



Lindsay Investments, LLC.

8326 172nd St NE, Arlington, WA 98223

PFN # _____

Preliminary Plat Submittal: February 2026

**Stormwater Site Plan Report
for
Lindsay Subarea Plan
Lindsay Investments, LLC.**

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Section 1 – Summary and Minimum Requirements

1.1 Project Description

Lindsay Project 1, is a proposed preliminary plat within the Lindsay subarea plan. The preliminary plat will reside on a 32.26-*acres* of land in the City of Arlington. The parcels are owned by Lindsay Investments, LLC. The development is located on Parcel Numbers 310525-002-006-00, 310526-001-001-00, -002-00, -022-00, -023-00 and bears the address 8326 172nd St NE, Arlington, WA 98223. The development will contain 12.17-*acres* impervious surface of which 6.11-*acres* will be pollution generating and 6.06-*acres* will be non-pollution generating impervious surface.

The development of the parcels will consist of single family homes, roads, driveways, and recreational park features. The neighborhood will include LID stormwater management features and conform to the requirements set forth in Arlington Municipal Code (AMC).

The project will incorporate the preferred options for On-site Stormwater Management to the maximum extent feasible in accordance with the 2019 Stormwater Management Manual for Western Washington (SMMWW). The most preferred option from the Manual is Full Dispersion, BMP T5.30. A portion of the site will incorporate Full Dispersion. The second preferred option for non-pollution generating impervious surface is Rooftop Dispersion BMPs. Rooftops will be routed to Downspout Dispersion Trenches (BMP T5.10B) where applicable. Pollution Generating Impervious Surfaces are managed with Bioretention Cells (BMP T7.30) to expose stormwater to the native soil column to preserve natural infiltration pathways to the broadest application possible. This is the second preferred option for PGHS. The site will also use stormwater mitigation strategies that are not listed within the Stormwater Manual as BMP's. Many of the rooftops will be routed to individual rock detention chambers which provide storage and exposure of stormwater to native soils. This fulfills the intent of MR #5 despite not being a recognized BMP. Stormwater leaving these chambers will then be detained in conventional stormwater systems prior to discharge.

Stormwater generated onsite will be managed via LID BMPs under Minimum Requirement #5 to the maximum extent feasible. Stormwater generated from surfaces exceeding the criteria for Runoff Treatment Control (MR#6) and Flow Control (MR #7) will be first directed to On-Site stormwater BMPs and then managed through conventional stormwater techniques. Stormwater leaving the developed sites will comply with all Minimum Requirements to the maximum extent feasible.

1.2 Project Data Summary

Existing and proposed project areas are presented in Table 2 for determination of stormwater management requirements based on prescribed thresholds as outlined in the AMC Section 13.28.

1.3 Construction Activities

The full site is steep and extensive grading will be required. Grading and lots will be configured to blend to the existing topography to the maximum extent feasible in an effort to reduce perimeter walls and provide a more natural aesthetic. Gravel base and asphalt will be imported to create roads, aisles, parking, and driveways. The organic stripping's stockpiled on site will be reused/recycled for soil amendments within vegetated areas. A wetland creation area will also be used for organic soil deposition to eliminate the trucking required to remove these soils.

Project disturbance area is 24.44-*acres*. A separate document titled **Stormwater Pollution Prevention Plan for Lindsay Project 1** will detail construction methods for eliminating erosion and sedimentation control.

Table 1 – Project Location Data

Project Data:	
Applicant	Lindsay Investments, LLC.
Project Name	Lindsay Project 1
Project T.S.R. Location	Section 25, 26, Township 31 N, Range 5 W
Project Address	8326 172nd St NE, Arlington, WA 98223
Parcel ID(s)	310525-002-006-00, 310526-001-001-00, -002-00, -022-00, -023-00
Watershed	Snohomish, Stillaguamish
WRIA number	7, 5
Basin	Quilceda Creek, Lower Stillaguamish
Sub-Basin	Middle Fork Quilceda Creek, Portage Creek

Table 2 - Project Theshhold Data Summary

Project Data:	
Project Name	Lindsay Project 1
Existing Conditions:	
Total Site Area	1,405,371 sf (32.26ac)
Proposed Activity:	
Proposed Activity	Preliminary Plat
Proposed Clearing Area (Total)	1,064,703 sf (24.44 ac)
Proposed Grading Area (Total)	1,064,703 sf (24.44 ac)
Allowable New NPGIS (Total)	264,000 sf (6.06 ac)
Allowable New PGIS (Total)	265,941 sf (6.11 ac)
Proposed Replaced Impervious Area	0 sf (0.0000 ac)
Native Vegetation convert to Lawn	0 sf (0.0000 ac)
Native Vegetation convert to Pasture	0 sf (0.0000 ac)
Total New Impervious Area (Total Allowed)	529,941 sf (12.17 ac)
Proposed Disturbance Area	1,064,703 sf (24.44 ac)
Project Qualification:	
Development Type	New Development
Minimum Requirements	1 thru 9

1.4 Minimum Requirements and Thresholds

The project qualifies as new development under Volume I, Chapter 2 of the 2019 DOE Stormwater Management Manual for Western Washington (SMMWW). The SMMWW is specified as the governing document for stormwater management per AMC 13.28.150. This specifies compliance with Minimum Requirements 1-9 of the SMMWW.

Lindsay Project 1 requires a full stormwater site plan and compliance with the minimum requirements set forth in the SMMWW.

A full construction SWPPP is required. The SWPPP is provided as a separate stand-alone document titled **Construction Stormwater Pollution Prevention Plan for Lindsay Project 1**

Minimum Requirements

1. Preparation of Stormwater Site Plans
2. Construction Stormwater Pollution Prevention
3. Source Control of Pollution
4. Preservation of Natural Drainage Systems and Outfalls
5. On-site Stormwater Management
6. Runoff Treatment
7. Flow Control
8. Wetlands Protection
9. Operation and Maintenance

These are addressed sequentially in this document.

Section 2 - MR-1: PREPARE STORMWATER SITE PLAN

2.1 Existing Site Conditions

2.1.1 Site Location

The project is located in Section 25, 26 in Township 31 North, Range 5 West. The site's centroid address is nearest 8326 172nd St NE, Arlington, WA 98223. The site is configured from multiple parcels encompassing the Lindsay Subarea.

The location of the site is shown in Figure 1 below. The site is located south of 172nd St NE and west of Highway 9. Access to the site will be from the 172nd St NE Right-of-way. The project is located in the Snohomish and Stillaguamish watershed (WRIA-7 & WRIA-5), in the Quilceda Creek and Portage Creek Sub-Basin's. The majority of the development will be within the Snohomish Watershed. Only a small portion of the site, along the northeast corner, is within the Stillaguamish Watershed (WRIA-5).

2.1.2 Site Description

The site has a total area of 1,405,371-*square feet* (32.26-*acres*). The property is zoned Residential Ultra Low Capacity (RULC) and its current use is listed as single-family residences and Vacant.

2.1.3 Vegetative Cover

The development area is pasture with trees scattered throughout the site. Forested areas exist along the southern portions of the subarea. An aerial photo can be seen in Section 11.1 as Figure 2.

2.1.4 Topography

The pre-developed existing topography both onsite and offsite was evaluated using survey drone LiDAR, survey point files, and augmented with DNR LiDAR for areas outside of the project area. The surfaces were combined to create one large conglomerate surface. The average slope as indicated by the LiDAR model is 5.6% throughout the parcel.

The site topography is generally moderate to steep with some upland flat areas. Topography is diverse but no significant geological hazard areas exist. The ESNW geotechnical report refers to minor geologically hazardous areas that may be regraded to effectively eliminate any potential risk. (Earth Solutions NW, LLC., 2024)

2.1.5 Critical Areas

See Critical Areas report and Final Mitigation Plan by Soundview Consultants. (Soundview Consultants, 2025) Existing wetlands and ditches are located throughout the site, likely the result of historic farming in the area. The proposed project intends to excavate a prior farmed and filled area to join two wetlands together that were once likely a singular entity. The wetland creation area will serve to provide upland habitat and hydrology to the headwaters of Quilceda Creek and its tributaries.

An existing conditions map is presented in Figure 2.

2.1.6 Soils

The NRCS Soil mappings for the site consist of Tokul gravelly medial loams. NRCS aerial photography of the soil mappings can be seen in Figure 3. USGS maps indicate the site is underlain by glacial Till soils which are confirmed by onsite soil investigations from ESNW. (Earth Solutions NW, LLC., 2024)

Soil log locations are shown in Figure 4. Analysis of the site indicates a large portion of the site as silty sand increasing in density with depth. This is typical of geologic studies of the site which define the site as Quaternary Vashon glacial till.

Soil explorations of the area corroborate with the NRCS soil mappings.

Groundwater elevation is found to be deep with review of well logs in the vicinity of the site. Stormwater which has percolated through top soil becomes mantled above the impermeable Till layer. This water is referred to as interflow and flows laterally along the underlying topography typically expressing itself at the surface in stream valleys or wetlands. (Minard, 1985) Interflow is seasonal with flow corresponding with the upstream soil thickness and extent whereas groundwater is significant.

2.1.7 Existing Basin Analysis

The project falls within both the Portage Creek Sub-Basin that is a portion of the Stillaguamish Watershed and the Middle Fork Quilceda Creek Sub-Basin that is in the Snohomish Watershed. A high point running from NW to SE separates the two basins. The Portage Creek portion resides in the NE corner of the site and is roughly 4.5 acres. The remaining site is within the Quilceda Creek Basin.

It is assumed and highly likely that the entirety of this area is drained through surface runoff and shallow interflow. Very little infiltration will occur through the cemented Till soils. Surface and subsurface flow patterns likely follow the existing topography unless buried stormwater systems exist on site. Agricultural activities have been noted in the past with irrigation and ditching existing in place. The majority of this work appears to be located in the eastern portion of the Linsday Subarea. The project plans to restore some of the hydrology which existed prior to these agricultural efforts.

Portage Creek drains to the Stillaguamish River before reaching Puget Sound. There are no known drainage deficiencies or drainage complaints downstream from the project site.

Stormwater management design is reflective of the discharges to each basin in an effort to maintain natural hydrologic patterns.

2.1.8 Upstream Analysis

There is a significant upstream area to the Subarea site. The upstream areas typically flow through the project site channelized within one of the streams or drainages which flow from the southeast to the northeast. This flow reaches Edgecomb/Quilceda Creek at the northwest corner of the subarea at 172nd St. Upstream runoff that reaches the project site not already in a channelized corridor is minimal and in a dispersed state. This flow may only exist along the eastern boundary line and will be capture and discharged in its natural state. The southern boundary may have intermittent dispersed flows enter into the site. An existing driveway along the southern boundary captures most of this flow and channelizes it into culverts which convey to creeks and drainages north of this existing gravel drive.

All upstream contribution to the site should be collected, managed, and discharged following the requirements of Minimum Requirement #4- Preservation of natural drainage pathways.

2.1.9 Existing Drainage

The site topography trends northward. Due to the presence of “C” type soils, surface runoff is expected to occur. There is considerable ditching and land alteration of the existing sites which have altered the natural drainage patterns and courses. The project intends to restore the natural drainage pathways through dispersion without causing flooding or downstream erosion problems.

2.1.10 Downstream Analysis

Stormwater developed onsite will follow the existing drainage channels and streams. Nearly all stormwater generated onsite will be discharged to the streams and channels due to the onsite Till soils which prevents or retards infiltration.

The majority of the site stormwater will leave the subarea in the northwest corner. A small portion of the site will discharge to the northeast corner within a different drainage basin.

Northwest Downstream Route (Quilceda Creek Basin)

Stormwater discharged within the western portion of the site leaves the site within Edgecomb Creek at the northwest corner of the site. Edgecomb Creek parallels 172nd St to the 67th Ave intersection where it passes beneath 67th through a 60-*inch* diameter culvert. Flow continues traveling west before crossing beneath the railroad through a 24-*inch* diameter culvert. The railroad crossing is 2,600 *feet* from the project site. Edgecombe Creek flows through a rechanneled stream corridor following 67th Ave before merging with Quilceda Creek.

Northeast Downstream Route (Portage Creek Basin)

Stormwater leaves the Northeast corner of the project site alongside 172nd St NE. Stormwater flows through a neighboring 12-*inch* driveway culvert and roughly 150-*feet* of open ditch before reaching a 30-*inch* culvert that flows north beneath 172nd St. Water then flows beneath 172nd St NE through an arch culvert before continuing northwest. Flows continue through wetlands and vegetated areas

for 1,300-*feet* before reaching an existing pond at 178th PI NE. Water continues to the northwest through the Glen Eagle residential development.

There are no known flooding or erosion concerns adjacent to the site.

Section 3 – MR-2: Stormwater Pollution Prevention Plan

3.1 Storm Water Pollution Prevention Plan

A Storm Water Pollution Prevention Plan (SWPPP) has been prepared for this project and presented as a separate document titled “**Stormwater Pollution Prevention Plan for Lindsay Project 1**”, **6-Feb-2026**

Section 4 - MR-3: Source Control of Pollution

The 2019 SMWW Volume-I, Ch-2.5.3 require source control BMPs for all development projects for the intended purpose to prevent stormwater from coming in contact with pollutants. The activities and the associated source control BMPs are listed in Volume-IV of the manual. These are primarily commercial industrial developments that involve significant pollutant generation potential. The proposed stormwater facilities addressed in this report manage stormwater generated from passenger vehicle parking, driveways, roads and non-pollution generating rooftop. No source control BMPs apply to these facilities controlling stormwater from these surfaces.

No Volume-IV source control BMPs are specified.

For construction activities, source control BMPs prescribed in Volume-II are specified and described in the construction SWPPP per MR#2.

Section 5 - MR-4: Preserve Natural Drainage Systems and Outfalls

All drainage courses are to be preserved to the maximum extent feasible. All outfalls will remain in their current locations. Natural drainage patterns as they once existed shall be retained. Pre-developed conditions experience a sheet flow drainage pattern to the northwest and northeast. The developed site is designed to disperse flows to maintain the existing pattern to the west and east. Stormwater in the eastern portion of the site will be managed through Full Dispersion by excavating and recreating the existing natural hydrology and wetland hydrology that existed before the agricultural drainage systems were installed. Wetlands will be hydrated to the maximum extent feasible while meeting the stream protection duration requirements.

Stormwater is intended to be dispersed along the perimeter of all critical area buffers to the maximum extent feasible to replenish natural hydrology through the soil column.

Level spreader dispersion trenches will deposit stormwater to the natural soil column allowing water to diffuse below ground. Higher flows will express stormwater across the surface.

The combination of implemented BMP controls for stormwater generated from the development will mimic the natural stormwater routes and mechanisms though all known, available, and reasonable methods of control and treatment. (Full Dispersion, Bioretention, Downspout Dispersion, etc.) Conventional detention systems will discharge to the native corridors with level spreaders.

Section 6 - MR-5: On-site Stormwater Management

Minimum Requirement #5 specifies requirements for on-site stormwater BMPs. This requirement mandates that on-site stormwater runoff be infiltrated, dispersed, and/or retained to the maximum extent feasible without causing flooding or erosion impacts. Projects triggering Minimum Requirements 1 through 5 must use On-site stormwater management BMPs from List #1 for all surfaces or demonstrate compliance with the LID Performance Standard. Projects triggering Minimum Requirements 1 through 9 must meet the requirements of Table 2.5.1 in Vol. 1 of the 2019 SMMWW. Table 2.5.1 specifies the requirements for new or redevelopment depending on UGA and parcel size to meet the requirements of the LID Performance Standard and/or List #2. List #1 and List #2 specify stormwater BMPs in order of preference. The first BMP determined feasible is required.

This project triggers MR's 1-9 for the Preliminary Plat Submittal of Project 1. This project is within the City's UGA. This project is required to adhere to the LID Performance Standard or List #2 per Table 2.5.1.

