDIMENTATION CONTROL

Construction activities, including stripping and grading, will expose soils to the erosional effects of wind and water. As such, erosion and sedimentation control will be required. Erosion and sedimentation rates and quantities can be influenced by construction methods, slope length and gradient, amount of soil exposed and/or disturbed, soil type, construction sequencing and weather. Implementing an erosion and sedimentation control plan will reduce impacts to the project where erosion-prone areas are present.

Erosion and sedimentation control measures may be implemented by using a combination of interceptor swales, straw bale barriers, silt fences and straw mulch for temporary erosion protection of exposed soils. All disturbed areas should be finish graded and seeded as soon as practicable to reduce the risk of erosion. Erosion and sedimentation control measures should be installed and maintained in accordance with the requirements of the City or other appropriate jurisdiction.

Until permanent erosion protection is established, and the site is stabilized, site monitoring may be required by qualified personnel to evaluate the effectiveness of the erosion control measures and to repair and/or modify them as appropriate. Provisions for modifications to the erosion control system based on monitoring observations should be included in the erosion and sedimentation control plan. Where sloped areas are present, some sloughing and raveling of exposed or disturbed soil on slopes should be expected. We recommend that disturbed soil be restored promptly so that surface runoff does not become channeled.

6.3. CLEARING, STRIPPING AND DEMOLITION

Existing surfaces within the proposed building, pavement and hardscaping areas should be cleared and stripped of all vegetation and organics prior to site development. Greater stripping depths will be required to remove localized zones of loose or organic-rich soil. During clearing and stripping, stumps and primary root systems of shrubs and trees should be completely removed. Voids caused by removal of stumps and/or root systems should be backfilled with compacted structural fill. Stripped material should be transported off site or processed and used in landscaping areas.

Existing structural improvements (e.g., pavements, hardscaping and foundations) within proposed development areas should be demolished and removed. Existing utilities should be removed or abandoned and left in place from within new building footprints and rerouted, if needed. In order to reduce the risk of future settlement, existing utility lines larger than 4 inches in diameter that are located beneath proposed buildings should be completely removed or filled with grout if abandoned and left in place.

Voids and depressions encountered or created during site preparation, clearing, stripping and/or resulting from demolition should be cleaned of loose soil or debris down to firm soil and backfilled with compacted structural fill. We recommend earthwork at the site be performed during dry weather and/or exposed soils should be promptly covered and protected to avoid excessive disturbance. Greater disturbance depths should be expected if site preparation and earthwork are conducted during periods of wet weather.

Demolition of structures and surrounding features can also cause excessive disturbance of subgrade, and at many times, these areas can be left with debris and uncompacted or left loose and exposed. In these instances, additional excavation and removal of exposed soil should be expected as earthwork continues. We suggest that if construction occurs sometime after demolition, that the demolition area be cleared of debris, compacted, and proper erosion control measures implemented.

6.4. DEBRIS AND OBSTACLES

Brick debris was encountered in boring B-5 and we anticipate brick, other debris and other deleterious material (including concrete, asphalt and wood debris) will be present within existing fill during excavation. In addition, cobbles and boulders are common within glacial deposits. Obstacles, debris and other deleterious material (if encountered) should be removed from within the footprint of the new improvements. The earthwork contractor should be prepared to encounter and remove debris and boulders, if encountered. Voids caused by boulder removal should be backfilled with structural fill.

6.5. SUBGRADE PREPARATION

Specific subgrade preparation recommendations for shallow foundations, slabs-on-grade, and pavements are presented in their respective sections of this report and should be reviewed in combination with the recommendations provided below.

Subgrades should be thoroughly compacted to a uniformly firm and unyielding condition upon completion of stripping and demolition, prior to placing fills, structures, or pavements. We recommend prepared subgrades be evaluated by a member of our firm to identify areas of yielding or soft soil. Probing with a steel probe rod or proof-rolling with a heavy piece of wheeled construction equipment are appropriate methods of evaluation. If soft or otherwise unsuitable subgrade areas are revealed during evaluation that cannot be compacted to a stable and uniformly firm condition, we recommend: (1) the unsuitable soils be scarified (e.g., with a ripper or farmer’s disc), aerated and recompacted, if practical; or (2) the unsuitable soils be removed and replaced with compacted structural fill, as needed.

6.6. TEMPORARY EXCAVATIONS AND CUT SLOPES

Based on the soil types and densities encountered in our explorations we anticipate some shallow excavations at the site could experience caving and/or sloughing. Excavations deeper than 4 feet should be shored or laid back at a stable slope if workers are required to enter. All excavations, shoring and temporary slope inclinations must conform to applicable provisions of Occupational Safety and Health Administration (OSHA), Washington Industrial Safety and Health Act (WISHA), Title 296 Washington Administrative Code (WAC) Part N "Excavation, Trenching and Shoring" and other appropriate regulations. In our opinion, site soils should be considered an OSHA Soil Type C for planning, provided there is no seepage and excavations occur during periods of dry weather. Regardless of the soil type encountered in the excavation shoring, trench boxes or sloped sidewalls will be required under Washington Industrial Safety and Health Act (WISHA). We recommend contract documents specify that the contractor is responsible for selecting excavation and dewatering methods, monitoring the excavations for safety and providing shoring, as required, to protect personnel and structures.

To maintain site grading and provide safe working conditions, we recommend temporary slopes be inclined no steeper than about 1.5H:1V. This is consistent with guidance for OSHA Type C soils. Where dense glacial till deposits are encountered, it may be possible to temporarily slope excavations on the order of 1H:1V; these areas should be reviewed on a case-by-case basis during construction.

These recommendations assume all surface loads are kept a minimum distance of at least one-half the depth of the cut away from the top of the slope and seepage is not present on the slope face. Flatter cut slopes will be necessary where seepage/groundwater occurs, or if surface surcharge loads are anticipated. Temporary covering with heavy plastic sheeting should be used to protect these slopes during periods of wet weather. Due to the granular nature of the site soils, excavation sidewalls should be expected to ravel and show some signs of sloughing during construction. Management of sloughing or raveling slopes should be expected.

6.7. WET WEATHER PROTECTION

The wet weather season generally begins in October and continues through May; however, periods of wet weather may occur during any month of the year. If earthwork activities (e.g., grading, excavations, etc.) occur during wet weather conditions, additional efforts and methods to secure the site and reduce ground disturbance will be necessary. The contractor should be responsible for wet weather construction practices and protecting the subgrade during construction. We recommend the following steps be taken for earthwork activities during wet weather:

- The ground surface in and around the work area should be sloped so that surface water is directed away from the work area. The ground surface should be graded so that areas of ponded water do not develop. Measures should be taken by the contractor to prevent surface water from collecting in excavations and trenches. Measures should be implemented to remove surface water from the work area.
- Existing pavement and hardscape should remain in place as long as possible to protect the underlying subgrade from wet weather effects.
- Slopes with exposed soils should be covered with plastic sheeting or similar means.
- Earthwork activities should not take place during periods of heavy precipitation.

- The contractor should cover soil stockpiles that will be used as structural fill with plastic sheeting. It may be prudent to segregate the siltier surface materials from underlying cleaner gravels so as to not add fine-grained particles, making them potentially unusable.
- Site soil should not be left uncompacted and exposed to moisture. Sealing the surficial soils by rolling with a smooth-drum roller prior to periods of precipitation will reduce the extent to which these soils become wet or unstable.
- Construction traffic should be restricted to specific areas of the site, preferably areas that are surfaced with the existing gravel or structural fill materials not susceptible to wet weather disturbance.
- Construction activities should be scheduled so that the length of time that soils are left exposed to moisture is reduced to the extent practical.
- Concrete should be placed as soon as practical after preparing excavations and bearing surfaces.
- Foundation bearing surface protection should also be considered as discussed in Section 6.2.

6.8. GROUNDWATER HANDLING CONSIDERATIONS

Based on conditions encountered in our borings, we anticipate the depth to static groundwater to be much deeper than excavations anticipated for this project. Although not encountered in our borings, we anticipate perched groundwater conditions could be present in areas of the site and at various times throughout the year. The presence, quantity and location of perched groundwater (if encountered) is expected to be dependent on infiltration of surface water that slows or terminates into low permeable soil. We anticipate perched groundwater will be discontinuous, intermittent and will vary depending on a variety of conditions, including season, rainfall events and other factors.

We anticipate controlling perched groundwater with sumps, pumps and/or diversion ditches will be adequate for excavations relatively shallow excavations that are only open for a short amount of time. Ultimately, we recommend the contractor performing the work be made responsible for collecting groundwater encountered.

6.9. PERMANENT CUT AND FILL SLOPES

We recommend permanent slopes be constructed at a maximum inclination of 2H:1V to manage erosion. Where 2H:1V slopes are not feasible, protective facings and/or retaining structures should be considered. Where access for landscape maintenance is desired, we recommend a maximum inclination of 3H:1V. To achieve uniform compaction of newly created slopes, we recommend fill slopes be overbuilt by at least 12 inches and subsequently cut back to expose well-compacted fill.

These guidelines assume all surface loads are kept at a minimum distance of at least one-half the height of the slope away from the top of the slope and seepage is not present on the slope face. Flatter cut slopes or additional drainage measures could be necessary where seepage occurs or if surface surcharge loads are anticipated.

Exposed areas should be re-vegetated as soon as practical to reduce surface erosion and sloughing. Temporary protection should be used until permanent protection is established. Surface water runoff should be collected and directed away from slopes to prevent water from running down the face of the slope.

6.10. FILL MATERIALS

6.10.1. Structural Fill

Fill placed to support structural bearing elements, surfaces, pavements and/or hardscapes, should be specified as structural fill. Our recommendations for fill materials are presented below. We recommend GeoEngineers review contractor submittals for earthwork materials to be used. Material used for fill must be free of clays, debris, organic contaminants and rock fragments larger than 3 inches.

The workability of material for use as structural fill will depend on the gradation and moisture content of the soil. As the percentage of fines increases, fill materials become increasingly sensitive to changes in moisture. Typically, soil containing more than about 5 percent fines is sensitive to changes in moisture and will become difficult to compact, even when just a few percent above the OMC. Budgets should include provisions for import granular fill, crushed rock, or other fill materials if construction is planned during the wet weather season. We can provide specific recommendations for imported material specific for its intended use and based on the time of year of construction, once site development plans and schedule are finalized.

6.10.2. Reuse of On-site Soils as Structural Fill

We anticipate the majority of site soils within planned excavation depths (up to about 10 feet bgs) will predominantly consist of sand and gravel with silt and silty sand; fines content tested varied between 7 and 47 percent. Portions of these soils also included debris (including brick) and organic material. Soils with greater than about 5 percent fines content will be sensitive to small changes in moisture and will be susceptible to disturbance from construction traffic (including vehicle and foot traffic) when wet or if earthwork is performed during wet weather. When the moisture content of these soils is more than a few percent above the OMC, the soil can become muddy and unstable, and it will be challenging or impossible to meet the required compaction criteria. Based on our explorations, we anticipate that some of the materials generated will be above the OMC and may require drying back in order to obtain the specified compaction.

We do not recommend on-site materials be considered for use during the wet season or during periods of wet weather, as compaction to required standards could become difficult to impossible if the soil becomes wet. On-site soils can be considered for use as structural fill during extended periods of dry weather, if the material is adequately moisture-conditioned and compacted as recommended in this report, and if debris and organic material are sufficiently segregated out of the material stockpile. If it is desired to try and use on site materials, we recommend the earthwork contractor provide a detailed plan of its use, including excavation, storage, protection and placement, and that it be reviewed by the project design team and engineers, prior to acceptance for use, and with provisions where applicable.

6.10.3. Imported Fill Materials

Weather, material use, and site conditions should be considered when determining the type of import fill materials purchased and brought to the site for use as structural fill. If prolonged dry weather prevails during the earthwork phase of construction, materials with a somewhat higher fines content (up to about 12 percent passing the U.S. No. 200 sieve) may be acceptable. For most applications, we recommend that structural fill material consist of material similar to “Select Borrow” or “Gravel Borrow” as described in Section 9-03.14 of the WSDOT Standard Specifications. For imported material during wet weather, we recommend crushed rock or gravel borrow with fines content limited to 5 percent of the material passing the US No. 200 sieve, based on the ¾-inch fraction be used for structural fill.

Additional recommended fill materials Section 9-03 of the WSDOT Standard Specifications for various backfill uses are presented in Table 5 below.

TABLE 5. RECOMMENDED IMPORTED FILL MATERIALS

MATERIAL USE CASE	RECOMMENDED WSDOT STANDARD SPECIFICATION	MATERIAL NOTES
General Structural Fill – All Weather	9-03.14(1) or 9-03.14(2)	-
General Structural Fill – Wet Weather	9-03.14(1) or 9-03.9(3) (Base Course)	Recommend limiting fines content to 5 percent in wet weather conditions
Crushed Rock	9-03.9(3) (Base Course)	Recommend limiting fines content to 5 percent in wet weather conditions
Capillary Break	"AASHTO Grading No. 7" described in Specification 9-03.1.4(C) or 9-03.9(3) (Base Course)	Recommend limiting fines content to 5 percent in wet weather conditions
Retaining Wall Drainage Zone Backfill	9-03.12	-
Pipe Bedding	9-03.12(3)	-
Drain Backfill	9-03.12	-
Pavement Subbase	9-03.14(1) or 9-03.10	Recommend at least 30 percent gravel (material retained on No. 4 sieve) and limiting fines content to 5 percent in wet weather conditions

6.11. FILL PLACEMENT AND COMPACTION

Fill should be placed in uniform horizontal lifts above subgrades prepared as previously recommended. Each lift must be compacted to a firm, non-yielding condition by mechanical means prior to additional fill placement. Loose lift thickness should not exceed 12 inches when using heavy compaction equipment (e.g., vibratory hoe-packs and steel drum rollers). Loose lift thickness should not exceed 6 inches when using small hand-operated compaction equipment. The actual thickness will be dependent on the fill material and the type and size of compaction equipment used. It is the contractor's responsibility to select appropriate compaction equipment and place the material in lifts that are thin enough to meet the required compaction criteria.

Each lift should be moisture-conditioned to within 3 percent of the OMC and then compacted to the specified density before placing subsequent lifts. OMC content and maximum dry density (MDD) should be determined in accordance with ASTM International (ASTM) Test Method D 1557 (Modified Proctor). The OMC varies with gradation and should be evaluated during construction. Fill material that is not near the OMC should be moisture conditioned prior to compaction.

During fill and backfill placement, material should be regularly evaluated and tested to verify adequate compaction is being achieved. Compaction should typically be evaluated by means of in-place density testing unless other methods are proposed, such as materials with oversized particles, and are approved by GeoEngineers during construction. These other methods typically involve procedural placement and compaction specifications together with verifying requirements such as proof-rolling. Recommended fill compaction criteria is provided in Table 6 below.

TABLE 6. RECOMMENDED FILL COMPACTION CRITERIA

Fill Material	LOCATION	RECOMMENDED COMPACTION, % MDD AT ± 3% OF OMC
Structural Fill (including trench backfill)	Foundations and Floor Slabs	95
	Pavements and Hardscapes	95% to 2 feet below the bottom of pavement or hardscape section and 90% below that depth of 2 feet
Retaining Wall Backfill	Within 5 feet Laterally from Walls and Subsurface Structures	92
Non-Structural Zones	Landscaping, etc.	85 - 90
Pipe Zone Bedding	Utility Trenches	90

7.0 Limitations

We have prepared this report for the use by Korsmo Construction, design-build team members and their authorized agents for the Lowell Elementary School Replacement project. Korsmo Construction may distribute copies of this report to other authorized agents and regulatory agencies as may be required for the Project.

Our services were provided to assist in the design of foundations for a planned structure located on or near sloping property. Our recommendations are intended to improve the overall stability of the site and to reduce the potential for future property damage related to earth movements, drainage, or erosion. Qualified engineering and construction practices can help mitigate the risks inherent in construction on slopes, although those risks cannot be eliminated completely. Favorable performance of structures in the near term is useful information for anticipating future performance, but it cannot predict or imply a certainty of long-term performance, especially under conditions of adverse weather or seismic activity.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practices in this area at the time this report was prepared. The conclusions, recommendations and opinions presented in this report are based on our professional knowledge, judgment and experience. No warranty, express or implied, applies to the services or this report.

Any electronic form, facsimile, or hard copy of the original document (email, text, table and/or figure), if provided, and any attachments should be considered a copy of the original document. The original document is stored by GeoEngineers, Inc. and will serve as the official document of record.

Please refer to Appendix B titled "Report Limitations and Guidelines for Use" for additional information pertaining to use of this report.

8.0 References

American Society of Civil Engineers (2017). ASCE Standard 7-16 Minimum Design Loads and Associated Criteria for Buildings and Other Structures.

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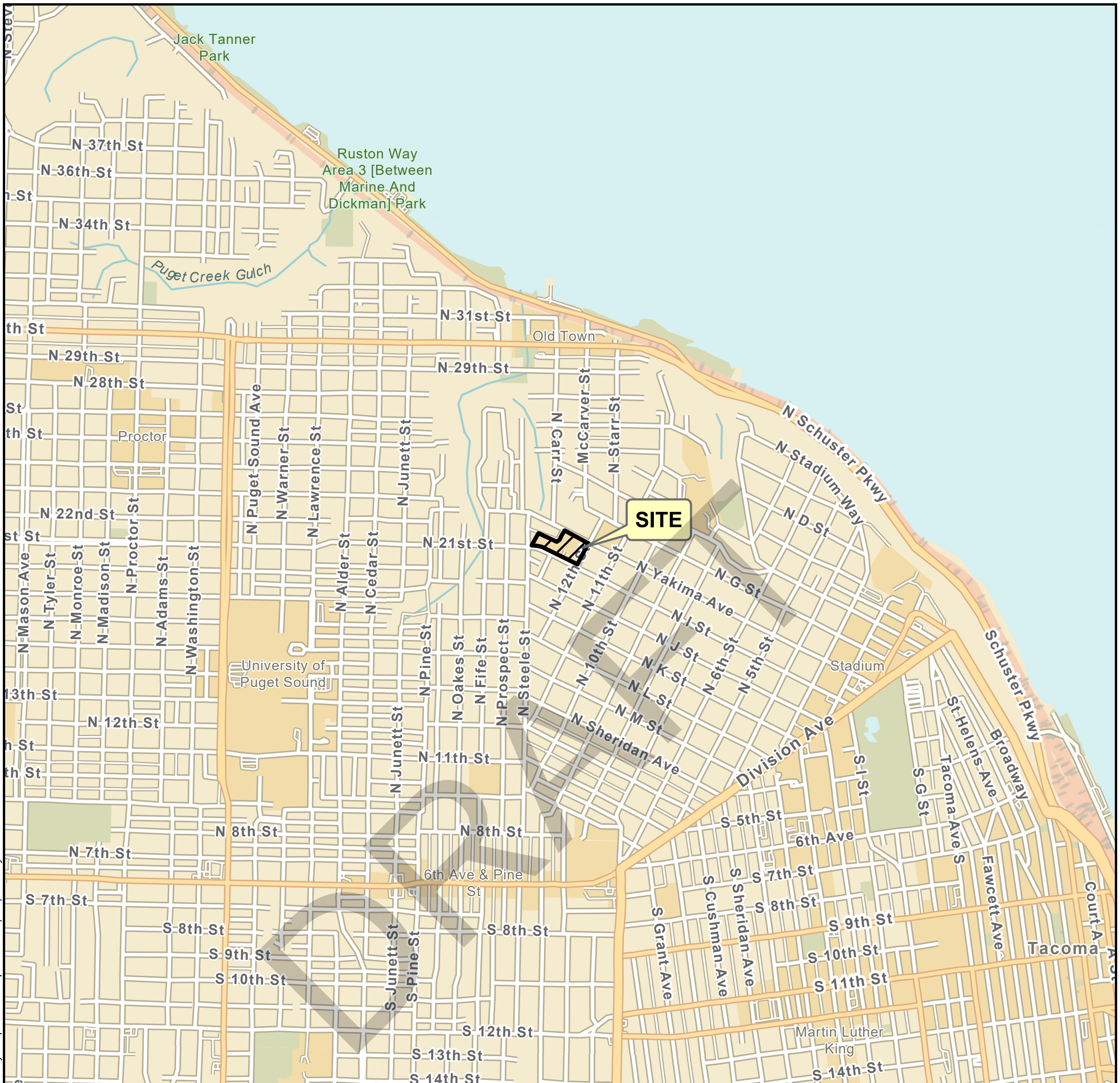
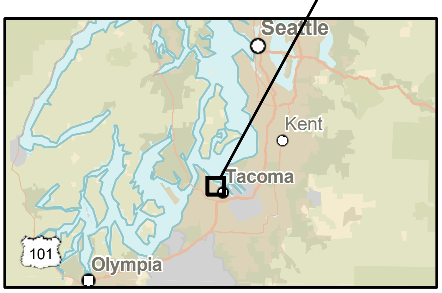
Figures





N

0 2,000
Feet

Source(s):
- ESRI

Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Disclaimer: This figure was created for a specific purpose and project. Any use of this figure for any other project or purpose shall be at the user's sole risk and without liability to GeoEngineers. The locations of features shown may be approximate. GeoEngineers makes no warranty or representation as to the accuracy, completeness, or suitability of the figure, or data contained therein. The file containing this figure is a copy of a master document, the original of which is retained by GeoEngineers and is the official document of record.

