Track and Field Improvements
815 21st ST SE
Puyallup, WA 98372
Parcel #: 0420352148
Owner: Cascade Christian Schools

DRAINAGE CONTROL REPORT

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Stormwater Site Plan (SSP)
("Drainage Report")

Cascade Christian Schools
815 21st ST SE
Puyallup, WA 98372

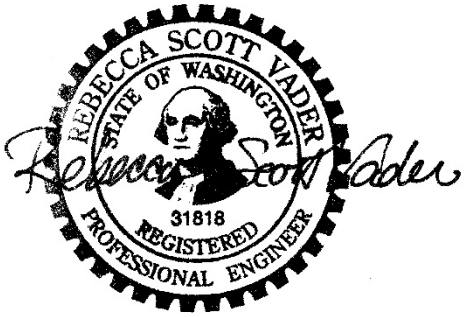
Parcel(s): 0420352148

Permit No:__ PRCCP 20220589

Permit Application March 30,2022

Revisions Resubmitted December 02, 2024
Revised V4 May 19, 2025

The following report has been prepared in conformance with sound engineering principles and standards, with the best available site and technical information at the time of investigation. The report contained herein has been prepared by the undersigned Professional Engineer Licensed in the State of Washington.



Rebecca Scott Vader, PE

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OVERVIEW

This Storm Drainage Report is a supplement to the overall campus Master Plan Drainage Plan, and is submitted as supporting documentation for permits required by the for the construction of the proposed Project, a phase of a larger effort.

Per the current campus CUP, the project must meet the stormwater requirements set in Puyallup's adopted 2009 Stormwater Manual, which references the 2005 Department of Ecology (DOE) Stormwater Management Manual for Western Washington with revisions as adopted by the City of Puyallup, the local jurisdiction in Title 21. The format lays out the section names, the order of presentation, and the contents of each section, as well as the names and content of certain of the figures and tables.

The Drainage Report has a main body, which documents the results of the design processes:

Step 1: Site Analysis: Collect and Analyze Information on Existing Conditions.
Step 2: Prepare Preliminary Development Layout.
Step 3: Perform Offsite Analysis.
Step 4: Determine the Applicable Minimum Requirements.
Step 5: Select Permanent Stormwater Controls.
Step 6: Prepare CSWPPP.
Step 7: Report on Project.
Step 8: Have jurisdictional check for compliance.

The appendices to the Report contain the calculations as well as other required documents such as the *Construction Storm Water Pollution Prevention Plan* and the *Maintenance and Source Control Plan*, which in turn contain appended forms, checklists, and other aids.

The facilities are designed in accordance with the City of Puyallup Standards Section 200. LID is the preferred and commonly-used approach to site development.

Note to Reader: Since these reports draw heavily on reference documents, lists, and standards, in certain areas of the report, typical items may be included in the text to indicate that they were considered, but ~~struck through~~ to show that they are not applicable to this project. Correspondingly, tables and lists may have <u>underlined</u> or **bold** text to indicate selected items.

LIMITATIONS

Work for this project was performed for Cascade Christian Schools and prepared in conformance with sound engineering principles and standards, with the best available site and technical information at the time of investigation. This work is specific to the project, site, and client, and should not be applied to any other purpose without consultation with Vader Engineering.

EXISTING SITE CONDITIONS

The existing site consists of a junior/senior high school site and parking on the west side near 21st ST SE. There is an existing track and field and stormwater detention pond in the center of the campus, and the east side abutting 25th ST SE are baseball and softball fields. The proposed Cascade Christian School improvements are a phase of a larger plan of work.

The current stormwater system was designed as part of the previously approved TIR by AHBL dated November 1995, which provided the overall stormwater design for the entire build out of the campus. This TIR was updated in 2016 by Abbey Road Group and confirmed the pond volume, bioswale sizing, and other criteria were still current. These are attached by reference and scanned pdfs provided for convenience.

Access to the campus drainage pond constructed during Phase 1A handles the detention requirements for the project. The storm detention pond was designed to match or fall below discharge at 50% of the 2-year, the 10-year storm, and the 100-year storm. Water Quality treatment for the traffic bearing surfaces is routed through a bioswale.

Stormwater from the developed site is and will remain conveyed through the existing developments storm conveyance system to then a detention pond and released to the storm drain conveyance system in 21st Street East through an outlet system onsite. Then surface water is conveyed north to Deer Creek and the Puyallup River on the north side of East Pioneer. Sizing to confirm this capacity was last performed in 2016 by the Abbey Road Group.

Please refer to *Figures 1 – 3,* following, to aid in the description. Please also see works by other professionals done earlier in the Master Plan. Items of note:

- Survey was performed by Abbey Road Group, March 25, 2016
- Soils investigation was performed by Earth Consultants, Inc. July 7, 1995
- Vegetation to be protected by tract or easement: N/A
- The watershed, or basin, where the site is located is geologically within the Deer Creek Basin, which discharges to the Puyallup River and then to Commencement Bay of Puget Sound.
- Notable critical areas mapped, if any, see figures, are discussed below.
- The previously developed commercial site is on a slope of <5% overall.

A site visit was performed 2-11-22 by a representative of Vader Engineering. An extensive, existing drainage system drains the site, as well as conveys bypass drainage from properties upstream to the south and east. According to the previous TIR, the system was first constructed as a 16- inch cedar box culvert. The system has been maintained and upgraded with a 12-inch concrete pipe and most recently an 8-inch perforated pipe. Several laterals connect to the mainline described above. The combined bypass on onsite system discharges west to 21st through a 48" conveyance[Revision 1] that then drains north to Pioneer Way, where it eventually connects with what is mapped as Unnamed Creek, and referred to previously as Deer Creek.

The existing drainage system is currently well maintained and functions at it's designed capacity.

An on-flow basin enters the site at the south end of the track & field, and has a separate drainage bypass system that will not be impacted by this project.

No other reports that impose more restrictive conditions on the drainage were found. More detail is shown in the Offsite Analysis section.

The following tabulates the existing site data:

Table 1 – Parcel Data

Addresses:	811 21st ST SE
Parcel Number:	0420352148
Lot Areas:	756,448 SF (17.37 AC) Revised V4 to include adtl portables parcel
Total Developed Site:	100% (no native conditions on site)
Project/Clearing Area:	188,500 SF Revised V4
Impervious Site* Area:	Please see table 1, below
Zoning:	RS-04/RS-08
Soils (See Appendix):	Briscot Loam Silty sand
Infiltration Rates:	N/A

Utilities at the site: If needed, special installation measures to avoid conflict with stormwater quantity and quality control features are listed with the utility.

Water: City of Puyallup
Sewer: City of Puyallup
Power: Puget Sound Energy (PSE)
Communications: Private provider
Gas: PSE

Fuel Tanks: No evidence of fuel tanks found; tanks not considered likely with site history.

Figure 1 – Vicinity Map

Property, Roads, Geographic Areas, Watersheds

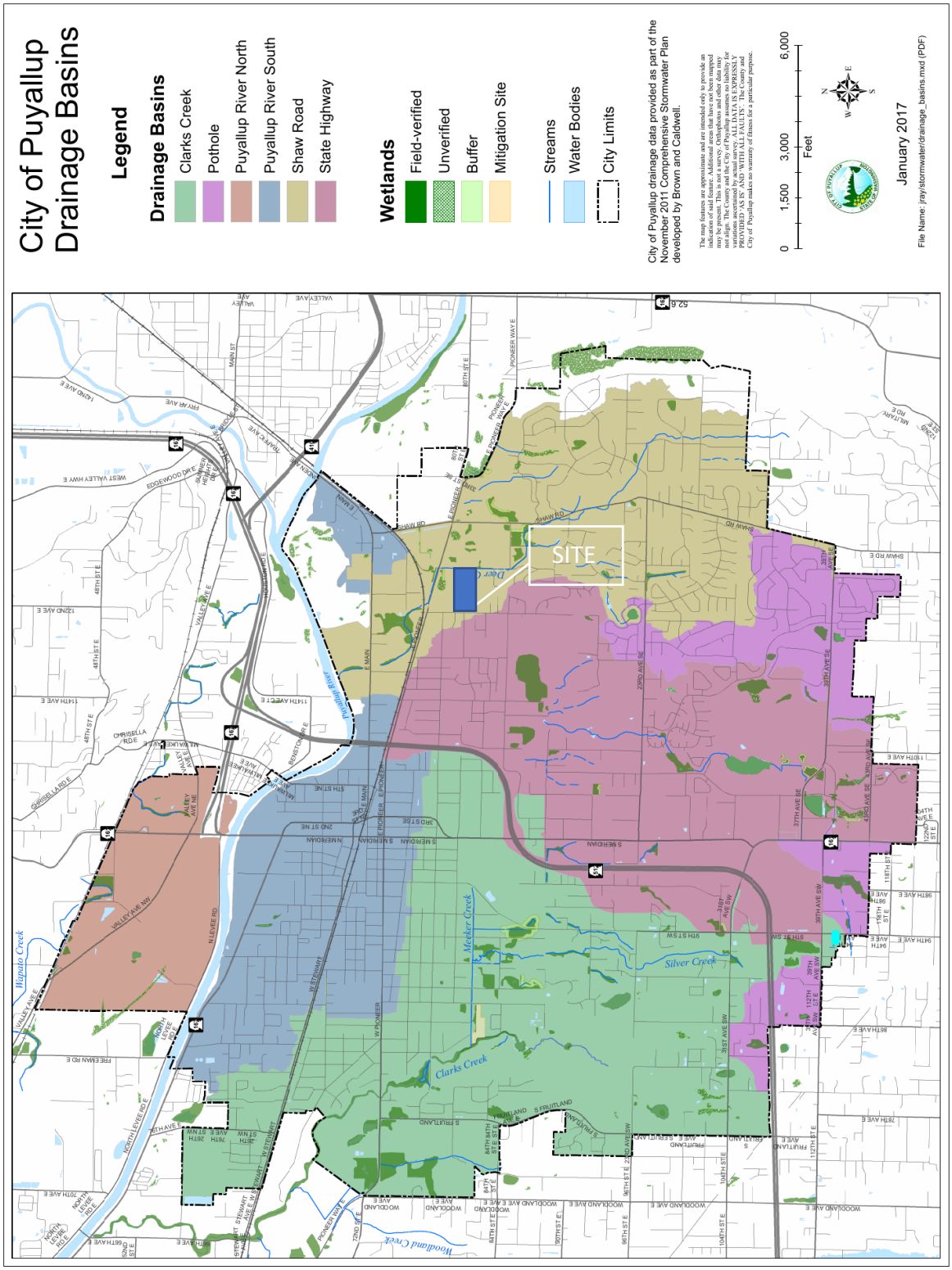


Figure 2 – Basin Map and flow path

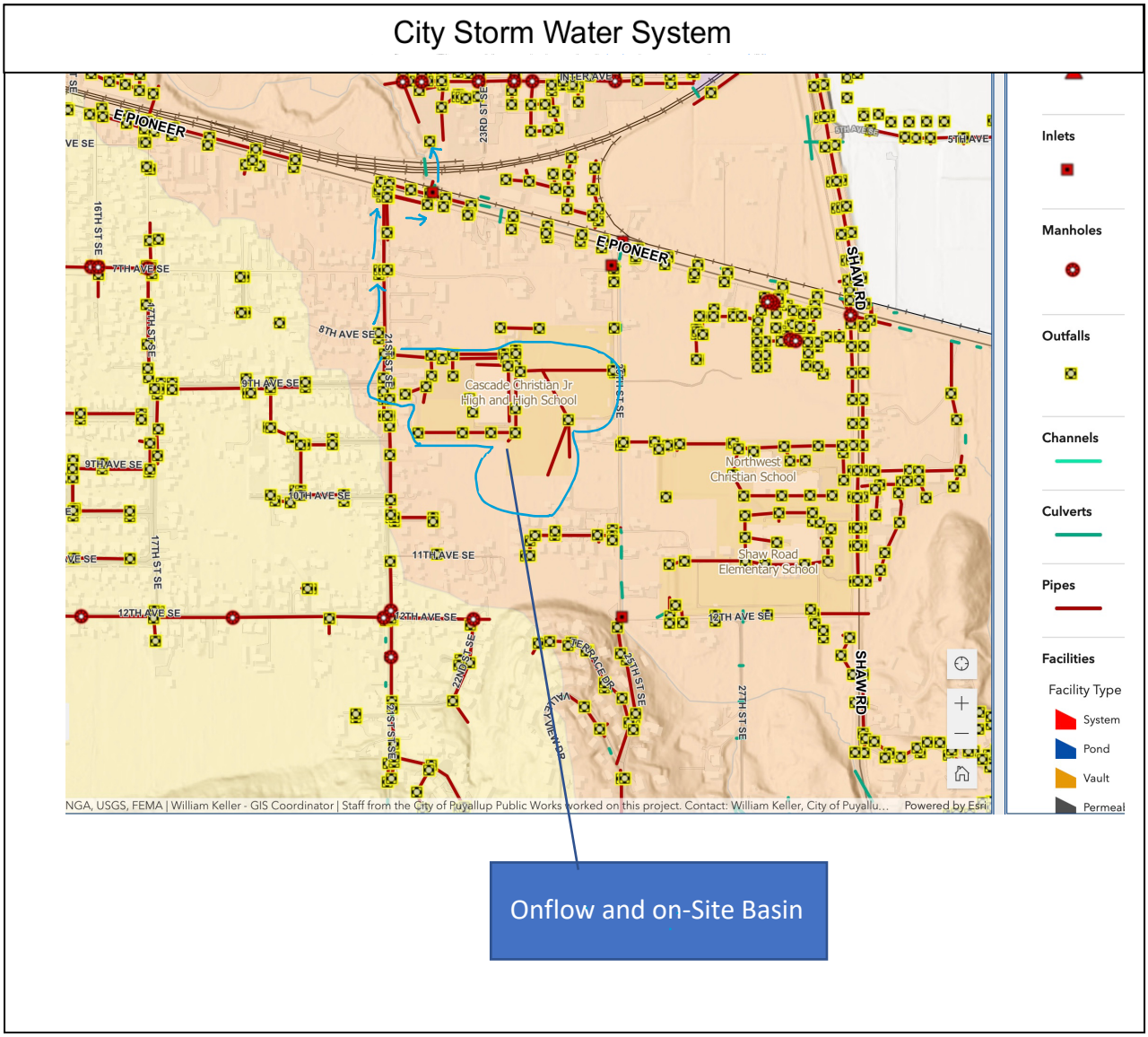
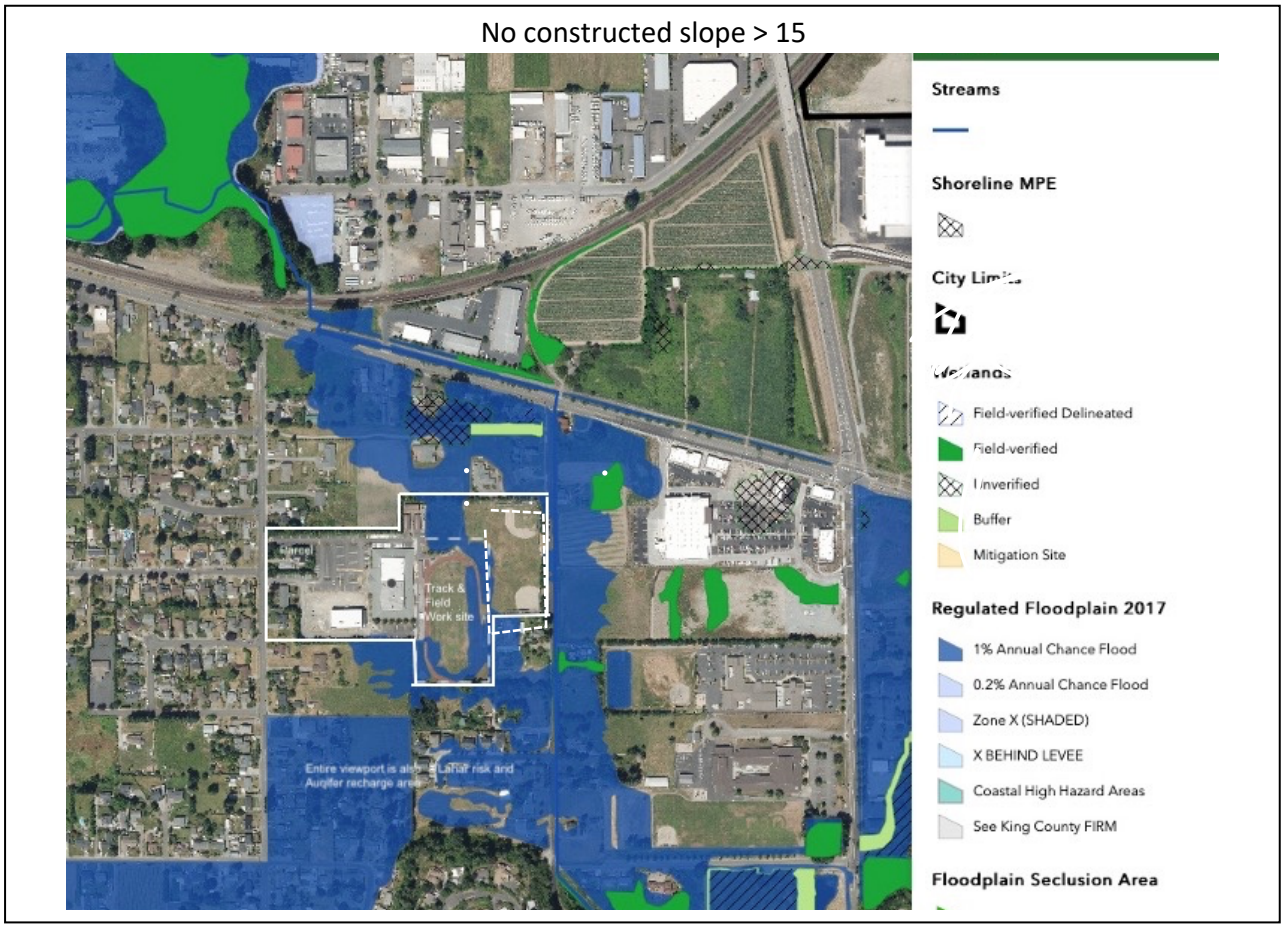


Figure 3 – Critical Areas: Streams, Wetlands, and Floodplains Map

Revised V4 to include adtl portable parcel



PROJECT DESCRIPTION:

The project intends to upgrade the athletic fields from the mid-1990s facilities to a more current material; enlarge the track by 2 lanes to regulation size; enlarge bleacher seating and pedestrian paths; ~~add a concession and restroom building~~[Removed V4] ; and enlarge the administrative office at 811 21st ST SE in the jurisdiction of Puyallup Washington. This project will be on-site work only, retaining current accesses from the public road and served by existing public water, sewer and power, with onsite service extensions. Stormwater will continue to be handled onsite and additional onsite conveyance and detention will be provided.

Please refer to *Figure 4 – Campus Site Plan and Figure 5-Site Development* to aid in the project description and show the development layout.

The layout must consider:

Avoid critical areas: None Avoidable.

Preserve natural (forest) areas: None.

Consider best use of mixed soil types: Locate infiltration where depth and type are favorable.

Minimize impervious areas: Meet landscaping ratios established by jurisdiction.

Maintain & Use Natural Drainage Patterns: Use Infiltration where possible. Retain constructed conveyances already in place.

Figure 4 – Campus Site Plan

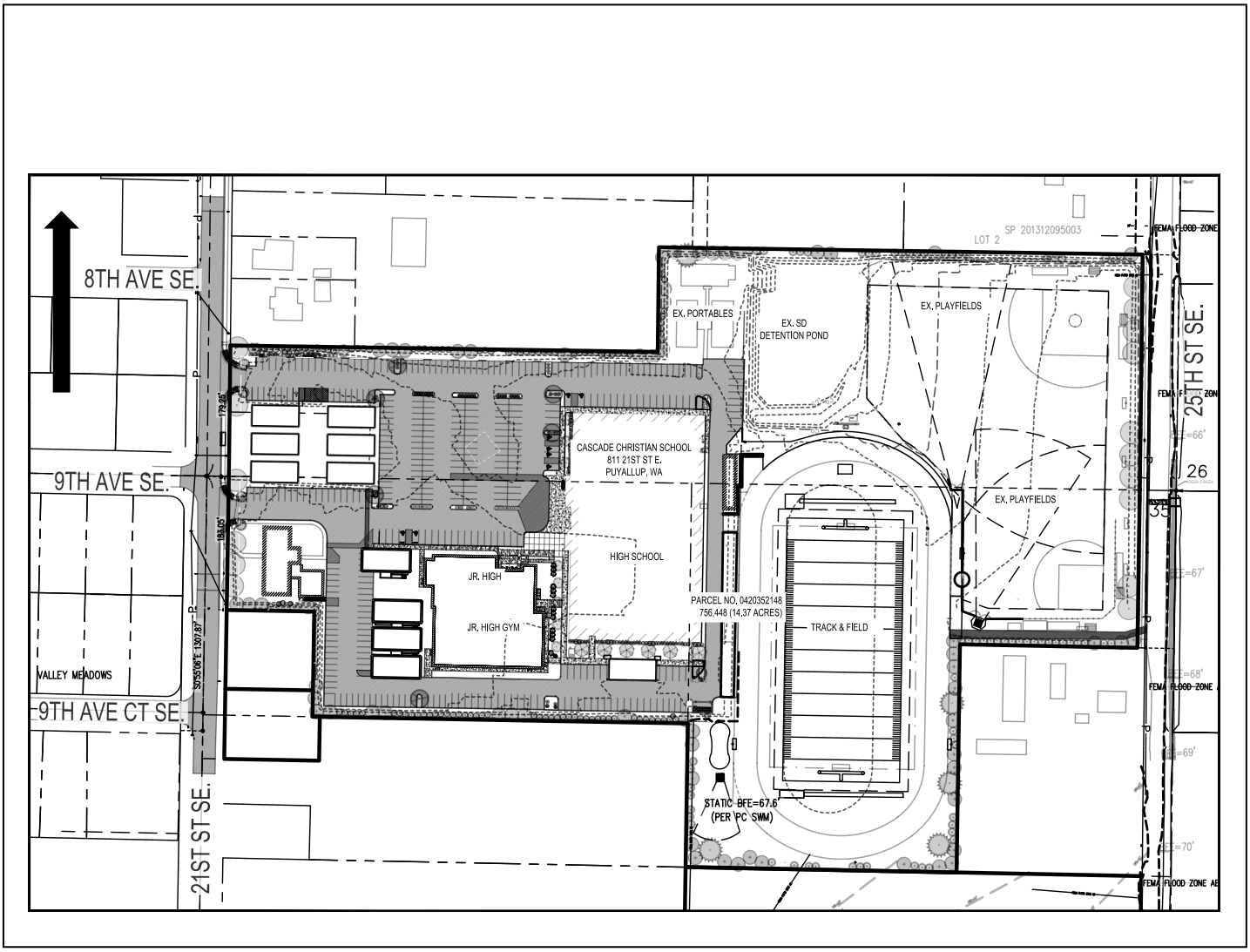
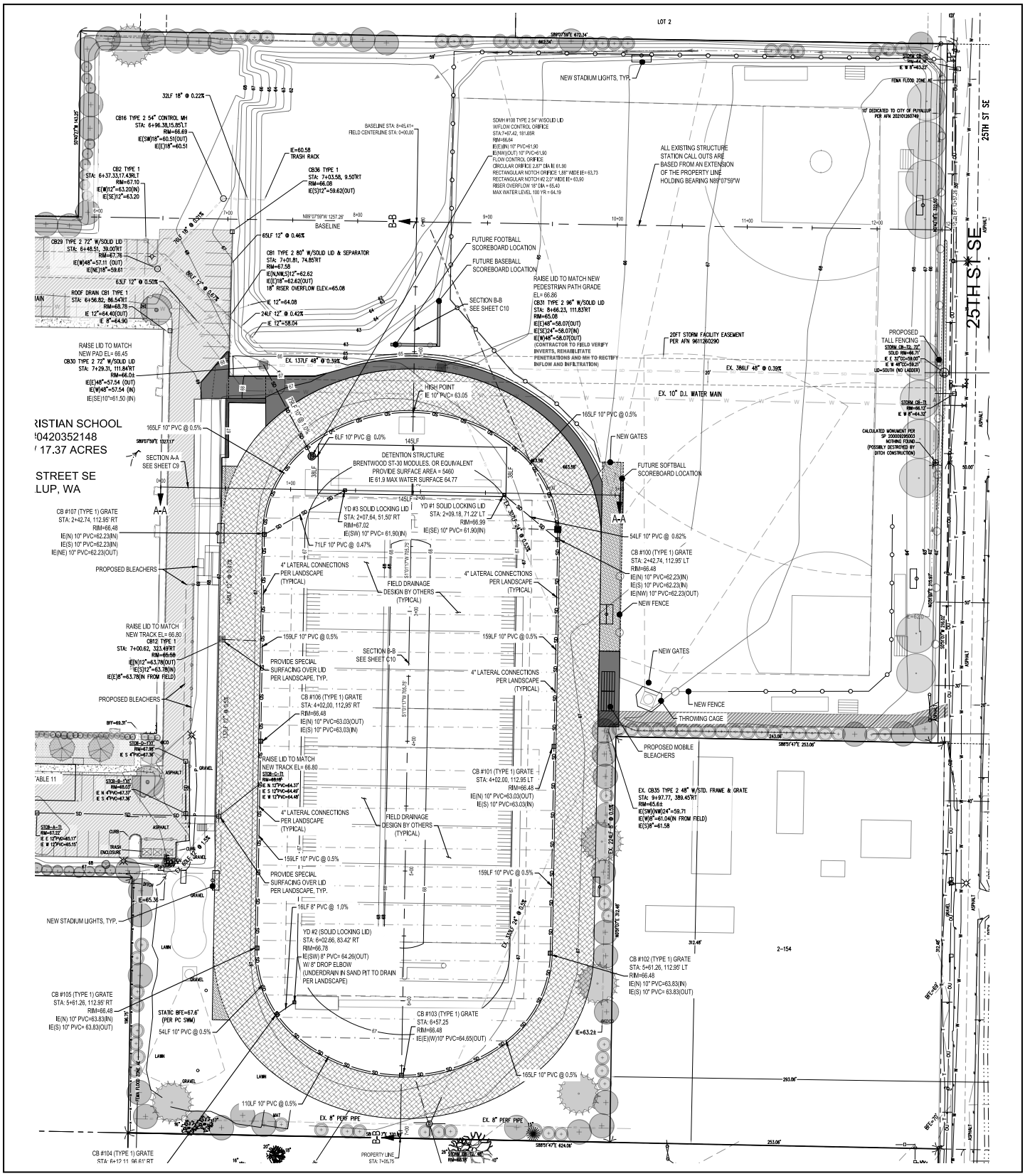