List #1 and #2 contain appropriate BMPs to mitigate a particular developed surface. The surfaces included in the list are Lawn and Landscaped Areas, Roofs, and other hard (impervious) surfaces (road/driveway/parking).

Lawn/Landscape is required to utilize BMP T5.13, Post-Construction Soil Quality and Depth.

Roofs are required to employ BMP T5.30 Full Dispersion or Downspout Infiltration, Rain Gardens or Bioretention, BMP T5.10A Downspout Dispersion Systems, or perforated stub-out connections. The first feasible BMP in this list must be used.

Other Hard surfaces (Roads, Driveways, Parking Lots, Etc.) must utilize BMP T5.30 Full Dispersion, BMP T5.15 Permeable Pavement, Bioretention, Sheet Flow Dispersion, or Concentrated Flow Dispersion. The first feasible BMP in this list must be used.

All lawn/landscape and native vegetation rehydration areas will meet the requirements of BMP T5.13.

In some limited cases, roofs adjacent to the stream buffer will be able to provide BMP T5.30 Full Dispersion. Full Dispersion requires 100 *foot* flow paths within native areas on slopes which do not exceed 15%. The east portion of the site will be topographically modified to provide flow paths meeting this requirement through areas replanted with native vegetation. A recreated wetland area will be provided downstream from the full dispersion and serve to rehydrate the surrounding wetlands that have been altered during farming.

Rooftops adjacent to buffers and native areas may be dispersed through the application of BMP T5.10B to the maximum extent feasible. Steep slopes may preclude their installations in some scenarios. Areas subject to flow control may be required to convey rooftops to detention facilities. These rooftops will be connected to the conveyance system through gravel detention systems that closely mimic the perforated stub-out connections BMP T5.10C, except they are intended to detain stormwater on each individual lot. The intent of the perforated stub-out connection is to allow stormwater as many chances as possible to be reintroduced to the native soil column and replenish

natural hydrologic pathways. The rock detention chamber will mimic this intent will also providing detention. Rooftops will be managed following the indented feasibility list above.

Driveways, roadways, and sidewalk surfaces for the development site are predominately managed through bioretention cells. There will be a small area in the east which manages the roads and driveways through Full Dispersion. Permeable Pavement will not be feasible due to the consolidated nature of Till soils which preclude infiltration. Driveway Sheet flow dispersion, BMP T5.12, will also not be feasible due to the urban road section requirements. In areas of the site adjacent to native vegetation with flow paths exceeding 50-*feet* and slopes less than 15%, this BMP may be applied. There are very few locations where this may be acceptable and project site specific proposals will need to identify these areas.

Full Dispersion requires native open space to be retained at a ratio of 65 to 10. The project will be able to maintain the 65:10 open space to impervious surface ratio within the portion of the site defined as Full Dispersion. Not all urban developments are capable of achieving Full Dispersion. Unfortunately, the entire site cannot be accommodated with Full Dispersion but as much of the site will be managed with this primary preferred method as possible.

Bioretention used to meet MR #5 is designed in accordance with BMP T7.30 per Page 7-3 of Vol. V of the 2019 SMMWW. Stormwater is released to the bioretention cells through sheet flow or a bubble-up conveyance system. The bubble-up system is designed to reduce erosion of the bioretention soil media at the surface of the cell.

A site plan showing the stormwater management and development can be seen in Figure 4.

Section 7 - MR-6: Runoff Treatment

Minimum Requirement #6 specifies the requirements for providing runoff treatment. The threshold for requiring a treatment BMP is 5,000 *square feet* of PGIS (Pollution Generating Impervious Surface) or a total of more than $\frac{3}{4}$ of an acre of PGPS (Pollution Generating Pervious Surface).

This project is expected to generate 265,941 *square feet* (6.11 *acres*) of PGIS based on road and driveway areas, therefore treatment facility BMPs are required for this project.

Runoff treatment facility selection is outlined in Vol. I, Ch. 4.2, Step V of the 2019 SMMWW. Step V outlines the treatment facility selection flow chart based on the intended use of a project. Treatment selection is based on if the site is a high-use site, if the downstream receiving waters are phosphorous sensitive, and/or if the site is required to provide enhanced treatment. The definitions of high-use, phosphorous control, and enhanced treatment can be found in Step V in Section 4.2 of the 2019 SMMWW.

The project is not a high use site.

The project is not required to treat for phosphorous.

Enhanced treatment is not required for the project.

Basic treatment is required per Vol. I, Ch. 2 & 4 of the 2019 SMMWW.

Enhanced and Basic treatment is provided through the use of bioretention facilities per Vol. III Section 3.3.12 of the 2019 SMMWW. The bioretention specified will provide the additional enhanced treatment of stormwater influent. The bio-cell treats stormwater through the infiltration of stormwater through soils and their ability to absorb pollutants. Soils have a CEC of greater than 5 meg/100g to a depth of 12 *inches*. On-site soils are suitable for use. See Vol III. Section 3.3.12 of the 2019 SMMWW for specific soil design criteria.

Road, Driveway, and Parking Area

The project has PGIS areas exceeding the threshold for simple treatment BMPs. Therefore, the development is required to employ treatment for its respective road, driveway, and parking areas. The project utilizes bio-retention cells for treatment. The bio-cell mitigates polluted stormwater through physical, chemical, and biological treatment processes. The treatment process reduces pollutant loads to downstream receiving waters. Pretreatment (flow entrance and presettling) is handled by the 5/8" clean chip rock filter that is adjacent the edge of asphalt along its entire length or through bubble-up structures at point conveyances. Stormwater then percolates through compost amended soils and plantings to obtain treatment. Stormwater flows through this part of the cell at a rate of 12.0 *inches/hour*. Stormwater that has passed through the engineered soil media will be stored within a rock layer beneath the cell. The total percolated runoff through the bio-cell's amended soils is well over the 91% total runoff volume treatment requirement, with a combined efficiency of 95%. See Section **Error! Reference source not found.**

Section 8 - MR-7: Flow Control

8.1 Flow Control

Minimum Requirement #7 specifies the requirements for runoff flow control. The threshold for requiring Minimum Requirement #7 is 5,000 *square feet* of impervious surface. Flow control shall be provided if the project creates more than 10,000 *square feet* of effective impervious area in a threshold discharge area, converts $\frac{3}{4}$ of an acre or more of native vegetation to lawn, 2.5 *acres* or more native vegetation is converted to pasture, or a combination of impervious and converted pervious surfaces cause a 0.1 *cfs* increase in the 100-year flow frequency from a continuous simulation runoff model.

The project exceeds this requirement and is required to provide flow control.

All runoff from impervious surfaces and converted surfaces must be infiltrated if feasible. If determined infeasible standard flow control will govern. Standard flow control requires that stormwater discharges match pre-developed discharge durations for the range of pre-developed discharge rates from 50% of the 2-year peak flow to the 50-year peak flow. The pre-developed condition shall be matched to the fully-forested condition (soils and vegetation) to which the Western Washington Hydrologic Model (WWHM) is calibrated, unless reasonable, historic information is provided that indicates the site was prairie prior to Euro-American settlement. This requirement may also be met by dispersion and infiltration.

Rooftop, driveway, and roadway that are managed with BMP T5.30 Full Dispersion are discounted from the model. Full Dispersion of surfaces only occur in the SE portion of the site and drain to the wetland creation area through 100-ft flow paths consisting of native vegetation.

Outside of the Full Dispersion area, the site stormwater management practices combine traditional detention and bio-retention for the remaining surfaces. The project uses bioretention cells to manage and treat all incoming impervious surface generated stormwater (PGIS and NPGIS).

The bioretention cells consist of 1.5 *feet* of amended soils, 0.5 *feet* of filter, and varying thicknesses of rock. The bioretention cells detain stormwater before releasing to the downstream trunk lines. There are four basin's located on site, each with independent flow control assessment. Each comprises of bioretention cell and detention vault to meet the necessary flow control requirement of each area. Lots within the West basin area will discharge to an individual lot rock detention chamber. These stormwater systems are orifice controlled with a 0.25" orifice to meter stormwater draining directly from the homes rooftop. These are then collected in a lot drain trunk line and metered flows are directed to the detention vault for final storage and discharge.

See Figure 5 for basin map of contributing stormwater areas to proposed facilities.

Hydrologic Analysis was conducted using the latest version of the WWHM software. Software reports are in Section **Error! Reference source not found.** Supplementary information for the continuous simulation models is presented in Section 12.4. A site plan showing the location of bioretention swale can be seen in Section 11.1.

Section 9 - MR-8: Wetlands Protection

AMC 13.28.150 (MR 8) specifies requirements for detention or treatment in wetlands and wetland buffers as well as discharge of stormwater to a stream or wetland.

Minimum Requirement #8 requires that stormwater discharges to wetlands within a projects TDA shall meet a specified Level of Wetland Protection. There are four Wetland Protection Levels that apply to the TDA: General Protection, Protection from Pollutants, Wetland Hydroperiod protection Method 1, and Method 2.

Both General Protection and Protection from Pollutants wetland protection levels are satisfied with the proper implementation of Minimum Requirement #2 and Minimum Requirement #5 & #6, respectively.

Wetland Hydroperiod Protection Methods require monitoring of wetland discharges to maintain existing wetland input volumes. The wetland input volume is a different analysis than the flow rate control of the Stream Protection Duration requirement of Minimum Requirement #7. Minimum Requirement #8 does take precedence over satisfying Minimum Requirement #7. (See Vol. I, Ch.3, Section 3.4.8 of the SMMWW)

However, none of the wetlands on-site or downstream meet the criteria of Method 1 or Method 2 for discharges. Therefore, MR#8 is satisfied with the implementation of General Protection and Protection from Pollutants criteria.

Section 10 - MR-9: Operation and Maintenance

Minimum Requirement #9 contains requirements for inspection, operation and maintenance of stormwater facilities and BMPs. Specific maintenance standards and requirements are outlined in Volume V of the 2019 SMMWW. The 2019 SMMWW requires the regular maintenance and inspection of drainage facilities.

The Operations and Maintenance manual will be supplied with Construction Plans for this project and presented as a separate document titled **“Operations and Maintenance manual for Lindsay Project 1”, 6-Feb-2026.**



Figure 2 - Existing Conditions

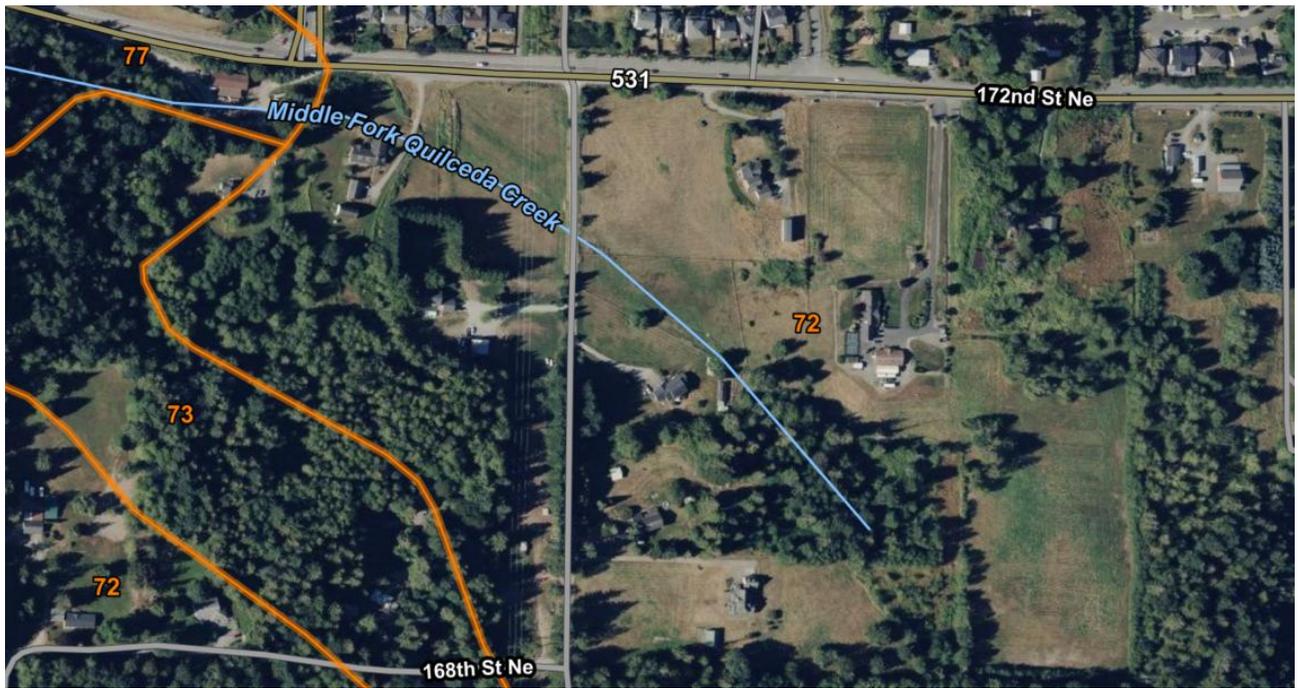


Figure 3 - NRCS Soil Map (Not to Scale)



Figure 4 - Site Plan



Figure 5 - Stormwater Basin Map for Proposed Facilities

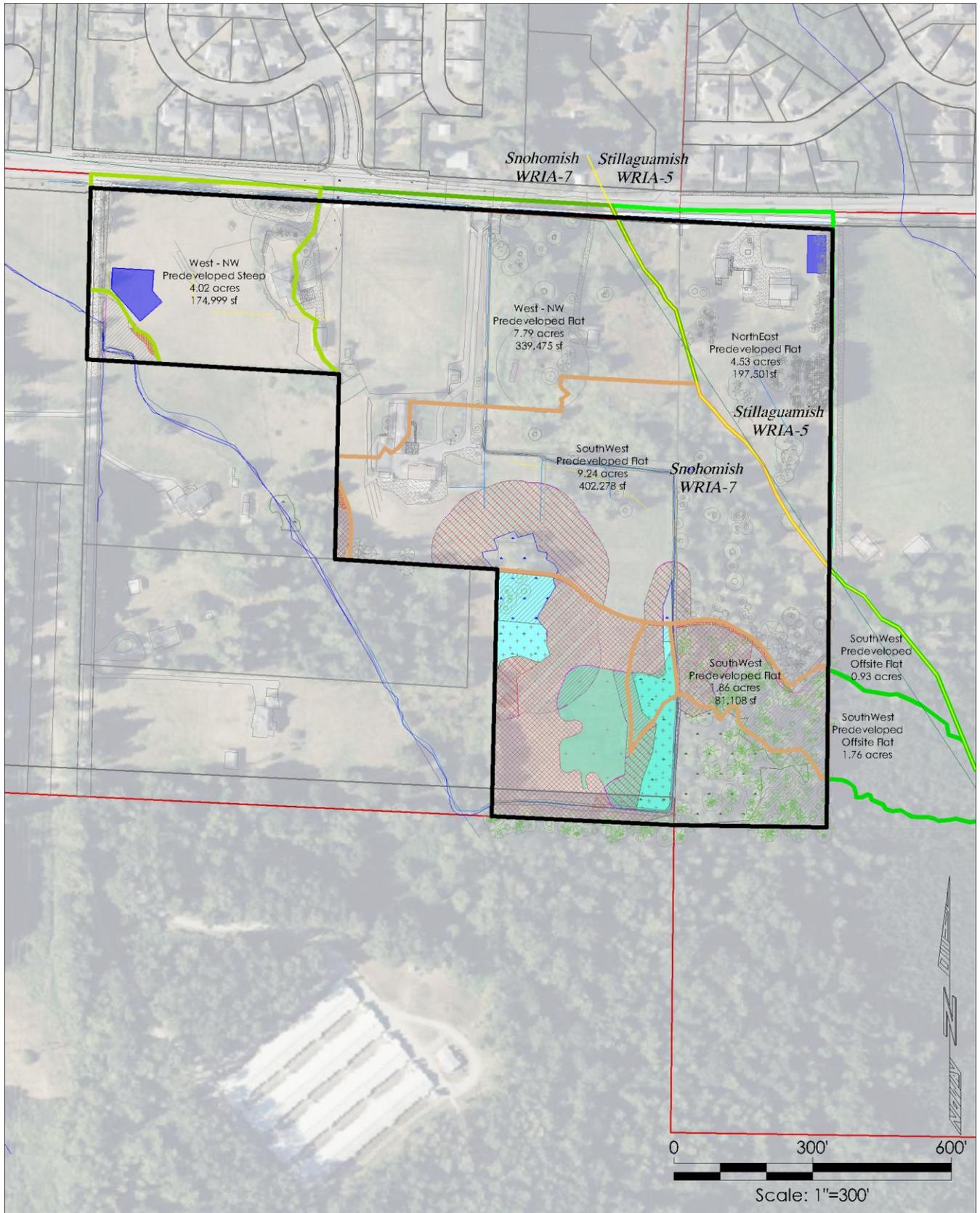


Figure 6 – Existing PreDeveloped Basin Map

Section 12 Support Data

This appendix contains the following support data as applicable to this report:

