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Taco Time

Stormwater Site Plan
Drainage Report

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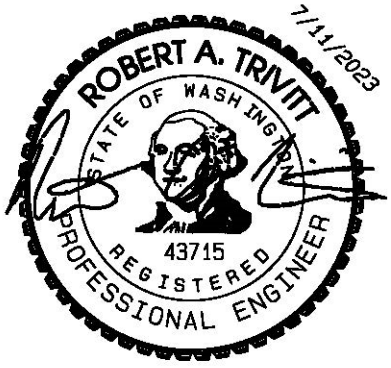
DATE: July 11, 2023



JOB NO: 2935

ENGINEER: Robert A. Trivitt, P.E.

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Section I - Project Overview

Overview:

The site is located on the north side of E Main, east of SR 512. The site address is 1115 E Main. Tax parcel numbers are 784510-003-2 & 042027-1-171. Total parcel area is 3.21 acres. The site is currently developed with a Taco Time Restaurant, primarily on parcel -003-2. The project consists of the construction of a new Taco Time Restaurant building and expansion of the existing parking lot. The existing building will remain for use by other tenants.

Improvements for the project will include the new building, additional parking lot, storm drainage facilities, expansion of existing driveway approach, sanitary sewer service, water service, and other underground utilities.

Project Requirements:

Determination of Applicable Minimum Requirements

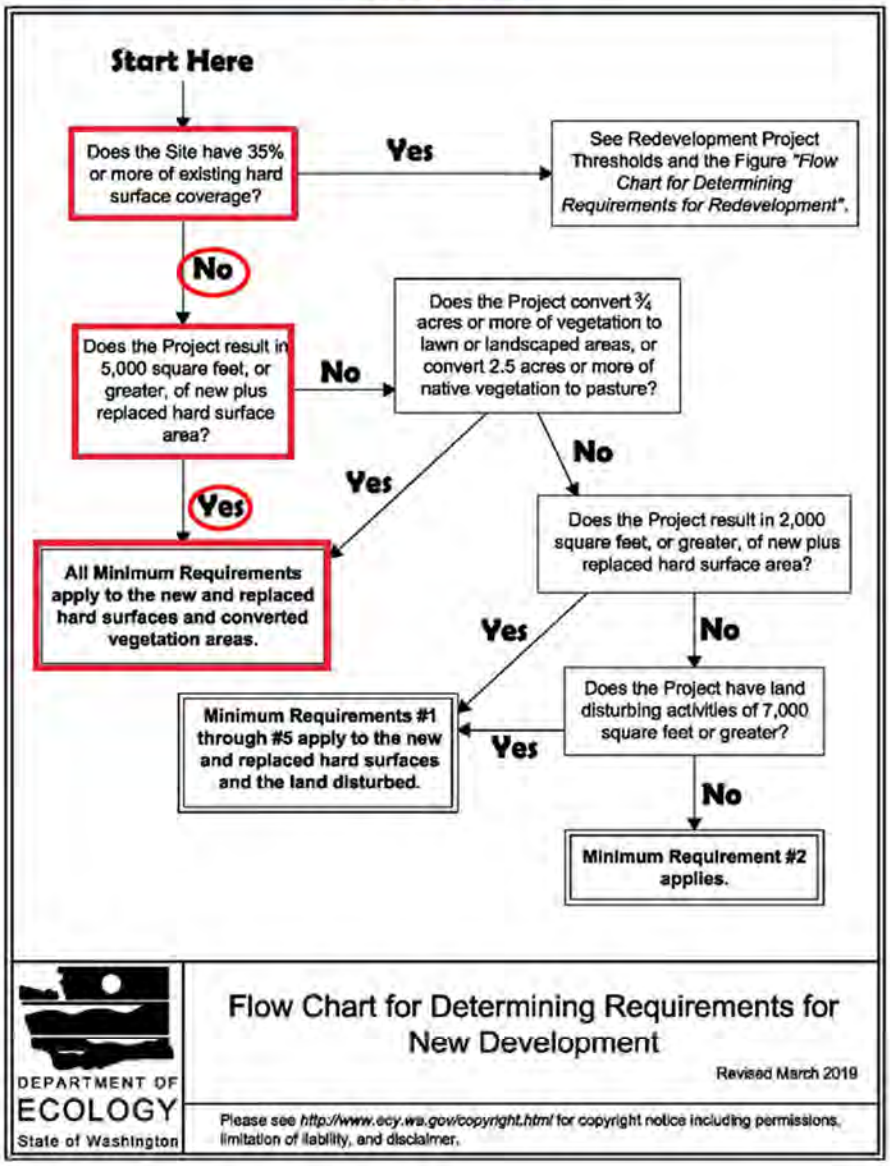
Per PMC 21.10.040 the City of Puyallup has adopted the Washington State Department of Ecology Stormwater Management Manual for Western Washington (SMMWW), with the version in effect being "the most current version approved for city use by the council." The 2019 DOE Manual has been adopted by the City and is the controlling regulation and is referred to as "the Manual" or "SMMWW" hereinafter.

The project consists of over 18,000 sf of new plus replaced hard surfaces onsite. The existing hard surfaces are less than 35% of the site and therefore, the project is considered new development. Since the total new plus replaced hard surfaces for the project are greater than 5,000 square feet, all minimum requirements apply to the new and replaced hard surfaces and converted vegetation areas.

Provide an area table in section 1 to use in determining minimum requirements. The City encourages using the table provided during Preliminary Site Plan to ensure all required areas are tabulated. Email Lance Hollingsworth if you have trouble finding this table again. [Storm Report, Pg 3]

It appears there may be more than one TDA onsite. Define the different TDAs with a numeric naming convention (TDA 1, TDA 2) and show in a TDA map. Use the TDAs when considering minimum requirements 6,7, and 8 per the Ecology Manual. [Storm Report, Pg 3]

Figure I-3.1: Flow Chart for Determining Requirements for New Development



Discussion of Minimum Requirements

The Minimum Requirements per Section I-3.4 of the Manual:

Minimum Requirement #1: Preparation of Stormwater Site Plans

The Stormwater Site Plan consists of a report and construction plans. This report and the associated civil plans satisfy Minimum Requirement #1.

Minimum Requirement #2: Construction Stormwater Pollution Prevention (SWPPP)

The SWPPP consist of a narrative and drawings. The narrative is addressed in Section V of this report. The drawings include a TESC plan, notes, and details as part of the site development construction plans.

Minimum Requirement #3: Source Control of Pollution

The proposed use of the site is as a restaurant. A separate document addressing source control for this use per Section IV of the Manual is included with this submittal to address this requirement.

Minimum Requirement #4: Preservation of Natural Drainage Systems and Outfalls

Currently, drainage from the original improvements to the site, generally the southwest portion of the site, is collected in a conveyance system that connects to the existing closed conveyance system in E Main. This drainage will remain largely unchanged with the proposed development. Drainage from improvements to the site made in 2003 is collected, routed through a bioswale for treatment, then infiltrated in an underground gallery, with an overflow connection into the original conveyance system. With the proposed development, the bioswale will be filled and replaced with a StormFilter catch basin. The original infiltration trench will remain and drainage to it largely unchanged. The improvements proposed under this permit will infiltrate runoff to the greatest extent feasible to preserve the natural drainage system and outfall.

An infiltration trench cannot be used as a technical equivalent for permeable pavement. Continue feasibility discussion with remaining BMPs in the list. Document the site conditions and Ecology Manual infeasibility criteria used to deem each BMP infeasible to satisfy MR 5. [Storm Report, Pg 6]

Minimum Requirement #5: On-site Stormwater Management

Because the project triggers MR #1-9, and is inside the urban growth area, the project must either meet the Low Impact Development Performance Standard, or use List #2 to determine applicable On-Site Stormwater Management BMPs. This project will use List #2. For each surface the BMP's must be considered in the order listed for that type of surface and use the first BMP that is considered feasible.

Lawn and Landscaped Areas:

- All lawn and landscaped areas will meet the requirements of BMP T5.13, Post Construction Soil Quality and Depth with notes on the plans to this effect.

Roofs:

1. BMP T5.30: Full Dispersion – infeasible due to inadequate vegetated area to meet the 65:10 ratio.
2. BMP T5.10A: Downspout Full Infiltration – will be used for the new building.

Other Hard Surfaces:

1. BMP T5.30: Full Dispersion – infeasible due to inadequate vegetated area to meet the 65:10 ratio
2. BMP T5.15: Permeable pavement – infeasible due to fill required for grading of parking lot; as a technical equivalent, an infiltration trench per BMP T7.20 will be used

Minimum Requirement #6: Runoff Treatment

New plus replaced pollution generating hard surfaces (PGHS) is the parking lot paving. The total area is well over 5,000 square feet and therefore runoff treatment is required. As a commercial development, enhanced treatment is required. A Filterra system will be used to meet enhanced treatment requirements, per GULD designation by DOE. The existing bioswale meets the basic treatment standard and will be replaced by a StormFilter catch basin with ZPG media which meet basic treatment requirements per GULD designation by DOE.

Consider MR 6 thresholds for each TDA. [Storm Report, Pg 6]

Minimum Requirement #7: Flow Control

The total new plus replaced hard surface for the project is well over 10,000 sf. Roof runoff will be infiltrated in an infiltration trench. Runoff from new paving will be infiltrated in an underground gallery, the StormTank system. Therefore, through the use of infiltration, the effective impervious area will be essentially zero. The converted vegetation areas are below the thresholds, and the increase in runoff rates for the 100-year event is less than 0.15 cfs. Therefore, this minimum requirement does not apply.

If you justify how each TDA effective impervious surface was reduced below the 10K threshold, the flow control standard is not required to be met. [Storm Report, Pg 6]

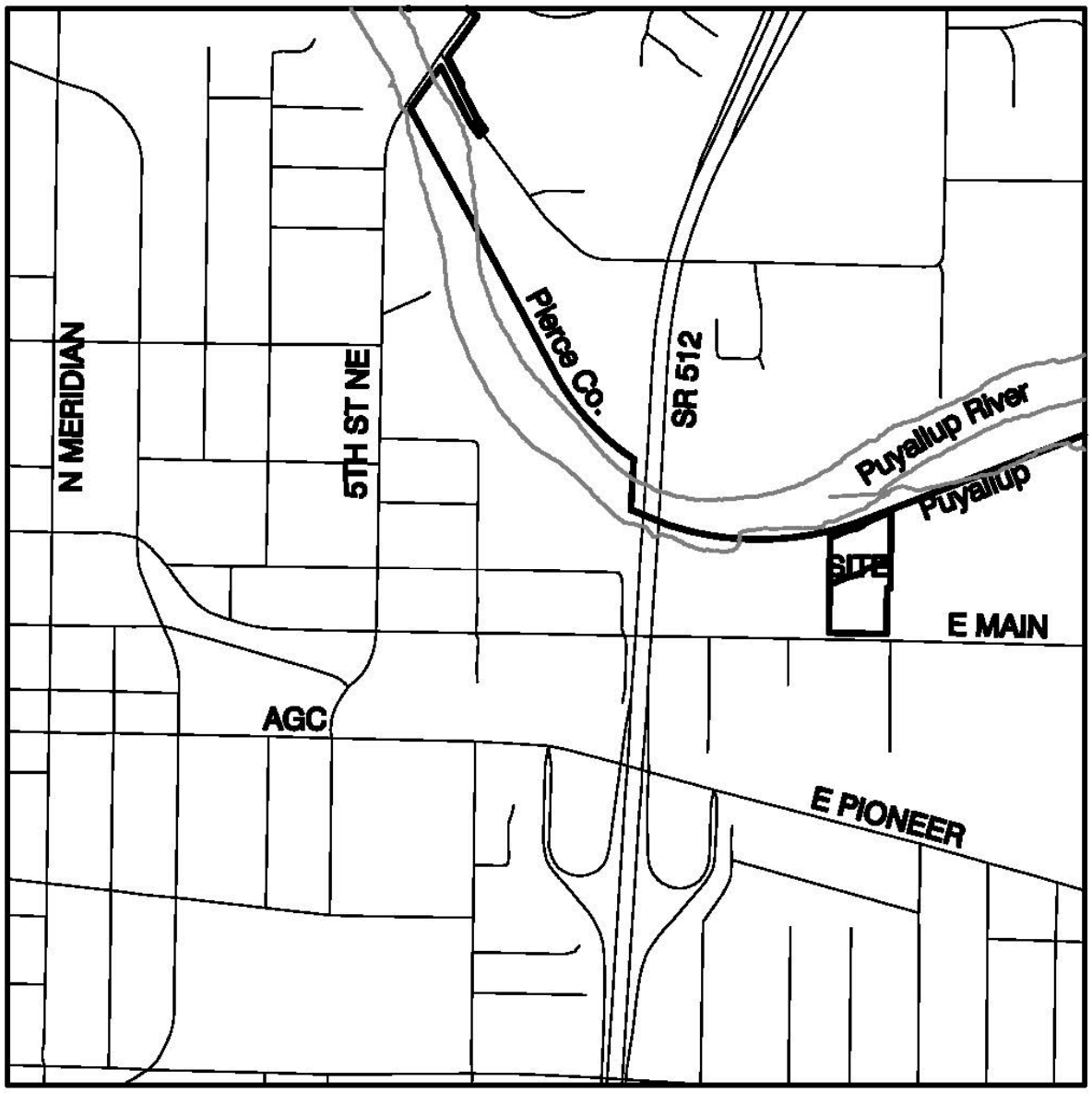
Minimum Requirement #8: Wetlands Protection

There are no wetlands on or near the site..

Minimum Requirement #9: Operation and Maintenance

The stormwater facilities required for this project that require a maintenance plan are: conveyance system, infiltration trench, StormTank infiltration gallery, Filterra, and StormFilter catch basin. All onsite stormwater facilities will be owned, operated, and maintained by the property owner. An O&M plan is included as a separate document.

Figure 1. Site Location:



VICINITY MAP

Section II – Existing Conditions Summary

Topography:

In existing conditions the south 150 feet of the site is generally flat, sloping gently to the south with an average slope of less than 1%. The 100 feet to the north of this area slopes moderately to the north with a slope between 5-20%. This area is where most of the proposed construction will occur. From this area to the north the site is nearly flat sloping gently to the north.

Ground Cover:

The site is developed with a restaurant building and parking lot. The area north of the development is forest and brush.

Drainage:

Drainage in the developed area is controlled with existing closed conveyance systems. The area in the southwest collects runoff and connects to the existing public storm line in E Main. The newer parking lot development drainage is collected in a closed conveyance system, directed through a bioswale which releases to an infiltration gallery with overflow into the closed conveyance system in the southwest portion of the site. Drainage from the undeveloped portion of the site currently sheet flows north towards the Puyallup River.

Soils:

The NRCS Soil Survey of Pierce County indicates the soils on the portion of the site to be developed are Puyallup fine sandy loam (31A). Puyallup soils are hydrologic group A. Based on the soils exploration performed by GeoResources, infiltration is feasible on the eastern portion of the development with a design infiltration rate of 1.1 inches per hour. Groundwater monitoring found peak groundwater at depths ranging from 5.3 to 8.8 feet or elevations 43.7 to 47.7. Based on the location of monitoring wells, peak groundwater is estimated at 47.7 at the proposed roof drain infiltration trench and 46.0 at the main infiltration trench.

Floodplain

The site is mapped with an AE floodplain at elevation 46.3. All proposed improvements are outside the mapped floodplain.

Include FEMA Panel number and date.
[Storm Report, Pg 8]

Section III – Off-Site Analysis

Upstream

Contours are generally perpendicular to property lines and therefore, there is little potential for upstream runoff entering the site.

Downstream

From the south 150 feet of the project site, runoff generally flows into the existing onsite conveyance system either directly or indirectly to the existing public closed conveyance system in E Main. Drainage from the remainder of the site sheet flows north on the site about 250 feet to a low point onsite near the north property line. From the low point, runoff flows northeast and north approximately 500 feet into the Puyallup River.

Problems

There are no known drainage problems along this downstream route.

Name the different developed basins with a numeric naming convention for clarity (Basin 1, Basin 2) and define each basin by its drainage characteristics. Tie this back to the developed basin map in the back of the report for clarity. [Storm Report, Pg 10]

Section IV – Permanent Stormwater Control Plan

Existing Site Hydrology

In existing conditions, runoff from the existing development on the south end of the site flows ultimately into the closed conveyance system in E Main. A portion, from the original development of the site, is collected, and tightlined directly into the storm system in E Main. Drainage from parking lot improvements constructed in 2002-2003 is routed through a bioswale, then into an infiltration gallery, with overflow into the existing onsite conveyance system. Drainage from these areas is connected to POC 2 in the WWHM analysis. Drainage from the area north of the existing improvements sheet flows north across the site. This area is connected to POC 1 in the WWHM analysis. Slopes in the already developed area are flat. Slopes north of this area are a mix of flat and moderate. The project site is within the 42-inch, East rainfall zone and WWHM is run with 15-minute intervals. The infiltration gallery is modeled based on the as-builts: 114.8 feet long, 16.4 feet wide, 1.98 feet of storage depth before overflow, and 94% voids. The infiltration rate determined for the new improvements, 1.1 in/hr is used.

The drainage sub-basins in existing conditions are:

EXISTING TO NORTH-POC 1	sf	acre
C, Forest, Flat	3662	0.0841
C, Forest, Mod	15745	0.3615
C, Lawn, Flat	586	0.0135
Total	19993	0.4590

PRE-2003 IMPROVEMENTS		
DIRECT DISCHARGE TO SOUTH POC 2		
Existing	Area (sf)	acre
C, Lawn, Flat	7639	0.1754
Roof	3625	0.0832
Paving	8532	0.1959
Walk	197	0.0045
Total Impervious	12354	0.2836
Total	19993	0.4590

2003/2004 IMPROVEMENTS		
TO BIOSWALE AND INFILTRATION POC 2		
Existing	Area (sf)	acre
C, Lawn, Flat	5278	0.1212
Paving	19303	0.4431
Total	24581	0.5643

Remove existing conditions flow calculations. They are not needed for infiltration design. [Storm Report, Pg 10]

The peak runoff rates from the site calculated by WWHM2012 for existing conditions are:

Flow Frequency

Flow(cfs)	0501 15m POC 1	0502 15m POC 2
2 Year =	0.0112	0.1127
5 Year =	0.0176	0.1553
10 Year =	0.0218	0.1868
25 Year =	0.0271	0.2306
50 Year =	0.0308	0.2663
100 Year =	0.0345	0.3047

Existing developed areas are never used for sizing BMPs, only for determining minimum requirements. In terms of full infiltration onsite, existing flows are not needed for the sizing design if 100 percent is infiltrated. If the design was detention, the entire site would have to be considered forested for the existing condition. [Storm Report, Pg 10]

The storage depths in the existing trench are:

Stage Frequency (feet)		1019 15m
2 Year	=	0.4256
5 Year	=	0.7267
10 Year	=	0.9727
25 Year	=	1.3396
50 Year	=	1.6556
100 Year	=	2.0098

See Appendix A for WWHM analysis.