Vicinity Map

Lowell Elementary School Replacement
Tacoma, Washington

GeoEngineers

Figure 1

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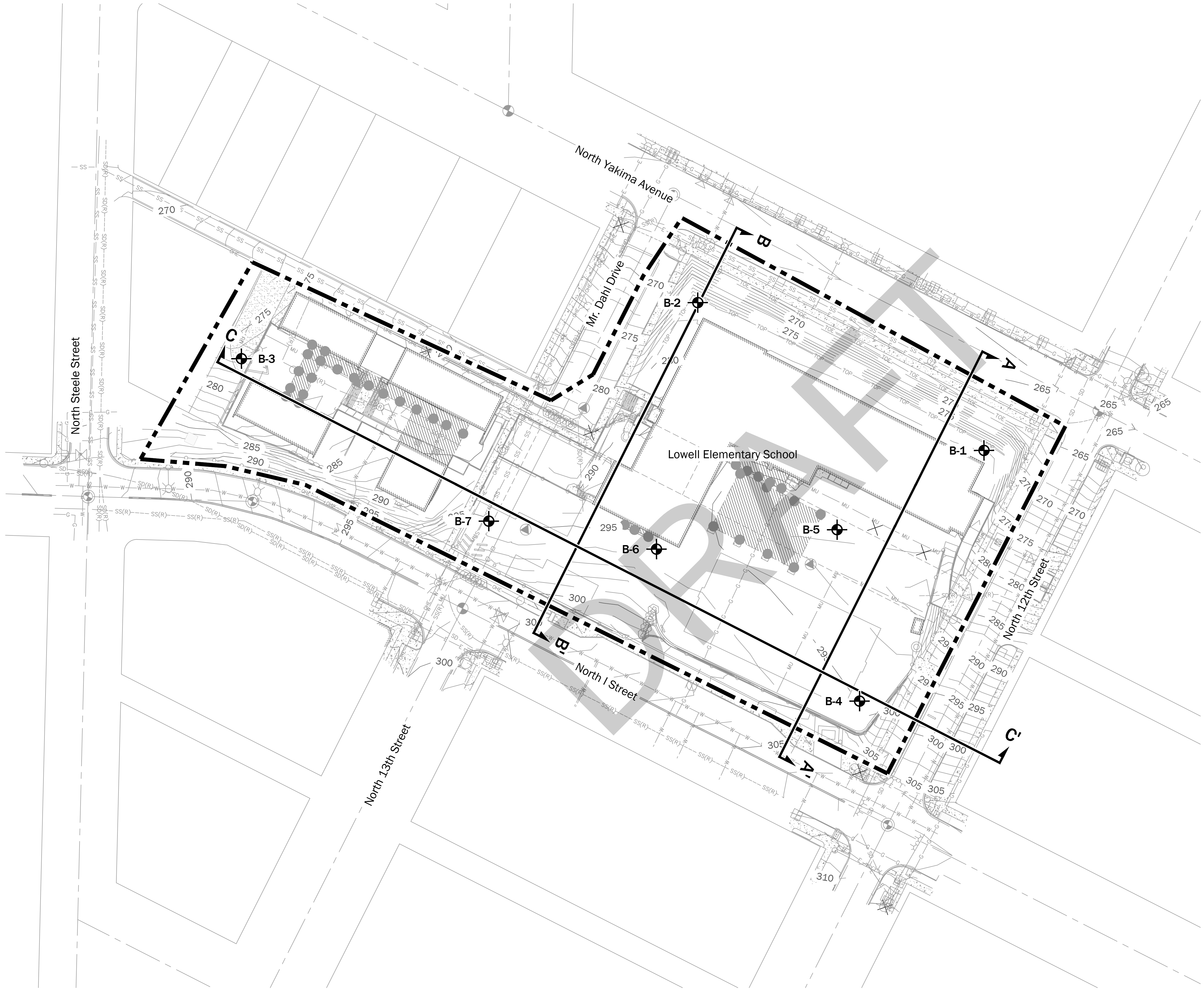

Legend

- Site Boundary
- B-1 Boring by GeoEngineers, 2024
- A A' Cross Section Location

Source(s):
- Survey and Background from Apex Engineering, dated 2/26/2024

Coordinate System: WA State Plane, South Zone, NAD83, US Foot

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N

0 80
Feet

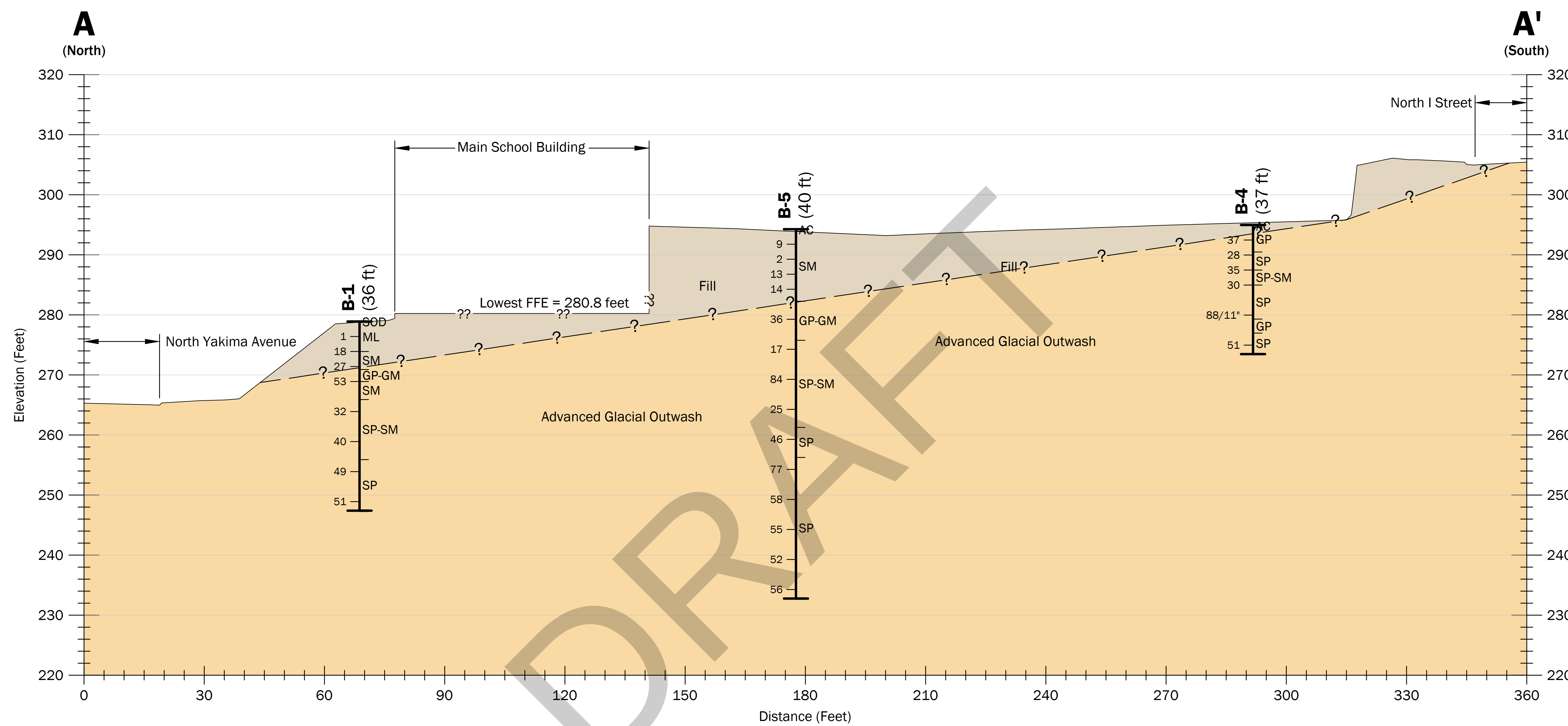
Site and Exploration Plan

Lowell Elementary School Replacement
Tacoma, Washington

GEOENGINEERS

Figure 2

P:\0\0522043\CAD\00\Geotech Report\052204300_F02_Site and Exploration Plan.dwg 2 Date Exported:4/23/2024 10:52 AM - by Jackson N. Fellows



Note(s):

1. The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Source(s):
Survey and Background from Apex Engineering, dated 2/26/2024

Datum: NAVD88

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Legend

Boring ID (Offset)

- Boring
- Inferred Soil Contact
- Soil Classification
- Groundwater Measured in Piezometer
- Blow Count
- Fill
- Undifferentiated Glacial Deposits
- Advanced Glacial Outwash

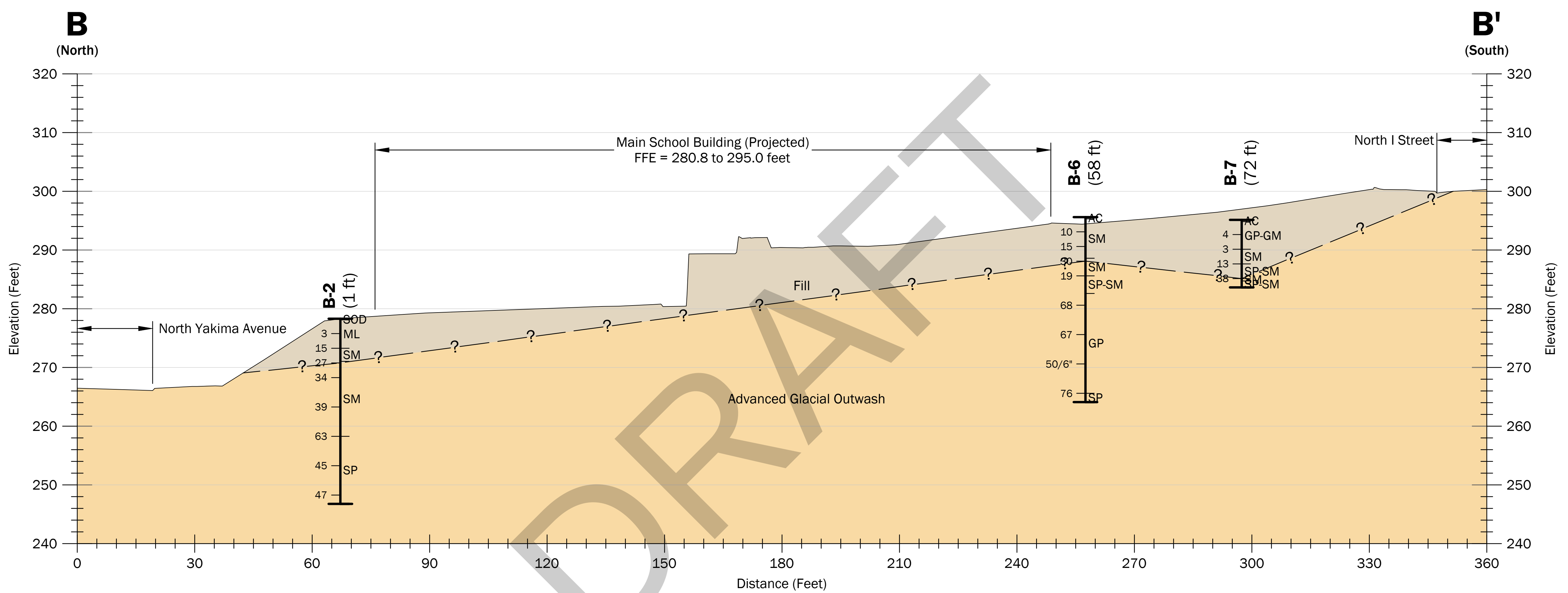
0 30 Horizontal Feet
0 20 Vertical Feet
Vertical Exaggeration =1.5X

Cross Section A-A'

Lowell Elementary School Replacement
Tacoma, Washington

GEOENGINEERS

Figure 3



Note(s):

1. The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Source(s):
Survey and Background from Apex Engineering, dated 2/26/2024

Datum: NAVD88

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Legend

Boring ID (Offset)

- Boring
- Inferred Soil Contact
- Soil Classification
- Groundwater Measured in Piezometer
- Blow Count
- Fill
- Undifferentiated Glacial Deposits
- Advanced Glacial Outwash

Horizontal Feet (0–30)
Vertical Feet (0–20)
Vertical Exaggeration =1.5X

Cross Section B-B'

Lowell Elementary School Replacement
Tacoma, Washington

GEOENGINEERS

Figure 4

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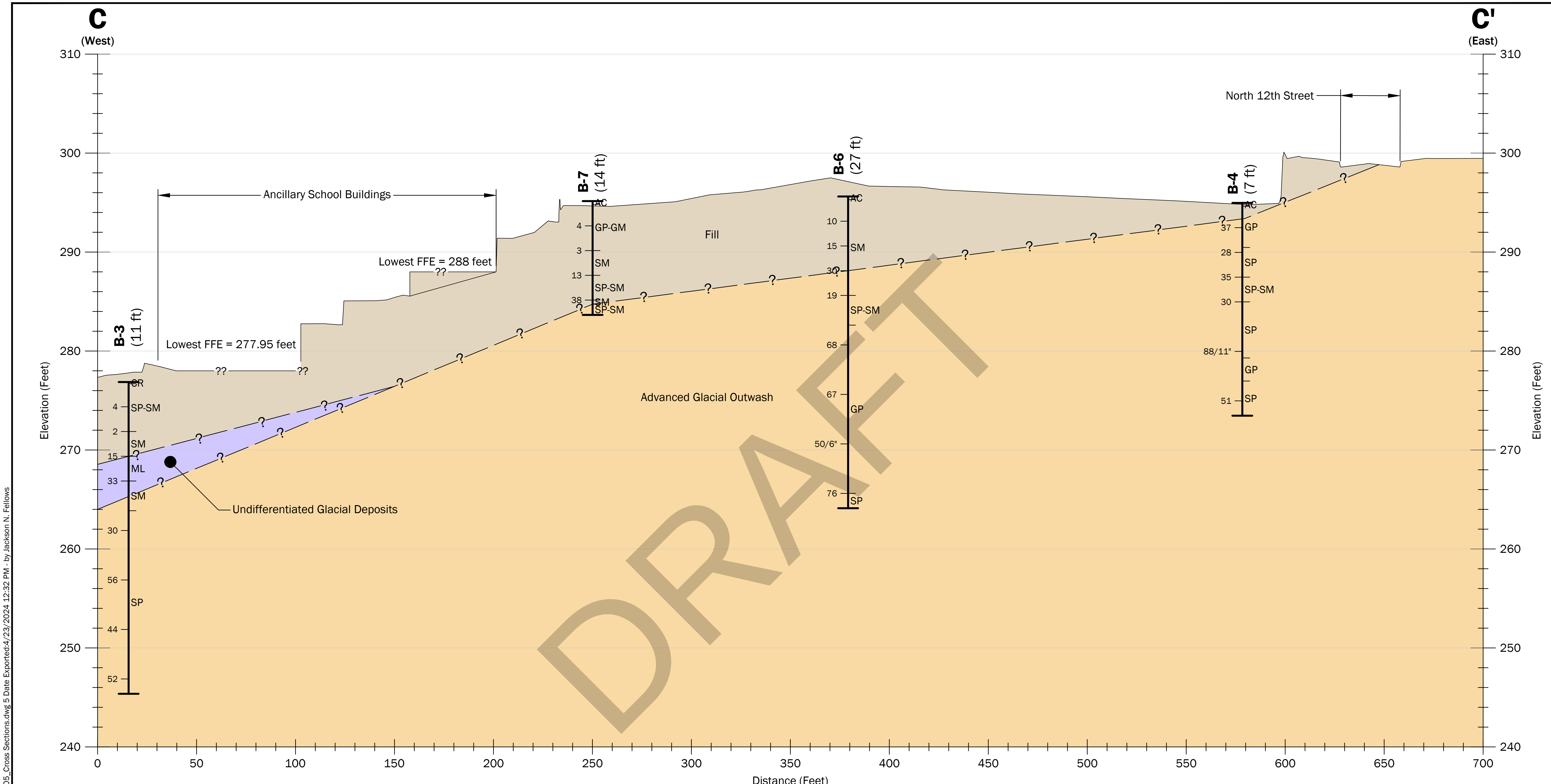

Note(s):

1. The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Source(s):
Survey and Background from Apex Engineering, dated 2/26/2024

Datum: NAVD88

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Legend

Boring ID (Offset)

Boring

— —?— —?— or - - - - Inferred Soil Contact

SM Soil Classification

Groundwater Measured in Piezometer

20 Blow Count

Fill

Undifferentiated Glacial Deposits

Advanced Glacial Outwash

0 50 Horizontal Feet

0 10 Vertical Feet

Vertical Exaggeration = 5X

Cross Section C-C'

Lowell Elementary School Replacement
Tacoma, Washington

GEOENGINEERS

Figure 5

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Appendices

Appendix A
Subsurface Explorations and Laboratory Testing

Appendix A
Subsurface Explorations and Laboratory Testing

SUBSURFACE EXPLORATIONS

Soil and groundwater conditions in the project area were explored by advancing five borings (B-1 through B-7) on April 1 and 2, 2024 at the approximate locations shown in the Site and Exploration Plan, Figure 2. Locations of the explorations were determined in the field using an electronic tablet with global positioning system (GPS) software. The locations and elevations of the explorations should be considered approximate.

Borings were drilled to depths between approximately 11.5 to 61.5 feet below ground surface (bgs). These depths correspond to bottom of borings between about Elevation 291 and 250 feet. Drilling was advanced using hollow-stem auger methods and a truck-mounted drill rig provided and operated by Holocene Drilling, Inc. under subcontract to GeoEngineers, Inc. Representative soil samples were obtained from each boring at approximate 2½- to 5-foot-depth intervals using a standard penetration test (SPT) split spoon sampler. The samplers were driven into the soil using a 140-pound autohammer, free-falling 30 inches on each blow. The number of blows required to drive the sampler each of three, 6-inch increments of penetration were recorded in the field. The sum of the blow counts for the last two, 6-inch increments of penetration is reported on the boring logs as the SPT N-value.

Explorations were completed under observation by a representative from our firm. Our field representative examined and classified the soils encountered, obtained soil samples, observed groundwater conditions, and maintained a detailed log of the explorations. Recovered soils were visually classified in general accordance with ASTM International (ASTM) D 2488 and the classification chart listed in Key to Exploration Logs, Figure A-1. Summary logs of the borings are presented as Figures A-2 through A-8.

The logs are based on interpretation of the field and laboratory data and indicate the depth at which subsurface materials, or their characteristics change, although these changes might be gradual. If the change occurred between samples, it was interpreted. Soil densities noted on the logs are based on the blow count data obtained in the borings and our judgment based on the conditions encountered.

Observations of groundwater conditions were made during drilling and are noted in the logs. Groundwater conditions observed during drilling represent a short-term condition and may or may not be representative of the long-term groundwater conditions at the site and should be considered approximate.

After drilling and sampling efforts were completed, borings were backfilled by the driller in accordance with Washington State Department of Ecology (Ecology) requirements.

LABORATORY TEST RESULTS

Soil samples obtained from the explorations were retained in sealed plastic bags to prevent moisture loss and transported to the GeoEngineers' laboratory. Representative soil samples were selected for laboratory tests to evaluate the pertinent geotechnical engineering characteristics of the soils and to confirm our field classification. The following paragraphs provide a description of the tests performed.

Moisture Content (MC)

Moisture content was determined in general accordance with ASTM Test Method D 2216. The test results are used to aid in soil classification and correlation with other pertinent engineering soil properties. The test results are presented on the exploration logs, as indicated for the sample tested.

Percent Fines (%F)

Percent fines content represents the percentage by weight of the sample passing (finer than) the U.S. No. 200 sieve. Samples were “washed” through the U.S. No. 200 sieve to estimate the relative percentages of coarse- and fine-grained particles in the soil in general accordance with ASTM D 1140. Test results are presented on the exploration logs at the respective sample depths.

Particle Size Gradation – Sieve Analysis (SA)

Sieve analyses were performed in general accordance with ASTM Test Method D 6913. This test method covers the quantitative determination of the distribution of particle sizes in soils. Typically, the distribution of particle sizes larger than 75 micrometers (μm) is determined by sieving. Figures A-9 and A-10 present the results of our sieve analyses.

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS MORE THAN 50% RETAINED ON NO. 200 SIEVE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS
				SP	POORLY-GRADED SANDS, GRAVELLY SAND
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% PASSING NO. 200 SIEVE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS, ROCK FLOUR, 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 SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS AND SILTS OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: Multiple symbols are used to indicate borderline or dual soil classifications

ADDITIONAL MATERIAL SYMBOLS

SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
	AC	Asphalt Concrete
	CC	Cement Concrete
	CR	Crushed Rock/ Quarry Spalls
	SOD	Sod/Forest Duff
	TS	Topsoil

Groundwater Contact

Measured groundwater level in exploration, well, or piezometer

Measured free product in well or piezometer

Graphic Log Contact

Distinct contact between soil strata

Approximate contact between soil strata

Material Description Contact

Contact between geologic units

Contact between soil of the same geologic unit

Sampler Symbol Descriptions

Modified California Sampler (6-inch sleeve) or Dames & Moore

Standard Penetration Test (SPT)

Shelby tube

Piston

Direct-Push

Bulk or grab

Continuous Coring

Blowcount is recorded for driven samplers as the number of blows required to advance sampler 12 inches (or distance noted). See exploration log for hammer weight and drop.

"P" indicates sampler pushed using the weight of the drill rig.

"WOH" indicates sampler pushed using the weight of the hammer.

Laboratory / Field Tests

%F	Percent fines
%G	Percent gravel
AL	Atterberg limits
CA	Chemical analysis
CP	Laboratory compaction test
CS	Consolidation test
DD	Dry density
DS	Direct shear
HA	Hydrometer analysis
MC	Moisture content
MD	Moisture content and dry density
Mohs	Mohs hardness scale
OC	Organic content
PM	Permeability or hydraulic conductivity
PI	Plasticity index
PL	Point load test
PP	Pocket penetrometer
SA	Sieve analysis
TX	Triaxial compression
UC	Unconfined compression
UU	Unconsolidated undrained triaxial compression
VS	Vane shear

Sheen Classification

NS	No Visible Sheen
SS	Slight Sheen
MS	Moderate Sheen
HS	Heavy Sheen

NOTE: The reader must refer to the discussion in the report text and the logs of explorations for a proper understanding of subsurface conditions. Descriptions on the logs apply only at the specific exploration locations and at the time the explorations were made; they are not warranted to be representative of subsurface conditions at other locations or times.

Key to Exploration Logs

GeoEngineers

Figure A-1

Drilled	Start	End	Total Depth (ft)	Logged By	Checked By	Driller	Drilling Method
	4/1/2024	4/1/2024	31.5	RJS	MWR	Holocene Drilling, Inc.	Hollow-stem Auger

Surface Elevation (ft) Vertical Datum	279 NAVD88	Hammer Data	Autohammer 140 (lbs) / 30 (in) Drop	Drilling Equipment	Diedrich 55 Track Rig
Easting (X) Northing (Y)	1152533 711470	System Datum	WA State Plane South NAD83 (feet)	Groundwater not observed at time of exploration	

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA: Recovered (in)	FIELD DATA: Blows/foot	FIELD DATA: Sample Name / Testing	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
279	0				SOD	Grass with sod			
					ML	Brown-gray silt with occasional sand and organic matter (rootlets) (very soft, moist) (fill)			
		6	1	S-1					
275									
	5	14	18	S-2 %F	SM	Brown silty fine to medium sand; iron staining (medium dense, moist)	18	44	
		13	27	S-3					
270					GP-GM	Brown fine gravel with silt and sand (medium dense, moist) (glacial outwash)			
	10	5	53	S-4	SM	Brown fine to medium sand with silt (medium dense, moist)			Blow counts overstated on a rock
265					SP-SM	Brown-gray fine to medium sand with silt (dense, moist)			
	15	15	32	S-5					
260									
	20	15	40	S-6		Grades gray with occasional gravel			
255					SP	Gray fine to medium sand with occasional gravel (dense, moist)			
	25	14	49	S-7					
250									
	30	14	51	S-8		Lacks gravel			

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Topographic Survey. Vertical approximated based on Topographic Survey.

Log of Boring B-1

GeoEngineers

Project: Lowell Elementary School Replacement
Project Location: Tacoma, Washington
Project Number: 0522-043-00

Drilled	Start 4/1/2024	End 4/1/2024	Total Depth (ft) 31.5	Logged By RJS / Checked By MWR	Driller Holocene Drilling, Inc.	Drilling Method Hollow-stem Auger

Surface Elevation (ft) / Vertical Datum	278 / NAVD88	Hammer Data	Autohammer 140 (lbs) / 30 (in) Drop	Drilling Equipment	Diedrich 55 Track Rig
Easting (X) / Northing (Y)	1152305 / 711588	System Datum	WA State Plane South NAD83 (feet)	Groundwater not observed at time of exploration	

Notes:

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0							SOD	Grass with sod			
								ML	Brown sandy silt with organic matter (rootlets) (soft, moist) (fill)			
275			12	3		S-1						
	5		10	15		S-2 %F		SM	Brown silty fine to medium sand with gravel and organic matter (rootlets) (medium dense, moist)	18	33	
270			15	27		S-3		SM	Brown-gray silty fine to medium sand with gravel (dense, moist) (glacial outwash)			
	10		16	34		S-4						
265												
	15		14	39		S-5 SA			Becomes with occasional gravel	11	14	
260												
	20		15	63		S-6		SP	Gray fine to medium sand (dense to very dense, moist)			
255												
	25		10	45		S-7						
250												
	30		11	47		S-8						

DRAFT

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Topographic Survey. Vertical approximated based on Topographic Survey.

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Log of Boring B-2

GeoEngineers

Project: Lowell Elementary School Replacement
Project Location: Tacoma, Washington
Project Number: 0522-043-00

Drilled	Start 4/1/2024	End 4/1/2024	Total Depth (ft)	31.5	Logged By RJS, Checked By MWR	Driller	Holocene Drilling, Inc.	Drilling Method	Hollow-stem Auger

Surface Elevation (ft) / Vertical Datum	275 / NAVD88	Hammer Data	Autohammer 140 (lbs) / 30 (in) Drop	Drilling Equipment	Diedrich 55 Track Rig
Easting (X) / Northing (Y)	1151956 / 711582	System Datum	WA State Plane South NAD83 (feet)	Groundwater not observed at time of exploration	

Notes:

Elevation (feet)	Depth (feet)	Recovered (in)	Blows/foot	Sample Name / Testing	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
275	0				CR	Crushed rock surfacing			
					SP-SM	Gray-brown fine to medium sand with silt, gravel and occasional brick and wood fragments (loose, moist) (fill)			
		7	4	S-1					
270	5	11	2	S-2	SM	Brown silty fine to medium sand with occasional gravel (very loose, moist)			
		15	15	S-3 %F	ML	Gray-brown silty fine to medium sand (medium dense, moist) (undifferentiated glacial deposits)	18	44	
265	10	15	33	S-4		Grades fine to coarse with gravel			Blow count overstated on gravel
					SP	Gray-brown fine to medium sand with occasional gravel (medium dense, moist) (glacial outwash)			
260	15	15	30	S-5					Blow count overstated on gravel
255	20	14	56	S-6		Grades gray and dense to very dense			
250	25	13	44	S-7		Lacks gravel			
245	30	15	52	S-8					

DRAFT

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Topographic Survey. Vertical approximated based on Topographic Survey.

Log of Boring B-3

GeoEngineers

Project: Lowell Elementary School Replacement
Project Location: Tacoma, Washington
Project Number: 0522-043-00

Figure A-4
Sheet 1 of 1

Drilled	Start 4/1/2024	End 4/1/2024	Total Depth (ft) 21.5	Logged By RJS / Checked By MWR	Driller Holocene Drilling, Inc.	Drilling Method Hollow-stem Auger

Surface Elevation (ft) / Vertical Datum	295 / NAVD88	Hammer Data	Autohammer 140 (lbs) / 30 (in) Drop	Drilling Equipment	Diedrich 55 Track Rig
Easting (X) / Northing (Y)	1152434 / 711271	System Datum	WA State Plane South NAD83 (feet)	Groundwater not observed at time of exploration	

Notes:

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
295	0							AC	Approximately 4 inches of asphalt concrete pavement			
								GP	Brown-gray fine to coarse gravel with sand (medium dense, moist) (glacial outwash)			
		X	8	37		S-1						Blow count overstated on gravel
290	5	X	12	28		S-2		SP	Gray fine to medium sand with occasional gravel (medium dense, moist)			
		X	17	35		S-3 / SA		SP-SM	Brown-gray fine to medium sand with silt and occasional gravel (dense, moist)	12	9	
285	10	X	16	30		S-4		SP	Brown-gray fine to medium sand (dense, moist)			
280	15	X	16	88/11"		S-5						
								GP	Brown-gray fine gravel with sand (dense, moist)			
								SP	Brown-gray fine to medium sand with gravel (very dense, moist)			
275	20	X	17	51		S-6						

DRAFT

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Topographic Survey. Vertical approximated based on Topographic Survey.