- Soils Data
- Reference Documents
- Topographic Data
- Continuous Simulation Modeling
- Software Output

12.1 Soils

The following data was extracted from Web Soil Survey, National Cooperative Soil Survey:

Table 3 - Soil Table

17—Everett very gravelly sandy loam, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2t629

Elevation: 30 to 900 feet

Mean annual precipitation: 35 to 91 inches

Mean annual air temperature: 48 to 52 degrees F

Frost-free period: 180 to 240 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Everett and similar soils: 80 percent

Minor components: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Everett

Setting

Landform: Eskers, moraines, kames

Landform position (two-dimensional): Summit, shoulder

Landform position (three-dimensional): Crest, interfluvium

Down-slope shape: Convex

Across-slope shape: Convex

Parent material: Sandy and gravelly glacial outwash

Typical profile

O_i - 0 to 1 inches: slightly decomposed plant material

A - 1 to 3 inches: very gravelly sandy loam

B_w - 3 to 24 inches: very gravelly sandy loam

C₁ - 24 to 35 inches: very gravelly loamy sand

C₂ - 35 to 60 inches: extremely cobbly coarse sand

Properties and qualities

Slope: 0 to 8 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Somewhat excessively drained

Capacity of the most limiting layer to transmit water (K_{sat}): High (1.98 to 5.95 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 3.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4s

Hydrologic Soil Group: A

Forage suitability group: Droughty Soils (G002XN402WA), Droughty Soils (G002XF403WA), Droughty Soils (G002XS401WA)

Hydric soil rating: No

39—Norma loam

Map Unit Setting

National map unit symbol: 2hyx

Elevation: 0 to 1,000 feet

Mean annual precipitation: 35 to 60 inches

Mean annual air temperature: 48 to 52 degrees F

Frost-free period: 150 to 200 days

Farmland classification: Prime farmland if drained

Map Unit Composition

Norma, undrained, and similar soils: 85 percent

Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Norma, Undrained

Setting

Landform: Depressions, drainageways

Parent material: Alluvium

Typical profile

H1 - 0 to 10 inches: ashy loam

H2 - 10 to 28 inches: sandy loam

H3 - 28 to 60 inches: sandy loam

Properties and qualities

Slope: 0 to 3 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Poorly drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)

Depth to water table: About 0 inches

Frequency of flooding: None

Frequency of ponding: Frequent

Available water storage in profile: Moderate (about 9.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 5w

Hydrologic Soil Group: B/D

Forage suitability group

74—Tokul gravelly medial loam, 15 to 30 percent slopes

Map Unit Setting

National map unit symbol: 2t61m

Elevation: 160 to 1,640 feet

Mean annual precipitation: 45 to 70 inches

Mean annual air temperature: 46 to 52 degrees F

Frost-free period: 140 to 200 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Tokul and similar soils: 70 percent

Minor components: 30 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tokul

Setting

Landform: Hillslopes, till plains

Landform position (two-dimensional): Footslope

Landform position (three-dimensional): Side slope, tread

Down-slope shape: Convex

Across-slope shape: Convex

Parent material: Volcanic ash mixed with loess over glacial till

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material

Oa - 1 to 2 inches: highly decomposed plant material

A - 2 to 6 inches: gravelly medial loam

Bs1 - 6 to 9 inches: gravelly medial loam

Bs2 - 9 to 17 inches: gravelly medial loam

Bs3 - 17 to 24 inches: gravelly medial loam

BC - 24 to 33 inches: gravelly medial fine sandy loam

2Bsm - 33 to 62 inches: cemented material

Properties and qualities

Slope: 15 to 30 percent

Depth to restrictive feature: 20 to 39 inches to cemented horizon; 20 to 39 inches to densic material

Natural drainage class: Moderately well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)

Depth to water table: About 18 to 36 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Moderate (about 8.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: B

Forage suitability group: Limited Depth Soils (G002XF303WA), Unnamed (G002XN303WA)

Hydric soil rating: No

77—Tokul-Winston gravelly loams, 25 to 65 percent slopes

Map Unit Setting

National map unit symbol: 2j08

Elevation: 150 to 1,900 feet

Mean annual precipitation: 40 to 80 inches

Mean annual air temperature: 46 to 50 degrees F

Frost-free period: 140 to 200 days

Farmland classification: Not prime farmland

Map Unit Composition

Tokul and similar soils: 60 percent

Winston and similar soils: 30 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tokul

Setting

Landform: Till plains, escarpments

Parent material: Volcanic ash over basal till

Typical profile

H1 - 0 to 4 inches: gravelly medial loam

H2 - 4 to 22 inches: gravelly medial loam

H3 - 22 to 31 inches: gravelly medial fine sandy loam

H4 - 31 to 60 inches: gravelly sandy loam

Properties and qualities

Slope: 25 to 65 percent

Depth to restrictive feature: 20 to 40 inches to densic material

Natural drainage class: Moderately well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)

Depth to water table: About 18 to 36 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 5.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: C

Hydric soil rating: No

Description of Winston

Setting

Landform: Escarpments

Parent material: Volcanic ash and glacial outwash

Typical profile

H1 - 0 to 3 inches: gravelly ashy loam

H2 - 3 to 25 inches: gravelly fine sandy loam

H3 - 25 to 60 inches: extremely gravelly coarse sand

Properties and qualities

Slope: 25 to 65 percent

Depth to restrictive feature: 20 to 40 inches to strongly contrasting textural stratification

Natural drainage class: Somewhat excessively drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Moderate (about 7.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: B

Hydric soil rating: No

Data Source Information

Natural Resources Conservation Service

Web Soil Survey, National Cooperative Soil Survey

7/23/2014

Soil Survey Area: Arlington, Washington (Snohomish County)

12.2 Reference Documents

Cobalt Geosciences, LLC. (2022). *Geotechnical Evaluation Proposed Development Parcel No.31051400101800*. Kenmore: Haberman, Philip A.

Cobalt Geosciences, LLC. (2023). *Groundwater Elevations*. Kenmore.

Earth Solutions NW, LLC. (2024). *Geotechnical Engineering Study Lindsay Annexation*. Redmond.

Minard, J. (1985). *Geologic Map of the Arlington East Quadrangle, Snohomish County, Washington*. USGS.

Sewall, E. (2022). *Lot 19 - Revised Critical Area Report*. Sewall Wetland Consulting, Inc.

Soundview Consultants. (2025). *Conceptual Mitigation Plan - Lindsay Annexation*. Gig Harbor: Soundview Consultants.

12.3 Topographic Data

- Snohomish County 2005 LiDAR survey was used to augment the existing site topography and the downstream and surrounding areas. Citation: LiDAR Bare Earth DEM Files: be_48122b22.zip. Available: Puget Sound LiDAR Consortium, Seattle, WA
- Modeled coordinate system: Lateral - Washington State Plan Plane - North, FIPS 4601; Vertical – NAVD 88

12.4 Continuous Simulation Modeling

12.4.1 Continuous Simulation Background

HSPF based continuous simulation modeling was used to evaluate the hydrologic performances of the pre-developed and developed sub-basins in order to accurately assess flow rates.

The currently adopted continuous simulation models use the HSPF (Hydraulic Simulation Program in FORTRAN) software engine. The HSPF model uses a robust and detail accounting of the 'water budget', including evaporation, evapotranspiration, interception, interflow, and groundwater. The modeling accounts for and assesses land segment areas that include vegetation or impervious cover, soil types, and slopes. The modeling also utilizes over 50 years of continuous rainfall data (precipitation) and evaporation data for the area. The HSPF continuous modeling is considered the best available science for hydrologic analysis.

12.5 Modeling Methodology

HSPF modeling was managed via the Western Washington Hydrology Model (WWHM) interface program. The current professional version of WWHM by Clearcreek Solutions, Inc., WWHM-2012 was used. The current data precipitation and evaporation set provided by DOE with the WWHM-2012 software interface was used that includes quantized data in 15-minute time steps from October 1948 to October 2009.

The WWHM program comes packaged with generic, well considered HSPF modeling parameters. These settings allow for the modeling of the majority of the topological conditions found in the Puget Sound area. Where conditions fall reasonably outside the range of the default HSPF parameters, adjustments should be made to more accurately reflect those conditions. These are generally limited to the pervious land segments (IMPLNDS) and are mostly limited to slopes (SLSUR), infiltration rates (INFILT), and length of flow path (LSUR). For this project, HSPF parameters were not adjusted to reflect site conditions.

12.5.1 Existing Conditions

The surface vegetative cover is assumed forested with steep slope. The NRCS soil maps indicate A,B,D soils throughout the project area. For hydrologic modeling, C-type soils are used as the site is mapped by USGS to be Advance outwash with the upstream basin primarily mapped as C, Till. Both of these geologic units have been glacially consolidated. Consolidated soils are mapped as C-type soils. Outside of the disturbance area, there is no land conversion.

12.5.2 Developed Conditions

The site is steep and grading will consist of stripping existing soils and importing some structural soils to establish building pads. All areas are accounted for and used in the WHMM program except for the Areas dispersed with Full Dispersion (Rooftop, Driveway, parking, road, and remaining percentage of associated yards areas). The remaining area of the site is used for stormwater management. Three difference basins exist within the remaining site area. The west basin has a combination of detention vault and individual lot rock detention chambers. Road and Driveway runoff are captured by the bioretention cells before draining to the vault. Stormwater in the southwest portion of the site is directly to a series of bioretention cells before final storage in a rock detention chamber. The rock detention chamber detains stormwater before release to the downstream drainage pathway. The northeast basin collects stormwater from rooftops in conveyance swale or pipe conveyance system before discharging to the detention vault. The road and driveway areas within the NE Basin collect stormwater in a bioretention cell utilized for water quality treatment only before filtered stormwater is released to the detention vault. The NE basin discharges to the east and is within a separate watershed then the rest of the site. A portion of the upstream offsite flow is inevitably cut-off from the western basin. This area is brought to the northeast and site grading has been reorganized to ensure equilibrium of areas flowing to each watershed.

The stormwater bio-retention cells will be excavated down below the sealed surface layer to expose stormwater to the native soil profile. The exposure of stormwater to the native soil reintroduces natural hydrology to the site and surrounding/downstream areas. This is key to the preservation of late-summer stream flows in head-water type sites in our region. The bio-cell areas are accounted for in the WWHM bio-retention element and are therefore discounted from the basin area.

Section 13 - Software Output

The following WWHM reports in this section represent individual sub-basin analysis for hydrologic flow evaluations. The following heading is common to all reports.

The West Basin uses a Time Series element which is a combination of the 79 lots draining to the individual lot rock detention systems.

13.1 West Basin

WWHM2012
PROJECT REPORT

Project Name: West WSDOT AV wIndRck Swale3 2025UPDT
Site Name: Lindsay Annexation
Site Address: 172nd St NE
City : Arlington
Report Date: 12/3/2025
MGS Regoin : Puget East
Data Start : 1901/10/1
Data End : 2058/09/30
DOT Data Number: 05
Version Date: 2025/05/13
Version : 4.3.2

Low Flow Threshold for POC 1 : 50 Percent of the 2 Year

High Flow Threshold for POC 1: 50 year

PREDEVELOPED LAND USE

Name : Basin 1
Bypass: No
GroundWater: No

<u>Pervious Land Use</u>	<u>acre</u>
C, Forest, Flat	8.493
C, Forest, Steep	4.317
Pervious Total	12.81
<u>Impervious Land Use</u>	<u>acre</u>
Impervious Total	0
Basin Total	12.81

Element Flows To:

Surface	Interflow	Groundwater
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MITIGATED LAND USE

Name : Basin 1
Bypass: No
GroundWater: No

<u>Pervious Land Use</u>	<u>acre</u>
Pervious Total	0
<u>Impervious Land Use</u>	<u>acre</u>
ROADS FLAT	1.89

DRIVEWAYS FLAT 0.85
SIDEWALKS FLAT 0.49
Impervious Total 3.23

Basin Total 3.23

Element Flows To:

Surface	Interflow	Groundwater
Surface retention 1	Surface retention 1	

Name : Vault 1

Width : 77 ft.

Length : 100 ft.

Depth: 9 ft.

Discharge Structure

Riser Height: 8 ft.

Riser Diameter: 12 in.

Notch Type : V-notch

Notch Angle: 0.500

Notch Height: 4.000 ft.

Orifice 1 Diameter: 1.669 in. **Elevation**: 0 ft.

Orifice 2 Diameter: 0.745 in. **Elevation**: 3.95 ft.

Orifice 3 Diameter: 1 in. **Elevation**: 5.5 ft.