Figure 5 – Site Development Plan



Revision 1, Revision 4

Table 2 – Basin Summary

Basin ID	Drains From	Drains To	Future offsite Discharge flow	Length to Facility
Track & Field	Track and field	North drainage pond	no change	N/A

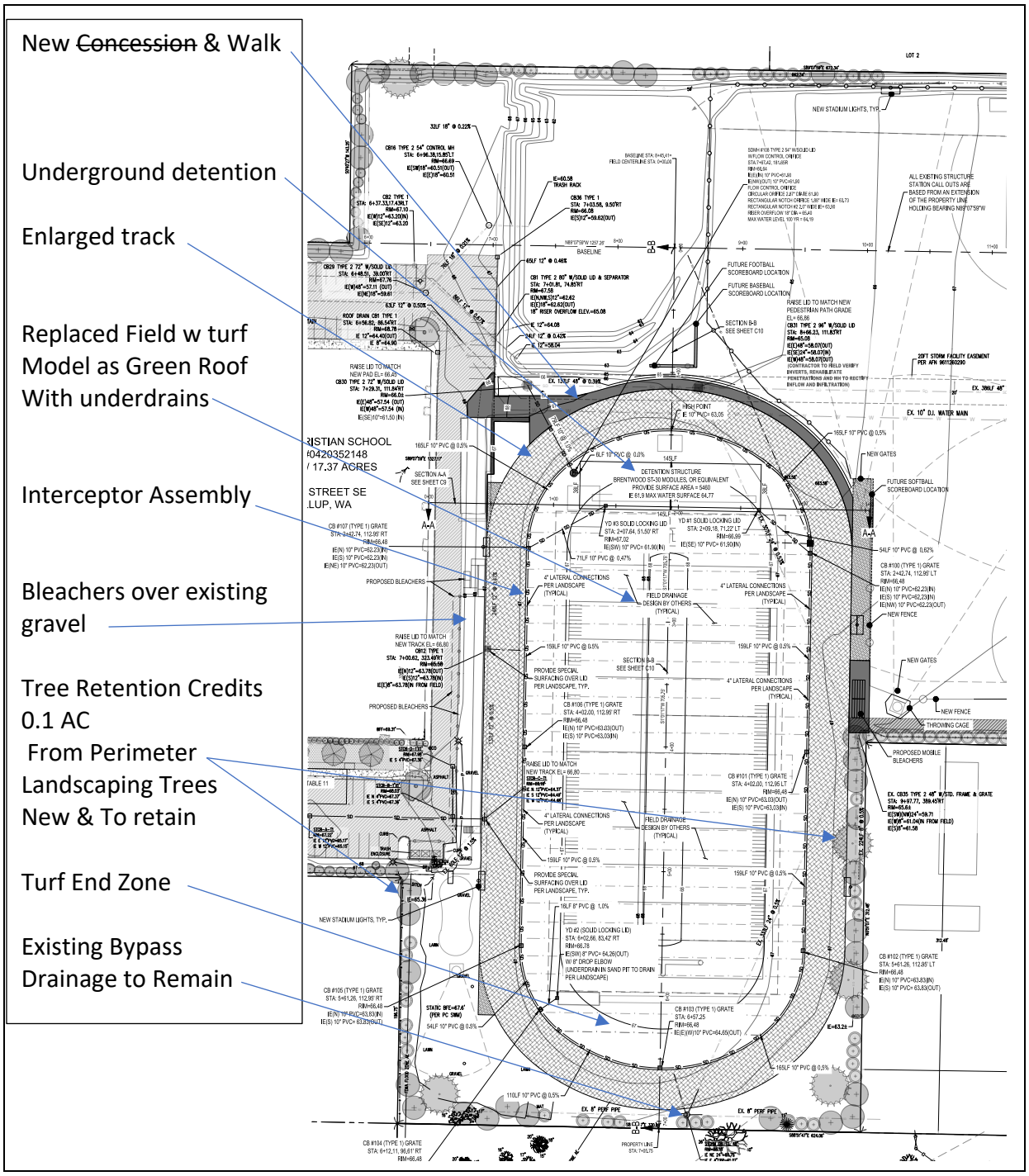
Table 3 - Schedule of Drainage Feature Locations and Structures

Stormwater Additions Schedule							
Pipes – PVC SDR 35, Infiltration- Aluminized CMP ALTA2 -16 gauge, or A-2000 PVC							
Designation	**Dia.**	**Material**	**Discharge**	**From**	**To**	**Slope**	**Remarks**
Track Detention	Brentwood ST-36 Modules 5460 SF			Interceptor	48" outfall	N/A	-Direct connection to outfall pipe to avoid conflict with route around building.
Track & Field Interceptor Assembly	10"	A-2000 PVC or Al CMP	encircling	Under drains	Detention Modules	0.5%	Connector
~~Concession Roof~~	~~6"~~	~~A-2000 AL CMP~~	~~Splash~~	~~Roof~~	~~Pond~~	~~N/A~~	
SD ByPass Re-route	48"	Smooth-walled, water-tight. Shop Drawing required	Same as existing	Eastern offsite/ 25th	Western Offsite/ 21st	0.39%	84 LF and 3 additional SD MH to re-route around concession building.

Revision 1

Revision V4 remove Concession from proposal

Figure 6 – Work Map



Revision 1

OFFSITE ANALYSIS

Task 1: Study Area Definitions and Maps

Please refer to Figures above to aid in the description of the Offsite Analysis. The study area was extended to 0.25 miles downstream. Upstream conditions were not studied or changed. Please see the previous TIRs for complete analysis of upstream and the overall parcel.

Emergency services located along the flow path? None
Environmentally Sensitive Areas in flow path? None

Task 2: Resource Review

The following resources and documents were reviewed in preparing this analysis. Pertinent excerpts from these resources have been included in this study.

1. Stormwater Map for area.
2. Survey filed with the State of Washington.
3. Soil Survey and investigations.
4. Local Project Data from previous phases of the Master Plan.

Task 3: Field Inspection

Revision 1

Field inspection was performed by a representative of Vader Engineering on 2-11-22. Observations were later updated with the findings on the City records.

An extensive, existing drainage system drains the site. There is a 48” SD that conveys offsite bypass drainage east to west across the project site. Also on site is a south to north 24-inch pipe that is part of the existing bypass drainage system. Onsite drainage is conveyed to and detained in a pond just north of the project area. The on-site drainage joins the upstream bypass in a SDMH just west of the detention pond , and the 48” SD continues West to 21st St SE.
The SD turns north down 21st Street SE and across Pioneer Way to an existing storm manhole on the north side of Pioneer Way.

The Conveyance section will go into further detail for the offsite calculations. There were no apparent deficiencies in the downstream conveyances. No signs of overflow, erosion, sedimentation, etc. were observed in the field.

Task 4: Downstream Drainage System Description and Existing and Potential Problems

Please see *Figure 7 below* to aid in the following description.

Figure 7- Downstream Map Pierce GIS Terrain

The parcel data from Pierce County lists the following categories of possible Site Constraints and refers to City of Puyallup. Figure 3 from Puyallup Maps shows a 1% flood chance along one side of the track, which is acceptable. The entire valley floor area is mapped as an Aquifer Recharge Area, Liquefaction Susceptible Area, and Lahar Hazard Area, which are unavoidable. Pierce County does not map any of the following.

- Erosion Hazard: Not mapped.
- Fish and Wildlife Habitat: Not mapped.

- Floodway: Not mapped.
- Landslide: Not mapped.
- Mine Hazard: Not mapped.
- Resource Land: Not mapped.
- Right-Of-Way Need Area: Not mapped.
- Wetlands: Not mapped.

Bypass drainage from the project which will not be controlled? No.
For emergency overflow or other instances where rainwater may be conveyed downstream, the available flow paths are: North to the existing creek which flows north west to connect to the Puyallup River.

No drainage issues are known to exist within the immediate downstream area, and the street and City storm system are in good condition and relatively new. Both options will be used as overflow pathways for convenient portions of the site.

Task 5: Mitigation of Existing or Potential Problems

The following mitigations are proposed so that no drainage issues are anticipated from this proposed re-development if constructed according the design:

- Erosion Potential: Provide TESC measures until the project is stabilized.

DETERMINE APPLICABLE MINIMUM REQUIREMENTS

Section 3. Applicability of the Minimum Requirements

3.1 Thresholds

Not all of the Minimum Requirements apply to every development or redevelopment project. The applicability varies depending on the project type and size. This section identifies thresholds that determine the applicability of the Minimum Requirements to projects. Use the flow charts in Figures 3.1, 3.2, and 3.3 to determine which of the Minimum Requirements apply. The Minimum Requirements themselves are presented in Section 4 of this Appendix.

Use the thresholds in sections 3.2 and 3.3 at the time of application for a subdivision, plat, short plat, building permit, or other construction permit. The plat or short plat approval shall identify all stormwater BMPs that are required for each lot. For projects involving only land disturbing activities, (e.g., clearing or grading), the thresholds apply at the time of application for the permit allowing or authorizing that activity. Note the exemption in Section 1 for forest practices other than Class IV General.

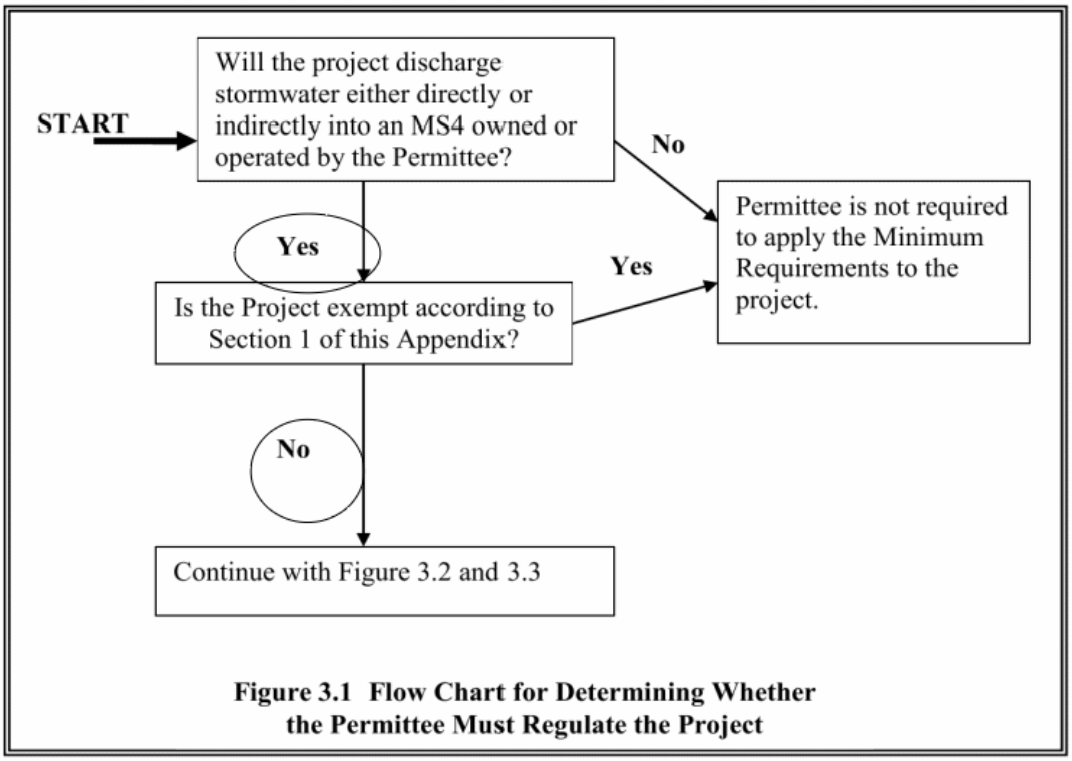
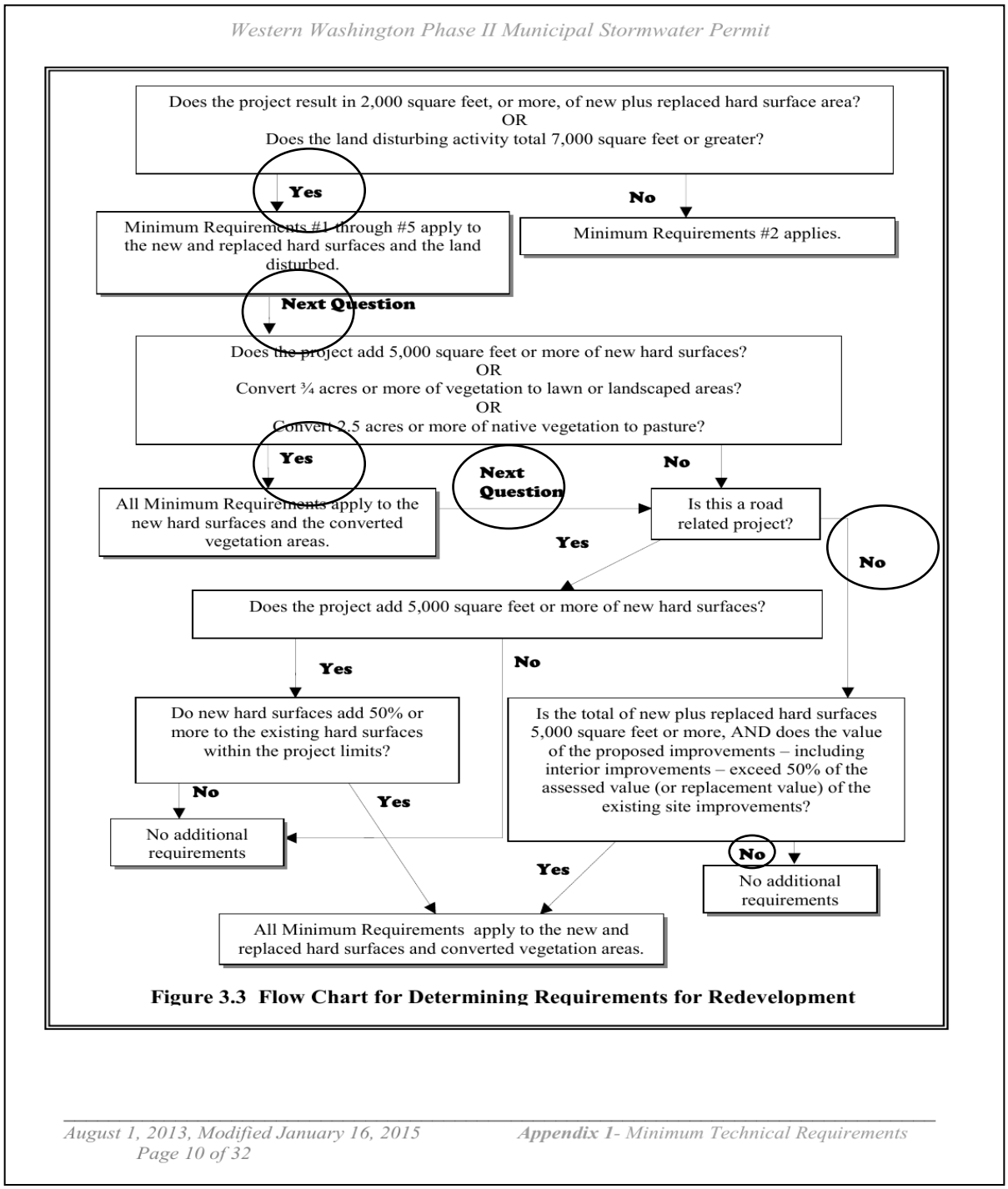


Figure 3.1 Flow Chart for Determining Whether the Permittee Must Regulate the Project

Since 35% of this area is already hard surface, the redevelopment flow chart applies. *Figure 8- Flow Chart for Determining Requirements* displays the applicable design analysis for the project.

Figure 8 – DOE SMMWW: Minimum Requirements for Redevelopment



A. MINIMUM REQUIREMENTS SUMMARY

MINIMUM REQUIREMENT #1: Preparation of Stormwater Site Plans

A set of stormwater drawings submitted with this report constitute the Stormwater Site Plans.

MINIMUM REQUIREMENT #2: Construction Stormwater Pollution Prevention (CSWPPP)

All new and redevelopment projects are responsible for preventing erosion and discharge of sediment and other pollutants into waters. A 13-point *Construction SWPPP* is referenced as *Appendix B* of this report, and provided as a stand-alone document for easier use

MINIMUM REQUIREMENT #3: Source Control of Pollution

All Known, Available, and Reasonable techniques (AKART) for ongoing protection of stormwater from pollutants sourced from the project are described in the *Operations*, *Maintenance, and Source Control Manual*. Typical source control measures are proposed for a professional office.

MINIMUM REQUIREMENT #4: Preservation of Natural Drainage Systems & Outfall

The stormwater from the site will continue discharge through existing conveyances to the natural location in a manner that does not cause significant adverse impact to the receiving waters and downstream properties.

MINIMUM REQUIREMENT #5: On-site Stormwater Management

Dispersion and infiltration are not feasible at this site. All impervious areas added or replaced will be routed to detention to control quantity. Pervious surfaces will meet the soil amendment standard. Please refer to Section 5 of this report.

MINIMUM REQUIREMENT #6: Runoff Treatment

With more than 5,000 SF of pollution-generating hard surface (PGHS) or ¾ Acre of PG Pervious Surface, Treatment is required and already provided. The Basic Treatment criteria applied for discharges on this project. Please see the previous TIR.

MINIMUM REQUIREMENT #7: Flow Control

This project is not Flow Control exempt and must meet the requirements from the 2009 Manual of not exceeding 50% of the 2 year or the 10 or 100-year flow events. Please see Section 5, Permanent Stormwater Controls.

MINIMUM REQUIREMENT #8: Wetlands Protection

In addition to #7, this requirement applies to projects whose stormwater discharges into a wetland; either directly, or, through a conveyance system. Not Applicable for this system. Please see Section 5, Permanent Stormwater Controls.

MINIMUM REQUIREMENT #9: Operation and Maintenance

Stormwater Operations are described in the *Operations Maintenance and Source Control Manual,* referenced as *Appendix C,* and provided as a stand-alone document for future use. A

sample log of actions is provided. This is to be kept onsite or in reasonable access to the site and transferred with the property to future owners.

OPTIONAL GUIDANCE #1: Financial Liability
Bond and liability assurances will be provided by the proponent or a representative of the proponent (Contractor) prior to start of construction to ensure construction compliance. The owner will be responsible for on-going cost of private maintenance.

OPTIONAL GUIDANCE #2: Offsite Analysis and Mitigation
Projects that discharge off site must address potential impacts to water quality, erosion, slope stability and drainage impacts, and propose mitigation for predicted impacts. Previous TIR Analyzed this and determined no mitigation was triggered.

SELECT PERMANENT STORMWATER CONTROLS

This section addresses the analysis and design of the drainage flow controls and water quality measures. Selection of Flow Control Facilities starts by:

- Following the LID Flow chart to determine the required list, then;
- If using the LID Performance Standard, select any combination of BMPs that achieves performance standard. Move to Step II, if not, then;
- Following the priority listings for that LID List and analyzing the infeasibility criteria to determine the first feasible BMP for each of 3 surface types.
    - Once a BMP is selected it is sized.
    - Placed on the design drawings.
    - No other On-site Stormwater LID BMPS is necessary for that surface.
- Apply any LID credits generated toward
    - Flow control (peak and/or duration matching).
    - Treatment design (basic or enhanced).

Additional analysis of components such as the conveyance system, and in cases with potential for high groundwater, buoyancy resistance, are also addressed in this section.