Reference the basin map that is provided at the end of the report. [Storm Report, Pg 12]

Developed Site Hydrology

The proposed improvements will modify the exact areas draining to existing storm systems. The area draining into the existing bioswale and infiltration gallery will be reduced. The area draining directly into the existing conveyance system will have minor modifications. Roof drainage from the new restaurant will be routed to an infiltration trench. Runoff from the new parking lot will be routed to a Filterra system for treatment and an infiltration gallery made of StormTank modules to minimize the required footprint for flow control. The developed drainage basins are:

TO NEW FILTERRA & INFILTRATION TRENCH - POC 1	sf	acre
C, Lawn, Flat	7303	0.1677
Roof	648	0.0149
Paving, Flat	16962	0.3894
Total Impervious	17610	0.4043
Total	24913	0.5719

TO ROOF DOWNSPOUT INFIL. TRENCH-POC 2	sf	acre
Roof	3941	0.0905
DIRECT DISCHARGE-POC 2		
	sf	acre
C, Lawn, Flat	5099	0.1171
Roof	3625	0.0832
Paving	5674	0.1303
Walk	2888	0.0663
Total Impervious	12187	0.2798
Total	17286	0.3968

TO STORMFILTER & EX. INFILTRATION-POC 2	sf	acre
C, Lawn, Flat	3353	0.0770
Paving, Flat	9564	0.2196
Walk, Flat	589	0.0135
Total Impervious	10153	0.2331
Total	13506	0.3101

The peak runoff rates prior to infiltration are:

Flow Frequency

Flow(cfs)	0701 15m POC 1	0702 15m POC2
2 Year =	0.1618	0.1223
5 Year =	0.2200	0.1652
10 Year =	0.2627	0.1965
25 Year =	0.3216	0.2395
50 Year =	0.3692	0.2742
100 Year =	0.4201	0.3111

Flow frequency is not needed for modeling infiltration facilities that achieve 100 percent infiltration. [Storm Report, Pg 12]

Flow Control – Parking Lot Infiltration Gallery – POC 1

Runoff from the new parking lot will be routed to an infiltration gallery. This gallery is made of StormTank Chambers with a gravel bed. To meet groundwater separation requirements the bottom of the facility must be at a minimum elevation of 49.0. For this design six inches of gravel base is required. The bottom of gravel base will be set at 48.5 and the base layer will not be used in the infiltration system analysis. The bottom of chambers will be at elevation 49.0. The chambers will be surrounded by 1 foot of gravel and will be topped by 1 foot of gravel. To account for this, in the WWHM model, the first layer is input at 2 feet deep (the height of the chambers) with a porosity of 0.9 (a composite of the chamber porosity at 96% and the gravel porosity at 40%); and the second layer is input as 1 foot at 0.4 porosity. A standpipe is set at 3 feet of height and the system sized for 100% infiltration.

Per the WWHM analysis in Appendix A, the required StormTank gallery size is 53 feet long by 35 feet wide. The resulting storage depths are:

Stage (feet)	Frequency 1011 15m
2 Year =	0.4306
5 Year =	0.7427
10 Year =	0.9995
25 Year =	1.3847
50 Year =	1.7181
100 Year =	2.0932

Because the infiltration gallery is sized for full infiltration of runoff, there are no discharges in developed conditions for POC 1 and therefore flow control requirements are met.

Flow Control – POC 2

Downspout Infiltration Trench

Roof runoff from the restaurant will be routed to an infiltration trench designed using WWHM. To size an infiltration gallery using WWHM the trench is modeled as a gravel trench/bed. Standard infiltration trenches have 30% voids. The project site is within the 42-inch East rainfall basin. As noted above, a design rate of 1.1 in/hr is used. A standpipe is set at the design depth of the trench, 2 feet, and the trench sized until there is zero discharge through the standpipe.

Per the WWHM analysis in Appendix A, the required trench size is 80 feet long by 8 feet wide by 2 feet deep. The resulting storage depths are:

Stage Frequency (feet)		1003 15m
2 Year	=	0.3151
5 Year	=	0.6056
10 Year	=	0.8396
25 Year	=	1.1766
50 Year	=	1.4545
100 Year	=	1.7531

Existing Infiltration Trench

Routing the developed conditions drainage area through the existing infiltration trench results in the following storage depths:

Stage Frequency (feet)		1015 15m
2 Year	=	0.0911
5 Year	=	0.1679
10 Year	=	0.2375
25 Year	=	0.3509
50 Year	=	0.4568
100 Year	=	0.5838

Flow Control Requirements

The resulting peak flows in developed conditions for POC 2 are:

Flow Frequency Flow(cfs)		0802 15m
2 Year	=	0.1082
5 Year	=	0.1473
10 Year	=	0.1759
25 Year	=	0.2155
50 Year	=	0.2475
100 Year	=	0.2817

Explain how there is an applicable flow frequency discharge off-site if 100% infiltration is achieved. [Storm Report, Pg 14]

For POC 2, the only new impervious areas are the restaurant roof and a small concrete walkway area. These areas total less than 10,000 sf, and will the roof area infiltrated, the effective impervious area is less than 500 sf. The change in 100-year flow rates from existing to developed is from 0.30 cfs to 0.28 cfs. Since there is less than a 0.15 cfs increase, flow control is not required for POC 2.

Correct typo. [Storm Report, Pg 14]

Meeting Flow control standard does not appear to be required based on report stating effective impervious area is reduced to under 10,000 SF through infiltraiton. Contact Lance Hollingsworth for clarification of design intent. [Storm Report, Pg 14]

Treatment

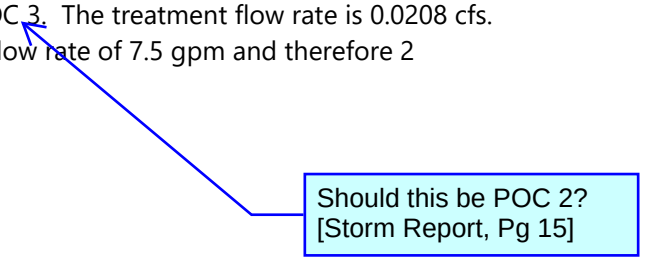
POC 1

Treatment of runoff for POC 1 will be through the use of a Filterra system. Per the DOE GULD for Filterra, the required size of the system is based on a design infiltration rate. For both basic and enhanced treatment, the required infiltration rate is 175 in/hr. The treatment rate for the project is 0.0374 cfs. Per the spreadsheet below the resulting required area is 9.2sf. Due to depth restraints, the shallow version of the Filterra will be used. This typically requires upsizing to the next size Filterra system. However, the smallest size Filterra is 4ft by 4ft or 16 sf, which is 1.7 times the required area, and therefore the 4'x4' Filterra will be used.

	Filterra			Bay Size			100-year
Treatment	Infil. Rate		Req'd Area	Length	Width	Area	flow
Rate (cfs)	in/hr	ft/sec	sf	ft	ft	sf	cfs
0.0374	175	0.00405	9.2	4	4	16	0.4201

POC 2

The proposed development will eliminate the existing bioswale currently providing treatment for the existing parking lot improvements made in 2002-2003. The bioswale will be replaced with a StormFilter catch basin. To isolate the area routed to treatment in the WWHM model, the sub-basin routed to the infiltration trench is connected directly to POC 3. The treatment flow rate is 0.0208 cfs. This equals 9.34 gpm. Standard cartridges have a design flow rate of 7.5 gpm and therefore 2 cartridges will be required.



Section V – Construction Stormwater Pollution Prevention Plan

Following are the 12 elements of the SWPPP. Where specific BMP's are prescribed, they are explained as shown on the engineering drawings for the project. Alternate BMP's may be acceptable in lieu of, or as a supplement to the prescribed BMP's. Where identified, alternate BMP's are listed and requirements included.

Element #1 – Mark Clearing Limits

Construction fencing will be used to mark clearing limit, except where boundary fencing already exists.

Element #2 – Establish Construction Access

Construction access or activities occurring on unpaved areas shall be minimized, yet where necessary, access points shall be stabilized to minimize the tracking of sediment onto public roads, and wheel washing, street sweeping, and street cleaning shall be employed to prevent sediment from entering state waters. All wash wastewater shall be controlled on site. The existing paved access may be used as a construction access. If needed a stabilized construction entrance will be constructed. BMPs related to establishing construction access that will be used on this project include:

- Stabilized Construction Entrance (C105)

Use an "approved equal" track-out device/facility on top of existing paved access. [Storm Report, Pg 16 - SWPPP]

Element #3 – Control Flow Rates

Due to the limited scope of work, no BMPs to control flow rates are required.

Element #4 – Install Sediment Controls

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

- Silt Fence (C233)

Include wheel wash BMP C106 since it is mentioned in narrative. [Storm Report, Pg 16 - SWPPP]

Element #5 – Stabilize Soils

Exposed and unworked soils shall be stabilized with the application of effective BMPs to prevent erosion throughout the life of the project. The specific BMPs for soil stabilization that shall be used on this project include:

- Temporary and Permanent Seeding (C120)
- Mulching (C121)

No soils shall remain exposed and unworked for more than 7 days during the dry season (May 1 to September 30) and 2 days during the wet season (October 1 to April 30). Regardless of the time of year, all soils shall be stabilized at the end of the shift before a holiday or weekend if needed based on weather forecasts.

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

Alternate BMP's:

- Plastic Covering (C123)
- Sodding (C124)
- Topsoiling (C125)

Add City Design Standard Section 501.5 to Element 5 narrative. [Storm Report, Pg 16 - SWPPP]

Element #6 – Protect Slopes

The slopes within the clearing limits do not warrant special protection. A retaining wall will be constructed early in the construction process, mitigating the need for any slope protection.

Element #7 – Protect Drain Inlets

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

- Storm Drain Inlet Protection (C220)

Element #8 – Stabilize Channels and Outlets

Where site runoff is to be conveyed in channels or discharged to a stream or some other natural drainage point, efforts will be taken to prevent downstream erosion. No surface channels or outlets are proposed for this project.

Element #9 – Control Pollutants

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

Vehicles, construction equipment, and/or petroleum product storage/dispensing:

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

Specific construction related BMP's to be used include:

Material Delivery, Storage and Containment (C153)

Add concrete washout, concrete handling, treating high pH water, and saw cutting BMPs to element 9. [Storm Report, Pg 17 - SWPPP]

Element #10 – Control Dewatering

Work will commence during the dry season, therefore no dewatering is likely to be required. If groundwater is encountered during construction, the water from all de-watering systems for trenches and foundations may be disposed of in one of the following manners:

(1) Foundation, vault, and trench de-watering water which have similar characteristics to stormwater runoff at the site shall be discharged into a controlled conveyance system prior to discharge to a sediment trap or sediment pond.

(2) Clean, non-turbid de-watering water, such as well-point ground water, can be discharged to systems tributary to or directly into surface waters of the state, provided the de-watering flow does not cause erosion or flooding of receiving waters. Clean de-watering water should not be routed through stormwater sediment ponds. Other disposal options for clean, non-turbid de-watering water may include:

(a) Infiltration;

(b) Transportation off-site in a vehicle (such as a vacuum flush truck) for legal disposal in a manner that does not pollute state waters;

(c) On-site chemical treatment or other suitable treatment technologies approved by the department and Washington State Department of Ecology;

(d) Sanitary sewer discharge with local sewer district approval, if there is no other option; and

(e) Use of a sedimentation bag with outfall to a ditch or swale for small volumes of localized de-watering water.

Element #11 – Maintain BMPs

All temporary and permanent erosion and sediment control BMPs shall be maintained and repaired as needed to assure continued performance of their intended function. Maintenance and repair shall be conducted in accordance with each particular BMP's specifications. Visual monitoring of the BMPs will be conducted at least once every calendar week and within 24 hours of any rainfall event (typically around 0.5" in 24-hour period) that causes a discharge from the site. If the site becomes inactive, and is temporarily stabilized, the inspection frequency may be reduced to once every month, during the dry season.

All temporary erosion and sediment control BMPs shall be removed within 30 days after the final site stabilization is achieved or after the temporary BMPs are no longer needed. The need for TESC measures continuance or removal shall be determined by the designated site CESC lead person with concurrence of the County inspector. Trapped sediment shall be removed or stabilized on site. Disturbed soil resulting from removal of BMPs or vegetation shall be permanently stabilized.

Element #12 – Manage the Project

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

- Design the project to fit the existing topography, soils, and drainage patterns.
- Emphasize erosion control rather than sediment control.
- Minimize the extent and duration of the area exposed.
- Keep runoff velocities low.
- Retain sediment on site.
- Thoroughly monitor site and maintain all ESC measures. A Certified Erosion and Sedimentation Control Lead (CESCL) person shall be assigned to the project and will file regular and special inspection reports with the County Planning and Land Services Department.
- Schedule major earthwork during the dry season.

In addition, project management will incorporate the key components listed below:
As this project site is located west of the Cascade Mountain Crest, the project will be managed according to the following key project components:

Phasing of Construction

- The construction project is being phased to the extent practicable in order to prevent soil erosion, and, to the maximum extent possible, the transport of sediment from the site during construction.
- Revegetation of exposed areas and maintenance of that vegetation shall be an integral part of the clearing activities during each phase of construction, per the Scheduling BMP (C 162).

Seasonal Work Limitations

- From October 1 through April 30, clearing, grading, and other soil disturbing activities shall only be permitted if shown to the satisfaction of the local permitting authority that silt-laden runoff will be prevented from leaving the site through a combination of the following:
  - ☐ Site conditions including existing vegetative coverage, slope, soil type, and proximity to receiving waters; and
  - ☐ Limitations on activities and the extent of disturbed areas; and
  - ☐ Proposed erosion and sediment control measures.
- Based on the information provided and/or local weather conditions, the local permitting authority may expand or restrict the seasonal limitation on site disturbance.
- The following activities are exempt from the seasonal clearing and grading limitations:
  - ☐ Routine maintenance and necessary repair of erosion and sediment control BMPs;
  - ☐ Routine maintenance of public facilities or existing utility structures that do not expose the soil or result in the removal of the vegetative cover to soil; and
  - ☐ Activities where there is 100 percent infiltration of surface water runoff within the site in approved and installed erosion and sediment control facilities.

Coordination with Utilities and Other Jurisdictions

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

Inspection and Monitoring

- All BMPs shall be inspected, maintained, and repaired as needed to assure continued performance of their intended function. Site inspections shall be conducted by a person who is knowledgeable in the principles and practices of erosion and sediment control. This person has the necessary skills to:
  - ☐ Assess the site conditions and construction activities that could impact the quality of stormwater, and
  - ☐ Assess the effectiveness of erosion and sediment control measures used to control the quality of stormwater discharges.
- A Certified Erosion and Sediment Control Lead shall be on-site or on-call at all times.
- Whenever inspection and/or monitoring reveals that the BMPs identified in this SWPPP are inadequate, due to the actual discharge of or potential to discharge a significant amount of any pollutant, appropriate BMPs or design changes shall be implemented as soon as possible.

Maintaining an Updated Construction SWPPP

- This SWPPP shall be retained on-site or within reasonable access to the site.
- The SWPPP shall be modified whenever there is a change in the design, construction, operation, or maintenance at the construction site that has, or could have, a significant effect on the discharge of pollutants to waters of the state.
- The SWPPP shall be modified if, during inspections or investigations conducted by the owner/operator, or the applicable local or state regulatory authority, it is determined that the SWPPP is ineffective in eliminating or significantly minimizing pollutants in stormwater discharges from the site. The SWPPP shall be modified as necessary to include additional or modified BMPs designed to correct problems identified. Revisions to the SWPPP shall be completed within seven (7) days following the inspection.

Specific management related BMP's to be used include:

- Certified Erosion and Sediment Control Lead (C160)
- Scheduling (C162)

Add all applicable BMP detail sheets from Ecology Manual to SWPPP. [Storm Report, Pg 21 - SWPPP]

Add Site Inspection Form form Ecology SWPPP Template. [Storm Report, Pg 21 - SWPPP]

Section VI – Special Reports and Studies

See Geotech report in Appendix B.

Section VII – Other Permits

Building permits will be required for construction of the restaurant building and the retaining wall.

Sewer and water service permits will be required.

Section VIII – Operation and Maintenance Manual

An Operations and Maintenance Manual is required for the StormTank gallery, Filterra, infiltration trench, and conveyance system. The O&M Manual is included as a separate document.

Section IX – Bond Quantities Worksheet

Any required bond amounts will be calculated when required for permit issuance.

