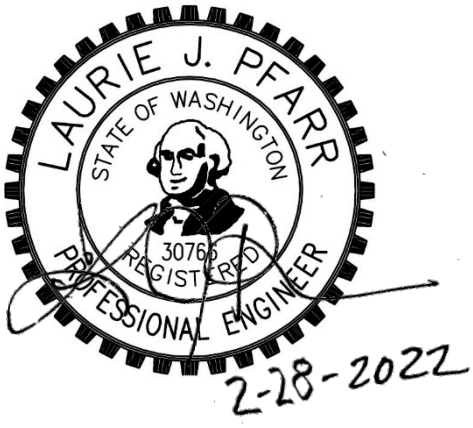
Giaudrone Middle School
Field and Track Conversion

4902 S Alaska St

Tacoma, WA 98408

Stormwater Site Plan
February 28, 2022

The information contained in this report was prepared by and under the direct supervision of the undersigned:



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GIAUDRONE MIDDLE SCHOOL
FIELD AND TRACK CONVERSION
STORMWATER SITE PLAN

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FIELD AND TRACK CONVERSION
STORMWATER SITE PLAN
FEBRUARY 28, 2022

CHAPTER 1 – PROJECT INFORMATION

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Associated permits
The site disturbance is over one acre, and therefore an NPDES permit will be required. This will be coordinated directly with the Washington State Department of Ecology.

Vesting
This Stormwater Site Plan addresses the requirements of the City of Tacoma 2021 Stormwater Management Manual (SWMM). Refer to Chapter 5 of this report for a summary of the minimum requirements that are applicable to this project area.

CHAPTER 2 – PROJECT OVERVIEW

This Stormwater Site Plan is for the Giaudrone Middle School Athletic Field Improvements project. The site is located at 4902 S Alaska St in Tacoma, Washington; Section 20, Township 20 North, Range 3 East, Willamette Meridian. Refer to Figure 1 – Vicinity Map for site location. This project will involve the conversion of the existing natural grass playfield to synthetic turf. A new underdrain system will be installed beneath the turf field as well as the rubberized track and D-zone area. The track will be resurfaced with a rubberized surfacing over asphalt. A new shotput court will also be constructed near the northwest corner of the field.

CHAPTER 3 – EXISTING PROJECT SITE CONDITIONS

The existing project area consists of the existing cinder track and underdrained grass playfield located in the southern portion of the Giaudrone Middle School property. There is a concrete walkway for pedestrian access along the north side of the track and a driveway for maintenance access off of S Alaskan Street at the southeast corner of the track. The field area is surrounded by grass slopes on the east, south, and west sides. There is a concrete sound barrier wall along the west

side of the field. The project disturbance area is bounded by the Giaudrone Middle School campus to the north, S Alaskan Street to the east, single-family residential properties to the south, and Interstate 5 to the west. Refer to Figure 2 – Existing Impervious Coverage & Conditions for a layout of the existing project site.

The existing topography within the project area includes a high point in the center of the field of approximately 375, sloping outward toward the track at around 1.5%. The track is relatively flat, but beyond there are steep slopes to the south and west. The lawn area east of the track slopes down to the sidewalk at about 20%. The area north of the track is relatively flat, with a slight low point between the edge of the track and the concrete walkway.

The existing site is located in the Flett Creek Watershed but is split into two threshold discharge areas (TDA) as described below:

West TDA
Stormwater runoff from the grass field, in general, is collected by the existing field underdrain system. Flow from the majority of the track is collected by catch basins along the north and west sides, and a swale along the bottom of the slope to the south. Stormwater in the swale is conveyed west to a pipe that connects to the onsite storm system. The wall along the west side of the field prevents runoff from flowing over the steep slope beyond. The onsite storm system discharges to the public system along Interstate 5.

East TDA
Runoff from the eastern portion of the track sheet flows east onto the adjacent lawn and then into the public storm system in S Alaska Street via a catch basin in the gutter.

Runoff from the west and east TDAs does not combine within ¼ mile downstream. Refer to the Downstream Flowpath section below for a detailed description of the downstream drainage course.

Based on City of Tacoma mapping, there are steep slopes along the south and west sides of the fields. There is a critical aquifer recharge area mapped along the far western edge of the property, along the toe of the steep slope area. There are no wetlands on site or in the immediate vicinity of the site. Based on the City of Tacoma maps, the site is within the 5-year modeled wellhead protection zone and the South Tacoma Groundwater Protection District. There are no groundwater wells onsite or within 100 feet of the site. The site is not located within or in close proximity to any superfund sites in Tacoma listed by the US Environmental Protection Agency (EPA), nor is runoff from the project site tributary to any superfund sites. The site is located within the City of Tacoma Smelter Plume with an average arsenic concentration in the soil of under 20 parts per million (ppm) according to the Department of Ecology. Per the Flood Insurance Rate Map (FIRM) #53053C0304E, the project is located within Zone X; an area determined to be outside the 0.2% annual chance of flooding. Therefore, flooding is not anticipated to be a concern for the site.

Per the Natural Resources Conservation Service Web Soil Survey, the site soils are Urban land-Alderwood complex, 5 to 12 percent slopes. Refer to Figure 3 – Soils Map. A geotechnical investigation has been conducted by GeoEngineers, Inc. The geotechnical explorations encountered a layer of fill which extended to 3.5 – 10 feet below ground surface. Beneath the fill, recessional outwash was observed extending to 11.5 – 21.5 feet below ground surface. Glacial till was encountered beneath the outwash in one boring at 13 feet below ground surface. Groundwater was

not observed in any of the borings which extended to a maximum of 26 feet below ground surface. Infiltration may be feasible in the recessional outwash layer, though underlying glacial till is considered a low permeability layer.

Downstream Flowpath

The table below lists the receiving waterbodies downstream of the project site. Refer to Figure 4 – Downstream Flowpath for a visual depiction of the drainage course from the project site to the Puget Sound.

Table 1 – Receiving Waterbodies

Receiving Waterbody Name - West TDA	Type of Receiving Waterbody - West TDA	Receiving Waterbody Name - East TDA	Type of Receiving Waterbody - East TDA
Unknown	Wetland - Unknown	Unknown	Wetland - Unknown
Wapato Lake	Lake	Wapato Lake	Lake
Wards Lake	Lake	Wards Lake	Lake
Flett Creek	Creek	Flett Creek	Creek
Chambers Creek	Creek	Chambers Creek	Creek
Puget Sound	Marine	Puget Sound	Marine

CHAPTER 4 – PROPOSED PROJECT SITE CONDITIONS

This project will involve the conversion of the existing natural grass playfield to synthetic turf. A new underdrain system will be installed beneath the turf field as well as the rubberized track and D-zone area. The track will be resurfaced with a rubberized surfacing over asphalt pavement. A new shotput court will also be constructed near the northwest corner of the field.

As discussed in Chapter 5 of this report, the project is required to address minimum requirements #1-5 for the new and replaced hard surfaces and land disturbed, and #6-9 for all new hard surfaces and converted vegetation areas. However, per the glossary in the SWMM, converted vegetation areas are "surfaces on a project site where native vegetation, pasture, scrub/shrub, uncultivated vegetation, or unmaintained non-native vegetation are converted to lawn or landscaped areas, or where native vegetation is converted to pasture." There are no surfaces on the project that fit this description. Thus, for minimum requirements #6-9, the new hard surfaces are therefore designated as the "target surface".

The following table describes the target surfaces that must be mitigated. Per coordination with the City of Tacoma, the underdrained synthetic turf field is considered landscaping and not a hard or converted surface. The new and replaced hard surfaces associated with the project are shown in Table 1 below and Figure 5 – Proposed Conditions. The only replaced hard surface is the existing track. This was subtracted to provide the new hard surface. The proposed hard surfaces will be modeled as 100% impervious. Refer to Figure 5 – Proposed Conditions for a visual representation of the target surfaces associated with this project.

Table 2 – West TDA Target Surfaces

	Square Feet	Acres
Rubberized Surfacing	43,293	0.994
Concrete Pavement	4,898	0.112
New Plus Replaced Hard Surface	**48,191**	**1.106**
Replaced Hard Surface	-31,535	-0.724
New Hard Surface (Target Surface)	**16,656**	**0.382**

Table 3 – East TDA Target Surfaces

	Square Feet	Acres
Rubberized Surfacing	4,721	0.108
Concrete Pavement	1,937	0.044
Cinder Surfacing	1,645	0.038
New Plus Replaced Hard Surface	**8,303**	**0.191**
Replaced Hard Surface	-4,999	-0.115
New Hard Surface (Target Surface)	**3,304**	**0.076**

Proposed Site Hydrology

The overall drainage patterns throughout the site are not being changed by the proposed improvements. Stormwater discharge from the proposed underdrain system will connect to an existing catch basin on the north side of the field and the detention facility will discharge to an existing catch basin near the northwest corner of the field. Figure 5 – Proposed Conditions shows the proposed stormwater system and connection points.

The proposed track will match existing drainage conditions by sloping away from the field. Runoff from the track will be as previously described except that the exiting catch basins along the southwestern edge of the track will be rerouted to drain to the proposed detention facility.

Rain falling upon the proposed synthetic turf and rubberized D-zone surfacing will be collected by subsurface drainage systems. No surface runoff is anticipated from these surfaces because of the permeable nature of the materials. For the turf field, stormwater will percolate vertically and gradually flow horizontally through the base crushed rock layer to the nearest drainage lateral trench. Refer to the field cross section on Sheet F-2.1 in Appendix A. Once stormwater infiltrates into the field-sub base, it will be collected by 4-inch perforated laterals running west-east which discharge to an 8-inch collector drain line running south-north through the center of the field. The outlet from the field drainage system will connect to an existing catch basin along the north side of the field. For the rubberized D-zone, stormwater will percolate vertically into the aggregate storage of the detention facility. The flow control structure will discharge to the existing catch basin at the northwest corner of the field. Refer to Sheet F-1.3 in Appendix A, which is the storm drainage plan for this project.

The synthetic turf surface includes a tufted fiber and woven synthetic backing that is perforated to allow a minimum vertical infiltration rate of 20 inches per hour. Turf fiber shall be 100%

polyethylene athletic quality yarn designed specifically for outdoor use and stabilized to resist the effects of ultra-violet degradation, heat, wear, water, and airborne pollution. The synthetic turf is infilled with a mixture of rounded sand particles and granulated SPR crumb rubber that do not interlock and are also highly permeable and has a minimum vertical infiltration rate of 20 inches per hour. Below the synthetic turf surface is a top course and base course permeable crushed aggregate constructed of a specially graded sand and gravel mixture that results in a permeable base below the field. The vertical infiltration rates through the synthetic turf are tested by an independent third-party testing agency after manufacture of the turf. Testing of the permeable aggregate occurs on site after placement and compaction. Horizontal movement through the gravel subbase provides attenuation of the stormwater flow through this material.

CHAPTER 5 – MINIMUM REQUIREMENT DETERMINATION

Per the 2021 SWMM, the site is considered a redevelopment if there is more than 35% existing impervious coverage. The existing impervious surface coverage for the entire property was determined to be approximately 49.2%, and therefore minimum requirements will be dictated by Figure 1-2 of the SWMM, which is shown below.

There will be greater than 5,000 square feet (SF) of new hard surface. The improvements associated with this project will not exceed 50% of the assessed value of the existing improvements. Therefore, based upon Figure 1-2 of the 2021 SWMM, Minimum Requirements #1 through #9 will apply to all **new hard surfaces** and the **converted vegetation areas** for the project site.

Cumulative Impacts
Per section 1.3.2 of the Tacoma SWMM, cumulative impacts of surfaces after January 1, 2003 must be taken into account for minimum requirements applicability. Based on record drawings, the school campus appears to have been remodeled during 2003 and 2004. However, per the path on Figure 1-2, this project on its own already exceeds the area thresholds and we have been prescribed the path outlined below as confirmed by City of Tacoma personnel.

Figure 1-2: from the 2021 City of Tacoma SWMM

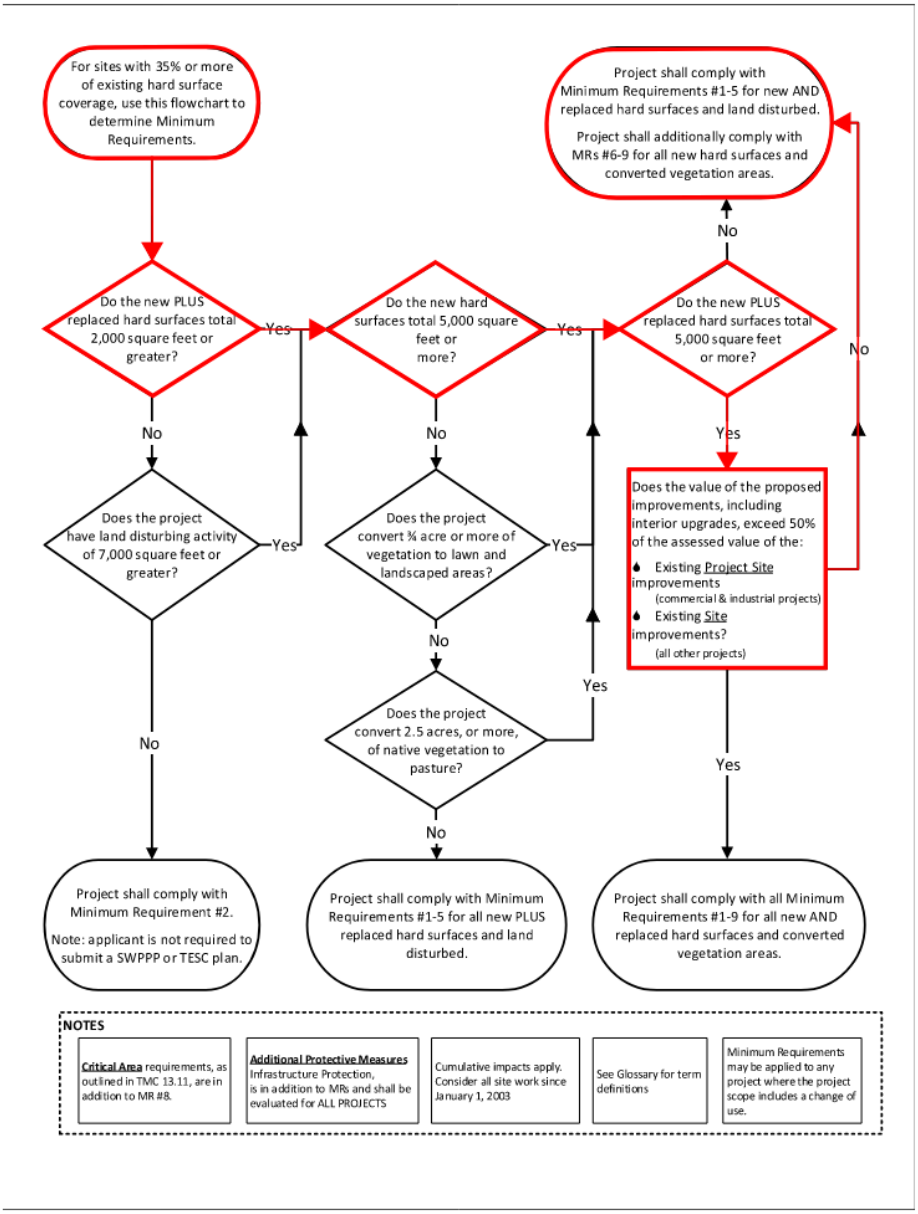


Figure 1 - 2: Redevelopment Flowchart

Table 4 – Minimum Requirements Required

Threshold Discharge Area	Applicable Minimum Requirements	Applicable Surface Type Requiring Mitigation
West TDA and East TDA	MR#1-5	New and Replaced Hard Surfaces and Converted Vegetation Areas and Land Disturbed
West TDA and East TDA	MR#6-9	New Hard Surfaces and Converted Vegetation Areas

CHAPTER 6 – DISCUSSION OF MINIMUM REQUIREMENTS

Below is a list of the Minimum Requirements and a description of how they are addressed in this project:

Minimum Requirement #1: Preparation of a Stormwater Site Plan

This document is the Stormwater Site Plan. It outlines the existing and proposed site and drainage conditions, describes the flow control systems, and presents the stormwater analysis.

Minimum Requirement #2: Construction Stormwater Pollution Prevention Plan

The Construction Stormwater Pollution Prevention Plan (SWPPP) narrative is attached in Appendix E of this report.

Minimum Requirement #3: Source Control

A copy of the Source Control Selection Worksheet is included in Appendix E. Since the site is classified as commercial project type, the following BMPs for all commercial and industrial sites apply, which include:

- **BMP S100: Correcting Illicit Discharges to the Stormwater System**
- **BMP S101: Labeling Stormwater Inlets**
- **BMP S102: Formation of a Pollution Prevention Team**
- **BMP S103: Preventative Maintenance/Good Housekeeping**
- **BMP S104: Spill Prevention and Cleanup**
- **BMP S105: Employee Training**
- **BMP S106: Inspections**
- **BMP S107: Record Keeping**

Below is a description of the specific source control activities applicable to the project:

- **BMP S139: Stormwater System Maintenance –** The project will construct pipes, catch basins, and a detention facility that will need to be maintained.
- **BMP S142: Soil Erosion and Sediment Control at Commercial and Industrial Sites –** This site will be implementing erosion and sedimentation control BMP measures during the construction process. The project would not require any permanent erosion control post-construction, nor are there any existing erosion concerns at the site.
- **BMP S143: Landscaping and Lawn/Vegetation Management –** The project will include limited landscaping improvements and lawn restoration around the track and field.

Copies of all applicable BMPs from the 2021 SWMM are included in Appendix E.

Minimum Requirement #4: Preserving Drainage Patterns and Outfalls

The proposed improvements will not alter the existing downstream path. In the West TDA, the proposed underdrain system will connect to the same onsite storm system as the existing underdrain system and the replaced track will continue to be collected by the existing catch basins and swale. In the East TDA, runoff will continue to sheet flow onto the adjacent lawn area.

Minimum Requirement #5: Onsite Stormwater Management

Per section 1.4.5 of the SWMM, on-site stormwater management best management practices (BMPs) must be implemented per List #2 if a project is subject to minimum requirements #1-9 and is not flow control exempt. This project is proposing to use compost amended soil (BMP T5.13) for disturbed pervious areas. The following table shows the List #2 on-site stormwater management BMPs and whether are not they will be feasible for this project. Refer to Appendix B for the relevant infeasibility checklists.

Table 5 – On-Site Stormwater Management BMP Evaluation

BMP	Feasibility	Explanation
Lawn/Landscaped Areas		
Post-Construction Soil Quality and Depth	Yes	Post-Construction Soil Quality and Depth per BMP L613 will be utilized for all disturbed landscaping/lawn areas.
Roofs		
All Roof BMPs	N/A	There are no roof surfaces associated with this project.
Other Hard Surfaces		
1. Full Dispersion	No	A 65 to 10 ratio of forested or native vegetation area to impervious area cannot be achieved.
2. Permeable Pavement or Compost-Amended Vegetated Filter Strip (CAVFS)	No	The underdrained turf field and rubberized track and D-zone are permeable, vertically-draining surfaces, but do not count as an on-site stormwater management BMP. Permeable pavement per BMP L633 is infeasible for the track because the majority of the area cannot be located more than 50 feet from the top of slopes 20% or greater. CAVFS per BMP T1050 is infeasible for the proposed track because it cannot be located more than 50 feet from the top of slopes 15% or greater.
3. Bioretention	No	Bioretention per BMP L630 is not feasible because there is no area available for siting that is 50 feet or more from the top of a slope greater than 20%.
4. Sheet Flow Dispersion Or Concentrated Flow Dispersion	No	The southern and eastern portions of the track will match existing conditions and continue to sheet flow onto adjacent grass slopes. However, since these slopes are greater than 15%, sheet flow and concentrated flow dispersion BMPs are infeasible and cannot be used to meet MR#5.

Minimum Requirement #6: Stormwater Treatment

As previously discussed, the target surface for Minimum Requirement #6 consists only of the new hard surfaces. There are no proposed pollution generating new hard surfaces, as the track, shotput area, and concrete will not be subject to any vehicular traffic. Therefore, stormwater treatment facilities are not required.

The project site is located within the South Tacoma Groundwater Protection District (STGPD). The project does not propose to construct any infiltration facilities. Therefore, no additional requirements are triggered per the STGPD Infiltration Policy.

Minimum Requirement #7: Flow Control

East TDA

Flow control requirements were determined using the flow chart in Section 1.4.7 of the SWMM. The TDA is not flow control exempt as defined in the glossary of the SWMM. However, the project will propose less than 10,000 square feet of effective impervious surface within the TDA, the project will not convert any vegetation areas to lawn, landscape, or pasture, and causes less than a 0.15 cubic feet per second (cfs) increase in the 100-year flowrate. Therefore, flow control facilities are not required for this TDA.

According to section 1.4.7.3 of the SWMM, *"TDAs that, through a combination of effective hard surfaces and converted vegetation areas, cause a 0.15 cfs or greater increase in the 100-year return period flowrate as estimated using an approved continuous simulation model with 15-minute timesteps. Comparison shall be between existing and proposed project site land cover conditions."*

An MGS Flood model was used to test whether the target surfaces will create a 0.15 cfs increase in 100-year peak flows from existing site conditions. The target impervious surface consists of the new effective impervious area from Table 3. This impervious surface will be entered in an MGS Flood basin element for the post-developed scenario. In the predeveloped scenario, that same area will be entered as lawn (existing condition) per the stipulation outlined in the exception. The MGS Flood output is included in Appendix B. Table 6 below summarizes the result of the model.

Table 6 – East TDA 100-Year Peak Flow Comparison

	100-year peak flow (cfs)
100-year Existing Condition Peak Flow Rate	0.032 cfs
100-year Proposed Condition Peak Flow Rate	0.085 cfs
Difference in 100-year Peak Flow Rates	**0.053 cfs**

As can be seen from Table 6, the target surfaces associated with this project create less than a 0.15 cfs increase in 100-year peak flows when compared back to existing conditions. Therefore, flow control facilities are not required for the East TDA.

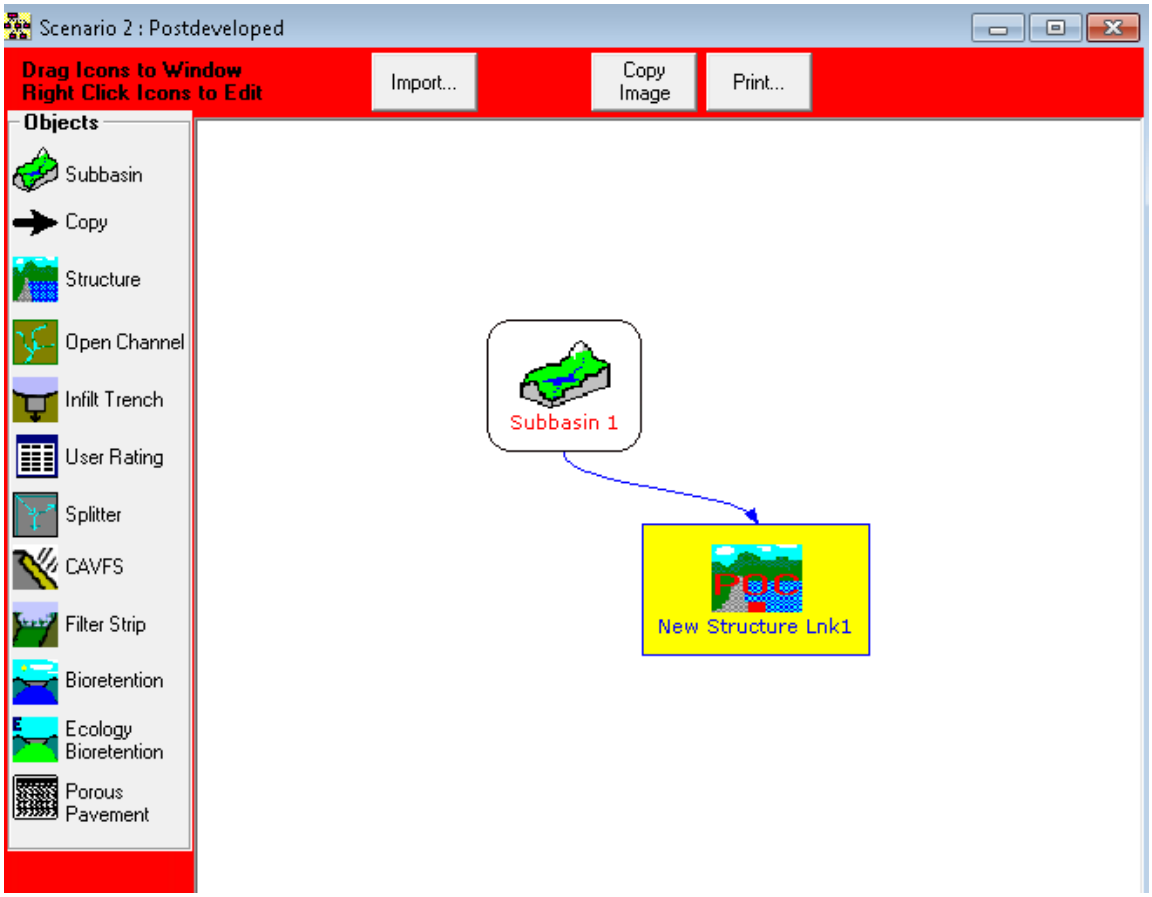
West TDA

Flow control requirements were determined using the flow chart in Section 1.4.7 of the SWMM. The TDA is not flow control exempt as defined in the glossary of the SWMM and the project will propose more than 10,000 square feet of effective impervious surface within the TDA. Therefore, flow control is required for the West TDA. The standard flow control requirement is as follows: "stormwater discharges shall match developed discharge durations to predeveloped discharge durations for the range of predeveloped discharge rates from 50% of the 2-year return period flowrate up to the full 50-year return period flowrate."

The project is required to mitigate the new hard surface (target surface) to the predeveloped forested condition. As previously mentioned, there are no converted vegetation areas associated with the project.

Stormwater modeling was conducted using MGS Flood, an approved runoff model per Appendix III-2.2 of the 2019 DOE Manual. The project proposes to utilize storage in the base course aggregate beneath the permeable rubberized D-Zone at the west side of the field to meet flow control requirements. A stage storage spreadsheet was used to calculate the storage within the base course aggregate at an interval of stage heights. A copy of this spreadsheet is included within Appendix B. The void space within the aggregate was assumed to be 30%. The stage storage table was imported into the MGS Flood model for use as the detention facility. The following illustration shows the post developed scenario in MGS Flood.

Illustration 1 – MGS Flood Postdeveloped Scenario



The predeveloped scenario reflects the target surface (new hard surface) as forested area, as required by flow control requirements. The detention basin consists of the rubberized D-zone and a portion of the adjacent track that will be collected and routed to the detention facility. The detention basin is reflected in the post developed scenario and routed to the aggregate detention

basin, as it is the physical area that is draining to it. The total hard surface routed to the detention facility exceeds the target surface (new hard surface) requiring mitigation. The excess area of 3,456 SF is not required to be mitigated and is included as impervious area in the predeveloped scenario. Thus, there is no bypass basin included to account for new hard surfaces that cannot physically drain to detention, as there is enough collection of compensatory hard surface. Refer to Figure 5 – Proposed Conditions for delineation of the detention basin and associated areas. See the following tables for a listing of the areas input into the MGS Flood model.

Table 7 – West TDA Predeveloped Modeled Basin

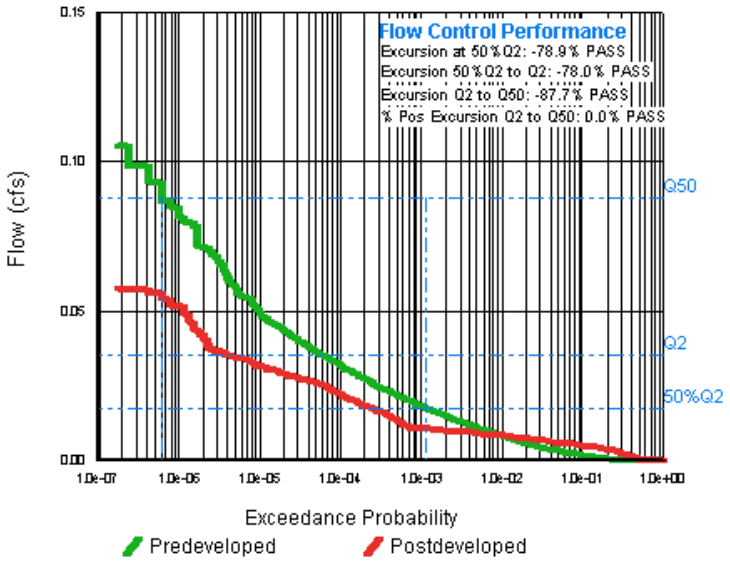
	Square Feet	Acres
Forested Area	16,656	0.382
Impervious	3,456	0.080
Total Predeveloped Basin Area	**20,112**	**0.462**

Table 8 – West TDA Postdeveloped Detention Basin

	Square Feet	Acres
Impervious Area	20,112	0.462
Grass Area	0	0.000
Total Detention Basin Area	**20,112**	**0.462**

The following graph shows the duration plot from MGS Flood, showing that the proposed detention facility will meet the standard flow control requirement.

Graph 1 – Flow Duration Plot



The resulting detention system will involve a permeable aggregate detention storage section with a live storage depth of 22-inches (1.83 feet) and a surface area of 12,803 SF. After accounting for the 30% void ratio, the storage volume is 7,042 cubic feet. The control structure will be a type-2 catch basin with an 8-inch control riser located northwest of the track & field. The riser will have a bottom orifice that is 0.6-inches in diameter and a rectangular notch with a width of 0.25-inches and a height of 7-inches from the top of the riser. The full MGS Flood report for the flow control sizing is attached in Appendix B.

Minimum Requirement #8: Wetlands Protection

Stormwater from the both TDAs eventually discharges to the wetland north of Wapato Lake.

General Protection
The general protection practices outlined in Section 1.4.8.3.1 are not applicable since the wetland is offsite, far downstream of the project site and will not be directly impacted by the proposed project.

Protection from Pollutants
Construction Stormwater BMPs, Source Control BMPs, and OSM BMPs will be applied as described in this report and the project SWPPP. As previously discussed, stormwater treatment BMPs per Minimum Requirement #6 are not required.

Wetland Hydroperiod Protection
The proposed project is not anticipated to significantly impact the wetland hydroperiod. The entire school property drains to the wetland and consists of approximately 307,969 existing impervious surfaces. The total new hard surface of 19,931 SF results in only a 6.5% increase in impervious coverage. Flows from the 16,627 SF of new hard surface in the West TDA will be attenuated by the flow control facility. Based on this, the change in average runoff volume is not expected to exceed the requirements outlined in Section 1.4.8.3.3.2 of the SWMM.

Minimum Requirement #9: Operations and Maintenance

The Operation and Maintenance Manual is available as a stand-alone document as part of the permit submittal. It is also attached in Appendix D of this report.

CHAPTER 7 – ADDITIONAL PROTECTIVE MEASURE – INFRASTRUCTURE PROTECTION

The project proposes greater than 10,000 square feet of new impervious surface. The smallest pipe within ¼ mile downstream of the site is greater than 12-inches. Therefore, per Table 1-2 in Section 1.5 of Volume 1 of the SWMM, single segment capacity analysis is required. Inlet and gutter capacity analysis is not required since the project does not propose through curb discharges. See Chapter 8 for more information on the conveyance capacity analysis.

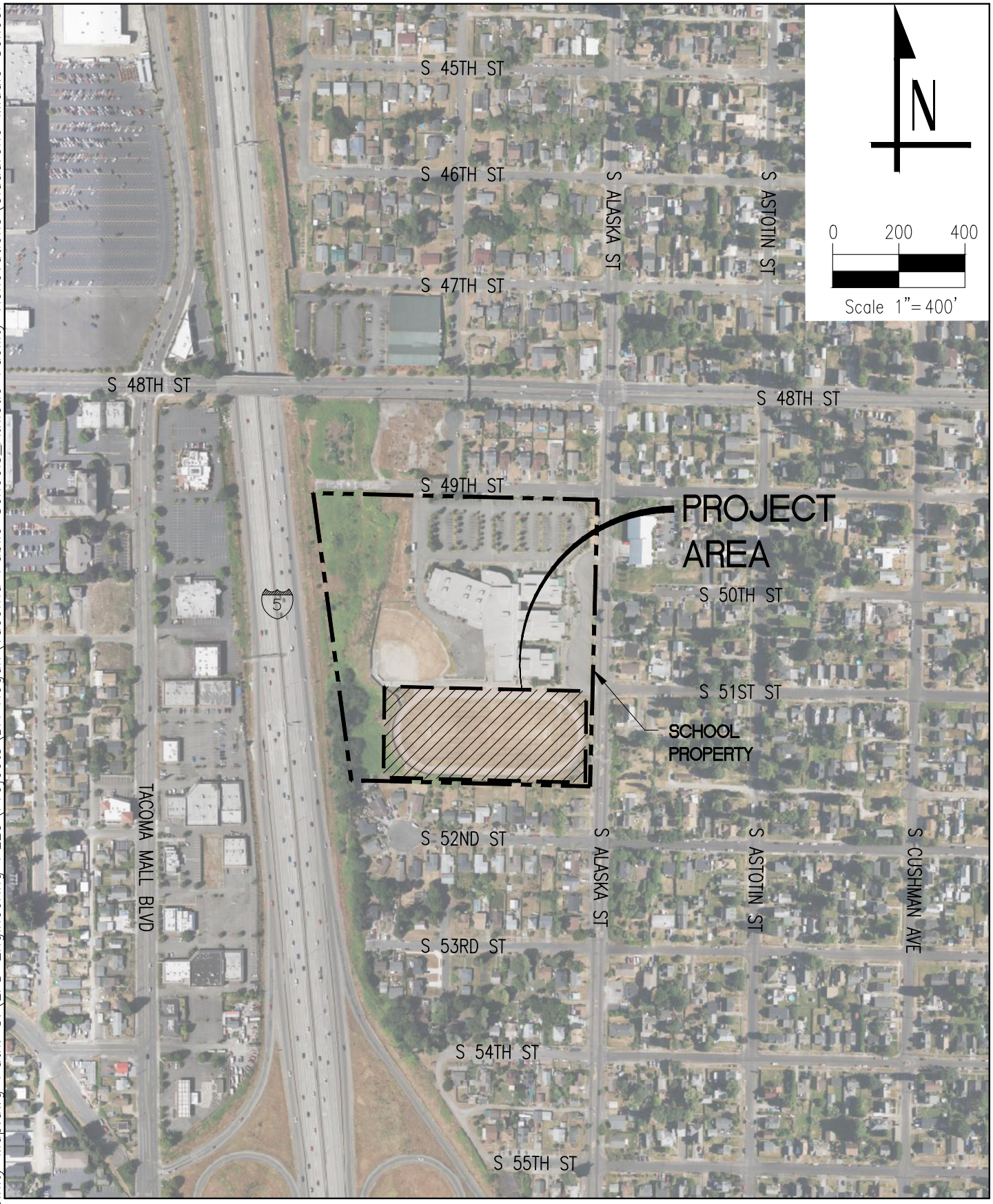
CHAPTER 8 – CONVEYANCE SYSTEM DESIGN

A conveyance analysis was performed for the outlet pipe from the detention system for the field. According to Section 2.1.1. of Volume 4 of the SWMM, single event modeling shall be used for conveyance sizing. Per Section 3.3 of the SWMM, flow rates are calculated using the SCS TR-20 Method. This is compared to the full-flow capacity of the pipe, which is determined using Manning's equation. Refer to the Conveyance Analysis Spreadsheet in Appendix B.

The 8-inch PVC pipe outlet (n=0.012) from the detention (slope at 1.0%) has a full-flow capacity of 1.31 cubic feet per second (cfs). This is the chosen pipe for analysis, as it is more conservative than the 8-inch inlet from the flow control structure (slope greater than 2.0%), which has a larger full-flow capacity. See the attached calculation sheet in Appendix B, using the SCS TR-20 Method to find the 100-year peak flow rate, which was found to be 0.621 cfs. Thus, the 8-inch outlet pipe will have sufficient conveyance capacity for the proposed conditions.

The 8-inch CPEP collector pipe (n=0.012) from the synthetic turf field underdrain system (slope at 0.5%) has a full-flow capacity of 0.93 cfs. See the attached calculation sheet in Appendix B, using the SCS TR-20 Method to find the 100-year peak flow rate, which was found to be 0.040 cfs. The 8-inch outlet pipe will have adequate conveyance capacity for the proposed conditions.

FIGURES



GIAUDRONE MIDDLE SCHOOL FIELD AND TRACK CONVERSION

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DESCRIPTION

VICINITY MAP

FEBRUARY 28, 2022

FIGURE

1

File: Figure 1 – Vicinity Map.dwg Path: S:\LPD Engineering PLLC\Projects\DA Hogan\Tacoma Public Schools_Athletic Facility Renovations\Giaudrone Middle School\Drai

N

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Scale 1"= 200'

EXISTING HARD SURFACE AREA	
Existing Hard Surface	307,969 SF
Total Site Area	625,957 SF
Percentage of Site Impervious	49.2%

Existing Vegetation Area	95,399 SF
Existing Lawn/Landscape	222,589 SF

s:\lpd engineering pllc\projects\da hogan\tacoma public schools_athletic facility renovations\giaudrone middle school\drainage\tir exhibits\figure 2 - existing impervious coverage & conditions.dwg

GIAUDRONE MIDDLE SCHOOL FIELD AND TRACK CONVERSION

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Description: EXISTING IMPERVIOUS COVERAGE & CONDITIONS

FEBRUARY 28, 2022

Figure 2

KING COUNTY AREA, WASHINGTON (WA633)

MAP UNIT SYMBOL	MAP UNIT NAME
988	Urban land, 0% to 5% slopes
3055	Urban land–Alderwood complex, 0% to 15% slopes
3056	Urban land–Alderwood complex, 5% to 12% slopes
3057	Urban land–Alderwood complex, 12% to 35% slopes

N

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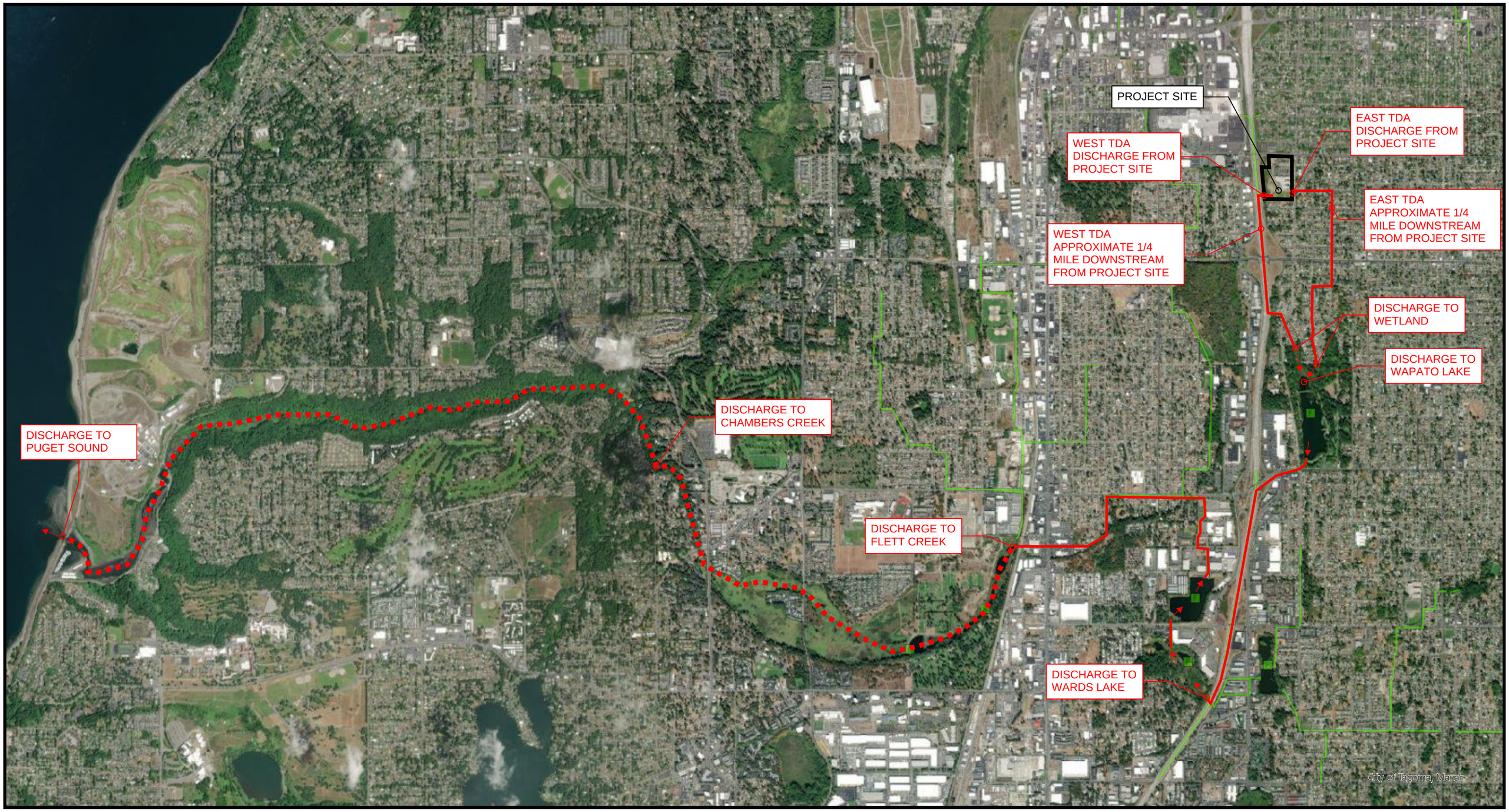
DESCRIPTION

SOILS MAP

FEBRUARY 28, 2022

FIGURE 3

Figure 4 - Downstream Flowpath
Giaudrone MS



tacomaMAP

Last Printed: 1/27/2022 4:36 PM

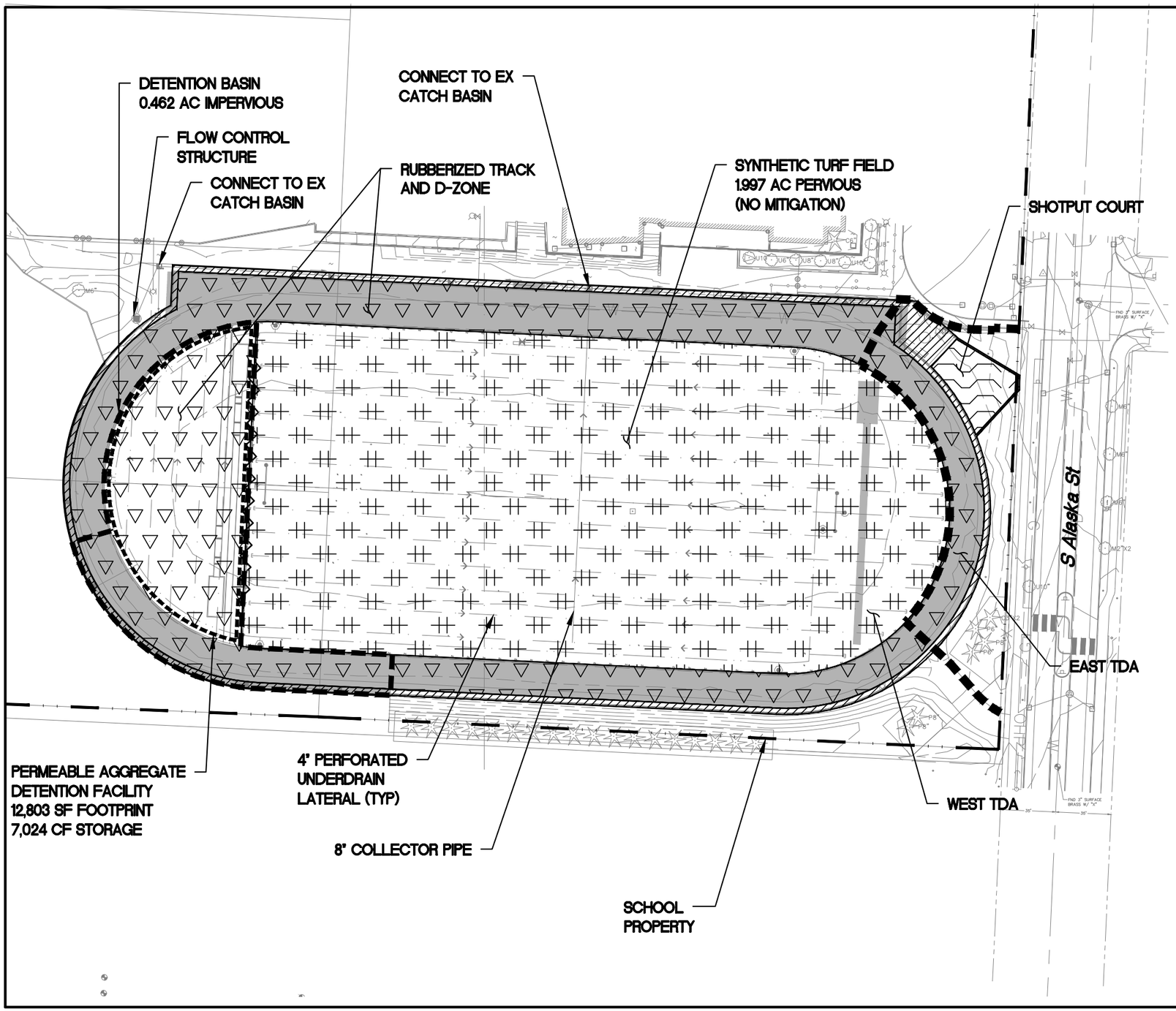
Scale: 1:40,000

0 500 1,000 2,000 3,000 4,000
ft

* This map is not suitable for site-specific analysis or for utility location *

See full disclaimer below:
http://geohub.cityoftacoma.org/pages/disclaimer

N



Target Surfaces

- RUBBERIZED SURFACING
- CONCRETE
- CINDERS
- REPLACED HARD SURFACE
- SYNTHETIC TURF FIELD

N

0 35 70

Scale 1"= 70'

West TDA Target Surfaces

RUBBERIZED SURFACING	43,293 SF (0.994 AC)
CONCRETE PAVEMENT	4,898 SF (0.112 AC)
NEW PLUS REPLACED HARD SURFACE	48,191 SF (1.106 AC)
REPLACED HARD SURFACE	−31,535 SF (−0.724 AC)
NEW HARD SURFACE (TARGET SURFACE)	16,656 SF (0.382 AC)

East TDA Target Surfaces

RUBBERIZED SURFACING	4,721 SF (0.108 AC)
CONCRETE PAVEMENT	1,937 SF (0.044 AC)
CINDER SURFACING	1,645 SF (0.038 AC)
NEW PLUS REPLACED HARD SURFACE	8,303 SF (0.191 AC)
REPLACED HARD SURFACE	−4,999 SF (−0.115 AC)
NEW HARD SURFACE (TARGET SURFACE)	3,304 SF (0.076 AC)

s:\lpd engineering pllc\projects\da hogan\tacoma public schools_athletic facility renovations\giaudrone middle school\drainage\tir exhibits\figure 5- proposed conditions.dwg

GIAUDRONE MIDDLE SCHOOL FIELD AND TRACK CONVERSION

LPD engineering pllc
1932 First Ave,
Suite 201,
Seattle, WA 98101
p. 206.725.1211
f. 206.973.5344
www.lpdengineering.com

Description

PROPOSED CONDITIONS

FEBRUARY 28, 2022

Figure

5

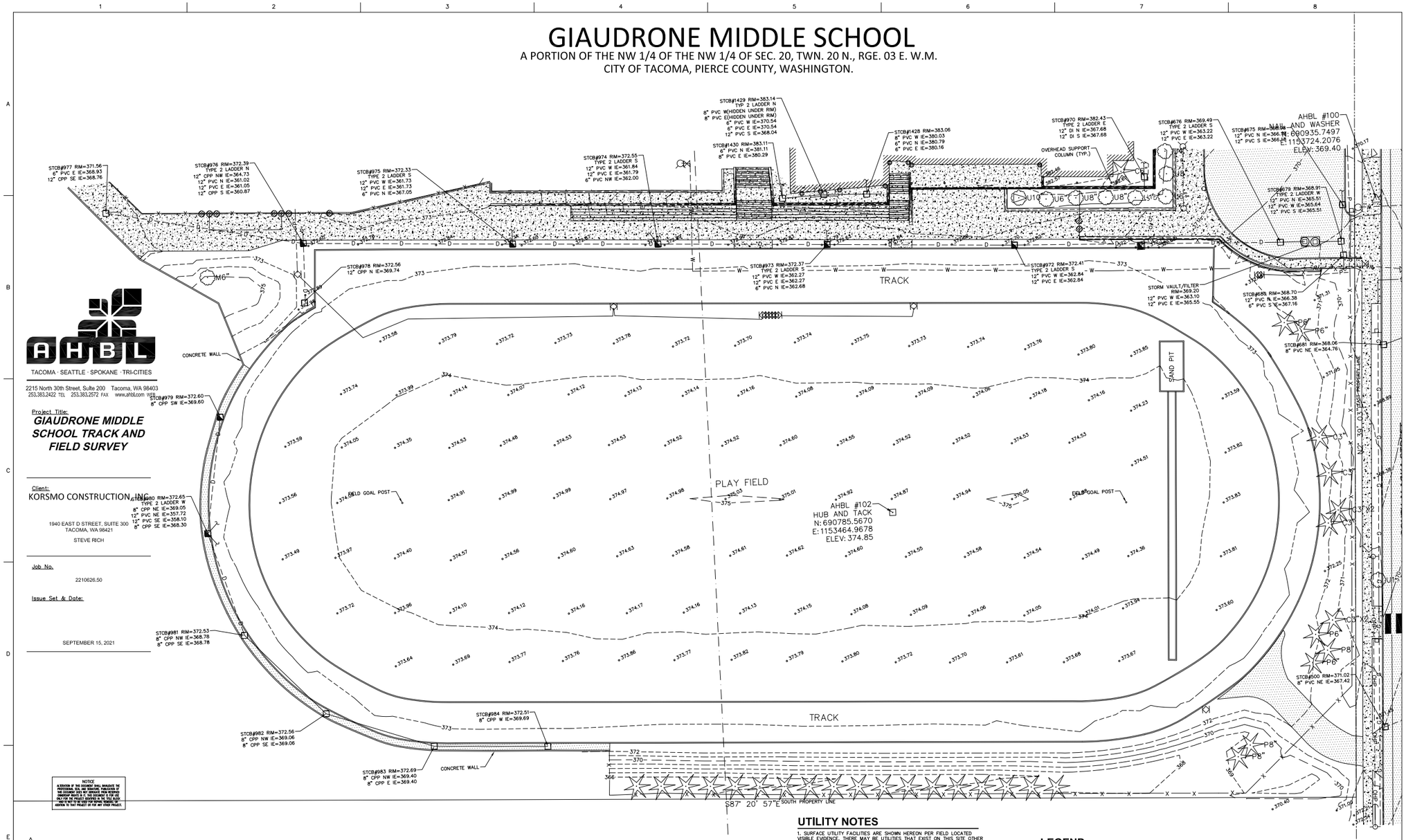
LPD engineering pllc

APPENDIX A

Design Drawings

GIAUDRONE MIDDLE SCHOOL

A PORTION OF THE NW 1/4 OF THE NW 1/4 OF SEC. 20, TWN. 20 N., RGE. 03 E. W.M.
CITY OF TACOMA, PIERCE COUNTY, WASHINGTON.



UTILITY NOTES

1. SURFACE UTILITY FACILITIES ARE SHOWN HEREON PER FIELD LOCATED VISIBLE EVIDENCE. THERE MAY BE UTILITIES THAT EXIST ON THIS SITE OTHER THAN THOSE GRAPHICALLY DEPICTED HEREON.

2. UNDERGROUND (BURIED) UTILITIES SHOWN HEREON ARE BASED ON COMBINATIONS OF VISIBLE SURFACE EVIDENCE, UTILITY LOCATOR MARKINGS AND RECORD DATA (SUCH AS AS-BUILT OR UTILITY DESIGN DRAWINGS). ALL UNDERGROUND UTILITIES SHOWN HEREON ARE APPROXIMATE AND, IN SOME CASES, ARE SHOWN AS STRAIGHT LINES BETWEEN FIELD LOCATED SURFACE UTILITY FACILITIES. UNDERGROUND UTILITIES MAY HAVE BENDS, CURVES OR CONNECTIONS WHICH ARE NOT SHOWN.

3. ALTHOUGH LOCATIONS OF UNDERGROUND UTILITIES BASED ON UTILITY LOCATOR MARKINGS AND RECORD DATA (SUCH AS AS-BUILT OR UTILITY DESIGN DRAWINGS) ARE DEEMED RELIABLE, AHBL, INC. ASSUMES NO LIABILITY FOR THE ACCURACY OF SAID DATA.

4. CALL 1-800-424-5555 BEFORE ANY CONSTRUCTION.

EQUIPMENT USED

3" TOTAL STATION UTILIZING STANDARD FIELD TRAVERSE METHODS FOR CONTROL AND STAKING.

SURVEYOR'S CERTIFICATE

I, DAVID FOLLANSBEE, A PROFESSIONAL LAND SURVEYOR IN THE STATE OF WASHINGTON, HEREBY CERTIFY THAT THIS MAP CORRECTLY REPRESENTS A SURVEY MADE BY ME OR UNDER MY DIRECT SUPERVISION IN SEPTEMBER 2021 IN COMPLIANCE WITH THE REQUIREMENTS OF THE SURVEY RECORDING ACT, CHAPTER 58.09 R.C.W. AND 332-130 W.A.C., AT THE REQUEST OF STEVE RICH.

DAVID FOLLANSBEE, PLS 45161 DATE

LEGEND

- FOUND MONUMENT AS NOTED
- HUB AND TACK
- SET NAIL AND WASHER
- BOLLARD
- SIGN AS NOTED
- GATE POST
- CLEANOUT
- STORM CATCH BASIN
- STORM MANHOLE
- GUY ANCHOR
- UTILITY POWER POLE
- LUMINAIRE
- FIRE HYDRANT
- IRRIGATION CONTROL VALVE
- WATER VALVE
- CONIFEROUS TREE
- DECIDUOUS TREE
- LEFT TURN ARROW
- D — STORM LINE
- W — WATER LINE
- G — GAS LINE
- P — ELECTRICAL LINE
- OHP — OVERHEAD UTILITIES
- FENCE
- ASPHALT
- CONCRETE

VERTICAL DATUM

CITY OF TACOMA VERTICAL CONTROL- NGVD29 DATUM

BASIS OF BEARING

CITY OF TACOMA SURVEY MONUMENTS- NAD83/91 WASHINGTON SOUTH US FOOT

NOTE:
1. STAMPED/ SIGNED SURVEY ON FILE
2. NOT ALL UTILITIES SHOWN ARE FIELD VERIFIED - D.A. HOGAN HAS MODIFIED THE SURVEY IN SOME INSTANCES TO INCLUDE AS-BUILT UTILITY INFORMATION PROVIDED BY THE OWNER. FIELD VERIFY AT INITIAL SITE PREPARATION WHERE NOTED

NORTH

SCALE: 1" = 20'

AHBL
TACOMA · SEATTLE · SPOKANE · TRI-CITIES
2215 North 30th Street, Suite 200 Tacoma, WA 98403
253.383.2422 TEL 253.383.2572 FAX www.ahbl.com WEB

Project Title:
GIAUDRONE MIDDLE SCHOOL TRACK AND FIELD SURVEY

Client:
KORSMO CONSTRUCTION, INC
1940 EAST D STREET, SUITE 300
TACOMA, WA 98421
STEVE RICH

Job No.
2210626.50

Issue Set & Date:
SEPTEMBER 15, 2021

Revisions:

Sheet Title:
TOPOGRAPHIC SURVEY

Designed by: GD Drawn by: Checked by: DF

Sheet No.
1
1 of 2 Sheets

File: F-0.1 Giaudrone CURRENT 24x36.dwg Plotted by: reneef Date: 27-Feb-22 11:58:18am

REVISION	DATE

GIAUDRONE MIDDLE SCHOOL FIELD AND TRACK CONVERSION

TACOMA PUBLIC SCHOOLS
EVERY STUDENT. EVERY DAY.

KORSMO CONSTRUCTION

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Seattle, WA 98104
(206) 285-0400 Phone

Civil Engineer
LPD Engineering
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Structural Engineer
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1601 5th Ave Suite 1600
Seattle, WA 98101
(206) 622-5822 Phone

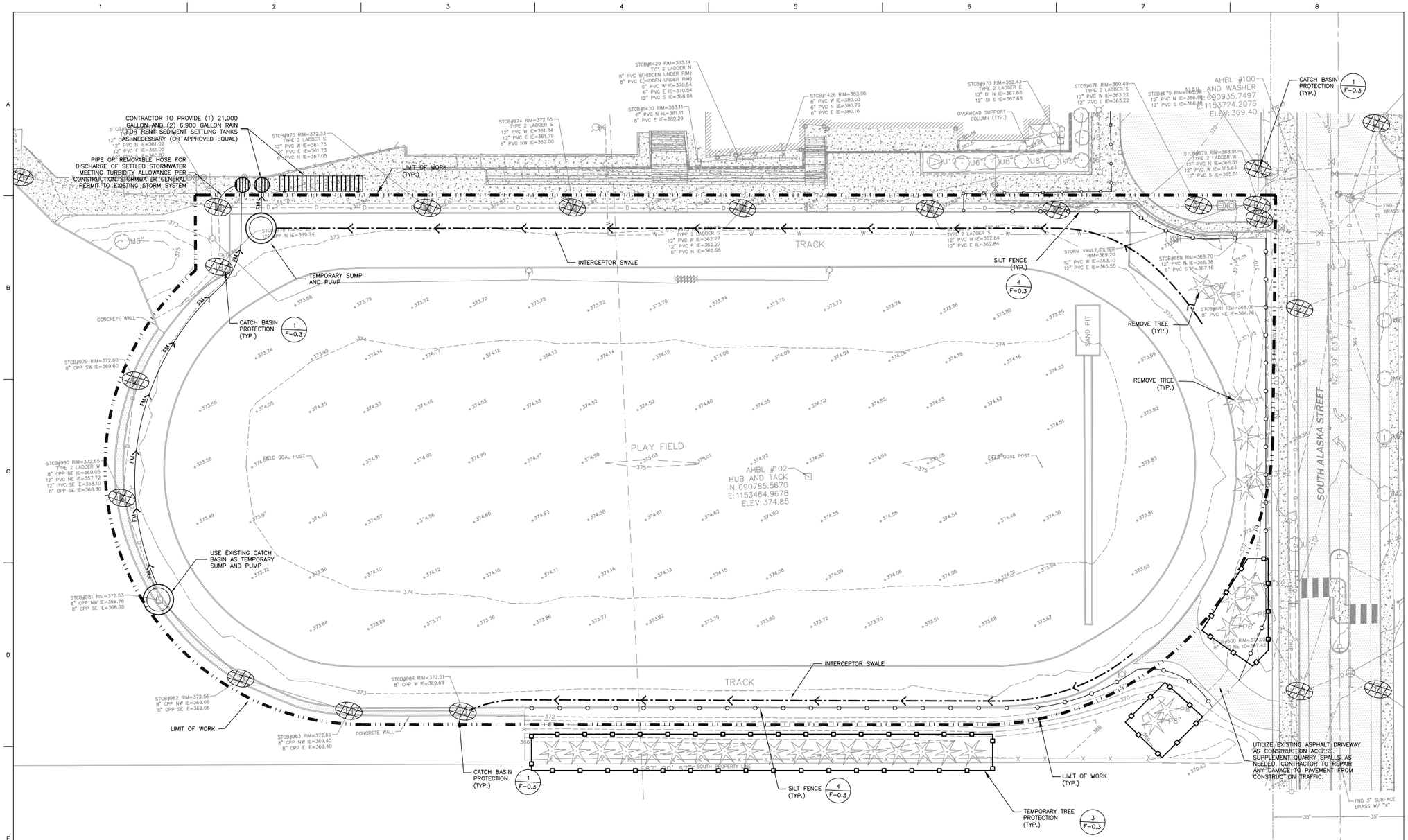
Electrical Engineer
Stantec
4100 194th St SW Suite 400
Lynnwood, WA 98036
(206) 224-3689 Phone

PERMIT SET

DATE	2-28-22
SCALE	1"=20'
DRAWN	-
CHECKED	-

TOPOGRAPHICAL SURVEY

SHEET
F-0.1



T.E.S.C. NOTES

1. SEE SHEET F-0.3 FOR CITY OF TACOMA STANDARD TESC NOTES.
2. ALL LOCATIONS OF EXISTING UTILITIES SHOWN HEREON HAVE BEEN ESTABLISHED BY FIELD SURVEY OR OBTAINED FROM AVAILABLE RECORDS AND SHOULD THEREFORE BE CONSIDERED APPROXIMATE ONLY AND NOT NECESSARILY COMPLETE. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO INDEPENDENTLY VERIFY AND AVOID ANY OTHER UTILITIES SHOWN HEREON WHICH MAY BE AFFECTED BY THE IMPLEMENTATION OF THIS PLAN.
3. MAINTAIN EX. SD CONVEYANCE SYSTEM UNTIL REMAINDER OF PROPOSED SD CONVEYANCE SYSTEM HAS BEEN FULLY CONSTRUCTED AND APPROVED FOR USE. EX. SD CONVEYANCE SYSTEM MAY BE UTILIZED FOR TESC CONVEYANCE PROVIDED ALL FLOWS MEET WATER QUALITY REQUIREMENTS AT POINT OF DISCHARGE FROM SITE.
4. NOT ALL REQUIRED CB PROTECTION IS INDICATED ON THIS PLAN. INSTALL CB PROTECTION PER DETAIL 1/F-0.3 ON ALL EX CATCH BASINS TO REMAIN DURING CONSTRUCTION AND ALL INSTALLED CATCH BASINS. MAINTAIN PROTECTION UNTIL TRIBUTARY SURFACES ARE STABILIZED.
5. MAINTAIN/RELOCATE TESC MEASURES AND PROVIDE ADDITIONAL TESC MEASURES AS REQUIRED TO STABILIZE EXPOSED SOILS, MINIMIZE SEDIMENT TRANSPORT ON SITE, AND MEET ALL SITE DISCHARGE AND PERMIT REQUIREMENTS. ADDITIONAL FACILITIES BEYOND THOSE INDICATED ON THIS PLAN MAY BE REQUIRED, AND IT IS THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE AND PROVIDE ADDITIONAL MEASURES THAT ARE NECESSITATED DUE TO THEIR OPERATIONS AND SEQUENCING OF THE WORK. ALL TESC MEASURES SHALL BE REMOVED FOLLOWING SITE STABILIZATION WITH FINAL PAVING AND PLANTING.
6. CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ALL REQUIRED MONITORING, TESTING, REPORTING AND ALL OTHER COMPLIANCE MEASURES AS NECESSARY TO MEET PROJECT NPDES CONSTRUCTION STORMWATER GENERAL PERMIT COVERAGE REQUIREMENTS.
7. CONTRACTOR SHALL DESIGN AND PROVIDE ALL TEMPORARY STORAGE AND WATER QUALITY TREATMENT FACILITIES, INCLUDING BUT NOT LIMITED TO PRETREATMENT AND STORAGE TANKS, SAND FILTRATION, CHEMICAL TREATMENT SYSTEMS, PIPING, PUMPS, AND ANY OTHER FACILITIES REQUIRED TO MEET THE NPDES CONSTRUCTION STORMWATER GENERAL PERMIT WATER QUALITY REQUIREMENTS FOR ALL SITE DISCHARGES. NUMBER, TYPE AND LOCATION OF TREATMENT SYSTEMS SHALL BE DETERMINED BY CONTRACTOR IN ACCORDANCE WITH THEIR OPERATIONS.
8. PROVIDE TEMP ACCESS ROADS AND WORKING SURFACES TO STABILIZE SOILS IN AREAS OF OPERATIONS. EXTENTS SHOWN ARE SCHEMATIC; ACTUAL EXTENTS OF TEMP ACCESS, WORKING SURFACES AND NUMBER AND LOCATION OF TEMPORARY SUMPS/SUMP PUMPS SHALL BE DETERMINED BY CONTRACTOR IN ACCORDANCE WITH THEIR OPERATIONS.
9. REMOVE ALL TEMP ACCESS ROADS AND WORKING SURFACES PRIOR TO FINAL RESTORATION. INSTALL EROSION BLANKER AT PERIMETER EDGES OF CONSTRUCTION ACCESS ROUTE TO PROTECT EXISTING SOILS.
10. INSTALL EROSION BLANKET PRIOR TO HYDROSEEDING CONSTRUCTION ACCESS RESTORATION AREA.

T.E.S.C. LEGEND

- SILT FENCE
- CATCH BASIN PROTECTION
- TEMPORARY TREE PROTECTION FENCE
- FM — FORCE MAIN
- LIMIT OF WORK

Know what's below. Call before you dig.

NORTH

0 20' 40'

SCALE: 1" = 20'

File: F-0.1 Gaudrone CURRENT 24x36.dwg Plotted by: reneef Date: 25-Feb-22 4:26:14pm

REVISION	DATE

GIAUDRONE MIDDLE SCHOOL FIELD AND TRACK CONVERSION

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Stantec
4100 194th St SW Suite 400
Lynnwood, WA 98036
(206) 224-3689 Phone

DAVID L. ANDERSON — STATE OF WASHINGTON — REGISTERED PROFESSIONAL ENGINEER

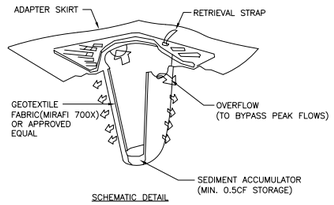
PERMIT SET

DATE	2-28-22
SCALE	1"=20'
DRAWN	DMD
CHECKED	DLA/JAB

TESC PLAN

SHEET

F-0.2



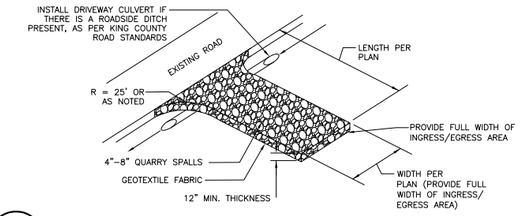
SCHEMATIC DETAIL

PROVIDE "STREAMGUARD SEDIMENT CATCH BASIN INSERT" OR APPROVED EQUAL

MANUFACTURER'S NAME: BOWHEAD ENVIRONMENTAL & SAFETY
ADDRESS: PO BOX 375 PRESTON, WA 98050
TELEPHONE: FOR INFORMATION: (800) 909-3677
WWW.SHOPBOWHEAD.COM

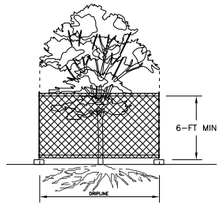
1 / F-0.3 TEMPORARY CATCH BASIN PROTECTION

NOT TO SCALE



2 / F-0.3 STABILIZED CONSTRUCTION ENTRANCE

NOT TO SCALE

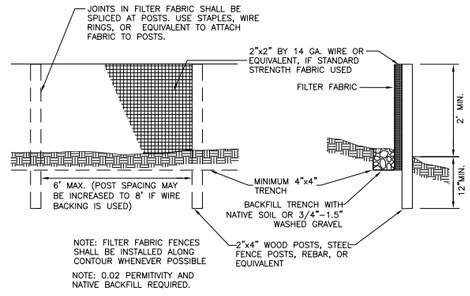


NOTES:

1. 6-FT. HIGH TEMPORARY CHAIN LINK FENCE SHALL BE PLACED AT THE DRIPLINE OF THE TREE TO BE SAVED. FENCE SHALL COMPLETELY ENCIRCLE THE TREE(S). INSTALL FENCE POSTS USING PIER BLOCKS ONLY. AVOID DRIVING POSTS OR STAKES INTO MAJOR ROOTS.
2. FOR ROOTS OVER 1-IN DIA. THAT ARE DAMAGED DURING CONSTRUCTION, MAKE A CLEAN, STRAIGHT CUT TO REMOVE THE DAMAGED PORTION. ALL EXPOSED ROOTS SHALL BE TEMPORARILY COVERED WITH DAMP BURLAP TO PREVENT DRYING, AND SHALL BE COVERED WITH SOIL AS SOON AS POSSIBLE.
3. WORK WITHIN PROTECTION FENCE SHALL BE DONE MANUALLY. NO STOCKPILING OF MATERIALS, VEHICULAR TRAFFIC, OR STORAGE OF EQUIPMENT OR MACHINERY SHALL BE ALLOWED WITHIN THE LIMIT OF THE FENCING.

3 / F-0.3 TREE PROTECTION

NOT TO SCALE



4 / F-0.3 TEMPORARY FILTER FABRIC FENCE

NOT TO SCALE

T.E.S.C. NOTES

1. THE IMPLEMENTATION OF THESE TESC PLANS AND THE CONSTRUCTION, MAINTENANCE, REPLACEMENT, AND UPGRADING OF TESC FACILITIES IS THE RESPONSIBILITY OF THE APPLICANT/ CONTRACTOR UNTIL ALL CONSTRUCTION IS COMPLETED AND APPROVED, VEGETATION/LANDSCAPING IS ESTABLISHED AND THE ENTIRE SITE IS STABILIZED.
2. THE BOUNDARIES OF THE CLEARING LIMITS SHOWN ON THIS PLAN SHALL BE CLEARLY MARKED IN THE FIELD PRIOR TO CONSTRUCTION. DURING THE CONSTRUCTION PERIOD, NO DISTURBANCE BEYOND THE CLEARING LIMITS SHALL BE PERMITTED. THE MARKING SHALL BE MAINTAINED BY THE APPLICANT/CONTRACTOR FOR THE DURATION OF CONSTRUCTION.
3. THE TESC FACILITIES SHOWN ON THIS PLAN SHALL BE CONSTRUCTED PRIOR TO AND/OR IN CONJUNCTION WITH ALL CLEARING AND GRADING ACTIVITIES, AND IN SUCH A MANNER AS TO ENSURE THAT SEDIMENT AND SEDIMENT LADEN WATER DO NOT ENTER THE DRAINAGE SYSTEM OR ROADWAYS, OR VIOLATE APPLICABLE WATER STANDARDS.
4. THE TESC FACILITIES SHOWN ON THIS PLAN ARE THE MINIMUM REQUIREMENTS FOR ANTICIPATED SITE CONDITIONS. DURING THE CONSTRUCTION PERIOD, TESC FACILITIES SHALL BE UPGRADED AS NEEDED FOR UNEXPECTED STORM EVENTS AND TO ENSURE THAT SEDIMENT AND SEDIMENT-LADEN WATER DO NOT LEAVE THE SITE.
5. THE CESCL, CPESC, OR ESC LEAD SHALL BE IDENTIFIED IN THE SWPPP AND SHALL BE ONSITE OR ON-CALL AT ALL TIMES.
6. THE CESCL, CPESC, OR ESC LEAD MUST BE KNOWLEDGEABLE IN THE PRINCIPLES AND PRACTICES OF EROSION AND SEDIMENT CONTROL AND HAVE THE SKILLS TO ASSESS:
   a. SITE CONDITIONS AND CONSTRUCTION ACTIVITIES THAT COULD IMPACT THE QUALITY OF STORMWATER.
   b. EFFECTIVENESS OF EROSION AND SEDIMENT CONTROL MEASURES USED TO CONTROL THE QUALITY OF STORMWATER DISCHARGES.
7. THE CESCL, CPESC, OR ESC LEAD MUST EXAMINE STORMWATER VISUALLY FOR THE PRESENCE OF SUSPENDED SEDIMENT, TURBIDITY, DISCOLORATION, AND OIL SHEEN AND EVALUATE THE EFFECTIVENESS OF BMPS TO DETERMINE IF IT IS NECESSARY TO INSTALL, MAINTAIN, OR REPAIR BMPS.
8. THE CESCL, CPESC, OR ESC LEAD MUST INSPECT ALL AREAS DISTURBED BY CONSTRUCTION ACTIVITIES, ALL BMPS, AND ALL STORMWATER DISCHARGE POINTS AT LEAST ONCE EVERY CALENDAR WEEK AND WITHIN 24 HOURS OF ANY DISCHARGE FROM THE SITE. (INDIVIDUAL DISCHARGE EVENTS THAT LAST MORE THAN ONE DAY DO NOT REQUIRE DAILY INSPECTIONS). THE CESCL OR INSPECTORMAY REDUCE THE INSPECTION FREQUENCY FOR TEMPORARY STABILIZED, INACTIVE SITES TO ONCE EVERY CALENDAR MONTH.
9. CONSTRUCTION SITE OPERATORS MUST CORRECT ANY PROBLEMS IDENTIFIED BY THE CESCL, CPESC,OR ESC LEAD BY:
   a. REVIEWING THE SWPPP FOR COMPLIANCE WITH THE 13 CONSTRUCTION SWPPP ELEMENTS AND MAKING APPROPRIATE REVISIONS WITHIN 7 DAYS OF THE INSPECTION.
   b. FULLY IMPLEMENT AND MAINTAIN APPROPRIATE SOURCE CONTROL AND/OR TREATMENT BMPS AS SOON AS POSSIBLE BUT CORRECTING THE PROBLEM WITHIN 10 DAYS.
   c. DOCUMENTING BMP IMPLEMENTATION AND MAINTENANCE IN THE SITE LOG BOOK. (REQUIRED FOR SITES LARGER THAN 1 ACRE BUT RECOMMENDED FOR ALL SITES).

   SAMPLING AND ANALYSIS OF THE STORMWATER DISCHARGES FROM A CONSTRUCTION SITE MAY BE NECESSARY ON A CASE-BY-CASE BASIS TO ENSURE COMPLIANCE WITH STANDARDS. ECOLOGY OR THE CITY WILL ESTABLISH THESE MONITORING AND ASSOCIATED REPORTING REQUIREMENTS.
10. AT NO TIME SHALL MORE THAN ONE FOOT OF SEDIMENT BE ALLOWED TO ACCUMULATE WITHIN A CATCH BASIN SEDIMENT TRAP.
11. ALL CATCH BASINS AND CONVEYANCE LINES SHALL BE CLEANED PRIOR TO PAVING. THE CLEANING OPERATION SHALL NOT FLUSH SEDIMENT-LADEN WATER INTO THE DOWNSTREAM SYSTEM.
12. STABILIZED CONSTRUCTION ENTRANCES SHALL BE INSTALLED AT THE BEGINNING OF CONSTRUCTION AND MAINTAINED FOR THE DURATION OF THE PROJECT. ADDITIONAL MEASURES MAY BE REQUIRED TO ENSURE THAT ALL PAVED AREAS ARE KEPT CLEAN FOR THE DURATION OF THE PROJECT.

REVISION	DATE

GIAUDRONE MIDDLE SCHOOL FIELD AND TRACK CONVERSION

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DAVID L. ANDERSON — STATE OF WASHINGTON — EXPIRES 10/13/2022 — PROFESSIONAL ENGINEER

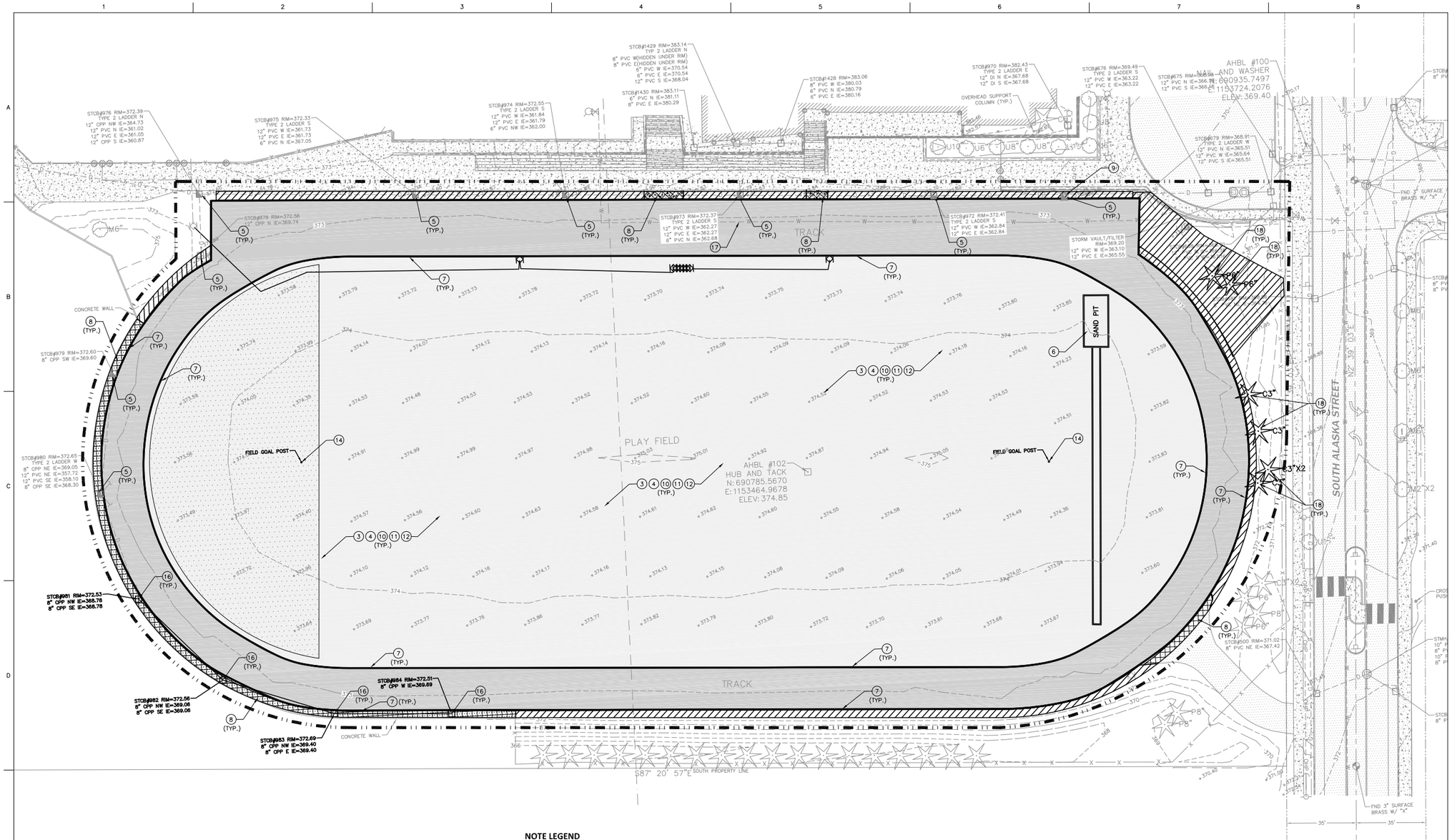
PERMIT SET	
DATE	2-28-22
SCALE	NTS
DRAWN	DMD
CHECKED	DLA/JAB

TESC DETAILS

SHEET

F-0.3

File: F-0.3 TESC Details.dwg Plotted by: reneef Date: 27-Feb-22 11:59:52am



DEMOLITION NOTES

1. CALL BEFORE YOU DIG. LOCATE, IDENTIFY AND VERIFY CONDITION OF ALL SITE UTILITIES PRIOR TO COMMENCING THE WORK.
2. CONTRACTOR SHALL BE RESPONSIBLE FOR SECURING ALL GATES AND FENCES AT PERIMETER OF THIS SITE TO ESTABLISH A SECURE WORK AREA. WORK SHALL INCLUDE TEMPORARY FENCING. SECURITY FENCE TO BE 6 FEET HEIGHT, CHAINLINK.
3. STRIP AREA WITHIN LIMITS OF DISTURBANCE OF EXISTING SOD AND ORGANIC MATERIALS AND DISPOSE OF OFF SITE. ALL EXCESS AND UNSUITABLE SOIL MATERIALS SHALL BE REMOVED AND DISPOSED OF OFF SITE.
4. APPROVED EXISTING SAND FIELD (LESS ORGANICS), CINDER MATERIALS AND SAND MAY BE INCORPORATED INTO THE EARTHWORK AFTER REMOVAL AND DISPOSAL OF THE ORGANIC MATERIALS. ALL EXCESS MATERIAL TO BE DISPOSED OF OFF SITE. SALVAGE SELECT UNCONTAMINATED CINDERS FOR RE-USE AT THE SHOT PUT. CINDERS SHALL NOT BE CONTAMINATED WITH ORGANIC MATERIAL OR SITE SOIL.
5. PROTECT ALL EXISTING CATCH BASINS TO REMAIN DURING CONSTRUCTION. INSTALL T.E.S.C. MEASURES AROUND RIMS AND MAINTAIN THROUGHOUT CONSTRUCTION. ALL EXISTING CATCH BASINS SHALL BE TAKEN OFF-LINE PRIOR TO LAND CLEARING ACTIVITIES. OUTLET PIPES SHALL BE PLUGGED TO PREVENT DISCHARGE OF TURBID WATER IN THE DOWNSTREAM SYSTEM. PROPOSED INLETS SHALL BE PROTECTED WITH CATCH BASIN INSERTS, AND THEIR OUTLETS SHALL BE PLUGGED UNTIL THE SITE IS STABILIZED. SEE T.E.S.C. PLAN F-0.2.
6. REMOVE EXISTING JUMP PIT SAND, CONCRETE CURB, CINDERS AND DISPOSE OF OFFSITE.
7. REMOVE EXISTING CONCRETE CURB AND DISPOSE OF OFF SITE.

NOTE LEGEND

1. (INDICATES CENERAL CONSTRUCTION NOTE)
3. (INDICATES SPECIFIC CONSTRUCTION KEYNOTE)

8. REMOVE EXISTING ASPHALT OR CONCRETE PAVING AND DISPOSE OF OFFSITE.
9. REMOVE EXISTING JUNCTION BOXES AND DISPOSE OF OFF SITE.
10. REMOVE ALL EXISTING SUBSURFACE DRAINAGE LATERAL AND COLLECTOR LINES PRIOR TO SUBGRADE ESTABLISHMENT AND DISPOSE OF OFF SITE. BACKFILL ALL VOIDS WITH STRUCTURAL FILL OR EXISTING PEA GRAVEL.
11. REMOVE EXISTING IRRIGATION CONTROL VALVES AND CORRESPONDING BOXES AND DELIVER TO THE OWNER ON SITE UNLESS OTHERWISE NOTED. CAP AND PROTECT EXISTING IRRIGATION MAINLINE TO REMAIN.
12. REMOVE EXISTING IRRIGATION SPRINKLER HEADS AND RISER ASSEMBLIES, CLEAN, PACKAGE AND DELIVER TO THE OWNER ONSITE UNLESS OTHERWISE NOTED. BACKFILL ALL VOIDS WITH STRUCTURAL FILL OR EXISTING PEA GRAVEL.
13. THE IRRIGATION WATER SUPPLY TO THE EXISTING SOFTBALL FIELDS SHALL BE MAINTAINED THROUGHOUT THE PROJECT. ANY SHUT DOWN TO THESE IRRIGATION SYSTEMS SHALL BE COORDINATED WITH THE SCHOOL DISTRICT GROUNDS DEPARTMENT A MINIMUM OF 48 HOURS PRIOR TO THE SHUT DOWN. THE DURATION OF ANY INTERRUPTIONS TO THE IRRIGATION SERVICE TO THOSE FIELDS SHALL NOT EXCEED 24 HOURS.
14. REMOVE EXISTING GOAL POSTS AND SALVAGE FOR REPAINTING. REMOVE EXISTING FOOTING AND DISPOSE OF OFF SITE. BACKFILL WITH STRUCTURAL AND COMPACT 95%
15. PROTECT ALL UTILITIES TO REMAIN FROM ANY DAMAGE THROUGHOUT CONSTRUCTION.
16. REMOVE EXISTING CATCH BASINS AND STORM DRAINAGE PIPE AND DISPOSE OFF SITE. BACKFILL WITH STRUCTURAL FILL AND COMPACT TO 95%. PLUG PENETRATION AT STORM DRAINAGE OUTFALL IN THE NEXT DOWNSTREAM STRUCTURE
17. POT HOLE EXISTING WATER LINE PRIOR TO INSTALLATION OF DRAINAGE SYSTEM, COORDINATE COLLECTOR DEPTH WITH EXISTING WATER LINE, REPORT ANY CONFLICTS TO ENGINEER
18. REMOVE EXISTING TREE AND ROOTS
19. BACKFILL ALL EXCAVATIONS WITH STRUCTURAL FILL AND COMPACT TO 95%.

