Exhibit 16

June 30, 2014

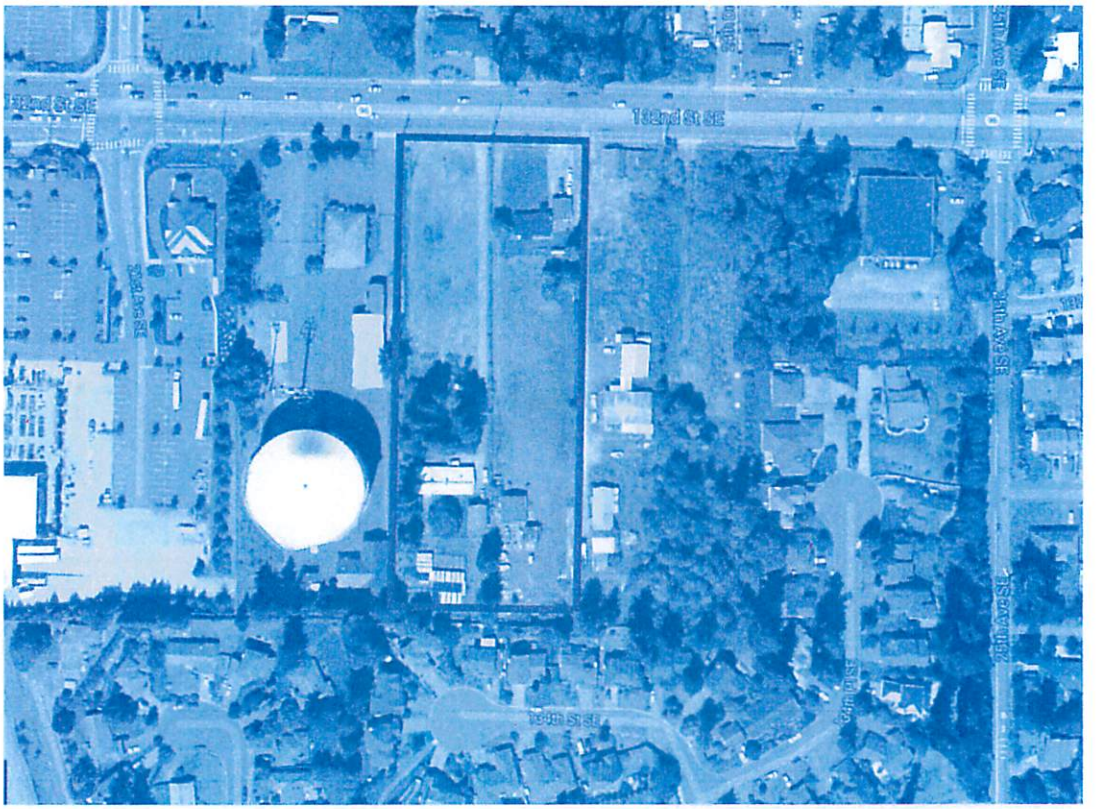
Prepared for:
Taylor Development
15 Lake Bellevue Drive #102
Bellevue, WA 98005 (425) 869-1300

CRESTVIEW VILLAGE

Technical Information Report (TIR)

Project Location:
2226 & 2304 132nd ST SE
Mill Creek, WA 98012

SDA Project # 318-002



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1704 W. Marine View Drive, Suite 140 Everett, WA 98201 ■ 425.486.6533 ■ www.sdaengineers.com

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CITY OF MILL CREEK

Crestview Village
Technical Information Report (TIR)

Project Location:
2226 & 2304 132nd ST SE
Mill Creek, WA 98012

Prepared For:
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Date:
June 30, 2014

Project Number:
318-002

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SECTION 1

EXECUTIVE SUMMARY

PROJECT OVERVIEW

The proposed project is to construct a subdivision of approximately 3.12 acres into 25 new single family residences, located on the south side of 132nd St. SE in the City of Mill Creek. The project will clear, grade and construct roads, utility extensions and features and eventually construct single family residences on the lots. The project is located at 2226 & 2304 132nd St. SE, Mill Creek WA 98012 in the NW ¼ of section 32, Township 28 North, Range 5 East, W.M. More specifically, the project occupies tax lot numbers **28053200201400 & 28053200200900**. A vicinity map has been included as **Figure 1** of this document.

The sites currently contain single family residences, driveways and garages, with the majority of the site remaining as pastured grass land with limited tree clusters. The project site is bordered on the west by Silver Lake Water District property containing water utilities, irrigation and storage, to the south by the Wexford Court housing development, to the east by a residential property, and to the north by 132nd St. SE.

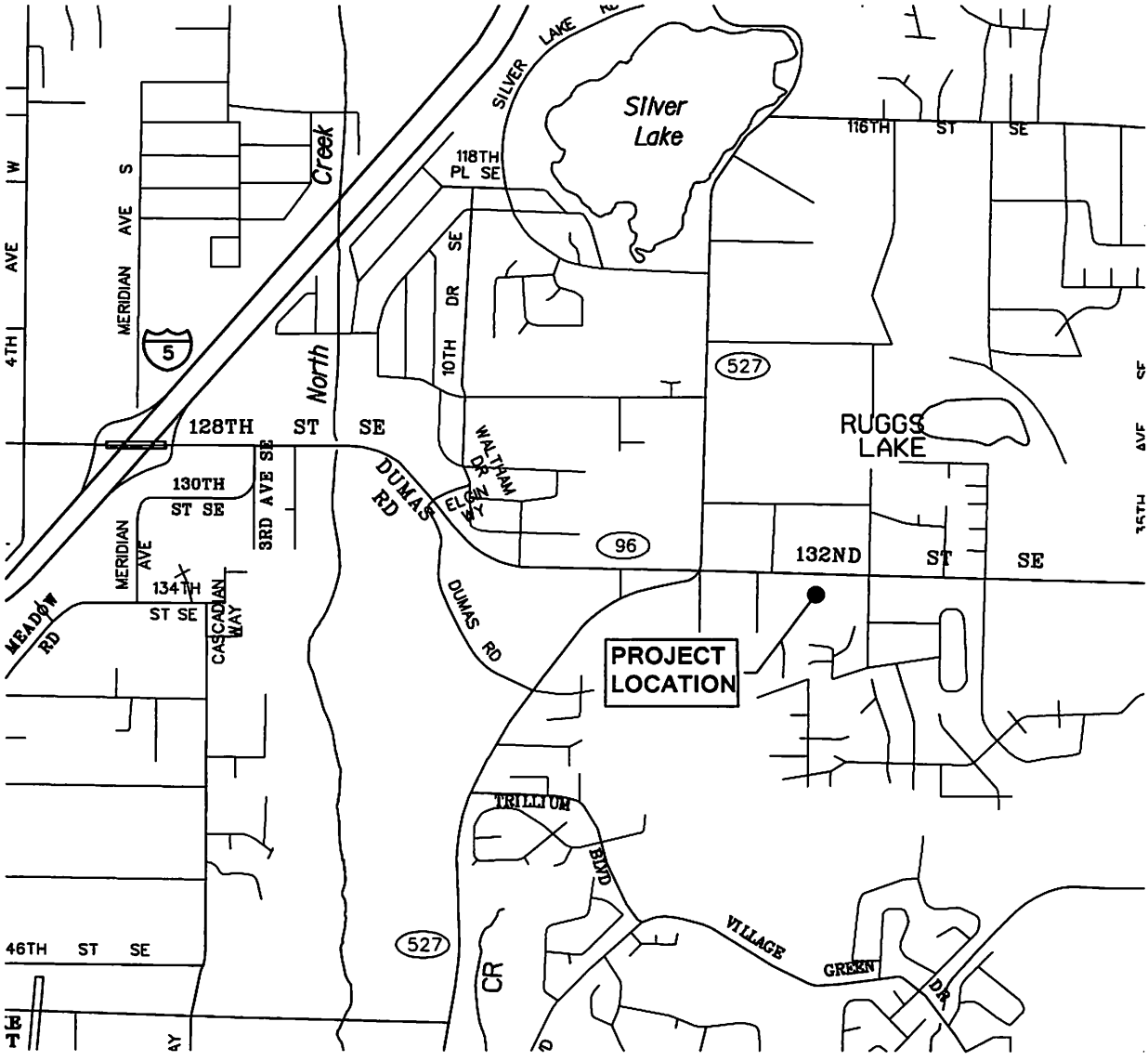
In order to keep the drainage release in its natural patterns, onsite stormwater runoff will be captured and conveyed to a proposed detention vault to detain peak flow volumes and regulate release rates that mimic the predeveloped site. The detention vault will be located in the northwest corner of the project site, adjacent to 132nd St. SE, and will be constructed as a wetvault to incorporate wetpool storage volumes in order to provide water quality treatment. Treated and mitigated flows will release north to the existing City of Mill Creek stormwater system located within 132nd St. SE. The vault and stormwater quality elements are subject to the requirements of the 2005 Washington State Department of Ecology Stormwater Management Manual.

Per the NRCS web soil survey, site soils are Alderwood-Urban land complex with 2 to 8 percent slopes. This unit is about 60 percent Alderwood gravelly sandy loam and about 25 percent Urban land, formed in glacial till. This soil type is moderately deep over a hardpan, and is moderately well drained with a low available water capacity. Typically, the upper surface is a dark greyish brown gravelly sandy loam about 7 inches thick, with a subsoil of dark yellowish brown and dark brown very gravelly sandy loam about 23 inches thick. The lower part is olive brown very gravelly sandy loam about 5 inches thick. Depth to the weakly cemented hardpan ranges from 20 to 40 inches. Permeability is moderately rapid above the hardpan and very slow through it.

The site has a single drainage basin. Stormwater runoff currently drains overland from southwest towards the northeast following the natural topography of the area. Topography contours of the area suggest peak volumes flow downhill before crossing the property boundary and entering the 132nd St SE right-of-way.

VICINITY MAP

SCALE: 1"= 2000"



TJS Design TJS Drawn 03/31/2014 Date 318-002 Project No.	Civil Engineering Project Management Planning 1724 W. Marine View Drive, Suite 140; Everett, Washington 98201 Office: 425.486.6533 Fax: 425.486.6593 www.sdaengineers.com	CREEK VIEW VILLAGE VICINITY MAP	1" = 2000' Scale 01 Figure No.

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SITE CHARACTERISTICS

SCALE: NTS

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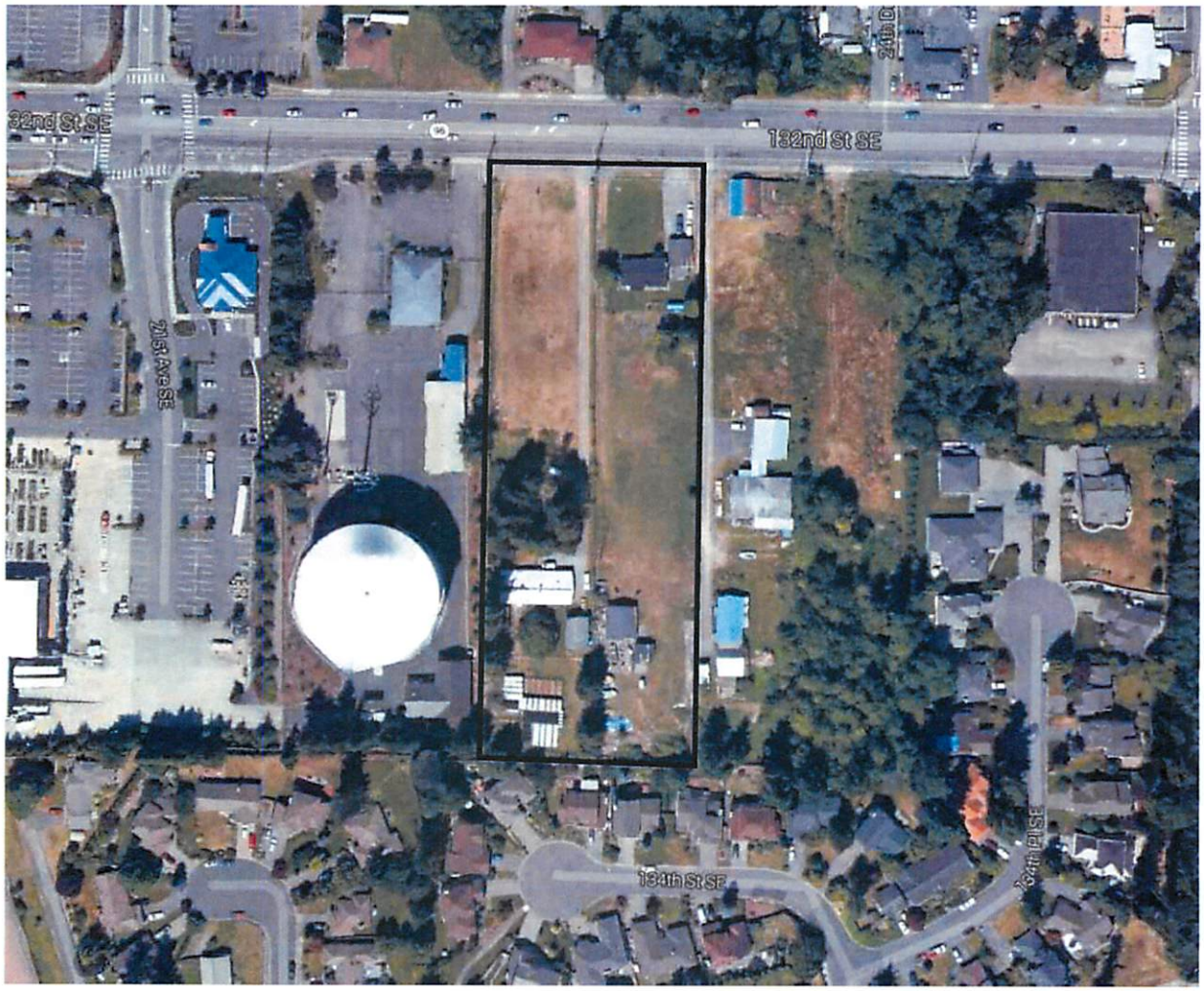

TJS Design TJS Drawn 03/31/2014 Date 318-002 Project No.	SDA Civil Engineering Project Management Planning 1724 W. Marine View Drive, Suite 140; Everett, Washington 98201 Office: 425.486.6533 Fax: 425.486.6593 www.sdaengineers.com	CREEK VIEW VILLAGE SITE CHARACTERISTICS	NTS Scale 02 Figure No.