APPENDIX A

WWHM Analysis

WWHM2012

PROJECT REPORT

General Model Information

Project Name:	Taco Time
Site Name:	Taco Time
Site Address:	1115 E Main
City:	Puyallup
Report Date:	7/14/2023
Gage:	42 IN EAST
Data Start:	10/01/1901
Data End:	09/30/2059
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2019/09/13
Version:	4.2.17

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year
High Flow Threshold for POC1:	50 Year
Low Flow Threshold for POC2:	50 Percent of the 2 Year
High Flow Threshold for POC2:	50 Year
Low Flow Threshold for POC3:	50 Percent of the 2 Year
High Flow Threshold for POC3:	50 Year

Landuse Basin Data

Predeveloped Land Use

If 100 percent infiltration is achieved, predeveloped basin information should be empty and not used in WWHM. Call Lance Hollingsworth if you have any questions. [Storm Report, Pg 26 - WWHM Pg 3]

2003 Improvements

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Lawn, Flat	0.1212
Pervious Total	0.1212

Impervious Land Use	acre
PARKING FLAT	0.4431
Impervious Total	0.4431
Basin Total	0.5643

Element Flows To:

Surface	Interflow	Groundwater
Existing Trench	Existing Trench	

South Basin

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Lawn, Flat	0.1754
Pervious Total	0.1754

Impervious Land Use	acre
ROOF TOPS FLAT	0.0832
SIDEWALKS FLAT	0.0045
PARKING FLAT	0.1959
Impervious Total	0.2836
Basin Total	0.459

Element Flows To:

Surface	Interflow	Groundwater

North Basin

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Lawn, Flat	0.0135
C, Forest, Flat	0.0841
C, Forest, Mod	0.3615
Pervious Total	0.4591

Impervious Land Use	acre
Impervious Total	0
Basin Total	0.4591

Element Flows To:

Surface	Interflow	Groundwater

Basin 4

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Forest, Flat	0.3101
Pervious Total	0.3101
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.3101

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Roof

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
Pervious Total	0
Impervious Land Use	acre
ROOF TOPS FLAT	0.0905
Impervious Total	0.0905
Basin Total	0.0905

Element Flows To:

Surface	Interflow	Groundwater
Downspout Trench		

Basin 2

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Lawn, Flat	0.1677
Pervious Total	0.1677

Impervious Land Use	acre
ROOF TOPS FLAT	0.0149
PARKING FLAT	0.4043
Impervious Total	0.4192
Basin Total	0.5869

Element Flows To:

Surface	Interflow	Groundwater
StormTank	StormTank	

Basin 3

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Lawn, Flat	0.077
Pervious Total	0.077

Impervious Land Use	acre
SIDEWALKS FLAT	0.0135
PARKING FLAT	0.2196
Impervious Total	0.2331
Basin Total	0.3101

Element Flows To:

Surface	Interflow	Groundwater
Existing Trench	Existing Trench	

Basin 4

Bypass:	Yes
GroundWater:	No

Pervious Land Use	acre
C, Lawn, Flat	0.1171
Pervious Total	0.1171

Impervious Land Use	acre
ROOF TOPS FLAT	0.0832
SIDEWALKS FLAT	0.0663
PARKING FLAT	0.1303
Impervious Total	0.2798
Basin Total	0.3969

Element Flows To:

Surface	Interflow	Groundwater

Routing Elements
Predeveloped Routing

Existing Trench

Predeveloped trench performance is not needed if developed existing trench performance infiltrates 100 percent.

Bottom Length:	114.80 ft.
Bottom Width:	16.40 ft.
Trench bottom slope 1:	0 To 1
Trench Left side slope 0:	0 To 1
Trench right side slope 2:	0 To 1
Material thickness of first layer:	4
Pour Space of material for first layer:	0.94
Material thickness of second layer:	0
Pour Space of material for second layer:	0
Material thickness of third layer:	0
Pour Space of material for third layer:	0
Infiltration On	
Infiltration rate:	1.1
Infiltration safety factor:	1
Total Volume Infiltrated (ac-ft.):	225.668
Total Volume Through Riser (ac-ft.):	0.008
Total Volume Through Facility (ac-ft.):	225.676
Percent Infiltrated:	100
Total Precip Applied to Facility:	0
Total Evap From Facility:	0
Discharge Structure	
Riser Height:	1.98 ft.
Riser Diameter:	8 in.
Element Flows To:	
Outlet 1	Outlet 2

Gravel Trench Bed Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.043	0.000	0.000	0.000
0.0331	0.043	0.001	0.000	0.047
0.0662	0.043	0.002	0.000	0.047
0.0993	0.043	0.004	0.000	0.047
0.1324	0.043	0.005	0.000	0.047
0.1656	0.043	0.006	0.000	0.047
0.1987	0.043	0.008	0.000	0.047
0.2318	0.043	0.009	0.000	0.047
0.2649	0.043	0.010	0.000	0.047
0.2980	0.043	0.012	0.000	0.047
0.3311	0.043	0.013	0.000	0.047
0.3642	0.043	0.014	0.000	0.047
0.3973	0.043	0.016	0.000	0.047
0.4304	0.043	0.017	0.000	0.047
0.4636	0.043	0.018	0.000	0.047
0.4967	0.043	0.020	0.000	0.047
0.5298	0.043	0.021	0.000	0.047
0.5629	0.043	0.022	0.000	0.047
0.5960	0.043	0.024	0.000	0.047
0.6291	0.043	0.025	0.000	0.047
0.6622	0.043	0.026	0.000	0.047
0.6953	0.043	0.028	0.000	0.047

0.7284	0.043	0.029	0.000	0.047
0.7616	0.043	0.030	0.000	0.047
0.7947	0.043	0.032	0.000	0.047
0.8278	0.043	0.033	0.000	0.047
0.8609	0.043	0.035	0.000	0.047
0.8940	0.043	0.036	0.000	0.047
0.9271	0.043	0.037	0.000	0.047
0.9602	0.043	0.039	0.000	0.047
0.9933	0.043	0.040	0.000	0.047
1.0264	0.043	0.041	0.000	0.047
1.0596	0.043	0.043	0.000	0.047
1.0927	0.043	0.044	0.000	0.047
1.1258	0.043	0.045	0.000	0.047
1.1589	0.043	0.047	0.000	0.047
1.1920	0.043	0.048	0.000	0.047
1.2251	0.043	0.049	0.000	0.047
1.2582	0.043	0.051	0.000	0.047
1.2913	0.043	0.052	0.000	0.047
1.3244	0.043	0.053	0.000	0.047
1.3576	0.043	0.055	0.000	0.047
1.3907	0.043	0.056	0.000	0.047
1.4238	0.043	0.057	0.000	0.047
1.4569	0.043	0.059	0.000	0.047
1.4900	0.043	0.060	0.000	0.047
1.5231	0.043	0.061	0.000	0.047
1.5562	0.043	0.063	0.000	0.047
1.5893	0.043	0.064	0.000	0.047
1.6224	0.043	0.065	0.000	0.047
1.6556	0.043	0.067	0.000	0.047
1.6887	0.043	0.068	0.000	0.047
1.7218	0.043	0.070	0.000	0.047
1.7549	0.043	0.071	0.000	0.047
1.7880	0.043	0.072	0.000	0.047
1.8211	0.043	0.074	0.000	0.047
1.8542	0.043	0.075	0.000	0.047
1.8873	0.043	0.076	0.000	0.047
1.9204	0.043	0.078	0.000	0.047
1.9536	0.043	0.079	0.000	0.047
1.9867	0.043	0.080	0.003	0.047
2.0198	0.043	0.082	0.056	0.047
2.0529	0.043	0.083	0.138	0.047
2.0860	0.043	0.084	0.238	0.047
2.1191	0.043	0.086	0.348	0.047
2.1522	0.043	0.087	0.460	0.047
2.1853	0.043	0.088	0.563	0.047
2.2184	0.043	0.090	0.651	0.047
2.2516	0.043	0.091	0.720	0.047
2.2847	0.043	0.092	0.768	0.047
2.3178	0.043	0.094	0.813	0.047
2.3509	0.043	0.095	0.852	0.047
2.3840	0.043	0.096	0.889	0.047
2.4171	0.043	0.098	0.925	0.047
2.4502	0.043	0.099	0.959	0.047
2.4833	0.043	0.100	0.993	0.047
2.5164	0.043	0.102	1.025	0.047
2.5496	0.043	0.103	1.056	0.047
2.5827	0.043	0.104	1.086	0.047
2.6158	0.043	0.106	1.116	0.047

2.6489	0.043	0.107	1.144	0.047
2.6820	0.043	0.109	1.172	0.047
2.7151	0.043	0.110	1.200	0.047
2.7482	0.043	0.111	1.226	0.047
2.7813	0.043	0.113	1.253	0.047
2.8144	0.043	0.114	1.278	0.047
2.8476	0.043	0.115	1.303	0.047
2.8807	0.043	0.117	1.328	0.047
2.9138	0.043	0.118	1.352	0.047
2.9469	0.043	0.119	1.376	0.047

Mitigated Routing

Downspout Trench

Bottom Length:	80.00 ft.
Bottom Width:	8.00 ft.
Trench bottom slope 1:	0 To 1
Trench Left side slope 0:	0 To 1
Trench right side slope 2:	0 To 1
Material thickness of first layer:	3
Pour Space of material for first layer:	0.3
Material thickness of second layer:	0
Pour Space of material for second layer:	0
Material thickness of third layer:	0
Pour Space of material for third layer:	0
Infiltration On	
Infiltration rate:	1.1
Infiltration safety factor:	1
Total Volume Infiltrated (ac-ft.):	40.825
Total Volume Through Riser (ac-ft.):	0
Total Volume Through Facility (ac-ft.):	40.825
Percent Infiltrated:	100
Total Precip Applied to Facility:	0
Total Evap From Facility:	0
Discharge Structure	
Riser Height:	2 ft.
Riser Diameter:	8 in.
Element Flows To:	
Outlet 1	Outlet 2

Gravel Trench Bed Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.014	0.000	0.000	0.000
0.0333	0.014	0.000	0.000	0.016
0.0667	0.014	0.000	0.000	0.016
0.1000	0.014	0.000	0.000	0.016
0.1333	0.014	0.000	0.000	0.016
0.1667	0.014	0.000	0.000	0.016
0.2000	0.014	0.000	0.000	0.016
0.2333	0.014	0.001	0.000	0.016
0.2667	0.014	0.001	0.000	0.016
0.3000	0.014	0.001	0.000	0.016
0.3333	0.014	0.001	0.000	0.016
0.3667	0.014	0.001	0.000	0.016
0.4000	0.014	0.001	0.000	0.016
0.4333	0.014	0.001	0.000	0.016
0.4667	0.014	0.002	0.000	0.016
0.5000	0.014	0.002	0.000	0.016
0.5333	0.014	0.002	0.000	0.016
0.5667	0.014	0.002	0.000	0.016
0.6000	0.014	0.002	0.000	0.016
0.6333	0.014	0.002	0.000	0.016
0.6667	0.014	0.002	0.000	0.016
0.7000	0.014	0.003	0.000	0.016
0.7333	0.014	0.003	0.000	0.016
0.7667	0.014	0.003	0.000	0.016

0.8000	0.014	0.003	0.000	0.016
0.8333	0.014	0.003	0.000	0.016
0.8667	0.014	0.003	0.000	0.016
0.9000	0.014	0.004	0.000	0.016
0.9333	0.014	0.004	0.000	0.016
0.9667	0.014	0.004	0.000	0.016
1.0000	0.014	0.004	0.000	0.016
1.0333	0.014	0.004	0.000	0.016
1.0667	0.014	0.004	0.000	0.016
1.1000	0.014	0.004	0.000	0.016
1.1333	0.014	0.005	0.000	0.016
1.1667	0.014	0.005	0.000	0.016
1.2000	0.014	0.005	0.000	0.016
1.2333	0.014	0.005	0.000	0.016
1.2667	0.014	0.005	0.000	0.016
1.3000	0.014	0.005	0.000	0.016
1.3333	0.014	0.005	0.000	0.016
1.3667	0.014	0.006	0.000	0.016
1.4000	0.014	0.006	0.000	0.016
1.4333	0.014	0.006	0.000	0.016
1.4667	0.014	0.006	0.000	0.016
1.5000	0.014	0.006	0.000	0.016
1.5333	0.014	0.006	0.000	0.016
1.5667	0.014	0.006	0.000	0.016
1.6000	0.014	0.007	0.000	0.016
1.6333	0.014	0.007	0.000	0.016
1.6667	0.014	0.007	0.000	0.016
1.7000	0.014	0.007	0.000	0.016
1.7333	0.014	0.007	0.000	0.016
1.7667	0.014	0.007	0.000	0.016
1.8000	0.014	0.007	0.000	0.016
1.8333	0.014	0.008	0.000	0.016
1.8667	0.014	0.008	0.000	0.016
1.9000	0.014	0.008	0.000	0.016
1.9333	0.014	0.008	0.000	0.016
1.9667	0.014	0.008	0.000	0.016
2.0000	0.014	0.008	0.000	0.016
2.0333	0.014	0.009	0.043	0.016
2.0667	0.014	0.009	0.121	0.016
2.1000	0.014	0.009	0.219	0.016
2.1333	0.014	0.009	0.329	0.016
2.1667	0.014	0.009	0.441	0.016
2.2000	0.014	0.009	0.547	0.016
2.2333	0.014	0.009	0.639	0.016
2.2667	0.014	0.010	0.711	0.016
2.3000	0.014	0.010	0.762	0.016
2.3333	0.014	0.010	0.808	0.016
2.3667	0.014	0.010	0.847	0.016
2.4000	0.014	0.010	0.885	0.016
2.4333	0.014	0.010	0.921	0.016
2.4667	0.014	0.010	0.956	0.016
2.5000	0.014	0.011	0.989	0.016
2.5333	0.014	0.011	1.022	0.016
2.5667	0.014	0.011	1.053	0.016
2.6000	0.014	0.011	1.084	0.016
2.6333	0.014	0.011	1.114	0.016
2.6667	0.014	0.011	1.143	0.016
2.7000	0.014	0.011	1.171	0.016

2.7333	0.014	0.012	1.198	0.016
2.7667	0.014	0.012	1.225	0.016
2.8000	0.014	0.012	1.252	0.016
2.8333	0.014	0.012	1.277	0.016
2.8667	0.014	0.012	1.303	0.016
2.9000	0.014	0.012	1.328	0.016
2.9333	0.014	0.012	1.352	0.016
2.9667	0.014	0.013	1.376	0.016
3.0000	0.014	0.013	1.399	0.016

StormTank

Bottom Length:	53.00 ft.
Bottom Width:	35.00 ft.
Trench bottom slope 1:	0 To 1
Trench Left side slope 0:	0 To 1
Trench right side slope 2:	0 To 1
Material thickness of first layer:	2
Pour Space of material for first layer:	0.9
Material thickness of second layer:	1
Pour Space of material for second layer:	0.4
Material thickness of third layer:	1
Pour Space of material for third layer:	0.01
Infiltration On	
Infiltration rate:	1.1
Infiltration safety factor:	1
Total Volume Infiltrated (ac-ft.):	224.481
Total Volume Through Riser (ac-ft.):	0
Total Volume Through Facility (ac-ft.):	224.481
Percent Infiltrated:	100
Total Precip Applied to Facility:	0
Total Evap From Facility:	0
Discharge Structure	
Riser Height:	3 ft.
Riser Diameter:	6 in.
Element Flows To:	
Outlet 1	Outlet 2

Gravel Trench Bed Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.042	0.000	0.000	0.000
0.0444	0.042	0.001	0.000	0.047
0.0889	0.042	0.003	0.000	0.047
0.1333	0.042	0.005	0.000	0.047
0.1778	0.042	0.006	0.000	0.047
0.2222	0.042	0.008	0.000	0.047
0.2667	0.042	0.010	0.000	0.047
0.3111	0.042	0.011	0.000	0.047
0.3556	0.042	0.013	0.000	0.047
0.4000	0.042	0.015	0.000	0.047
0.4444	0.042	0.017	0.000	0.047
0.4889	0.042	0.018	0.000	0.047
0.5333	0.042	0.020	0.000	0.047
0.5778	0.042	0.022	0.000	0.047
0.6222	0.042	0.023	0.000	0.047
0.6667	0.042	0.025	0.000	0.047
0.7111	0.042	0.027	0.000	0.047
0.7556	0.042	0.029	0.000	0.047
0.8000	0.042	0.030	0.000	0.047
0.8444	0.042	0.032	0.000	0.047
0.8889	0.042	0.034	0.000	0.047
0.9333	0.042	0.035	0.000	0.047
0.9778	0.042	0.037	0.000	0.047
1.0222	0.042	0.039	0.000	0.047
1.0667	0.042	0.040	0.000	0.047
1.1111	0.042	0.042	0.000	0.047

1.1556	0.042	0.044	0.000	0.047
1.2000	0.042	0.046	0.000	0.047
1.2444	0.042	0.047	0.000	0.047
1.2889	0.042	0.049	0.000	0.047
1.3333	0.042	0.051	0.000	0.047
1.3778	0.042	0.052	0.000	0.047
1.4222	0.042	0.054	0.000	0.047
1.4667	0.042	0.056	0.000	0.047
1.5111	0.042	0.057	0.000	0.047
1.5556	0.042	0.059	0.000	0.047
1.6000	0.042	0.061	0.000	0.047
1.6444	0.042	0.063	0.000	0.047
1.6889	0.042	0.064	0.000	0.047
1.7333	0.042	0.066	0.000	0.047
1.7778	0.042	0.068	0.000	0.047
1.8222	0.042	0.069	0.000	0.047
1.8667	0.042	0.071	0.000	0.047
1.9111	0.042	0.073	0.000	0.047
1.9556	0.042	0.074	0.000	0.047
2.0000	0.042	0.075	0.000	0.047
2.0444	0.042	0.076	0.000	0.047
2.0889	0.042	0.077	0.000	0.047
2.1333	0.042	0.078	0.000	0.047
2.1778	0.042	0.078	0.000	0.047
2.2222	0.042	0.079	0.000	0.047
2.2667	0.042	0.080	0.000	0.047
2.3111	0.042	0.081	0.000	0.047
2.3556	0.042	0.081	0.000	0.047
2.4000	0.042	0.082	0.000	0.047
2.4444	0.042	0.083	0.000	0.047
2.4889	0.042	0.084	0.000	0.047
2.5333	0.042	0.084	0.000	0.047
2.5778	0.042	0.085	0.000	0.047
2.6222	0.042	0.086	0.000	0.047
2.6667	0.042	0.087	0.000	0.047
2.7111	0.042	0.087	0.000	0.047
2.7556	0.042	0.088	0.000	0.047
2.8000	0.042	0.089	0.000	0.047
2.8444	0.042	0.090	0.000	0.047
2.8889	0.042	0.090	0.000	0.047
2.9333	0.042	0.091	0.000	0.047
2.9778	0.042	0.092	0.000	0.047
3.0222	0.042	0.092	0.017	0.047
3.0667	0.042	0.092	0.090	0.047
3.1111	0.042	0.092	0.184	0.047
3.1556	0.042	0.092	0.277	0.047
3.2000	0.042	0.092	0.346	0.047
3.2444	0.042	0.092	0.385	0.047
3.2889	0.042	0.092	0.423	0.047
3.3333	0.042	0.092	0.454	0.047
3.3778	0.042	0.092	0.484	0.047
3.4222	0.042	0.092	0.511	0.047
3.4667	0.042	0.092	0.537	0.047
3.5111	0.042	0.092	0.562	0.047
3.5556	0.042	0.092	0.586	0.047
3.6000	0.042	0.092	0.609	0.047
3.6444	0.042	0.092	0.632	0.047
3.6889	0.042	0.092	0.653	0.047

3.7333	0.042	0.092	0.674	0.047
3.7778	0.042	0.092	0.694	0.047
3.8222	0.042	0.092	0.714	0.047
3.8667	0.042	0.092	0.733	0.047
3.9111	0.042	0.092	0.751	0.047
3.9556	0.042	0.092	0.769	0.047
4.0000	0.042	0.092	0.787	0.047