DEMOLITION LEGEND

- EXISTING NATURAL TURF AND ROOT ZONE SAND TO BE REMOVED AND DISPOSED OF OFF SITE
- CINDER SURFACING TO BE REMOVED AND DISPOSED OF OFF SITE
- EXISTING NATURAL TURF TO BE REMOVED AND DISPOSED OF OFF SITE
- REMOVE EXISTING ASPHALT OR CONCRETE PAVING
- LIMIT OF WORK
- EXISTING CONCRETE CURBING TO BE REMOVED AND DISPOSED OF OFF SITE
- EXISTING TREE REMOVAL
- D — REMOVE EXISTING DRAIN PIPE

811 Know what's below. Call before you dig.

NORTH

0 20' 40'

SCALE: 1" = 20'

REVISION	DATE

GIAUDRONE MIDDLE SCHOOL FIELD AND TRACK CONVERSION

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DAVID L. ANDERSON — STATE OF WASHINGTON — 19878 — REGISTERED PROFESSIONAL ENGINEER

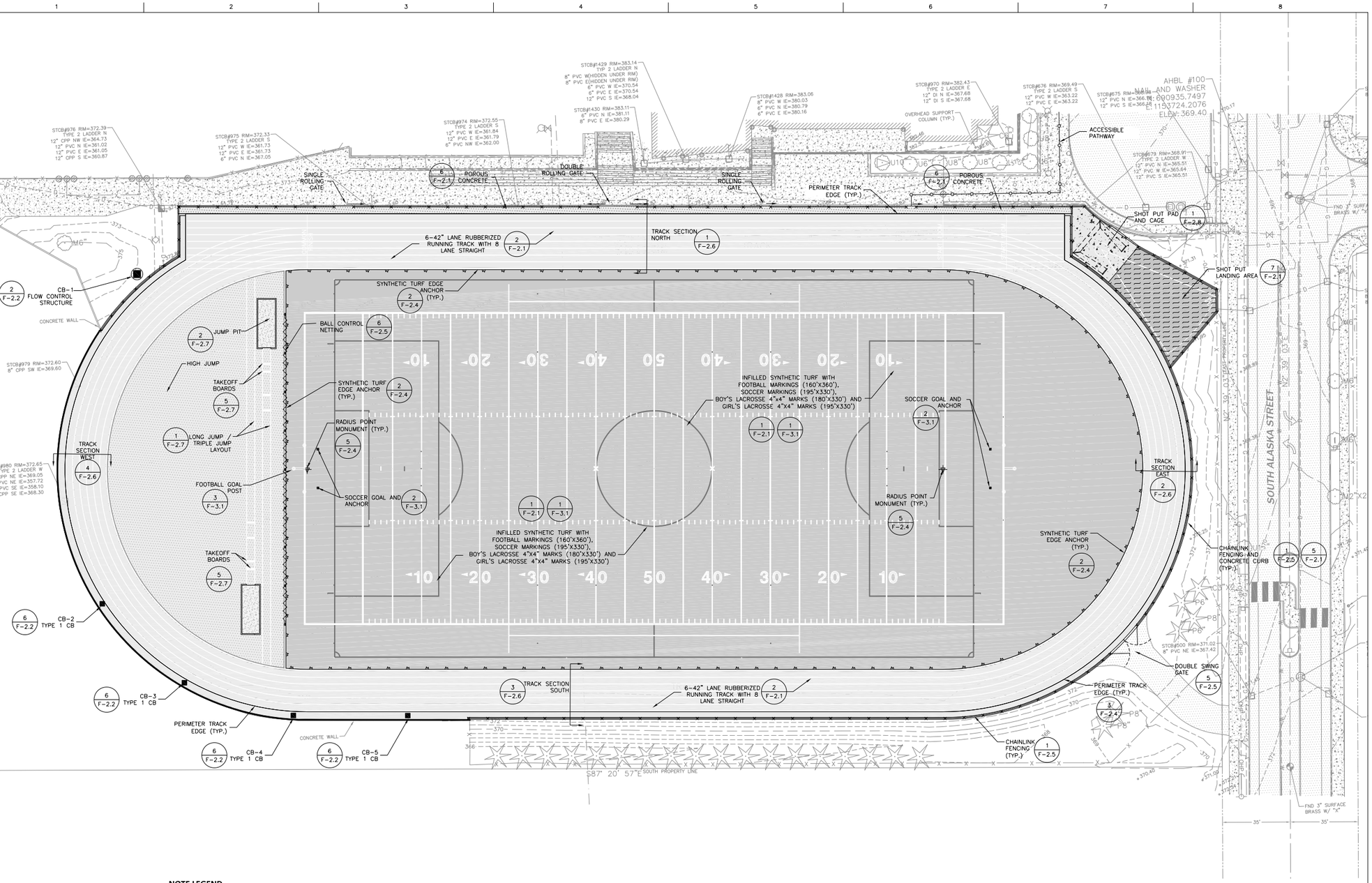
PERMIT SET	
DATE	2-28-22
SCALE	1"=20'
DRAWN	DMD
CHECKED	DLA/JAB

DEMOLITION PLAN

SHEET

F-0.4

File: F-0.1 Giaudrone CURRENT 24x36.dwg Plotted by: reneef Date: 27-Feb-22 12:04:05pm



LAYOUT NOTES

NOTE LEGEND

1. (INDICATES GENERAL CONSTRUCTION NOTE)
(3) (INDICATES SPECIFIC CONSTRUCTION KEYNOTE)

1. FIELD LOCATE EXISTING RADIUS POINT MONUMENT FOR TRACK STRIPING. MEASURING LINE RADIUS FOR TRACK IS R114.87'. DISTANCE BETWEEN RADIUS POINTS IS 295.32'.
2. PRIOR TO INSTALLATION OF THE RUBBERIZED SURFACE THE EXISTING PAVING SHALL BE CHECKED FOR PLANARITY BY THE ENGINEER, GENERAL CONTRACTOR, AND TRACK VENDOR.
FOR ESTIMATING PURPOSES, IT IS ASSUMED THAT 900SF OF EXISTING ASPHALT PAVING SHALL REQUIRE GRINDING OF 0.10'. THE EXISTING ASPHALT PAVING SHALL BE GROUND TO THE REQUIRED PLANARITY WITHIN SPECIFIED TOLERANCES. MICROGRIND OR EQUIVALENT.
3. FINISH SURFACE PLANARITY OF ASPHALT SHALL NOT DEVIATE MORE THAN 1/8" WHEN MEASURED WITH A 10 FOOT STRAIGHT EDGE IN ALL DIRECTIONS.
4. IMMEDIATELY PRIOR TO APPLICATION OF RUBBERIZED SURFACING, EXISTING POROUS ASPHALT SHALL BE THOROUGHLY CLEANED OF ALL DIRT, DEBRIS OR ANY OTHER SUBSTANCES THAT WILL BE DETRIMENTAL TO THE INSTALLATION. ALL SURFACES TO BE VACUUMED WITH A COMMERCIAL HEAVY DUTY UNIT AND PRESSURE WASHED.
5. PRIOR TO APPLICATION OF PRIMER, THE PERMEABILITY IS TO BE INSPECTED BY THE ENGINEER AND MUST BE APPROVED BEFORE ANY SURFACE APPLICATION OF RUBBERIZED SURFACING. CONTRACTOR TO ARRANGE FOR HOSE AND COUPLERS.
6. APPLY SUCH PRIMING MATERIAL AS MAY BE NECESSARY TO ASSURE COMPLETE BOND OF POLYURETHANE TO THE EXISTING POROUS ASPHALT OR CONVENTIONAL ASPHALT PAVING.
7. THE RUBBERIZED SURFACING SHALL CONSIST OF A PERMEABLE POLYURETHANE BASE MATT WITH A PERMEABLE POLYURETHANE STRUCTURAL SPRAY.
8. CONTRACTOR MUST PROTECT ALL ADJACENT AREAS FROM ANY CONTAMINATION OR OVER SPRAY FROM RUBBERIZED SURFACING INSTALLATION PROCEDURES. TAPE PLASTIC SHEETING TO EDGING OR ADJACENT EXPOSED ASPHALT CONCRETE PAVING TO PROTECT FIELD SURFACING, ADJACENT AREAS AND STRUCTURES INCLUDING FENCING.
9. FURNISH AND INSTALL COMPLETE TRACK AND FIELD EVENT LINES AND MARKINGS TO MATCH THAT OF THE EXISTING TRACK AND FIELD EVENTS.
10. FURNISH AND INSTALL COMPLETE TRACK AND FIELD EVENT LINES AND MARKINGS.
11. PRIOR TO TESTING, MANUFACTURING AND SHIPMENT OF SYNTHETIC TURF MATERIAL, CONTRACTOR SHALL FIELD VERIFY SYNTHETIC TURF SURFACING DIMENSIONS TO MATCH EXISTING FIELD. SEE SYNTHETIC TURF COMPOSITE LAYOUT PLAN FOR SYNTHETIC TURF LINES AND MARKINGS.
12. PROTECT ALL EXISTING PERMEABLE AGGREGATE BASE TO REMAIN. DISTURBED OR SEGREGATED PERMEABLE AGGREGATE MATERIALS SHALL BE REMOVED AND REPLACED WITH NEW TOP COURSE AGGREGATE AS DIRECTED BY THE ENGINEER.
13. THE CONTRACTOR SHALL UTILIZE EXTREME CARE DURING TURF INSTALLATION TO PROTECT EXISTING SUPPLEMENTAL PAD AND PERMEABLE AGGREGATE BASE TO REMAIN. PRIOR TO INSTALLATION OF NEW SYNTHETIC TURF SYSTEM, REMOVE ALL RESIDUE AND THOROUGHLY CLEAN THE EXISTING SUPPLEMENTAL PAD, AND REPAIR OR REPLACE ANY DAMAGE TO THE EXISTING SUPPLEMENTAL PAD. THE SUPPLEMENTAL PAD IS TO BE INSPECTED BY THE ENGINEER AND MUST BE APPROVED BEFORE TURF INSTALLATION. THE EXISTING PAD IS A 10MM REGUPOL PRODUCT. CONTRACTOR SHALL ASSUME 1000 SF OF PAD REPAIR OR REPLACEMENT AREAS.
14. PRIOR TO COMMENCING TURF INSTALLATION:
14.1. PREPARE THE EXISTING SUPPLEMENTAL PAD FLUSH TO THE EXISTING EDGE ANCHOR.
14.2. MEET 1/4" IN 10' PLANARITY REQUIREMENT.
14.3. VERIFY INFILTRATION AS DIRECTED.
15. FURNISH AND INSTALL FOUR NEW SOCCER GOALS ANCHORS (2 EACH SIDE).
16. PROTECT ALL EXISTING UTILITIES TO REMAIN THROUGHOUT CONSTRUCTION.
17. INSTALL GOAL POSTS AFTER PAINTING , COLOR TO BE WHITE. ADJUST EXISTING GOAL POSTS TO PRODUCE 10'-0" CLEARANCE FROM SURFACE OF NEW SYNTHETIC TURF INFILL. CONSTRUCT NEW GOAL POST COVERS TO MATCH NEW TURF.

LAYOUT LEGEND

- SYNTHETIC TURF AND PERMEABLE AGGREGATE
- RUBBERIZED SURFACING AND ASPHALT PAVING
- VERTICALLY DRAINING RUBBERIZED SURFACING OVER PEA-ROCK URETHANE AND PERMEABLE BASE
- CINDERS
- CONCRETE PAVING
- POROUS CONCRETE PAVING
- CHAINLINK FENCE AND CONCRETE CURB
- CHAINLINK FENCE
- CONCRETE CURBING
- LIMIT OF SYNTHETIC TURF AND CONCRETE EDGE ANCHOR
- FLOW CONTROL STRUCTURE
- TYPE 1 CATCH BASIN
- EXISTING CATCH BASIN
- ACCESSIBILITY ROUTE

NORTH

0 20' 40'

SCALE: 1" = 20'

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DAVID L. ANDERSON — STATE OF WASHINGTON — REGISTERED PROFESSIONAL ENGINEER

PERMIT SET

DATE	2-28-22
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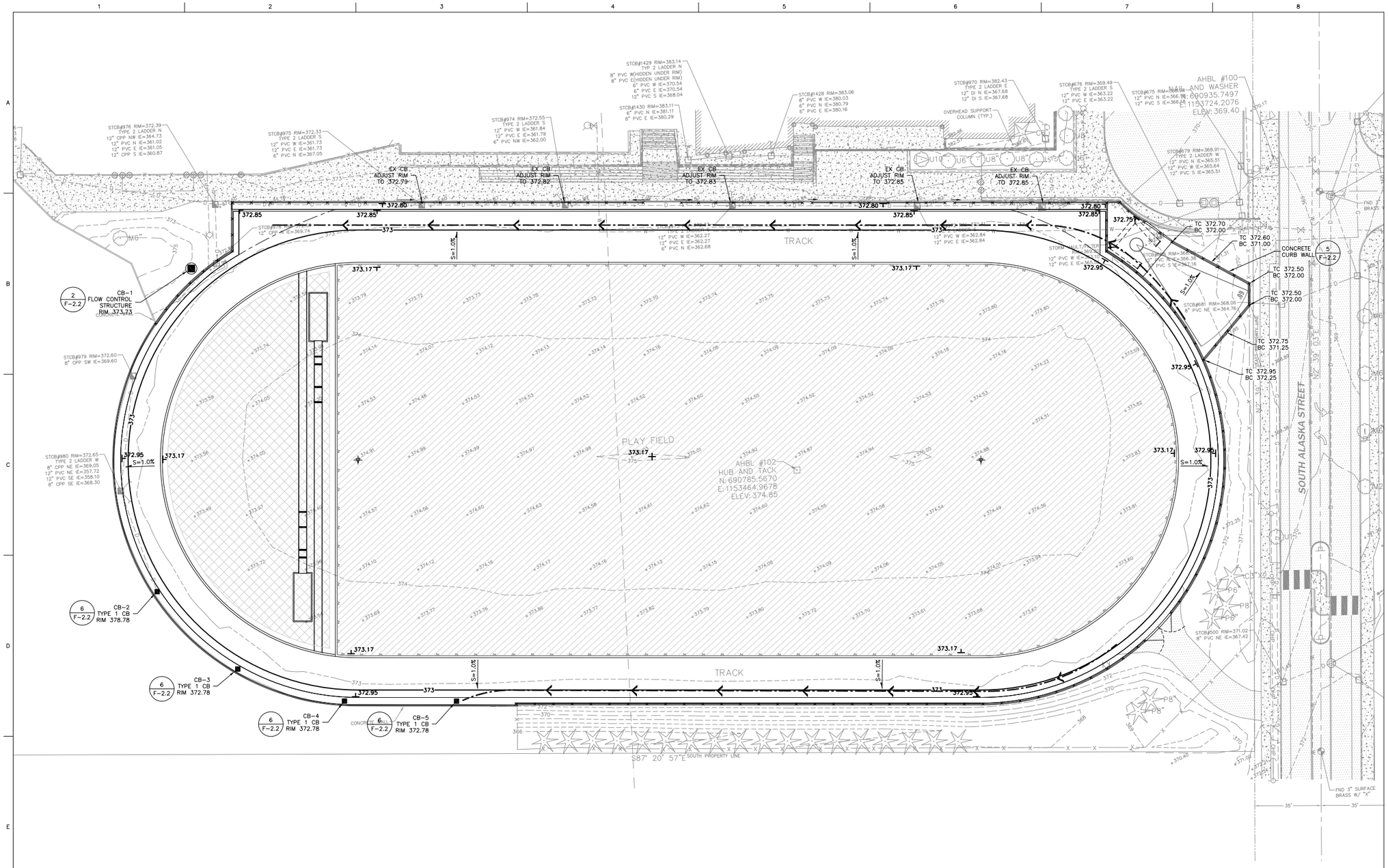
CHECKED	DLA/JAB

LAYOUT PLAN

SHEET

F-1.1

Plot: F-0.1 Gaudrone CURRENT 24x36.dwg Plotted by: reneef Date: 28-Feb-22 9:40:37am



FIELD AND TRACK ELEVATIONS

SYNTHETIC TURF FIELD:

FINISHED GRADE OF SYNTHETIC TURF INFILL:	373.17
FINISHED GRADE OF SUPPLEMENTAL PAD:	373.04
FINISHED GRADE OF TOP COURSE PERMEABLE AGGREGATE:	372.95
FINISHED GRADE OF BASE COURSE PERMEABLE AGGREGATE:	372.78
SUBGRADE ELEVATION:	372.11

RUBBERIZED RUNNING TRACK AREAS:

INSIDE EDGE:

FINISHED GRADE OF RUBBERIZED SURFACING:	373.17
FINISHED GRADE OF ASPHALT PAVING:	373.13
FINISHED GRADE OF BASE AGGREGATE:	372.84
SUBGRADE ELEVATION:	372.34

OUTSIDE EDGE:

FINISHED GRADE OF RUBBERIZED SURFACING:	372.95
FINISHED GRADE OF ASPHALT PAVING:	372.91
FINISHED GRADE OF BASE AGGREGATE:	372.62
SUBGRADE ELEVATION:	372.12

NORTH EDGE:

FINISHED GRADE OF RUBBERIZED SURFACING:	372.85
FINISHED GRADE OF ASPHALT PAVING:	372.81
FINISHED GRADE OF BASE AGGREGATE:	372.52
SUBGRADE ELEVATION:	372.02

GRADING NOTES

1. THE CONTRACTOR SHALL CALL AND NOTIFY DIGALERT AT 8-1-1 A MINIMUM OF 2 WORKING DAYS BEFORE DEMOLITION, DIGGING, OR GRADING OPERATIONS OCCUR.
2. NEW CONTOURS SHOWN ARE FINISH GRADE ELEVATIONS.
3. BACKFILL AND COMPACT EXCAVATED AREAS RESULTING FROM DEMOLITION ACTIVITIES WITH SELECT FILL TO 95% WITH 12" MAX LIFTS.
4. STRIP FIELD AREA OF EXISTING SOD AND ORGANIC MATERIALS AND DISPOSE OF OFF SITE. ALL EXCESS AND UNSUITABLE SOIL MATERIALS SHALL BE REMOVED AND DISPOSED OF OFF SITE.
5. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IN THE EVENT OR DISCOVERY OF POOR SOILS, GROUNDWATER OR DISCREPANCIES IN THE EXISTING CONDITIONS AS NOTED ON THE PLANS.
6. ALL PERIMETER PAVING SHALL MEET AND MATCH ADJACENT SURFACES.

NOTE LEGEND

1. (INDICATES GENERAL CONSTRUCTION NOTE)
(3) (INDICATES SPECIFIC CONSTRUCTION KEYNOTE)

GRADING LEGEND

- 372 — EXISTING CONTOUR LINES
- 373.17 — SPOT ELEVATION
- GRADE BREAK
- LIMIT OF PERMEABLE AGGREGATE
- PERMEABLE AGGREGATE OVER DETENTION BASIN
- CHAINLINK FENCE AND CONCRETE CURB
- CHAINLINK FENCE
- S=1.0% — SURFACE SLOPE

TC 374.85 TOP OF CURB ELEVATION

BC 369.40 BOTTOM OF CURB ELEVATION

TOP OF CURB ELEVATION (TW)

FINISH GRADE ELEVATION (FG)

BOTTOM OF CURB ELEVATION (BW)

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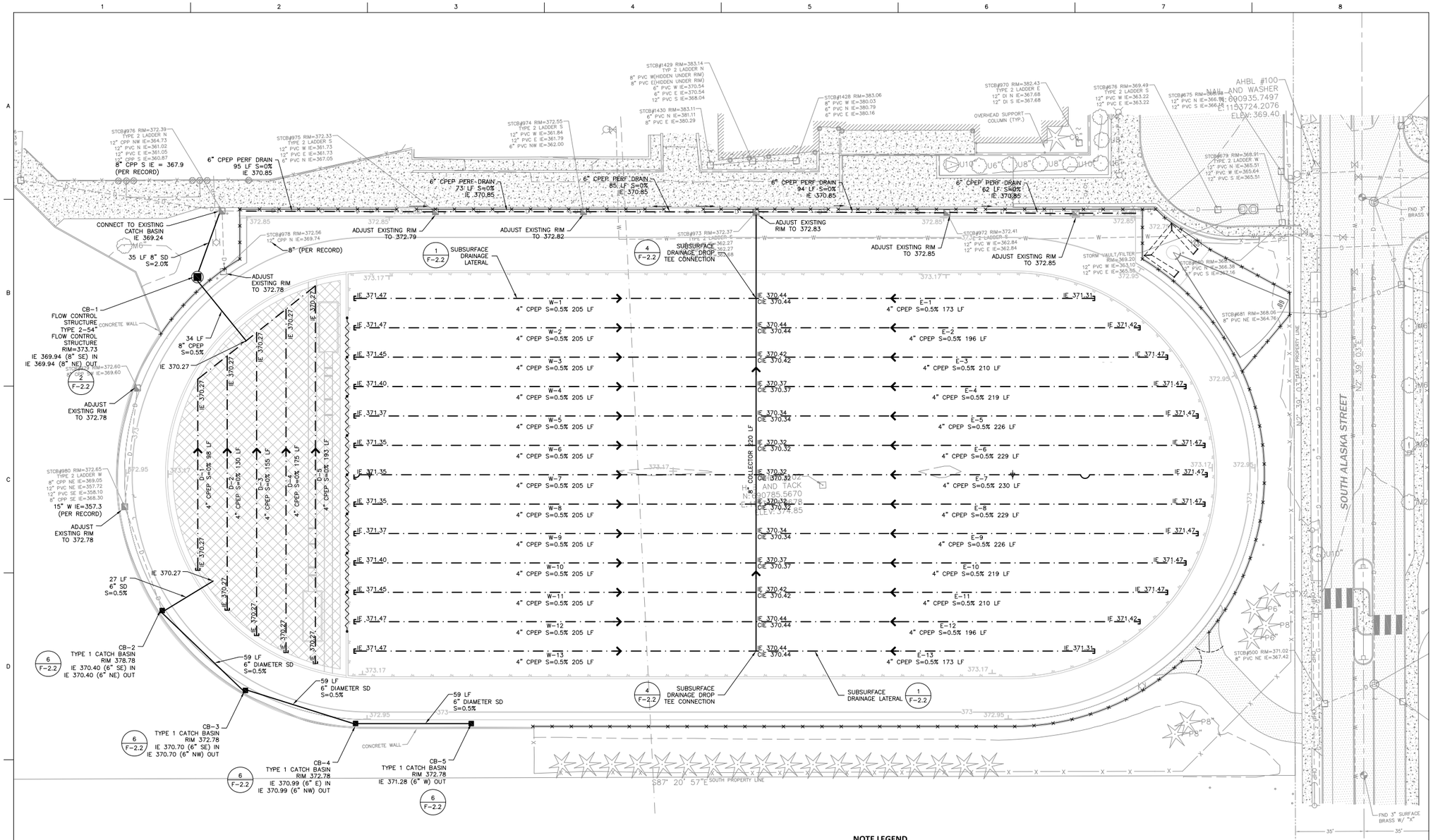
GRADING PLAN

SHEET

F-1.2

File: F-0.1 Gaudrone CURRENT 24x36.dwg Plotted by: reneef Date: 28-Feb-22 9:49:24am



DRAINAGE NOTES

1. SUBSURFACE DRAINAGE COLLECTOR PIPE CAN BE INSTALLED PRIOR TO FINAL ACCEPTANCE OF THE FIELD SUBGRADE.
2. COORDINATION: IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO ENSURE THAT THE IRRIGATION PIPING IS INSTALLED AT A SUFFICIENT DEPTH BELOW SUBGRADE BEFORE THE TRENCHING FOR THE SUBSURFACE DRAINAGE SYSTEMS TO AVOID CONFLICTS BETWEEN SYSTEMS.
3. TRENCHING FOR THE SUBSURFACE DRAINAGE LATERALS SHALL NOT PROCEED UNTIL THE IRRIGATION SYSTEM PIPING HAS BEEN BACKFILLED AND COMPACTED AND THE FIELD SUBGRADE IS APPROVED BY ENGINEER.
4. TRENCH EXCAVATION SHALL BE MADE TO THE ALIGNMENT, ELEVATION, GRADE AND SLOPE AS INDICATED ON THE DRAWINGS. TRENCHING SHALL BE ACCOMPLISHED UTILIZING EQUIPMENT WITH SLOPE AND DEPTH CONTROL, SUCH AS "LASER PLANE CONTROL SYSTEM", SO AS TO ENSURE ACCURACY IN THE BOTTOM OF THE TRENCH.
5. NO HIGH POINTS ABOVE DESIGNATED INVERT OR CALCULATED TRENCH BOTTOM ELEVATION WILL BE PERMITTED. NO SLOUGHING OF SITE MATERIAL OR LOOSE EXCAVATED SOIL WILL BE PERMITTED TO REMAIN IN THE TRENCHES.
6. SURPLUS EXCAVATED SOIL SHALL BE REMOVED FROM THE FIELD AREA PRIOR TO COMMENCING ON THE NEXT ADJACENT TRENCH. EXCAVATED MATERIAL MAY NOT REMAIN ON SUBGRADE.
7. PROVIDE A SMOOTH, EVEN SUBGRADE AFTER REMOVAL OF THE TRENCH MATERIAL. SUBGRADE TO BE COMPACTED TO 95%. LEAVE NO LOOSE MATERIAL ON THE SUBGRADE.
8. EXCAVATION BELOW INVERT GRADE MUST BE ESTABLISHED TO A DEPTH SO AS TO PROVIDE FOR SPECIFIED PLACEMENT OF PEA GRAVEL BEDDING AT BOTTOM OF PIPE ELEVATION PRIOR TO LAYING THE PERFORATED PIPE.
9. NO FOREIGN MATERIAL WILL BE PERMITTED INSIDE, ALONGSIDE, UNDER, OR ON TOP OF THE PERFORATED DRAIN PIPE.
10. THE BACKFILL FOR ALL PERFORATED PIPE SHALL BE CLEAN WASHED PEA GRAVEL. REFER TO THE SPECIFICATIONS FOR THE GRADATION REQUIREMENTS.
11. ALL TRENCHES TO HAVE BACKFILL MATERIAL "CROWNED" A MINIMUM OF 2" ABOVE SUBGRADE TO PROTECT FROM FOREIGN MATERIAL AND PROVIDE FOR EASE OF LOCATION IDENTIFICATION. CROWNS WITH FOREIGN MATERIAL CONTAMINATION SHALL BE REMOVED PRIOR TO PLACEMENT OF BASE SAND (NATURAL TURF) OR BASE AGGREGATE.
12. DURING PLACEMENT OF SPECIFIED TRENCH BACKFILL, PIPE MUST BE HELD IN PLACE TO PREVENT DISPLACEMENT AND PROVIDE FOR ACHIEVING SPECIFIED INVERT ELEVATION. DO NOT DAMAGE PIPE OR ALLOW PIPE TO BE DISPLACED BY PLACEMENT OF BACKFILL MATERIAL.
13. CAP THE ENDS OF ALL LATERAL RUNS. ALL OPEN ENDS DURING CONSTRUCTION ARE TO BE TEMPORARILY CAPPED OR PLUGGED.
14. CONNECTION OF LATERALS TO COLLECTOR DRAINS SHALL BE MADE WITH A COMBINATION REDUCING TEE AND REDUCING SADDLE TEE.
15. NO TRUCKS OR EQUIPMENT WILL BE ALLOWED TO DRIVE OVER THE TOP OF THE TRENCHES EXCEPT TRACK-EQUIPPED MACHINERY UTILIZED IN SPREADING IMPORTED SAND (NATURAL TURF) BASE AGGREGATE (SYNTHETIC TURF) MATERIALS. BACKFILLED TRENCHES ARE TO BE STAKED AND FLAGGED 3' ABOVE GRADE AT MAXIMUM 30' SPACING FOR IDENTITY.
16. COORDINATE SUBSURFACE DRAINAGE COLLECTOR LOCATION TO AVOID FENCE POST LOCATIONS.
17. BACKFILL AT TRENCHES CROSSING TRACK TO BE LEAN CONCRETE OR CDF TO TOP OF SUBGRADE.
18. ADJUST CATCH BASIN RIM ELEVATIONS AT TRACK AND FIELD EDGE TO ACCOMMODATE RUBBERIZED OR SYNTHETIC TURF SURFACING COVERS.
19. CONNECT DRAIN FROM TAKEOFF BOARD ASSEMBLIES TO LATERAL OR COLLECTOR PIPING. SLOPE TO DRAIN.
20. POT HOLE EXISTING WATER LINE PRIOR TO INSTALLATION OF DRAINAGE SYSTEM. COORDINATE COLLECTOR DEPTH WITH EXISTING WATER LINE, REPORT ANY CONFLICTS TO ENGINEER

NOTE LEGEND

(1) (INDICATES GENERAL CONSTRUCTION NOTE)
(3) (INDICATES SPECIFIC CONSTRUCTION KEYNOTE)

DRAINAGE LEGEND

- END CAP
- 4" PERF. CORR. POLY DRAIN TUBING
- CPEP SOLID SUBSURFACE DRAINAGE COLLECTOR OR STORM DRAIN PIPE
- S=0.50% SLOPE
- FLOW DIRECTION
- IE 414.30 INVERT ELEVATION
- CIE 413.00 COLLECTOR INVERT ELEVATION
- FLOW CONTROL STRUCTURE
- CLEANOUT
- EXISTING CATCH BASIN INLET
- TYPE 1 CATCH BASIN
- DETENTION BASIN AGGREGATE

NORTH

0 20' 40'

SCALE: 1" = 20'

File: F-0.1 Glaudrone CURRENT 24x36.dwg Plotted by: reneef Date: 28-Feb-22 9:54:19am

REVISION	DATE

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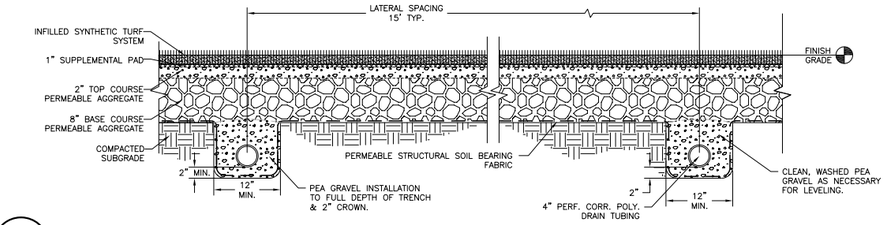
DRAINAGE PLAN

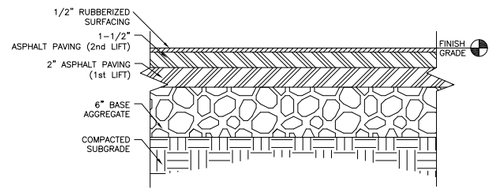
SHEET

F-1.3



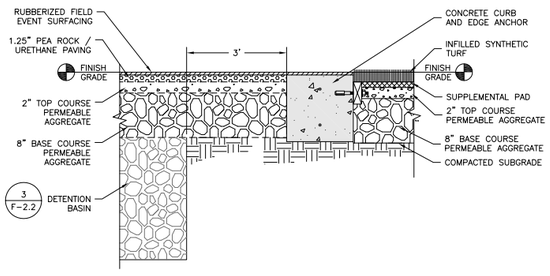
1 F-2.1 SYNTHETIC TURF FIELD SECTION

NOT TO SCALE



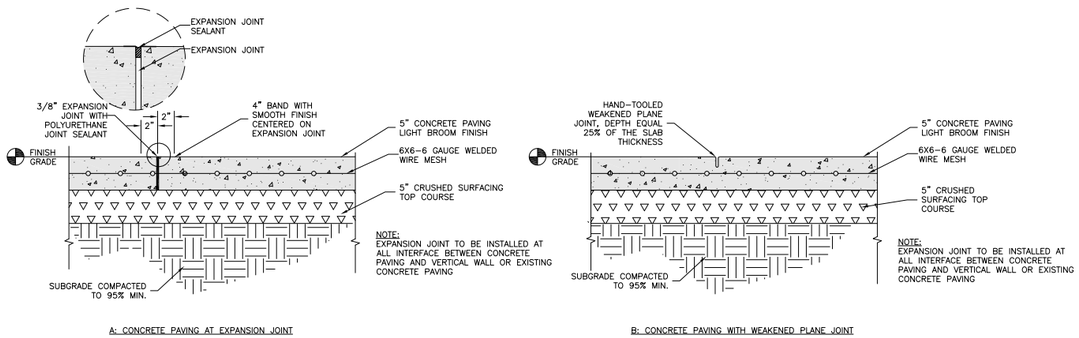
2 F-2.1 RUBBERIZED TRACK SECTION

NOT TO SCALE



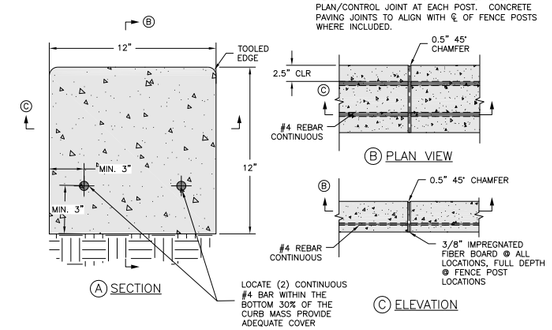
3 F-2.1 PERMEABLE FIELD EVENT DRAINAGE SECTION WITH CURB

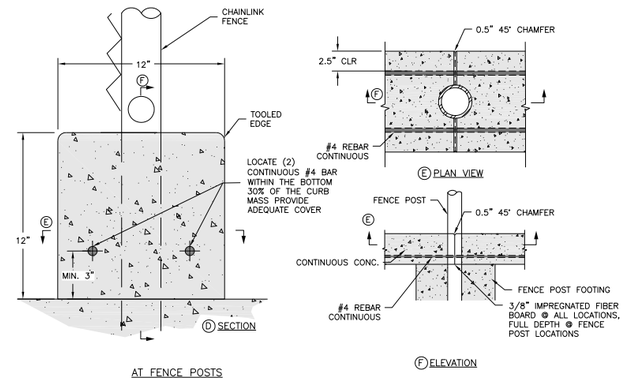
NOT TO SCALE



4 F-2.1 CONCRETE PAVING

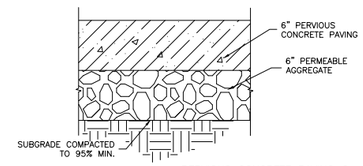
NOT TO SCALE





5 F-2.1 CONCRETE CURB & EXPANSION JOINT

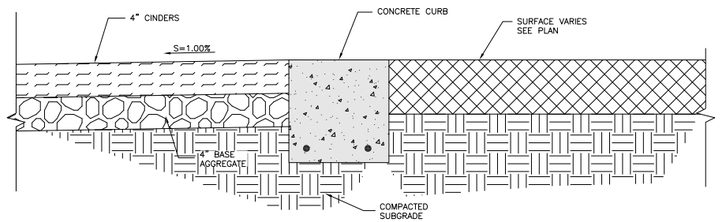
NOT TO SCALE



PERVIOUS CONCRETE PAVING @ WALKWAY

6 F-2.1 PERVIOUS CONCRETE PAVING

NOT TO SCALE



7 F-2.1 SHOT PUT LANDING AREA

NOT TO SCALE

REVISION	DATE

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DAVID L. ANDERSON STATE OF WASHINGTON 22009 REGISTERED PROFESSIONAL ENGINEER

PERMIT SET	
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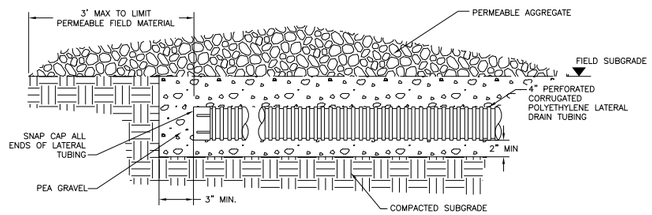
TYPICAL DETAILS

SHEET

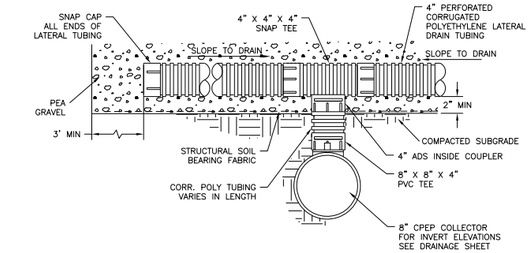
F-2.1

File: F-2.1 Typical Details.dwg Plotted by: reneef Date: 28-Feb-22 10:14:19am



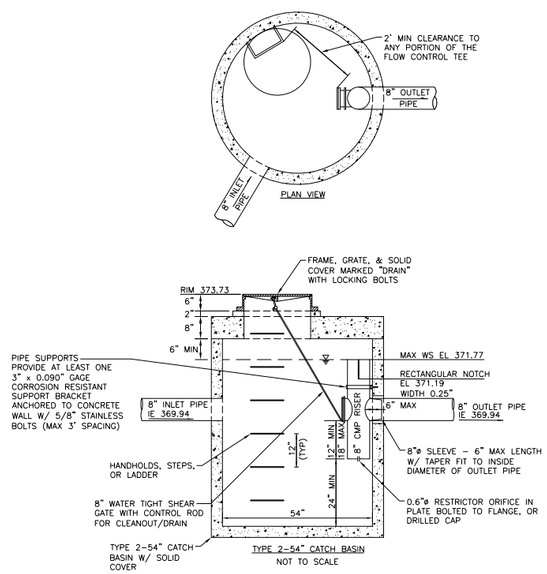
1 F-2.2 SUBSURFACE DRAINAGE LATERAL

NOT TO SCALE



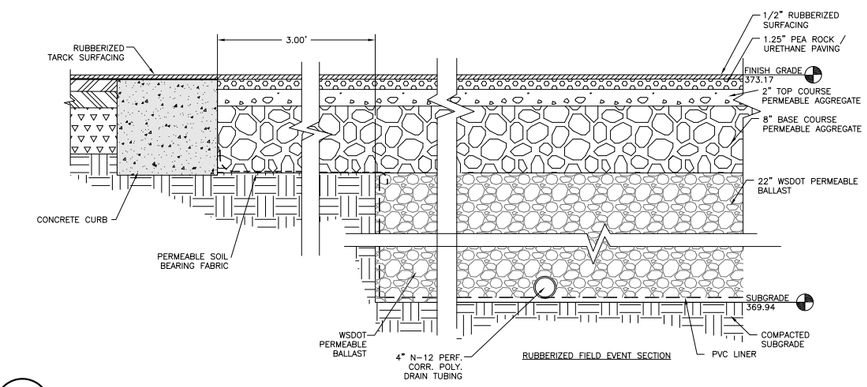
4 F-2.2 SUBSURFACE DRAINAGE DROP-TEE

NOT TO SCALE



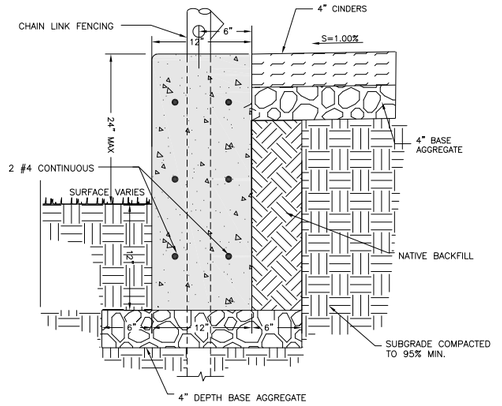
2 F-2.2 FLOW CONTROL

NOT TO SCALE



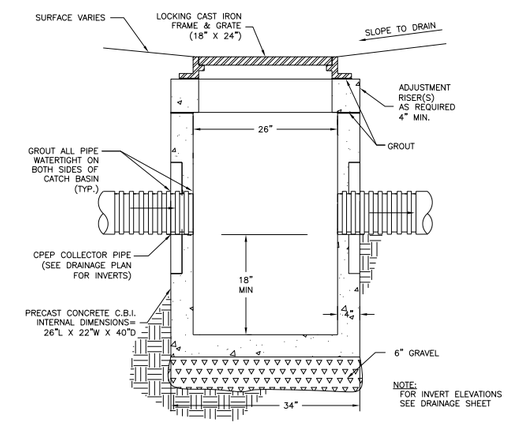
3 F-2.2 DETENTION BASIN

NOT TO SCALE



5 F-2.2 CURB WALL DETAIL

NOT TO SCALE



6 F-2.2 TYPE 1 CATCH BASIN

NOT TO SCALE

REVISION	DATE

GIAUDRONE MIDDLE SCHOOL FIELD AND TRACK CONVERSION

TACOMA PUBLIC SCHOOLS
EVERY STUDENT. EVERY DAY.

KORSMO CONSTRUCTION

Field Consultant
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DAVID L. ANDERSON — STATE OF WASHINGTON — 19009 — REGISTERED PROFESSIONAL ENGINEER

PERMIT SET

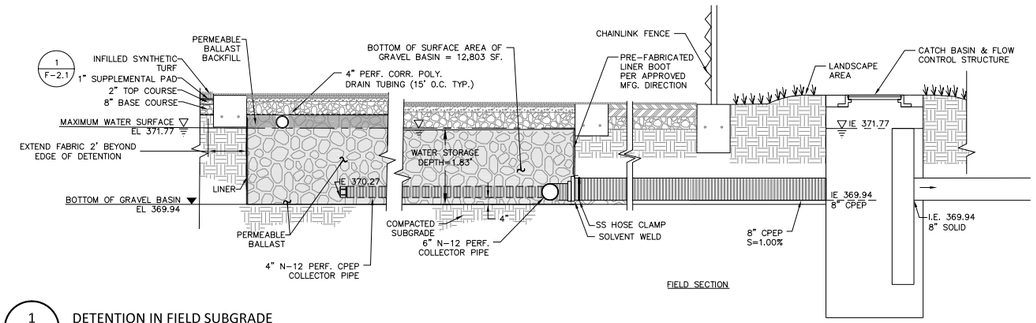
DATE	2-28-22
SCALE	NTS
DRAWN	DMD
CHECKED	DLA/JAB

DRAINAGE DETAILS

SHEET

F-2.2

File: F-2.2 Drainage Details.dwg Plotted by: JeffB Date: 28-Feb-22 4:33:23pm



1 / F-2.3 DETENTION IN FIELD SUBGRADE

NOT TO SCALE

REVISION	DATE

GIAUDRONE MIDDLE SCHOOL FIELD AND TRACK CONVERSION

TACOMA PUBLIC SCHOOLS
EVERY STUDENT. EVERY DAY.

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DAVID L. ANDERSON — STATE OF WASHINGTON — 19384 — REGISTERED PROFESSIONAL ENGINEER

PERMIT SET

DATE	2-28-22
SCALE	NTS
DRAWN	DMD
CHECKED	DLA/JAB

DETENTION DETAILS

SHEET

F-2.3

File: F-2.3 Detention Details.dwg Plotted by: reneef Date: 25-Feb-22 4:51:06pm

LPD engineering pllc

APPENDIX B

Calculations and Supporting Information

City of Tacoma Thresholds Table

Giaudrone Middle School

Table Notes - Do Not Copy Into SSP	Surface Type	Onsite	Onsite - West TDA	Onsite - East TDA	Project Notes
See Glossary - Project Site	Total Project Site Area (ft^2)	625,957	612,787	13170	
See Glossary - Site	Total Site Area (ft^2)	625,957	612,787	13170	
See Glossary - Hard Surface	Existing Hard Surface Area (ft^2)	307,969	302,925	5044	
See Glossary - Native Vegetation	Existing Native Vegetation Area (ft^2)	0	0	0	
See Glossary - Vegetation	Existing Vegetation Area (ft^2)	95,399	95,399	0	
See Glossary - Lawn/Landscaped	Existing Lawn/Landscaped Area (ft^2)	222,589	214,463	8126	
See Glossary - Pasture	Existing Pasture Area (ft^2)	0	0	0	
Equals E5/E2 * 100. <35% is considered new development; equal to or greater than 35% is redevelopment	Existing Hard Surface Coverage (%)	49.20%	49.43%	38.30%	
See Glossary - New Hard Surface and Pollution Generating Hard Surface If>5,000 and E33<50%, Review MR#6 and MR#9 and if required applies to new PGHS only and this is amount of PGHS that requires treatment. If a single TDA is <5,000 SF, treatment not required for that TDA.	New Pollution Generating Hard Surface Area (ft^2)	0	0	0	
See Glossary - New Hard Surface. This will be all other new hard surfaces that are not PGHS.	New Non-Pollution Generating Hard Surface Area (ft^2)	19931	16627	3304	
(E12+E13)	Total New Hard Surface Area (ft^2)	19931	16627	3304	
See Glossary - Replaced Hard Surface and Pollution Generating Hard Surface	Replaced Pollution Generating Hard Surface Area (ft^2)	0	0	0	
See Glossary - Replaced Hard Surface. This will be all other replaced hard surfaces that are not PGHS.	Replaced Non-Pollution Generating Hard Surface Area (ft^2)	35214	30215	4999	
(E15+E16)	Total Replaced Hard Surface Area (ft^2)	35214	30215	4999	
(E14+E17) >2,000 - Review MR #1-5 >5,000 - Review MR#1-9	Total of New Plus Replaced Hard Surface Area (ft^2)	55145	46842	8303	
(E12+E15) >5,000 and B29>50%, Review MR#6 and MR#9 and if required applies to new and replaced PGHS and this is amount of PGHS that requires treatment. If a single TDA is <5,000 SF, treatment not required for that TDA.	Total of New Plus Replaced Pollution Generating Hard Surface Area (ft^2)	0	0	0	
See Glossary - Vegetation, Lawn Area, and Landscaped Areas If >32,670 - Review MR#1-#9	Amount of Vegetation Converted to Lawn/Landscaped Area (ft^2)	0	0	0	
See Glossary - Native Vegetation and Pasture If >108,900 - Review MR#1-#9	Amount of Native Vegetation Converted to Pasture (ft^2)	0	0	0	
(E18+E20+E21) The total area that requires compliance with MRs if B29>50%. Typically the amount of area requiring flow control if flow control is required.	Total of New Plus Replaced Hard Surfaces and Converted Vegetation Areas (ft^2)	55145	46842	8303	
(E12+E18+E19) The total area that requires compliance with MRs if E29<50%. Typically the amount of area requiring flow control if flow control is required.	Total of New Hard Surfaces and Converted Vegetation Areas (ft^2)	19931	16627	3304	
See Glossary - Hard Surface and Vegetation	Amount of Existing Hard Surface Converted to Vegetation (ft^2)	0	0	0	
See Glossary - Native Vegetation	Amount of Native Vegetation to Remain (ft^2)	0	0	0	
See Glossary - Vegetation	Amount of Existing Vegetation to Remain (ft^2)	95,399	95,399	0	
See Glossary - Existing Hard Surface	Amount of Existing Hard Surface to Remain (ft^2)	272,755	272,710	45	
See Glossary - Lawn/Landscaped Areas	Amount of Existing Lawn/Landscaped to Remain (ft^2)	202,658	197,836	4822	86,976 SF grass field converted to synthetic turf
See Glossary - Pasture	Amount of Existing Pasture to Remain (ft^2)	0	0	0	
See Glossary - Land Disturbing Activities If >7,000 - Review MR#1-5	Amount of Land Disturbing Activity (ft^2)	150000	139000	11000	
Construction Cost Estimates of proposed improvements and building improvements - including interior improvements.	Value of Proposed Improvements ($)	2400000	N/A	N/A	
Per Pierce County Auditor	Assessed value of Existing Project Site Improvements ($)	24000000	N/A	N/A	
(E31/E32 * 100) If >50%: new hard surfaces, replaced hard surfaces, and converted vegetation areas shall be comply with MR#1-9 as applicable. If <50%: Only New Hard Surfaces and Converted Vegetation Areas Comply with MR#1-9 as applicable.	Proposed Improvements Compared to Existing Project Site Improvements (%)	10%	N/A	N/A	

City of Tacoma Stormwater Management Manual – Infeasibility Checklist
Surface Type: Other Hard Surfaces
BMP L611: Concentrated Flow Dispersion

Version: 07/01/2021

It is not necessary to answer all questions when determining if a BMP is feasible for Minimum Requirement #5 – The List Approach. Unless otherwise noted, a single answer of No means the BMP is considered infeasible for meeting Minimum Requirement #5 – The List Approach. Applicant may choose which questions to answer when determining feasibility.

Questions #1-8 relate to infeasibility criteria that are based on conditions such as topography and distances to predetermined boundaries and certain design criteria.

Question Number	Question	Yes	No	NA
1	Can the concentrated flow dispersion system be placed 10 feet or more from any building structure?	☐	☐	☐
2	Can the concentrated flow dispersion system be placed 5 feet or more from any other structure or property line?	☐	☐	☐
3	Can the concentrated flow dispersion system be placed 50 feet or more from the top of any slope 15% or greater?	☐	☒	☐
4	Can the concentrated flow dispersion system be placed 50 feet or more from geologically hazardous areas?	☐	☐	☐
5	Can the concentrated flow dispersion system maintain setbacks from Onsite Sewage Systems per WAC 246-272A-0210?	☐	☐	☐
6	Is it possible to maintain or construct a vegetated flowpath of at least 25 feet from the discharge location and any property line, structure, slope greater than 15%, surface water, or other hard surface?	☐	☐	☐
7	Will installing concentrated flow dispersion cause conflicts with any of the following? (An answer of yes means this BMP is infeasible.) Place a checkmark next to the applicable item (7a-7e).	☐	☐	☐
7a	Requirements of the Historic Preservation Laws and Archeology Laws, Federal Superfund or Washington State Model Toxics Control Act, Federal Aviation Administration requirements for airports, or Americans with Disability Act	☐		
7b	Special zoning district design criteria adopted and being implemented through any City of Tacoma planning efforts	☐		
7c	Public health and safety standards	☐		
7d	Transportation regulations to maintain the option for future expansion or multi-modal use of public rights-of-way	☐		
7e	Critical Area Preservation Ordinance	☐		
8	Can the design standards in BMP L611 be met?	☐	☐	☐
8a	Describe the design standard that cannot be met:			

Questions #9 require evaluation of site specific conditions and a written recommendation from an appropriate Washington State Licensed Professional (e.g., Professional Engineer, Professional Geologist, Professional Hydrogeologist).

9	Will the use of concentrated flow dispersion cause erosion or flooding problems onsite or an adjacent properties? (An answer of yes means this BMP is not feasible).	☐	☐	☐

N/A – this project does not involve any concentrated flow

City of Tacoma Stormwater Management Manual – Infeasibility Checklist
Surface Type: Other Hard Surfaces
BMP L612: Sheet Flow Dispersion

Version: 07/01/2021

It is not necessary to answer all questions when determining if a BMP is feasible for Minimum Requirement #5 – The List Approach. Unless otherwise noted, a single answer of No means the BMP is considered infeasible for meeting Minimum Requirement #5 – The List Approach. Applicant may choose which questions to answer when determining feasibility.

Questions #1-9 relate to infeasibility criteria that are based on conditions such as topography and distances to predetermined boundaries and certain design criteria.

Question Number	Question	Yes	No	NA
1	Can the sheet flow dispersions system be placed 10 feet or more from any building structure?	☐	☐	☐
2	Can the sheet flow dispersion system be placed 5 feet or more from any other structure or property line?	☐	☐	☐
3	Can the sheet flow dispersion system be placed 50 feet or more from the top of any slope 15% or greater?	☐	☒	☐
4	Can the sheet flow dispersion system be placed 50 feet or more from geologically hazardous areas?	☐	☐	☐
5	Can the sheet flow dispersion system maintain setbacks from Onsite Sewage Systems per WAC 246-272A-0210?	☐	☐	☐
6	Is it possible to provide a vegetated flowpath width of 10 feet or greater for up to 20 feet of width of paved or impervious surface?	☐	☐	☐
7	For paved or impervious surfaces widths 20 feet or greater, is it possible to provide a vegetated flowpath width of 20 feet or greater (additional 10 feet of width must be added for each increment of 20 feet or more in width)?	☐	☐	☐
8	Will installing sheet flow dispersion cause conflicts with any of the following? (An answer of yes means this BMP is infeasible.) Place a checkmark next to the applicable item (8a-8e).	☐	☐	☐
8a	Requirements of the Historic Preservation Laws and Archeology Laws, Federal Superfund or Washington State Model Toxics Control Act, Federal Aviation Administration requirements for airports, or Americans with Disability Act	☐		
8b	Special zoning district design criteria adopted and being implemented through any City of Tacoma planning efforts	☐		
8c	Public health and safety standards	☐		
8d	Transportation regulations to maintain the option for future expansion or multi-modal use of public rights-of-way	☐		
8e	Critical Area Preservation Ordinance	☐		
9	Can the design standards in BMP L612 be met?	☐	☐	☐
9a	Describe the design standard that cannot be met:			

Questions #10 require evaluation of site specific conditions and a written recommendation from an appropriate Washington State Licensed Professional (e.g., Professional Engineer, Professional Geologist, Professional Hydrogeologist).

10	Will the use of sheet flow dispersion cause erosion or flooding problems onsite or an adjacent properties? (An answer of yes means this BMP is not feasible).	☐	☐	☐

City of Tacoma Stormwater Management Manual – Infeasibility Checklist
Surface Type: Lawn and Landscaped Areas
BMP L613: Post Construction Soil Quality and Depth

Version: 07/01/2021

It is not necessary to answer all questions when determining if a BMP is feasible for Minimum Requirement #5 – The List Approach. Unless otherwise noted, a single answer of No means the BMP is considered infeasible for meeting Minimum Requirement #5 – The List Approach. Applicant may choose which questions to answer when determining feasibility.

Questions #1-2 relate to infeasibility criteria that are based on conditions such as topography and distances to predetermined boundaries and certain design criteria.

Question Number	Question	Yes	No	NA
1	Can the soil amendments be placed on slopes less than 33%?	☒	☐	☐
2	Will installing sheet flow dispersion cause conflicts with any of the following? (An answer of yes means this BMP is infeasible.) Place a checkmark next to the applicable item (2a-2e).	☐	☒	☐
2a	Requirements of the Historic Preservation Laws and Archeology Laws, Federal Superfund or Washington State Model Toxics Control Act, Federal Aviation Administration requirements for airports, or Americans with Disability Act	☐		
2b	Special zoning district design criteria adopted and being implemented through any City of Tacoma planning efforts	☐		
2c	Public health and safety standards	☐		
2d	Transportation regulations to maintain the option for future expansion or multi-modal use of public rights-of-way	☐		
2e	Critical Area Preservation Ordinance	☐		

City of Tacoma Stormwater Management Manual – Infeasibility Checklist
Surface Type: Roofs and Other Hard Surfaces
BMP L614: Full Dispersion

Version: 07/01/2021

It is not necessary to answer all questions when determining if a BMP is feasible for Minimum Requirement #5 – The List Approach. Unless otherwise noted, a single answer of No means the BMP is considered infeasible for meeting Minimum Requirement #5 – The List Approach. Applicant may choose which questions to answer when determining feasibility.

Questions #1-9 relate to infeasibility criteria that are based on conditions such as topography and distances to predetermined boundaries and certain design criteria.

Question Number	Question	Yes	No	NA
1	Can the flow spreader and dispersion areas be placed 10 feet or more from any building structure?	☐	☐	☐
2	Can the flow spreader and dispersion areas be placed 5 feet or more from any other structure or property line?	☐	☐	☐
3	Can the dispersion areas be placed 50 feet or more from the top of any slope 15% or greater?	☐	☐	☐
4	Can the dispersion areas be placed 50 feet or more from geologically hazardous areas?	☐	☐	☐
5	Can the dispersion area be located outside of critical areas, critical area buffers, streams, or lakes?	☐	☐	☐
6	Can the flow spreader and dispersion area maintain setbacks from Onsite Sewage Systems per WAC 246-272A-0210?	☐	☐	☐
8	Will installing a full dispersion system cause conflicts with any of the following? (An answer of yes means this BMP is infeasible.) Place a checkmark next to the applicable item (8a-8e).	☐	☐	☐
8a	Requirements of the Historic Preservation Laws and Archeology Laws, Federal Superfund or Washington State Model Toxics Control Act, Federal Aviation Administration requirements for airports, or Americans with Disability Act	☐		
8b	Special zoning district design criteria adopted and being implemented through any City of Tacoma planning efforts	☐		
8c	Public health and safety standards	☐		
8d	Transportation regulations to maintain the option for future expansion or multi-modal use of public rights-of-way	☐		
8e	Critical Area Preservation Ordinance	☐		
9	Can the design standards in BMP L614 be met?	☐	☒	☐
9a	Describe the design standard that cannot be met: A 65 to 10 ratio of forested to native vegetation area to impervious area cannot be achieved.			

Questions #10 require evaluation of site specific conditions and a written recommendation from an appropriate Washington State Licensed Professional (e.g., Professional Engineer, Professional Geologist, Professional Hydrogeologist).

10	Will the use of a full dispersion cause erosion or flooding problems onsite or on adjacent properties? (An answer of yes means this BMP is not feasible).	☐	☐	☐

City of Tacoma Stormwater Management Manual – Infeasibility Checklist
Surface Type: Roofs or Other Hard Surface
BMP L630: Bioretention

Version: 07/01/2021

It is not necessary to answer all questions when determining if a BMP is feasible for Minimum Requirement #5 – The List Approach. Unless otherwise noted, a single answer of No means the BMP is considered infeasible for meeting Minimum Requirement #5 – The List Approach. Applicant may choose which questions to answer when determining feasibility.

Questions #1-18 relate to infeasibility criteria that are based on conditions such as topography and distances to predetermined boundaries. Citation of the following do not need site-specific written recommendations from a Washington State Licensed Professional Engineer or Washington State Licensed Professional Geologist though some criteria may require professional services to determine if the infeasibility criteria apply.

Question Number	Question	Yes	No	NA
1	Can the bioretention facility be placed 10 feet or more from any building structure?	☐	☐	☐
2	Can the bioretention facility be placed 5 feet or more from any other structure or property line?	☐	☐	☐
3	Can the bioretention facility be placed 50 feet or more from the top of any slope greater than 20%?	☐	☒	☐
4	Can the bioretention facility be placed 50 feet or more from geologically hazardous areas?	☐	☐	☐
5	Can the bioretention facility be located outside of designated erosion or landslide hazard areas?	☐	☐	☐
6	Can the bioretention facility be located greater than 100 feet from an underground storage tank whose capacity including tank and underground connecting pipe is 1100 gallons or more?	☐	☐	☐
7	Can the bioretention facility be located greater than 10 feet from an underground storage tank (tank used for petroleum product, chemical, or liquid hazardous waste storage) whose capacity including tank and underground connecting pipe is 1100 gallons or less?	☐	☐	☐
8	Can the bioretention facility be located greater than 100 feet of a closed or active landfill?	☐	☐	☐
9	Can the bioretention facility be located greater than 100 feet from drinking water well or a spring used for drinking water supply?	☐	☐	☐
10	Can the bioretention facility be placed 10 feet or more from small on-site sewage disposal drainfields? (For large on-site sewage disposal setbacks see WAC Chapter 246-727B).	☐	☐	☐
11	Can the bioretention facility be located on slopes less than 8%?	☐	☐	☐
12	Is the bioretention facility compatible with the surrounding drainage system (e.g., project drains to an existing stormwater system whose elevation precludes proper connection to the bioretention facility)?	☐	☐	☐
13	For properties with known soil or groundwater contamination, can the bioretention facility be located greater than 100 feet from an area known to have deep soil contamination?	☐	☐	☐
14	For properties with known soil or groundwater contamination, can the bioretention facility be located such that infiltration will not increase or change the direction of the migration of pollutants in the groundwater? (Based upon groundwater modeling).	☐	☐	☐
15	For properties with known soil or groundwater contamination, can the bioretention facility be located in an area that does not have contaminated surface soils that are proposed to remain in place?	☐	☐	☐
16	For properties with known soil or groundwater contamination, can the bioretention facility be located in areas not prohibited by an approved cleanup plan under the state Model Toxics Control Act or Federal Superfund Law, or an environmental covenant under Chapter 64.70 RCW?	☐	☐	☐

17	For bioretention facilities that are constructed with imported compost materials, can the bioretention facility be located greater than ¼ mile from a phosphorus-sensitive waterbody? (Does not apply to discharges to Wapato Lake).	☐	☐	☐
18	Will installing a bioretention facility cause conflicts with any of the following? (An answer of yes means this BMP is infeasible.) Place a checkmark next to the applicable item (18a-18e).	☐	☐	☐
18a	Requirements of the Historic Preservation Laws and Archeology Laws, Federal Superfund or Washington State Model Toxics Control Act, Federal Aviation Administration requirements for airports, or Americans with Disability Act	☐		
18b	Special zoning district design criteria adopted and being implemented through any City of Tacoma planning efforts	☐		
18c	Public health and safety standards	☐		
18d	Transportation regulations to maintain the option for future expansion or multi-modal use of public rights-of-way	☐		
18e	Critical Area Preservation Ordinance	☐		
Questions #19-21 relate to infeasibility criteria that are based upon subsurface characteristics and require a soils report to determine infeasibility.				
19	Is the depth from the lowest level of the bioretention soil mix or any underlying gravel layer to the seasonal high groundwater table or other impermeable layer equal to or greater than 1 foot? This applies only if the contributing area to the bioretention facility has less than 5,000 square feet of pollution-generating impervious surface, and less than 10,000 square feet of impervious surface, and less than ¾ acre pervious surface.	☐	☐	☐
20	Is the depth from the lowest level of the bioretention soil mix or any underlying gravel layer to the seasonal high groundwater table or other impermeable layer equal to or greater than 3 feet? This applies only if the contributing area to the bioretention facility has: 5,000 square feet or greater of pollution-generating impervious surface, or 10,000 square feet or greater of impervious surface, or more ¾ acre pervious surface AND the bioretention facility cannot be broken down into amounts smaller than those listed above.	☐	☐	☐
21	Was the soil classified as having a measured native soil saturated hydraulic conductivity of 0.3 in/hour or more?	☐	☐	☐
Questions 22-29 require evaluation of site specific conditions and a written recommendation from an appropriate Washington State Licensed Professional (e.g., Professional Engineer, Professional Geologist, Professional Hydrogeologist).				
22	Will the proposed bioretention facility location threaten the safety or reliability of preexisting underground utilities, preexisting underground storage tanks, preexisting structures, or preexisting road or parking lot surfaces? (An answer of yes means the BMP is infeasible).	☐	☐	☐
23	Will the proposed bioretention facility location allow for a safe overflow pathway to the City stormwater system or a private stormwater system?	☐	☐	☐
24	Are there reasonable concerns about erosion, slope failure, or downgradient flooding due to infiltration? (An answer of yes means the BMP is infeasible).	☐	☐	☐
25	Is the project located in an area whose groundwater drains into an erosion hazard or landslide hazard area? (An answer of yes means the BMP is infeasible).	☐	☐	☐
26	Will infiltrating water threaten existing below grade basements? (An answer of yes means the BMP is infeasible).	☐	☐	☐
27	Will infiltrating water threaten shoreline structures such as bulkheads? (An answer of yes means the BMP is infeasible).	☐	☐	☐

28	Is there lack of usable space onsite for bioretention facilities at redevelopment sites? (An answer of yes means the BMP is infeasible).	☐	☒	☐
29	For public road projects, is there insufficient space within the ROW to install a bioretention facility? (An answer of yes means this BMP is infeasible).	☐	☐	☒

City of Tacoma Stormwater Management Manual – Infeasibility Checklist
Surface Type: Other Hard Surface
BMP L633: Permeable Pavement

Version: 07/01/2021

It is not necessary to answer all questions when determining if a BMP is feasible for Minimum Requirement #5 – The List Approach. Unless otherwise noted, a single answer of No means the BMP is considered infeasible for meeting Minimum Requirement #5 – The List Approach. Applicant may choose which questions to answer when determining feasibility.

Questions #1-24 relate to infeasibility criteria that are based on conditions such as topography and distances to predetermined boundaries. Citation of the following do not need site-specific written recommendations from a Washington State Licensed Professional Engineer or Washington State Licensed Professional Geologist though some criteria may require professional services to determine if the infeasibility criteria apply.

Question Number	Question	Yes	No	NA
1	Can the permeable pavement be placed 10 feet or more from any building structure?	☐	☐	☐
2	Can the permeable pavement be placed 5 feet or more from any other structure or property line?	☐	☐	☐
3	Can the permeable pavement be placed 50 feet or more from the top of any slope greater than 20%?	☐	☒	☐
4	Can the permeable pavement be placed 50 feet or more from geologically hazardous areas?	☐	☐	☐
5	Can the permeable pavement be located outside of designated erosion or landslide hazard areas?	☐	☐	☐
7	Can the permeable pavement be located greater than 10 feet from an underground storage tank (tank used for petroleum product, chemical, or liquid hazardous waste storage) whose capacity including tank and underground connecting pipe is 1100 gallons or less?	☐	☐	☐
8	Can the permeable pavement be located greater than 100 feet of a closed or active landfill?	☐	☐	☐
9	Can the permeable pavement be located greater than 100 feet from drinking water well or a spring used for drinking water supply if the permeable pavement is (or has run-on from) a pollution-generating hard surface?	☐	☐	☐
10	Can the permeable pavement be placed 10 feet or more from small on-site sewage disposal drainfields? (For large on-site sewage disposal setbacks see WAC Chapter 246-727B).	☐	☐	☐
11	Can the permeable pavement be constructed such that the subgrade is less than 6%?	☐	☐	☐
12	Can the permeable pavement be constructed such that the wearing course is less than 6% (after reasonable attempts have been made to design the grade)?	☐	☐	☐
13	Is the location for permeable pavement a multi-level parking garage, above a culvert, or a bridge? An answer of yes means the BMP is not feasible.	☐	☐	☐
14	Does the road receive more than very low traffic volumes? (Roads with a projected average daily traffic volume of 400 vehicles or less). This infeasibility criterion cannot be used for sidewalks or non-traffic bearing surfaces. An answer of yes means the BMP is not feasible.	☐	☐	☐
15	Does the road receive more than very low truck traffic? (Roads not subject to through truck traffic but may receive up to weekly use by utility trucks, daily school bus use, and multiple daily use by pick-up trucks, mail/parcel delivery trucks, and maintenance vehicles.). This infeasibility criterion cannot be used for sidewalks or non-traffic bearing surfaces. An answer of yes means the BMP is not feasible.	☐	☐	☐
16	Does the area typically generate high concentrations of oil due to high traffic turnover or frequent transfer of oil? (See SWMM for additional guidance.) An answer of yes means the BMP is not feasible.	☐	☐	☐

17	Can the permeable pavement be located outside of areas with industrial activity as identified in 40 CFR 122.26(b)14?	☐	☐	☐
18	Can permeable pavement be located outside of areas where the risk of concentrated pollutant spills is likely such as gas stations, truck stops, and industrial chemical storage areas?	☐	☐	☐
19	Can permeable pavement be located outside of areas likely to have long-term excessive sediment deposition after construction?	☐	☐	☐
20	For properties with known soil or groundwater contamination, can the permeable pavement be located greater than 100 feet from an area known to have deep soil contamination?	☐	☐	☐
21	For properties with known soil or groundwater contamination, can the permeable pavement be located such that infiltration will not increase or change the direction of the migration of pollutants in the groundwater? (Based upon groundwater modeling).	☐	☐	☐
22	For properties with known soil or groundwater contamination, can the permeable pavement be located in an area that does not have contaminated surface soils that are proposed to remain in place?	☐	☐	☐
23	For properties with known soil or groundwater contamination, can the permeable pavement be located in areas not prohibited by an approved cleanup plan under the state Model Toxics Control Act or Federal Superfund Law, or an environmental covenant under Chapter 64.70 RCW?	☐	☐	☐
24	Will installing permeable pavement cause conflicts with any of the following? (An answer of yes means this BMP is infeasible.) Place a checkmark next to the applicable item (24a-24e).	☐	☐	☐
24a	Requirements of the Historic Preservation Laws and Archeology Laws, Federal Superfund or Washington State Model Toxics Control Act, Federal Aviation Administration requirements for airports, or Americans with Disability Act	☐		
24b	Special zoning district design criteria adopted and being implemented through any City of Tacoma planning efforts	☐		
24c	Public health and safety standards	☐		
24d	Transportation regulations to maintain the option for future expansion or multi-modal use of public rights-of-way	☐		
24e	Critical Area Preservation Ordinance	☐		
Questions #25-28 relate to infeasibility criteria that are based upon subsurface characteristics and require a soils report to determine infeasibility.				
25	Is the depth from the lowest layer designed as part of the permeable pavement section to the seasonal high groundwater elevation, bedrock, or other impermeable layer equal to or greater than 1 foot?	☐	☐	☐
26	For pollution generating pervious pavement surfaces, can the soil suitability criteria for treatment be met? (See SWMM – BMP L633)	☐	☐	☐
27	Was the soil classified as having a measured native soil saturated hydraulic conductivity of 0.3 in/hour or more?	☐	☐	☐
28	Is the existing impervious surface that will be replaced non-polluting generating and located over an outwash soil with a saturated hydraulic conductivity of 4 inches/hour or greater?	☐	☐	☐
Questions 29-40 require evaluation of site specific conditions and a written recommendation from an appropriate Washington State Licensed Professional (e.g., Professional Engineer, Professional Geologist, Professional Hydrogeologist).				
29	Will the proposed permeable pavement location threaten the safety or reliability of preexisting underground utilities, preexisting underground storage tanks, preexisting structures, or preexisting road or parking lot surfaces? (An answer of yes means the BMP is infeasible).	☐	☐	☐

30	Will infiltrating and ponded water compromise existing adjacent impervious pavements? (An answer of yes means the BMP is infeasible).	☐	☐	☐
31	Are there reasonable concerns about erosion, slope failure, or downgradient flooding due to infiltration? (An answer of yes means the BMP is infeasible).	☐	☐	☐
32	Can the permeable pavement be located outside area whose groundwater drains into an erosion hazard or landslide hazard area?	☐	☐	☐
33	Will infiltrating water threaten existing below grade basements? (An answer of yes means the BMP is infeasible).	☐	☐	☐
34	Will infiltrating water threaten shoreline structures such as bulkheads? (An answer of yes means the BMP is infeasible).	☐	☐	☐
35	Can permeable pavement be located away from the bottom of steep, erosion prone areas that are likely to erode sediment?	☐	☐	☐
36	Can permeable pavement be located away from fill soils that can become unstable when saturated?	☐	☐	☐
37	Will permeable pavement construction on steep slopes cause erosion and structural failure? (An answer of yes means the BMP is infeasible).	☐	☐	☐
38	Will permeable pavement construction on steep slopes cause runoff velocities that preclude adequate infiltration at the pavement surfaces? (An answer of yes means the BMP is infeasible).	☐	☐	☐
39	Can permeable pavement provide sufficient strength to support the anticipated loads?	☐	☐	☐
40	Are underlying soils suitable for supporting traffic loads when saturated?	☐	☐	☐

City of Tacoma Stormwater Management Manual – Infeasibility Checklist
Surface Type: Other Hard Surfaces
BMP T1050: Compost-Amended Vegetated Filter Strip (CAVFS)

Version: 07/01/2021

It is not necessary to answer all questions when determining if a BMP is feasible for Minimum Requirement #5 – The List Approach. Unless otherwise noted, a single answer of No means the BMP is considered infeasible for meeting Minimum Requirement #5 – The List Approach. Applicant may choose which questions to answer when determining feasibility.

Questions #1-9 relate to infeasibility criteria that are based on conditions such as topography and distances to predetermined boundaries and certain design criteria.

Question Number	Question	Yes	No	NA
1	Can the CAVFS be placed 10 feet or more from any building structure?	☐	☐	☐
2	Can the CAVFS be placed 5 feet or more from any other structure or property line?	☐	☐	☐
3	Can the CAVFS be located outside critical areas, critical area buffers, streams, or lakes?	☐	☐	☐
4	Can the CAVFS be placed 50 feet or more from the top of any slope 15% or greater?	☐	☒	☐
5	Can the CAVFS be placed 50 feet or more from geologically hazardous areas?	☐	☐	☐
6	Can the CAVFS maintain setbacks from Onsite Sewage Systems per WAC 246-272A-0210?	☐	☐	☐
7	Will the sidewalk, walkway, or trail exceed a lateral slope of 5% or a longitudinal slope of 8%? (An answer of yes means this BMP is infeasible)	☐	☐	☐
8	Will installing concentrated flow dispersion cause conflicts with any of the following? (An answer of yes means this BMP is infeasible.) Place a checkmark next to the applicable item (8a-8e).	☐	☐	☐
8a	Requirements of the Historic Preservation Laws and Archeology Laws, Federal Superfund or Washington State Model Toxics Control Act, Federal Aviation Administration requirements for airports, or Americans with Disability Act	☐		
8b	Special zoning district design criteria adopted and being implemented through any City of Tacoma planning efforts	☐		
8c	Public health and safety standards	☐		
8d	Transportation regulations to maintain the option for future expansion or multi-modal use of public rights-of-way	☐		
8e	Critical Area Preservation Ordinance	☐		
9	Can the design standards in BMP T1050 be met?	☐	☐	☐
9a	Describe the design standard that cannot be met: This project is required to provide flow control and this tennis court project is being added to a previously designed detention system for the school site. A CAVFS was tested as an option, but the area required would be too vast and take up the majority of the lawn area to the east of the project area. The School District needs this area for future development.			

Questions #10 require evaluation of site specific conditions and a written recommendation from an appropriate Washington State Licensed Professional (e.g., Professional Engineer, Professional Geologist, Professional Hydrogeologist).

10	Will the use of CAVFS cause erosion or flooding problems onsite or on adjacent properties? (An answer of yes means this BMP is not feasible).	☐	☐	☐

Questions #11-12 relate to infeasibility criteria that are based upon subsurface characteristics and require a soils report to determine infeasibility.

11	Is the depth from the lowest level of the CAVFS to the seasonal high groundwater table or other impermeable layer equal to or greater than 1 foot?	☐	☐	☐
12	Was the soil classified as having a measured native soil saturated hydraulic conductivity of 0.3 in/hour or more?	☐	☐	☐

MGS FLOOD
PROJECT REPORT – 100-YEAR PEAK FLOW COMPARISON (EAST TDA)

Program Version: MGSFlood 4.57
Program License Number: 201410003
Project Simulation Performed on: 02/15/2022 11:53 AM
Report Generation Date: 02/15/2022 11:53 AM

Input File Name: 2022-02-15 Flow Increase (east TDA).fld
Project Name: Giaudrone MS
Analysis Title: East TDA 100-yr Flow Increase
Comments:

PRECIPITATION INPUT

Computational Time Step (Minutes): 15

Extended Precipitation Time Series Selected
Climatic Region Number: 15

Full Period of Record Available used for Routing
Precipitation Station : 96004005 Puget East 40 in_5min 10/01/1939-10/01/2097
Evaporation Station : 961040 Puget East 40 in MAP
Evaporation Scale Factor : 0.750

HSPF Parameter Region Number: 1
HSPF Parameter Region Name : Ecology Default

********** Default HSPF Parameters Used (Not Modified by User) **********

********** WATERSHED DEFINITION **********

Predevelopment/Post Development Tributary Area Summary

	Predeveloped	Post Developed
Total Subbasin Area (acres)	0.076	0.076
Area of Links that Include Precip/Evap (acres)	0.000	0.000
Total (acres)	0.076	0.076

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 1

---------- Subbasin : Subbasin 1 ----------

	-------Area (Acres) --------
C, Lawn, Flat	0.076
Subbasin Total	0.076

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 1

---------- Subbasin : Subbasin 1 ----------
-------Area (Acres) --------
SIDEWALKS/FLAT 0.076

Subbasin Total 0.076

**********FLOOD FREQUENCY AND DURATION STATISTICS**********

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 1
Number of Links: 0

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 1
Number of Links: 0

**********Compliance Point Results **********

Scenario Predeveloped Compliance Subbasin: Subbasin 1

Scenario Postdeveloped Compliance Subbasin: Subbasin 1

**** Point of Compliance Flow Frequency Data ****
Recurrence Interval Computed Using Gringorten Plotting Position

Predevelopment Runoff		Postdevelopment Runoff	
Tr (Years)	Discharge (cfs)	Tr (Years)	Discharge (cfs)
2-Year	5.919E-03	2-Year	2.992E-02
5-Year	1.029E-02	5-Year	3.831E-02
10-Year	1.561E-02	10-Year	4.426E-02
25-Year	2.381E-02	25-Year	5.698E-02
50-Year	3.181E-02	50-Year	7.135E-02
100-Year	3.193E-02	100-Year	8.529E-02
200-Year	3.391E-02	200-Year	9.020E-02
500-Year	3.658E-02	500-Year	9.658E-02

** Record too Short to Compute Peak Discharge for These Recurrence Intervals

Giaudrone MS - Field Detention SSD Table

D-zone Finish Grade	373.17	feet
Rubberized Layer	1	inches
Gravel Top Course	2.5	inches
Gravel Base Course	35.26	inches
Total Depth of surfacing	38.76	inches
Base Course Storage Section	22	inches
Storage Volume at Riser Height	7,042	cu ft
Field Detention Area	12,803	sq ft
Base Course Porosity	30%	

Table to be copied into MGS Flood

Stage (ft)	*Elevation [MGS] (ft)*	*Area (sf)*	*Volume (cu-ft)*
0.000	100.00	0.0	0.0
0.042	100.04	12803.00	160.04
0.083	100.08	12803.10	320.08
0.125	100.13	12803.20	480.11
0.167	100.17	12803.30	640.15
0.208	100.21	12803.40	800.19
0.250	100.25	12803.50	960.23
0.292	100.29	12803.60	1120.26
0.333	100.33	12803.70	1280.30
0.375	100.38	12803.80	1440.34
0.417	100.42	12803.90	1600.38
0.458	100.46	12804.00	1760.41
0.500	100.50	12804.10	1920.45
0.542	100.54	12804.20	2080.49
0.583	100.58	12804.30	2240.53
0.625	100.63	12804.40	2400.56
0.667	100.67	12804.50	2560.60
0.708	100.71	12804.60	2720.64
0.750	100.75	12804.70	2880.68
0.792	100.79	12804.80	3040.71
0.833	100.83	12804.90	3200.75
0.875	100.88	12805.00	3360.79
0.917	100.92	12805.10	3520.83
0.958	100.96	12805.20	3680.86
1.000	101.00	12805.30	3840.90
1.042	101.04	12805.40	4000.94
1.083	101.08	12805.50	4160.98
1.125	101.13	12805.60	4321.01
1.167	101.17	12805.70	4481.05
1.208	101.21	12805.80	4641.09
1.250	101.25	12805.90	4801.13
1.292	101.29	12806.00	4961.16
1.333	101.33	12806.10	5121.20
1.375	101.38	12806.20	5281.24
1.417	101.42	12806.30	5441.28
1.458	101.46	12806.40	5601.31
1.500	101.50	12806.50	5761.35
1.542	101.54	12806.60	5921.39
1.583	101.58	12806.70	6081.43
1.625	101.63	12806.80	6241.46
1.667	101.67	12806.90	6401.50
1.708	101.71	12807.00	6561.54
1.750	101.75	12807.10	6721.58
1.792	101.79	12807.20	6881.61
1.833	101.83	12807.30	7041.65
1.875	101.88	12807.40	7201.69
1.917	101.92	12807.50	7361.73
1.958	101.96	12807.60	7521.76
2.000	102.00	12807.70	7681.80
2.042	102.04	12807.80	7841.84
2.083	102.08	12807.90	8001.88
2.125	102.13	12808.00	8161.91
2.167	102.17	12808.10	8321.95
2.208	102.21	12808.20	8481.99
2.250	102.25	12808.30	8642.03
2.292	102.29	12808.40	8802.06
2.333	102.33	12808.50	8962.10

MGS FLOOD
PROJECT REPORT – FLOW CONTROL (WEST TDA)

Program Version: MGSFlood 4.57
Program License Number: 201410003
Project Simulation Performed on: 02/24/2022 9:35 AM
Report Generation Date: 02/24/2022 9:35 AM

Input File Name: 2022-02-23 Detention (west TDA).fld
Project Name: Giaudrone MS
Analysis Title: West TDA Detention
Comments:

PRECIPITATION INPUT

Computational Time Step (Minutes): 15

Extended Precipitation Time Series Selected
Climatic Region Number: 15

Full Period of Record Available used for Routing
Precipitation Station : 96004005 Puget East 40 in_5min 10/01/1939-10/01/2097
Evaporation Station : 961040 Puget East 40 in MAP
Evaporation Scale Factor : 0.750

HSPF Parameter Region Number: 1
HSPF Parameter Region Name : Ecology Default

********** Default HSPF Parameters Used (Not Modified by User) **********

********** WATERSHED DEFINITION **********

Predevelopment/Post Development Tributary Area Summary

	Predeveloped	Post Developed
Total Subbasin Area (acres)	0.462	0.462
Area of Links that Include Precip/Evap (acres)	0.000	0.000
Total (acres)	0.462	0.462

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 1

---------- Subbasin : Subbasin 1 ----------

	-------Area (Acres) --------
C, Forest, Flat	0.382
SIDEWALKS/FLAT	0.080
Subbasin Total	0.462

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 1

---------- Subbasin : Subbasin 1 ----------

	-------Area (Acres) --------
SIDEWALKS/FLAT	0.462
Subbasin Total	0.462

********** **LINK DATA** **********

----------SCENARIO: PREDEVELOPED
Number of Links: 0

********** **LINK DATA** **********

----------SCENARIO: POSTDEVELOPED
Number of Links: 1

Link Name: New Structure Lnk1
Link Type: Structure
Downstream Link: None

User Specified Elevation Volume Table Used

Elevation (ft)	Pond Volume (cu-ft)
100.00	0.
100.04	160.
100.08	320.
100.13	480.
100.17	640.
100.21	800.
100.25	960.
100.29	1120.
100.33	1280.
100.38	1440.
100.42	1600.
100.46	1760.
100.50	1921.
100.54	2081.
100.58	2241.
100.63	2401.
100.67	2561.
100.71	2721.
100.75	2881.
100.79	3041.
100.83	3201.
100.88	3361.
100.92	3521.
100.96	3681.

101.00	3841.
101.04	4001.
101.08	4161.
101.13	4321.
101.17	4481.
101.21	4641.
101.25	4801.
101.29	4961.
101.33	5121.
101.38	5281.
101.42	5441.
101.46	5601.
101.50	5761.
101.54	5921.
101.58	6081.
101.63	6242.
101.67	6402.
101.71	6562.
101.75	6722.
101.79	6882.
101.83	7042.
101.88	7202.
101.92	7362.
101.96	7522.
102.00	7682.
102.04	7842.
102.08	8002.
102.13	8162.
102.17	8322.
102.21	8482.
102.25	8642.
102.29	8802.
102.33	8962.