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SECTION 2

MINIMUM REQUIREMENT #1

PREPARATION OF STORMWATER SITE PLANS

STORMWATER SITE PLANNING PROCESS

The Department of Ecology's 2005 Stormwater Management Manual for Western Washington and is used as the governing design document for the Puget Sound Basin surface runoff control. The following is a listing of the applicable minimum "core" and "special" requirements outlined in Volume 1 - Chapter 3 of the manual, with a brief description of how each was addressed:

Step 1: Collect and Analyze Information on Existing Conditions

The parcels currently contain single family residences, driveways and garages, with the majority of the site remaining as pastured grass land with limited tree clusters. The project site is bordered on the west by Silver Lake Water District property containing water utilities, irrigation and storage, to the south by the Wexford Court housing development, to the east by a neighboring residential property, and to the north by 132nd St. SE.

Per the NRCS web soil survey, site soils are Alderwood-Urban land complex with 2 to 8 percent slopes. This unit is about 60 percent Alderwood gravelly sandy loam and about 25 percent Urban land, formed in glacial till. This soil type is moderately deep over a hardpan, and is moderately well drained with a low available water capacity. Typically, the upper surface is a dark greyish brown gravelly sandy loam about 7 inches thick, with a subsoil of dark yellowish brown and dark brown very gravelly sandy loam about 23 inches thick. The lower part is olive brown very gravelly sandy loam about 5 inches thick. Depth to the weakly cemented hardpan ranges from 20 to 40 inches. Permeability is moderately rapid above the hardpan and very slow through it.

The site has a single drainage basin. Stormwater runoff currently drains overland from southwest towards the northeast following the natural topography of the area. Topography contours of the area suggest peak volumes flow downhill before crossing the property boundary and entering the 132nd St SE right-of-way.

There are no designated wetlands and wetland buffer zones, creeks, streams, steep slopes, or erosion hazards on site. Thus there are no critical areas.

The project looks to add more than 5,000 square feet of new impervious surfaces, thus minimum requirements 1 – 9 apply to this project. Per Vol. I – Figure 2.2 for New Development Projects.

Step 2: Prepare a Preliminary Development Layout

The proposed project is to construct a subdivision of approximately 3.12 acres into 25 new single family residences, located on the south side of 132nd St. SE in the City of Mill Creek. The project will clear, grade and construct roads, utility extensions and features and eventually construct single family residences on the lots. The project is located at 2226 & 2304 132nd St. SE, Mill Creek WA 98012 in the NW ¼ of section 32, Township 28 North, Range 5 East, W.M. More specifically, the project occupies tax lot numbers **28053200201400 & 28053200200900**. A vicinity map has been included as **Figure 1** of this document.

The parcels currently contain single family residences, driveways and garages, with the majority of the site remaining as pastured grass land with limited tree clusters. These structures will be removed, the site cleared and graded, with the intention of building 25 new single family residences. The project site is bordered on the west by Silver Lake Water District property containing water utilities, irrigation and storage, to the south by the Wexford Court housing development, to the east by a neighboring residential property, and to the north by 132nd St. SE.

The immediate proposal is to construct 24 single family residences, with a temporary turn-around to be constructed at the terminus of the proposed road located in lot #17. When future development occurs on the adjacent parcel to the east with a road section that connects to the road section within this proposal, the temporary turn-around will be removed and an additional single family residence will be constructed at a later date on lot #17.

In order to keep the drainage release in its natural patterns, onsite stormwater runoff will be captured and conveyed to a proposed detention vault to detain peak flow volumes and regulate release rates that mimic the predeveloped site. The detention vault will be located in the northwest corner of the project site, adjacent to 132nd St. SE, and will be constructed as a wetvault to incorporate wetpool storage volumes in order to provide water quality treatment. Treated and mitigated flows will release north to the existing City of Mill Creek stormwater system located within 132nd St. SE. The vault and stormwater quality elements are subject to the requirements of the 2005 Washington State Department of Ecology Stormwater Management Manual.

Step 3: Perform Offsite (Upstream and Downstream) Analysis

The parcels currently contain single family residences, driveways and garages, with the majority of the site remaining as pastured grass land with limited tree clusters. The site has a single drainage basin. Stormwater runoff currently drains overland from southwest towards the northeast following the natural topography of the area. Topography contours of the area suggest peak volumes flow downhill before crossing the property boundary and entering the 132nd St SE right-of-way.

Upstream: Refer to **Appendix 2A** for full Upstream Analysis.

Downstream: Refer to **Appendix 2B** for full Downstream Analysis.

Step 4: Determine Applicable Minimum Requirements

As the site is 3.12 acres and is proposing 25 lots, all 9 requirements apply.

Step 5: Prepare a Permanent Stormwater Control Plan

The proposed project is to construct a subdivision of approximately 3.12 acres into 25 new single family residences, located on the south side of 132nd St. SE in the City of Mill Creek. The project will clear, grade and construct roads, utility extensions and features and eventually construct single family residences on the lots.

In order to keep the drainage release in its natural patterns, onsite stormwater runoff will be captured and conveyed to a proposed detention vault to detain peak flow volumes and regulate release rates that mimic the predeveloped site. The detention vault will be located in the northwest corner of the project site, adjacent to 132nd St. SE, and will be constructed as a wetvault to incorporate wetpool storage volumes in order to provide water quality treatment. Treated and mitigated flows will release north to the existing City of Mill Creek stormwater system located within 132nd St. SE. The vault and stormwater quality elements are subject to the requirements of the 2005 Washington State Department of Ecology Stormwater Management Manual.

Step 6: Prepare a Stormwater Pollution Prevention Plan (SWPPP)

The 12 step outline is included in section 3 of this report, the full SWPPP is included as **Appendix 3-A**.

Step 7: Complete the Stormwater Site Plan

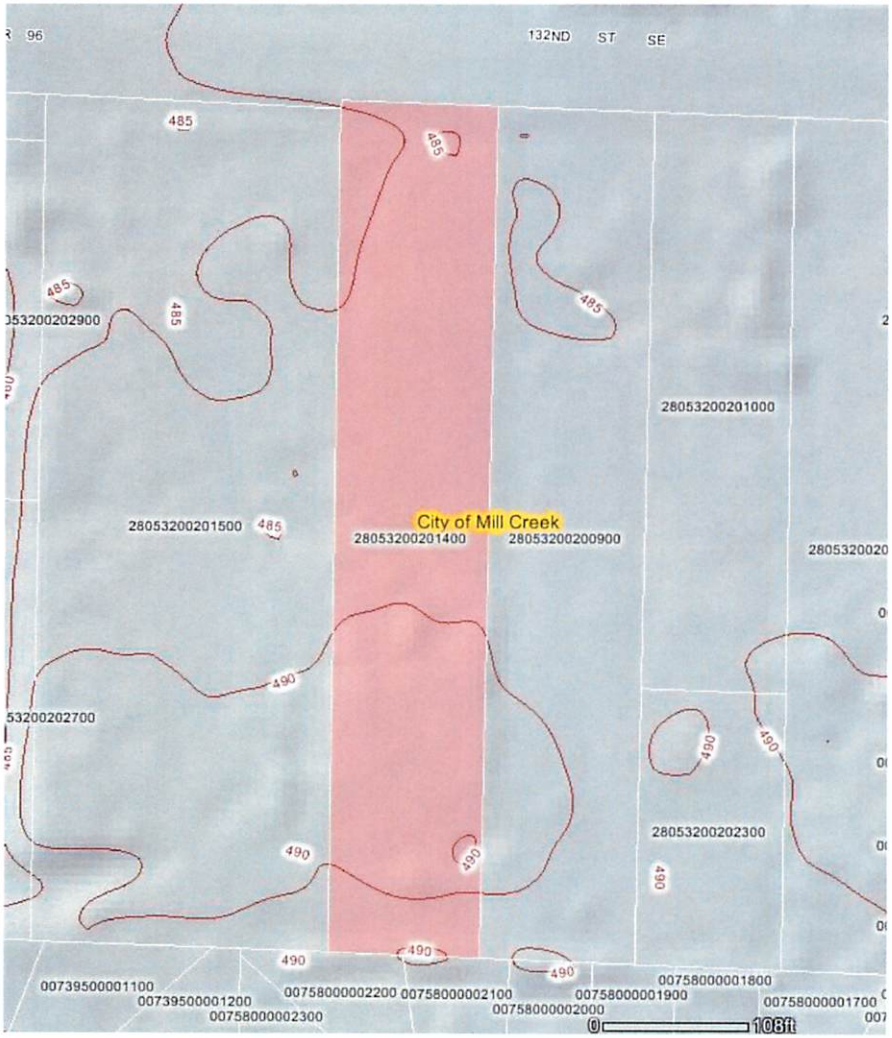
The stormwater site plan is complete and all documents pertaining to the project have been included within this document.

APPENDIX 2-A

UPSTREAM ANALYSIS EXHIBIT

Upstream Drainage Basin

There is no upstream basin draining to the project site as the parcel site atop a small bluff, as seen in the following Snoscape Image. Stormwater runoff currently drains overland from southwest towards the northeast following the natural topography of the area.



APPENDIX 2-B

DOWNSTREAM ANALYSIS EXHIBIT

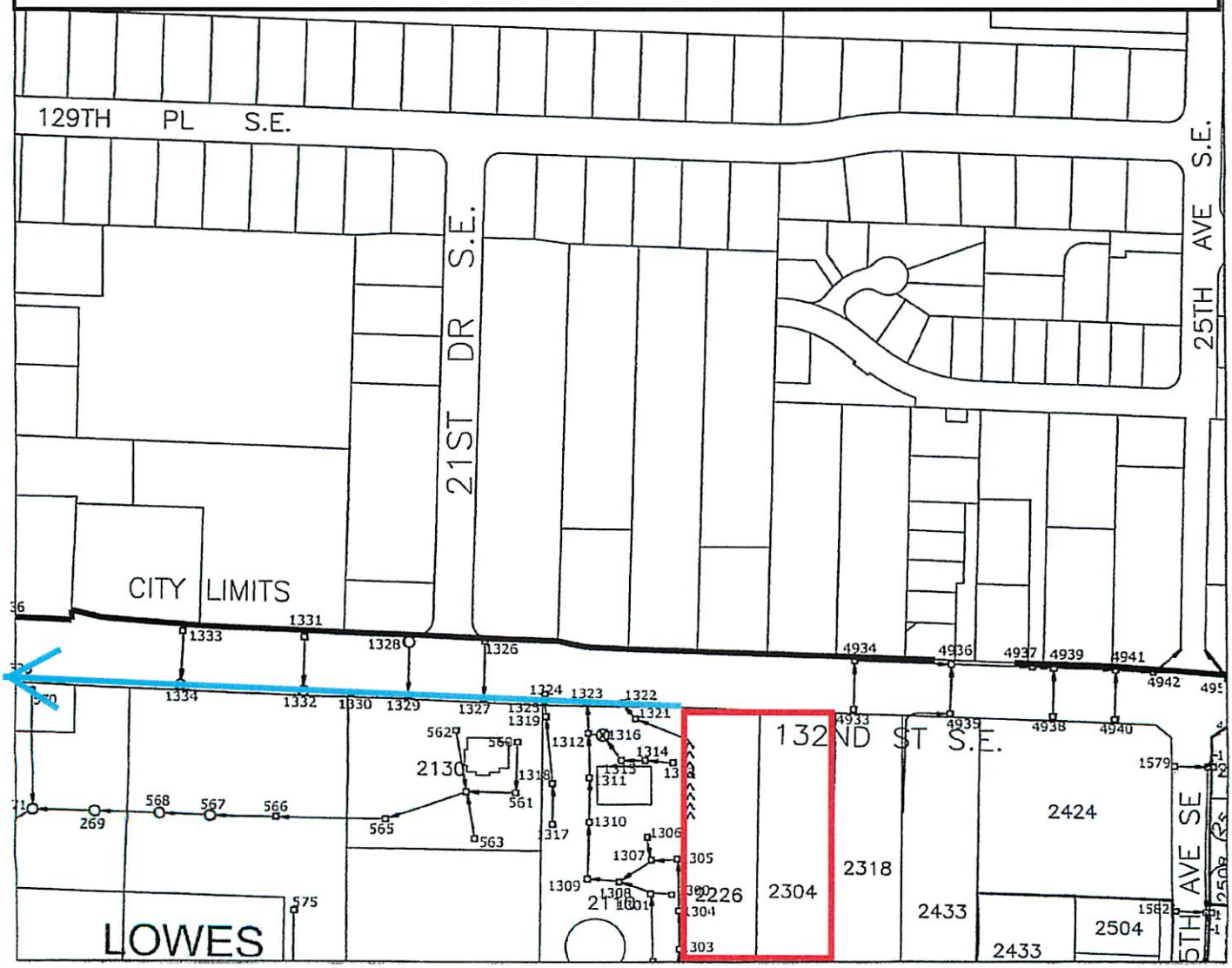
CITY OF MILL CREEK STORM DRAINAGE SYSTEM

1E

UPDATED APRIL 29, 2013

THE SITE HAS A SINGLE DRAINAGE BASIN. STORMWATER RUNOFF CURRENTLY DRAINS OVERLAND FROM THE SOUTHWEST TOWARDS THE NORTHEAST FOLLOWING THE NATURAL TOPOGRAPHY OF THE AREA. TOPOGRAPHY CONTOURS OF THE AREA SUGGEST PEAK VOLUMES FLOW DOWNHILL BEFORE CROSSING THE PROPERTY BOUNDARY AND ENTERING 132ND ST SE.