Element Flows To:

Outlet 1	Outlet 2
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Vault Hydraulic Table

<u>Stage(feet)</u>	<u>Area(ac.)</u>	<u>Volume(ac-ft.)</u>	<u>Discharge(cfs)</u>	<u>Infilt(cfs)</u>
0.0000	0.176	0.000	0.000	0.000
0.1000	0.176	0.017	0.023	0.000
0.2000	0.176	0.035	0.033	0.000
0.3000	0.176	0.053	0.041	0.000
0.4000	0.176	0.070	0.047	0.000
0.5000	0.176	0.088	0.053	0.000
0.6000	0.176	0.106	0.058	0.000
0.7000	0.176	0.123	0.063	0.000
0.8000	0.176	0.141	0.067	0.000
0.9000	0.176	0.159	0.071	0.000
1.0000	0.176	0.176	0.075	0.000
1.1000	0.176	0.194	0.079	0.000
1.2000	0.176	0.212	0.082	0.000
1.3000	0.176	0.229	0.086	0.000
1.4000	0.176	0.247	0.089	0.000
1.5000	0.176	0.265	0.092	0.000
1.6000	0.176	0.282	0.095	0.000
1.7000	0.176	0.300	0.098	0.000
1.8000	0.176	0.318	0.101	0.000
1.9000	0.176	0.335	0.104	0.000
2.0000	0.176	0.353	0.106	0.000
2.1000	0.176	0.371	0.109	0.000
2.2000	0.176	0.388	0.112	0.000
2.3000	0.176	0.406	0.114	0.000
2.4000	0.176	0.424	0.117	0.000
2.5000	0.176	0.441	0.119	0.000
2.6000	0.176	0.459	0.121	0.000

2.7000	0.176	0.477	0.124	0.000
2.8000	0.176	0.494	0.126	0.000
2.9000	0.176	0.512	0.128	0.000
3.0000	0.176	0.530	0.130	0.000
3.1000	0.176	0.548	0.133	0.000
3.2000	0.176	0.565	0.135	0.000
3.3000	0.176	0.583	0.137	0.000
3.4000	0.176	0.601	0.139	0.000
3.5000	0.176	0.618	0.141	0.000
3.6000	0.176	0.636	0.143	0.000
3.7000	0.176	0.654	0.145	0.000
3.8000	0.176	0.671	0.147	0.000
3.9000	0.176	0.689	0.149	0.000
4.0000	0.176	0.707	0.154	0.000
4.1000	0.176	0.724	0.158	0.000
4.2000	0.176	0.742	0.162	0.000
4.3000	0.176	0.760	0.166	0.000
4.4000	0.176	0.777	0.169	0.000
4.5000	0.176	0.795	0.173	0.000
4.6000	0.176	0.813	0.177	0.000
4.7000	0.176	0.830	0.181	0.000
4.8000	0.176	0.848	0.186	0.000
4.9000	0.176	0.866	0.190	0.000
5.0000	0.176	0.883	0.195	0.000
5.1000	0.176	0.901	0.201	0.000
5.2000	0.176	0.919	0.206	0.000
5.3000	0.176	0.936	0.213	0.000
5.4000	0.176	0.954	0.219	0.000
5.5000	0.176	0.972	0.226	0.000
5.6000	0.176	0.989	0.242	0.000
5.7000	0.176	1.007	0.254	0.000
5.8000	0.176	1.025	0.265	0.000
5.9000	0.176	1.042	0.277	0.000
6.0000	0.176	1.060	0.288	0.000
6.1000	0.176	1.078	0.300	0.000
6.2000	0.176	1.096	0.312	0.000
6.3000	0.176	1.113	0.325	0.000
6.4000	0.176	1.131	0.339	0.000
6.5000	0.176	1.149	0.352	0.000
6.6000	0.176	1.166	0.367	0.000
6.7000	0.176	1.184	0.382	0.000
6.8000	0.176	1.202	0.397	0.000
6.9000	0.176	1.219	0.413	0.000
7.0000	0.176	1.237	0.430	0.000
7.1000	0.176	1.255	0.448	0.000
7.2000	0.176	1.272	0.466	0.000
7.3000	0.176	1.290	0.485	0.000
7.4000	0.176	1.308	0.504	0.000
7.5000	0.176	1.325	0.524	0.000
7.6000	0.176	1.343	0.545	0.000
7.7000	0.176	1.361	0.567	0.000
7.8000	0.176	1.378	0.589	0.000
7.9000	0.176	1.396	0.612	0.000
8.0000	0.176	1.414	0.636	0.000
8.1000	0.176	1.431	0.972	0.000
8.2000	0.176	1.449	1.549	0.000
8.3000	0.176	1.467	2.154	0.000
8.4000	0.176	1.484	2.606	0.000

8.5000	0.176	1.502	2.852	0.000
8.6000	0.176	1.520	3.091	0.000
8.7000	0.176	1.537	3.289	0.000
8.8000	0.176	1.555	3.473	0.000
8.9000	0.176	1.573	3.646	0.000
9.0000	0.176	1.590	3.810	0.000
9.1000	0.176	1.608	3.966	0.000
9.2000	0.000	0.000	4.116	0.000

Name : Bioretention 1
Bottom Length: 70.00 ft.
Bottom Width: 40.00 ft.
Material thickness of first layer: 1.5
Material type for first layer: SMMWW 12 in/hr
Material thickness of second layer: 0.5
Material type for second layer: Sand
Material thickness of third layer: 0.5
Material type for third layer: GRAVEL
Underdrain used
Underdrain Diameter (feet): 0.5
Orifice Diameter (in.): 3
Offset (in.): 0
Flow Through Underdrain (ac-ft.): 1567.75
Total Outflow (ac-ft.): 1603.043
Percent Through Underdrain: 97.8
Discharge Structure
Riser Height: 1 ft.
Riser Diameter: 12 in.
Notch Type: Rectangular
Notch Width: 0.250 ft.
Notch Height: 0.160 ft.

Element Flows To:
Outlet 1 **Outlet 2**
 Vault 1

Bioretention 1 Hydraulic Table

<u>Stage(feet)</u>	<u>Area(ac.)</u>	<u>Volume(ac-ft.)</u>	<u>Discharge(cfs)</u>	<u>Infilt(cfs)</u>
0.0000	0.0643	0.0000	0.0000	0.0000
0.0440	0.0643	0.0013	0.0000	0.0000
0.0879	0.0643	0.0026	0.0000	0.0000
0.1319	0.0643	0.0039	0.0000	0.0000
0.1758	0.0643	0.0052	0.0000	0.0000
0.2198	0.0643	0.0065	0.0000	0.0000
0.2637	0.0643	0.0078	0.0000	0.0000
0.3077	0.0643	0.0090	0.0000	0.0000
0.3516	0.0643	0.0103	0.0000	0.0000
0.3956	0.0643	0.0116	0.0000	0.0000
0.4396	0.0643	0.0129	0.0000	0.0000
0.4835	0.0643	0.0142	0.0000	0.0000
0.5275	0.0643	0.0155	0.0000	0.0000
0.5714	0.0643	0.0168	0.0000	0.0000
0.6154	0.0643	0.0181	0.0000	0.0000
0.6593	0.0643	0.0194	0.0000	0.0000
0.7033	0.0643	0.0207	0.0000	0.0000
0.7473	0.0643	0.0220	0.0000	0.0000

0.7912	0.0643	0.0233	0.0000	0.0000
0.8352	0.0643	0.0245	0.0000	0.0000
0.8791	0.0643	0.0258	0.0000	0.0000
0.9231	0.0643	0.0271	0.0000	0.0000
0.9670	0.0643	0.0284	0.0000	0.0000
1.0110	0.0643	0.0297	0.0000	0.0000
1.0549	0.0643	0.0310	0.0000	0.0000
1.0989	0.0643	0.0323	0.0000	0.0000
1.1429	0.0643	0.0336	0.0000	0.0000
1.1868	0.0643	0.0349	0.0000	0.0000
1.2308	0.0643	0.0362	0.0000	0.0000
1.2747	0.0643	0.0375	0.0000	0.0000
1.3187	0.0643	0.0388	0.0000	0.0000
1.3626	0.0643	0.0401	0.0000	0.0000
1.4066	0.0643	0.0413	0.0000	0.0000
1.4505	0.0643	0.0426	0.0000	0.0000
1.4945	0.0643	0.0439	0.0000	0.0000
1.5385	0.0643	0.0451	0.0000	0.0000
1.5824	0.0643	0.0462	0.0000	0.0000
1.6264	0.0643	0.0473	0.0000	0.0000
1.6703	0.0643	0.0485	0.0000	0.0000
1.7143	0.0643	0.0496	0.0000	0.0000
1.7582	0.0643	0.0507	0.0000	0.0000
1.8022	0.0643	0.0518	0.0000	0.0000
1.8462	0.0643	0.0530	0.0000	0.0000
1.8901	0.0643	0.0541	0.0000	0.0000
1.9341	0.0643	0.0552	0.0000	0.0000
1.9780	0.0643	0.0564	0.0000	0.0000
2.0220	0.0643	0.0575	0.0000	0.0000
2.0659	0.0643	0.0587	0.0000	0.0000
2.1099	0.0643	0.0599	0.0000	0.0000
2.1538	0.0643	0.0611	0.0000	0.0000
2.1978	0.0643	0.0622	0.0000	0.0000
2.2418	0.0643	0.0634	0.0000	0.0000
2.2857	0.0643	0.0646	0.0000	0.0000
2.3297	0.0643	0.0657	0.0000	0.0000
2.3736	0.0643	0.0669	0.0000	0.0000
2.4176	0.0643	0.0681	0.0000	0.0000
2.4615	0.0643	0.0693	0.0000	0.0000
2.5000	0.0643	0.0703	0.0000	0.0000

Surface retention 1 Hydraulic Table

<u>Stage(feet)</u>	<u>Area(ac.)</u>	<u>Volume(ac-ft.)</u>	<u>Discharge(cfs)</u>	<u>To Amended(cfs)</u>	<u>Wetted Surface</u>
2.5000	0.0643	0.0703	0.0000	0.7778	0.0000
2.5440	0.0649	0.0731	0.0000	0.7778	0.0000
2.5879	0.0656	0.0760	0.0000	0.8234	0.0000
2.6319	0.0663	0.0789	0.0000	0.8462	0.0000
2.6758	0.0670	0.0818	0.0000	0.8689	0.0000
2.7198	0.0676	0.0848	0.0000	0.8917	0.0000
2.7637	0.0683	0.0878	0.0035	0.9145	0.0000
2.8077	0.0690	0.0908	0.0060	0.9373	0.0000
2.8516	0.0697	0.0938	0.0073	0.9601	0.0000
2.8956	0.0704	0.0969	0.0080	0.9829	0.0000
2.9396	0.0711	0.1000	0.0146	1.0057	0.0000
2.9835	0.0718	0.1032	0.0159	1.0285	0.0000
3.0275	0.0725	0.1063	0.0216	1.0513	0.0000
3.0714	0.0732	0.1095	0.0286	1.0741	0.0000
3.1154	0.0739	0.1128	0.0314	1.0969	0.0000

3.1593	0.0746	0.1160	0.0367	1.1197	0.0000
3.2033	0.0753	0.1193	0.0378	1.1425	0.0000
3.2473	0.0761	0.1227	0.0383	1.1652	0.0000
3.2912	0.0768	0.1260	0.0461	1.1880	0.0000
3.3352	0.0775	0.1294	0.0500	1.2108	0.0000
3.3791	0.0782	0.1328	0.0577	1.2336	0.0000
3.4231	0.0790	0.1363	0.0616	1.2564	0.0000
3.4670	0.0797	0.1398	0.0684	1.2792	0.0000
3.5110	0.0804	0.1433	0.0718	1.3020	0.0000
3.5549	0.0812	0.1469	0.0778	1.3248	0.0000
3.5989	0.0819	0.1504	0.0808	1.3476	0.0000
3.6429	0.0827	0.1541	0.0861	1.3704	0.0000
3.6868	0.0834	0.1577	0.0888	1.3932	0.0000
3.7308	0.0842	0.1614	0.0937	1.4160	0.0000
3.7747	0.0849	0.1651	0.0962	1.4387	0.0000
3.8187	0.0857	0.1689	0.1007	1.4615	0.0000
3.8626	0.0865	0.1726	0.1030	1.4843	0.0000
3.9066	0.0872	0.1765	0.1072	1.5071	0.0000
3.9505	0.0880	0.1803	0.1093	1.5299	0.0000
3.9945	0.0888	0.1842	0.1133	1.5527	0.0000
4.0000	0.0889	0.1847	0.1153	1.5556	0.0000

Name : Surface retention 1

Element Flows To:

Outlet 1	Outlet 2
Vault 1	Bioretention 1

Name : frntg

Bypass: No

GroundWater: No

<u>Pervious Land Use</u>	<u>acre</u>
Pervious Total	0
<u>Impervious Land Use</u>	<u>acre</u>
ROADS FLAT	0.4
SIDEWALKS FLAT	0.06
Impervious Total	0.46
Basin Total	0.46

Element Flows To:

Surface	Interflow	Groundwater
Surface retention 1	Surface retention 1	

Name : Time Series 1

Time Series number 849 is connected to:

Element Flows To:

Outlet 1	Outlet 2
Vault 1	

Name : Bioretention 2
Bottom Length: 720.00 ft.
Bottom Width: 5.00 ft.
Material thickness of first layer: 1.5
Material type for first layer: SMMWW 12 in/hr
Material thickness of second layer: 0.5
Material type for second layer: Sand
Material thickness of third layer: 2
Material type for third layer: GRAVEL
Underdrain used
Underdrain Diameter (feet): 0.5
Orifice Diameter (in.): 0.75
Offset (in.): 0
Flow Through Underdrain (ac-ft.): 634.748
Total Outflow (ac-ft.): 651.451
Percent Through Underdrain: 97.44
Discharge Structure
Riser Height: 1 ft.
Riser Diameter: 12 in.

Element Flows To:
Outlet 1 **Outlet 2**
 Vault 1

Bioretention 2 Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0826	0.0000	0.0000	0.0000
0.0604	0.0826	0.0023	0.0000	0.0000
0.1209	0.0826	0.0046	0.0000	0.0000
0.1813	0.0826	0.0069	0.0000	0.0000
0.2418	0.0826	0.0091	0.0000	0.0000
0.3022	0.0826	0.0114	0.0000	0.0000
0.3626	0.0826	0.0137	0.0008	0.0000
0.4231	0.0826	0.0160	0.0013	0.0000
0.4835	0.0826	0.0183	0.0027	0.0000
0.5440	0.0826	0.0206	0.0035	0.0000
0.6044	0.0826	0.0228	0.0042	0.0000
0.6648	0.0826	0.0251	0.0046	0.0000
0.7253	0.0826	0.0274	0.0052	0.0000
0.7857	0.0826	0.0297	0.0054	0.0000
0.8462	0.0826	0.0320	0.0059	0.0000
0.9066	0.0826	0.0343	0.0061	0.0000
0.9670	0.0826	0.0365	0.0065	0.0000
1.0275	0.0826	0.0388	0.0066	0.0000
1.0879	0.0826	0.0411	0.0070	0.0000
1.1484	0.0826	0.0434	0.0072	0.0000
1.2088	0.0826	0.0457	0.0075	0.0000
1.2692	0.0826	0.0480	0.0077	0.0000
1.3297	0.0826	0.0503	0.0080	0.0000
1.3901	0.0826	0.0525	0.0081	0.0000
1.4505	0.0826	0.0548	0.0084	0.0000
1.5110	0.0826	0.0568	0.0085	0.0000
1.5714	0.0826	0.0588	0.0088	0.0000
1.6319	0.0826	0.0608	0.0089	0.0000
1.6923	0.0826	0.0628	0.0092	0.0000
1.7527	0.0826	0.0648	0.0093	0.0000

1.8132	0.0826	0.0668	0.0096	0.0000
1.8736	0.0826	0.0688	0.0097	0.0000
1.9341	0.0826	0.0708	0.0100	0.0000
1.9945	0.0826	0.0728	0.0101	0.0000
2.0549	0.0826	0.0749	0.0103	0.0000
2.1154	0.0826	0.0769	0.0104	0.0000
2.1758	0.0826	0.0790	0.0106	0.0000
2.2363	0.0826	0.0811	0.0108	0.0000
2.2967	0.0826	0.0832	0.0110	0.0000
2.3571	0.0826	0.0852	0.0111	0.0000
2.4176	0.0826	0.0873	0.0113	0.0000
2.4780	0.0826	0.0894	0.0114	0.0000
2.5385	0.0826	0.0915	0.0115	0.0000
2.5989	0.0826	0.0935	0.0115	0.0000
2.6593	0.0826	0.0956	0.0118	0.0000
2.7198	0.0826	0.0977	0.0122	0.0000
2.7802	0.0826	0.0998	0.0127	0.0000
2.8407	0.0826	0.1018	0.0132	0.0000
2.9011	0.0826	0.1039	0.0137	0.0000
2.9615	0.0826	0.1060	0.0142	0.0000
3.0220	0.0826	0.1080	0.0147	0.0000
3.0824	0.0826	0.1101	0.0152	0.0000
3.1429	0.0826	0.1122	0.0156	0.0000
3.2033	0.0826	0.1143	0.0161	0.0000
3.2637	0.0826	0.1163	0.0165	0.0000
3.3242	0.0826	0.1184	0.0169	0.0000
3.3846	0.0826	0.1205	0.0173	0.0000
3.4451	0.0826	0.1226	0.0178	0.0000
3.5055	0.0826	0.1246	0.0181	0.0000
3.5659	0.0826	0.1267	0.0185	0.0000
3.6264	0.0826	0.1288	0.0189	0.0000
3.6868	0.0826	0.1308	0.0193	0.0000
3.7473	0.0826	0.1329	0.0197	0.0000
3.8077	0.0826	0.1350	0.0200	0.0000
3.8681	0.0826	0.1371	0.0204	0.0000
3.9286	0.0826	0.1391	0.0207	0.0000
3.9890	0.0826	0.1412	0.0211	0.0000
4.0000	0.0826	0.1416	0.0305	0.0000