Storage volume at riser crest

Constant Infiltration Option Used
Infiltration Rate (in/hr): 0.00

Riser Geometry
Riser Structure Type : Circular
Riser Diameter (in) : 8.00
Common Length (ft) : 0.000
Riser Crest Elevation : 101.83 ft

Hydraulic Structure Geometry

Number of Devices: 2

---Device Number 1 ---
Device Type : Circular Orifice
Control Elevation (ft) : 100.00
Diameter (in) : 0.60
Orientation : Horizontal
Elbow : No

--- Device Number 2 ---
Device Type : Vertical Rectangular Orifice
Control Elevation (ft) : 101.25
Length (in) : 0.25
Height (in) : 7.00
Orientation : Vertical
Elbow : No

**********FLOOD FREQUENCY AND DURATION STATISTICS**********

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 1
Number of Links: 0

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 1
Number of Links: 1

********** Subbasin: Subbasin 1 **********

Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	0.182
5-Year	0.233
10-Year	0.269
25-Year	0.346
50-Year	0.434
100-Year	0.518
200-Year	0.548
500-Year	0.587

********** Link: New Structure Lnk1 ********** Link Inflow Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	0.182
5-Year	0.233
10-Year	0.269
25-Year	0.346
50-Year	0.434
100-Year	0.518
200-Year	0.548
500-Year	0.587

********** Link: New Structure Lnk1 ********** Link WSEL Stats

WSEL Frequency Data(ft)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	WSEL Peak (ft)
1.05-Year	100.534
1.11-Year	100.597
1.25-Year	100.683
2.00-Year	100.890
3.33-Year	101.034
5-Year	101.229
10-Year	101.512
25-Year	101.646
50-Year	101.727
100-Year	101.788

*************Compliance Point Results **************

Scenario Predeveloped Compliance Subbasin: Subbasin 1

Scenario Postdeveloped Compliance Link: New Structure Lnk1

***** Point of Compliance Flow Frequency Data *****
Recurrence Interval Computed Using Gringorten Plotting Position

Predevelopment Runoff		Postdevelopment Runoff	
Tr (Years)	Discharge (cfs)	Tr (Years)	Discharge (cfs)
2-Year	3.544E-02	2-Year	9.064E-03
5-Year	4.646E-02	5-Year	1.065E-02
10-Year	5.636E-02	10-Year	1.928E-02
25-Year	7.220E-02	25-Year	2.619E-02
50-Year	8.761E-02	50-Year	3.095E-02
100-Year	9.812E-02	100-Year	3.475E-02
200-Year	0.103	200-Year	5.005E-02
500-Year	0.109	500-Year	7.055E-02

** Record too Short to Compute Peak Discharge for These Recurrence Intervals

****** Flow Duration Performance ******

Excursion at Predeveloped 50%Q2 (Must be Less Than or Equal to 0%):	-78.9%	PASS
Maximum Excursion from 50%Q2 to Q2 (Must be Less Than or Equal to 0%):	-78.0%	PASS
Maximum Excursion from Q2 to Q50 (Must be less than 10%):	-87.7%	PASS
Percent Excursion from Q2 to Q50 (Must be less than 50%):	0.0%	PASS

MEETS ALL FLOW DURATION DESIGN CRITERIA: PASS

Giaudrone MS Atheltic Facility Improvements
Conveyance Analysis Spreadsheet

Pipe Run	Size *(inches)*	Mannings N	Plan Slope *(ft/ft)*	Qfull *(cfs)*	Tributary Basins	Total Tributary Area *(acres)*	Tributary Impervious Area *(acres)*	Tributary Pervious Area *(acres)*	Qtrib, 100-year (SCS TR-20)* *(cfs)*	% Full
Detention Outlet	8	0.012	0.01	**1.31**	Detention Basin	0.462	0.462	0.000	**0.621**	**47%**
Field Collector	8	0.012	0.005	**0.93**	Turf Field Area	1.997	0.000	1.997	**0.040**	**4%**

* See calculation sheets

Conveyance Calculations (Detention Outlet) – SCS TR-20 Method

Per 2021 Tacoma Stormwater Management Manual, Volume 4, 2.1.3

$$S = \frac{1000}{CN} - 10$$

S = potential storage (inches)

CN_i = 98 (Curve Number per Table 4-5 from Tacoma SWMM, impervious area)

S_i = 0.204 inches

$$Q = \frac{(P - 0.2S)^2}{P + 0.8S}$$

Q = runoff (inches)

P = 4.1 inches (Precipitation per Table 4-4 from Tacoma SWMM, 100-year)

Q_i = 3.865 inches

$$q_p = \frac{484AQ}{t_p} = \frac{726AQ}{t_c}$$

q_p = peak discharge (cfs)

Project Areas

A_i = 0.000721 square miles (drainage area equal to new plus replaced hard surface 0.462 acres)

$t_{c,i}$ = 3.26 minutes (time of concentration, impervious – see attached calculation)

$q_{p,i}$ (100-year) = 0.621 cfs

TIME OF CONCENTRATION CALCULATION FOR IMPERVIOUS SURFACE

2/25/22

n=Manning's Roughness Coefficent for Overland Flow

Reach	Reach Type	Surface Description	"n"	Length (l) Feet	Slope (S)	P2 in	T hour	T of C Min.
AB	Sheet Flow	Pavement	0.011	24	0.01	2	0.01076	0.65

Assume no time in detention

						Pipe Diam (in)	Vel-FPS	Cap CFS	T of C Min.
BC	Pipe	CB1 to CB2	0.012	59	0.50%	6	2.190	0.43	.45
CD	Pipe	CB2 to CB3	0.012	59	0.50%	6	2.190	0.43	.45
DE	Pipe	CB3 to CB4	0.012	59	0.50%	6	2.190	0.43	.45
EF	Pipe	CB4 to Det	0.012	27	0.50%	6	2.190	0.43	.21
FG	Pipe	Through Det	0.012	140	0.50%	6	2.190	0.43	1.07
					Total Tc =				**3.26**

SHEET FLOW:

Calculated per Chapter 15 of the USDA NRCS National Engineering Handbook

$$T_t = \frac{0.007(n\ell)^{0.8}}{(P_2)^{0.5} S^{0.4}} \qquad \text{(eq. 15–8)}$$

where:

T_t = travel time, h

n = Manning's roughness coefficient (table 15–1)

ℓ = sheet flow length, ft

P_2 = 2-year, 24-hour rainfall, in

S = slope of land surface, ft/ft

PIPE FLOW:

THE TIME OF CONCENTRATION CALCULATION ESTIMATES FLOW VELOCITIES ASSUMING THE PIPES ARE FLOWING FULL
THE FLOW THROUGH THESE PIPES WILL BE SIGNIFICANTLY LESS THAN THEIR CAPACITY
THEREFORE, THE ACTUAL VELOCITIES WILL BE LESS THAN THOSE INDICATED ON THE CALCULATION
AND THE ACTUAL TIME OF CONCENTRATION WILL BE GREATER THAN THAT CALCULATED

AB	Track sheet flow
BC	Catch basin to catch basin (6" ductile iron pipe system)
CD	Catch basin to catch basin (6" ductile iron pipe system)
DE	Catch basin to catch basin (6" ductile iron pipe system)
EF	Catch basin to gravel detention basin (6" ductile iron pipe system)
FG	Assumed water movement through gravel detention basin

Conveyance Calculations (Field Collector) – SCS TR-20 Method

Per 2021 Tacoma Stormwater Management Manual, Volume 4, 2.1.3

$$S = \frac{1000}{CN} - 10$$

S = potential storage (inches)

$CN_p = 92$ (Curve Number per Table 4-5 from Tacoma SWMM, lawn/landscape area)

S_p = 0.870 inches

$$Q = \frac{(P - 0.2S)^2}{P + 0.8S}$$

Q = runoff (inches)

P = 4.1 inches (Precipitation per Table 4-4 from Tacoma SWMM)

Q_p = 3.214 inches

$$q_p = \frac{484AQ}{t_p} = \frac{726AQ}{t_c}$$

q_p = peak discharge (cfs)

Project Areas

A_p = 0.00312 square miles (drainage area equal to synthetic turf area 1.997 acres)

$t_{c,p}$ = 182.70 minutes (time of concentration, field percolation – see attached calculation)

$q_{p,p}$ (100-year) = 0.04 cfs

TIME OF CONCENTRATION CALCULATION FOR SYNTHETIC FIELD

2/25/22

Reach	Reach Type	Surface Description	Permeability "k" (ft/min)	Length Feet	Upper Elev	Lower Elev	GRAD.	Vel-FPM	Cap CFS	T of C Min.	Inches
AB	Percolation	TURF	.0278	0.125	100.00	99.88	1.00	0.028	NA	4.50	1.50
BC	Percolation	Synthetic Pad	.1389	0.08	99.88	99.79	1.00	0.139	NA	0.60	1.00
CD	Percolation	AGGREGATE	.9910	0.17	99.79	99.63	1.00	0.991	NA	0.17	2.00
DE	Percolation	AGGREGATE	.9910	0.67	99.63	98.96	1.00	0.991	NA	0.67	8.00
	Gradient Buildup - assume earlier storm - no time										
EF	Percolation	AGGREGATE	.9910	7.50	98.96	98.63	0.04	0.044	NA	170.28	90.00
FG	Percolation	AGGREGATE	.9910	1.00	98.63	97.63	1.00	0.991	NA	1.01	12.00

			"n"	Length Feet	Upper Elev	Lower Elev	Slope	Pipe Diam			
GH	Pipe	CPEP Lateral	0.024	205	97.63	96.60	0.50%	4	0.836	0.07	4.09
HI	Pipe	CPEP Collector	0.012	220	96.60	95.50	0.50%	8	2.653	0.93	1.38
								Total Tc =			**182.70**

AGGREGATE PERMEABILITY (HAZEN METHOD):
APPROXIMATE 10th PERCENTILE PARTICLE SIZE IS BETWEEN No. 30 & 40 SIEVE
K=100(DxD) WHERE D = 10th % PARTICLE SIZE IN cm & K= PERMEABILITY IN cm/sec

GRADIENT BUILDUP:
ASSUME DESIGN STORM OCCURS IMMEDIATELY AFTER ANOTHER STORM EVENT AND A 4 INCH GRADIENT IS IN PLACE
BASED ON A 2 YEAR DESIGN STORM .
IF DESIGN STORM EVENT OCCURS WITHOUT AN EXISTING GRADIENT, THE TIME OF CONCENTRATION WILL BE
SIGNIFICANTLY INCREASED TO ALLOW FOR ADEQUATE PRECIPITATION TO PROVIDE A GRADIENT

LATERAL PERCOLATION:
FLOW VELOCITY IS THE PRODUCT OF THE PERMEABILITY AND THE GRADIENT (DARCY'S LAW)

PIPE FLOW:
THE TIME OF CONCENTRATION CALCULATION ESTIMATES FLOW VELOCITIES ASSUMING THE PIPES ARE FLOWING FULL
THE FLOW THROUGH THESE PIPES WILL BE SIGNIFICANTLY LESS THAN THEIR CAPACITY
THEREFORE, THE ACTUAL VELOCITIES WILL BE LESS THAN THOSE INDICATED ON THE CALCULATION
AND THE ACTUAL TIME OF CONCENTRATION WILL BE GREATER THAN THAT CALCULATED

AB	1.5" TURF
BC	1" PAD
CD	2" TOP COURSE PERMEABLE AGGREGATE
DE	8" BASE COURSE PERMEABLE AGGREGATE
EF	LATERAL DISTANCE BETWEEN DRAINAGE LATERALS - LATERAL PERCOLATION DISTANCE
FG	TRENCH DRAIN DEPTH
GH	LATERAL PIPE TO 8" COLLECTOR PIPE
HI	8" COLLECTOR PIPE TO EX CB

APPENDIX C

Construction Stormwater Pollution Prevention Plan (SWPPP)

Construction Stormwater Pollution Prevention Plan (SWPPP) Report

Giaudrone Middle School Field and Track Conversion

Prepared For
Permit Number TBD

Project Location
4902 S Alaska St, Tacoma, WA 98408

2110000220, 2110000460, 2110000430

SWPPP Prepared By

Name	Organization	Contact Telephone Number	Email Address
Andrew Wong/ Laurie Pfarr	LPD Engineering	206-725-1211	andreww@lpdengineering.com

Erosion and Sediment Control Lead

Name	Organization	Contact Telephone Number	Email Address	CESCL/CPESC Number (if applicable)
Justin Swider	Korsmo Construction	253-208-6932	jswider@korsmo.com	ECO-3-8162015

Proposed Construction Schedule

Proposed Start Date	Proposed End Date	Described proposed phasing or sequencing (if any)
June 2022	August 2022	None

Date Prepared
February 28, 2022

(Insert Professional Engineer Certification and Stamp, if necessary)

Table of Contents

1. Project Information

A. Project Contents

See Title Page for Construction Stormwater Pollution Prevention Plan Development Team and Erosion and Sediment Control Lead.

B. Property Owner

Name	Organization	Mailing Address	Contact Telephone Number	Email Address
Dale Stafford	Tacoma Public Schools	601 S 8th St, Tacoma, WA 98405	253-517-1000	dstaffo@tacoma.k12.wa.us

C. Applicant (if different than Property Owner)

Name	Organization	Mailing Address	Contact Telephone Number	Email Address
Jeff Burke	D.A. Hogan & Associates	119 1st Ave, Suite 110, Seattle, WA 98104	206-285-0400	jeffb@dahogan.com

D. Associated Permits

i) Associated City of Tacoma Permit Number(s)

BLD2002-00204

ii) Other Federal, State, or Local Associated Permit Types and Numbers

An NPDES permit will be required since the project disturbs more than 1 acre.

E. Vesting

i) City of Tacoma Stormwater Management Manual Edition Used

2021 Stormwater Management Manual (SWMM)

ii) If using a manual other than the most current version, provide vesting justification:

2. Project Overview

A. Provide a brief description of the proposed project.

This project will involve the conversion of the existing natural grass playfield at Giaudrone Middle School to synthetic turf. A new underdrain system will be installed beneath the turf field as well as the rubberized track and D-zone area. The track will be resurfaced with a rubberized surfacing over asphalt. A new shotput court will also be constructed near the northwest corner of the field.

3. Existing Project Site Conditions

A. Describe in words and/or provide a figure(s) or drawing(s) that describe the existing site conditions.

The existing project area consists of the existing cinder track and underdrained grass playfield located in the southern portion of the Giaudrone Middle School property. There is a concrete walkway for pedestrian access along the north side of the track and a driveway for maintenance access off of S Alaskan Street at the southeast corner of the track. The field area is surrounded by grass slopes on the east, south, and west sides. There is a concrete sound barrier wall along the west side of the field. The project disturbance area is bounded by the Giaudrone Middle School campus to the north, S Alaskan Street to the east, single-family residential properties to the south, and Interstate 5 to the west.

The existing topography within the project area includes a high point in the center of the field of approximately 375, sloping outward toward the track at around 1.5%. The track is relatively flat, but beyond there are steep slopes to the south and west. The lawn area east of the track slopes down to the sidewalk at about 20%. The area north of the track is relatively flat, with a slight low point between the edge of the track and the concrete walkway.

The existing site is located in the Flett Creek Watershed but is split into two threshold discharge areas (TDA) as described below:

West TDA Stormwater runoff from the grass field, in general, is collected by the existing field underdrain system. Flow from the majority of the track is collected by catch basins along the north and west sides, and a swale along the bottom of the slope to the south. Stormwater in the swale is conveyed west to a pipe that connects to the onsite storm system. The wall along the west side of the field prevents runoff from flowing over the steep slope beyond. The onsite storm system discharges to the public system along Interstate 5.

East TDA Runoff from the eastern portion of the track sheet flows east onto the adjacent lawn and then into the public storm system in S Alaska Street via a catch basin in the gutter.

Based on City of Tacoma mapping, there are steep slopes along the south and west sides of the fields. There is a critical aquifer recharge area mapped along the far western edge of the property, along the toe of the steep slope area. There are no wetlands on site or in the immediate vicinity of the site. Based on the City of Tacoma maps, the site is within the 5-year modeled wellhead protection zone and the South Tacoma Groundwater Protection District. There are no groundwater wells onsite or within 100 feet of the site. The site is not located within or in close proximity to any superfund sites in Tacoma listed by the US Environmental

Protection Agency (EPA), nor is runoff from the project site tributary to any superfund sites. The site is located within the City of Tacoma Smelter Plume with an average arsenic concentration in the soil of under 20 parts per million (ppm) according to the Department of Ecology. Per the Flood Insurance Rate Map (FIRM) #53053C0304E, the project is located within Zone X; an area determined to be outside the 0.2% annual chance of flooding. Therefore, flooding is not anticipated to be a concern for the site.

Per the Natural Resources Conservation Service Web Soil Survey, the site soils are Urban land-Alderwood complex, 5 to 12 percent slopes.

4. 13 Elements of Construction Stormwater Pollution Prevention

Below the 13 Elements of Construction Stormwater Pollution Prevention are provided. For each element, place a checkmark next to the BMP that will be used to satisfy the element. If Other is checked describe how the element will be addressed in detail. If an element is not required, justification for why that element is not required must be included. Volume 3, Table 3-1: Construction Stormwater BMPs by SWPP Element is a guide that can be used to help determine appropriate BMPs to address each Element.

4.1 Element #1: Preserve Vegetation and Mark Clearing Limits

- Before beginning any land disturbing activities, including clearing and grading, clearly mark all clearing limits, sensitive areas and their buffers, and trees that are to be preserved within the construction area to prevent damage and offsite impacts. Mark clearing limits both in the field and on the plans.
- Retain the duff layer, native topsoil, and natural vegetation in an undisturbed state to the maximum degree practicable. If it is not practicable to retain the duff layer in place, stockpile it onsite, cover it to prevent erosion, and replace it immediately upon completion of the ground-disturbing activities.
- Plastic, metal, fabric fence, or other physical barriers may be used to mark the clearing limits.

The BMP(s) proposed to meet this element are:

☒ BMP C101: Preserving Natural Vegetation
☐ BMP C102: Buffer Zone
☒ BMP C103: High Visibility Fence
☐ Other: (Insert description of how element will be addressed)
☐ This Element is not required for this project because: (Insert Justification as to why Element is not required)

4.2 Element #2: Establish Construction Access

- Limit construction vehicle ingress and egress to one route, if possible.
- Stabilize access points with a pad of quarry spalls, crushed rock, or other equivalent BMPs to minimize tracking of sediment.
- Locate wheel wash or tire baths onsite if other measures fail to control sediment from leaving the site.
- No tracking of sediment offsite is allowed. If sediment is tracked offsite, offsite areas (including roadways) shall be thoroughly and immediately cleaned by shoveling or pickup sweeping. Transport sediment to a controlled sediment disposal area.
- Keep streets clean at ALL times. Clean tracked sediment immediately.
- Washing of sediment to the stormwater system is not allowed.

The BMP(s) proposed to meet this element are:

☒ BMP C105: Stabilized Construction Entrance
☒ BMP C106: Wheel Wash
☐ BMP C107: Construction Road/Parking Area Stabilization
☐ Other: (Insert description of how element will be addressed)
☐ This Element is not required for this project because: (Insert justification as to why Element is not required)

4.3 Element #3: Control Flow Rates

- Protect downstream properties, receiving waters, and conveyance systems from erosion and other damage due to increases in the velocity and peak volumetric flowrate of stormwater from the project site. A quantitative downstream analysis may be required to ensure no damage to the downstream conveyance system during construction. See Additional Protective Measure - Infrastructure Protection.
- Where necessary, construct flow control facilities as one of the first steps in grading.
- Flow control facilities shall be functional prior to construction of site improvements (e.g. impervious surfaces). It may be necessary to install temporary flow control facilities to meet flow control requirements during construction.
- Control structures designed for permanent flow control BMPs are not appropriate for use during construction without modification. If used during construction, modify the control structure to allow for long-term storage of runoff and enable sediments to settle. Verify that the BMP is sized appropriately for this purpose. Restore BMPs to their original design dimensions, remove sediment, and install a final control structure at completion of the project.
- Velocity of water leaving the site shall not exceed 3 feet/second if the discharge is to a stream or ditch.
- Permanent infiltration facilities shall not be used for flow control during construction unless lined. The bottom of the facility shall be scarified to ensure any compaction that occurred during construction is mitigated.

The BMP(s) proposed to meet this element are:

☐ BMP C203: Water Bars
☒ BMP C207: Check Dams
☐ BMP C209: Outlet Protection
☐ BMP C235: Wattles
☐ BMP C240: Sediment Trap
☐ BMP C241: Temporary Sediment Pond
☒ Other: BMP C253 Portable Sediment Tank
☐ This Element is not required for this project because: (Insert justification as to why Element is not required)

4.4 Element #4: Install Sediment Controls

- Design, install, and maintain effective erosion controls and sediment control to minimize the discharge of pollutants.
- Minimize sediment discharges from the site. The design, installation and maintenance of erosion and sediment controls must address factors such as the amount, frequency, intensity and duration of precipitation, the nature of resulting stormwater, and soil characteristics, including the range of soil particle sizes expected to be present on the site.
- Prior to leaving a construction site or prior to discharge to an infiltration facility, stormwater from disturbed areas shall pass through a sediment removal BMP.
- Construct sediment control BMPs as one of the first steps in grading. These BMPs shall be functional before other land disturbing activities take place.
- Locate BMPs in a manner to avoid interference with the movement of juvenile salmonids attempting to enter off-channel areas or conveyance channels.
- Provide and maintain natural buffers around surface waters, direct stormwater to vegetated areas to increase sediment removal and maximize infiltration, where feasible.
- Seed and mulch earthen structures such as dams, dikes, and diversions according to the timing indicated in Element #5.
- Design outlet structures to withdraw impounded stormwater from the surface to avoid discharging sediment that is still suspended lower in the water column. If installing a floating pump structure, include a stopper to prevent the pump basket from hitting the bottom of the pond.
- Full stabilization includes concrete or asphalt paving; quarry spalls used as ditch lining; or the use of rolled erosion products, a bonded fiber matrix product, or vegetative cover in a manner that will fully prevent soil erosion.

The BMP(s) proposed to meet this element are:

☐ BMP C231: Brush Barrier
☐ BMP C232: Gravel Filter
☒ BMP C233: Silt Fence
☐ BMP C234: Vegetated Filter Strip
☐ BMP C235: Wattles
☐ BMP C240: Sediment Trap
☐ BMP C241: Temporary Sediment Pond
☐ BMP C250: Construction Stormwater Chemical Treatment
☒ Other: C253 Portable Sediment Tank
☐ This Element is not required for this project because: (Insert justification as to why Element is no required)

4.5 Element #5: Stabilize Soils

- Stabilize exposed and unworked soils by application of effective BMPs that prevent erosion.

- From October 1 through April 30, no soils shall remain exposed and unworked for more than 2 days. From May 1 to September 30, no soils shall remain exposed and unworked for more than 7 days. This stabilization requirement applies to all soils onsite, whether at final grade or not.
- Stabilize soils at the end of the shift, before a holiday or weekend, if needed, based on the weather forecast.
- Select appropriate soil stabilization measures for the time of year, site conditions, estimated duration of use, and the potential water quality impacts that stabilization agents may have on downstream waters or groundwater.
- Stabilize soil stockpiles from erosion, protect stockpiles with sediment trapping measures, and where possible, locate piles away from stormwater system inlets, waterways, and conveyance channels.
- Control stormwater volume and velocity within the site to minimize soil erosion.
- Control stormwater discharges, including peak volumetric flowrates and total stormwater volume, to minimize erosion at outlets and to minimize downstream channel and stream bank erosion.
- Minimize the amount of soil exposed during construction activity.
- Minimize the disturbance of steep slopes.
- Minimize soil compaction and, unless infeasible, preserve topsoil.
- Ensure the gravel base used for stabilization is clean and does not contain fines or sediment.

<u>The BMP(s) proposed to meet this element are:</u>

☒ BMP C120: Temporary and Permanent Seeding
☒ BMP C121: Mulching
☒ BMP C122: Nets and Blankets
☒ BMP C123: Plastic Covering
☒ BMP C124: Sodding
☒ BMP C125: Compost
☒ BMP C126: Topsoiling
☐ BMP C127: Polyacrylamide for Soil Erosion Protection
☒ BMP C130: Surface Roughening
☐ BMP C131: Gradient Terraces
☒ BMP C140: Dust Control
☐ Other: (Insert description of how element will be addressed)
☐ This Element is not required for this project because: (Insert justification as to why Element is not required)

4.6 Element #6: Protect Slopes

- Design and construct cut-and-fill slopes in a manner to minimize erosion. Applicable practices include, but are not limited to, reducing continuous length of slope with terracing and diversions, reducing slope steepness, and roughening slope surfaces (for example, track walking).
- Divert offsite stormwater (sometimes called run-on) or groundwater away from slopes and disturbed areas with interceptor dikes and/or swales. Manage offsite stormwater separately from stormwater generated on the site.
- At the top of the slopes, collect stormwater in pipe slope drains or protected channels to prevent erosion. Size temporary pipe slope drains to convey either:
  - The peak volumetric flowrate calculated using a 10-minute time step from a Type 1A, 10-year, 24-hour frequency storm using a single event model, or
  - The 10-year return period flowrate, indicated by an Ecology-approved continuous simulation model, using a 15-minute time step.
- Use the existing land cover condition for predicting flowrates from tributary areas outside the project limits. For tributary areas on the project site, use the temporary or permanent project land cover condition, whichever will produce the highest flowrate. If using, a continuous simulation model, model bare soils as landscaped areas.
- Provide temporary or permanent conveyance to remove groundwater seepage from the slope surface of exposed soil areas.
- Place excavated material on the uphill side of trenches, consistent with safety and space considerations.
- Place check dams at regular intervals within channels that are cut down a slope.
- Stabilize soils on slopes, as specified in Element #5.

<u>The BMP(s) proposed to meet this element are:</u>

☒ BMP C120: Temporary and Permanent Seeding
☒ BMP C121: Mulching
☒ BMP C122: Nets and Blankets
☒ BMP C123: Plastic Covering
☒ BMP C124: Sodding
☒ BMP C130: Surface Roughening
☐ BMP C131: Gradient Terraces
☒ BMP C200: Interceptor Dike and Swale
☐ BMP C201: Grass-Lined Channels
☐ BMP C203: Water Bars
☐ BMP C204: Pipe Slope Drains
☐ BMP C205: Subsurface Drains
☐ BMP C206: Level Spreader
☒ BMP C207: Check Dams
☐ BMP C208: Triangular Silt Dike (Geotextile-Encased Check Dam)
☐ Other: (Insert description of how element will be addressed)

☐ BMP This Element is not required for this project because: (Insert justification as to why Element is not required)

4.7 Element #7: Protect Stormwater System Inlets

- Protect all stormwater system inlets that are operable during construction so that stormwater does not enter the conveyance system without first being filtered or treated to remove sediment.
- Clean or remove and replace inlet protection devices when sediment has filled 1/3 of the available storage (unless a different standard is specified by the product manufacturer).
- Keep all approach roads clean. Do not allow sediment to enter the stormwater system.
- Inspect inlets weekly at a minimum and daily during storm events.

The BMP(s) proposed to meet this element are:

☒ BMP C220: Stormwater System Inlet Protection

☐ Other: (Insert description of how element will be addressed)

☐ This Element is not required for this project because: (Insert justification as to why Element is not required)

4.8 Element #8: Stabilize Channels and Outlets

- Design, construct, and stabilize all temporary onsite conveyance channels to prevent erosion from either:
  - The peak volumetric flowrate calculated using a 10-minute time step from a Type 1A, 10-year, 24-hour frequency storm using a single event model, or
  - The 10-year return period flowrate, indicated by an Ecology-approved continuous simulation model, using a 15-minute time step.
- Use the existing land cover condition for predicting flowrates from tributary areas outside the project limits. For tributary areas on the project site, use the temporary or permanent project land cover condition, whichever will produce the highest flowrate. If using a continuous simulation model, model bare soils as landscaped areas.
- Provide stabilization, including armoring material, adequate to prevent erosion of outlets, adjacent stream banks, slopes, and downstream reaches at the outlets of all conveyance systems.

The BMP(s) proposed to meet this element are:

☐ BMP C122: Nets and Blankets

☐ BMP C202: Rip Rap Channel Lining

☒ BMP C207: Check Dams

☒ Other: C200 Interceptor Dike and Swale

☐ This Element is not required for this project because: (Insert justification as to why Element is not required)

4.9 Element #9: Control Pollutants

- Design, install, implement and maintain effective pollution prevention measures to minimize the discharge of pollutants.
- All discharges to the City of Tacoma wastewater system require City approval. Some discharges to the City of Tacoma stormwater system require City approval. The approval may include a separate Special Approved Discharge (SAD) permit. Visit https://www.cityoftacoma.org/government/city_departments/environmentalservices/wastewater/wastewater_permits_and_manuals for additional information about SAD Permits.
- Handle and dispose of all pollutants, including waste materials and demolition debris that occur on site in a manner that does not cause contamination of stormwater.
- Provide cover, containment, and protection from vandalism for all chemicals, liquid products, petroleum products, and other materials that have the potential to pose a threat to human health and the environment. Provide secondary containment for tanks holding pollutants including onsite fueling tanks. Secondary containment means placing tanks or containers within an impervious structure capable of containing 110% of the volume contained in the largest tank within the containment structure. Double-walled tanks do not require additional secondary containment.
- Conduct maintenance, fueling, and repair of heavy equipment and vehicles using spill prevention and control measures. Clean contaminated surfaces immediately following any spill incident.
- Conduct oil changes, hydraulic system drain down, solvent and degreasing cleaning operations, fuel tank drain down and removal, and other activities, which may result in discharge or spillage of pollutants to the ground or into stormwater using spill prevention measures, such as drip pans.
- Discharge wheel wash or tire bath wastewater to a separate onsite treatment system that prevents discharge to surface water. Alternatively, discharge wheel wash or tire bath wastewater to the wastewater system (only allowed with SAD Permit approval).
- Apply fertilizers and pesticides in a manner and at application rates that will not result in loss of chemicals to stormwater. Follow manufacturers' recommendations for application rates and procedures.
- Use BMPs to prevent or treat contamination of stormwater by pH modifying sources. These sources include, but are not limited to, recycled concrete stockpiles, bulk cement, cement kiln dust, fly ash, new concrete washing and curing waters, waste streams generated from concrete grinding and sawing, exposed aggregate processes, dewatering concrete vaults, and concrete pumping and mixer washout waters.
- Adjust the pH of stormwater if necessary to prevent violations of water quality standards.
- Manage concrete washout appropriately.
    - Washout concrete truck drums or concrete handling equipment in onsite or offsite designated concrete washout areas only.
        - Do not washout concrete truck drums or concrete handling equipment to streets, the stormwater system, receiving waterbodies, or the ground.
    - Washout of small concrete handling equipment may be disposed of in a formed areas awaiting concrete where it will not contaminate stormwater and surface water or groundwater.
    - Do not use upland land applications for discharging wastewater from concrete washout areas.
    - Do not dump excess concrete onsite, except in designated concrete washout areas.

  - Do not washout anything contaminated with concrete into formed areas awaiting infiltration BMPs.
  - Concrete spillage or concrete discharge directly to groundwater or surface waters of the State is prohibited.
- Written approval from the Department of Ecology is required prior to using chemical treatment other than CO2, dry ice, or food grade vinegar to adjust pH.
- Clean contaminated surfaces immediately following any discharge or spill incident.
- Uncontaminated water from water-only based shaft drilling for construction of building, road, and bridge foundations may be infiltrated provided the wastewater is managed in a way that prohibits discharge to surface waters. Prior to infiltration, water from water-only based shaft drilling that comes into contact with curing concrete must be neutralized until pH is in the range of 6.5 to 8.5.

The BMP(s) proposed to meet this element are:

☒ BMP C151: Concrete Handling
☒ BMP C152: Sawcutting and Surface Pollution Prevention
☒ BMP C153: Material Delivery, Storage and Containment
☐ BMP C154: Concrete Washout Area
☐ BMP C250: Construction Stormwater Chemical Treatment
☐ Other: (Insert description of how element will be addressed)
☐ This Element is not required for this project because: (Insert justification as to why Element is not required)

4.10 Element #10: Dewatering

- Dewatering discharges to the City of Tacoma stormwater conveyance system or the City of Tacoma wastewater system may require City approval through a Special Approved Discharge (SAD) Permit. See https://www.cityoftacoma.org/government/city_departments/environmentalservices/wastewater/wastewater_permits_and_manuals for more information on the SAD Permit Process.
- Discharge foundation, vault, and trench dewatering water that has similar characteristics to site stormwater into a controlled conveyance system prior to discharge to a sediment trap or sediment pond. Stabilize channels as specified in Element #8.
- Clean, non-turbid dewatering water, such as well-point groundwater, can be discharged to systems tributary to state surface waters, as specified in Element #8, provided the dewatering flow does not cause erosion or flooding of receiving waters. Do not route clean dewatering water through TESC BMPs.
- Handle highly turbid or contaminated dewatering water separately from stormwater at the site.
- Other disposal options, depending on site constraints, may include:
  - Infiltration
  - Transport offsite in vehicle, such as a vacuum flush truck, for legal disposal in a manner that does not pollute state waters
  - Ecology approved onsite chemical treatment or other suitable treatment technologies

- Use of a sedimentation bag that discharges to a ditch or swale for small volumes of localized dewatering

The BMP(s) proposed to meet this element are:

☐ BMP C203: Water Bars
☒ BMP C206: Level Spreader
☒ BMP C236: Vegetative Filtration
☐ Other: (Insert description of how element will be addressed)
☐ This Element is not required for this project because: (Insert justification as to why Element is not required)

4.11 Element #11: Maintain BMPs

- Maintain and repair as needed all temporary and permanent erosion and sediment control BMPs to assure continued performance of their intended function. Conduct maintenance and repairs in accordance with BMP specifications.
- Remove temporary erosion and sediment control BMPs within 30 days after final site stabilization is achieved or after the temporary BMPs are no longer needed. Trapped sediment shall be removed or stabilized onsite. Permanently stabilize disturbed soil resulting from removal of BMPs or vegetation.

The BMP(s) proposed to meet this element are:

☒ BMP C150: Materials on Hand
☒ BMP C160: Erosion and Sediment Control Lead
☒ BMP C236: Vegetative Filtration
☐ Other: (Insert description of how element will be addressed)
☐ This Element is not required for this project because: (Insert justification as to why Element is not required)

4.12 Element #12: Manage the Project

- *Phasing of Construction* – Phase development projects in order to prevent soil erosion and the transport of sediment from the project site during construction, unless the Erosion and Sediment Control Lead can demonstrate that construction phasing is infeasible. Revegetation of exposed areas and maintenance of that vegetation shall be an integral part of the clearing activities for any phase.
- *Seasonal Work Limitations* – From October 1 through April 30, clearing, grading, and other soil disturbing activities shall only be permitted if shown to the satisfaction of the City that silt-laden stormwater will be prevented from leaving the site through a combination of the following:
    - Site conditions including existing vegetative coverage, slope, soil type, and proximity to receiving waters;
    - Limitations on activities and the extent of disturbed areas; and

- Proposed erosion and sediment control measures.

Based on the information provided and local weather conditions, the City may expand or restrict the seasonal limitation onsite disturbance. The following activities are exempt from the seasonal clearing and grading limitations:

- Routine maintenance and necessary repair of erosion and sediment control BMPs
- Routine maintenance of public facilities or existing utility structures that do not expose the soil or result in the removal of the vegetative cover to soil
- Activities where there is one hundred percent infiltration of stormwater within the site in approved and installed erosion and sediment control facilities

- *Inspection and Monitoring*
  a. Inspect, maintain, and repair all BMPs as needed to assure continued performance of their intended function. Projects regulated under the Construction Stormwater General Permit (CSWGP) must conduct site inspections and monitoring in accordance with Special Condition S4 of the CSWGP.
  b. Projects that disturb one or more acres must have site inspections conducted by a Certified Erosion and Sediment Control Lead (CESCL) or Certified Professional in Erosion and Sediment Control (CPESC).
  c. Projects disturbing less than one acre must have an Erosion Sediment Control Lead (ESC) conduct inspections. The ESC Lead does not have to have CESCL or CPESC certification.
  d. The CESCL, CPESC, or ESC Lead shall be identified in the SWPPP and shall be onsite or on-call at all times.
  e. The CESCL, CPESC, or ESC Lead must examine stormwater visually for the presence of suspended sediment, turbidity, discoloration, and oil sheen and evaluate the effectiveness of BMPs to determine if it is necessary to install, maintain, or repair BMPs.
  f. The CESCL, CPESC, or ESC Lead must inspect all areas disturbed by construction activities, all BMPs, and all locations where stormwater leaves the site at least once every calendar week and within 24 hours of any discharge from the site. (Individual discharge events that last more than one day do not require daily inspections). The CESCL, CPESC, or ESC Lead may reduce the inspection frequency for temporary stabilized, inactive sites to once every calendar month.
  g. Construction site operators must correct any problems identified by the CESCL, CPESC, or ESC Lead by:
     - Reviewing the SWPPP for compliance with the 13 construction SWPPP elements and making appropriate revisions within 7 days of the inspection.
     - Fully implementing and maintaining appropriate source control and/or treatment BMPs as soon as possible but correcting the problem within 10 days.
     - Documenting BMP implementation and maintenance in the site log book. (Required for sites larger than 1 acre but recommended for all sites).

  Sampling and analysis of the stormwater discharges from a construction site may be necessary on a case-by-case basis to ensure compliance with standards. Ecology or the City will establish these monitoring and associated reporting requirements.
- *Responsible Party* – For all projects, a 24-hour responsible party shall be listed in the SWPPP, along with that person's telephone number and email address.
- *Maintenance of the Construction SWPPP* – Keep the Construction SWPPP onsite or within reasonable access to the site. Modify the SWPPP whenever there is a change in the design,

construction, operation, or maintenance at the construction site that has, or could have, a significant effect on the discharge of pollutants to waters of the state.
Modify the SWPPP if, during inspections or investigations conducted by the owner/operator, City staff, or by local or state officials, it is determined that the SWPPP is ineffective in eliminating or significantly minimizing pollutants in stormwater discharges from the site. Modify the SWPPP as necessary to include additional or modified BMPs designed to correct problems identified. Complete revisions to the SWPPP within seven (7) days following the inspection. City of Tacoma Environment Services (review staff or inspector) may require that a modification to the SWPPP go through additional City review.

The BMP(s) proposed to meet this element are:

☒ BMP C150: Materials on Hand
☒ BMP C160: Erosion and Sediment Control Lead
☒ BMP C162: Scheduling
☐ Other: (Insert description of how element will be addressed)
☐ This Element is not required for this project because: (Insert justification as to why Element is not required)

4.13 Element #13: Protect Permanent Stormwater BMPs

- Protect all permanent stormwater BMPs from sedimentation through installation and maintenance of erosion and sediment control BMPs on portions of the site that drain into the BMPs. Restore all BMPs to their fully functioning condition if they accumulate sediment during construction. Sediment impacting Best Management Practices shall be removed before system start-up. Restoring the BMP shall include removal of all sediment and full replacement of treatment media.
- Prevent compacting infiltration facilities by excluding construction equipment and foot traffic.
- Keep all heavy equipment off native soils under infiltration BMPs that have been excavated to final grade to retain the infiltration rate of the soils.
- Protect lawn and landscaped areas from compaction due to construction equipment and material stockpiles.
- Do not allow muddy construction equipment on the base material of permeable pavement or on the permeable pavement section.
- Do not allow sediment laden runoff onto permeable pavements or base materials of permeable pavements.
- Permeable pavements fouled with sediment or that can no longer pass an initial infiltration test must be cleaned prior to final acceptance.

The BMP(s) proposed to meet this element are:

☐ BMP C102: Buffer Zone
☒ BMP C103: High Visibility Fence
☐ BMP C200: Interceptor Dike and Swale

☐ BMP C201: Grass-Lined Channels
☐ BMP C207: Check Dams
☐ BMP C208: Triangular Silt Dike (Geotextile-Encased Check Dam)
☐ BMP C231: Brush Barrier
☒ BMP C233: Silt Fence
☐ BMP C234: Vegetated Filter Strip
☐ Other: (Insert description of how element will be addressed)
☐ This Element is not required for this project because: (Insert justification as to why Element is not required)

Appendices

A. Modeling Report

Sediment Tank Sizing Calculations

Per Volume 3 of the 2021 City of Tacoma Stormwater Management Manual (Section 1

Project Name: Giaudrone MS Playground

Required Minimum Storage Volume of Sediment Tank:

V (cf) = Pump discharge (gpm) x 16

Where: Pump Discharge = 2-year developed flow rate from MGS Flood with 15-minute time steps

V = Required Volume in cubic feet

Calculation:

multiplier =	16	
Q =	0.645	cfs
Pump Discharge =	289.50	gpm
V =	**4631.9**	**cubic feet**
V =	**34646.8**	**gallons**

MGS FLOOD
PROJECT REPORT – TESC SIZING

Program Version: MGSFlood 4.57
Program License Number: 201410003
Project Simulation Performed on: 02/17/2022 2:17 PM
Report Generation Date: 02/17/2022 2:17 PM

Input File Name: 2022-02-17 TESC Sizing.fld
Project Name: Giaudrone MS
Analysis Title: Detention
Comments:

PRECIPITATION INPUT

Computational Time Step (Minutes): 15

Extended Precipitation Time Series Selected
Climatic Region Number: 15

Full Period of Record Available used for Routing
Precipitation Station : 96004005 Puget East 40 in_5min 10/01/1939-10/01/2097
Evaporation Station : 961040 Puget East 40 in MAP
Evaporation Scale Factor : 0.750

HSPF Parameter Region Number: 1
HSPF Parameter Region Name : Ecology Default

********** Default HSPF Parameters Used (Not Modified by User) **********

********** WATERSHED DEFINITION **********

Predevelopment/Post Development Tributary Area Summary

	Predeveloped	Post Developed
Total Subbasin Area (acres)	3.263	3.263
Area of Links that Include Precip/Evap (acres)	0.000	0.000
Total (acres)	3.263	3.263

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 1

---------- Subbasin : Subbasin 1 ----------

	-------Area (Acres) --------
C, Lawn, Flat	1.997
SIDEWALKS/FLAT	1.266
Subbasin Total	3.263

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 1

---------- Subbasin : Subbasin 1 ----------

	-------Area (Acres) --------
C, Lawn, Flat	1.997
SIDEWALKS/FLAT	1.266
Subbasin Total	3.263

**************************FLOOD FREQUENCY AND DURATION STATISTICS*********************

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 1
Number of Links: 0

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 1
Number of Links: 0

*************Compliance Point Results ***************

Scenario Predeveloped Compliance Subbasin: Subbasin 1

Scenario Postdeveloped Compliance Subbasin: Subbasin 1

***** Point of Compliance Flow Frequency Data *****
Recurrence Interval Computed Using Gringorten Plotting Position

Predevelopment Runoff		Postdevelopment Runoff	
Tr (Years)	Discharge (cfs)	Tr (Years)	Discharge (cfs)
2-Year	0.645	2-Year	0.645
5-Year	0.854	5-Year	0.854
10-Year	1.082	10-Year	1.082
25-Year	1.440	25-Year	1.440
50-Year	1.869	50-Year	1.869
100-Year	2.292	100-Year	2.292
200-Year	2.328	200-Year	2.328
500-Year	2.363	500-Year	2.363

** Record too Short to Compute Peak Discharge for These Recurrence Intervals

B. Temporary Erosion and Sediment Control BMPs

1.3 BMP C103: High Visibility Fence

1.3.1 Purpose

Fencing is intended to:

- Restrict clearing to approved limits.
- Prevent disturbance of sensitive areas, their buffers, and other areas required to be left undisturbed.
- Limit construction traffic to designated construction entrances or roads.
- Protect areas where marking with survey tape or flagging may not provide adequate protection.

1.3.2 Conditions of Use

To establish clearing limits, plastic, fabric, or metal fence may be used:

- At the boundary of sensitive areas, their buffers, and other areas required to be left uncleared.
- As necessary to control vehicle access to and on the site.

1.3.3 Design and Installation Specifications

- High visibility plastic fence shall be composed of a high-density polyethylene material and shall be at least four feet in height. Posts for the fencing shall be steel or wood and placed every 6 feet on center (maximum) or as needed to ensure rigidity. The fencing shall be fastened to the post every six inches with a polyethylene tie. On long continuous lengths of fencing, a tension wire or rope shall be used as a top stringer to prevent sagging between posts. The fence color shall be high visibility orange. The fence tensile strength shall be 360 lbs./ft. using the ASTM D4595 testing method.
- If appropriate, install fabric silt fence in accordance with BMP C233: Silt Fence to act as high visibility fence. Silt fence shall be at least 3 feet high and must be highly visible to meet the requirement of this BMP.
- Design and install metal fences according to the manufacturer's specifications.
- Metal fences shall be at least 3 feet high and must be highly visible.
- Do not wire or staple fences to trees.

1.3.4 Maintenance Standards

- If the fence has been damaged or its visibility reduced, it shall be repaired or replaced immediately and visibility restored.

1.4 BMP C105: Stabilized Construction Entrance/Exit

1.4.1 Purpose

Construction entrances are stabilized to reduce the amount of sediment transported onto paved roads by vehicles or equipment by constructing a stabilized pad of quarry spalls at entrances and exits to construction sites.

1.4.2 Conditions of Use

Construction entrances shall be stabilized wherever traffic will be leaving a construction site and traveling on paved roads or other paved areas within 1,000 feet of the site.

Construction vehicle ingress and egress shall be limited to one route. Additional routes may be allowed for very large projects or linear projects.

For residential construction provide stabilized construction entrances/exits for each residence. Stabilized surfaces shall be of sufficient length/width to provide vehicle access/parking based upon lot size and configuration. See Figure 3 - 1: Stabilized Construction Entrance.

1.4.3 Design and Installation Specifications

- The stabilized construction entrance shall be:
  - A minimum of 15' wide; and a minimum of 100' feet long.

  The length of the entrance may be reduced to the maximum practicable size when the size or configuration of the site does not allow the full lengths.

- Construct stabilized construction entrance with a pad that is:
  - A minimum 12" thick pad of 4" to 8" quarry spalls, or
  - A minimum 4" course of asphalt treated base, or
  - Existing pavement, or
  - A minimum 12" thick pad of permeable ballast meeting the requirements of WSDOT's Standard Specifications for Road, Bridge, and Municipal Construction Section 9-03.9(2).
  - For single-family residence construction, the concrete pad may be clean 1 ½" minimum aggregate placed at least 8" thick.
  - Manufactured alternatives to construction entrance may be used provided they ensure no track-out.
- Do not use crushed concrete, cement or asphalt rubble for the stabilized construction entrance.
- Place a separation geotextile under the spalls to prevent fine sediment from pumping up into the rock pad. The geotextile shall meet WSDOT Standard Specification 9-33.2(1) Table 3 - Geotextile for Separation or Soil Stabilization or the following standards:
  - Grab Tensile Strength (ASTM D4751) – 200 psi min.
  - Grab Tensile Elongation (ASTM D4632) – 30% max.
  - Mullen Burst Strength (ASTM D3786-80a) – 400 psi min.

- AOS (ASTM D4751) – 20 to 45 (U.S. standard sieve size)

- Consider early installation of the first lift of asphalt or extra concrete in areas that will be paved; this can be used as a stabilized entrance.
- Install fencing (see BMP C103: High Visibility Fence) as necessary to restrict traffic to the construction entrance.
- Whenever possible, construct the entrance on a firm, compacted subgrade. This can substantially increase the effectiveness of the pad and reduce the need for maintenance
- If possible, install the stabilized construction entrance on the uphill side of the site so that stormwater will not pond near the stabilized construction entrance.
- Construction entrance should avoid crossing existing sidewalks if possible. If a construction entrance must cross a sidewalk, the sidewalk must be covered and protected from sediment leaving the site.

1.4.4 Maintenance Standards

- Add quarry spalls or additional permeable ballast if the pad is no longer in accordance with the specifications.
- If the entrance is not preventing sediment from being tracked onto pavement, alternative measures to keep the streets free of sediment shall be used. This may include replacement of the stabilized construction entrance, street sweeping, an increase in the dimensions of the entrance, or the installation of a wheel wash.
- No tracking of sediment onto the roadway is allowed. If sediment is tracked onto the road, immediately clean the road thoroughly by shoveling or pickup sweeping. Transport sediment to a controlled sediment disposal area.
- Perform street sweeping by hand or with a high efficiency sweeper. Do not use a non-high efficiency mechanical sweeper because this creates dust and throws soils into storm systems or conveyance ditches.
- Keep streets clean at ALL times. Clean tracked sediment immediately.
- Street washing of sediment to the stormwater system is not allowed.
- If sediment is discharged to the stormwater system it is the responsibility of the applicant to clean the downstream system.
- Immediately remove any materials that are loosened from the pad and end up on the roadway.
- Install fencing if vehicles are entering or exiting the site at points other than the construction entrance(s).
- Upon project completion and site stabilization, permanently stabilize all construction accesses intended as permanent access for maintenance.

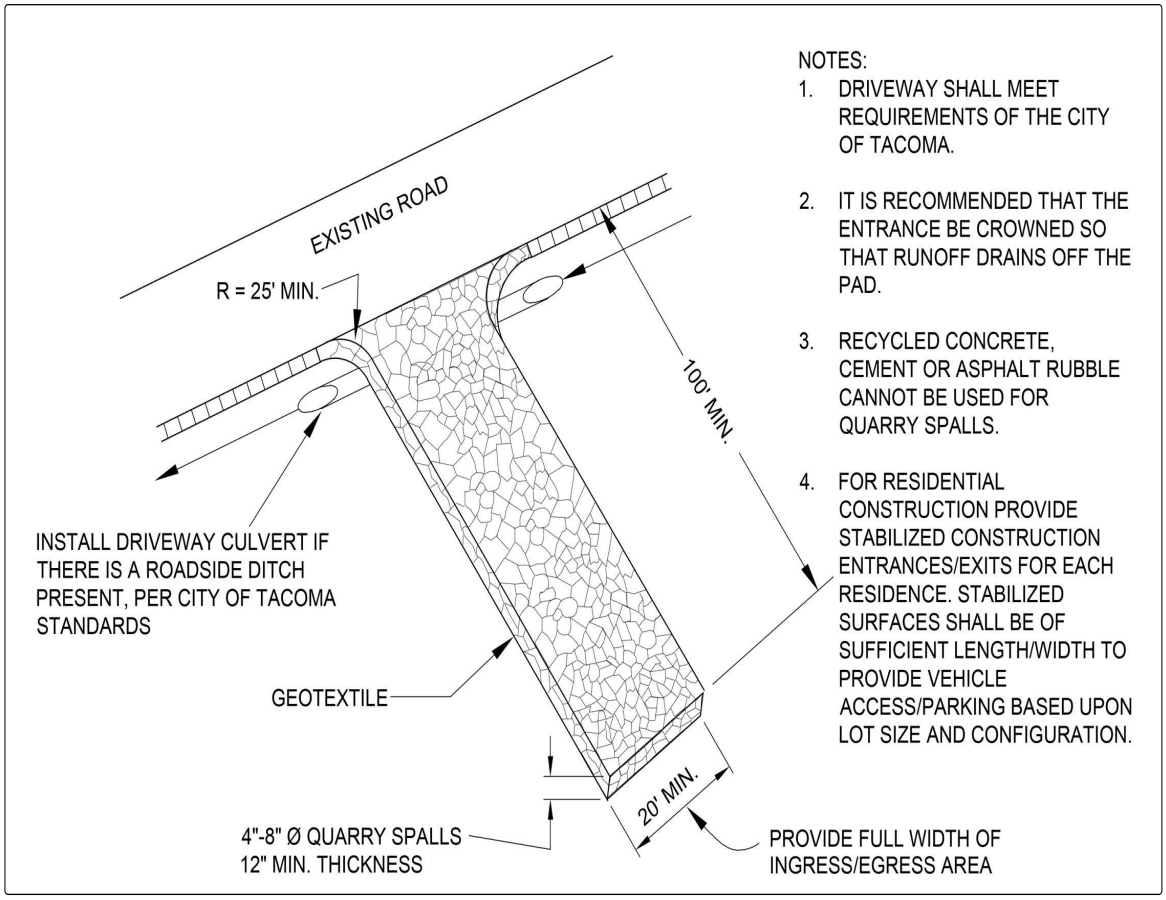

Figure 3 - 1: Stabilized Construction Entrance

1.5 BMP C106: Wheel Wash

1.5.1 Purpose

Wheel washes reduce the amount of sediment transported onto paved roads by washing sediment from the wheels of motor vehicles prior to the motor vehicle leaving the construction site.

1.5.2 Conditions of Use

- Can be used when a stabilized construction entrance (see BMP C105: Stabilized Construction Entrance/Exit) is not preventing sediment from being tracked onto pavement.
- Wheel washing is generally an effective BMP when installed with careful attention to topography. For example, a wheel wash can be detrimental if installed at the top of a slope abutting a right-of-way where the water from the dripping truck can run unimpeded into the street.
- Pressure washing combined with an adequately sized and surfaced pad with direct discharge to a large 10-foot x 10-foot sump can be very effective.
- Discharge wheel wash or tire bath wastewater to a separate onsite treatment system that prevents discharge to surface water or to the wastewater system with a City of Tacoma Special Approved Discharge permit.
- Consider using a closed-loop recirculation system to conserve water.
- Wheel wash or tire bath wastewater shall not include wastewater from concrete washout areas.

1.5.3 Design and Installation Specifications

- A minimum of 6 inches of asphalt treated base (ATB) over crushed base material or 8 inches over a good subgrade is recommended to pave the wheel wash.
- Use a low clearance truck to test the wheel wash before paving. Either a belly dump or lowboy will work well to test clearance.
- Keep the water level from 12 to 14 inches deep to avoid damage to truck hubs and filling the truck tongues with water.
- Figure 3 - 2: Wheel Wash provides a potential detail for a design of a wheel wash. The applicant is not required to construct the wheel wash per this detail.
    - An effective wheel wash will have:
        - A stabilized approach (pavement, permeable ballast, rumble plates) that is clear of exposed soil.
        - An appropriately sized wash deck that allows for at least one complete tire revolution (additional revolutions will be required for more cohesive soil)
        - Multiple angled spray patterns that reach all tires and the vehicle undercarriage
        - High-volume, moderate-pressure spray
        - Reasonably clear rinse water

    - A collection system for overspray and drip out
    - A stabilized egress (pavement, permeable ballast, rumble plates) that is clear of exposed soil.
- Midpoint spray nozzles are only needed in extremely muddy conditions.
- Polymers may be used to promote coagulation and flocculation in a closed-loop system. Polyacrylamide (PAM) added to the wheel wash water at a rate of 0.25 - 0.5 pounds per 1,000 gallons of water increases effectiveness and reduces cleanup time. If PAM is already being used for dust or erosion control and is being applied by a water truck, the same truck can be used to change the wash water.

1.5.4 Maintenance Standards

- The wheel wash should start out the day with fresh water.
- The wash water should be changed as necessary with a minimum of once per day. On large earthwork jobs where more than 10-20 trucks per hour are expected, the wash water will need to be changed more often.
- Wheel wash or tire bath wastewater shall be discharged to a separate onsite treatment system, such as closed-loop recirculation or land application, or to the wastewater system with a City of Tacoma Special Approved Discharge permit.

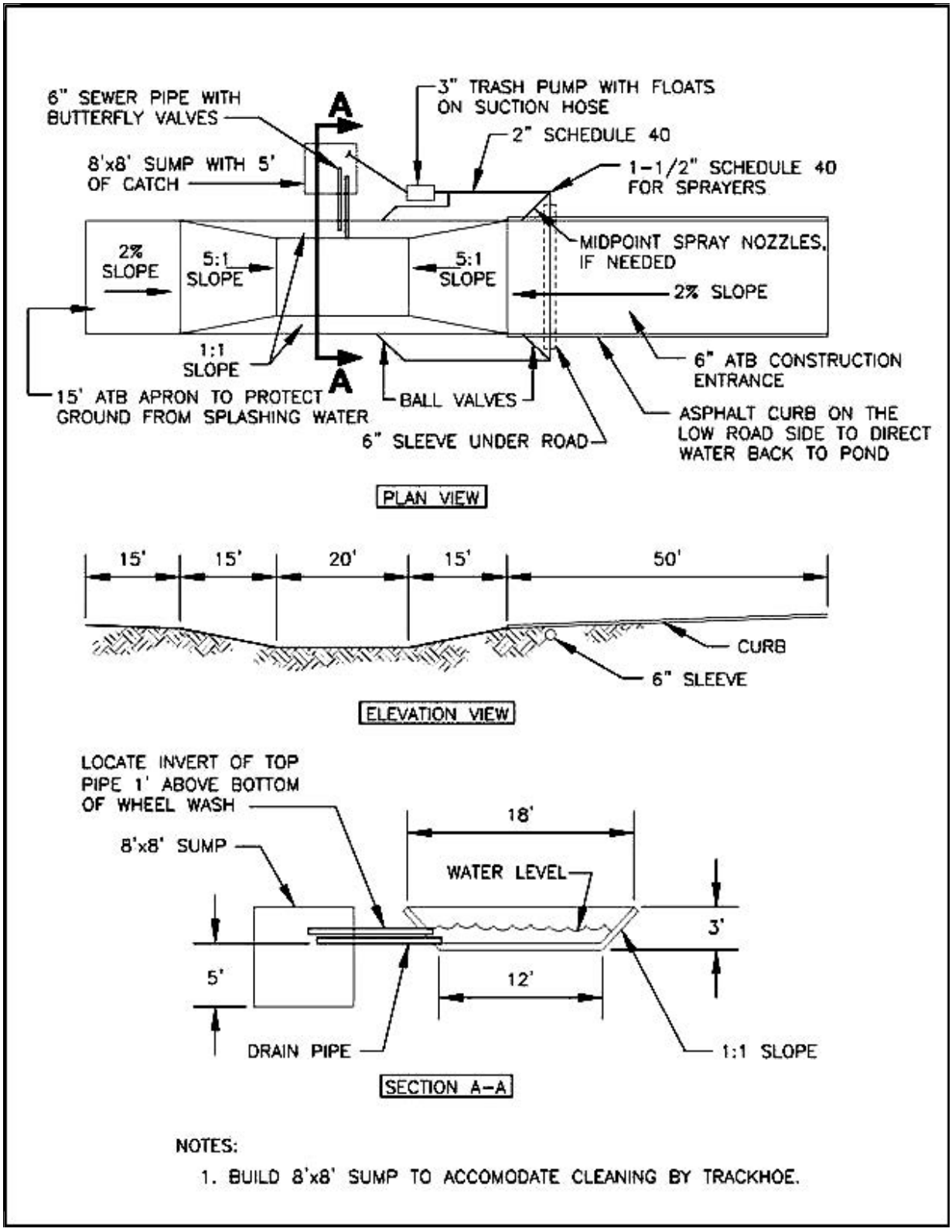

Figure 3 - 2: Wheel Wash

1.7 BMP C120: Temporary and Permanent Seeding

1.7.1 Purpose

Seeding reduces erosion by stabilizing exposed soils. A well-established vegetative cover is one of the most effective methods of reducing erosion.

1.7.2 Conditions of Use

- Seeding may be used throughout the project on disturbed areas that have reached final grade or that will remain unworked.
- Channels that will be vegetated should be installed before major earthwork and hydroseeded with a Bonded Fiber Matrix. The vegetation should be well established (i.e., 75 percent cover) before water is allowed to flow in the ditch. With channels that will have high flows, install erosion control blankets over the hydroseed. If vegetation cannot be established from seed before water is allowed in the ditch, sod should be installed in the bottom of the ditch over hydromulch and blankets.
- Seed detention ponds as required.
- Mulch is required at all times because it protects seeds from heat, moisture loss, and transport due to runoff.

  Mulch can be applied on top of the seed or simultaneously by hydroseeding. See BMP C121: Mulching for specifications.

- All disturbed areas shall be reviewed in late August to early September and all seeding shall be completed by the end of September. Otherwise, vegetation will not establish itself enough to provide more than average protection.
- At final site stabilization, seed and mulch all disturbed areas not otherwise vegetated or stabilized.

1.7.3 Design and Installation Specifications

- Seed during seasons most conducive to plant growth.
  - The optimum seeding windows for western Washington are April 1 through June 30 and September 1 through October 1.
  - Seeding that occurs between July 1 and August 30 will require irrigation until 75 percent grass cover is established.
  - Seeding that occurs between October 1 and March 30 will require a mulch or an erosion control blanket until 75 percent grass cover is established.
- To prevent seed from being washed away, confirm that all required surface water control measures have been installed.
- The seedbed should be firm and rough. All soil should be roughened no matter what the slope. If compaction is required for engineering purposes, track walk slopes before seeding. Backblading or smoothing of slopes greater than 4:1 is not allowed if they are to be seeded.
- New and more effective restoration-based landscape practices rely on deeper incorporation than that provided by a simple single-pass rototilling treatment. Wherever practical, the subgrade should be initially ripped to improve long-term permeability, infiltration, and water inflow qualities. At a minimum for permanent areas, use soil

amendments to achieve organic matter and permeability performance defined in engineered soil/landscape systems. For systems that are deeper than 8 inches, complete the rototilling process in multiple lifts, or prepare the soil system properly and then place it to achieve the specified depth.

- The use of fertilizers is discouraged. Fertilizers should only be used where necessary to ensure growth. Amending soils per BMP L613: Post-Construction Soil Quality and Depth should be considered (and may be required for permanent lawn and landscaped areas) as the first measure for ensuring vegetation growth. If fertilization is necessary, naturally-derived fertilizers should be chosen over chemically-derived fertilizers. Apply fertilizers per manufacturer's direction. Always use slow-release fertilizers.
- Hydroseed applications shall include a minimum of 1,500 pounds per acre of mulch with 3 percent tackifier. See BMP C121: Mulching for specifications.
- On steep slopes, Bonded Fiber Matrix (BFM) or Mechanically Bonded Fiber Matrix (MBFM) products should be used. BFM/MBFM products are applied at a minimum rate of 3,000 pounds per acre of mulch with approximately 10 percent tackifier. Application is made so that a minimum of 95 percent soil coverage is achieved. Numerous products are available commercially and should be installed per manufacturer's instructions. Most products require 24-36 hours to cure before a rainfall and cannot be installed on wet or saturated soils. Generally, these products come in 40-50 pound bags and include all necessary ingredients except for seed and fertilizer.
- BFMs and MBFMs have some advantages over blankets:
  - No surface preparation required;
  - Can be installed via helicopter in remote areas;
  - On slopes steeper than 2.5:1, blanket installers may need to be roped and harnessed for safety;
- In most cases, the shear strength of blankets is not a factor when used on slopes, only when used in channels. BFMs and MBFMs are good alternatives to blankets in most situations where vegetation establishment is the goal.
- When installing seed via hydroseeding operations, only about 1/3 of the seed actually ends up in contact with the soil surface. This reduces the ability to establish a good stand of grass quickly. One way to overcome this is to increase seed quantities by up to 50 percent.
- Vegetation establishment can also be enhanced by dividing the hydromulch operation into two phases:
  - Phase 1- Install all seed and fertilizer with 25-30 percent mulch and tackifier onto soil in the first lift;
  - Phase 2- Install the rest of the mulch and tackifier over the first lift.
- An alternative is to install the mulch, seed, fertilizer, and tackifier in one lift. Then, spread or blow straw over the top of the hydromulch at a rate of about 800-1000 pounds per acre. Hold straw in place with a standard tackifier. Both of these approaches will increase cost moderately but will greatly improve and enhance vegetative establishment. The increased cost may be offset by the reduced need for:
  - Irrigation
  - Reapplication of mulch
  - Repair of failed slope surfaces

- This technique works with standard hydromulch (1,500 pounds per acre minimum) and BFM/MBFMs (3,000 pounds per acre minimum).

- Provide a healthy topsoil to areas to be permanently landscaped. This will reduce the need for fertilizers, improve overall topsoil quality, provide for better vegetal health and vitality, improve hydrologic characteristics, and reduce the need for irrigation. See the Post-Construction Soil Quality and Depth BMP in Volume 4 for more information. Compost shall meet specification in A900: Compost. City of Tacoma Tagro Potting Soil can be used as an alternative to the compost component. Areas that will be seeded only and not landscaped may need compost or meal-based mulch included in the hydroseed in order to establish vegetation. Replace native topsoil on the disturbed soil surface before application.
- Seed that is installed as a temporary measure may be installed by hand if it will be covered by straw, mulch, or topsoil. Seed that is installed as a permanent measure may be installed by hand on small areas (usually less than 1 acre) that will be covered with mulch, topsoil, or erosion blankets.
- Unless otherwise stated, seed mixes shall be applied at a rate of 120 pounds per acre. This rate may be reduced is soil amendments of slow-release fertilizers are used.
- See Table 3 - 2: Standard Temporary Erosion Control Seed Mix to Table 3 - 8: Native Wet Biofiltration Swale Seed Mix for recommended seed mixes. Seed mixes are also shown in A1000: Vegetation. Seed mix should be chosen based upon location, exposure, soil type, slope, and expected foot traffic. Alternative seed mixes may be used provided justification is provided for their use.
    - Table 3 - 2: Standard Temporary Erosion Control Seed Mix is a standard mix where only temporary vegetative cover is required.

Table 3 - 2: Standard Temporary Erosion Control Seed Mix

Scientific Name	Common Name	Percent By Weight
Festuca rubra var. commutata	Chewings fescue	40
Lolium perenne	perennial rye	40
Agrostis capillaris	colonial bentgrass	10
Trifolium repens	white Dutch clover	10

    - Table 3 - 3: Native Temporary Erosion Control Seed Mix is a mix made from native species that can be used where only temporary vegetative cover is required.

Table 3 - 3: Native Temporary Erosion Control Seed Mix

Scientific Name	Common Name	Percent By Weight
Bromus carinatus	California brome	25
Deschampsia caespitosa	Tufted hairgrass	15
Festuca rubra	native red fescue	20
Hordeum brachyantherum	meadow barley	40

- Table 3 - 4: Landscaping Seed Mix is a mix appropriate as a final vegetative cover for lawn areas.

Table 3 - 4: Landscaping Seed Mix

Scientific Name	Common Name	Percent By Weight
Lolium perenne	perennial rye	70
Festuca rubra var. commutata	Chewings fescue	30

- Table 3 - 5: Low Growing Turf Seed Mix is a mix appropriate for dry situations and requires little maintenance once established.

Table 3 - 5: Low Growing Turf Seed Mix

Scientific Name	Common Name	Percent By Weight
Festuca arundinaceae	dwarf tall fescue	45
Lolium perenne var. barclay	dwarf perennial rye	30
Festuca rubra	red fescue	20
Agrostis capillaris	colonial bentgrass	5

- Table 3 - 6: Native Meadow Seed Mix is a mix recommended for areas that will be maintained infrequently or not at all and where native plant colonization is desirable.

Table 3 - 6: Native Meadow Seed Mix

Scientific Name	Common Name	Percent By Weight
grasses		
Bromus carinatus	California brome	30
Deschampsia caespitosa	tufted hairgrass	10
Elymus glaucus	blue wildrye	10
Festuca roemerii	Roemer's fescue	20
perennials		
Achillea millefolium	yarrow	5
Eriophyllum lanatum	Oregon sunshine	5
Eschscholzia californica	California poppy	3
Lupinus bicolor	bicolor lupine	6
Solidago canadensis	Canada goldenrod	3
annuals		
Clarkia amoena	farewell to spring	5
Gilia capitata	globe gilia	3

◦ Table 3 - 7: Native Basic Biofiltration Swale Seed Mix represents a mix appropriate for intermittently wet areas.

Table 3 - 7: Native Basic Biofiltration Swale Seed Mix

Scientific Name	Common Name	Percent by Weight
Beckmannia syzigachne	American slough grass	5
Danthonia californica	California oat grass	5
Deschampsia caespitosa	tufted hairgrass	15
Elymus glaucus	blue wildrye	30
Glyceria occidentalis	western mannagrass	15
Hordeum brachyantherum	meadow barley	30

◦ Table 3 - 8: Native Wet Biofiltration Swale Seed Mix represents a mix appropriate for wet areas that are not regulated wetlands.

- Apply this mix at a rate of 60 pounds per acre.

Table 3 - 8: Native Wet Biofiltration Swale Seed Mix

Scientific Name	Common Name	Percent by Weight
Beckmannia syzigachne	American slough grass	10
Carex obnupta	lough sledge	40
Carex stipata	beaked sedge	5
Eleocharis palustris	common spikerush	5
Glyceria occidentalis	western mannagrass	20
Juncus patens	spreading rush	15
Scirpus microcarpus	small-fruited bullrush	5

1.7.4 Maintenance Standards

- Reseed any seeded areas that fail to establish at least 75 percent cover within 6 weeks from the initial seeding (100 percent cover for areas that receive sheet or concentrated flows). If reseeding is ineffective, use an alternate method, such as sodding, mulching, or nets/blankets. If winter weather prevents adequate grass growth, this time limit may be relaxed at the discretion of the City.
- After adequate cover is achieved, reseed and protect with mulch any areas that experience erosion. If the erosion problem is stormwater and surface water related, the problem shall be fixed and the eroded area reseeded and protected by mulch.
- Water seeded areas if necessary. Watering shall not cause runoff.

1.8 BMP C121: Mulching

1.8.1 Purpose

The purpose of mulching soils is to provide immediate temporary protection from erosion. Mulch also enhances plant establishment by conserving moisture, holding fertilizer, seed, and topsoil in place, and moderating soil temperatures. Only the most common types are discussed in this section.

1.8.2 Conditions of Use

As a temporary cover measure, mulch should be used:

- On disturbed areas that require cover measures for less than 30 days.
- As a cover for seed.
- During the wet season on slopes steeper than 3H:1V with more than 10 feet of vertical relief.
- Mulch may be applied at any time of the year and must be refreshed periodically.
- Tackifiers shall be plant-based, such as guar or alpha plantago, or chemical-based such as poly-acrylamide or polymers.
- Install mulch or tackifier products per manufacturer's recommendations.

1.8.3 Design and Installation Specifications

- Mulch shall be compost, chipped site vegetation, hydro-mulch, wood-based mulch or wood straw, wood strand mulch, or straw. See Table 3 - 9: Mulch Standards and Guidelines for specifications, application rates, and additional information.
- A minimum of 2” of mulch is required. Increase the mulch thickness until the ground is 95% covered (not visible under the mulch). Thickness may need to increase for disturbed areas in or near sensitive or other areas susceptible to erosion.
- Mulch used within the ordinary high-water mark of surface waters should be selected to minimize potential flotation of organic matter. Compost has a higher specific gravities (densities) than straw, wood, or chipped material.

1.8.4 Maintenance Standards

- The thickness of the cover must be maintained.
- Remulch and/or protect with a net or blanket any areas that experience erosion. If the erosion problem is stormwater and surface water related, then fix the problem and remulch the eroded area.

Table 3 - 9: Mulch Standards and Guidelines

Compost

- Compost shall:
  - Meet the definition for "composted material" per WAC 173-350-100 and comply with standards in WAC 173-350-220, except the feedstock may contain biosolids or manure feedstocks.
  - Be coarse compost meeting the following size gradations (by dry weight) when tested in accordance with the U.S. Composting Council "Test Methods for the Examination of Compost and Composting" (TMECC) Test Method 02.02-B.

Sieve Size	Minimum Percent Passing
3"	100
1"	90
3/4"	70
¼"	40

  - Have no visible water or dust during handling.
  - Have soil organic matter content of 40% to 65%.
  - Have a carbon to nitrogen ratio below 25:1. Carbon to nitrogen ratio may be as high as 35:1 for plantings composed entirely of plants native to the Puget Sound Lowlands region.
  - Be applied a minimum of 2" thick (~100 tons/acre) though thicker application rates may provide more effective control.
- Do not use near wetlands or phosphorus impaired waterbodies.
- Compost can be later tilled into soils to help meet the requirements of BMP L613: Post-Construction Soil Quality and Depth as required per Minimum Requirement #5.

Compost specifications are also contained in A900: Compost.

Chipped Site Vegetation

- Chipped site vegetation shall:
  - Have an average size of 2-4" with gradations from fine to 6" in length for texture, variation, and interlocking properties.
  - Be applied a minimum of 2" thick.
- Do not apply on slopes greater than 10%.
- Do not use within 200 feet of surface waterbodies.

Using chipped site vegetation is a cost-effective way to dispose of debris associated with clearing and grubbing material. The decomposition of the chipped vegetation may help impart nutrients for grass establishment.

Table 3 - 9: Mulch Standards and Guidelines

Hydro-mulch
• Hydro-mulch shall: ◦ Be applied with seed and tackifier. • May be applied without seed and tackifier if application rate is doubled. ◦ Have no growth inhibiting factors. ◦ Have fibers less than ¾" in length to ensure machinery does not clog. Be applied at 35-45 pounds per 1,000 sf or 1500-2000 pounds per acre with a hydromulcher.
Wood-based Mulch or Wood Straw
• Wood-based mulch or straw mulch shall: ◦ Have no visible water or dust during handling. ◦ Be purchased from a supplier with a Solid Waste Handling Permit or a supplier that is exempt from solid waste regulations. ◦ Be applied 2" thick (~100 tons/acre) • Wood-based mulch or wood straw is often called "hog" or "hogged fuel". The preparation of wood-based mulch typically does not account for weed seed control so the inclusion of weed plants or seeds should be monitored and minimized or prevented during application.
Wood Strand Mulch
• Wood strand mulch shall be: ◦ A blend of loose long, thin wood pieces derived from native conifers or deciduous trees with high length-width ratio. ◦ A minimum of 95% of the wood strand shall have lengths between 2" and 10" with a width and thickness between 1/16" and 3/8". ◦ Free of resin, tannin, or other compounds that are detrimental to plant establishment and growth. ◦ Applied 2" thick. Do not use sawdust or wood shavings.
Straw
• Straw shall be: ◦ Air-dried. ◦ Free from undesirable seed and coarse material. ◦ Applied 2"-3" thick (5 bales per 1000 ft^2 or 2-3 tons per acre) • Thickness may be reduced by half when used with seeding. • Hand-application requires a greater thickness than blown straw to ensure required coverage. ◦ Held in place by crimping, using a tackifier, or covering with netting. Blown straw shall be held in place using a tackifier. • Although straw can be cost-effect, straw can introduce and/or encourage weed species and has no long-term benefits so should only be used when other materials are unavailable. Do not used within the ordinary high-water elevation of surface waters (due to flotation).

1.10 BMP C123: Plastic Covering

1.10.1 Purpose

Plastic covering provides immediate, short-term erosion protection to slopes and disturbed areas.

1.10.2 Conditions of Use

- Plastic covering may be used on disturbed areas that require cover measures for less than 30 days, except as stated below.
- Plastic is particularly useful for protecting cut and fill slopes and stockpiles.
- The relatively rapid breakdown of most polyethylene sheeting makes it unsuitable for long-term (greater than six months) applications.
- Due to rapid runoff caused by plastic covering, this method shall not be used upslope of areas that might be adversely impacted by concentrated runoff. Such areas include steep and/or unstable slopes.
- Whenever plastic is used to protect slopes, water collection measures must be installed at the base of the slope. These measures include plastic-covered berms, channels, and pipes used to convey clean rainwater away from bare soil and disturbed areas. At no time is clean runoff from a plastic covered slope to be mixed with dirty runoff from a project.
- Other uses for plastic include:
  - Temporary ditch liner;
  - Pond liner in temporary sediment pond;
  - Liner for bermed temporary fuel storage area if plastic is not reactive to the type of fuel being stored;
  - Emergency slope protection during heavy rains; and
  - Temporary conveyance used to direct stormwater and surface water.

1.10.3 Design and Installation Specifications

Plastic slope cover must be installed as follows:

- Run plastic up and down slope, not across slope.
- Plastic may be installed perpendicular to a slope if the slope length is less than 10 feet.
- Minimum of 8-inch overlap at seams.
- On long or wide slopes, or slopes subject to wind, all seams should be taped.
- Place plastic into a small (12-inch wide by 6-inch deep) slot trench at the top of the slope and backfill with soil to keep water from flowing underneath.
- Place sand filled burlap or geotextile bags every 3 to 6 feet along seams and pound a wooden stake through each to hold them in place. Alternative options for holding plastic in place exist and may be considered with COT approval.
- Inspect plastic for rips, tears, and open seams regularly and repair immediately. This prevents high velocity runoff from contacting bare soil, which causes extreme erosion;
- Plastic sheeting shall have a minimum thickness of 6 mil.

- If erosion at the toe of a slope is likely, a gravel berm, riprap, or other suitable protection shall be installed at the toe of the slope in order to reduce the velocity of runoff.

1.10.4 Maintenance Standards

- Torn sheets must be replaced and open seams repaired.
- If the plastic begins to deteriorate due to ultraviolet radiation, it must be completely removed and replaced.
- When the plastic is no longer needed, it shall be completely removed.
- Properly dispose of products used to weigh down covering.

1.11 BMP C124: Sodding

1.11.1 Purpose

The purpose of sodding is to establish turf for immediate erosion protection and to stabilize conveyance systems where concentrated overland flow will occur.

1.11.2 Conditions of Use

Sodding may be used in the following areas:

- Disturbed areas that require short-term or long-term cover.
- Disturbed areas that require immediate vegetative cover.
- All waterways that require vegetative lining. Waterways may also be seeded rather than sodded, and protected with a net or blanket.

1.11.3 Design and Installation Specifications

Sod shall be free of weeds, of uniform thickness (approximately 1-inch thick), and shall have a dense root mat for mechanical strength.

The following steps are recommended for sod installation:

- Shape and smooth the surface to final grade in accordance with the approved grading plan. Overexcavate areas as needed to allow room for placing soil amendment and sod.
- Amend 4 inches (minimum) of compost into the top 8 inches of the soil if the organic content of the soil is less than ten percent or the infiltration rate is less than 0.6 inches per hour. Compost used shall:
  - Meet the definition for “composted material” per WAC 173-350-100 and comply with standards in WAC 173-350-220, except the feedstock may contain biosolids or manure feedstocks.
  - Have no visible water or dust during handling.
  - Have soil organic matter content of 40% to 65%.
  - Have a carbon to nitrogen ratio below 25:1. Carbon to nitrogen ratio may be as high as 35:1 for plantings composed entirely of plants native to the Puget Sound Lowlands region.

    City of Tacoma Tagro Potting Soil can be used as an alternative to the compost component in BMP C124: Sodding.
- Fertilize according to the supplier's recommendations.
- Work lime and fertilizer 1 to 2 inches into the soil, and smooth the surface.
- Lay strips of sod beginning at the lowest area to be sodded and perpendicular to the direction of water flow. Wedge strips securely into place. Square the ends of each strip to provide for a close, tight fit. Stagger joints at least 12 inches. Staple on slopes steeper than 3H:1V. Staple the upstream edge of each sod strip.
- Roll the sodded area and irrigate.
- When sodding is carried out in alternating strips or other patterns, seed the areas between the sod immediately after sodding.

1.11.4 Maintenance Standards

If the grass is unhealthy, the cause shall be determined and appropriate action taken to reestablish a healthy groundcover. If it is impossible to establish a healthy groundcover due to frequent saturation, instability, or some other cause, the sod shall be removed, the area seeded with an appropriate mix, and protected with a net or blanket.

1.12 BMP C125: Compost

1.12.1 Purpose

The purpose of compost is to help establish vegetation and filter stormwater thus removing fine sediment and other contaminants. Compost can be used alone as a compost blanket, as a berm, or inside a sock.

1.12.2 Conditions of Use

- Do not use if stormwater will discharge to a nutrient sensitive waterbody.
- Do not use as a stormwater system inlet protection measure.

1.12.3 Design and Installation Specifications

- Compost shall:
  - Meet the definition for "composted material" per WAC 173-350-100 and comply with standards in WAC 173-350-220, except the feedstock may contain biosolids or manure feedstocks.
  - Be coarse compost meeting the following size gradations (by dry weight) when tested in accordance with the U.S. Composting Council "Test Methods for the Examination of Compost and Composting" (TMECC) Test Method 02.02-B.

Sieve Size	Minimum Percent Passing
3"	100
1"	90
3/4"	70
¼"	40

  - Have no visible water or dust during handling.
  - Have soil organic matter content of 40% to 65%.
  - Have a carbon to nitrogen ratio below 25:1. Carbon to nitrogen ratio may be as high as 35:1 for plantings composed entirely of plants native to the Puget Sound Lowlands region.
- Do not use near wetlands or phosphorus impaired waterbodies.
- Compost can be later tilled into soils to help meet the requirements of BMP L613: Post-Construction Soil Quality and Depth as required per Minimum Requirement #5.

City of Tacoma TAGRO Potting Soil can be used as an alternative to the compost component in BMP C125: Compost.

Compost specifications are also contained in A900: Compost.

Compost Blankets

Compost blankets are simply compost blanketed over an area.

- Place compost 3" thick.
- Compost can be blown onto slopes up to 2:1 or spread by hand on shallower slopes.
- Compost can be mixed with a seed mix to ensure rapid vegetation.

- Compost does not need to be removed after construction phase unless required by the Erosion and Sediment Control Lead.

Compost Berms

Compost berms are a perimeter sediment control that can be used instead of silt fence.

- Do not use compost berms on steep slopes.
- Berm width shall be a minimum of 2 feet.
- Berm height shall be a minimum of 12 inches.
- Berm width shall be twice the berm height.

Compost can be blown in place or placed by front-end loader.

Compost should be spread over proposed landscaped section when construction is complete to aid in revegetation.

Compost Socks

Compost socks are similar to straw wattles.

- Sock material that is biodegradable will last up to 6 months and can be used for soil amendment after 6 months.
- Sock material that is non-biodegradable must be removed after construction is complete.
- Place socks perpendicular to flow.
- Walk socks in place to ensure good soil contact.
- Install wooden stakes every 12” on steep slopes or every 24” on shallow slopes

1.12.4 Maintenance Standards

Compost Blankets

- Inspect compost regularly.
- Ensure a 3” thick blanket.

Compost Berms

- Inspect compost berm regularly.
- Ensure vehicular traffic does not cross berm and track compost offsite. If this occurs, sweep compost immediately.

Compost Socks

- Do not allow erosion or concentrated runoff under or around the barrier.
- Inspect the socks after each rainfall and repair any socks that tear or are not abutting the ground.

1.13 BMP C126: Topsoiling

1.13.1 Purpose

To provide a suitable growth medium for final site stabilization with vegetation. While not a permanent cover practice in itself, topsoiling is an integral component of providing permanent cover in those areas where there is an unsuitable soil surface for plant growth. Native soils and disturbed soils that have been organically amended not only retain much more stormwater, but they also serve as effective biofilters for urban pollutants and, by supporting more vigorous plant growth, reduce the amount of water, fertilizer, and pesticides needed to support installed landscapes. Topsoil does not include any subsoils, only the material from the top several inches, including organic debris.

Use this BMP in conjunction with other BMPs such as seeding, mulching, or sodding. This BMP is functionally equivalent to BMP L613: Post-Construction Soil Quality and Depth which is required per Minimum Requirement #5: Onsite Stormwater Management for disturbed areas that will be developed as lawn or landscaped areas at the completed project.

1.13.2 Conditions of Use

- Permanent landscaped areas shall contain healthy topsoil that reduces the need for fertilizers, improves overall topsoil quality, provides for better vegetal health and vitality, improves hydrologic characteristics, and reduces the need for irrigation.
- Leave native soils and the duff layer undisturbed to the maximum extent practicable.
- To the maximum extent practical, native soils disturbed during clearing and grading shall be restored to a condition equal to or better than the original site condition's moisture-holding capacity. Use onsite native topsoil, incorporate amendments into onsite soil, or import blended topsoil to meet this requirement.
- Topsoiling is a required procedure when establishing vegetation on shallow soils, and soils of critically low pH (high acid) levels.
- Stripping of the existing, properly functioning soil system and vegetation for the purpose of topsoiling during construction is not acceptable. If an existing soil system is functioning properly, it shall be preserved in its undisturbed and uncompacted condition.
- Depending on where the topsoil comes from, or what vegetation was onsite before disturbance, invasive plant seeds may be included and could cause problems for establishing native plants, landscaped areas, or grasses.
- Topsoil from the site will contain mycorrhizal bacteria that are necessary for healthy root growth and nutrient transfer. These native mycorrhiza are acclimated to the site and will provide optimum conditions for establishing grasses. Commercially available mycorrhiza products should be used when topsoil is brought in from offsite.

1.13.3 Design and Installation Specifications

If topsoiling is to be done, the following items should be considered:

- Topsoil shall have:
  - A minimum depth of 8-inches. Scarify subsoils below the topsoil layer at least 4-inches with some incorporation of the upper material to avoid stratified layers, where feasible. Ripping or restructuring the subgrade may also provide additional benefits regarding the overall infiltration and interflow dynamics of the soil system.

- A minimum organic content of 10% dry weight in planting beds, and 5% organic matter content in turf areas. Incorporate organic amendments to a minimum 8-inch except where tree roots or other natural features limit the depth of incorporation.
- A pH between 6.0 and 8.0 or matching the pH of the undisturbed soil.

- To obtain a topsoil meeting the above specifications return native topsoil to the site, import topsoil of sufficient organic content, and/or incorporate organic amendments:
  - To meet the organic content requirements, the compost shall:
    - Meet the definition for "composted material" per WAC 173-350-100 and comply with standards in WAC 173-350-220, except the feedstock may contain biosolids or manure feedstocks.
    - Have no visible water or dust during handling.
    - Have soil organic matter content of 40% to 65%.
    - Have a carbon to nitrogen ratio below 25:1. Carbon to nitrogen ratio may be as high as 35:1 for plantings composed entirely of plants native to the Puget Sound Lowlands region.

      City of Tacoma TAGRO Topsoil Mix can be used as an alternative to the compost component in BMP C125: Compost.
  - For till soils use a mixture of approximately two parts soil to one part compost. This equates to 4 inches of compost mixed to a depth of 12 inches in till soils. Increasing the concentration of compost beyond this level can have negative effects on vegetal health, while decreasing the concentrations can reduce the benefits of amended soils.
- Mulch planting beds with 2" of organic material.
- If blended topsoil is imported, fines should be limited to 25 percent passing through a 200 sieve.
- The final composition and construction of the soil system will result in a natural selection or favoring of certain plant species over time. For example, recent practices have shown that incorporation of topsoil may favor grasses, while layering with mildly acidic, high-carbon amendments may favor more woody vegetation.
- Locate the topsoil stockpile so it meets specifications and does not interfere with work on the site. It may be possible to locate more than one pile in proximity to areas where topsoil will be used.
- Allow sufficient time in scheduling for topsoil to be spread prior to seeding, sodding, or planting.
- Do not place topsoil while in a frozen or muddy condition, when the subgrade is excessively wet, or when conditions exist that may otherwise be detrimental to proper grading or proposed sodding or seeding.
- Care must be taken not to apply topsoil over subsoil if the two soils have contrasting textures. Sandy topsoil over clayey subsoil is a particularly poor combination, as water creeps along the junction between the soil layers and causes the topsoil to slough.
- If topsoil and subsoil are not properly bonded, water will not infiltrate the soil profile evenly and it will be difficult to establish vegetation. The best method to prevent a lack of bonding is to work the topsoil into the layer below for a depth of at least 6 inches.

- Field exploration of the site shall be made to determine if there is surface soil of sufficient quantity and quality to justify stripping. Topsoil shall be friable and loamy (loam, sandy loam, silt loam, sandy clay loam, clay loam). Areas of natural groundwater recharge should be avoided.
- Confine stripping to the immediate construction area. A 4- to 6- inch stripping depth is common, but depth may vary depending on the particular soil. Place all surface runoff control structures in place prior to stripping.

Stockpile topsoil in the following manner:

- Side slopes of the stockpile shall not exceed 2:1.
- Surround all topsoil stockpiles between October 1 and April 30 with an interceptor dike with gravel outlet and silt fence. Between May 1 and September 30, install an interceptor dike with gravel outlet and silt fence if the stockpile will remain in place for a longer period of time than active construction grading.
- Complete erosion control seeding or covering with clear plastic or other mulching materials of stockpiles within 2 days (October 1 through April 30) or 7 days (May 1 through September 30) of the formation of the stockpile. Do not cover native topsoil stockpiles with plastic.
- Topsoil shall not be placed while in a frozen or muddy condition, when the subgrade is excessively wet, or when conditions exist that may otherwise be detrimental to proper grading or proposed sodding or seeding.
- Maintain previously established grades on the areas to be topsoiled according to the approved plan.
- When native topsoil is to be stockpiled and reused, the following should apply to ensure that the mycorrhizal bacterial, earthworms, and other beneficial organisms will not be destroyed:
  - Topsoil is to be re-installed within 4 to 6 weeks;
  - Topsoil is not to become saturated with water;
  - Plastic cover is not allowed.

1.13.4 Maintenance Standards

- Inspect stockpiles regularly, especially after large storm events. Stabilize any areas that have eroded.
- Establish soil quality and depth toward the end of the construction. Once established, protect from compaction and erosion.
- Plant and mulch soil after installation.
- Leave plant debris or its equivalent on the soil surface to replenish organic matter.
- Reduce and adjust, where possible, the use of irrigation, fertilizers, herbicides and pesticides, rather than continuing to implement formerly established practices.

1.15 BMP C130: Surface Roughening

1.15.1 Purpose

Surface roughening aids in the establishment of vegetative cover, reduces runoff velocity, increases infiltration, and provides for sediment trapping through the provision of a rough soil surface. Horizontal depressions are created by operating a tiller or other suitable equipment on the contour or by leaving slopes in a roughened condition by not fine grading them.

1.15.2 Conditions for Use

- All slopes steeper than 3H:1V and greater than 5 vertical feet require surface roughening.
- Areas with grades steeper than 3H:1V should be roughened to a depth of 2 to 4 inches prior to seeding.
- Areas that will not be stabilized immediately may be roughened to reduce runoff velocity until seeding takes place.
- Slopes with a stable rock face do not require roughening.
- Slopes where mowing is planned should not be excessively roughened.

1.15.3 Design and Installation Specifications

- There are different methods for achieving a roughened soil surface on a slope, and the selection of an appropriate method depends upon the type of slope. Roughening methods include stair-step grading, grooving, contour furrows, and tracking. See Figure 3 - 5: Surface Roughening by Tracking and Contour Furrows for tracking and contour furrows. Factors to be considered in choosing a method are slope steepness, mowing requirements, and whether the slope is formed by cutting or filling.
- Disturbed areas that will not require mowing may be stair-step graded, grooved, or left rough after filling.
- Stair-step grading is particularly appropriate in soils containing large amounts of soft rock. Each "step" catches material that sloughs from above, and provides a level site where vegetation can become established. Stairs should be wide enough to work with standard earth moving equipment. Stair steps must be on contour or gullies will form on the slope.
- Areas that will be mowed (these areas should have slopes less steep than 3:1) may have small furrows left by disking, harrowing, raking, or seed-planting machinery operated on the contour.
- Graded areas with slopes greater than 3:1 but less than 2:1 should be roughened before seeding. This can be accomplished in a variety of ways, including "track walking," or driving a crawler tractor up and down the slope, leaving a pattern of cleat imprints parallel to slope contours.
- Tracking is done by operating equipment up and down the slope to leave horizontal depressions in the soil.

1.15.4 Maintenance Standards

- Areas that are graded in this manner should be seeded as quickly as possible.
- Regular inspections should be made of the area. If rills appear, they should be re-graded and re-seeded immediately.