AS SEEN IN THE CITY OF MILL CREEK STORM DRAINAGE SYSTEM FIGURE, STORMWATER FLOWS ENTER THE EXISTING CITY OF MILL CREEK STORMWATER SYSTEM LOCATED WITHIN 132ND ST SE AND FLOW EASTWARD.

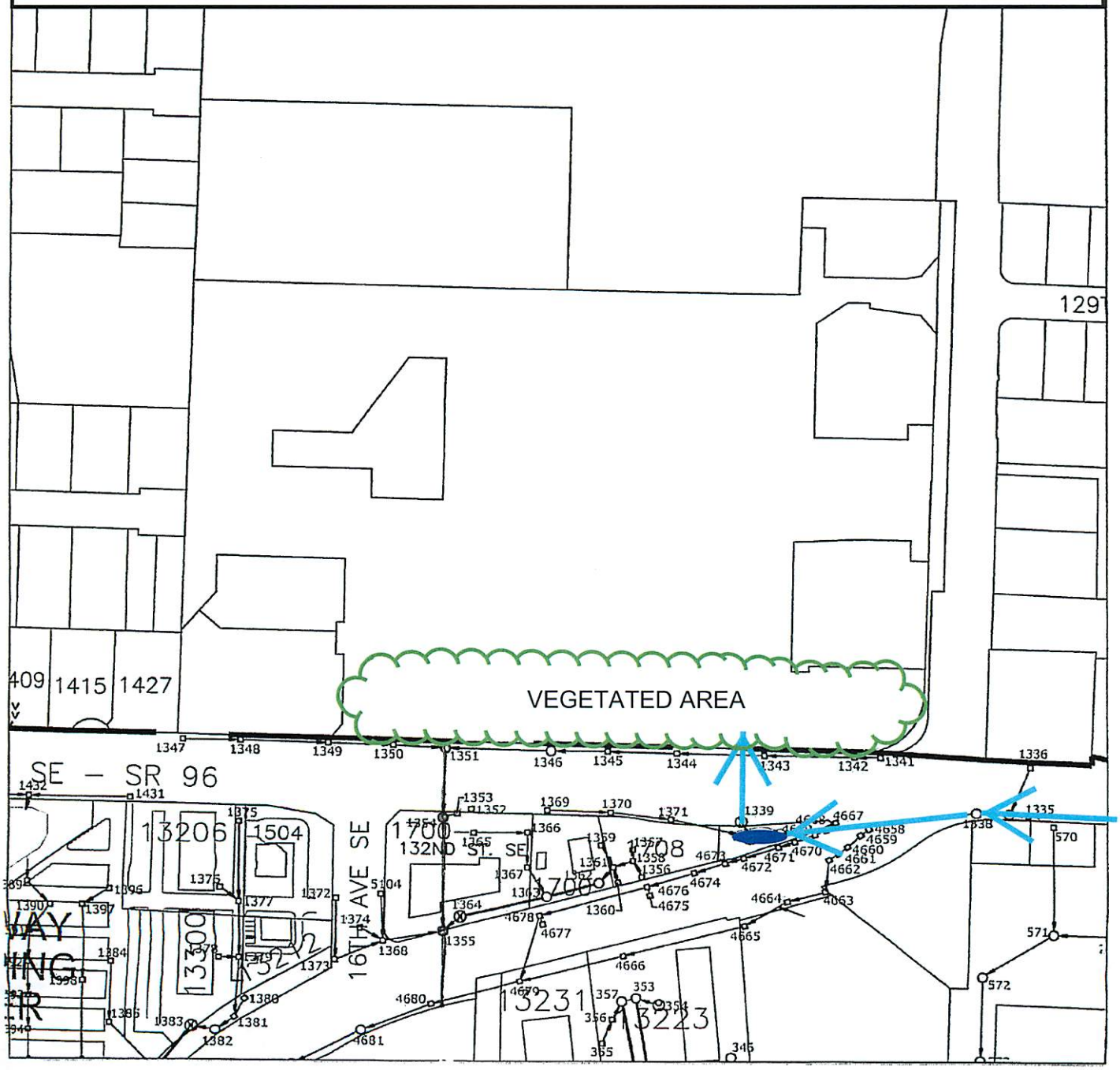


CITY OF MILL CREEK STORM DRAINAGE SYSTEM

1D

UPDATED: APRIL 29, 2013

STORMWATER FLOWS DRAIN EAST TO AN EXISTING STORMWATER POND LOCATED ON THE SOUTH WEST CORNER OF SR 96 AND SR 527. THIS POND OUTFALLS TO THE NORTH TO A VEGETATED AREA LOCATED ON THE SOUTH SIDE OF THE FRED MEYER SHOPPING CENTER.



SECTION 3

MINIMUM REQUIREMENT #2

CONSTRUCTION STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

CSWPPP ANALYSIS & DESIGN

This section, along with the Temporary Erosion and Sediment Control (TESC) Plan contained in the engineering drawings, is intended to serve as the construction Stormwater Pollution Prevention Plan (SWPPP) for the project. The SWPPP is outlined in conformance with the 2005 edition of the Washington State Department of Ecology's Stormwater Management Manual for Western Washington (DOE Manual).

1.0 – INTRODUCTION

An introductory overview of the project has been provided in the Executive Summary of this report.

2.0 – SITE DESCRIPTION

A general site description has been provided in the Executive Summary of this report. Additional detailed information is provided through the rest of this report.

3.0 – CONSTRUCTION STORMWATER BMPs

3.1 – 12 BMP ELEMENTS

Element #1 – Mark Clearing Limits

To protect adjacent properties and to reduce the area of soil exposed to construction, the limits of construction will be clearly marked before land-disturbing activities begin. Trees that are to be preserved, as well as all sensitive areas and their buffers, shall be clearly delineated, both in the field and on the plans. In general, natural vegetation and native topsoil shall be retained in an undisturbed state to the maximum extent possible. The BMPs relevant to marking the clearing limits are identified in Appendix 2B.

Alternate BMPs for marking clearing limits are included in Appendix 2C as a quick reference tool for the onsite inspector in the event the primary BMP(s) are deemed ineffective or inappropriate during construction to satisfy the requirements set forth in the General NPDES Permit (Appendix 2D). To avoid potential erosion and sediment control issues that may cause a violation of the NPDES Construction Stormwater permit, the Certified Erosion and Sediment Control Lead will promptly initiate the implementation of one or more of the alternative BMPs after the first sign that existing BMPs are ineffective or failing.

Element #2 – Establish Construction Access

Construction access or activities occurring on unpaved areas shall be minimized, yet where necessary, access points shall be stabilized to minimize the tracking of sediment onto public roads, and wheel washing, street sweeping, and street cleaning shall be employed to prevent sediment from entering state waters. All wash wastewater shall be controlled on site. The specific BMPs related to establishing construction access that will be used on this project are identified in Appendix 2B.

Alternate construction access BMPs are included in Appendix 2C as a quick reference tool for the onsite inspector in the event the primary BMP(s) are deemed ineffective or inappropriate during construction to satisfy the requirements set forth in the General NPDES Permit (Appendix 2D). To avoid potential erosion and sediment control issues that may cause a violation of the NPDES Construction Stormwater permit, the Certified Erosion and Sediment Control Lead will promptly initiate the implementation of one or more of the alternative BMPs after the first sign that existing BMPs are ineffective or failing.

Element #3 - Control Flow Rates

In order to protect the properties and waterways downstream of the project site, stormwater discharges from the site will be controlled. The specific BMPs for flow control that shall be used on this project are identified in Appendix 2B.

Alternate flow control BMPs are included in Appendix 2C as a quick reference tool for the onsite inspector in the event the primary BMP(s) are deemed ineffective or inappropriate during construction to satisfy the requirements set forth in the General NPDES Permit. To avoid potential erosion and sediment control issues that may cause a violation of the NPDES Construction Stormwater permit, the Certified Erosion and Sediment Control Lead will promptly initiate the implementation of one or more of the alternative BMPs after the first sign that existing BMPs are ineffective or failing.

In general, discharge rates of stormwater from the site will be controlled where increases in impervious area or soil compaction during construction could lead to downstream erosion, or where necessary to meet local agency stormwater discharge requirements (e.g. discharge to combined sewer systems).

Element #4 - Install Sediment Controls

All stormwater runoff from disturbed areas shall pass through an appropriate sediment removal BMP before leaving the construction site or prior to being discharged to an infiltration facility. The specific BMPs to be used for controlling sediment on this project are identified in Appendix 2B.

Alternate sediment control BMPs are included in Appendix 2C as a quick reference tool for the onsite inspector in the event the primary BMP(s) are deemed ineffective or inappropriate during construction to satisfy the requirements set forth in the General NPDES Permit (Appendix 2D). To avoid potential erosion and sediment control issues that may cause a violation of the NPDES Construction Stormwater permit, the Certified Erosion and Sediment Control Lead will promptly initiate the implementation of one or more of the alternative BMPs at the first sign that existing BMPs are ineffective or failing.

In addition, sediment will be removed from paved areas in and adjacent to construction work areas manually or using mechanical sweepers, as needed, to minimize tracking of sediments on vehicle tires away from the site and to minimize wash off of sediments from adjacent streets in runoff.
Whenever possible, sediment laden water shall be discharged into onsite, relatively level, vegetated areas (BMP C240 paragraph 4, Volume II page 116).

In some cases, sediment discharge in concentrated runoff can be controlled using permanent stormwater BMPs (e.g., infiltration swales, ponds, trenches). Sediment loads can limit the effectiveness of some permanent stormwater BMPs, such as those used for infiltration or biofiltration; however, those BMPs designed to remove solids by settling (wet ponds or detention ponds) can be used during the construction phase. When permanent stormwater BMPs will be used to control sediment discharge during construction, the structure will be protected from excessive sedimentation with adequate erosion and sediment control BMPs. Any accumulated sediment shall be removed after construction is complete and the permanent stormwater BMP will be restabilized with vegetation per applicable design requirements once the remainder of the site has been stabilized.

Element #5 - Stabilize Soils

Exposed and unworked soils shall be stabilized with the application of effective BMPs to prevent erosion throughout the life of the project. The specific BMPs for soil stabilization that shall be used on this project are identified in Appendix 2B.

Seeding will be used on disturbed areas that have reached final grade or that will remain unworked for more than thirty days. Plastic Covering will be used on the temporary stock pile areas and elsewhere on the site as needed. Dust control will be implemented as needed, to prevent it being required all roadways and driveways to be paved will receive early application of gravel base.

Alternate soil stabilization BMPs are included in Appendix 2C as a quick reference tool for the onsite inspector in the event the primary BMP(s) are deemed ineffective or inappropriate during construction to satisfy the requirements set forth in the General NPDES Permit (Appendix 2D). To avoid potential erosion and sediment control issues that may cause a violation of the NPDES Construction Stormwater permit, the Certified Erosion and Sediment Control Lead will promptly initiate the implementation of one or more of the alternative BMPs after the first sign that existing BMPs are ineffective or failing.

The project site is located west of the Cascade Mountain Crest. As such, no soils shall remain exposed and unworked for more than 7 days during the dry season (May 1 to September 30) and 2 days during the wet season (October 1 to April 30). Regardless of the time of year, all soils shall be stabilized at the end of the shift before a holiday or weekend if needed based on weather forecasts.