Surface retention 2 Hydraulic Table

<u>Stage(feet)</u>	<u>Area(ac.)</u>	<u>Volume(ac-ft.)</u>	<u>Discharge(cfs)</u>	<u>To Amended(cfs)</u>	<u>Wetted Surface</u>
4.0000	0.0826	0.1416	0.0000	1.0000	0.0000
4.0604	0.0887	0.1468	0.0000	1.0000	0.0000
4.1209	0.0947	0.1523	0.0000	1.0806	0.0000
4.1813	0.1008	0.1582	0.0000	1.1209	0.0000
4.2418	0.1068	0.1645	0.0000	1.1612	0.0000
4.3022	0.1129	0.1711	0.0000	1.2015	0.0000
4.3626	0.1190	0.1781	0.0000	1.2418	0.0000
4.4231	0.1250	0.1855	0.0000	1.2821	0.0000
4.4835	0.1311	0.1933	0.0000	1.3223	0.0000
4.5440	0.1372	0.2014	0.0000	1.3626	0.0000
4.6044	0.1433	0.2098	0.0000	1.4029	0.0000
4.6648	0.1494	0.2187	0.0000	1.4432	0.0000
4.7253	0.1555	0.2279	0.0000	1.4835	0.0000
4.7857	0.1616	0.2375	0.0000	1.5238	0.0000
4.8462	0.1677	0.2474	0.0000	1.5641	0.0000
4.9066	0.1739	0.2578	0.0000	1.6044	0.0000
4.9670	0.1800	0.2684	0.0000	1.6447	0.0000

5.0275	0.1861	0.2795	0.0483	1.6850	0.0000
5.0879	0.1923	0.2909	0.2754	1.7253	0.0000
5.1484	0.1984	0.3028	0.5952	1.7656	0.0000
5.2088	0.2046	0.3149	0.9624	1.8059	0.0000
5.2692	0.2107	0.3275	1.3333	1.8462	0.0000
5.3297	0.2169	0.3404	1.6654	1.8864	0.0000
5.3901	0.2231	0.3537	1.9255	1.9267	0.0000
5.4505	0.2292	0.3674	2.1028	1.9670	0.0000
5.5000	0.2343	0.3788	2.2515	2.0000	0.0000

Name : Surface retention 2

Element Flows To:

Outlet 1	Outlet 2
Vault 1	Bioretention 2

Name : Time Series 2

Time Series number 830 is connected to:

Element Flows To:

Outlet 1	Outlet 2
Surface retention 2	

Name : Basin 3

Bypass: Yes

GroundWater: No

<u>Pervious Land Use</u>	<u>acre</u>
C, Pasture, Flat	.75
Pervious Total	0.75

<u>Impervious Land Use</u>	<u>acre</u>
Impervious Total	0

Basin Total 0.75

Element Flows To:

Surface	Interflow	Groundwater
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ANALYSIS RESULTS

Stream Protection Duration

Predeveloped Landuse Totals for POC #1

Total Pervious Area:12.81

Total Impervious Area:0

Mitigated Landuse Totals for POC #1

Total Pervious Area:0.75

Total Impervious Area:3.69

Flow Frequency Return Periods for Predeveloped. POC #1

<u>Return Period</u>	<u>Flow(cfs)</u>
2 year	0.319581
5 year	0.474704
10 year	0.565067
25 year	0.664995
50 year	0.730004
100 year	0.787893

Flow Frequency Return Periods for Mitigated. POC #1

<u>Return Period</u>	<u>Flow(cfs)</u>
2 year	0.203467
5 year	0.358589
10 year	0.516462
25 year	0.805136
50 year	1.106533
100 year	1.504751

Stream Protection Duration

POC #1

The Facility PASSED

The Facility PASSED.

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.1598	48174	46490	96	Pass
0.1656	43974	40242	91	Pass
0.1713	40137	34572	86	Pass
0.1771	36730	29777	81	Pass
0.1828	34247	26529	77	Pass
0.1886	31566	23281	73	Pass
0.1943	29078	20220	69	Pass
0.2001	26793	17655	65	Pass
0.2059	25081	16020	63	Pass
0.2116	23160	14192	61	Pass
0.2174	21348	12794	59	Pass
0.2231	19774	11511	58	Pass
0.2289	18552	10493	56	Pass
0.2347	17236	9606	55	Pass
0.2404	16047	8902	55	Pass
0.2462	14858	8417	56	Pass
0.2519	13977	8147	58	Pass
0.2577	13008	7834	60	Pass
0.2635	12095	7476	61	Pass
0.2692	11236	7074	62	Pass
0.2750	10603	6749	63	Pass
0.2807	9909	6369	64	Pass
0.2865	9292	6011	64	Pass
0.2923	8698	5698	65	Pass
0.2980	8114	5354	65	Pass
0.3038	7663	5101	66	Pass
0.3095	7212	4804	66	Pass
0.3153	6782	4593	67	Pass
0.3211	6402	4357	68	Pass
0.3268	6116	4178	68	Pass
0.3326	5780	4001	69	Pass
0.3383	5456	3829	70	Pass
0.3441	5154	3636	70	Pass
0.3499	4922	3469	70	Pass

0.3556	4674	3312	70	Pass
0.3614	4427	3131	70	Pass
0.3671	4171	3005	72	Pass
0.3729	3995	2888	72	Pass
0.3787	3798	2732	71	Pass
0.3844	3591	2591	72	Pass
0.3902	3398	2479	72	Pass
0.3959	3252	2348	72	Pass
0.4017	3106	2230	71	Pass
0.4075	2970	2123	71	Pass
0.4132	2834	2014	71	Pass
0.4190	2722	1957	71	Pass
0.4247	2612	1884	72	Pass
0.4305	2500	1810	72	Pass
0.4363	2377	1728	72	Pass
0.4420	2292	1638	71	Pass
0.4478	2222	1584	71	Pass
0.4535	2150	1526	70	Pass
0.4593	2076	1460	70	Pass
0.4651	1985	1409	70	Pass
0.4708	1898	1366	71	Pass
0.4766	1800	1315	73	Pass
0.4823	1700	1272	74	Pass
0.4881	1610	1211	75	Pass
0.4939	1557	1169	75	Pass
0.4996	1481	1102	74	Pass
0.5054	1400	1069	76	Pass
0.5111	1334	1024	76	Pass
0.5169	1282	983	76	Pass
0.5227	1238	937	75	Pass
0.5284	1176	903	76	Pass
0.5342	1107	863	77	Pass
0.5399	1065	807	75	Pass
0.5457	1015	770	75	Pass
0.5515	964	739	76	Pass
0.5572	914	696	76	Pass
0.5630	872	672	77	Pass
0.5687	835	649	77	Pass
0.5745	799	632	79	Pass
0.5803	767	602	78	Pass
0.5860	724	571	78	Pass
0.5918	694	548	78	Pass
0.5975	659	525	79	Pass
0.6033	627	498	79	Pass
0.6090	585	462	78	Pass
0.6148	541	428	79	Pass
0.6206	488	386	79	Pass
0.6263	447	357	79	Pass
0.6321	420	334	79	Pass
0.6378	402	314	78	Pass
0.6436	378	287	75	Pass
0.6494	349	260	74	Pass
0.6551	325	233	71	Pass
0.6609	312	204	65	Pass
0.6666	292	178	60	Pass
0.6724	272	155	56	Pass
0.6782	255	141	55	Pass
0.6839	240	135	56	Pass

0.6897	224	130	58	Pass
0.6954	210	128	60	Pass
0.7012	195	126	64	Pass
0.7070	176	120	68	Pass
0.7127	159	116	72	Pass
0.7185	140	115	82	Pass
0.7242	127	112	88	Pass
0.7300	115	110	95	Pass

Water Quality BMP Flow and Volume for POC #1

On-line facility volume: 0 acre-feet
On-line facility target flow: 0 cfs.
Adjusted for 15 min: 0 cfs.
Off-line facility target flow: 0 cfs.
Adjusted for 15 min: 0 cfs.

LID Report

LID Technique	Used for	Total Volume	Volume	Infiltration	Cumulative	Percent
Water Quality Percent	Comment	Needs	Through	Volume	Volume	Volume
Water Quality	Treatment?	Treatment	Facility	(ac-ft.)	Infiltration	
Infiltrated	Treated	(ac-ft)	(ac-ft)		Credit	
Vault 1 POC	N	2992.82			N	0.00
retention 1	N	1458.77			N	0.00
retention 2	N	592.82			N	0.00
Total Volume Infiltrated		5044.41	0.00	0.00		0.00
0.00	0%	No Treat.	Credit			
Compliance with LID Standard 8						
Duration Analysis Result = Failed						

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13.2 Southwest Basin

**WWHM2012
PROJECT REPORT**

Project Name: SW Basin 3cells Vlt WSDOT 37x37
Site Name: Lindsay Annexation
Site Address: 172nd St NE
City : Arlington
Report Date: 2/6/2026
MGS Regoin : Puget East
Data Start : 1901/10/1
Data End : 2058/09/30
DOT Data Number: 04
Version Date: 2025/05/13
Version : 4.3.2

Low Flow Threshold for POC 1 : 50 Percent of the 2 Year

High Flow Threshold for POC 1: 50 year

PREDEVELOPED LAND USE

Name : Basin 1
Bypass: No
GroundWater: No

<u>Pervious Land Use</u>	<u>acre</u>
C, Forest, Flat	10.16
Pervious Total	10.16

<u>Impervious Land Use</u>	<u>acre</u>
Impervious Total	0

Basin Total 10.16

Element Flows To:

Surface	Interflow	Groundwater
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MITIGATED LAND USE

Name : Basin A
Bypass: No
GroundWater: No

<u>Pervious Land Use</u>	<u>acre</u>
C, Pasture, Flat	1.57
Pervious Total	1.57

<u>Impervious Land Use</u>	<u>acre</u>
ROADS FLAT	0.15
ROOF TOPS FLAT	0.88
DRIVEWAYS FLAT	0.14
Impervious Total	1.17

Basin Total 2.74

Element Flows To:

Surface	Interflow	Groundwater
Surface retention A	Surface retention A	

Name : Bioretention A
Bottom Length: 204.00 ft.
Bottom Width: 20.00 ft.
Material thickness of first layer: 1.5
Material type for first layer: SMMWW 12 in/hr
Material thickness of second layer: 0.5
Material type for second layer: Sand
Material thickness of third layer: 2
Material type for third layer: GRAVEL

Underdrain used

Underdrain Diameter (feet): 0.5
Orifice Diameter (in.): 0.75
Offset (in.): 0
Flow Through Underdrain (ac-ft.): 675.404
Total Outflow (ac-ft.): 712.726
Percent Through Underdrain: 94.76

Discharge Structure

Riser Height: 1 ft.
Riser Diameter: 12 in.
Notch Type: Rectangular
Notch Width: 0.125 ft.
Notch Height: 0.250 ft.

Element Flows To:

Outlet 1 **Outlet 2**
Surface retention BB

Bioretention A Hydraulic Table

<u>Stage(feet)</u>	<u>Area(ac.)</u>	<u>Volume(ac-ft.)</u>	<u>Discharge(cfs)</u>	<u>Infilt(cfs)</u>
0.0000	0.0937	0.0000	0.0000	0.0000
0.0604	0.0937	0.0026	0.0000	0.0000
0.1209	0.0937	0.0052	0.0000	0.0000
0.1813	0.0937	0.0078	0.0000	0.0000
0.2418	0.0937	0.0104	0.0000	0.0000
0.3022	0.0937	0.0129	0.0000	0.0000
0.3626	0.0937	0.0155	0.0008	0.0000
0.4231	0.0937	0.0181	0.0013	0.0000
0.4835	0.0937	0.0207	0.0027	0.0000
0.5440	0.0937	0.0233	0.0035	0.0000
0.6044	0.0937	0.0259	0.0042	0.0000
0.6648	0.0937	0.0285	0.0046	0.0000
0.7253	0.0937	0.0311	0.0052	0.0000
0.7857	0.0937	0.0337	0.0054	0.0000
0.8462	0.0937	0.0362	0.0059	0.0000
0.9066	0.0937	0.0388	0.0061	0.0000
0.9670	0.0937	0.0414	0.0065	0.0000
1.0275	0.0937	0.0440	0.0066	0.0000
1.0879	0.0937	0.0466	0.0070	0.0000
1.1484	0.0937	0.0492	0.0072	0.0000
1.2088	0.0937	0.0518	0.0075	0.0000
1.2692	0.0937	0.0544	0.0077	0.0000
1.3297	0.0937	0.0570	0.0080	0.0000
1.3901	0.0937	0.0595	0.0081	0.0000
1.4505	0.0937	0.0621	0.0084	0.0000
1.5110	0.0937	0.0644	0.0085	0.0000
1.5714	0.0937	0.0667	0.0088	0.0000
1.6319	0.0937	0.0689	0.0089	0.0000
1.6923	0.0937	0.0712	0.0092	0.0000
1.7527	0.0937	0.0735	0.0093	0.0000
1.8132	0.0937	0.0757	0.0096	0.0000
1.8736	0.0937	0.0780	0.0097	0.0000
1.9341	0.0937	0.0802	0.0100	0.0000
1.9945	0.0937	0.0825	0.0101	0.0000
2.0549	0.0937	0.0849	0.0103	0.0000
2.1154	0.0937	0.0872	0.0104	0.0000
2.1758	0.0937	0.0896	0.0106	0.0000

2.2363	0.0937	0.0919	0.0108	0.0000
2.2967	0.0937	0.0943	0.0110	0.0000
2.3571	0.0937	0.0966	0.0111	0.0000
2.4176	0.0937	0.0990	0.0113	0.0000
2.4780	0.0937	0.1013	0.0114	0.0000
2.5385	0.0937	0.1037	0.0115	0.0000
2.5989	0.0937	0.1060	0.0115	0.0000
2.6593	0.0937	0.1084	0.0118	0.0000
2.7198	0.0937	0.1107	0.0122	0.0000
2.7802	0.0937	0.1131	0.0127	0.0000
2.8407	0.0937	0.1154	0.0132	0.0000
2.9011	0.0937	0.1178	0.0137	0.0000
2.9615	0.0937	0.1201	0.0142	0.0000
3.0220	0.0937	0.1224	0.0147	0.0000
3.0824	0.0937	0.1248	0.0152	0.0000
3.1429	0.0937	0.1271	0.0156	0.0000
3.2033	0.0937	0.1295	0.0161	0.0000
3.2637	0.0937	0.1318	0.0165	0.0000
3.3242	0.0937	0.1342	0.0169	0.0000
3.3846	0.0937	0.1365	0.0173	0.0000
3.4451	0.0937	0.1389	0.0178	0.0000
3.5055	0.0937	0.1412	0.0181	0.0000
3.5659	0.0937	0.1436	0.0185	0.0000
3.6264	0.0937	0.1459	0.0189	0.0000
3.6868	0.0937	0.1483	0.0193	0.0000
3.7473	0.0937	0.1506	0.0197	0.0000
3.8077	0.0937	0.1530	0.0200	0.0000
3.8681	0.0937	0.1553	0.0204	0.0000
3.9286	0.0937	0.1577	0.0207	0.0000
3.9890	0.0937	0.1600	0.0211	0.0000
4.0000	0.0937	0.1605	0.0305	0.0000