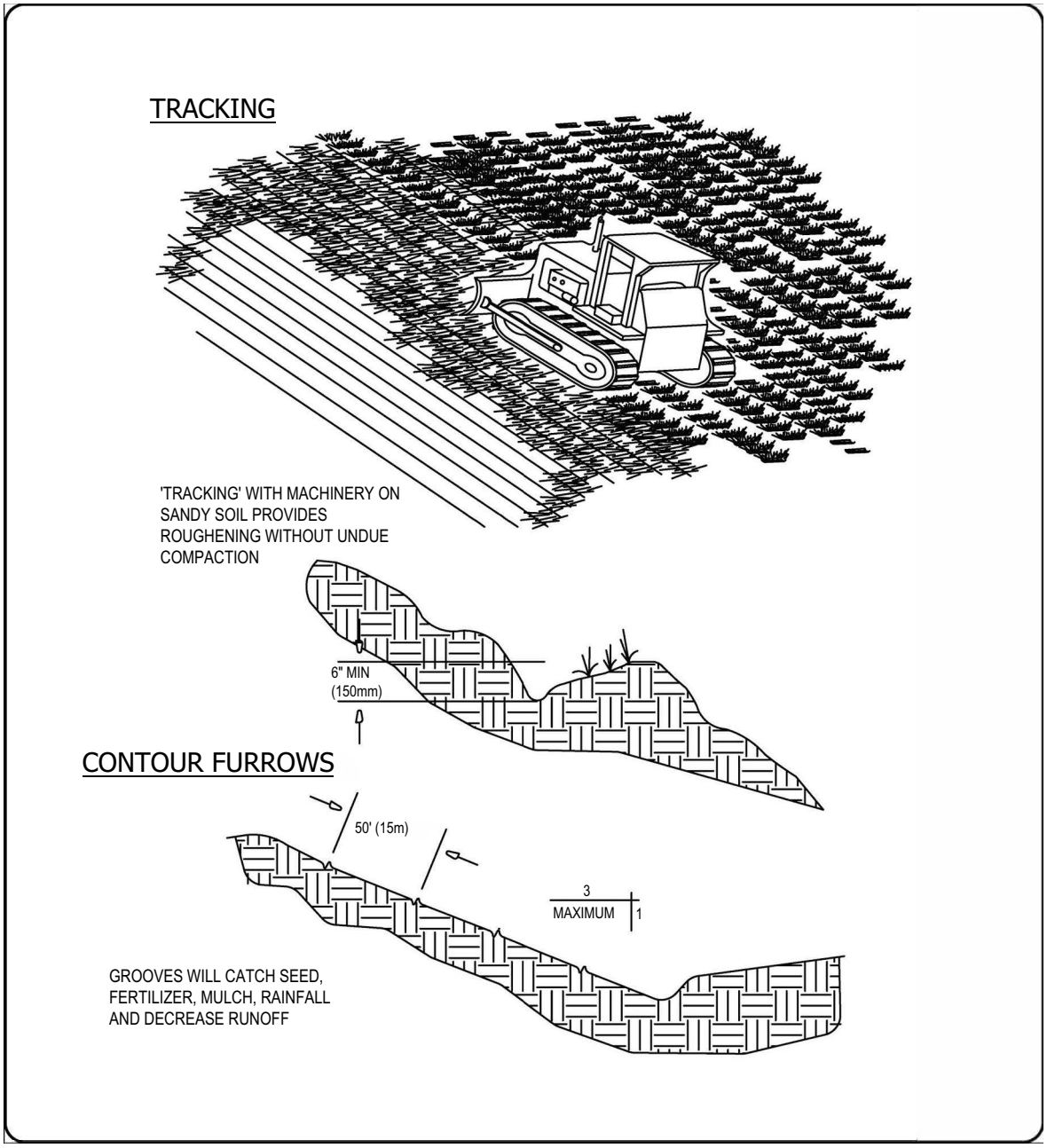

Figure 3 - 5: Surface Roughening by Tracking and Contour Furrows

1.17 BMP C140: Dust Control

1.17.1 Purpose

Dust control prevents wind transport of dust from disturbed soil surfaces.

1.17.2 Conditions of Use

Use dust control practices in areas (including roadways) subject to surface and air movement of dust where onsite and offsite impacts to streets, the stormwater system, or receiving waterbodies are likely.

1.17.3 Design and Installation Specifications

- Vegetate or mulch areas that will not receive vehicle traffic. In areas where planting, mulching, or paving is impractical, apply gravel or landscaping rock.
- Limit dust generation by clearing only to those areas where immediate activity will take place, leaving the remaining area(s) in the original condition, if stable. Maintain the original ground cover as long as practical.
- Construct natural or artificial windbreaks or windscreens. These may be designed as enclosures for small dust sources.
- Sprinkle the site with water until surface is wet. Repeat as needed. To prevent carryout of mud onto street, refer to Stabilized Construction Entrance (BMP C105: Stabilized Construction Entrance/Exit).
- Irrigation water can be used for dust control. Install irrigation systems as a first step on sites where dust control is a concern.
- Spray exposed soil areas with a dust palliative, following the manufacturer's instructions and cautions regarding handling and application. Used oil is prohibited from use as a dust suppressant.
- PAM (BMP C127: Polyacrylamide for Soil Erosion Protection) added to water at a rate of 2/3 pounds per 1,000 gallons of water per acre and applied from a water truck is more effective than water alone. This is due to the increased infiltration of water into the soil and reduced evaporation. In addition, small soil particles are bonded together and are not as easily transported by wind. Adding PAM may actually reduce the quantity of water needed for dust control. There are concerns with the proper use of PAM, refer to BMP C127: Polyacrylamide for Soil Erosion Protection for more information on PAM application. PAM use requires COT approval.
- Lower speed limits. High vehicle speed increases the amount of dust stirred up from unpaved roads and lots.
- Upgrade the road surface strength by improving particle size, shape, and mineral types that make up the surface and base materials.
- Add surface gravel to reduce the source of dust emission. Limit the amount of fine particles to 10 to 20 percent.
- Use geotextile fabrics to increase the strength of new roads or roads undergoing reconstruction.
- Encourage the use of alternate, paved routes, if available.
- Restrict use of paved roadways by tracked vehicles and heavy trucks to prevent damage to road surfaces and bases.

- Apply chemical dust suppressants using the admix method, blending the product with the top few inches of surface material. Suppressants may also be applied as surface treatments.
- Pave unpaved permanent roads and other trafficked areas.
- Use vacuum street sweepers.
- Remove mud and other dirt promptly so it does not dry and then turn into dust.
- Limit dust-causing work on windy days.
- Contact the Puget Sound Clean Air Agency for guidance and training on other dust control measures. Compliance with the Puget Sound Clean Air Agency's recommendations/requirements constitutes compliance with this BMP.

1.17.4 Maintenance Standards

Evaluate the potential for dust generation frequently during dry periods. Complete the actions outlined above as needed to limit the dust.

Any dust which leaves the site must be cleaned immediately.

1.18 BMP C150: Materials On Hand

1.18.1 Purpose

Quantities of erosion prevention and sediment control materials should be kept on the project site at all times to be used for regular maintenance and emergency situations such as unexpected heavy summer rains. Having these materials onsite reduces the time needed to implement BMPs when inspections indicate that existing BMPs are not meeting the Construction SWPPP requirements.

1.18.2 Conditions of Use

Construction projects of any size or type can benefit from having materials on hand. A small commercial development project could have a roll of plastic and some gravel available for immediate protection of bare soil and temporary berm construction. A large earthwork project, such as highway construction, might have several tons of straw, several rolls of plastic, flexible pipe, sandbags, geotextile fabric, and steel “T” posts.

- Materials are stockpiled and readily available before any site clearing, grubbing, or earthwork begins. A large contractor or developer could keep a stockpile of materials that are available to be used on several projects.
- If storage space at the project site is at a premium, the contractor could maintain the materials at a location less than one hour from the project site.

1.18.3 Design and Installation Specifications

Depending on project type, size, complexity, and length, materials and quantities will vary. Table 3 - 10: Materials on Hand, provides a good minimum that will cover numerous situations.

Table 3 - 10: Materials on Hand

Material	Measure	Quantity
Clear Plastic, 6 mil	100 foot roll	1-2
Drain Pipe, 6 or 8 inch diameter	25 foot section	4-6
Sandbags, filled	each	25-50
Quarry Spalls	ton	2-4
Washed Gravel	cubic yard	2-4
Geotextile Fabric	100 foot roll	1-2
Catch Basin Inserts	each	2-4
Steel “T” Posts	each	12-24

1.18.4 Maintenance Standards

- All materials with the exception of the quarry spalls, steel “T” posts, and gravel should be kept covered and out of both sun and rain.
- Re-stock materials used as needed.

1.19 BMP C151: Concrete Handling

1.19.1 Purpose

Concrete work can generate process water and slurry that contain fine particles and high pH, both of which can violate water quality standards in the receiving water. Concrete spillage or concrete discharge to waters of the State is prohibited. Use this BMP to minimize and eliminate concrete, concrete process water, and concrete slurry from entering waters of the State.

1.19.2 Conditions of Use

Utilize these management practices any time concrete is used.

Concrete construction projects include, but are not limited to, the following:

- Curbs
- Sidewalks
- Roads
- Bridges
- Foundations
- Floors
- Runways

Disposal options for concrete, in order of preference are:

1. Offsite disposal
2. Concrete washout areas
3. De minimus washout to formed areas awaiting concrete

1.19.3 Design and Installation Specifications

- Wash concrete truck drums at an approved offsite location or in designated concrete washout areas only.
    - Return unused concrete remaining in the truck and pump to the originating batch plant for recycling. Do not dump excess concrete onsite, except in designated concrete washout areas as allowed in BMP C154: Concrete Washout Area.
- Do not wash out concrete trucks onto the ground (including formed areas awaiting concrete), or into the stormwater conveyance system, open ditches, streets, or streams.
- Wash small concrete handling equipment (e.g. hand tools, screeds, shovels, rakes, floats, trowels, and wheelbarrows) into designated concrete washout areas or into formed areas awaiting concrete pour.
- At no time shall concrete be washed off into the footprint of an area where an infiltration feature will be installed.
- Wash equipment difficult to move, such as concrete paving machines, in areas that do not directly drain to natural or constructed stormwater conveyance or potential infiltration areas.

- Do not allow washwater from areas, such as concrete aggregate driveways, to discharge directly (without detention or treatment) to natural or constructed stormwater conveyances.
- Contain washwater and leftover product in a lined container when no designated concrete washout areas (or formed areas, allowed as described above) are available. Dispose of contained concrete and concrete washwater (process water) properly. Always use forms or solid barriers for concrete pours within 15-feet of surface waters.
- Refer to BMP C252: Treating and Disposing of High pH Water and BMP C253: Portable Sediment Tank for pH adjustment requirements.
- Refer to the Construction Stormwater General Permit for pH monitoring requirements if the project involves one of the following activities:
  - Significant concrete work (as defined in the Construction Stormwatwer General Permit).
  - The use of engineered soils amended with (but not limited to) Portland cement-treated base, cement kiln dust or fly ash.
  - Discharging stormwater to segments of water bodies on the 303(d) list (Category 5) for high pH.

1.19.4 Maintenance Standards

Containers shall be checked for holes in the liner daily during concrete pours and repaired the same day.

1.20 BMP C152: Sawcutting and Surfacing Pollution Prevention

1.20.1 Purpose

Sawcutting and surfacing operations generate slurry and process water that contains fine particles and high pH (concrete cutting), both of which can violate water quality standards in the receiving water. This BMP is intended to minimize and eliminate process water and slurry from entering waters of the State

1.20.2 Conditions of Use

Anytime sawcutting or surfacing operations take place, use these management practices. Sawcutting and surfacing operations include, but are not limited to, the following:

- Sawing
- Coring
- Grinding
- Roughening
- Hydro-demolition
- Bridge and road surfacing

1.20.3 Design and Installation Specifications

- Vacuum slurry and cuttings during cutting and surfacing operations.
- Do not leave slurry and cuttings on permanent concrete or asphalt pavement overnight.
- Do not allow slurry and cuttings to enter any natural or constructed conveyance system.
- Dispose of collected slurry and cuttings in a manner that does not violate groundwater or surface water quality standards.
- Do not allow process water that is generated during hydro-demolition, surface roughening, or similar operations to enter any natural or constructed conveyance system. Dispose of process water in a manner that does not violate groundwater or surface water quality standards.
- Handle and dispose of cleaning waste material and demolition debris in a manner that does not cause contamination of water. If the area is swept with a pick-up sweeper, haul the material out of the area to an appropriate disposal site.

1.20.4 Maintenance Standards

Continually monitor operations to determine whether slurry, cuttings, or process water could enter waters of the state. If inspections show that a violation of water quality standards could occur, stop operations and immediately implement preventive measures such as berms, barriers, secondary containment, and vacuum trucks.

1.21 BMP C153: Material Delivery, Storage and Containment

1.21.1 Purpose

Prevent, reduce, or eliminate the discharge of pollutants from material delivery and storage to the stormwater system or watercourses by minimizing the storage of hazardous materials onsite, storing materials in a designated area, and installing secondary containment.

1.21.2 Conditions of Use

These procedures are suitable for use at all construction sites with delivery and storage of the following materials:

- Petroleum products such as fuel, oil, and grease
- Soil stabilizers and binders (e.g. Polyacrylamide)
- Fertilizers, pesticides, and herbicides
- Detergents
- Asphalt and concrete compounds
- Hazardous chemicals such as acids, lime, adhesives, paints, solvents, and curing compounds
- Any other material that may be detrimental if released to the environment

1.21.3 Design and Installation Specifications

The following steps should be taken to minimize risk:

- Locate temporary storage area away from vehicular traffic, near the construction entrance(s), and away from conveyance systems and receiving waterbodies.
- Supply Material Safety Data Sheets (MSDS) for all materials stored. Keep chemicals in their original labeled containers.
- Surrounding materials with earth berms is an option for temporary secondary containment.
- Minimize hazardous material storage onsite.
- Handle hazardous materials as infrequently as possible.
- During the wet weather season (October 1 through April 30), consider storing materials in a covered area.
- Store materials in secondary containment, such as an earthen dike, a horse trough, or a children's wading pool for non-reactive materials such as detergents, oil, grease, and paints. "Bus boy" trays or concrete mixing trays may be used as secondary containment for small amounts of material.
- Do not store chemicals, drums, or bagged materials directly on the ground. Place these items on a pallet and, when possible, in secondary containment.
- If drums cannot be stored under a roof, domed plastic covers are inexpensive and snap to the top of drums, preventing water from collecting.

1.21.4 Material Storage Areas and Secondary Containment Practices:

- Store liquids, petroleum products, and substances listed in 40 CFR Parts 110, 117, or 302 in approved containers and drums and do not overfill the containers or drums. Store containers and drums in temporary secondary containment facilities.
- Temporary secondary containment facilities shall provide for a spill containment volume able to contain precipitation from a 25 year, 24 hour storm event plus 10% of the total enclosed container volume of all containers, or 110% of the capacity of the largest container within its boundary, whichever is greater.
- Secondary containment facilities shall be impervious to the materials stored therein for a minimum contact time of 72 hours.
- Secondary containment facilities shall be maintained free of accumulated rainwater and spills. In the event of spills or leaks, collect accumulated rainwater and spills and place into drums. Handle these liquids as hazardous waste unless testing determines them to be non-hazardous. Dispose of all wastes properly.
- Provide sufficient separation between stored containers to allow for spill cleanup and emergency response access.
- During the wet weather season (October 1 through April 30), cover each secondary containment facility during non-working days, prior to and during rain events.
- Keep material storage areas clean, organized, and equipped with an ample supply of appropriate spill clean-up material.
- The spill kit should include, at a minimum:
    - 1 water resistant nylon bag
    - 3 oil absorbent socks (3-inches by 4-feet)
    - 2 oil absorbent socks (3-inches by 10-feet)
    - 12 oil absorbent pads (17-inches by 19-inches)
    - 1 pair splash resistant goggles
    - 3 pairs nitrile gloves
    - 10 disposable bags with ties
    - Instructions

1.21.5 Maintenance Standards

Any stormwater within the material storage area shall be pumped or otherwise discharged after each rain event. Before pumping, the stormwater must be evaluated to determine if it must go to treatment or can be discharged without treatment. If stormwater is contaminated, direct the discharge to appropriate treatment.

Restock spill kit materials as needed.

1.23 BMP C160: Erosion and Sediment Control Lead

1.23.1 Purpose

The project proponent must designate at least one person as the responsible representative in charge of erosion and sediment control (ESC) and water quality protection. The designated person shall be the erosion and sediment control (ESC) lead, who is responsible for ensuring compliance with all local, state, and federal erosion and sediment control and water quality requirements.

1.23.2 Conditions of Use

- An erosion and sediment control contact is required for all project sites.
- A certified erosion and sediment control lead (CESCL) or certified professional in erosion and sediment control (CPESC) is required on projects that include, but are not limited to:
  - Construction activity that disturbs one acre of land or more.
- Projects disturbing less than one acre must have an Erosion Sediment Control Lead (ESC) conduct inspections. The ESC Lead does not have to have CESCL or CPESC certification.
- The CESCL, CPESC, or ESC Lead shall be identified in the SWPPP and shall be onsite or on-call at all times.
- The CESCL, CPESC, or ESC Lead must be knowledgeable in the principles and practices of erosion and sediment control and have the skills to assess:
  - Site conditions and construction activities that could impact the quality of stormwater.
  - Effectiveness of erosion and sediment control measures used to control the quality of stormwater discharges.

1.23.3 Specifications

- The CESCL lead shall:
  - Have a current certified erosion and sediment control lead (CESCL) certificate proving attendance in an erosion and sediment control training course that meets the minimum ESC training and certification requirements established by Ecology.
- For additional information concerning the Certified Professional in Erosion and Sediment Control program please go to https://envirocertintl.org/cpesc/.
- The ESC lead shall have authority to act on behalf of the contractor or developer and shall be available, on call, 24 hours per day throughout the period of construction.
- The Construction SWPPP shall include the name, telephone number, email, and address of the designated ESC lead.
- An ESC lead may provide inspection and compliance services for multiple construction projects in the same geographic region.
- Duties and responsibilities of the ESC lead shall include, but are not limited to, the following:
  - Inspecting all areas disturbed by construction activities, all BMPs and all locations where runoff leaves the site at least once every calendar week and within 24 hours of

any discharge from the site. The ESC lead may reduce the inspection frequency for temporary stabilized, inactive sites to monthly.

- Examining stormwater visually for the presence of suspended sediment, turbidity, discoloration, and oil sheen.
- Evaluating the effectiveness of BMPs.
- Maintaining a permit file onsite at all times which includes the SWPPP and any associated permits and plans.
- Directing BMP installation, inspection, maintenance, modification, and removal.
- Updating all project drawings and the Construction SWPPP with changes made.
- Keeping daily logs and inspection reports. Inspection reports should include:
  - Inspection date/time.
  - Weather information, general conditions during inspection, and approximate amount of precipitation since the last inspection.
  - A summary or list of all BMPs implemented, including observations of all erosion/sediment control structures or practices. The following shall be noted:
    - Locations of BMPs inspected,
    - Locations of BMPs that need maintenance,
    - Locations of BMPs that failed to operate as designed or intended, and
    - Locations where additional or different BMPs are required.
  - Visual monitoring results, including a description of discharged stormwater. The presence of suspended sediment, turbid water, discoloration, and oil sheen shall be noted, as applicable.
  - Any water quality monitoring performed during inspection.
  - General comments and notes, including a brief description of any BMP repairs, maintenance, or installations made as a result of the inspection.
- Facilitate, participate in, and take corrective actions resulting from inspections performed by outside agencies or the owner.
- Keep an inventory of equipment onsite.

1.24 BMP C162: Scheduling

1.24.1 Purpose

Sequencing a construction project reduces the amount and duration of soil exposed to erosion.

1.24.2 Conditions of Use

The construction sequence schedule is an orderly listing of all major land-disturbing activities together with the necessary erosion and sediment control measures planned for the project. This type of schedule guides the contractor on work to be done before other work is started so serious erosion and sedimentation problems can be avoided.

Following a specified work schedule that coordinates the timing of land-disturbing activities and the installation of control measures is perhaps the most cost-effective way of controlling erosion during construction. The removal of surface ground cover leaves a site vulnerable to accelerated erosion. Construction procedures that limit land clearing, provide timely installation of erosion and sedimentation controls, and restore protective cover quickly can significantly reduce the erosion potential of a site.

1.24.3 Design Considerations

- Minimize construction during rainy periods.
- Schedule projects to disturb only small portions of the site at any one time. Complete grading as soon as possible. Immediately stabilize the disturbed portion before grading the next portion. Practice staged seeding in order to revegetate cut and fill slopes as the work progresses.

1.25 BMP C200: Interceptor Dike and Swale

1.25.1 Purpose

Provide a dike or swale, at the top or base of a disturbed slope or along the perimeter of a disturbed construction area to convey stormwater. Use the dike and/or swale to intercept the runoff from unprotected areas and direct it to areas where erosion can be controlled. This can prevent runoff from entering the work area or sediment-laden runoff from leaving the construction site.

1.25.2 Conditions of Use

Where the runoff from an exposed site or disturbed slope must be conveyed to an erosion control facility that can safely convey the stormwater.

- Locate upslope of a construction site to prevent runoff from entering disturbed area.
- When placed horizontally across a disturbed slope, it reduces the amount and velocity of runoff flowing down the slope.
- Locate downslope to collect runoff from a disturbed area and direct it to a sediment basin.

1.25.3 Design and Installation Specifications

- Stabilize dike and/or swale and channel with temporary or permanent vegetation or other channel protection during construction.
- Steep grades require channel protection and check dams.
- Channel requires a positive grade to allow stormwater and surface water to drain; steeper grades require channel protection and check dams.
- Review construction for areas where overtopping may occur.
- Should be used at the top of new fill before vegetation is established.
- May be used as a permanent diversion channel to carry the runoff.
- Sub-basin tributary area should be one acre or less.
- Design capacity for either:
    - The peak volumetric flowrate calculated using a 10-minute time step from a Type 1A, 10-year, 24-hour frequency storm using a single event model, or
    - The 10-year return period flowrate, indicated by an Ecology-approved continuous simulation model, using a 15-minute time step.

      Design for worst-case land cover conditions.

      For permanent facilities, design capacity per Volume 4.

Interceptor Dikes

Interceptor dikes shall meet the following criteria:

Top Width	2 feet minimum.
Height	1.5 feet minimum on berm.
Side Slope	2:1 or flatter.
Grade	Depends on topography, however, dike system minimum is 0.5% and maximum is 1%
Compaction	Minimum of 90 percent ASTM D698 standard proctor.

Horizontal Spacing of Interceptor Dikes:

Average Slope	**Slope Percent**	**Flowpath Length**
20H:1V or less	3-5%	300 feet
(10 to 20)H:1V	5-10%	200 feet
(4 to 10)H:1V	10-25%	100 feet
(2 to 4)H:1V	25-50%	50 feet

Stabilization depends on velocity and reach.

Slopes <5%	Seed and mulch applied within 5 days of dike construction (see BMP C121: Mulching).
Slopes 5 - 40%	Dependent on runoff velocities and dike materials. Stabilization should be done immediately using either sod or riprap or other measures to avoid erosion. See Volume 5, Section 4.3: Open Channel Specifications for additional guidance on channel protection.

- The upslope side of the dike shall be graded to ensure stormwater and surface water reach the dike outlet. No erosion shall occur at the outlet. Provide energy dissipation measures as necessary. Sediment-laden runoff must be released through a sediment trapping facility.
- Minimize construction traffic over temporary dikes. Use temporary cross culverts for channel crossing.

Interceptor Swales

Interceptor swales shall meet the following criteria: **Maintenance Standards**

Bottom Width	2 feet minimum; the bottom shall be level.
Depth	1-foot minimum.
Side Slope	2H:1V or flatter
Grade	Maximum 5 percent, and be graded to ensure stormwater and surface water reach a suitable outlet (such as a sediment pond).
Stabilization	Seed as per BMP C120: Temporary and Permanent Seeding, or BMP C202: Rip Rap Channel Lining, 12 inches thick of riprap pressed into the bank and extending at least 8 inches vertical from the bottom.

- Inspect diversion dikes and interceptor swales once a week and after every rainfall. Immediately remove sediment from the flow area.
- Repair damage caused by construction traffic or other activity before the end of each working day.
- Check outlets and make timely repairs as needed to avoid gully formation. When the area below the temporary diversion dike is permanently stabilized, remove the dike and fill and stabilize the channel to blend with the natural surface.

1.32 BMP C207: Check Dams

1.32.1 Purpose

Construction of small dams across a swale or ditch reduces the velocity of concentrated flow and dissipates energy at the check dam.

1.32.2 Conditions of Use

- Use check dams where temporary channels or permanent channels are not yet vegetated, channel lining is infeasible, and velocity checks are required.
- Do not place check dams in streams unless approved by the State Department of Fish and Wildlife. Do not place check dams in wetlands without approval from the City of Tacoma Planning and Development Services and other appropriate state agencies.
- Do not place check dams below the expected backwater from any salmonid bearing water between September 15 and June 15 to ensure that there is no loss of high flow refuge habitat for overwintering juvenile salmonids and emergent salmonid fry.

1.32.3 Design and Installation Specifications

- Construct rock check dams from appropriately sized rock; rock or pea-gravel filled bags; or other products intended for this purpose. The rock used must be large enough to stay in place given the expected design flow through the channel. The rock must be placed by hand or by mechanical means (no dumping of rock to form dam) to achieve complete coverage of the ditch or swale and to ensure that the center of the dam is lower than the edges.
- Before installing check dams bypass upstream flow away from the work area.
- Whatever material is used, the dam should form a triangle when viewed from the side. This prevents undercutting as water flows over the face of the dam rather than falling directly onto the ditch bottom.
- Check dams in association with sumps work more effectively at slowing flow and retaining sediment than just a check dam alone. A deep sump should be provided immediately upstream of the check dam.
- In some cases, if carefully located and designed, check dams can remain as permanent installations with very minor regrading. They may be left as either spillways, in which case accumulated sediment would be graded and seeded, or as check dams to prevent further sediment from leaving the site.
- Check dams can be constructed of either rock or pea-gravel filled bags. Numerous new products are also available for this purpose. They tend to be re-usable, quick and easy to install, effective, and cost efficient.
- Check dams should be placed perpendicular to the flow of water.
- The maximum spacing between the dams shall be such that the toe of the upstream dam is at the same elevation as the top of the downstream dam.
- Keep a maximum height of 2 feet at the center of the dam.
- Keep the center of the check dam at least 12 inches lower than the outer edges at natural ground elevation.
- Keep the side slopes of the check dam at 2H:1V or flatter.

- Key the stone into the ditch banks and extend it beyond the abutments a minimum of 18 inches to avoid washouts from overflow around the dam.
- Use filter fabric foundation under a rock or sand bag check dam. If a blanket ditch liner is used, this is not necessary. A piece of organic or synthetic blanket cut to fit will also work for this purpose.
- In the case of grass-lined ditches and swales, remove all check dams and accumulated sediment when the grass has matured sufficiently to protect the ditch or swale - unless the slope of the swale is greater than 4 percent. Seed and mulch the area beneath the check dams immediately after dam removal.
- Ensure that channel appurtenances, such as culvert entrances below check dams, are not subject to damage or blockage from displaced stones. Figure 3 - 15: Check Dams, depicts a typical rock check dam.

1.32.4 Maintenance Standards

- Monitor check dams for performance and sediment accumulation during and after each runoff producing rainfall. Remove sediment when it reaches one half the sump depth.
- Anticipate submergence and deposition above the check dam and erosion from high flows around the edges of the dam.
- If significant erosion occurs between dams, install a protective riprap liner in that portion of the channel.

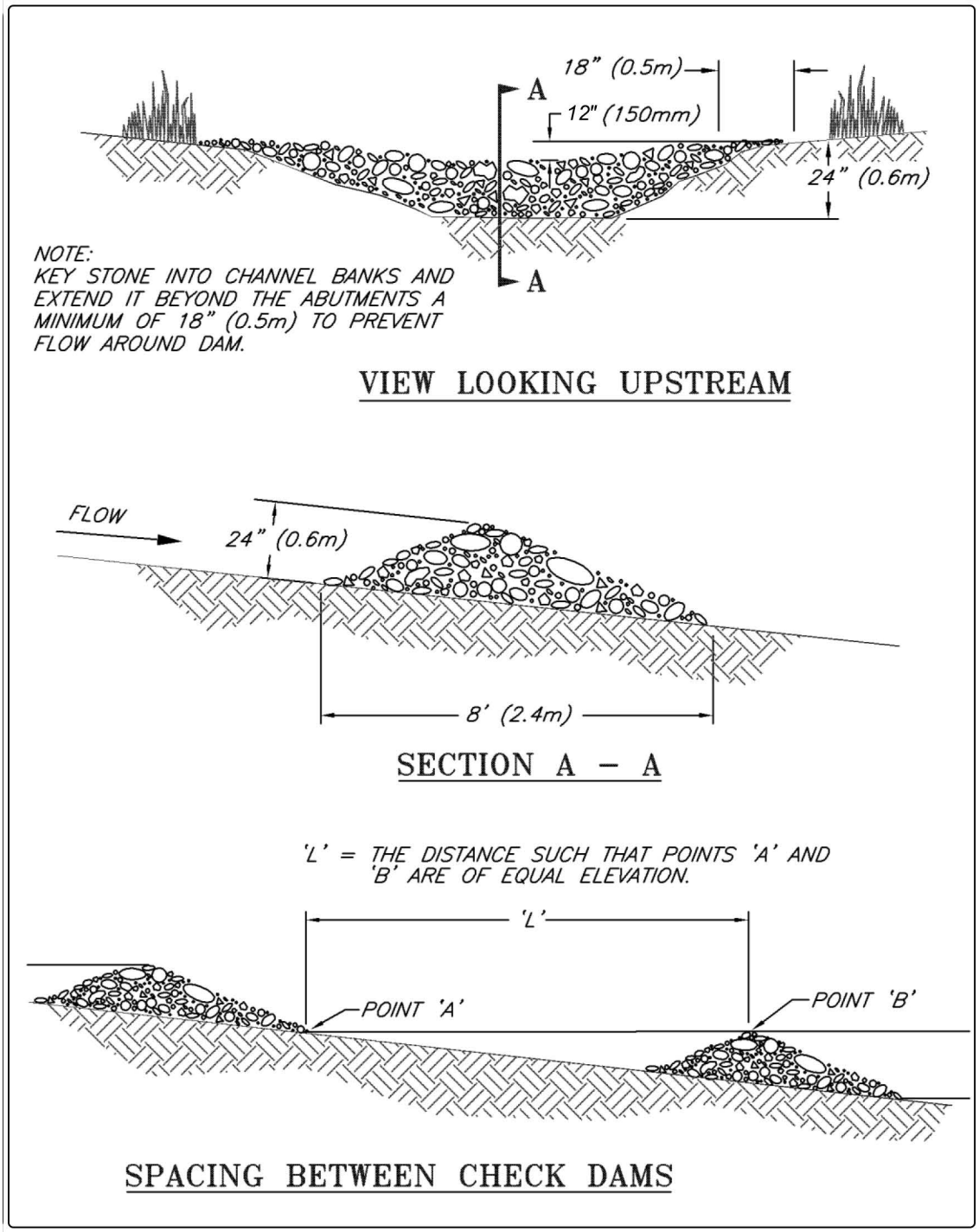

Figure 3 - 15: Check Dams

1.35 BMP C220: Stormwater System Inlet Protection

1.35.1 Purpose

To prevent coarse sediment from entering stormwater systems prior to permanent stabilization of the disturbed area.

1.35.2 Conditions of Use

- Use where inlets are to be made operational before permanent stabilization of the disturbed area.
- Provide protection for all stormwater system inlets downslope and within 500 feet of a disturbed or construction area, unless those inlets are preceded by another sediment trapping device.
- Table 3 - 11: Stormwater System Inlet Protection lists several options for inlet protection. All of the methods for stormwater system inlet protection are prone to plugging and require a high frequency of maintenance. Contributing areas should be limited to 1 acre or less. Emergency overflows may be required where stormwater ponding would cause a hazard. If an emergency overflow is provided, additional end-of-pipe treatment may be required.

Table 3 - 11: Stormwater System Inlet Protection

Type of Inlet Protection	Emergency Overflow	Applicable for Paved/ Earthen Surfaces	Conditions of Use
Excavated drop inlet protection	Yes, temporary flooding will occur	Earthen	Applicable for heavy flows. Easy to maintain. Large area requirement: 30’ x 30’ per acre.
Block and gravel drop filter	Yes	Paved or earthen	Applicable for heavy concentrated flows. Will not pond.
Gravel and mesh filter	No	Paved	Applicable for heavy concentrated flows. Will pond. Can withstand traffic.
Catch basin filters	Yes	Paved or earthen	Frequent maintenance required.
Curb inlet protection with a wooden weir	Small capacity overflow	Paved	Used for sturdy, more compact installation.
Block and gravel curb inlet protection	Yes	Earthen	Sturdy, but limited filtration.
Culvert inlet sediment trap			18-month expected life.

1.35.3 Design and Installation Specifications

Excavated Drop Inlet Protection

- An excavated impoundment around the inlet. Sediment settles out of the stormwater prior to entering the stormwater conveyance system..

- Provide depth of 1 to 2 feet, as measured from the crest of the inlet structure.
- Slope sides of excavation no steeper than 2H:1V.
- Minimum volume of excavation 35 cubic yards.
- Shape excavation to fit site with longest dimension oriented toward the longest inflow area.
- Install provisions for collection and conveyance to prevent standing water problems.
- Clear the area of all debris.
- Grade the approach to the inlet uniformly.
- Drill weep holes into the side of the inlet.
- Protect weep holes with screen wire and washed aggregate.
- Seal weep holes when removing structure and stabilizing area.
- It may be necessary to build a temporary dike to the down slope side of the structure to prevent bypass flow.

Block and Gravel Filter

- A block and gravel filter is a barrier formed around the stormwater system inlet with standard concrete blocks and gravel. See Figure 3 - 17: Drop Inlet with Block and Gravel Filter.
- Provide a height 1 to 2 feet above inlet.
- Recess the first row 2 inches into the ground for stability.
- Support subsequent courses by placing a piece of 2x4 lumber through the block opening.
- Do not use mortar.
- Lay some blocks in the bottom row on their side for dewatering the pool.
- Place hardware cloth or comparable wire mesh with ½-inch openings over all block openings.
- Place gravel just below the top of blocks on slopes of 2H:1V or flatter.
- An alternative design is a gravel berm surrounding the inlet with the following characteristics:
  - Provide an inlet slope of 3H:1V.
  - Provide an outlet slope of 2H:1V.
  - Provide a 1-foot wide level stone area between the structure and the inlet.
  - Use inlet slope stones 3 inches in diameter or larger.
  - For outlet slope use gravel ½- to ¾-inch at a minimum thickness of 1-foot.

Gravel and Wire Mesh Filter

- A gravel and wire mesh filter is a gravel barrier placed over the top of the inlet (see). This structure does not provide an overflow.
- Use a hardware cloth or comparable wire mesh with 1/2-inch openings.

- Place wire mesh over the drop inlet so that the wire extends a minimum of 1-foot beyond each side of the inlet structure.
- Overlap the strips if more than one strip of mesh is necessary.

- Place coarse aggregate over the wire mesh.
  - Provide at least a 12-inch depth of aggregate over the entire inlet opening and extend at least 18-inches on all sides.

Catch Basin Filters

- Inserts (Figure 3 - 19: Catch Basin Filter) shall be designed by the manufacturer for use at construction sites. The limited sediment storage capacity increases the frequency of inspection and maintenance required, which may be daily for heavy sediment loads. The maintenance requirements can be reduced by combining a catch basin filter with another type of inlet protection. This type of inlet protection provides flow bypass without overflow and therefore may be a better method for inlets located along active rights-of-way.
- Provide a minimum of 5 cubic feet of storage.
- Requires dewatering provisions.
- Provide a high-flow bypass that will not clog under normal use at a construction site.
- The catch basin filter is inserted in the catch basin just below the grating.

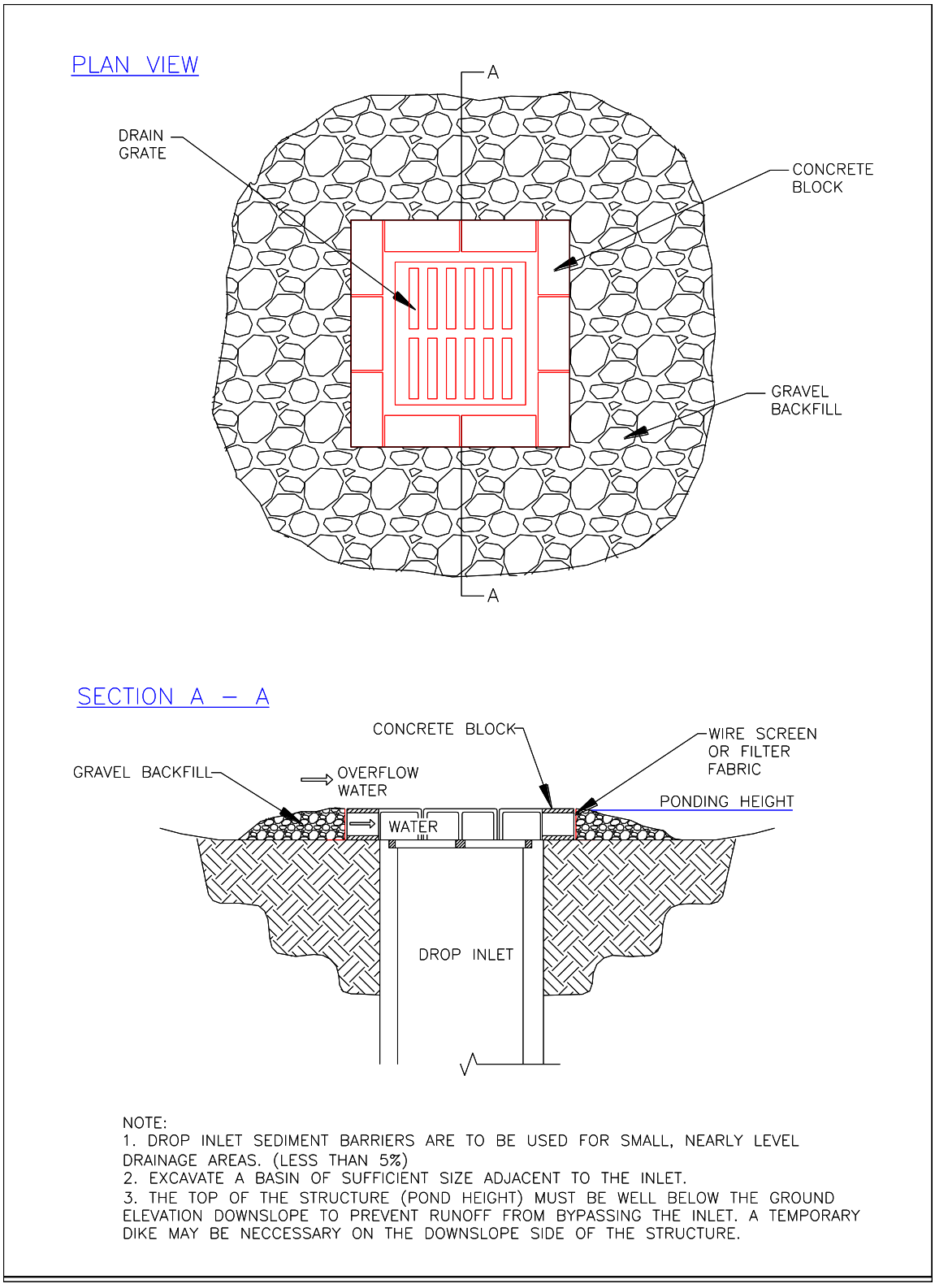

Figure 3 - 17: Drop Inlet with Block and Gravel Filter

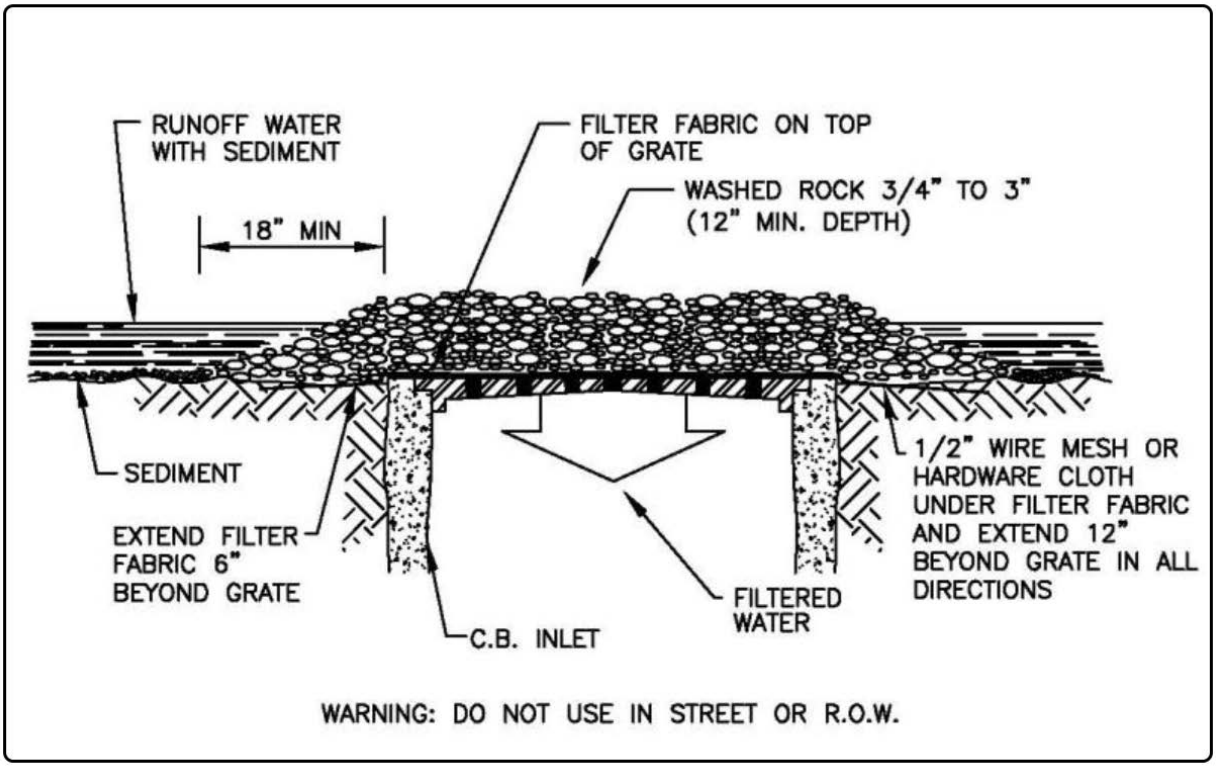

Figure 3 - 18: Gravel and Wire Mesh Filter

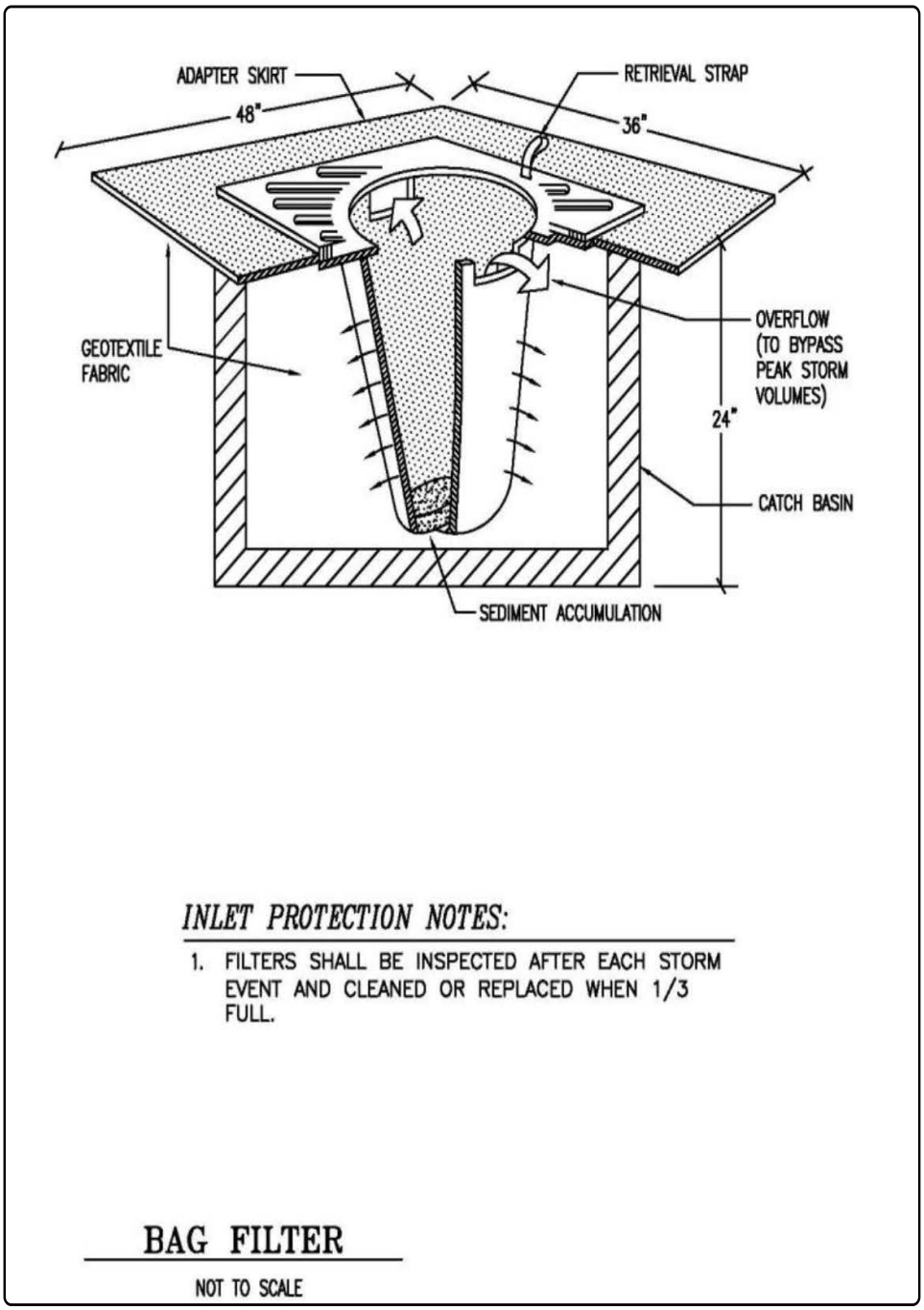

Figure 3 - 19: Catch Basin Filter

Curb Inlet Protection with Wooden Weir

Barrier formed around a curb inlet with a wooden frame and gravel.

- Use wire mesh with ½-inch openings.
- Use extra strength filter cloth.
- Construct a frame.
- Attach the wire and filter fabric to the frame.
- Pile coarse washed aggregate against the wire and fabric.
- Place weight on frame anchors.

Block and Gravel Curb Inlet Protection

Barrier formed around an inlet with concrete blocks and gravel. See Figure 3 - 20: Block and Gravel Curb Inlet Protection.

- Use wire mesh with ½-inch openings.
- Place two concrete blocks on their sides abutting the curb at either side of the inlet opening. These are spacer blocks.
- Place a 2x4 stud through the outer holes of each spacer block to align the front blocks.
- Place blocks on their sides across the front of the inlet and abutting the spacer blocks.
- Place wire mesh over the outside vertical face.
- Pile coarse aggregate against the wire to the top of the barrier.

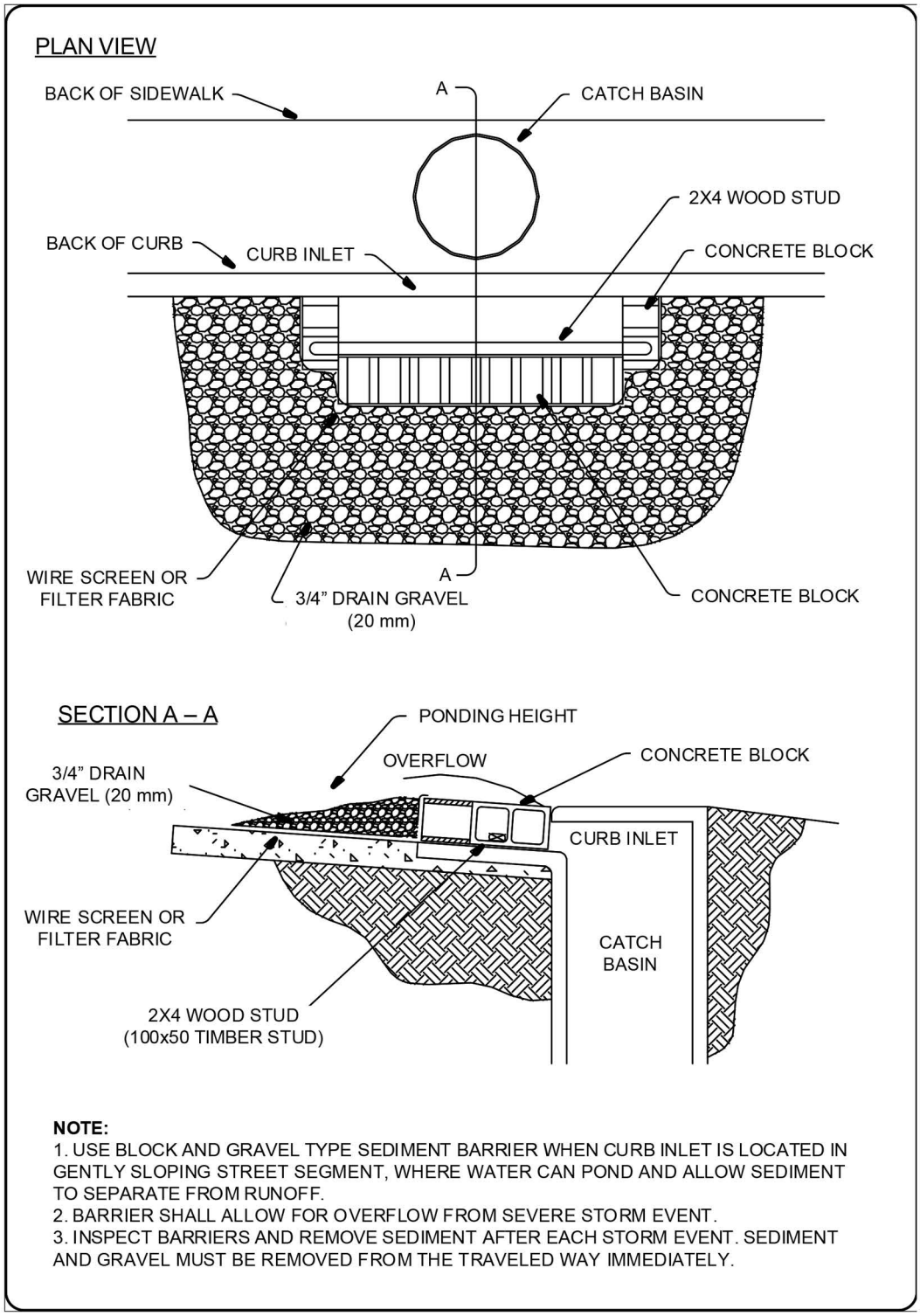

Figure 3 - 20: Block and Gravel Curb Inlet Protection

Curb and Gutter Sediment Barrier

Sandbag or rock berm (riprap and aggregate) 3 feet high and 3 feet wide in a horseshoe shape. See Figure 3 - 21: Curb and Gutter Sediment Barrier.

- Construct a horseshoe shaped berm, faced with coarse aggregate if using riprap, 3 feet high and 3 feet wide, at least 2 feet from the inlet.
- Construct a horseshoe shaped sedimentation trap on the outside of the berm sized to sediment trap standards for protecting a culvert inlet.

1.35.4 Maintenance Standards

- Inspect inlet protection frequently, especially after storm events. If the insert becomes clogged, clean or replace it.
- For systems using stone filters: If the stone filter becomes clogged with sediment, the stones must be pulled away from the inlet and cleaned or replaced. Since cleaning of gravel at a construction site may be difficult, an alternative approach would be to use the clogged stone as fill and put fresh stone around the inlet.
- Do not wash sediment into the stormwater system while cleaning. Spread all excavated material evenly over the surrounding land area or stockpile and stabilize as appropriate.
- Do not allow accumulated sediment to enter the stormwater system.
- Inlet protection shall be removed when area is fully stabilized and erosion and sediment controls are no longer needed.

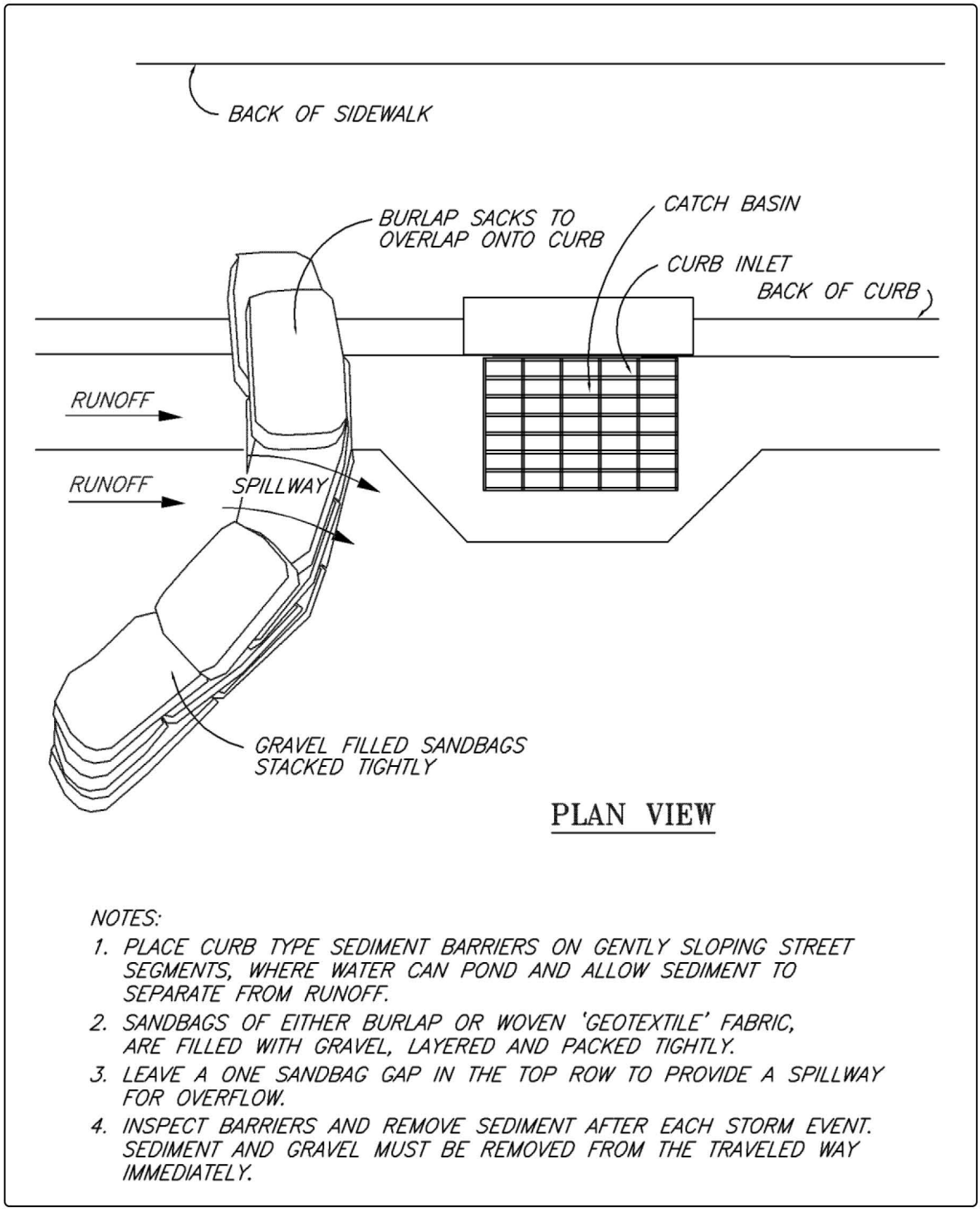

Figure 3 - 21: Curb and Gutter Sediment Barrier

1.38 BMP C233: Silt Fence

1.38.1 Purpose

Silt fence reduces the transport of coarse sediment from a construction site by providing a temporary physical barrier to sediment and reducing the runoff velocities of overland flow.

1.38.2 Conditions of Use

- Silt fence may be used downslope of all disturbed areas.
- Silt fence shall prevent sediment carried by runoff from going beneath, through, or over the top of the silt fence, but shall allow the water to pass through the fence.
- Silt fence is not intended to treat concentrated flows, nor is it intended to treat substantial amounts of overland flow. Convey concentrated flows to a sediment trapping BMP.
- Do not construct silt fences in streams or use them in V-shaped ditches. Silt fences do not provide an adequate method of silt control for anything deeper than sheet or overland flow.

1.38.3 Design and Installation Specifications

- Use in combination with other construction stormwater BMPs.
- Maximum slope steepness (perpendicular to the silt fence line) 1H:1V.
- Maximum sheet or overland flow path length to the silt fence of 100 feet.
- Do not allow flows greater than 0.5 cfs.
- Use geotextile fabric that meets the following standards or WSDOT Standard Specification 9-33.2(1) Table 6 - Geotextile for Temporary Silt Fence. All geotextile properties listed below are minimum average roll values (i.e., the test result for any sampled roll in a lot shall meet or exceed the values shown in Table 3 - 12: Geotextile Fabric Standards for Silt Fence):

Table 3 - 12: Geotextile Fabric Standards for Silt Fence

Standard	Description
Polymeric Mesh AOS (ASTM D4751)	0.60 mm maximum for silt film wovens (#30 sieve). 0.30 mm maximum for all other geotextile types (#50 sieve). 0.15 mm minimum for all fabric types (#100 sieve).
Water Permittivity (ASTM D4491)	0.02 sec^{-1} minimum
Grab Tensile Strength (ASTM D4632)	180 lbs. minimum for extra strength fabric. 100 lbs. minimum for standard strength fabric.
Grab Tensile Strength (ASTM D4632)	30% maximum
Ultraviolet Resistance (ASTM D4355)	70% minimum

- Support standard strength fabrics with wire mesh, chicken wire, 2-inch x 2-inch wire, safety fence, or jute mesh to increase the strength of the geotextile. Silt fence materials are available that have synthetic mesh backing attached.

- Silt fence material shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of six months of expected usable construction life at a temperature range of 0° F to 120° F.
- 100 percent biodegradable silt fence is available that is strong, long lasting, and can be left in place after the project is completed, if permitted by the local jurisdiction.
- Refer to Figure 3 - 23: Silt Fence for standard silt fence details. Include the following Standard Notes for silt fence on construction plans and specifications:
  - The Contractor shall install and maintain temporary silt fences at the locations shown in the Plans.
  - Construct silt fences in areas of clearing, grading, or where runoff will drain prior to starting those activities.
  - The silt fence shall have a 2-feet min. and a 2½-feet max. height above the original ground surface.
  - The geotextile fabric shall be sewn together at the point of manufacture to form fabric lengths as required. Locate all sewn seams at support posts. Alternatively, two sections of silt fence can be overlapped, provided that the overlap is long enough and that the adjacent silt fence sections are close enough together to prevent silt laden water from escaping through the fence at the overlap.
  - Attach the geotextile fabric on the up-slope side of the posts and secure with staples, wire, or in accordance with the manufacturer's recommendations. Attach the geotextile fabric to the posts in a manner that reduces the potential for tearing.
  - Support the geotextile fabric with wire or plastic mesh, dependent on the properties of the geotextile selected for use. If wire or plastic mesh is used, fasten the mesh securely to the up-slope side of the posts with the geotextile fabric up-slope of the mesh.
  - Mesh support, if used, shall consist of steel wire with a maximum mesh spacing of 2-inches, or a prefabricated polymeric mesh. The strength of the wire or polymeric mesh shall be equivalent to or greater than 180 lbs. grab tensile strength. The polymeric mesh must be as resistant to the same level of ultraviolet radiation as the geotextile fabric it supports.
  - Bury the bottom of the geotextile fabric 4-inches min. below the ground surface. Backfill and tamp soil in place over the buried portion of the geotextile fabric, so that no flow can pass beneath the silt fence and scouring cannot occur. When wire or polymeric back-up support mesh is used, the wire or polymeric mesh shall extend into the ground 3-inches min.
  - Drive or place the silt fence posts into the ground 18-inches min. A 12–inch min. depth is allowed if topsoil or other soft subgrade soil is not present and 18-inches cannot be reached. Increase fence post min. depths by 6 inches if the fence is located on slopes of 3H:1V or steeper and the slope is perpendicular to the fence. If required post depths cannot be obtained, the posts shall be adequately secured by bracing or guying to prevent overturning of the fence due to sediment loading.
  - Use wood, steel or equivalent posts. The spacing of the support posts shall be a maximum of 6-feet. Posts shall consist of either:

- Wood with minimum dimensions of 2 inches by 2 inches by 3 feet. Wood shall be free of defects such as knots, splits, or gouges.
- No. 6 steel rebar or larger.
- ASTM A 120 steel pipe with a minimum diameter of 1-inch.
- U, T, L, or C shape steel posts with a minimum weight of 1.35 lbs./ft.
- Other steel posts having equivalent strength and bending resistance to the post sizes listed above.

◦ Locate the silt fences on contour as much as possible, except at the ends of the fence, where the fence shall be turned uphill such that the silt fence captures the runoff water and prevents water from flowing around the end of the fence.

◦ If the fence must cross contours, with the exception of the ends of the fence, place check dams perpendicular to the back of the fence to minimize concentrated flow and erosion..The slope of the fence line where contours must be crossed shall not be steeper than 3H:1V.

- Check dams shall be approximately 1-foot deep at the back of the fence. Check dams shall be continued perpendicular to the fence at the same elevation until the top of the check dam intercepts the ground surface behind the fence.
- Check dams shall consist of crushed surfacing base course, gravel backfill for walls, or shoulder ballast. Check dams shall be located every 10 feet along the fence where the fence must cross contours.

- Refer to Figure 3 - 24: Silt Fence Installation by Slicing for slicing method details. The following are specifications for silt fence installation using the slicing method:

◦ The base of both end posts must be at least 2 to 4 inches above the top of the geotextile fabric on the middle posts for ditch checks to drain properly. Use a hand level or string level, if necessary, to mark base points before installation.

◦ Install posts 3 to 4 feet apart in critical retention areas and a maximum of 6 feet apart in standard applications.

◦ Install posts 24 inches deep on the downstream side of the silt fence, and as close as possible to the geotextile fabric, enabling posts to support the geotextile fabric from upstream water pressure.

◦ Install posts with the nipples facing away from the geotextile fabric.

◦ Attach the geotextile fabric to each post with three ties, all spaced within the top 8 inches of the fabric. Attach each tie diagonally 45 degrees through the fabric, with each puncture at least 1 inch vertically apart. Each tie should be positioned to hang on a post nipple when tightening to prevent sagging.

◦ Wrap approximately 6 inches of geotextile fabric around the end posts and secure with 3 ties.

◦ No more than 24 inches of a 36-inch geotextile fabric is allowed above ground level.

◦ Compact the soil immediately next to the geotextile fabric with the front wheel of a tractor, skid steer, or roller exerting at least 60 pounds per square inch. Compact the upstream side first and then each side twice for a total of four trips. Check and correct

the silt fence installation for any deviation before compaction. Use a flat-bladed shovel to tuck the fabric deeper into the ground if necessary.

1.38.4 Maintenance Standards

- Repair any damage immediately.
- Intercept and convey all evident concentrated flows uphill of the silt fence to a sediment trapping BMP.
- Check the uphill side of the fence for signs of the fence clogging and acting as a barrier to flow and then causing channelization of flows parallel to the fence. If this occurs, replace the fence and remove the trapped sediment.
- Remove sediment deposits when the deposit reaches approximately one-third the height of the silt fence, or install a second silt fence.
- Replace geotextile fabric that has deteriorated due to ultraviolet breakdown.

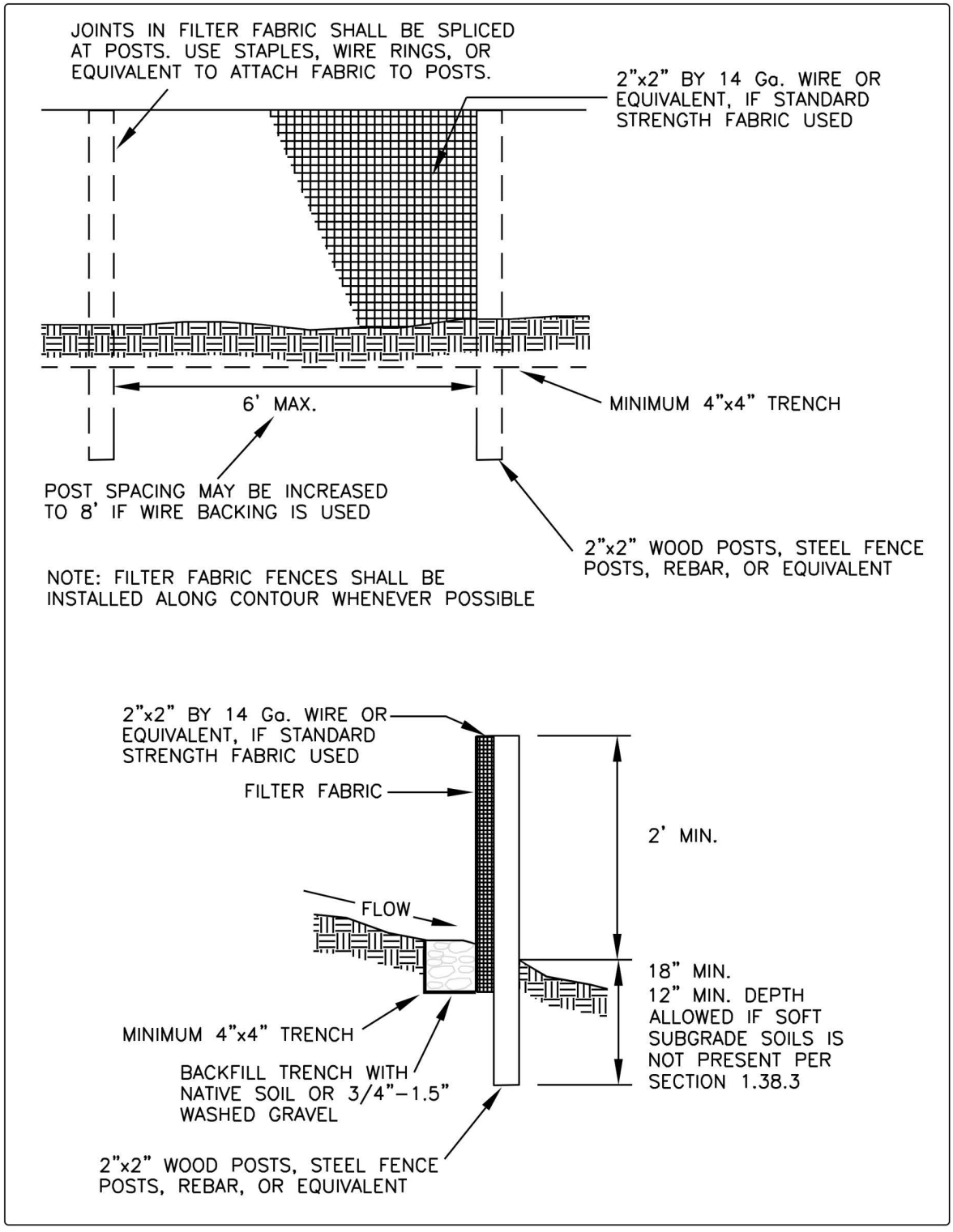

Figure 3 - 23: Silt Fence

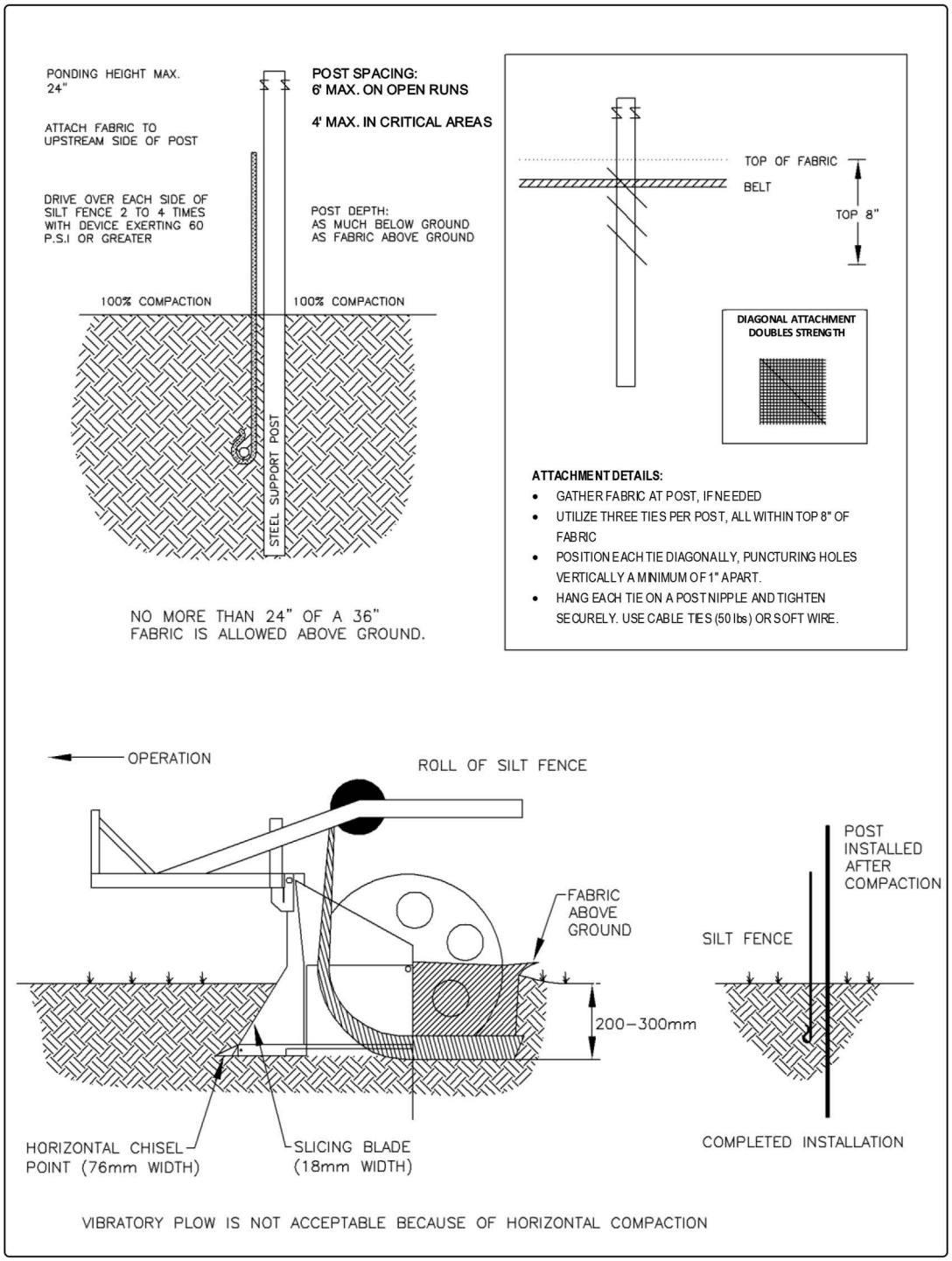

Figure 3 - 24: Silt Fence Installation by Slicing

1.41 BMP C236: Vegetative Filtration

1.41.1 Purpose

Vegetative filtration as a BMP is used in conjunction with detention storage in the form of portable tanks or BMP C241: Temporary Sediment Pond, BMP C206: Level Spreader, and a pumping system with surface intake. Vegetative filtration improves turbidity levels of stormwater discharges by filtering runoff through existing vegetation where undisturbed forest floor duff layer or established lawn with thatch layer are present. Vegetative filtration can also be used to infiltrate dewatering waste from foundations, vaults, and trenches as long as runoff does not occur.

1.41.2 Conditions of Use

- For every five acre of disturbed soil use one acre of grass field, farm pasture, or wooded area. Reduce or increase this area depending on project size, groundwater table height, and other site conditions.
- Wetlands shall not be used for filtration.
- Do not use this BMP in areas with a high groundwater table, or in areas that will have a high seasonal groundwater table during the use of this BMP.
- This BMP may be less effective on soils that prevent the infiltration of the water, such as hard till.
- Using other effective source control measures throughout a construction site will prevent the generation of additional highly turbid water and may reduce the time period or area need for this BMP.
- Stop distributing water into the vegetated area if standing water or erosion results.
- On large projects that phase the clearing of the site, areas retained with native vegetation may be used as a temporary vegetative filtration area.

1.41.3 Design Criteria

- Find land adjacent to the project that has a vegetated field, preferably a farm field, or wooded area.
- If the project site does not contain enough vegetated field area consider obtaining permission from adjacent landowners (especially for farm fields).
- Install a pump and downstream distribution manifold depending on the project size. Generally, the main distribution line should reach 100 to 200-feet long (large projects, or projects on tight soil, will require systems that reach several thousand feet long with numerous branch lines off of the main distribution line).
- The manifold should have several valves, allowing for control over the distribution area in the field.
- Install several branches of 4-inch diameter schedule 20 polyvinyl chloride (PVC) pipe, or 6-inch fire hose, which can convey the turbid water out to various sections of the field. See Figure 3 - 26: Manifold and Branches in a Wooded, Vegetated Spray Field.
- Determine the branch length based on the field area geography and number of branches. Typically, branches stretch from 200-feet to several thousand feet. Lay branches on contour with the slope.

- On uneven ground, sprinklers perform well. Space sprinkler heads so that spray patterns do not overlap.
- On relatively even surfaces, a level spreader using 4-inch perforated pipe may be used as an alternative option to the sprinkler head setup. Install pipe at the highest point on the field and at various lower elevations to ensure full coverage of the filtration area. Place the pipe with the holes up to allow for a gentle weeping evenly out all holes. Leveling the pipe by staking and using sandbags may be required.
- To prevent over saturating of the vegetative filtration area, rotate the use of branches or spray heads.Repeat as needed based on monitoring the spray field.

Table 3 - 14: Flowpath Guidelines for Vegetative Filtration

Average Slope	Average Area % Slope	Estimated Flowpath Length (ft)
1.5H:1V	67%	250 feet
2H:1V	50%	200 feet
4H:1V	25%	150 feet
6H:1V	16.7%	115 feet
10H:1V	10%	100 feet

1.41.4 Maintenance Standards

- Monitor the spray field on a daily basis to ensure that over saturation of any portion of the field doesn't occur at any time. The presence of standing puddles of water or creation of concentrated flows visually signify that over saturation of the field has occurred.
- Monitor the vegetated spray field all the way down to the nearest surface water, or farthest spray area, to ensure that the water has not caused overland or concentrated flows, and has not created erosion around the spray nozzle(s).
- Do not exceed water quality standards for turbidity.
- It is recommended that a separate inspection log be developed, maintained and kept with the existing site logbook to aid the operator conducting inspections. This separate "Field Filtration Logbook" can also aid in demonstrating compliance with permit conditions.
- Inspect the spray nozzles daily, at a minimum, for leaks and plugging from sediment particles.
- If erosion, concentrated flows, or over saturation of the field occurs, rotate the use of branches or spray heads or move the branches to a new field location.
- Check all branches and the manifold for unintended leaks.

Figure 3 - 26: Manifold and Branches in a Wooded, Vegetated Spray Field

1.47 BMP C253: Portable Sediment Tank

1.47.1 Purpose

A portable sediment tank is used during construction to remove sediment from runoff originating from disturbed areas of the site. Sediment-laden water is pumped into the tank where sediment settles. Portable sediment tanks are often known by their proprietary name: Baker Tank or Rain for Rent Tanks.

1.47.2 Conditions of Use

- Sediment tanks shall be placed on level, even ground.
- Sediment tanks can be used where space is limited.

1.47.3 Design and Installation Specifications

- Sediment tanks shall be a minimum of 2 feet deep.
- Sediment tanks shall have an emergency overflow that directs discharge to a safe, appropriate location. Show the emergency overflow discharge location on the TESC Plans.
- The outlet riser or pipe should be a minimum 1.5 feet above the bottom to avoid discharging sediment-laden water.
- Show the tank configuration, size, and location on the TESC Plans.
- The minimum storage volume shall be calculated as follows:
    - Pump Discharge (GPM) * 16 = Cubic Feet of Storage
- Any tank shape is acceptable as long as the minimum volume requirements is obtained.
- Ensure tank is clearly marked showing level when cleanout is needed.

1.47.4 Maintenance Standards

- Follow manufacturer or vendor specifications for maintenance.
- Inspect tank daily and during storm events to ensure tank does not need repair.
- Clean out tank when 1/3 of original sediment capacity has been used. Dispose of sediment in accordance with local, state and federal regulations.

APPENDIX D

Operations and Maintenance Manual

Operation and Maintenance Manual

Giaudrone Middle School Field and Track Conversion

Prepared For

City of Tacoma, Permit #TBD

Project Location

4902 S Alaska St

Tacoma, WA 98408

2110000220, 2110000460, 2110000430

Prepared By

Name	Organization	Contact Telephone Number	Email Address
Andrew Wong/ Laurie Pfarr	LPD Engineering PLLC	(206) 725-1211	andreww@lpdengineering.com

Person(s) Responsible for Maintenance of Stormwater Facilities

Name	Organization	Contact Telephone Number	Email Address
TBD	Tacoma School District Maintenance and Operations	(253) 571-1000	info@tacoma.k12.wa.us

Date Prepared

February 28, 2022

Operation and Maintenance Manual will be kept at: Giaudrone Middle School main office and Tacoma Public Schools district office. The O&M Manual must be made available for inspection by the City upon request.

Facility Summary

Narrative Description of proposed stormwater system: The stormwater system consists of the field underdrain system and a detention facility beneath the permeable rubberized D-zone. The detention facility will utilize storage within the aggregate base course beneath the surface. A flow control structure at the outlet point will attenuate flows. The outlet from the flow control structure will connect to an existing catch basin on-site near the northwest corner of the field. The underdrain system will bypass the detention facility and connect directly to the existing storm system north of the track.

Facility Location Identifier on associated figure.	**Facility Type – Provide BMP Name and Number from SWMM. Include Manufacturer Name and Manufacturer Model Number, if applicable.**	**Facility Description – What Facility Does, How it Works, and applicable information such Number of Cartridges, Type of Cartridges, Height of Cartridges, etc. as applicable for Emerging Technologies**	**Estimated Operation and Maintenance Cost**
1	Compost Amended Soil (Post-Construction Soil Quality and Depth) BMP L613	Due to various disturbed lawn areas as a result of the new construction, it is necessary to restore the landscape areas to provide appropriate soil quality and depth for continued stormwater function. Section 19.1 (BMP L613) of the Tacoma SWMM list the design criteria to follow.	$1,000

3	Flow Control Structure (restrictor)	The flow control restrictor is used to attenuate stormwater outflow and utilize the storage capabilities of the detention system. It is designed with a bottom orifice and notch that are sized to meet flow control requirements. The control riser is located within a Type-2 catch basin northwest of the field.	$2,000

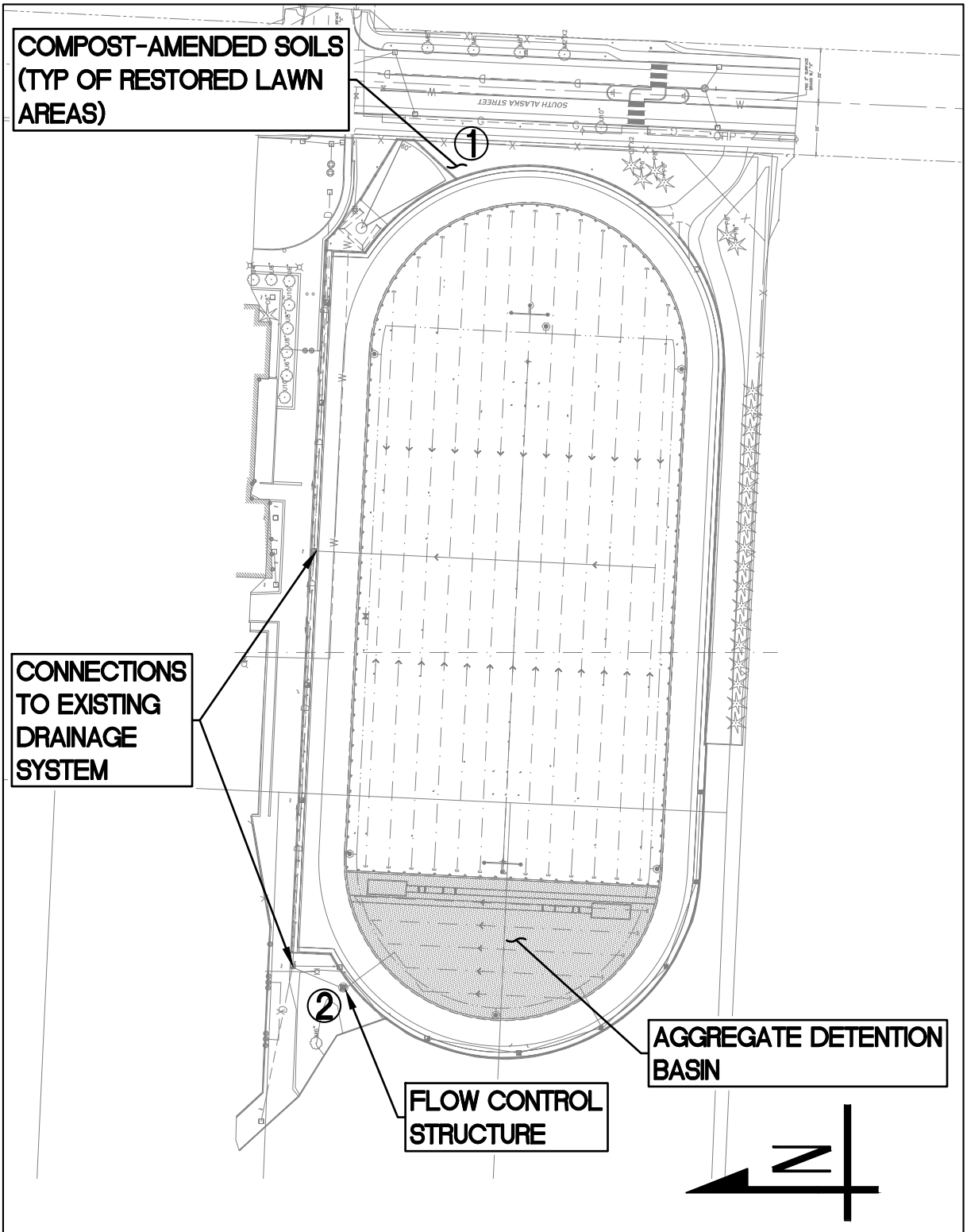

EXHIBIT A - STORMWATER FACILITIES MAP
GIAUDRONE MIDDLE SCHOOL FIELD AND TRACK CONVERSION

Maintenance Schedules

Compost Amended Soil Maintenance

Compost amended soil shall have ongoing routine maintenance such as fertilization, debris removal, mowing, etc. Annual maintenance includes checking soil media for waterlog, erosion/scouring, weeds or unhealthy vegetation.

Refer to the attached maintenance requirements (Table #25) from the 2021 City of Tacoma Stormwater Management Manual for the compost amended soil.

Flow Control Structure Maintenance

The flow control structure for the detention system is located northwest of the field. The flow control restrictor consists of a CMP riser pipe, equipped with an orifice in the bottom of the riser pipe submerged beneath the outlet level. There is also a rectangular notch at the top of the CMP riser. The shear and lift handle shall always be closed, and only be opened during emergencies when the orifice becomes plugged or during maintenance operations.

Due to the intended use of the tennis courts, there is expected to be little to no sediment that could reach the flow control structure. In addition, the catch basin will be equipped with a solid locking lid, thus preventing debris from entering it.

The 8-inch riser does not take up a significant volume of the interior space within the type-2, 54" diameter catch basin; the flow control riser shall have 2-foot minimum clearance from the access ladder steps. There is a shear gate proposed on the control structure, as is typical, allowing access to the downstream drain line from within the catch basin. The control structure riser pipe will be easily accessible from the surface when the solid lid is removed from the Type-2 catch basin. With the cover removed, maintenance personnel will be able to look straight down into the riser pipe to confirm it is functioning normally. Therefore, there should typically be no need to physically enter the structure, as everything will be visible from the top. In addition, the flow restrictor can be removed from the outlet pipe as necessary, by removing the support straps and sliding the tee structure out of the outlet pipe.

In the event that sediment accumulates in the catch basin due to unforeseen conditions, vactor truck cleaning of the catch basin with the use of a small diameter hose can be performed to remove any sediment within the bottom of the structure. This will not require maintenance staff to enter the structure. The flow control structure shall be inspected on an annual basis.

Refer to the attached maintenance requirements (Table #5) from the 2021 City of Tacoma Stormwater Management Manual for general maintenance guidelines for control structures/flow restrictors.

Maintenance Activity Log

A sample maintenance activity log is attached with this document.

Covenant and Easement Agreement

The draft City of Tacoma Covenant and Easement Agreement is attached. Document to be recorded at later date.

Access and Easement Documentation

Not applicable.

Maintenance Activity Log

To be completed by maintenance staff and provided to the City of Tacoma upon request.

Property Name/Owner:	Site Address:
Property Manager/Contact:	Phone:
Facility Type:	Location on Property:
Requirement met by Facility (circle all that apply): On-site Stormwater Management Treatment/Water Quality Flow Control	

Date	Reason for Inspection/Action (circle one)	Condition Observed	Action Taken	Initials
	Complaint or Problem Regular Maintenance			
	Complaint or Problem Regular Maintenance			
	Complaint or Problem Regular Maintenance			
	Complaint or Problem Regular Maintenance			
	Complaint or Problem Regular Maintenance			
	Complaint or Problem Regular Maintenance			
	Complaint or Problem Regular Maintenance			

When Recorded Return To:

City of Tacoma
Planning and Development Services
747 Market Street, Room 620
Tacoma, WA 98402

Document Title: MAINTENANCE COVENANT AND ACCESS EASEMENT **Giaudrone Middle School Field and Track Conversion**
Grantor: **Tacoma Public Schools**
Grantee: **CITY OF TACOMA, a Municipal Corporation**
Legal Description (abbreviated): **Southeast Quarter of Section 16, Township 21 North, Range 3, Willamette Meridian** See Page 9, Exhibit "A", for Complete Legal Description of Subject Property
Reference Number(s): City of Tacoma Short Plat No. N/A City of Tacoma Work Order No. N/A; City of Tacoma Building Permit No. N/A City of Tacoma Site Development Permit No. TBD
Assessor's Parcel Numbers: 2110000220, 2110000460, 2110000430

MAINTENANCE COVENANT AND ACCESS EASEMENT

Giaudrone Middle School Field and Track Conversion

Grantor as fee simple owner of the herein described Property, hereby freely and voluntarily grants to the City of Tacoma, a municipal corporation operating under the laws of the state of Washington (**City**), and its successors and assignees, the following maintenance covenant and access easement, which covenant and easement shall run with the land and be binding on all current and future owners or any portion of, or interest in, Grantor's real property situated in Pierce County, Washington and legally described in **Exhibit A** .

RECITALS

A. Grantor is the owner of certain real property situated in the City of Tacoma, Pierce County, Washington, legally described on **Exhibit A** attached hereto and commonly known as Giaudrone Middle School the "**Property**".