In general, cut and fill slopes will be stabilized as soon as possible and soil stockpiles will be temporarily covered with plastic sheeting. All stockpiled soils shall be stabilized from erosion, protected with sediment trapping measures, and where possible, be located away from storm drain inlets, waterways, and drainage channels.

Element #6 - Protect Slopes

All cut and fill slopes will be designed, constructed, and protected in a manner than minimizes erosion. The specific BMPs that will be used to protect slopes for this project are identified in Appendix 2B.

Alternate slope protection BMPs are included in Appendix 2C as a quick reference tool for the onsite inspector in the event the primary BMP(s) are deemed ineffective or inappropriate during construction to satisfy the requirements set forth in the General NPDES Permit (Appendix 2D). To avoid potential erosion and sediment control issues that may cause a violation of the NPDES Construction Stormwater permit, the Certified Erosion and Sediment Control Lead will promptly initiate the implementation of one or more of the alternative BMPs after the first sign that existing BMPs are ineffective or failing.

Element #7 - Protect Drain Inlets

All storm drain inlets and culverts made operable during construction shall be protected to prevent unfiltered or untreated water from entering the drainage conveyance system. However, the first priority is to keep all access roads clean of sediment and keep street wash water separate from entering storm drains until treatment can be provided. Storm Drain Inlet Protection (BMP C220) will be implemented for all drainage inlets and culverts that could potentially be impacted by sediment-laden runoff on and near the project site. The inlet protection measures to be applied on this project are identified in Appendix 2B.

If the primary BMP options are deemed ineffective or inappropriate during construction to satisfy the requirements set forth in the General NPDES Permit (Appendix 2D), or if no BMPs are listed above but deemed necessary during construction, the Certified Erosion and Sediment Control Lead shall implement one or more of the alternative BMP inlet protection options.

Element #8 - Stabilize Channels and Outlets

Where site runoff is to be conveyed in channels, or discharged to a stream or some other natural drainage point, efforts will be taken to prevent downstream erosion. The specific BMPs for channel and outlet stabilization that shall be used on this project are identified in Appendix 2B.

Alternate channel and outlet stabilization BMPs are included in Appendix 2C as a quick reference tool for the onsite inspector in the event the primary BMP(s) are deemed ineffective or inappropriate during construction to satisfy the requirements set forth in the General NPDES Permit (Appendix 2D). To avoid potential erosion and sediment control issues that may cause a violation(s) of the NPDES Construction Stormwater permit, the Certified Erosion and Sediment Control Lead will promptly initiate the implementation of one or more of the alternative BMPs after the first sign that existing BMPs are ineffective or failing.

The project site is located west of the Cascade Mountain Crest. As such, all temporary on-site conveyance channels shall be designed, constructed, and stabilized to prevent erosion from the expected peak 10 minute velocity of flow from a Type 1A, 10-year, 24-hour recurrence interval storm for the developed condition. Alternatively, the 10-year, 1-hour peak flow rate indicated by an approved continuous runoff simulation model, increased by a factor of 1.6, shall be used. Stabilization, including armoring material, adequate to prevent erosion of outlets, adjacent streambanks, slopes, and downstream reaches shall be provided at the outlets of all conveyance systems.

Element #9 - Control Pollutants

All pollutants, including waste materials and demolition debris, that occur onsite shall be handled and disposed of in a manner that does not cause contamination of stormwater. Good housekeeping and preventative measures will be taken to ensure that the site will be kept clean, well-organized, and free of debris. Any required BMPs to be implemented to control specific sources of pollutants are identified in Appendix 2B.

The contractor shall implement the following measures as much as is practicable, in order to mitigate pollutant impacts from vehicles, construction equipment, and/or petroleum product storage/dispensing:

- All vehicles, equipment, and petroleum product storage/dispensing areas will be inspected regularly to detect any leaks or spills, and to identify maintenance needs to prevent leaks or spills.
- On-site fueling tanks and petroleum product storage containers shall include secondary containment.
- Spill prevention measures, such as drip pans, will be used when conducting maintenance and repair of vehicles or equipment.
- In order to perform emergency repairs on site, temporary plastic will be placed beneath and, if raining, over the vehicle.

- Contaminated surfaces shall be cleaned immediately following any discharge or spill incident.

- The contractor shall implement the following concrete and grout pollution control measures:

- Process water and slurry resulting from concrete work will be prevented from entering the waters of the State by implementing Concrete Handling measures (BMP C151).

The contractor shall implement the following Solid Waste pollution control measures:

- Solid waste will be stored in secure, clearly marked containers.

Element #10 - Control Dewatering

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

Clean, non-turbid de-watering water, such as well-point groundwater, can be discharged to systems tributary to state surface waters, provided the de-watering flow does not cause erosion or flooding of receiving waters. These clean waters shoul not be routed through stormwater sediment ponds.

Highly turbid or contaminated dewatering water shall be handled separately from stormwater.

Element #11 - Maintain BMPs

All BMPs should be monitored and maintained regularly to ensure adequate operation. A TESC supervisor shall be identified at the beginning of the project to provide monitoring and direct the appropriate maintenance activity. As site conditions change, all BMPs shall be updated as necessary to maintain compliance with local regulations.

Temporary BMPs can be removed when they are no longer needed. All temporary erosion and sediment control BMPs shall be removed within 30 days after construction is completed and the site is stabilized.

Element #12 - Manage the Project

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

- Design the project to 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.

As this project site is located west of the Cascade Mountain Crest, the project will be managed according to the following key project components:

Phasing of Construction

- The construction project is being phased to the extent practicable in order to prevent soil erosion, and, to the maximum extent possible, the transport of sediment from the site during construction.

- Revegetation of exposed areas and maintenance of that vegetation shall be an integral part of the clearing activities during each phase of construction, per the Scheduling BMP (C 162).

Seasonal Work Limitations

- From October 1 through April 30, clearing, grading, and other soil disturbing activities shall only be permitted if shown to the satisfaction of the local permitting authority that silt-laden runoff will be prevented from leaving the site through a combination of the following:

  - Site conditions including existing vegetative coverage, slope, soil type, and proximity to receiving waters; and

  - Limitations on activities and the extent of disturbed areas; and

  - Proposed erosion and sediment control measures.

- Based on the information provided and/or local weather conditions, the local permitting authority may expand or restrict the seasonal limitation on site disturbance.

- The following activities are exempt from the seasonal clearing and grading limitations:

  - Routine maintenance and necessary repair of erosion and sediment control BMPs;
  - Routine maintenance of public facilities or existing utility structures that do not expose the soil or result in the removal of the vegetative cover to soil; and
  - Activities where there is 100 percent infiltration of surface water runoff within the site in approved and installed erosion and sediment control facilities.

Coordination with Utilities and Other Jurisdictions

- Care has been taken to coordinate with utilities, other construction projects, and the local jurisdiction in preparing this SWPPP and scheduling the construction work.

Inspection and Monitoring

- All BMPs shall be inspected, maintained, and repaired as needed to assure continued performance of their intended function. Site inspections shall be conducted by a person who is knowledgeable in the principles and practices of erosion and sediment control. This person has the necessary skills to:

  - Assess the site conditions and construction activities that could impact the quality of stormwater, and

  - Assess the effectiveness of erosion and sediment control measures used to control the quality of stormwater discharges.

- A Certified Erosion and Sediment Control Lead shall be on-site or on-call at all times.

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

Maintaining an Updated Construction SWPPP

- This SWPPP shall be retained on-site or within reasonable access to the site.

- The SWPPP shall be modified whenever there is a change in the design, construction, operation, or maintenance at the construction site that has, or could have, a significant effect on the discharge of pollutants to waters of the state.

- The SWPPP shall be modified if, during inspections or investigations conducted by the owner/operator, or the applicable local or state regulatory authority, it is determined that the SWPPP is ineffective in eliminating or significantly minimizing pollutants in stormwater discharges from the site. The SWPPP shall be modified as necessary to include additional or modified BMPs designed to correct problems identified. Revisions to the SWPPP shall be completed within seven (7) days following the inspection.

3.2 – SITE SPECIFIC BMPs

Site specific BMPs are shown on the TESC plan sheet(s) in Appendix 2A.

4.0 – CONSTRUCTION PHASING AND BMP IMPLEMENTATION

The BMP implementation schedule will be driven by the construction schedule. The list below provides an estimate of the anticipated construction schedule. The project site is located west of the Cascade Mountain Crest. As such, the dry season is considered to be from May 1 to September 30, and the wet season is considered to be from October 1 to April 30.

5.0 – POLLUTION PREVENTION TEAM

5.1 ROLES AND RESPONSIBILITIES

The pollution prevention team consists of personnel responsible for implementation of the SWPPP, including the following:

- Certified Erosion and Sediment Control Lead (CESCL) – primary contractor contact, responsible for site inspections (BMPs, visual monitoring, sampling, etc.); to be called upon in case of failure of any ESC measures.
- Resident Engineer – For projects with engineered structures only (sediment ponds/traps, sand filters, etc.): Sitge respresentative for the owner that is the project's supervising engineer responsible for inspections and issuing instructions and drawings to the contractor's site supervisor or representative.
- Emergency Ecology Contact – Individual to be contacted at Ecology in case of emergency.
- Emergency Owner Contact – Individual that is the site owner or representative of the site owner to be contacted in the case of an emergency.
- Non-Emergency Ecology Contact – Individual that is the site owner or representative of the site owner that can be contacted if required.

- Monitoring Personnel – Personnel responsible for conducting water quality monitoring; for most sites this person is also the CESCL.

5.2 TEAM MEMBERS

Names and contact information for those identified as members of the pollution prevention team are provided in the project summary in Appendix 2B.

6.0 – SITE INSPECTIONS AND MONITORING

Monitoring includes visual inspection, monitoring for water quality parameters of concern, and documentation of the inspection and monitoring findings in a site log book. A site log book will be maintained for all on-site construction activities and will include:

- A record of the implementation of the SWPPP and other permit requirments;
- Site inspections; and,
- Stormwater quality monitoring.

For convenience, the inspection forma and water quality monitoring forms included in Appendix 2E of this report include the required information for the site log book. This SWPPP may function as the site log book, if desired, or the forms may be separated and included in a separate site log book. However, if separated, the site log book must be maintained on-site or within reasonable access to the site and be made available upon request to Ecology or the local jurisdiction.

6.1 SITE INSPECTION

All BMPs will be inspected, maintained, and repaired as needed to assure continued performance of their intended function. The inspector will be a Certified Erosion and Sediment Control Lead (CESCL) per BMP C160. The name and contact information for the CESCL is provided in Section 5 of this SWPPP.

Site inspection will occur in all areas disturbed by construction activities and at all stormwater discharge points. Stormwater will be examined for the presence of suspended sediment, turbidity, discoloration, and oily sheen. The site inspector will 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 will be documented in the site log book or forms provided in this document. All new BMPs or design changes will be documented in the SWPPP as soon as possible.

6.1.1 Site Inspection Frequency

Site inspections will be conducted at least once a week and within 24 hours following any rainfall event which causes a discharge of stormwater from the site. For sites with temporary stabilization measures, the site inspection frequency can be reduced to once every month.

6.1.2 Site Inspection Documentation

The site inspector will record each site inspection using the site log inspection forms provided in Appendix 2E. The site inspection log forms may be separated from this SWPPP document, but will be maintained on-site or within reasonable access to the site and be made available upon request to Ecology or the local jurisdiction.

6.2 Stormwater Quality Monitoring

6.2.1 Turbidity Sampling

Monitoring requirements for the proposed project will include turbidity sampling to monitor site discharges for water quality compliance with the 2005 Washington State Department of Ecology Stormwater Management Manual NPDES Construction Stormwater General Permit (Appendix 2D). Sampling will be conducted at all site discharge points at least once per calendar week.

Turbidity monitoring will follow the analytical methodologies described in Section S4 of the 2005 Construction Stormwater General Permit (Appendix 2D). The key benchmark values that require action include 25 NTU and 250 NTU for turbidity. If the 25 NTU benchmark for turbidity is exceeded, the following steps will be conducted:

1. Ensure all BMPs specified in this SWPPP are installed and functioning as intended.

2. Assess whether additional BMPs should be implemented and make revisions to the SWPPP as necessary.

3. Sample the discharge location daily until the analysis results are less than 25 NTU (turbidity) or 32 cm (transparency).

If the turbidity is greater than 25 NTU but less than 250 NTU for more than 3 days, additional treatment BMPs will be implemented within 24 hours of the third consecutive sample that exceeded the benchmark value. Additional treatment BMPs will include, but are not limited to, off-site treatment, infiltration, filtration and chemical treatment.

If the 250 NTU benchmark for turbidity is exceeded at any time, the following steps will be conducted:

1. Notify Ecology by phone within 24 hours of analysis.

2. Continue daily sampling until the turbidity is less than 25 NTU.

3. Initiate additional treatment BMPs such as off-site treatment, infiltration, filtration and chemical treatment within 24 hours of the first 250 NTU exceedance.

4. Implement additional treatment BMPs as soon as possible, but within 7 days of the first 250 NTU exceedance.

5. Describe inspection results and remedial actions that are taken in the site log book and in monthly discharge monitoring reports.