Surface retention A Hydraulic Table

<u>Stage(feet)</u>	<u>Area(ac.)</u>	<u>Volume(ac-ft.)</u>	<u>Discharge(cfs)</u>	<u>To Amended(cfs)</u>	<u>Wetted Surface</u>
4.0000	0.0937	0.1605	0.0000	1.1333	0.0000
4.0604	0.0955	0.1662	0.0000	1.1333	0.0000
4.1209	0.0974	0.1720	0.0000	1.2247	0.0000
4.1813	0.0993	0.1780	0.0000	1.2703	0.0000
4.2418	0.1012	0.1840	0.0000	1.3160	0.0000
4.3022	0.1031	0.1902	0.0000	1.3617	0.0000
4.3626	0.1050	0.1965	0.0000	1.4073	0.0000
4.4231	0.1069	0.2029	0.0000	1.4530	0.0000
4.4835	0.1088	0.2094	0.0000	1.4987	0.0000
4.5440	0.1107	0.2160	0.0000	1.5443	0.0000
4.6044	0.1126	0.2228	0.0000	1.5900	0.0000
4.6648	0.1145	0.2296	0.0000	1.6357	0.0000
4.7253	0.1165	0.2366	0.0000	1.6813	0.0000
4.7857	0.1184	0.2437	0.0028	1.7270	0.0000
4.8462	0.1204	0.2509	0.0124	1.7727	0.0000
4.9066	0.1223	0.2583	0.0258	1.8183	0.0000
4.9670	0.1243	0.2657	0.0421	1.8640	0.0000
5.0275	0.1262	0.2733	0.1003	1.9096	0.0000
5.0879	0.1282	0.2810	0.3274	1.9553	0.0000
5.1484	0.1302	0.2888	0.6472	2.0010	0.0000
5.2088	0.1322	0.2967	1.0144	2.0466	0.0000
5.2692	0.1342	0.3048	1.3853	2.0923	0.0000
5.3297	0.1362	0.3129	1.7174	2.1380	0.0000
5.3901	0.1382	0.3212	1.9776	2.1836	0.0000

5.4505	0.1402	0.3296	2.1548	2.2293	0.0000
5.5000	0.1418	0.3366	2.3035	2.2667	0.0000

Name : Surface retention A

Element Flows To:

Outlet 1	Outlet 2
Surface retention BB	Bioretention A

Name : Basin B

Bypass: No

GroundWater: No

<u>Pervious Land Use</u>	<u>acre</u>
C, Pasture, Flat	1.01
Pervious Total	1.01

<u>Impervious Land Use</u>	<u>acre</u>
ROADS FLAT	0.39
ROOF TOPS FLAT	0.52
DRIVEWAYS FLAT	0.3
Impervious Total	1.21

Basin Total 2.22

Element Flows To:

Surface	Interflow	Groundwater
Surface retention BB	Surface retention BB	

Name : Basin c

Bypass: No

GroundWater: No

<u>Pervious Land Use</u>	<u>acre</u>
C, Pasture, Flat	1.27
Pervious Total	1.27

<u>Impervious Land Use</u>	<u>acre</u>
ROADS FLAT	0.29
ROOF TOPS FLAT	0.64
DRIVEWAYS FLAT	0.15
Impervious Total	1.08

Basin Total 2.35

Element Flows To:

Surface	Interflow	Groundwater
Surface retention 3	Surface retention 3	

Name : Bioretention 3

Bottom Length: 169.50 ft.

Bottom Width: 30.00 ft.

Material thickness of first layer: 1.5

Material type for first layer: SMMWW 12 in/hr

Material thickness of second layer: 0.5

Material type for second layer: Sand
Material thickness of third layer: 2
Material type for third layer: GRAVEL
Underdrain used
Underdrain Diameter (feet): 0.5
Orifice Diameter (in.): 2.5
Offset (in.): 0
Flow Through Underdrain (ac-ft.): 1995.261
Total Outflow (ac-ft.): 2003.595
Percent Through Underdrain: 99.58

Discharge Structure

Riser Height: 1 ft.
Riser Diameter: 12 in.
Notch Type: Rectangular
Notch Width: 0.125 ft.
Notch Height: 0.250 ft.

Element Flows To:

Outlet 1 **Outlet 2**
 Vault 1

Bioretention 3 Hydraulic Table

<u>Stage(feet)</u>	<u>Area(ac.)</u>	<u>Volume(ac-ft.)</u>	<u>Discharge(cfs)</u>	<u>Infilt(cfs)</u>
0.0000	0.1167	0.0000	0.0000	0.0000
0.0604	0.1167	0.0032	0.0000	0.0000
0.1209	0.1167	0.0065	0.0000	0.0000
0.1813	0.1167	0.0097	0.0000	0.0000
0.2418	0.1167	0.0129	0.0000	0.0000
0.3022	0.1167	0.0161	0.0000	0.0000
0.3626	0.1167	0.0194	0.0115	0.0000
0.4231	0.1167	0.0226	0.0167	0.0000
0.4835	0.1167	0.0258	0.0203	0.0000
0.5440	0.1167	0.0290	0.0325	0.0000
0.6044	0.1167	0.0323	0.0397	0.0000
0.6648	0.1167	0.0355	0.0433	0.0000
0.7253	0.1167	0.0387	0.0494	0.0000
0.7857	0.1167	0.0419	0.0525	0.0000
0.8462	0.1167	0.0452	0.0579	0.0000
0.9066	0.1167	0.0484	0.0605	0.0000
0.9670	0.1167	0.0516	0.0652	0.0000
1.0275	0.1167	0.0548	0.0675	0.0000
1.0879	0.1167	0.0581	0.0718	0.0000
1.1484	0.1167	0.0613	0.0739	0.0000
1.2088	0.1167	0.0645	0.0777	0.0000
1.2692	0.1167	0.0678	0.0797	0.0000
1.3297	0.1167	0.0710	0.0833	0.0000
1.3901	0.1167	0.0742	0.0851	0.0000
1.4505	0.1167	0.0774	0.0884	0.0000
1.5110	0.1167	0.0803	0.0901	0.0000
1.5714	0.1167	0.0831	0.0933	0.0000
1.6319	0.1167	0.0859	0.0949	0.0000
1.6923	0.1167	0.0887	0.0979	0.0000
1.7527	0.1167	0.0915	0.0994	0.0000
1.8132	0.1167	0.0944	0.1023	0.0000
1.8736	0.1167	0.0972	0.1038	0.0000
1.9341	0.1167	0.1000	0.1065	0.0000
1.9945	0.1167	0.1028	0.1079	0.0000
2.0549	0.1167	0.1058	0.1106	0.0000

2.1154	0.1167	0.1087	0.1119	0.0000
2.1758	0.1167	0.1116	0.1145	0.0000
2.2363	0.1167	0.1145	0.1158	0.0000
2.2967	0.1167	0.1175	0.1183	0.0000
2.3571	0.1167	0.1204	0.1195	0.0000
2.4176	0.1167	0.1233	0.1219	0.0000
2.4780	0.1167	0.1263	0.1231	0.0000
2.5385	0.1167	0.1292	0.1255	0.0000
2.5989	0.1167	0.1321	0.1267	0.0000
2.6593	0.1167	0.1350	0.1303	0.0000
2.7198	0.1167	0.1380	0.1353	0.0000
2.7802	0.1167	0.1409	0.1409	0.0000
2.8407	0.1167	0.1438	0.1466	0.0000
2.9011	0.1167	0.1468	0.1523	0.0000
2.9615	0.1167	0.1497	0.1578	0.0000
3.0220	0.1167	0.1526	0.1632	0.0000
3.0824	0.1167	0.1555	0.1685	0.0000
3.1429	0.1167	0.1585	0.1736	0.0000
3.2033	0.1167	0.1614	0.1786	0.0000
3.2637	0.1167	0.1643	0.1834	0.0000
3.3242	0.1167	0.1673	0.1881	0.0000
3.3846	0.1167	0.1702	0.1928	0.0000
3.4451	0.1167	0.1731	0.1972	0.0000
3.5055	0.1167	0.1760	0.2016	0.0000
3.5659	0.1167	0.1790	0.2059	0.0000
3.6264	0.1167	0.1819	0.2102	0.0000
3.6868	0.1167	0.1848	0.2143	0.0000
3.7473	0.1167	0.1877	0.2184	0.0000
3.8077	0.1167	0.1907	0.2224	0.0000
3.8681	0.1167	0.1936	0.2263	0.0000
3.9286	0.1167	0.1965	0.2302	0.0000
3.9890	0.1167	0.1995	0.2341	0.0000
4.0000	0.1167	0.2000	0.3392	0.0000

Surface retention 3 Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Wetted Surface
4.0000	0.1167	0.2000	0.0000	1.4125	0.0000
4.0604	0.1184	0.2071	0.0000	1.4125	0.0000
4.1209	0.1201	0.2143	0.0000	1.5263	0.0000
4.1813	0.1217	0.2216	0.0000	1.5832	0.0000
4.2418	0.1234	0.2290	0.0000	1.6402	0.0000
4.3022	0.1251	0.2365	0.0000	1.6971	0.0000
4.3626	0.1268	0.2441	0.0000	1.7540	0.0000
4.4231	0.1285	0.2519	0.0000	1.8109	0.0000
4.4835	0.1302	0.2597	0.0000	1.8678	0.0000
4.5440	0.1319	0.2676	0.0000	1.9247	0.0000
4.6044	0.1336	0.2756	0.0000	1.9816	0.0000
4.6648	0.1354	0.2838	0.0000	2.0386	0.0000
4.7253	0.1371	0.2920	0.0000	2.0955	0.0000
4.7857	0.1388	0.3003	0.0028	2.1524	0.0000
4.8462	0.1406	0.3088	0.0124	2.2093	0.0000
4.9066	0.1423	0.3173	0.0258	2.2662	0.0000
4.9670	0.1441	0.3260	0.0421	2.3231	0.0000
5.0275	0.1458	0.3347	0.1003	2.3800	0.0000
5.0879	0.1476	0.3436	0.3274	2.4370	0.0000
5.1484	0.1494	0.3526	0.6472	2.4939	0.0000
5.2088	0.1512	0.3617	1.0144	2.5508	0.0000
5.2692	0.1529	0.3709	1.3853	2.6077	0.0000

5.3297	0.1547	0.3802	1.7174	2.6646	0.0000
5.3901	0.1565	0.3896	1.9776	2.7215	0.0000
5.4505	0.1583	0.3991	2.1548	2.7784	0.0000
5.5000	0.1598	0.4069	2.3035	2.8250	0.0000

Name : Surface retention 3

Element Flows To:

Outlet 1	Outlet 2
Vault 1	Bioretention 3

Name : Bioretention BB

Bottom Length: 168.70 ft.

Bottom Width: 15.00 ft.

Material thickness of first layer: 1.5

Material type for first layer: SMMWW 12 in/hr

Material thickness of second layer: 0.5

Material type for second layer: Sand

Material thickness of third layer: 2.5

Material type for third layer: GRAVEL

Underdrain used

Underdrain Diameter (feet): 0.5

Orifice Diameter (in.): 1.5

Offset (in.): 0

Flow Through Underdrain (ac-ft.): 1344.457

Total Outflow (ac-ft.): 1365.677

Percent Through Underdrain: 98.45

Discharge Structure

Riser Height: 1 ft.

Riser Diameter: 12 in.

Notch Type: Rectangular

Notch Width: 0.125 ft.

Notch Height: 0.250 ft.

Element Flows To:

Outlet 1	Outlet 2
Surface retention 3	

Bioretention BB Hydraulic Table

<u>Stage(feet)</u>	<u>Area(ac.)</u>	<u>Volume(ac-ft.)</u>	<u>Discharge(cfs)</u>	<u>Infilt(cfs)</u>
0.0000	0.0581	0.0000	0.0000	0.0000
0.0659	0.0581	0.0018	0.0000	0.0000
0.1319	0.0581	0.0035	0.0000	0.0000
0.1978	0.0581	0.0053	0.0000	0.0000
0.2637	0.0581	0.0070	0.0000	0.0000
0.3297	0.0581	0.0088	0.0032	0.0000
0.3956	0.0581	0.0105	0.0057	0.0000
0.4615	0.0581	0.0123	0.0067	0.0000
0.5275	0.0581	0.0140	0.0121	0.0000
0.5934	0.0581	0.0158	0.0150	0.0000
0.6593	0.0581	0.0175	0.0194	0.0000
0.7253	0.0581	0.0193	0.0217	0.0000
0.7912	0.0581	0.0210	0.0229	0.0000
0.8571	0.0581	0.0228	0.0247	0.0000
0.9231	0.0581	0.0245	0.0256	0.0000
0.9890	0.0581	0.0263	0.0272	0.0000

1.0549	0.0581	0.0280	0.0280	0.0000
1.1209	0.0581	0.0298	0.0294	0.0000
1.1868	0.0581	0.0315	0.0301	0.0000
1.2527	0.0581	0.0333	0.0315	0.0000
1.3187	0.0581	0.0350	0.0322	0.0000
1.3846	0.0581	0.0368	0.0334	0.0000
1.4505	0.0581	0.0385	0.0340	0.0000
1.5165	0.0581	0.0401	0.0352	0.0000
1.5824	0.0581	0.0416	0.0358	0.0000
1.6484	0.0581	0.0431	0.0370	0.0000
1.7143	0.0581	0.0447	0.0375	0.0000
1.7802	0.0581	0.0462	0.0386	0.0000
1.8462	0.0581	0.0477	0.0392	0.0000
1.9121	0.0581	0.0493	0.0402	0.0000
1.9780	0.0581	0.0508	0.0407	0.0000
2.0440	0.0581	0.0524	0.0417	0.0000
2.1099	0.0581	0.0540	0.0422	0.0000
2.1758	0.0581	0.0556	0.0432	0.0000
2.2418	0.0581	0.0571	0.0437	0.0000
2.3077	0.0581	0.0587	0.0446	0.0000
2.3736	0.0581	0.0603	0.0451	0.0000
2.4396	0.0581	0.0619	0.0460	0.0000
2.5055	0.0581	0.0635	0.0464	0.0000
2.5714	0.0581	0.0651	0.0473	0.0000
2.6374	0.0581	0.0667	0.0477	0.0000
2.7033	0.0581	0.0683	0.0488	0.0000
2.7692	0.0581	0.0699	0.0505	0.0000
2.8352	0.0581	0.0715	0.0526	0.0000
2.9011	0.0581	0.0730	0.0547	0.0000
2.9670	0.0581	0.0746	0.0568	0.0000
3.0330	0.0581	0.0762	0.0589	0.0000
3.0989	0.0581	0.0778	0.0610	0.0000
3.1648	0.0581	0.0794	0.0629	0.0000
3.2308	0.0581	0.0810	0.0649	0.0000
3.2967	0.0581	0.0826	0.0668	0.0000
3.3626	0.0581	0.0842	0.0686	0.0000
3.4286	0.0581	0.0858	0.0704	0.0000
3.4945	0.0581	0.0874	0.0721	0.0000
3.5604	0.0581	0.0889	0.0738	0.0000
3.6264	0.0581	0.0905	0.0755	0.0000
3.6923	0.0581	0.0921	0.0771	0.0000
3.7582	0.0581	0.0937	0.0787	0.0000
3.8242	0.0581	0.0953	0.0802	0.0000
3.8901	0.0581	0.0969	0.0818	0.0000
3.9560	0.0581	0.0985	0.0833	0.0000
4.0220	0.0581	0.1001	0.0847	0.0000
4.0879	0.0581	0.1017	0.0862	0.0000
4.1538	0.0581	0.1032	0.0876	0.0000
4.2198	0.0581	0.1048	0.0890	0.0000
4.2857	0.0581	0.1064	0.0904	0.0000
4.3516	0.0581	0.1080	0.0918	0.0000
4.4176	0.0581	0.1096	0.0931	0.0000
4.4835	0.0581	0.1112	0.0945	0.0000
4.5000	0.0581	0.1116	0.1295	0.0000