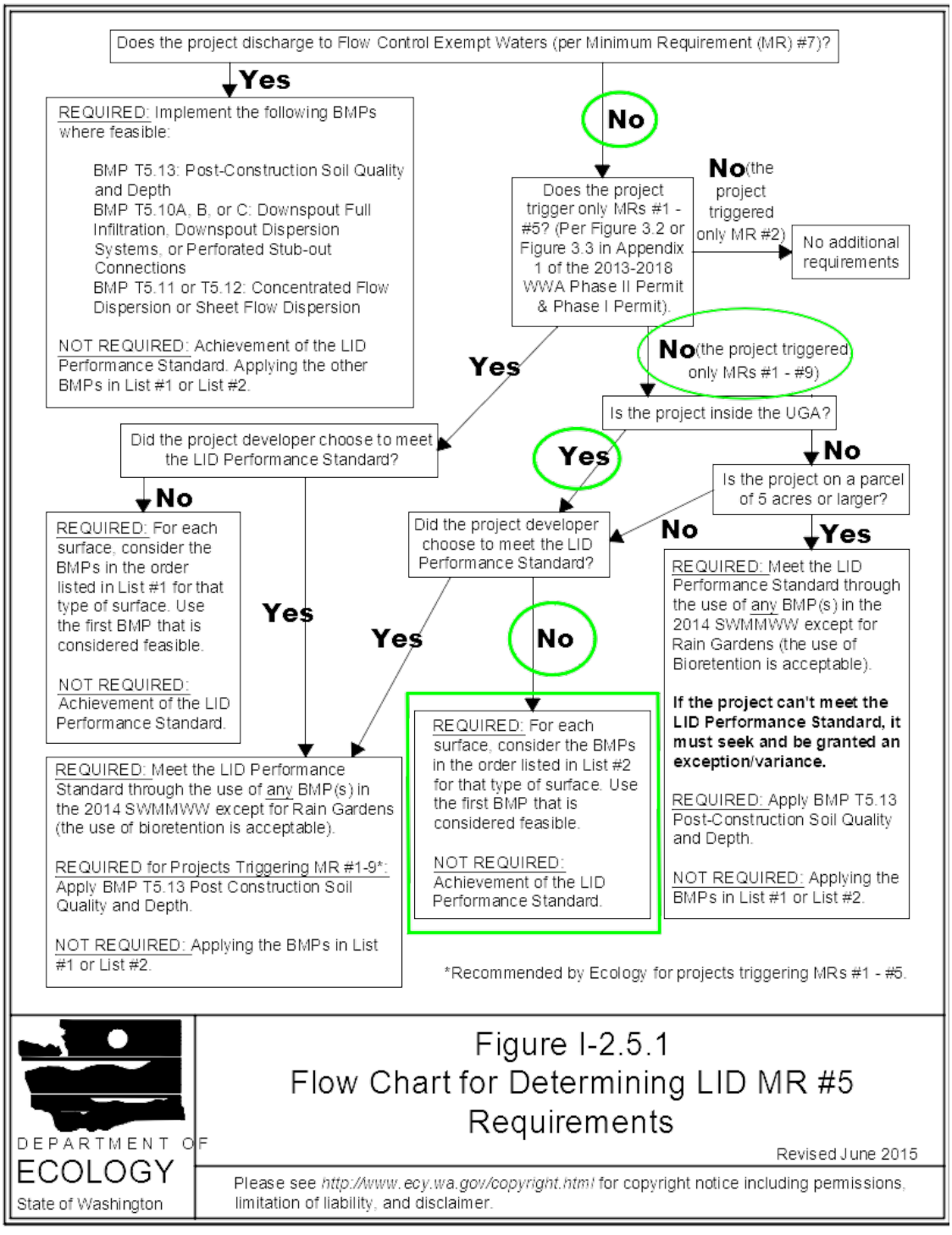
Step I: Determine and Read the Applicable Minimum Requirements

The Flow Chart for LID requirements, *Figure 9*, below, indicates that this project is to either follow List #2, or meet the Performance Standard.

The selection of Flow Control Facilities is made either by the performance method or by following the priority listings for LID List and analyzing the infeasibility criteria to determine the first feasible BMP for each of 3 surface types. Once a BMP is selected it is sized and placed on the design drawings. No other On-site Stormwater Management BMP is necessary for that surface. This repeats until all surfaces are accounted for.

Since this is the last in a series of Master Plan projects that are regulated under the 2009 SWM, the flow control standard is 50% of the Q2, the 10 year, and the 100-year rather than the 50 year (Q50) probability event.

Figure 9 – DOE SMMWW: Flow Chart for LID MR #5 Requirements



B. Onsite Stormwater Management

The following On-site Stormwater Management BMPs were selected.

Table 4 - LID BMP Analysis

BMP	Evaluation & Impact	BMP Credits (if applicable)
Lawn and Landscaped Areas:		
1. **Soil preservation and amendment** BMP in Volume III, Section 3.1.	Stockpile topsoil and amend and re-spread in pervious areas. Mulch existing Landscaping (Trees) **Selected.**	Model these areas as Pasture rather than lawn.
Roofs:		
1. Collect & Convey	To Detention	
Other Hard Surfaces:		
1. Track Interceptor	Model as an oversized perforated pipe connection	
1. **Field Artificial Turf**	Model top 5" of bedding as a Green Roof	

Step II: Select Source Control BMPS

Source control is applied by project type from the BMPs listed in Vol IV of the SWMMWW. There are Operational BMPS that are presented as Applicable and additional measures presented as Recommended. The Source Control areas for this project are:

- S411 BMPs for Landscaping and Lawn/ Vegetation Management
- S417 BMPs for Maintenance of Stormwater Drainage and Treatment Systems
- S421 BMPs for Parking and Storage of Vehicles and Equipment
- S424 BMPs for Roof/ Building Drains at Manufacturing and Commercial Buildings

Please see the *Operations, Maintenance, and Source Control Manual* for this project for more detail about the selected BMPs.

Step III: Determine threshold Discharge Areas and Applicable Requirements for Treatment, Flow Control, and Wetlands Protection

Part 1 Read the Definitions.
Read DOE SWMWW Volume 1 Section 2.3.

Part 2: Outline the threshold discharge areas.
The entire onsite project is within 1 discharge area.

Part 3: Determine amount of Pollution-generating hard surfaces (including pervious pavements, if any) and pollution-generating pervious surfaces
No new or replaced Pollution Generating Surfaces are expected.
Part 4: Compute total effective impervious and converted vegetation areas (in each discharge area, if applicable).
The Total Effective Impervious and Converted Vegetation Areas are tabulated within the MGS Program output see Appendix A. Credits of 0.1 AC for retained trees within 20 ft of an impervious surface are eliminated from modelling, reducing the impervious post developed area. (BMPT 5.16)[Revision 1.]

Part 5: Use an approved continuous runoff model (e.g., WWHM) with 15-minute timestep to determine whether there is an 0.15 cfs increase in 100-year return frequency flow. (0.1 cfs increase for 1-hr timestep).
Before adding infiltration assembly items MGS Flood 4 simulations show that the project would exceed the exemption from flow control rate increase. Continue to next section.

Step IV: Select Flow Control BMPs and Facilities

Part 1: Determine whether you can infiltrate.
No, the soils do not meet the needs for Flow Control BMP infiltration. Please see the recommendations in the Soils Report previously submitted

Part 2: Use an approved continuous simulation runoff model to size detention. (Refer to Volume III, Chapter 2)
Flow control was modelled with MGS Flood 4 software in the fully forested and proposed conditions, with onsite management features added to restrict the future runoff rates to no more than match the forested rates. Inputs to the model are shown in the summary reports attached in Appendix A.

The model simulates a variety of discharges at various probability intervals, including the stipulated reoccurrences for water quality treatment, for flow control matching, and for conveyance sizing. These simulations are then used to size facilities and their outlet control devices within the optimization routine of the model. Following that, outputs are used to size conveyance piping and treatment facilities to achieve water quality requirements, if needed.

The majority of the calculations for this work are internal to the model, so copies of the simulation files are provided to the reviewer electronically for verification and comparison to the summary reports and features shown on the drawings. Otherwise, the accuracy of calculations is presumed given the regulatory requirement to use a specified model.

In this case, a combination of features is proposed to provide flow control, including

- Post-Construction Soil Quality and Depth to reduce runoff from vegetated areas.
- Under turf bedding, with 4” pipes in 1 ft trenches at 15 ft on center, at 0.5% slope.

- Interceptor Assemblies. These are rock filled trenches with perforated distribution pipes used to increase the net porosity of the assembly. These are modelled using the Trench icon in MGS Flood. This feature lies along the interior edge of the track.
- On Site Detention.

This runoff is not subject to water quality treatment as is does not generate from traffic-bearing surfaces.

See notes on Stormwater Plan Sheets, for sizes and locations of these features. More detail about the calculations for volume is presented in Appendix A and in the electronic files.

Flow Control Summary: The new detention will fully mitigate flow from new and replaced pervious areas and hardscapes.

Step V: Select Treatment Facilities. (Refer to Chapter 2 of Volume V)

Step V: Select Treatment Facilities

Run-off from Traffic-bearing surfaces is already collected and treated via a Bioswale. Traffic-bearing surfaces will not be increased, rather will be reduced by the amount covered by the bleacher addition, so no additional treatment is proposed. The bioswale is likely to be disturbed by adjacent construction, so will be restored to the same length and grade and protected with walls along it's edges rather than berms.
Revision 1

Step VI: Review Selection of BMPs and Facilities

The City of Puyallup is the review jurisdiction and will make a determination of the adequacy of the proposal, recapped as:

- Retain existing systems to maximum extent practicable.
- Minimize new impervious effects by siting over existing hard surfaces.
- Provide detention for flow control and treament for the new and replaced areas.
- Provide soil amendment for disturbed pervious areas.
- Overflows release at existing outfalls.

Step VII: Permanent Stormwater Control Plan

Please see the drawings to aid in the description of the stormwater control plan. The permanent stormwater control plan uses amended soils to reduce runoff from disturbed pervious areas, and underground detention for new roof and pavement areas to meet the Flow Control standard. This section presents the remainder of the stormwater components.

HYDROLOGIC ANALYSIS

The hydrologic analysis was performed in Ecology-approved MGSFlood4 and is presented in Appendix A.

CONVEYANCE SYSTEM HYDRAULIC ANALYSIS AND DESIGN

Additional conveyance pipes are used in new track interceptor trenches onsite and must carry at least the 25-year flow event as sized interior to the cad program and confirmed with Chezy-Manning's equation. The pipes are generally provided 3 feet of cover under traffic bearing areas, 1 ft under pedestrian areas. Instead of sloping pipes sufficiently to calculate at 3 FPS flow rates (when flowing full) to provide cleaning velocity, the pipes are protected from clogging with the granular bedding of the interceptor trench. Interceptor and underdrain pipes are laid a minimum slope to increase detention capacity.

Conveyance Summary with references and sources of information for:

Channels: Not used except as overflow devices.
Culverts: Not used.
Roof Drains: ~~Yes 4" or 6" PVC~~ Not used. Revison 4 concession roof eliminated.
Gutters: ~~Standard roof gutters only.~~ Not used. Revison 4 concession roof eliminated.
Nomographs and explanatory tables: Not used.

SOIL AMENDMENT ANALYSIS

Any topsoil and duff from the cleared and graded areas will be stockpiled for re-use as soil amendment. The site was previously farmed, then graded for the existing track and field, so there will be less available organic soil than some raw land site. In the event of a topsoil shortfall, amendment mulch will be purchased. The Puyallup Standards for Soil Amendment and Depth is provided on the drawing sheets with the erosion control notes and details.

BOUYANCY RESISTANCE

Not applicable, perforated pipe in ground will not significantly displace water, and groundwater was not observed or indicated at the project elevations. Structures are expected to terminate well above highest groundwater.

CSWPPP TEMPORARY EROSION AND SEDIMENT CONTROL ANALYSIS AND DESIGN

Please refer to Appendix B – Construction SWPPP of this report for the full details of the Temporary Erosion and Sediment Control Plan for the construction period. For convenience during construction this is provided as a separate document.

Erosion and Sedimentation Control Analysis and Design

There is more than an acre of disturbance on this project, so a Construction NPDES permit from Washington State Department of Ecology is triggered. Proposed temporary measures possible for this project will include the following BMP's:

- Perimeter protection via filter fences, vegetated buffers, and straw or triangular wattles.

- Stabilized construction entrance (existing paving)
- Cover Measures such as straw mulch, hydroseed or other mulching and planting method to stabilize unworked areas.
- Surface Water Control with permanent conveyance and temporary drainage swales to the detention pond.
- Catch Basin protection for existing catch basins on site, such as filters with gravel outlets.
- Sediment retention from a temporary sediment pond within existing detention pond.
- Maintenance of TESC.

Final stabilization will be hard surfacing and planted landscaping per Landscape Architect plans.

Pollution Prevention and Spill Control Criteria
Basic construction activities that will occur during this project will be subject to the preventative measures to avoid impacting stormwater. During construction, Concrete Handling BMPs will be the primary potential source of pollution beyond sedimentation.

For ongoing source control activities related to the commercial use, maintenance practices, and solid waste, please see the measures presented in Appendix D*, Operations, Maintenance and Source Control,* submitted under its own cover for easier reference by workers.

REPORT ON PROJECT

A. SPECIAL REPORTS AND STUDIES

Soils Report:
Geotechnical Engineering Study by Earth Consultants, Inc. July 7, 1995
submitted under separate cover as file2205-CCS-1995.TIR.ApdxD.GeoRpt.pdf
Limited Geotechnical Site Evaluation by Krazan &Associates, Inc March 4, 2008
Submitted under separate cover as file 2205-CCS-AbbeyRD.TIR.GeoLetter.pdf
Other Previous TIR and Figures Submitted under separate cover:
Abbey RD.TIR.2016 with files for F1; F4 Pond Calcs; F5 1995 TIR; which references 1995 TIR Deer Creek Culvert; Apdx A Basins.
Wetlands Delineation: N/A
Fish & Wildlife: N/A
Forest Practices: N/A

Reports and Studies appended to this report include the *Construction Storm Water Pollution Prevention Plan* and the *Operations, Maintenance, and Source Control Plan.* These plans detail specific maintenance activities, frequencies, responsible parties, equipment needs, and triggering conditions for the construction period and ongoing operations, respectively.

B. OTHER PERMITS

Agency	Permit/Approval	If Applicable, requirements that affect project *
Tacoma-Pierce County Health Department	Onsite Sewage Disposal and Well Permits	
Washington State Department of Transportation (WSDOT)	Developer/Local Agency Agreement	
Ecology	Construction Stormwater General Permit (NPDES NOI)	Apply, notify, and report once coverage begins.
Washington State Department of Fish and Wildlife	Hydraulic Project Approval	
Washington State Department of Ecology	Dam Safety Permit	
United States Army Corps of Engineers	Section 10 Permit	
United States Army Corps of Engineers	Section 401 Certification	
United States Army Corps of Engineers	Section 404 Permit	
Local Jurisdiction	Critical Areas Permit	
Local Jurisdiction	Building Permit	Setbacks, coverage, etc.
Local Jurisdiction	Other Permits	

- If blank, does not apply.

Revision V4 to names of Local and Ecology Permit and applicability

C. BOND QUANTITIES, FACILITY SUMMARIES AND DECLARATION OF COVENANT

Bond and liability assurances will be provided by the representative of the Proponent (Contractor) prior to start of construction.

Facility summaries are listed in the *Maintenance Manual.*

Declaration of Covenants are Legal instruments employed to guarantee preservation of drainage systems and access for maintenance purposes:

Declaration of Maintenance Access Covenant: Recording #_____TBD
ROW Dedications: None.
Easements: Existing access easements

Check Compliance with Applicable Minimum Requirements.

This analysis was coordinated with the overall master plan, the proposal for the building permit and the recommendations of the geotechnical studies and landscape architect. Compliance checks are made by the jurisdiction at submittal, and by the Erosion Control Lead and Inspector during the construction of the design.

This page inserted for duplex print spacing.

Appendix A: Calculations

Bioswale Wall Bottom Elevation Calculations

{Version 25.05.15 Kept for version-to-version continuity, but Struck Through as this feature is no longer being proposed, so this calculation is no longer relevant.}
Revision 1

~~Find the adequate depth for the concession building extended footing and bioswale retaining wall so it does not place a surcharge on the re-routed 48"SD.~~

~~**CONCLUSIONS**: Building footing shall bear no higher than ELEV 60.86 (Aprx 2' 4" depth)~~
~~Bioswale wall footing shall bear no higher than ELEV 58.0~~

~~METHOD - provide a 45º (ie 1:1) bearing path between the bottom of the footing and the base of the pipe.~~

~~CRITERIA -~~
~~The CL of new 48 to building wall is 10 ft, so edge is 8 ft~~
~~The 48" IE is 53.86~~
~~Concessions FF = 63.12~~
~~CL of new 48" to bioswale wall 5 ft~~
~~Lowest FG at bioswale wall = 59.00~~

~~CALCULATION:~~
~~Assuming the Building spread footing extends 7 ft from the outside of the footing~~
~~At 1:1 over 7ft~~
~~Add 53.86 + 7 = 60.86 the highest allowable bearing elevation of building north side footing wall.~~
~~Subtract FF 63.12 - 60.86 = 2.26 wall.~~

~~Assuming the Bioswale wall extends 0.5 ft from face of wall~~
~~At 1:1~~
~~Add 53.46 + 4.5 = 57.96 or about ELEV 58~~
~~This is 1 ft below the lowest FG adjacent to the wall, so a standard 1 ft deep wall footing is OK.~~

Hydrologic Simulation

Report results from MGSFlood 4 simulations for stormwater are inserted below.

The first report is for detention facility sizing for the increased impervious surface from bringing the track to regulation size. This detention facility is set above the design water surface elevation of the primary detention pond, to avoid backwater complications.

Since no new traffic-bearing impervious is added, no water quality features are sized.

Assumptions used:

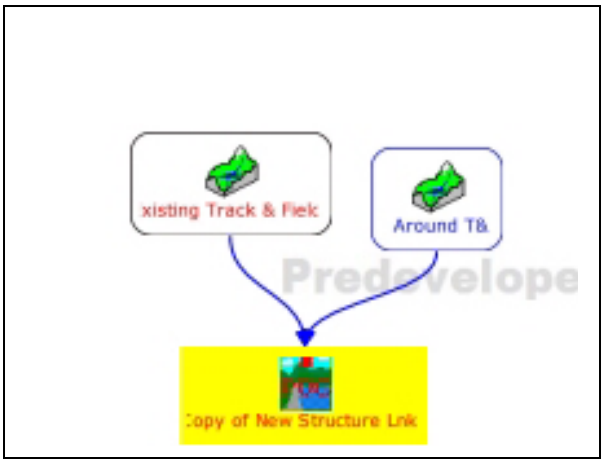
The addition of 1805 Sf of roof to the office is in an area analyzed as impervious in the Master Drainage Plan. It will continue to drain to the main detention pond, so was not evaluated as de minims area which will not exceed the performance standard for the redeveloped site.

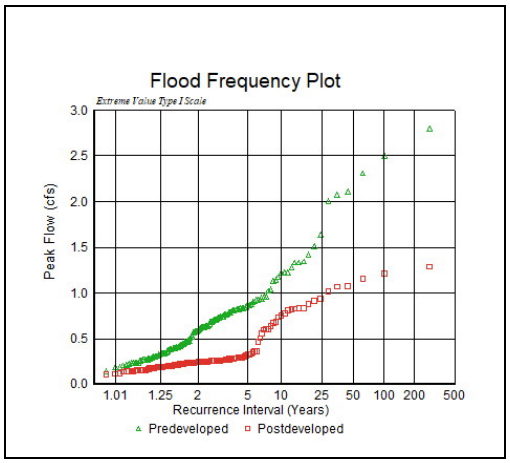
Post-Development scenario reduced by 0.1 Ac for credit for retained & proposed trees within 20 ft of a new impervious surface.

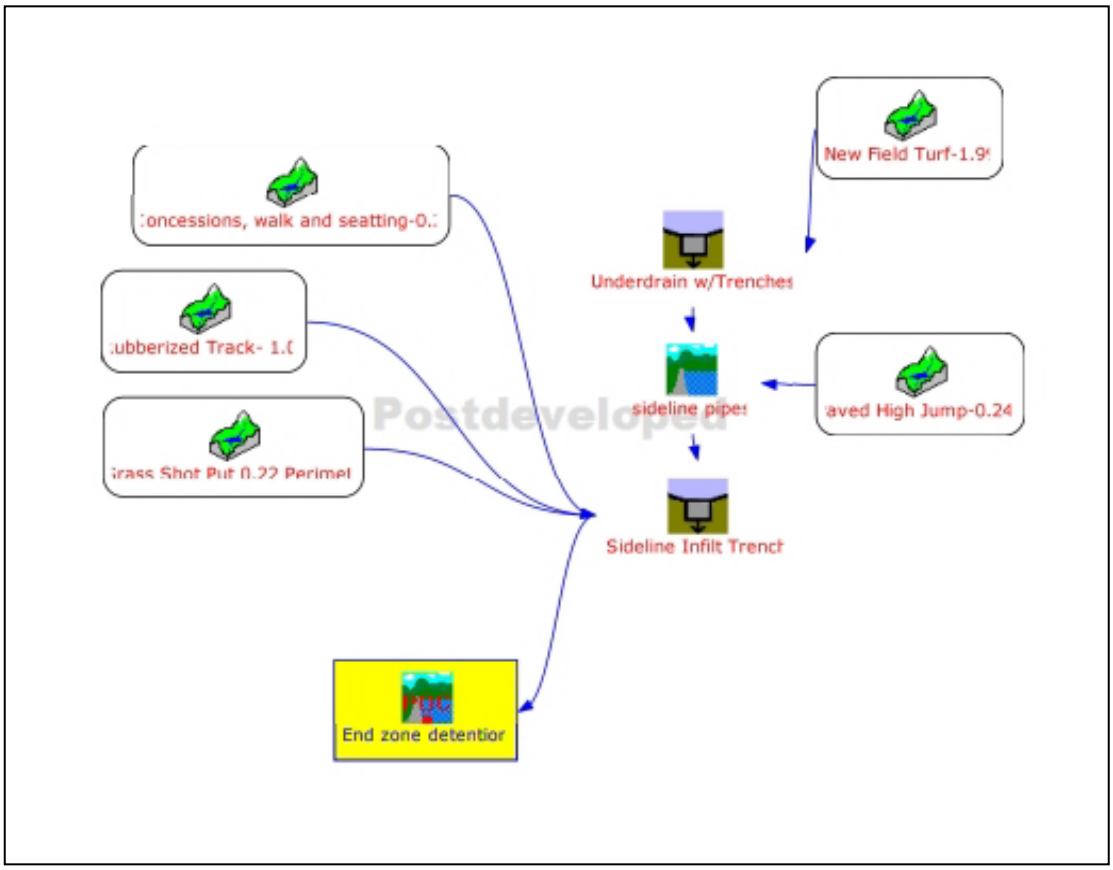
Since the facilities are open to the native subsoil, not lined, we have elected to use the very minimal infiltration rate of 0.10 in/hr to distinguish between the two conditions, as MGS Flood does not optimize well with absolutely 0 infiltration. This is supported by the 1995 geo letter in the "Excess infiltration" remark under the pond design criteria. Another source for this adjustment is Doug Howie, DOE, in email, and, most meaningfully, the instructions in the MGS User Manual.