Existing Trench

Bottom Length:	114.80 ft.
Bottom Width:	16.40 ft.
Trench bottom slope 1:	0 To 1
Trench Left side slope 0:	0 To 1
Trench right side slope 2:	0 To 1
Material thickness of first layer:	4
Pour Space of material for first layer:	0.94
Material thickness of second layer:	0
Pour Space of material for second layer:	0
Material thickness of third layer:	0
Pour Space of material for third layer:	0
Infiltration On	
Infiltration rate:	1.1
Infiltration safety factor:	1
Total Volume Infiltrated (ac-ft.):	121.452
Total Volume Through Riser (ac-ft.):	0
Total Volume Through Facility (ac-ft.):	121.452
Percent Infiltrated:	100
Total Precip Applied to Facility:	0
Total Evap From Facility:	0
Discharge Structure	
Riser Height:	1.98 ft.
Riser Diameter:	8 in.
Element Flows To:	
Outlet 1	Outlet 2

Gravel Trench Bed Hydraulic Table

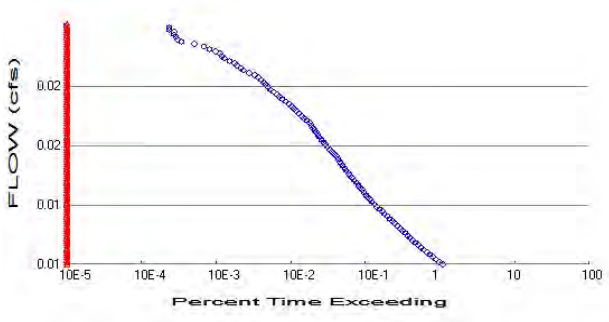
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.043	0.000	0.000	0.000
0.0331	0.043	0.001	0.000	0.047
0.0662	0.043	0.002	0.000	0.047
0.0993	0.043	0.004	0.000	0.047
0.1324	0.043	0.005	0.000	0.047
0.1656	0.043	0.006	0.000	0.047
0.1987	0.043	0.008	0.000	0.047
0.2318	0.043	0.009	0.000	0.047
0.2649	0.043	0.010	0.000	0.047
0.2980	0.043	0.012	0.000	0.047
0.3311	0.043	0.013	0.000	0.047
0.3642	0.043	0.014	0.000	0.047
0.3973	0.043	0.016	0.000	0.047
0.4304	0.043	0.017	0.000	0.047
0.4636	0.043	0.018	0.000	0.047
0.4967	0.043	0.020	0.000	0.047
0.5298	0.043	0.021	0.000	0.047
0.5629	0.043	0.022	0.000	0.047
0.5960	0.043	0.024	0.000	0.047
0.6291	0.043	0.025	0.000	0.047
0.6622	0.043	0.026	0.000	0.047
0.6953	0.043	0.028	0.000	0.047
0.7284	0.043	0.029	0.000	0.047
0.7616	0.043	0.030	0.000	0.047
0.7947	0.043	0.032	0.000	0.047
0.8278	0.043	0.033	0.000	0.047

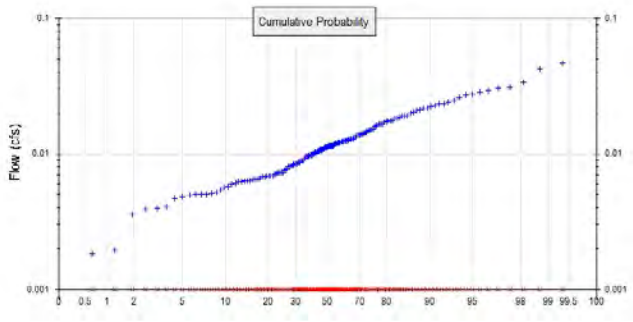
0.8609	0.043	0.035	0.000	0.047
0.8940	0.043	0.036	0.000	0.047
0.9271	0.043	0.037	0.000	0.047
0.9602	0.043	0.039	0.000	0.047
0.9933	0.043	0.040	0.000	0.047
1.0264	0.043	0.041	0.000	0.047
1.0596	0.043	0.043	0.000	0.047
1.0927	0.043	0.044	0.000	0.047
1.1258	0.043	0.045	0.000	0.047
1.1589	0.043	0.047	0.000	0.047
1.1920	0.043	0.048	0.000	0.047
1.2251	0.043	0.049	0.000	0.047
1.2582	0.043	0.051	0.000	0.047
1.2913	0.043	0.052	0.000	0.047
1.3244	0.043	0.053	0.000	0.047
1.3576	0.043	0.055	0.000	0.047
1.3907	0.043	0.056	0.000	0.047
1.4238	0.043	0.057	0.000	0.047
1.4569	0.043	0.059	0.000	0.047
1.4900	0.043	0.060	0.000	0.047
1.5231	0.043	0.061	0.000	0.047
1.5562	0.043	0.063	0.000	0.047
1.5893	0.043	0.064	0.000	0.047
1.6224	0.043	0.065	0.000	0.047
1.6556	0.043	0.067	0.000	0.047
1.6887	0.043	0.068	0.000	0.047
1.7218	0.043	0.070	0.000	0.047
1.7549	0.043	0.071	0.000	0.047
1.7880	0.043	0.072	0.000	0.047
1.8211	0.043	0.074	0.000	0.047
1.8542	0.043	0.075	0.000	0.047
1.8873	0.043	0.076	0.000	0.047
1.9204	0.043	0.078	0.000	0.047
1.9536	0.043	0.079	0.000	0.047
1.9867	0.043	0.080	0.003	0.047
2.0198	0.043	0.082	0.056	0.047
2.0529	0.043	0.083	0.138	0.047
2.0860	0.043	0.084	0.238	0.047
2.1191	0.043	0.086	0.348	0.047
2.1522	0.043	0.087	0.460	0.047
2.1853	0.043	0.088	0.563	0.047
2.2184	0.043	0.090	0.651	0.047
2.2516	0.043	0.091	0.720	0.047
2.2847	0.043	0.092	0.768	0.047
2.3178	0.043	0.094	0.813	0.047
2.3509	0.043	0.095	0.852	0.047
2.3840	0.043	0.096	0.889	0.047
2.4171	0.043	0.098	0.925	0.047
2.4502	0.043	0.099	0.959	0.047
2.4833	0.043	0.100	0.993	0.047
2.5164	0.043	0.102	1.025	0.047
2.5496	0.043	0.103	1.056	0.047
2.5827	0.043	0.104	1.086	0.047
2.6158	0.043	0.106	1.116	0.047
2.6489	0.043	0.107	1.144	0.047
2.6820	0.043	0.109	1.172	0.047
2.7151	0.043	0.110	1.200	0.047
2.7482	0.043	0.111	1.226	0.047

2.7813	0.043	0.113	1.253	0.047
2.8144	0.043	0.114	1.278	0.047
2.8476	0.043	0.115	1.303	0.047
2.8807	0.043	0.117	1.328	0.047
2.9138	0.043	0.118	1.352	0.047
2.9469	0.043	0.119	1.376	0.047

Analysis Results

POC 1





+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0.4591
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.1677
Total Impervious Area: 0.4192

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.011215
5 year	0.017611
10 year	0.02184
25 year	0.027062
50 year	0.030831
100 year	0.034486

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0
5 year	0
10 year	0
25 year	0
50 year	0
100 year	0

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1902	0.011	0.000
1903	0.007	0.000
1904	0.016	0.000
1905	0.006	0.000
1906	0.004	0.000
1907	0.017	0.000
1908	0.012	0.000
1909	0.012	0.000
1910	0.017	0.000
1911	0.011	0.000

1912	0.047	0.000
1913	0.017	0.000
1914	0.005	0.000
1915	0.008	0.000
1916	0.011	0.000
1917	0.004	0.000
1918	0.011	0.000
1919	0.010	0.000
1920	0.011	0.000
1921	0.012	0.000
1922	0.012	0.000
1923	0.010	0.000
1924	0.005	0.000
1925	0.007	0.000
1926	0.011	0.000
1927	0.009	0.000
1928	0.008	0.000
1929	0.018	0.000
1930	0.011	0.000
1931	0.011	0.000
1932	0.008	0.000
1933	0.010	0.000
1934	0.023	0.000
1935	0.010	0.000
1936	0.010	0.000
1937	0.017	0.000
1938	0.010	0.000
1939	0.001	0.000
1940	0.010	0.000
1941	0.007	0.000
1942	0.016	0.000
1943	0.008	0.000
1944	0.019	0.000
1945	0.013	0.000
1946	0.008	0.000
1947	0.006	0.000
1948	0.023	0.000
1949	0.021	0.000
1950	0.007	0.000
1951	0.009	0.000
1952	0.031	0.000
1953	0.028	0.000
1954	0.010	0.000
1955	0.009	0.000
1956	0.005	0.000
1957	0.015	0.000
1958	0.029	0.000
1959	0.019	0.000
1960	0.005	0.000
1961	0.018	0.000
1962	0.011	0.000
1963	0.005	0.000
1964	0.006	0.000
1965	0.021	0.000
1966	0.006	0.000
1967	0.010	0.000
1968	0.010	0.000
1969	0.010	0.000

1970	0.015	0.000
1971	0.022	0.000
1972	0.014	0.000
1973	0.019	0.000
1974	0.012	0.000
1975	0.024	0.000
1976	0.013	0.000
1977	0.006	0.000
1978	0.020	0.000
1979	0.006	0.000
1980	0.012	0.000
1981	0.012	0.000
1982	0.006	0.000
1983	0.018	0.000
1984	0.009	0.000
1985	0.014	0.000
1986	0.011	0.000
1987	0.023	0.000
1988	0.013	0.000
1989	0.012	0.000
1990	0.014	0.000
1991	0.011	0.000
1992	0.014	0.000
1993	0.015	0.000
1994	0.022	0.000
1995	0.005	0.000
1996	0.025	0.000
1997	0.011	0.000
1998	0.012	0.000
1999	0.002	0.000
2000	0.009	0.000
2001	0.005	0.000
2002	0.020	0.000
2003	0.014	0.000
2004	0.012	0.000
2005	0.028	0.000
2006	0.007	0.000
2007	0.008	0.000
2008	0.012	0.000
2009	0.008	0.000
2010	0.007	0.000
2011	0.007	0.000
2012	0.011	0.000
2013	0.007	0.000
2014	0.005	0.000
2015	0.012	0.000
2016	0.004	0.000
2017	0.016	0.000
2018	0.031	0.000
2019	0.034	0.000
2020	0.010	0.000
2021	0.015	0.000
2022	0.006	0.000
2023	0.013	0.000
2024	0.042	0.000
2025	0.011	0.000
2026	0.018	0.000
2027	0.007	0.000

2028	0.006	0.000
2029	0.012	0.000
2030	0.022	0.000
2031	0.007	0.000
2032	0.005	0.000
2033	0.007	0.000
2034	0.007	0.000
2035	0.026	0.000
2036	0.014	0.000
2037	0.004	0.000
2038	0.013	0.000
2039	0.002	0.000
2040	0.007	0.000
2041	0.008	0.000
2042	0.027	0.000
2043	0.013	0.000
2044	0.017	0.000
2045	0.011	0.000
2046	0.013	0.000
2047	0.010	0.000
2048	0.013	0.000
2049	0.012	0.000
2050	0.008	0.000
2051	0.014	0.000
2052	0.007	0.000
2053	0.012	0.000
2054	0.015	0.000
2055	0.006	0.000
2056	0.006	0.000
2057	0.009	0.000
2058	0.011	0.000
2059	0.018	0.000

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.0466	0.0000
2	0.0425	0.0000
3	0.0338	0.0000
4	0.0311	0.0000
5	0.0305	0.0000
6	0.0290	0.0000
7	0.0285	0.0000
8	0.0277	0.0000
9	0.0273	0.0000
10	0.0262	0.0000
11	0.0247	0.0000
12	0.0241	0.0000
13	0.0234	0.0000
14	0.0234	0.0000
15	0.0228	0.0000
16	0.0223	0.0000
17	0.0218	0.0000
18	0.0217	0.0000
19	0.0209	0.0000
20	0.0209	0.0000
21	0.0203	0.0000
22	0.0199	0.0000

23	0.0191	0.0000
24	0.0191	0.0000
25	0.0191	0.0000
26	0.0185	0.0000
27	0.0184	0.0000
28	0.0183	0.0000
29	0.0176	0.0000
30	0.0175	0.0000
31	0.0174	0.0000
32	0.0172	0.0000
33	0.0171	0.0000
34	0.0166	0.0000
35	0.0165	0.0000
36	0.0165	0.0000
37	0.0160	0.0000
38	0.0159	0.0000
39	0.0152	0.0000
40	0.0150	0.0000
41	0.0149	0.0000
42	0.0147	0.0000
43	0.0146	0.0000
44	0.0144	0.0000
45	0.0143	0.0000
46	0.0140	0.0000
47	0.0140	0.0000
48	0.0138	0.0000
49	0.0138	0.0000
50	0.0138	0.0000
51	0.0133	0.0000
52	0.0132	0.0000
53	0.0129	0.0000
54	0.0129	0.0000
55	0.0128	0.0000
56	0.0128	0.0000
57	0.0126	0.0000
58	0.0125	0.0000
59	0.0124	0.0000
60	0.0124	0.0000
61	0.0124	0.0000
62	0.0123	0.0000
63	0.0123	0.0000
64	0.0122	0.0000
65	0.0122	0.0000
66	0.0121	0.0000
67	0.0121	0.0000
68	0.0120	0.0000
69	0.0119	0.0000
70	0.0118	0.0000
71	0.0116	0.0000
72	0.0115	0.0000
73	0.0115	0.0000
74	0.0115	0.0000
75	0.0115	0.0000
76	0.0114	0.0000
77	0.0114	0.0000
78	0.0113	0.0000
79	0.0112	0.0000
80	0.0112	0.0000

81	0.0111	0.0000
82	0.0111	0.0000
83	0.0110	0.0000
84	0.0109	0.0000
85	0.0107	0.0000
86	0.0107	0.0000
87	0.0106	0.0000
88	0.0106	0.0000
89	0.0105	0.0000
90	0.0105	0.0000
91	0.0104	0.0000
92	0.0103	0.0000
93	0.0102	0.0000
94	0.0101	0.0000
95	0.0099	0.0000
96	0.0098	0.0000
97	0.0098	0.0000
98	0.0097	0.0000
99	0.0097	0.0000
100	0.0096	0.0000
101	0.0096	0.0000
102	0.0096	0.0000
103	0.0092	0.0000
104	0.0089	0.0000
105	0.0088	0.0000
106	0.0088	0.0000
107	0.0086	0.0000
108	0.0086	0.0000
109	0.0084	0.0000
110	0.0084	0.0000
111	0.0084	0.0000
112	0.0083	0.0000
113	0.0081	0.0000
114	0.0080	0.0000
115	0.0080	0.0000
116	0.0077	0.0000
117	0.0075	0.0000
118	0.0073	0.0000
119	0.0073	0.0000
120	0.0073	0.0000
121	0.0072	0.0000
122	0.0071	0.0000
123	0.0071	0.0000
124	0.0069	0.0000
125	0.0069	0.0000
126	0.0069	0.0000
127	0.0068	0.0000
128	0.0068	0.0000
129	0.0067	0.0000
130	0.0066	0.0000
131	0.0065	0.0000
132	0.0065	0.0000
133	0.0064	0.0000
134	0.0063	0.0000
135	0.0063	0.0000
136	0.0063	0.0000
137	0.0062	0.0000
138	0.0062	0.0000

139	0.0061	0.0000
140	0.0060	0.0000
141	0.0057	0.0000
142	0.0056	0.0000
143	0.0054	0.0000
144	0.0051	0.0000
145	0.0051	0.0000
146	0.0051	0.0000
147	0.0051	0.0000
148	0.0050	0.0000
149	0.0050	0.0000
150	0.0048	0.0000
151	0.0047	0.0000
152	0.0041	0.0000
153	0.0040	0.0000
154	0.0039	0.0000
155	0.0036	0.0000
156	0.0019	0.0000
157	0.0018	0.0000
158	0.0012	0.0000

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0056	60331	0	0	Pass
0.0059	54564	0	0	Pass
0.0061	49368	0	0	Pass
0.0064	44736	0	0	Pass
0.0066	40592	0	0	Pass
0.0069	37046	0	0	Pass
0.0071	33900	0	0	Pass
0.0074	30958	0	0	Pass
0.0076	28293	0	0	Pass
0.0079	26060	0	0	Pass
0.0082	23988	0	0	Pass
0.0084	22105	0	0	Pass
0.0087	20465	0	0	Pass
0.0089	18947	0	0	Pass
0.0092	17462	0	0	Pass
0.0094	16083	0	0	Pass
0.0097	14836	0	0	Pass
0.0099	13712	0	0	Pass
0.0102	12720	0	0	Pass
0.0104	11762	0	0	Pass
0.0107	10892	0	0	Pass
0.0110	10072	0	0	Pass
0.0112	9269	0	0	Pass
0.0115	8554	0	0	Pass
0.0117	7867	0	0	Pass
0.0120	7307	0	0	Pass
0.0122	6787	0	0	Pass
0.0125	6377	0	0	Pass
0.0127	5994	0	0	Pass
0.0130	5651	0	0	Pass
0.0133	5311	0	0	Pass
0.0135	4997	0	0	Pass
0.0138	4718	0	0	Pass
0.0140	4444	0	0	Pass
0.0143	4198	0	0	Pass
0.0145	3950	0	0	Pass
0.0148	3716	0	0	Pass
0.0150	3472	0	0	Pass
0.0153	3284	0	0	Pass
0.0155	3101	0	0	Pass
0.0158	2929	0	0	Pass
0.0161	2756	0	0	Pass
0.0163	2633	0	0	Pass
0.0166	2493	0	0	Pass
0.0168	2381	0	0	Pass
0.0171	2250	0	0	Pass
0.0173	2133	0	0	Pass
0.0176	1973	0	0	Pass
0.0178	1837	0	0	Pass
0.0181	1719	0	0	Pass
0.0183	1616	0	0	Pass
0.0186	1519	0	0	Pass
0.0189	1432	0	0	Pass