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Log of Boring B-4

GEOENGINEERS

Project: Lowell Elementary School Replacement
Project Location: Tacoma, Washington
Project Number: 0522-043-00

Drilled	Start 4/2/2024	End 4/2/2024	Total Depth (ft) 61.5
Logged By RJS	Checked By MWR	Driller Holocene Drilling, Inc.	Drilling Method Hollow-stem Auger
Surface Elevation (ft) 294	Vertical Datum NAVD88	Hammer Data Autohammer 140 (lbs) / 30 (in) Drop	Drilling Equipment Diedrich 55 Track Rig
Easting (X) 1152416	Northing (Y) 711407	System Datum WA State Plane South NAD83 (feet)	Groundwater not observed at time of exploration

Notes:

Elevation (feet)	Depth (feet)	Recovered (in)	Blows/foot	Sample Name / Testing	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0				AC	Approximately 3 to 4 inches of asphalt concrete pavement			
					SM	Brown-gray silty fine to coarse sand with gravel and crushed red brick (loose, moist) (fill)			Drill chatter from 1½ to 2½ feet
290		9	9	S-1					Significant brick in sample
	5	4	2	S-2		Grades fine to medium and with decreased brick fragments			
285		13	13	S-3 / %F			16	33	
	10	0	14	S-4		No recovery			
280					GP-GM	Brown-gray fine to coarse gravel with silt and sand (medium dense, moist) (glacial outwash)			
	15	14	36	S-5 / SA			11	14	
275					SP-SM	Brown-gray fine to medium sand with silt and occasional gravel (medium dense, moist)			
	20	15	17	S-6 / SA			11	14	
270									
	25	15	84	S-7		Grades fine to coarse and with gravel			Blow count overstated on gravel
265									
	30	14	25	S-8					
260					SP	Gray fine to medium sand (dense, moist)			
	35								

DRAFT

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Topographic Survey. Vertical approximated based on Topographic Survey.

Date:4/23/24 Path:P:\0\0522043\GINT\052204300.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_GEOTECH_STANDARD_%F_NO_GW

Log of Boring B-5

GEOENGINEERS

Project: Lowell Elementary School Replacement
Project Location: Tacoma, Washington
Project Number: 0522-043-00

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	35		16	46		S-9						
255								SP	Gray medium to coarse sand with occasional gravel (very dense, moist)			
	40		18	77		S-10						
250												
	45		17	58		S-11			Grades fine to medium and lacks gravel			
245												
	50		17	55		S-12			Becomes with occasional gravel			
240												
	55		15	52		S-13						
235												
	60		16	56		S-14			Lacks gravel			

Log of Boring B-5 (continued)

GeoEngineers

Project: Lowell Elementary School Replacement
Project Location: Tacoma, Washington
Project Number: 0522-043-00

Drilled	Start 4/2/2024	End 4/2/2024	Total Depth (ft) 31.5	Logged By RJS / Checked By MWR	Driller Holocene Drilling, Inc.	Drilling Method Hollow-stem Auger

Surface Elevation (ft) 296 / Vertical Datum NAVD88	Hammer Data: Autohammer 140 (lbs) / 30 (in) Drop	Drilling Equipment: Diedrich 55 Track Rig	
Easting (X) 1152272 / Northing (Y) 711392	System Datum: WA State Plane South NAD83 (feet)	Groundwater not observed at time of exploration	

Notes:

Elevation (feet)	Depth (feet)	Recovered (in)	Blows/foot	Sample Name / Testing	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0				AC	Approximately 3 to 4 inches of asphalt concrete pavement			
295					SM	Gray-brown silty fine to medium sand with occasional gravel; iron staining (loose to medium dense, moist) (fill)			
		12	10	S-1					
290	5	15	15	S-2 %F			15	23	
		7	30	S-3	SM	Gray-brown silty fine to medium sand with occasional gravel (medium dense to dense, moist) (glacial outwash)			Blow count overstated on gravel
285	10	12	19	S-4	SP-SM	Brown-gray fine to medium sand with silt (medium dense, moist) (glacial outwash)			
					GP	Brown-gray fine to coarse gravel with sand (very dense, moist)			
280	15	10	68	S-5					
275	20	12	67	S-6					
270	25	10	50/6"	S-7					
265	30	12	76	S-8	SP	Brown-gray fine to medium sand with gravel (very dense, moist)			

DRAFT

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Topographic Survey. Vertical approximated based on Topographic Survey.

Log of Boring B-6

GEOENGINEERS

Project: Lowell Elementary School Replacement
Project Location: Tacoma, Washington
Project Number: 0522-043-00

Figure A-7
Sheet 1 of 1

Drilled	Start 4/2/2024	End 4/2/2024	Total Depth (ft) 11.5	Logged By RJS / Checked By MWR	Driller Holocene Drilling, Inc.	Drilling Method Hollow-stem Auger

Surface Elevation (ft) / Vertical Datum	295 / NAVD88	Hammer Data	Autohammer 140 (lbs) / 30 (in) Drop	Drilling Equipment	Diedrich 55 Track Rig
Easting (X) / Northing (Y)	1152139 / 711414	System Datum	WA State Plane South NAD83 (feet)	Groundwater not observed at time of exploration	

Notes:

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0							AC	Approximately 3 to 4 inches of asphalt concrete pavement			
								GP-GM	Brown fine to coarse gravel with silt and sand (loose, moist) (fill)			
			5	4		S-1						
290	5		4	3		S-2		SM	Brown silty fine to coarse sand with gravel (very loose, moist)			
			13	13		S-3		SP-SM	Brown fine to medium sand with silt and gravel (medium dense, moist)			
285	10		16	38		S-4 / SA		SM	Brown silty fine to medium sand with gravel (dense, moist)	14	17	
								SP-SM	Brown-gray silty fine to medium sand with occasional gravel (dense, moist) (glacial outwash)			

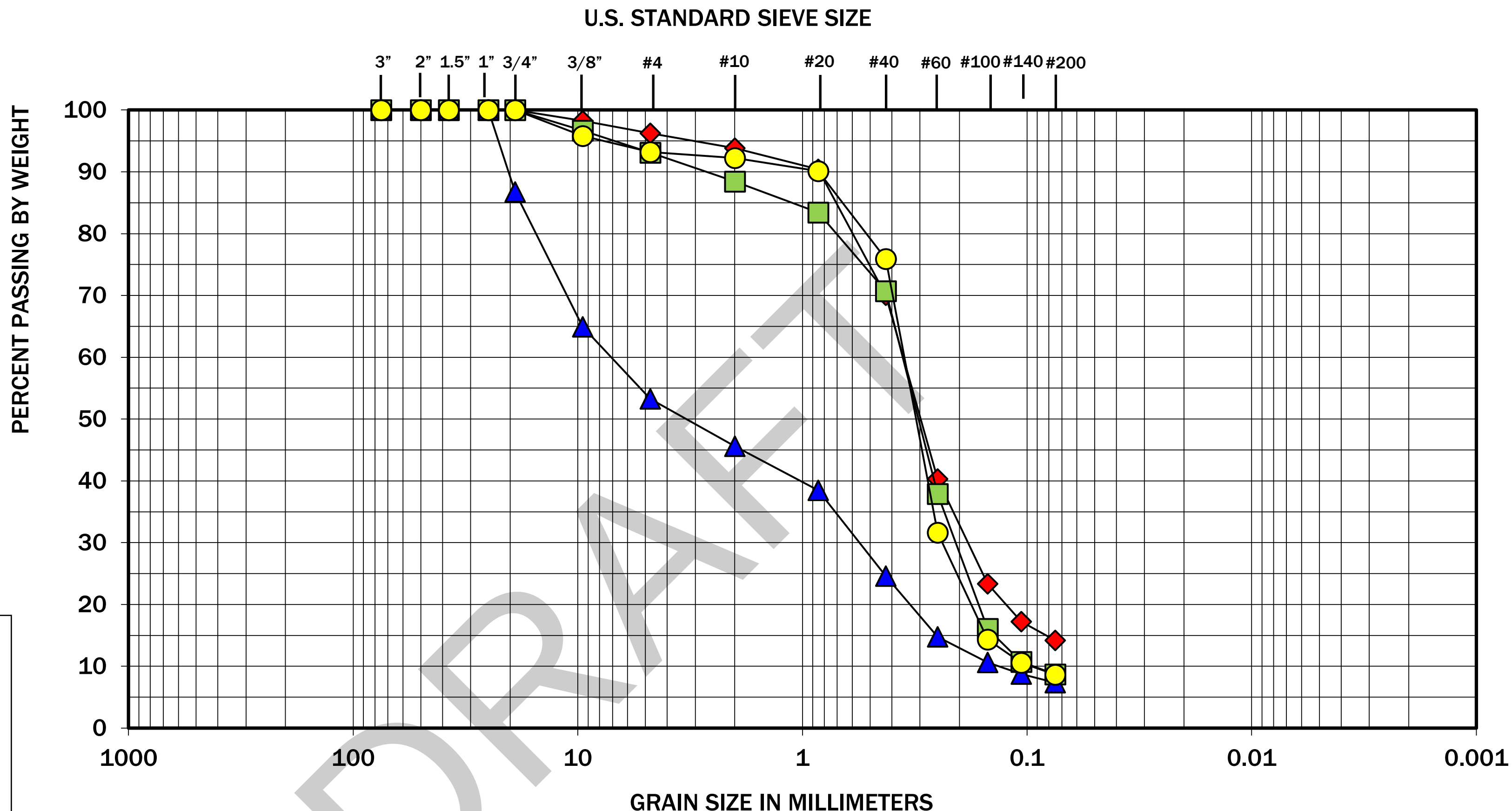
Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Topographic Survey. Vertical approximated based on Topographic Survey.

Date:4/23/24 Path:P:\0\0522043\GINT\052204300.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_GEOTECH_STANDARD_%F_NO_GW

Log of Boring B-7

GeoEngineers

Project: Lowell Elementary School Replacement
Project Location: Tacoma, Washington
Project Number: 0522-043-00



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Symbol	Boring Number	Depth (feet)	Moisture (%)	Soil Description
◆	B-2	15	11	Silty sand (SM)
■	B-4	7.5	12	Poorly graded sand with silt (SP-SM)
▲	B-5	15	7	Poorly graded gravel with silt and sand (GP-GM)
●	B-5	20	14	Poorly graded sand with silt (SP-SM)

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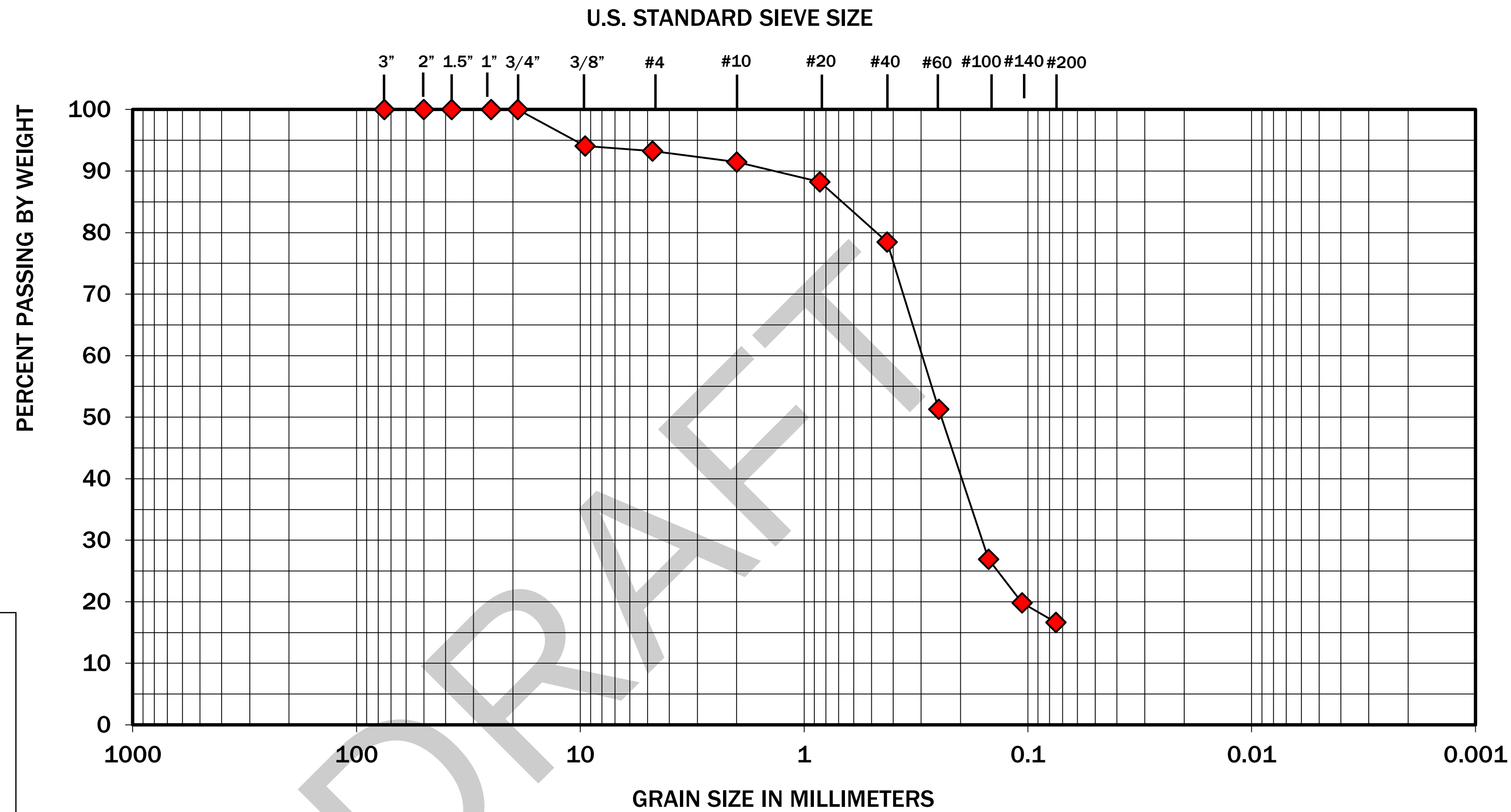
The grain size analysis results were obtained in general accordance with ASTM D6913. GeoEngineers 17425 NE Union Hill Road Ste 250, Redmond, WA 98052

GeoEngineers

Lowell Elementary School Replacement
Tacoma, Washington

Sieve Analysis Results

Figure A-9



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Symbol	Boring Number	Depth (feet)	Moisture (%)	Soil Description
◆	B-7	10	14	Silty sand (SM)

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The grain size analysis results were obtained in general accordance with ASTM D6913. GeoEngineers 17425 NE Union Hill Road Ste 250, Redmond, WA 98052

GeoEngineers

Lowell Elementary School Replacement
Tacoma, Washington

Sieve Analysis Results

Figure A-10

Appendix B
Report Limitations and Guidelines for Use

Appendix B
Report Limitations and Guidelines for Use[1]

This appendix provides information to help you manage your risks with respect to the use of this report.

READ THESE PROVISIONS CLOSELY

It is important to recognize that the geoscience practices (geotechnical engineering, geology and environmental science) rely on professional judgment and opinion to a greater extent than other engineering and natural science disciplines, where more precise and/or readily observable data may exist. To help clients better understand how this difference pertains to our services, GeoEngineers includes the following explanatory "limitations" provisions in its reports. Please confer with GeoEngineers if you need to know more how these "Report Limitations and Guidelines for Use" apply to your project or site.

GEOTECHNICAL SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES, PERSONS AND PROJECTS

This report has been prepared for Korsmo Construction for the Project specifically identified in the report. The information contained herein is not applicable to other sites or projects.

GeoEngineers structures its services to meet the specific needs of its clients. No party other than the party to whom this report is addressed may rely on the product of our services unless we agree to such reliance in advance and in writing. Within the limitations of the agreed scope of services for the Project, and its schedule and budget, our services have been executed in accordance with our agreement with Korsmo Construction dated March 21, 2024 and generally accepted geotechnical practices in this area at the time this report was prepared. We do not authorize, and will not be responsible for, the use of this report for any purposes or projects other than those identified in the report.

A GEOTECHNICAL ENGINEERING OR GEOLOGIC REPORT IS BASED ON A UNIQUE SET OF PROJECT-SPECIFIC FACTORS

This report has been prepared for the proposed Lowell Elementary School Replacement project located in Tacoma, Washington. GeoEngineers considered a number of unique, project-specific factors when establishing the scope of services for this project and report. Unless GeoEngineers specifically indicates otherwise, it is important not to rely on this report if it was:

- Not prepared for you,
- Not prepared for your project,
- Not prepared for the specific site explored, or
- Completed before important project changes were made.

[1] Developed based on material provided by GBA, GeoProfessional Business Association; www.geoprofessional.org..

For example, changes that can affect the applicability of this report include those that affect:

- The function of the proposed structure;
- Elevation, configuration, location, orientation or weight of the proposed structure;
- Composition of the design team; or
- Project ownership.

If changes occur after the date of this report, GeoEngineers cannot be responsible for any consequences of such changes in relation to this report unless we have been given the opportunity to review our interpretations and recommendations. Based on that review, we can provide written modifications or confirmation, as appropriate.

ENVIRONMENTAL CONCERNS ARE NOT COVERED

Unless environmental services were specifically included in our scope of services, this report does not provide any environmental findings, conclusions, or recommendations, including but not limited to, the likelihood of encountering underground storage tanks or regulated contaminants.

INFORMATION PROVIDED BY OTHERS

GeoEngineers has relied upon certain data or information provided or compiled by others in the performance of our services. Although we use sources that we reasonably believe to be trustworthy, GeoEngineers cannot warrant or guarantee the accuracy or completeness of information provided or compiled by others.

SUBSURFACE CONDITIONS CAN CHANGE

This geotechnical or geologic report is based on conditions that existed at the time the study was performed. The findings and conclusions of this report may be affected by the passage of time, by man-made events such as construction on or adjacent to the site, new information or technology that becomes available subsequent to the report date, or by natural events such as floods, earthquakes, slope instability or groundwater fluctuations. If more than a few months have passed since issuance of our report or work product, or if any of the described events may have occurred, please contact GeoEngineers before applying this report for its intended purpose so that we may evaluate whether changed conditions affect the continued reliability or applicability of our conclusions and recommendations.

GEOTECHNICAL AND GEOLOGIC FINDINGS ARE PROFESSIONAL OPINIONS

Our interpretations of subsurface conditions are based on field observations from widely spaced sampling locations at the site. Site exploration identifies the specific subsurface conditions only at those points where subsurface tests are conducted or samples are taken. GeoEngineers reviewed field and laboratory data and then applied its professional judgment to render an informed opinion about subsurface conditions at other locations. Actual subsurface conditions may differ, sometimes significantly, from the opinions presented in this report. Our report, conclusions and interpretations are not a warranty of the actual subsurface conditions.

GEOTECHNICAL ENGINEERING REPORT RECOMMENDATIONS ARE NOT FINAL

We have developed the following recommendations based on data gathered from subsurface investigation(s). These investigations sample just a small percentage of a site to create a snapshot of the subsurface conditions elsewhere on the site. Such sampling on its own cannot provide a complete and accurate view of subsurface conditions for the entire site. Therefore, the recommendations included in this report are preliminary and should not be considered final. GeoEngineers' recommendations can be finalized only by observing actual subsurface conditions revealed during construction. GeoEngineers cannot assume responsibility or liability for the recommendations in this report if we do not perform construction observation.

We recommend that you allow sufficient monitoring, testing and consultation during construction by GeoEngineers to confirm that the conditions encountered are consistent with those indicated by the explorations, to provide recommendations for design changes if the conditions revealed during the work differ from those anticipated, and to evaluate whether earthwork activities are completed in accordance with our recommendations. Retaining GeoEngineers for construction observation for this project is the most effective means of managing the risks associated with unanticipated conditions. If another party performs field observation and confirms our expectations, the other party must take full responsibility for both the observations and recommendations. Please note, however, that another party would lack our project-specific knowledge and resources.

A GEOTECHNICAL ENGINEERING OR GEOLOGIC REPORT COULD BE SUBJECT TO MISINTERPRETATION

Misinterpretation of this report by members of the design team or by contractors can result in costly problems. GeoEngineers can help reduce the risks of misinterpretation by conferring with appropriate members of the design team after submitting the report, reviewing pertinent elements of the design team's plans and specifications, participating in pre-bid and preconstruction conferences, and providing construction observation.

GIVE CONTRACTORS A COMPLETE REPORT AND GUIDANCE

To help reduce the risk of problems associated with unanticipated subsurface conditions, GeoEngineers recommends giving contractors the complete geotechnical engineering or geologic report, including these "Report Limitations and Guidelines for Use." When providing the report, you should preface it with a clearly written letter of transmittal that:

- Advises contractors that the report was not prepared for purposes of bid development and that its accuracy is limited; and
- Encourages contractors to confer with GeoEngineers and/or to conduct additional study to obtain the specific types of information they need or prefer.

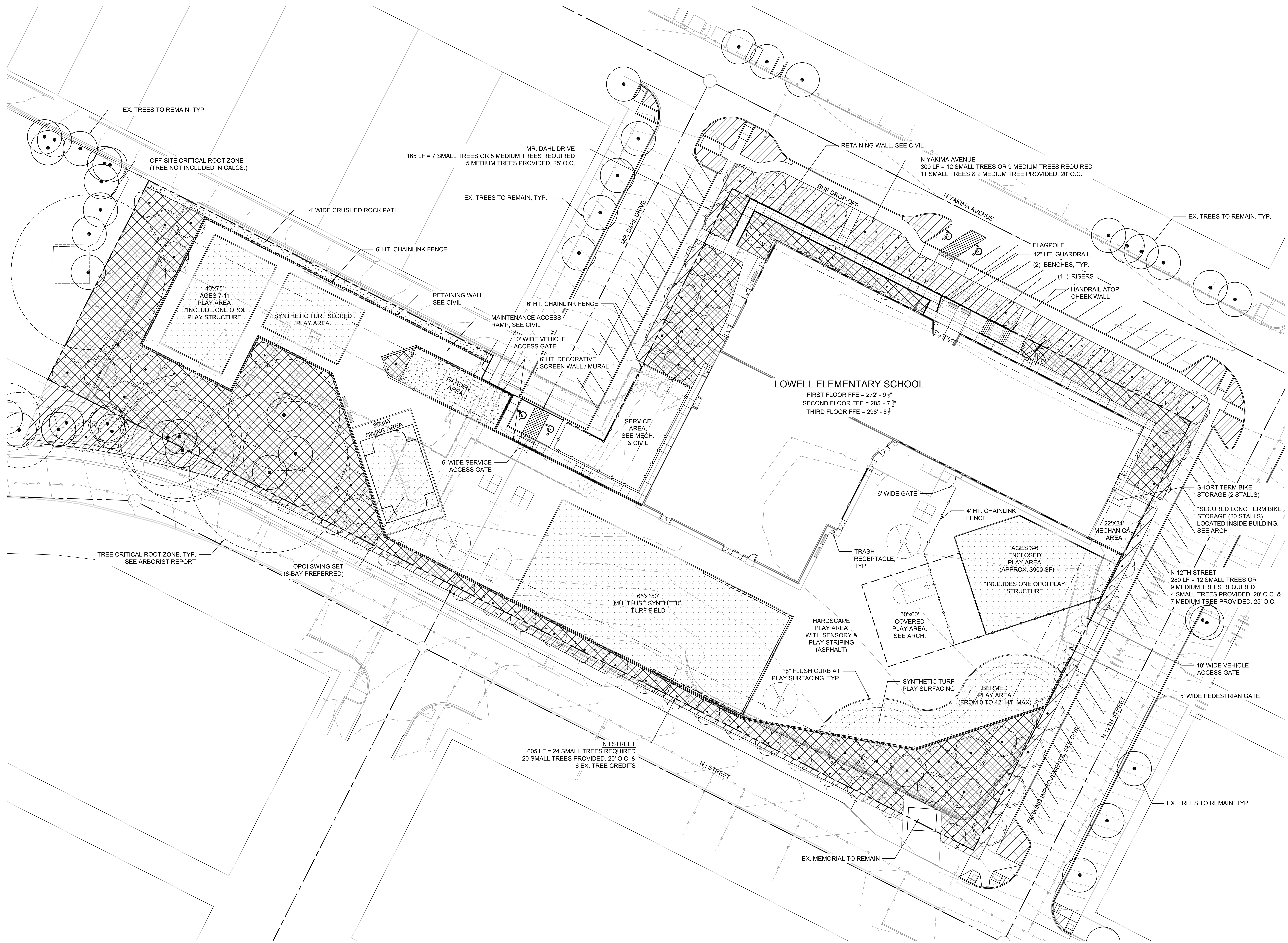
CONTRACTORS ARE RESPONSIBLE FOR SITE SAFETY ON THEIR OWN CONSTRUCTION PROJECTS

Our geotechnical recommendations are not intended to direct the contractor's procedures, methods, schedule or management of the work site. The contractor is solely responsible for job site safety and for managing construction operations to minimize risks to on-site personnel and adjacent properties.