> 1995 Geo Report by Earth Consultants Inc TP-11 log and Map location
> GW about 8 ft below surface grade in 1995
> Silty sandy soils prone to liquefaction (i.e. granular, so use geotextile to sperate layers to reduce migration in seasonal high water events.)
> Infiltration rates these types of soils 0.1 –

Please see the pre and post scenario figures and report output below.


xisting Track & Fiek
Around T&
Predevelope
opy of New Structure Link


Flood Frequency Plot
Extreme Value Type I Scale
Peak Flow (cfs)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1.01
1.25
2
5
10
25
50
100
200
500
Recurrence Interval (Years)
Predeveloped
Postdeveloped


New Field Turf-1.9
oncessions, walk and seatting-0.
Underdrain w/Trenches
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End zone detentior

Appendix B CSWPPP - Construction Stormwater Pollution Prevention Plan

Introduction to Construction Storm Water Pollution Prevention Plans

This report shall be located on the construction site or within reasonable access to the site, and the drawings shall be kept on the construction site at all times, so for convenience is published as a stand-alone document.

The CSWPPP contains the concise, site-specific information about existing conditions constructions schedule, and other pertinent items to supplement what is shown on the drawings.

Track and Field Improvements
815 21st ST SE
Puyallup, WA 98372
Parcel #: 0420352148
Owner: Cascade Christian Schools

Construction Stormwater Pollution Prevention Plan

Vader ENGINEERING
253-363-2065 info@vaderengineering.com

Construction Stormwater Pollution Prevention Plan
(CSWPPP)

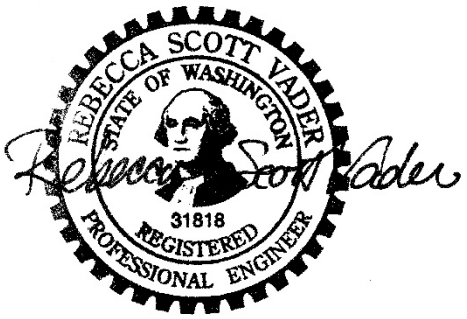
Track and Field Improvements
815 21st ST SE
Puyallup, WA 98372

Parcel(s): 0420352148

Permit No _PRCCP 20220589

Application Submitted March 30,2022
Revised December 2, 2024
Revised V4 May 15, 2025
Approved ____,

Work for this project was performed for Cascade Christian Schools, and prepared in conformance with sound engineering principles and standards, with the best available site and technical information at the time of investigation. This work is specific to the project, site, and client, and should not be applied to any other purpose without consultation with Vader Engineering. The report contained herein has been prepared by the undersigned Professional Engineer(s) Licensed in the State of Washington.



Rebecca Scott Vader, PE

Proximity Requirement

A copy of this CSWPP Plan shall be retained onsite or within reasonable access to the site until construction completes and the site achieves permanent stabilization.

A log of preventative activities that indicate what actions were taken to maintain erosion control shall also be kept and be available for inspection.

EROSION CONTROL LEAD REQUIREMENT

The proponent shall be responsible to see that the general contractor identifies an Erosion and Sediment Control Lead for the Construction SWPPP. That individual shall be onsite or on call at all times. If a preconstruction meeting is held, this person shall attend. For sites disturbing 1 acre or more, that lead must be a Certified Lead. Certification may be obtained by an approved training program that meets the erosion and sediment control training criteria established by Ecology. See BMPC160 Certified Erosion and Sediment Control Lead (CESCL) for more information about the duties of the Lead.

CESCL (Required > 1 ac)

Lead Name:_____
24hr Contact Telephone:_____
Fax number:_____
Address:_____

If needed: Update

Lead Name:_____
24hr Contact Telephone:_____
Fax number:_____
Address:_____

Construction Emergency Contact:

Name:_____
24hr Contact Telephone:_____

Owner Emergency Contact:

Name:_____
24hr Contact Telephone:_____

Table of Contents

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Introduction to Construction Storm Water Pollution Prevention Plans

This narrative contains the concise, site-specific information about existing conditions constructions schedule, and other pertinent items to supplement what is shown on the drawings. This report shall be located on the construction site or within reasonable access to the site, and the drawings shall be kept on the construction site at all times.

One primary purpose of the CSWPPP narrative is to describe the scope of self-conducted inspections and set out inspection frequency. This narrative provides a basic template to document the major observations related to implementing the CSWPPP and actions taken to maintain, repair or improve erosions and sedimentation control (TESC) as a result of the ongoing inspections. The site and project descriptions are above in the main body of the text.

Approval of this Construction SWPPP does not constitute an approval of permanent drainage design (e.g., size and location of impervious surfaces, pipes, restrictors, channels, retention, detention/infiltration facilities, utilities, etc.). These are covered under different narratives and plans.

Each site, and some sub-sites, will select which Best Management Practices are expected to protect the receiving waters. For construction sites that eventually discharge to surface water, the primary concern is compliance with Washington State water quality standards. For sites that infiltrate runoff, both the infiltrative capacity of the constructed facilities and the prevention of groundwater pollution will be monitored.

The implementation of this Construction SWPPP and the construction, maintenance, replacement, and upgrading of these Construction SWPPP facilities is the responsibility of the applicant/contractor until all construction is completed and approved and vegetation and/or landscaping is established.

There are 13 elements to a Construction Storm Water Pollution Prevention Plan. However, some elements do not apply to every site. When this is encountered, a justification is provided in the text.

Note to Reader: The CSWPPP is formatted by section, with typical guidance presented at the beginning of a section and project- specific notes added in bold italic text at the end of the section. Adequate TESC control requires continuous adjustments to the stage of construction and weather conditions, so all BMPs are available to the contractor if needed for control.

Since these reports draw heavily on reference documents, lists, and standards, in certain areas of the report, typical items may be included in the text to indicate that they were considered but ~~struck through~~ to show that they are not applicable to this project. Correspondingly, tables and lists may have <u>underlined</u> or **bold** text to indicate selected items.

Section 1 - General Project Description

This project proposes to re-build a track and field on the site of the one that is smaller than athletic regulation and in need of significant maintenance, add the lighting from the master plan, and to add the adjoining seating and Restrooms/ Concession building. The existing pathways and field entrance will have minor changes for ADA access. The project area totals about 4.3 acres of a larger, developed campus. The balance of the campus that drains to distinct onsite basins will not be modified in the SW management design. No work within a ROW is proposed.

The proponent intends to provide stormwater facilities below ground for the new and replaced areas and retain the use of the existing collection system in the areas remaining unchanged. The project projects no impacts to critical areas so includes no mitigation on or adjacent to the site.

Please refer to the CSWPP Plan Sheets to assist in the description of the project and site and for the full details of the Temporary Erosion and Sediment Control Plan for the construction period. The objective of a CSWPPP is to control erosion and prevent sediment and other pollutants from leaving the site during the construction phase of a project. The personnel and practices narrated in this CSWPPP describe how that is to be accomplished.

Table 1 – Parcel Data

Addresses:	815 21st ST SE
Parcel Number:	0420352148
Lot Area:	756,448 SF (17.37 AC)
Total Developed Site:	100% (no native conditions on site)
Project Site Area Total Disturbed:	188,500 SF
Pervious Area Cleared for 'first time'	0
Impervious Area Pre-Project:	6.40 AC
New & Replaced Impervious:	0.84 AC
Cut	152 - CY
Fill	1,769 - CY
Project Landscaping:	8 Lane Track, Asphalt paths, Artificial Turf Field, Grass, Trees, Shrubs
Soils:	Briscot Loam

Utilities at the site: Water: City of Puyallup; Sewer: City of Puyallup; Power: PSE; Communications: Qwest; Gas: PSE; Cable: Comcast

Current Discharge: Onsite detention pond, discharge to Deer Creek, a tributary to the Puyallup River

Proposed Discharge: Same

Permanent stabilization: Asphalt paving, Retaining walls, structures, and landscaping.

Section 2 – Site, Adjacent, and Critical Areas Descriptions

SITE: The project site is near the center of an existing school campus. The project area was previously cleared, graded, developed, and benefits from existing Master Plan infrastructure. Please see figure below.

The following tabulates the existing site data:

Addresses:	815 21st ST SE
Parcel Number:	0420352148
Lot Areas:	743,764 SF (17.07 AC)
Total Developed Site:	743,764 SF (no native conditions on site)
Project/Clearing Area:	222,000 SF
Impervious Site* Area:	Please see table 1, below
Zoning:	RS-08/RS-04
Soils (See Appendix):	Sandy Loam
Infiltration used?:	Unlined Detention Pond, expect incidental infiltration
Infiltration Rates:	0.1 in/hr for unlined detention ponds (Howie, DOE)

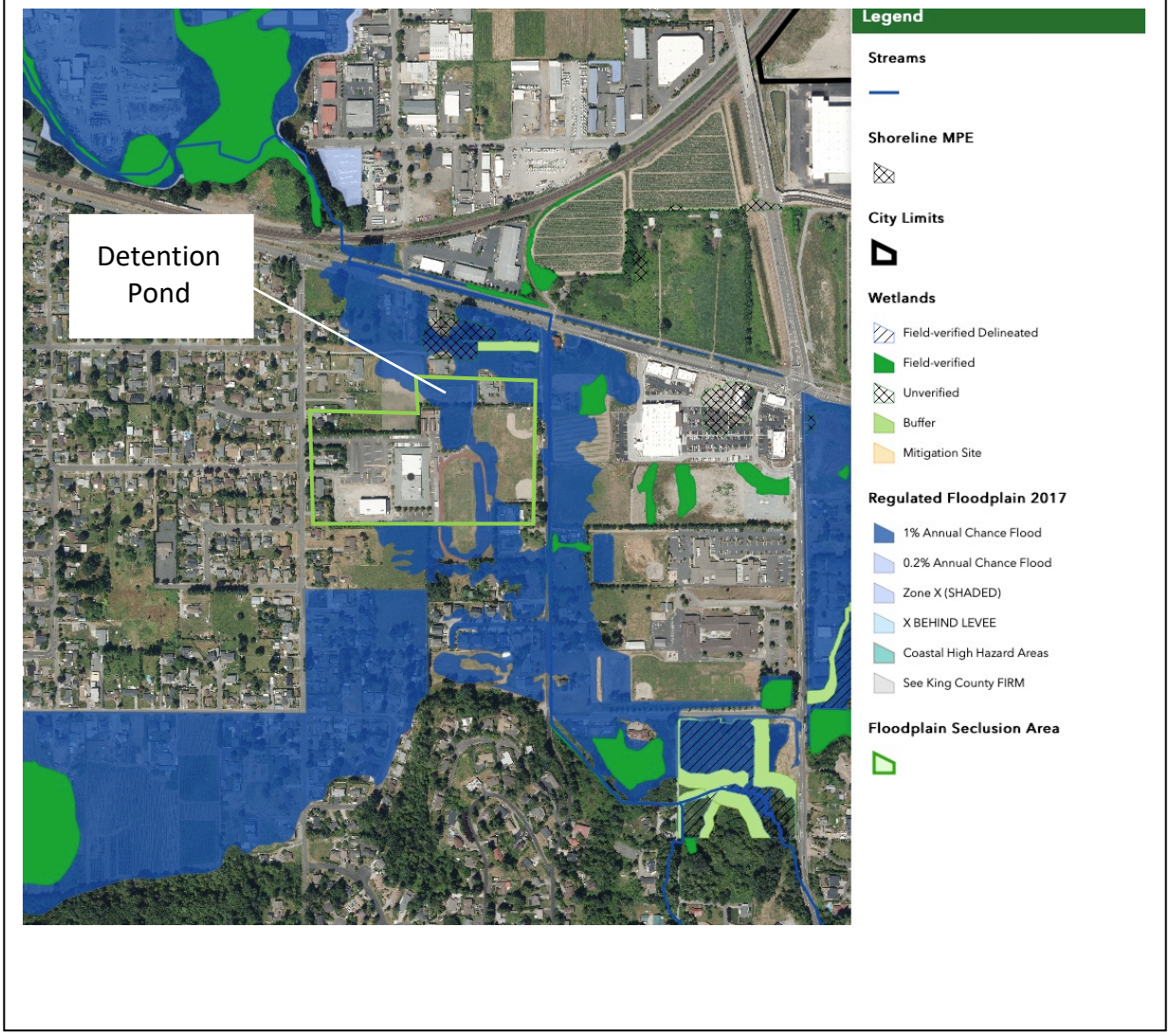
Connecting to right-of-way drainage system? Onsite connection, which discharges to 21st ST SE

Utilities at the site: If needed, special installation measures to avoid conflict with stormwater quantity and quality control features are listed with the utility.

- Water: City of Puyallup
- Sewer: City of Puyallup
- Power: PSE
- Communications: Private provider
- Gas: PSE

Fuel Tanks: No evidence of fuel tanks found; tanks not considered likely with site history.

Figure 1: Critical Areas Map



Source: City of Puyallup GIS. Map disclaimed as approximate and not surveyed.

Adjacent Areas:

Residential Areas:	Residential properties surround the site.
Roads:	21st ST SE (not affected)
	25th ST SE (not affected)
Stream and receiving waters:	Overflow to Deer Creek then the Puyallup River.
Lakes:	None.
Wetlands:	None
Run on to the active project site expected?	No, due to constructed drainage and high points.

The drainage discharge to the immediate receiving water is infiltration. The emergency overflow is piped north to deer creek where it enters a well-managed existing drainage system.

Critical Areas:

Inside a mapped Critical Drainage Area?	No.
Constructing within a Critical Area or buffer?	Lahar, Aquifer, and Liquefaction.[Revision V4.]
Within 200 feet of a mapped Critical Area?	Yes, see above

Critical areas for runoff that are down gradient of the project site?
In basin, but Not directly downgradient.

Special requirements for working near or within critical areas:
No site disturbance proposed in runoff-sensitive critical areas.

Soils: Please see the *Geotechnical Investigation* by Cobalt Geosciences for more detail on items summarized below:

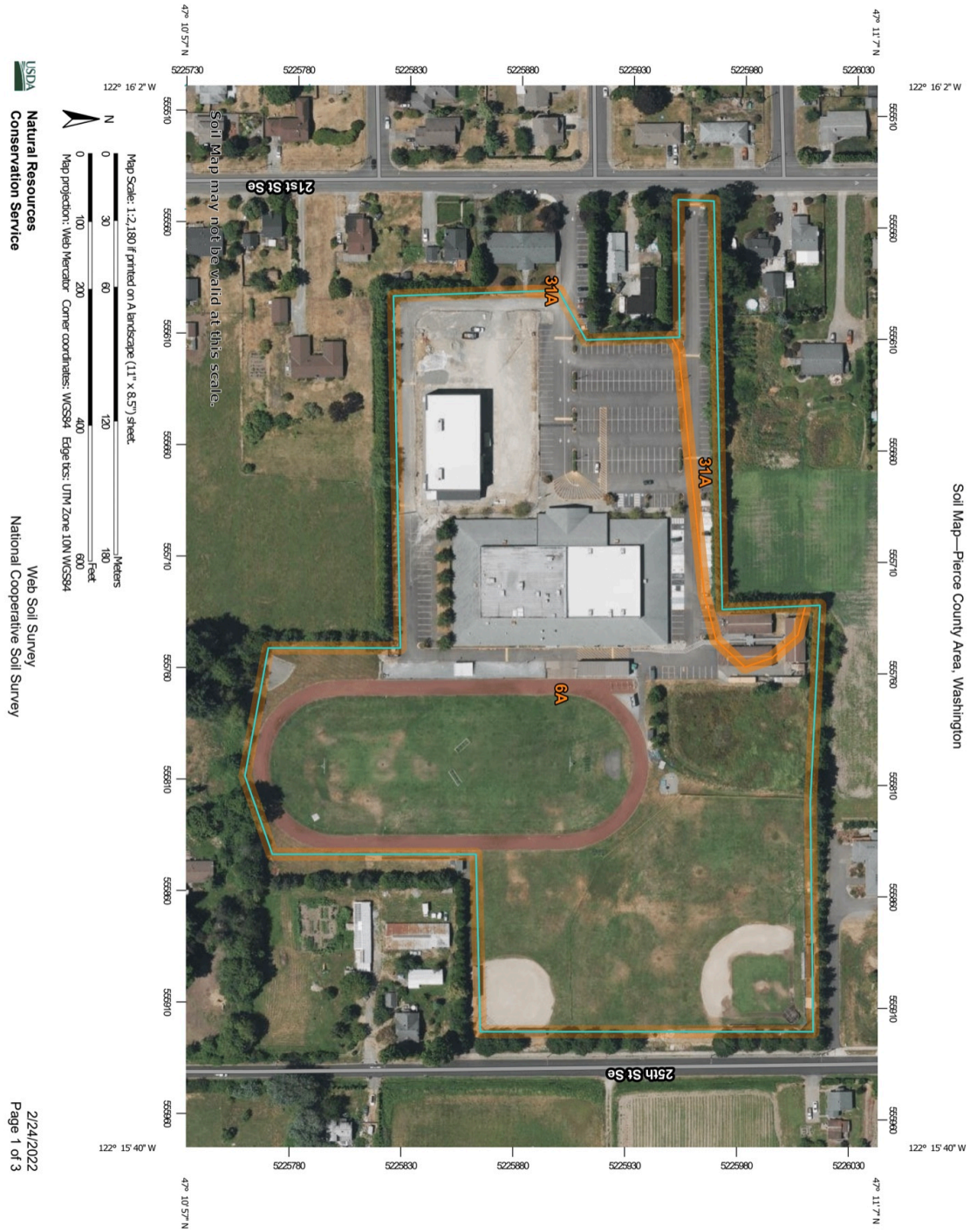
Soil Name(s):	Biscot
Soil Mapping unit:	Loam
Erodibility:	Slight to Moderate
Settleability:	Good due to low fines content
Permeability:	Moderate to good
Depth:	more than 10 ft (limits of observation)
Texture:	Sandy Loam
Soil Structure:	Medium dense to dense

Potential Problems: Silt traces, if present in the soils will be the major contributors to sediment-laden water, as the sand and gravel will settle quickly.

Net grading /cut /fill: 0/1617 CY/152 CY/1769 cy
The goal to reduce net fill and import will be pursued with re-using excavated soil as structural fill whenever it meets specifications. Imported material meeting specifications for pavement courses, pipe bedding, trench interceptor, turf support, and structural fill will be used as needed to achieve project goals with the construction conditions.

Unsuitable export, if any, will be to accredited/commercial receiving pit.

Figure 2 – Soils Map and Work Area



Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
6A	Briscot loam	13.6	94.3%
31A	Puyallup fine sandy loam	0.8	5.7%
Totals for Area of Interest		**14.5**	**100.0%**

Section 3 - Construction BMPs 13 Elements

The following list describes how each of the required elements is addressed. The types of BMPs selected are discussed below, and the locations, details, and related notes are shown on the drawing sheets. Many of the BMPs have inspection or maintenance components. It is these items that will populate the CSWPPP log kept electronically by the designated inspector. The log will record the date, the recent rainfall events, BMP modifications, and progression of construction, such as permanent stabilization of an area.

Some of the BMPs selected are redundant, however, all CSWPPP BMPs are included to provide flexibility during construction. BMPs may be substituted within type and/or layered across elements or time to achieve the necessary level of control.

ELEMENT 1: MARK CLEARING LIMITS

Clearing limits are shown on the drawing the CSWPP, also known as TESC Plan, and were selected to fulfill the requirement to limit ground disturbance.:

Before beginning land-disturbing activities, flag or paint the clearing limits. Retain any duff layer, topsoil and groundcover within the clearing limits to the maximum degree practicable. The project limits will be marked by high visibility paint or flagging on the hard surfaces and upgradients, and:

- BMP C233 Silt Fence or
- BMP C 235 Straw Wattles on down gradients and pervious areas.
- BMP C103 High Visibility Fence for in transit areas

Not initially selected or not applicable:

- BMP C101 Preserve Natural Vegetation, (none)
- BMP C102 Buffer Zones.

ELEMENT 2: ESTABLISH CONSTRUCTION ACCESS

The construction vehicle access and exit shall be limited to one route if possible. To fulfil this requirement, use:

-
- BMP C107 Construction Road/ Parking Area Stabilization (existing onsite paving)

Check daily during site activity for track out onto ROW. Clean daily or as necessary, more frequently during wet weather, to prevent sediment from entering waters of the state.

- Sediment shall be removed from roads by shoveling or pickup sweeping and shall be transported to a controlled sediment disposal area.
- Pavement washing will be allowed only after sediment is removed in this manner. Wastewater shall be controlled by pumping back onsite, or otherwise be prevented from discharging untreated into systems tributary to state surface waters.

- If sediment is tracked offsite, refer to extra measures in the entrance notes on the drawings.

Not initially Selected:

- BMP C105 Stabilized Construction Entrance
- BMP C106 Wheel Wash

The proposed construction access will be from the onsite pavements and/or the new parking entrance.

ELEMENT 3: CONTROL FLOW RATES

This project conveys runoff to, and in, constructed components so care is needed to prevent erosive flow rates from accumulating sediment and discharging it in interceptor/infiltration beds before full stabilization is achieved. Protection from internal flow rates may be necessary to avoid gully formation or excessive erosion inside the construction limits, primarily where steeper grades are used.

The controls to meet this requirement are split between large area and channel measures. To reduce formation of runoff, concentration of rivulets, and/or mobilization of fines over Large Areas:

- BMP C120 Temporary and Permanent Seeding
- BMP C121 Mulching
- BMP C122 Nets and Blankets
- BMP C130 Surface Roughening
- ~~BMP C131 Gradient Terraces~~
-

And to intercept, slow, and re-spread runoff in temporary or permanent Channels:

- BMP C207 Check Dams,
- BMP C235 Wattles,
- BMP 201 and 202 Grass-lined and Blanket or Rock-Lined Channels, and
- ~~BMP C203 Water Bars.~~

Other BMPs of this type and BMPs primarily listed under other elements may be combined or substituted to achieve stable base in onsite conveyances. In the event that prescriptive sizing from the table in Part 4 below becomes ineffective, custom sizing was performed according to the sizing calculations contained in Appendix A of this document.

Check weekly for adequate control of erosion between placements. Sediment retained behind these velocity resistors shall be removed before the accumulated depth exceeds ½ the depth of the device.

ELEMENT 4: INSTALL SEDIMENT CONTROLS

Design of Construction Sediment Control was performed in accordance with 2015 SWMMWW Vol II BMP C240 to minimize erosion and avoid discharge of sediment offsite or into onsite sensitive areas.

Sediment controls will be needed for soil stockpiles, at the edges of disturbance, and along the upstream side of interceptor/infiltration ~~or dispersion~~ trenches that are near to upslope disturbances.

Where safe and practical, trench spoils will be placed uphill, or for infiltration or dispersion trenches, removed. Also use:

- ~~BMP C231 Brush Barrier (if brush harvestable onsite or nearby)~~
- BMP C232 Gravel Filter Berm
- BMP C233 Silt Fence
- BMP C234 Vegetated Strip (where available on the east side).
- BMP C235 Wattles placed at the downstream edges of disturbance
- BMPC 251 Construction Stormwater Filtration

These BMPs are not intended to act as a barrier to flows. Check uphill sides for signs of clogging or sediment accumulations more than 1/3 the height of the device. If this occurs, remove the sediment, add another parallel BMP, or replace.