0.0191	1349	0	0	Pass
0.0194	1283	0	0	Pass
0.0196	1220	0	0	Pass
0.0199	1151	0	0	Pass
0.0201	1098	0	0	Pass
0.0204	1045	0	0	Pass
0.0206	985	0	0	Pass
0.0209	909	0	0	Pass
0.0211	836	0	0	Pass
0.0214	771	0	0	Pass
0.0217	713	0	0	Pass
0.0219	656	0	0	Pass
0.0222	612	0	0	Pass
0.0224	567	0	0	Pass
0.0227	526	0	0	Pass
0.0229	482	0	0	Pass
0.0232	426	0	0	Pass
0.0234	391	0	0	Pass
0.0237	360	0	0	Pass
0.0240	325	0	0	Pass
0.0242	294	0	0	Pass
0.0245	273	0	0	Pass
0.0247	254	0	0	Pass
0.0250	240	0	0	Pass
0.0252	223	0	0	Pass
0.0255	203	0	0	Pass
0.0257	181	0	0	Pass
0.0260	154	0	0	Pass
0.0262	128	0	0	Pass
0.0265	119	0	0	Pass
0.0268	106	0	0	Pass
0.0270	98	0	0	Pass
0.0273	84	0	0	Pass
0.0275	72	0	0	Pass
0.0278	66	0	0	Pass
0.0280	62	0	0	Pass
0.0283	54	0	0	Pass
0.0285	45	0	0	Pass
0.0288	38	0	0	Pass
0.0290	28	0	0	Pass
0.0293	19	0	0	Pass
0.0296	17	0	0	Pass
0.0298	16	0	0	Pass
0.0301	15	0	0	Pass
0.0303	15	0	0	Pass
0.0306	13	0	0	Pass
0.0308	13	0	0	Pass

Water Quality

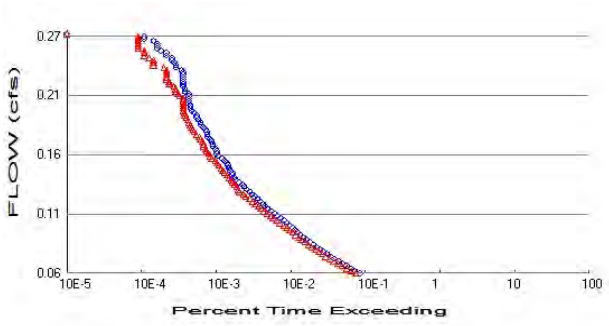
Water Quality BMP Flow and Volume for POC #1

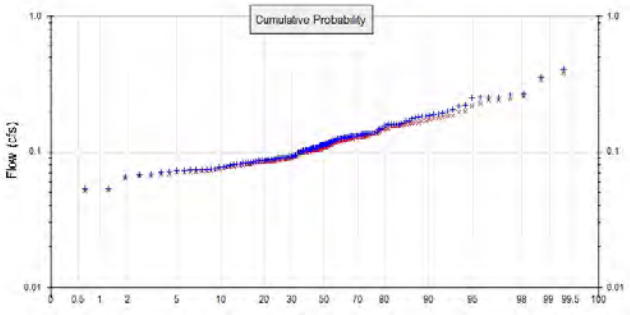
On-line facility volume:	0.051 acre-feet
On-line facility target flow:	0.0648 cfs.
Adjusted for 15 min:	0.0648 cfs.
Off-line facility target flow:	0.0374 cfs.
Adjusted for 15 min:	0.0374 cfs.

LID Report

LID Technique	Used for Treatment ?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
StormTank POC	☐	204.28			☐	100.00			
Total Volume Infiltrated		204.28	0.00	0.00		100.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Passed

POC 2





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #2
Total Pervious Area: 0.2966
Total Impervious Area: 0.7267

Mitigated Landuse Totals for POC #2
Total Pervious Area: 0.1941
Total Impervious Area: 0.6034

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #2

Return Period	**Flow(cfs)**
2 year	0.112739
5 year	0.15527
10 year	0.186801
25 year	0.230649
50 year	0.266339
100 year	0.304722

Flow Frequency Return Periods for Mitigated. POC #2

Return Period	**Flow(cfs)**
2 year	0.108243
5 year	0.147279
10 year	0.175948
25 year	0.215518
50 year	0.247512
100 year	0.281739

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #2

Year	**Predeveloped**	**Mitigated**
1902	0.124	0.122
1903	0.137	0.135
1904	0.188	0.175
1905	0.073	0.071
1906	0.077	0.076
1907	0.121	0.114
1908	0.093	0.089
1909	0.106	0.104
1910	0.116	0.108
1911	0.127	0.120
1912	0.253	0.227

1913	0.083	0.081
1914	0.404	0.380
1915	0.075	0.073
1916	0.132	0.130
1917	0.053	0.052
1918	0.105	0.103
1919	0.071	0.068
1920	0.099	0.093
1921	0.083	0.079
1922	0.137	0.128
1923	0.091	0.086
1924	0.150	0.147
1925	0.068	0.066
1926	0.121	0.120
1927	0.104	0.102
1928	0.081	0.078
1929	0.168	0.159
1930	0.158	0.154
1931	0.082	0.079
1932	0.088	0.084
1933	0.087	0.083
1934	0.160	0.148
1935	0.071	0.070
1936	0.106	0.102
1937	0.130	0.128
1938	0.074	0.072
1939	0.087	0.085
1940	0.162	0.158
1941	0.159	0.157
1942	0.137	0.128
1943	0.124	0.119
1944	0.191	0.180
1945	0.131	0.128
1946	0.112	0.106
1947	0.079	0.077
1948	0.112	0.108
1949	0.164	0.161
1950	0.094	0.092
1951	0.139	0.137
1952	0.205	0.186
1953	0.183	0.167
1954	0.092	0.088
1955	0.082	0.081
1956	0.073	0.072
1957	0.089	0.086
1958	0.125	0.116
1959	0.126	0.117
1960	0.087	0.085
1961	0.268	0.254
1962	0.106	0.103
1963	0.074	0.073
1964	0.252	0.238
1965	0.114	0.107
1966	0.087	0.084
1967	0.135	0.127
1968	0.103	0.099
1969	0.095	0.091
1970	0.113	0.107

1971	0.115	0.107
1972	0.356	0.335
1973	0.186	0.183
1974	0.148	0.142
1975	0.180	0.164
1976	0.176	0.164
1977	0.066	0.064
1978	0.133	0.123
1979	0.126	0.121
1980	0.132	0.123
1981	0.113	0.110
1982	0.090	0.087
1983	0.131	0.124
1984	0.129	0.122
1985	0.156	0.145
1986	0.072	0.069
1987	0.121	0.117
1988	0.074	0.071
1989	0.074	0.073
1990	0.094	0.090
1991	0.134	0.128
1992	0.121	0.119
1993	0.136	0.134
1994	0.108	0.102
1995	0.077	0.074
1996	0.110	0.104
1997	0.093	0.089
1998	0.119	0.112
1999	0.115	0.113
2000	0.107	0.102
2001	0.082	0.081
2002	0.184	0.168
2003	0.090	0.087
2004	0.131	0.128
2005	0.254	0.247
2006	0.115	0.113
2007	0.138	0.132
2008	0.113	0.108
2009	0.079	0.078
2010	0.107	0.103
2011	0.100	0.098
2012	0.107	0.103
2013	0.105	0.100
2014	0.092	0.091
2015	0.192	0.177
2016	0.091	0.089
2017	0.159	0.155
2018	0.113	0.104
2019	0.249	0.157
2020	0.128	0.121
2021	0.104	0.099
2022	0.168	0.162
2023	0.199	0.195
2024	0.264	0.240
2025	0.102	0.101
2026	0.146	0.139
2027	0.127	0.124
2028	0.049	0.049

2029	0.089	0.085
2030	0.177	0.172
2031	0.053	0.052
2032	0.086	0.085
2033	0.107	0.105
2034	0.084	0.083
2035	0.124	0.116
2036	0.086	0.084
2037	0.113	0.111
2038	0.129	0.120
2039	0.221	0.217
2040	0.091	0.088
2041	0.116	0.111
2042	0.132	0.124
2043	0.137	0.135
2044	0.100	0.097
2045	0.082	0.079
2046	0.091	0.087
2047	0.104	0.102
2048	0.085	0.084
2049	0.128	0.125
2050	0.104	0.099
2051	0.160	0.149
2052	0.101	0.100
2053	0.086	0.084
2054	0.217	0.200
2055	0.103	0.100
2056	0.138	0.136
2057	0.068	0.066
2058	0.129	0.127
2059	0.157	0.155

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #2

Rank	Predeveloped	Mitigated
1	0.4042	0.3799
2	0.3556	0.3354
3	0.2678	0.2538
4	0.2640	0.2472
5	0.2540	0.2404
6	0.2528	0.2379
7	0.2523	0.2268
8	0.2487	0.2168
9	0.2207	0.1995
10	0.2174	0.1954
11	0.2050	0.1855
12	0.1990	0.1830
13	0.1924	0.1801
14	0.1909	0.1774
15	0.1879	0.1745
16	0.1858	0.1724
17	0.1838	0.1684
18	0.1831	0.1675
19	0.1803	0.1642
20	0.1773	0.1640
21	0.1756	0.1621
22	0.1679	0.1608
23	0.1678	0.1593

24	0.1642	0.1578
25	0.1617	0.1567
26	0.1596	0.1565
27	0.1595	0.1551
28	0.1592	0.1547
29	0.1592	0.1542
30	0.1577	0.1487
31	0.1573	0.1480
32	0.1559	0.1475
33	0.1499	0.1454
34	0.1482	0.1417
35	0.1458	0.1395
36	0.1388	0.1369
37	0.1384	0.1358
38	0.1381	0.1352
39	0.1374	0.1350
40	0.1374	0.1337
41	0.1373	0.1322
42	0.1368	0.1297
43	0.1357	0.1284
44	0.1354	0.1282
45	0.1337	0.1281
46	0.1332	0.1276
47	0.1321	0.1275
48	0.1319	0.1275
49	0.1317	0.1270
50	0.1315	0.1270
51	0.1314	0.1254
52	0.1314	0.1242
53	0.1301	0.1242
54	0.1288	0.1240
55	0.1288	0.1233
56	0.1287	0.1227
57	0.1277	0.1223
58	0.1275	0.1218
59	0.1267	0.1206
60	0.1266	0.1205
61	0.1265	0.1204
62	0.1260	0.1200
63	0.1246	0.1197
64	0.1241	0.1193
65	0.1240	0.1190
66	0.1237	0.1173
67	0.1214	0.1168
68	0.1213	0.1165
69	0.1207	0.1156
70	0.1206	0.1139
71	0.1187	0.1134
72	0.1160	0.1126
73	0.1158	0.1120
74	0.1154	0.1114
75	0.1150	0.1113
76	0.1150	0.1097
77	0.1142	0.1079
78	0.1135	0.1078
79	0.1131	0.1078
80	0.1130	0.1073
81	0.1129	0.1070

82	0.1126	0.1069
83	0.1117	0.1056
84	0.1117	0.1054
85	0.1100	0.1042
86	0.1083	0.1041
87	0.1069	0.1039
88	0.1067	0.1033
89	0.1066	0.1033
90	0.1066	0.1031
91	0.1064	0.1027
92	0.1064	0.1025
93	0.1055	0.1022
94	0.1052	0.1022
95	0.1048	0.1021
96	0.1041	0.1015
97	0.1041	0.1010
98	0.1036	0.1000
99	0.1036	0.0999
100	0.1033	0.0996
101	0.1026	0.0994
102	0.1024	0.0992
103	0.1012	0.0987
104	0.1001	0.0984
105	0.0998	0.0966
106	0.0987	0.0933
107	0.0948	0.0924
108	0.0941	0.0910
109	0.0937	0.0907
110	0.0928	0.0896
111	0.0926	0.0894
112	0.0919	0.0890
113	0.0916	0.0886
114	0.0911	0.0881
115	0.0909	0.0877
116	0.0907	0.0875
117	0.0906	0.0868
118	0.0903	0.0867
119	0.0896	0.0861
120	0.0892	0.0859
121	0.0888	0.0851
122	0.0876	0.0850
123	0.0871	0.0849
124	0.0870	0.0845
125	0.0869	0.0844
126	0.0867	0.0843
127	0.0859	0.0842
128	0.0858	0.0842
129	0.0857	0.0840
130	0.0854	0.0832
131	0.0839	0.0827
132	0.0830	0.0814
133	0.0828	0.0811
134	0.0824	0.0806
135	0.0822	0.0791
136	0.0820	0.0789
137	0.0819	0.0789
138	0.0807	0.0776
139	0.0787	0.0776

140	0.0785	0.0766
141	0.0770	0.0756
142	0.0769	0.0744
143	0.0751	0.0733
144	0.0744	0.0730
145	0.0740	0.0726
146	0.0738	0.0723
147	0.0735	0.0719
148	0.0733	0.0710
149	0.0729	0.0708
150	0.0722	0.0704
151	0.0715	0.0690
152	0.0710	0.0682
153	0.0683	0.0662
154	0.0681	0.0658
155	0.0657	0.0640
156	0.0533	0.0524
157	0.0531	0.0518
158	0.0493	0.0487

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0564	4690	4119	87	Pass
0.0585	4031	3562	88	Pass
0.0606	3543	3099	87	Pass
0.0627	3066	2680	87	Pass
0.0649	2688	2391	88	Pass
0.0670	2413	2085	86	Pass
0.0691	2124	1863	87	Pass
0.0712	1909	1643	86	Pass
0.0733	1692	1461	86	Pass
0.0755	1513	1316	86	Pass
0.0776	1372	1184	86	Pass
0.0797	1232	1051	85	Pass
0.0818	1118	953	85	Pass
0.0839	997	856	85	Pass
0.0861	900	762	84	Pass
0.0882	818	704	86	Pass
0.0903	735	643	87	Pass
0.0924	683	589	86	Pass
0.0945	630	536	85	Pass
0.0967	588	484	82	Pass
0.0988	530	443	83	Pass
0.1009	493	398	80	Pass
0.1030	447	358	80	Pass
0.1052	406	323	79	Pass
0.1073	366	300	81	Pass
0.1094	343	266	77	Pass
0.1115	306	242	79	Pass
0.1136	270	221	81	Pass
0.1158	251	203	80	Pass
0.1179	236	186	78	Pass
0.1200	218	171	78	Pass
0.1221	198	157	79	Pass
0.1242	181	138	76	Pass
0.1264	168	129	76	Pass
0.1285	156	115	73	Pass
0.1306	143	109	76	Pass
0.1327	131	104	79	Pass
0.1348	124	97	78	Pass
0.1370	112	91	81	Pass
0.1391	102	88	86	Pass
0.1412	98	82	83	Pass
0.1433	92	77	83	Pass
0.1454	91	71	78	Pass
0.1476	86	68	79	Pass
0.1497	83	64	77	Pass
0.1518	79	60	75	Pass
0.1539	77	57	74	Pass
0.1561	72	54	75	Pass
0.1582	67	48	71	Pass
0.1603	59	46	77	Pass
0.1624	57	44	77	Pass
0.1645	56	41	73	Pass
0.1667	54	40	74	Pass

0.1688	50	38	76	Pass
0.1709	50	38	76	Pass
0.1730	48	36	75	Pass
0.1751	46	34	73	Pass
0.1773	43	33	76	Pass
0.1794	42	30	71	Pass
0.1815	41	28	68	Pass
0.1836	40	27	67	Pass
0.1857	37	26	70	Pass
0.1879	35	25	71	Pass
0.1900	34	24	70	Pass
0.1921	32	23	71	Pass
0.1942	30	22	73	Pass
0.1963	30	21	70	Pass
0.1985	28	21	75	Pass
0.2006	26	20	76	Pass
0.2027	25	20	80	Pass
0.2048	25	20	80	Pass
0.2070	24	20	83	Pass
0.2091	24	20	83	Pass
0.2112	24	20	83	Pass
0.2133	24	18	75	Pass
0.2154	24	17	70	Pass
0.2176	21	16	76	Pass
0.2197	21	16	76	Pass
0.2218	20	15	75	Pass
0.2239	20	13	65	Pass
0.2260	20	13	65	Pass
0.2282	20	12	60	Pass
0.2303	20	12	60	Pass
0.2324	20	12	60	Pass
0.2345	20	12	60	Pass
0.2366	19	12	63	Pass
0.2388	16	11	68	Pass
0.2409	16	8	50	Pass
0.2430	15	8	53	Pass
0.2451	14	8	57	Pass
0.2473	14	7	50	Pass
0.2494	12	6	50	Pass
0.2515	12	6	50	Pass
0.2536	10	6	60	Pass
0.2557	9	5	55	Pass
0.2579	9	5	55	Pass
0.2600	9	5	55	Pass
0.2621	8	5	62	Pass
0.2642	6	5	83	Pass
0.2663	6	5	83	Pass

Water Quality

Water Quality BMP Flow and Volume for POC #2

On-line facility volume:	0.0449 acre-feet
On-line facility target flow:	0.0571 cfs.
Adjusted for 15 min:	0.0571 cfs.
Off-line facility target flow:	0.033 cfs.
Adjusted for 15 min:	0.033 cfs.

LID Report

LID Technique	Used for Treatment ?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
Downspout Trench POC	☐	37.15			☐	100.00			
Existing Trench POC	☐	110.52			☐	100.00			
Total Volume Infiltrated		147.67	0.00	0.00		100.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Passed

POC 3

POC #3 was not reported because POC must exist in both scenarios and both scenarios must have been run.

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

No PERLND changes have been made.

IMPLND Changes

No IMPLND changes have been made.