B. As a condition of permit approval No. type permit number, the following private stormwater management system ("**Stormwater System**") was constructed or will be constructed at the Property in accordance with approved construction plans and as further described below and depicted in the approved permit.

The Stormwater System on the Property consists of:

A perforated underdrain system beneath the new turf field, connecting to existing catch basin north of track. New track surfacing will slope away from field. A few catch basins in southwest will be collected and routed to permeable aggregate detention basin located beneath the rubberized D-zone area. The outlet from the detention basin goes to flow control structure to the northwest of the track/field. This will attenuate outflow and utilize storage in the detention facility. The stormwater will then be piped to an existing catch basin on-site.

C. The City has approved the Permit submitted by Grantor, or Grantor's tenant, for the new development or redevelopment of the Property, including Stormwater System as described above. The Stormwater System is designed in accordance with City's stormwater regulations. Any damages caused by the failure of the Stormwater System shall be the sole responsibility of the Grantor or Grantor's successors-in-interest.

D. Failure to inspect, maintain, repair, and replace the Stormwater System after construction can result in an unacceptable impact to the public stormwater system or receiving waters. The

City requires Grantor to enter into this Agreement as a condition to the City's approval of Permit(s) for the development or redevelopment of the Property. This Agreement confirms Grantor's, and Grantor's successors and assigns', obligation to inspect, maintain, repair, and replace the Stormwater System. The term "**Owner(s)**" is used herein to refer to the owner or owners of any part of the Property on which Stormwater System are located. "Owner(s)" include Grantor while Grantor owns any part of the Property on which Stormwater System are located and, to the extent applicable, includes any homeowners association owning common areas on the Property on which Stormwater System are located.

E. In connection with its new development or redevelopment of the Property, Grantor may divide the property into individual lots (each a "**Lot**" and collectively the "**Lots**"). The Stormwater System for the Property will be maintained by the Owner(s). Therefore, although Grantor will be the sole owner responsible for constructing, inspecting, maintaining, repairing, and replacing the Stormwater System while Grantor owns the entirety of the Property, upon Grantor's sale or transfer of ownership of any Lot, or part of the Property, those responsibilities will be transferred jointly and severally to the subsequent Owner(s).

G. "Emergency" shall mean and refer to any time that the Stormwater System, or a discharge into or therefrom, pose an imminent threat to the health, well-being or safety of person's or property and immediate remedial action is required.

COVENANTS AND EASEMENT

NOW, THEREFORE, for good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the City and Grantor agree as follows:

1. Incorporation of Recitals and Exhibits. The Recitals and exhibits attached to this Agreement are incorporated into and made a part of this Agreement as though fully set forth herein.

2. Run with the Land. The parties' rights, duties and obligations contained herein shall run with the land and shall be binding upon the Grantor and its successors and assigns (including, without limitation, the Owner(s) of the Lot(s) and any homeowner's association owning common areas in the Property). Those rights and obligations shall inure to the benefit of the City, as well

as its successors and assigns and provide a public benefit.

3. Agreement to Maintain and Repair. The Owner(s) shall, at their sole expense, themselves or through qualified independent contractors or through Owners' tenants, at all times during their ownership of the Property, or any portion thereof, maintain the Stormwater System in good working order, condition and repair, clear of all debris, and in compliance with the Permit and all applicable state and local rules, regulations, and guidelines (including those adopted from time to time by the City and including the City's Stormwater regulations) and the Stormwater System Operation and Maintenance Manual (the "**O&M Manual**") required to be provided by the Grantor pursuant to the City's stormwater regulations. The O&M Manual shall be retained within reasonable access to the site of the Stormwater System and shall be transferred with the Property, or any portion thereof, to a new Owner(s).

4. Agreement to Inspect. The Owner(s) shall perform, at a minimum, regular inspections of all Stormwater System covered by this Agreement, in accordance with the O&M Manual and applicable stormwater regulations and guidelines. The regular inspection required by this Agreement shall identify work necessary to repair or maintain the Stormwater System in good working order. The Owner(s) shall maintain records of inspection, maintenance activities (including identification of the corrective actions taken in response to the regular inspection), monitoring activities and results (if applicable), and receipts for such activities when contracted for. Such records shall be maintained for six years and made available to the City for inspection and copying upon request.

5. Easement. Grantor hereby grants the City, its employees, independent contractors and designees, a nonexclusive easement for ingress and egress over, across and under the Property from time to time at the City's sole discretion to inspect, sample, and monitor components of the Stormwater System and discharges therefrom to ensure that the Stormwater System are being maintained and operated in accordance with the O&M Manual and applicable stormwater regulations and guidelines. Grantor hereby grants to the City permission to undertake the actions described in Sections 7 and 8 of this Agreement. The City agrees that, except in case of Emergency, it shall conduct such inspections at Reasonable Times and that City, its employees, independent contractors and designees, shall conduct their activities in compliance with Owner's reasonable rules associated with access over and across the Property; provided that, such rules shall be in writing and provided to the City upon request (except to the extent prohibited by law), and shall not impair or prevent access to the

Stormwater System for the purposes set forth in this Agreement. Owner(s) shall cooperate with the City, its employees, independent contractors and designees, to ensure safe and secure access to the Stormwater System for the purposes set forth herein. The term "**reasonable times**" as used herein, shall mean between the hours of 7:00 a.m. to 6:00 p.m., Monday through Friday, excluding holidays, but may also include the days and hours that commercial activities are conducted on the Property by the Owner, or its tenant's.

6. Improvements by Grantor. Owner(s) shall not place or construct any permanent structures, landscaping or other improvements on the Property that would restrict or interfere with the proper functioning of the Stormwater System or the City's access to perform the inspection, maintenance, or repair authorized under this Agreement. Any permanent structures or improvements subsequent to this agreement shall be permitted when required by the City set forth in the Building Code and Stormwater Management Manual.

7. Failure to Perform Agreement. If the City, in its sole and reasonable discretion, determines that the Owner(s) are not in compliance with the duties or obligations described in Sections 3 and 4 of this Agreement, the City or its designee shall provide the non-complying Owner(s) written notice to perform the maintenance and/or repair work specified in the notice. Provided, however, no prior written notice shall be required in the case of an Emergency, which shall be governed by Section 8. If such work is not performed to the City's reasonable satisfaction within thirty (30) days after the date of such notice, or such other time as the City may in its sole discretion determine, exercise its rights under the Easement described in Section 5 of this Agreement to enter the Property, with all materials and construction equipment determined by the City to be necessary to perform any and all work required to bring the Stormwater System into compliance with this Agreement. Grantee may, in its sole discretion, extend said thirty day time period upon receipt of Owner's written formal request for same, given good cause.

8. Emergency. If the City, in its sole discretion, determines that there exists or will likely exist an emergency on or about the Property with respect to the Stormwater System, the City, may immediately exercise its rights under the Easement described in Section 5 of this Agreement to immediately enter the Property, with all material and necessary construction equipment determined to be necessary to perform any and all work required to bring the Stormwater System into compliance with this Agreement, and in such case the City shall use reasonable efforts to notify the affected Owner(s) prior to entering the Property. Owner(s) shall

cooperate with the City, its employees, independent contractors and designees, to ensure safe and secure access to the Stormwater System on Property for the purposes set forth herein. Notwithstanding the above, the work performed may consist only of avoiding or mitigating the emergency and/or cleaning and/or repairing the Stormwater System to their original condition and standards.

9. City under No Obligation. The City, as well as its departments, employees, independent contractors and/or designees shall have no obligation to exercise its rights under this Agreement, including the right under Sections 7 and 8 of this Agreement, to perform the work required of the Owner(s), or to perform any other maintenance or repair of the Stormwater System. In addition, neither the City, nor any of its departments, employees, independent contractors and/or designees shall have any liability to any Owner(s) in connection with the exercise or non-exercise of such rights, the maintenance or repair of the Stormwater System, or the failure to perform the same.

10. Grantor Obligations. Grantor and each Owner agree that, prior to sale of any portion of the Property, they will make specific references to this Agreement and the O&M Manual in a separate notice paragraph in any contract, deed, lease or other legal instrument by which any possessory or equitable interest in the Property is conveyed.

11. Reimbursement. If the City exercises its rights as described in Section 7 and Section 8 to perform compliance work and enters the Property pursuant to the Easement described in Section 5 of this Agreement, the Owner(s) shall reimburse the City for all its costs and expenses incurred in connection therewith within thirty (30) days after receipt of an invoice. If the Property is owned by more than one owner (i.e., multiple lot owners), for each property or Lot where the City exercises its rights as described in Section 6 and Section 7, the Owner(s) shall be severally liable for reimbursing the City for all its costs and expenses incurred in connection therewith within. If any of the Owner(s) fail to pay the invoiced amount within such period, such amount shall thereafter accrue interest at the statutory rate. Such amount, together with interest, shall be a lien on the Property (and each of the Lots within the Property) that may be foreclosed in accordance with applicable law.

12. Enforcement. In the event of a breach of any of the terms, covenants, agreements and/or conditions of this Agreement, the parties shall be entitled to any and all remedies available at law or in equity, including but not limited to the equitable remedies of specific performance or

mandatory or prohibitory injunction issued by a court of appropriate jurisdiction. In the event it becomes necessary for any party to defend or institute legal proceedings as a result of the failure of either party to comply with the terms, covenants, agreements and/or conditions of this Agreement, the prevailing party in such litigation shall be entitled to be reimbursed for all costs incurred or expended in connection with such legal proceedings, including, but not limited to, reasonable attorneys' fees (including appellate fees) and court costs.

13. Modification or Termination. No change or modification of, or waiver under, this Agreement shall be valid unless it is in writing and signed by authorized representative of the City. No waiver of a breach or violation of any term, covenant, agreement or condition contained in this Agreement shall be deemed to be a waiver of any subsequent breach or violation of the same or any other term, covenant, agreement or condition in this Agreement. If the conditions at the Property requiring this Agreement have changed or no longer exist, then the Owner(s) may submit a request to the City that this Agreement be amended or terminated.

14. All Writings Contained Herein. This Agreement, together with all exhibits, constitutes the complete and final agreement of the parties, replaces and supersedes all oral and/or written proposals and agreements heretofore made on the subject matter.

15. Assignment. The obligations of Grantor under this Agreement shall run with the land and therefore shall bind the purchasers of the Property, in whole or in part, without the necessity of any separate agreement evidencing or confirming the assignment and the purchaser's assumption of the obligations.

16. Choice of Law; Venue; Severability. This Agreement shall be construed under the laws of the State of Washington and venue for any dispute related to this Agreement shall be in Pierce County, Washington. If any provision of this Agreement shall be determined to be invalid or unenforceable, the remaining provisions of this Agreement shall not be affected thereby, and every provision of this Agreement shall remain in full force and effect and enforceable to the fullest extent permitted by law. This Agreement shall be construed as covenants applicable to the Property and a violation hereof shall not be construed as causing a reversion of title.

17. Authority. If Grantor is an entity, the individual executing this Agreement on behalf of Grantor represents and warrants to the City that said individual the full power and authority to do so and that Grantor has full right and authority to enter into this Agreement and perform its

obligations under this Agreement.

18. Effective Date. This Easement shall become effective on the date it is recorded by the Pierce County Auditor's Office.

IN WITNESS WHEREOF, the GRANTOR has executed this instrument this _____ day of _____, 20_____.

_____

Dale Stafford, Tacoma Public Schools
Choose an item.

ACKNOWLEDGEMENT

STATE OF WASHINGTON)
) SS.
COUNTY OF PIERCE)

I, the undersigned, a Notary Public, do hereby certify that on this _____ day of _____, 20___, personally appeared before me_____ _____to me known to be the _____(title of the grantor or grantor representative who executed the within instrument) and acknowledged that he/she/they signed and sealed the same, on oath stated that he/she/they was authorized to execute the instrument and acknowledged it as his/her/their free and voluntary act and deed for the uses and purposes therein mentioned.

Given under my hand and official seal this _____ day of _____, 20___.

_____
Notary Public in and for the State of Washington
residing at _____
My Commission expires _____

GRANTEE
CITY OF TACOMA

_____
Corey Newton, P.E.
Environmental Services Division Manager,
PDS Site & Building Division

Approved as to Form:

_____
Deputy City Attorney

EXHIBIT A

SUBJECT PROPERTY LEGAL DESCRIPTION

SECTION 20 TOWNSHIP 20 RANGE 03 QUARTER 22 ACME ADD: AMCE ADD L1 THRU 16 B 13 L1 THRU 16 B THRU 14 L1 THRU 16 B THRU 16 B 16 L1 THRU 16 B 17 L1 THRU 16 B 18 TOG/W VAC ALLY ABUTT PER #15769 TOG/W VAC ST ABUTT UNDER ORD #16973 EXC POR CYD TO CY OF TAC FOR ADD'L R/W ETN 1120061 NW OF NW 20-20-03E APPROX 8.79 ACS (DCGREMS1-29-81) DC09/23/96CL DC/BL 05-30-03BL

LPD engineering pllc

APPENDIX E

Source Control

Giaudrone Middle School Field and Track Conversion
Source Control Selection Worksheet

BMP	Property/Site Type or Activity Type	Potential Pollutant(s) Associated with Activity or Pollutant that BMP is being used for.
BMP S100: Correcting Illicit Discharges to the Stormwater System	All commercial and industrial sites.	Wastewater, process water.
BMP S101: Labeling Stormwater Inlet	All commercial and industrial sites.	Wastes from dumping.
BMP S102: Formation of a Pollution Prevention team	All commercial and industrial sites.	
BMP S103: Preventative Maintenance/Good Housekeeping	All commercial and industrial sites.	
BMP S104: Spill Prevention and Cleanup	All commercial and industrial sites.	Leaks and spills of liquid and solid waste.
BMP S105: Employee Training	All commercial and industrial sites.	
BMP S106: Inspections	All commercial and industrial sites.	
BMP S107: Record Keeping	All commercial and industrial sites.	
S139: Stormwater System Maintenance	All properties with stormwater systems.	Excess sediment, oils, hydrocarbons and sediment
BMP S142: Soil Erosion and Sediment Control at Commercial and Industrial Sites	Properties whose operations may cause erosion.	Soil
BMP S143: Landscaping and Lawn/Vegetation Management	Properties and areas in the ROW that have landscaping and/or lawn areas.	Toxic organic compounds, heavy metals, oils, total suspended solids, coliform bacteria, fertilizers, and pesticides.

1.1 BMP S100: Correcting Illicit Discharges to the Stormwater System

1.1.1 Applicability

This BMP applies to all properties. Illicit discharges are unpermitted wastewater or process wastewater discharges to the stormwater system or to surface water, rather than to a wastewater system, industrial process wastewater processing area, or other appropriate treatment. They can also include swimming pool water, filter backwash, cleaning solutions/washwaters, cooling water, etc. Experience has shown that illicit discharges are common, particularly in older buildings.

1.1.2 Required BMPs

- For all real properties, responsible parties must examine their plumbing systems to identify any potential illicit discharges. Review site plans, engineering drawings, or other sources of information for the plumbing systems on the property.
- If an illicit discharge is suspected, trace the source using an appropriate method such as visual reconnaissance, smoke test, flow test, dye test with a nontoxic dye, or closed circuit television (CCTV) inspection. These tests are to be performed by qualified personnel such as a plumbing contractor.

Note: Contact City of Tacoma Environmental Compliance at (253) 502-2222 and the Washington State Department of Ecology prior to performing a dye test which may result in a discharge to a receiving water.

- If illicit connections are found, permanently plug or disconnect the connections.
- Eliminate prohibited discharges to the stormwater system, groundwater, or surface water.
- Convey illicit discharges to the wastewater system if allowed by the City of Tacoma.
- Obtain all necessary permits for altering or repairing side sewers and plumbing fixtures. Restrictions on certain types of discharges, particularly industrial process waters, may require pretreatment of discharges before they enter the wastewater system. It is the responsibility of the property owner or business operator to obtain the necessary permits and to replace the connection. Visit tacomapermits.org for information on the types of connection permits that may be required. Certain discharges may require Special Approved Discharge (SAD) permits - see https://www.cityoftacoma.org/government/city_departments/environmentalservices/wastewater/wastewater_permits_and_manuals

1.1.3 Recommended Additional BMPs

At commercial and industrial facilities, conduct a survey of wastewater discharge connections to the stormwater system and to surface water as follows:

- Conduct a field survey of buildings, particularly older buildings, and other industrial areas to locate stormwater inlets that receive stormwater from buildings and paved surfaces. Note where these discharge.
- During non-stormwater conditions, inspect each stormwater inlet for non-stormwater discharges. Record the locations of all non-stormwater discharges. Include all permitted discharges.
- If useful, prepare a map of each area. Show on the map the known location of the stormwater system, wastewater system, and permitted and unpermitted discharges. Aerial photos may be useful. Check records such as piping schematics to identify known

side sewer connections and show these on the map. Consider using smoke, dye, or chemical analysis tests to detect connections between two conveyance systems (e.g., process water and stormwater). If desirable, conduct TV inspections of the stormwater system and record the footage on videotape.

- Compare the observed locations of connections with the information on the map and revise the map accordingly. Note suspect connections that are inconsistent with the field survey.
- Identify all illicit connections to the stormwater system or to surface water and take the actions specified above as applicable

1.2 BMP S101: Labeling Stormwater Inlets

1.2.1 Applicability

This BMP applies to all properties that have stormwater inlets such as catch basins. This BMP also applies to stormwater inlets in the ROW. Waste materials dumped into stormwater inlets can have severe impacts on receiving waters. Posting notices regarding discharge prohibitions at stormwater inlets can prevent waste dumping. Stormwater inlet signs and stencils are highly visible source control BMPs that are typically placed directly adjacent to stormwater inlets.

1.2.2 Required BMPs

- Label all stormwater inlets to help prevent the improper disposal of pollutants.
  - Stormwater inlets at new development and redevelopment project sites shall be fully marked before final construction permit closeout.
  - Existing stormwater inlets that are not marked shall be marked as time allows and weather permits.
- Apply stormwater inlet markers adjacent to inlets where possible. If adherence of marker is not possible, stamp stormwater inlet grate or provide an alternate means of labeling.
  - Stormwater inlet markers shall be obtained from the City of Tacoma. Contact the project Site Plan Reviewer or stormandsewer@cityoftacoma.org.
- Apply stormwater inlet markers in weather appropriate for the adhesive to fully adhere.
- Place the marker in clear sight facing toward anyone approaching the inlet from either side.
- Use a brief statement and / or graphical icons to discourage illegal dumping. City provided stormwater inlet markers include these messages and graphical icons. Examples include:
  - “No Dumping - Drains to Stream"
  - “No Pollutants - Drains to Puget Sound"
  - “Dump No Waste - Drains to Lake"
  - “No Dumping - Puget Sound Starts Here"
- Replace inlet markers when they are no longer legible. Signage on top of curbs tends to weather and fade. Signage on face of curbs tends to be worn by contact with vehicle tires and sweeper brooms.
- When installing markers, temporarily block the stormwater inlet so that no pollutants are discharged from the labeling activities.

1.2.3 Recommended Additional BMPs

- Use a stormwater inlet marker and stamped grate to increase visibility of the message.
- Additionally label stormwater inlets with individual identifiers to assist in inspection and operation and maintenance activities.

1.3 BMP S102: Formation of a Pollution Prevention Team

1.3.1 Applicability

This BMP applies to commercial (including multi-family properties such as apartment buildings) and industrial properties and/or companies that manage those properties whether located onsite on a regular basis or not.

1.3.2 Required BMPs

The pollution prevention team should be responsible for implementing and maintaining all BMPs and treatment for the site. This team should be able to address any corrective actions needed on site to mitigate potential stormwater contamination. The team members should:

- Consist of those people who are familiar with the facility and its operations.
- Possess the knowledge and skills to assess conditions and activities that could impact stormwater quality at your facility, and who can evaluate the effectiveness of control measures.
- Assign pollution prevention team staff to be on duty on a daily basis to cover applicable facilities when those facilities are in operation.
- Have the primary responsibility for developing and overseeing facility activities necessary to comply with stormwater requirements.
- Have access to all applicable permit, monitoring, SWPPP, and other records.
- Be trained in the operation, maintenance and inspections of all BMPs and reporting procedures.
- Establish responsibilities for inspections, operation, maintenance, and emergencies.
- Regularly meet to review overall facility operations and BMP effectiveness.

1.4 BMP S103: Preventive Maintenance / Good Housekeeping

1.4.1 Applicability

This BMP applies to properties and activities in the ROW. Preventative maintenance and good housekeeping practices reduce the potential for stormwater to come into contact with pollutants and can reduce maintenance intervals for the stormwater and wastewater system.

1.4.2 Required BMPs

- Prevent the discharge of unpermitted liquid or solid wastes, process wastewater, and sewage to ground or surface water, or to the stormwater system that discharges to surface water, or to the ground. Conduct all oily parts cleaning, steam cleaning, or pressure washing of equipment or containers inside a building, or on an impervious contained area, such as a concrete pad. Direct contaminated stormwater from such an area to the wastewater system, or to other approved treatment. Pretreatment may be required, see https://www.cityoftacoma.org/government/city_departments/environmentalservices/wastewater/wastewater_permits_and_manuals for additional information.
- Promptly contain and clean up solid and liquid pollutant leaks and spills including oils, solvents, fuels, and dust from manufacturing operations on an exposed soil, vegetation, or paved area.
- If a contaminated surface must be pressure washed, collect the resulting washwater for proper disposal (usually involves plugging stormwater inlets, or otherwise preventing discharge and pumping or vactoring up washwater, for discharge to wastewater system or for vactor truck transport to a wastewater treatment plant for disposal).
- Do not hose down pollutants from any area to the ground, into the stormwater system, or into receiving waters. Convey pollutants before discharge to a treatment system approved by the local jurisdiction.
- Sweep all appropriate surfaces with vacuum sweepers quarterly, or more frequently as needed, for the collection and disposal of dust and debris that could contaminate stormwater. Use mechanical sweepers, and manual sweeping as necessary to access areas that a vacuum sweeper can't reach to ensure that all surface contaminants are routinely removed.
- Do not pave over contaminated soil unless it has been determined that groundwater has not been and will not be contaminated by the soil. Call Ecology for assistance.
- Construct impervious areas that are compatible with the materials handled. Portland cement concrete, asphalt, or equivalent material may be considered.
- Use drip pans to collect leaks and spills from industrial/commercial equipment such as cranes at ship/boat building and repair facilities, log stackers, industrial parts, trucks and other vehicles stored outside.
- At industrial and commercial facilities, drain oil and fuel filters before disposal. Discard empty oil and fuel filters, oily rags, and other oily solid waste into appropriately closed and properly labeled containers, and in compliance with the Uniform Fire Code or International Building Code.
- For the storage of liquids, use containers, such as steel and plastic drums, that are rigid and durable, corrosion resistant to the weather and fluid content, non-absorbent, water tight, rodent-proof, and equipped with a close fitting cover.

- For the temporary storage of solid wastes contaminated with liquids or other potential polluted materials, use dumpsters, garbage cans, drums, and comparable containers, which are durable, corrosion resistant, non-absorbent, non-leaking, and equipped with either a solid cover or screen cover to prevent littering. If covered with a screen, the container must be stored under a roof or other form of adequate cover.
- Where exposed to stormwater, use containers, piping, tubing, pumps, fittings, and valves that are appropriate for their intended use and for the contained liquid.
- Clean oils, debris, sludge, etc. from all stormwater facilities regularly, including catch basins, settling/detention basins, oil/water separators, boomed areas, and conveyance systems to prevent the contamination of stormwater. Contact the Washington State Department of Ecology's Hazardous Waste and Toxics Reduction Program for information on how handle potentially dangerous waste.
- Promptly repair or replace all substantially cracked or otherwise damaged paved secondary containment, high-intensity parking, and any other areas subject to stormwater and surface water, subjected to pollutant material leaks or spills. Promptly repair or replace all leaking connections, pipes, hoses, valves, etc., which can contaminate stormwater.
- Do not connect floor drains in potential pollutant source areas to the stormwater system, surface water, or to the ground.

1.4.3 Recommended Additional BMPs

- Where feasible, store potential stormwater pollutant materials inside a building or under a cover and/or containment.
- Minimize use of toxic cleaning solvents, such as chlorinated solvents, and other toxic chemicals.
- Use environmentally safe raw materials, products, additives, etc. such as substitutes for zinc used in rubber production.
- Recycle waste materials such as solvents, coolants, oils, degreasers, and batteries to the maximum extent feasible. Contact Ecology's Hazardous Waste & Toxics Reduction Program at https://ecology.wa.gov/About-us/Get-to-know-us/Our-Programs/Hazardous-Waste-Toxics-Reduction for recommendations on recycling or disposal of vehicle waste liquids and other waste materials.
- In uncovered areas, empty drip pans immediately after a spill or leak is collected.
- Use solid absorbents, e.g., clay and peat absorbents and rags for cleanup of liquid spills/ leaks, where practicable.
- Promptly repair/replace/reseal damaged paved areas at industrial facilities.
- Recycle materials, such as oils, solvents, and wood waste, to the maximum extent practicable.

Note: Evidence of stormwater contamination by oils and grease can include the presence of visible sheen, color, or turbidity in the runoff, or present or historical operational problems at the facility. Operators can use simple pH tests, for example with litmus or pH paper. These tests can screen for high or low pH levels (anything outside a 6.5-8.5 range) due to contamination in stormwater.

1.5 BMP S104: Spill Prevention and Cleanup

1.5.1 Applicability

This BMP applies to all spills and leaks that may happen on any parcel and in the ROW. Spills and leaks can damage public infrastructure, interfere with sewage treatment, and cause a threat to human health or the environment. Spills are often preventable if appropriate chemical and waste handling techniques are practiced effectively and the spill response plan is immediately implemented. Additional spill control requirements may be required based on the specific activity occurring on site.

1.5.2 Required BMPs

Spill Prevention

- Clearly label or mark all containers that contain potential pollutants.
- Store and transport liquid materials in appropriate containers with tight-fitting lids.
- Place drip pans underneath all containers, fittings, valves, and where materials are likely to spill or leak. Empty spill pans immediately after material is collected.
- Use tarpaulins, ground cloths, or drip pans in areas where materials are mixed, carried, and applied to capture any spilled materials.
- Train employees on the safe techniques for handling materials used on the site and to check for leaks and spills.

Spill Plan

See www.cityoftacoma.org/stormwatermanual_templates for a template that can be used.

- Develop and implement a spill plan and update it annually or whenever there is a change in activities or staff responsible for spill cleanup. Post a written summary of the plan at areas with a high potential for spills, such as loading docks, product storage areas, waste storage areas, and near a phone. The spill plan may need to be posted at multiple locations.
- Describe the facility, including the owner's name, address, and telephone number; the nature of the facility activity; and the general types of chemicals and oils used at the facility.
- Designate spill response employees to be on-site during business activities. Provide a current list of the names and telephone numbers (home and office) of designated spill response employees who are responsible for implementing the spill plan.
- Provide a site plan showing the locations of storage areas for chemicals and oils, inlets/ catch basins, spill kits and other relevant infrastructure or materials information.
- Describe the emergency cleanup and disposal procedures. Note the location of all spill kits in the spill plan.
- List the names and telephone numbers of public agencies to contact in the event of a spill.
- Train key personnel in the implementation of the Spill Plan.

Spill Cleanup Kits

- Store all cleanup kits near areas with a high potential for spills so that they are easily accessible in the event of a spill. The contents of the spill kit must be appropriate to the

types and quantities of materials stored or otherwise used at the facility, and refilled when the materials are used. Spill kits must be located within 25 feet of all fueling/fuel transfer areas, including onboard mobile fuel trucks.

Note: Ecology recommends that the kit(s) include salvage drums or containers, such as high density polyethylene, polypropylene or polyethylene sheet-lined steel; polyethylene or equivalent disposal bags; an emergency response guidebook; safety gloves/clothes/equipment; shovels or other soil removal equipment; and oil containment booms and absorbent pads; all stored in an impervious. container.

Spill Cleanup and Proper Disposal of Waste

- Stop, contain, and clean up all spills immediately upon discovery.
- Implement the spill plan immediately.
- Contact the designated spill response employees.
- Block off and seal nearby inlets/catch basins to prevent materials from entering the stormwater system.
- Use the appropriate material to clean up the spill.
- Do not use emulsifiers or dispersants such as liquid detergents or degreasers unless disposed of properly. Emulsifiers and dispersants are not allowed to be used on surface water, or in a place where they may enter the stormwater system, surface waters, treatments systems, or the wastewater system.
- Immediately notify Ecology (https://ecology.wa.gov/Regulations-Permits/Reporting-requirements/Spills-If-you-spill) and the City of Tacoma at 311 if a spill has reached or may reach the wastewater or stormwater system, groundwater, or surface water. Notification must comply with state and federal spill reporting requirements.
- Do not wash absorbent material into interior floor drains or stormwater system inlets/ catch basins.
- Place used spill control materials in appropriate containers and dispose of according to regulations.

1.6 BMP S105: Employee Training

1.6.1 Applicability

This BMP applies to commercial (including multi-family properties such as apartment buildings) and industrial properties and/or companies that manage those properties whether located onsite on a regular basis or not.

1.6.2 Required BMPs

Train all employees that work in pollutant source areas about the following topics:

- Identifying Pollution Prevention Team Members.
- Identifying pollutant sources.
- Understanding pollutant control measures.
- Spill prevention and response.
- Emergency response procedures.
- Handling practices that are environmentally acceptable. Particularly those related to vehicle/equipment liquids such as fuels, and vehicle/equipment cleaning.

Additional specialized training may be needed for staff who will be responsible for handling hazardous materials.

1.7 BMP S106: Inspections

1.7.1 Applicability

This BMP applies to commercial (including multi-family properties such as apartment buildings) and industrial properties and/or companies that manage those properties whether located onsite on a regular basis or not. It is recommended that all other properties inspect their property at least monthly to asses and remedy potential sources of stormwater pollution.

1.7.2 Required BMPs

Qualified personnel shall conduct inspections monthly. Make and maintain a record of each inspection on-site. Inspections shall:

- Be conducted by someone familiar with the facility's site, operations, and BMPs.
- Verify the accuracy of the pollutant source descriptions in the SWPPP.
- Assess all BMPs that have been implemented for effectiveness and needed maintenance and locate areas where additional BMPs are needed.
- Reflect current conditions on the site.
- Include written observations of the presence of floating materials, suspended solids, oil and grease, discoloration, turbidity and odor in the stormwater discharges. In areas where acid or alkaline materials are handled or stored use a simple litmus or pH paper to identify those types of stormwater contaminants where needed.
- Eliminate or obtain a permit for unpermitted non-stormwater discharges to the stormwater system or receiving waters, such as process wastewater and vehicle/equipment washwater.
- Identify actions to address inspection deficiencies.

1.8 BMP S107: Record Keeping

1.8.1 Applicability

This BMP applies to commercial (including multi-family properties such as apartment buildings) and industrial properties and/or companies that manage those properties whether located onsite on a regular basis or not. It is recommended that all other properties keep records (such as inspection records) which may be useful in identifying any issues that might arise.

1.8.2 Required BMPs

See the applicable permit for specific record-keeping requirements and retention schedules for the following reports. At a minimum, retain the following reports for five years:

- Inspection reports which should include:
  - Time and date of the inspection
  - Locations inspected
  - Statement on status of compliance with the permit
  - Summary report of any remediation activities required
  - Name, title, and signature of person conducting the inspection
- Reports on spills of oil or hazardous substances in greater than Reportable Quantities (Code of Federal Regulations Title 40 Parts 302.4 and 117). Report spills of the following: antifreeze, oil, gasoline, or diesel fuel, that cause:
  - A violation of the State of Washington's Water Quality Standards.
  - A film or sheen upon or discoloration of the waters of the State or adjoining shorelines.
  - A sludge or emulsion to be deposited beneath the surface of the water or upon adjoining shorelines.

To report a spill or to determine if a spill is a substance of a Reportable Quantity, call the Washington State Department of Ecology at (360) 407-6300

In addition, call the Washington Emergency Management Division at 1-800-258-5990 or 1- 800-OILS-911 AND the National Response Center at 1-800-424-8802.

Also, refer to Focus on Emergency Spill Response (Ecology, 2009).

1.8.3 Recommended Additional BMPs

Maintain records of all related pollutant control and pollutant generating activities such as training, materials purchased, material use and disposal, maintenance performed, etc.

2.6.6 BMP S139: Stormwater System Maintenance

2.6.6.1 Applicability

This BMP applies to all properties and ROW that have stormwater systems. Components of the stormwater system include gutters, downspouts, catch basins, stormwater pipes, onsite stormwater management BMPs, stormwater treatment BMPs, and flow control BMPs. Contaminants such as excess sediment, oils, hydrocarbons and sediment can be found in parts of the stormwater system.

2.6.6.2 Required BMPs

- Properly maintain all portions of the stormwater system.
- Conduct maintenance activities in a way that does not negatively affect the downstream stormwater system. Utilize Temporary Erosion and Sediment Control BMPs as necessary.
- Maintain Onsite Stormwater Management BMPs, Stormwater Treatment BMPs, and Flow Control BMPs per the onsite Operation and Maintenance Manual. If an O&M Manual does not exist, create one per the operation and maintenance procedures in Volume 4.
- Inspect and clean treatment BMPs, conveyance systems, and catch basins as needed, and determine necessary O&M improvements.
- Promptly repair any deterioration threatening the structural integrity of stormwater facilities. These include replacement of clean-out gates, catch basin lids, and rock in emergency spillways.
- Regularly remove debris and sludge from BMPs and properly dispose per BMP S162: Well, Utility, Directional and Geotechnical Drilling.
- Clean catch basins when the depth of deposits reaches 60 percent of the sump depth as measured from the bottom of basin to the invert of the lowest pipe into or out of the basin. However, in no case should there be less than six inches clearance from the debris surface to the invert of the lowest pipe. Some catch basins (for example, WSDOT's Catch Basin Type 1L (WSDOT, 2011)) may have as little as 12 inches sediment storage below the invert. These catch basins need frequent inspection and cleaning to prevent scouring. Where these catch basins are part of a stormwater collection and treatment system, the system owner/operator may choose to concentrate maintenance efforts on downstream control devices as part of a systems approach.
- Properly dispose of all solids, polluted material, and stagnant water collected through system cleaning. Do not decant water back into the stormwater system from eductor trucks or vacuum equipment since there may be residual contaminants in the cleaning equipment. Do not jet material downstream into the public stormwater system.
- Remove woody debris from the catch basin as frequently as needed to ensure proper operation of the catch basin.
- Post warning signs; "Dump No Waste - Drains to Groundwater," "Streams," "Lakes," or emboss on or adjacent to all stormwater system inlets where possible.
- Dispose of sediment and liquids from catch basins at a decant facility. Disposal shall also comply with the Washington State Department of Ecology Stormwater Management Manual for Western Washington - Appendix IV-B: Management of Street Waste Solids and Liquids.

2.7.3 BMP S142: Soil Erosion and Sediment Control at Commercial and Industrial Sites

2.7.3.1 Applicability

This BMP applies to properties whose operations may cause erosion. Industrial activities on soil areas, exposed and disturbed soils, steep grades, etc. can be sources of sediments that can contaminate stormwater.

2.7.3.2 Required BMPs

- Limit the exposure of erodible soil.
- Stabilize entrances/exits to prevent track-out.
- Stabilize or cover erodible soil to prevent erosion. Cover practice options include:
  - Use vegetative cover such as grass, trees, shrubs, or erodible soil areas.
  - Cover exposed areas with mats such as clear plastic, jute, or synthetic fiber. See BMP C122: Nets and Blankets and BMP C123: Plastic Covering.
  - Preserve natural vegetation including grass, trees, shrubs, and vines when possible. See BMP C101: Preserving Natural Vegetation.
- If stabilizing or covering the erodible soil is not possible, then structural controls must be implemented which might include:
  - Vegetated swales
  - BMP C200: Interceptor Dike and Swale
  - BMP C233: Silt Fence
  - BMP C207: Check Dams
  - BMP C232: Gravel Filter Berm
  - Sedimentation Basin
  - Proper Grading
  - Paving

2.8 Vegetation Maintenance

2.8.1 BMP S143: Landscaping and Lawn/Vegetation Management

2.8.1.1 Applicability

This BMP applies to all properties and areas of the ROW that have landscaping and/or lawn areas. Landscaping can include grading, soil transfer, vegetation removal, pesticide and fertilizer application, and watering. Stormwater contaminants include toxic organic compounds, heavy metals, oils, total suspended solids, coliform bacteria, fertilizers, and pesticides.

Lawn and vegetation management can include control of objectionable weeds, insects, mold, bacteria, and other pests with chemical pesticides and is conducted commercially at commercial, industrial, and residential sites. Examples include weed control on golf course lawns, access roads, and utility corridors and during landscaping; sap stain and insect control on lumber and logs; rooftop moss removal; killing nuisance rodents; fungicide application to patio decks; and residential lawn/plant care. Toxic pesticides such as pentachlorophenol, carbamates, and organometallics can be released to the environment by leaching and dripping from treated parts, container leaks, product misuse, and outside storage of pesticide contaminated materials and equipment. Poor management of the vegetation, poor application of pesticides or fertilizers, and non-targeted irrigation water or overwatering can cause appreciable stormwater contamination.

2.8.1.2 Required BMPs

- Install engineered soil/landscape systems to improve the infiltration and regulation of stormwater in landscaped areas. Apply BMP L613: Post-Construction Soil Quality and Depth BMPs as required per Minimum Requirement #5: Onsite Stormwater Management.
- Do not dispose of collected vegetation into wetlands, waterways or the stormwater system.
- Select the right plants for the planting location based on proposed use, available maintenance, soil conditions, sun exposure, water availability, height, site factors, and space available.
- Ensure that plants selected for planting are not on the noxious weed list. The Washington State Noxious Weed List can be found at: https://www.nwcb.wa.gov/printable-noxious-weed-list
- Do not blow vegetation or other debris into the stormwater system.
- Dispose of collected vegetation such as grass clippings, leaves, and sticks by composting or recycling.
- Use manual and/or mechanical methods of vegetation removal (pincer-type weeding tools, flame weeders, or hot water weeders as appropriate) rather than applying herbicides, where practical.
- Use at least an 8" topsoil layer with at least 8% organic matter to provide a sufficient vegetation-growing medium.
    - Organic material is at the least water-soluble form of nutrients that can be added to the soil. Composted organic matter generally releases only between 2 and 10 percent of its total nitrogen annually, and this release corresponds closely to the plant

growth cycle. Return natural plant debris and mulch to the soil, to continue recycling nutrients indefinitely.

- Select the appropriate turfgrass mixture for the climate and soil type.
  - Certain tall fescues and rye grasses resist insect attack because the symbiotic endophytic fungi found naturally in their tissues repel or kill common leaf and stem-eating lawn insects.
    - The fungus causes no known adverse effects to the host plant or to humans.
    - Tall fescues and rye grasses do not repel root-feeding lawn pests such as Crane Fly larvae.
    - Tall fescues and rye grasses are toxic to ruminants such as cattle and sheep.
  - Endophytic grasses are commercially available; use them in areas such as parks or golf courses where grazing does not occur.
  - Local agricultural or gardening resources such as the Washington State University Extension office can offer advice on which types of grass are best suited to the area and soil type.
- Use the following seeding and planting BMPs, or equivalent BMPs, to obtain information on grass mixtures, temporary and permanent seeding procedures, maintenance of a recently planted area, and fertilizer application rates: BMP C120: Temporary and Permanent Seeding, BMP C121: Mulching, BMP C123: Plastic Covering, and BMP C124: Sodding.
- Adjusting the soil properties of the subject site can assist in selection of desired plant species. Consult a soil restoration specialist for site-specific conditions.

2.8.1.3 Recommended Additional BMPs

- Conduct mulch-mowing whenever practicable.
- Use native plants in landscaping. Native plants do not require extensive fertilizer or pesticide applications. Native plants may also require less water.
- Till a topsoil mix or composted organic material into the soil to create a well-mixed transition layer that encourages deeper root systems and drought-resistant plants.
- Apply an annual topdressing application of 3/8" compost. Amending existing landscapes and turf systems by increasing the percent organic matter and depth of topsoil can:
  - Substantially improve the permeability of the soil.
  - Increase the disease and drought resistance of the vegetation.
  - Reduce the demand for fertilizers and pesticides.
- Disinfect gardening tools after pruning diseased plants to prevent the spread of disease.
- Prune trees and shrubs in a manner appropriate for each species.
- If specific plants have a high mortality rate, assess the cause and replace with another more appropriate species.

- When working around and below mature trees, follow the most current American National Standards Institute (ANSI) ANSI A300 standards and Internationl Society of Arboriculture BMPs to the extent practicable.
- Monitor tree support systems (stakes, guys, etc.).
  - Repair and adjust as needed to provide support and prevent tree damage.
  - Remove tree supports after one growing season or maximum of 1 year.
  - Backfill stake holes after removal.
- When continued, regular pruning (more than one time during the growing season) is required to maintain visual sight lines for safety or clearance along a walk or dive, consider relocating the plant to a more appropriate location.
- Make reasonable attempts to remove and dispose of Class C noxious weeds.
- Reseed bare turf areas until the vegetation fully covers the ground surface.
- Watch for and respond to new occurrences of especially aggressive weeds such as Himalayan blackberry, Japanese knotweed, morning glory, English ivy, and red canary grass to avoid invasion.
- Plant and protect trees.
- Aerate lawns regularly in areas of heavy use where the soil tends to become compacted. Conduct aeration while the grasses in the lawn are growing most vigorously. Remove layers of thatch greater than ¾" deep.
- Set the mowing height at the highest acceptable level and mow at times and intervals designed to minimize stress on the turf. Generally mowing only 1/3 of the grass blade height will prevent stressing turf.
  - Mowing is a stress-creating activity for turfgrass.
  - Grass decreases its productivity when mowed too short and there is less growth of roots and rhizomes. The turf becomes less tolerant of environmental stresses, more disease prone and more reliant on outside means such as pesticides, fertilizers, and irrigation.

LPD engineering pllc

APPENDIX F

Geotechnical Report

Geotechnical Engineering Services Report

Giaudrone Middle School Playfield Improvements
Tacoma, Washington

for
Korsmo Construction

February 28, 2022

GeoEngineers
Earth Science + Technology

Geotechnical Engineering Services Report

Giaudrone Middle School Playfield Improvements
Tacoma, Washington

for
Korsmo Construction

February 28, 2022

GeoEngineers

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Geotechnical Engineering Services Report

Giaudrone Middle School Playfield Improvements
Tacoma, Washington

File No. 0522-036-00

February 28, 2022

Prepared for:

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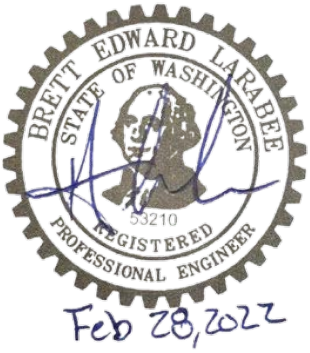

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1.0 INTRODUCTION AND PROJECT UNDERSTANDING

GeoEngineers, Inc. (GeoEngineers) is pleased to present this geotechnical engineering services report for the Giaudrone Middle School Field Improvements project. The project site is located at 4902 South Alaska Street in Tacoma, Washington. A vicinity map is provided as Figure 1. Our understanding of the project is based on information provided in the "Geotechnical Investigation Scope" document prepared by DA Hogan dated September 14, 2021 and our conversations with the project team.

The project consists of improvements to the existing natural turf playfield and surrounding track at Giaudrone Middle School. Proposed improvements include new synthetic turf playfields, site grading (grade changes of up to 5 feet are envisioned), stormwater infiltration facilities, field lighting poles (up to 80 feet tall), ball control fencing (up to 30 feet tall) and other access, landscaping and hardscaping improvements. Stormwater facilities at the site, if included, will be designed in accordance with the *2021 City of Tacoma Stormwater Management Manual* (SWMM).

2.0 PURPOSE AND SCOPE OF SERVICES

The purpose of our services is to complete subsurface explorations at the site as a basis for providing geotechnical design and construction recommendations for the project. Our services have been provided in accordance with our signed Task Order executed on January 10, 2022. Our specific scope of services is summarized in our proposal dated December 6, 2021.

GeoEngineers is also providing Environmental Services for the project as the project site is located within the mapped footprint of the Tacoma Smelter Plume (TSP). The results of our environmental services are being provided in a separate deliverable.

3.0 SITE CONDITIONS

3.1. Surface Conditions

Giaudrone Middle School (GMS) is located in a residential neighborhood of South Tacoma. The GMS campus is generally bound by South 49th Street to the north, South Alaska Street to the east, single family homes to the south and an undeveloped slope that leads down to Interstate 5 to the west. The playfield area is located south of the GMS building. The playfield consists of an oval shaped natural turf playfield surrounded by a dirt/gravel surfaced track. A baseball/softball field is located to the northwest of the playfield area however we understand that improvements to the baseball/softball field are not currently envisioned.

The playfield area is bordered by a chain link fence on the east, south sides, a concrete wall on the west side and by concrete hardscaping that includes concrete steps and stadium style seating to the north. The playfield area is relatively flat however grade changes are present on all sides of the playfield. The playfield area is about 10 feet lower than the GMS building; this grade change is accommodated by the concrete hardscaping mentioned previously. The playfield is about 4 to 6 feet higher than South Alaska Street (to the east) and the bordering residential properties to the south. These grade changes are accommodated by grass and landscape slopes that are on the order of 2 Horizontal to 1 Vertical (2H:1V).

The slope on the west side of the playfield is relatively steep (on the order of 1H:1V) and is around 40 feet tall. This slope is vegetated with grass, scotch broom and blackberry bushes.

3.2. Site History

Based on our review of historic aerial photos, the existing playfield was constructed around 2002 as part of constructing the current GMS. The current playfield area was originally developed as a playfield for the old Giaudrone School. As part of the 2002 construction, the playfield area was regraded and expanded to the west. We did not review grading plans associated with this construction; however, based on aerial photos it appears that the grading consisted of cutting on the east side of the playfield and filling on the west side of the playfield and on the slope above Interstate 5. We expect that fill depths could have exceed 10 feet during this construction.

3.3. Subsurface Conditions

3.3.1. Literature Review

Based on review of the *Geologic Map of the Tacoma 1:100,000 Quadrangle* (2015), the project site is underlain by Vashon Glacial Till (Qgt) deposits. Glacial till soils are typically comprised of a mixture of sand gravel and cobbles in a silty matrix. Glacial till deposits can also contain boulders. Glacial till deposits were deposited below the base of advancing and retreating glaciers and are highly over-consolidated. Glacial till deposits are typically dense to very dense; however, the upper few feet of the deposit can be weathered and relatively less dense than the underlying intact glacial till. Glacial till is typically defined as an NRCS Hydraulic Group C or D soil.

Also mapped in the project vicinity are recessional outwash deposits (Qgo). Recessional outwash deposits consist primarily of silt, clay, sand and gravel that was deposited by glacial meltwater. These deposits were not consolidated by the source glaciers after deposition and therefore are typically less dense or compact than glacial till or other glacially consolidated soils. Recessional outwash is typically defined as an NRCS Hydraulic Group A or B soil.

We reviewed the *Hydrogeologic Framework, Groundwater Movement, and Water Budget in the Chambers-Clover Creek Watershed and Vicinity Report* (U.S. Geological Survey Report 2012-5055). According to the report, which provides a summary of average aquifer elevations in the Tacoma area, static groundwater depths at the site are expected to be more than about 150 feet below existing site grades.

3.3.2. Subsurface Explorations and Laboratory Testing

GeoEngineers explored subsurface conditions at the site by advancing six borings at the approximate locations shown on the Site Plan, Figure 2. Summary explorations logs and the results of laboratory testing completed on select soil samples are provided in Appendix A. Borings extended as deep as about 26.5 feet below ground surface (bgs). Additional details regarding our subsurface exploration and laboratory testing program are provided in Appendix A.

3.3.3. Soil and Groundwater Conditions

Our borings were advanced in areas surfaced with sod. Sod thickness was typically on the order of 2 inches in our explorations. Below the sod in our explorations, we observed what we interpret to be three general soils units, fill, recessional outwash and glacial till.

Fill was observed in our borings starting below the sod and extended to between about 3.5 and 10 feet below ground surface. Fill was typically thickest in the borings on the western side of the site where we expect fill was placed as part of construction of the current playfield. Fill also extended to around 10 feet bgs in B-6 (southeast corner of the site) which we expect is associated with grading or filling more localized to that area. Observed fill soils typically consisted of loose to medium dense sand with silt and silty sand with variable gravel content. Occasional organic matter was observed within some of the fill soils.

Below the fill we observed recessional outwash extended to around 11.5 and 21.5 feet bgs. Recessional outwash was observed at the boring termination depths in B-2, B-3, B-4, B-5 and B-6 (16.5 feet, 16.5 feet, 11.5 feet, 16.5 feet and 21.5 feet, respectively). We observed what we interpret to be glacial till below the recessional outwash in B-1 starting around 13 feet bgs. B-1 was terminated within the glacial till soils around 26.5 feet bgs. Observed recessional outwash soils consisted primarily of medium dense to dense silty sand with variable gravel content. Lenses of sand with silt were also observed within the recessional outwash. Observed glacial till typically consisted of dense to very dense silty sand with gravel.

We did not encounter what we interpret to be the regional groundwater table in our explorations. Literature reviewed indicates, and we expect, that the regional groundwater is located more than 150 feet bgs in deeper underlying layers of glacial deposits. We observed what we interpret to be slow perched groundwater seepage in B-2 around 15 feet bgs and in B-6 around 10 feet bgs. We expect that areas of perched groundwater will be seasonal, isolated and discontinuous across the site.

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1. Primary Geotechnical Considerations

Based on our understanding of the project, the explorations performed for this study and our experience, it is our opinion that the proposed improvements can be designed and constructed generally as envisioned with regards to geotechnical considerations. A summary of key geotechnical considerations for the project is provided below and is followed by our detailed recommendations.

- We did not identify potentially liquefiable soils in our explorations and in our opinion the risk of liquefaction occurring at this site is low.
- Most of the soils observed in our borings contain a significant percentage of fines and could be difficult or impossible to work with when wet or become easily disturbed if exposed to wet weather. Depending on the intended use of the material and the prevailing conditions, it may be difficult to reuse these soils as structural fill.
- In our opinion, proposed improvements at the site can be satisfactorily supported using shallow foundations or drilled pier type foundations provided that the foundations are designed and constructed as recommended in this report.
- In our opinion, infiltration is feasible at this site, primarily within the recessional outwash soils however design infiltration rates for these soils may be relatively low and infiltration could be further reduced by the underlying glacial till soils. Additional field testing will be necessary to establish a design infiltration rate for stormwater infiltration facilities.

4.2. Seismic Design Considerations

4.2.1. Seismic Design Parameters

We understand that seismic design will be performed in accordance with 2018 IBC Standards. The following parameters provided in Table 1 should be used for design.

TABLE 1. SEISMIC DESIGN PARAMETERS

2018 IBC Seismic Design Parameters	
Spectral Response Acceleration at Short Periods (S_S)	1.346g
Spectral Response Acceleration at 1-Second Periods (S_1)	0.466g
Site Class	D
Site Modified Peak Ground Acceleration (PGA)	0.55g
Design Spectral Response Acceleration at Short Periods (SD_S)	0.9g
Design Spectral Response Acceleration at 1-Second Periods (SD_1)	0.57g

4.2.2. Liquefaction

Liquefaction refers to a condition where vibration or shaking of the ground, usually from earthquake forces, results in development of excess pore pressures and subsequent loss of strength in the affected soil deposit. In general, soils that are susceptible to liquefaction include loose to medium dense "clean" to silty sands below the water table.

We reviewed the *Liquefaction Susceptibility Map of Pierce County, Washington* (Palmer et al. 2004). According to the map, the potential for liquefaction at this site is very low. Based on the soil conditions observed in our explorations and our interpretation of the regional geology and groundwater table, it is also our opinion the potential for liquefaction at this site is low.

4.2.3. Lateral Spreading Potential

Lateral spreading related to seismic activity typically involves lateral displacement of large, surficial blocks of non-liquefied soil when a layer of underlying soil loses strength during seismic shaking. Lateral spreading usually develops in areas where sloping ground or large grade changes (including retaining walls) are present. Based on our understanding of the liquefaction risk at the site and the proposed improvements it is our opinion that the risk of lateral spreading is low.

4.2.4. Surface Rupture Potential

According to the Washington State Department of Natural Resources (DNR) Interactive Natural Hazards Map, the project site is in the vicinity of the Tacoma Fault zone. However, because bedrock in this area is covered by hundreds of feet of glacial soils, it is unlikely that movement of the fault would result in significant surface rupture at the ground surface. In our opinion the risk for surface fault rupture occurring at this site is low.

4.3. Site Development and Earthwork

We anticipate that site development and earthwork will include demolition of existing features, excavating for shallow foundations, utilities, and other improvements, establishing subgrades for structures and hardscaping, and placing and compacting fill and backfill materials. We expect that site grading and earthwork can be accomplished with conventional earthmoving equipment. The following sections provide specific recommendations for site development and earthwork.

4.3.1. Clearing, Stripping and Demolition

Clearing and stripping depths will likely be on the order of 2 to 3 inches in areas currently surfaced with sod or other landscaping. Greater stripping depths could be required within structural areas or areas of unsuitable soils, if observed during construction. Stripped grass and sod material must not be reused as fill.

While not encountered in our borings, in our experience cobbles and boulders can also be present in the recessional outwash and glacial till soils present at the site. Accordingly, the contractor should be prepared to remove boulders and cobbles, if encountered during grading or excavation. Boulders may be removed from the site or used in landscape areas. Voids caused by boulder removal should be backfilled with structural fill.

We recommend that existing pavements and hardscaping be completely removed from areas that will be developed. During removal of these features, disturbance of surficial soils may occur, especially if left exposed to wet conditions. Disturbed soils may require additional remediation during construction and grading. If utilities exist beneath planned structures, they should be removed and backfilled or abandoned in place.

We support the use of recycled flat work materials, where appropriate in location, material size, and placement techniques. Local jurisdictions may require additional chemical testing of these materials before use. We can review this as an option if this becomes a consideration for any demolition.

4.3.2. Erosion and Sedimentation Control

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 the project impact on erosion-prone areas. The plan should be designed in accordance with applicable city, county and/or state standards. The plan should incorporate basic planning principles, including:

- Scheduling grading and construction to reduce soil exposure;
- Re-vegetating or mulching denuded areas;
- Directing runoff away from exposed soils;
- Reducing the length and steepness of slopes with exposed soils;
- Decreasing runoff velocities;
- Preparing drainage ways and outlets to handle concentrated or increased runoff;
- Confining sediment to the project site;

- Inspecting and maintaining control measures frequently.

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.

Temporary erosion protection should be used and maintained in areas with exposed or disturbed soils to help reduce erosion and reduce transport of sediment to adjacent areas and receiving waters. Permanent erosion protection should be provided by paving, structure construction or landscape planting.

Until the 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.

4.3.3. Temporary Excavation

Excavations deeper than 4 feet must be shored or laid back at a stable slope if workers are required to enter. Shoring and temporary slope inclinations must conform to the provisions of Title 296 Washington Administrative Code (WAC), Part N, "Excavation, Trenching and Shoring." 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). The contract documents should 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.

In general, temporary cut slopes at this site should be inclined no steeper than about 1½H:1V (horizontal to vertical). This guideline assumes that all surface loads are kept at a minimum distance of at least one-half the depth of the cut away from the top of the slope and that seepage is not present on the slope face. Flatter cut slopes will be necessary where seepage occurs or if surcharge loads are anticipated. Temporary covering with heavy plastic sheeting should be used to protect slopes during periods of wet weather.

4.3.4. Permanent Slopes

If permanent slopes are necessary, we recommend they be constructed at a maximum inclination of 2H:1V. Where 2H:1V permanent slopes are not feasible, protective facings and/or retaining structures should be considered.

To achieve uniform compaction, we recommend that fill slopes be overbuilt slightly and subsequently cut back to expose well-compacted fill. Fill placement on slopes steeper than about 5H:1V should be benched into the slope face. The configuration of benches depends on the equipment being used. Bench excavations should be level and extend into the slope face.

Exposed areas should be re-vegetated as soon as practical to reduce the surface erosion and sloughing. Temporary protection should be used until permanent protection is established.

4.3.5. Groundwater Handling Considerations

Based on our understanding of the proposed site improvements, we do not anticipate that the regional groundwater table will be encountered in excavations at the site.

We encountered what we interpret to be perched groundwater around 15 feet bgs during drilling of B-2 and around 10 feet bgs during drilling of B-6. We recommend that the contractor performing the work be prepared to encounter perched groundwater seepage in excavations at the site. The interface between the fill material and native soils and contacts between relatively more permeable and relatively less permeable materials are likely locations for accumulation of perched groundwater. Groundwater seepage handling needs will typically be lower during the late summer and early fall months. We anticipate that shallow perched groundwater, if encountered, can be handled adequately with sumps, pumps and/or diversion ditches, as necessary. Ultimately, we recommend that the contractor performing the work be made responsible for controlling and collecting groundwater encountered.

4.3.6. Surface Drainage

Surface water from roofs, pavements and landscape areas should be collected and controlled. Curbs or other appropriate measures such as sloping pavements, sidewalks and landscape areas should be used to direct surface flow away from buildings, erosion sensitive areas and from behind retaining structures. Roof and catchment drains should not be connected to wall or foundation drains.

4.3.7. Subgrade Preparation

Subgrades that will support slab-on-grade floors, pavements, and other site features bearing on final grade should be thoroughly compacted to a uniformly firm and unyielding condition on completion of stripping/excavation and before placing structural fill. We recommend that subgrades for structures, pavements and other bearing surfaces be evaluated, as appropriate, 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 that: (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.

4.3.8. Subgrade Protection and Wet Weather Considerations

The wet weather season generally begins in October and continues through May in Western Washington; however, periods of wet weather can occur during any month of the year. The soils encountered in our explorations contain a significant amount of fines. Soil with high fines content is very sensitive to small changes in moisture and is susceptible to disturbance from construction traffic when wet or if earthwork is performed during wet weather. If wet weather earthwork is unavoidable, we recommend that the following steps be taken.

- 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.
- Earthwork activities should not take place during periods of heavy precipitation.
- Slopes with exposed soils should be covered with plastic sheeting.

- The contractor should take necessary measures to prevent on-site soils and other soils to be used as fill from becoming wet or unstable. These measures may include the use of plastic sheeting and controlling surface water with ditches, sumps with pumps and by grading. The site soils should not be left uncompacted and exposed to moisture. Sealing the exposed soils by rolling with a smooth-drum roller prior to periods of precipitation will help 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 working pad 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.
- During periods of wet weather, concrete should be placed as soon as practical after preparation of the footing excavations. Foundation bearing surfaces should not be exposed to standing water. If water pools in the base of the excavation, it should be removed before placing structural fill or reinforcing steel.
- If footing excavations are exposed to extended wet weather conditions, a lean concrete mat or a layer of clean crushed rock can be considered for foundation bearing surface protection.

4.4. Fill Materials

4.4.1. Structural Fill

The workability of material for use as structural fill will depend on the gradation and moisture content of the soil. We recommend that washed crushed rock or select granular fill, as described below, be used for structural fill during the rainy season. If prolonged dry weather prevails during the earthwork phase of construction, materials with a somewhat higher fines content may be acceptable. Weather, material use, schedule, duration exposed, 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.

Material used for structural fill should be free of debris, organic contaminants and rock fragments larger than 6 inches. 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 Washington State Department of Transportation (WSDOT) Standard Specifications.

4.4.2. Select Granular Fill/Wet Weather Fill

Select granular fill should consist of well-graded sand and gravel or crushed rock with a maximum particle size of 6 inches and less than 5 percent fines by weight based on the minus ¾-inch fraction. Organic matter, debris or other deleterious material should not be present. In our opinion, material with gradation characteristics similar to WSDOT Specification 9-03.9 (Aggregates for Ballast and Crushed Surfacing), "Gravel Backfill for Walls" as described in Section 9-03.12(2) of the WSDOT Standard Specifications, or 9-03.14 (Borrow) is suitable for use as select granular fill, provided that the fines content is less than 5 percent (based on the minus ¾-inch fraction) and the maximum particle size is 6 inches.

4.4.3. Pipe Bedding

Trench backfill for the bedding and pipe zone should consist of well-graded granular material similar to "gravel backfill for pipe zone bedding" described in Section 9-03.12(3) of the WSDOT Standard

Specifications. The material must be free of roots, debris, organic matter and other deleterious material. Other materials may be appropriate depending on manufacturer specifications and/or local jurisdiction requirements.

4.4.4. Trench Backfill

Trench backfill must be free of debris, organic material and rock fragments larger than 6 inches. We recommend that import trench backfill material consist of material similar to "Select Borrow" or "Gravel Borrow" as described in Section 9-03.14 of the WSDOT Standard Specifications. Where water is present, alternative materials may need to be considered.

4.4.5. Gravel Backfill For Walls

Backfill material used within 5 feet behind retaining walls should consist of free-draining material similar to "Gravel Backfill for Walls" as described in Section 9-03.12(2) of the WSDOT Standard Specifications.

4.4.6. Capillary Break Material

Structural fill placed as capillary break material below on-grade floor slabs should consist of ¾-inch coarse aggregate with negligible sand or silt as described in Section 9-03.1(4)C Grading No. 67 of the WSDOT Standard Specifications. WSDOT Specification 9-03.9 (Aggregates for Ballast and Crushed Surfacing, Crushed Surfacing Base Course [CSBC]) may also be considered.

4.4.7. Crushed Surfacing for Pavements and Sidewalks

Structural fill placed as CSBC below pavements and sidewalks should meet the requirements for Crushed Surfacing Base Course, Section 9-03.9(3) of the WSDOT Standard Specifications.

4.4.8. Recycled Materials

Recycled asphalt and concrete can be considered for use as structural fill provided that material meets the gradation requirements for its intended use. Recycled materials should not be used as capillary break material, in drainage applications, within infiltration facilities, or in areas where groundwater flow may occur. Crushed asphalt has the potential to creep under large and sustained loads. Accordingly, we recommend that crushed/recycled asphalt not be used under foundation elements or below slab on grade. Crushed asphalt can be considered for use below pavements.

4.4.9. On-Site Soil

Soils at the site are primarily comprised of silty sand and are extremely moisture sensitive. These soils will be very difficult or impossible to properly compact when wet and we do not recommend they be reused as structural fill during periods of wet weather. In addition, it is possible that existing soils will be generated at moisture contents above what is optimum for compaction. In this case, the soils would need to be moisture conditioned prior to re-use. Space for drying out material during dryer weather or covering on-site materials generated during wet weather should be considered. During wetter or even slightly colder times of year, such as when temperatures get below about 60 degrees, accommodations to cover stockpiled material generated on site that will be used as structural fill should be planned.

If earthwork occurs during a typical wet season, or if the soils are persistently wet and cannot be dried back due to prevailing wet weather conditions, we recommend the use of imported select granular fill, as

described above. It will likely be more financially practical to use on site material regardless of time of year. If considered during the wet season, we strongly recommend that provision in the plans and specifications include specific guidance as to use of this material, protection of this material, and removal of this material, or that it become clear and consistent during the bid process where native soil is proposed for use. Ultimately, we still suggest that the district plan for additional purchase of provision for protection of material and/or imported select granular fill during the wet season.

4.4.10. Fill Placement and Compaction

To obtain proper compaction, fill soil should be compacted near optimum moisture content and in uniform horizontal lifts. Lift thickness and compaction procedures will depend on the moisture content and gradation characteristics of the soil and the type of equipment used. The maximum allowable moisture content varies with the soil gradation and should be evaluated during construction. Generally, 12-inch loose lifts are appropriate for steel-drum vibratory roller compaction equipment. Compaction should be achieved by mechanical means. During fill and backfill placement, sufficient testing of in-place density should be conducted by a representative of GeoEngineers to check that adequate compaction is being achieved.

4.4.10.1. Area Fills and Pavement Bases

Fill placed to raise site grades and materials under pavements and structural areas should be placed on subgrades prepared as previously recommended. Fill material placed below structures and footings should be compacted to at least 95 percent of the theoretical maximum dry density (MDD) per ASTM International (ASTM) D 1557. Fill material placed shallower than 2 feet below pavement sections should be compacted to at least 95 percent of the MDD. Fill placed deeper than 2 feet below pavement sections should be compacted to at least 90 percent of the MDD. Fill material placed in landscaping areas should be compacted to a firm condition that will support construction equipment, as necessary, typically around 85 to 90 percent of the MDD.

4.4.10.2. Backfill Behind Below-Grade Structures

Backfill behind retaining walls or below-grade structures should be compacted to between 90 and 92 percent of the MDD. Overcompaction of fill placed directly behind below-grade structures should be avoided. We recommend use of hand-operated compaction equipment and maximum 6-inch loose lift thickness when compacting fill within about 5 feet behind below-grade structures.

4.4.10.3. Trench Backfill

For utility excavations, we recommend that the initial lift of fill over the pipe be thick enough to reduce the potential for damage during compaction, but generally should not be greater than about 18 inches above the pipe. In addition, rock fragments greater than about 1 inch in maximum dimension should be excluded from this lift.

Trench backfill material placed below structures and footings should be compacted to at least 95 percent of the MDD. In paved areas, trench backfill should be uniformly compacted in horizontal lifts to at least 95 percent of the MDD in the upper 2 feet below subgrade. Fill placed below a depth of 2 feet from subgrade in paved areas must be compacted to at least 90 percent of the MDD. In non-structural areas, trench backfill should be compacted to a firm condition that will support construction equipment, as necessary.

4.5. Foundation Support

4.5.1. General

We understand that the new field lighting poles and ball control fencing will be supported on either conventional shallow foundations (spread footings) or on drilled pier type foundations (pier foundations). We expect that other improvements around the site will be supported on spread footings.

We recommend that footings be established at least 18 inches below the lowest adjacent grade and have minimum widths of 24 inches. In our opinion drainage systems around or below foundations are not necessary to maintain bearing support.

Prepared foundation bearing surfaces should be observed and evaluated by a member of our firm prior to placement of structural fill, formwork, or steel reinforcement. Our representative will confirm that the bearing surfaces have been prepared in accordance with our recommendations and is suitable for supporting the design footing load and provide recommendations for remediation, if necessary.

The sections below provide our recommendations for design and construction of spread footings and pier foundations.

4.5.2. Spread Footings

4.5.2.1. General

Spread footings can bear on existing site soils provided the soils can be proof compacted to a uniformly firm and unyielding condition. Loose or disturbed materials present at the base of footing excavations should be removed or compacted. If exposed foundation bearing soils cannot be recompacted in place to a suitable condition, we recommend that they be removed and replaced with compacted structural fill as needed. We expect that overexcavation below footings, if required, can be limited to 18 inches for the anticipated improvements.

4.5.2.2. Allowable Soil Bearing Pressure and Settlement

Foundations bearing on surfaces prepared as recommended above may be designed using an allowable soil bearing pressure of 2,000 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 when considering total loads, including earthquake or wind loads. These are net bearing pressures. The weight of the footing and overlying backfill can be ignored in calculating footing sizes. The actual bearing resistance will depend in part on the depth of the footings and the condition of the foundation bearing surface soils.

We estimate that settlement of footings designed and established on surfaces prepared as recommended will be less than about 1 inch, with differential settlements of less than ½ inch between comparably loaded isolated column footings or along 50 feet of continuous footing. Settlement is expected to occur rapidly as loads are applied. Settlements could be greater than estimated if loose or disturbed soil is present beneath footings. As design progresses, we should be provided the actual structure loads and footing sizes in order to confirm the settlement estimates above are appropriate.

4.5.2.3. Lateral Resistance

The ability of soil to resist lateral loads is a function of frictional resistance, which can develop on the base of footings and slabs and passive resistance, which can develop on the face of below-grade elements of the structure as these elements tend to move into the soil. We expect that the allowable

frictional resistance on the base of footings may be computed using a coefficient of friction of 0.40 applied to the vertical dead-load forces. The allowable passive resistance on the face of footings or other embedded foundation elements may be computed using an equivalent fluid density of 300 pounds per cubic foot (pcf) for undisturbed site soils or structural fill extending out from the face of the foundation element a distance at least equal to two and one-half times the depth of the element. 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 passive earth pressure value is based on the assumptions that the adjacent grade is level and that groundwater remains below the base of the footing throughout the year. 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.

4.5.3. Pier Foundations

4.5.3.1. General

We expect that pier footings will consist of a precast or cast in place concrete foundation installed into a predrilled/or excavated hole. The sections below provide recommendations for design and construction of pier foundations.

4.5.3.2. Axial Resistance

Pier foundations will achieve axial downward resistance through end bearing resistance at the toe of the pier and through skin friction along the length of the foundation. Uplift resistance will be achieved through skin friction only.

We recommend that end bearing resistance of pier foundations be estimated assuming an allowable soil bearing pressure of 2,000 psf. Downward skin friction resistance can be estimated using an allowable unit skin resistance of 300 psf per linear foot of embedded foundation. Uplift skin frication resistance can be estimated using an allowable unit skin resistance of 240 psf per linear foot of embedded foundation. These values are appropriate for pier embedment depths up to about 15 feet. If foundation embedment depths are expected to exceed 15 feet, we should be notified and we will develop a foundation specific estimate of pier axial resistance.

For example, a 2 foot diameter pier footing embedded 10 feet below grade would achieve the following allowable resistances:

$$End\ Bearing\ Resistance = \mathrm{B}earing\ pressure\ (psf) \times Toe\ Area\ (sf)$$

$$= 2{,}000psf\ \times\ \pi(\frac{2\ ft.}{2})^2 \cong 6{,}280\ lbs.$$

$$Downward\ Skin\ Resistance = Unit\ Skin\ Resistance \times Pier\ Perimeter\ (ft) \times Pier\ Embedment(ft)$$

$$= 300\ psf\ \times \pi\ (2\ ft) \times 10\ ft. \cong 18{,}850\ lbs.$$

$$Upward\ Skin\ Resistance = Unit\ Uplift\ Resistance \times Pier\ Perimeter\ (ft) \times Pier\ Embedment(ft)$$

$$= 240\ psf\ \times \pi(2\ ft) \times 10\ ft. \cong 15{,}000\ lbs.$$

4.5.3.3. Lateral Resistance

The tables below provide recommendations for evaluating lateral resistance of pier foundations. Table 2 provides allowable lateral bearing resistance values for the soils encountered in our borings. Lateral bearing resistances are based on correlations presented in Table 17-2 of the WSDOT *Geotechnical Design Manual*.

TABLE 2: LATERAL SOIL BEARING RESISTANCE

Depth Range (feet)	Allowable Lateral Bearing Resistance (psf)
0 to 5	1,500
5 to 20	2,500
20 and below	4,000

Table 3 provides recommended soil parameters for lateral pier foundation analyses using the software program LPILE (Ensoft Inc. 2016).

TABLE 3: RECOMMENDED LPILE PARAMETERS

Depth Range (feet)	p-y Curve Type	Eff. Unit Wt. (pcf)	Friction Angle (deg)	K (pci)
0 to 5	Sand (Reese)	120	30	50
5 to 20	Sand (Reese)	120	32	80
20 and below	Sand (Reese)	120	34	225

If lateral pier foundation analyses are completed using LPILE, we recommend that we be allowed to review the results of the analyses to confirm that the results are consistent with our experience designing foundations and our understanding of soil conditions at the site.

4.5.3.4. Construction Considerations

We present two conditions to consider when constructing pier foundations.

- Condition #1, an excavation the same dimension of the designed foundation is created, and the precast foundation is placed in the excavation or the foundation is cast directly against undisturbed earth; or
- Condition #2, an excavation larger than the designed dimension of the foundation is created, a casing is placed into the excavation and the foundation concrete is cast inside the casing. The casing could be left in place permanently, or removed from the excavation as the foundation is constructed. If the casing is left in place any overexcavated area outside of the casing would need to be backfilled with controlled density fill (CDF).

Construction of Condition #1 requires the sidewalls of the excavation to stay stable during construction of the foundation. Construction of Condition #2 does not require the sidewalls of the excavation to remain stable. Based on the soil and groundwater conditions at the site it is our opinion that there is a risk that the sidewalls of the excavations will cave, especially in areas of the site where there is more fill.

We anticipate that casing will be necessary to complete the excavations for pier foundations. If a sacrificial or permanent casing is used, this practice should be coordinated with the structural engineer.

We recommend that the base of the pier footing excavations be free of loose or disturbed soils prior to construction of the foundation. If loose or disturbed soils are present at the base of the excavation and cannot be adequately compacted or removed, we recommend that quarry spalls be pushed into the excavation subgrade until a stable base is established. If water accumulates in the excavation, the water should be removed from the excavation prior to pouring concrete.

4.6. Retaining Walls and Below Grade Structures

4.6.1. General

We understand that retaining walls may be included around the site to accommodate planned site grading. We expect that both cut and fill type walls may be considered. There are many retaining wall types that could be considered for this site and selection of the wall type will depend in part on, wall location, wall height, surcharge loads cost considerations and aesthetics. The sections below provide general design and construction considerations for different retaining wall types.

4.6.1.1. Modular Block Walls

Modular block retaining walls can consist of smaller landscaping sized blocks, larger rectangular modular blocks (ecology blocks or Ultra blocks) or rock baskets (gabion baskets). These wall types can be used in cut and fill applications and can typically support retained heights up to about 4 feet without including soil reinforcement or incorporating a wall face batter. For wall heights between 4 and 6 feet, soil reinforcement can typically be avoided provided the wall face is battered. In the case of taller modular block walls (about 6 to 12 feet), the bottom row, or bottom two rows of blocks are typically rotated 90 degrees or perpendicular to the slope cut so the short side of the block faces the front of the wall.

For wall heights greater than 6 feet, these types of walls are still feasible; however, it will likely be necessary to incorporate soil reinforcement behind the wall to maintain stability during seismic conditions. Reinforcement zones typically have a minimum length of about 6 feet (measured form the back face of the wall); however, the length of reinforcement will increase with the overall wall height. Because of this, incorporating reinforcement behind modular block walls is likely best suited for fill walls where significant cuts will not be required to create room for the reinforcement zone.

Wall height, size and construction techniques, including preparation of temporary slopes for construction, worker safety, nearby structures in the excavation zone, and property limits should also be considered when choosing walls of this type.

4.6.1.2. Cast In Place Walls

Conventional cast in place retaining walls are feasible for use at this site. Cast in place walls can be designed to retain slopes in excess of 10 feet; however, as the retained wall height increases, wall footing sizes and structural reinforcement requirements will also increase. For wall heights in excess of 10 feet, it is not uncommon for reinforcement to be incorporated into the retained soil to help reduce the soil earth pressures on the wall. Foundations for cast in place walls typically must be embedded a few feet below finished grade for adequate bearing support and to help develop passive resistance on the footing. In many instances, foundation size for walls can be as much as 80 percent of the height of the wall, which can require more soil removal and backfill during construction.

4.6.1.3. Structural Earth Walls

Structural earth walls (SEWs) or mechanically stabilized earth (MSE) walls consist of a fill soil mass reinforced with geo-synthetic or steel straps to provide tension resistance to the soil. The exposed face of the soil mass is protected by a fascia. This permanent fascia can consist of concrete panels, segmental concrete blocks, wire gabions or a cast-in-place facing over geo-synthetic wraps. It is also possible to construct SEWs with vegetated faces.

SEWs are typically used in fill applications where there is sufficient room to construct the reinforced soil mass. For planning purposes, the length of the reinforcement zone can be assumed to be equal to the exposed height of the wall.

4.6.1.4. Soil Nail and Soldier Pile Walls

Soil nail and soldier pile walls could be considered, however for the expected wall applications at this site we expect that these wall types would be more expensive than the wall types discussed previously. These wall types will likely be advantageous if retained wall heights exceed about 10 feet and are best suited for "top-down" construction techniques and cut applications. If taller retaining walls are envisioned at the site, we can provide additional recommendations for design of soil nail or soldier pile walls.

4.6.2. Design Parameters

We recommend the following lateral earth pressures be used for design of conventional retaining walls and below-grade structures. Our design pressures assume that the ground surface around the retaining structures will be level or near level. If drained design parameters are used, drainage systems must be included in the design in accordance with the recommendations presented in section "4.6.3 Drainage" below.

- Active soil pressure may be estimated using an equivalent fluid density of 35 pcf for the drained condition.
- Active soil pressure may be estimated using an equivalent fluid density of 85 pcf for the undrained condition; this value includes hydrostatic pressures.
- At-rest soil pressure may be estimated using an equivalent fluid density of 55 pcf for the drained condition.
- At-rest soil pressure may be estimated using an equivalent fluid density of 95 pcf for the undrained condition; this value includes hydrostatic pressures.
- For seismic considerations, a uniform lateral pressure of 10H 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.
- An additional 2 feet of fill representing a typical traffic surcharge of 250 psf should be included if vehicles are allowed to operate within ½ the height of the retaining walls. Other surcharge loads should be considered on a case-by-case basis. We can provide additional surcharge loads for specific loading conditions once known.

The active soil pressure condition assumes the wall is free to move laterally 0.001 H, where H is the wall height). The at-rest condition is applicable where walls are restrained from movement. The above-recommended lateral soil pressures do not include other surcharge loads than described or the effects of

sloping backfill surfaces. We should be consulted if other surcharge loads are anticipated or if sloping backfill conditions are planned, this may change the lateral pressure values provided.

Over-compaction of fill placed directly behind retaining walls or below-grade structures must be avoided. We recommend use of hand-operated compaction equipment and maximum 6-inch loose lift thickness when compacting fill within about 5 feet of retaining walls and below-grade structures.

Retaining wall foundation bearing surfaces should be prepared following Section 4.5 "Foundation Support" of this report. Provided bearing surfaces are prepared as recommended retaining wall foundations may be designed using the allowable soil bearing values and lateral resistance values presented above. We estimate settlement of retaining structures will be similar to the values previously presented for spread foundations.

4.6.3. Drainage

If retaining walls or below-grade structures are designed using drained parameters, a drainage system behind the structure must be constructed to collect water and prevent the buildup of hydrostatic pressure against the structure. We recommend the drainage system include a zone of free-draining backfill a minimum of 18 inches in width against the back of the wall. The drainage material should consist of coarse sand and gravel containing less that 5 percent fines based on the fraction of material passing the ¾-inch sieve. Material similar to "Gravel Backfill for Drains" per WSDOT Standard Specifications Section 9-03.12(4) is also suitable. Waffle board-type drainage mats may be considered instead of gravel provided they are protected from accumulating silt and discharge appropriately.

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 drain pipe should be metal or rigid PVC pipe and be sloped to drain by gravity. Discharge should be routed to appropriate discharge areas and designed 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.

4.7. Pavement Design

4.7.1. General

Paved areas are expected to include parking areas, driveways and sidewalk areas. Based on our experience, we provide recommended conventional asphalt concrete pavement (ACP) and Portland cement concrete (PCC) sections below. These pavement sections may not be adequate for heavy construction traffic loads such as those imposed by concrete transit mixers, dump trucks or cranes. Additional pavement thickness may be necessary to prevent pavement damage during construction if other loading types are planned. The recommended sections assume that final improvements surrounding the pavements will be designed and constructed such that stormwater or excess irrigation water from landscape areas does not accumulate below the pavement section or pond on pavement surfaces.

Existing pavements, hardscaping or other structural elements should be removed prior to placement of new pavement sections. Pavement subgrade should be prepared as recommended in Section 4.3.7 "Subgrade Preparation" of this report. Crushed surfacing base course and subbase should be moisture

conditioned to near optimum moisture content and compacted to at least 95 percent of the theoretical MDD per ASTM D 1557.

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 the CSBC sections provided may consist of CSTC as a leveling layer and for more precise grade development.

Hot mix asphalt should conform to applicable sections of 5-04, 9-02 and 9-03 of the WSDOT Standard Specifications.

PCC mix design should conform with Section 5-05.3(1) of the WSDOT Standard Specifications. Aggregates for PCC should conform to applicable sections of 9-03.1 of the WSDOT Standard Specifications.

Some areas of pavement may exhibit settlement and subsequent cracking over time. 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.

4.7.2. Asphalt Concrete Pavement Sections

Recommended minimum ACP sections are provided below.

4.7.2.1. Standard-Duty ACP – Automobile Driveways and Parking Areas

- 2 inches of hot mix asphalt, class ½ inch, PG 58-22
- 4 inches of compacted CSBC
- 6 inches of subbase consisting of imported granular structural fill to provide uniform grading and pavement support, to maintain drainage, and to provide separation from fine-grained subgrade soil
- Native soil, existing fill or structural fill prepared as recommended in Section 4.3.7 “Subgrade Preparation” of this report

4.7.2.2. Heavy-Duty ACP – Areas Subject to Heavy-Duty Traffic

- 3 inches of hot mix asphalt, class ½ inch, PG 58-22
- 6 inches of compacted CSBC
- 6 inches of subbase consisting of imported granular structural fill to provide uniform grading and pavement support, to maintain drainage, and to provide separation from fine-grained subgrade soil
- Native soil, existing fill or structural fill prepared as recommended in Section 4.3.7 “Subgrade Preparation” of this report

4.7.3. Portland Cement Concrete Pavement Design

Recommended minimum PCC pavement sections are provided below. The provided sidewalk PCC pavement section meets the minimum sidewalk thickness requirements of the City of Tacoma. In our opinion steel reinforcement does not need to be included in PCC pavements that will be primarily used in landscaping and pedestrian areas (areas not subjected to heavy vehicle traffic). Reinforcement could be considered to reduce the potential for cracking in areas where the concrete slabs have irregular shapes or where new slabs abut existing concrete slabs, and the joint layout between the slabs cannot be

matched. If reinforcement is considered, we are available to discuss typical steel reinforcement volumes with the project structural engineer, who ultimately designs the location, size and layout of reinforcement.

4.7.3.1. Sidewalk PCC Pavement – Pedestrian Areas Not Subjected to Vehicle Loading

- 4 inches of PCC with a minimum 14-day flexural strength of 650 psi
- 2 inches of compacted CSBC
- Native subgrade or structural fill prepared in accordance with Section 4.3.7 "Subgrade Preparation" of this report

4.7.3.2. Standard PCC Pavement – Automobile Driveways and Parking Areas

- 6 inches of PCC with a minimum 14-day flexural strength of 650 psi
- 4 inches of compacted CSBC
- Native subgrade, existing fill or structural fill prepared in accordance with Section 4.3.7 "Subgrade Preparation" of this report

4.7.3.3. Heavy Duty PCC Pavement – Areas Subject to Heavy Truck Traffic

- 9 inches (minimum) of PCC with a minimum 14-day flexural strength of 650 psi
- 4 inches of compacted CSBC
- Native subgrade, existing fill or structural fill prepared in accordance with Section 4.3.7 "Subgrade Preparation" of this report

4.8. Stormwater Infiltration

4.8.1. General

Stormwater facilities at the site, if planned, will be designed in accordance with the 2021 City of Tacoma SWMM. Based on the subsurface conditions observed in our explorations it is our opinion stormwater infiltration into the recessional outwash soils is feasible.

Recessional outwash soils were observed in our borings between about 3.5 and 21.5 feet bgs (relative thickness and depths of the unit varies across the site). Underlying the recessional outwash soils at the site is glacial till, which has a much lower infiltration potential than the recessional outwash. The depth to glacial till was not confirmed in all of our borings, however for stormwater planning purposes we recommend assuming that till is present below about 15 feet bgs. As recommended in the SWMM, the base of infiltration facilities should maintain a 5-foot separation distance from the top of the glacial till layer. If maintaining this separation distance is not possible, the infiltration facilities may need to be designed using the infiltration rate of the underlying glacial till. In addition, further study into requirements of a groundwater mounding analysis could be required.

For planning purposed we recommend that outward limits of infiltration facilities be setback at least 100 feet from the tops of slopes on the west side of the site and about 50 feet from tops of slopes on the east and south sides of the site. This setback distance should be evaluated further once the locations and sizes of planned infiltration facilities are known.

4.8.2. Preliminary Infiltration Rate Estimate

To provide a preliminary estimate of infiltration rates for the site soils, we used the Soil Grain Size Analysis Method presented in the SWMM. The Soil Grain Size Analysis Method is an empirical correlation between soil gradation and infiltration rate. This method typically does not account for other factors that influence in-situ infiltration rate such as relative density, degree of weathering, soil layering, and groundwater conditions. As such, the design values presented are preliminary and further study as discussed below will be needed as part of final design of infiltration facilities.

We recommend that following preliminary infiltration rates be considered for preliminary design of infiltration facilities:

- For facilities located within recessional outwash and with base depths within 10 feet of existing grade – 0.25 to 0.5 inches per hour
- For facilities with base elevations deeper than 10 feet below existing site grades – 0.1 inches per hour

The rates provided above are the "long-term" saturated infiltration rates, which include the appropriate reduction factors recommended in the SWMM.

4.8.3. Recommendations for Additional Studies

If infiltration facilities are included at this site, additional testing, analysis, and reporting will be required to establish the final design infiltration rate. This is also a requirement of the SWMM. Where infiltration facilities are considered, we recommend that at least one PIT should be performed at each proposed location. The location of the PIT should be near (ideally within) the footprint of the proposed infiltration facilities. We can assist with performing PITs, and associated analysis and reporting, if requested.

5.0 LIMITATIONS

We have prepared this report for Korsmo Construction for the Giaudrone Middle School Playfield Improvements project located in Tacoma, Washington. Korsmo Construction may distribute copies of this report to owner and 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 practices for geotechnical engineering 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.