Due to the area of disturbance, to prepare for the event that construction occurs during wet weather and the above do not adequately control sediment, also use:

- BMP C240 Sediment Trap(s)

There are several published approximations available for addressing the needs of sub basins as construction progresses. Sizing of the sediment traps may enlarge a trap above the minimum size shown on the standard drawings. The surface area of the trap is 2080 SF per CFS of inflow from a 2-year runoff event. The 2- year event runoff from either the continuous modelling software or the Rational Method is used to size sediment settling, divided over multiple traps so that each portion of the excavation being worked had a trap before the temporary discharge point. The excavation area is modelled as ½ lawn and ½ impervious to simulate bare soil.

Because this is an extensive site, a larger unit is also selected:

- BMP C241 Temporary Sediment Pond

  (See Form C for sizing)

  The Temporary Sediment pond has at least a 3:1 length to width ratio. If insufficient, add temporary filter fabric or bale baffles in increase sinuosity to between 3:1 and 6:1

The proposed plan is intended as guidance and the Contractor shall be responsible for implementing and maintaining appropriate sediment controls based on changing site conditions.

ELEMENT 5: STABILIZE SOILS

All exposed and unworked soils shall be stabilized by application of effective BMPs that protect the soil from the erosive forces of raindrop impact and flowing water, and wind 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. Soils shall be stabilized at the end of the shift before a holiday or weekend if needed based on the weather forecast. This applies to all soils on site, whether at final grade or not.

Stabilizing soils will be a key to constructing wet season grading and drainage. A wide selection of stabilization BMPS is proposed in order to meet the varied needs of cut and fill slopes, stockpiles, and surfaces brought near grade but not yet paved, including, but not limited to:

- BMP C120 Temporary and Permanent Seeding
- BMP C121 Mulching
- BMP C122 Nets and Blankets
- BMP C123 Plastic Covering
- BMP C124 Sodding
- BMP C125 Topsoiling/Composting
- BMP C126 Polyacrylamide (PAM) for Soil Erosion Protection
- BMP C130 Surface Roughening
- ~~BMP C 131 Gradient Terraces~~
- BMO C140 Dust Control

All of these BMPs require good contact with the ground and prompt repair of areas that are damaged. Check for rills and re-grade to avoid gully formation.

The proposed sediment control details and notes are provided on Sheets C3 through C4 of the Plan set.

ELEMENT 6: PROTECT SLOPES

This project includes trenching and temporary cuts for foundations ~~and/or permanent cut and fill slopes~~ up to 2H: 1V that will need protection from erosion during rainfall and storm events. The site soils will erode before stabilization is achieved, so it is important to divert runoff away from slopes with permanent or temporary interceptors.

In addition to the BMPs listed in elements above, if run-on begins to occur, apply above the slope as needed:

- ~~BMP C200 Interceptor Dike and Swale~~
- BMP C205 Subsurface Drains
- BMP C206 Level Spreader
- BMP C 207 Check Dams
- BMP C208 Triangular Silt Dike to prevent gully formation or other erosion of the constructed slopes.

Direct the flow line of these features at grades of .5 to 1% to an outfall above a permanently stabilized vegetated strip or facility which can safely contain the stormwater.

Check outlets and make timely repairs to avoid gully formation. When the area below the diversion is permanently stabilized, remove the BMP and blend the channel with the natural surface.

Provide drainage to remove ground water intersecting the slope surface of exposed soil areas.
-Not expected ~~*- Primarily for the foundation and built up retaining walls.*~~ Revision V4

ELEMENT 7: PROTECT DRAIN INLETS

Provide protection for all storm drain inlets within or down slope of construction until permanent stabilization is achieved. For inlets that are in operation before permanent stabilization of the disturbed drainage area, apply:

- BMP C220 Storm Drain Inlet Protection (any of multiple configurations)

Check inlet protection filters at least weekly and after storm events. Clean or replace clogged inserts or exterior filters. Take care not to wash sediment into storm drains while cleaning but spread removed material evenly over the surrounding land or move to a stockpile and stabilize as appropriate.

Protection needed at onsite inlets, existing and proposed

ELEMENT 8: STABILIZE CHANNELS AND OUTLETS

All temporary onsite conveyance channels shall be designed, constructed and stabilized to prevent erosion from the peak 10-minute flow velocity from a Type 1A 10-year 24-hour frequency storm for the developed condition, or alternate method ad detailed in the SWMMWW procedure in Vol II Section 3.3.3. Element 8.

Stabilization, including riprap armoring material, adequate to prevent erosion of outlets, adjacent stream banks, slopes and downstream reaches is already provided at the outlet of the conveyance system.

In the event that temporary ~~or permanent~~ channels shows signs of erosion, stabilize with:

- BMP C202 Blanket-lined or Rock-Lined Channels
- ~~BMP C203 Water Bars~~
- ~~BMP C204 Pipe Slope Drains~~
- BMP C205 Subsurface Drains
- BMP C206 Level Spreader
- BMP C207 Check Dams and
- BMP C 208 Triangular Silt Dike (geotextile encased)
- BMP C209 Outlet Protection.

Check on any Channel Stabilization features for inadequate performance, such as erosion at the sides, or sediment accumulation during and after each runoff producing rainfall. If significant erosion occurs between check dams, install a protective liner on that portion of the channel. Remove sediment before it exceeds ½ the depth of the backwater/sump.

ELEMENT 9: CONTROL POLLUTANTS

All pollutants, including waste materials and demolition debris, that occur on-site shall be handled and disposed of in a manner that does not cause contamination of stormwater. See the Source Control section of the Drainage Report for more information. A copy of the permitted and prohibited discharges list is appended to this report for convenience. Use:

- BMP C151 Concrete Handling
- BMP C153 Material Delivery, Storage and Containment

to prevent pollution from concrete foundation wash waters, petroleum products, detergents, soil stabilizers, fertilizers, asphalt compounds, or paints in the event that they are stored on the project site. Such items stored in their usual and accustomed places in the buildings and places outside the construction area are not subject to these construction provisions.

Cover, containment, and protection from vandalism shall be provided for all chemicals, liquid products, petroleum products, and non-inert wastes present on the site (see Chapter 173-304 WAC for the definition of inert waste).

Keep material storage areas clean, organized, and supplied with appropriate spill cleanup materials or kits. Further provisions may be necessary for liquids, petroleum products, and substances listed in 40 CFR Parts 110, 117 of 302. In the unlikely event that these are part of the project site, add to the inspection log document the selection of proper storage, secondary containment, adequate spacing, and other items listed in the BMP.

Maintenance and repair of heavy equipment and vehicles, and other activities which may result in discharge or spillage of pollutants to the ground or into stormwater runoff must be conducted using spill prevention measures, such as drip pans. Contaminated surfaces shall be cleaned immediately following any discharge or spill incident. Report all spills to 911. Emergency repairs may be performed onsite using temporary plastic placed beneath and, if raining, over the vehicle.

Concrete work and other high pH components need appropriate protections, use where needed:

- BMP C152 Sawcutting and Surfacing Pollution Protection
- BMP C154 Concrete Washout Areas
- ~~BMP C250 Construction Stormwater Chemical Treatment~~
- ~~BMP C251 Construction Stormwater Filtration~~
- ~~BMP C252 High pH Neuralization Using CO_2~~
- ~~BMP C253pH Control for High pH Water~~

Application of agricultural chemicals, including fertilizers and pesticides, shall be conducted in a manner and at application rates that will not result in loss of chemical to stormwater runoff. Manufacturers' label recommendations shall be followed for application rates and procedures.

If used, wheel wash, or tire bath wastewater, shall be discharged to a separate onsite treatment system or pumped and hauled to a sanitary sewer facility if allowed by the local wastewater authority.

The Contractor shall be responsible that no wastes enter the runoff.

ELEMENT 10: CONTROL DE-WATERING

Other than gravity footing drains to relieve pressure at foundations and retaining walls, permanent dewatering not expected. In the event that permanent dewatering is needed, contact the geotechnical and civil engineers for coordination of outfall. If temporary dewatering is needed, discharge only non-turbid water to the vegetated areas of the site. Use filters to clean turbid water if necessary, including the use of:

- BMP C 236 Vegetative Filtration.
- BMP C240 Sediment Trap

Highly turbid of otherwise compromised dewatering water, such as from concrete pours or clean up, shall be handled separately from stormwater. (BMP C151 Concrete Handling)

All foundation and trench de-watering water, which has similar characteristics to stormwater runoff at the site, shall be discharged into a controlled conveyance system, prior to discharge to a sediment trap or sediment pond. Channels must be stabilized, as specified in Element #8.

~~Clean, non-turbid de-watering water, such as well-point ground water, can be discharged to systems tributary to state surface waters, as specified in Element #8, provided the de-watering flow does not cause erosion or flooding of the receiving waters. These clean waters should not be routed through stormwater sediment ponds.~~ *Ongoing dewatering not expected.*

Other disposal options, depending on site constraints, may include: 1) infiltration, 2) transport offsite in vehicle, such as a vacuum flush truck, for legal disposal in a manner that does not pollute state waters, 3) onsite treatment using chemical treatment or other suitable treatment technologies, or 4) sanitary sewer discharge– or 5) use of sedimentation bag with outfall to a vegetated ditch or swale for small volumes of localized dewatering.

Significant dewatering activities are not expected during this project; however, the Contractor shall be responsible that no wastes enter the runoff.

ELEMENT 11: MAINTAIN BMP'S

The construction phase erosion and sedimentation BMPs must be maintained until the site is accepted by the jurisdiction as permanently stabilized. The BMP's and any accumulated sediments or waste then need to be removed promptly, within 30 days.

For a construction site of at least 1 acre, (this project disturbs over an acre) a:

- **BMP C160 Certified Erosion and Sediment Control Lead is prescribed,** ~~and is always recommended.~~

The Owner/Contractor must identify the inspector charged with visually examining stormwater that discharges from site, if any, for:

- Suspended sediment,
- Turbidity,
- Discoloration, and
- Oil sheen.

This inspector will evaluate the effectiveness of BMPS and determine if maintenance, repair, or improvement is necessary to achieve discharge thresholds.

- BMP C150 Materials On Hand will allow efficient maintenance.

Inspect BMP implementation and maintenance and document in the site log at least once a week and within 24 hours of a precipitation event that causes a stormwater discharge from the property. In the wet season, inspect daily. Any problems shall be addressed within 10 days of the inspection.

The *TEMPORARY EROSION AND SEDIMENTATION CONTROL MAINTENANCE REQUIREMENTS* on the drawings read as follows:

1. Erosion and sedimentation control facilities shall be inspected after each storm event and daily during prolonged rainfall.
2. Necessary repairs of replacement of facilities shall be accomplished promptly.
3. Sediment deposits shall be removed after each storm event or when the level of deposition reaches approximately one-half the maximum potential depth.
4. Sediment deposits remaining in place after the ESC facilities are no longer required shall be dressed to conform to the existing grade, prepared, and seeded.
5. Temporary erosion and sedimentation control facilities shall be maintained by: _TBD by Contractor_____

ELEMENT 12: MANAGE THE PROJECT

Erosion and sediment control BMPs for this project have been designed based on the following principles:

- Fit the existing topography, soils, and drainage patterns.
- Emphasize erosion control rather than sediment control.
- Minimize the extent and duration of the area exposed.
- Keep runoff velocities low.
- Retain sediment on site.
- Thoroughly monitor site and maintain all ESC measures.
- Schedule major earthwork during the dry season if possible.

If it is determined that the CSWPPP is ineffective in eliminating or significantly minimizing ESC problems, additional BMP measures or modifications will be necessary until the problems are corrected. BMPs may be selected from the alternatives listed in the Volume 2 of the Stormwater Manual. Revisions shall be made within 7 days following the determination of insufficiency.

Sampling and analysis of the stormwater discharged from a construction site may be necessary on a case-by-case basis to ensure compliance with Discharge and Surface Water Standards:

- Discharge: Runoff leaving the construction site shall be free of settleable solids, as measured with an Imhoff Cone and in accordance with Standard Methods for the Examination of Water and Wastewater, most recent edition, American Water Works Association. "Free of settle able solids" shall be defined as measuring less than 2.5 mL/L/hr, for storms up to the water quality design event.
- Surface Water: For storms up to the water quality design event, turbidity downstream of a construction site may not increase more than 5 NTU, if upstream turbidity is 50 NTU or less, and may not increase more than 10 percent, if upstream turbidity is over 50 NTU. To the extent practicable, samples should be taken far enough downstream so that the construction site discharge has been well-mixed with the surface water.

Whenever inspection and/or monitoring reveals that the BMP's identified in the Construction SWPPP are inadequate, due to the actual discharge of or potential to discharge a significant amount of any pollutant, appropriate BMP's or design changes shall be implemented as soon as possible.

In addition to conducting and documenting the daily, weekly, after rainfall and monthly inspections, rainfall-responsive scheduling can reduce the effort necessary to achieve erosion and sedimentation control.

- BMP C162 Scheduling

provides for managing the land-disturbing activities by micro scheduling grading to reduce the amount and duration of soil exposed, especially during rainy periods. Small portions of the site may be cleared, brought to grade, and stabilized before clearing the next section.

Per the DOE, the following activities are exempt from the seasonal clearing and grading limitations:

- Routine maintenance and necessary repair of erosion and sediment control BMP's;
- Routine maintenance of public facilities or existing utility structures that do not (a) expose the soil or (b) result in the removal of the soil's vegetative cover; and
- Self-contained project sites, where there is complete infiltration of the water quality design event runoff within the site.

ELEMENT 13: PROTECT LOW IMPACT DEVELOPMENT BMPS

Construct clog-able portions of any Treatment BMPs such as infiltration, dispersion, and filters after the contributing area receives permanent stabilization treatments.

Clean and remove temporary sediment accumulations from CBs and diversion sumps prior to allowing discharge to the surface dispersion pipes.

If discharge of sediment-laden water to vegetation is used as a protection, re-spread sediment before it accumulates to the degree that it smothers the vegetation.

4. Section 4 - Construction Schedule & Phasing

Construction is expected to begin shortly after permits are obtained. To aid in management of reliable construction, the proponent intends to retain a contractor both experienced and familiar with the area and the soils. A contractor based close to the project site will allow site work scheduling to accommodate the weather patterns as much as practical.

For more specifics on the CSWPPP schedule, the following notes from the TESC drawings are shown on the drawings.

CONSTRUCTION SEQUENCE:

1. HOLD A PRECONSTRUCTION MEETING WITH THE CITY OF PUYALLUP AND OBTAIN REQUIRED PERMITS.
2. ESTABLISH CLEARING AND GRADING LIMITS.
3. CONSTRUCT TEMPORARY CONSTRUCTION ENTRANCE.
4. CONSTRUCT PERIMETER DITCHES, SILT FENCES, AND OTHER EROSION AND CONTROL DEVICES AS SHOWN ON THE PLAN.
5. CONSTRUCT PROTECTION DEVICES FOR CRITICAL AREAS AND SIGNIFICANT TREES PROPOSED FOR RETENTION.
6. SCHEDULE AN EROSION CONTROL INSPECTION WITH THE CITY OF PUYALLUP.
7. GRADING ACTIVITIES MAY ONLY COMMENCE AFTER ALL DRAINAGE AND EROSION CONTROL MEASURES ARE IN PLACE PER THE APPROVED PLAN.
8. IDENTIFY EROSION CONTROL MEASURES WHICH REQUIRE REGULAR MAINTENANCE.
9. EROSION AND SEDIMENT CONTROLS MAY ONLY BE REMOVED ONCE THE SITE IS STABILIZED TO THE CITY OF PUYALLUP SITE INSPECSTOR'S SATISFACTION.

The project shall be phased where feasible to accomplish soil-exposing activities in the dry season. This project has limited activities –grading, connecting utilities, paving, constructing the building improvements and landscaping, that are expected to occur without interruption.

Grading and Drainage during the wet season requires greater vigilance in erosion and sedimentation control. Manage the land-disturbing activities by micro scheduling grading to reduce the amount and duration of soil exposed, especially during rainy periods.

The building foundation portion of the site is expected to be cleared, set to grade, and stabilized with foundation concrete early in the schedule. Backfill for final grade around the building will occur later. And topsoil and plantings near the end of the project in an advantageous weather window for planting.

Transport of sediment from the construction site will be prevented by directing the discharge from the excavation into sediment control features.

In addition to conducting and documenting the daily, weekly, after rainfall and monthly inspections, rainfall-responsive scheduling can reduce the effort necessary to achieve erosion and sedimentation control.

Section 5 – Pollution Prevention

The names of the proponent contact, construction emergency contact and onsite temporary erosion and sedimentation control personnel are recorded on the front cover of this document.

During construction, when erosion and sedimentation pollution are at elevated potential, the primary goal is TESC. A certified CESCL is mandated for sites disturbing more than 1 acre.

After stabilization, the prevention of stormwater pollution from the operations and maintenance of the business become important. This is addressed in the Operations, Maintenance, and Source Control report.

Section 6 – Inspections and Monitoring

All BMPs must be inspected, maintained and repaired as needed to assure continue performance of their intended function. Site inspection shall occur in all areas disturbed by construction activities and at any stormwater discharge point. During inspections, the Contractor shall evaluate and document the effectiveness of the installed BMPs and determine if it is necessary to repair or replace any of the BMPs to improve the quality of stormwater discharges.

All maintenance and repairs shall be documented in the site log. All new BMPs or design changes shall be documented in the SWPPP as soon as possible.

If a project is less than 1 acre and does not discharge to an impaired water body, regular stormwater sampling and reporting to Ecology under the NPDES general construction permit is not triggered.

EROSION CONTROL LEAD

The owner shall identify an Erosion and Sediment Control Lead in the Construction SWPPP and that individual shall be onsite or on call at all times. If a preconstruction meeting is held, this person shall attend. For sites disturbing 1 acre or more, that lead must be a Certified Lead.

Duties and responsibilities of the Lead shall include, but are not limited to the following:

- Maintaining permit file on site 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/weekly logs, and inspection reports. Inspection reports should include:
    - Inspection locations, dates and times.
    - Weather information, including conditions during the inspection and recent rainfall events.

    - A summary list of BMPs implemented, including field observations. The list should include the following:
        - List of all BMPs in place on the project site
        - BMPs inspected
        - BMPs needing maintenance
        - BMPs failed and needing replacement
        - Recommended replacements or other actions
        - Visual observations or water quality monitoring conducted
        - Monitoring results
        - Comments and notes
- Facilitate, participate in, and take corrective actions resulting from inspections performed by outside agencies or the owner.

Keep the contact information up to date if the role is assigned to another. If a pre-construction meeting is held, this person shall attend.

For convenience, inspection report forms follow, and may be reproduced without limitation. A table summarizing how and when to report on the various conditions observed follows the forms.

Section 7 – Record Keeping

The inspection forms may be kept with this document or in a separate log that is also maintained on site or within reasonable access to the site and mad available for viewing upon request to jurisdictional personnel. If requested by a jurisdictional agency in writing, a copy of the records shall be submitted within 14 days.

3-year Records Retention Schedule

The records created as part of implementing and inspecting the CSWPPP shall be retained by the Contractor during the life of the construction project and for at least 3 years following permit coverage. Records may be transferred to Owner following determination of permanent stabilization and BMP removal.

Conclusion - Manage the Project

Erosion and sediment control BMPs for this project have been designed based on the following principles:

- Fit the existing topography, soils, and drainage patterns.
- Emphasize erosion control rather than sediment control.
- Minimize the extent and duration of the area exposed.
- Keep runoff velocities low.
- Retain sediment on site.
- Thoroughly monitor site and maintain all ESC measures.
- Schedule major earthwork during the dry season if possible.

If it is determined that the CSWPPP is ineffective in eliminating or significantly minimizing ESC problems, additional BMP measures or modifications will be necessary until the problems are corrected. BMPs may be selected from the alternatives listed in the SWMMWW. Revisions shall be made within 10 days following the determination of insufficiency.

Form A -Sample Site Inspection Form

From http://www.ecy.wa.gov/programs/wq/stormwater/construction/

Project Name _____ Permit # _____ Inspection Date _____ Time _____

Name of Certified Erosion Sediment Control Lead (CESCL) or qualified inspector if *less than one acre*

Print Name: _____

Approximate rainfall amount since the last inspection (in inches): _____

Approximate rainfall amount in the last 24 hours (in inches): _____

Current Weather Clear ☐ Cloudy ☐ Mist ☐ Rain ☐ Wind ☐ Fog ☐

A. Type of inspection: Weekly ☐ Post Storm Event ☐ Other ☐

B. Phase of Active Construction (check all that apply):

Pre Construction/installation of erosion/sediment controls	☐	Clearing/Demo/Grading	☐	Infrastructure/storm/roads	☐
Concrete pours	☐	Vertical Construction/buildings	☐	Utilities	☐
Offsite improvements	☐	Site temporary stabilized	☐	Final stabilization	☐

C. Questions:

1. Were all areas of construction and discharge points inspected?	Yes ___	No ___
2. Did you observe the presence of suspended sediment, turbidity, discoloration, or oil sheen	Yes ___	No ___
3. Was a water quality sample taken during inspection? (*refer to permit conditions S4 & S5*)	Yes ___	No ___
4. Was there a turbid discharge 250 NTU or greater, or Transparency 6 cm or less?*	Yes ___	No ___
5. If yes to #4 was it reported to Ecology?	Yes ___	No ___
6. Is pH sampling required? pH range required is 6.5 to 8.5.	Yes ___	No ___

If answering yes to a discharge, describe the event. Include when, where, and why it happened; what action was taken, and when.

Form B – BMP Site Inspection

Form B –BMP Site Inspection Form

Copy this form as needed. Mark N for Not functioning, I for Improvement needed, and P for Performing. This form adapted from the Ecology SWPPP Template.

Inspection of BMPs						
Element 1: Mark Clearing Limits						
BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	
BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	
Element 2: Establish Construction Access						
BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	
Element 3: Control Flow Rates						
BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	
BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

Element 4: Install Sediment Controls

BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

Element 5: Stabilize Soils

BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

Element 6: Protect Slopes

BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

Element 7: Protect Drain Inlets

BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

Element 8: Stabilize Channels and Outlets						
BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

Element 9: Control Pollutants						
BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

Element 10: Control Dewatering						
BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

Element 11: Maintain BMPS						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

Element 12: Manage the Project						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

Form C – Sediment Pond Sizing

Sediment Pond Sizing.22.03.26.xlsx

Import or Calculate Design Inflow Rates

Use returns from MGSFLOOD, skip to next section

If Hydrologic Modelling not required, Use Rational Method

Q = CIA

Where:

Q is design inflow rate, approximating Cubic feet per second — Use 2 yr unless 10 yr warranted.
C is a coefficient selected to represent the land surface condition — Select 0.5 for dense residential.
I is the rainfall intensity in inches per hour. — See Mapped Intensities.
A is the area of the basin in acres — Calculate from design drawings.