BIOLOGICAL POLLUTANTS

GeoEngineers' Scope of Work specifically excludes the investigation, detection, prevention or assessment of the presence of Biological Pollutants. Accordingly, this report does not include any interpretations, recommendations, findings or conclusions regarding the detecting, assessing, preventing or abating of Biological Pollutants, and no conclusions or inferences should be drawn regarding Biological Pollutants as they may relate to this project. The term "Biological Pollutants" includes, but is not limited to, molds, fungi, spores, bacteria and viruses, and/or any of their byproducts.

A Client that desires these specialized services is advised to obtain them from a consultant who offers services in this specialized field.



SEE SHEET L-101 FOR CONCEPT PLANT SCHEDULE, NOTES & CALCULATIONS
SEE SHEET L-102 FOR PLANTING DETAILS
SEE SHEET L-103 FOR NARRATIVE

IF SHEET MEASURES LESS THAN 30"X42", IT IS A REDUCED PRINT. REDUCE SCALE ACCORDINGLY

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SEAL
STATE OF WASHINGTON
KRISTIN GLANDON
NO. 1119 EXP. 08/29/2024
LANDSCAPE ARCHITECT
07.24.2024

KG DESIGNS
(253) 341-9451
Kristin@kgdesignspnw.com

TACOMA PUBLIC SCHOOLS

PROJECT
TACOMA PUBLIC SCHOOLS
LOWELL ELEMENTARY REPLACEMENT
810 MR DAHL DR
TACOMA, WA 98403

REVISIONS

DATE
08.19.2024
BCRA NO.
23175
DRAWN BY: JM
REVIEWED BY: KG
SHEET TITLE
PLANTING PLAN

bcra

SHEET
L-100
CUP SUBMITTAL

CONCEPT PLANT SCHEDULE L-100

	SMALL TREES	41
	MEDIUM TREES	20
	MEMORIAL TREE (CONSIDERED SMALL TREE)	1
	EVERGREEN TREES INCLUDES CONIFERS & BROADLEAF EVERGREENS (CONSIDERED MEDIUM TREE)	15
	EX. TREE TO REMAIN QTY. INCLUDES ON-SITE & ABUTTING ROW TREES ONLY	10
	SHRUBS & GROUNDCOVER (ON-SITE)	27,030 sf
	ROW PLANTING	13,078 sf

LANDSCAPE CALCULATIONS PER CITY OF TACOMA UFM

ON-SITE CALCULATIONS

OVERALL SITE LANDSCAPING
AREA NOT COVERED BY STRUCTURES: 94,723 sf
LANDSCAPING AREA REQUIRED: 4,736 sf (5% ONSITE FOR RESIDENTIAL DISTRICT)
LANDSCAPING AREA PROVIDED: 27,030 sf (SHRUB & GROUNDCOVER PLANTING AREA)

TREE CANOPY COVERAGE = 30% (28,417 sf)
REQUIRED TREES: 95 SMALL TREES OR
57 MEDIUM TREES

TREES PROVIDED: 41 SMALL TREES
35 MEDIUM TREES
5 EXISTING TREES TO REMAIN (WORTH 18 CREDITS PER ARBORIST REPORT)
94 TREES/CREDITS PROVIDED

20% OF TOTAL NEW TREES TO BE EVERGREEN: 76 TOTAL NEW TREES PROVIDED (15 EVERGREEN TREES)

EXISTING TREE CREDITS:
EXISTING TREES TO BE RETAINED PER ARBORIST REPORT
25 - DOUGLAS FIR (32.5" DBH) = 4 TREE CREDITS
26 - DOUGLAS FIR (30.5" DBH) = 3 TREE CREDITS
27 - DOUGLAS FIR (46.8" DBH) = 4 TREE CREDITS
29 - BIG LEAF MAPLE (36" DBH) = 4 TREE CREDITS
30 - BIG LEAF MAPLE (28" DBH) = 3 TREE CREDITS

TOTAL EXISTING TREE CREDITS = 18 LARGE TREES

SITE PERIMETER LANDSCAPING:
REQUEST EXEMPTION DUE TO PUBLIC SCHOOL, EXISTING USE AND NEED FOR CLEAR SIGHT LINES. PROPOSED ENHANCED LANDSCAPING INCLUDES PRESERVING MATURE TREES AND SPECIFYING DROUGHT TOLERANT AND NATIVE ADAPTED PLANT SPECIES.

LANDSCAPE BUFFERS:
NOT REQUIRED

PARKING LOT LANDSCAPING:
INTERIOR PARKING TREE REQUIREMENTS: UNDER 5 STALLS, NOT REQUIRED

PERIMETER PLANTING REQUIREMENTS:
EXEMPT AS NO PARKING LOT REQUIRED

BIKE STALL REQUIREMENTS PER TMC 13.06512.D.7:
SECURE LONG TERM BIKE STALLS (10 TWO-SIDED RACKS) = 20 STALLS PROVIDED
STANDARD SHORT TERM BIKE STALLS (1 TWO-SIDED RACKS) = 2 STALLS PROVIDED

OFF-SITE CALCULATIONS

STREET TREES:
SITE FRONTAGE: 1,350 LF OF SITE FRONTAGE
REQUIRED TREES: 4 SMALL TREES, 3 MEDIUM TREES OR
2 LARGE TREES PER 100 LF OF SITE FRONTAGE
TOTAL REQUIRED = 54 SMALL, 41 MEDIUM OR 27 LARGE TREES

STREET TREES PROVIDED: 37 NEW SMALL STREET TREES
3 NEW MEDIUM STREET TREES
2 EXISTING STREET TREES (WORTH 6 CREDITS PER ARBORIST REPORT)
46 STREET TREES/CREDITS

EXISTING STREET TREE CREDITS:
EXISTING TREES TO BE RETAINED PER ARBORIST REPORT
28 - BIG LEAF MAPLE (30" DBH) = 3 STREET TREE CREDITS
36 - INCENSE CEDAR (22" DBH) = 3 STREET TREE CREDITS

TOTAL EXISTING STREET TREE CREDITS = 6 STREET TREE CREDITS

GENERAL PLANTING NOTES

1. ALL ROOT PACKAGES MUST BE FREE OF ANY WEEDS..
2. ALL TREE STAKES MUST BE REMOVED BY THE CONTRACTOR BY THE END OF THE FIRST FULL GROWING SEASON.
3. AT THE DIRECTION OF THE LANDSCAPE ARCHITECT, PRUNING MAY BE REQUIRED TO REMOVE DAMAGED, CROSSING, MISSHAPEN OR LOW BRANCHING LIMBS. TREES SHOULD NOT REQUIRE SIGNIFICANT PRUNING TO CORRECT HEALTH OR AESTHETIC DEFICIENCIES.
4. REFER TO CIVIL DEMOLITION DRAWINGS AND ARBORIST REPORT FOR REMOVAL REQUIREMENTS AND PROTECTION FENCING AROUND EXISTING VEGETATION.
5. REFER TO PLANTING PLANS FOR LOCATION OF EXISTING TREES TO BE RETAINED.
6. REFER TO ARBORIST REPORT FOR SCHEDULE OF EXISTING TREES TO BE SAVED OR REMOVED.
7. REFER TO PLANTING AND SEEDING SPECIFICATION FOR ADDITIONAL REQUIREMENTS.
8. REFER TO LANDSCAPE MANAGEMENT PLAN FOR MAINTENANCE REQUIREMENTS.
9. SEE SOIL PREPARATION PLAN FOR TOPSOIL AND MULCH DEPTHS.
10. SEE SPECIFICATIONS FOR PLANT MATERIAL, TOPSOIL AND PLANTING MIX TYPES, MULCHING, SOIL AMENDMENTS, FERTILIZERS AND WARRANTIES.
11. PLANTING SHALL CONFORM TO ALL CITY OF TACOMA CODE REQUIREMENTS, INCLUDING PRESERVATION OF ADEQUATE INTERSECTION SIGHT DISTANCE LINES/TRIANGULAR AREAS.
12. CONTRACTOR SHALL VERIFY ON-SITE CONDITIONS PRIOR TO BIDDING AND CONSTRUCTION.
13. PERMANENT, UNDERGROUND IRRIGATION TO BE INSTALLED IN ALL NEW LANDSCAPE AREAS
14. THE CONTRACTOR AND OWNER ARE RESPONSIBLE FOR READING THE PLANS, SPECIFICATIONS AND NOTES.
15. THE CONTRACTOR SHALL VERIFY ALL PLANT MATERIAL QUANTITIES PRIOR TO INSTALLATION. ANY PLANT MATERIAL QUANTITIES LISTED ARE FOR THE CONVENIENCE OF THE CONTRACTOR. ACTUAL NUMBER OF SYMBOLS SHALL HAVE PRIORITY OVER QUANTITY DESIGNATED. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COUNTING THE TOTAL NUMBER OF PLANTS INDICATED ON THE PLANS AND ESTIMATING GROUNDCOVER QUANTITIES.
16. THE CONTRACTOR SHALL FURNISH AND PAY FOR ALL CONTAINER OR FIELD GROWN TREES, SHRUBS AND GROUNDCOVERS, INCLUDING SEEDED AND SODDED TURF, HYDROMULCHES AND FLATTED GROUNDCOVERS. THE CONTRACTOR SHALL ALSO BE RESPONSIBLE AND PAY FOR: PLANTING OF ALL PLANT MATERIALS; THE SPECIFIED GUARANTEE OF ALL PLANT MATERIALS; THE STAKING AND GUYING OF TREES AND THE CONTINUOUS PROTECTION OF ALL PLANT MATERIALS UPON THEIR ARRIVAL AT THE SITE.

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SEAL
STATE OF WASHINGTON
KRISTIN GLANDON
NO. 1119 EXP. 08/29/2024
LANDSCAPE ARCHITECT
07.24.2024

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Kristin@kgdesignspnw.com

TACOMA PUBLIC SCHOOLS

PROJECT
TACOMA PUBLIC SCHOOLS
LOWELL ELEMENTARY REPLACEMENT
810 MR DAHL DR
TACOMA, WA 98403

REVISIONS

DATE
08.19.2024
BCRA NO.
23175
DRAWN BY: JM
REVIEWED BY: KG
SHEET TITLE
CONCEPT PLANT SCHEDULE, NOTES, & CALCULATIONS

SHEET
L-101
CUP SUBMITTAL

NOTES:

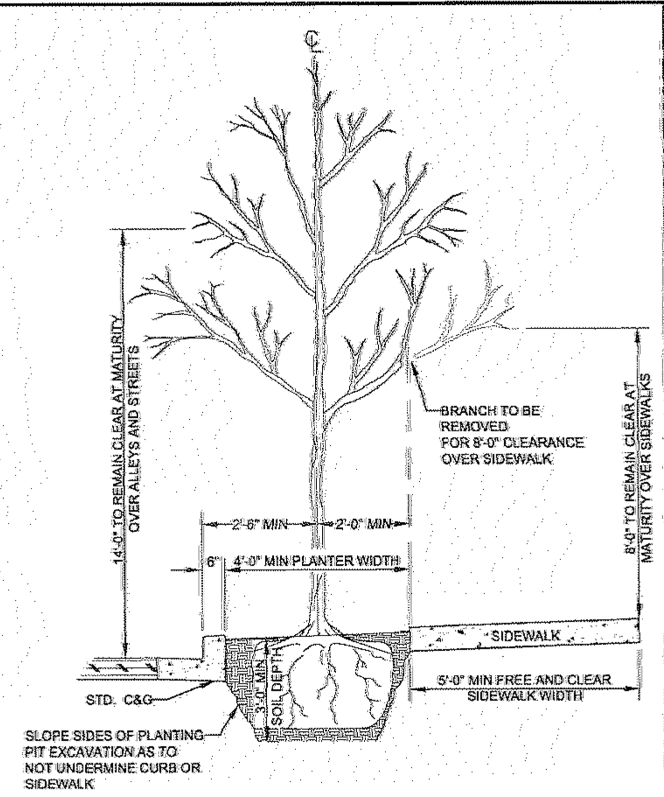
1. Street trees shall have a trunk free of branches up to the height listed below when planted:
   A. Small trees, whose mature height is 15 to 25 feet, shall have a trunk free of branches up to a minimum of 4 feet.
   B. Conifer/evergreen trees shall have a trunk free of branches up to a minimum of 2 feet.
   C. Trees with ascending branches (examples - Ulmus Americana and Zelkova Serrata) may be branched 1 foot or More below the standard height and still provide proper clearance when planted.
   D. All other trees shall have a trunk free of branches up to a minimum of 6 feet.
2. Street trees shall not be less than 1.5 inches in caliper for broadleaf trees or 6 feet in height for evergreen/conifers.
3. For minimum unpaved planting area dimensions refer to tree well dimension detail, STANDARD PLAN NO. LS-03.
4. The accessible portion of the sidewalk must be a minimum of 5 feet and be free of obstructions.

MINIMUM TREE SETBACKS (AT PLANTING):

Centerline of tree to centerline of:	
Street corner (extension of outside face of curb)	25'-0"
Stop or yield sign	25'-0"
Utility pole	15'-0"
Other traffic control sign	5'-0"
Centerline of tree to edge of:	
Driveway	5'-0"
Face of curb	2'-6"
Pavement	2'-0"
Edge of tree to edge of:	
Utility worker access lids	5'-0"
Gas shutoff valves	5'-0"
Fire hydrant & hydrant branch	10'-0"
Water meter, water service & water mains	5'-0"
Storm inlet, cb, & manhole	5'-0"
Storm/sanitary service connections & mains	5'-0"

MINIMUM TREE CLEARANCES (AT MATURITY):

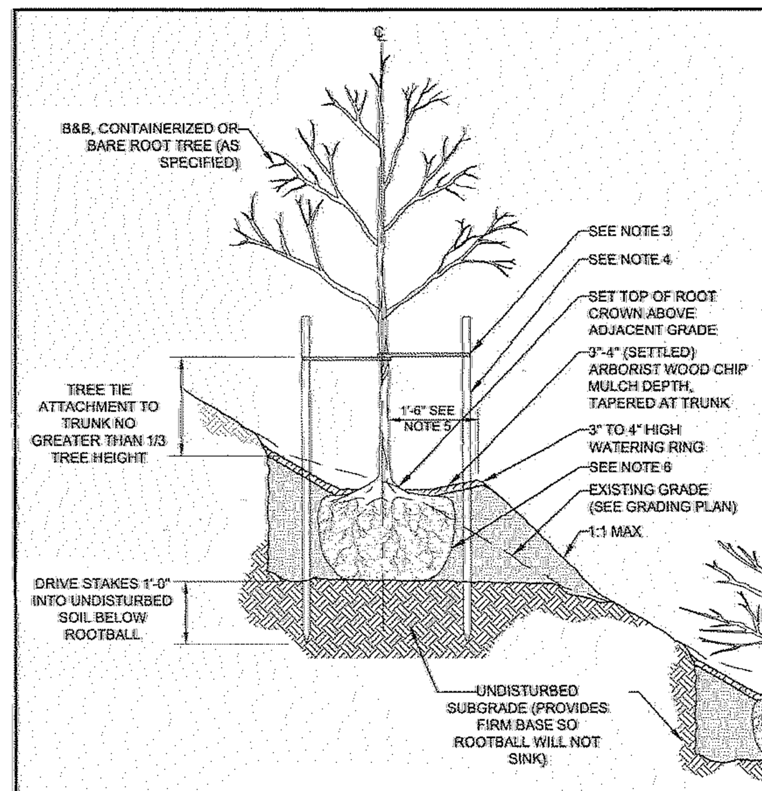
Lowest branch to surface of:	
Streets	14'-0"
Sidewalks	8'-0"



CITY OF TACOMA
DEPARTMENT OF PUBLIC WORKS

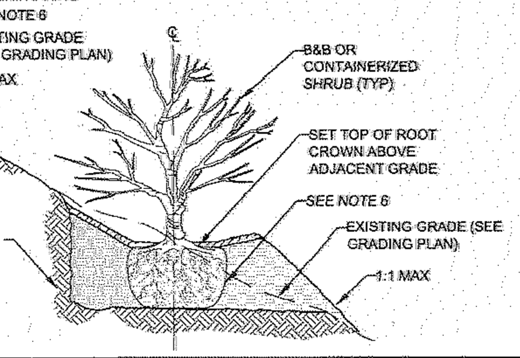
APPROVED FOR PUBLICATION
CITY ENGINEER — DATE

STREET TREE CLEARANCE
STANDARD PLAN NO. LS-02



NOTES:

1. Stake trees per STD PLAN NO. LS-01
2. Slopes steeper than 2:1 may require an approves embankment stabilization system to create a level tree pit such as
   -Rock facing
   -Precast concrete wall units
   -Timber wall
   -Manufactured slope retention units
3. "Chainlock" or equal tree tie material (1" side) nail or staple tree tie material to stake to hold vertically. Loop each tie around half tree loosely to provide 1" slack for trunk growth.
4. Stake tree with (2) treated 2"Ø rot resistant doweled wood tree stakes 6'-0" to 8'-0" in length located outside of root mass
5. Shape soil to provide 3' diameter or Rootball diameter, whichever is greater, watering ring.
6. Remove all wire, strings and burlap material from Rootball.



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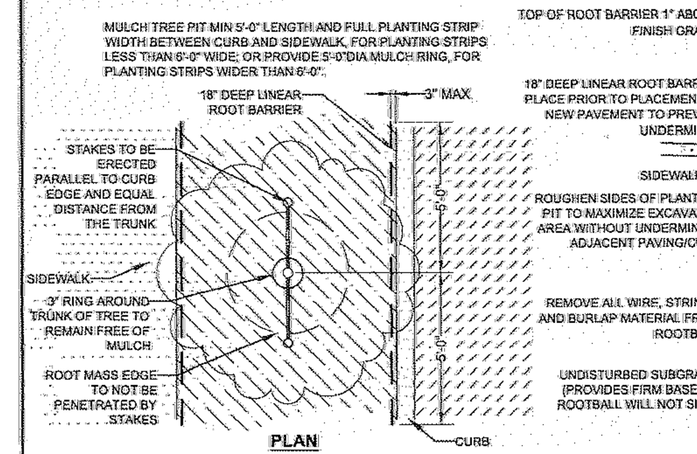
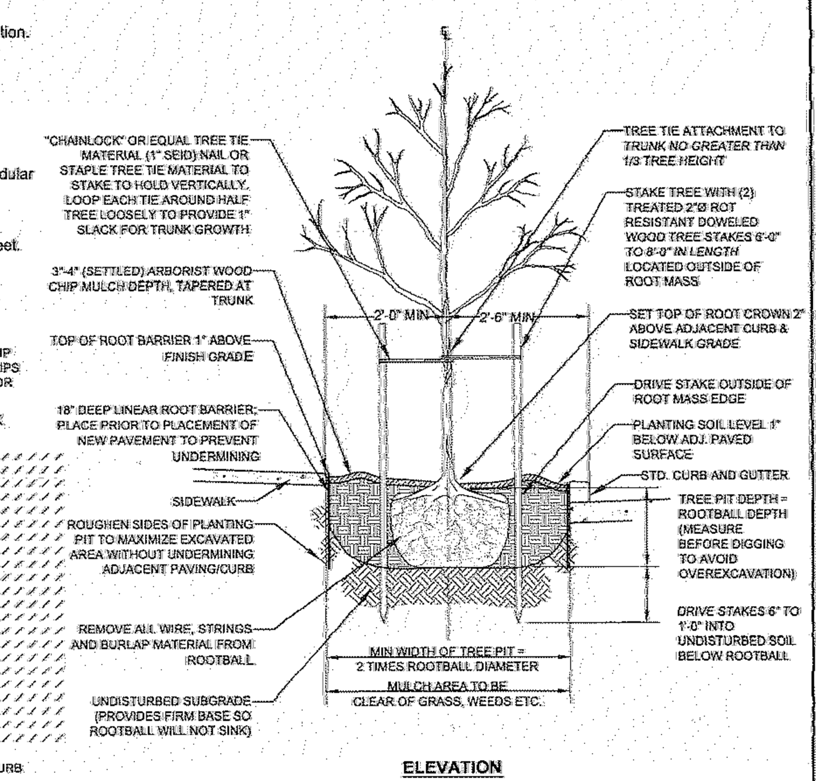
TREE & SHRUBS PLANTING ON SLOPES
STANDARD PLAN NO. LS-04

NOTES:

1. Planting includes removal of stakes one year after installation.
2. Shape soil surface to provide 4' dia watering ring.
3. Tree clearance shall be per STD PLAN LS-02.
4. See STD PLAN LS-03 for tree well dimension detail.
5. Root barriers shall be an injection molded or extruded modular component made of high density polypropylene or polyethylene plastic. 18" depth x 10' length root barrier is required along edge of roadways, curbs, driveways, trails, sidewalks, or other structures where root ball is within 4 feet. install root barrier for newly planted trees only.





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STREET TREE PLANTING
STANDARD PLAN NO. LS-01

TREE SIZE:

Trees are categorized as small, medium or large based the canopy factor, which takes into account the trees mature height, crown spread and growth ratE. The following formula shall be used to determine the canopy factor:

(MATURE HEIGHT IN FEET) X (MATURE WIDTH IN FEET) X (GROWTH RATE) X (0.01) = CANOPY FACTOR

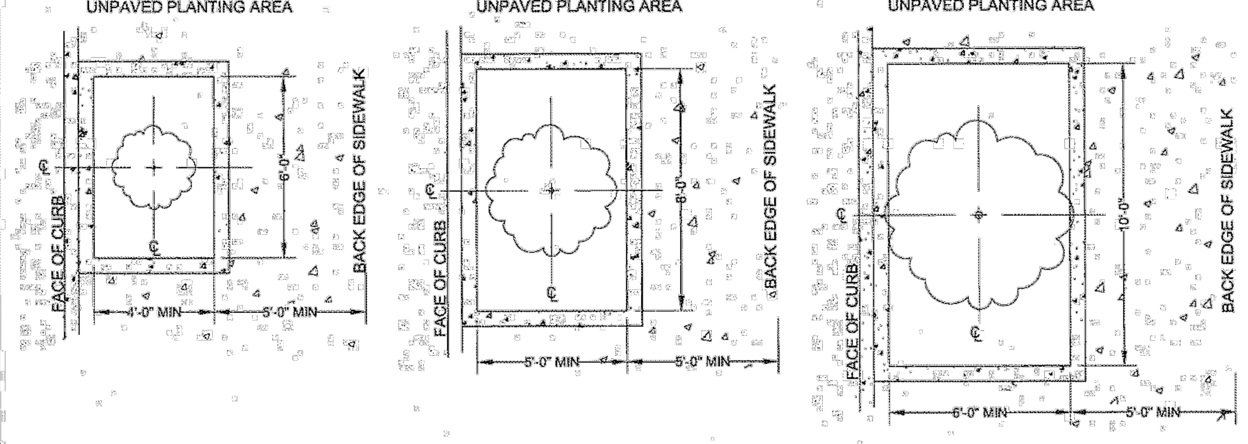
The growth rate number is 1 for slow growing trees, 2 for moderately growing trees and 3 for fast growing trees.