Surface retention BB Hydraulic Table

<u>Stage(feet)</u>	<u>Area(ac.)</u>	<u>Volume(ac-ft.)</u>	<u>Discharge(cfs)</u>	<u>To Amended(cfs)</u>	<u>Wetted Surface</u>
4.5000	0.0581	0.1116	0.0000	0.7029	0.0000

0.9000	0.031	0.028	0.051	0.000
1.0000	0.031	0.031	0.054	0.000
1.1000	0.031	0.034	0.057	0.000
1.2000	0.031	0.037	0.059	0.000
1.3000	0.031	0.040	0.062	0.000
1.4000	0.031	0.044	0.064	0.000
1.5000	0.031	0.047	0.067	0.000
1.6000	0.031	0.050	0.069	0.000
1.7000	0.031	0.053	0.071	0.000
1.8000	0.031	0.056	0.073	0.000
1.9000	0.031	0.059	0.075	0.000
2.0000	0.031	0.062	0.077	0.000
2.1000	0.031	0.066	0.079	0.000
2.2000	0.031	0.069	0.081	0.000
2.3000	0.031	0.072	0.083	0.000
2.4000	0.031	0.075	0.084	0.000
2.5000	0.031	0.078	0.086	0.000
2.6000	0.031	0.081	0.088	0.000
2.7000	0.031	0.084	0.089	0.000
2.8000	0.031	0.087	0.091	0.000
2.9000	0.031	0.091	0.093	0.000
3.0000	0.031	0.094	0.094	0.000
3.1000	0.031	0.097	0.096	0.000
3.2000	0.031	0.100	0.097	0.000
3.3000	0.031	0.103	0.099	0.000
3.4000	0.031	0.106	0.100	0.000
3.5000	0.031	0.109	0.102	0.000
3.6000	0.031	0.113	0.103	0.000
3.7000	0.031	0.116	0.105	0.000
3.8000	0.031	0.119	0.106	0.000
3.9000	0.031	0.122	0.108	0.000
4.0000	0.031	0.125	0.109	0.000
4.1000	0.031	0.128	0.111	0.000
4.2000	0.031	0.131	0.114	0.000
4.3000	0.031	0.135	0.118	0.000
4.4000	0.031	0.138	0.122	0.000
4.5000	0.031	0.141	0.127	0.000
4.6000	0.031	0.144	0.131	0.000
4.7000	0.031	0.147	0.136	0.000
4.8000	0.031	0.150	0.141	0.000
4.9000	0.031	0.153	0.146	0.000
5.0000	0.031	0.157	0.150	0.000
5.1000	0.031	0.160	0.156	0.000
5.2000	0.031	0.163	0.162	0.000
5.3000	0.031	0.166	0.168	0.000
5.4000	0.031	0.169	0.174	0.000
5.5000	0.031	0.172	0.197	0.000
5.6000	0.031	0.175	0.206	0.000
5.7000	0.031	0.179	0.214	0.000
5.8000	0.031	0.182	0.223	0.000
5.9000	0.031	0.185	0.232	0.000
6.0000	0.031	0.188	0.241	0.000
6.1000	0.031	0.191	0.251	0.000
6.2000	0.031	0.194	0.260	0.000
6.3000	0.031	0.197	0.270	0.000
6.4000	0.031	0.201	0.280	0.000
6.5000	0.031	0.204	0.290	0.000
6.6000	0.031	0.207	0.300	0.000

6.7000	0.031	0.210	0.311	0.000
6.8000	0.031	0.213	0.321	0.000
6.9000	0.031	0.216	0.332	0.000
7.0000	0.031	0.219	0.343	0.000
7.1000	0.031	0.223	0.354	0.000
7.2000	0.031	0.226	0.366	0.000
7.3000	0.031	0.229	0.377	0.000
7.4000	0.031	0.232	0.389	0.000
7.5000	0.031	0.235	0.400	0.000
7.6000	0.031	0.238	0.412	0.000
7.7000	0.031	0.241	0.424	0.000
7.8000	0.031	0.245	0.437	0.000
7.9000	0.031	0.248	0.449	0.000
8.0000	0.031	0.251	0.461	0.000
8.1000	0.031	0.254	0.965	0.000
8.2000	0.031	0.257	1.868	0.000
8.3000	0.031	0.260	2.966	0.000
8.4000	0.031	0.263	4.097	0.000
8.5000	0.031	0.267	5.105	0.000
8.6000	0.031	0.270	5.868	0.000
8.7000	0.031	0.273	6.361	0.000
8.8000	0.031	0.276	6.807	0.000
8.9000	0.031	0.279	7.193	0.000
9.0000	0.031	0.282	7.557	0.000
9.1000	0.031	0.285	7.904	0.000
9.2000	0.000	0.000	8.236	0.000

ANALYSIS RESULTS

Stream Protection Duration

Predeveloped Landuse Totals for POC #1
Total Pervious Area:10.16
Total Impervious Area:0

Mitigated Landuse Totals for POC #1
Total Pervious Area:3.85
Total Impervious Area:3.46

Flow Frequency Return Periods for Predeveloped. POC #1

<u>Return Period</u>	<u>Flow(cfs)</u>
2 year	0.219642
5 year	0.323011
10 year	0.377094
25 year	0.431
50 year	0.462572
100 year	0.488299

Flow Frequency Return Periods for Mitigated. POC #1

<u>Return Period</u>	<u>Flow(cfs)</u>
2 year	0.164971

5 year	0.316261
10 year	0.473887
25 year	0.767572
50 year	1.078791
100 year	1.494415

Stream Protection Duration

POC #1

The Facility PASSED

The Facility PASSED.

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.1098	56482	53889	95	Pass
0.1134	51566	46457	90	Pass
0.1169	48274	42917	88	Pass
0.1205	44260	38431	86	Pass
0.1241	40644	34588	85	Pass
0.1276	38243	32127	84	Pass
0.1312	35342	28835	81	Pass
0.1348	33261	26743	80	Pass
0.1383	30757	24316	79	Pass
0.1419	28989	22560	77	Pass
0.1455	26842	20225	75	Pass
0.1490	24943	18090	72	Pass
0.1526	23584	16856	71	Pass
0.1561	21899	15508	70	Pass
0.1597	20765	14627	70	Pass
0.1633	19306	13537	70	Pass
0.1668	18271	12805	70	Pass
0.1704	17000	11836	69	Pass
0.1740	16080	10999	68	Pass
0.1775	14985	10344	69	Pass
0.1811	13966	10041	71	Pass
0.1846	13240	9832	74	Pass
0.1882	12359	9579	77	Pass
0.1918	11753	9414	80	Pass
0.1953	11049	9182	83	Pass
0.1989	10509	8995	85	Pass
0.2025	9876	8549	86	Pass
0.2060	9215	8175	88	Pass
0.2096	8797	7911	89	Pass
0.2132	8280	7575	91	Pass
0.2167	7889	7333	92	Pass
0.2203	7393	6969	94	Pass
0.2238	7074	6716	94	Pass
0.2274	6667	6419	96	Pass
0.2310	6413	6199	96	Pass
0.2345	6105	5896	96	Pass
0.2381	5813	5621	96	Pass
0.2417	5588	5396	96	Pass
0.2452	5325	5117	96	Pass
0.2488	5133	4905	95	Pass
0.2523	4890	4635	94	Pass
0.2559	4713	4433	94	Pass
0.2595	4455	4111	92	Pass
0.2630	4201	3783	90	Pass
0.2666	4038	3484	86	Pass

0.2702	3853	3003	77	Pass
0.2737	3723	2773	74	Pass
0.2773	3544	2581	72	Pass
0.2809	3425	2462	71	Pass
0.2844	3282	2301	70	Pass
0.2880	3178	2189	68	Pass
0.2915	3065	2070	67	Pass
0.2951	2963	1969	66	Pass
0.2987	2898	1908	65	Pass
0.3022	2799	1833	65	Pass
0.3058	2735	1777	64	Pass
0.3094	2642	1718	65	Pass
0.3129	2524	1671	66	Pass
0.3165	2430	1615	66	Pass
0.3200	2319	1555	67	Pass
0.3236	2220	1511	68	Pass
0.3272	2104	1442	68	Pass
0.3307	2022	1399	69	Pass
0.3343	1913	1341	70	Pass
0.3379	1856	1301	70	Pass
0.3414	1769	1262	71	Pass
0.3450	1714	1232	71	Pass
0.3486	1642	1193	72	Pass
0.3521	1571	1154	73	Pass
0.3557	1517	1121	73	Pass
0.3592	1446	1091	75	Pass
0.3628	1397	1058	75	Pass
0.3664	1327	1021	76	Pass
0.3699	1276	995	77	Pass
0.3735	1226	962	78	Pass
0.3771	1168	929	79	Pass
0.3806	1123	909	80	Pass
0.3842	1066	877	82	Pass
0.3877	1036	852	82	Pass
0.3913	993	822	82	Pass
0.3949	960	795	82	Pass
0.3984	924	762	82	Pass
0.4020	891	734	82	Pass
0.4056	827	699	84	Pass
0.4091	756	672	88	Pass
0.4127	725	650	89	Pass
0.4163	688	614	89	Pass
0.4198	654	590	90	Pass
0.4234	612	565	92	Pass
0.4269	573	541	94	Pass
0.4305	531	519	97	Pass
0.4341	485	502	103	Pass
0.4376	458	477	104	Pass
0.4412	427	445	104	Pass
0.4448	401	430	107	Pass
0.4483	367	402	109	Pass
0.4519	356	389	109	Pass
0.4554	333	366	109	Pass
0.4590	317	343	108	Pass
0.4626	301	328	108	Pass

Water Quality BMP Flow and Volume for POC #1

On-line facility volume: 0 acre-feet
On-line facility target flow: 0 cfs.
Adjusted for 15 min: 0 cfs.
Off-line facility target flow: 0 cfs.
Adjusted for 15 min: 0 cfs.

LID Report

LID Technique	Used for	Total Volume	Volume	Infiltration	Cumulative	Percent
Water Quality	Percent	Comment	Needs	Through	Volume	Volume
Water Quality		Treatment	Facility	(ac-ft.)	Infiltration	Volume
Infiltrated	Treated	(ac-ft)	(ac-ft)		Credit	
Vault 1 POC	N	0.00			N	0.00
retention 3	N	0.00			N	0.00
retention BB	N	0.00			N	0.00
retention A	N	0.00			N	0.00
Total Volume Infiltrated		0.00	0.00	0.00		0.00
0.00	0%	No Treat.	Credit			

Compliance with LID Standard 8
 Duration Analysis Result = Passed

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13.3 Northeast Basin

WWHM2012
PROJECT REPORT

Project Name: AV test WQ b4 Vlt 80.25x39
Site Name: Lindsay NE Basin Vault
Site Address:
City :
Report Date: 1/9/2025
MGS Regoin : Puget East
Data Start : 1901/10/1
Data End : 2058/09/30
DOT Data Number: 05
Version Date: 2023/03/31
Version : 4.2.19

Low Flow Threshold for POC 1 : 50 Percent of the 2 Year

High Flow Threshold for POC 1: 50 year

PREDEVELOPED LAND USE

Name : Basin 1
 Bypass: No
 GroundWater: No

<u>Pervious Land Use</u>	<u>acre</u>
C, Forest, Flat	4.4
Pervious Total	4.4
<u>Impervious Land Use</u>	<u>acre</u>
ROADS FLAT	0.13
Impervious Total	0.13
Basin Total	4.53

Element Flows To:		
Surface	Interflow	Groundwater

MITIGATED LAND USE

Name : Upstream
 Bypass: Yes
 GroundWater: No

<u>Pervious Land Use</u>	<u>acre</u>
C, Forest, Flat	1.36
Pervious Total	1.36
<u>Impervious Land Use</u>	<u>acre</u>
Impervious Total	0
Basin Total	1.36

Element Flows To:		
Surface	Interflow	Groundwater
Vault 1		

Name : Basin 2
 Bypass: No
 GroundWater: No

<u>Pervious Land Use</u>	<u>acre</u>
C, Pasture, Flat	1.41
Pervious Total	1.41
<u>Impervious Land Use</u>	<u>acre</u>
ROOF TOPS FLAT	1
Impervious Total	1
Basin Total	2.41

Element Flows To:		
Surface	Interflow	Groundwater
Vault 1	Vault 1	

Name : Vault 1

Width : 38.03 ft.
 Length : 80.25 ft.
 Depth: 7 ft.

Discharge Structure

Riser Height: 6 ft.
 Riser Diameter: 18 in.
 Orifice 1 Diameter: 1.14 in. Elevation: 0 ft.
 Orifice 2 Diameter: 1.9 in. Elevation: 3.95 ft.
 Orifice 3 Diameter: 1.1 in. Elevation: 4.97 ft.

Element Flows To:

Outlet 1 Outlet 2

Vault Hydraulic Table

<u>Stage(feet)</u>	<u>Area(ac.)</u>	<u>Volume(ac-ft.)</u>	<u>Discharge(cfs)</u>	<u>Infilt(cfs)</u>
0.0000	0.070	0.000	0.000	0.000
0.0778	0.070	0.005	0.009	0.000
0.1556	0.070	0.010	0.013	0.000
0.2333	0.070	0.016	0.017	0.000
0.3111	0.070	0.021	0.019	0.000
0.3889	0.070	0.027	0.022	0.000
0.4667	0.070	0.032	0.024	0.000
0.5444	0.070	0.038	0.026	0.000
0.6222	0.070	0.043	0.027	0.000
0.7000	0.070	0.049	0.029	0.000
0.7778	0.070	0.054	0.031	0.000
0.8556	0.070	0.059	0.032	0.000
0.9333	0.070	0.065	0.034	0.000
1.0111	0.070	0.070	0.035	0.000
1.0889	0.070	0.076	0.036	0.000
1.1667	0.070	0.081	0.038	0.000
1.2444	0.070	0.087	0.039	0.000
1.3222	0.070	0.092	0.040	0.000
1.4000	0.070	0.098	0.041	0.000
1.4778	0.070	0.103	0.042	0.000
1.5556	0.070	0.109	0.044	0.000
1.6333	0.070	0.114	0.045	0.000
1.7111	0.070	0.119	0.046	0.000
1.7889	0.070	0.125	0.047	0.000
1.8667	0.070	0.130	0.048	0.000
1.9444	0.070	0.136	0.049	0.000
2.0222	0.070	0.141	0.050	0.000
2.1000	0.070	0.147	0.051	0.000
2.1778	0.070	0.152	0.052	0.000
2.2556	0.070	0.158	0.053	0.000
2.3333	0.070	0.163	0.053	0.000
2.4111	0.070	0.168	0.054	0.000
2.4889	0.070	0.174	0.055	0.000
2.5667	0.070	0.179	0.056	0.000
2.6444	0.070	0.185	0.057	0.000
2.7222	0.070	0.190	0.058	0.000
2.8000	0.070	0.196	0.059	0.000
2.8778	0.070	0.201	0.059	0.000
2.9556	0.070	0.207	0.060	0.000
3.0333	0.070	0.212	0.061	0.000
3.1111	0.070	0.218	0.062	0.000
3.1889	0.070	0.223	0.063	0.000