Appendix

Predeveloped Schematic

Mitigated Schematic

Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1901 10 01        END    2059 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   Taco Time.wdm
MESSU       25   PreTaco Time.MES
            27   PreTaco Time.L61
            28   PreTaco Time.L62
            31   POCTaco Time2.dat
            30   POCTaco Time1.dat
END FILES

OPN SEQUENCE
    INGRP               INDELT 00:15
      PERLND      16
      IMPLND      11
      IMPLND       4
      IMPLND       8
      PERLND      10
      PERLND      11
      RCHRES       1
      COPY       502
      COPY       501
      DISPLY       2
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    2        South Basin                MAX                    1    2   31    9
    1        North Basin                MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  502         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                        in  out           ***
   16     C, Lawn, Flat           1    1    1    1   27    0
   10     C, Forest, Flat         1    1    1    1   27    0
   11     C, Forest, Mod          1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***
```

```
  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   16         0    0    1    0    0    0    0    0    0    0    0    0
   10         0    0    1    0    0    0    0    0    0    0    0    0
   11         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   16         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   10         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   11         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   16         0    0    0    0    0    0    0    0    0    0    0
   10         0    0    0    0    0    0    0    0    0    0    0
   11         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   16              0       4.5      0.03       400      0.05       0.5     0.996
   10              0       4.5      0.08       400      0.05       0.5     0.996
   11              0       4.5      0.08       400       0.1       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   16              0         0         2         2         0         0         0
   10              0         0         2         2         0         0         0
   11              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   16            0.1      0.25      0.25         6       0.5      0.25
   10            0.2       0.5      0.35         6       0.5       0.7
   11            0.2       0.5      0.35         6       0.5       0.7
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS       AGWS      GWVS
   16              0         0         0         0       2.5          1         0
   10              0         0         0         0       2.5          1         0
   11              0         0         0         0       2.5          1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                   in  out           ***
   11      PARKING/FLAT           1    1    1   27    0
    4      ROOF TOPS/FLAT         1    1    1   27    0
    8      SIDEWALKS/FLAT         1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***
```

```
  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
   11         0    0    1    0    0    0
    4         0    0    1    0    0    0
    8         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
   11         0    0    4    0    0    0    1    9
    4         0    0    4    0    0    0    1    9
    8         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
   11         0    0    0    0    0
    4         0    0    0    0    0
    8         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
   11          400      0.01       0.1        0.1
    4          400      0.01       0.1        0.1
    8          400      0.01       0.1        0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
   11             0         0
    4             0         0
    8             0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
   11             0         0
    4             0         0
    8             0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                <--Area-->     <-Target->   MBLK   ***
<Name>   #                <-factor->     <Name>   #   Tbl#   ***
2003 Improvements***
PERLND  16                    0.1212     RCHRES   1      2
PERLND  16                    0.1212     RCHRES   1      3
IMPLND  11                    0.4431     RCHRES   1      5
South Basin***
PERLND  16                    0.1754     COPY   502     12
PERLND  16                    0.1754     COPY   502     13
IMPLND   4                    0.0832     COPY   502     15
IMPLND   8                    0.0045     COPY   502     15
IMPLND  11                    0.1959     COPY   502     15
North Basin***
PERLND  16                    0.0135     COPY   501     12
PERLND  16                    0.0135     COPY   501     13
PERLND  10                    0.0841     COPY   501     12
PERLND  10                    0.0841     COPY   501     13
PERLND  11                    0.3615     COPY   501     12
PERLND  11                    0.3615     COPY   501     13
```

```
******Routing******
RCHRES   1                           1     COPY   502     17
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   502 OUTPUT MEAN   1 1   48.4        DISPLY   2     INPUT  TIMSER 1
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                 ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG            ***
                                         in  out                             ***
    1     Existing Trench         2    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
    1         1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
    1         4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                      ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *       *  *  *  *  *         ***
    1        0  1  0  0    4  5  0  0  0       0  0  0  0  0       2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
    1             1      0.02       0.0       0.0       0.5       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                         ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
         *** ac-ft     for each possible exit       for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
    1           0          4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
  FTABLE      1
   91    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.043221  0.000000  0.000000  0.000000
  0.033111  0.043221  0.001345  0.000000  0.047940
  0.066222  0.043221  0.002690  0.000000  0.047940
```

0.099333	0.043221	0.004036	0.000000	0.047940
0.132444	0.043221	0.005381	0.000000	0.047940
0.165556	0.043221	0.006726	0.000000	0.047940
0.198667	0.043221	0.008071	0.000000	0.047940
0.231778	0.043221	0.009417	0.000000	0.047940
0.264889	0.043221	0.010762	0.000000	0.047940
0.298000	0.043221	0.012107	0.000000	0.047940
0.331111	0.043221	0.013452	0.000000	0.047940
0.364222	0.043221	0.014798	0.000000	0.047940
0.397333	0.043221	0.016143	0.000000	0.047940
0.430444	0.043221	0.017488	0.000000	0.047940
0.463556	0.043221	0.018833	0.000000	0.047940
0.496667	0.043221	0.020179	0.000000	0.047940
0.529778	0.043221	0.021524	0.000000	0.047940
0.562889	0.043221	0.022869	0.000000	0.047940
0.596000	0.043221	0.024214	0.000000	0.047940
0.629111	0.043221	0.025560	0.000000	0.047940
0.662222	0.043221	0.026905	0.000000	0.047940
0.695333	0.043221	0.028250	0.000000	0.047940
0.728444	0.043221	0.029595	0.000000	0.047940
0.761556	0.043221	0.030940	0.000000	0.047940
0.794667	0.043221	0.032286	0.000000	0.047940
0.827778	0.043221	0.033631	0.000000	0.047940
0.860889	0.043221	0.034976	0.000000	0.047940
0.894000	0.043221	0.036321	0.000000	0.047940
0.927111	0.043221	0.037667	0.000000	0.047940
0.960222	0.043221	0.039012	0.000000	0.047940
0.993333	0.043221	0.040357	0.000000	0.047940
1.026444	0.043221	0.041702	0.000000	0.047940
1.059556	0.043221	0.043048	0.000000	0.047940
1.092667	0.043221	0.044393	0.000000	0.047940
1.125778	0.043221	0.045738	0.000000	0.047940
1.158889	0.043221	0.047083	0.000000	0.047940
1.192000	0.043221	0.048429	0.000000	0.047940
1.225111	0.043221	0.049774	0.000000	0.047940
1.258222	0.043221	0.051119	0.000000	0.047940
1.291333	0.043221	0.052464	0.000000	0.047940
1.324444	0.043221	0.053810	0.000000	0.047940
1.357556	0.043221	0.055155	0.000000	0.047940
1.390667	0.043221	0.056500	0.000000	0.047940
1.423778	0.043221	0.057845	0.000000	0.047940
1.456889	0.043221	0.059191	0.000000	0.047940
1.490000	0.043221	0.060536	0.000000	0.047940
1.523111	0.043221	0.061881	0.000000	0.047940
1.556222	0.043221	0.063226	0.000000	0.047940
1.589333	0.043221	0.064571	0.000000	0.047940
1.622444	0.043221	0.065917	0.000000	0.047940
1.655556	0.043221	0.067262	0.000000	0.047940
1.688667	0.043221	0.068607	0.000000	0.047940
1.721778	0.043221	0.069952	0.000000	0.047940
1.754889	0.043221	0.071298	0.000000	0.047940
1.788000	0.043221	0.072643	0.000000	0.047940
1.821111	0.043221	0.073988	0.000000	0.047940
1.854222	0.043221	0.075333	0.000000	0.047940
1.887333	0.043221	0.076679	0.000000	0.047940
1.920444	0.043221	0.078024	0.000000	0.047940
1.953556	0.043221	0.079369	0.000000	0.047940
1.986667	0.043221	0.080714	0.003852	0.047940
2.019778	0.043221	0.082060	0.056020	0.047940
2.052889	0.043221	0.083405	0.138135	0.047940
2.086000	0.043221	0.084750	0.238662	0.047940
2.119111	0.043221	0.086095	0.348949	0.047940
2.152222	0.043221	0.087441	0.460186	0.047940
2.185333	0.043221	0.088786	0.563644	0.047940
2.218444	0.043221	0.090131	0.651815	0.047940
2.251556	0.043221	0.091476	0.720025	0.047940
2.284667	0.043221	0.092821	0.768399	0.047940
2.317778	0.043221	0.094167	0.813566	0.047940
2.350889	0.043221	0.095512	0.852509	0.047940
2.384000	0.043221	0.096857	0.889749	0.047940

```
  2.417111  0.043221  0.098202  0.925493  0.047940
  2.450222  0.043221  0.099548  0.959906  0.047940
  2.483333  0.043221  0.100893  0.993127  0.047940
  2.516444  0.043221  0.102238  1.025273  0.047940
  2.549556  0.043221  0.103583  1.056441  0.047940
  2.582667  0.043221  0.104929  1.086715  0.047940
  2.615778  0.043221  0.106274  1.116168  0.047940
  2.648889  0.043221  0.107619  1.144864  0.047940
  2.682000  0.043221  0.108964  1.172858  0.047940
  2.715111  0.043221  0.110310  1.200200  0.047940
  2.748222  0.043221  0.111655  1.226932  0.047940
  2.781333  0.043221  0.113000  1.253094  0.047940
  2.814444  0.043221  0.114345  1.278721  0.047940
  2.847556  0.043221  0.115691  1.303844  0.047940
  2.880667  0.043221  0.117036  1.328492  0.047940
  2.913778  0.043221  0.118381  1.352692  0.047940
  2.946889  0.043221  0.119726  1.376465  0.047940
  2.980000  0.043221  0.121072  1.399836  0.047940
  END FTABLE  1
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1             PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1             IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    1             PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1             IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
RCHRES   1 HYDR   RO     1 1        1      WDM   1016 FLOW     ENGL      REPL
RCHRES   1 HYDR   O      1 1        1      WDM   1017 FLOW     ENGL      REPL
RCHRES   1 HYDR   O      2 1        1      WDM   1018 FLOW     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1019 STAG     ENGL      REPL
COPY   502 OUTPUT MEAN   1 1     48.4      WDM    502 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    501 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>           <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK        2
PERLND     PWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    2

  MASS-LINK        3
PERLND     PWATER IFWO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    3

  MASS-LINK        5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    5

  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15

  MASS-LINK       17
```

```
RCHRES     OFLOW  OVOL   1                COPY           INPUT  MEAN
  END MASS-LINK   17

END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1901 10 01        END    2059 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   Taco Time.wdm
MESSU       25   MitTaco Time.MES
            27   MitTaco Time.L61
            28   MitTaco Time.L62
            32   POCTaco Time3.dat
            31   POCTaco Time2.dat
            30   POCTaco Time1.dat
END FILES

OPN SEQUENCE
    INGRP               INDELT 00:15
      IMPLND       4
      PERLND      16
      IMPLND      11
      IMPLND       8
      RCHRES       1
      RCHRES       2
      RCHRES       3
      COPY       503
      COPY         2
      COPY       502
      COPY       602
      COPY         1
      COPY       501
      COPY       601
      DISPLY       3
      DISPLY       2
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    3        Basin  3                   MAX                    1    2   32    9
    2        Downspout Trench           MAX                    1    2   31    9
    1        StormTank                  MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  503         1    1
    2         1    1
  502         1    1
  602         1    1
  501         1    1
  601         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
```

```
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                          in  out           ***
   16     C, Lawn, Flat           1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   16         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   16         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   16         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   16              0       4.5      0.03       400      0.05       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   16              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   16            0.1      0.25      0.25         6       0.5      0.25
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
             ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   16              0         0         0         0       2.5         1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                       User  t-series Engl Metr ***
                                        in  out           ***
    4      ROOF TOPS/FLAT         1    1    1   27    0
   11      PARKING/FLAT           1    1    1   27    0
    8      SIDEWALKS/FLAT         1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    4         0    0    1    0    0    0
```

```
   11         0    0    1    0    0    0
    8         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    4         0    0    4    0    0    0    1    9
   11         0    0    4    0    0    0    1    9
    8         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    4         0    0    0    0    0
   11         0    0    0    0    0
    8         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    4            400      0.01       0.1       0.1
   11            400      0.01       0.1       0.1
    8            400      0.01       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    4              0         0
   11              0         0
    8              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    4              0         0
   11              0         0
    8              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                <--Area-->     <-Target->   MBLK   ***
<Name>   #                <-factor->     <Name>   #   Tbl#   ***
Roof***
IMPLND   4                    0.0905     RCHRES   1      5
Basin  2***
PERLND  16                    0.1677     RCHRES   2      2
PERLND  16                    0.1677     RCHRES   2      3
IMPLND   4                    0.0149     RCHRES   2      5
IMPLND  11                    0.4043     RCHRES   2      5
Basin  3***
PERLND  16                     0.077     RCHRES   3      2
PERLND  16                     0.077     RCHRES   3      3
IMPLND   8                    0.0135     RCHRES   3      5
IMPLND  11                    0.2196     RCHRES   3      5
Basin  3***
PERLND  16                     0.077     COPY   503     12
PERLND  16                     0.077     COPY   503     13
IMPLND   8                    0.0135     COPY   503     15
IMPLND  11                    0.2196     COPY   503     15
Basin  4***
PERLND  16                    0.1171     COPY   502     12
PERLND  16                    0.1171     COPY   602     12
PERLND  16                    0.1171     COPY   502     13
```

```
PERLND  16                      0.1171     COPY   602     13
IMPLND   4                      0.0832     COPY   502     15
IMPLND   4                      0.0832     COPY   602     15
IMPLND   8                      0.0663     COPY   502     15
IMPLND   8                      0.0663     COPY   602     15
IMPLND  11                      0.1303     COPY   502     15
IMPLND  11                      0.1303     COPY   602     15

******Routing******
IMPLND   4                      0.0905     COPY     2     15
PERLND  16                      0.1677     COPY     1     12
IMPLND   4                      0.0149     COPY     1     15
IMPLND  11                      0.4043     COPY     1     15
PERLND  16                      0.1677     COPY     1     13
PERLND  16                       0.077     COPY     2     12
IMPLND   8                      0.0135     COPY     2     15
IMPLND  11                      0.2196     COPY     2     15
PERLND  16                       0.077     COPY     2     13
RCHRES   1                           1     COPY   502     17
RCHRES   2                           1     COPY   501     17
RCHRES   3                           1     COPY   502     17
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   503 OUTPUT MEAN   1 1   48.4        DISPLY   3     INPUT  TIMSER 1
COPY   502 OUTPUT MEAN   1 1   48.4        DISPLY   2     INPUT  TIMSER 1
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<----------------><---> User T-series  Engl Metr LKFG             ***
                                        in  out                             ***
    1     Downspout Trench-004    2    1    1    1   28    0    1
    2     StormTank               2    1    1    1   28    0    1
    3     Existing Trench         2    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
    1         1    0    0    0    0    0    0    0    0    0
    2         1    0    0    0    0    0    0    0    0    0
    3         1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ******************* PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
    1         4    0    0    0    0    0    0    0    0    0    1    9
    2         4    0    0    0    0    0    0    0    0    0    1    9
    3         4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                  ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
          FG FG FG FG  possible  exit  *** possible  exit      possible  exit
           *  *  *  *    *  *  *  *       *  *  *  *  *          ***
    1      0  1  0  0    4  5  0  0  0       0  0  0  0  0       2  2  2  2  2
    2      0  1  0  0    4  5  0  0  0       0  0  0  0  0       2  2  2  2  2
```

```
    3        0  1  0  0    4  5  0  0  0       0  0  0  0  0       2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN      DELTH     STCOR        KS      DB50        ***
  <------><--------><--------><--------><--------><--------><-------->        ***
    1              1      0.02        0.0       0.0       0.5       0.0
    2              2      0.01        0.0       0.0       0.5       0.0
    3              3      0.02        0.0       0.0       0.5       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                          ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
           *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
    1            0         4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    2            0         4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    3            0         4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
  FTABLE      1
   92    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)     (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.014692  0.000000  0.000000  0.000000
  0.033333  0.014692  0.000147  0.000000  0.016296
  0.066667  0.014692  0.000294  0.000000  0.016296
  0.100000  0.014692  0.000441  0.000000  0.016296
  0.133333  0.014692  0.000588  0.000000  0.016296
  0.166667  0.014692  0.000735  0.000000  0.016296
  0.200000  0.014692  0.000882  0.000000  0.016296
  0.233333  0.014692  0.001028  0.000000  0.016296
  0.266667  0.014692  0.001175  0.000000  0.016296
  0.300000  0.014692  0.001322  0.000000  0.016296
  0.333333  0.014692  0.001469  0.000000  0.016296
  0.366667  0.014692  0.001616  0.000000  0.016296
  0.400000  0.014692  0.001763  0.000000  0.016296
  0.433333  0.014692  0.001910  0.000000  0.016296
  0.466667  0.014692  0.002057  0.000000  0.016296
  0.500000  0.014692  0.002204  0.000000  0.016296
  0.533333  0.014692  0.002351  0.000000  0.016296
  0.566667  0.014692  0.002498  0.000000  0.016296
  0.600000  0.014692  0.002645  0.000000  0.016296
  0.633333  0.014692  0.002792  0.000000  0.016296
  0.666667  0.014692  0.002938  0.000000  0.016296
  0.700000  0.014692  0.003085  0.000000  0.016296
  0.733333  0.014692  0.003232  0.000000  0.016296
  0.766667  0.014692  0.003379  0.000000  0.016296
  0.800000  0.014692  0.003526  0.000000  0.016296
  0.833333  0.014692  0.003673  0.000000  0.016296
  0.866667  0.014692  0.003820  0.000000  0.016296
  0.900000  0.014692  0.003967  0.000000  0.016296
  0.933333  0.014692  0.004114  0.000000  0.016296
  0.966667  0.014692  0.004261  0.000000  0.016296
  1.000000  0.014692  0.004408  0.000000  0.016296
  1.033333  0.014692  0.004555  0.000000  0.016296
  1.066667  0.014692  0.004702  0.000000  0.016296
  1.100000  0.014692  0.004848  0.000000  0.016296
  1.133333  0.014692  0.004995  0.000000  0.016296
  1.166667  0.014692  0.005142  0.000000  0.016296
  1.200000  0.014692  0.005289  0.000000  0.016296
  1.233333  0.014692  0.005436  0.000000  0.016296
  1.266667  0.014692  0.005583  0.000000  0.016296
  1.300000  0.014692  0.005730  0.000000  0.016296
  1.333333  0.014692  0.005877  0.000000  0.016296
  1.366667  0.014692  0.006024  0.000000  0.016296
```