Tree size categories are as follows:
A. LARGE TREES = Canopy factor greater than 90
B. MEDIUM TREES = Canopy factor from 40-90
C. SMALL TREES = Canopy factor less than 40

SMALL TREES
24 SQUARE FEET MIN
UNPAVED PLANTING AREA

MEDIUM TREES
40 SQUARE FEET MIN
UNPAVED PLANTING AREA

LARGE TREES
60 SQUARE FEET MIN
UNPAVED PLANTING AREA



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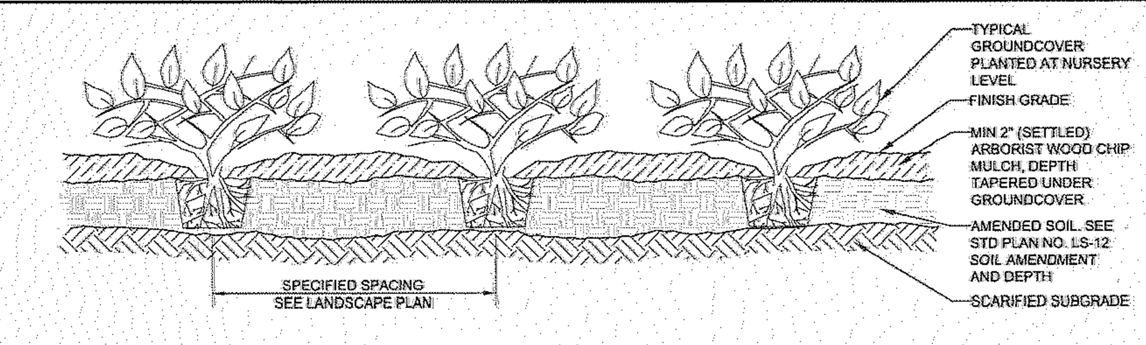
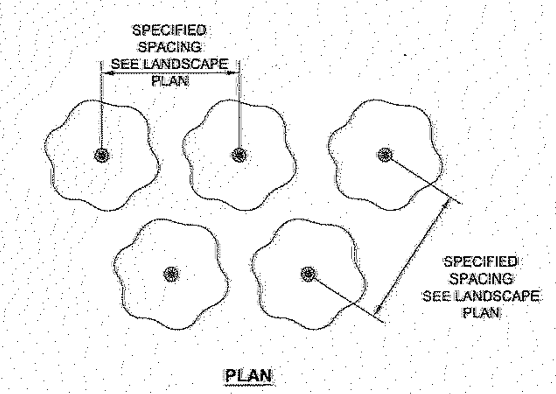
TREE WELL DIMENSION
STANDARD PLAN NO. LS-03



ELEVATION



PLAN

PLANT SPACING (INCHES)	PLANTS NEEDED TO FILL 100 SF
6	460
8	260
10	167
12	115
18	51
24	29
30	19
36	13
48	7

TYPICAL PLANT QUANTITY NEEDED TO FILL 100 SF

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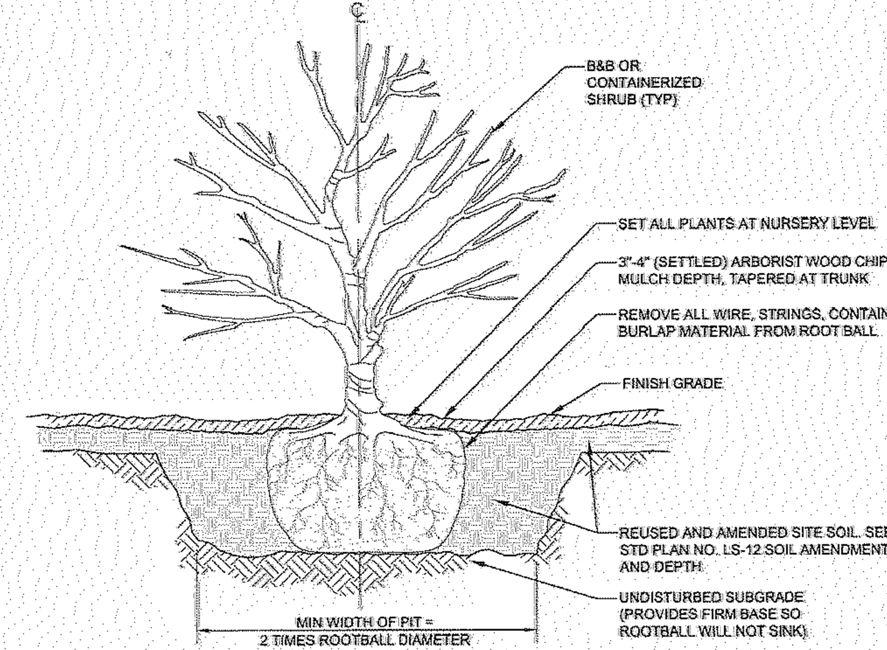
GROUNDCOVER PLANTING
STANDARD PLAN NO. LS-06



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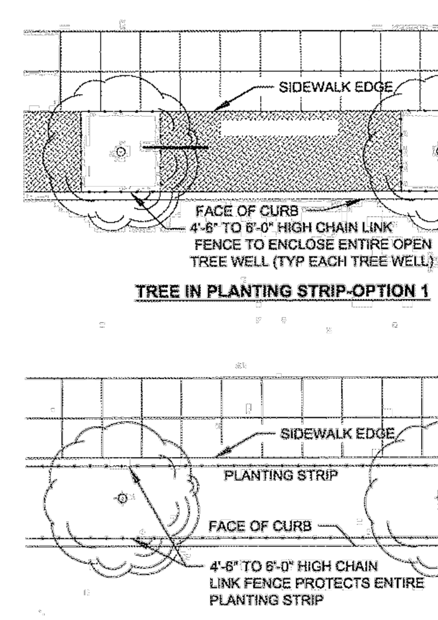
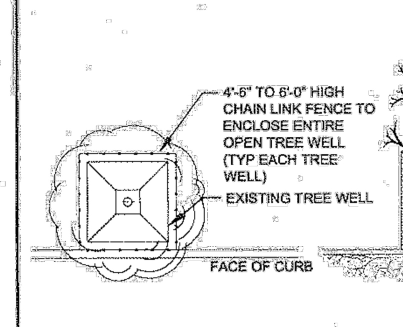
SHRUB PLANTING
STANDARD PLAN NO. LS-05

NOTES:

1. Tree protection requirements included in this standard detail are for trees which are directly adjacent to paved surfaces which will be retained through construction.
2. Required protection measures for trees other than those in tree wells and planting strips are contained in the TYPICAL TREE PROTECTION FENCING STANDARD PLAN NO. LS-09.
3. Reusable temporary tree and landscape protection fencing can be substituted for chain link fencing in tree wells and planting strips (SEE REUSABLE TREE PROTECTION FENCING FOR PAVED AREAS STANDARD PLAN NO. LS-11).
4. Consider traffic turning visibility and pedestrian visibility when selecting fence height; typically shorter fencing around tree pits between sidewalk and roadway is desired.





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TREE PROTECTION FENCING FOR TREES IN PAVED AREAS
STANDARD PLAN NO. LS-10

TREE PROTECTION ZONE (TPZ)

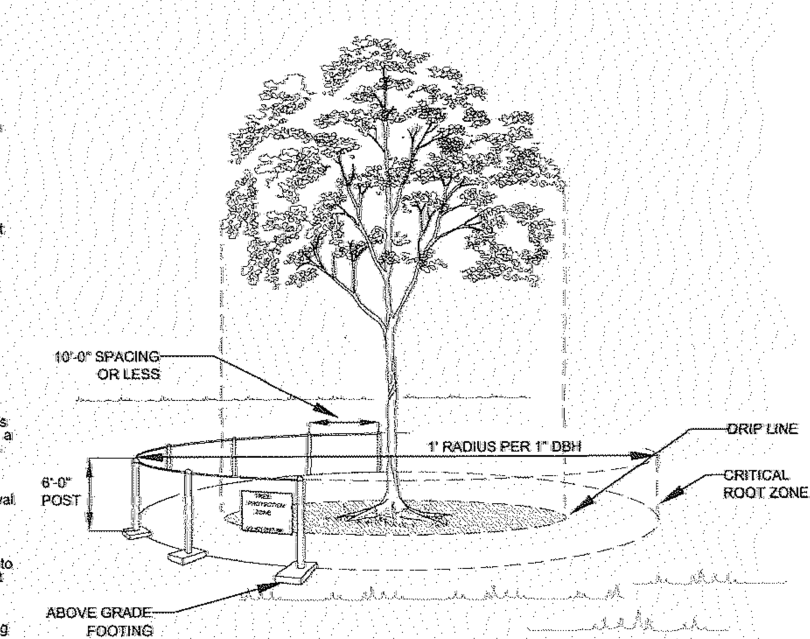
The Tree Protection Zone is an arborist defined area surrounding the trunk intended to protect the roots and soil to ensure future tree health and safety.

The location of the Tree Protection Zone is at the edge of the Critical Root Zone OR Drip Line, whichever is greater, or area as defined by the projects arborist.

For Critical Root Zone and Drip Line measurements see TREE PROTECTION DURING CONSTRUCTION STANDARD PLAN NO. LS-08.

TREE PROTECTION FENCING

1. Erect readily visible six-foot (6'-0") high chain link fencing at the edge of the Tree Protection Zone, and at the boundary of any open space tracts or conservation easements that abut the construction site except where, due to space restrictions, a specific distance is specified by the project's arborist.
2. Fencing shall be secured 6 foot metal posts with movable footings located above ground. metal posts shall not be more than 10 feet apart.
3. Fencing shall be flush with the initial undisturbed grade.
4. Signs shall be attached to the fencing stating that the tree is designated for protection and the area inside the fencing is a TPZ, which is not to be disturbed unless prior approval has been obtained from the city and/or the project's arborist.
5. Maintain the fencing in place until the city authorizes removal or a final certificate of occupancy is issued, whichever occurs first.
6. Ensure that any landscaping done in the TPZ, subsequent to the removal of the fencing, shall be accomplished with light machinery or hand labor.
7. No construction activity shall occur within the TPZ, including but not limited to:
   -Dumping or storage of materials such as building supplies, soil, waste items, and
   -storage of vehicles or equipment



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TREE PROTECTION DURING CONSTRUCTION
STANDARD PLAN NO. LS-09

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SEAL
STATE OF WASHINGTON — KRISTIN GLANDON — LANDSCAPE ARCHITECT — NO. 1118 EXP. 08/29/2024
07.24.2024

KG DESIGNS
(253) 341-9451
Kristin@kgdesignsjme.com

TACOMA PUBLIC SCHOOLS

PROJECT
TACOMA PUBLIC SCHOOLS
LOWELL ELEMENTARY REPLACEMENT
810 MR DAHL DR
TACOMA, WA 98403

REVISIONS

DATE 08.19.2024
BCRA NO. 23175
DRAWN BY: JM
REVIEWED BY: KG
SHEET TITLE
PLANTING DETAILS

SHEET
L-103
CUP SUBMITTAL

138 S.W. 154th Street
Suite B
Burien, Wa. 98166
Phone:206.244.1060
Fax: 206.244.1063

NOVO
Laboratory & Consulting Services, Inc.

May 6, 2024

Ms. Sarah D. Fischer
DBIA, AIA, LEED AP, NCARB
Senior Pre-Construction Manager
KORSMO CONSTRUCTION
1940 East D Street, Suite 300
Tacoma, Washington 98421

Transmitted via E-Mail, sfischer@korsmo.com

NOVO Project No. 0180-243.001

RE: Preliminary Draft Good Faith Inspection Letter
Lowell Elementary School Replacement Project

Dear Sarah:

Between the dates of April 1st, and 5th 2024, I, Richard L. Carlson (AHERA Building Inspector Certification #189376 Certification Expiration Date: May 22, 2024), AHERA-accredited Building Inspector, from NOVO Laboratory & Consulting Services, Inc. (NOVO) conducted a regulated building materials investigation of Lowell Elementary School located at 810 Mr. Dahl Drive in Tacoma, Washington.

The inspection included the testing of suspect asbestos-containing materials (ACM); collection of paint chip samples to identify the levels of lead paint; the assessment of various heavy metals and silica-containing construction materials, and the inspection of fluorescent lamps for polychlorinated biphenyl (PCB) containing ballast and mercury containing fluorescent light tubes.

The purpose of the survey was to provide information in order to meet the AHERA asbestos sampling protocol as stated in 40 CFR 763.86. This sampling protocol is required for all asbestos surveys prior to renovation or demolition of a building under the Puget Sound Clean Air Agency, Regulation III, Section 4.

In addition, the survey assists the building owner in meeting the "Good Faith Inspection" requirements as stated in Washington Administrative Code 296-62-07721, (Communication of Hazards to Employees). Under the regulation, the Owner of a building to be renovated or demolished must present a contractor with a written statement whether the materials to be disturbed contain asbestos prior to submitting a bid.

The lead paint assessment was performed in order to provide information to assist in complying with WAC 296-155-176, lead-in-construction and WAC 296-173-303. The lead-in-construction regulations are designed to protect workers from lead hazards during renovation, demolition, and other types of construction projects which impact lead containing materials.

Metals sampling was performed as a screening measure for eight EPA RCRA metals potentially associated with various building materials.

An investigation of the lighting fixtures was performed to determine the quantity and location of PCB containing ballast and mercury containing fluorescent light tubes. According to The Washington State Department of Ecology, local health departments, and landfills, PCB containing light ballast must be disposed of as hazardous waste. DOE recommends that fluorescent light tubes be recycled at an approved recycling facility.

The purpose of the survey for other regulated materials was to identify potential hazards within the proposed areas of work, communicate the hazards to prospective bidders and develop technical specifications for work impacting these hazards.

PROJECT INFORMATION

NOVO understands that the project will consist of the complete deconstruction of two existing school buildings including; a 1950 2-story and 1961 single-story buildings and the construction of a new building scheduled to open in the fall of ~~2028.~~ 2026

METHODS OF THE SURVEY

Asbestos

A walk-through inspection of accessible portions of subject property was performed to identify suspect asbestos-containing material (ACM). A limited inspection was conducted to investigate concealed areas throughout the subject buildings; however, not all concealed spaces have been surveyed for suspect ACM. If during the course of demolition of the buildings, suspect materials are discovered that are not identified in this report, the materials must be treated as asbestos containing until the material is sampled by an AHERA Certified Building Inspector and analyzed by an accredited laboratory.

Upon identifying a suspect material, its location and type were noted. Samples were obtained, placed in plastic bags, and labeled with an identification number. Samples were collected in accordance with the AHERA asbestos sampling protocol as stated in 40 CFR 763.86 to achieve a representative characterization of the visible suspect asbestos containing materials found.

Samples were collected within EPA guidelines to minimize potential contamination to the surrounding area. Bulk sample locations, associated notes, and observations were documented on-site at the time of sampling. All applicable data was transferred to the field data sheets.

A total of one hundred ninety-eight (198) bulk material samples were collected and analyzed for asbestos. The samples were analyzed for asbestos content using Polarized Light Microscopy (PLM) with dispersion staining in accordance with USEPA 600/M-82/020 test method. Samples for asbestos form minerals were analyzed in NOVO's Burien laboratory.

Lead Containing Paint

Representative paint chip samples were collected of various types of painted building components. Each area of paint to be sampled was scored with a sharp knife or scalpel, and the paint film was lifted off by sliding a thin blade along the score and underneath the paint. NOVO removed the paint down to the substrate (i.e. concrete, wood, steel, etc.), making sure all layers of paint were intact. Additional paints may exist under the surface coat in different areas other than those tested. Each sample was placed into a pre-labeled plastic bag and secured with a locking mechanism. Subsequently, a wet cloth was used to clean the area; all residual material was placed into a plastic bag and removed by NOVO.

Lead paint chip samples and chain-of-custody submittal sheets were delivered to EMC Labs in Phoenix, Arizona for lead analysis. EMC is accredited by the American Industrial Hygiene Association as an Environmental Lead Proficiency Analytical Testing (ELPAT) Lab. The paint chip samples were analyzed in accordance with the Environmental Protection Agency (EPA) Method 7000B.

Heavy Metals Containing Materials

The metals sampling was performed as a screening measure for eight EPA Resource Conservation and Recovery Act (RCRA) metals potentially associated with specific building materials at the school facility. Samples and chain-of-custody submittal sheets were delivered to Freemont Analytical for analysis. The samples were analyzed in accordance with EPA Method 6020B.

Polychlorinated Biphenyl (PCB) Light Ballast and Mercury Containing Fluorescent Light Tubes

Each homogeneous light fixture type identified was disassembled, and the ballast labeling examined. If the label on the ballast did not state, "NO PCB's", it was assumed to contain PCB's. There are fluorescent light tubes present throughout the building and they have been known to contain mercury.

Other Regulated Building Materials (Fugitive Dust and Silica)

For the other regulated materials, no sampling was performed. Our results are based on visual observations and research.

SAMPLING RESULTS AND DISCUSSION

Asbestos-Containing Materials

Below is a summary of the bulk asbestos samples collected during our inspection and their laboratory results:

Material Description	Sample #	Layer	Location	Lab Result
Vinyl wall base	LACM01	1	Classroom 201	NAD
Mastic (gold) associated with above base	LACM01	2	Classroom 201	NAD
Vinyl floor tile (9"x9" tan)	**LACM02**	**1**	**Classroom 201**	**5% Ch**
Mastic (black) associated with above tile	LACM02	2	Classroom 201	NAD
Asphaltic paper (black) located beneath floor tile	LACM03		Classroom 201	NAD
Cementitious wall base	LACM04		Classroom 201	NAD
Cementitious wall base	LACM05		Second floor main corridor	NAD
Linoleum (green & white) at column	LACM06		Classroom 201	NAD
Vinyl flooring (2'x2' blue)	LACM07		Classroom 201	NAD
Sheet vinyl (gold pebble pattern), associated backing and adhesives. Located below above blue vinyl	**LACM08**		**Classroom 201**	**35% Ch**
Countertop laminate (green & white)	LACM09		Classroom 201	NAD
Countertop laminate (red)	LACM10		Classroom 201	NAD
Carpet adhesive (gold) at walk off mat	LACM11		Second floor main corridor	NAD
Vinyl flooring (2'x2' light blue)	LACM12		Second floor main corridor	NAD
Leveling compound (gray) beneath carpet	LACM13		Classroom 202	NAD
Ceiling tile (1'x1' aligned dot)	LACM14		Classroom 202	NAD
Asphaltic paper (black) located beneath carpet	LACM15	1	Classroom 202	NAD
Mastic (black) associated with above paper	LACM15	2	Classroom 202	NAD
Light weight concrete over wood subfloor beneath carpet	LACM16		Classroom 204	NAD

Material Description	Sample #	Layer	Location	Lab Result
Carpet adhesive (gold)	LACM17		Main entry	NAD
Cementitious poured flooring	LACM18		Main entry	NAD
Vinyl floor tile (12”x12” beige)	LACM19	1	Main office area	NAD
Mastic (black) associated with above tile	LACM19	2	Main office area	NAD
Vinyl wall base	LACM20	1	Main office area	NAD
Mastic (clear) associated with above base	LACM20	2	Main office area	NAD
Ceiling panel (2’x4’ random)	LACM21		Main office area	NAD
Ceiling tile (1’x1’ aligned dot)	LACM22		Main office area	NAD
Gypsum wallboard above 1’x1’ ceiling tile	LACM23		Main office area	NAD
Vinyl floor tile (9”x9” green), beneath carpet	**LACM24**	**1**	**Main office area**	**5% Ch**
Mastic (black) associated with above tile	LACM24	2	Main office area	NAD
Sink undercoating (gray)	**LACM25**		**Staff lounge**	**2% Ch**
Vinyl floor tile (12”x12” beige)	LACM26	1	Staff lounge	NAD
Mastic (black) associated with above tile	LACM26	2	Staff lounge	NAD
Ceiling panel (2’x4’ random)	LACM27		Staff lounge	NAD
Cloth flex connector	**LACM28**		**Mezzanine at stage area**	**65% Ch**
Gypsum wallboard no joint compound present	LACM29		Mezzanine at stage area	NAD
Vinyl flooring (2’x2’ light blue)	LACM30	1	Auditorium	NAD
Mastic (black) associated with above tile	LACM30	2	Auditorium	NAD
Mastic (black)	LACM31	1	Auditorium	NAD
Light weight concrete	LACM31	2	Auditorium	NAD
Gypsum wallboard no joint compound present	LACM32		Mezzanine at stage area	NAD
Vinyl floor tile (12”x12” beige)	LACM33	1	Work room area	NAD
Mastic (black) associated with above tile	LACM33	2	Work room area	NAD

Material Description	Sample #	Layer	Location	Lab Result
Vinyl wall base	LACM34	1	Work room area	NAD
Mastic (gold) associated with above base	LACM34	2	Work room area	NAD
Joint compound	LACM34		Work room area	NAD
Ceiling panel (2'x4' random)	LACM35		Work room area	NAD
Sink undercoating (gray)	**LACM36**		**Work room area**	**5% Ch**
Ceiling tile (1'x1' aligned dot)	LACM37		Work room area	NAD
Ceiling panel (2'x4' random)	LACM38		Library	NAD
Carpet adhesive with residual black mastic	LACM39		Classroom 206	NAD
Countertop laminate (green & white)	LACM40	1	Classroom 207	NAD
Adhesive associated with above countertop	LACM40	2	Classroom 207	NAD
Mortar associated with glass block above windows	LACM41		Classroom 209	NAD
Paper behind unit ventilator	LACM42		Classroom 209	NAD
Vinyl floor tile (9"x9" red) beneath unit ventilator	**LACM43**	**1**	**Classroom 209**	**5% Ch**
Mastic (black) associated with above tile	LACM43	2	Classroom 209	NAD
Packing mud at floor penetration beneath unit ventilator	**LACM44**		**Classroom 209**	**30% Ch**
Exterior glazing compound at old metal framed windows	**LACM45**		**Classroom 209**	**3% Ch**
Carpet adhesive with residual black mastic	LACM46		Classroom 210	NAD
Ceiling tile (1'x1' craters)	LACM47		Basement	NAD
Ceiling tile (1'x1' craters)	LACM48	1	Basement	NAD
Mastic (brown) dot associated with above ceiling tile	LACM48	2	Basement	NAD
Wall tile (1'x1' craters)	LACM49		Basement	NAD
Mastic (brown) dot associated with above wall tile	LACM50		Basement	NAD

Material Description	Sample #	Layer	Location	Lab Result
Ceiling tile (1’x1’ craters)	LACM51		Basement	NAD
Wall tile (1’x1’ craters)	LACM52	1	Basement	NAD
Mastic (brown) dot associated with above ceiling tile	LACM52	2	Basement	NAD
Interior glazing compound at old metal framed windows	**LACM53**		**Basement**	**3% Ch**
Interior glazing compound at old metal framed windows	**LACM54**		**Basement**	**3% Ch**
Joint compound	LACM55	1	Classroom 101	NAD
Gypsum wallboard	LACM55	2	Classroom 101	NAD
Joint compound	LACM56	1	Classroom 103	NAD
Gypsum wallboard	LACM56	2	Classroom 103	NAD
Joint compound	LACM57	1	Boiler room	NAD
Gypsum wallboard	LACM57	2	Boiler room	
Wall tile (1’x1’ craters)	LACM58		Basement	NAD
Mastic (brown) dot associated with above wall tile	LACM59		Basement	NAD
Ceiling panel (2’x4’ craters)	LACM60		Classroom 103	NAD
Leveling compound (gray) below carpet	LACM61		Classroom 103	NAD
Vinyl floor tile (9”x9” red) beneath carpet	**LACM62**	**1**	**Classroom 103**	**5% Ch**
Mastic (black) associated with above tile	LACM62	2	Classroom 103	NAD
Wall tile (1’x1’ aligned dot)	LACM63		Classroom 103	NAD
Mastic (brown) dot associated with above wall tile	LACM64		Classroom 103	NAD
Sink undercoating (black)	LACM65		Classroom 103	NAD
Sealant (gray) at seams of sheet metal HVAC ducting	**LACM66**		**Classroom 103**	**5% Ch**
Carpet mastic (gold)	LACM67		Basement, telephone room	NAD
Interior glazing compound at old metal framed windows	LACM68		Classroom 101	NAD

Material Description	Sample #	Layer	Location	Lab Result
Ceiling tile (1'x1' craters)	LACM69		Basement, telephone room	NAD
Mastic (brown) dot associated with above ceiling tile	LACM70		Basement, telephone room	NAD
Ceiling panel (2'x4' craters)	LACM71		Classroom 101	NAD
Ceiling panel (2'x4' fissures)	LACM72		Basement, supply room	NAD
Joint compound	**LACM73**	**1**	**Classroom 104**	**<1% Ch**
Paper with joint compound	**LACM73**	**2**	**Classroom 104**	**<1% Ch**
Gypsum wallboard	LACM73	3	Classroom 104	NAD
Joint compound	LACM74	1	Classroom 107	NAD
Gypsum wallboard	LACM74	2	Classroom 107	NAD
Carpet adhesive with residual black mastic	LACM75		Classroom 104	NAD
Vinyl wall base	LACM76	1	Classroom 104	NAD
Mastic (brown) associated with above base	LACM76	2	Classroom 104	NAD
Sink undercoating (black)	LACM77		Classroom 105	NAD
Ceiling panel (2'x4' craters)	LACM78		Classroom 105	NAD
Vinyl wall base	LACM79	1	Classroom 105	NAD
Mastic (brown) associated with above base	LACM79	2	Classroom 105	NAD
Wall tile (1'x1' aligned dot)	LACM80		Basement	NAD
Mastic (brown) dot associated with above wall tile	LACM81		Basement	NAD
Primer coat (white) on concrete column	LACM82		Classroom 104	NAD
Primer coat (white) on concrete column	LACM83		Classroom 105	NAD
Primer coat (white) on concrete column	LACM84		Basement	NAD
Asphalt at crawlspace area	LACM85		Basement	NAD
Asphalt at crawlspace area	LACM86		Basement	NAD