3.2667	0.070	0.228	0.063	0.000
3.3444	0.070	0.234	0.064	0.000
3.4222	0.070	0.239	0.065	0.000
3.5000	0.070	0.245	0.066	0.000
3.5778	0.070	0.250	0.066	0.000
3.6556	0.070	0.256	0.067	0.000
3.7333	0.070	0.261	0.068	0.000
3.8111	0.070	0.267	0.068	0.000
3.8889	0.070	0.272	0.069	0.000
3.9667	0.070	0.277	0.082	0.000
4.0444	0.070	0.283	0.101	0.000
4.1222	0.070	0.288	0.112	0.000
4.2000	0.070	0.294	0.121	0.000
4.2778	0.070	0.299	0.129	0.000
4.3556	0.070	0.305	0.136	0.000
4.4333	0.070	0.310	0.142	0.000
4.5111	0.070	0.316	0.148	0.000
4.5889	0.070	0.321	0.153	0.000
4.6667	0.070	0.327	0.159	0.000
4.7444	0.070	0.332	0.164	0.000
4.8222	0.070	0.337	0.168	0.000
4.9000	0.070	0.343	0.173	0.000
4.9778	0.070	0.348	0.180	0.000
5.0556	0.070	0.354	0.191	0.000
5.1333	0.070	0.359	0.199	0.000
5.2111	0.070	0.365	0.206	0.000
5.2889	0.070	0.370	0.213	0.000
5.3667	0.070	0.376	0.219	0.000
5.4444	0.070	0.381	0.224	0.000
5.5222	0.070	0.386	0.230	0.000
5.6000	0.070	0.392	0.235	0.000
5.6778	0.070	0.397	0.240	0.000
5.7556	0.070	0.403	0.245	0.000
5.8333	0.070	0.408	0.250	0.000
5.9111	0.070	0.414	0.254	0.000
5.9889	0.070	0.419	0.259	0.000
6.0667	0.070	0.425	0.537	0.000
6.1444	0.070	0.430	1.137	0.000
6.2222	0.070	0.435	1.909	0.000
6.3000	0.070	0.441	2.777	0.000
6.3778	0.070	0.446	3.666	0.000
6.4556	0.070	0.452	4.500	0.000
6.5333	0.070	0.457	5.212	0.000
6.6111	0.070	0.463	5.760	0.000
6.6889	0.070	0.468	6.145	0.000
6.7667	0.070	0.474	6.505	0.000
6.8444	0.070	0.479	6.816	0.000
6.9222	0.070	0.485	7.113	0.000
7.0000	0.070	0.490	7.397	0.000
7.0778	0.070	0.495	7.671	0.000
7.1556	0.000	0.000	7.936	0.000

Name : Bioretention 1
Bottom Length: 100.00 ft.
Bottom Width: 1.00 ft.
Material thickness of first layer: 1.5
Material type for first layer: SMMWW 12 in/hr

Material thickness of second layer: 0.5
Material type for second layer: Sand
Material thickness of third layer: 0.5
Material type for third layer: GRAVEL

Underdrain used

Underdrain Diameter (feet): 0.5
Orifice Diameter (in.): 6
Offset (in.): 0
Flow Through Underdrain (ac-ft.): 209.75
Total Outflow (ac-ft.): 225.021
Percent Through Underdrain: 93.21

Discharge Structure

Riser Height: 0.5 ft.
Riser Diameter: 6 in.

Element Flows To:

Outlet 1 **Outlet 2**
 Vault 1

Bioretention 1 Hydraulic Table

<u>Stage(feet)</u>	<u>Area(ac.)</u>	<u>Volume(ac-ft.)</u>	<u>Discharge(cfs)</u>	<u>Infilt(cfs)</u>
0.0000	0.0023	0.0000	0.0000	0.0000
0.0385	0.0023	0.0000	0.0000	0.0000
0.0769	0.0023	0.0001	0.0000	0.0000
0.1154	0.0023	0.0001	0.0000	0.0000
0.1538	0.0023	0.0002	0.0000	0.0000
0.1923	0.0023	0.0002	0.0000	0.0000
0.2308	0.0023	0.0002	0.0000	0.0000
0.2692	0.0023	0.0003	0.0000	0.0000
0.3077	0.0023	0.0003	0.0000	0.0000
0.3462	0.0023	0.0004	0.0002	0.0000
0.3846	0.0023	0.0004	0.0003	0.0000
0.4231	0.0023	0.0004	0.0004	0.0000
0.4615	0.0023	0.0005	0.0005	0.0000
0.5000	0.0023	0.0005	0.0007	0.0000
0.5385	0.0023	0.0006	0.0009	0.0000
0.5769	0.0023	0.0006	0.0009	0.0000
0.6154	0.0023	0.0006	0.0011	0.0000
0.6538	0.0023	0.0007	0.0014	0.0000
0.6923	0.0023	0.0007	0.0015	0.0000
0.7308	0.0023	0.0008	0.0016	0.0000
0.7692	0.0023	0.0008	0.0020	0.0000
0.8077	0.0023	0.0008	0.0024	0.0000
0.8462	0.0023	0.0009	0.0025	0.0000
0.8846	0.0023	0.0009	0.0028	0.0000
0.9231	0.0023	0.0010	0.0032	0.0000
0.9615	0.0023	0.0010	0.0037	0.0000
1.0000	0.0023	0.0010	0.0037	0.0000
1.0385	0.0023	0.0011	0.0043	0.0000
1.0769	0.0023	0.0011	0.0049	0.0000
1.1154	0.0023	0.0012	0.0052	0.0000
1.1538	0.0023	0.0012	0.0055	0.0000
1.1923	0.0023	0.0013	0.0062	0.0000
1.2308	0.0023	0.0013	0.0069	0.0000
1.2692	0.0023	0.0013	0.0071	0.0000
1.3077	0.0023	0.0014	0.0077	0.0000
1.3462	0.0023	0.0014	0.0086	0.0000

1.3846	0.0023	0.0015	0.0093	0.0000
1.4231	0.0023	0.0015	0.0095	0.0000
1.4615	0.0023	0.0015	0.0104	0.0000
1.5000	0.0023	0.0016	0.0114	0.0000
1.5385	0.0023	0.0016	0.0119	0.0000
1.5769	0.0023	0.0016	0.0125	0.0000
1.6154	0.0023	0.0017	0.0136	0.0000
1.6538	0.0023	0.0017	0.0147	0.0000
1.6923	0.0023	0.0017	0.0149	0.0000
1.7308	0.0023	0.0018	0.0160	0.0000
1.7692	0.0023	0.0018	0.0162	0.0000
1.8077	0.0023	0.0019	0.0173	0.0000
1.8462	0.0023	0.0019	0.0182	0.0000
1.8846	0.0023	0.0019	0.0186	0.0000
1.9231	0.0023	0.0020	0.0200	0.0000
1.9615	0.0023	0.0020	0.0215	0.0000
2.0000	0.0023	0.0020	0.0215	0.0000
2.0385	0.0023	0.0021	0.0215	0.0000
2.0769	0.0023	0.0021	0.0215	0.0000
2.1154	0.0023	0.0021	0.0370	0.0000
2.1538	0.0023	0.0022	0.0370	0.0000
2.1923	0.0023	0.0022	0.0370	0.0000
2.2308	0.0023	0.0022	0.0370	0.0000
2.2692	0.0023	0.0023	0.0370	0.0000
2.3077	0.0023	0.0023	0.0370	0.0000
2.3462	0.0023	0.0024	0.0370	0.0000
2.3846	0.0023	0.0024	0.0370	0.0000
2.4231	0.0023	0.0024	0.0370	0.0000
2.4615	0.0023	0.0025	0.0370	0.0000
2.5000	0.0023	0.0025	0.0370	0.0000
2.5000	0.0023	0.0025	0.0370	0.0000

Surface retention 1 Hydraulic Table

<u>Stage(feet)</u>	<u>Area(ac.)</u>	<u>Volume(ac-ft.)</u>	<u>Discharge(cfs)</u>	<u>To Amended(cfs)</u>	<u>Wetted Surface</u>
2.5000	0.0023	0.0025	0.0000	0.0278	0.0000
2.5385	0.0028	0.0026	0.0000	0.0278	0.0000
2.5769	0.0034	0.0027	0.0000	0.0292	0.0000
2.6154	0.0039	0.0029	0.0000	0.0299	0.0000
2.6538	0.0045	0.0030	0.0000	0.0306	0.0000
2.6923	0.0050	0.0032	0.0000	0.0313	0.0000
2.7308	0.0056	0.0034	0.0000	0.0321	0.0000
2.7692	0.0061	0.0036	0.0000	0.0328	0.0000
2.8077	0.0067	0.0039	0.0000	0.0335	0.0000
2.8462	0.0072	0.0041	0.0000	0.0342	0.0000
2.8846	0.0078	0.0044	0.0000	0.0349	0.0000
2.9231	0.0083	0.0047	0.0000	0.0356	0.0000
2.9615	0.0089	0.0051	0.0000	0.0363	0.0000
3.0000	0.0095	0.0054	0.0000	0.0370	0.0000
3.0385	0.0100	0.0058	0.0399	0.0377	0.0000
3.0769	0.0106	0.0062	0.1109	0.0385	0.0000
3.1154	0.0112	0.0066	0.1943	0.0392	0.0000
3.1538	0.0117	0.0071	0.2743	0.0399	0.0000
3.1923	0.0123	0.0075	0.3368	0.0406	0.0000
3.2308	0.0129	0.0080	0.3761	0.0413	0.0000
3.2692	0.0135	0.0085	0.4086	0.0420	0.0000
3.3077	0.0141	0.0090	0.4368	0.0427	0.0000
3.3462	0.0147	0.0096	0.4633	0.0434	0.0000
3.3846	0.0152	0.0102	0.4883	0.0442	0.0000

3.4231	0.0158	0.0108	0.5122	0.0449	0.0000
3.4615	0.0164	0.0114	0.5349	0.0456	0.0000
3.5000	0.0170	0.0120	0.5568	0.0463	0.0000

Name : Surface retention 1

Element Flows To:

Outlet 1	Outlet 2
Vault 1	Bioretention 1

Name : Basin 3

Bypass: Yes

GroundWater: No

<u>Pervious Land Use</u>	<u>acre</u>
Pervious Total	0
<u>Impervious Land Use</u>	<u>acre</u>
ROADS FLAT	0.13
Impervious Total	0.13
Basin Total	0.13

Element Flows To:

Surface	Interflow	Groundwater
Vault 1		

Name : Basin 4

Bypass: No

GroundWater: No

<u>Pervious Land Use</u>	<u>acre</u>
Pervious Total	0
<u>Impervious Land Use</u>	<u>acre</u>
ROADS FLAT	0.3
DRIVEWAYS FLAT	0.13
SIDEWALKS FLAT	0.09
Impervious Total	0.52
Basin Total	0.52

Element Flows To:

Surface	Interflow	Groundwater
Surface retention 1	Surface retention 1	

ANALYSIS RESULTS

Stream Protection Duration

Predeveloped Landuse Totals for POC #1
 Total Pervious Area:4.4
 Total Impervious Area:0.13

Mitigated Landuse Totals for POC #1
 Total Pervious Area:2.77
 Total Impervious Area:1.65

Flow Frequency Return Periods for Predeveloped. POC #1

<u>Return Period</u>	<u>Flow(cfs)</u>
2 year	0.107737
5 year	0.164445
10 year	0.207058
25 year	0.266639
50 year	0.315212
100 year	0.367401

Flow Frequency Return Periods for Mitigated. POC #1

<u>Return Period</u>	<u>Flow(cfs)</u>
2 year	0.071559
5 year	0.114541
10 year	0.15343
25 year	0.21742
50 year	0.278064
100 year	0.351924

Stream Protection Duration

POC #1

The Facility PASSED

The Facility **PASSED.**

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0539	11971	12044	100	Pass
0.0565	10594	9098	85	Pass
0.0591	9397	6649	70	Pass
0.0618	8397	4824	57	Pass
0.0644	7503	3325	44	Pass
0.0671	6708	2298	34	Pass
0.0697	6029	1489	24	Pass
0.0723	5416	1415	26	Pass
0.0750	4884	1359	27	Pass
0.0776	4400	1306	29	Pass
0.0803	3984	1267	31	Pass
0.0829	3584	1230	34	Pass
0.0855	3258	1192	36	Pass
0.0882	2980	1149	38	Pass
0.0908	2710	1113	41	Pass
0.0935	2452	1077	43	Pass
0.0961	2242	1036	46	Pass
0.0987	2070	998	48	Pass
0.1014	1892	971	51	Pass
0.1040	1733	939	54	Pass
0.1067	1603	890	55	Pass
0.1093	1484	860	57	Pass
0.1119	1385	833	60	Pass
0.1146	1302	796	61	Pass
0.1172	1213	770	63	Pass

0.1199	1125	738	65	Pass
0.1225	1040	706	67	Pass
0.1251	964	670	69	Pass
0.1278	898	639	71	Pass
0.1304	839	605	72	Pass
0.1331	798	572	71	Pass
0.1357	751	542	72	Pass
0.1383	710	513	72	Pass
0.1410	664	480	72	Pass
0.1436	615	450	73	Pass
0.1463	580	419	72	Pass
0.1489	544	394	72	Pass
0.1515	507	370	72	Pass
0.1542	471	347	73	Pass
0.1568	439	321	73	Pass
0.1595	414	297	71	Pass
0.1621	384	278	72	Pass
0.1647	366	259	70	Pass
0.1674	339	241	71	Pass
0.1700	319	223	69	Pass
0.1727	302	206	68	Pass
0.1753	280	190	67	Pass
0.1779	261	180	68	Pass
0.1806	247	174	70	Pass
0.1832	229	165	72	Pass
0.1859	212	159	75	Pass
0.1885	192	148	77	Pass
0.1911	179	143	79	Pass
0.1938	158	136	86	Pass
0.1964	147	130	88	Pass
0.1991	135	124	91	Pass
0.2017	125	116	92	Pass
0.2043	113	110	97	Pass
0.2070	102	104	101	Pass
0.2096	93	95	102	Pass
0.2123	86	89	103	Pass
0.2149	79	79	100	Pass
0.2175	71	72	101	Pass
0.2202	61	66	108	Pass
0.2228	58	60	103	Pass
0.2255	52	52	100	Pass
0.2281	49	50	102	Pass
0.2307	43	44	102	Pass
0.2334	39	38	97	Pass
0.2360	37	33	89	Pass
0.2387	32	27	84	Pass
0.2413	27	25	92	Pass
0.2439	27	22	81	Pass
0.2466	26	18	69	Pass
0.2492	23	16	69	Pass
0.2519	21	13	61	Pass
0.2545	19	10	52	Pass
0.2571	17	10	58	Pass
0.2598	16	9	56	Pass
0.2624	15	9	60	Pass
0.2651	13	8	61	Pass
0.2677	12	8	66	Pass
0.2703	12	8	66	Pass

0.2730	12	8	66	Pass
0.2756	11	8	72	Pass
0.2783	11	8	72	Pass
0.2809	11	8	72	Pass
0.2835	11	7	63	Pass
0.2862	11	6	54	Pass
0.2888	10	6	60	Pass
0.2915	10	6	60	Pass
0.2941	10	6	60	Pass
0.2967	10	6	60	Pass
0.2994	10	6	60	Pass
0.3020	9	6	66	Pass
0.3047	9	6	66	Pass
0.3073	8	6	75	Pass
0.3099	8	6	75	Pass
0.3126	7	6	85	Pass
0.3152	7	5	71	Pass

Water Quality BMP Flow and Volume for POC #1

On-line facility volume: 0 acre-feet

On-line facility target flow: 0 cfs.

Adjusted for 15 min: 0 cfs.

Off-line facility target flow: 0 cfs.

Adjusted for 15 min: 0 cfs.

LID Report

LID Technique	Used for	Total Volume	Volume	Infiltration	Cumulative	Percent
Water Quality	Percent	Comment	Needs	Through	Volume	Volume
Water Quality		Treatment	Facility	(ac-ft.)	Infiltration	
Infiltrated	Treated	(ac-ft)	(ac-ft)		Credit	
Vault 1 POC	N	801.55			N	0.00
retention 1	N	204.77			N	0.00
Total Volume Infiltrated		1006.32	0.00	0.00		0.00
0.00	0%	No Treat.				
Compliance with LID Standard 8						
Duration Analysis Result = Passed						

PerlnD and Implnd Changes

No changes have been made.

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