Location	Condition	Event	C coeff	I in/hr	A acres	Q quantity
Pond 1	BareSoil	2 yr	0.5		0	0.0
	Bare soil	10yr	0.5		0	0.0

Sediment Pond Surface Area Size Calculation and/or Verification Check

Use Published algorithm to calculate required size, and/or check against available size

SA = 2* Q/Vs

Where:

SA is Surface Area in square feet
Q is inflow rate in Cubic Feet per Second — From above
Vs is Velocity of Settling, for silts, listed at 0.00096 feet per second

Location	Event	Q	SA reqd sf	if verifying, enter pond surface area *			Result
Pond 1	2 yr	0.8	1,604	23	70	1,610	OK
Pond 1	10 yr	1.3	2,750	30	92	2,760	OK

* If length/width not at least 3:1, add temporary sinuousation baffles to achieve ratio

Sediment Pond Dimension Calculation and/or Verification Check

Cells Return Calculated SF at ration for entered width

SA reqd / width = length

Where:

Enter value, Minimum width is 7 feet per manual
Acceptable Acceptable length to width is between 3:1 and 6:1

Location	2 yr SA reqd s	ENTER Width >7	Length to Width Ratio 3	4	5	6
Trap 1	-	30	90	120	150	180
	AREA PRODUCED		2,700	3,600	4,500	5,400

Compare to reqd area and iterate until sufficient

3.2.18.4 Maintenance Standards

- Remove sediment from the trap when it reaches 1-foot in depth.
- Repair any damage to the pond embankments or slopes.

Vader ENGINEERING 3/30/2022 1

Sediment Pond Sizing.22.03.26.xlsx

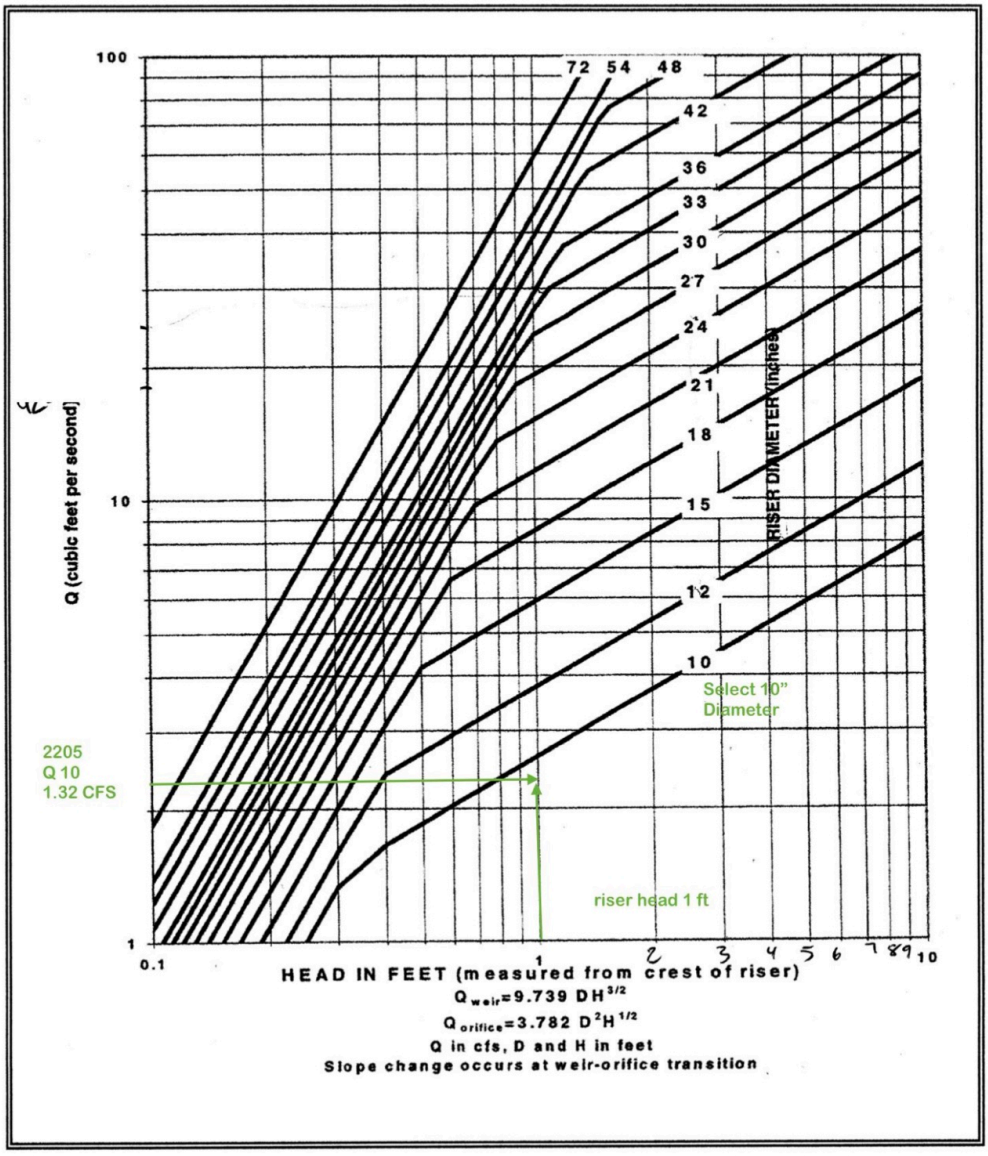


Figure 4.2.21 – Riser Inflow Curves

MGS FLOOD
PROJECT REPORT

Program Version: MGSFlood 4.55
Program License Number: 201910004
Project Simulation Performed on: 03/29/2022 8:11 PM
Report Generation Date: 03/29/2022 8:13 PM

Input File Name: 2205.MGS.3.29.ESC.fld
Project Name: 2205 CCS Track
Analysis Title: ESC Sizing
Comments: Half grass Half impervious to approximate bare subgrade

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 : USGS Default

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

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

Predevelopment/Post Development Tributary Area Summary

	Predeveloped	Post Developed
Total Subbasin Area (acres)	4.252	4.241
Area of Links that Include Precip/Evap (acres)	0.000	0.000
Total (acres)	4.252	4.241

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 2

---------- Subbasin : Track & Field ----------

	-------Area (Acres) --------
Till Grass	1.500
Impervious	1.502
Subbasin Total	3.002

---------- Subbasin : Around T&F ----------

	-------Area (Acres) --------
Till Forest	0.400
Till Grass	0.850
Subbasin Total	1.250

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 4

---------- Subbasin : Rubberized Track-1.01,GrassEnd Zone-0.51 ----------

	-------Area (Acres) --------
Till Grass	0.750
Impervious	0.752

Subbasin Total 1.502

---------- Subbasin : New Field Turf-2. ----------
-------Area (Acres) --------
Till Grass 1.100
Impervious 1.100

Subbasin Total 2.200

---------- Subbasin : Paved High Jump-0.24 ----------
-------Area (Acres) --------
Till Grass 0.120
Impervious 0.120

Subbasin Total 0.240

---------- Subbasin : Concessions, walk and seatting-0.299 ----------
-------Area (Acres) --------
Till Grass 0.149
Impervious 0.150

Subbasin Total 0.299

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

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

Link Name: Copy of New Structure Lnk2
Link Type: Structure
Downstream Link: None

Prismatic Pond Option Used
Pond Floor Elevation (ft) : 57.00
Riser Crest Elevation (ft) : 60.00
Max Pond Elevation (ft) : 61.00
Storage Depth (ft) : 3.00
Pond Bottom Length (ft) : 190.0
Pond Bottom Width (ft) : 135.0
Pond Side Slopes (ft/ft) : L1= 3.00 L2= 3.00 W1= 3.00 W2= 3.00
Bottom Area (sq-ft) : 25650.
Area at Riser Crest El (sq-ft) : 31,824.
(acres) : 0.731
Volume at Riser Crest (cu-ft) : 86,049.
(ac-ft) : 1.975
Area at Max Elevation (sq-ft) : 34026.
(acres) : 0.781
Vol at Max Elevation (cu-ft) : 118,968.
(ac-ft) : 2.731

Hydraulic Conductivity (in/hr) : 0.01
Massmann Regression Used to Estimate Hydralic Gradient
Depth to Water Table (ft) : 5.00
Bio-Fouling Potential : Low
Maintenance : Average or Better

Riser Geometry
Riser Structure Type : Circular
Riser Diameter (in) : 18.00
Common Length (ft) : 0.000
Riser Crest Elevation : 60.00 ft

Hydraulic Structure Geometry

Number of Devices: 2

---Device Number 1 ---
Device Type : Circular Orifice
Control Elevation (ft) : 57.00
Diameter (in) : 5.89
Orientation : Horizontal
Elbow : Yes

---Device Number 2 ---
Device Type : Circular Orifice
Control Elevation (ft) : 58.50
Diameter (in) : 8.00
Orientation : Horizontal
Elbow : Yes

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

----------SCENARIO: POSTDEVELOPED
Number of Links: 3

Link Name: Sediment Pond
Link Type: Structure
Downstream Link: None

Prismatic Pond Option Used
Pond Floor Elevation (ft) : 58.00
Riser Crest Elevation (ft) : 62.00
Max Pond Elevation (ft) : 62.50
Storage Depth (ft) : 4.00
Pond Bottom Length (ft) : 93.0
Pond Bottom Width (ft) : 30.0
Pond Side Slopes (ft/ft) : L1= 0.01 L2= 0.01 W1= 0.01 W2= 0.01
Bottom Area (sq-ft) : 2790.
Area at Riser Crest El (sq-ft) : 2,800.
(acres) : 0.064
Volume at Riser Crest (cu-ft) : 11,180.
(ac-ft) : 0.257
Area at Max Elevation (sq-ft) : 2801.
(acres) : 0.064
Vol at Max Elevation (cu-ft) : 12,580.
(ac-ft) : 0.289

Hydraulic Conductivity (in/hr) : 0.01
Massmann Regression Used to Estimate Hydralic Gradient
Depth to Water Table (ft) : 5.00
Bio-Fouling Potential : Low
Maintenance : Average or Better

Riser Geometry
Riser Structure Type : Circular
Riser Diameter (in) : 10.00
Common Length (ft) : 0.390
Riser Crest Elevation : 62.00 ft

Hydraulic Structure Geometry

Number of Devices: 1

---Device Number 1 ---
Device Type : Circular Orifice
Control Elevation (ft) : 58.00
Diameter (in) : 10.00
Orientation : Horizontal
Elbow : No

Link Name: 10" Sideline pipes as rectangle
Link Type: Structure
Downstream Link Name: Sediment Pond

Prismatic Pond Option Used
Pond Floor Elevation (ft) : 100.00
Riser Crest Elevation (ft) : 101.83
Max Pond Elevation (ft) : 102.83
Storage Depth (ft) : 1.83
Pond Bottom Length (ft) : 770.0
Pond Bottom Width (ft) : 0.7
Pond Side Slopes (ft/ft) : L1= 0.01 L2= 0.01 W1= 0.01 W2= 0.00
Bottom Area (sq-ft) : 508.
Area at Riser Crest El (sq-ft) : 522.
(acres) : 0.012
Volume at Riser Crest (cu-ft) : 943.
(ac-ft) : 0.022
Area at Max Elevation (sq-ft) : 530.
(acres) : 0.012
Vol at Max Elevation (cu-ft) : 1,469.
(ac-ft) : 0.034

Hydraulic Conductivity (in/hr) : 0.01
Massmann Regression Used to Estimate Hydralic Gradient
Depth to Water Table (ft) : 7.00
Bio-Fouling Potential : Low
Maintenance : Average or Better

Riser Geometry
Riser Structure Type : Circular
Riser Diameter (in) : 10.00
Common Length (ft) : 0.000
Riser Crest Elevation : 101.83 ft

Hydraulic Structure Geometry

Number of Devices: 1

---Device Number 1 ---
Device Type : Circular Orifice
Control Elevation (ft) : 100.00
Diameter (in) : 4.00
Orientation : Horizontal
Elbow : Yes

Link Name: Sideline Infilt Trench
Link Type: Infiltration Trench
Downstream Link: None

Trench Type : Trench at Toe of Embankment
Trench Length (ft) : 384.00
Trench Width (ft) : 20.00
Trench Depth (ft) : 2.00
Trench Bottom Elev (ft) : 100.00
Trench Rockfill Porosity (%) : 30.00

Hydraulic Conductivity (in/hr) : 0.10
Massmann Regression Used to Estimate Hydralic Gradient
Depth to Water Table (ft) : 5.00
Bio-Fouling Potential : Low
Maintenance : Average or Better

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

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 2
Number of Links: 1

********** Link: Copy of New Structure Lnk2 ********** Link WSEL Stats
WSEL Frequency Data(ft)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	WSEL Peak (ft)
1.05-Year	57.051
1.11-Year	57.060
1.25-Year	57.070
2.00-Year	57.099
3.33-Year	57.130
5-Year	57.160
10-Year	57.206
25-Year	57.293
50-Year	57.316
100-Year	57.401

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 4
Number of Links: 3

********** Link: Sediment Pond ********** Link WSEL Stats
WSEL Frequency Data(ft)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	WSEL Peak (ft)
1.05-Year	58.025
1.11-Year	58.029
1.25-Year	58.036
2.00-Year	58.070
3.33-Year	58.120
5-Year	58.142
10-Year	58.222
25-Year	58.385
50-Year	58.514
100-Year	58.662

************Groundwater Recharge Summary **************
Recharge is computed as input to Perlnd Groundwater Plus Infiltration in Structures

Total Predeveloped Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: Track & Field	183.316
Subbasin: Around T&F	172.851
Link: Copy of New Structur	2.732
Total:	358.898

Total Post Developed Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: Rubberized Track-1.0	91.658
Subbasin: New Field Turf-2.	134.432
Subbasin: Paved High Jump-0.24	14.665
Subbasin: Concessions, walk an	18.209
Link: Sediment Pond	0.125
Link: 10" Sideline pipes a	Not Computed
Link: Sideline Infilt Tren	Not Computed
Total:	259.089

Total Predevelopment Recharge is Greater than Post Developed
Average Recharge Per Year, (Number of Years= 158)
Predeveloped: 2.272 ac-ft/year, Post Developed: 1.640 ac-ft/year

************Water Quality Facility Data **************

----------SCENARIO: PREDEVELOPED

Number of Links: 1

********** Link: Copy of New Structure Lnk2 **********

Infiltration/Filtration Statistics----------
Inflow Volume (ac-ft): 1182.37
Inflow Volume Including PPT-Evap (ac-ft): 1182.37
Total Runoff Infiltrated (ac-ft): 2.73, 0.23%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 1180.42
Secondary Outflow To Downstream System (ac-ft): 0.00
Volume Lost to ET (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered+ET)/Total Volume: 0.23%

----------SCENARIO: POSTDEVELOPED

Number of Links: 3

********** Link: Sediment Pond **********

Basic Wet Pond Volume (91% Exceedance): 11879. cu-ft
Computed Large Wet Pond Volume, 1.5*Basic Volume: 17818. cu-ft

Infiltration/Filtration Statistics----------
Inflow Volume (ac-ft): 1377.42
Inflow Volume Including PPT-Evap (ac-ft): 1377.42
Total Runoff Infiltrated (ac-ft): 0.12, 0.01%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 1378.22
Secondary Outflow To Downstream System (ac-ft): 0.00
Volume Lost to ET (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered+ET)/Total Volume: 0.01%

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

Scenario Predeveloped Compliance Link: Copy of New Structure Lnk2
Scenario Postdeveloped Compliance Link: Sediment Pond

***** 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	0.772	2-Year	0.707
5-Year	1.026	5-Year	1.004
10-Year	1.322	10-Year	1.255
25-Year	1.779	25-Year	1.654
50-Year	2.352	50-Year	1.910
100-Year	2.747	100-Year	2.170
200-Year	2.850	200-Year	2.281
500-Year	2.976	500-Year	2.424

** 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%):	127.0%	FAIL
Maximum Excursion from 50%Q2 to Q2 (Must be Less Than or Equal to 0%):	127.0%	FAIL
Maximum Excursion from Q2 to Q50 (Must be less than 10%):	42.1%	FAIL
Percent Excursion from Q2 to Q50 (Must be less than 50%):	59.1%	FAIL

FLOW DURATION DESIGN CRITERIA: FAIL

****** LID Duration Performance ******

Excursion at Predeveloped 8%Q2 (Must be Less Than 0%):	24.6%	FAIL
Maximum Excursion from 8%Q2 to 50%Q2 (Must be Less Than 0%):	145.6%	FAIL

LID DURATION DESIGN CRITERIA: FAIL

End of CSWPPP document.

Page inserted for duplex print spacing.

Appendix C: O&M – OPERATIONS, MAINTENANCE & SOURCE CONTROL MANUAL

Retention Requirement

A copy of this Manual shall be retained onsite or within reasonable access to the site, and shall be transferred with the property to the new owner. To facilitate retention and transmission, this document is published as a stand-alone text titled Operations, Maintenance, and Source Control Manual.

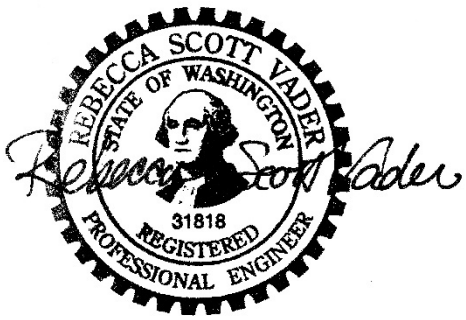
A log of maintenance activity that indicate what actions were taken shall also be kept and be available for inspection.

Track and Field Improvements
815 21st ST SE
Puyallup, WA 98372
Parcel #: 0420352148
Owner: Cascade Christian Schools

Stormwater Operations, Maintenance & Source Control Manual

Stormwater Owner's designated Facility Manager:
_____
Address: _____
_____
Phone Cell: _____
Email: _____

Permit # PRCCP 20220589



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Introduction to Maintenance and Source Control Manuals

This Stormwater Operations, Maintenance, and Source Control Manual is a required element of the overall Stormwater Drainage Narrative submitted as supporting documentation for permits required by the jurisdiction for the construction of the proposed Project, and as an aid and a reference to the property owner and future facility manager. The manual and appendices contain forms, checklists, and other aids for use after construction and throughout the operations period.

To keep stormwater quality intact and infrastructure in good condition, new projects use both Operational and Source Control Best Management Practices (BMPs) to preclude damage to the stormwater systems and Maintenance practices to preserve the function of the stormwater components. Routine, scheduled maintenance extends the time between major repairs or replacements.

This manual describes what maintenance conditions to check for, and how often to check, for the various facilities that make up the stormwater system on this site. Private facility owners are responsible for ensuring that their stormwater facilities are maintained and continue to function as designed. Maintenance may be done in-house, by a maintenance contractor, or a mix of parties.

Stormwater management facilities are most effective coupled with good operations procedures. Good operations, such as educating facility users of proper storage and disposal of chemicals and potential pollutants, procedures for spill cleanup, proper use of fertilizers and other vegetation management products, and maintenance of equipment to prevent release of pollutants to the stormwater system, are termed Source Control BMPs.

Source control BMPS are addressed for the expected activities on the site. If the use of the site changes, the selection of source controls will need to be updated to match.

This is completed using the format set forth in Volume V of the *2012 Department of Ecology (DOE) Stormwater Management Manual for Western Washington,* as adopted and amended by the City of Puyallup. Maintenance checklists are from *City of Puyallup Site Management Plan for Stormwater Operations and Maintenance (SMP),* unless otherwise noted.[Revision V4.]

Since these reports draw heavily on reference documents, lists, and standards, in certain areas of the report, typical items may be included in the text to indicate that they were considered but ~~struck through~~ to show that they are not applicable to this project. Correspondingly, lists may also have <u>underlined</u> or **Bold** text to indicated selected items.

1. Maintenance Importance and Intent

Private facility owners are responsible for ensuring that their stormwater facilities are maintained and continue to function as designed. This section addresses the operations, maintenance, and source control deriving from the areas of concern constructed by the proposed project, and is intended to be a living document used by both the facility owner, the tenant/site operator, and the individuals performing the work, even if a third party.

> "The importance of maintenance for the proper functioning of stormwater control facilities cannot be over-emphasized. A substantial portion of failures (clogging of filters, resuspension of sediments, loss of storage capacity, etc.) are due to inadequate maintenance. Stormwater BMP maintenance is essential to ensure that BMPs function as intended throughout their full life cycle."

The fundamental goal of maintenance activities is to ensure the entire flow regime designed for this site continues to function as designed. For this site these include:

- Maintain ability to safely convey design stormwater flows.
- Maintain stormwater runoff quality.
- Clearly identify systems so they can be protected.
- Keep maintenance costs low.
- Prevent large-scale or expensive stormwater system failures.
- Prevent water quality violations or damage to downstream features.

The intent of this section and manual is to pass on to the responsible party(s) all the information critical to understand the design of the system, risks and considerations for proper use, suggestions for maintenance frequencies, and cost so that realistic budgets can be established.

Annual Cost of Maintenance

Costs to maintenance the facilities vary by type, but the budgeting rule of thumb is that annual costs will be 5 to 10% of the Stormwater facility's total capital cost if provided by contractors. Once vegetation is established (where used), routine measures are estimated to have an annual cost of $200 to $600 per acre of facility, with the remaining costs credited toward funding eventual replacement of decayed stormwater features.

Cascade Christian Schools is expected to accomplish these duties with direct employees and may supplement with contractors from time to time to meet operational needs.

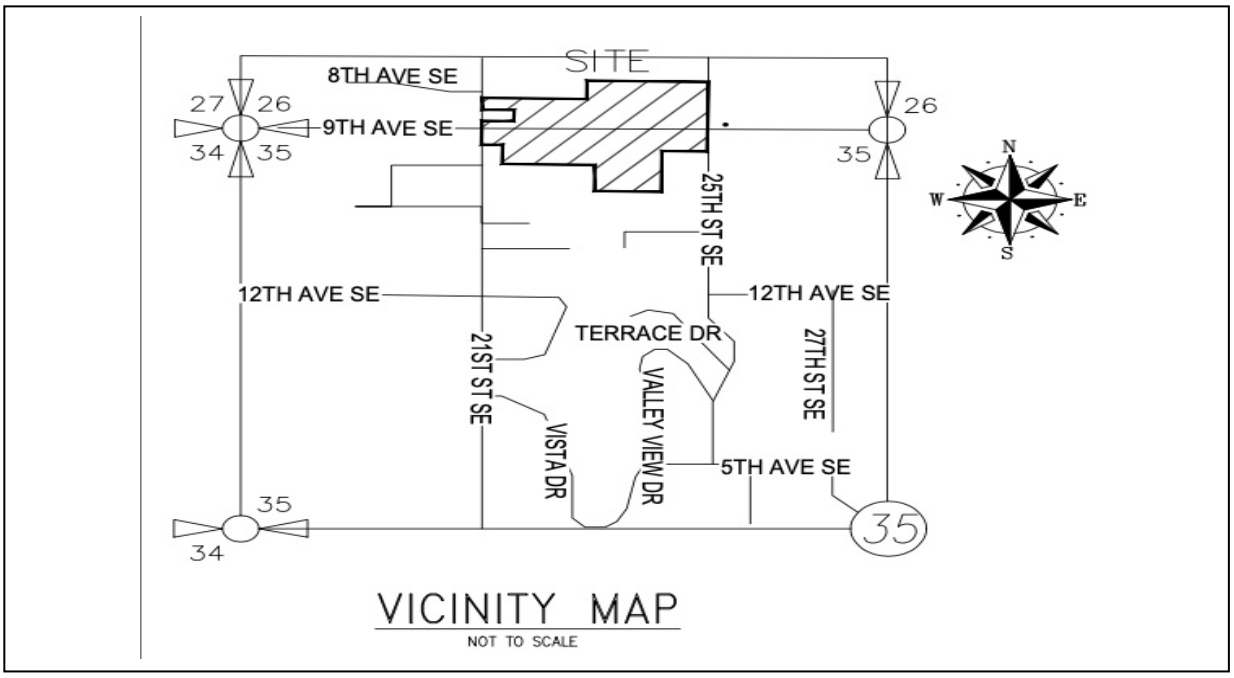
Routine, scheduled maintenance extends the time between major repairs or replacements. Most facilities have life expectancies of 25 to 50 years, with longer life spans achievable by conscientious maintenance.