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

FIGURES

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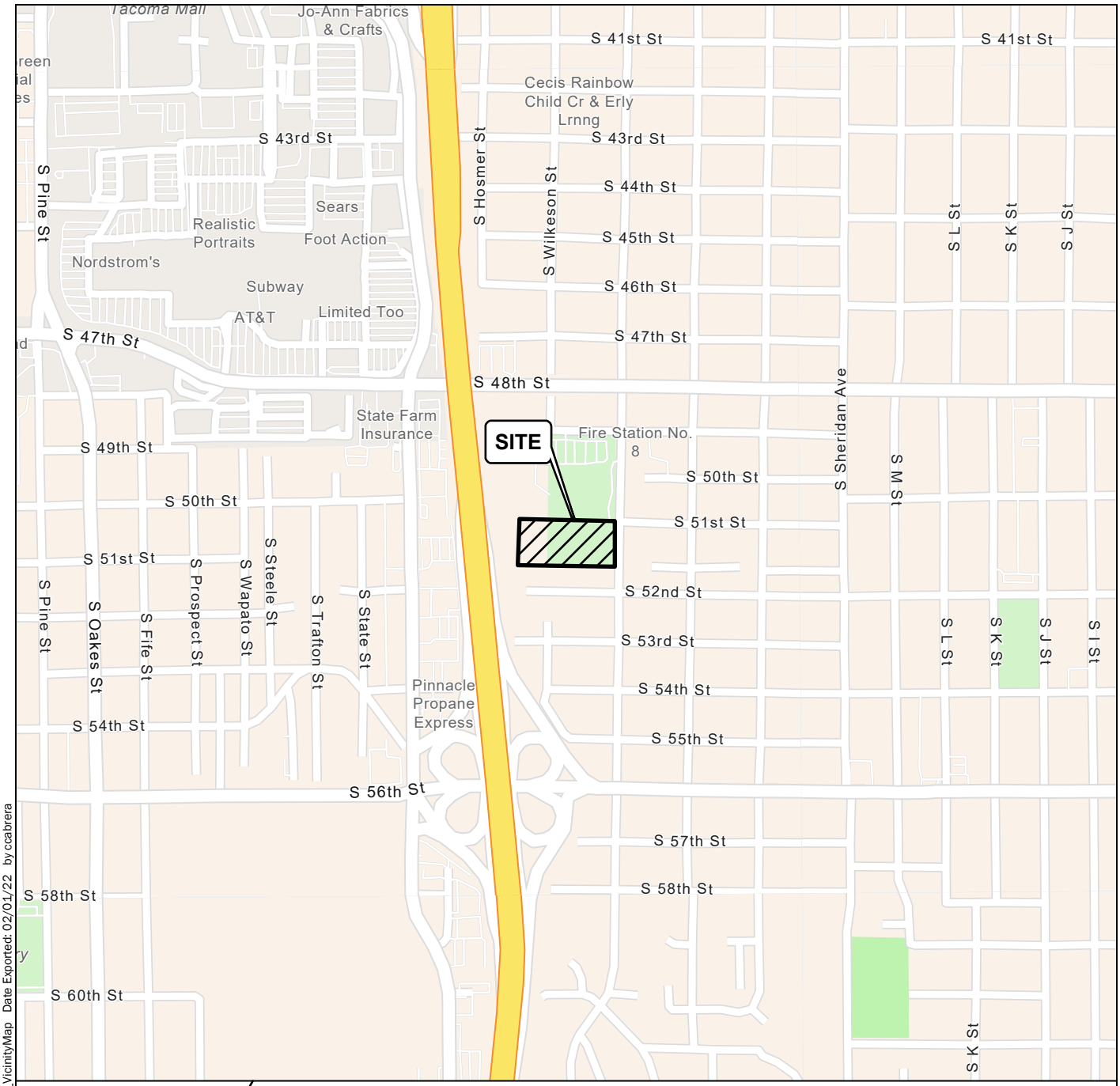

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: ESRI

Projection: NAD 1983 UTM Zone 10N

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Vicinity Map

Giaudrone Middle School Playfield Improvements
Tacoma, Washington

GeoEngineers

Figure 1

P:\0\0522036\CAD\00\Geotech Report\052203600_F02_Site Plan.dwg TAB:F02 - Site Plan Date Exported: 02/18/22 - 8:06 by gregister

Legend

B-1 Boring by GeoEngineers, Inc., 2022

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Aerial from Google Earth Pro dated 08/14/2020.

Projection: Washington State Plane, South Zone, NAD83, US Foot

N W E S

50 0 50
Feet

Site Plan

Giaudrone Middle School Playfield Improvements
Tacoma, Washington

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Figure 2

APPENDICES

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APPENDIX A
Subsurface Explorations and Laboratory Testing

APPENDIX A
SUBSURFACE EXPLORATIONS AND LABORATORY TESTING

Subsurface Explorations

General

Soil conditions at the project site were explored by advancing six borings on February 7, 2022. The approximate locations of our explorations are shown on Figure 2. The explorations were located in the field using a global positioning system (GPS) device. The locations of the explorations shown on the Site Plan (Figure 2) should be considered approximate.

Soil Borings

Borings were generally extended to between 11.5 and 26.5 feet below ground surface (bgs). Borings were advanced using a track-mounted hollow-stem auger drill rig equipment and operators under subcontract to GeoEngineers. The explorations were continuously monitored by a representative from our firm who examined and classified the soil encountered, obtained representative soil samples, and maintained a detailed log of the explorations. Soil encountered in the borings was classified in general accordance with ASTM International (ASTM) D 2488 and the classification chart listed in Key to Exploration Logs, Figure A-1. Logs of the borings are presented in Figures A-2 through A-7. The logs are based on interpretation of the field and laboratory data and indicate the depth at which we interpret subsurface materials or their characteristics to change, although these changes might actually be gradual.

Soil samples were obtained from the borings at approximate 2½- to 5-foot-depth intervals using a 2-inch, outside-diameter, standard split-spoon sampler (Standard Penetration Test [SPT]) in general accordance with ASTM D 1586. The sampler was driven into the soil using a 140-pound automatic hammer, free-falling 30 inches. 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 final 12 inches of penetration, unless otherwise noted, is reported on the boring logs.

Laboratory Testing

General

Soil samples obtained from the borings and test pits were returned to our laboratory for further examination and testing. The testing completed on each sample is presented in the corresponding boring log. A description of the laboratory testing completed on this project is provided below.

Grain-Size Analysis

Grain-size analyses were performed on selected soil samples in general accordance with ASTM Test Method D 6913. This test provides a quantitative determination of the distribution of particle sizes in soils. Figure A-7 presents the results of the grain-size analyses.

Percent Passing the U.S. No. 200 Sieve

Selected samples were “washed” through the U.S. No. 200 sieve to estimate the relative percentages of coarse- and fine-grained particles in the soil. The percent passing value represents the percentage by weight of the sample finer than the U.S. No. 200 sieve (fines). The tests were conducted in general

accordance with ASTM D 1140. The test results are presented on the exploration logs in Appendix A at the respective sample depths.

Moisture Content

The moisture content of selected samples was determined in general accordance with ASTM D 2216. The test results are used to aid in determining the moisture content of the soil, soil classification and correlation with other pertinent engineering soil properties. The test results are presented on the exploration logs in Appendix A at the respective sample depths.

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
MORE THAN 50% RETAINED ON NO. 200 SIEVE	SAND AND SANDY SOILS	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS
				SP	POORLY-GRADED SANDS, GRAVELLY SAND
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS	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
MORE THAN 50% PASSING NO. 200 SIEVE	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

2.4-inch I.D. split barrel / Dames & Moore (D&M)

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 lead 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 2/7/2022	End 2/7/2022	Total Depth (ft)	26.5	Logged By / Checked By	OA/AG BEL	Driller	Holocene Drilling, Inc.	Drilling Method	Hollow-stem Auger
Surface Elevation (ft) Vertical Datum	377 NAVD88				Hammer Data	Autohammer 140 (lbs) / 30 (in) Drop			Drilling Equipment	Diedrich D50 Turbo Rubber Track
Easting (X) Northing (Y)	1153155 690931				System Datum	WA State Plane South NAD83 (feet)			Groundwater not observed at time of exploration	

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA: Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0						SOD	Approximately 2 inches of sod			
375		6			1 MC		SM	Brown silty fine sand with gravel and occasional organic matter (fine roots) (loose, moist) (fill)	18		
		12	19		2		GP-GM	Gray fine to coarse gravel with silt and sand and occasional minor oxidation staining (medium dense, moist)			
	5						SM	Gray silty fine sand (medium dense, moist)			
		13	15		3		SP-SM	Dark gray fine sand with silt (medium dense, moist)			
370							SM	Gray silty fine sand (medium dense, moist) (recessional outwash)			
		13	26		4		SM	Gray silty fine to medium sand with gravel and occasional moderate oxidation staining (medium dense, moist)			
	10	13	36		5 %F		SM	Gray silty fine to medium sand with gravel and occasional minor oxidation staining (dense, moist)	11	32	
365							SM	Gray silty fine to medium sand with gravel (dense, moist) (glacial till)			
	15	3	47		6						
360											
	20	18	43		7						
355											
	25	18	56		8			Becomes very dense			

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

Log of Boring B-1

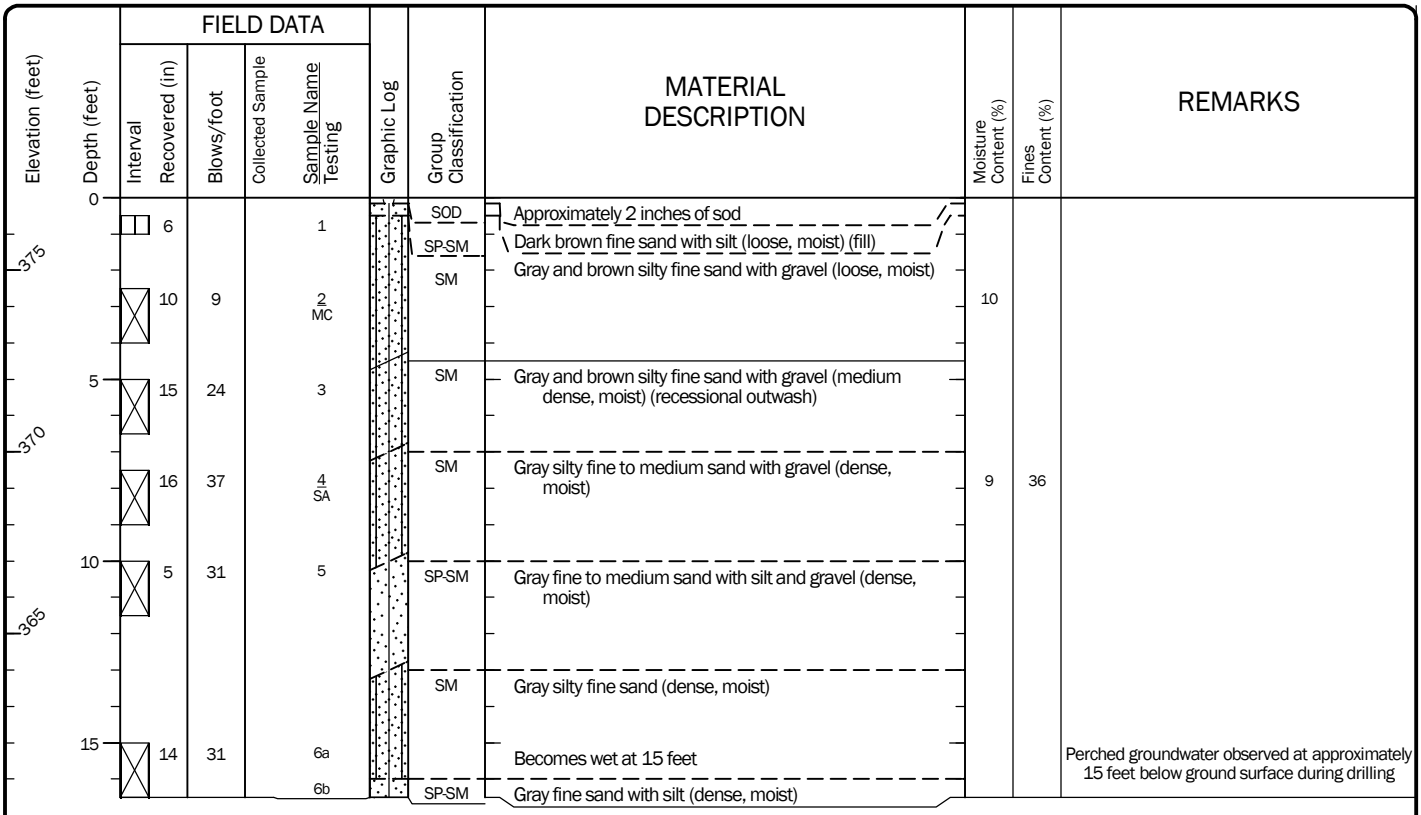
GeoEngineers

Project: Giaudrone Middle School Field Improvements
Project Location: Tacoma, Washington
Project Number: 0522-036-00

Figure A-2
Sheet 1 of 1

Drilled: Start 2/7/2022 End 2/7/2022	Total Depth (ft): 16.5	Logged By: OA/AG Checked By: BEL	Driller: Holocene Drilling, Inc.	Drilling Method: Hollow-stem Auger	
Surface Elevation (ft): 377 Vertical Datum: NAVD88		Hammer Data: Autohammer 140 (lbs) / 30 (in) Drop		Drilling Equipment: Diedrich D50 Turbo Rubber Track	
Easting (X): 1153256 Northing (Y): 690847		System Datum: WA State Plane South NAD83 (feet)		See "Remarks" section for groundwater observed	

Notes:



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

Log of Boring B-2

GeoEngineers

Project: Giaudrone Middle School Field Improvements
Project Location: Tacoma, Washington
Project Number: 0522-036-00

Figure A-3
Sheet 1 of 1

Drilled Start 2/7/2022 End 2/7/2022	Total Depth (ft) 16.5	Logged By OA/AG Checked By BEL	Driller Holocene Drilling, Inc.	Drilling Method Hollow-stem Auger	
Surface Elevation (ft) 377 Vertical Datum NAVD88		Hammer Data Autohammer 140 (lbs) / 30 (in) Drop		Drilling Equipment Diedrich D50 Turbo Rubber Track	
Easting (X) 1153246 Northing (Y) 690714		System Datum WA State Plane South NAD83 (feet)		Groundwater not observed at time of exploration	

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA: Interval Recovered (in)	FIELD DATA: Blows/foot	FIELD DATA: Collected Sample	FIELD DATA: Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0						SOD	Approximately 2 inches of sod			
375		6			1 MC		SP-SM	Dark brown fine sand with silt and occasional organic matter (fine roots) (loose, moist) (fill)	9		
		14	4		2a 2b		SM	Brown-gray silty fine to medium sand with gravel (loose, moist)			
								Grades to gray			
	5	7	5		3 SA				9	31	
370		14	6		4						Moderate drill chatter at 6 feet below ground surface
	10	15	19		5 %F		SM	Gray and dark brown silty fine to coarse sand with gravel (medium dense, moist) (outwash)	13	34	
365											
	15	15	23		6		SM	Gray silty fine to medium sand with gravel (medium dense, moist)			

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

Log of Boring B-3

GeoEngineers

Project: Giaudrone Middle School Field Improvements
Project Location: Tacoma, Washington
Project Number: 0522-036-00

Figure A-4
Sheet 1 of 1

Drilled	Start 2/7/2022	End 2/7/2022	Total Depth (ft)	11.5	Logged By / Checked By	OA/AG / BEL	Driller	Holocene Drilling, Inc.	Drilling Method	Hollow-stem Auger
Surface Elevation (ft) / Vertical Datum	378 / NAVD88				Hammer Data	Autohammer 140 (lbs) / 30 (in) Drop			Drilling Equipment	Diedrich D50 Turbo Rubber Track
Easting (X) / Northing (Y)	1153519 / 690780				System Datum	WA State Plane South NAD83 (feet)			Groundwater not observed at time of exploration	

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA: Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0	6			1		SOD	Approximately 2 inches of sod			
							SP-SM	Brown fine to medium sand with silt and occasional organic matter (fine roots) (loose, moist) (fill)			
375		10	26		2 SA		SM	Brown-gray silty fine to medium sand with gravel (medium dense, moist)	7	26	
	5	0	11		3						Drill chatter
370							SM	Gray silty fine to coarse sand with occasional gravel (medium dense, moist) (recessional outwash)			
		16	22		4			Grades to gray			
	10	10	14		5						

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

Log of Boring B-4

GeoEngineers

Project: Giaudrone Middle School Field Improvements
Project Location: Tacoma, Washington
Project Number: 0522-036-00

Figure A-5
Sheet 1 of 1

Drilled Start 2/7/2022 End 2/7/2022	Total Depth (ft) 17.5	Logged By OA/AG Checked By BEL	Driller Holocene Drilling, Inc.	Drilling Method Hollow-stem Auger	
Surface Elevation (ft) 377 Vertical Datum NAVD88		Hammer Data Autohammer 140 (lbs) / 30 (in) Drop		Drilling Equipment Diedrich D50 Turbo Rubber Track	
Easting (X) 1153578 Northing (Y) 690875		System Datum WA State Plane South NAD83 (feet)		Groundwater not observed at time of exploration	

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA: Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0	6			1		SOD	Approximately 2 inches of sod			
375							SP-SM	Brown and gray fine to medium sand with silt and gravel, occasional organic matter (fine roots) (medium dense, moist) (fill)			
		16	10		2 MC		SM	Brown silty fine to medium sand with gravel and occasional organic matter (fine roots) (medium dense, moist)	15		2 inches of heavy black staining at 3½ feet
	5	15	19		3 %F		SM	Gray silty fine to medium sand with gravel (medium dense, moist) (recessional outwash)	8	28	
370		10	32		4						
	10	0	16		5						Drill chatter
365											
	15	0	20		6 7						No recovery with SPT; CA sampler driven for recovery
360											

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

Date:2/28/22 Path:P:\0\0522036\GINT\052203600.GPJ DBLibrary:LLibrary:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_GEOTECH_STANDARD_%F_NO_GW

Log of Boring B-5

GeoEngineers

Project: Giaudrone Middle School Field Improvements
Project Location: Tacoma, Washington
Project Number: 0522-036-00

Figure A-6
Sheet 1 of 1

Drilled Start 2/7/2022 End 2/7/2022	Total Depth (ft) 21.5	Logged By OA/AG Checked By BEL	Driller Holocene Drilling, Inc.	Drilling Method Hollow-stem Auger	
Surface Elevation (ft) 374 Vertical Datum NAVD88		Hammer Data Autohammer 140 (lbs) / 30 (in) Drop		Drilling Equipment Diedrich D50 Turbo Rubber Track	
Easting (X) 1153611 Northing (Y) 690658		System Datum WA State Plane South NAD83 (feet)		See "Remarks" section for groundwater observed	

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	Approximately 2 inches of sod			
			6			1		SP-SM	Dark brown fine to coarse sand with silt and gravel, occasional organic matter (fine roots) (loose, moist) (fill)			
370			12	8		2a 2b		SM	Brown-gray silty fine sand with gravel (medium dense, wet)			
	5		14	18		3						
			10	8		4						Rock in shoe
365												
	10		14	3		5 %F		SM	Brown-gray silty fine sand with occasional organic matter (woody debris) (very loose, wet) (recessional outwash)	24	34	Perched groundwater observed at approximately 10 feet below ground surface during drilling
360								SM	Gray silty fine to coarse sand (medium dense, moist)			
	15		2	10		6						Moderate drill chatter
355												
								SM	Brown-gray silty fine to medium sand, with occasional organic matter (wood debris) and gravel (very loose, moist)			
	20		10	3		7						

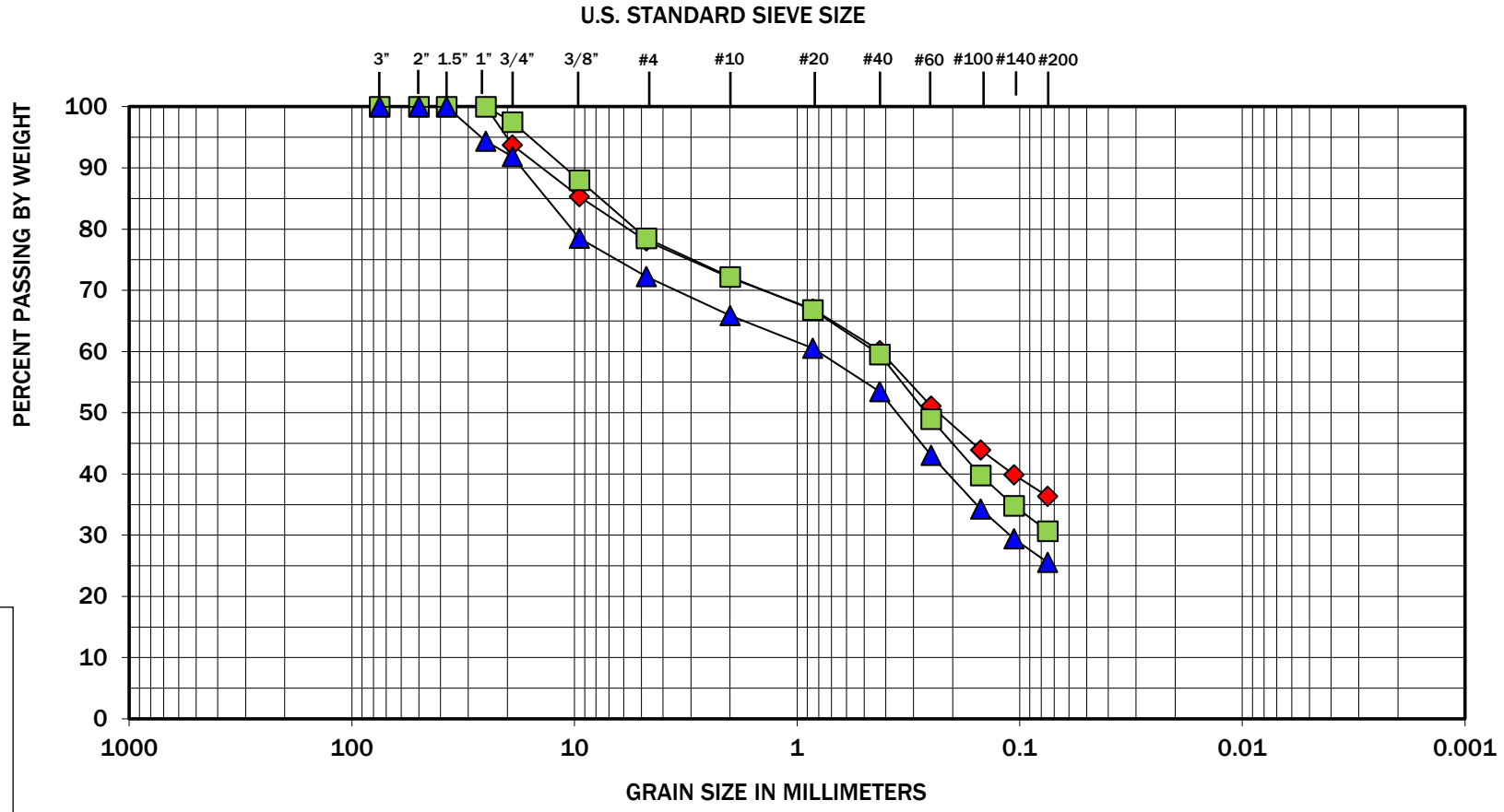
Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery. Vertical approximated based on Aerial Imagery.

Log of Boring B-6

GeoEngineers

Project: Giaudrone Middle School Field Improvements
Project Location: Tacoma, Washington
Project Number: 0522-036-00

Figure A-7
Sheet 1 of 1



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Symbol	Boring Number	Depth (feet)	Moisture (%)	Laboratory Soil Description
◆	B2	7.5	9	Silty sand with gravel (SM)
■	B3	5	9	Silty sand with gravel (SM)
▲	B4	2.5	7	Silty sand with gravel (SM)

Sieve Analysis Results

Giaudrone Middle School Playfield Improvements
Tacoma, Washington

GeoEngineers

Figure-1

AASHTO ACCREDITED

The grain size analysis results were obtained in general accordance with ASTM C 136. GeoEngineers 17425 NE Union Hill Road Ste 250, Redmond, WA 98052

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 the Korsmo Construction and for the Project(s) 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 generally accepted geotechnical practices in this area at the time this report was prepared, and our Agreement with Korsmo Construction dated January 10, 2022. 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 Giaudrone Middle School Playfield Improvement 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 ASFE, Professional Firms Practicing in the Geosciences; www.asfe.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.

Do Not Redraw the Exploration Logs

Geotechnical engineers and geologists prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. The logs included in a geotechnical engineering or geologic report should never be redrawn for inclusion in architectural or other design drawings. Photographic or electronic reproduction is acceptable, but separating logs from the report can create a risk of misinterpretation.

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.

GeoEngineers

TACOMA SCHOOL DISTRICT

FIELD AND TRACK CONVERSION AT GIAUDRONE MIDDLE SCHOOL

VICINITY MAP

SITE MAP

Project Site:
Giaudrone Middle School
4902 S Alaska St,
Tacoma, WA 98408

Parcel Information

Tax Parcel:
2110000220
Legal Description:
SECTION 20 TOWNSHIP 20 RANGE 03 QUARTER 22 ACME ADD: ACME ADD L 1 THRU 16 B 13 L 1 THRU 16 B 14 L 1 THRU 16 B 15 L 1 THRU 16 B 16 L 1 THRU 16 B 17 L 1 THRU 16 B 18 TOG/W VAC ALLY ABUTT PER #15769 TOG/W VAC ST ABUTT UNDER ORD #16973 EXC POR CYD TO CY OF TAC FOR ADD'L R/W ETN 1120061 NW OF NW 20-20-03E APPROX 8.79 ACS (DCGREMS1-29-81) DC09/23/96CL DC/BL 05-30-03BL

Owner	Design-Builder	Prime Consultant	Civil Engineer	Landscape Design
Tacoma School District	Korsmo Construction	D.A. Hogan & Associates, Inc.	LPD Engineering	KG Designs
601 S 8th Street	1940 E D Street	119 1st Avenue S., Suite 110	1982 1st Avenue, Suite 201	24012 SE 196th St
Tacoma, WA 98405	Tacoma, WA 98421	Seattle, WA 98104	Seattle, WA 98101	Maple Valley, WA 98038
253-571-1000 Phone	(253) 582-6712 Phone	(206) 285-0400 Phone	(206) 725-1211 Phone	(253) 341-9451 Phone

Drawing Index

REVISION	DATE

GIAUDRONE MIDDLE SCHOOL FIELD AND TRACK CONVERSION

TACOMA PUBLIC SCHOOLS
EVERY STUDENT. EVERY DAY.

KORSMO CONSTRUCTION

Field Consultant
D.A. Hogan & Associates, Inc.
119 1st Avenue S., Suite 110,
Seattle, WA 98104
(206) 285-0400 Phone

Civil Engineer
LPD Engineering
1982 1st Avenue, Suite 201
Seattle, WA 98101
(206) 725-1211 Phone

Landscape Design
KG Designs
24012 SE 196th St
Maple Valley, WA 98038
(253) 341-9451 Phone

Structural Engineer
KPFF
1601 5th Ave Suite 1600
Seattle, WA 98101
(206) 622-5822 Phone

Electrical Engineer
Stantec
4100 194th St SW Suite 400
Lynnwood, WA 98036
(206) 224-3689 Phone

DAVID L. ANDERSON — STATE OF WASHINGTON — REGISTERED PROFESSIONAL ENGINEER

PERMIT SET

DATE	2-28-22
SCALE	NTS
DRAWN	DMD
CHECKED	DLA/JAB

COVER & SHEET INDEX

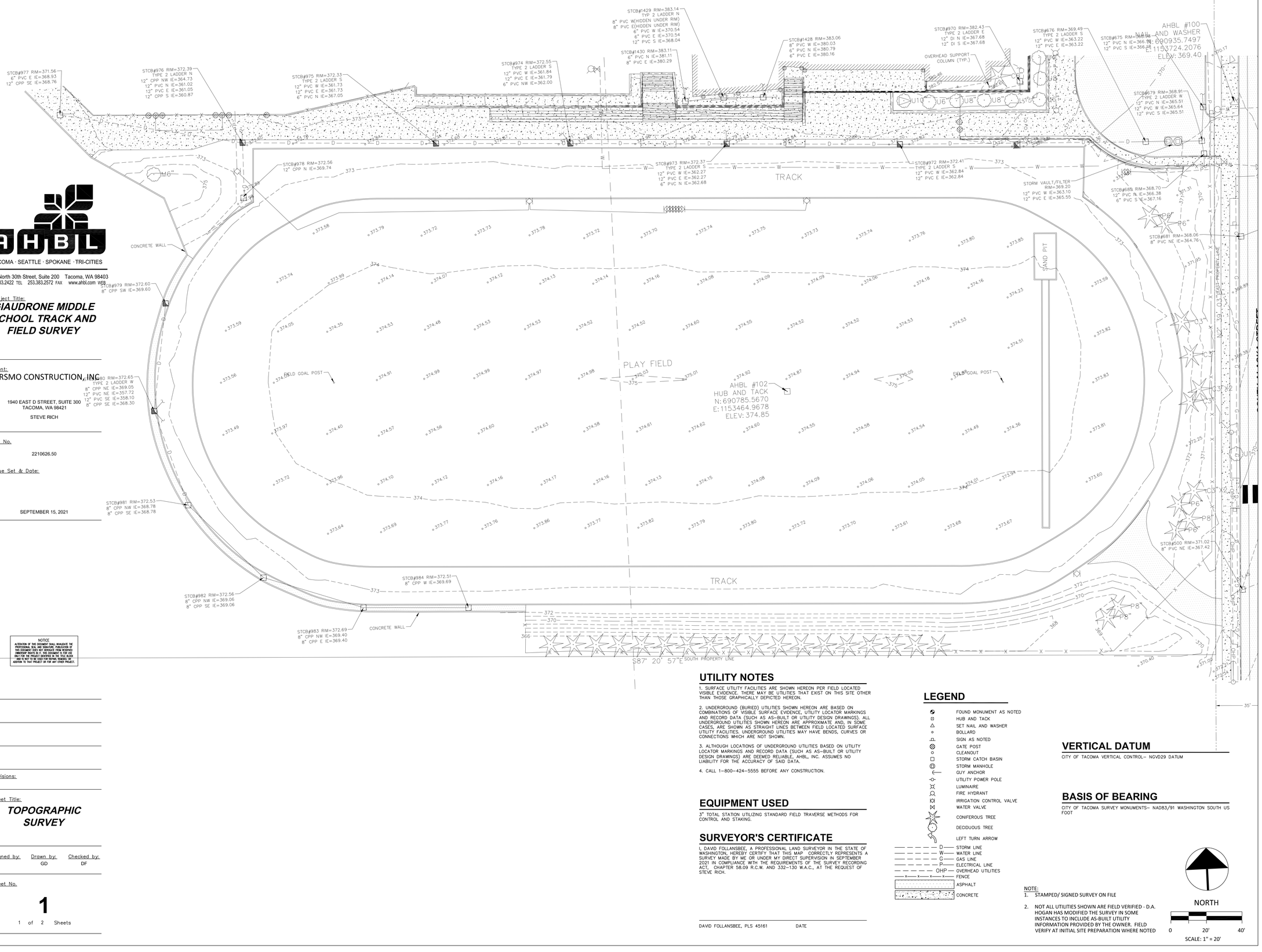
SHEET

F-0.0

File: F-0.0 Cover.dwg Plotted by: JeffB Date: 01-Mar-22 8:45:26am

GIAUDRONE MIDDLE SCHOOL

A PORTION OF THE NW 1/4 OF THE NW 1/4 OF SEC. 20, TWN. 20 N., RGE. 03 E. W.M.
CITY OF TACOMA, PIERCE COUNTY, WASHINGTON.



UTILITY NOTES

1. SURFACE UTILITY FACILITIES ARE SHOWN HEREON PER FIELD LOCATED VISIBLE EVIDENCE. THERE MAY BE UTILITIES THAT EXIST ON THIS SITE OTHER THAN THOSE GRAPHICALLY DEPICTED HEREON.

2. UNDERGROUND (BURIED) UTILITIES SHOWN HEREON ARE BASED ON COMBINATIONS OF VISIBLE SURFACE EVIDENCE, UTILITY LOCATOR MARKINGS AND RECORD DATA (SUCH AS AS-BUILT OR UTILITY DESIGN DRAWINGS). ALL UNDERGROUND UTILITIES SHOWN HEREON ARE APPROXIMATE AND, IN SOME CASES, ARE SHOWN AS STRAIGHT LINES BETWEEN FIELD LOCATED SURFACE UTILITY FACILITIES. UNDERGROUND UTILITIES MAY HAVE BENDS, CURVES OR CONNECTIONS WHICH ARE NOT SHOWN.

3. ALTHOUGH LOCATIONS OF UNDERGROUND UTILITIES BASED ON UTILITY LOCATOR MARKINGS AND RECORD DATA (SUCH AS AS-BUILT OR UTILITY DESIGN DRAWINGS) ARE DEEMED RELIABLE, AHBL, INC. ASSUMES NO LIABILITY FOR THE ACCURACY OF SAID DATA.

4. CALL 1-800-424-5555 BEFORE ANY CONSTRUCTION.

EQUIPMENT USED

3" TOTAL STATION UTILIZING STANDARD FIELD TRAVERSE METHODS FOR CONTROL AND STAKING.

SURVEYOR'S CERTIFICATE

I, DAVID FOLLANSBEE, A PROFESSIONAL LAND SURVEYOR IN THE STATE OF WASHINGTON, HEREBY CERTIFY THAT THIS MAP CORRECTLY REPRESENTS A SURVEY MADE BY ME OR UNDER MY DIRECT SUPERVISION IN SEPTEMBER 2021 IN COMPLIANCE WITH THE REQUIREMENTS OF THE SURVEY RECORDING ACT, CHAPTER 58.09 R.C.W. AND 332-130 W.A.C., AT THE REQUEST OF STEVE RICH.

DAVID FOLLANSBEE, PLS 45161 DATE

LEGEND

- FOUND MONUMENT AS NOTED
- HUB AND TACK
- SET NAIL AND WASHER
- BOLLARD
- SIGN AS NOTED
- GATE POST
- CLEANOUT
- STORM CATCH BASIN
- STORM MANHOLE
- GUY ANCHOR
- UTILITY POWER POLE
- LUMINAIRE
- FIRE HYDRANT
- IRRIGATION CONTROL VALVE
- WATER VALVE
- CONIFEROUS TREE
- DECIDUOUS TREE
- LEFT TURN ARROW
- D — STORM LINE
- W — WATER LINE
- G — GAS LINE
- P — ELECTRICAL LINE
- OHP — OVERHEAD UTILITIES
- FENCE
- ASPHALT
- CONCRETE

VERTICAL DATUM

CITY OF TACOMA VERTICAL CONTROL- NGVD29 DATUM

BASIS OF BEARING

CITY OF TACOMA SURVEY MONUMENTS- NAD83/91 WASHINGTON SOUTH US FOOT

NOTE:
1. STAMPED/ SIGNED SURVEY ON FILE
2. NOT ALL UTILITIES SHOWN ARE FIELD VERIFIED - D.A. HOGAN HAS MODIFIED THE SURVEY IN SOME INSTANCES TO INCLUDE AS-BUILT UTILITY INFORMATION PROVIDED BY THE OWNER. FIELD VERIFY AT INITIAL SITE PREPARATION WHERE NOTED

NORTH
0 20' 40'
SCALE: 1" = 20'

AHBL
TACOMA · SEATTLE · SPOKANE · TRI-CITIES
2215 North 30th Street, Suite 200 Tacoma, WA 98403
253.383.2422 TEL 253.383.2572 FAX www.ahbl.com WEB

Project Title:
GIAUDRONE MIDDLE SCHOOL TRACK AND FIELD SURVEY

Client:
KORSMO CONSTRUCTION, INC.
1940 EAST D STREET, SUITE 300
TACOMA, WA 98421
STEVE RICH

Job No.
2210626.50

Issue Set & Date:
SEPTEMBER 15, 2021

Revisions:

Sheet Title:
TOPOGRAPHIC SURVEY

Designed by:	Drawn by:	Checked by:
	GD	DF

Sheet No.
1
1 of 2 Sheets

File: F-0.1 Giaudrone CURRENT 24x36.dwg Plotted by: reneef Date: 27-Feb-22 11:58:18am

REVISION	DATE

GIAUDRONE MIDDLE SCHOOL FIELD AND TRACK CONVERSION

TACOMA PUBLIC SCHOOLS
EVERY STUDENT. EVERY DAY.

KORSMO CONSTRUCTION

Field Consultant
D.A. Hogan & Associates, Inc.
119 1st Avenue S., Suite 110,
Seattle, WA 98104
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Civil Engineer
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KG Designs
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(253) 341-9451 Phone

Structural Engineer
KPFF
1601 5th Ave Suite 1600
Seattle, WA 98101
(206) 622-5822 Phone

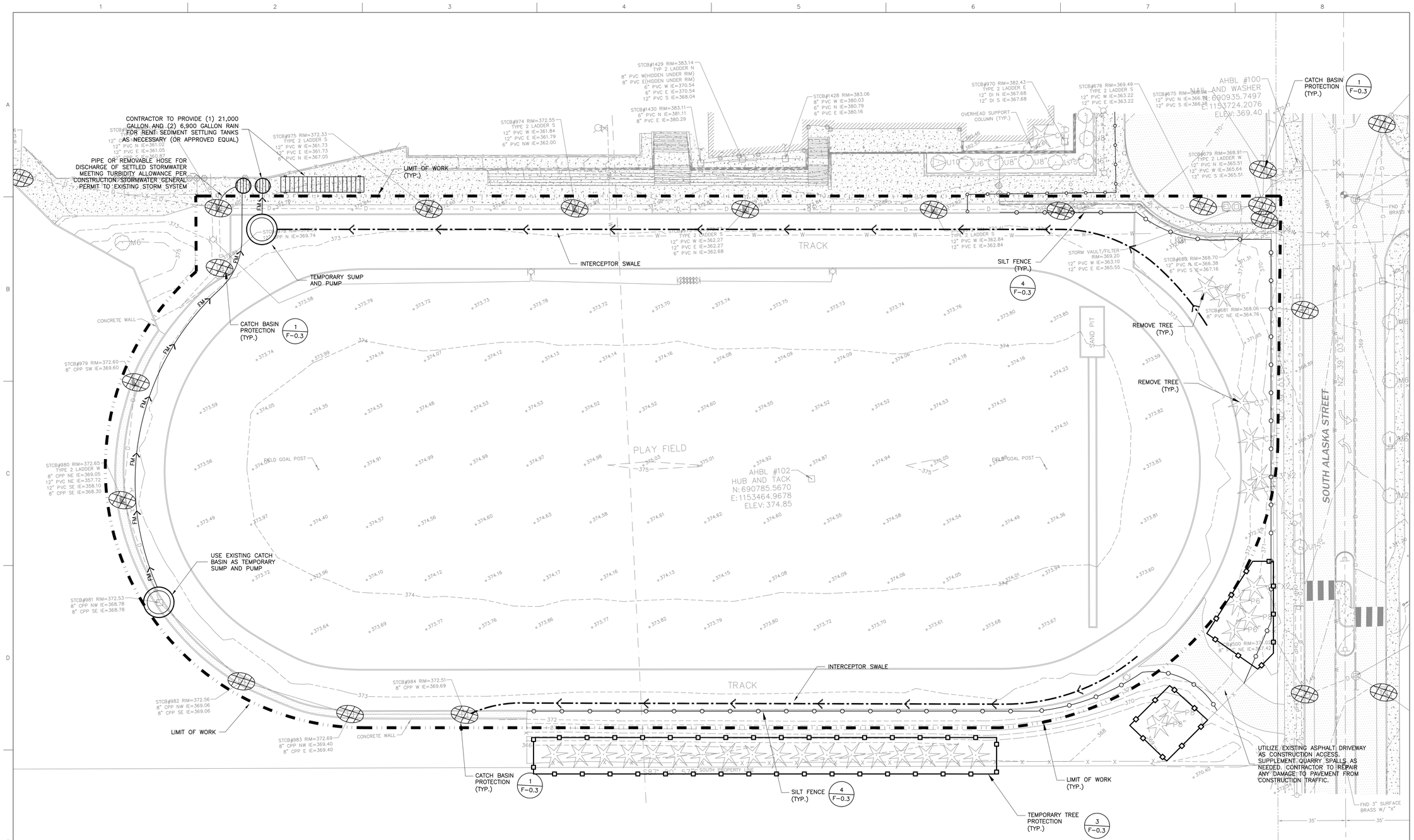
Electrical Engineer
Stantec
4100 194th St SW Suite 400
Lynnwood, WA 98036
(206) 224-3689 Phone

PERMIT SET

DATE	2-28-22
SCALE	1"=20'
DRAWN	-
CHECKED	-

TOPOGRAPHICAL SURVEY

SHEET
F-0.1



T.E.S.C. NOTES

1. SEE SHEET F–0.3 FOR CITY OF TACOMA STANDARD TESC NOTES.
2. ALL LOCATIONS OF EXISTING UTILITIES SHOWN HEREON HAVE BEEN ESTABLISHED BY FIELD SURVEY OR OBTAINED FROM AVAILABLE RECORDS AND SHOULD THEREFORE BE CONSIDERED APPROXIMATE ONLY AND NOT NECESSARILY COMPLETE. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO INDEPENDENTLY VERIFY AND AVOID ANY OTHER UTILITIES SHOWN HEREON WHICH MAY BE AFFECTED BY THE IMPLEMENTATION OF THIS PLAN.
3. MAINTAIN EX. SD CONVEYANCE SYSTEM UNTIL REMAINDER OF PROPOSED SD CONVEYANCE SYSTEM HAS BEEN FULLY CONSTRUCTED AND APPROVED FOR USE. EX. SD CONVEYANCE SYSTEM MAY BE UTILIZED FOR TESC CONVEYANCE PROVIDED ALL FLOWS MEET WATER QUALITY REQUIREMENTS AT POINT OF DISCHARGE FROM SITE.
4. NOT ALL REQUIRED CB PROTECTION IS INDICATED ON THIS PLAN. INSTALL CB PROTECTION PER DETAIL 1/F–0.3 ON ALL EX CATCH BASINS TO REMAIN DURING CONSTRUCTION AND ALL INSTALLED CATCH BASINS. MAINTAIN PROTECTION UNTIL TRIBUTARY SURFACES ARE STABILIZED.
5. MAINTAIN/RELOCATE TESC MEASURES AND PROVIDE ADDITIONAL TESC MEASURES AS REQUIRED TO STABILIZE EXPOSED SOILS, MINIMIZE SEDIMENT TRANSPORT ON SITE, AND MEET ALL SITE DISCHARGE AND PERMIT REQUIREMENTS. ADDITIONAL FACILITIES BEYOND THOSE INDICATED ON THIS PLAN MAY BE REQUIRED, AND IT IS THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE AND PROVIDE ADDITIONAL MEASURES THAT ARE NECESSITATED DUE TO THEIR OPERATIONS AND SEQUENCING OF THE WORK. ALL TESC MEASURES SHALL BE REMOVED FOLLOWING SITE STABILIZATION WITH FINAL PAVING AND PLANTING.
6. CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ALL REQUIRED MONITORING, TESTING, REPORTING AND ALL OTHER COMPLIANCE MEASURES AS NECESSARY TO MEET PROJECT NPDES CONSTRUCTION STORMWATER GENERAL PERMIT COVERAGE REQUIREMENTS.
7. CONTRACTOR SHALL DESIGN AND PROVIDE ALL TEMPORARY STORAGE AND WATER QUALITY TREATMENT FACILITIES, INCLUDING BUT NOT LIMITED TO PRETREATMENT AND STORAGE TANKS, SAND FILTRATION, CHEMICAL TREATMENT SYSTEMS, PIPING, PUMPS, AND ANY OTHER FACILITIES REQUIRED TO MEET THE NPDES CONSTRUCTION STORMWATER GENERAL PERMIT WATER QUALITY REQUIREMENTS FOR ALL SITE DISCHARGES. NUMBER, TYPE AND LOCATION OF TREATMENT SYSTEMS SHALL BE DETERMINED BY CONTRACTOR IN ACCORDANCE WITH THEIR OPERATIONS.
8. PROVIDE TEMP ACCESS ROADS AND WORKING SURFACES TO STABILIZE SOILS IN AREAS OF OPERATIONS. EXTENTS SHOWN ARE SCHEMATIC; ACTUAL EXTENTS OF TEMP ACCESS, WORKING SURFACES AND NUMBER AND LOCATION OF TEMPORARY SUMPS/SUMP PUMPS SHALL BE DETERMINED BY CONTRACTOR IN ACCORDANCE WITH THEIR OPERATIONS.
9. REMOVE ALL TEMP ACCESS ROADS AND WORKING SURFACES PRIOR TO FINAL RESTORATION. INSTALL EROSION BLANKER AT PERIMETER EDGES OF CONSTRUCTION ACCESS ROUTE TO PROTECT EXISTING SOILS.
10. INSTALL EROSION BLANKET PRIOR TO HYDROSEEDING CONSTRUCTION ACCESS RESTORATION AREA.

T.E.S.C. LEGEND

- SILT FENCE
- CATCH BASIN PROTECTION
- TEMPORARY TREE PROTECTION FENCE
- FORCE MAIN
- LIMIT OF WORK

811 Know what's below. Call before you dig.

NORTH

0 20' 40'

SCALE: 1" = 20'

File: F–0.1 Gloudrone CURRENT 24x36.dwg Plotted by: reneef Date: 25–Feb–22 4:26:14pm

REVISION	DATE

GIAUDRONE MIDDLE SCHOOL FIELD AND TRACK CONVERSION

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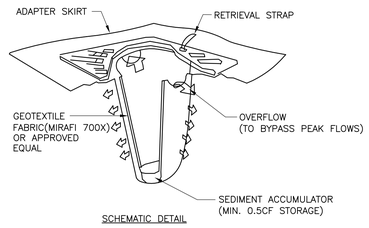
DAVID L. ANDERSON — STATE OF WASHINGTON — EXPIRES 12/31/2022 — PROFESSIONAL ENGINEER

PERMIT SET	
DATE	2-28-22
SCALE	1"=20'
DRAWN	DMD
CHECKED	DLA/JAB

TESC PLAN

SHEET

F-0.2



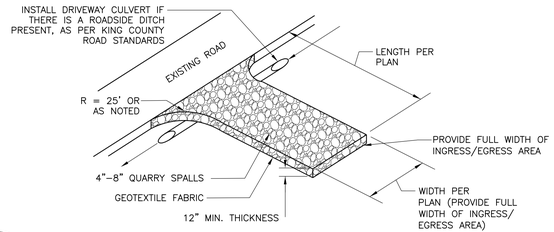
SCHEMATIC DETAIL

PROVIDE "STREAMGUARD SEDIMENT CATCH BASIN INSERT" OR APPROVED EQUAL

MANUFACTURER'S NAME: BOWHEAD ENVIRONMENTAL & SAFETY
ADDRESS: PO BOX 375 PRESTON, WA 98050
TELEPHONE: FOR INFORMATION: (800) 909-3677
WWW.SHOPBOWHEAD.COM

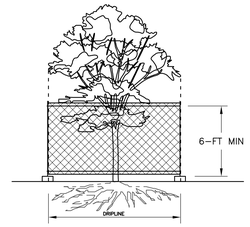
1 F-0.3 **TEMPORARY CATCH BASIN PROTECTION**

NOT TO SCALE



2 F-0.3 **STABILIZED CONSTRUCTION ENTRANCE**

NOT TO SCALE

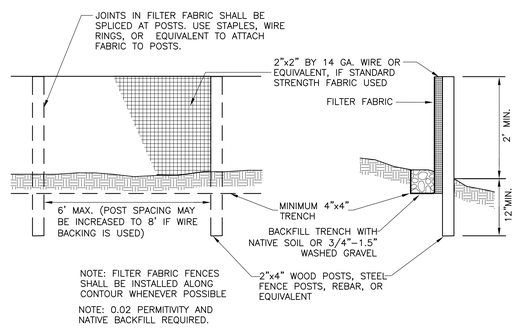


NOTES:

1. 6–FT. HIGH TEMPORARY CHAIN LINK FENCE SHALL BE PLACED AT THE DRIPLINE OF THE TREE TO BE SAVED. FENCE SHALL COMPLETELY ENCIRCLE THE TREE(S). INSTALL FENCE POSTS USING PIER BLOCKS ONLY. AVOID DRIVING POSTS OR STAKES INTO MAJOR ROOTS.
2. FOR ROOTS OVER 1–IN DIA. THAT ARE DAMAGED DURING CONSTRUCTION, MAKE A CLEAN, STRAIGHT CUT TO REMOVE THE DAMAGED PORTION. ALL EXPOSED ROOTS SHALL BE TEMPORARILY COVERED WITH DAMP BURLAP TO PREVENT DRYING, AND SHALL BE COVERED WITH SOIL AS SOON AS POSSIBLE.
3. WORK WITHIN PROTECTION FENCE SHALL BE DONE MANUALLY. NO STOCKPILING OF MATERIALS, VEHICULAR TRAFFIC, OR STORAGE OF EQUIPMENT OR MACHINERY SHALL BE ALLOWED WITHIN THE LIMIT OF THE FENCING.

3 F-0.3 **TREE PROTECTION**

NOT TO SCALE



NOTE: FILTER FABRIC FENCES SHALL BE INSTALLED ALONG CONTOUR WHENEVER POSSIBLE

NOTE: 0.02 PERMITIVITY AND NATIVE BACKFILL REQUIRED.

4 F-0.3 **TEMPORARY FILTER FABRIC FENCE**

NOT TO SCALE

T.E.S.C. NOTES

1. THE IMPLEMENTATION OF THESE TESC PLANS AND THE CONSTRUCTION, MAINTENANCE, REPLACEMENT, AND UPGRADING OF TESC FACILITIES IS THE RESPONSIBILITY OF THE APPLICANT/ CONTRACTOR UNTIL ALL CONSTRUCTION IS COMPLETED AND APPROVED, VEGETATION/LANDSCAPING IS ESTABLISHED AND THE ENTIRE SITE IS STABILIZED.
2. THE BOUNDARIES OF THE CLEARING LIMITS SHOWN ON THIS PLAN SHALL BE CLEARLY MARKED IN THE FIELD PRIOR TO CONSTRUCTION. DURING THE CONSTRUCTION PERIOD, NO DISTURBANCE BEYOND THE CLEARING LIMITS SHALL BE PERMITTED. THE MARKING SHALL BE MAINTAINED BY THE APPLICANT/CONTRACTOR FOR THE DURATION OF CONSTRUCTION.
3. THE TESC FACILITIES SHOWN ON THIS PLAN SHALL BE CONSTRUCTED PRIOR TO AND/OR IN CONJUNCTION WITH ALL CLEARING AND GRADING ACTIVITIES, AND IN SUCH A MANNER AS TO ENSURE THAT SEDIMENT AND SEDIMENT LADEN WATER DO NOT ENTER THE DRAINAGE SYSTEM OR ROADWAYS, OR VIOLATE APPLICABLE WATER STANDARDS.
4. THE TESC FACILITIES SHOWN ON THIS PLAN ARE THE MINIMUM REQUIREMENTS FOR ANTICIPATED SITE CONDITIONS. DURING THE CONSTRUCTION PERIOD, TESC FACILITIES SHALL BE UPGRADED AS NEEDED FOR UNEXPECTED STORM EVENTS AND TO ENSURE THAT SEDIMENT AND SEDIMENT–LADEN WATER DO NOT LEAVE THE SITE.
5. THE CESCL, CPESC, OR ESC LEAD SHALL BE IDENTIFIED IN THE SWPPP AND SHALL BE ONSITE OR ON–CALL AT ALL TIMES.
6. THE CESCL, CPESC, OR ESC LEAD MUST BE KNOWLEDGEABLE IN THE PRINCIPLES AND PRACTICES OF EROSION AND SEDIMENT CONTROL AND HAVE THE SKILLS TO ASSESS:
   a. SITE CONDITIONS AND CONSTRUCTION ACTIVITIES THAT COULD IMPACT THE QUALITY OF STORMWATER.
   b. EFFECTIVENESS OF EROSION AND SEDIMENT CONTROL MEASURES USED TO CONTROL THE QUALITY OF STORMWATER DISCHARGES.
7. THE CESCL, CPESC, OR ESC LEAD MUST EXAMINE STORMWATER VISUALLY FOR THE PRESENCE OF SUSPENDED SEDIMENT, TURBIDITY, DISCOLORATION, AND OIL SHEEN AND EVALUATE THE EFFECTIVENESS OF BMPS TO DETERMINE IF IT IS NECESSARY TO INSTALL, MAINTAIN, OR REPAIR BMPS.
8. THE CESCL, CPESC, OR ESC LEAD MUST INSPECT ALL AREAS DISTURBED BY CONSTRUCTION ACTIVITIES, ALL BMPS, AND ALL STORMWATER DISCHARGE POINTS AT LEAST ONCE EVERY CALENDAR WEEK AND WITHIN 24 HOURS OF ANY DISCHARGE FROM THE SITE. (INDIVIDUAL DISCHARGE EVENTS THAT LAST MORE THAN ONE DAY DO NOT REQUIRE DAILY INSPECTIONS). THE CESCL OR INSPECTORMAY REDUCE THE INSPECTION FREQUENCY FOR TEMPORARY STABILIZED, INACTIVE SITES TO ONCE EVERY CALENDAR MONTH.
9. CONSTRUCTION SITE OPERATORS MUST CORRECT ANY PROBLEMS IDENTIFIED BY THE CESCL, CPESC,OR ESC LEAD BY:
   a. REVIEWING THE SWPPP FOR COMPLIANCE WITH THE 13 CONSTRUCTION SWPPP ELEMENTS AND MAKING APPROPRIATE REVISIONS WITHIN 7 DAYS OF THE INSPECTION.
   b. FULLY IMPLEMENT AND MAINTAIN APPROPRIATE SOURCE CONTROL AND/OR TREATMENT BMPS AS SOON AS POSSIBLE BUT CORRECTING THE PROBLEM WITHIN 10 DAYS.
   c. DOCUMENTING BMP IMPLEMENTATION AND MAINTENANCE IN THE SITE LOG BOOK. (REQUIRED FOR SITES LARGER THAN 1 ACRE BUT RECOMMENDED FOR ALL SITES).

   SAMPLING AND ANALYSIS OF THE STORMWATER DISCHARGES FROM A CONSTRUCTION SITE MAY BE NECESSARY ON A CASE–BY–CASE BASIS TO ENSURE COMPLIANCE WITH STANDARDS. ECOLOGY OR THE CITY WILL ESTABLISH THESE MONITORING AND ASSOCIATED REPORTING REQUIREMENTS.
10. AT NO TIME SHALL MORE THAN ONE FOOT OF SEDIMENT BE ALLOWED TO ACCUMULATE WITHIN A CATCH BASIN SEDIMENT TRAP.
11. ALL CATCH BASINS AND CONVEYANCE LINES SHALL BE CLEANED PRIOR TO PAVING. THE CLEANING OPERATION SHALL NOT FLUSH SEDIMENT–LADEN WATER INTO THE DOWNSTREAM SYSTEM.
12. STABILIZED CONSTRUCTION ENTRANCES SHALL BE INSTALLED AT THE BEGINNING OF CONSTRUCTION AND MAINTAINED FOR THE DURATION OF THE PROJECT. ADDITIONAL MEASURES MAY BE REQUIRED TO ENSURE THAT ALL PAVED AREAS ARE KEPT CLEAN FOR THE DURATION OF THE PROJECT.

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DAVID L. ANDERSON — STATE OF WASHINGTON — 22009 — REGISTERED PROFESSIONAL ENGINEER

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TESC DETAILS

SHEET

F-0.3

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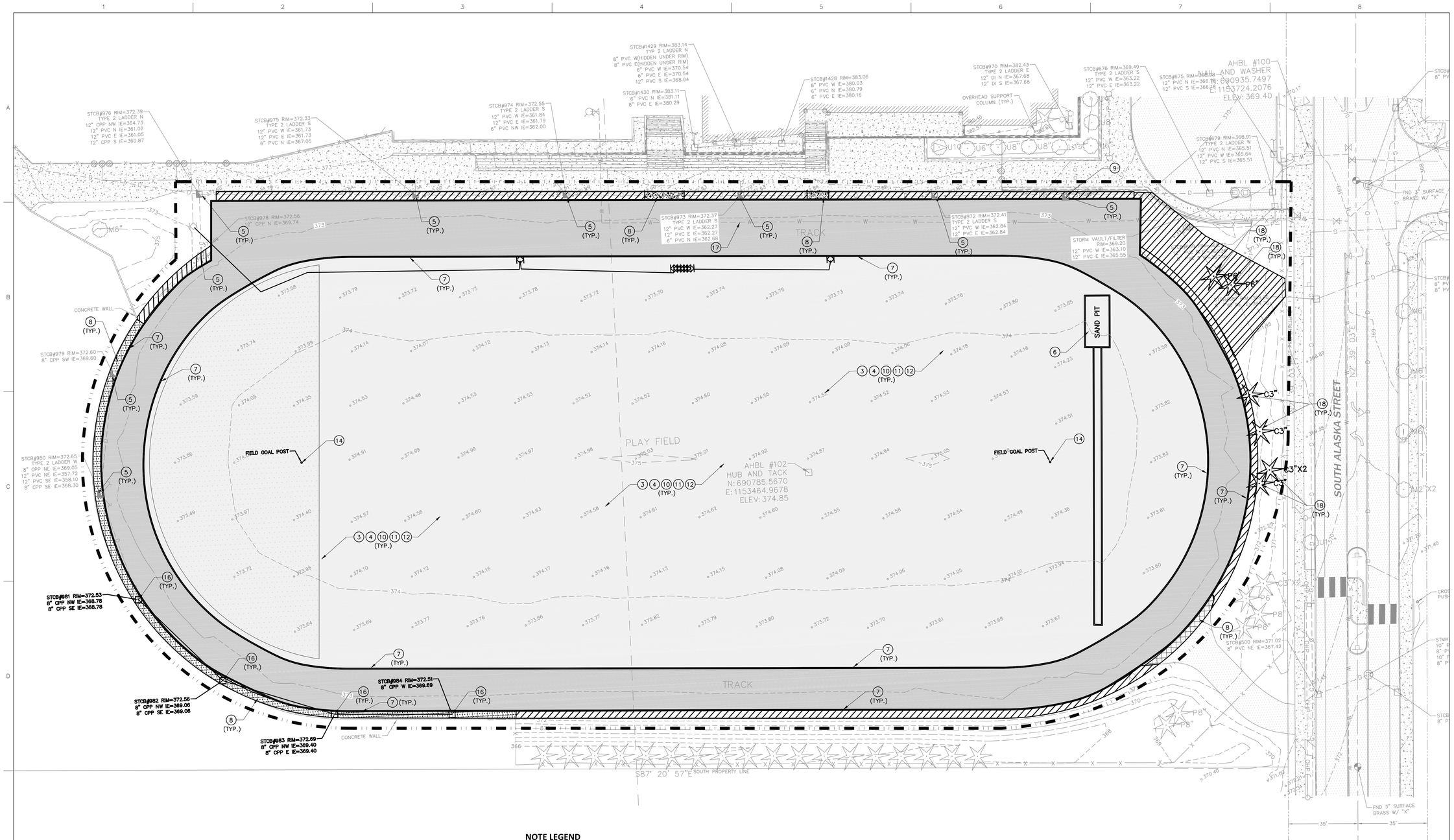

DEMOLITION NOTES

1. CALL BEFORE YOU DIG. LOCATE, IDENTIFY AND VERIFY CONDITION OF ALL SITE UTILITIES PRIOR TO COMMENCING THE WORK.
2. CONTRACTOR SHALL BE RESPONSIBLE FOR SECURING ALL GATES AND FENCES AT PERIMETER OF THIS SITE TO ESTABLISH A SECURE WORK AREA. WORK SHALL INCLUDE TEMPORARY FENCING. SECURITY FENCE TO BE 6 FEET HEIGHT, CHAINLINK.
3. STRIP AREA WITHIN LIMITS OF DISTURBANCE OF EXISTING SOD AND ORGANIC MATERIALS AND DISPOSE OF OFF SITE. ALL EXCESS AND UNSUITABLE SOIL MATERIALS SHALL BE REMOVED AND DISPOSED OF OFF SITE.
4. APPROVED EXISTING SAND FIELD (LESS ORGANICS), CINDER MATERIALS AND SAND MAY BE INCORPORATED INTO THE EARTHWORK AFTER REMOVAL AND DISPOSAL OF THE ORGANIC MATERIALS. ALL EXCESS MATERIAL TO BE DISPOSED OF OFF SITE. SALVAGE SELECT UNCONTAMINATED CINDERS FOR RE-USE AT THE SHOT PUT. CINDERS SHALL NOT BE CONTAMINATED WITH ORGANIC MATERIAL OR SITE SOIL.
5. PROTECT ALL EXISTING CATCH BASINS TO REMAIN DURING CONSTRUCTION. INSTALL T.E.S.C. MEASURES AROUND RIMS AND MAINTAIN THROUGHOUT CONSTRUCTION. ALL EXISTING CATCH BASINS SHALL BE TAKEN OFF-LINE PRIOR TO LAND CLEARING ACTIVITIES. OUTLET PIPES SHALL BE PLUGGED TO PREVENT DISCHARGE OF TURBID WATER IN THE DOWNSTREAM SYSTEM. PROPOSED INLETS SHALL BE PROTECTED WITH CATCH BASIN INSERTS, AND THEIR OUTLETS SHALL BE PLUGGED UNTIL THE SITE IS STABILIZED. SEE T.E.S.C. PLAN F-0.2.
6. REMOVE EXISTING JUMP PIT SAND, CONCRETE CURB, CINDERS AND DISPOSE OF OFFSITE.
7. REMOVE EXISTING CONCRETE CURB AND DISPOSE OF OFF SITE.

NOTE LEGEND

1. (INDICATES GENERAL CONSTRUCTION NOTE)
3. (INDICATES SPECIFIC CONSTRUCTION KEYNOTE)

8. REMOVE EXISTING ASPHALT OR CONCRETE PAVING AND DISPOSE OF OFFSITE.
9. REMOVE EXISTING JUNCTION BOXES AND DISPOSE OF OFF SITE.
10. REMOVE ALL EXISTING SUBSURFACE DRAINAGE LATERAL AND COLLECTOR LINES PRIOR TO SUBGRADE ESTABLISHMENT AND DISPOSE OF OFF SITE. BACKFILL ALL VOIDS WITH STRUCTURAL FILL OR EXISTING PEA GRAVEL.
11. REMOVE EXISTING IRRIGATION CONTROL VALVES AND CORRESPONDING BOXES AND DELIVER TO THE OWNER ON SITE UNLESS OTHERWISE NOTED. CAP AND PROTECT EXISTING IRRIGATION MAINLINE TO REMAIN.
12. REMOVE EXISTING IRRIGATION SPRINKLER HEADS AND RISER ASSEMBLIES, CLEAN, PACKAGE AND DELIVER TO THE OWNER ONSITE UNLESS OTHERWISE NOTED. BACKFILL ALL VOIDS WITH STRUCTURAL FILL OR EXISTING PEA GRAVEL.
13. THE IRRIGATION WATER SUPPLY TO THE EXISTING SOFTBALL FIELDS SHALL BE MAINTAINED THROUGHOUT THE PROJECT. ANY SHUT DOWN TO THESE IRRIGATION SYSTEMS SHALL BE COORDINATED WITH THE SCHOOL DISTRICT GROUNDS DEPARTMENT A MINIMUM OF 48 HOURS PRIOR TO THE SHUT DOWN. THE DURATION OF ANY INTERRUPTIONS TO THE IRRIGATION SERVICE TO THOSE FIELDS SHALL NOT EXCEED 24 HOURS.
14. REMOVE EXISTING GOAL POSTS AND SALVAGE FOR REPAINTING. REMOVE EXISTING FOOTING AND DISPOSE OF OFF SITE. BACKFILL WITH STRUCTURAL AND COMPACT 95%
15. PROTECT ALL UTILITIES TO REMAIN FROM ANY DAMAGE THROUGHOUT CONSTRUCTION.
16. REMOVE EXISTING CATCH BASINS AND STORM DRAINAGE PIPE AND DISPOSE OFF SITE. BACKFILL WITH STRUCTURAL FILL AND COMPACT TO 95%. PLUG PENETRATION AT STORM DRAINAGE OUTFALL IN THE NEXT DOWNSTREAM STRUCTURE
17. POT HOLE EXISTING WATER LINE PRIOR TO INSTALLATION OF DRAINAGE SYSTEM, COORDINATE COLLECTOR DEPTH WITH EXISTING WATER LINE, REPORT ANY CONFLICTS TO ENGINEER
18. REMOVE EXISTING TREE AND ROOTS
19. BACKFILL ALL EXCAVATIONS WITH STRUCTURAL FILL AND COMPACT TO 95%.

DEMOLITION LEGEND

- EXISTING NATURAL TURF AND ROOT ZONE SAND TO BE REMOVED AND DISPOSED OF OFF SITE
- CINDER SURFACING TO BE REMOVED AND DISPOSED OF OFF SITE
- EXISTING NATURAL TURF TO BE REMOVED AND DISPOSED OF OFF SITE
- REMOVE EXISTING ASPHALT OR CONCRETE PAVING
- LIMIT OF WORK
- EXISTING CONCRETE CURBING TO BE REMOVED AND DISPOSED OF OFF SITE
- EXISTING TREE REMOVAL
- D — REMOVE EXISTING DRAIN PIPE

811. Know what's below. Call before you dig.

NORTH

0 20' 40'

SCALE: 1" = 20'

REVISION	DATE

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DEMOLITION PLAN

SHEET

F-0.4

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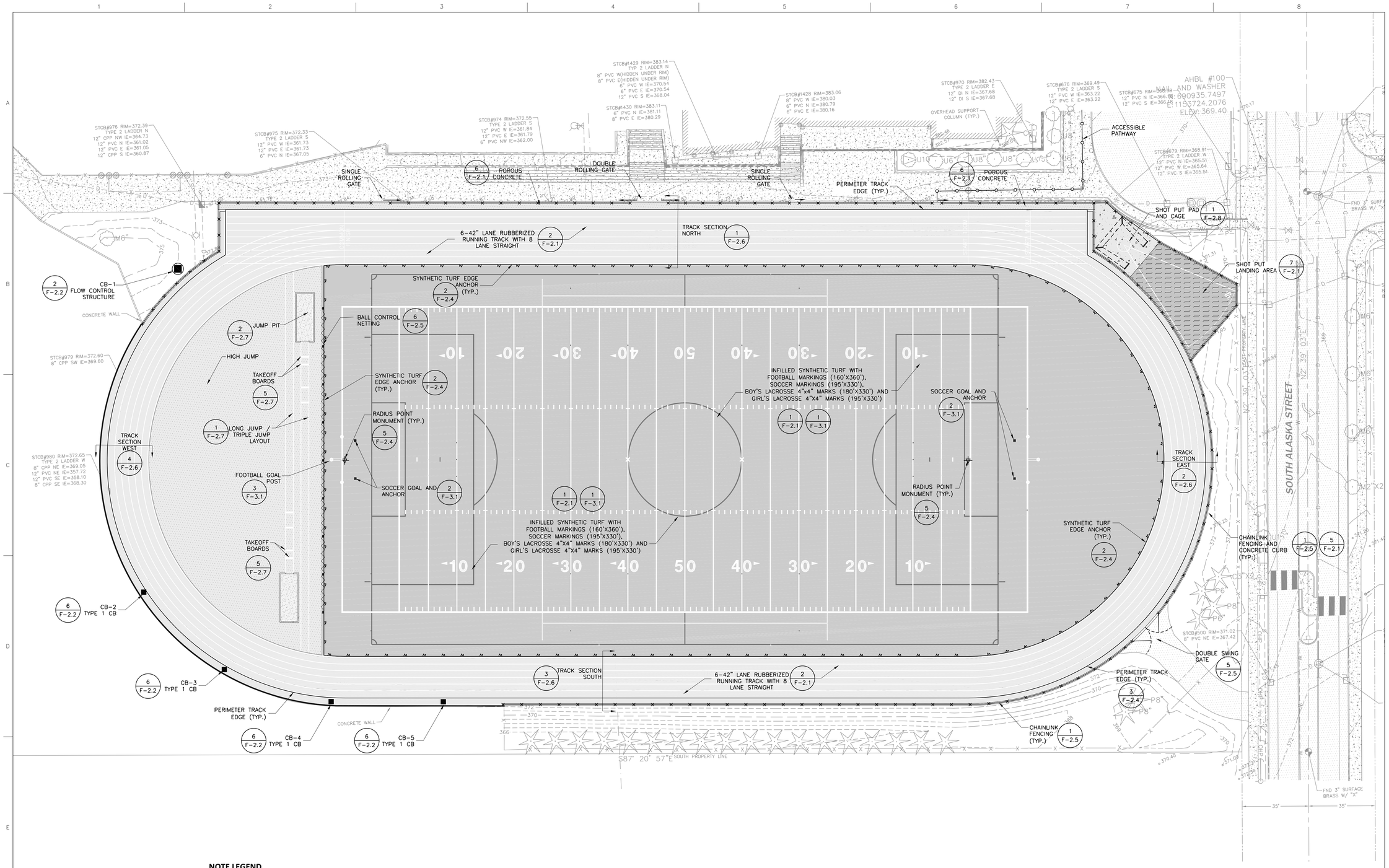

LAYOUT NOTES

NOTE LEGEND

1. (INDICATES GENERAL CONSTRUCTION NOTE)
3. (INDICATES SPECIFIC CONSTRUCTION KEYNOTE)

1. FIELD LOCATE EXISTING RADIUS POINT MONUMENT FOR TRACK STRIPING. MEASURING LINE RADIUS FOR TRACK IS R114.87'. DISTANCE BETWEEN RADIUS POINTS IS 295.32'.
2. PRIOR TO INSTALLATION OF THE RUBBERIZED SURFACE THE EXISTING PAVING SHALL BE CHECKED FOR PLANARITY BY THE ENGINEER, GENERAL CONTRACTOR, AND TRACK VENDOR. FOR ESTIMATING PURPOSES, IT IS ASSUMED THAT 900SF OF EXISTING ASPHALT PAVING SHALL REQUIRE GRINDING OF 0.10'. THE EXISTING ASPHALT PAVING SHALL BE GROUND TO THE REQUIRED PLANARITY WITHIN SPECIFIED TOLERANCES. MICROGRIND OR EQUIVALENT.
3. FINISH SURFACE PLANARITY OF ASPHALT SHALL NOT DEVIATE MORE THAN 1/8" WHEN MEASURED WITH A 10 FOOT STRAIGHT EDGE IN ALL DIRECTIONS.
4. IMMEDIATELY PRIOR TO APPLICATION OF RUBBERIZED SURFACING, EXISTING POROUS ASPHALT SHALL BE THOROUGHLY CLEANED OF ALL DIRT, DEBRIS OR ANY OTHER SUBSTANCES THAT WILL BE DETRIMENTAL TO THE INSTALLATION. ALL SURFACES TO BE VACUUMED WITH A COMMERCIAL HEAVY DUTY UNIT AND PRESSURE WASHED.
5. PRIOR TO APPLICATION OF PRIMER, THE PERMEABILITY IS TO BE INSPECTED BY THE ENGINEER AND MUST BE APPROVED BEFORE ANY SURFACE APPLICATION OF RUBBERIZED SURFACING. CONTRACTOR TO ARRANGE FOR HOSE AND COUPLERS.
6. APPLY SUCH PRIMING MATERIAL AS MAY BE NECESSARY TO ASSURE COMPLETE BOND OF POLYURETHANE TO THE EXISTING POROUS ASPHALT OR CONVENTIONAL ASPHALT PAVING.
7. THE RUBBERIZED SURFACING SHALL CONSIST OF A PERMEABLE POLYURETHANE BASE MATT WITH A PERMEABLE POLYURETHANE STRUCTURAL SPRAY.
8. CONTRACTOR MUST PROTECT ALL ADJACENT AREAS FROM ANY CONTAMINATION OR OVER SPRAY FROM RUBBERIZED SURFACING INSTALLATION PROCEDURES. TAPE PLASTIC SHEETING TO EDGING OR ADJACENT EXPOSED ASPHALT CONCRETE PAVING TO PROTECT FIELD SURFACING, ADJACENT AREAS AND STRUCTURES INCLUDING FENCING.
9. FURNISH AND INSTALL COMPLETE TRACK AND FIELD EVENT LINES AND MARKINGS TO MATCH THAT OF THE EXISTING TRACK AND FIELD EVENTS.
10. FURNISH AND INSTALL COMPLETE TRACK AND FIELD EVENT LINES AND MARKINGS.
11. PRIOR TO TESTING, MANUFACTURING AND SHIPMENT OF SYNTHETIC TURF MATERIAL, CONTRACTOR SHALL FIELD VERIFY SYNTHETIC TURF SURFACING DIMENSIONS TO MATCH EXISTING FIELD. SEE SYNTHETIC TURF COMPOSITE LAYOUT PLAN FOR SYNTHETIC TURF LINES AND MARKINGS.
12. PROTECT ALL EXISTING PERMEABLE AGGREGATE BASE TO REMAIN. DISTURBED OR SEGREGATED PERMEABLE AGGREGATE MATERIALS SHALL BE REMOVED AND REPLACED WITH NEW TOP COURSE AGGREGATE AS DIRECTED BY THE ENGINEER.
13. THE CONTRACTOR SHALL UTILIZE EXTREME CARE DURING TURF INSTALLATION TO PROTECT EXISTING SUPPLEMENTAL PAD AND PERMEABLE AGGREGATE BASE TO REMAIN. PRIOR TO INSTALLATION OF NEW SYNTHETIC TURF SYSTEM, REMOVE ALL RESIDUE AND THOROUGHLY CLEAN THE EXISTING SUPPLEMENTAL PAD, AND REPAIR OR REPLACE ANY DAMAGE TO THE EXISTING SUPPLEMENTAL PAD. THE SUPPLEMENTAL PAD IS TO BE INSPECTED BY THE ENGINEER AND MUST BE APPROVED BEFORE TURF INSTALLATION. THE EXISTING PAD IS A 10MM REGUPOL PRODUCT. CONTRACTOR SHALL ASSUME 1000 SF OF PAD REPAIR OR REPLACEMENT AREAS.
14. PRIOR TO COMMENCING TURF INSTALLATION:
    - 14.1. PREPARE THE EXISTING SUPPLEMENTAL PAD FLUSH TO THE EXISTING EDGE ANCHOR.
    - 14.2. MEET 1/4" IN 10' PLANARITY REQUIREMENT.
    - 14.3. VERIFY INFILTRATION AS DIRECTED.
15. FURNISH AND INSTALL FOUR NEW SOCCER GOALS ANCHORS (2 EACH SIDE).
16. PROTECT ALL EXISTING UTILITIES TO REMAIN THROUGHOUT CONSTRUCTION.
17. INSTALL GOAL POSTS AFTER PAINTING , COLOR TO BE WHITE. ADJUST EXISTING GOAL POSTS TO PRODUCE 10'-0" CLEARANCE FROM SURFACE OF NEW SYNTHETIC TURF INFILL. CONSTRUCT NEW GOAL POST COVERS TO MATCH NEW TURF.

LAYOUT LEGEND

- SYNTHETIC TURF AND PERMEABLE AGGREGATE
- RUBBERIZED SURFACING AND ASPHALT PAVING
- VERTICALLY DRAINING RUBBERIZED SURFACING OVER PEA-ROCK URETHANE AND PERMEABLE BASE
- CINDERS
- CONCRETE PAVING
- POROUS CONCRETE PAVING
- CHAINLINK FENCE AND CONCRETE CURB
- CHAINLINK FENCE
- CONCRETE CURBING
- LIMIT OF SYNTHETIC TURF AND CONCRETE EDGE ANCHOR
- FLOW CONTROL STRUCTURE
- TYPE 1 CATCH BASIN
- EXISTING CATCH BASIN
- ACCESSIBILITY ROUTE

NORTH

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DAVID L. ANDERSON — STATE OF WASHINGTON — 22010 — REGISTERED PROFESSIONAL ENGINEER

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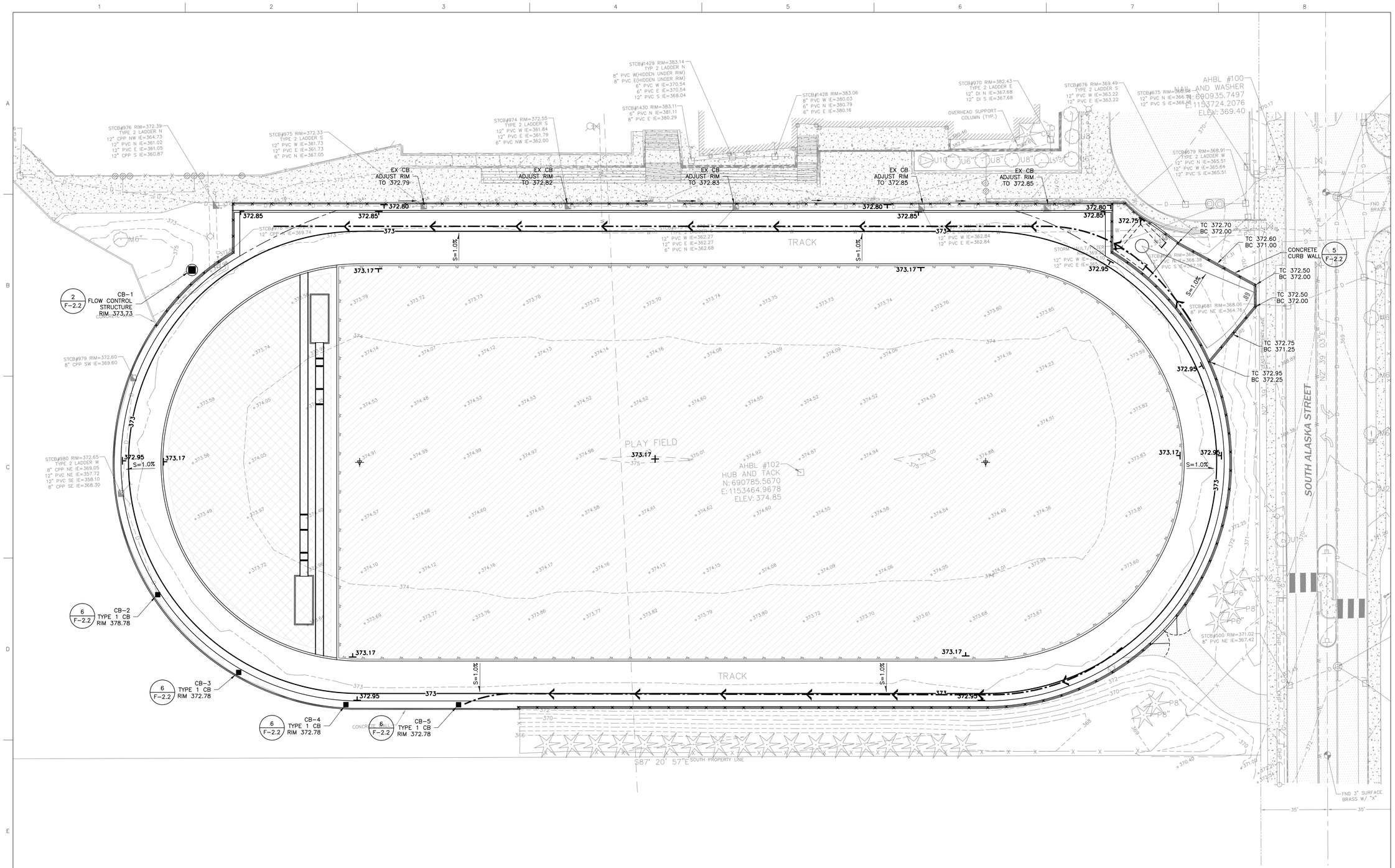
LAYOUT PLAN

SHEET

F-1.1

File: F-0.1 Giaudrone CURRENT 24x36.dwg Plotted by: reneef Date: 28-Feb-22 9:40:37am



FIELD AND TRACK ELEVATIONS

SYNTHETIC TURF FIELD:

FINISHED GRADE OF SYNTHETIC TURF INFILL:	373.17
FINISHED GRADE OF SUPPLEMENTAL PAD:	373.04
FINISHED GRADE OF TOP COURSE PERMEABLE AGGREGATE:	372.95
FINISHED GRADE OF BASE COURSE PERMEABLE AGGREGATE:	372.78
SUBGRADE ELEVATION:	372.11

RUBBERIZED RUNNING TRACK AREAS:

INSIDE EDGE:

FINISHED GRADE OF RUBBERIZED SURFACING:	373.17
FINISHED GRADE OF ASPHALT PAVING:	373.13
FINISHED GRADE OF BASE AGGREGATE:	372.84
SUBGRADE ELEVATION:	372.34

OUTSIDE EDGE:

FINISHED GRADE OF RUBBERIZED SURFACING:	372.95
FINISHED GRADE OF ASPHALT PAVING:	372.91
FINISHED GRADE OF BASE AGGREGATE:	372.62
SUBGRADE ELEVATION:	372.12

NORTH EDGE:

FINISHED GRADE OF RUBBERIZED SURFACING:	372.85
FINISHED GRADE OF ASPHALT PAVING:	372.81
FINISHED GRADE OF BASE AGGREGATE:	372.52
SUBGRADE ELEVATION:	372.02

GRADING NOTES

1. THE CONTRACTOR SHALL CALL AND NOTIFY DIGALERT AT 8-1-1 A MINIMUM OF 2 WORKING DAYS BEFORE DEMOLITION, DIGGING, OR GRADING OPERATIONS OCCUR.
2. NEW CONTOURS SHOWN ARE FINISH GRADE ELEVATIONS.
3. BACKFILL AND COMPACT EXCAVATED AREAS RESULTING FROM DEMOLITION ACTIVITIES WITH SELECT FILL TO 95% WITH 12" MAX LIFTS.
4. STRIP FIELD AREA OF EXISTING SOD AND ORGANIC MATERIALS AND DISPOSE OF OFF SITE. ALL EXCESS AND UNSUITABLE SOIL MATERIALS SHALL BE REMOVED AND DISPOSED OF OFF SITE.
5. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IN THE EVENT OR DISCOVERY OF POOR SOILS, GROUNDWATER OR DISCREPANCIES IN THE EXISTING CONDITIONS AS NOTED ON THE PLANS.
6. ALL PERIMETER PAVING SHALL MEET AND MATCH ADJACENT SURFACES.