6.2.2 pH Sampling

Stormwater runoff will be monitored for pH starting on the first day of any activity that includes more than 40 yards of poured or recycled concrete, or after the application of "Engineered Soils" such as, Portland cement treated base, cement kiln dust, or fly ash. This does not include fertilizers. For concrete work, pH monitoring will start the first day concrete is poured and continue until 3 weeks after the last pour. For engineered soils, the pH monitoring period begins when engineered soils are first exposed to precipitation and continue until the area is fully stabilized.

Stormwater samples will be collected daily from all points of discharge from the site and measured for pH using a calibrated pH meter, pH test kit, or wide range pH indicator paper. If the measured pH is 8.5 or greater, the following steps will be conducted:

1. Prevent the high pH water from entering storm drains or surface water.

2. Adjust or neutralize the high pH water if necessary using appropriate technology such as CO_2 sparging (liquid or dry ice).

3. Contact Ecology if chemical treatment other than CO_2 sparging is planned.

7.0 – REPORTING AND RECORDKEEPING

7.1 RECORDKEEPING

7.1.1 Site Log Book

A site log book will be maintained for all on-site construction activities and will include:

- A record of the implementation of the SWPPP and other permit requirements;
- Site inspections; and,
- Stormwater quality monitoring.

For convenience, the inspection form and water quality monitoring forms included in Appendix 2E of this report include the required information for the site log book.

7.1.2 Records Retention

Records of all monitoring information (site log book, inspection reports/checklists, etc.), this Stormwater Pollution Prevention Plan, and any other documentation of compliance with permit requirements will be retained during the life of the construction project and for a minimum of three years following the termination of permit coverage in accordance with permit condition S5.C.

7.1.3 Access to Plans and Records

The SWPPP, General Permit, Notice of Authorization letter, and Site Log Book will be retained on site or within reasonable access to the site and will be made immediately available upon request to Ecology or the local jurisdiction. A copy of this SWPPP will be provided to Ecology within 14 days of receipt of a written request for the SWPPP from Ecology. Any other information requested by Ecology will be submitted within a reasonable time. A copy of the SWPPP or access to the SWPPP will be provided to the public when requested in writing in accordance with permit condition S5.G.

7.1.4 Updating the SWPPP

In accordance with Conditions S3, S4.B, and S9.B.3 of the General Permit, this SWPPP will be modified if the SWPPP is ineffective in eliminating or significantly minimizing pollutants in stormwater discharges from the site or there has been a change in design, construction, operation, or maintenance at the site that has a significant effect on the discharge, or potential for discharge, of pollutants to the waters of the State. The SWPPP will be modified within seven days of determination based on inspection(s) that additional or modified BMPs are necessary to correct problems identified, and an updated timeline for BMP implementation will be prepared.

7.2 REPORTING

7.2.1 Discharge Monitoring Reports

Discharge Monitoring Report (DMR) forms will not be submitted to Ecology because water quality sampling is not being conducted at the site.

7.2.2 Notification of Noncompliance

If any of the terms and conditions of the permit are not met, and it causes a threat to human health of the environment, the following steps will be taken in accordance with permit section S5.F:

1. Ecology will be immediately notified of the failure to comply.
2. Immediate action will be taken to control the noncompliance issue and to correct the problem. If applicable, sampling and analysis of any noncompliance will be repeated immediately and the results submitted to Ecology within five (5) days of becoming aware of the violation.
3. A detailed written report describing the noncompliance will be submitted to Ecology within five (5) days, unless requested earlier by Ecology.

In accordance with permit condition S2.A, a complete application form will be submitted to Ecology and the appropriate local jurisdiction (if applicable) to be covered by the General Permit.

APPENDIX 3A

SITE PLAN WITH BMP MEASURES

)FESSIONAL IN EROSION AND SEDIMENT CONTROL

SSOCIATES
/ DRIVE #140

104
rs.com
/RE

TEMPORARY CATCH BASIN FILTERS

STABILIZED CONSTRUCTION ENTRANCE

PROPERTY LINE

INTERCEPTOR SWALE

CLEARING/GRADING LIMITS

FILTER FABRIC FENCE

10' CONTOUR (PROPOSED)

2 CONTOUR (PROPOSED)

10' CONTOUR (EXISTING)

2' CONTOUR (EXISTING)

N

1"=50'

50 0 50 100

Scale Feet

Call 2 Working Days Before You Dig
1-800-424-5555
Utilities Underground Location Center
(ID,MT,ND,OR,WA)

REVISIONS

No.	Description	Date
2	SECOND SUBMITTAL	06-30-14
1	FIRST SUBMITTAL	04-01-14

SJR Drawn By
ACR Designed By
ACR Checked By
ACR Approved By
04-01-14 Date

1"=50' Horiz. Scale
- Vert. Scale
318-002-14 Project No.

Date 06-30-14

SDA
Civil Engineering
Project Management
Planning
1724 W. Marine View Drive, Suite 140; Everett, Washington 98201
Office: 425.486.6533 Fax: 425.486.6593 www.sdaengineers.com

Client
TAYLOR DEVELOPMENT
15 LAKE BELLEVUE DRIVE #102
BELLEVUE, WA. 98005
(425) 869-1300

ROBERT FITZMAURICE
Contact

CRESTVIEW VILLAGE

TESC AND GRADING PLAN

C3.0

Jun 30, 2014 - 11:56AM Last Saved By: TStanley

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APPENDIX 3B

SWPPP PROJECT SUMMARY

PROJECT TEAM MEMBERS:

Title	Name(s)	Phone Number
Certified Erosion & Sediment Control Lead	Bill Helsley	(425) 486-6533
Resident Engineer	Andrew Reaves	(425) 486-6533
Emergency Ecology Contact	Puget Sound Office	(425) 649-7000
Emergency Owner Contact	Andrew Reaves	(425) 486-6533
Non-Emergency Ecology Contact	Northwest Region	(425) 649-7000
Monitoring Personnel	Bill Helsley	(425) 486-6533

ESTIMATED CONSTRUCTION SCHEDULE:

- Construction Start Date — July 2014
- Install ESC Measures — July 2014
- Construction End Date — October 2015

CONSTRUCTION BMP LIST:

- Silt Fence (BMP C233)
- Storm Drain Inlet Protection (BMP C220)
- Materials on Hand (BMP C150)
- Detention Pond Or Vault
- Temporary and Permanent Seeding (BMP C120)
- Plastic Covering (BMP C123)
- Topsoiling (BMP C125)
- Early application of gravel base on areas to be paved
- Interceptor Dike and Swale (BMP C200)
- Check Dams (BMP C207)
- Grass-Lined Channels (BMP C201)
- Check Dams (BMP C207)
- Straw Wattles (BMP C235)

APPENDIX 3C

ALTERNATIVE BMPs

The following includes a list of possible alternative BMPs for each of the 12 elements not described in the main SWPPP text. This list can be referenced in the event a BMP for a specific element is not functioning as designed and an alternative BMP needs to be implemented.

Element #1 - Mark Clearing Limits

- High Visibility Plastic or Metal Fence (BMP C103)

Element #2 - Establish Construction Access

- Wheel Wash (BMP C106)

Element #3 - Control Flow Rates

- (none)

Element #4 - Install Sediment Controls

- Straw Bale Barrier (BMP C230)
- Vegetated Strip (BMP C234)
- Materials on Hand (BMP C150)

Element #5 - Stabilize Soils

- Dust Control (BMP C140)
- Topsoiling (BMP C125)
- Sodding (BMP C124)

Element #6 - Protect Slopes

- Straw Wattles (BMP C235)
- Grass-Lined Channels (BMP C201)

Element #7 - Protect Drain Inlets

- (none)

Element #8 - Stabilize Channels and Outlets

- Level Spreader (BMP C206)

Element #10 - Control Dewatering

- (none)

APPENDIX 3D

GENERAL PERMIT

Construction Stormwater General Permit

A copy of the construction stormwater general permit will be added to this appendix once it is obtained.

APPENDIX 3E

SITE LOG & INSPECTION FORMS

Site Inspection Forms (and Site Log)

The results of each inspection shall be summarized in an inspection report or checklist that is entered into or attached to the site log book. It is suggested that the inspection report or checklist be included in this appendix to keep monitoring and inspection information in one document, but this is optional. However, it is mandatory that this SWPPP and the site inspection forms be kept onsite at all times during construction, and that inspections be performed and documented as outlined below.

At a minimum, each inspection report or checklist shall include:

a. Inspection date/times

b. Weather information: general conditions during inspection, approximate amount of precipitation since the last inspection, and approximate amount of precipitation within the last 24 hours.

c. A summary or list of all BMPs that have been implemented, including observations of all erosion/sediment control structures or practices.

d. The following shall be noted:

   i. Locations of BMPs inspected,
   ii. Locations of BMPs that need maintenance,
   iii. The reason maintenance is needed
   iv. Locations of BMPs that failed to operate as designed or intended, and
   v. Locations where additional or different BMPs are needed, and the reason(s) why.

e. A description of stormwater discharged from the site. The presence of suspended sediment, turbid water, discoloration, and/or oil sheen shall be noted, as applicable.

f. A description of any water quality monitoring performed during inspection, and the results of that monitoring.

g. General comments and notes, including a brief description of any BMP r repairs, maintenance or installations made as a result of the inspection.

h. A statement that, in the judgment of the person conducting the site inspection, the site is either in compliance or out of compliance with the terms and conditions of the SWPPP and the NPDES permit. If the site inspection indicates that the site is out of compliance, the inspection report shall include a summary of the remedial actions required to bring the site back into compliance, as well as a schedule of implementation.

i. Name, title, and signature of person conducting the site inspection; and the following statement: "I certify under penalty of law that this report is true, accurate, and complete, to the best of my knowledge and belief".

When the site inspection indicates that the site is not in compliance with any terms and conditions of the NPDES permit, the Permittee shall take immediate action(s) to: stop, contain, and clean up the unauthorized discharges, or otherwise stop the noncompliance; correct the problem(s); implement appropriate Best Management Practices (BMPs), and/or conduct maintenance of existing BMPs; and achieve compliance with all applicable standards and permit conditions. In addition, if the noncompliance causes a threat to human health or the environment, the Permittee shall comply with the Noncompliance Notification requirements in Special Condition S5.F of the permit.

Site Inspection Form

General Information

Project Name:
Inspector Name: **Title:**
CESCL # :
Date: **Time:**
Inspection Type:
- ☐ After a rain event
- ☐ Weekly
- ☐ Turbidity/transparency benchmark exceedance
- ☐ Other

Weather
Precipitation Since last inspection In last 24 hours
Description of General Site Conditions:

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	

BMP:

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

Element 3: Control Flowrates

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	

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	

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	

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	

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	

BMP:

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

Stormwater Discharges From the Site		Observed? Y	N		Problem/Corrective Action
Location					
	Turbidity				
	Discoloration				
	Sheen				
Location					
	Turbidity				
	Discoloration				
	Sheen				

Water Quality Monitoring
Was any water quality monitoring conducted? ☐ Yes ☐ No If water quality monitoring was conducted, record results here:
If water quality monitoring indicated turbidity 250 NTU or greater; or transparency 6 cm or less, was Ecology notified by phone within 24 hrs? ☐ Yes ☐ No
If Ecology was notified, indicate the date, time, contact name and phone number below: Date: Time: Contact Name: Phone #:
General Comments and Notes Include BMP repairs, maintenance, or installations made as a result of the inspection.
Were Photos Taken? ☐ Yes ☐ No If photos taken, describe photos below:

APPENDIX 3F

TESC CALCULATIONS

SECTION 4

MINIMUM REQUIREMENT #3

SOURCE CONTROL OF POLLUTION

Source Control Narrative

There are no hazardous materials proposed to be on site that would require source control BMP's.

SECTION 5

MINIMUM REQUIREMENT #4

PRESERVATION OF NATURAL DRAINAGE SYSTEMS AND OUTFALLS

NATURAL DRAINAGE COURSE DESCRIPTION

The site has a single drainage basin. Stormwater runoff currently drains overland from southwest towards the northeast following the natural topography of the area. Topography contours of the area suggest peak volumes flow downhill before crossing the property boundary and entering the 132nd St SE right-of-way.

Developed Drainage Course Description

In order to keep the drainage release in its natural patterns, onsite stormwater runoff will be captured and conveyed to a proposed detention vault to detain peak flow volumes and regulate release rates that mimic the predeveloped site. The detention vault will be located in the northwest corner of the project site, adjacent to 132nd St. SE, and will be constructed as a wetvault to incorporate wetpool storage volumes in order to provide water quality treatment. Treated and mitigated flows will release north to the existing City of Mill Creek stormwater system located within 132nd St. SE.

Performance Standards

The detention vault and stormwater quality elements are subject to the requirements of the 2005 Washington State Department of Ecology Stormwater Management Manual. See **Appendix 8-A** for full WWHM3 flow control data outputs.

SECTION 6

MINIMUM REQUIREMENT #5

ON-SITE STORMWATER MANAGEMENT

ON-SITE STORMWATER MANAGEMENT

Existing Site Hydrology

The site has a single drainage basin. Stormwater runoff currently drains overland from southwest towards the northeast following the natural topography of the area. Topography contours of the area suggest peak volumes flow downhill before crossing the property boundary and entering the 132nd St SE right-of-way.