Material Description	Sample #	Layer	Location	Lab Result
Asphalt at crawlspace area	LACM87		Basement	NAD
Paper remnants from sonotube at concrete column	LACM88		Basement	NAD
Exterior glazing compound at metal framed windows	LACM89		Main building exterior	NAD
Exterior frame sealant at metal window frames	**LACM90**		**Main building exterior**	**5% Ch**
Exterior frame sealant at metal window frames	**LACM91**		**Main building exterior**	**5% Ch**
Exterior frame sealant at metal window frames	**LACM92**		**Main building exterior**	**5% Ch**
Sealant at point of connection between exterior brick veneer and concrete at window openings	**LACM93**		**Main building exterior**	**5% Ch**
Sealant at point of connection between exterior brick veneer and concrete at window openings	**LACM94**		**Main building exterior**	**5% Ch**
Sealant at point of connection between metal window frame and concrete	**LACM95**		**Main building exterior**	**5% Ch**
Sealant at point of connection between metal window frame and concrete	**LACM96**		**Main building exterior**	**5% Ch**
Sealant at point of connection between metal window frame and concrete	**LACM97**		**Main building exterior**	**5% Ch**
Exterior glazing compound at metal framed windows	**LACM98**		**Main building exterior**	**5% Ch**
Exterior sealant at metal door frames	**LACM99**		**Main building exterior**	**5% Ch**
Exterior sealant at metal door frames	**LACM100**		**Main building exterior**	**5% Ch**
Sealant at CMU block exterior walls above windows	**LACM101**		**Main building exterior**	**5% Ch**
Sealant at CMU block exterior walls above windows	**LACM102**		**Main building exterior**	**5% Ch**
Sealant at CMU block exterior walls above windows	**LACM103**	**1**	**Main building exterior**	**5% Ch**
Sealant at CMU block exterior walls above windows	**LACM103**	**2**	**Main building exterior**	**5% Ch**

Material Description	Sample #	Layer	Location	Lab Result
Roofing shingle	LACM104		Storage shed	NAD
Asphaltic roofing paper below shingles	LACM105		Storage shed	NAD
Sealant (black) at wood framed window	LACM106		1961 classroom building exterior	NAD
Exterior sealant (gray) at wood framed window	**LACM107**		**1961 classroom building exterior**	**5% Ch**
Exterior sealant (gray) at wood framed window	**LACM108**		**1961 classroom building exterior**	**5% Ch**
Exterior sealant (gray) at wood framed window	**LACM109**		**1961 classroom building exterior**	**5% Ch**
Exterior sealant (gray) at main entrance door/window unit	**LACM110**		**Main building exterior**	**5% Ch**
Glazing compound at windows within main entry	LACM111		Main building exterior	NAD
Leveling compound	LACM112	1	Classroom 203	NAD
Asphaltic flooring paper	LACM112	2	Classroom 203	NAD
Mastic (brown) associated with above paper	LACM112	3	Classroom 203	NAD
Carpet adhesive (gold)	LACM113	1	Classroom 307	NAD
Vinyl floor tile (9”x9” tan)	**LACM113**	**2**	**Classroom 307**	**5% Ch**
Mastic (black) associated with above tile	LACM113	3	Classroom 307	NAD
Vinyl wall base	LACM114	1	Classroom 307	NAD
Mastic (brown) associated with above base	LACM114	2	Classroom 307	NAD
Cement asbestos board at wall	**LACM115**		**Classroom 307**	**30% Ch**
Sink undercoating (gray)	LACM116		Classroom 307	NAD
Carpet adhesive (gold)	LACM117	1	Classroom 307	NAD
Vinyl floor tile (9”x9” tan)	**LACM117**	**2**	**Classroom 307**	**5% Ch**
Mastic (black) associated with above tile	LACM117	3	Classroom 307	NAD
Ceiling tile (1’x1’ scrambled punch)	LACM118		Classroom 307	NAD
Ceiling tile (1’x1’ scrambled punch)	LACM119	1	Classroom 307	NAD

Material Description	Sample #	Layer	Location	Lab Result
Mastic (brown) dot associated with above ceiling tile	LACM119	2	Classroom 307	NAD
Ceiling tile (1'x1' scrambled punch)	LACM120		Classroom 307	NAD
Mastic (brown) dot associated with above ceiling tile	LACM121		Classroom 307	NAD
Vinyl wall base	LACM122	1	Classroom 307	NAD
Mastic (brown) associated with above base	LACM122	2	Classroom 307	NAD
Joint compound	**LACM123**	**1**	**Classroom 307**	**<1% Ch**
Gypsum wallboard	LACM123	2	Classroom 307	NAD
Joint compound	**LACM124**	**1**	**Classroom 307**	**<1% Ch**
Gypsum wallboard	LACM124	2	Classroom 307	NAD
Joint compound	**LACM125**	**1**	**Classroom 307**	**<1% Ch**
Gypsum wallboard	LACM125	2	Classroom 307	NAD
Carpet adhesive	LACM126		Classroom 305/306	NAD
Vinyl wall base	LACM127	1	Classroom 305/306	NAD
Mastic (brown) associated with above base	LACM127	2	Classroom 305/306	NAD
Mastic (clear) associated with above base	LACM127	3	Classroom 305/306	NAD
Vinyl floor tile (9"x9" brown)	**LACM128**	**1**	**Classroom 305/306**	**5% Ch**
Mastic (black) associated with above tile	LACM128	2	Classroom 305/306	NAD
Sheet vinyl (gray pebble pattern), associated backing	LACM129	1	Classroom 305/306	NAD
Adhesive (gold) associated with above vinyl	LACM129	2	Classroom 305/306	NAD
Vinyl floor tile (12"x12" beige)	LACM130	1	Classroom 305/306	NAD
Mastic (black) associated with above tile	LACM130	2	Classroom 305/306	NAD
Vinyl wall base	LACM131	1	Classroom 305/306	NAD
Mastic (brown) associated with above base	LACM131	2	Classroom 305/306	NAD

Material Description	Sample #	Layer	Location	Lab Result
Window sealant (black gummy)	LACM132		Classroom 305/306	NAD
Ceiling tile (1'x1' scrambled punch)	LACM133		Classroom 305/306	NAD
Mastic (brown) dot associated with above ceiling tile	LACM134		Classroom 305/306	NAD
Ceiling tile (1'x1' scrambled punch)	LACM135		Classroom 305/306	NAD
Mastic (brown) dot associated with above ceiling tile	LACM136		Classroom 305/306	NAD
Joint compound	**LACM137**	**1**	**Classroom 305/306**	**<1% Ch**
Gypsum wallboard	LACM137	2	Classroom 305/306	NAD
Joint compound	**LACM138**	**1**	**Classroom 305/306**	**<1% Ch**
Gypsum wallboard	LACM138	2	Classroom 305/306	NAD
Joint compound	**LACM139**	**1**	**Classroom 305/306**	**<1% Ch**
Gypsum wallboard	LACM139	2	Classroom 305/306	NAD
Ceiling tile (1'x1' scrambled punch)	LACM140		Classroom 303/304	NAD
Mastic (brown) dot associated with above ceiling tile	LACM141		Classroom 303/304	NAD
Vinyl floor tile (9"x9" brown)	**LACM142**	**1**	**Classroom 303/304**	**5% Ch**
Mastic (black) associated with above tile	LACM142	2	Classroom 303/304	NAD
Vinyl wall base	LACM143	1	Classroom 303/304	NAD
Mastic (brown) associated with above base	LACM143	2	Classroom 303/304	NAD
Vinyl floor tile (12"x12" white with black)	LACM144	1	Classroom 303/304	NAD
Mastic (black) associated with above tile	LACM144	2	Classroom 303/304	NAD
Vinyl floor tile (9"x9" beige)	**LACM145**	**1**	**Classroom 303/304**	**5% Ch**
Mastic (black) associated with above tile	LACM145	2	Classroom 303/304	NAD
Joint compound with wall paper	**LACM146**	**1**	**Classroom 303/304**	**<1% Ch**
Gypsum wallboard	LACM146	2	Classroom 303/304	NAD
Joint compound	**LACM147**	**1**	**Classroom 303/304**	**<1% Ch**

Material Description	Sample #	Layer	Location	Lab Result
Gypsum wallboard	LACM147	2	Classroom 303/304	NAD
Joint compound	**LACM148**	**1**	**Classroom 303/304**	**<1% Ch**
Gypsum wallboard	LACM148	2	Classroom 303/304	NAD
Ceiling tile (1’x1’ scrambled punch)	LACM149		Classroom 303/304	NAD
Mastic (brown) dot associated with above ceiling tile	LACM150		Classroom 303/304	NAD
Carpet adhesive with residual black mastic	LACM151		Classroom 303/304	NAD
Vinyl floor tile (12”x12” off white)	LACM152		Classroom 301/302	NAD
Joint compound	LACM153	1	Classroom 301/302	NAD
Gypsum wallboard	LACM153	2	Classroom 301/302	NAD
Carpet adhesive with residual black mastic	LACM154		Classroom 301/302	NAD
Joint compound	LACM155	1	Classroom 301/302	NAD
Gypsum wallboard	LACM155	2	Classroom 301/302	NAD
Joint compound	LACM156	1	Classroom 301/302	NAD
Gypsum wallboard	LACM156	2	Classroom 301/302	NAD
Ceiling tile (1’x1’ scrambled punch)	LACM157		Classroom 301/302	NAD
Mastic (brown) dot associated with above ceiling tile	LACM158		Classroom 301/302	NAD
Ceiling tile (1’x1’ scrambled punch)	LACM159		Classroom 301/302	NAD
Mastic (brown) dot associated with above ceiling tile	LACM160		Classroom 301/302	NAD
Vinyl floor tile (9”x9” brown)	**LACM161**	**1**	**Classroom 301/302**	**5% Ch**
Mastic (black) associated with above tile	LACM161	2	Classroom 301/302	NAD
Vinyl floor tile (12”x12” beige)	LACM162	1	Classroom 301/302	NAD
Mastic (gold) associated with above tile	LACM162	2	Classroom 301/302	NAD
Vinyl wall base	LACM163	1	Classroom 301/302	NAD
Mastic (brown) associated with above base	LACM163	2	Classroom 301/302	NAD

Material Description	Sample #	Layer	Location	Lab Result
Carpet adhesive (gold)	LACM164		Classroom 301/302	NAD
Silver coat at roof hatch	LACM165	1	Main building roof	NAD
Roofing tar / mastic at roof hatch	LACM165	2	Main building roof	NAD
Roofing tar / mastic at metal flashing	LACM166		Main building roof	NAD
Roofing tar / mastic at seams of sheet metal ducting	LACM167		Main building roof	NAD
Silver coat, at exhaust pipe roof penetration	LACM168	1	Main building roof	NAD
Roofing tar / mastic, at exhaust pipe roof penetration	LACM168	2	Main building roof	NAD
Roofing tar / mastic at exhaust pipe roof penetration	**LACM168**	**3**	**Main building roof**	**15% Ch**
Sealant (gray) at HVAC duct	LACM169		Main building roof	**5% Ch**
Silver coat	LACM170	1	Main building roof	NAD
Roofing tar / mastic at HVAC duct	LACM170	2	Main building roof	NAD
Roofing tar / mastic at HVAC duct	**LACM170**	**3**	**Main building roof**	**15% Ch**
Built-up roofing material	LACM171		Main building roof	NAD
Built-up roofing material	LACM172		Main building roof	NAD
Built-up roofing material at parapet wall	LACM173	1	Main building roof	NAD
Built-up roofing material at parapet wall	LACM173	2	Main building roof	NAD
Built-up roofing material	LACM174	1	Main building roof	NAD
Built-up roofing material	LACM174	2	Main building roof	NAD
Built-up roofing material	LACM174	3	Main building roof	NAD
Built-up roofing material	LACM175	1	Main building roof	NAD
Built-up roofing material	LACM175	2	Main building roof	NAD
Built-up roofing material	LACM175	3	Main building roof	NAD
Built-up roofing material	LACM176	1	Main building roof	NAD
Built-up roofing material	LACM176	2	Main building roof	NAD

Material Description	Sample #	Layer	Location	Lab Result
Built-up roofing material	LACM176	3	Main building roof	NAD
Built-up roofing material	LACM177	1	Main building roof	NAD
Built-up roofing material	LACM177	2	Main building roof	NAD
Built-up roofing material	LACM177	3	Main building roof	NAD
Built-up roofing material	LACM178	1	Main building roof	NAD
Built-up roofing material	LACM178	2	Main building roof	NAD
Built-up roofing material	LACM178	3	Main building roof	NAD
Built-up roofing material	LACM179	1	Main building roof	NAD
Built-up roofing material	LACM179	2	Main building roof	NAD
Built-up roofing material	LACM179	3	Main building roof	NAD
Built-up roofing material	LACM180	1	Main building roof	NAD
Built-up roofing material	LACM180	2	Main building roof	NAD
Roofing at concrete window ledge	LACM181	1	Main building roof	NAD
Roofing at concrete window ledge	**LACM181**	**2**	**Main building roof**	**15% Ch**
Sealant (gray) at HVAC duct	LACM182		Main building roof	NAD
Sealant (gray) at HVAC duct	LACM183		Main building roof	NAD
Sealant (gray) at boiler exhaust	**LACM184**		**Main building roof**	**5% Ch**
Roofing tar on concrete deck below roofing	LACM185		Main building roof	NAD
Built-up roofing material	LACM186	1	Main building roof	NAD
Built-up roofing material	LACM186	2	Main building roof	NAD
Built-up roofing material	LACM186	3	Main building roof	NAD
Built-up roofing material	LACM186	4	Main building roof	NAD
Roofing tar on concrete deck below roofing	LACM187		Main building roof	NAD
Built-up roofing material	LACM188		1961 classroom building roof area	NAD

Material Description	Sample #	Layer	Location	Lab Result
Built-up roofing material	LACM189		1961 classroom building roof area	NAD
Built-up roofing material	LACM190		1961 classroom building roof area	NAD
Built-up roofing material	LACM191		1961 classroom building roof area	NAD
Built-up roofing material	LACM192	1	1961 classroom building roof area	NAD
Built-up roofing material	LACM192	2	1961 classroom building roof area	NAD
Built-up roofing material	LACM192	3	1961 classroom building roof area	NAD
Built-up roofing material	LACM192	4	1961 classroom building roof area	NAD
Built-up roofing material	LACM193		1961 classroom building roof area	NAD
Roofing tar at aggregate patch	LACM194		1961 classroom building roof area	NAD
Roofing tar / mastic at metal flashing	LACM195		1961 classroom building roof area	NAD
Cementitious wall base	LACM196	1	Second floor main corridor	NAD
Mastic (brown)	LACM196	2	Second floor main corridor	NAD
Cementitious wall base	LACM197		Second floor main corridor	NAD
Cementitious wall base	LACM198		Second floor main corridor	NAD

Legend:

ACM	Asbestos Containing Material	NAD	No Asbestos Detected
Ch	Chrysotile Asbestos	Tr	Tremolite Asbestos

The following ACM (>1% asbestos) has been identified in association with the subject property:

- Vinyl floor tile (9"x9"), with non-asbestos containing mastic present within classrooms 101, 102, 103, 201, and within select portions of the main office area. ACM tiles are located beneath a layer of carpet.
- Vinyl floor tile (9"x9"), with non-asbestos containing mastic present beneath unit ventilators throughout the main building second floor.

- Vinyl floor tile (9"x9"), with non-asbestos containing mastic present throughout classroom building 307.
- Vinyl floor tile (9"x9"), with non-asbestos containing mastic present at entry areas within classroom buildings 301/302, 303/304, and 305/306.
- Vinyl floor tile (9"x9"), with non-asbestos containing mastic present at classroom building 303/304 restroom.
- Sheet vinyl flooring, associated backing and adhesives present within classroom 201 at sink area. ACM sheet vinyl is located beneath a layer of non-asbestos vinyl tile.
- Stainless steel sinks contaminated with asbestos containing undercoating (gray) located within the main building, second floor work room and staff lounge areas.
- Cloth vibration joint connectors associated with mechanical units at the mechanical mezzanines near the stage area.
- Packing mud at pipe penetrations at floor areas present beneath unit ventilators throughout the main building second floor.
- Glazing compounds and perimeter frame sealants associated with metal framed windows present throughout the main building.
- Perimeter frame sealants associated with wood framed windows present throughout 1961 classroom building's exterior.
- Sealant at seams of sheet metal HVAC ducting present within select ceiling areas at the main building basement.
- Sealant at point of connection between exterior brick veneer and concrete at select window openings at the main building.
- Sealant at perimeter of CMU block exterior walls above windows at the main building. Sealant is present at both interior and exterior areas associated with the CMU block walls.
- Sealant at perimeter of exterior metal door frames present throughout the main school building.
- Cement asbestos board wall panel (4'x4'), at storage area within classroom building 307.
- Roof mastics and sealants at select applications including; pipe penetrations, metal flashing, rooftop HVAC equipment and ducting, and roof hatches across the main building roof area.
- Roofing material at the exterior concrete window ledges associated with the roof level, high bay windows for the gymnasium.
- Hard pipe insulation and associated fittings and joints routed throughout the main building.
- Hard mudded pipe fittings and joints associated with fiberglass insulation on select piping routed throughout the main building.

- and, Tank insulation associated with a single raised water tank located within the main building boiler room.

Due to the safety concerns associated with conducting sampling within live electrical panels, components within electrical panels observed throughout the building were not sampled. Until sampling can be arranged, components within electrical panels should be presumed to contain asbestos.

Due to destructive sampling requirements and the possibility of voiding product warranties the following conditions and materials were not accessible and are presumed asbestos-containing materials. Until sampling can be arranged, these materials should be presumed to contain asbestos.

- fire doors and associated frames;
- Gaskets associated with mechanical piping valves and flanges;
- Cores associated with sheet metal exhaust hoods located within the main building kitchen area;
- Moisture/vapor barriers beneath hard wood flooring;
- CMU hollow block exterior walls may have asbestos contaminated vermiculite insulation within the interior portions of the block;
- 9”x9” vinyl floor tiles may be present beneath existing casework and interior walls at the main building;
- Select chalk boards within the main school building;
- Mastics and adhesives associated with cork boards, tack boards, white boards, and chalkboards;
- Mastics and adhesives associated with ceramic floor and wall tiles present at select restrooms and the kitchen within the main school building.
- and, the transformer vault located beneath the main entrance stairwell was inaccessible during our initial investigation phase. There may be suspect ACM within this space. In addition, transformers may have PCB containing oils.

Additional investigation will be performed by NOVO following completion of the 2024 school year to address the conditions noted on the previous page.

The following materials were tested and found to contain 1% or less asbestos:

- Joint compound associated with gypsum wallboard systems throughout both the main 1950 school building and each of the four 1961 classroom buildings.

The federal Occupational Safety & Health Administration (OSHA), and the State Department of Labor and Industries regulate these materials for worker protection and permit purposes. Initial exposure assessments are required prior to work impacting these materials, but are not regulated to the same degree as materials containing greater than 1% asbestos.

Additional suspect asbestos-containing materials may be present within hidden locations. If due to change in scope or other unforeseen conditions, additional areas or materials not addressed in this report become likely to be impacted, the materials must be treated as asbestos-containing until the material is sampled by an AHERA Certified Building Inspector and analyzed by an accredited laboratory.

Lead Containing Paint

The table provided below lists the suspect paints sampled during the inspection and the laboratory results:

Sample No.	Location	Surface Color	Building Component	Substrate	Lab Result
LLCP01	**Classroom 201**	**Off white**	**Wall**	**CMU**	**0.109%**
LLCP02	**Basement Level**	**Tan**	**Wall**	**GWB**	**0.122%**
LLCP03	**Basement Level**	**Blue**	**Column**	**Concrete**	**0.205%**
LLCP04	**Basement Level**	**Blue**	**Door frame**	**Metal**	**0.206%**
LLCP05	**Basement Level**	**Tan**	**Ceiling**	**Concrete**	**0.096%**
LLCP06	**Basement Level**	**White**	**Wall**	**Concrete**	**0.111%**
LLCP07	**Basement Level**	**Tan**	**Window frame**	**Wood**	**0.115%**
LLCP08	**Basement Level**	**White**	**Window frame**	**Metal**	**0.118%**
LLCP09	**South exterior**	**Tan**	**Wall**	**Concrete**	**0.056**
LLCP10	**North exterior**	**White**	**Window frame**	**Metal**	**1.68%**
LLCP11	**South exterior**	**Green**	**Window frame**	**Wood**	**2.67%**
LLCP12	**Covered play area**	**Tan**	**Structural beam**	**Metal**	**<0.025%**
LLCP13	**1961 Buildings exterior**	**Tan**	**Trim**	**Wood**	**<0.031%**
LLCP14	**1961 Buildings exterior**	**Off white**	**Window frame**	**Wood**	**1.44%**
LLCP15	**1961 Buildings exterior**	**Blue**	**Metal column**	**Metal**	**0.738%**

Sampling results indicate that painted building components contain some amount of lead in paint. Renovation operations are likely to disturb lead-containing building materials and result in worker exposure to lead. Necessary precautions shall be taken to prevent or minimize the release of lead in the form of dust, fumes or mists from lead-containing building materials into the air or onto surrounding environments. All workers and supervisory personnel who will be at the job site must be informed of the potential hazards of lead and of necessary precautions and housekeeping procedures to reduce the potential for exposure in areas where lead is known or suspected to be present.

For work on painted building components, which may result in personnel exposures, the contractor must assess the hazard. Based on the assessment, and previous similar work and exposure monitoring results, the contractor may have to provide any or all of the following for employees per WAC 296-155-176:

- Respiratory protection.
- Protective clothing.
- Clean change areas.
- Clean hand washing facilities.
- Biological monitoring to consist of blood sampling and analysis for lead and zinc protoporphyrin levels.
- Hazard communication training.

Initial employee exposure monitoring must be conducted for each separate task involving the handling of lead containing painted building materials. If 8-hour time-weighted average (TWA) exposures exceed the action level of 30 micrograms of lead per cubic meter of air ($\mu g/m^3$), the contractor must continue to conduct periodic air monitoring at specified intervals, and institute medical surveillance and comprehensive training programs. If the WAC/OSHA 8-hour TWA permissible exposure limit (PEL) of 50 $\mu g/m^3$ for lead is exceeded, more stringent and additional requirements become effective, such as engineering controls, respiratory protection, regulated work areas and warning signs in lead work areas.

The disposal of the construction debris with lead paints is also a key issue. The Washington State Department of Ecology, local health departments, and landfills are responsible for regulating the disposal of the lead paints. Dangerous waste testing for lead (Toxicity Characteristics Leaching Procedure - TCLP) must be performed prior to disposal of the construction debris. Testing should also be performed after it is decided how the debris will be segregated for disposal. Debris with lead-based paint leaching greater than 5.0 mg/L during TCLP analysis are classified as dangerous waste under the Washington Administrative Code (WAC 173-303) and the EPA Code of Federal Regulations (CFR 40 Part 261).

Heavy Metals

Historical data indicates the following materials are presumed to contain lead:

- lead pipes, lead soldering on copper lines;
- galvanized ductwork;
- sheet metal and mechanical equipment;
- lead glazing on all ceramic tile walls, floors and baseboards;
- lead counterbalances;
- and, lead sleeves at rooftop exhaust pipes.

Metals sampling was performed as a screening measure for eight EPA RCRA metals potentially associated with various building materials at the school. Laboratory results indicate the presence of metals as indicated below:

- Mortar associated with typical interior concrete masonry units (CMU) block walls was found to contain arsenic (22.7 mg/Kg), barium (71.4 mg/Kg), cadmium (0.0519 mg/Kg), chromium (24.3 mg/Kg), lead (51.5 mg/Kg), mercury (0.265 mg/Kg) and selenium (0.265 mg/Kg).
- Mortar associated with typical exterior brick veneer walls was found to contain arsenic (19.8 mg/Kg), barium (40.0 mg/Kg), cadmium (0.376 mg/Kg), chromium (17.2 mg/Kg), lead (11.5 mg/Kg), mercury (0.140 mg/Kg) and selenium (0.397 mg/Kg).
- Mortar associated with typical exterior CMU block walls was found to contain arsenic (3.17 mg/Kg), barium (43.0 mg/Kg), cadmium (0.0416 mg/Kg), chromium (14.8 mg/Kg), lead (4.76 mg/Kg), and selenium (0.251 mg/Kg).

Polychlorinated Biphenyl (PCB) Light Ballast and Mercury-Containing Fluorescent Light Tubes

Suspect PCB-containing light ballast were observed at specific areas throughout the subject property. The Washington State Department of Ecology, local health departments, and landfills are responsible for regulating the disposal of polychlorinated biphenyl-filled light ballast. Washington State regulations specifically ban the disposal of PCB-filled ballast from sanitary landfills.

There are fluorescent light tubes present throughout the subject property and they have been known to contain mercury. The Washington State Department of Ecology recommends that fluorescent light tubes be recycled at an approved recycling facility.