```
1.400000  0.014692  0.006171  0.000000  0.016296
1.433333  0.014692  0.006318  0.000000  0.016296
1.466667  0.014692  0.006465  0.000000  0.016296
1.500000  0.014692  0.006612  0.000000  0.016296
1.533333  0.014692  0.006758  0.000000  0.016296
1.566667  0.014692  0.006905  0.000000  0.016296
1.600000  0.014692  0.007052  0.000000  0.016296
1.633333  0.014692  0.007199  0.000000  0.016296
1.666667  0.014692  0.007346  0.000000  0.016296
1.700000  0.014692  0.007493  0.000000  0.016296
1.733333  0.014692  0.007640  0.000000  0.016296
1.766667  0.014692  0.007787  0.000000  0.016296
1.800000  0.014692  0.007934  0.000000  0.016296
1.833333  0.014692  0.008081  0.000000  0.016296
1.866667  0.014692  0.008228  0.000000  0.016296
1.900000  0.014692  0.008375  0.000000  0.016296
1.933333  0.014692  0.008522  0.000000  0.016296
1.966667  0.014692  0.008669  0.000000  0.016296
2.000000  0.014692  0.008815  0.000000  0.016296
2.033333  0.014692  0.008962  0.042996  0.016296
2.066667  0.014692  0.009109  0.121030  0.016296
2.100000  0.014692  0.009256  0.219469  0.016296
2.133333  0.014692  0.009403  0.329384  0.016296
2.166667  0.014692  0.009550  0.441835  0.016296
2.200000  0.014692  0.009697  0.547841  0.016296
2.233333  0.014692  0.009844  0.639435  0.016296
2.266667  0.014692  0.009991  0.711272  0.016296
2.300000  0.014692  0.010138  0.762603  0.016296
2.333333  0.014692  0.010285  0.808195  0.016296
2.366667  0.014692  0.010432  0.847643  0.016296
2.400000  0.014692  0.010579  0.885334  0.016296
2.433333  0.014692  0.010725  0.921485  0.016296
2.466667  0.014692  0.010872  0.956270  0.016296
2.500000  0.014692  0.011019  0.989833  0.016296
2.533333  0.014692  0.011166  1.022295  0.016296
2.566667  0.014692  0.011313  1.053758  0.016296
2.600000  0.014692  0.011460  1.084308  0.016296
2.633333  0.014692  0.011607  1.114021  0.016296
2.666667  0.014692  0.011754  1.142961  0.016296
2.700000  0.014692  0.011901  1.171186  0.016296
2.733333  0.014692  0.012048  1.198748  0.016296
2.766667  0.014692  0.012195  1.225689  0.016296
2.800000  0.014692  0.012342  1.252051  0.016296
2.833333  0.014692  0.012489  1.277869  0.016296
2.866667  0.014692  0.012635  1.303176  0.016296
2.900000  0.014692  0.012782  1.328001  0.016296
2.933333  0.014692  0.012929  1.352370  0.016296
2.966667  0.014692  0.013076  1.376307  0.016296
3.000000  0.014692  0.013223  1.399836  0.016296
3.033333  0.014692  0.013713  1.422975  0.016296
END FTABLE  1
FTABLE      2
 92    5
   Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
    (ft)   (acres) (acre-ft)   (cfs)     (cfs)   (ft/sec)    (Minutes)***
0.000000  0.042585  0.000000  0.000000  0.000000
0.044444  0.042585  0.001703  0.000000  0.047234
0.088889  0.042585  0.003407  0.000000  0.047234
0.133333  0.042585  0.005110  0.000000  0.047234
0.177778  0.042585  0.006814  0.000000  0.047234
0.222222  0.042585  0.008517  0.000000  0.047234
0.266667  0.042585  0.010220  0.000000  0.047234
0.311111  0.042585  0.011924  0.000000  0.047234
0.355556  0.042585  0.013627  0.000000  0.047234
0.400000  0.042585  0.015331  0.000000  0.047234
0.444444  0.042585  0.017034  0.000000  0.047234
0.488889  0.042585  0.018737  0.000000  0.047234
0.533333  0.042585  0.020441  0.000000  0.047234
0.577778  0.042585  0.022144  0.000000  0.047234
0.622222  0.042585  0.023848  0.000000  0.047234
```

0.666667	0.042585	0.025551	0.000000	0.047234
0.711111	0.042585	0.027254	0.000000	0.047234
0.755556	0.042585	0.028958	0.000000	0.047234
0.800000	0.042585	0.030661	0.000000	0.047234
0.844444	0.042585	0.032365	0.000000	0.047234
0.888889	0.042585	0.034068	0.000000	0.047234
0.933333	0.042585	0.035771	0.000000	0.047234
0.977778	0.042585	0.037475	0.000000	0.047234
1.022222	0.042585	0.039178	0.000000	0.047234
1.066667	0.042585	0.040882	0.000000	0.047234
1.111111	0.042585	0.042585	0.000000	0.047234
1.155556	0.042585	0.044288	0.000000	0.047234
1.200000	0.042585	0.045992	0.000000	0.047234
1.244444	0.042585	0.047695	0.000000	0.047234
1.288889	0.042585	0.049399	0.000000	0.047234
1.333333	0.042585	0.051102	0.000000	0.047234
1.377778	0.042585	0.052805	0.000000	0.047234
1.422222	0.042585	0.054509	0.000000	0.047234
1.466667	0.042585	0.056212	0.000000	0.047234
1.511111	0.042585	0.057916	0.000000	0.047234
1.555556	0.042585	0.059619	0.000000	0.047234
1.600000	0.042585	0.061322	0.000000	0.047234
1.644444	0.042585	0.063026	0.000000	0.047234
1.688889	0.042585	0.064729	0.000000	0.047234
1.733333	0.042585	0.066433	0.000000	0.047234
1.777778	0.042585	0.068136	0.000000	0.047234
1.822222	0.042585	0.069839	0.000000	0.047234
1.866667	0.042585	0.071543	0.000000	0.047234
1.911111	0.042585	0.073246	0.000000	0.047234
1.955556	0.042585	0.074949	0.000000	0.047234
2.000000	0.042585	0.075707	0.000000	0.047234
2.044444	0.042585	0.076464	0.000000	0.047234
2.088889	0.042585	0.077221	0.000000	0.047234
2.133333	0.042585	0.077978	0.000000	0.047234
2.177778	0.042585	0.078735	0.000000	0.047234
2.222222	0.042585	0.079492	0.000000	0.047234
2.266667	0.042585	0.080249	0.000000	0.047234
2.311111	0.042585	0.081006	0.000000	0.047234
2.355556	0.042585	0.081763	0.000000	0.047234
2.400000	0.042585	0.082520	0.000000	0.047234
2.444444	0.042585	0.083277	0.000000	0.047234
2.488889	0.042585	0.084034	0.000000	0.047234
2.533333	0.042585	0.084791	0.000000	0.047234
2.577778	0.042585	0.085548	0.000000	0.047234
2.622222	0.042585	0.086305	0.000000	0.047234
2.666667	0.042585	0.087063	0.000000	0.047234
2.711111	0.042585	0.087820	0.000000	0.047234
2.755556	0.042585	0.088577	0.000000	0.047234
2.800000	0.042585	0.089334	0.000000	0.047234
2.844444	0.042585	0.090091	0.000000	0.047234
2.888889	0.042585	0.090848	0.000000	0.047234
2.933333	0.042585	0.091605	0.000000	0.047234
2.977778	0.042585	0.092362	0.000000	0.047234
3.022222	0.042585	0.092381	0.017558	0.047234
3.066667	0.042585	0.092400	0.090096	0.047234
3.111111	0.042585	0.092419	0.184914	0.047234
3.155556	0.042585	0.092438	0.277515	0.047234
3.200000	0.042585	0.092457	0.346488	0.047234
3.244444	0.042585	0.092476	0.385798	0.047234
3.288889	0.042585	0.092494	0.423219	0.047234
3.333333	0.042585	0.092513	0.454610	0.047234
3.377778	0.042585	0.092532	0.483969	0.047234
3.422222	0.042585	0.092551	0.511647	0.047234
3.466667	0.042585	0.092570	0.537902	0.047234
3.511111	0.042585	0.092589	0.562934	0.047234
3.555556	0.042585	0.092608	0.586899	0.047234
3.600000	0.042585	0.092627	0.609923	0.047234
3.644444	0.042585	0.092646	0.632109	0.047234
3.688889	0.042585	0.092665	0.653543	0.047234
3.733333	0.042585	0.092684	0.674296	0.047234

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3.777778  0.042585  0.092703  0.694428  0.047234
3.822222  0.042585  0.092722  0.713993  0.047234
3.866667  0.042585  0.092741  0.733036  0.047234
3.911111  0.042585  0.092759  0.751597  0.047234
3.955556  0.042585  0.092778  0.769711  0.047234
4.000000  0.042585  0.092797  0.787408  0.047234
4.044444  0.042585  0.094690  0.804715  0.047234
END FTABLE  2
FTABLE      3
 91    5
   Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
    (ft)   (acres) (acre-ft)   (cfs)     (cfs)   (ft/sec)    (Minutes)***
0.000000  0.043221  0.000000  0.000000  0.000000
0.033111  0.043221  0.001345  0.000000  0.047940
0.066222  0.043221  0.002690  0.000000  0.047940
0.099333  0.043221  0.004036  0.000000  0.047940
0.132444  0.043221  0.005381  0.000000  0.047940
0.165556  0.043221  0.006726  0.000000  0.047940
0.198667  0.043221  0.008071  0.000000  0.047940
0.231778  0.043221  0.009417  0.000000  0.047940
0.264889  0.043221  0.010762  0.000000  0.047940
0.298000  0.043221  0.012107  0.000000  0.047940
0.331111  0.043221  0.013452  0.000000  0.047940
0.364222  0.043221  0.014798  0.000000  0.047940
0.397333  0.043221  0.016143  0.000000  0.047940
0.430444  0.043221  0.017488  0.000000  0.047940
0.463556  0.043221  0.018833  0.000000  0.047940
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END FTABLES

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WDM      2 PREC     ENGL    1              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    1              PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1              IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

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RCHRES   1 HYDR   O      2 1        1      WDM   1002 FLOW     ENGL       REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1003 STAG     ENGL       REPL
COPY     2 OUTPUT MEAN   1 1     48.4      WDM    702 FLOW     ENGL       REPL
COPY   502 OUTPUT MEAN   1 1     48.4      WDM    802 FLOW     ENGL       REPL
COPY   602 OUTPUT MEAN   1 1     48.4      WDM    902 FLOW     ENGL       REPL
RCHRES   2 HYDR   RO     1 1        1      WDM   1008 FLOW     ENGL       REPL
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RCHRES   3 HYDR   O      2 1        1      WDM   1014 FLOW     ENGL       REPL
RCHRES   3 HYDR   STAGE  1 1        1      WDM   1015 STAG     ENGL       REPL
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  END MASS-LINK    2

  MASS-LINK        3
PERLND     PWATER IFWO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    3

  MASS-LINK        5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    5

  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15

  MASS-LINK       17
RCHRES     OFLOW  OVOL   1                 COPY           INPUT  MEAN
  END MASS-LINK   17


END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

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APPENDIX B

Soil Reports

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September 23, 2022

Taco Time Northwest
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Renton, Washington 98057

Attn: Robby Tonkin
(206) 499-1360
rtonkin@tacotimenw.com

Final Soils Report
Proposed Restaurant
1115 & 1129 East Main
Puyallup, Washington
PN: 7845100032 & 0420271171
Doc ID: TacoTimeNorthwest.EMainSt.SR

INTRODUCTION

This *Final Soils Report* summarizes our site observations and geotechnical data review, and addresses the feasibility of stormwater infiltration for the proposed restaurant to be constructed at 1115 and 1129 East Main in Puyallup, Washington. The approximate site location is shown on Figure 1.

Our understanding of the project is based on our correspondence with you and Azure Green Consultants, our review of the provided site plan, our October 14, 2021 subsurface explorations, our July 6, 2022 infiltration tests, our review of the *Preliminary Storm, SS, & Water Plan* prepared by Azure Green Consultants dated June 21, 2022, our understanding of the City of Puyallup's development codes, and our experience in the site area. We understand that you propose to construct a new restaurant on the undeveloped portion of the site. Development will also include expanding parking and converting the existing restaurant into a separate retail space. We anticipate that the new structure will be a one- to two-story, wood-framed structure supported by conventional shallow foundations.

SCOPE

The purpose of our services was to evaluate the surface and subsurface conditions across the site as a basis for providing geotechnical recommendations and design criteria for the proposed restaurant. Specifically, the scope of services for this project included the following:

1. Reviewing the available geologic, hydrogeologic, and geotechnical data for the site area;
2. Exploring surface and subsurface conditions by reconnoitering the site and monitoring the excavation of a series of three test pits at select locations across the site and installed shallow (less than 10 feet) groundwater monitoring stand pipes in each of the test pits;
3. Return to the site and performing two small scale pilot infiltration tests (PITs) in accordance with the 2014 SWMMWW;

4. Describing surface and subsurface conditions, including soil type, depth to groundwater, if encountered, and an estimate of seasonal high groundwater levels;
5. Monitoring groundwater levels bi-weekly throughout the wet season;
6. Perform 2 small-scale Pilot Infiltration Tests (PITs) at select locations at the site;
7. Providing our opinion about the feasibility of onsite infiltration in accordance with the 2014 SWMMWW, including a preliminary design infiltration rate based on grain size analysis, as applicable; and,
8. Preparing this *Soils Report* that satisfies the 2014 SWMMWW requirements and summarizes our site observations and conclusions, and our geotechnical recommendations, along with the supporting data.

SITE CONDITIONS

Surface Conditions

As mentioned above, the site is located at 1115 and 1129 East Main in Puyallup, Washington, within an area of existing commercial development. The site consists of two tax parcels, that when combined is generally trapezoidal in shape, measures approximately 480 to 570 feet long (north to south) by approximately 275 feet wide (east to west), and encompasses approximately 3.3 acres. The site is bounded by the Puyallup River to the north, E Main St to the south, an RV park to the west, and commercial and non-developed parcels to the east. The southern portion of the site is currently developed with an existing Taco Time building in the southwestern portion of the site. The remaining area of the southern portion of the site is developed with automobile parking. The northern portion of the site is undeveloped.

Based on topographic information obtained from Pierce County Public GIS and our site observations, the ground surface of the site generally slopes down to the north. In the southern portion of the site, in the area of the existing commercial development, the ground surface is relatively level. In the central portion of the site, the ground surface slopes down to the north at approximately 4 to 8 percent. These slopes continue at similar inclinations throughout the northern portion of the site. The total topographic relief of the site is on the order of approximately 15 feet. The existing site configuration and topography are shown on the Site & Exploration Map, Figure 2 and Site Vicinity Map, Figure 3.

Vegetation in the southern portion of the site generally consists of commercial landscaping in the parking lot area with some scattered coniferous and deciduous trees with areas of maintained grass. In the central and northern portion of the site, vegetation generally consists of a moderate stand of coniferous and deciduous trees with a moderately dense understory of native and invasive plants and shrubs. No seeps, springs, or standing water was observed at the time of our site reconnaissance. No areas of surficial erosion or slope movement were observed at the time of our site visit.

Site Soils

The Natural Resource Conservation Service (NRCS) Web Soil Survey maps the site as being underlain by Pilchuck fine sandy loam (29A) and Puyallup sandy loam (31A). Detailed descriptions of the above listed soil types are included below. A copy of the NRCS soils map is included as Figure 4.

Pilchuck fine sandy loam (29A): The Pilchuck soils are mapped across the northern portion of the site. These soils are derived from mixed alluvium under hardwoods and conifers, form on slopes of less

than 3 percent, have a "none" erosion hazard when exposed, and are included in hydrologic soils group C.

Puyallup sandy loam (31A): The Puyallup fine sandy loam soils are mapped across the southern portion of the site. These soils are derived from alluvium, form on slopes of 0 to 3 percent, have a "slight" erosion hazard when exposed, and are included in hydrologic soils group A.

Site Geology

According to the *draft Geologic map of the Puyallup 7.5-minute Quadrangle, Washington* by Troost, (in review) the site is mapped as being underlain by Quaternary Alluvium (Qal). A detailed description of the geologic unit is included below. An excerpt from the geologic map is included as Figure 5.