Developed Site Hydrology

In order to keep the drainage release in its natural patterns, onsite stormwater runoff will be captured and conveyed to a proposed detention vault to detain peak flow volumes and regulate release rates that mimic the predeveloped site. The detention vault will be located in the northwest corner of the project site, adjacent to 132nd St. SE, and will be constructed as a wetvault to incorporate wetpool storage volumes in order to provide water quality treatment. Treated and mitigated flows will release north to the existing City of Mill Creek stormwater system located within 132nd St. SE.

The detention vault and stormwater quality elements are subject to the requirements of the 2005 Washington State Department of Ecology Stormwater Management Manual. See **Appendix 8-A** for full WWHM3 flow control data outputs.

Performance Standards

Flow Control and Stormwater Quality elements are subject to the requirements of the 2005 Washington State Department of Ecology Stormwater Management Manual. The modeling software used for both water quality treatment design flows and volumes is version 3 of WWHM Continuous Stormwater Modeling Software.

SECTION 7

MINIMUM REQUIREMENT #6

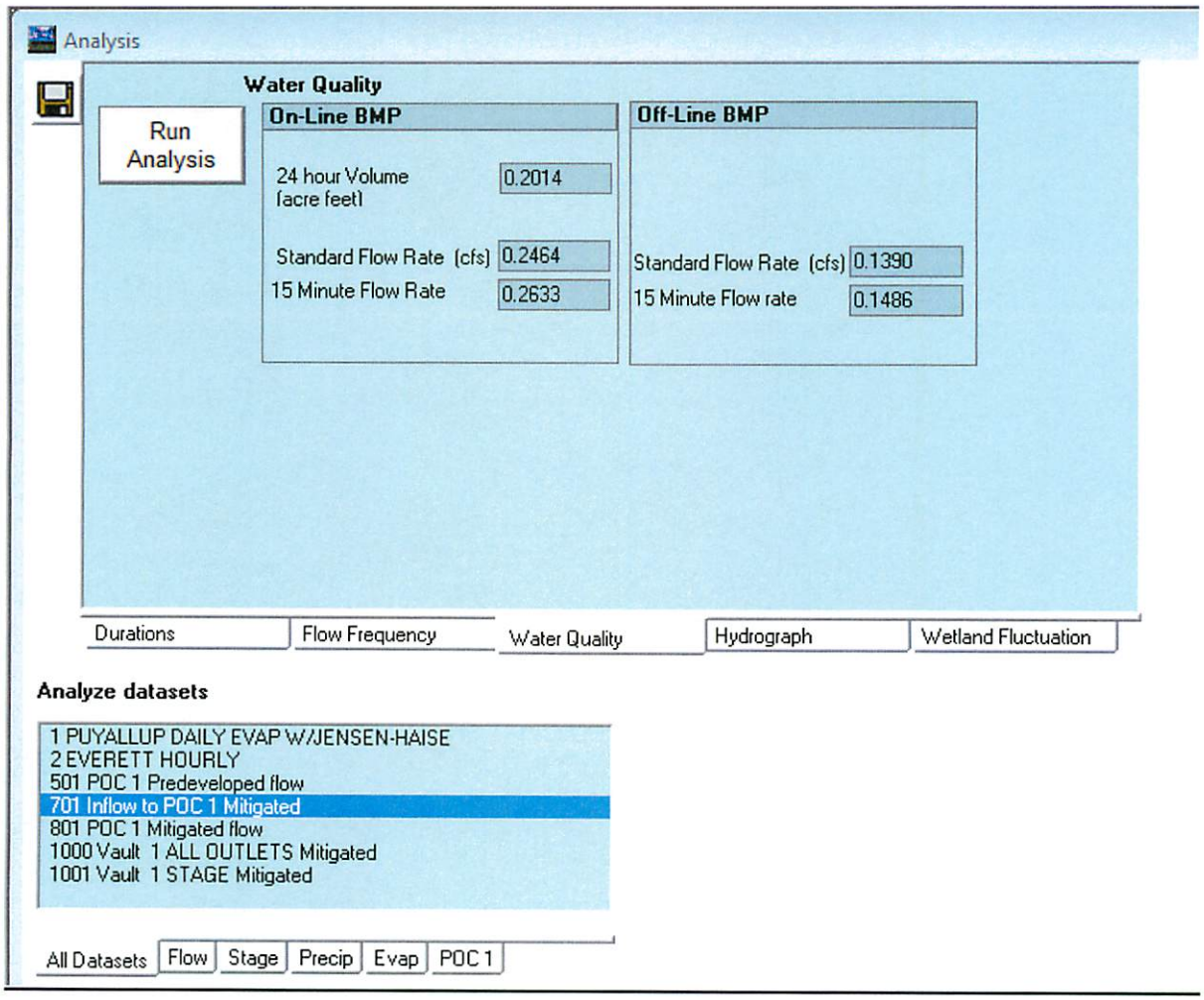
RUNOFF TREATMENT

PROJECT RUNOFF TREATMENT

In order to keep the drainage release in its natural patterns, onsite stormwater runoff will be captured and conveyed to a proposed detention vault to detain peak flow volumes and regulate release rates that mimic the predeveloped site. The detention vault will be located in the northwest corner of the project site, adjacent to 132nd St. SE, and will be constructed as a wetvault to incorporate wetpool storage volumes in order to provide water quality treatment. Treated and mitigated flows will release north to the existing City of Mill Creek stormwater system located within 132nd St. SE.

The detention vault and stormwater quality elements are subject to the requirements of the 2005 Washington State Department of Ecology Stormwater Management Manual. See **Appendix 8-A** for full WWHM3 flow control data outputs.

WWHM3 – 701 Inflow to Detention Vault:



The dead storage design was calculated using the computed WWHM3 701 inflow to POC 1 Mitigated volume of .2014 acre-feet, shown above. The detention vault has been designed to accommodate flow control detention volumes plus water quality dead storage treatment volumes.

Dead storage design calculations are provided in **Appendix 7-A.**

APPENDIX 7-A

WETVAULT DESIGN CALCULATIONS

	Made by: TJS	Date: 6/25/2014	Project: Crestview Village
	Checked by:	Date:	Project No: 318-002
	Backchecked by:	Date:	Sheet No: 1

Required Treatment Volume (per WWHM Calculations): **0.2014** ac-ft

Required Treatment Volume (converted to cu. ft.): **8773** CF

	est. 30%	2631.9
Wetpool Storage Design Dimensions:	est. 70%	6141.1

			Vault with vertical walls		
Cell #1 Bottom Width:	22	FT	Side Slope #1:	0	:1
Cell #1 Bottom Length:	30	FT	Side Slope #2:	0	:1
Cell #2 Bottom Width:	22	FT	End Slope #1:	0	:1
Cell #2 Bottom Length:	70	FT	End Slope #2:	0	:1
Dead storage depth	4	FT			

Wetpool Volume Calculations:

Cell #1 Volume:	2,640	CF	(30% of total)
Cell #2 Volume:	6,160	CF	(70% of total)
Total Wetpool Volume:	**8,800**	**CF**	

Required	**8773**	**CF**	**Proposed**	**8,800**	**CF**

SECTION 8

MINIMUM REQUIREMENT #7

FLOW CONTROL

FLOW CONTROL

Existing Site Hydrology

The site has a single drainage basin. Stormwater runoff currently drains overland from southwest towards the northeast following the natural topography of the area. Topography contours of the area suggest peak volumes flow downhill before crossing the property boundary and entering the 132nd St SE right-of-way.

Developed Site Hydrology

In order to keep the drainage release in its natural patterns, onsite stormwater runoff will be captured and conveyed to a proposed detention vault to detain peak flow volumes and regulate release rates that mimic the predeveloped site. The detention vault will be located in the northwest corner of the project site, adjacent to 132nd St. SE, and will be constructed as a wetvault to incorporate wetpool storage volumes in order to provide water quality treatment. Treated and mitigated flows will release north to the existing City of Mill Creek stormwater system located within 132nd St. SE.

The detention vault and stormwater quality elements are subject to the requirements of the 2005 Washington State Department of Ecology Stormwater Management Manual. See **Appendix 8-A** for full WWHM3 flow control data outputs.

Performance Standards

Flow Control and Stormwater Quality elements are subject to the requirements of the 2005 Washington State Department of Ecology Stormwater Management Manual. The modeling software used for both water quality treatment design flows and volumes is the version 3 of WWHM3 Continuous Stormwater Modeling Software.

LID FEASIBILITY DISCUSSION

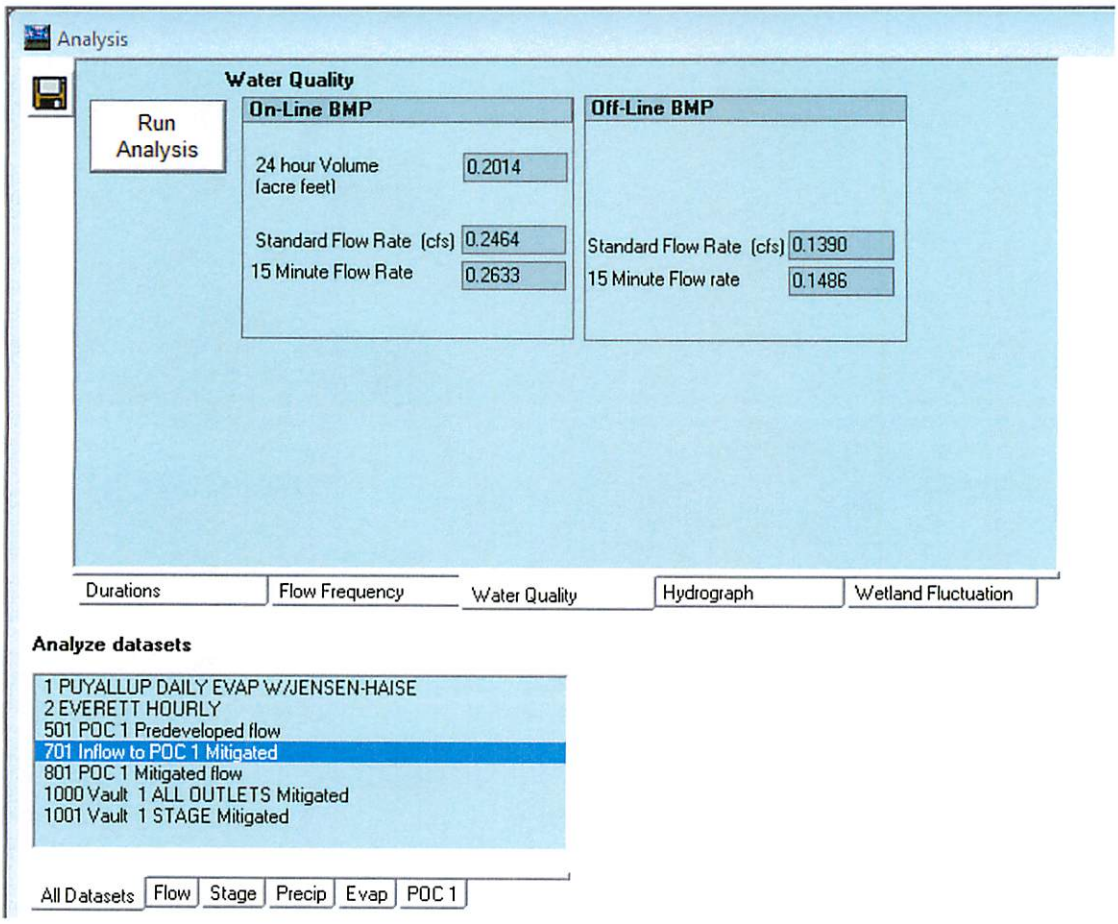
The soils underlying and surrounding Low Impact Development (LID) methods are a principal design element for determining infiltration capacity, as well as the LID type, and size. Per the NRCS web soil survey, site soils are Alderwood-Urban land complex with 2 to 8 percent slopes. This unit is about 60 percent Alderwood gravelly sandy loam and about 25 percent Urban land, formed in glacial till. This soil type is moderately deep over a hardpan, and is moderately well drained with a low available water capacity.

Because of the low available water capacity, Low Impact Development (LID) methods are considered infeasible for the project site. The limited infiltration and storage capacity of the underlying till soil undermines the successful application of LID methods such as permeable pavement and bioretention facilities. No LID facilities are proposed for this project.

APPENDIX 8-A

FLOW CONTROL DESIGN CALCULATIONS

701 Inflow to POC 1 Mitigated



Western Washington Hydrology Model
PROJECT REPORT

Project Name: 318-002 - CV
Site Address:
City : Mill Creek
Report Date : 6/25/2014
Gage : Everett
Data Start : 1948/10/01
Data End : 1997/09/30
Precip Scale: 1.00
WWHM3 Version:

PREDEVELOPED LAND USE

Name : Basin 1
Bypass: No

GroundWater: No

Pervious Land Use	Acres
C, Forest, Flat	3.12

Impervious Land Use	Acres

Element Flows To:

Surface	Interflow	Groundwater

Name : Basin 1
Bypass: No

GroundWater: No

Pervious Land Use	Acres
C, Lawn, Flat	1.47

Impervious Land Use	Acres
ROADS FLAT	0.57
ROADS MOD	1.08

Element Flows To:

Surface	Interflow	Groundwater
Vault 1,	Vault 1,	

Name : Vault 1
Width : 72 ft.
Length : 72 ft.
Depth: 7.25ft.
Discharge Structure
Riser Height: 6.25 ft.
Riser Diameter: 18 in.
NotchType : Rectangular
Notch Width : 0.010 ft.
Notch Height: 1.494 ft.
Orifice 1 Diameter: 0.72 in. **Elevation:** 0 ft.