Fugitive and Silica Dust

All Construction work will potentially generate fugitive dust. Contractors must control the release of all fugitive dust levels and to comply with the latest regulations from the State of Washington Department of Labor and Industries (WISHA), Puget Sound Clean Air Agency (PSCAA) and any other applicable federal, state, and local government regulations.

Certain building materials including but not limited to the following; concrete, brick, mortar, glass, gypsum wallboard, asphalt filler, plaster, ceramic tile, roofing granules, caulking (clay), fireproofing, and construction dust are presumed to contain silica. The contractor must be informed of the presence of silica-containing construction materials and the requirements of WAC 296-062-07515.

Underground Storage Tanks (UST)

Historical drawings indicate the presence of (1) 6,000-gallon heating oil UST, one (1) 400-gallon starter fuel heating oil UST, and associated underground piping systems. The design team will discuss rather the UST system will be decommissioned and closed in place the UST or decommissioned and removed.

LIMITATIONS

The conclusions of the report are professional opinions based solely upon visual site observations and interpretations of analyses as described in our report. The opinions presented herein apply to the site conditions existing at the time of our investigation and interpretation of current regulations pertaining to regulated materials. Therefore, our opinions and recommendations may not apply to future conditions that may exist at the building, which we have not had the opportunity to evaluate. The regulations should always be verified prior to any work involving regulated materials.

A representative number of wall and ceiling cavities, and mechanical chases were inspected. The number of these areas included in the inspection was determined to be sufficient by the inspector for the for the purpose of identification and quantification of suspect ACM. However, not all concealed areas have been surveyed for suspect ACM.

If during the course of renovation work, suspect materials are discovered that are not identified in this report, the materials must be treated as asbestos containing until the material is sampled by an AHERA Certified Building Inspector and analyzed by an accredited laboratory.

Within the limitations of scope, schedule, and budget, our services have been executed in accordance with generally accepted practices in this area at the time this report was prepared. No other hazardous materials/wastes were investigated. No other conditions, expressed or implied, should be understood.

It is a pleasure doing business with you. If you have questions or require additional information please contact me at 206.244.1060 or via email at rich@novolc.com. Thank you.

Sincerely,

Richard L. Carlson
Consulting Services Manager

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253.383.4940

April 29, 2024

Tacoma Public Schools
c/o Korsmo Construction
1940 East D Street, Suite 300
Tacoma, Washington 98401

Attention: Sarah Fischer, AIA, DBIA

Subject: Soil Sampling and Analytical Results Summary
Tacoma Smelter Plume Evaluation
Lowell Elementary School Replacement
Tacoma, Washington
File No. 0522-043-01

Introduction and Project Understanding

GeoEngineers is pleased to present this letter summarizing the Tacoma Smelter Plume (TSP) soil sampling activities performed at the Lowell Elementary School property located at 810 Mr. Dahl Drive in Tacoma, Washington (Property). The approximately 2.81-acre Property is shown on the Vicinity Map, Figure 1. The Property is undergoing redevelopment by Tacoma Public Schools including demolition of existing structures and reconstruction of new elementary school facilities including administrative and classroom buildings, outdoor playgrounds, landscaped areas and parking lots.

The Lowell Elementary School property is located within the footprint of the area-wide contamination from the Tacoma Smelter Plume (TSP) as mapped by the Washington State Department of Ecology (Ecology). The Ecology map shows predicted arsenic concentrations in surface/near surface soil relative to the Ecology Model Toxics Control Act (MTCA) Method A cleanup level for unrestricted land use of 20 milligrams per kilogram (mg/kg). This information is made available to the public through Ecology's Dirt Alert website at https://fortress.wa.gov/ecy/dirtalert/. Based on the Ecology map, the arsenic concentrations are predicted to be between 20 mg/kg and 40 mg/kg in surface soil on the Property. As a result, samples are required to be collected for laboratory chemical analysis to characterize the soil from 0 to 6 inches below ground surface (bgs) and 6 to 12 inches bgs in accordance with Ecology requirements.

GeoEngineers prepared a field sampling plan for our staff to follow that included the sampling locations and requirements for evaluation consistent with the Tacoma Smelter Plume Model Remedies Guidance (TSPMRG) document (Ecology 2019). The samples for this evaluation were combined into one decision unit (DU1) for the Property, as discussed below. The TSP soil sampling was performed on April 3, 2024 at the

Property, and soil samples were collected from 0 to 6 inches bgs at 24 locations and from 6 to 12 inches bgs at six locations in accordance with the TSPMRG document.

The following sections describe the methodology, field activities and results of the TSP evaluation for the Lowell Elementary School property.

Methodology

One decision unit (DU1) was selected for the Property based on information that the entire property is planned for redevelopment. The evaluation consisted of the collection of soil samples from 0 to 6 inches bgs and 6 to 12 inches bgs from boring locations that were approximately evenly spaced across the Property. A combined total of 30 soil samples were collected to characterize arsenic and lead concentrations over the approximately 2.81 acre Property.

Samples were collected from soil borings representing decision unit DU-1 that included the following:

- 0 to 6 inches bgs depth interval – 24 soil samples.
- 6 to 12 inches bgs depth interval – six soil samples (25 percent of the total soil boring locations).

The sampling locations are presented on Figure 2.

Based on the TSPMRG, soil concentrations within a decision unit are considered elevated if the average arsenic concentration is greater than 20 mg/kg and/or the average lead concentration is greater than 250 mg/kg, or if any single sample has an arsenic concentration greater than 40 mg/kg and/or a lead concentration greater than 500 mg/kg.

Field Activities and Chemical Analyses

Soil samples were collected at the Lowell Elementary School property on April 3, 2024 for chemical analysis. Twenty-four soil borings were completed on the Property using a limited access direct push drill rig. Each boring was completed to 2 feet bgs so that there would be enough soil recovered to fill the sample jars. Each soil boring included collection of a soil sample from 0 to 6 inches bgs and 25 percent of the soil borings also included a soil sample collected from 6 to 12 inches bgs for a total of 30 soil samples.

The sample locations are shown on the Sample Location Map, Figure 2. The soil samples were submitted for chemical analysis for total arsenic and lead by United States Environmental Protection Agency (EPA) Method 6010D. The analytical laboratory report is provided in Appendix A.

Results of the TSP Evaluation

The analytical results for all 30 soil samples collected during the investigation are presented in Table 1 using the format identified in the TSPMRG.

Arsenic was either not detected at a concentration greater than the laboratory reporting limit or was detected at concentrations less than the maximum concentration (40 mg/kg) allowed under the TSPMRG in soil samples collected during the sampling event. The average arsenic concentration was 7.8 mg/kg in the 0- to 6-inch bgs soil samples and 13.4 mg/kg in the 6- to 12-inch bgs soil samples. Additionally, arsenic was detected in three soil samples at a concentration greater than the MTCA Method A cleanup level for unrestricted land use (20 mg/kg).

Lead was either not detected at a concentration greater than the laboratory reporting limit or was detected at concentrations less than the maximum concentration (500 mg/kg) allowed under the TSPMRG in soil samples collected during the sampling event. The average lead concentration was 42.1 mg/kg in the 0- to 6-inch bgs soil samples and 28.6 mg/kg in the 6- to 12-inch bgs soil samples. Additionally, lead was not detected in any single soil sample at a concentration greater than the MTCA Method A cleanup level for unrestricted land use (250 mg/kg).

Conclusions

The results of the investigation at the Lowell Elementary School property to evaluate the TSP indicate that average arsenic and lead concentrations are less than the respective MTCA cleanup levels for unrestricted land use and meet the TSPMRG criteria for soil as no single sample exceeded the maximum allowable concentrations of 40 mg/kg for arsenic and 500 mg/kg for lead. Furthermore, the results of the soil and duff samples indicate that the surface soils at property were not impacted by the TSP Tacoma Smelter Plume above the threshold indicated on Ecology's Dirt Alert site and indicate that the proposed development area falls below the "elevated" criteria and does not require remediation under the TSPMRG.

References

Washington State Department of Ecology. 2019. "Tacoma Smelter Plume Model Remedies Guidance" Toxics Cleanup Program Publication Number 19-09-101.

Washington State Department of Ecology. 2020. Website "Dirt Alert" https://apps.ecology.wa.gov/dirtalert/

Limitations

We have prepared this report for Korsmo Construction on behalf of Tacoma Public Schools to support redevelopment of the Lowell Elementary School property located in Tacoma, Washington. Korsmo Construction may distribute copies of this report to the owner, owner's authorized agents and regulatory agencies as may be required for the project.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted environmental science practices in this area at the time this report was prepared. The conclusions, recommendations, and opinions presented in this report are based on our professional knowledge, judgment and experience. No warranty or other conditions, express or implied, should be understood.

Please refer to Appendix B titled "Report Limitations and Guidelines for Use" for additional information pertaining to use of this report.

Please call if you have questions or require additional information.

Sincerely,
GeoEngineers, Inc.

Aaron M. Waggoner, LG, LHG
Senior Geologist

Tim L Syverson, LG
Associate Environmental Geologist

AMW:TLS:ch

Attachments:
Table 1. Chemical Analytical Data – Arsenic and Lead Concentrations in Soil
Figure 1. Vicinity Map
Figure 2. Sample Location Map
Appendix A. Laboratory Analytical Data
Appendix B. Report Limitations and Guidelines for Use

Table 1

Chemical Analytical Data - Arsenic and Lead Concentrations[1] in Soil

Lowell Elementary School - Tacoma Public Schools

Tacoma, Washington

DU	Sample Number	Sample Depth Interval (inches)	Date	Time	Corresponding Sample ID	Testing Parameters[2] (mg/kg)			
						Arsenic	Average Arsenic[3]	Lead	Average Lead[3]
1	1	0-6	4/3/2024	0814	DU1-01-06	12 U	7.8	32	42.1
1	2		4/3/2024	0859	DU1-02-06	12 U		190	
1	4		4/3/2024	0915	DU1-03-06	11 U		52	
1	5		4/3/2024	0928	DU1-04-06	12 U		6.0 U	
1	6		4/3/2024	0939	DU1-05-06	12 U		5.9 U	
1	7		4/3/2024	0951	DU1-06-06	11 U		5.3 U	
1	8		4/3/2024	1003	DU1-07-06	11 U		5.5 U	
1	9		4/3/2024	1016	DU1-08-06	15		5.3 U	
1	11		4/3/2024	1031	DU1-09-06	12 U		6.0 U	
1	12		4/3/2024	1044	DU1-10-06	11 U		87	
1	14		4/3/2024	1055	DU1-11-06	12 U		13	
1	15		4/3/2024	1116	DU1-12-06	12 U		6.0 U	
1	16		4/3/2024	1130	DU1-13-06	12 U		13	
1	17		4/3/2024	1142	DU1-14-06	12 U		10	
1	18		4/3/2024	1203	DU1-15-06	13		220	
1	20		4/3/2024	1239	DU1-16-06	12 U		28	
1	21		4/3/2024	1409	DU1-17-06	11 U		64	
1	22		4/3/2024	1424	DU1-18-06	12 U		120	
1	24		4/3/2024	1450	DU1-19-06	12 U		7.3	
1	25		4/3/2024	1459	DU1-20-06	**22**		56	
1	27		4/3/2024	1513	DU1-21-06	12 U		13	
1	28		4/3/2024	1526	DU1-22-06	12 U		6.0 U	
1	29		4/3/2024	1539	DU1-23-06	19		67	
1	30		4/3/2024	1602	DU1-24-06	12 U		15	
1	3	6-12	4/3/2024	0905	DU1-02-12	12 U	13.4	12	28.6
1	10		4/3/2024	1018	DU1-08-12	11 U		5.4 U	
1	13		4/3/2024	1046	DU1-10-12	33		31	
1	19		4/3/2024	1205	DU1-15-12	12 U		70	
1	23		4/3/2024	1426	DU1-18-12	12 U		29	
1	26		4/3/2024	1501	DU1-20-12	24		27	
MTCA Method A ULU Cleanup Levels						20	N/A	250	N/A
TSPMRG Maximum Criteria						40	20	500	250

Notes:

[1] Chemical analysis was performed by OnSite Environmental, Inc., of Redmond, Washington.

[2] Metals analyzed by United States Environmental Protection Agency (EPA) Method 6010D.

[3] Non-detects are assigned a value equal to half the laboratory detection limit for the purpose of calculating the average concentration within a decision unit.

TSPMRG = Tacoma Smelter Plume Model Remedy Guidance

U = Analyte not detected at or greater than the laboratory reporting limit

MTCA = Model Toxics Control Act

DU = Decision Unit

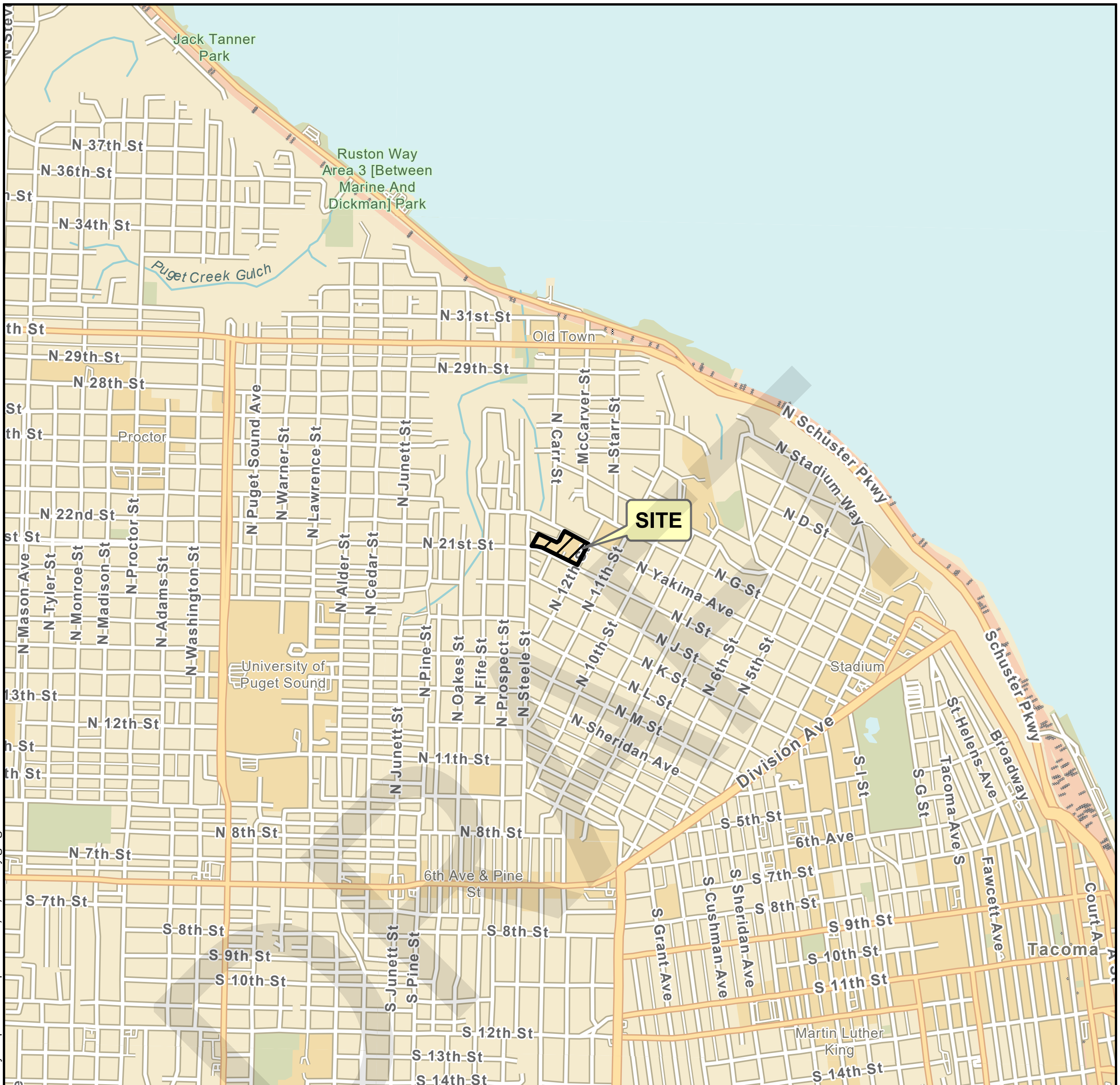
mg/kg = milligram per kilogram

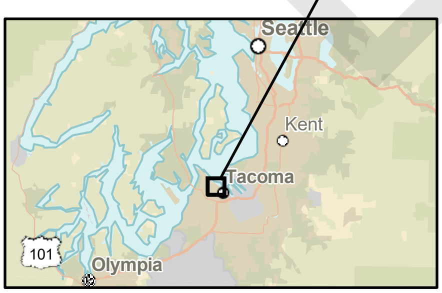
ULU = Unrestricted Land Use

N/A = Not Applicable

EPA = United States Environmental Protection Agency

Bold = Analyte detected greater than the corresponding MTCA Method A Cleanup Levels; Arsenic >20 mg/kg, Lead >250 mg/kg.





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Feet

Source(s):
- ESRI

Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Disclaimer: This figure was created for a specific purpose and project. Any use of this figure for any other project or purpose shall be at the user's sole risk and without liability to GeoEngineers. The locations of features shown may be approximate. GeoEngineers makes no warranty or representation as to the accuracy, completeness, or suitability of the figure, or data contained therein. The file containing this figure is a copy of a master document, the original of which is retained by GeoEngineers and is the official document of record.

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Vicinity Map	
Lowell Elementary School Replacement Tacoma, Washington	
GeoEngineers	Figure 1

Legend

Site Boundary

0-Inch to 6-Inch Soil Sample Location

0-Inch to 6-Inch and 6-Inch to 12-Inch Soil Sample Location

Source(s):
- Aerial from Google Earth Pro, dated 08/24/2022

Coordinate System: WA State Plane, South Zone, NAD83, US Foot

Disclaimer: This figure was created for a specific purpose and project. Any use of this figure for any other project or purpose shall be at the user's sole risk and without liability to GeoEngineers. The locations of features shown may be approximate. GeoEngineers makes no warranty or representation as to the accuracy, completeness, or suitability of the figure, or data contained therein. The file containing this figure is a copy of a master document, the original of which is retained by GeoEngineers and is the official document of record.

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Sample Location Map

Lowell Elementary School Replacement
Tacoma, Washington

GEOENGINEERS

Figure 2

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Appendix A
Laboratory Analytical Data

OnSite Environmental Inc.
14648 NE 95th Street, Redmond, WA 98052 • (425) 883-3881

April 12, 2024

Aaron Waggoner
GeoEngineers, Inc.
1101 Fawcett Avenue South, Suite 200
Tacoma, WA 98402

Re: Analytical Data for Project 0522-043-01 Task 0100
Laboratory Reference No. 2404-069

Dear Aaron:

Enclosed are the analytical results and associated quality control data for samples submitted on April 4, 2024.

The standard policy of OnSite Environmental, Inc. is to store your samples for 30 days from the date of receipt. If you require longer storage, please contact the laboratory.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning the data, or need additional information, please feel free to call me.

Sincerely,

David Baumeister
Project Manager

Enclosures

Date of Report: April 12, 2024
Samples Submitted: April 4, 2024
Laboratory Reference: 2404-069
Project: 0522-043-01 Task 0100

Case Narrative

Samples were collected on April 3, 2024 and received by the laboratory on April 4, 2024. They were maintained at the laboratory at a temperature of 2°C to 6°C.

Please note that any and all soil sample results are reported on a dry-weight basis, unless otherwise noted below. However the soil results for the QA/QC samples are reported on a wet-weight basis.

General QA/QC issues associated with the analytical data enclosed in this laboratory report will be indicated with a reference to a comment or explanation on the Data Qualifier page. More complex and involved QA/QC issues will be discussed in detail below.

Total Metals EPA 6010D Analysis

The duplicate RPD for Lead is outside control limits due to sample inhomogeneity.

Any other QA/QC issues associated with this extraction and analysis will be indicated with a footnote reference and discussed in detail on the Data Qualifier page.

Date of Report: April 12, 2024
Samples Submitted: April 4, 2024
Laboratory Reference: 2404-069
Project: 0522-043-01 Task 0100

ANALYTICAL REPORT FOR SAMPLES

Client ID	Laboratory ID	Matrix	Date Sampled	Date Received	Notes
DU1-01-06	04-069-01	Soil	4-3-24	4-3-24	
DU1-02-06	04-069-02	Soil	4-3-24	4-3-24	
DU1-02-12	04-069-03	Soil	4-3-24	4-3-24	
DU1-03-06	04-069-04	Soil	4-3-24	4-3-24	
DU1-04-06	04-069-05	Soil	4-3-24	4-3-24	
DU1-05-06	04-069-06	Soil	4-3-24	4-3-24	
DU1-06-06	04-069-07	Soil	4-3-24	4-3-24	
DU1-07-06	04-069-08	Soil	4-3-24	4-3-24	
DU1-08-06	04-069-09	Soil	4-3-24	4-3-24	
DU1-08-12	04-069-10	Soil	4-3-24	4-3-24	
DU1-09-06	04-069-11	Soil	4-3-24	4-3-24	
DU1-10-06	04-069-12	Soil	4-3-24	4-3-24	
DU1-10-12	04-069-13	Soil	4-3-24	4-3-24	
DU1-11-06	04-069-14	Soil	4-3-24	4-3-24	
DU1-12-06	04-069-15	Soil	4-3-24	4-3-24	
DU1-13-06	04-069-16	Soil	4-3-24	4-3-24	
DU1-14-06	04-069-17	Soil	4-3-24	4-3-24	
DU1-15-06	04-069-18	Soil	4-3-24	4-3-24	
DU1-15-12	04-069-19	Soil	4-3-24	4-3-24	
DU1-16-06	04-069-20	Soil	4-3-24	4-3-24	
DU1-17-06	04-069-21	Soil	4-3-24	4-3-24	
DU1-18-06	04-069-22	Soil	4-3-24	4-3-24	
DU1-18-12	04-069-23	Soil	4-3-24	4-3-24	
DU1-19-06	04-069-24	Soil	4-3-24	4-3-24	
DU1-20-06	04-069-25	Soil	4-3-24	4-3-24	
DU1-20-12	04-069-26	Soil	4-3-24	4-3-24	
DU1-21-06	04-069-27	Soil	4-3-24	4-3-24	
DU1-22-06	04-069-28	Soil	4-3-24	4-3-24	
DU1-23-06	04-069-29	Soil	4-3-24	4-3-24	
DU1-24-06	04-069-30	Soil	4-3-24	4-3-24	

Date of Report: April 12, 2024
Samples Submitted: April 4, 2024
Laboratory Reference: 2404-069
Project: 0522-043-01 Task 0100

TOTAL METALS
EPA 6010D

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**DU1-01-06**					
Laboratory ID:	04-069-01					
Arsenic	**ND**	12	EPA 6010D	4-10-24	4-10-24	
Lead	**32**	5.8	EPA 6010D	4-10-24	4-10-24	
Client ID:	**DU1-02-06**					
Laboratory ID:	04-069-02					
Arsenic	**ND**	12	EPA 6010D	4-10-24	4-10-24	
Lead	**190**	6.0	EPA 6010D	4-10-24	4-10-24	
Client ID:	**DU1-02-12**					
Laboratory ID:	04-069-03					
Arsenic	**ND**	12	EPA 6010D	4-10-24	4-10-24	
Lead	**12**	5.9	EPA 6010D	4-10-24	4-10-24	
Client ID:	**DU1-03-06**					
Laboratory ID:	04-069-04					
Arsenic	**ND**	11	EPA 6010D	4-10-24	4-10-24	
Lead	**52**	5.6	EPA 6010D	4-10-24	4-10-24	
Client ID:	**DU1-04-06**					
Laboratory ID:	04-069-05					
Arsenic	**ND**	12	EPA 6010D	4-10-24	4-10-24	
Lead	**ND**	6.0	EPA 6010D	4-10-24	4-10-24	
Client ID:	**DU1-05-06**					
Laboratory ID:	04-069-06					
Arsenic	**ND**	12	EPA 6010D	4-10-24	4-10-24	
Lead	**ND**	5.9	EPA 6010D	4-10-24	4-10-24	
Client ID:	**DU1-06-06**					
Laboratory ID:	04-069-07					
Arsenic	**ND**	11	EPA 6010D	4-10-24	4-10-24	
Lead	**ND**	5.3	EPA 6010D	4-10-24	4-10-24	

Date of Report: April 12, 2024
Samples Submitted: April 4, 2024
Laboratory Reference: 2404-069
Project: 0522-043-01 Task 0100