NOTE LEGEND

1. (INDICATES GENERAL CONSTRUCTION NOTE)
3. (INDICATES SPECIFIC CONSTRUCTION KEYNOTE)

GRADING LEGEND

- 372 — EXISTING CONTOUR LINES
- 373.17 — SPOT ELEVATION
- GRADE BREAK
- LIMIT OF PERMEABLE AGGREGATE
- PERMEABLE AGGREGATE OVER DETENTION BASIN
- CHAINLINK FENCE AND CONCRETE CURB
- CHAINLINK FENCE
- S=1.0% — SURFACE SLOPE

TC 374.85 TOP OF CURB ELEVATION

BC 369.40 BOTTOM OF CURB ELEVATION

TOP OF CURB ELEVATION (TW)

FINISH GRADE ELEVATION (FG)

BOTTOM OF CURB ELEVATION (BW)

811 Know what's below. Call before you dig.

NORTH

0 20' 40'

SCALE: 1" = 20'

File: F-0.1 Giaudrone CURRENT 24x36.dwg Plotted by: reneef Date: 28-Feb-22 9:49:24am

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DAVID L. ANDERSON — STATE OF WASHINGTON — REGISTERED PROFESSIONAL ENGINEER

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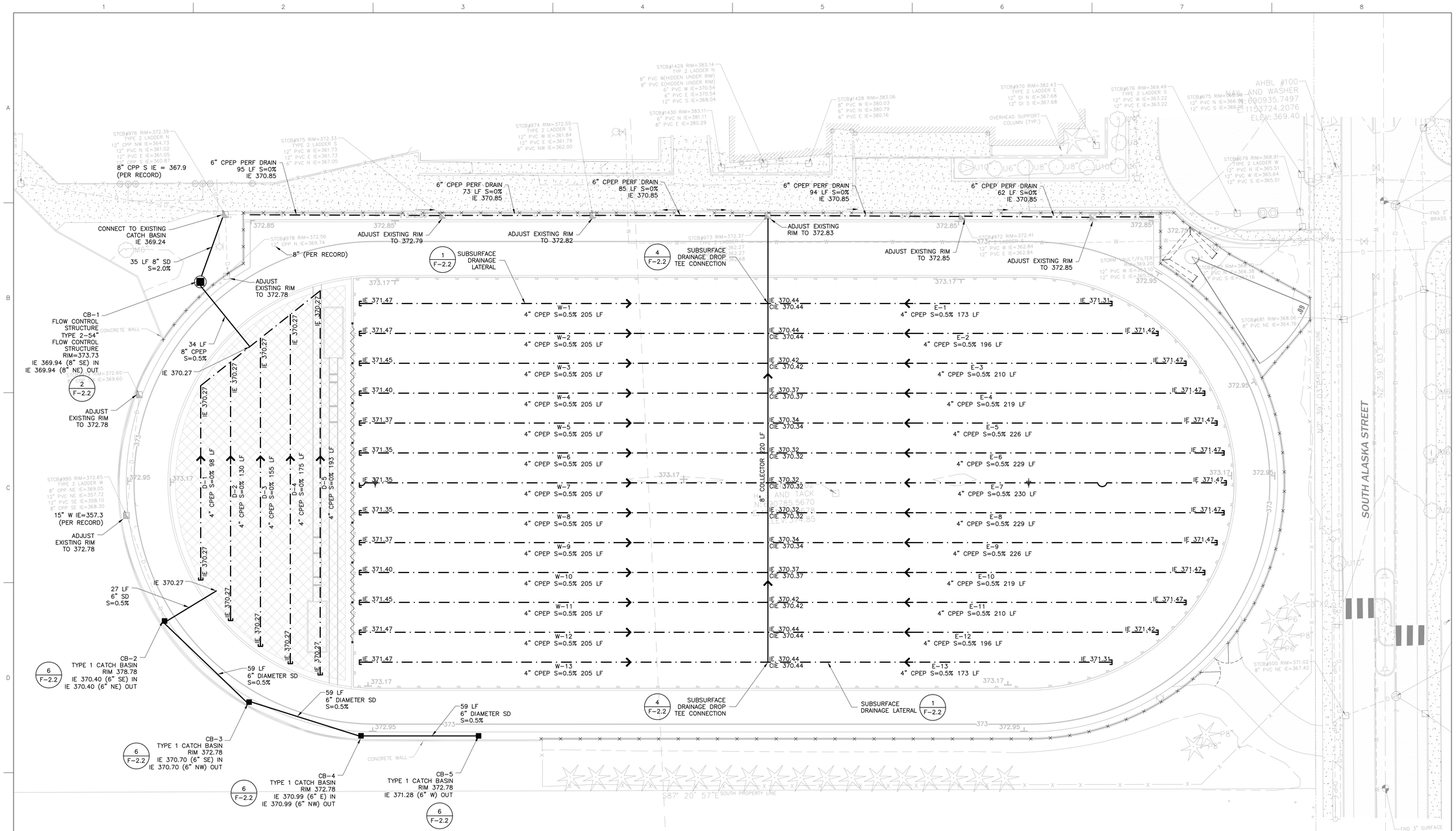
CHECKED	DLA/JAB

GRADING PLAN

SHEET

F-1.2



DRAINAGE NOTES

1. SUBSURFACE DRAINAGE COLLECTOR PIPE CAN BE INSTALLED PRIOR TO FINAL ACCEPTANCE OF THE FIELD SUBGRADE.
2. COORDINATION: IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO ENSURE THAT THE IRRIGATION PIPING IS INSTALLED AT A SUFFICIENT DEPTH BELOW SUBGRADE BEFORE THE TRENCHING FOR THE SUBSURFACE DRAINAGE SYSTEMS TO AVOID CONFLICTS BETWEEN SYSTEMS.
3. TRENCHING FOR THE SUBSURFACE DRAINAGE LATERALS SHALL NOT PROCEED UNTIL THE IRRIGATION SYSTEM PIPING HAS BEEN BACKFILLED AND COMPACTED AND THE FIELD SUBGRADE IS APPROVED BY ENGINEER.
4. TRENCH EXCAVATION SHALL BE MADE TO THE ALIGNMENT, ELEVATION, GRADE AND SLOPE AS INDICATED ON THE DRAWINGS. TRENCHING SHALL BE ACCOMPLISHED UTILIZING EQUIPMENT WITH SLOPE AND DEPTH CONTROL, SUCH AS "LASER PLANE CONTROL SYSTEM", SO AS TO ENSURE ACCURACY IN THE BOTTOM OF THE TRENCH.
5. NO HIGH POINTS ABOVE DESIGNATED INVERT OR CALCULATED TRENCH BOTTOM ELEVATION WILL BE PERMITTED. NO SLOUGHING OF SITE MATERIAL OR LOOSE EXCAVATED SOIL WILL BE PERMITTED TO REMAIN IN THE TRENCHES.
6. SURPLUS EXCAVATED SOIL SHALL BE REMOVED FROM THE FIELD AREA PRIOR TO COMMENCING ON THE NEXT ADJACENT TRENCH. EXCAVATED MATERIAL MAY NOT REMAIN ON SUBGRADE.
7. PROVIDE A SMOOTH, EVEN SUBGRADE AFTER REMOVAL OF THE TRENCH MATERIAL. SUBGRADE TO BE COMPACTED TO 95%. LEAVE NO LOOSE MATERIAL ON THE SUBGRADE.
8. EXCAVATION BELOW INVERT GRADE MUST BE ESTABLISHED TO A DEPTH SO AS TO PROVIDE FOR SPECIFIED PLACEMENT OF PEA GRAVEL BEDDING AT BOTTOM OF PIPE ELEVATION PRIOR TO LAYING THE PERFORATED PIPE.
9. NO FOREIGN MATERIAL WILL BE PERMITTED INSIDE, ALONGSIDE, UNDER, OR ON TOP OF THE PERFORATED DRAIN PIPE.
10. THE BACKFILL FOR ALL PERFORATED PIPE SHALL BE CLEAN WASHED PEA GRAVEL. REFER TO THE SPECIFICATIONS FOR THE GRADATION REQUIREMENTS.
11. ALL TRENCHES TO HAVE BACKFILL MATERIAL "CROWNED" A MINIMUM OF 2" ABOVE SUBGRADE TO PROTECT FROM FOREIGN MATERIAL AND PROVIDE FOR EASE OF LOCATION IDENTIFICATION. CROWNS WITH FOREIGN MATERIAL CONTAMINATION SHALL BE REMOVED PRIOR TO PLACEMENT OF BASE SAND (NATURAL TURF) OR BASE AGGREGATE.
12. DURING PLACEMENT OF SPECIFIED TRENCH BACKFILL, PIPE MUST BE HELD IN PLACE TO PREVENT DISPLACEMENT AND PROVIDE FOR ACHIEVING SPECIFIED INVERT ELEVATION. DO NOT DAMAGE PIPE OR ALLOW PIPE TO BE DISPLACED BY PLACEMENT OF BACKFILL MATERIAL.
13. CAP THE ENDS OF ALL LATERAL RUNS. ALL OPEN ENDS DURING CONSTRUCTION ARE TO BE TEMPORARILY CAPPED OR PLUGGED.
14. CONNECTION OF LATERALS TO COLLECTOR DRAINS SHALL BE MADE WITH A COMBINATION REDUCING TEE AND REDUCING SADDLE TEE.
15. NO TRUCKS OR EQUIPMENT WILL BE ALLOWED TO DRIVE OVER THE TOP OF THE TRENCHES EXCEPT TRACK-EQUIPPED MACHINERY UTILIZED IN SPREADING IMPORTED SAND (NATURAL TURF) BASE AGGREGATE (SYNTHETIC TURF) MATERIALS. BACKFILLED TRENCHES ARE TO BE STAKED AND FLAGGED 3' ABOVE GRADE AT MAXIMUM 30' SPACING FOR IDENTITY.
16. COORDINATE SUBSURFACE DRAINAGE COLLECTOR LOCATION TO AVOID FENCE POST LOCATIONS.
17. BACKFILL AT TRENCHES CROSSING TRACK TO BE LEAN CONCRETE OR CDF TO TOP OF SUBGRADE.
18. ADJUST CATCH BASIN RIM ELEVATIONS AT TRACK AND FIELD EDGE TO ACCOMMODATE RUBBERIZED OR SYNTHETIC TURF SURFACING COVERS.
19. CONNECT DRAIN FROM TAKEOFF BOARD ASSEMBLIES TO LATERAL OR COLLECTOR PIPING. SLOPE TO DRAIN.
20. POT HOLE EXISTING WATER LINE PRIOR TO INSTALLATION OF DRAINAGE SYSTEM. COORDINATE COLLECTOR DEPTH WITH EXISTING WATER LINE, REPORT ANY CONFLICTS TO ENGINEER

NOTE LEGEND

1. (INDICATES GENERAL CONSTRUCTION NOTE)
3. (INDICATES SPECIFIC CONSTRUCTION KEYNOTE)

DRAINAGE LEGEND

- END CAP
- 4" PERF. CORR. POLY DRAIN TUBING
- CPEP SOLID SUBSURFACE DRAINAGE COLLECTOR OR STORM DRAIN PIPE
- S=0.50% SLOPE
- FLOW DIRECTION
- IE 414.30 INVERT ELEVATION
- CIE 413.00 COLLECTOR INVERT ELEVATION
- FLOW CONTROL STRUCTURE
- CLEANOUT
- EXISTING CATCH BASIN INLET
- TYPE 1 CATCH BASIN
- DETENTION BASIN AGGREGATE

NORTH

0 20' 40'

SCALE: 1" = 20'

REVISION	DATE

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PERMIT SET

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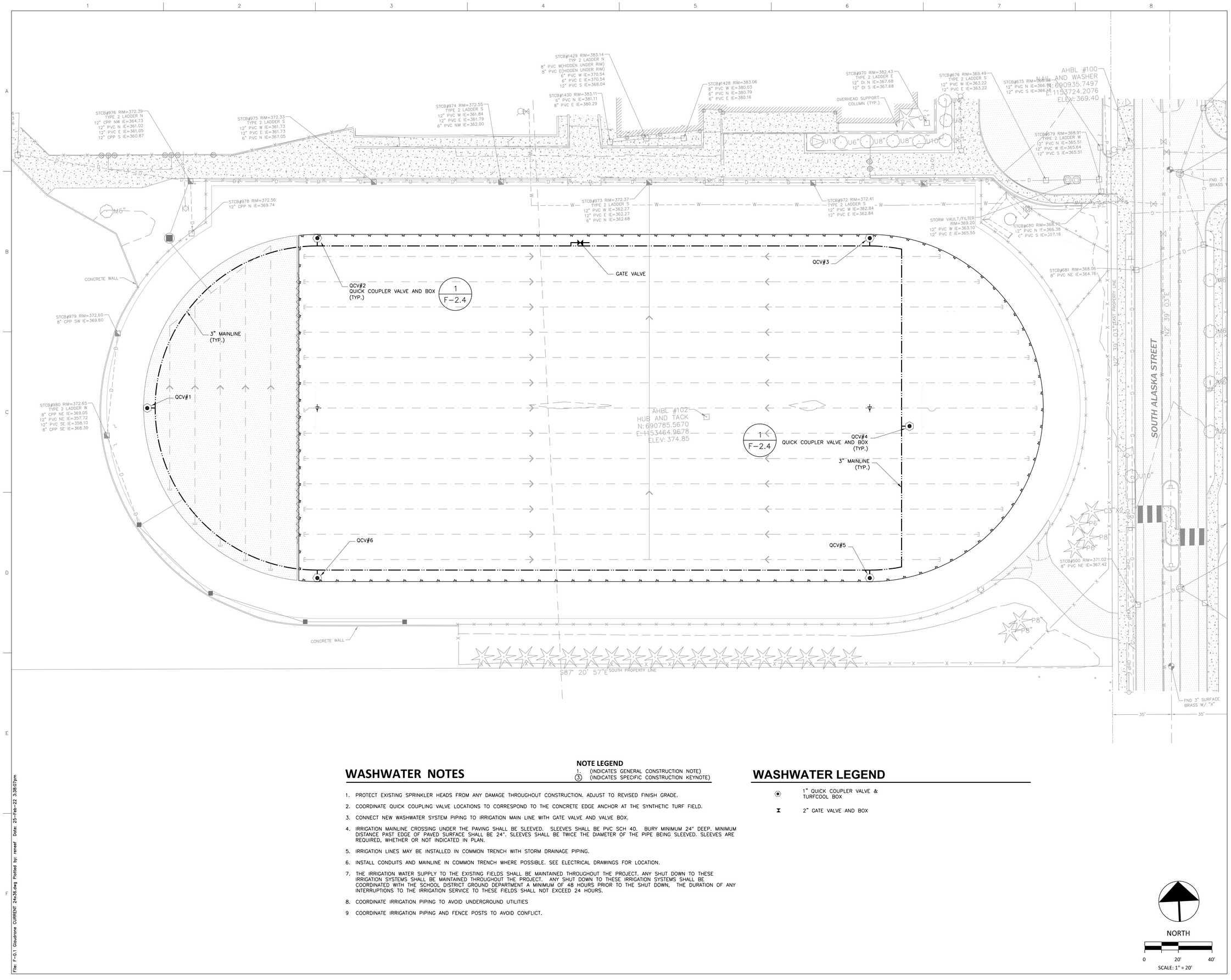
DRAINAGE PLAN

SHEET

F-1.3

File: F-0.1 Giaudrone CURRENT 24x36.dwg Plotted by: reneef Date: 28-Feb-22 9:54:19am



WASHWATER NOTES

NOTE LEGEND

1. (INDICATES GENERAL CONSTRUCTION NOTE)
(3) (INDICATES SPECIFIC CONSTRUCTION KEYNOTE)

1. PROTECT EXISTING SPRINKLER HEADS FROM ANY DAMAGE THROUGHOUT CONSTRUCTION. ADJUST TO REVISED FINISH GRADE.
2. COORDINATE QUICK COUPLING VALVE LOCATIONS TO CORRESPOND TO THE CONCRETE EDGE ANCHOR AT THE SYNTHETIC TURF FIELD.
3. CONNECT NEW WASHWATER SYSTEM PIPING TO IRRIGATION MAIN LINE WITH GATE VALVE AND VALVE BOX.
4. IRRIGATION MAINLINE CROSSING UNDER THE PAVING SHALL BE SLEEVED. SLEEVES SHALL BE PVC SCH 40. BURY MINIMUM 24" DEEP. MINIMUM DISTANCE PAST EDGE OF PAVED SURFACE SHALL BE 24". SLEEVES SHALL BE TWICE THE DIAMETER OF THE PIPE BEING SLEEVED. SLEEVES ARE REQUIRED, WHETHER OR NOT INDICATED IN PLAN.
5. IRRIGATION LINES MAY BE INSTALLED IN COMMON TRENCH WITH STORM DRAINAGE PIPING.
6. INSTALL CONDUITS AND MAINLINE IN COMMON TRENCH WHERE POSSIBLE. SEE ELECTRICAL DRAWINGS FOR LOCATION.
7. THE IRRIGATION WATER SUPPLY TO THE EXISTING FIELDS SHALL BE MAINTAINED THROUGHOUT THE PROJECT. ANY SHUT DOWN TO THESE IRRIGATION SYSTEMS SHALL BE MAINTAINED THROUGHOUT THE PROJECT. ANY SHUT DOWN TO THESE IRRIGATION SYSTEMS SHALL BE COORDINATED WITH THE SCHOOL DISTRICT GROUND DEPARTMENT A MINIMUM OF 48 HOURS PRIOR TO THE SHUT DOWN, THE DURATION OF ANY INTERRUPTIONS TO THE IRRIGATION SERVICE TO THESE FIELDS SHALL NOT EXCEED 24 HOURS.
8. COORDINATE IRRIGATION PIPING TO AVOID UNDERGROUND UTILITIES
9 COORDINATE IRRIGATION PIPING AND FENCE POSTS TO AVOID CONFLICT.

WASHWATER LEGEND

- ⊙ 1" QUICK COUPLER VALVE & TURFCOOL BOX
- ⧗ 2" GATE VALVE AND BOX

NORTH

0 20' 40'

SCALE: 1" = 20'

File: F-0.1 Giaudrone CURRENT 24x36.dwg Plotted by: reneef Date: 25-Feb-22 3:38:07pm

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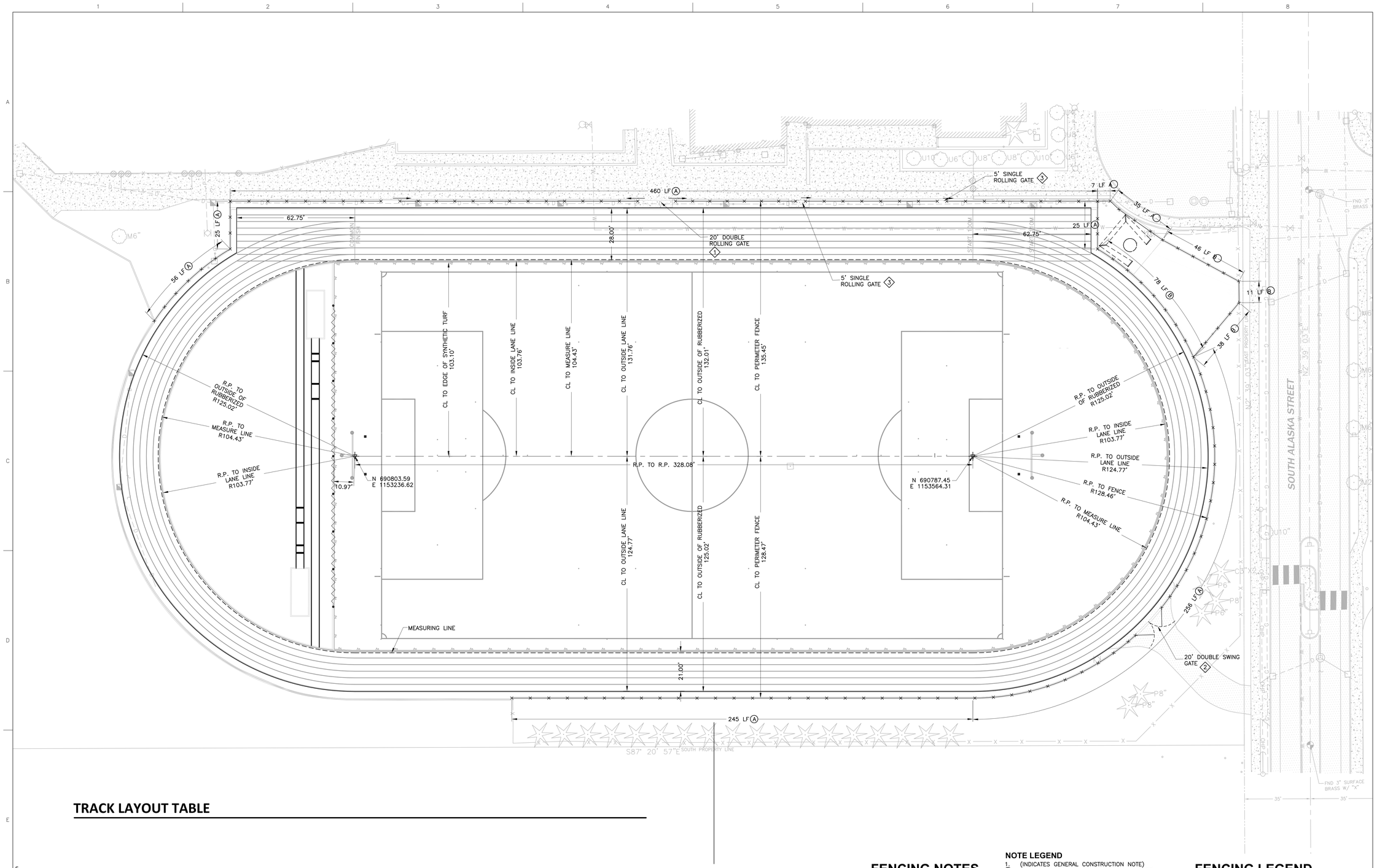
WASHWATER PLAN

SHEET

F-1.4



TRACK LAYOUT TABLE

LAYOUT CONTROL NOTES

1. DIMENSIONS INDICATED ARE TYPICALLY TO FACE OF CURB/WALL OR EDGE OF PAVEMENT.
2. CONTRACTOR WILL BE FURNISHED AUTOCAD FILES USED FOR DESIGN FOR USE DURING CONSTRUCTION.
3. TRACK RADII POINTS ARE THE INITIAL SETUP POINTS FOR WORK IN THIS AREA. IN THE EVENT OF A CONFLICT, ALL OTHER POINTS SHOULD BE CONSIDERED RELATIVE. CONTRACTOR SHALL UTILIZE EXISTING RADIUS POINT MONUMENTS, REPORT INFORMATION TO ENGINEER.

NOTE LEGEND
1. (INDICATES GENERAL CONSTRUCTION NOTE)
3 (INDICATES SPECIFIC CONSTRUCTION KEYNOTE)

FENCING NOTES

1. GATE LOCATIONS ARE SHOWN APPROXIMATELY.
2. GATES TO BE CENTERED AT PERPENDICULAR PATHWAYS WHEN OCCURS.
3. ALL GATES ARE LOCKABLE.
4. INSTALL LOCK BACK POST ON ALL SWING GATES.

FENCE TYPE KEY

Ⓐ 4' HEIGHT CHAIN LINK FENCE; 2" MESH X9 GAUGE, TOP, BOTTOM RAIL

Ⓑ 10' HEIGHT REMOVABLE BALL CONTROL NETTING (BASE BID)

GATE TYPE KEY (ALL CHAINLINK)

1 20' DOUBLE ROLLING GATE (2 X 10')

2 20' DOUBLE SWING GATE (2 X 7.5')

3 5' ROLLING GATE

FENCING LEGEND

- CHAINLINK FENCE AND CONCRETE CURB
- CHAINLINK FENCE
- CONCRETE CURBING
- EXISTING FENCE TO REMAIN
- Ⓑ FENCE TYPE AND LIMIT
- 1 GATE TYPE

NORTH

0 20' 40'

SCALE: 1" = 20'

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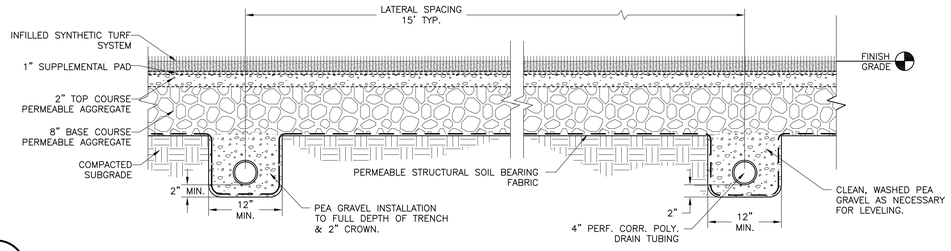
FENCING AND DIMENSIONING PLAN

SHEET

F-1.5

File: F-0.1 Giaudrone CURRENT 24x36.dwg Plotted by: reneef Date: 25-Feb-22 3:41:45pm



1 / F-2.1 SYNTHETIC TURF FIELD SECTION

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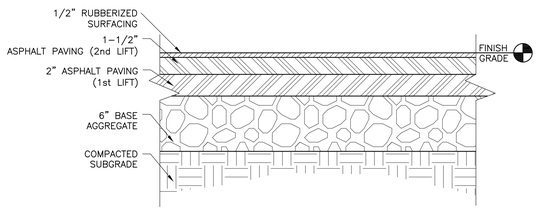

2 / F-2.1 RUBBERIZED TRACK SECTION

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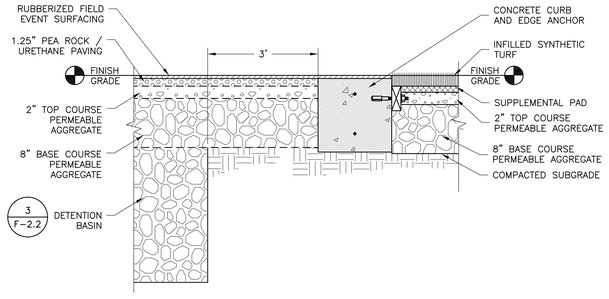

3 / F-2.1 PERMEABLE FIELD EVENT DRAINAGE SECTION WITH CURB

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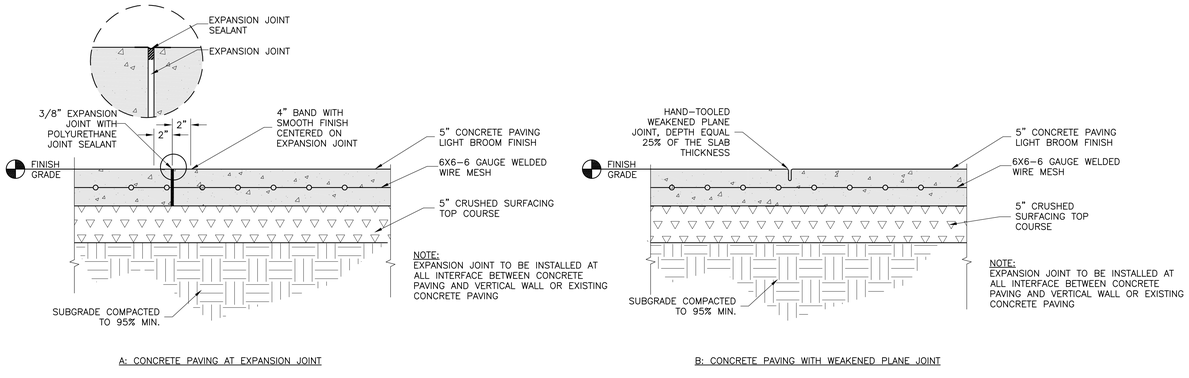

4 / F-2.1 CONCRETE PAVING

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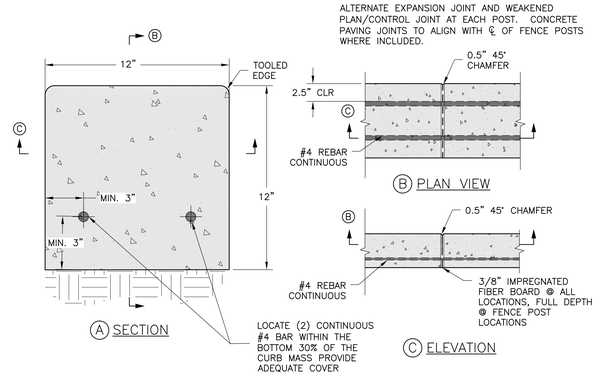

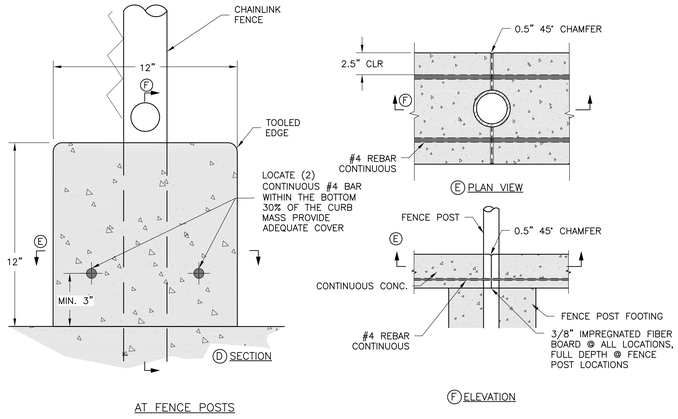

5 / F-2.1 CONCRETE CURB & EXPANSION JOINT

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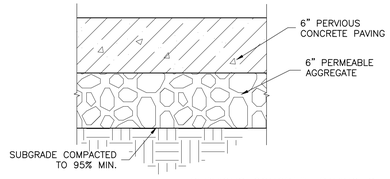

PERVIOUS CONCRETE PAVING @ WALKWAY

6 / F-2.1 PERVIOUS CONCRETE PAVING

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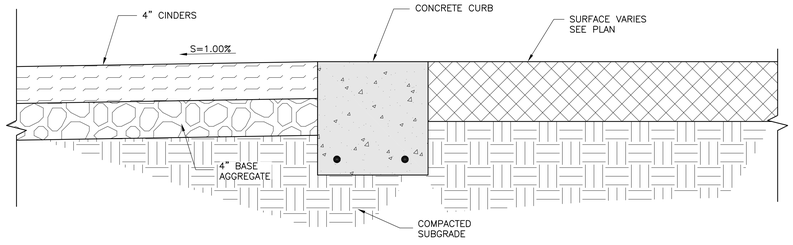

7 / F-2.1 SHOT PUT LANDING AREA

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TYPICAL DETAILS

SHEET

F-2.1

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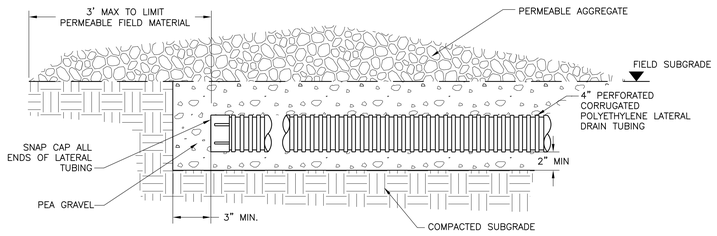

1 F-2.2 SUBSURFACE DRAINAGE LATERAL

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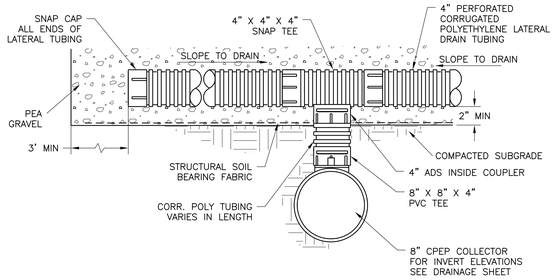
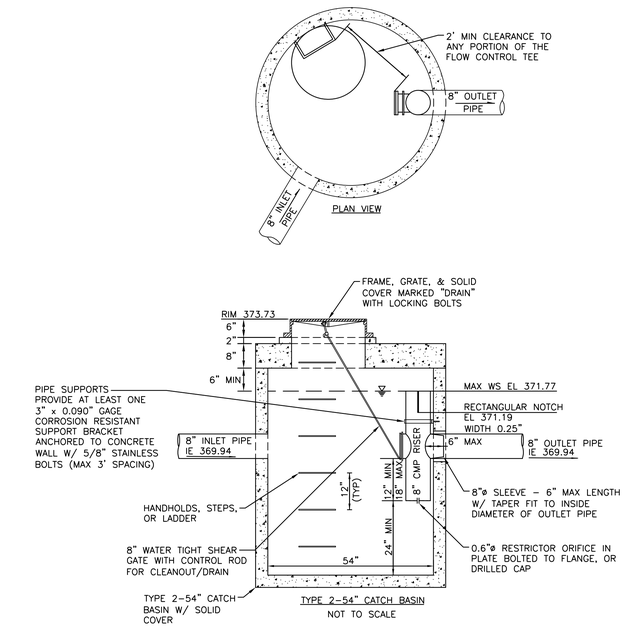


4 F-2.2 SUBSURFACE DRAINAGE DROP-TEE

NOT TO SCALE



2 F-2.2 FLOW CONTROL

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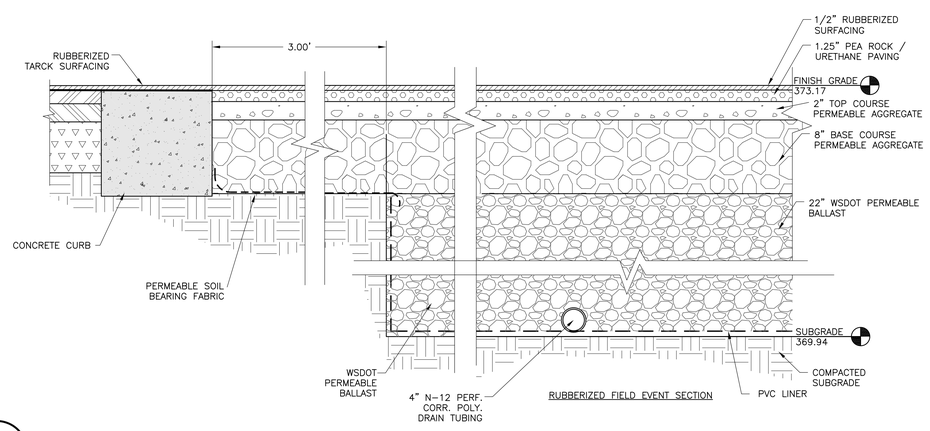

3 F-2.2 DETENTION BASIN

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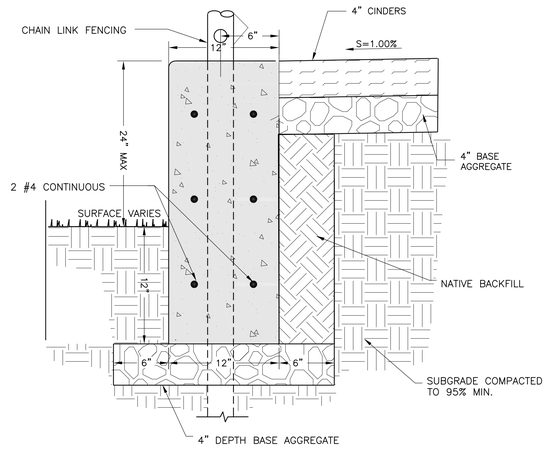
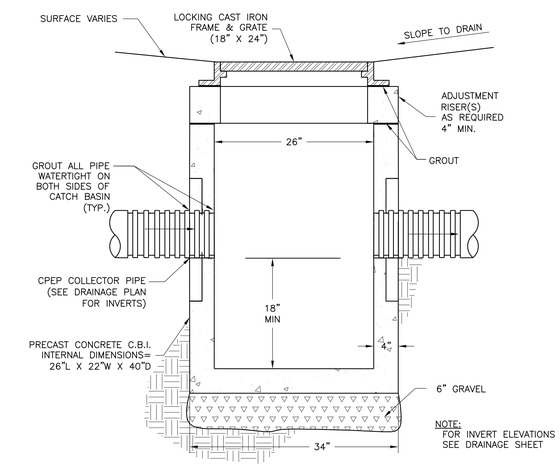


5 F-2.2 CURB WALL DETAIL

NOT TO SCALE



6 F-2.2 TYPE 1 CATCH BASIN

NOT TO SCALE

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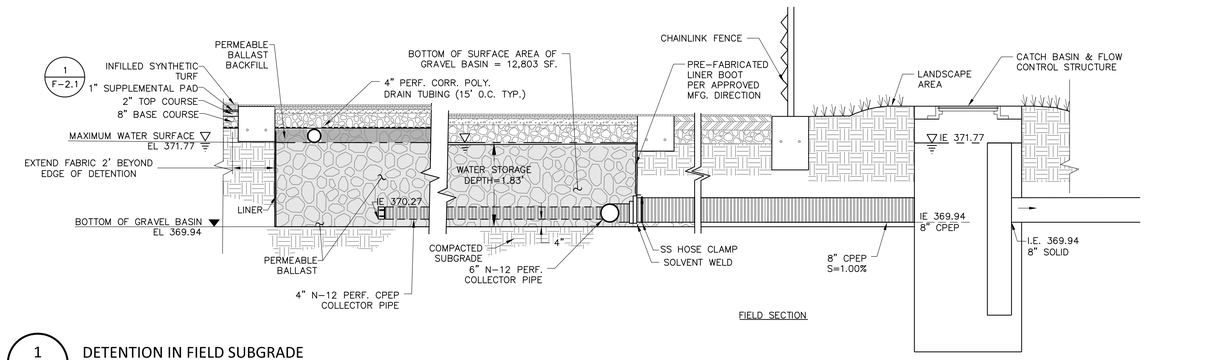
DRAWN	DMD
CHECKED	DLA/JAB

DRAINAGE DETAILS

SHEET

F-2.2

File: F-2.2 Drainage Details.dwg Plotted by: jeffB Date: 28-Feb-22 4:33:23pm



1
F-2.3

DETENTION IN FIELD SUBGRADE

NOT TO SCALE

REVISION	DATE

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STATE OF WASHINGTON
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DETENTION DETAILS

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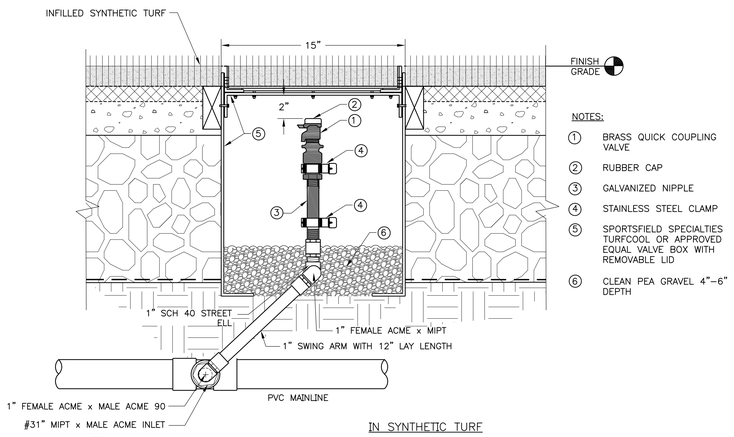
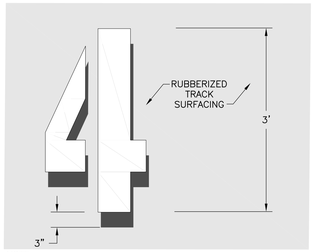
F-2.3

File: F-2.3 Detention Details.dwg Plotted by: reneef Date: 25-Feb-22 4:51:06pm



1 / F-2.4 QUICK COUPLING VALVE & BOXES
NOT TO SCALE



4 / F-2.4 TYPICAL TRACK NUMBER
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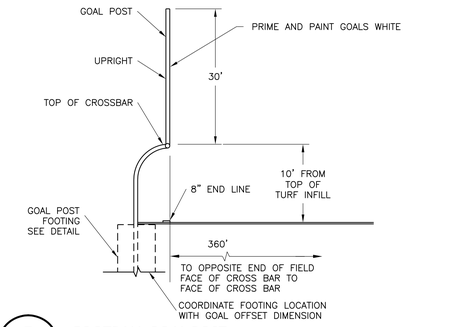
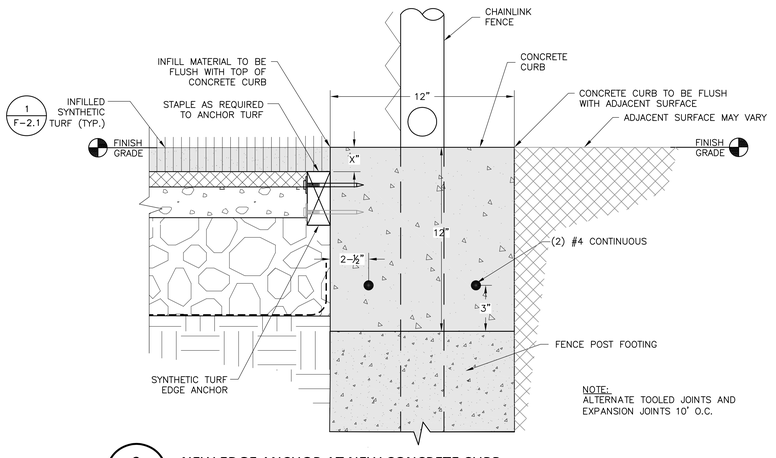
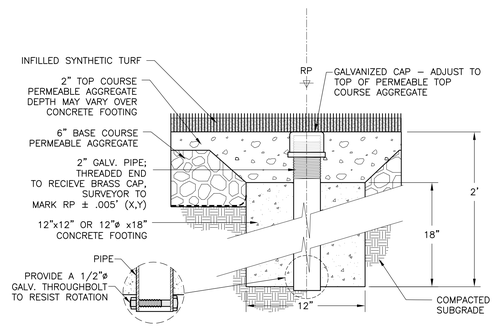


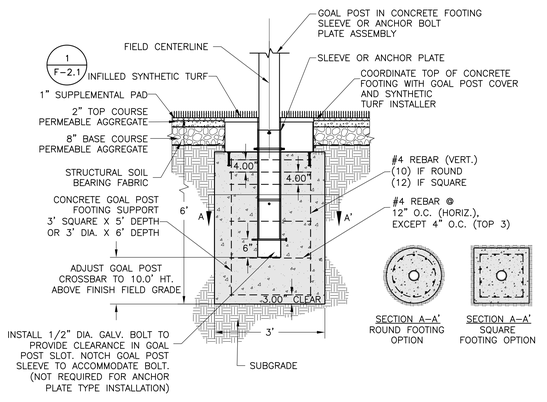
7 / F-2.4 FOOTBALL GOAL POST
NOT TO SCALE



2 / F-2.4 NEW EDGE ANCHOR AT NEW CONCRETE CURB
NOT TO SCALE



5 / F-2.4 RADIUS POINT MONUMENT
NOT TO SCALE



8 / F-2.4 FOOTBALL GOAL POST FOOTING
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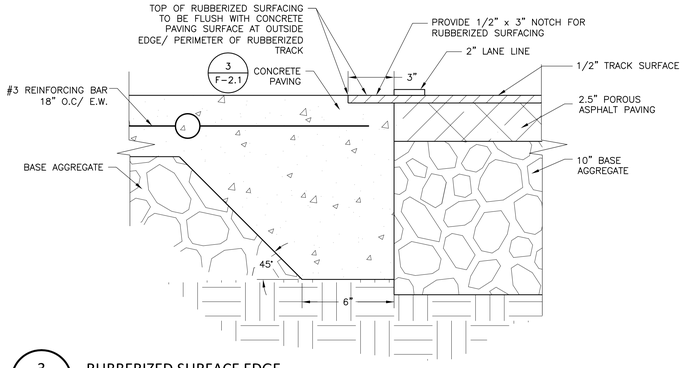
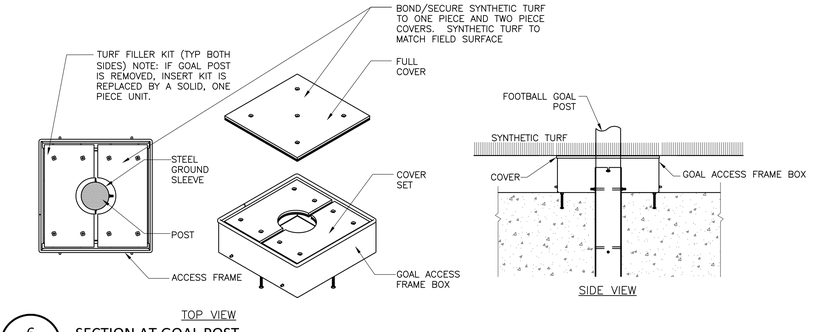


3 / F-2.4 RUBBERIZED SURFACE EDGE
NOT TO SCALE



6 / F-2.4 SECTION AT GOAL POST
NOT TO SCALE

REVISION	DATE

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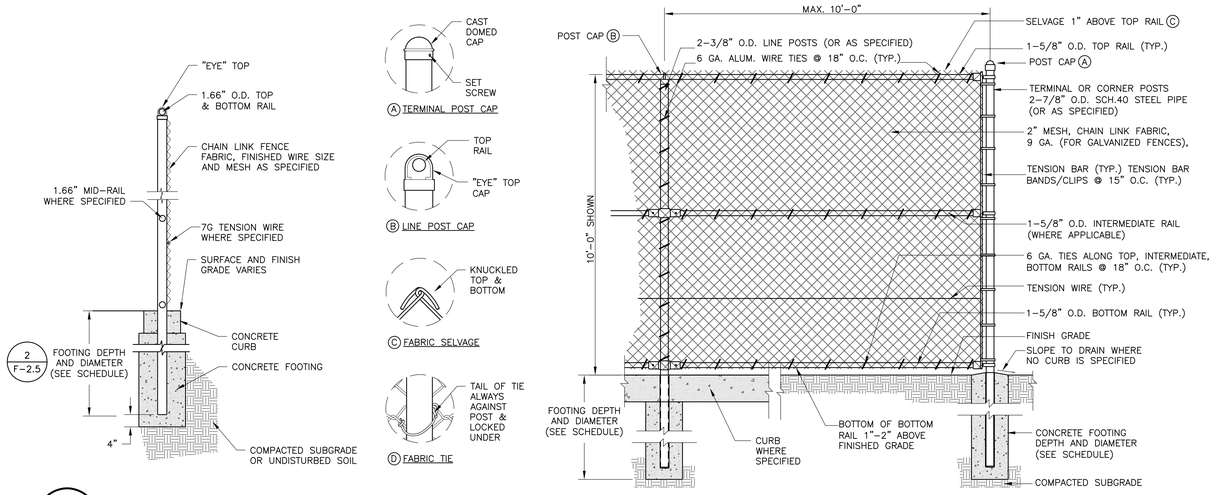
SITE DETAILS

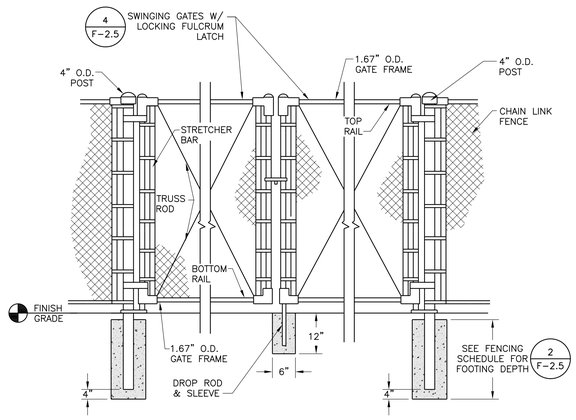
SHEET
F-2.4

File: F-2.4 Site Details.dwg Plotted by: reneef Date: 25-Feb-22 4:54:52pm



1 F-2.5 CHAINLINK FENCING ELEVATION & SECTION

NOT TO SCALE



5 F-2.5 DOUBLE SWING GATE

NOT TO SCALE

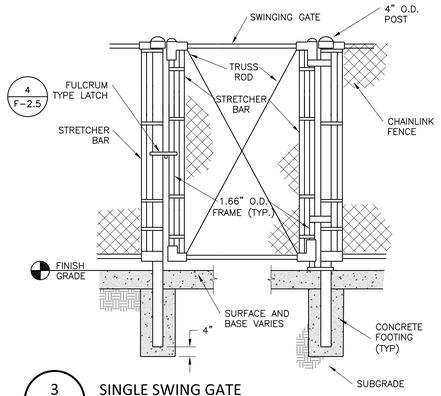
FENCING TYPE	7' HIGH FENCING	4' HIGH FENCING
CORNER POST	2.875" OD	2.875" OD
TERMINAL POST	4.000" OD	2.875" OD
LINE POST	2.875" OD	2.375" OD
FOOTING DEPTH	42"	24"
FOOTING DIAMETER	12"	12"
TOP RAIL HT.	7'	4'
INTERMEDIATE RAIL HTS.	---	---
BOTTOM RAIL HT	1"	1"
TENSION WIRE HTS.	3'	2'

FENCING NOTES:

1. ALL FENCING FABRIC SHALL BE 2" MESH NO. 9 GAUGE FINISHED STEEL WIRES WITH BLACK VINYL COATING EXCEPT FOR DESIGNATED SECTIONS OF THE BACKSTOP FENCING WHICH SHALL INCLUDE NO. 6 GAUGE FINISHED STEEL WIRES WITH BLACK VINYL COATING.
2. ALL POSTS, RAILS, BRACES, POST TOPS, STRETCHER BARS, BANDS, ETC. SHALL BE PAINTED BLACK.
3. TENSION WIRES AND WIRE TIES SHALL INCLUDE A BLACK VINYL COATING.
4. MAXIMUM POST SPACING: 10' ON CENTER.
5. ALIGN POSTS SO THAT FENCE FABRIC IS INSTALLED IN A CONTINUOUS, STRAIGHT LINE, REGARDLESS OF FENCE POST DIAMETER
6. ALL POSTS SHALL BE ASTM A53, GRADE B, SCHEDULE 40 UNLESS NOTED OTHERWISE

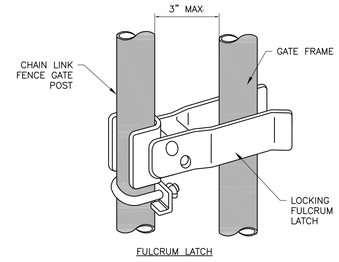
2 F-2.5 CHAINLINK SCHEDULE

NOT TO SCALE



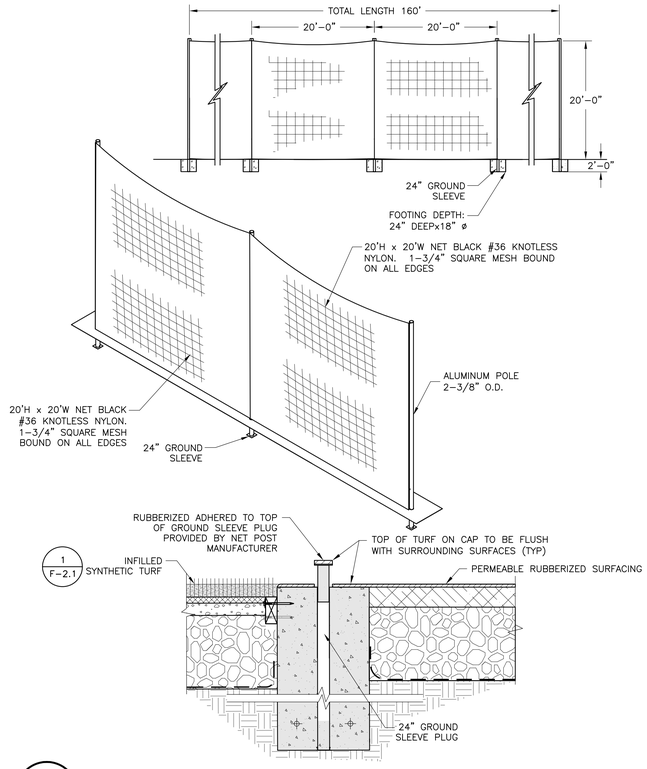
3 F-2.5 SINGLE SWING GATE

NOT TO SCALE



4 F-2.5 GATE LATCH

NOT TO SCALE



6 F-2.5 20' BALL CONTROL NETTING

NOT TO SCALE

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FENCING DETAILS

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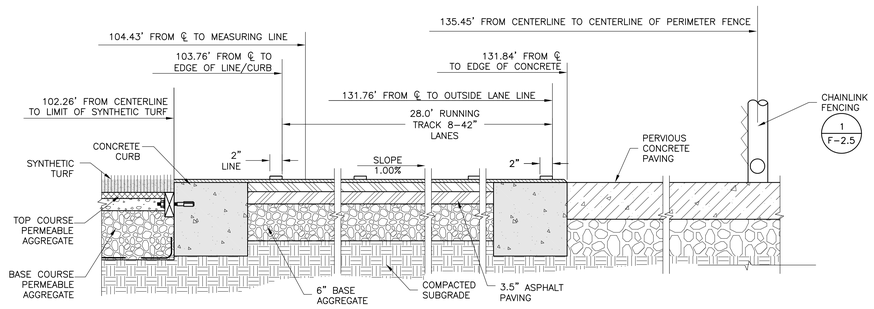
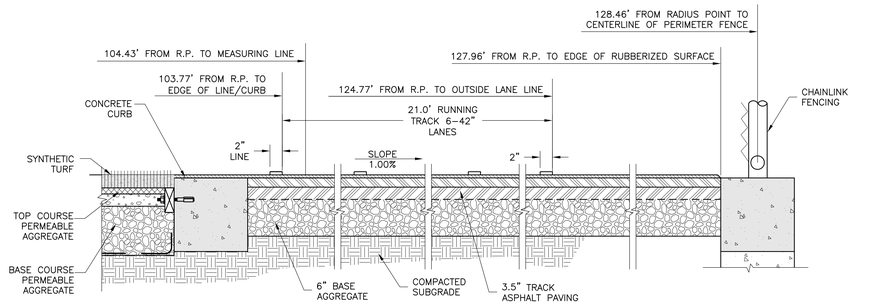
F-2.5

File: F-2.5 Fencing Details.dwg Plotted by: reneef Date: 27-Feb-22 11:47:28am



1 F-2.6 **TRACK SECTION NORTH**

NOT TO SCALE



2 F-2.6 **TRACK SECTION EAST**

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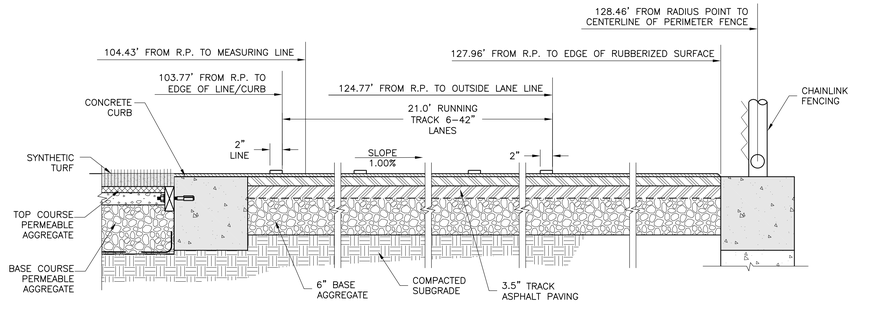

3 F-2.6 **TRACK SECTION SOUTH**

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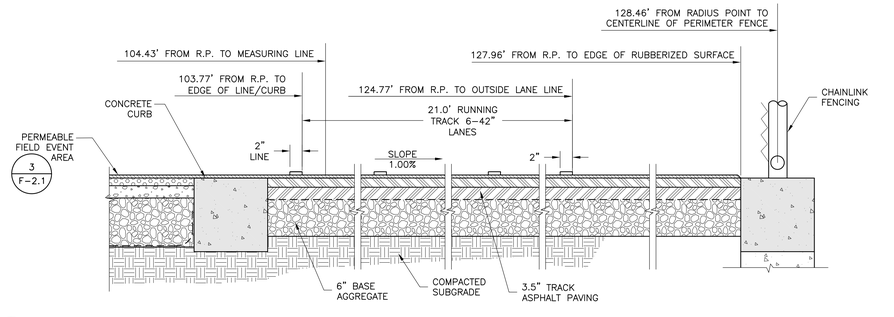

4 F-2.6 **TRACK SECTION WEST**

NOT TO SCALE

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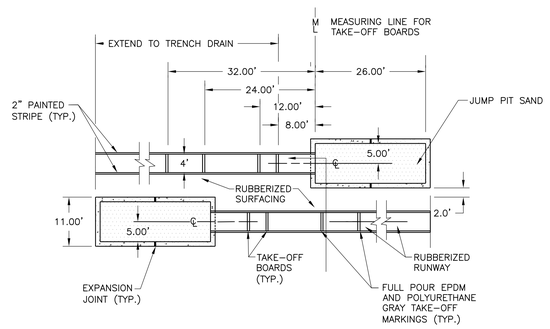
TRACK & FIELD DETAILS

SHEET

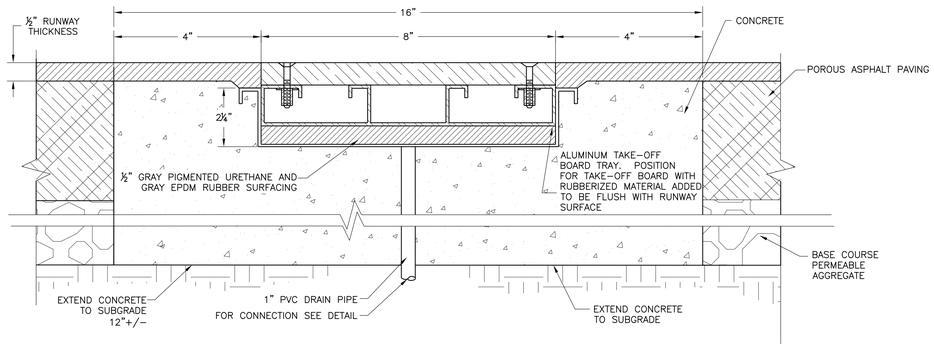
F-2.6

File: F-2.6 Track & Field Details.dwg Plotted by: reneef Date: 27-Feb-22 11:44:07am



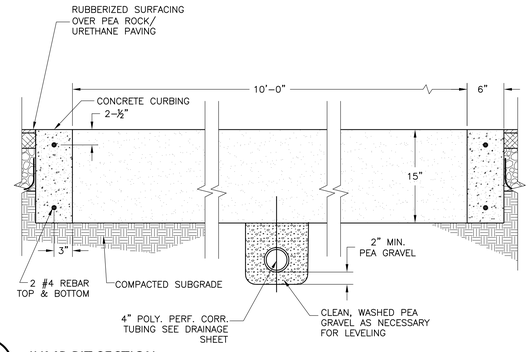
1 F-2.7 DUAL LONG JUMP TRIPLE JUMP- PLAN VIEW

NOT TO SCALE



4 F-2.7 TAKE-OFF BOARD SECTION

NOT TO SCALE



2 F-2.7 JUMP PIT SECTION

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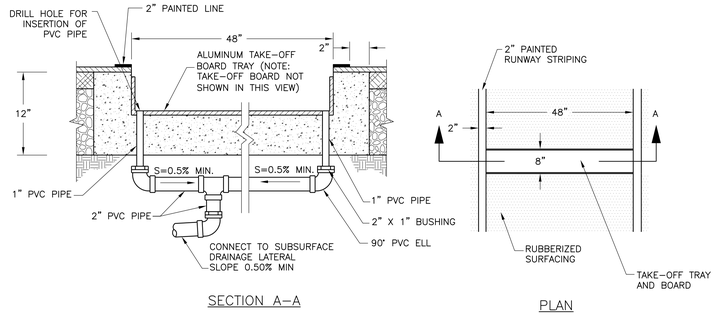

5 F-2.7 TAKE-OFF BOARD TRAY

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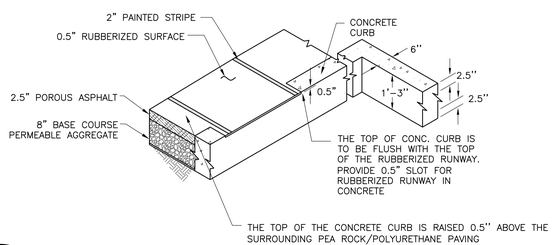

3 F-2.7 RUNWAY AT JUMP PIT CURB

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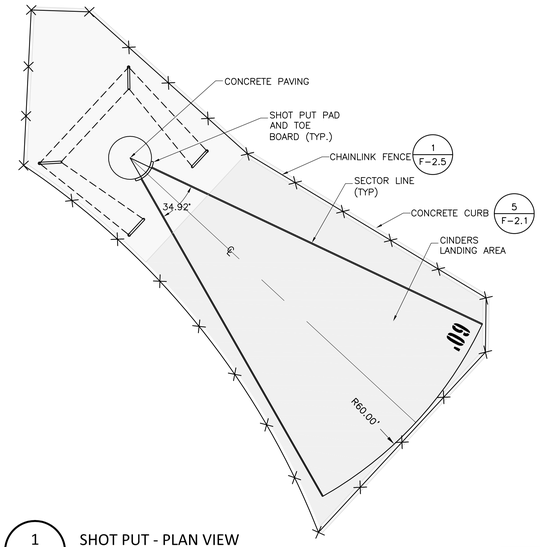
FIELD EVENT DETAILS

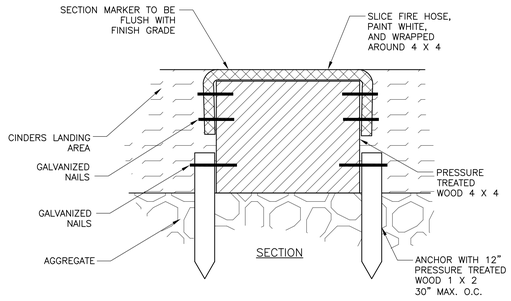
SHEET

F-2.7

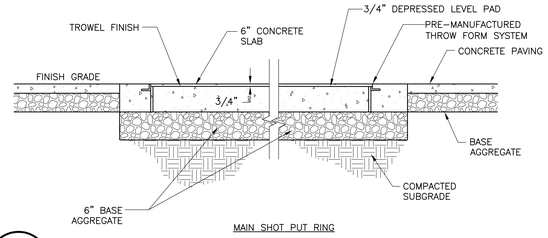
File: F-2.7 Field Event Details.dwg Plotted by: reneef Date: 27-Feb-22 11:51:06am



1 F-2.8 SHOT PUT - PLAN VIEW
NOT TO SCALE



4 F-2.8 SHOT PUT SECTOR LINE
NOT TO SCALE



2 F-2.8 SHOT PUT PAD
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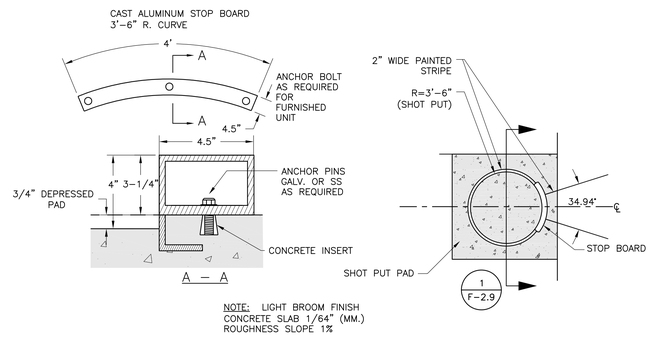
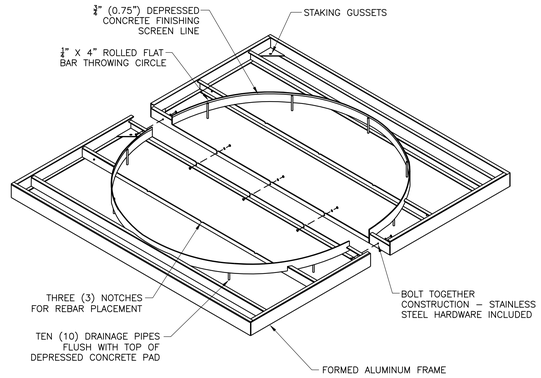


3 F-2.8 SHOT PUT PAD-TOE BOARD
NOT TO SCALE



5 F-2.8 THROW FORM SYSTEM
NOT TO SCALE

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FIELD EVENT DETAILS

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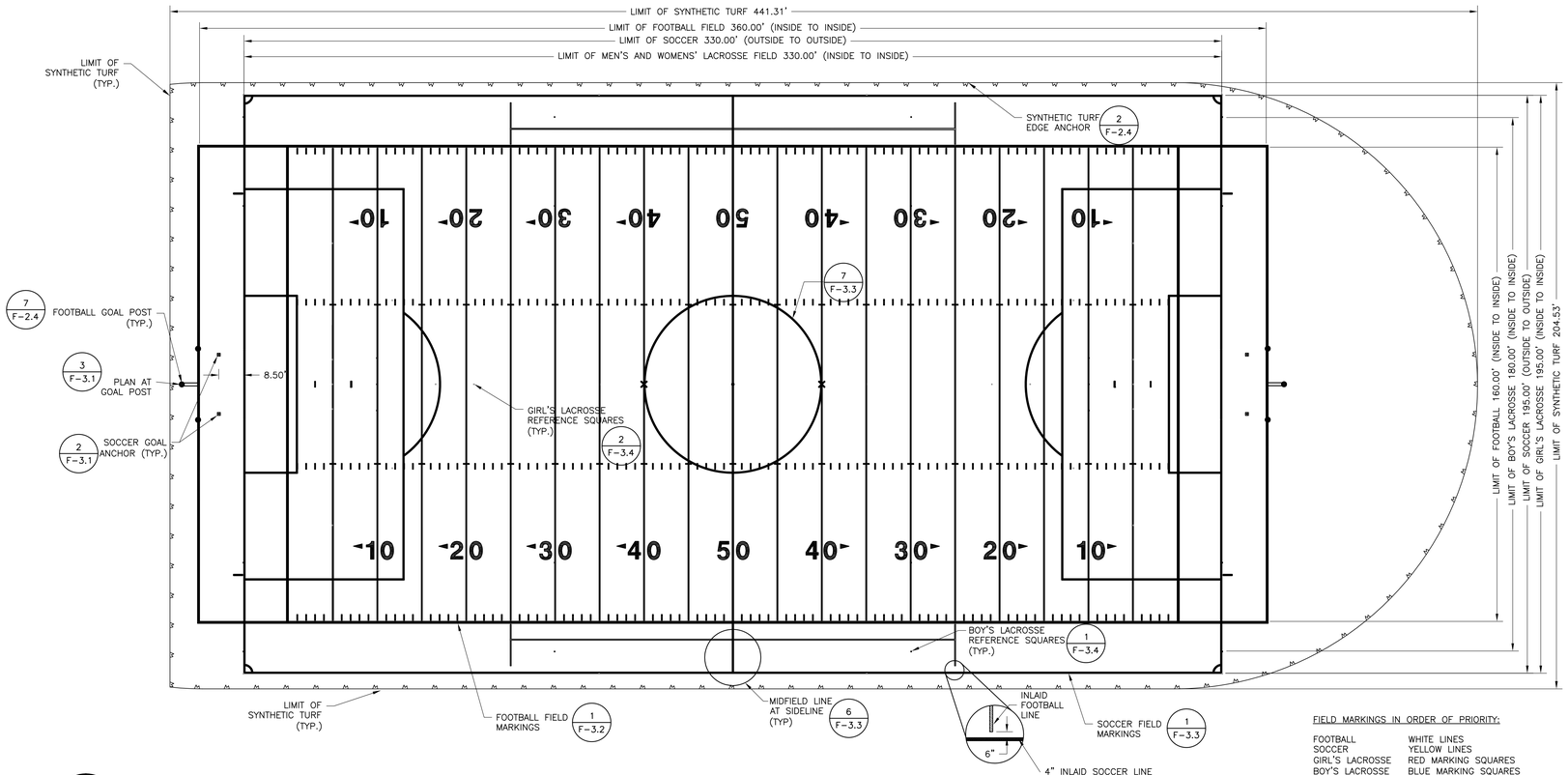
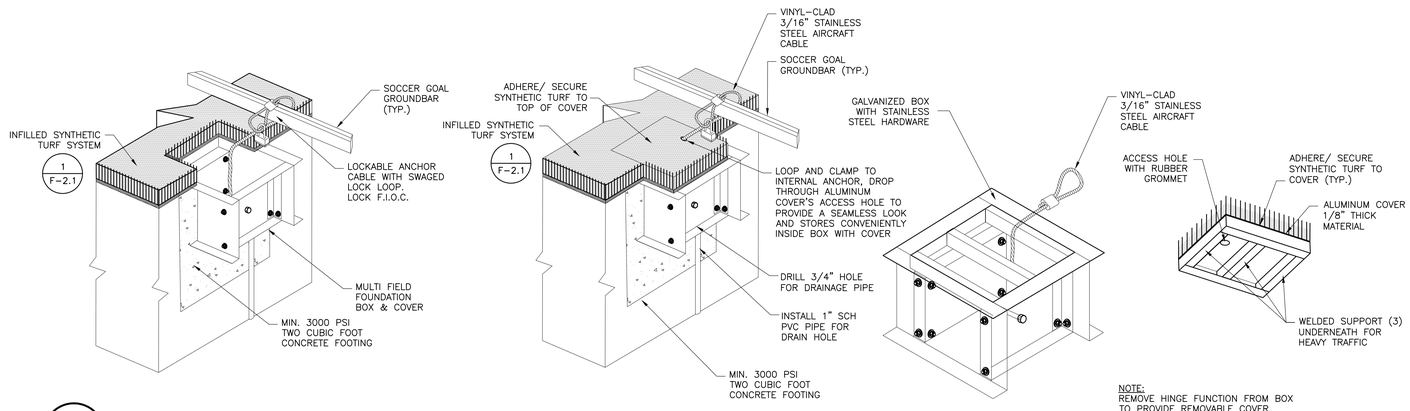
F-2.8

File: F-2.8 Field Event Details.dwg Plotted by: reneef Date: 27-Feb-22 11:50:12am



1/F-3.1 COMPOSITE MARKING PLAN
SCALE: 1"=20'



2/F-3.1 SOCCER GOAL ANCHOR
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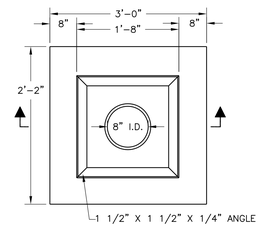

3/F-3.1 PLAN AT GOAL POST
NOT TO SCALE

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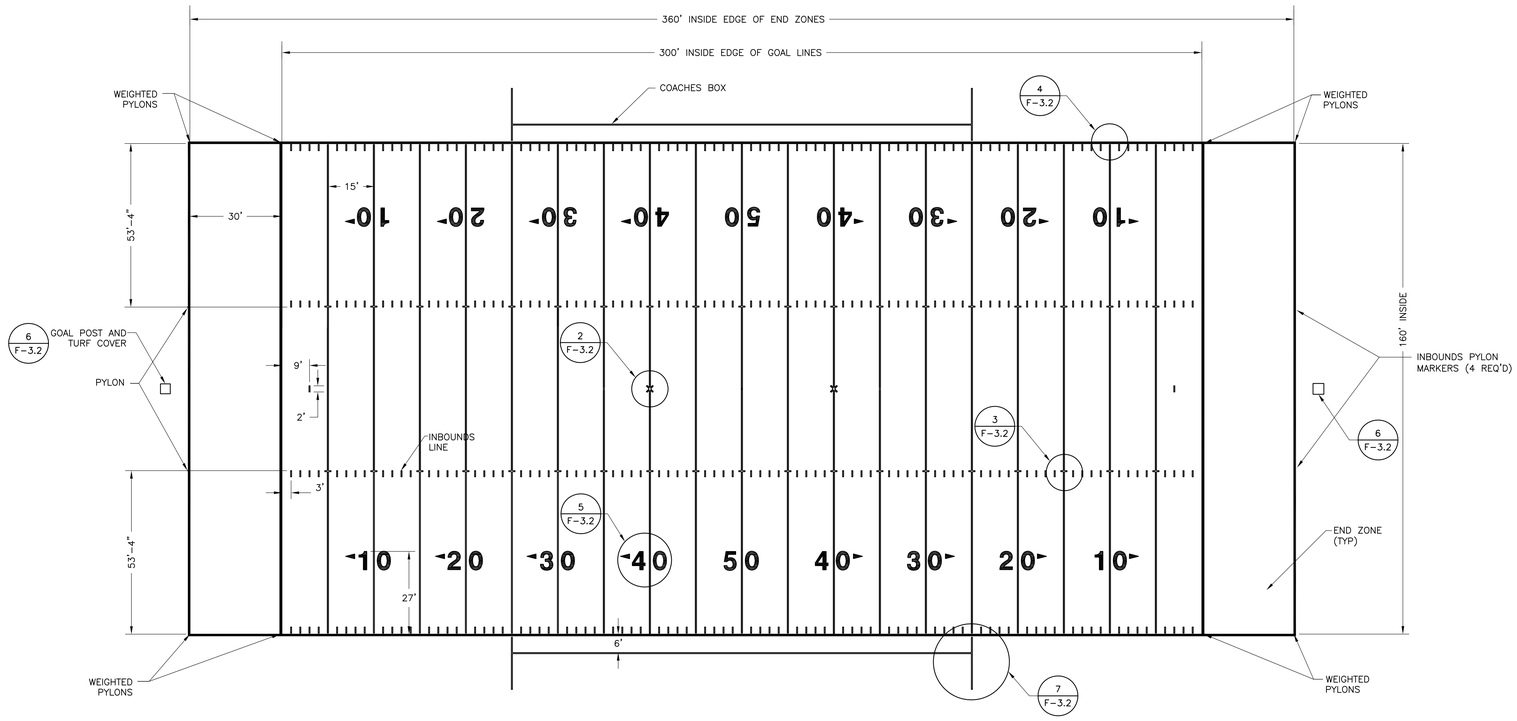
COMPOSITE LAYOUT PLAN & DETAILS

SHEET

F-3.1

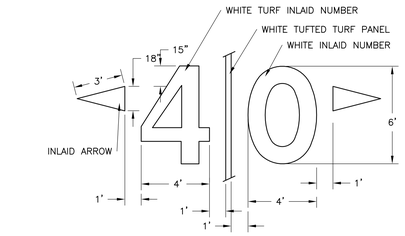
File: F-3.1 Composite Layout Plan & Details.dwg Plotted by: reneef Date: 27-Feb-22 11:52:12am



FOOTBALL LAYOUT NOTES

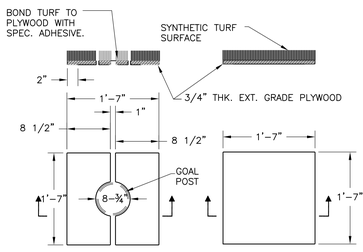
1. CONTRACTOR SHALL VERIFY ALL DIMENSIONS.
2. ALL LINE WORK IS TO BE LAID OUT WITH A TOLERANCE OF 1/4 INCH.
3. ALL YARDLINES SHALL BE 4 INCH, WHITE, TUFTED INTO THE TURF PANELS, THE GOAL LINES WILL BE 8" TUFTED INTO THE TURF PANELS.
4. AN 8 INCH WHITE LINE, TUFTED INTO THE TURF, WILL SURROUND THE ENTIRE PLAYING FIELD.
5. 24 INCH SHORT YARDLINE EXTENSIONS, 4 INCHES FROM THE SIDELINES SHALL BE 4 INCHES WIDE, WHITE, INLAID LINES.
6. THE COACHING BOX AND TEAM AREA SHALL BE PER NFHS RULES.
7. THE TWO SETS OF INBOUNDS LINES ARE 53 FEET 4 INCHES FROM THE SIDELINES. INBOUNDS LINES AND SHORT YARDLINE EXTENSIONS SHALL BE 24 INCHES LONG AND 4 INCHES WIDE, INLAID, WHITE LINES.
8. THE 3-YARD LINES ARE 24 INCHES LONG, 4 INCHES WIDE, WHITE INLAID LINES AT THE CENTERLINE OF THE FIELD AND THE 3 YARDLINE ON EACH END OF THE FIELD. REFER TO PLAN FOR LOCATION.
9. WHITE YARDLINE NUMBERS MEASURING 6 FEET IN HEIGHT AND 4 FEET IN WIDTH WITH THE TOP OF THE NUMBERS 27 FEET FROM THE SIDELINES ARE INLAID TURF.
10. DIRECTIONAL ARROWS POINT TOWARD RESPECTIVE ENDZONES. ARROWS ARE WHITE, INLAID TURF WITH BLUE INLAID SHADOWS. THERE ARE NO ARROWS ON THE 50 YARDLINE.
11. AN X WILL MARK THE SPOT OF THE KICKOFF AT THE 40 YARDLINE ON EACH END OF THE FIELD. THE 40 YARDLINE SHALL BE WHITE TURF TUFTED INTO THE TURF PANELS AND THE EXTENSIONS FROM THE X SHALL BE INLAID WHITE TURF.
12. PYLON LOCATIONS AT THE INTERSECTIONS OF THE GOAL LINES AND THE END LINES WITH THE SIDELINES, AND THE END LINES AND THE EXTENSION OF THE INBOUNDS LINE SHALL BE 4 INCHES BY 4 INCHES. THE PYLONS SHALL BE FREESTANDING, WEIGHTED TYPE.
13. THE 50 YARDLINE SHALL BE OUTLINED IN YELLOW INLAID TURF ON EACH SIDE OF THE WHITE YARDLINE.

1 F-3.2 FOOTBALL LAYOUT PLAN
SCALE: 1"=20'



NOTE: USE APPROPRIATE DIRECTIONAL ARROW AS REQUIRED

5 F-3.2 YARDLINE NUMBER DETAIL
NOT TO SCALE

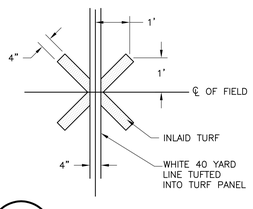


NOTE: FIELD VERIFY DIMENSIONS PRIOR TO FABRICATION

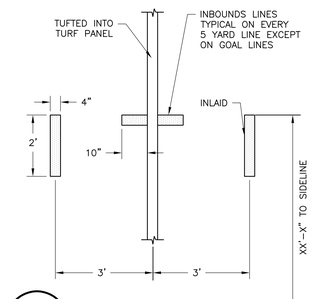
GOAL POST COVER TYPE "A"
2 SETS REQ'D AS SHOWN

GOAL POST COVER TYPE "B"
2 SETS REQ'D AS SHOWN

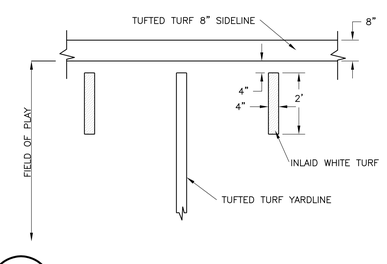
6 F-3.2 GOAL POST TURF COVER
NOT TO SCALE



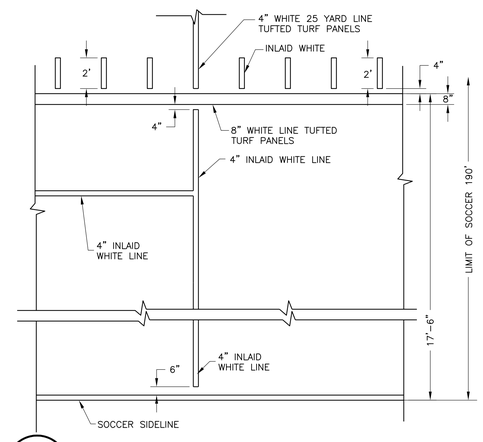
2 F-3.2 KICK-OFF MARKER
NOT TO SCALE



3 F-3.2 INBOUND LINE DETAIL
NOT TO SCALE



4 F-3.2 SIDE LINE DETAIL
NOT TO SCALE



7 F-3.2 COACHES BOX DETAIL
NOT TO SCALE

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DAVID L. ANDERSON — STATE OF WASHINGTON — REGISTERED PROFESSIONAL ENGINEER

PERMIT SET

DATE	2-28-22
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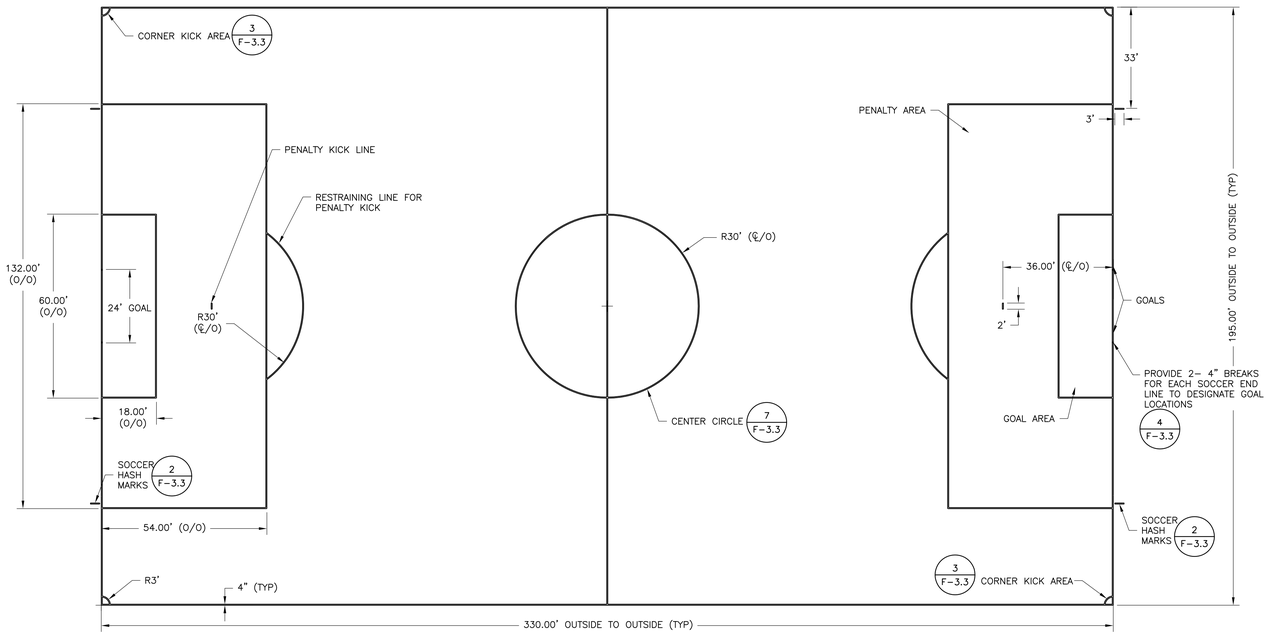
DRAWN	DMD
CHECKED	DLA/JAB

FOOTBALL LAYOUT PLAN & DETAILS

SHEET

F-3.2

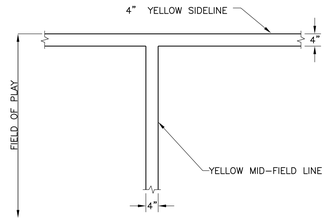
File: F-3.2 Football Layout Plan & Details.dwg Plotted by: reneef Date: 27-Feb-22 11:53:32am



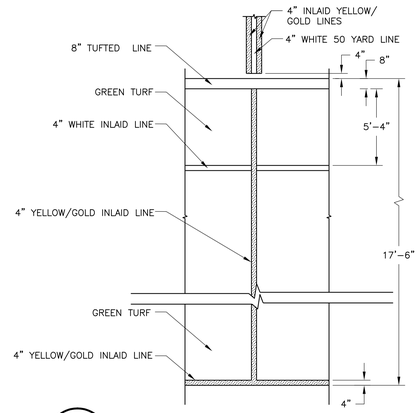
SOCCER LAYOUT NOTES

1. CONTRACTOR SHALL VERIFY ALL DIMENSIONS. ALL LINE WORK IS TO BE LAID OUT WITH A TOLERANCE OF 1/4 INCH.
2. ALL SOCCER LINES ARE 4 INCH YELLOW/GOLD INLAID TURF AS DIMENSIONED ON SOCCER LAYOUT PLAN.
3. THE SOCCER GOAL AREA IS 18 FEET BY 60 FEET. REFER TO PLAN FOR LOCATION.
4. THE SOCCER PENALTY AREA IS 54 FEET BY 132 FEET.
5. THE PENALTY MARK IS A 2 FOOT LINE, 4 INCHES WIDE, 36 FEET FROM THE END LINE AND CENTERED ON THE GOAL. THE RESTRAINING LINE FOR PENALTY KICK AN ARC 30 FEET FROM THIS MARK OUTSIDE OF THE PENALTY AREA. REFER TO PLAN FOR LOCATION.
6. THE HALFWAY LINE FOR THE SOCCER FIELD IS A 4 INCH YELLOW INLAID LINE WITH A CIRCLE, 30 FEET IN RADIUS IN THE CENTER OF THE FIELD. THE RADIUS POINT OF THE MIDFIELD CIRCLE WILL BE INLAID YELLOW DOT WITH A 9 INCH DIAMETER. THE FOOTBALL LINES WILL PASS THROUGH THE SOCCER LINES. THE 50 YARD LINE OF THE FOOTBALL FIELD WILL BE WHITE WITH 4 INCHES OF YELLOW INLAID TURF ON EACH SIDE AND WILL EXTEND TO THE SIDELINE OF THE FOOTBALL FIELD.
7. THE SOCCER LINE WILL EXTEND BEYOND THE FOOTBALL SIDELINE BEGINNING 4 INCHES OUTSIDE THE 8 INCH SIDELINE AND EXTENDING THROUGH THE COACHES BOX.
8. THE CORNERS OF THE SOCCER FIELD SHALL HAVE A 3 FOOT RADIUS IN YELLOW TURF DESIGNATING THE CORNER KICK AREA. THE HASH MARK IS A 3 FOOT LINE, 4 INCHES WIDE, 33 FEET FROM THE SIDE LINE AND EXTENDS AWAY FROM THE FIELD OF PLAY.

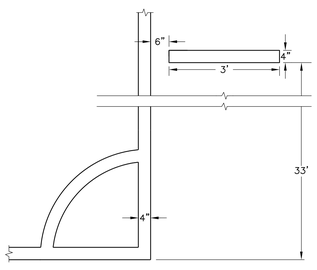
1 F-3.3 SOCCER LAYOUT PLAN
SCALE: 1"=20'



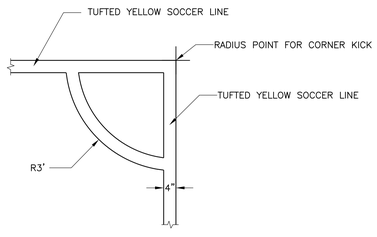
5 F-3.3 SOCCER SIDELINE
NOT TO SCALE



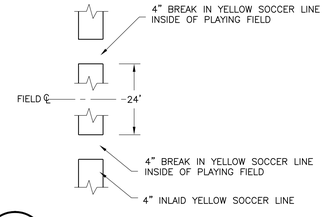
6 F-3.3 MID-FIELD LINE AT SIDELINE
NOT TO SCALE



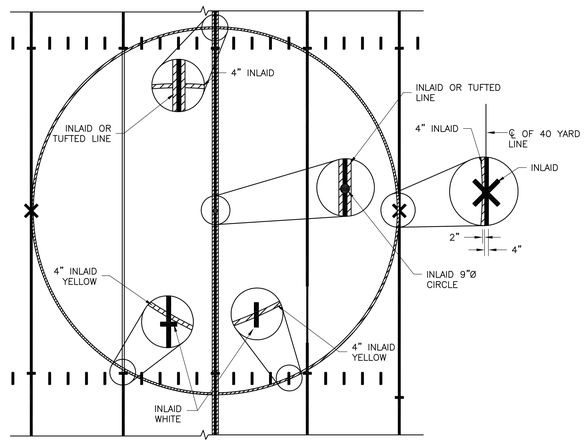
2 F-3.3 SOCCER HASH MARKS
NOT TO SCALE



3 F-3.3 CORNER KICK DETAIL
NOT TO SCALE



4 F-3.3 SOCCER GOAL ALIGNMENT SQUARES
NOT TO SCALE



7 F-3.3 SOCCER CIRCLE AND MID-FIELD LINE
NOT TO SCALE

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DAVID L. ANDERSON STATE OF WASHINGTON 22009 REGISTERED PROFESSIONAL ENGINEER

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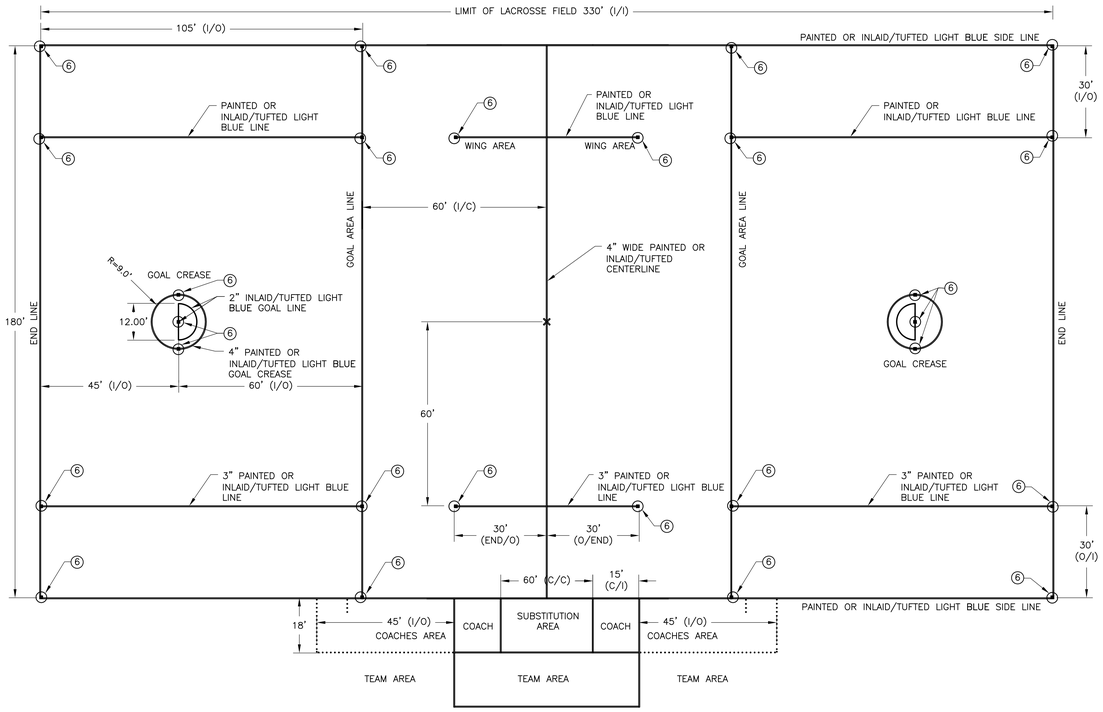
SOCCER LAYOUT PLAN & DETAILS

SHEET
F-3.3

File: F-3.3 Soccer Layout Plan & Details.dwg Plotted by: reneef Date: 27-Feb-22 11:54:10am



PAINTED MEN'S LACROSSE FIELD WITH PERMANENT REFERENCE MARKS

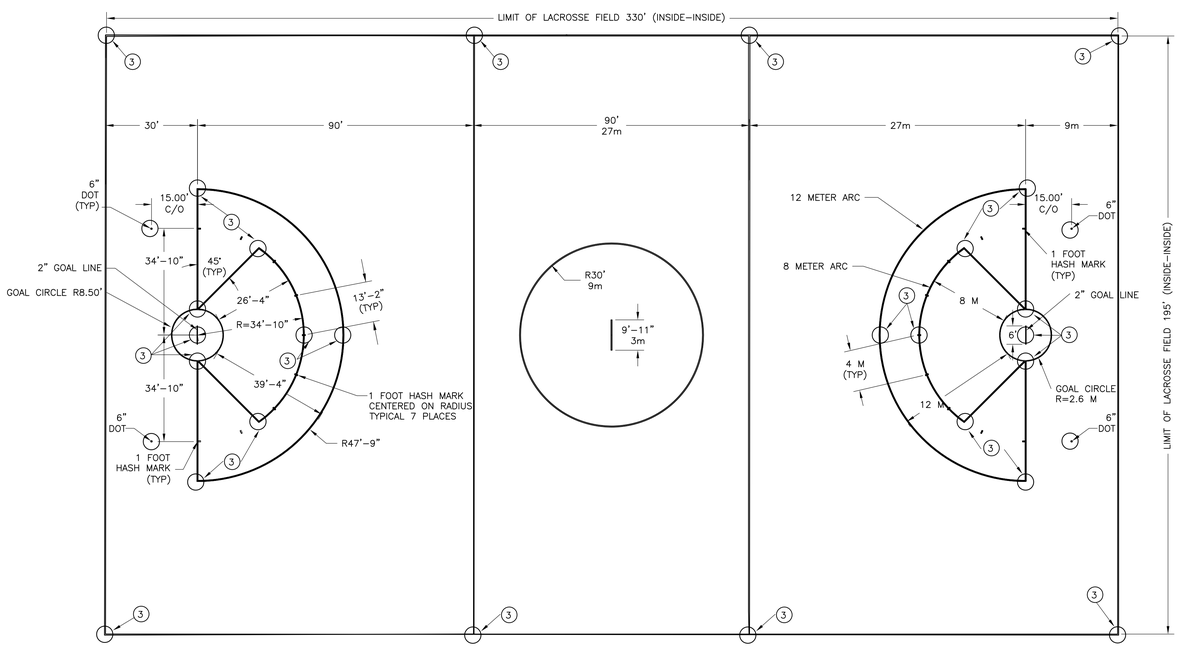
NOTES

1. PROVIDE LACROSSE LINES AND MARKINGS WITH 3" WIDE PAINTED OR INLAID/TUFTED LIGHT BLUE TURF. CENTERLINE WILL BE 4" ONLY.
2. ALL DIMENSIONS SPECIFIED ARE FOR MEN'S LACROSSE ONLY.
3. CENTER LINE ON LACROSSE FIELD IS A LIGHT BLUE LINE.
4. THE GOAL LINE SHALL BE A 2" LIGHT BLUE PAINTED OR INLAID/TUFTED LINE.
5. THE SUBSTITUTION AREA AND COACHES AREA WILL BE DEFINED BY 3" LIGHT BLUE HASH MARKS EXTENDING 3' OUTSIDE THE FIELD OF PLAY AS SHOWN ON THE PLAN.