Element Flows To:

Outlet 1 **Outlet 2**

Vault Hydraulic Table

Stage(ft)	Area(acr)	Volume(acr-ft)	Dschrg(cfs)	Infilt(cfs)
0.000	0.119	0.000	0.000	0.000
0.081	0.119	0.010	0.004	0.000
0.161	0.119	0.019	0.005	0.000
0.242	0.119	0.029	0.007	0.000
0.322	0.119	0.038	0.008	0.000
0.403	0.119	0.048	0.009	0.000
0.483	0.119	0.058	0.009	0.000
0.564	0.119	0.067	0.010	0.000
0.644	0.119	0.077	0.011	0.000
0.725	0.119	0.086	0.012	0.000
0.806	0.119	0.096	0.012	0.000
0.886	0.119	0.105	0.013	0.000
0.967	0.119	0.115	0.013	0.000
1.047	0.119	0.125	0.014	0.000
1.128	0.119	0.134	0.014	0.000
1.208	0.119	0.144	0.015	0.000
1.289	0.119	0.153	0.015	0.000
1.369	0.119	0.163	0.016	0.000
1.450	0.119	0.173	0.016	0.000
1.531	0.119	0.182	0.017	0.000
1.611	0.119	0.192	0.017	0.000
1.692	0.119	0.201	0.018	0.000
1.772	0.119	0.211	0.018	0.000
1.853	0.119	0.220	0.019	0.000
1.933	0.119	0.230	0.019	0.000
2.014	0.119	0.240	0.019	0.000
2.094	0.119	0.249	0.020	0.000
2.175	0.119	0.259	0.020	0.000
2.256	0.119	0.268	0.020	0.000
2.336	0.119	0.278	0.021	0.000
2.417	0.119	0.288	0.021	0.000
2.497	0.119	0.297	0.022	0.000
2.578	0.119	0.307	0.022	0.000
2.658	0.119	0.316	0.022	0.000
2.739	0.119	0.326	0.023	0.000
2.819	0.119	0.336	0.023	0.000
2.900	0.119	0.345	0.023	0.000
2.981	0.119	0.355	0.024	0.000
3.061	0.119	0.364	0.024	0.000
3.142	0.119	0.374	0.024	0.000
3.222	0.119	0.383	0.024	0.000
3.303	0.119	0.393	0.025	0.000
3.383	0.119	0.403	0.025	0.000
3.464	0.119	0.412	0.025	0.000
3.544	0.119	0.422	0.026	0.000
3.625	0.119	0.431	0.026	0.000
3.706	0.119	0.441	0.026	0.000
3.786	0.119	0.451	0.026	0.000
3.867	0.119	0.460	0.027	0.000
3.947	0.119	0.470	0.027	0.000
4.028	0.119	0.479	0.027	0.000
4.108	0.119	0.489	0.028	0.000
4.189	0.119	0.499	0.028	0.000
4.269	0.119	0.508	0.028	0.000
4.350	0.119	0.518	0.028	0.000
4.431	0.119	0.527	0.029	0.000
4.511	0.119	0.537	0.029	0.000
4.592	0.119	0.546	0.029	0.000

4.672	0.119	0.556	0.029	0.000
4.753	0.119	0.566	0.030	0.000
4.833	0.119	0.575	0.031	0.000
4.914	0.119	0.585	0.032	0.000
4.994	0.119	0.594	0.034	0.000
5.075	0.119	0.604	0.036	0.000
5.156	0.119	0.614	0.039	0.000
5.236	0.119	0.623	0.041	0.000
5.317	0.119	0.633	0.044	0.000
5.397	0.119	0.642	0.047	0.000
5.478	0.119	0.652	0.049	0.000
5.558	0.119	0.661	0.052	0.000
5.639	0.119	0.671	0.055	0.000
5.719	0.119	0.681	0.058	0.000
5.800	0.119	0.690	0.061	0.000
5.881	0.119	0.700	0.065	0.000
5.961	0.119	0.709	0.068	0.000
6.042	0.119	0.719	0.072	0.000
6.122	0.119	0.729	0.076	0.000
6.203	0.119	0.738	0.093	0.000
6.283	0.119	0.748	0.185	0.000
6.364	0.119	0.757	0.658	0.000
6.444	0.119	0.767	1.349	0.000
6.525	0.119	0.777	2.204	0.000
6.606	0.119	0.786	3.194	0.000
6.686	0.119	0.796	4.305	0.000
6.767	0.119	0.805	5.523	0.000
6.847	0.119	0.815	6.840	0.000
6.928	0.119	0.824	8.249	0.000
7.008	0.119	0.834	9.745	0.000
7.089	0.119	0.844	11.32	0.000
7.169	0.119	0.853	12.98	0.000
7.250	0.119	0.863	14.71	0.000
7.331	0.119	0.842	16.51	0.000

MITIGATED LAND USE

ANALYSIS RESULTS

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.057941
5 year	0.086265
10 year	0.10809
25 year	0.13936
50 year	0.165469
100 year	0.194104

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.037723
5 year	0.080908
10 year	0.128898
25 year	0.223309
50 year	0.328118
100 year	0.473388

Yearly Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated

1950	0.022	0.025
1951	0.081	0.041
1952	0.047	0.026
1953	0.042	0.025
1954	0.047	0.024
1955	0.071	0.028
1956	0.106	0.153
1957	0.076	0.182
1958	0.098	0.036
1959	0.072	0.029
1960	0.061	0.029
1961	0.060	0.029
1962	0.058	0.072
1963	0.066	0.023
1964	0.098	0.028
1965	0.056	0.022
1966	0.058	0.030
1967	0.030	0.026
1968	0.079	0.027
1969	0.084	0.032
1970	0.039	0.028
1971	0.045	0.027
1972	0.063	0.132
1973	0.061	0.026
1974	0.044	0.046
1975	0.052	0.037
1976	0.046	0.023
1977	0.047	0.029
1978	0.035	0.024
1979	0.046	0.025
1980	0.123	0.023
1981	0.050	0.026
1982	0.051	0.023
1983	0.059	0.045
1984	0.051	0.030
1985	0.057	0.186
1986	0.080	0.096
1987	0.198	0.495
1988	0.083	0.253
1989	0.045	0.039
1990	0.056	0.023
1991	0.059	0.034
1992	0.064	0.040
1993	0.045	0.034
1994	0.030	0.020
1995	0.025	0.040
1996	0.058	0.049
1997	0.110	0.052
1998	0.238	0.831

Ranked Yearly Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.2377	0.8305
2	0.1984	0.4955
3	0.1232	0.2527
4	0.1098	0.1861
5	0.1060	0.1820
6	0.0982	0.1532
7	0.0982	0.1322
8	0.0838	0.0957
9	0.0831	0.0721
10	0.0811	0.0517

11	0.0802	0.0489
12	0.0790	0.0465
13	0.0759	0.0455
14	0.0716	0.0414
15	0.0712	0.0398
16	0.0662	0.0396
17	0.0637	0.0392
18	0.0629	0.0373
19	0.0615	0.0361
20	0.0610	0.0345
21	0.0596	0.0338
22	0.0593	0.0324
23	0.0589	0.0300
24	0.0584	0.0296
25	0.0578	0.0291
26	0.0575	0.0289
27	0.0565	0.0288
28	0.0563	0.0287
29	0.0561	0.0281
30	0.0517	0.0280
31	0.0513	0.0277
32	0.0509	0.0274
33	0.0496	0.0268
34	0.0474	0.0259
35	0.0466	0.0259
36	0.0466	0.0258
37	0.0461	0.0257
38	0.0456	0.0254
39	0.0450	0.0252
40	0.0449	0.0250
41	0.0448	0.0241
42	0.0437	0.0236
43	0.0421	0.0234
44	0.0386	0.0233
45	0.0352	0.0233
46	0.0304	0.0229
47	0.0298	0.0229
48	0.0253	0.0219
49	0.0218	0.0202

POC #1
The Facility PASSED

The Facility PASSED.

Flow(CFS)	Predev	Dev	Percentage	Pass/Fail
0.0290	4776	4096	85	Pass
0.0303	4317	2808	65	Pass
0.0317	3923	2473	63	Pass
0.0331	3554	2160	60	Pass
0.0345	3216	1947	60	Pass
0.0359	2888	1781	61	Pass
0.0372	2603	1619	62	Pass
0.0386	2354	1494	63	Pass
0.0400	2141	1381	64	Pass
0.0414	1945	1282	65	Pass
0.0428	1746	1202	68	Pass
0.0441	1559	1130	72	Pass
0.0455	1391	1064	76	Pass
0.0469	1265	977	77	Pass
0.0483	1158	908	78	Pass
0.0497	1056	842	79	Pass

0.0510	963	790	82	Pass
0.0524	869	732	84	Pass
0.0538	788	685	86	Pass
0.0552	711	648	91	Pass
0.0565	633	609	96	Pass
0.0579	569	568	99	Pass
0.0593	519	534	102	Pass
0.0607	475	491	103	Pass
0.0621	430	453	105	Pass
0.0634	403	417	103	Pass
0.0648	378	382	101	Pass
0.0662	352	359	101	Pass
0.0676	325	329	101	Pass
0.0690	302	294	97	Pass
0.0703	283	265	93	Pass
0.0717	268	242	90	Pass
0.0731	254	218	85	Pass
0.0745	243	201	82	Pass
0.0758	223	186	83	Pass
0.0772	205	177	86	Pass
0.0786	190	167	87	Pass
0.0800	178	162	91	Pass
0.0814	162	157	96	Pass
0.0827	157	150	95	Pass
0.0841	150	143	95	Pass
0.0855	145	140	96	Pass
0.0869	138	133	96	Pass
0.0883	130	127	97	Pass
0.0896	125	120	96	Pass
0.0910	121	115	95	Pass
0.0924	118	112	94	Pass
0.0938	115	110	95	Pass
0.0952	114	106	92	Pass
0.0965	111	104	93	Pass
0.0979	110	100	90	Pass
0.0993	105	97	92	Pass
0.1007	105	96	91	Pass
0.1020	103	96	93	Pass
0.1034	101	93	92	Pass
0.1048	99	90	90	Pass
0.1062	96	90	93	Pass
0.1076	93	89	95	Pass
0.1089	87	88	101	Pass
0.1103	84	85	101	Pass
0.1117	82	84	102	Pass
0.1131	81	84	103	Pass
0.1145	77	82	106	Pass
0.1158	75	79	105	Pass
0.1172	74	77	104	Pass
0.1186	73	74	101	Pass
0.1200	72	72	100	Pass
0.1213	70	71	101	Pass
0.1227	70	68	97	Pass
0.1241	68	67	98	Pass
0.1255	66	65	98	Pass
0.1269	66	64	96	Pass
0.1282	64	61	95	Pass
0.1296	62	60	96	Pass
0.1310	60	56	93	Pass
0.1324	58	53	91	Pass
0.1338	58	51	87	Pass
0.1351	57	50	87	Pass
0.1365	54	50	92	Pass

0.1379	54	50	92	Pass
0.1393	54	48	88	Pass
0.1407	52	47	90	Pass
0.1420	52	43	82	Pass
0.1434	50	43	86	Pass
0.1448	49	41	83	Pass
0.1462	49	41	83	Pass
0.1475	47	41	87	Pass
0.1489	45	41	91	Pass
0.1503	45	39	86	Pass
0.1517	43	38	88	Pass
0.1531	41	38	92	Pass
0.1544	41	37	90	Pass
0.1558	40	37	92	Pass
0.1572	39	37	94	Pass
0.1586	37	36	97	Pass
0.1600	35	35	100	Pass
0.1613	35	33	94	Pass
0.1627	34	33	97	Pass
0.1641	34	32	94	Pass
0.1655	33	31	93	Pass

Water Quality BMP Flow and Volume for POC 1.
On-line facility volume: 0.2014 acre-feet
On-line facility target flow: 0.01 **cfs.**
Adjusted for 15 min: 0.2633 **cfs.**
Off-line facility target flow: 0.139 **cfs.**
Adjusted for 15 min: 0.1486 **cfs.**

Perlnd and Implnd Changes
No changes have been made.

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SECTION 9

MINIMUM REQUIREMENT #8

WETLANDS PROTECTION

WETLAND PROTECTION

Wetland Protection

There are no wetlands or wetland buffers on or near the developed portion of the site.