2. Project Location and Access Description

This project is to construct a small building and parking lot. It is a stand-alone project and an addition to a completed facility.

Addresses:	815 21st ST SE, Puyallup, WA 98372
Cross Street	21st ST SE
Directions to Facilities	Use Internal Drive aisles
Parcel Number:	0420352148
Outfall:	Infiltration in detention pond, overflow to Deer Creek

Figure 1 Vicinity Map



This project proposes to re-build a track and field on the site of the one that is smaller than athletic regulation and in need of significant maintenance, add the lighting from the master plan, and to add the adjoining seating. ~~and Restrooms/ Concession building~~.[Revision V4] The existing pathways and field entrance will have minor changes for ADA access. The project area totals about 4.3 acres of a larger, developed campus. The balance of the campus that drains to distinct onsite basins will not be modified in the SW management design. No work within a ROW is proposed.

The proponent intends to provide stormwater facilities below ground for the new and replaced areas and retain the use of the existing collection system in the areas remaining unchanged. The project projects no impacts to critical areas so includes no mitigation on or adjacent to the site.
Improvements in the Right of Way are ot expected, but if constructed will be maintained by the City of Puyallup and are not addressed here.

3. Facility Purpose and Performance Mechanisms

The following chart describes the stormwater BMPs and conveyance systems, and how these systems are designed to manage the volume, rate, and quality of stormwater runoff from the project.

Table: BMPs and Conveyance Purposes

BMP or Conveyance	Volume Management	Rate Management	Quality Management
Soil Amendment **Mulch**	Absorbs more precipitation than compacted or organic poor soils.	Increases time to first runoff and Decreases overall runoff volume.	Increases Biological activity – Caution, also leaches excess nutrients.
~~Dispersion, Partial or Full~~	~~Promotes evaporation and transpiration by Spreading volume over large area.~~	~~Increases time to first runoff and Decreases overall runoff volume.~~	~~Increases Biological activity – Caution, also leaches excess nutrients.~~
Catch Basins	Collects excess surface water.	None.	Settles out sediment and traps floating debris so discharge is cleaner.
Pipe	Carries flows to suitable discharge structure.	Pipe size and slope selected to carry volumes.	None.
Detention Assembly (Pond, Vault, Pipe Array**)**	Temporarily stores volume.	Controls release rate.	Only if wet pool is included or soils achieve quality.
~~Treatment Assembly **(filters,** separators, dead storage, etc)~~	~~None.~~	~~None.~~	~~Traps sediment and floating debris, filters and absorbs some dissolved elements.~~
~~Pervious Pavements~~	~~Absorbs Precipitation.~~	~~Increases time to first runoff and Decreases overall runoff volume.~~	~~Depends mostly on underlying native soils. Some Filtration.~~
~~**Infiltration Trenches** Pond Drywell~~	~~Absorbs precipitation.~~	~~Increases time to first runoff and Decreases overall runoff volume.~~	~~Depends mostly on underlying native soils. Some Filtration.~~
~~Bioretention, Rain Gardens~~	~~Absorbs precipitation.~~	~~Increases time to first runoff~~	~~Promotes biological sorption and filtration.~~

4. Description of Facilities Requiring Maintenance

A list of all stormwater structures and BMPs requiring maintenance is provided below, and shown graphically on Figure C-2 (existing) and C-3 (new on 2019 plans). All of the stormwater structures and BMPs requiring maintenance are the responsibility of the landowner.

Table: Facilities Requiring Maintenance

BMP or Stormwater Structure	Purpose	Functions by	Maintenance Requirement
Soil Amendment Mulch	Reduce runoff quantity and improve quality.	Gravity, storage capacity, and biological activity.	Keep Porosity and organic content high.
~~Roof Gutters and Downspouts~~ Revision V4	~~Carries flows to suitable discharge structure.~~	~~Gravity and channelization.~~	~~Keep Clean and free flowing.~~
Catch Basins (CB) and Storm Drain Man Holes (SDMH)	Collects excess surface water, settles out sediment and traps floating debris.	Still water over sump capacity.	Keep Clean and free flowing.
Pipes	Carries flows to suitable discharge structure.	Gravity and channelization.	Keep Clean and free flowing.
Treatment	Improve water quality	Gravity, biologic action, filtration.	Keep Clean and free flowing.
~~**Infiltration Trenches** And/or Permeable Paving~~	~~Reduce runoff quantity and/or improve quality~~	~~Gravity, storage capacity, and infiltration~~	~~Keep clean and retain porosity.~~
Detention Assembly	Reduce runoff rate by storing water temporarily.	Gravity and storage capacity.	Keep clean and retain volume.

Maintenance checklists for stormwater structures and BMPs requiring maintenance are attached as a list at the end of this text.

Table: Stormwater Additions Schedule

Stormwater Additions Schedule							
Pipes – PVC SDR 35, Infiltration- Aluminized CMP ALTA2 -16 gauge, or A-2000 PVC							
Designation	**Dia.**	**Material**	**Discharge**	**From**	**To**	**Slope**	**Remarks**
Track Detention	Brentwood ST-36 Modules 5460 SF			Interceptor	48” outfall	N/A	-Direct connection to outfall pipe to avoid conflict with route around building.
Track & Field Interceptor Assembly	10”	A-2000 PVC or Al CMP	encircling	Under drains	Detention Modules	0.5%	Connector
~~Concession Roof~~	~~6”~~	~~A-2000 AL CMP~~	~~Splash~~	~~Roof~~	~~Pond~~	~~N/A~~	Revision v4 removed concessions
SD ByPass Re-route	48”	Smooth-walled, water-tight. Shop Drawing required	Same as existing	Eastern offsite/ 25th	Western Offsite/ 21st	0.39%	84 LF and 3 additional SD MH to re-route around concession building.

Revision 1

5. Ownership and Responsible Parties

This section of the Maintenance and Source Control Manual identifies the party (or parties) the owner has made responsible for maintenance and operation of all stormwater structures and BMPs requiring maintenance. When the facility is in operation, keep the following up to date.

Stormwater Facility Manager:
Address:
Phone
Email:

Name of Maintenance Contractor:
Address:
Phone: Cell:
Email:
Contact Person:

Space for Update Name of Maintenance Contractor:
Address:
Phone: Cell:
Email:
Contact Person:

Space for Update Name of Maintenance Contractor:
Address:
Phone: Cell:
Email:
Contact Person:

The ultimate responsibility rests with the owner:
Cascade Christian Schools
811 21st ST Se
Puyallup, WA 98372
253-606-1854

6. Project History

This project is a re-build and expansion of a track and field with lighting ~~a concession stand complex~~Revision V4 and seating. The stormwater facilities constructed under that permit are functioning and will be retained. The new stormwater system will connect to the existing system, and overflows, if any, will discharge to Deer Creek. Please see the existing and new stormwater site plan figure above.

7. Maintenance and Inspection Plan and Instructions

This plan and instructions outline conditions for determining if maintenance actions are required, as identified through inspection. However, they are not intended to be measures of the facility's required condition at all times between inspections. Exceedance of these conditions at any time between inspections or maintenance activity does not automatically constitute a violation of these standards. However, based upon inspection observations, the inspection and maintenance presented in the checklists shall be adjusted to minimize the length of time that a facility is in a condition that requires a maintenance action.

The purpose of the items in the Stormwater Structures list is to collect runoff and excess subsurface drainage and, if necessary, move it to a treatment BMP so that the acceptable quality is attained before discharge. These structures all function by gravity flow, and do not require active processes to function. Maintenance is needed to keep them clean and free-draining. Stormwater Structures on this project will consist of:

- ~~Gutters & Downspouts,~~ Revision V4
- Catch Basins,
- Conveyance Pipes,
- Detention Vault
- Track Interceptor

The purpose of items in the BMP list is to control outlet flow rates and/or to restore the water quality by removing natural sediment, deposited particles, liquid drips, and other substances from the runoff before it leaves the site. For this site, the BMPs are a mix of constructed and natural functions. They are passive and function by a combination of gravity, filtration, and microbial action. Maintenance is needed to prevent them from being overtaken by other uses. BMPs on this project will consist of:

- Existing Bioswale
- Mulch beds in soil areas

A. Pollution Source Control Measures

Pollution source control is the application of pollution prevention practices on a developed site to reduce contamination of stormwater runoff at its source. BMPs and resource management systems are designed to reduce the amount of contaminants used, and potentially discharged to the environment, so that stormwater is of good quality.

Potential Pollutant Generating Sources

This section of the Maintenance and Source Control Manual contains pollution source controls that are specifically applicable to the proposed uses on site.

- S411 BMPs for Landscaping and Lawn/ Vegetation Management
- S417 BMPs for Maintenance of Stormwater Drainage and Treatment Systems
- S421 BMPs for Parking and Storage of Vehicles and Equipment
- S424 BMPs for Roof/ Building Drains at Manufacturing and Commercial Buildings

S411 BMPs for Landscaping and Lawn/ Vegetation Management

Operational BMPS

• Install engineered soil/landscape systems to improve the infiltration and regulation of stormwater in landscaped areas.

• Do not dispose of collected vegetation into waterways or storm sewer systems.

• Conduct mulch-mowing whenever practicable.

• Dispose of grass clippings, leaves, sticks, or other collected vegetation, by composting, if feasible.

• Use mulch or other erosion control measures on soils exposed for more than one week during the dry season or two days during the rainy season.

• Store and maintain appropriate oil and chemical spill cleanup materials in readily accessible locations when using oil or other chemicals. Ensure that employees are familiar with proper spill cleanup procedures.

• Till fertilizers into the soil rather than dumping or broadcasting onto the surface. Determine the proper fertilizer application rate for the types of soil and vegetation encountered.

• 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.

• Use manual and/or mechanical methods of vegetation removal rather than applying herbicides, where practical.

• Post notices and delineate the spray area prior to the application, as required by the local jurisdiction or by Ecology.

• Conduct spray applications during weather conditions as specified in the label direction and applicable local and state regulations. Do not apply during rain or immediately before expected rain.

Recommended Additional Operational BMPs for the use of pesticides:

• Consider alternatives to the use of pesticides such as covering or harvesting weeds, substitute vegetative growth, and manual weed control/moss removal.

• Consider the use of soil amendments, such as compost, that are known to control some common diseases in plants, such as Pythium root rot, ashy stem blight, and parasitic nematodes. The following are three possible mechanisms for disease control by compost addition (USEPA Publication 530-F-9-044):

1. Successful competition for nutrients by antibiotic production;
2. Successful predation against pathogens by beneficial microorganism; and
3. Activation of disease-resistant genes in plants by composts.

Installing an amended soil/landscape system can preserve both the plant system and the soil system more effectively. This type of approach provides a soil/landscape system with adequate depth, permeability, and organic matter to sustain itself and continue working as an effective stormwater infiltration system and a sustainable nutrient cycle.

• Once a pesticide is applied, evaluate its effectiveness for possible improvement. Records should be kept showing the effectiveness of the pesticides considered.

• Rinseate from equipment cleaning and/or triple-rinsing of pesticide containers should be used as product or recycled into product.

S417 BMPs for Maintenance of Stormwater Drainage and Treatment Systems

Pollutant Control Approach: Provide maintenance and cleaning of debris, sediments, and oil from stormwater collection, conveyance, and treatment systems to obtain proper operation.

Operational BMPS

Maintain stormwater treatment facilities per the operations and maintenance (O&M) procedures presented in Section 4.6 of Volume V in addition to the following BMPs:

• 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. Ensure adequacy of storm sewer capacities and prevent heavy sediment discharges to the sewer system.

• Regularly remove debris and sludge from BMPs used for peak-rate control, treatment, etc. and discharge to a sanitary sewer if approved by the sewer authority, or truck to an appropriate local or state government approved disposal site.

• 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 Type 1L basins) 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.

• Clean woody debris in a catch basin as frequently as needed to ensure proper operation of the catchbasin.

• Post warning signs; “Dump No Waste - Drains to Ground Water,” “Streams,” “Lakes,” or emboss on or adjacent to all storm drain inlets where possible.

• Disposal of sediments and liquids from the catch basins must comply with “Recommendations for Management of Street Wastes” described in Appendix IV-G of this volume.

S421 BMPs for Parking and Storage of Vehicles and Equipment

Of the Potential Pollutant Generating Sources listed for S421 Parking and Storage of Vehicles and Equipment, the following pollutant sources are not expected at this site:

- Not a Defined “High-Use” site
    - < 100 ADT/1,000 SF for gross building area
    - < 25 diesel vehicles over 10 tones gross weight.

Operational BMPS

Clean parking lot by sweeping. Do not hose down into stormwater system.

Storage of Solid Wastes

Improper storage of recycling, yard waste, and trash can lead not only to water pollution problems, but problems with neighborhood pets and vermin as well. Following the BMPs listed below can help keep the property a clean and healthy place.

All recycling and waste containers kept outside should have lids. If the lid is damaged, repair or replace it as soon as possible. If the container is supplied by your hauler, please call to have the lid repaired or replaced

- Leaking containers should be replaced. If your container is supplied by your hauler, contact the hauler to have damaged containers replaced.

- Store containers under cover if possible, or on grassy areas.

- Inspect the storage area regularly to pick up loose scraps of material and dispose of them properly.

- Reduce waste where possible.

S424 BMPs for Roof/ Building Drains at Manufacturing and Commercial Buildings

Pollutant Control Approach: Evaluate the potential sources of stormwater pollutants and apply source control BMPs where feasible.

Operational BMPS

- If leachates and/or emissions from buildings are suspected sources of stormwater pollutants, then sample and analyze the stormwater draining from the building.

- Sweep the area routinely to remove any zinc residuals.

- If a roof/building stormwater pollutant source is identified, implement appropriate source control measures such as air pollution control equipment, selection of materials, operational changes, material recycle, process changes, etc.

Structural Source Control BMPs:

- Paint/coat the galvanized surfaces as described in Ecology Publication # 08-10-025.

O & M Appendix A: Maintenance Checklists

Maintenance instructions are intended to explain to future property owners the purpose of each flow control element (BMP) and how it must be maintained and operated. A set of minimum maintenance instructions is provided for each flow control BMP selected. Maintenance checklists are from *City of Puyallup Site Management Plan for Stormwater Operations and Maintenance (SMP),* unless otherwise noted.[Revision V4.]

Support information is supplied in this section from Volume V of Department of Ecology *Stormwater Management Manual for Western Washington,* issued December 2024.

Maintenance timelines vary according to the severity of the impact.

Emergency Action:
Where maintenance and repair is necessary to correct health or safety problems, to prevent harmful materials from entering the stormwater system, or to remove harmful materials that have entered the stormwater system, such work shall be completed by the owner or operator of the stormwater system or stormwater facility within 24 hours of discovery of the need for maintenance or repair.

See section 5 for the emergency contact phone number.

Triggered Maintenance:
When maintenance and repair is found necessary to prevent water quality degradation, such work shall be completed within 14 calendar days of discovery of the need for maintenance or repair.

Routine Maintenance:
For other related problems, maintenance or repairs shall be completed within 30 calendar days of discovery or repair.

Maintenance and Inspection Record Keeping:
Maintenance performed shall be logged either on this document and it's copies, or in an electronic format that may be printed or transmitted to another party.

City of Puyallup's template Stormwater Annual Inspection Report is attached below, followed by checklists for the stormwater features.

Annual Inspection Report

City of Puyallup – Stormwater BMP Facilities Inspection and Maintenance Log

Return Form to:
Stormwater Engineer/ City of Puyallup
333 South Meridian
Puyallup, WA 98371

Facility Name: _____

Address: _____

Begin Date: _____ End Date: _____

Date	BMP ID#	BMP facility Description	Inspected By	Cause for Inspection	Exceptions Noted	Notes / Actions Taken

Instructions:

Record all inspections and maintenance for all treatment BMP's on this form. Use additional log sheets and/or attach extended comments or documentation as necessary. Submit a copy of the completed log with the Annual Independent Inspector Report to the City, and start a new log at that time. Checklists provided should be used prior to filling out this form. If you have any questions on how to complete your inspection, please contact City staff.

BMP ID #- always use ID# from the Operation and Maintenance Manual.
Inspected by- Note all Inspections and maintenance on this form, including the required independent annual inspection.
Cause for Inspection- Note if the inspection is routine, pre-rainy season, post storm, annual, or in response to a noted problem or complaint.
Exceptions Noted- Note any condition that requires correction or indicates a need for maintenance.
Notes / Actions Taken- Describe any maintenance done and need for follow up.

Catch Basin

Catch Basin			
Drainage System Feature	Potential Defect	Conditions When Maintenance Is Needed	Minimum Performance Standard
			Note: table spans multiple pages.
General	Trash and Debris	Trash or debris which is located immediately in front of the catch basin opening or is blocking inletting capacity of the basin by more than 10%.	No trash or debris located immediately in front of catch basin or on grate opening.
		Trash or debris (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of six inches clearance from the debris surface to the invert of the lowest pipe.	No trash or debris in the catch basin.
		Trash or debris in any inlet or outlet pipe blocking more than 1/3 of its height.	Inlet and outlet pipes free of trash or debris.
		Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).	No dead animals or vegetation present within the catch basin.
	Sediment	Sediment (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6 inches clearance from the sediment surface to the invert of the lowest pipe.	No sediment in the catch basin.
	Structure Damage to Frame and/or Top Slab	Top slab has holes larger than 2 square inches or cracks wider than 1/4 inch. (Intent is to make sure no material is running into basin.)	Top slab is free of holes and cracks.
		Frame not sitting flush on top slab, i.e., separation of more than 3/4 inch of the frame from the top slab. Frame not securely attached.	Frame is sitting flush on the riser rings or top slab and firmly attached.
	Fractures or Cracks in	Maintenance person judges that structure is unsound.	Basin replaced or repaired to design standards.

	Basin Walls/ Bottom	Grout fillet has separated or cracked wider than 1/2 inch and longer than 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering catch basin through cracks.	Pipe is regrouted and secure at basin wall.
	Settlement/ Misalignment	Catch basin has settled more than 1 inch or has rotated more than 2 inches out of alignment.	Basin replaced or repaired to design standards.
	Vegetation Inhibiting System	Vegetation growing across and blocking more than 10% of the basin opening.	No vegetation blocking opening to basin.
		Vegetation growing in inlet/outlet pipe joints that is more than six inches tall and less than six inches apart.	No vegetation or root growth present.
	Contaminants and Pollution	Any evidence of oil, gasoline, contaminants, or other pollutants. Sheen, obvious oil, or other contaminants present. • Identify and remove source	No contaminants or pollutants present.
Catch Basin Cover	Cover Not in Place	Cover is missing or only partially in place. Any open catch basin requires maintenance.	Catch basin cover is closed.
	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 1/2 inch of thread. One or more bolts are missing.	Mechanism opens with proper tools. All bolts are seated and no bolts are missing. Cover is secure.
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure (Intent is to keep cover from sealing off access to maintenance).	Cover can be removed by one maintenance person.
Metal Grates (If Applicable)	Grate Opening Unsafe	Grate with opening wider than 7/8 inch.	Grate opening meets design standards.
	Trash and Debris	Trash and debris that is blocking more than 20% of grate surface inletting capacity.	Grate free of trash and debris.
	Damaged or Missing	Grate missing or broken member(s) of the grate.	Grate is in place and meets design standards.
Oil/Debris Trap (If Applicable)	Dislodged	Oil or debris trap is misaligned with or dislodged from the outlet pipe.	Trap is connected to and aligned with outlet pipe.

Compost-Amended Soil

Compost-Amended Soil			
Drainage System Feature	Potential Defect	Conditions When Maintenance Is Needed	Minimum Performance Standard
Soil Media	Soils Waterlogged or Not Infiltrating	Soils become waterlogged, or otherwise do not appear to be infiltrating.	Soils have been aerated or amended such that infiltration occurs and soils to not remain completely saturated, per design specifications.
	Erosion/Scouring	Areas of potential erosion are visible, such as gullies or scouring.	Any eroded areas have been repaired, and sources of erosion addressed to prevent further soil erosion.
Vegetation	Vegetation in Poor Health	Less than 75% of planted vegetation is healthy with a generally good appearance.	At least 75% of planted vegetation is healthy with generally good appearance. Any conditions found that were deleterious to plant health have been corrected where possible. Routine maintenance schedule has been updated as necessary to ensure continued plant health and satisfactory appearance.
	Poisonous Plants and Noxious Weeds	Any poisonous plants or nuisance vegetation which may constitute a hazard to maintenance personnel or the public. Any evidence of noxious weeds as defined by State or local regulations.	No danger of poisonous vegetation where maintenance personnel or the public might normally be. Eradication of Class A weeds as required by State law. Control of other listed weeds as directed by local policies. Apply requirements of adopted IPM policy for the use of herbicides.
	Other Weeds Present	Other weeds (not listed on City/State noxious weed lists) are present on site.	Weeds have been removed per the routine maintenance schedule, following IPM protocols.

Conveyance Pipe

Conveyance Pipe			
Drainage System Feature	Potential Defect	Conditions When Maintenance Is Needed	Minimum Performance Standard
General	Contaminants and Pollution	Any evidence of oil, gasoline, contaminants, or other pollutants. Sheen, obvious oil, or other contaminants present. • Identify and remove source.	No contaminants or pollutants present.
	Obstructions, Including Roots	Root enters or deforms pipe, reducing flow.	Roots have been removed from pipe (using mechanical methods; do not put root-dissolving chemicals in storm sewer pipes). If necessary, vegetation over the line removed.
	Sediment and Debris	Sediment depth is greater than 20% of pipe diameter.	Pipe has been cleaned and is free of sediment/ debris. (Upstream debris traps installed where applicable.)
	Debris Barrier or Trash Rack Missing	Stormwater pipes > than 18 inches need debris barrier.	Debris barrier present on all stormwater pipes 18 inches and greater.
	Damage to protective coating or corrosion	Protective coating is damaged; rust or corrosion is weakening the structural integrity of any part of pipe.	Pipe repaired or replaced.
	Damaged	Any dent that decreases the cross section area of pipe by more than 20% or is determined to have weakened structural integrity of the pipe.	Pipe repaired or replaced.