(6) CONTRACTOR TO INSTALL 26–4" LIGHT BLUE SQUARE TURF AT LOCATIONS INDICATED AND INLAID/TUFTED LINES AT PERMANENTLY MARKED FIELD. SEE SHEET F–3.7 FOR LAYOUT.

1 / F-3.4 BOY'S LACROSSE REFERENCE MARKING PLAN

NOT TO SCALE



WOMEN'S LACROSSE NOTES:

1. TWO ARCS SHALL BE MARKED 8 METERS (8.8 YARDS) AND 12 METERS (13 YARDS) FROM THE GOAL CIRCLES. THE ARCS SHALL BE MEASURED FROM THE CENTER OF THE GOAL LINE, 10.6 METERS (34 FEET, 9 INCHES) FOR THE 8–METER MARK AND 14.6 METERS (47 FEET, 9 INCHES) FOR THE 12–METER MARK. THE 8 METER ARC SHALL END ON A LINE ON EACH SIDE THAT RUNS FROM A POINT ON EACH SIDE OF THE GOAL CIRCLE, WHERE IF THE GOAL LINE WERE CONTINUED IT WOULD CROSS THE GOAL LINE. THIS LINE WILL BE AT A 45–DEGREE ANGLE TO THE GOAL LINE EXTENDED. THE 8–METER ARC WILL BE SECTIONED OFF BY HASH MARKS 32 CENTIMETERS, (1 FOOT) IN LENGTH, PERPENDICULAR AND BISECTING THE ARC. THESE WILL BE MEASURED 4, 8 AND 12 METERS, RESPECTIVELY, FROM EITHER SIDE OF THE CENTER HASH MARK, WHICH SHALL BE MEASURED FROM THE CENTER OF AND PERPENDICULAR TO THE CENTER OF THE GOAL LINE, (10.6 METERS/34 FEET, 9 INCHES). TWO ADDITIONAL 32 CENTIMETER (1 FOOT) HASH MARKS WILL BE MADE 8 METERS FROM THE GOAL CIRCLE, PERPENDICULAR TO THE GOAL LINE EXTENDED. THE 12–METER ARC WILL END AT THE GOAL LINE EXTENDED. ALL LINES ARE 4" WIDE EXCEPT FOR THE 2" GOAL LINE.
2. THE GOAL CIRCLE HAS A RADIUS OF 2.6 METERS (8.5 FEET) MEASURED FROM THE CENTER OF THE GOAL LINE TO THE OUTER EDGE OF THE GOAL–CIRCLE LINE. THE GOAL CIRCLE LINE SHALL BE 5 CENTIMETERS (2 INCHES) WIDE.

(3) CONTRACTOR TO INSTALL 26–4" RED SQUARE TURF AT LOCATIONS INDICATED.

2 / F-3.4 GIRL'S LACROSSE LAYOUT PLAN

NOT TO SCALE

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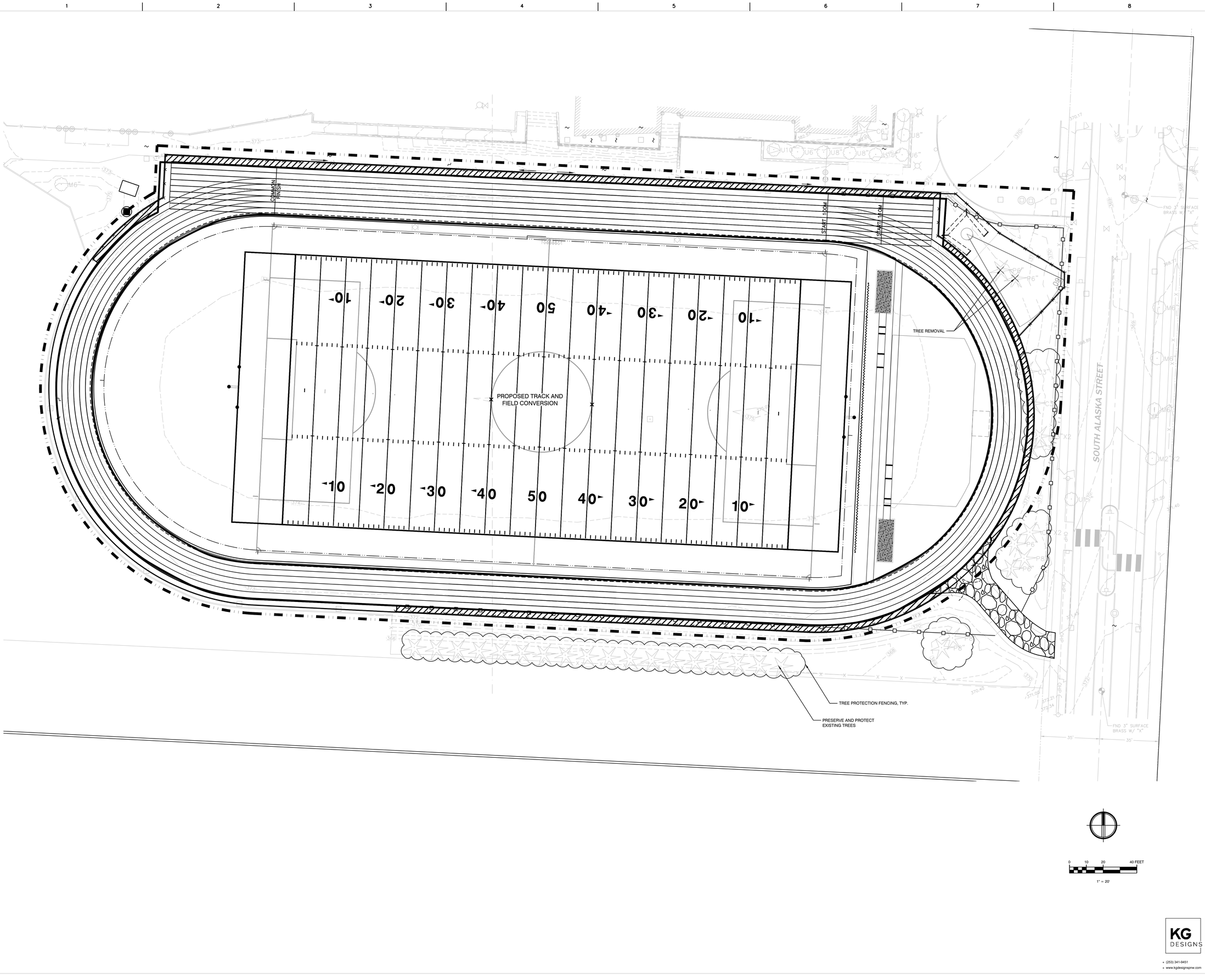
BOY'S AND GIRL'S LACROSSE LAYOUT PLAN

SHEET

F-3.4

File: F-3.4 Boy's and Girl's Lacrosse Layout Plan.dwg Plotted by: reneef Date: 27-Feb-22 11:54:45am



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CHECKED	KG

PLANTING PLAN

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L-1.0

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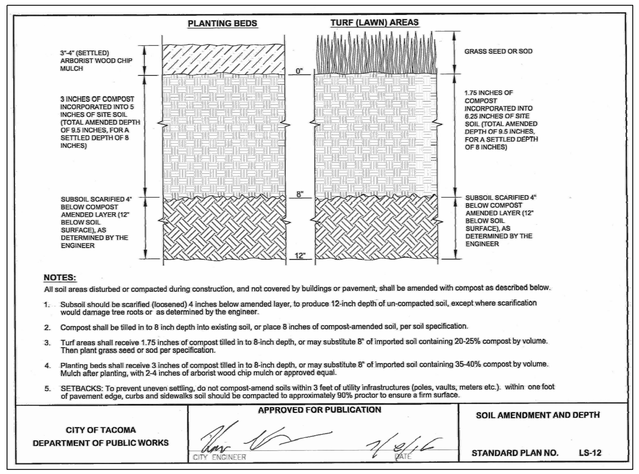


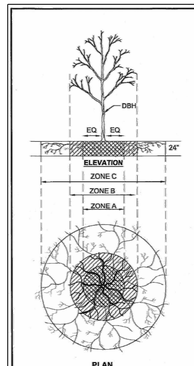
NOTES:

All soil areas disturbed or compacted during construction, and not covered by buildings or pavement, shall be amended with compost as described below.

1. Subsoil should be scarified (loosened) 4 inches below amended layer, to produce 12-inch depth of un-compacted soil, except where scarification would damage tree roots or as determined by the engineer.
2. Compost shall be tilled in to 8 inch depth into existing soil, or place 8 inches of compost-amended soil, per soil specification.
3. Turf areas shall receive 1.75 inches of compost tilled in to 8-inch depth, or may substitute 8" of imported soil containing 20-25% compost by volume. Then plant grass seed or sod per specification.
4. Planting beds shall receive 3 inches of compost tilled in to 8-inch depth, or may substitute 8" of imported soil containing 35-40% compost by volume. Mulch after planting, with 2-4 inches of arborist wood chip mulch or approved equal.
5. SETBACKS: To prevent uneven settling, do not compost-amend soils within 3 feet of utility infrastructures (poles, vaults, meters etc.). within one foot of pavement edge, curbs and sidewalks soil should be compacted to approximately 90% proctor to ensure a firm surface.

CITY OF TACOMA DEPARTMENT OF PUBLIC WORKS	APPROVED FOR PUBLICATION CITY ENGINEER 7/6/16 DATE	SOIL AMENDMENT AND DEPTH STANDARD PLAN NO. LS-12

SOIL SECTION



ZONE A (CRITICAL ROOT ZONE)
The Critical Root Zone is the area under a tree measuring 1 foot of radius per 1 inch of diameter at breast height (DBH) from the trunk outwards and 24 inches in depth. For example: for a 10 inch dbh tree, the Critical Root Zone is located at least 10 feet out from the trunk and 24 inches deep.

RESTRICTIONS
1. No disturbance allowed without site-specific inspection and approval of methods to minimize root damage.
2. If roots larger than 2" IN DIA. are encountered, inspection and approval is required before proceeding trenching/excavation work.
3. Tunneling is required to install lines 3'-0" below grade or deeper.

ZONE C (FEEDER ROOT ZONE)
The Feeder Root Zone is the area under a tree measuring 2 feet of radius per 1 inch of DBH from the trunk outwards and 24 inches in depth. For example: for a ten inch diameter tree, The Critical Root Zone is located at least 20 feet out from the trunk and 24 inches deep.

RESTRICTIONS
1. Operation of heavy equipment and/or stockpiling of materials subject to approval. *Surface protection measures required
2. Trenching permitted as follows:
-excavation by hand or WITH hand-driven trencher maybe required
-Minimize trench width to the extent possible
-Maintain 2/3 or more of ZONE C in an undisturbed condition

ZONE B (DRIP LINE)
The Drip Line is the area below the tree in which the boundary is designated by the edge of the tree's crown.

RESTRICTIONS
1. Operation of heavy equipment and/or stockpiling of materials subject to approval. *Surface protection measures required
2. Trenching permitted as follows:
-Excavation by hand or with a hand-driven trencher may be required
-Minimize trench width to the extent possible
-No disturbance permitted within ZONE A
-Maintain 2/3 or more of zone b in an undisturbed condition
3. Tunneling may be required for trenches deeper than 3'-0"

***SURFACE PROTECTION MEASURES**
1. Wood chip mulch layer, 6"-12" depth; or
2. 4" wood chip mulch layer under 3/4" plywood; or
3. 4" gravel over staked geotextile fabric
4. 4" wood chip mulch layer under steel plates;
5. 4" wood chip mulch layer under logging road mats

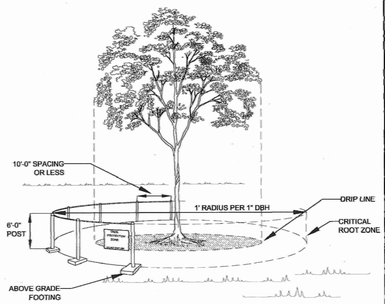
CITY OF TACOMA DEPARTMENT OF PUBLIC WORKS	APPROVED FOR PUBLICATION CITY ENGINEER 7/6/16 DATE	TREE PROTECTION DURING CONSTRUCTION STANDARD PLAN NO. LS-08

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



CITY OF TACOMA DEPARTMENT OF PUBLIC WORKS	APPROVED FOR PUBLICATION CITY ENGINEER 7/6/15 DATE	TREE PROTECTION DURING CONSTRUCTION STANDARD PLAN NO. LS-09

GENERAL NOTES

1. REFER TO CIVIL DEMOLITION DRAWINGS AND SPECIFICATIONS FOR REMOVAL REQUIREMENTS AND PROTECTION FENCING AROUND EXISTING VEGETATION.
2. REFER TO CIVIL PLANS FOR UTILITY WORK. CONTRACTOR RESPONSIBLE FOR PATCH AND REPAIR OF ALL EXISTING LANDSCAPE AREAS DISTURBED BY CONSTRUCTION WORK UNDER THIS CONTRACT.
3. REFER TO PLANTING AND SEEDING SPECIFICATION FOR ADDITIONAL REQUIREMENTS, INCLUDING EXTENDING MAINTENANCE REQUIREMENTS.
4. PLANTING SHALL CONFORM TO ALL CITY OF TACOMA CODE REQUIREMENTS, INCLUDING PRESERVATION OF ADEQUATE INTERSECTION SIGHT DISTANCE LINES/TRIANGULAR AREAS.
5. CONTRACTOR SHALL VERIFY ON-SITE CONDITIONS PRIOR TO BIDDING AND CONSTRUCTION.
6. CONTRACTOR SHALL REPAIR EXISTING IRRIGATION SYSTEM IF DISTURBED DURING CONSTRUCTION.
7. ALL LANDSCAPE AREAS TO RECEIVE SOIL AMENDMENTS PER CITY OF TACOMA STANDARDS.
8. THE CONTRACTOR AND OWNER ARE RESPONSIBLE FOR READING THE PLANS, SPECIFICATIONS AND NOTES.

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CHECKED	KG

PLANTING DETAILS

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L-1.0

Geotechnical Engineering Services Report

Giaudrone Middle School Playfield Improvements
Tacoma, Washington

for
Korsmo Construction

February 28, 2022

GeoEngineers
Earth Science + Technology

Geotechnical Engineering Services Report

Giaudrone Middle School Playfield Improvements
Tacoma, Washington

for
Korsmo Construction

February 28, 2022

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Geotechnical Engineering Services Report

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Tacoma, Washington

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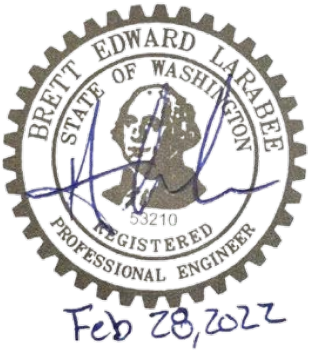

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1.0 INTRODUCTION AND PROJECT UNDERSTANDING

GeoEngineers, Inc. (GeoEngineers) is pleased to present this geotechnical engineering services report for the Giaudrone Middle School Field Improvements project. The project site is located at 4902 South Alaska Street in Tacoma, Washington. A vicinity map is provided as Figure 1. Our understanding of the project is based on information provided in the "Geotechnical Investigation Scope" document prepared by DA Hogan dated September 14, 2021 and our conversations with the project team.

The project consists of improvements to the existing natural turf playfield and surrounding track at Giaudrone Middle School. Proposed improvements include new synthetic turf playfields, site grading (grade changes of up to 5 feet are envisioned), stormwater infiltration facilities, field lighting poles (up to 80 feet tall), ball control fencing (up to 30 feet tall) and other access, landscaping and hardscaping improvements. Stormwater facilities at the site, if included, will be designed in accordance with the *2021 City of Tacoma Stormwater Management Manual* (SWMM).

2.0 PURPOSE AND SCOPE OF SERVICES

The purpose of our services is to complete subsurface explorations at the site as a basis for providing geotechnical design and construction recommendations for the project. Our services have been provided in accordance with our signed Task Order executed on January 10, 2022. Our specific scope of services is summarized in our proposal dated December 6, 2021.

GeoEngineers is also providing Environmental Services for the project as the project site is located within the mapped footprint of the Tacoma Smelter Plume (TSP). The results of our environmental services are being provided in a separate deliverable.

3.0 SITE CONDITIONS

3.1. Surface Conditions

Giaudrone Middle School (GMS) is located in a residential neighborhood of South Tacoma. The GMS campus is generally bound by South 49th Street to the north, South Alaska Street to the east, single family homes to the south and an undeveloped slope that leads down to Interstate 5 to the west. The playfield area is located south of the GMS building. The playfield consists of an oval shaped natural turf playfield surrounded by a dirt/gravel surfaced track. A baseball/softball field is located to the northwest of the playfield area however we understand that improvements to the baseball/softball field are not currently envisioned.

The playfield area is bordered by a chain link fence on the east, south sides, a concrete wall on the west side and by concrete hardscaping that includes concrete steps and stadium style seating to the north. The playfield area is relatively flat however grade changes are present on all sides of the playfield. The playfield area is about 10 feet lower than the GMS building; this grade change is accommodated by the concrete hardscaping mentioned previously. The playfield is about 4 to 6 feet higher than South Alaska Street (to the east) and the bordering residential properties to the south. These grade changes are accommodated by grass and landscape slopes that are on the order of 2 Horizontal to 1 Vertical (2H:1V).

The slope on the west side of the playfield is relatively steep (on the order of 1H:1V) and is around 40 feet tall. This slope is vegetated with grass, scotch broom and blackberry bushes.

3.2. Site History

Based on our review of historic aerial photos, the existing playfield was constructed around 2002 as part of constructing the current GMS. The current playfield area was originally developed as a playfield for the old Giaudrone School. As part of the 2002 construction, the playfield area was regraded and expanded to the west. We did not review grading plans associated with this construction; however, based on aerial photos it appears that the grading consisted of cutting on the east side of the playfield and filling on the west side of the playfield and on the slope above Interstate 5. We expect that fill depths could have exceed 10 feet during this construction.

3.3. Subsurface Conditions

3.3.1. Literature Review

Based on review of the *Geologic Map of the Tacoma 1:100,000 Quadrangle* (2015), the project site is underlain by Vashon Glacial Till (Qgt) deposits. Glacial till soils are typically comprised of a mixture of sand gravel and cobbles in a silty matrix. Glacial till deposits can also contain boulders. Glacial till deposits were deposited below the base of advancing and retreating glaciers and are highly over-consolidated. Glacial till deposits are typically dense to very dense; however, the upper few feet of the deposit can be weathered and relatively less dense than the underlying intact glacial till. Glacial till is typically defined as an NRCS Hydraulic Group C or D soil.

Also mapped in the project vicinity are recessional outwash deposits (Qgo). Recessional outwash deposits consist primarily of silt, clay, sand and gravel that was deposited by glacial meltwater. These deposits were not consolidated by the source glaciers after deposition and therefore are typically less dense or compact than glacial till or other glacially consolidated soils. Recessional outwash is typically defined as an NRCS Hydraulic Group A or B soil.

We reviewed the *Hydrogeologic Framework, Groundwater Movement, and Water Budget in the Chambers-Clover Creek Watershed and Vicinity Report* (U.S. Geological Survey Report 2012-5055). According to the report, which provides a summary of average aquifer elevations in the Tacoma area, static groundwater depths at the site are expected to be more than about 150 feet below existing site grades.

3.3.2. Subsurface Explorations and Laboratory Testing

GeoEngineers explored subsurface conditions at the site by advancing six borings at the approximate locations shown on the Site Plan, Figure 2. Summary explorations logs and the results of laboratory testing completed on select soil samples are provided in Appendix A. Borings extended as deep as about 26.5 feet below ground surface (bgs). Additional details regarding our subsurface exploration and laboratory testing program are provided in Appendix A.

3.3.3. Soil and Groundwater Conditions

Our borings were advanced in areas surfaced with sod. Sod thickness was typically on the order of 2 inches in our explorations. Below the sod in our explorations, we observed what we interpret to be three general soils units, fill, recessional outwash and glacial till.

Fill was observed in our borings starting below the sod and extended to between about 3.5 and 10 feet below ground surface. Fill was typically thickest in the borings on the western side of the site where we expect fill was placed as part of construction of the current playfield. Fill also extended to around 10 feet bgs in B-6 (southeast corner of the site) which we expect is associated with grading or filling more localized to that area. Observed fill soils typically consisted of loose to medium dense sand with silt and silty sand with variable gravel content. Occasional organic matter was observed within some of the fill soils.

Below the fill we observed recessional outwash extended to around 11.5 and 21.5 feet bgs. Recessional outwash was observed at the boring termination depths in B-2, B-3, B-4, B-5 and B-6 (16.5 feet, 16.5 feet, 11.5 feet, 16.5 feet and 21.5 feet, respectively). We observed what we interpret to be glacial till below the recessional outwash in B-1 starting around 13 feet bgs. B-1 was terminated within the glacial till soils around 26.5 feet bgs. Observed recessional outwash soils consisted primarily of medium dense to dense silty sand with variable gravel content. Lenses of sand with silt were also observed within the recessional outwash. Observed glacial till typically consisted of dense to very dense silty sand with gravel.

We did not encounter what we interpret to be the regional groundwater table in our explorations. Literature reviewed indicates, and we expect, that the regional groundwater is located more than 150 feet bgs in deeper underlying layers of glacial deposits. We observed what we interpret to be slow perched groundwater seepage in B-2 around 15 feet bgs and in B-6 around 10 feet bgs. We expect that areas of perched groundwater will be seasonal, isolated and discontinuous across the site.

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1. Primary Geotechnical Considerations

Based on our understanding of the project, the explorations performed for this study and our experience, it is our opinion that the proposed improvements can be designed and constructed generally as envisioned with regards to geotechnical considerations. A summary of key geotechnical considerations for the project is provided below and is followed by our detailed recommendations.

- We did not identify potentially liquefiable soils in our explorations and in our opinion the risk of liquefaction occurring at this site is low.
- Most of the soils observed in our borings contain a significant percentage of fines and could be difficult or impossible to work with when wet or become easily disturbed if exposed to wet weather. Depending on the intended use of the material and the prevailing conditions, it may be difficult to reuse these soils as structural fill.
- In our opinion, proposed improvements at the site can be satisfactorily supported using shallow foundations or drilled pier type foundations provided that the foundations are designed and constructed as recommended in this report.
- In our opinion, infiltration is feasible at this site, primarily within the recessional outwash soils however design infiltration rates for these soils may be relatively low and infiltration could be further reduced by the underlying glacial till soils. Additional field testing will be necessary to establish a design infiltration rate for stormwater infiltration facilities.

4.2. Seismic Design Considerations

4.2.1. Seismic Design Parameters

We understand that seismic design will be performed in accordance with 2018 IBC Standards. The following parameters provided in Table 1 should be used for design.

TABLE 1. SEISMIC DESIGN PARAMETERS

2018 IBC Seismic Design Parameters	
Spectral Response Acceleration at Short Periods (S_S)	1.346g
Spectral Response Acceleration at 1-Second Periods (S_1)	0.466g
Site Class	D
Site Modified Peak Ground Acceleration (PGA)	0.55g
Design Spectral Response Acceleration at Short Periods (SD_S)	0.9g
Design Spectral Response Acceleration at 1-Second Periods (SD_1)	0.57g

4.2.2. Liquefaction

Liquefaction refers to a condition where vibration or shaking of the ground, usually from earthquake forces, results in development of excess pore pressures and subsequent loss of strength in the affected soil deposit. In general, soils that are susceptible to liquefaction include loose to medium dense "clean" to silty sands below the water table.

We reviewed the *Liquefaction Susceptibility Map of Pierce County, Washington* (Palmer et al. 2004). According to the map, the potential for liquefaction at this site is very low. Based on the soil conditions observed in our explorations and our interpretation of the regional geology and groundwater table, it is also our opinion the potential for liquefaction at this site is low.

4.2.3. Lateral Spreading Potential

Lateral spreading related to seismic activity typically involves lateral displacement of large, surficial blocks of non-liquefied soil when a layer of underlying soil loses strength during seismic shaking. Lateral spreading usually develops in areas where sloping ground or large grade changes (including retaining walls) are present. Based on our understanding of the liquefaction risk at the site and the proposed improvements it is our opinion that the risk of lateral spreading is low.

4.2.4. Surface Rupture Potential

According to the Washington State Department of Natural Resources (DNR) Interactive Natural Hazards Map, the project site is in the vicinity of the Tacoma Fault zone. However, because bedrock in this area is covered by hundreds of feet of glacial soils, it is unlikely that movement of the fault would result in significant surface rupture at the ground surface. In our opinion the risk for surface fault rupture occurring at this site is low.

4.3. Site Development and Earthwork

We anticipate that site development and earthwork will include demolition of existing features, excavating for shallow foundations, utilities, and other improvements, establishing subgrades for structures and hardscaping, and placing and compacting fill and backfill materials. We expect that site grading and earthwork can be accomplished with conventional earthmoving equipment. The following sections provide specific recommendations for site development and earthwork.

4.3.1. Clearing, Stripping and Demolition

Clearing and stripping depths will likely be on the order of 2 to 3 inches in areas currently surfaced with sod or other landscaping. Greater stripping depths could be required within structural areas or areas of unsuitable soils, if observed during construction. Stripped grass and sod material must not be reused as fill.

While not encountered in our borings, in our experience cobbles and boulders can also be present in the recessional outwash and glacial till soils present at the site. Accordingly, the contractor should be prepared to remove boulders and cobbles, if encountered during grading or excavation. Boulders may be removed from the site or used in landscape areas. Voids caused by boulder removal should be backfilled with structural fill.

We recommend that existing pavements and hardscaping be completely removed from areas that will be developed. During removal of these features, disturbance of surficial soils may occur, especially if left exposed to wet conditions. Disturbed soils may require additional remediation during construction and grading. If utilities exist beneath planned structures, they should be removed and backfilled or abandoned in place.

We support the use of recycled flat work materials, where appropriate in location, material size, and placement techniques. Local jurisdictions may require additional chemical testing of these materials before use. We can review this as an option if this becomes a consideration for any demolition.

4.3.2. Erosion and Sedimentation Control

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 the project impact on erosion-prone areas. The plan should be designed in accordance with applicable city, county and/or state standards. The plan should incorporate basic planning principles, including:

- Scheduling grading and construction to reduce soil exposure;
- Re-vegetating or mulching denuded areas;
- Directing runoff away from exposed soils;
- Reducing the length and steepness of slopes with exposed soils;
- Decreasing runoff velocities;
- Preparing drainage ways and outlets to handle concentrated or increased runoff;
- Confining sediment to the project site;

- Inspecting and maintaining control measures frequently.

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.

Temporary erosion protection should be used and maintained in areas with exposed or disturbed soils to help reduce erosion and reduce transport of sediment to adjacent areas and receiving waters. Permanent erosion protection should be provided by paving, structure construction or landscape planting.

Until the 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.

4.3.3. Temporary Excavation

Excavations deeper than 4 feet must be shored or laid back at a stable slope if workers are required to enter. Shoring and temporary slope inclinations must conform to the provisions of Title 296 Washington Administrative Code (WAC), Part N, "Excavation, Trenching and Shoring." 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). The contract documents should 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.

In general, temporary cut slopes at this site should be inclined no steeper than about 1½H:1V (horizontal to vertical). This guideline assumes that all surface loads are kept at a minimum distance of at least one-half the depth of the cut away from the top of the slope and that seepage is not present on the slope face. Flatter cut slopes will be necessary where seepage occurs or if surcharge loads are anticipated. Temporary covering with heavy plastic sheeting should be used to protect slopes during periods of wet weather.

4.3.4. Permanent Slopes

If permanent slopes are necessary, we recommend they be constructed at a maximum inclination of 2H:1V. Where 2H:1V permanent slopes are not feasible, protective facings and/or retaining structures should be considered.

To achieve uniform compaction, we recommend that fill slopes be overbuilt slightly and subsequently cut back to expose well-compacted fill. Fill placement on slopes steeper than about 5H:1V should be benched into the slope face. The configuration of benches depends on the equipment being used. Bench excavations should be level and extend into the slope face.

Exposed areas should be re-vegetated as soon as practical to reduce the surface erosion and sloughing. Temporary protection should be used until permanent protection is established.

4.3.5. Groundwater Handling Considerations

Based on our understanding of the proposed site improvements, we do not anticipate that the regional groundwater table will be encountered in excavations at the site.

We encountered what we interpret to be perched groundwater around 15 feet bgs during drilling of B-2 and around 10 feet bgs during drilling of B-6. We recommend that the contractor performing the work be prepared to encounter perched groundwater seepage in excavations at the site. The interface between the fill material and native soils and contacts between relatively more permeable and relatively less permeable materials are likely locations for accumulation of perched groundwater. Groundwater seepage handling needs will typically be lower during the late summer and early fall months. We anticipate that shallow perched groundwater, if encountered, can be handled adequately with sumps, pumps and/or diversion ditches, as necessary. Ultimately, we recommend that the contractor performing the work be made responsible for controlling and collecting groundwater encountered.

4.3.6. Surface Drainage

Surface water from roofs, pavements and landscape areas should be collected and controlled. Curbs or other appropriate measures such as sloping pavements, sidewalks and landscape areas should be used to direct surface flow away from buildings, erosion sensitive areas and from behind retaining structures. Roof and catchment drains should not be connected to wall or foundation drains.

4.3.7. Subgrade Preparation

Subgrades that will support slab-on-grade floors, pavements, and other site features bearing on final grade should be thoroughly compacted to a uniformly firm and unyielding condition on completion of stripping/excavation and before placing structural fill. We recommend that subgrades for structures, pavements and other bearing surfaces be evaluated, as appropriate, 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 that: (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.

4.3.8. Subgrade Protection and Wet Weather Considerations

The wet weather season generally begins in October and continues through May in Western Washington; however, periods of wet weather can occur during any month of the year. The soils encountered in our explorations contain a significant amount of fines. Soil with high fines content is very sensitive to small changes in moisture and is susceptible to disturbance from construction traffic when wet or if earthwork is performed during wet weather. If wet weather earthwork is unavoidable, we recommend that the following steps be taken.

- 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.
- Earthwork activities should not take place during periods of heavy precipitation.
- Slopes with exposed soils should be covered with plastic sheeting.

- The contractor should take necessary measures to prevent on-site soils and other soils to be used as fill from becoming wet or unstable. These measures may include the use of plastic sheeting and controlling surface water with ditches, sumps with pumps and by grading. The site soils should not be left uncompacted and exposed to moisture. Sealing the exposed soils by rolling with a smooth-drum roller prior to periods of precipitation will help 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 working pad 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.
- During periods of wet weather, concrete should be placed as soon as practical after preparation of the footing excavations. Foundation bearing surfaces should not be exposed to standing water. If water pools in the base of the excavation, it should be removed before placing structural fill or reinforcing steel.
- If footing excavations are exposed to extended wet weather conditions, a lean concrete mat or a layer of clean crushed rock can be considered for foundation bearing surface protection.

4.4. Fill Materials

4.4.1. Structural Fill

The workability of material for use as structural fill will depend on the gradation and moisture content of the soil. We recommend that washed crushed rock or select granular fill, as described below, be used for structural fill during the rainy season. If prolonged dry weather prevails during the earthwork phase of construction, materials with a somewhat higher fines content may be acceptable. Weather, material use, schedule, duration exposed, 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.

Material used for structural fill should be free of debris, organic contaminants and rock fragments larger than 6 inches. 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 Washington State Department of Transportation (WSDOT) Standard Specifications.

4.4.2. Select Granular Fill/Wet Weather Fill

Select granular fill should consist of well-graded sand and gravel or crushed rock with a maximum particle size of 6 inches and less than 5 percent fines by weight based on the minus ¾-inch fraction. Organic matter, debris or other deleterious material should not be present. In our opinion, material with gradation characteristics similar to WSDOT Specification 9-03.9 (Aggregates for Ballast and Crushed Surfacing), "Gravel Backfill for Walls" as described in Section 9-03.12(2) of the WSDOT Standard Specifications, or 9-03.14 (Borrow) is suitable for use as select granular fill, provided that the fines content is less than 5 percent (based on the minus ¾-inch fraction) and the maximum particle size is 6 inches.

4.4.3. Pipe Bedding

Trench backfill for the bedding and pipe zone should consist of well-graded granular material similar to "gravel backfill for pipe zone bedding" described in Section 9-03.12(3) of the WSDOT Standard

Specifications. The material must be free of roots, debris, organic matter and other deleterious material. Other materials may be appropriate depending on manufacturer specifications and/or local jurisdiction requirements.

4.4.4. Trench Backfill

Trench backfill must be free of debris, organic material and rock fragments larger than 6 inches. We recommend that import trench backfill material consist of material similar to "Select Borrow" or "Gravel Borrow" as described in Section 9-03.14 of the WSDOT Standard Specifications. Where water is present, alternative materials may need to be considered.

4.4.5. Gravel Backfill For Walls

Backfill material used within 5 feet behind retaining walls should consist of free-draining material similar to "Gravel Backfill for Walls" as described in Section 9-03.12(2) of the WSDOT Standard Specifications.

4.4.6. Capillary Break Material

Structural fill placed as capillary break material below on-grade floor slabs should consist of ¾-inch coarse aggregate with negligible sand or silt as described in Section 9-03.1(4)C Grading No. 67 of the WSDOT Standard Specifications. WSDOT Specification 9-03.9 (Aggregates for Ballast and Crushed Surfacing, Crushed Surfacing Base Course [CSBC]) may also be considered.

4.4.7. Crushed Surfacing for Pavements and Sidewalks

Structural fill placed as CSBC below pavements and sidewalks should meet the requirements for Crushed Surfacing Base Course, Section 9-03.9(3) of the WSDOT Standard Specifications.

4.4.8. Recycled Materials

Recycled asphalt and concrete can be considered for use as structural fill provided that material meets the gradation requirements for its intended use. Recycled materials should not be used as capillary break material, in drainage applications, within infiltration facilities, or in areas where groundwater flow may occur. Crushed asphalt has the potential to creep under large and sustained loads. Accordingly, we recommend that crushed/recycled asphalt not be used under foundation elements or below slab on grade. Crushed asphalt can be considered for use below pavements.

4.4.9. On-Site Soil

Soils at the site are primarily comprised of silty sand and are extremely moisture sensitive. These soils will be very difficult or impossible to properly compact when wet and we do not recommend they be reused as structural fill during periods of wet weather. In addition, it is possible that existing soils will be generated at moisture contents above what is optimum for compaction. In this case, the soils would need to be moisture conditioned prior to re-use. Space for drying out material during dryer weather or covering on-site materials generated during wet weather should be considered. During wetter or even slightly colder times of year, such as when temperatures get below about 60 degrees, accommodations to cover stockpiled material generated on site that will be used as structural fill should be planned.

If earthwork occurs during a typical wet season, or if the soils are persistently wet and cannot be dried back due to prevailing wet weather conditions, we recommend the use of imported select granular fill, as

described above. It will likely be more financially practical to use on site material regardless of time of year. If considered during the wet season, we strongly recommend that provision in the plans and specifications include specific guidance as to use of this material, protection of this material, and removal of this material, or that it become clear and consistent during the bid process where native soil is proposed for use. Ultimately, we still suggest that the district plan for additional purchase of provision for protection of material and/or imported select granular fill during the wet season.

4.4.10. Fill Placement and Compaction

To obtain proper compaction, fill soil should be compacted near optimum moisture content and in uniform horizontal lifts. Lift thickness and compaction procedures will depend on the moisture content and gradation characteristics of the soil and the type of equipment used. The maximum allowable moisture content varies with the soil gradation and should be evaluated during construction. Generally, 12-inch loose lifts are appropriate for steel-drum vibratory roller compaction equipment. Compaction should be achieved by mechanical means. During fill and backfill placement, sufficient testing of in-place density should be conducted by a representative of GeoEngineers to check that adequate compaction is being achieved.

4.4.10.1. Area Fills and Pavement Bases

Fill placed to raise site grades and materials under pavements and structural areas should be placed on subgrades prepared as previously recommended. Fill material placed below structures and footings should be compacted to at least 95 percent of the theoretical maximum dry density (MDD) per ASTM International (ASTM) D 1557. Fill material placed shallower than 2 feet below pavement sections should be compacted to at least 95 percent of the MDD. Fill placed deeper than 2 feet below pavement sections should be compacted to at least 90 percent of the MDD. Fill material placed in landscaping areas should be compacted to a firm condition that will support construction equipment, as necessary, typically around 85 to 90 percent of the MDD.

4.4.10.2. Backfill Behind Below-Grade Structures

Backfill behind retaining walls or below-grade structures should be compacted to between 90 and 92 percent of the MDD. Overcompaction of fill placed directly behind below-grade structures should be avoided. We recommend use of hand-operated compaction equipment and maximum 6-inch loose lift thickness when compacting fill within about 5 feet behind below-grade structures.

4.4.10.3. Trench Backfill

For utility excavations, we recommend that the initial lift of fill over the pipe be thick enough to reduce the potential for damage during compaction, but generally should not be greater than about 18 inches above the pipe. In addition, rock fragments greater than about 1 inch in maximum dimension should be excluded from this lift.

Trench backfill material placed below structures and footings should be compacted to at least 95 percent of the MDD. In paved areas, trench backfill should be uniformly compacted in horizontal lifts to at least 95 percent of the MDD in the upper 2 feet below subgrade. Fill placed below a depth of 2 feet from subgrade in paved areas must be compacted to at least 90 percent of the MDD. In non-structural areas, trench backfill should be compacted to a firm condition that will support construction equipment, as necessary.

4.5. Foundation Support

4.5.1. General

We understand that the new field lighting poles and ball control fencing will be supported on either conventional shallow foundations (spread footings) or on drilled pier type foundations (pier foundations). We expect that other improvements around the site will be supported on spread footings.

We recommend that footings be established at least 18 inches below the lowest adjacent grade and have minimum widths of 24 inches. In our opinion drainage systems around or below foundations are not necessary to maintain bearing support.

Prepared foundation bearing surfaces should be observed and evaluated by a member of our firm prior to placement of structural fill, formwork, or steel reinforcement. Our representative will confirm that the bearing surfaces have been prepared in accordance with our recommendations and is suitable for supporting the design footing load and provide recommendations for remediation, if necessary.

The sections below provide our recommendations for design and construction of spread footings and pier foundations.

4.5.2. Spread Footings

4.5.2.1. General

Spread footings can bear on existing site soils provided the soils can be proof compacted to a uniformly firm and unyielding condition. Loose or disturbed materials present at the base of footing excavations should be removed or compacted. If exposed foundation bearing soils cannot be recompacted in place to a suitable condition, we recommend that they be removed and replaced with compacted structural fill as needed. We expect that overexcavation below footings, if required, can be limited to 18 inches for the anticipated improvements.

4.5.2.2. Allowable Soil Bearing Pressure and Settlement

Foundations bearing on surfaces prepared as recommended above may be designed using an allowable soil bearing pressure of 2,000 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 when considering total loads, including earthquake or wind loads. These are net bearing pressures. The weight of the footing and overlying backfill can be ignored in calculating footing sizes. The actual bearing resistance will depend in part on the depth of the footings and the condition of the foundation bearing surface soils.

We estimate that settlement of footings designed and established on surfaces prepared as recommended will be less than about 1 inch, with differential settlements of less than ½ inch between comparably loaded isolated column footings or along 50 feet of continuous footing. Settlement is expected to occur rapidly as loads are applied. Settlements could be greater than estimated if loose or disturbed soil is present beneath footings. As design progresses, we should be provided the actual structure loads and footing sizes in order to confirm the settlement estimates above are appropriate.

4.5.2.3. Lateral Resistance

The ability of soil to resist lateral loads is a function of frictional resistance, which can develop on the base of footings and slabs and passive resistance, which can develop on the face of below-grade elements of the structure as these elements tend to move into the soil. We expect that the allowable

frictional resistance on the base of footings may be computed using a coefficient of friction of 0.40 applied to the vertical dead-load forces. The allowable passive resistance on the face of footings or other embedded foundation elements may be computed using an equivalent fluid density of 300 pounds per cubic foot (pcf) for undisturbed site soils or structural fill extending out from the face of the foundation element a distance at least equal to two and one-half times the depth of the element. 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 passive earth pressure value is based on the assumptions that the adjacent grade is level and that groundwater remains below the base of the footing throughout the year. 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.

4.5.3. Pier Foundations

4.5.3.1. General

We expect that pier footings will consist of a precast or cast in place concrete foundation installed into a predrilled/or excavated hole. The sections below provide recommendations for design and construction of pier foundations.

4.5.3.2. Axial Resistance

Pier foundations will achieve axial downward resistance through end bearing resistance at the toe of the pier and through skin friction along the length of the foundation. Uplift resistance will be achieved through skin friction only.

We recommend that end bearing resistance of pier foundations be estimated assuming an allowable soil bearing pressure of 2,000 psf. Downward skin friction resistance can be estimated using an allowable unit skin resistance of 300 psf per linear foot of embedded foundation. Uplift skin frication resistance can be estimated using an allowable unit skin resistance of 240 psf per linear foot of embedded foundation. These values are appropriate for pier embedment depths up to about 15 feet. If foundation embedment depths are expected to exceed 15 feet, we should be notified and we will develop a foundation specific estimate of pier axial resistance.

For example, a 2 foot diameter pier footing embedded 10 feet below grade would achieve the following allowable resistances:

$$End\ Bearing\ Resistance = \mathrm{B}earing\ pressure\ (psf) \times Toe\ Area\ (sf)$$

$$= 2{,}000psf\ \times\ \pi(\frac{2\ ft.}{2})^2 \cong 6{,}280\ lbs.$$

$$Downward\ Skin\ Resistance = Unit\ Skin\ Resistance \times Pier\ Perimeter\ (ft) \times Pier\ Embedment(ft)$$

$$= 300\ psf\ \times \pi\ (2\ ft) \times 10\ ft. \cong 18{,}850\ lbs.$$

$$Upward\ Skin\ Resistance = Unit\ Uplift\ Resistance \times Pier\ Perimeter\ (ft) \times Pier\ Embedment(ft)$$

$$= 240\ psf\ \times \pi(2\ ft) \times 10\ ft. \cong 15{,}000\ lbs.$$

4.5.3.3. Lateral Resistance

The tables below provide recommendations for evaluating lateral resistance of pier foundations. Table 2 provides allowable lateral bearing resistance values for the soils encountered in our borings. Lateral bearing resistances are based on correlations presented in Table 17-2 of the WSDOT *Geotechnical Design Manual*.

TABLE 2: LATERAL SOIL BEARING RESISTANCE

Depth Range (feet)	Allowable Lateral Bearing Resistance (psf)
0 to 5	1,500
5 to 20	2,500
20 and below	4,000

Table 3 provides recommended soil parameters for lateral pier foundation analyses using the software program LPILE (Ensoft Inc. 2016).

TABLE 3: RECOMMENDED LPILE PARAMETERS

Depth Range (feet)	p-y Curve Type	Eff. Unit Wt. (pcf)	Friction Angle (deg)	K (pci)
0 to 5	Sand (Reese)	120	30	50
5 to 20	Sand (Reese)	120	32	80
20 and below	Sand (Reese)	120	34	225

If lateral pier foundation analyses are completed using LPILE, we recommend that we be allowed to review the results of the analyses to confirm that the results are consistent with our experience designing foundations and our understanding of soil conditions at the site.

4.5.3.4. Construction Considerations

We present two conditions to consider when constructing pier foundations.

- Condition #1, an excavation the same dimension of the designed foundation is created, and the precast foundation is placed in the excavation or the foundation is cast directly against undisturbed earth; or
- Condition #2, an excavation larger than the designed dimension of the foundation is created, a casing is placed into the excavation and the foundation concrete is cast inside the casing. The casing could be left in place permanently, or removed from the excavation as the foundation is constructed. If the casing is left in place any overexcavated area outside of the casing would need to be backfilled with controlled density fill (CDF).

Construction of Condition #1 requires the sidewalls of the excavation to stay stable during construction of the foundation. Construction of Condition #2 does not require the sidewalls of the excavation to remain stable. Based on the soil and groundwater conditions at the site it is our opinion that there is a risk that the sidewalls of the excavations will cave, especially in areas of the site where there is more fill.

We anticipate that casing will be necessary to complete the excavations for pier foundations. If a sacrificial or permanent casing is used, this practice should be coordinated with the structural engineer.

We recommend that the base of the pier footing excavations be free of loose or disturbed soils prior to construction of the foundation. If loose or disturbed soils are present at the base of the excavation and cannot be adequately compacted or removed, we recommend that quarry spalls be pushed into the excavation subgrade until a stable base is established. If water accumulates in the excavation, the water should be removed from the excavation prior to pouring concrete.

4.6. Retaining Walls and Below Grade Structures

4.6.1. General

We understand that retaining walls may be included around the site to accommodate planned site grading. We expect that both cut and fill type walls may be considered. There are many retaining wall types that could be considered for this site and selection of the wall type will depend in part on, wall location, wall height, surcharge loads cost considerations and aesthetics. The sections below provide general design and construction considerations for different retaining wall types.

4.6.1.1. Modular Block Walls

Modular block retaining walls can consist of smaller landscaping sized blocks, larger rectangular modular blocks (ecology blocks or Ultra blocks) or rock baskets (gabion baskets). These wall types can be used in cut and fill applications and can typically support retained heights up to about 4 feet without including soil reinforcement or incorporating a wall face batter. For wall heights between 4 and 6 feet, soil reinforcement can typically be avoided provided the wall face is battered. In the case of taller modular block walls (about 6 to 12 feet), the bottom row, or bottom two rows of blocks are typically rotated 90 degrees or perpendicular to the slope cut so the short side of the block faces the front of the wall.

For wall heights greater than 6 feet, these types of walls are still feasible; however, it will likely be necessary to incorporate soil reinforcement behind the wall to maintain stability during seismic conditions. Reinforcement zones typically have a minimum length of about 6 feet (measured form the back face of the wall); however, the length of reinforcement will increase with the overall wall height. Because of this, incorporating reinforcement behind modular block walls is likely best suited for fill walls where significant cuts will not be required to create room for the reinforcement zone.

Wall height, size and construction techniques, including preparation of temporary slopes for construction, worker safety, nearby structures in the excavation zone, and property limits should also be considered when choosing walls of this type.

4.6.1.2. Cast In Place Walls

Conventional cast in place retaining walls are feasible for use at this site. Cast in place walls can be designed to retain slopes in excess of 10 feet; however, as the retained wall height increases, wall footing sizes and structural reinforcement requirements will also increase. For wall heights in excess of 10 feet, it is not uncommon for reinforcement to be incorporated into the retained soil to help reduce the soil earth pressures on the wall. Foundations for cast in place walls typically must be embedded a few feet below finished grade for adequate bearing support and to help develop passive resistance on the footing. In many instances, foundation size for walls can be as much as 80 percent of the height of the wall, which can require more soil removal and backfill during construction.

4.6.1.3. Structural Earth Walls

Structural earth walls (SEWs) or mechanically stabilized earth (MSE) walls consist of a fill soil mass reinforced with geo-synthetic or steel straps to provide tension resistance to the soil. The exposed face of the soil mass is protected by a fascia. This permanent fascia can consist of concrete panels, segmental concrete blocks, wire gabions or a cast-in-place facing over geo-synthetic wraps. It is also possible to construct SEWs with vegetated faces.

SEWs are typically used in fill applications where there is sufficient room to construct the reinforced soil mass. For planning purposes, the length of the reinforcement zone can be assumed to be equal to the exposed height of the wall.

4.6.1.4. Soil Nail and Soldier Pile Walls

Soil nail and soldier pile walls could be considered, however for the expected wall applications at this site we expect that these wall types would be more expensive than the wall types discussed previously. These wall types will likely be advantageous if retained wall heights exceed about 10 feet and are best suited for "top-down" construction techniques and cut applications. If taller retaining walls are envisioned at the site, we can provide additional recommendations for design of soil nail or soldier pile walls.

4.6.2. Design Parameters

We recommend the following lateral earth pressures be used for design of conventional retaining walls and below-grade structures. Our design pressures assume that the ground surface around the retaining structures will be level or near level. If drained design parameters are used, drainage systems must be included in the design in accordance with the recommendations presented in section "4.6.3 Drainage" below.

- Active soil pressure may be estimated using an equivalent fluid density of 35 pcf for the drained condition.
- Active soil pressure may be estimated using an equivalent fluid density of 85 pcf for the undrained condition; this value includes hydrostatic pressures.
- At-rest soil pressure may be estimated using an equivalent fluid density of 55 pcf for the drained condition.
- At-rest soil pressure may be estimated using an equivalent fluid density of 95 pcf for the undrained condition; this value includes hydrostatic pressures.
- For seismic considerations, a uniform lateral pressure of 10H 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.
- An additional 2 feet of fill representing a typical traffic surcharge of 250 psf should be included if vehicles are allowed to operate within ½ the height of the retaining walls. Other surcharge loads should be considered on a case-by-case basis. We can provide additional surcharge loads for specific loading conditions once known.

The active soil pressure condition assumes the wall is free to move laterally 0.001 H, where H is the wall height). The at-rest condition is applicable where walls are restrained from movement. The above-recommended lateral soil pressures do not include other surcharge loads than described or the effects of

sloping backfill surfaces. We should be consulted if other surcharge loads are anticipated or if sloping backfill conditions are planned, this may change the lateral pressure values provided.

Over-compaction of fill placed directly behind retaining walls or below-grade structures must be avoided. We recommend use of hand-operated compaction equipment and maximum 6-inch loose lift thickness when compacting fill within about 5 feet of retaining walls and below-grade structures.

Retaining wall foundation bearing surfaces should be prepared following Section 4.5 "Foundation Support" of this report. Provided bearing surfaces are prepared as recommended retaining wall foundations may be designed using the allowable soil bearing values and lateral resistance values presented above. We estimate settlement of retaining structures will be similar to the values previously presented for spread foundations.

4.6.3. Drainage

If retaining walls or below-grade structures are designed using drained parameters, a drainage system behind the structure must be constructed to collect water and prevent the buildup of hydrostatic pressure against the structure. We recommend the drainage system include a zone of free-draining backfill a minimum of 18 inches in width against the back of the wall. The drainage material should consist of coarse sand and gravel containing less that 5 percent fines based on the fraction of material passing the ¾-inch sieve. Material similar to "Gravel Backfill for Drains" per WSDOT Standard Specifications Section 9-03.12(4) is also suitable. Waffle board-type drainage mats may be considered instead of gravel provided they are protected from accumulating silt and discharge appropriately.

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 drain pipe should be metal or rigid PVC pipe and be sloped to drain by gravity. Discharge should be routed to appropriate discharge areas and designed 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.

4.7. Pavement Design

4.7.1. General

Paved areas are expected to include parking areas, driveways and sidewalk areas. Based on our experience, we provide recommended conventional asphalt concrete pavement (ACP) and Portland cement concrete (PCC) sections below. These pavement sections may not be adequate for heavy construction traffic loads such as those imposed by concrete transit mixers, dump trucks or cranes. Additional pavement thickness may be necessary to prevent pavement damage during construction if other loading types are planned. The recommended sections assume that final improvements surrounding the pavements will be designed and constructed such that stormwater or excess irrigation water from landscape areas does not accumulate below the pavement section or pond on pavement surfaces.

Existing pavements, hardscaping or other structural elements should be removed prior to placement of new pavement sections. Pavement subgrade should be prepared as recommended in Section 4.3.7 "Subgrade Preparation" of this report. Crushed surfacing base course and subbase should be moisture

conditioned to near optimum moisture content and compacted to at least 95 percent of the theoretical MDD per ASTM D 1557.

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 the CSBC sections provided may consist of CSTC as a leveling layer and for more precise grade development.

Hot mix asphalt should conform to applicable sections of 5-04, 9-02 and 9-03 of the WSDOT Standard Specifications.

PCC mix design should conform with Section 5-05.3(1) of the WSDOT Standard Specifications. Aggregates for PCC should conform to applicable sections of 9-03.1 of the WSDOT Standard Specifications.

Some areas of pavement may exhibit settlement and subsequent cracking over time. 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.

4.7.2. Asphalt Concrete Pavement Sections

Recommended minimum ACP sections are provided below.

4.7.2.1. Standard-Duty ACP – Automobile Driveways and Parking Areas

- 2 inches of hot mix asphalt, class ½ inch, PG 58-22
- 4 inches of compacted CSBC
- 6 inches of subbase consisting of imported granular structural fill to provide uniform grading and pavement support, to maintain drainage, and to provide separation from fine-grained subgrade soil
- Native soil, existing fill or structural fill prepared as recommended in Section 4.3.7 “Subgrade Preparation” of this report

4.7.2.2. Heavy-Duty ACP – Areas Subject to Heavy-Duty Traffic

- 3 inches of hot mix asphalt, class ½ inch, PG 58-22
- 6 inches of compacted CSBC
- 6 inches of subbase consisting of imported granular structural fill to provide uniform grading and pavement support, to maintain drainage, and to provide separation from fine-grained subgrade soil
- Native soil, existing fill or structural fill prepared as recommended in Section 4.3.7 “Subgrade Preparation” of this report

4.7.3. Portland Cement Concrete Pavement Design

Recommended minimum PCC pavement sections are provided below. The provided sidewalk PCC pavement section meets the minimum sidewalk thickness requirements of the City of Tacoma. In our opinion steel reinforcement does not need to be included in PCC pavements that will be primarily used in landscaping and pedestrian areas (areas not subjected to heavy vehicle traffic). Reinforcement could be considered to reduce the potential for cracking in areas where the concrete slabs have irregular shapes or where new slabs abut existing concrete slabs, and the joint layout between the slabs cannot be

matched. If reinforcement is considered, we are available to discuss typical steel reinforcement volumes with the project structural engineer, who ultimately designs the location, size and layout of reinforcement.

4.7.3.1. Sidewalk PCC Pavement – Pedestrian Areas Not Subjected to Vehicle Loading

- 4 inches of PCC with a minimum 14-day flexural strength of 650 psi
- 2 inches of compacted CSBC
- Native subgrade or structural fill prepared in accordance with Section 4.3.7 "Subgrade Preparation" of this report

4.7.3.2. Standard PCC Pavement – Automobile Driveways and Parking Areas

- 6 inches of PCC with a minimum 14-day flexural strength of 650 psi
- 4 inches of compacted CSBC
- Native subgrade, existing fill or structural fill prepared in accordance with Section 4.3.7 "Subgrade Preparation" of this report

4.7.3.3. Heavy Duty PCC Pavement – Areas Subject to Heavy Truck Traffic

- 9 inches (minimum) of PCC with a minimum 14-day flexural strength of 650 psi
- 4 inches of compacted CSBC
- Native subgrade, existing fill or structural fill prepared in accordance with Section 4.3.7 "Subgrade Preparation" of this report

4.8. Stormwater Infiltration

4.8.1. General

Stormwater facilities at the site, if planned, will be designed in accordance with the 2021 City of Tacoma SWMM. Based on the subsurface conditions observed in our explorations it is our opinion stormwater infiltration into the recessional outwash soils is feasible.

Recessional outwash soils were observed in our borings between about 3.5 and 21.5 feet bgs (relative thickness and depths of the unit varies across the site). Underlying the recessional outwash soils at the site is glacial till, which has a much lower infiltration potential than the recessional outwash. The depth to glacial till was not confirmed in all of our borings, however for stormwater planning purposes we recommend assuming that till is present below about 15 feet bgs. As recommended in the SWMM, the base of infiltration facilities should maintain a 5-foot separation distance from the top of the glacial till layer. If maintaining this separation distance is not possible, the infiltration facilities may need to be designed using the infiltration rate of the underlying glacial till. In addition, further study into requirements of a groundwater mounding analysis could be required.

For planning purposed we recommend that outward limits of infiltration facilities be setback at least 100 feet from the tops of slopes on the west side of the site and about 50 feet from tops of slopes on the east and south sides of the site. This setback distance should be evaluated further once the locations and sizes of planned infiltration facilities are known.

4.8.2. Preliminary Infiltration Rate Estimate

To provide a preliminary estimate of infiltration rates for the site soils, we used the Soil Grain Size Analysis Method presented in the SWMM. The Soil Grain Size Analysis Method is an empirical correlation between soil gradation and infiltration rate. This method typically does not account for other factors that influence in-situ infiltration rate such as relative density, degree of weathering, soil layering, and groundwater conditions. As such, the design values presented are preliminary and further study as discussed below will be needed as part of final design of infiltration facilities.

We recommend that following preliminary infiltration rates be considered for preliminary design of infiltration facilities:

- For facilities located within recessional outwash and with base depths within 10 feet of existing grade – 0.25 to 0.5 inches per hour
- For facilities with base elevations deeper than 10 feet below existing site grades – 0.1 inches per hour

The rates provided above are the "long-term" saturated infiltration rates, which include the appropriate reduction factors recommended in the SWMM.

4.8.3. Recommendations for Additional Studies

If infiltration facilities are included at this site, additional testing, analysis, and reporting will be required to establish the final design infiltration rate. This is also a requirement of the SWMM. Where infiltration facilities are considered, we recommend that at least one PIT should be performed at each proposed location. The location of the PIT should be near (ideally within) the footprint of the proposed infiltration facilities. We can assist with performing PITs, and associated analysis and reporting, if requested.

5.0 LIMITATIONS

We have prepared this report for Korsmo Construction for the Giaudrone Middle School Playfield Improvements project located in Tacoma, Washington. Korsmo Construction may distribute copies of this report to owner and 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 practices for geotechnical engineering 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.

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

FIGURES

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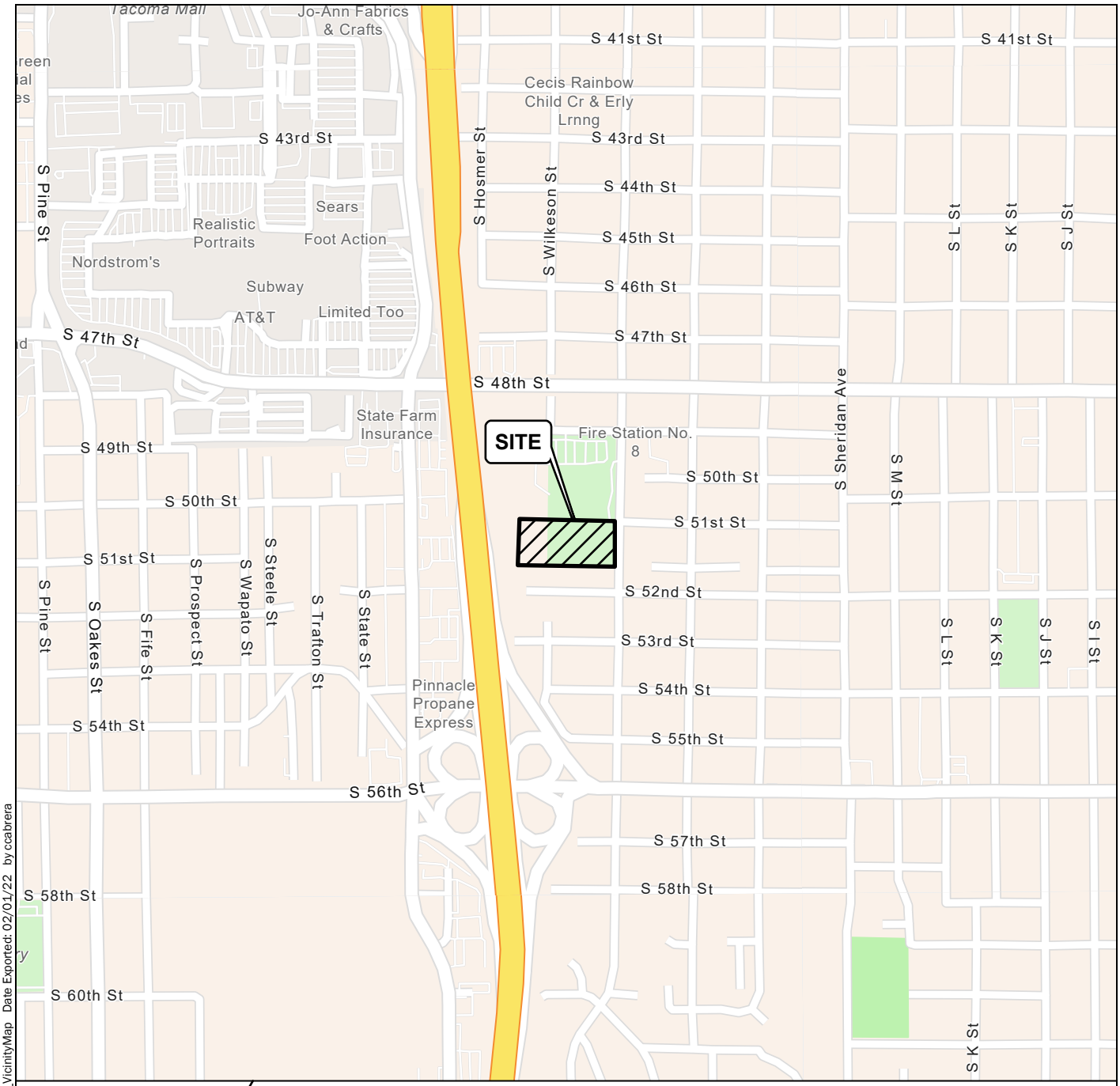

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: ESRI

Projection: NAD 1983 UTM Zone 10N

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Vicinity Map

Giaudrone Middle School Playfield Improvements
Tacoma, Washington

GeoEngineers

Figure 1

P:\0\0522036\CAD\00\Geotech Report\052203600_F02_Site Plan.dwg TAB:F02 - Site Plan Date Exported: 02/18/22 - 8:06 by gregister

Legend

B-1 Boring by GeoEngineers, Inc., 2022

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Aerial from Google Earth Pro dated 08/14/2020.

Projection: Washington State Plane, South Zone, NAD83, US Foot

N W E S

50 0 50
Feet

Site Plan

Giaudrone Middle School Playfield Improvements
Tacoma, Washington

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Figure 2

APPENDICES

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APPENDIX A
Subsurface Explorations and Laboratory Testing

APPENDIX A
SUBSURFACE EXPLORATIONS AND LABORATORY TESTING

Subsurface Explorations

General

Soil conditions at the project site were explored by advancing six borings on February 7, 2022. The approximate locations of our explorations are shown on Figure 2. The explorations were located in the field using a global positioning system (GPS) device. The locations of the explorations shown on the Site Plan (Figure 2) should be considered approximate.

Soil Borings

Borings were generally extended to between 11.5 and 26.5 feet below ground surface (bgs). Borings were advanced using a track-mounted hollow-stem auger drill rig equipment and operators under subcontract to GeoEngineers. The explorations were continuously monitored by a representative from our firm who examined and classified the soil encountered, obtained representative soil samples, and maintained a detailed log of the explorations. Soil encountered in the borings was classified in general accordance with ASTM International (ASTM) D 2488 and the classification chart listed in Key to Exploration Logs, Figure A-1. Logs of the borings are presented in Figures A-2 through A-7. The logs are based on interpretation of the field and laboratory data and indicate the depth at which we interpret subsurface materials or their characteristics to change, although these changes might actually be gradual.

Soil samples were obtained from the borings at approximate 2½- to 5-foot-depth intervals using a 2-inch, outside-diameter, standard split-spoon sampler (Standard Penetration Test [SPT]) in general accordance with ASTM D 1586. The sampler was driven into the soil using a 140-pound automatic hammer, free-falling 30 inches. 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 final 12 inches of penetration, unless otherwise noted, is reported on the boring logs.

Laboratory Testing

General

Soil samples obtained from the borings and test pits were returned to our laboratory for further examination and testing. The testing completed on each sample is presented in the corresponding boring log. A description of the laboratory testing completed on this project is provided below.

Grain-Size Analysis

Grain-size analyses were performed on selected soil samples in general accordance with ASTM Test Method D 6913. This test provides a quantitative determination of the distribution of particle sizes in soils. Figure A-7 presents the results of the grain-size analyses.

Percent Passing the U.S. No. 200 Sieve

Selected samples were “washed” through the U.S. No. 200 sieve to estimate the relative percentages of coarse- and fine-grained particles in the soil. The percent passing value represents the percentage by weight of the sample finer than the U.S. No. 200 sieve (fines). The tests were conducted in general

accordance with ASTM D 1140. The test results are presented on the exploration logs in Appendix A at the respective sample depths.

Moisture Content

The moisture content of selected samples was determined in general accordance with ASTM D 2216. The test results are used to aid in determining the moisture content of the soil, soil classification and correlation with other pertinent engineering soil properties. The test results are presented on the exploration logs in Appendix A at the respective sample depths.

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
MORE THAN 50% RETAINED ON NO. 200 SIEVE	SAND AND SANDY SOILS	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS
				SP	POORLY-GRADED SANDS, GRAVELLY SAND
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS	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
MORE THAN 50% PASSING NO. 200 SIEVE	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

2.4-inch I.D. split barrel / Dames & Moore (D&M)

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 lead 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

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Figure A-1

Drilled	Start 2/7/2022	End 2/7/2022	Total Depth (ft)	26.5	Logged By / Checked By	OA/AG BEL	Driller	Holocene Drilling, Inc.	Drilling Method	Hollow-stem Auger
Surface Elevation (ft) Vertical Datum	377 NAVD88				Hammer Data	Autohammer 140 (lbs) / 30 (in) Drop			Drilling Equipment	Diedrich D50 Turbo Rubber Track
Easting (X) Northing (Y)	1153155 690931				System Datum	WA State Plane South NAD83 (feet)			Groundwater not observed at time of exploration	

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA: Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0						SOD	Approximately 2 inches of sod			
375		6			1 MC		SM	Brown silty fine sand with gravel and occasional organic matter (fine roots) (loose, moist) (fill)	18		
		12	19		2		GP-GM	Gray fine to coarse gravel with silt and sand and occasional minor oxidation staining (medium dense, moist)			
	5						SM	Gray silty fine sand (medium dense, moist)			
		13	15		3		SP-SM	Dark gray fine sand with silt (medium dense, moist)			
370							SM	Gray silty fine sand (medium dense, moist) (recessional outwash)			
		13	26		4		SM	Gray silty fine to medium sand with gravel and occasional moderate oxidation staining (medium dense, moist)			
	10	13	36		5 %F		SM	Gray silty fine to medium sand with gravel and occasional minor oxidation staining (dense, moist)	11	32	
365							SM	Gray silty fine to medium sand with gravel (dense, moist) (glacial till)			
	15	3	47		6						
360											
	20	18	43		7						
355											
	25	18	56		8			Becomes very dense			

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

Log of Boring B-1

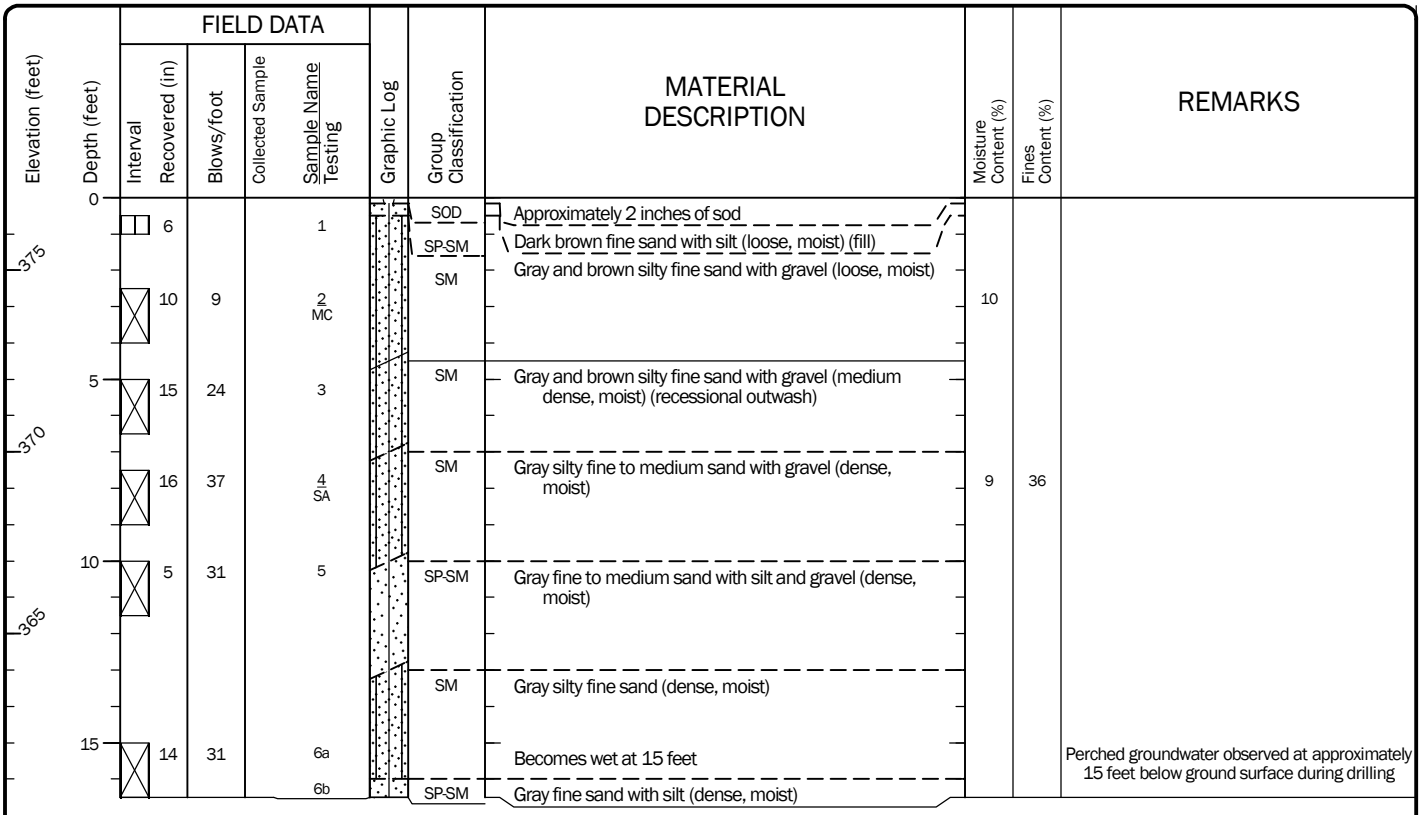
GeoEngineers

Project: Giaudrone Middle School Field Improvements
Project Location: Tacoma, Washington
Project Number: 0522-036-00

Figure A-2
Sheet 1 of 1

Drilled: Start 2/7/2022 End 2/7/2022	Total Depth (ft): 16.5	Logged By: OA/AG Checked By: BEL	Driller: Holocene Drilling, Inc.	Drilling Method: Hollow-stem Auger	
Surface Elevation (ft): 377 Vertical Datum: NAVD88		Hammer Data: Autohammer 140 (lbs) / 30 (in) Drop		Drilling Equipment: Diedrich D50 Turbo Rubber Track	
Easting (X): 1153256 Northing (Y): 690847		System Datum: WA State Plane South NAD83 (feet)		See "Remarks" section for groundwater observed	

Notes:



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

Log of Boring B-2

GeoEngineers

Project: Giaudrone Middle School Field Improvements
Project Location: Tacoma, Washington
Project Number: 0522-036-00

Figure A-3
Sheet 1 of 1

Drilled Start 2/7/2022 End 2/7/2022	Total Depth (ft) 16.5	Logged By OA/AG Checked By BEL	Driller Holocene Drilling, Inc.	Drilling Method Hollow-stem Auger	
Surface Elevation (ft) 377 Vertical Datum NAVD88		Hammer Data Autohammer 140 (lbs) / 30 (in) Drop		Drilling Equipment Diedrich D50 Turbo Rubber Track	
Easting (X) 1153246 Northing (Y) 690714		System Datum WA State Plane South NAD83 (feet)		Groundwater not observed at time of exploration	

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA: Interval Recovered (in)	FIELD DATA: Blows/foot	FIELD DATA: Collected Sample	FIELD DATA: Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0						SOD	Approximately 2 inches of sod			
375		6			1 MC		SP-SM	Dark brown fine sand with silt and occasional organic matter (fine roots) (loose, moist) (fill)	9		
		14	4		2a 2b		SM	Brown-gray silty fine to medium sand with gravel (loose, moist)			
								Grades to gray			
	5	7	5		3 SA				9	31	
370		14	6		4						Moderate drill chatter at 6 feet below ground surface
	10	15	19		5 %F		SM	Gray and dark brown silty fine to coarse sand with gravel (medium dense, moist) (outwash)	13	34	
365											
	15	15	23		6		SM	Gray silty fine to medium sand with gravel (medium dense, moist)			

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

Log of Boring B-3

GeoEngineers

Project: Giaudrone Middle School Field Improvements
Project Location: Tacoma, Washington
Project Number: 0522-036-00

Figure A-4
Sheet 1 of 1

Drilled	Start 2/7/2022	End 2/7/2022	Total Depth (ft)	11.5	Logged By / Checked By	OA/AG / BEL	Driller	Holocene Drilling, Inc.	Drilling Method	Hollow-stem Auger
Surface Elevation (ft) / Vertical Datum	378 / NAVD88				Hammer Data	Autohammer 140 (lbs) / 30 (in) Drop			Drilling Equipment	Diedrich D50 Turbo Rubber Track
Easting (X) / Northing (Y)	1153519 / 690780				System Datum	WA State Plane South NAD83 (feet)			Groundwater not observed at time of exploration	

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA: Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0	6			1		SOD	Approximately 2 inches of sod			
							SP-SM	Brown fine to medium sand with silt and occasional organic matter (fine roots) (loose, moist) (fill)			
375		10	26		2 SA		SM	Brown-gray silty fine to medium sand with gravel (medium dense, moist)	7	26	
	5	0	11		3						Drill chatter
370							SM	Gray silty fine to coarse sand with occasional gravel (medium dense, moist) (recessional outwash)			
		16	22		4			Grades to gray			
	10	10	14		5						

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

Log of Boring B-4

GeoEngineers

Project: Giaudrone Middle School Field Improvements
Project Location: Tacoma, Washington
Project Number: 0522-036-00

Figure A-5
Sheet 1 of 1

Drilled Start 2/7/2022 End 2/7/2022	Total Depth (ft) 17.5	Logged By OA/AG Checked By BEL	Driller Holocene Drilling, Inc.	Drilling Method Hollow-stem Auger	
Surface Elevation (ft) 377 Vertical Datum NAVD88		Hammer Data Autohammer 140 (lbs) / 30 (in) Drop		Drilling Equipment Diedrich D50 Turbo Rubber Track	
Easting (X) 1153578 Northing (Y) 690875		System Datum WA State Plane South NAD83 (feet)		Groundwater not observed at time of exploration	

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA: Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0	6			1		SOD	Approximately 2 inches of sod			
375							SP-SM	Brown and gray fine to medium sand with silt and gravel, occasional organic matter (fine roots) (medium dense, moist) (fill)			
		16	10		2 MC		SM	Brown silty fine to medium sand with gravel and occasional organic matter (fine roots) (medium dense, moist)	15		2 inches of heavy black staining at 3½ feet
	5	15	19		3 %F		SM	Gray silty fine to medium sand with gravel (medium dense, moist) (recessional outwash)	8	28	
370		10	32		4						
	10	0	16		5						Drill chatter
365											
	15	0	20		6 7						No recovery with SPT; CA sampler driven for recovery
360											

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

Date:2/28/22 Path:P:\0\0522036\GINT\052203600.GPJ DBLibrary:LLibrary:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_GEOTECH_STANDARD_%F_NO_GW

Log of Boring B-5

GeoEngineers

Project: Giaudrone Middle School Field Improvements
Project Location: Tacoma, Washington
Project Number: 0522-036-00

Figure A-6
Sheet 1 of 1

Drilled Start 2/7/2022 End 2/7/2022	Total Depth (ft) 21.5	Logged By OA/AG Checked By BEL	Driller Holocene Drilling, Inc.	Drilling Method Hollow-stem Auger	
Surface Elevation (ft) 374 Vertical Datum NAVD88		Hammer Data Autohammer 140 (lbs) / 30 (in) Drop		Drilling Equipment Diedrich D50 Turbo Rubber Track	
Easting (X) 1153611 Northing (Y) 690658		System Datum WA State Plane South NAD83 (feet)		See "Remarks" section for groundwater observed	

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	Approximately 2 inches of sod			
			6			1		SP-SM	Dark brown fine to coarse sand with silt and gravel, occasional organic matter (fine roots) (loose, moist) (fill)			
370			12	8		2a 2b		SM	Brown-gray silty fine sand with gravel (medium dense, wet)			
	5		14	18		3						
			10	8		4						Rock in shoe
365												
	10		14	3		5 %F		SM	Brown-gray silty fine sand with occasional organic matter (woody debris) (very loose, wet) (recessional outwash)	24	34	Perched groundwater observed at approximately 10 feet below ground surface during drilling
360								SM	Gray silty fine to coarse sand (medium dense, moist)			
	15		2	10		6						Moderate drill chatter
355												
								SM	Brown-gray silty fine to medium sand, with occasional organic matter (wood debris) and gravel (very loose, moist)			
	20		10	3		7						

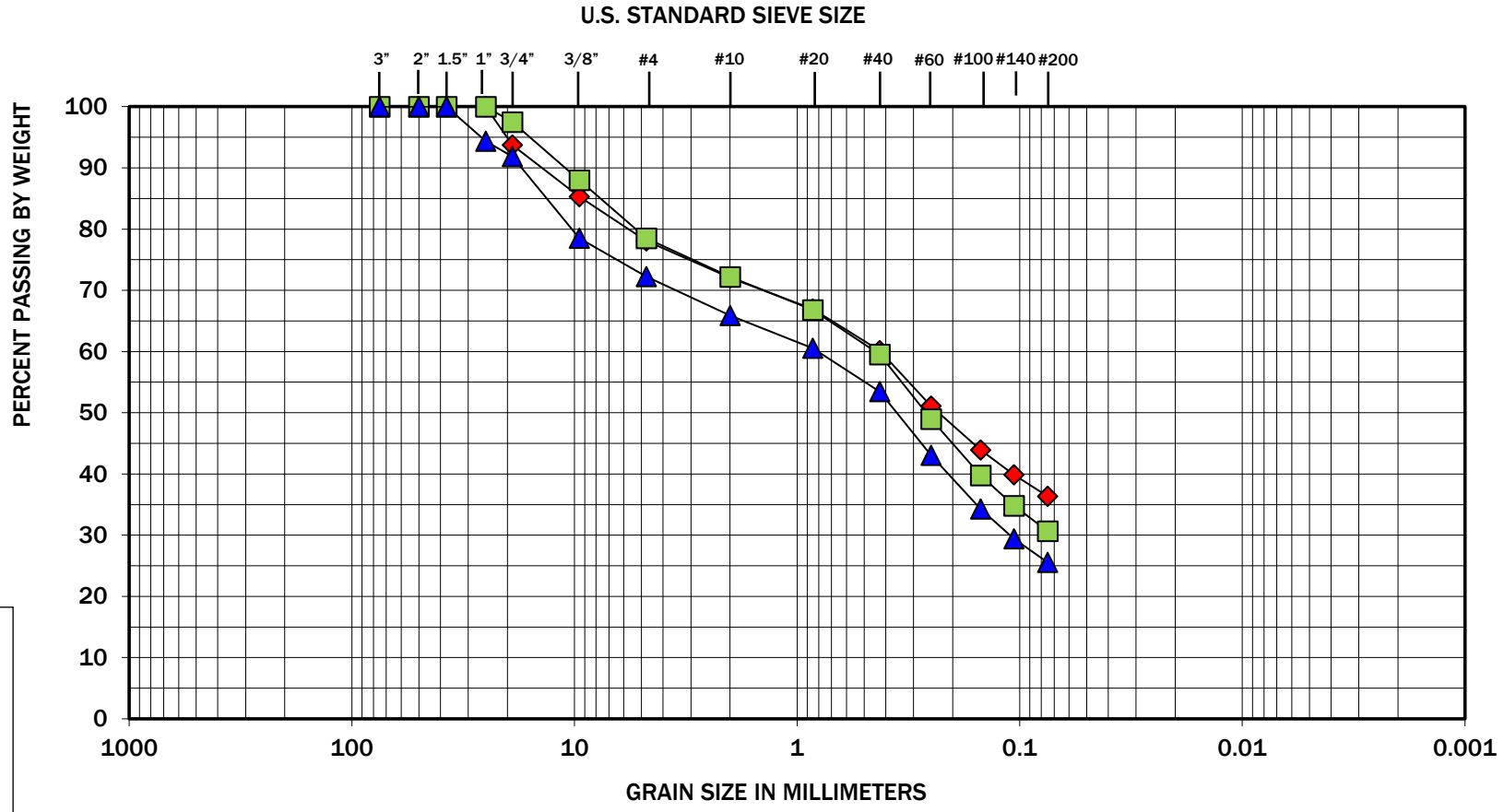
Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery. Vertical approximated based on Aerial Imagery.

Log of Boring B-6

GeoEngineers

Project: Giaudrone Middle School Field Improvements
Project Location: Tacoma, Washington
Project Number: 0522-036-00

Figure A-7
Sheet 1 of 1



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Symbol	Boring Number	Depth (feet)	Moisture (%)	Laboratory Soil Description
◆	B2	7.5	9	Silty sand with gravel (SM)
■	B3	5	9	Silty sand with gravel (SM)
▲	B4	2.5	7	Silty sand with gravel (SM)

Sieve Analysis Results

Giaudrone Middle School Playfield Improvements
Tacoma, Washington

GeoEngineers

Figure-1

AASHTO ACCREDITED

The grain size analysis results were obtained in general accordance with ASTM C 136. GeoEngineers 17425 NE Union Hill Road Ste 250, Redmond, WA 98052

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 the Korsmo Construction and for the Project(s) 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 generally accepted geotechnical practices in this area at the time this report was prepared, and our Agreement with Korsmo Construction dated January 10, 2022. 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 Giaudrone Middle School Playfield Improvement 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 ASFE, Professional Firms Practicing in the Geosciences; www.asfe.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.

Do Not Redraw the Exploration Logs

Geotechnical engineers and geologists prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. The logs included in a geotechnical engineering or geologic report should never be redrawn for inclusion in architectural or other design drawings. Photographic or electronic reproduction is acceptable, but separating logs from the report can create a risk of misinterpretation.

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.

GeoEngineers

DA HOGAN

MEMORANDUM

Date: **February 28, 2022**

To: **City of Tacoma**

From: **Jeff Burke**

Re: **PRE21-0325**
Giuadrone Middle School – Field & Track Renovation
4902 S Alaska St, Tacoma, WA 98408

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1. **Comment**
   Land Use Comments - Apparent Minor Modification
   Staff review implies this project will be a minor modification. To confirm this is a minor modification, please submit a memo showing how you meet all the following requirements for a minor modification and submit this with your site development permit:

   1. The modification will result in a change of use that is permitted outright in the current zoning classification.

   The proposal does not result in a change of use. The existing site is an athletic field and running track, the renovated condition is an athletic field and running track.

   2. The modification will not add more than a 10% increase in square footage to the site or approved structures.

   There is not any increase to the square footage of the site, all work is proposed within the existing property. There are not any new structures included in the proposed work.

   3. If a modification in a special condition of approval imposed upon the original permit is requested, the proposed change does not modify the intent of the original condition.

   A modification to the original permit is not requested. The intent of the site is an athletic facility and the site will continue to function as an athletic facility.

   4. The modification will not increase the overall impervious surface area of the site by more than 25%.

   Based on Pierce County Assessor information the site consist of seven parcels with a combined overall area of is 14.37 acres. (approximately 626,000 SF)

   Existing Impervious (buildings, paving, etc.) 308,000 SF (7.07 acres)

Existing Impervious Surface = 49.2%.

The project adds 20,000 SF (.46 acres) new impervious surface to the site.
(7.07 + 0.46) = 7.53 acres

Proposed Impervious Surface with improvements = 52.4%. (3.2% net increase)

5. The modification is unlikely to result in a notable increase in or any new significant adverse effects on adjacent properties or the environment.

The site continues to serve as an athletic facility for the school district and surrounding community. The field and track will continue to be used only during daylight hours, consistent with existing uses.

6. Any additions or expansions approved through a series of minor modifications that cumulatively exceed the requirements of this section shall be reviewed as a major modification.

All work identified has been included with the permit submittal. There are not any incremental improvements proposed.

Please contact me with any comments regarding the responses.

Sincerely,

Jeffrey Burke, PE