SECTION 10

MINIMUM REQUIREMENT #9

OPERATION AND MAINTENANCE

No. 3 – Underground Detention Pipes/Tanks

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
Storage Area	Plugged Air Vents	One-half of the cross section of a vent is blocked at any point or the vent is damaged.	Vents open and functioning.
	Debris and Sediment	The average sediment depth measured at multiple locations exceeds 10% of the detention pipe diameter (or the depth of the storage area) or the sediment depth measured at any single point exceeds 15% of the pipe diameter. (Example: The sediment depth in a 60-inch diameter detention pipe is measured at three locations. The sediment would need to be removed if the average depth of the three measurements is at least 6 inches or if the depth of any single measurement is at least 9 inches.	All sediment, debris, and organic matter removed from storage area.
	Joints Between Tank/Pipe Section	Any openings or voids at section joint allowing material to seep into or water to leak out of facility. Note: This may need an engineering analysis to assess the structural stability.	All joints between tank/pipe sections are sealed.
	Tank or Pipe Bent Out of Shape	Any part of tank/pipe is bent out of shape more than 10% of its design shape. Note: This may need an engineering analysis to assess the structural stability.	Tank/pipe section is repaired or replaced to design.
	Tank/Pipe Material	Any visible holes or cracks wider than a quarter of an inch or evidence of material seeping into or water leaking out of pipe wall, or qualified maintenance or inspection personnel determine that tank/pipe is not structurally sound.	Tank/pipe is repaired or replaced to design specifications and is structurally sound.
Access Hole	Cover Not in Place	Cover is missing or only partially in place. Any open manhole requires maintenance.	Manhole is closed.
	Locking Mechanism Not Working	Locking mechanism cannot be opened or lock bolts cannot be removed by one maintenance person with proper hand tools.	Mechanism or lock bolts open with proper hand tools.
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure with proper hand tools. Intent is to keep cover from sealing off access to maintenance.	Cover can be removed and reinstalled by one maintenance person with proper hand tools.
	Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, cracked/broken rungs, misalignment, rungs not securely attached to structure wall, rust, or cracks.	Ladder meets design standards and allows maintenance person safe access.
Catch Basins	See "Catch Basins" (No. 5)	See "Catch Basins" (No. 5).	See "Catch Basins" (No. 5).
Standpipe, Cleanout Gate, Orifice Plate	Obstructions, Damaged, or Missing	See "Control Structure/Flow Restrictors" (No. 4)	See "Control Structure/Flow Restrictors" (No. 4)

No. 4 – Control Structure/Flow Restrictor

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Standpipe	Obstructions	Any material blocking (or having the potential of blocking) the pipe overflow.	Pipe is free of all obstructions and works as designed.
	Structural Damage	Structure is not securely attached to manhole wall.	Structure is securely attached to wall and outlet pipe.
		Structure is not in upright position (allow up to 10% from plumb).	Structure is in correct position.
		Connections to outlet pipe are not watertight and show signs of rust.	Connections to outlet pipe are water tight; structure repaired or replaced and works as designed.
		Any holes other than designed holes in the structure.	Structure has no holes other than designed holes.
Cleanout Gate	Damaged or Missing	Cleanout gate is not watertight or is missing.	Gate is watertight and works as designed.
		Gate cannot be moved up and down by one maintenance person.	Gate moves up and down easily and is watertight.
		Chain/rod leading to gate is missing or damaged.	Chain is in place and works as designed.
		Gate is rusted over 50% of its surface area.	Gate is repaired or replaced to meet design standards.
Orifice Plate	Damaged or Missing	Control device is not working properly due to missing, out of place, or bent orifice plate.	Plate is in place and works as designed.
	Obstructions	Any trash, debris, sediment, or vegetation blocking the plate.	Plate is free of all obstructions and works as designed.
Overflow Pipe	Obstructions	Any trash or debris blocking (or having the potential of blocking) the overflow pipe.	Pipe is free of all obstructions and works as designed.
Access Hole	Cover Not in Place	Cover is missing or only partially in place. Any open manhole requires maintenance.	Manhole is closed.
	Locking Mechanism Not Working	Locking mechanism cannot be opened or lock bolts cannot be removed by one maintenance person with proper hand tools.	Mechanism or lock bolts open with proper hand tools.
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure with proper hand tools. Intent is to keep cover from sealing off access to maintenance.	Cover can be removed and reinstalled by one maintenance person with proper hand tools.
	Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, cracked/broken rungs, misalignment, rungs not securely attached to structure wall, rust, or cracks.	Ladder meets design standards and allows maintenance person safe access.

No. 4 – CONTROL STRUCTURE/FLOW RESTRICTORS

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Catch Basin	See –Catch Basins‖ (No. 5).	See –Catch Basins‖ (No. 5).	See –Catch Basins‖ (No. 5).
	Sediment & Debris	Sediment, trash, vegetation, and/or other debris material exceeds 25% of the catch basin sump depth or is 1 foot below the orifice plate.	Control structure orifice is not blocked. All sediment and debris removed.

No. 12 – Wetvaults

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Trash/Debris Accumulation	Trash and debris accumulated in vault, pipe or inlet/outlet (includes floatables and non-floatables).	Remove trash and debris from vault.
	Sediment Accumulation	Sediment accumulation in vault bottom exceeds the depth of the sediment zone plus 6 inches.	Remove sediment from vault.
	Damaged Pipes	Inlet/outlet piping damaged or broken and in need of repair.	Pipe repaired and/or replaced.
	Access Hole Cover Damaged/Not Working	One maintenance person cannot remove lid after applying normal lifting pressure with proper hand tools.	Cover can be removed and reinstalled by one maintenance person with proper hand tools.
	Ventilation	Ventilation area blocked or plugged.	Blocking material removed or cleared from ventilation area. Specified % of the vault surface area provides ventilation to the vault interior (see design specifications).
	Vault Structure Damage - Includes Cracks in Walls Bottom, Damage to Frame and/or Top Slab	Cracks wider than 1/2 inch or evidence of soil particles entering the structure through the cracks, or qualified maintenance or inspection personnel determine that the vault is not structurally sound.	Vault replaced or repairs made so that vault meets design specifications and is structurally sound.
		Cracks wider than 1/2 inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.	Vault repaired so that no cracks exist wider than 1/4 inch at the joint of the inlet/outlet pipe.
	Baffles	Baffles corroding, cracking, warping and/or showing signs of failure as determined by qualified maintenance or inspection personnel.	Baffles repaired or replaced to specifications.
	Access Ladder Damage	Ladder is corroded or deteriorated, not functioning properly, not attached to structure wall, missing rungs, has cracked/broken rungs and/or is misaligned. Confined space warning sign missing.	Ladder replaced or repaired to specifications, and allows maintenance person safe access. Replace sign warning of confined space entry requirements. Ladder and entry notification complies with OSHA standards.

No. 5 – CATCH BASINS

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is performed
General	Sediment & Debris	Sediment, trash, and/or other debris material is located immediately in front of the catch basin opening or is blocking inletting capacity of the basin by more than 10%.	No sediment or debris is located immediately in front of catch basin or on grate opening.
		Sediment, trash, and/or other debris material (located in the catch basin) 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 sediment or debris is in the catch basin.
		Sediment, trash, and/or other debris material located in any inlet or outlet pipe is blocking more than 1/3 of its height.	Inlet and outlet pipes are free of sediment and debris.
		Dead animals or vegetation that impair catch basin function or that could generate odors that could cause complaints or dangerous gases (e.g., methane).	No dead animals or vegetation are present within 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 seeping into the catch basin).	Top slab is free of holes and cracks. No water and/or soil is seeping into the catch basin
		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	Cracks wider than 1/2 inch or evidence of soil particles entering the structure through the cracks, or qualified maintenance or inspection personnel determine that the vault is not structurally sound.	Catch basin is 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 catch basin through cracks.	Pipe is regrouted and secure at basin wall.
	Settlement/ Misalignment	Settlement of misalignment of the catch basin causes a safety, function, or design problem.	Catch basin is replaced or repaired to design standards.
	Contaminants and Pollution	Any evidence of oil, gasoline, contaminants or other pollutants Note: Coordinate removal/cleanup with local and/or state water quality response agency.	Contaminants or pollutants are removed.
Access Hole Cover	Cover Not in Place	Cover is missing or only partially in place. Any open catch basin requires maintenance.	Catch basin cover is fully in place
	Locking Mechanism Not Working	Locking mechanism cannot be opened or lock bolts cannot be removed by one maintenance person with proper hand tools.	Mechanism or lock bolts open with proper hand tools.
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure with proper hand tools. Intent is keep cover from sealing off access to maintenance.	Cover can be removed and reinstalled by one maintenance person with proper hand tools.

No. 5 – CATCH BASINS

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is performed
Ladder	Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, cracked/broken rungs, rungs not securely attached to basin wall, misalignment, rust, cracks, or sharp edges.	Ladder meets design standards and allows maintenance person safe access.
Metal Grates (If Applicable)	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.

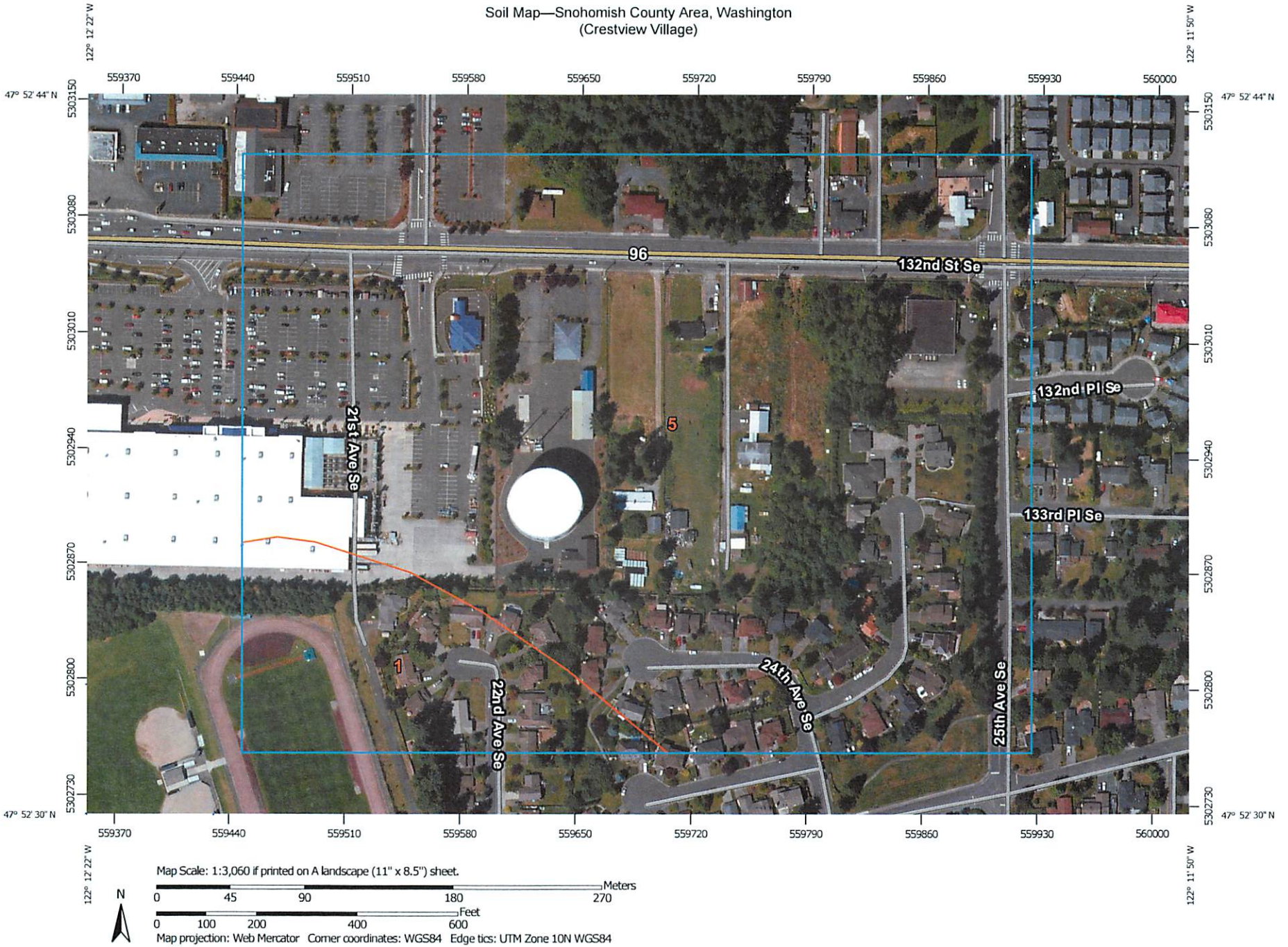
SECTION 11

SPECIAL REPORTS AND STUDIES

APPENDIX 11-A

NRCS SOIL SURVEY INFORMATION

Soil Map—Snohomish County Area, Washington
(Crestview Village)



MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Snohomish County Area, Washington
Survey Area Data: Version 10, Mar 25, 2014

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 9, 2010—Aug 20, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Snohomish County Area, Washington (WA661)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
1	Alderwood gravelly sandy loam, 2 to 8 percent slopes	5.4	12.6%
5	Alderwood-Urban land complex, 2 to 8 percent slopes	37.6	87.4%
Totals for Area of Interest		**43.0**	**100.0%**