Detention Pond

Detention Pond			
Drainage System Feature	Potential Defect	Conditions When Maintenance Is Needed	Minimum Performance Standard
			Note: table spans multiple pages.
General	Trash and Debris	Any trash and debris which exceed 1 cubic foot per 1,000 square feet. In general, there should be no visual evidence of dumping. If less than threshold all trash and debris will be removed as part of next scheduled maintenance.	Site is free of trash and debris.
	Poisonous Plants and Noxious Weeds	Any poisonous plants or nuisance vegetation which may constitute a hazard to maintenance personnel or the public. Any evidence of noxious weeds as defined by State or local regulations.	No danger of poisonous vegetation where maintenance personnel or the public might normally be. Eradication of Class A weeds as required by State law. Control of other listed weeds as directed by local policies. Apply requirements of adopted IPM policy for the use of herbicides.
	Vegetation Growth and Hazard Trees	Vegetation growth does not allow maintenance access or interferes with maintenance activity (i.e., slope mowing, silt removal, vacuuming, or equipment movements). If trees are not interfering with access or maintenance, do not remove. Dead, diseased, or dying trees are identified. (Use a certified Arborist to determine health of tree or removal requirements.)	Vegetation does not hinder maintenance activities. Harvested vegetation should be recycled into mulch or other beneficial uses (e.g., alders for firewood). Remove hazard trees.
	Contaminants and Pollution	Any evidence of oil, gasoline, contaminants, or other pollutants. (Coordinate removal/cleanup with local water quality response agency.)	No contaminants or pollutants present.
	Rodent Holes	Any evidence of rodent holes if facility is acting as a dam or berm, or any evidence of water piping through dam or berm via rodent holes.	Rodents destroyed and dam or berm repaired.
	Beaver Dams	Dam results in change or function of the facility.	Facility is returned to design function. (Coordinate trapping of beavers and removal of dams with appropriate permitting agencies.)
	Insects	When insects such as wasps and hornets interfere with maintenance activities.	Insects destroyed or removed from site. Apply insecticides in compliance with adopted IPM Plan.

Side Slopes of Pond	Erosion	Eroded damage over 2 inches deep where cause of damage is still present or where there is potential for continued erosion. Any erosion observed on a compacted berm embankment.	Slopes have been stabilized using appropriate erosion control measure(s); e.g., rock reinforcement, planting of grass, compaction. If erosion is occurring on compacted berms a licensed civil engineer should be consulted to resolve source of erosion.
Storage Area	Sediment	Accumulated sediment that exceeds 10% (typically 6" to 12") of the designed pond depth unless otherwise specified or affects inletting or outletting condition of the facility.	Sediment cleaned out to designed pond shape and depth; pond reseeded if necessary to control erosion.
	Liner (If Applicable)	Liner is visible and has more than three 1/4-inch holes in it.	Liner repaired or replaced. Liner is fully covered.
Pond Berms (Dikes)	Settlements	Any part of berm which has settled 4 inches lower than the design elevation. If settlement is apparent, measure berm to determine amount of settlement. Settling can be an indication of more severe problems with the berm or outlet works. A licensed civil engineer should be consulted to determine the source of the settlement.	Dike is built back to the design elevation.
	Piping	Discernible water flow through pond berm. Ongoing erosion with potential for erosion to continue. (Recommend a Geotechnical engineer be called in to inspect and evaluate condition and recommend repair of condition.	Piping eliminated. Erosion potential resolved.
	Tree Growth	Tree growth on berms over 4 feet in height may lead to piping through the berm which could lead to failure of the berm.	Trees removed. If root system is small (base less than 4 inches) the root system may be left in place. Otherwise the roots should be removed and the berm restored. A licensed civil engineer should be consulted for proper berm/spillway restoration.
	Erosion	Eroded damage over 2 inches deep where cause of damage is still present or where there is potential for continued erosion. Any erosion observed on a compacted berm embankment.	Slopes have been stabilized using appropriate erosion control measure(s); e.g., rock reinforcement, planting of grass, compaction. If erosion is occurring on compacted berms a licensed civil engineer should be consulted to resolve source of erosion.

Emergency Overflow/ Spillway	Tree Growth	Tree growth on emergency spillways creates blockage problems and may cause failure of the berm due to uncontrolled overtopping.	Trees removed. If root system is small (base less than 4 inches) the root system may be left in place. Otherwise the roots should be removed and the berm restored. A licensed civil engineer should be consulted for proper berm/spillway restoration.
	Rock Missing	Only one layer of rock exists above native soil in area five square feet or larger, or any exposure of native soil at the top of flow path of spillway.	Rocks and pad depth are restored to design standards.

Energy Dissipater / Outfall Protection

Energy Dissipaters			
Drainage System Feature	Potential Defect	Conditions When Maintenance Is Needed	Minimum Performance Standard
External:			
Rock Pad	Missing or Moved Rock	Only one layer of rock exists above native soil in area five square feet or larger, or any exposure of native soil.	Rock pad has been replaced to design function.
	Erosion	Soil erosion in or adjacent to rock pad.	Rock pad has been replaced to design function.
	Sediment	Sediment on top of rock pad exceeds 10% of the surface.	Rock pad has been cleared of sediment.
	Poisonous Plants and Noxious Weeds	Any poisonous plants or nuisance vegetation which may constitute a hazard to maintenance personnel or the public. Any evidence of noxious weeds as defined by State or local regulations.	No danger of poisonous vegetation where maintenance personnel or the public might normally be. Eradication of Class A weeds as required by State law. Control of other listed weeds as directed by local policies. Apply requirements of adopted IPM policy for the use of herbicides.
	Other Weeds	Other weeds (not listed on State noxious weed lists) are present on the rock pad.	Weeds have been removed per the routine maintenance schedule, following IPM protocols.
Dispersion Trench	Pipe Plugged with Sediment	Accumulated sediment that exceeds 20% of the design depth.	Pipe is free of sediment and meets design specifications.
	Not Discharging Water Properly	Visual evidence of water discharging at concentrated points along trench (normal condition is a "sheet flow" of water along trench). Intent is to prevent erosion damage.	Trench has been repaired or modified such that it does not discharge at concentrated points and meets design function.
	Perforations Plugged	Over 1/2 of perforations in pipe are plugged with debris and sediment.	Perforated pipe has been cleaned or replaced and <25% of perforations are plugged.
	Water Flows Out Top of "Distributor" Catch Basin	Maintenance person observes or receives credible report of water flowing out during any storm less than the design storm or its causing or appears likely to cause damage.	Facility rebuilt per design specifications or redesigned to meet approved City standards.
	Receiving Area Over-Saturated	Water in receiving area is causing or has potential of causing landslide problems.	No danger of landslides.
Gabions	Damaged Mesh	Mesh of gabion broken, twisted or deformed so structure is weakened or rock may fall out.	Mesh is intact, no rock missing.
	Corrosion	Gabion mesh shows corrosion through more than 1/4 of its gage.	All gabion mesh capable of containing rock and retaining designed form.

Energy Dissipaters			
Drainage System Feature	Potential Defect	Conditions When Maintenance Is Needed	Minimum Performance Standard
	Collapsed or Deformed Baskets	Gabion basket shape deformed due to any cause.	All gabion baskets intact, structure stands as designed.
	Missing Rock	Any rock missing that could cause gabion to lose structural integrity.	No rock missing.
Internal:			
Manhole/ Chamber	Worn or Damaged Post, Baffles, Side of Chamber	Structure dissipating flow deteriorates to 1/2 of original size or any concentrated worn spot exceeding one square foot which would make structure unsound.	Structure replaced to design standards.

Facility Discharge Points (Outfall)

Facility Discharge Point (Outfall)			
Drainage System Feature	Potential Defect	Conditions When Maintenance Is Needed	Minimum Performance Standard
Monitoring	Contaminants in Discharge Water	Any evidence of oil, gasoline, contaminants, or other pollutants. Sheen, obvious oil, or other contaminants present. • Identify and remove source.	Effluent discharge from facility is clear.
	Receiving Area Saturated	Water in receiving area is causing substrate to become saturated and unstable.	Receiving area is sound and not saturated.
	Ditch or Stream Banks Eroding (via Off Site Assessment)	Erosion, scouring, or headcuts in ditch or stream banks downstream of facility discharge point due to flow channelization or higher flows.	Ditch or stream banks are stable.
	Access	Vegetation is overgrown and there is no access to the outfall.	Vegetation is removed and/or path is cleared to access the outfall.
	Stains or Deposits	Stains or deposits present within the discharge area that are not natural occurring.	No stains or deposits exist and the source has been eliminated, unless the source is determined to be natural occurring.
	Stormwater Flow	Flow exists during the summer dry months when no flows should be present.	Source of the flows has been eliminated or source has been determined to be groundwater interflow.
General	Missing or Moved Rock	Only one layer of rock exists above native soil in area five square feet or larger, or any exposure of native soil.	Rock pad replaced to design function.
	Erosion	Soil erosion in or adjacent to rock pad.	Rock pad replaced to design function.
	Obstructions, Including Roots	Roots or debris enters pipe or deforms pipe, reducing flow.	Roots have been removed from pipe (using mechanical methods; do not put root-dissolving chemicals in storm sewer pipes). If necessary, vegetation over the line removed.
	Pipe Rusted or Deteriorated	Any part of the pipe that is broken, crushed, or deformed more than 20% or any other failure to the piping.	Pipe repaired or replaced to design standards.

Field Inlet

Field Inlet			
Drainage System Feature	Potential Defect	Conditions When Maintenance Is Needed	Minimum Performance Standard
			Note: table spans multiple pages.
General	Trash and Debris	Trash or debris which is located immediately in front of the catch basin opening or is blocking inletting capacity of the field inlet by more than 10%.	No trash or debris located immediately in front of field inlet or on grate opening.
		Trash or debris (in the field inlet) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of six inches clearance from the debris surface to the invert of the lowest pipe.	No trash or debris in the field inlet.
		Trash or debris in any inlet or outlet pipe blocking more than 1/3 of its height.	Inlet and outlet pipes free of trash or debris.
		Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).	No dead animals or vegetation present within the field inlet.
	Sediment	Sediment (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6 inches clearance from the sediment surface to the invert of the lowest pipe.	No sediment in the field inlet.
	Structure Damage to Frame and/or Top Slab	Top slab has holes larger than 2 square inches or cracks wider than 1/4 inch. (Intent is to make sure no material is running into basin).	Top slab is free of holes and cracks.
		Frame not sitting flush on top slab, i.e., separation of more than 3/4 inch of the frame from the top slab. Frame not securely attached.	Frame is sitting flush on the riser rings or top slab and firmly attached.
	Fractures or Cracks in Basin Walls/ Bottom	Maintenance person judges that structure is unsound.	Basin replaced or repaired to design standards.
		Grout fillet has separated or cracked wider than 1/2 inch and longer than 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering field inlet through cracks.	Pipe is regrouted and secure at basin wall.
	Settlement/ Misalignment	Basin has settled more than 1 inch or has rotated more than 2 inches out of	Basin replaced or repaired to design standards.

Field Inlet			
Drainage System Feature	Potential Defect	Conditions When Maintenance Is Needed	Minimum Performance Standard
			Note: table spans multiple pages.
	Vegetation Inhibiting System	Vegetation growing across and blocking more than 10% of the basin opening.	No vegetation blocking opening to basin.
		Vegetation growing in inlet/outlet pipe joints that is more than six inches tall and less than six inches apart.	No vegetation or root growth present.
	Contaminants and Pollution	Any evidence of oil, gasoline, contaminants, or other pollutants. Sheen, obvious oil, or other contaminants present. • Identify and remove source.	No contaminants or pollutants present.
Metal Grates	Grate Not in Place	Cover is missing or only partially in place. Any open field inlet requires maintenance.	Field inlet cover is closed.
	Grate Opening Unsafe	Grate with opening wider than 3 inches.	Grate opening meets design standards.
	Trash and Debris	Trash and debris that is blocking more than 20% of grate surface inletting capacity.	Grate free of trash and debris.
	Damaged or Missing	Grate missing or broken member(s) of the grate.	Grate is in place and meets design standards.

Grounds

Grounds (Landscaping)			
Drainage System Feature	Potential Defect	Conditions When Maintenance Is Needed	Minimum Performance Standard
Site	Trash or litter	Any trash and debris which exceed 1 cubic foot per 1,000 square feet (this is about equal to the amount of trash it would take to fill up one standard size office garbage can). In general, there should be no visual evidence of dumping.	Trash and debris cleared from site.
	Noxious weeds	Any noxious or nuisance vegetation which may constitute a hazard to County personnel or the public.	Noxious and nuisance vegetation removed according to applicable regulations. No danger of noxious vegetation where County personnel or the public might normally be.
	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint.	Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film.
	Grass/groundcover	Grass or groundcover exceeds 18 inches in height.	Grass or groundcover mowed to a height no greater than 6 inches.
Trees and Shrubs	Hazard	Any tree or limb of a tree identified as having a potential to fall and cause property damage or threaten human life. A hazard tree identified by a qualified arborist must be removed as soon as possible.	No hazard trees in facility.
	Damaged	Limbs or parts of trees or shrubs that are split or broken which affect more than 25% of the total foliage of the tree or shrub.	Trees and shrubs with less than 5% of total foliage with split or broken limbs.
		Trees or shrubs that have been blown down or knocked over.	No blown down vegetation or knocked over vegetation. Trees or shrubs free of injury.
		Trees or shrubs which are not adequately supported or are leaning over, causing exposure of the roots.	Tree or shrub in place and adequately supported; dead or diseased trees removed.

Perforated Stub-Out			
Drainage System Feature	Potential Defect	Conditions When Maintenance Is Needed	Minimum Performance Standard
Preventative	Blocking, obstructions	Debris or trash limiting flow into perforated pipe system or outfall of BMP is plugged or otherwise nonfunctioning.	Outfall of BMP is receiving designed flows from perforated pipe connection.
Inflow	Inflow impeded	Inflow into the perforated pipe is partially or fully blocked or altered to prevent flow from getting into the pipe.	Inflow to the perforated pipe is unimpeded.
Pipe Trench Area	Surface compacted	Ground surface over the perforated pipe trench is compacted or covered with impermeable material.	Ground surface over the perforated pipe is not compacted and free of any impervious cover.
Outflow	Outflow impeded	Outflow from the perforated pipe into the public drainage system is blocked.	Outflow to the public drainage system is unimpeded.
Outfall Area	Erosion or landslides	Existence of the perforated pipe is causing or exasperating erosion or landslides.	Perforated pipe system is sealed off and an alternative BMP is implemented.
Inspection	Frequency	Annually and prior to and following significant storms.	Perforated pipe system is operating as designed.

Roadside Ditch Maintenance			
Drainage System Feature	Potential Defect	Conditions When Maintenance Is Needed	Minimum Performance Standard
General	Trash and debris	Any trash and debris which exceed 1 cubic foot per 1,000 square feet. In general, there should be no visual evidence of dumping. If less than threshold all trash and debris will be removed as part of next scheduled maintenance.	Ditches are free of trash and debris.
	Poisonous Plants and Noxious Weeds	Any poisonous plants or nuisance vegetation which may constitute a hazard to maintenance personnel or the public. Any evidence of noxious weeds as defined by State or local regulations.	No danger of poisonous vegetation where maintenance personnel or the public might normally be. Eradication of Class A weeds as required by State law. Control of other listed weeds as directed by local policies. Apply requirements of adopted IPM policy for the use of herbicides.
	Vegetation Growth and Hazard Trees	Vegetation is impeding flow of water through the ditch, causing line of sight issues, does not allow maintenance access, or interferes with maintenance activity (i.e., slope mowing, silt removal, vacuuming, or equipment movements). If trees are not interfering with access or maintenance, do not remove. Dead, diseased, or dying trees are identified. (Use a certified Arborist to determine health of tree or removal requirements.)	Vegetation does not hinder maintenance activities. Harvested vegetation should be recycled into mulch or other beneficial uses (e.g., alders for firewood). Remove hazard trees.
	Poor Vegetation Coverage	When grass is sparse or bare or eroded patches occur in more than 10% of the ditch bottom.	Grass coverage has been restored to good condition and meets design function.
	Contaminants and Pollution	Any evidence of oil, gasoline, contaminants, or other pollutants. (Coordinate removal/cleanup with local water quality response agency.)	No contaminants or pollutants present.
	Rodent Holes	Any evidence of rodent holes if facility is acting as a dam or berm, or any evidence of water piping through dam or berm via rodent holes.	Rodents destroyed and dam or berm repaired.
	Beaver Dams	Dam results in change or function of the facility.	Facility is returned to design function. (Coordinate trapping of beavers and removal of dams with appropriate permitting agencies.)

Roadside Ditch Maintenance			
Drainage System Feature	Potential Defect	Conditions When Maintenance Is Needed	Minimum Performance Standard
General	Insects	When insects such as wasps and hornets interfere with maintenance activities.	Insects destroyed or removed from site. Apply insecticides in compliance with adopted City O&M policies.
	Side Slope Erosion	Eroded damage over 2 inches deep where cause of damage is still present or where there is potential for continued erosion. Any erosion observed on a compacted berm embankment.	Slopes have been stabilized using appropriate erosion control measure(s); e.g., rock reinforcement, planting of grass, compaction. If erosion is occurring on compacted berms a licensed civil engineer should be consulted to resolve source of erosion.
	Sediment	Sediment depth exceeds 2 inches in 10% of the ditch or affects inletting or outletting condition of the ditch.	Sediment cleaned out to designed ditch shape and depth; ditch reseeded if necessary to control erosion.
	Ponding	Standing water present for more than 48 hrs. and no inflow observed.	Ditch line is regraded to ensure positive grade in the direction of flow.
	Rock lining out of place or missing (if applicable)	One layer or less of rock exists above native soil area 5 square feet or more, any exposed native soil.	Replace rocks to design standards.

Sheet Flow and Concentrated Flow Dispersion			
Drainage System Feature	Potential Defect	Conditions When Maintenance Is Needed	Minimum Performance Standard
General	Pests	Signs of pest infestations (IPM protocol threshold(s) are exceeded), including rodent holes or mounds that disturb dispersion flow paths.	Pests are not present or engaged in activities that present a significant public health risk or compromise to the intended design function of the facility. Pests that have exceeded acceptable thresholds have been addressed using appropriate IPM measures.
Dispersion Trench	Concentrated Discharge	Visual evidence of water discharging at concentrated points along trench (normal condition is a "sheet flow" from edge of trench; intent is to prevent erosion damage).	Water is discharging as a sheet flow and any disruptive material (e.g. trash, debris, sediment accumulation) has been removed from trench surface.
	Surface of Trench	Accumulated trash, debris, or sediment on drain rock surface impedes sheet flow from facility. Vegetation/moss present on drain rock surface impedes sheet flow from facility.	Surface of drain rock is free of trash, debris, and sediment accumulation. Rock surface is open, free of vegetation buildup, and drains freely.
	Damage to or Trash/Sediment Accumulation Around Pipes	Accumulation of trash, debris, or sediment in driveway drains and area drains, etc. Pipe from sump to trench has accumulated sediment or is plugged. Cracked, collapsed, broken, or misaligned drain pipes.	Trash, debris, and sediment is cleared from dispersion trench components Pipes are free of damage or defects that hinder system from functioning according to design.
Rock Pad	General	Only one layer of rock exists above native soil in area 6 square feet or larger, or any exposure of native soil. Soil erosion in or adjacent to rock pad.	Rock pad has been repaired or replaced to meet design standards.
Dispersal Area	Erosion or Sediment Accumulation	Erosion (gullies/ rills) greater than 2 inches deep in dispersal area. Accumulated sediment or debris to extent that blocks or channelizes flow path.	Cause of erosion has been eliminated and the damaged area has been repaired and stabilized.
	Standing Water After Storm Event	Standing surface water in dispersion area remains for more than 3 days after the end of a storm event.	Standing water drains within 72 hours of a storm event.
	Transition Zone Erosion and Sizing	Adjacent soil erosion; uneven surface creating concentrated flow discharge; or less than two feet of width.	Transition zone meets design criteria and does not exhibit erosion or other evidence of concentrated flows.
	Poor Vegetation Cover	Poor vegetation cover such that erosion is occurring.	Vegetation has been properly watered and established to meet facility design specifications.
	Excessive Vegetation Cover	Vegetation inhibits dispersed flow along flow path.	Vegetation has been weeded, trimmed, pruned, or thinned to meet facility design criteria.

Downspout Splash Block

Downspout Splash Block			
Drainage System Feature	Potential Defect	Conditions When Maintenance Is Needed	Minimum Performance Standard
			Note: table spans multiple pages.
General	Pests	Signs of pest infestations (IPM protocol threshold(s) are exceeded), including rodent holes or mounds that disturb dispersion flow paths.	Pests are not present or engaged in activities that present a significant public health risk or compromise to the intended design function of the facility. Pests that have exceeded acceptable thresholds have been addressed using appropriate IPM measures.
	Inspection Frequency	Annually and after large storms.	Rain harvesting equipment is functioning normally.
Splash Block	Water Directed Towards Building	Water is being directed towards building structure.	Water is directed away from foundations and other building structures.
	Downspout water misdirected	Water coming from the downspout is not discharging to the dispersal area.	Water is discharging normally to the dispersal area.
	Dislodged	Splash block moved from outlet of downspout.	Splash block correctly positioned to catch discharge from downspout.
	Trash and Debris	Trash and debris accumulated on the splash block.	Splash block site free of any trash or debris.
	Erosion	Water coming off the splash block causing erosion.	No erosion occurs from the splash block.
		Water disrupts soil media.	Water is dispersed into soil/mulch/plantings in a manner that does not create erosion or other issues due to concentrated flows.

Dispersal Area	Erosion or Sediment Accumulation	Erosion (gullies/ rills) greater than 2 inches deep in dispersal area. Accumulated sediment or debris to extent that blocks or channelizes flow path.	Cause of erosion has been eliminated and the damaged area has been repaired and stabilized.
	Standing Water After Storm Event	Standing surface water in dispersion area remains for more than 3 days after the end of a storm event.	Standing water drains within 72 hours of a storm event.
	Transition Zone Erosion and Sizing	Adjacent soil erosion; uneven surface creating concentrated flow discharge; or less than two feet of width.	Transition zone meets design criteria and does not exhibit erosion or other evidence of concentrated flows.
	Poor Vegetation Cover	Poor vegetation cover such that erosion is occurring.	Vegetation has been properly watered and established to meet facility design specifications.
	Excessive Vegetation Cover	Vegetation inhibits dispersed flow along flow path.	Vegetation has been weeded, trimmed, pruned, or thinned to meet facility design criteria.

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Appendix D Soils Information

Please see the Geotechnical Engineering Study
By Earth Consultants, Inc
July 7, 1995
submitted under separate cover as file
2205-CCS)1995.TIR.ApdxD.GeoRpt.pdf

And

Limited Geotechnical Site Evaluation
By Krazan &Associates, Inc
March 4, 2008
Submitted under separate cover as file
2205-CCS-AbbeyRD.TIR.GeoLetter.pdf

Note: Site-specific soils information is useful for determining infiltration rates, foundation designs, and other vulnerabilities on sites, such as potential for slope failure (landslides). These investigations supplement published general information, such soil maps, topography when the site is near a steep slope, or when there are mapped wetlands and areas high groundwater or restrictive layers that do not offer much potential for infiltration.

Appendix E: Previous Master Plan TIR

Previously provided, please see separate document to limit file size.

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