TOTAL METALS
EPA 6010D

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**DU1-07-06**					
Laboratory ID:	04-069-08					
Arsenic	**ND**	11	EPA 6010D	4-10-24	4-10-24	
Lead	**ND**	5.5	EPA 6010D	4-10-24	4-10-24	
Client ID:	**DU1-08-06**					
Laboratory ID:	04-069-09					
Arsenic	**15**	11	EPA 6010D	4-10-24	4-10-24	
Lead	**ND**	5.3	EPA 6010D	4-10-24	4-10-24	
Client ID:	**DU1-08-12**					
Laboratory ID:	04-069-10					
Arsenic	**ND**	11	EPA 6010D	4-10-24	4-10-24	
Lead	**ND**	5.4	EPA 6010D	4-10-24	4-10-24	
Client ID:	**DU1-09-06**					
Laboratory ID:	04-069-11					
Arsenic	**ND**	12	EPA 6010D	4-10-24	4-10-24	
Lead	**ND**	6.0	EPA 6010D	4-10-24	4-10-24	
Client ID:	**DU1-10-06**					
Laboratory ID:	04-069-12					
Arsenic	**ND**	11	EPA 6010D	4-10-24	4-10-24	
Lead	**87**	5.5	EPA 6010D	4-10-24	4-10-24	
Client ID:	**DU1-10-12**					
Laboratory ID:	04-069-13					
Arsenic	**33**	11	EPA 6010D	4-10-24	4-10-24	
Lead	**31**	5.4	EPA 6010D	4-10-24	4-10-24	
Client ID:	**DU1-11-06**					
Laboratory ID:	04-069-14					
Arsenic	**ND**	12	EPA 6010D	4-10-24	4-10-24	
Lead	**13**	6.0	EPA 6010D	4-10-24	4-10-24	

Date of Report: April 12, 2024
Samples Submitted: April 4, 2024
Laboratory Reference: 2404-069
Project: 0522-043-01 Task 0100

TOTAL METALS
EPA 6010D

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**DU1-12-06**					
Laboratory ID:	04-069-15					
Arsenic	**ND**	12	EPA 6010D	4-10-24	4-10-24	
Lead	**ND**	6.0	EPA 6010D	4-10-24	4-10-24	
Client ID:	**DU1-13-06**					
Laboratory ID:	04-069-16					
Arsenic	**ND**	12	EPA 6010D	4-10-24	4-10-24	
Lead	**13**	5.9	EPA 6010D	4-10-24	4-10-24	
Client ID:	**DU1-14-06**					
Laboratory ID:	04-069-17					
Arsenic	**ND**	12	EPA 6010D	4-10-24	4-10-24	
Lead	**10**	6.1	EPA 6010D	4-10-24	4-10-24	
Client ID:	**DU1-15-06**					
Laboratory ID:	04-069-18					
Arsenic	**13**	12	EPA 6010D	4-10-24	4-10-24	
Lead	**220**	6.2	EPA 6010D	4-10-24	4-10-24	
Client ID:	**DU1-15-12**					
Laboratory ID:	04-069-19					
Arsenic	**ND**	12	EPA 6010D	4-10-24	4-10-24	
Lead	**70**	6.0	EPA 6010D	4-10-24	4-10-24	
Client ID:	**DU1-16-06**					
Laboratory ID:	04-069-20					
Arsenic	**ND**	12	EPA 6010D	4-10-24	4-10-24	
Lead	**28**	6.1	EPA 6010D	4-10-24	4-10-24	
Client ID:	**DU1-17-06**					
Laboratory ID:	04-069-21					
Arsenic	**ND**	11	EPA 6010D	4-11-24	4-11-24	
Lead	**64**	5.6	EPA 6010D	4-11-24	4-11-24	

Date of Report: April 12, 2024
Samples Submitted: April 4, 2024
Laboratory Reference: 2404-069
Project: 0522-043-01 Task 0100

TOTAL METALS
EPA 6010D

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**DU1-18-06**					
Laboratory ID:	04-069-22					
Arsenic	**ND**	12	EPA 6010D	4-11-24	4-11-24	
Lead	**120**	6.1	EPA 6010D	4-11-24	4-11-24	
Client ID:	**DU1-18-12**					
Laboratory ID:	04-069-23					
Arsenic	**ND**	12	EPA 6010D	4-11-24	4-11-24	
Lead	**29**	5.9	EPA 6010D	4-11-24	4-11-24	
Client ID:	**DU1-19-06**					
Laboratory ID:	04-069-24					
Arsenic	**ND**	12	EPA 6010D	4-11-24	4-11-24	
Lead	**7.3**	5.9	EPA 6010D	4-11-24	4-11-24	
Client ID:	**DU1-20-06**					
Laboratory ID:	04-069-25					
Arsenic	**22**	12	EPA 6010D	4-11-24	4-11-24	
Lead	**56**	6.1	EPA 6010D	4-11-24	4-11-24	
Client ID:	**DU1-20-12**					
Laboratory ID:	04-069-26					
Arsenic	**24**	12	EPA 6010D	4-11-24	4-11-24	
Lead	**27**	6.0	EPA 6010D	4-11-24	4-11-24	
Client ID:	**DU1-21-06**					
Laboratory ID:	04-069-27					
Arsenic	**ND**	12	EPA 6010D	4-11-24	4-11-24	
Lead	**13**	5.9	EPA 6010D	4-11-24	4-11-24	
Client ID:	**DU1-22-06**					
Laboratory ID:	04-069-28					
Arsenic	**ND**	12	EPA 6010D	4-11-24	4-11-24	
Lead	**ND**	6.0	EPA 6010D	4-11-24	4-11-24	

Date of Report: April 12, 2024
Samples Submitted: April 4, 2024
Laboratory Reference: 2404-069
Project: 0522-043-01 Task 0100

TOTAL METALS
EPA 6010D

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**DU1-23-06**					
Laboratory ID:	04-069-29					
Arsenic	**19**	12	EPA 6010D	4-11-24	4-11-24	
Lead	**67**	6.0	EPA 6010D	4-11-24	4-11-24	

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**DU1-24-06**					
Laboratory ID:	04-069-30					
Arsenic	**ND**	12	EPA 6010D	4-11-24	4-11-24	
Lead	**15**	6.0	EPA 6010D	4-11-24	4-11-24	

Date of Report: April 12, 2024
Samples Submitted: April 4, 2024
Laboratory Reference: 2404-069
Project: 0522-043-01 Task 0100

TOTAL METALS
EPA 6010D
QUALITY CONTROL

Matrix: Soil
Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0410SM1					
Arsenic	**ND**	10	EPA 6010D	4-10-24	4-10-24	
Lead	**ND**	5.0	EPA 6010D	4-10-24	4-10-24	
Laboratory ID:	MB0411SM1					
Arsenic	**ND**	10	EPA 6010D	4-11-24	4-11-24	
Lead	**ND**	5.0	EPA 6010D	4-11-24	4-11-24	

Analyte	Result		Spike Level		Source Result	Percent Recovery		Recovery Limits	RPD	RPD Limit	Flags
DUPLICATE											
Laboratory ID:	04-069-01										
	ORIG	DUP									
Arsenic	**ND**	**ND**	NA	NA		NA		NA	NA	20	
Lead	**27.7**	**26.3**	NA	NA		NA		NA	5	20	
Laboratory ID:	04-069-21										
	ORIG	DUP									
Arsenic	**ND**	**ND**	NA	NA		NA		NA	NA	20	
Lead	**57.2**	**72.5**	NA	NA		NA		NA	24	20	L
MATRIX SPIKES											
Laboratory ID:	04-069-01										
	MS	MSD	MS	MSD		MS	MSD				
Arsenic	**93.3**	**91.9**	100	100	ND	**93**	**92**	75-125	1	20	
Lead	**261**	**262**	250	250	27.7	**93**	**94**	75-125	1	20	
Laboratory ID:	04-069-21										
	MS	MSD	MS	MSD		MS	MSD				
Arsenic	**94.8**	**92.9**	100	100	ND	**95**	**93**	75-125	2	20	
Lead	**294**	**291**	250	250	57.2	**95**	**94**	75-125	1	20	

Date of Report: April 12, 2024
Samples Submitted: April 4, 2024
Laboratory Reference: 2404-069
Project: 0522-043-01 Task 0100

% MOISTURE

Client ID	Lab ID	% Moisture	Date Analyzed
DU1-01-06	04-069-01	**14**	4-8-24
DU1-02-06	04-069-02	**16**	4-8-24
DU1-02-12	04-069-03	**15**	4-8-24
DU1-03-06	04-069-04	**10**	4-8-24
DU1-04-06	04-069-05	**17**	4-8-24
DU1-05-06	04-069-06	**15**	4-8-24
DU1-06-06	04-069-07	**5**	4-8-24
DU1-07-06	04-069-08	**10**	4-8-24
DU1-08-06	04-069-09	**6**	4-8-24
DU1-08-12	04-069-10	**8**	4-8-24
DU1-09-06	04-069-11	**16**	4-8-24
DU1-10-06	04-069-12	**9**	4-8-24
DU1-10-12	04-069-13	**8**	4-8-24
DU1-11-06	04-069-14	**16**	4-8-24
DU1-12-06	04-069-15	**17**	4-8-24
DU1-13-06	04-069-16	**15**	4-8-24
DU1-14-06	04-069-17	**18**	4-8-24
DU1-15-06	04-069-18	**19**	4-8-24
DU1-15-12	04-069-19	**17**	4-8-24
DU1-16-06	04-069-20	**18**	4-8-24
DU1-17-06	04-069-21	**10**	4-8-24
DU1-18-06	04-069-22	**17**	4-8-24
DU1-18-12	04-069-23	**15**	4-8-24
DU1-19-06	04-069-24	**15**	4-8-24
DU1-20-06	04-069-25	**18**	4-8-24
DU1-20-12	04-069-26	**17**	4-8-24
DU1-21-06	04-069-27	**15**	4-8-24

Date of Report: April 12, 2024
Samples Submitted: April 4, 2024
Laboratory Reference: 2404-069
Project: 0522-043-01 Task 0100

% MOISTURE

Client ID	Lab ID	% Moisture	Date Analyzed
DU1-22-06	04-069-28	**16**	4-8-24
DU1-23-06	04-069-29	**17**	4-8-24
DU1-24-06	04-069-30	**16**	4-8-24

OnSite Environmental Inc.

Data Qualifiers and Abbreviations

A - Due to a high sample concentration, the amount spiked is insufficient for meaningful MS/MSD recovery data.

B - The analyte indicated was also found in the blank sample.

C - The duplicate RPD is outside control limits due to high result variability when analyte concentrations are within five times the quantitation limit.

E - The value reported exceeds the quantitation range and is an estimate.

F - Surrogate recovery data is not available due to the high concentration of coeluting target compounds.

H - The analyte indicated is a common laboratory solvent and may have been introduced during sample preparation, and be impacting the sample result.

I - Compound recovery is outside of the control limits.

J - The value reported was below the practical quantitation limit. The value is an estimate.

K - Sample duplicate RPD is outside control limits due to sample inhomogeneity. The sample was re-extracted and re-analyzed with similar results.

L - The RPD is outside of the control limits.

M - Hydrocarbons in the gasoline range are impacting the diesel range result.

M1 - Hydrocarbons in the gasoline range (toluene-naphthalene) are present in the sample.

N - Hydrocarbons in the lube oil range are impacting the diesel range result.

N1 - Hydrocarbons in diesel range are impacting lube oil range results.

O - Hydrocarbons indicative of heavier fuels are present in the sample and are impacting the gasoline result.

P - The RPD of the detected concentrations between the two columns is greater than 40.

Q - Surrogate recovery is outside of the control limits.

S - Surrogate recovery data is not available due to the necessary dilution of the sample.

T - The sample chromatogram is not similar to a typical ____________.

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

U1 - The practical quantitation limit is elevated due to interferences present in the sample.

V - Matrix Spike/Matrix Spike Duplicate recoveries are outside control limits due to matrix effects.

W - Matrix Spike/Matrix Spike Duplicate RPD are outside control limits due to matrix effects.

X - Sample extract treated with a mercury cleanup procedure.

X1 - Sample extract treated with a sulfuric acid/silica gel cleanup procedure.

X2 - Sample extract treated with a silica gel cleanup procedure.

Y - The calibration verification for this analyte exceeded the 20% drift specified in methods 8260 & 8270, and therefore the reported result should be considered an estimate. The overall performance of the calibration verification standard met the acceptance criteria of the method.

Y1 - Negative effects of the matrix from this sample on the instrument caused values for this analyte in the bracketing continuing calibration verification standard (CCVs) to be outside of 20% acceptance criteria. Because of this, quantitation limits and sample concentrations should be considered estimates.

Z -

ND - Not Detected at PQL
PQL - Practical Quantitation Limit
RPD - Relative Percent Difference

OnSite Environmental Inc.
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Phone: (425) 883-3881 • www.onsite-env.com

Chain of Custody

Company: GeoEngineers
Project Number: 0522-043-01 Task 0100
Project Name: Lowell Elementary
Project Manager: Aaron Waggoner
Sampled by: KCJ

Turnaround Request (in working days) (Check One)
- ☐ Same Day
- ☐ 1 Day
- ☐ 2 Days
- ☐ 3 Days
- ☒ Standard (7 Days) (TPH analysis 5 Days)
- ☐ ______ (other)

Laboratory Number: 04-069

Lab ID	Sample Identification	Date Sampled	Time Sampled	Matrix	Number of Containers	Project VOCs (1)	VOCs by 8260C + TICs	VOCs by 8260C	Alkalinity by EPA 310.2	TOC by SM 5310B	COD by EPA 410.4 (2)	Total Fe by EPA 6010D	Total and Dis Mn by EPA 6000 series (3)	Nitrate by EPA 353.2 (4)	Sulfate by ASTM D516-07	Sulfide by SM4500S2D (2)	Methane, Ethane, Ethene by RSK 175	Chloride by SM4500-Cl E	As & Pb by EPA Method 6010D	% Moisture
1	DU1-01-06	4/3/2024	0814	S	1														X	X
2	DU1-02-06	↓	0859	↓	↓														↓	↓
3	DU1-02-12	↓	0905	↓	↓														↓	↓
4	DU1-03-06	↓	0915	↓	↓														↓	↓
5	DU1-04-06	↓	0928	↓	↓														↓	↓
6	DU1-05-06	↓	0939	↓	↓														↓	↓
7	DU1-06-06	↓	0951	↓	↓														↓	↓
8	DU1-07-06	↓	1003	↓	↓														↓	↓
9	DU1-08-06	↓	1016	↓	↓														↓	↓
10	DU1-08-12	↓	1018	↓	↓														↓	↓

	Signature	Company	Date	Time
Relinquished	Kathryn Epstein	GEI	4/4/24	1549
Received	Nicaille [illegible]	OSE	4/4/24	1549
Relinquished				
Received				
Relinquished				
Received				
Reviewed/Date		Reviewed/Date		

Comments/Special Instructions:

Chromatograms with final report ☐

Data Package: Level III ☐ Level IV ☐ Electronic Data Deliverables (EDDs) ☐ ______

Chain of Custody

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Phone: (425) 883-3881 • www.onsite-env.com

Laboratory Number: 04-069

Company: GeoEngineers
Project Number: 0522-043-01 Task 0100
Project Name: Lowell Elementary
Project Manager: Aaron Waggoner
Sampled by: KCJ

Turnaround Request (in working days) (Check One)
- [ ] Same Day
- [ ] 1 Day
- [ ] 2 Days
- [ ] 3 Days
- [x] Standard (7 Days) (TPH analysis 5 Days)
- [ ] ________ (other)

Lab ID	Sample Identification	Date Sampled	Time Sampled	Matrix	Number of Containers	Project VOCs (1)	VOCs by 8260C + TICs	VOCs by 8260C	Alkalinity by EPA 310.2	TOC by SM 5310B	COD by EPA 410.4 (2)	Total Fe by EPA 6010D	Total and Dis Mn by EPA 6000 series (3)	Nitrate by EPA 353.2 (4)	Sulfate by ASTM D516-07	Sulfide by SM4500S2D (2)	Methane, Ethane, Ethene by RSK 175	Chloride by SM4500-Cl E	As & Pb by EPA Method 6010D	% Moisture
11	DU1-09-06	4/3/2024	1031	S	1														x	X
12	DU1-10-06		1044																	
13	DU1-10-12		1046																	
14	DU1-11-06		1055																	
15	DU1-12-06		1116																	
16	DU1-13-06		1130																	
17	DU1-14-06		1142																	
18	DU1-15-06		1203																	
19	DU1-15-12		1205																	
20	DU1-15-06		1239																	

	Signature	Company	Date	Time
Relinquished				
Received	[signature]	OSE	4/4/24	1549
Relinquished				
Received				
Relinquished				
Received				
Reviewed/Date		Reviewed/Date		

Comments/Special Instructions:

Chromatograms with final report ☐

Data Package: Level III ☐ Level IV ☐ Electronic Data Deliverables (EDDs) ☐ ________

Chain of Custody

Page 3 of 3

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Phone: (425) 883-3881 • www.onsite-env.com

Laboratory Number: 04-069

Company: GeoEngineers
Project Number: 0522-043-01 Task 0100
Project Name: Lowell Elementary
Project Manager: Aaron Waggoner
Sampled by: KCJ

Turnaround Request (in working days)
(Check One)
☐ Same Day ☐ 1 Day
☐ 2 Days ☐ 3 Days
☒ Standard (7 Days) (TPH analysis 5 Days)
☐ ______ (other)

Lab ID	Sample Identification	Date Sampled	Time Sampled	Matrix	Number of Containers	Project VOCs (1)	VOCs by 8260C + TICs	VOCs by 8260C	Alkalinity by EPA 310.2	TOC by SM 5310B	COD by EPA 410.4 (2)	Total Fe by EPA 6010D	Total and Dis Mn by EPA 6000 series (3)	Nitrate by EPA 353.2 (4)	Sulfate by ASTM D516-07	Sulfide by SM4500S2D (2)	Methane, Ethane, Ethene by RSK 175	Chloride by SM4500-Cl E	As & Pb by EPA Method 6010D	% Moisture
21	DU1-17-06	4/3/2024	1409	S	1														X	X
22	DU1-18-06	↓	1424	↓	↓														↓	↓
23	DU1-18-12	↓	1426	↓	↓														↓	↓
24	DU1-19-06	↓	1450	↓	↓														↓	↓
25	DU1-20-06	↓	1459	↓	↓														↓	↓
26	DU1-20-12	↓	1501	↓	↓														↓	↓
27	DU1-21-06	↓	1513	↓	↓														↓	↓
28	DU1-22-06	↓	1526	↓	↓														↓	↓
29	DU1-23-06	↓	1539	↓	↓														↓	↓
30	DU1-24-06	↓	1602	↓	↓														↓	↓

	Signature	Company	Date	Time
Relinquished				
Received	Nichele Bifri	OSE	4/4/24	1549
Relinquished				
Received				
Relinquished				
Received				

Comments/Special Instructions:

Reviewed/Date: Reviewed/Date:

Chromatograms with final report ☐

Data Package: Level III ☐ Level IV ☐ Electronic Data Deliverables (EDDs) ☐ ______

Appendix B
Report Limitations and Guidelines for Use

Appendix B
Report Limitations and Guidelines for Use[1]

This appendix provides information to help you manage your risks with respect to the use of this report. Please confer with GeoEngineers if you need to know more about how these "Report Limitations and Guidelines for Use" apply to your project or property.

READ THESE PROVISIONS CLOSELY

It is important to recognize that environmental engineering and geoscience practices (geotechnical engineering, geology and environmental science) are less exact than other engineering and natural science disciplines. GeoEngineers includes these explanatory "limitations" provisions in our reports to help reduce the risk of misunderstandings or unrealistic expectations that lead to disappointments, claims and disputes.

ENVIRONMENTAL SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES, PERSONS AND PROJECTS

GeoEngineers has prepared this Soil Sampling and Analytical Results Summary to support redevelopment of the Lowell Elementary School Property (property) located in Tacoma, Washington in general accordance with the scope and limitations of our proposal, dated February 15, 2024. This report has been prepared for the exclusive use of Tacoma Public Schools and their authorized agents. This report is not intended for use by others, and the information contained herein is not applicable to other properties.

GeoEngineers structures its services to meet the specific needs of its clients. For example, an ESA study conducted for a property owner may not fulfill the needs of a prospective purchaser of the same property. Because each environmental study is unique, each environmental report is unique, prepared solely for the specific client and property. Use of this report is not recommended for any purpose or project other than as expressly stated in this report.

THIS ENVIRONMENTAL REPORT IS BASED ON A UNIQUE SET OF PROJECT-SPECIFIC FACTORS

This report has been prepared to support redevelopment of the Lowell Elementary School Property (property) located in Tacoma, Washington. GeoEngineers considered a number of unique, project-specific factors when establishing the scope of services for this Project. Unless GeoEngineers specifically indicates otherwise, it is important not to rely on this report if it was:

[1] Developed based on material provided by GBA, GeoProfessional Business Association; www.geoprofessional.org.

- not prepared for you,
- not prepared for your Project,
- not prepared for the specific site explored, or
- completed before Project changes were made.

If changes to the Project or property occur after the date of this report, GeoEngineers cannot be responsible for any consequences of such changes in relation to this report unless we have been given the opportunity to review our interpretations and recommendations in the context of such changes. Based on that review, we can provide written modifications or confirmation, as appropriate.

RELIANCE CONDITIONS FOR THIRD PARTIES

This report was prepared for the exclusive use of the party(ies) to whom this report is addressed. No other party may rely on the product of our services unless we agree to such reliance in advance and in writing. Within the limitations of the agreed Project scope, schedule and budget, our services have been executed in accordance with our Agreement with the Client and generally accepted environmental practices in this area at the time this report was prepared.

UNDERSTAND THAT GEOTECHNICAL ISSUES HAVE NOT BEEN ADDRESSED

Unless geotechnical engineering was specifically included in our scope of service, this report does not provide any geotechnical findings, conclusions, or recommendations, including but not limited to, the suitability of subsurface materials for construction purposes.

DO NOT SEPARATE DOCUMENTATION FROM THE REPORT

Environmental reports often include supplemental documentation, such as maps, figures and table. Do not separate such documentation from the report. Further, do not, and do not permit any other party to redraw or modify any of the supplemental documentation for incorporation into other professionals' instruments of service.

ENVIRONMENTAL REGULATIONS CHANGE AND EVOLVE

Some substances may be present in the vicinity of the subject property in quantities or under conditions that may have led, or may lead, to contamination of the subject property, but are not included in current local, state or federal regulatory definitions of hazardous substances or do not otherwise present current potential liability. GeoEngineers cannot be responsible if the standards for appropriate inquiry, or regulatory definitions of hazardous substances, change or if more stringent environmental standards are developed in the future.

SUBSURFACE CONDITIONS CAN CHANGE

This environmental report is based on conditions that existed at the time the study was performed. The findings and conclusions of this report may be affected by the passage of time, by man-made events such as construction on or adjacent to the subject property, by new releases of hazardous substances, new information or technology that become available subsequent to the report date, or by natural events such as floods, earthquakes, slope instability or groundwater fluctuations. Please contact GeoEngineers before applying this report for its intended purpose so that GeoEngineers may evaluate whether changed conditions affect the continued applicability of the report.

SOIL AND GROUNDWATER END USE

The cleanup levels referenced in this report are site- and situation-specific. The cleanup levels may not be applicable for other properties or for other uses of the affected soil and/or groundwater. Note that hazardous substances may be present in some of the on-site soil and/or groundwater at detectable concentrations that are less than the referenced cleanup levels. GeoEngineers will not assume responsibility for potential environmental liability arising out of the transfer of soil and/or groundwater from the subject property to another location, or the reuse of such soil and/or groundwater in any instances that we did not recommend, know of, or control.

MOST ENVIRONMENTAL FINDINGS ARE PROFESSIONAL OPINIONS

Our interpretations of subsurface conditions are based on field observations and chemical analytical data from widely spaced sampling locations at the subject property. Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. GeoEngineers reviewed field and laboratory data and then applied its professional judgment to render an informed opinion about subsurface conditions throughout the property. Actual subsurface conditions may differ significantly from those indicated in this report. Our report, conclusions and interpretations should not be construed as a warranty of the subsurface conditions.

BIOLOGICAL POLLUTANTS

GeoEngineers' Scope of Work specifically excludes the investigation, detection, prevention or assessment of the presence of Biological Pollutants. Accordingly, this report does not include any interpretations, recommendations, findings or conclusions regarding the detecting, assessing, preventing or abating of Biological Pollutants, and no conclusions or inferences should be drawn regarding Biological Pollutants as they may relate to this Project. The term "Biological Pollutants" includes, but is not limited to, molds, fungi, spores, bacteria and viruses, and/or any of their byproducts.

A Client that desires these specialized services is advised to obtain them from a consultant who offers services in this specialized field.

INFORMATION PROVIDED BY OTHERS

GeoEngineers has relied upon certain data or information provided or compiled by others in the performance of our services. Although we use sources that we reasonably believe to be trustworthy, GeoEngineers cannot warrant or guarantee the accuracy or completeness of information provided or compiled by others.