Quarternary Alluvium (Qal): Alluvial soils generally consist of normally consolidated, stratified deposits of sand, silt, clay, and occasional peat that were deposited along the Puyallup River channel. The existing topography, as well as the surficial and shallow soils in the area, are the result of fluvial action, including down-cutting by the river, channel meandering and migration, and flood deposits.

Subsurface Explorations

On October 14, 2021, a field representative from GeoResources visited the site and monitored the excavation of three test pits to depths of about 9½ to 10½ feet below the existing ground surface, logged the subsurface conditions encountered in each test pit, and obtained representative soil samples. The test pits were excavated by a small track-mounted excavator operated by a licensed operated working under subcontract to GeoResources. The soil densities presented on the logs were based on the difficulty of excavation and our experience. The number and location of the test pits were selected in the field based on project information provided by Azure Green Consultants, consideration for underground utilities, existing site conditions, and current site usage. An open standpipe piezometer (OSP) was installed in each test pit and backfilled with the excavated soils and bucket tamped, but not otherwise compacted.

On July 6, 2022, we returned to the site to perform two pilot infiltration tests (PITs) at depths of approximately 4 feet below existing ground surface. As part of the test, we logged subsurface conditions encountered in each exploration, and obtained representative soil samples. The PITs were excavated by a small track-mounted excavator operated by a licensed earthwork contractor working for you and GeoResources. The soil densities presented on the logs were based on the difficulty of excavation and our experience. Each PIT was then backfilled with the excavated soils and bucket tamped, but not otherwise compacted.

The subsurface explorations excavated as part of this evaluation indicate the subsurface conditions at specific locations only, as actual subsurface conditions can vary across the site. Furthermore, the nature and extent of such variation would not become evident until additional explorations are performed or until construction activities have begun. Based on our experience in the area and extent of prior explorations in the area, it is our opinion that the soils encountered in the explorations are generally representative of the soils at the site.

The soils encountered were visually classified in accordance with the Unified Soil Classification System (USCS) and ASTM D: 2488. The approximate locations of our test pits are indicated on the attached Site & Exploration Map, Figure 2. The USCS is included in Appendix A as

Figure A-1, while the descriptive logs of our test pits and PITs are included as Figures A-2 through A-4.

Subsurface Conditions

At the locations of our test pits we encountered uniform subsurface conditions that in our opinion generally confirmed the mapped stratigraphy at the site. Our test pits generally encountered approximately ¾ to 1 foot of topsoil. Underlying the topsoil in test pit TP-1 we encountered approximately 4½ feet of brown silty sand with significant amounts of concrete, some metal, and trace organics. We interpret these soils to be undocumented fill. Underlying the topsoil in test pit TP-2 we encountered brown poorly graded sand with some silt and gravel in a loose to medium dense, moist condition. We interpret these soils be weathered alluvium. Underlying the topsoil in test pit TP-3 and the weathered alluvium in test pit TP-2, we encountered brown-grey to grey fine silty sand in a medium dense, moist condition. We interpret these soils to be alluvium and were encountered to the full depth explored in test pit TP-2. Underlying the undocumented fill in test pit TP-1 and the alluvium in test pit TP-3, we encountered brown grey sandy silt in a stiff, moist condition. We interpret these soils to be consistent with alluvium deposits. These soils were encountered to the full depth explored.

At the locations of our Pilot Infiltration Tests (PITs) we encountered relatively uniform subsurface conditions that, in our opinion, generally confirmed the mapped stratigraphy and the encountered stratigraphy in our previously excavated test pits. Our PITs encountered approximately ¾ feet of topsoil mantling approximately 1 to 1 ¼ feet of brown poorly graded sand with some silt and gravel to dark brown silty sand in a loose to medium dense, moist condition. We interpret these soils to be weathered alluvium. Underlying the weathered alluvium in PIT-1 we encountered approximately 3¾ feet of brown-grey sandy silt in a medium stiff, moist condition. We interpret these soils to be alluvium. Underlying the weathered alluvium in PIT-2 and the sandy silt alluvium in PIT-1, we encountered brown-grey silty sand in a medium dense, moist condition. We interpret these soils to be alluvium and these soils were encountered to the full depth explored.

Laboratory Testing

Geotechnical laboratory tests were performed on two samples retrieved from the test pits to estimate index engineering properties of the soils encountered. Laboratory testing included visual soil classification per ASTM D: 2487 and ASTM D: 2488, moisture content determinations per ASTM D: 2216, and grain size analyses per ASTM D: 6913 standard procedures. The results of the laboratory tests are included in Appendix B.

Groundwater Conditions

At the locations and time of our test pit explorations we did not encounter groundwater seepage within the depths explored. However, we did observe iron-oxide staining/discoloration, otherwise known as mottling, at approximately 4 to 5¼ feet below existing ground surface. Mottling is generally indicative of a seasonal or fluctuating groundwater surface, often associated with perched groundwater. Perched groundwater table develops when the vertical infiltration of precipitation through a more permeable soil, is slowed at depth by a deeper, less permeable soil type. We anticipate fluctuations in the local groundwater levels will occur in response to precipitation patterns, off-site construction activities, and site utilization. We performed wet season monitoring of the groundwater elevation on a bi-weekly basis throughout the 2021/2022 wet season. Table 1,

below, summarizes the depth and elevation of groundwater encountered during our wet season monitoring.

TABLE 1:
APPROXIMATE DEPTH AND ELEVATION OF ENCOUNTERED GROUNDWATER

Date	OSP-1 (47.92')		OSP-2 (49.91')		OSP-3 (54.06')	
	Measured Depth to Water (feet)	Water Elevation (feet)	Measured Depth to Water (feet)	Water Elevation (feet)	Measured Depth to Water (feet)	Water Elevation (feet)
12/28/2021	6.9	42.1	6.6	43.9	9.7	46.8
1/14/2022	6.1	42.9	5.7	44.8	8.8	47.7
1/28/2022	7.1	41.9	6.8	43.7	9.7	46.8
2/11/2022	7.8	41.3	7.5	43.0	10.0	46.5
2/23/2022	8.3	40.9	7.9	42.6	10.0	46.5
3/1/2022	5.3	43.7	5.5	45.0	9.3	47.2
3/9/2022	6.4	42.6	6.5	44.0	9.5	47.0
3/21/2022	7.0	42.0	6.7	43.8	9.7	46.8

Notes:
1= Elevations of OSP's provided by Azure Green Consultants

CONCLUSIONS AND RECOMMENDATIONS

Based on the results of our data review, site reconnaissance, and subsurface explorations, it is our opinion that the infiltration of stormwater runoff generated onsite by the new impervious surfaces may be feasible for this project.

Infiltration Recommendations

Based on our site observations and subsurface explorations, it is our opinion that stormwater infiltration via a trench or basin type system may be feasible at the site. Per Volume 3.1.1 of the 2014 SWMMWW, downspout infiltration is considered feasible on lots or sites if 3 feet or more of permeable soil from the proposed final grade to the seasonal high ground water table exists and at least 1 foot of clearance from the expected bottom elevation of the infiltration facility to the seasonal high ground water table can be met. For the purposes of this infiltration feasibility evaluation, we have assumed that, at a minimum, the standard infiltration trench section (6 inches of topsoil over a 2 foot deep trench) and the standard permeable pavement section (6 inches of pavement over 6 inches of storage course) would be used for a total depth of 3.5 feet. Deeper trenches and thicker storage courses may be designed by a civil engineer where the vertical separation requirements can be met. The silty sand to sandy silt alluvium soils encountered in test pits TP-2 and TP-3 encountered mottling at approximately 4 to 5 feet below existing ground surface. We interpret the mottling to be indicative of seasonal high groundwater. Test pit TP-1 encountered approximately 4½ feet of undocumented fill, therefore infiltration is not feasible near this location.

The City of Puyallup uses the 2012 Stormwater Management Manual for Western Washington, with 2014 updates (2014 SWMMWW). Volume III Section 3.4.2 of the 2014 SWMMWW requires at least 1 foot of separation from the bottoms of rain gardens and permeable pavement to

seasonal high groundwater. A 1 foot or 3 foot minimum vertical separation from the bottom of bioretention is required depending upon the drainage area. For the purposes of this evaluation, a standard permeable pavement section (6 inches of pavement over 6 inches of storage course) would be used. Based on the above, shallow infiltration facilities such as rain gardens, bioretention, and permeable pavement appear to be feasible. Deeper trenches and thicker storage courses may be designed by a civil engineer where the vertical separation requirements can be met.

We performed two small scale Pilot Infiltration Tests (PITs) in the area of the parking lot infiltration gallery (PIT-1) and the proposed roof Infiltration area (PIT-2). After applying correction factors of 0.5 for test method, 0.5 for site variability, and 0.9 for maintenance, we recommend a long term design infiltration rate of approximately 0.3 inches per hour within the sandy silt of PIT-1 and 1.1 inches per hour within the silty sand of PIT-2. All minimum vertical separations, horizontal setback requirements, and infeasibility criteria per 2014 SWMMWW should be considered prior to the selection, design and location of any stormwater facility for the proposed development.

Construction Considerations

Appropriate design, construction and maintenance measures will be required to ensure the infiltration rate can be effectively maintained over time. Stormwater Best Management Practices (BMPs) in accordance with the 2014 SWMMWW should be included in the project plans and specifications to minimize the potential for fines contamination of Low Impact Development BMPs utilized at the site.

Suspended solids could clog the underlying soil and reduce the infiltration rate. To reduce potential clogging of the infiltration systems, the infiltration system should not be connected to the stormwater runoff system until after construction is complete and the site area is landscaped, paved or otherwise protected. Additional measures may also be taken during construction to minimize the potential of fines contamination of the proposed infiltration system, such as utilizing an alternative storm water management location during construction or leaving the bottom of the permanent systems 1 to 2 feet high, and subsequently excavating to the finished grade once the site soils have been stabilized. All contractors working on the site (builders and subcontractors) should divert sediment laden stormwater away from proposed infiltration facilities during construction and landscaping activities. No concrete trucks should be washed or cleaned, and washout areas should not be within the vicinity of the proposed infiltration facilities. After construction activities have been completed, periodic sweeping of the paved areas will help extend the life of the infiltration system.

LIMITATIONS

We have prepared this report for use by Taco Time NW and other members of the design team, for use in the permitting and design of a portion of this project. The data used in preparing this report and this report should be provided to prospective contractors for their bidding or estimating purposes only. Our report, conclusions and interpretations are based on subsurface explorations and data from others and limited site reconnaissance, and should not be construed as a warranty of the subsurface conditions.

Variations in subsurface conditions are possible between the explorations and may also occur with time. A contingency for unanticipated conditions should be included in the budget and schedule. Sufficient monitoring, testing and consultation should be provided by our firm during construction to confirm that the conditions encountered are consistent with those indicated by the explorations, to

provide recommendations for design changes should the conditions revealed during the work differ from those anticipated, and to evaluate whether earthwork and foundation installation activities comply with contract plans and specifications.

The scope of our services does not include services related to environmental remediation and construction safety precautions. Our recommendations are not intended to direct the contractor's methods, techniques, sequences or procedures, except as specifically described in our report for consideration in design.

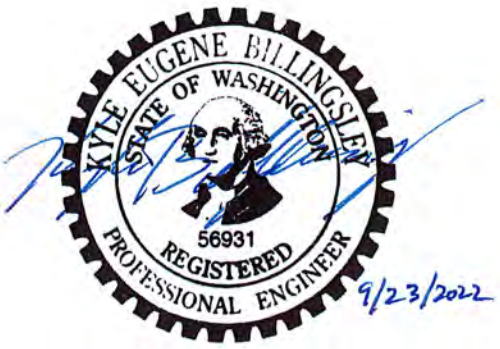
If there are any changes in the loads, grades, locations, configurations or type of facilities to be constructed, the conclusions and recommendations presented in this report may not be fully applicable. If such changes are made, we should be given the opportunity to review our recommendations and provide written modifications or verifications, as appropriate.

◆ ◆ ◆

We have appreciated the opportunity to be of service to you on this project. If you have any questions or comments, please do not hesitate to call at your earliest convenience.

Respectfully submitted,
GeoResources, LLC

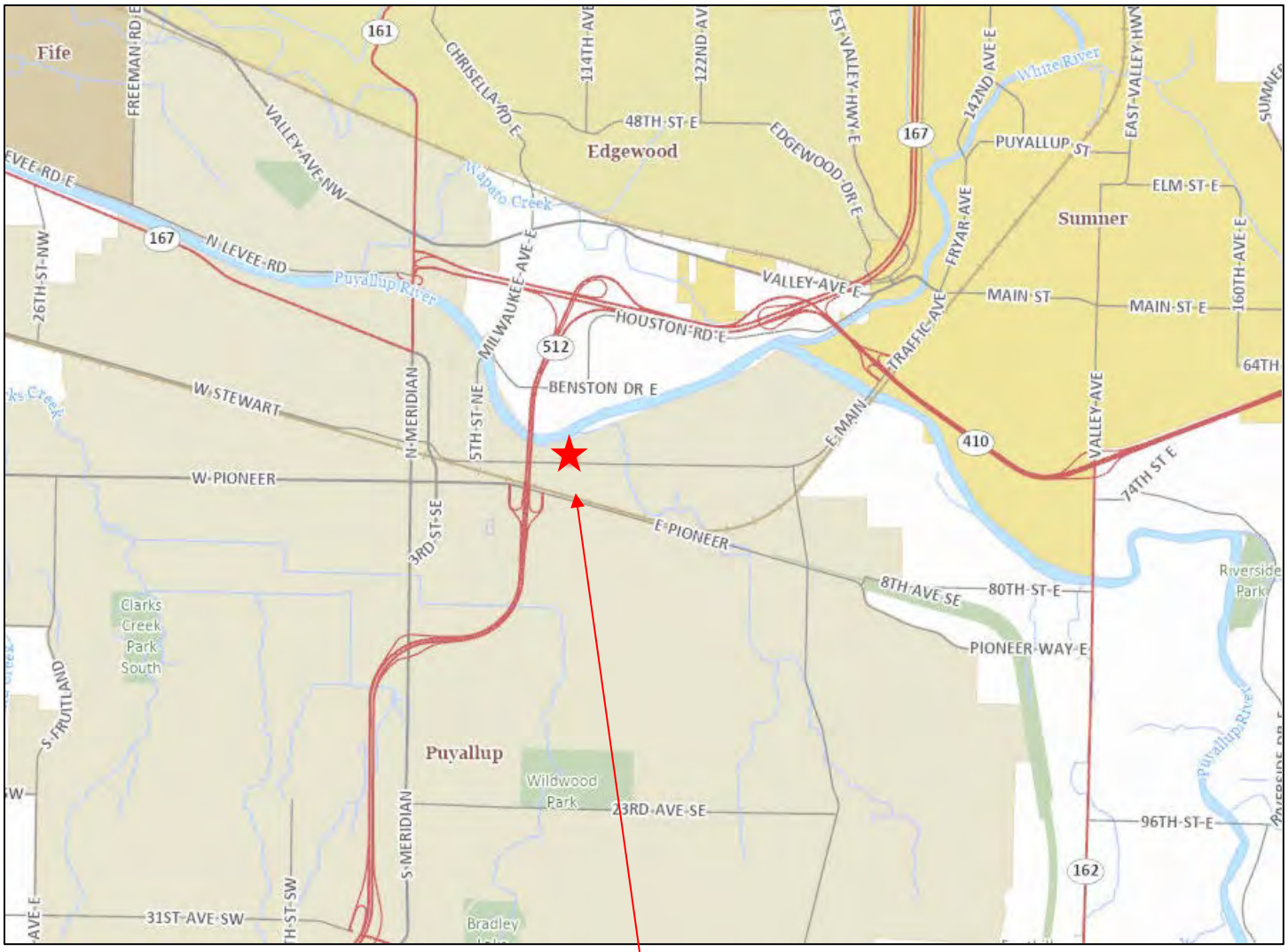
Davis Carlsen, GIT
Staff Geologist



Kyle E. Billingsley, PE
Project Engineer

Eric W. Heller, PE, LG
Senior Geotechnical Engineer

DC:KEB:EWH/dc
DocID: TacoTimeNorthwest.EMainSt.SR
Attachments:
Figure 1: Site Vicinity Map
Figure 2: Site & Exploration Plan
Figure 3. Site Vicinity Map
Figure 4: NRCS Soils Map
Figure 5: Geologic Map
Appendix A – Subsurface Explorations
Appendix B – Laboratory Test Results



Approximate Site Location

Map created from Peirce County Public GIS (https://matterhornwab.co.pierce.wa.us/publicgis/)

Not to Scale

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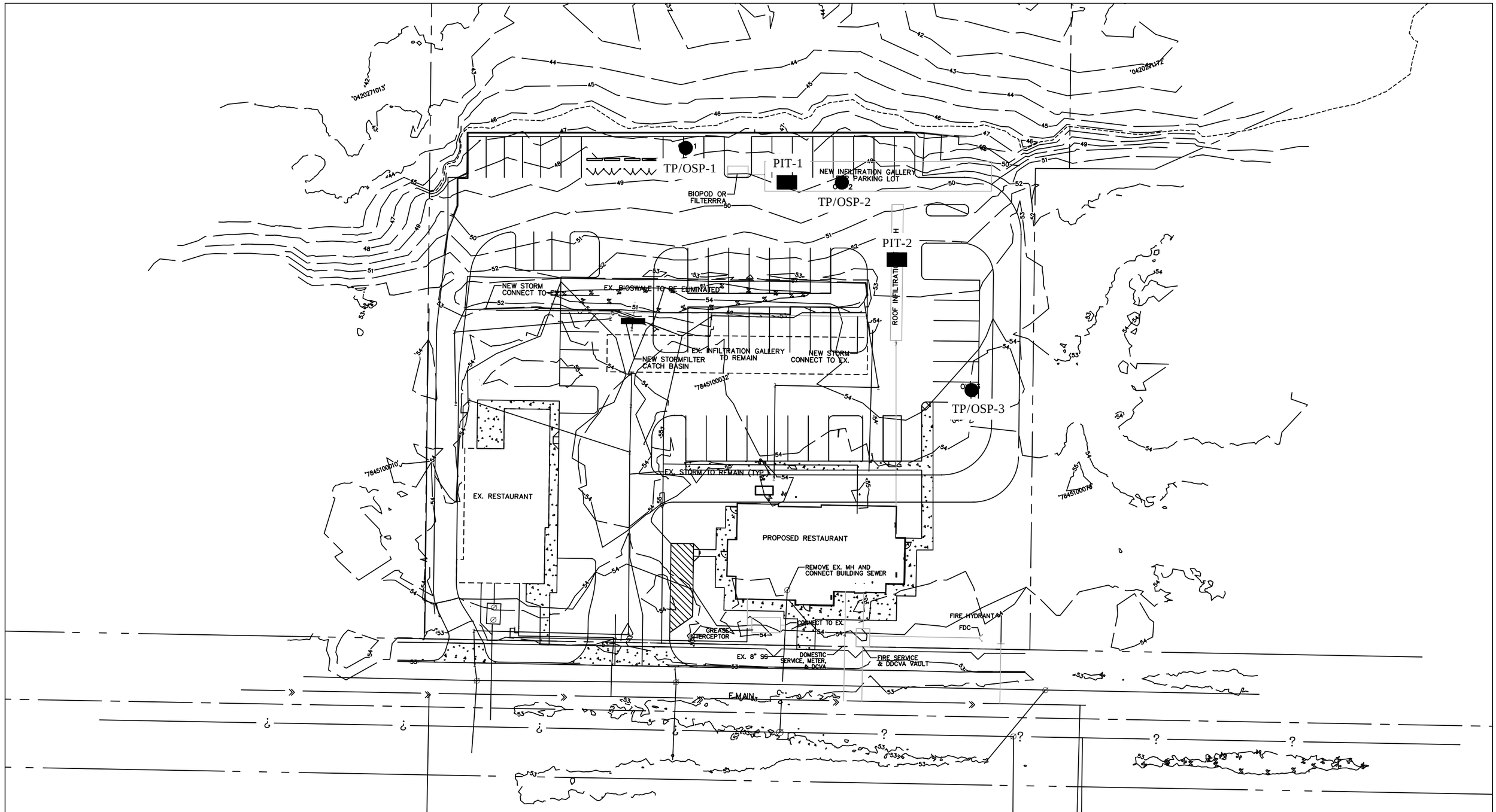
Site Location Map

Proposed Taco Time
1115 & 1129 East Main
Puyallup, Washington
PN: 7845100032 & 0420271171

DocID: TacoTimeNorthwest.EMainSt.F.docx	September 2022	Figure 1



● TP/OSP - # Test Pit/ Open Standpipe Piezometer number and approximate location

■ PIT - # Pilot Infiltration Test number and approximate location

Notes:
Site plan prepared by Azure Green Consultants dated August 1, 2022.

Scale:1" = 40'

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Site & Exploration Plan
1115 & 1129 East Main
Puyallup, Washington
PN: 7845100032 & 0420271171

TacoTimeNorthwest.EMaint.F2	September 2022	Figure 2

Approximate Site Location

Map created from Peirce County Public GIS (https://matterhornwab.co.pierce.wa.us/publicgis/)

Not to Scale

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Site Vicinity Map

Proposed Taco Time
1115 & 1129 East Main
Puyallup, Washington
PN: 7845100032 & 0420271171

DocID: TacoTimeNorthwest.EMainSt.F	September 2022	Figure 3

Approximate Site Location

Map created from Web Soil Survey (http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx)

Soil Type	Soil Name	Parent Material	Slopes	Erosion Hazard	Hydrologic Soils Group
W	Water	-	-	-	-
29A	Pilchuck fine sandy loam	Mixed alluvium under hardwoods and conifers	<3	None	C
31A	Puyallup fine sandy loam	Alluvium	0 to 3	Slight	A

Not to Scale

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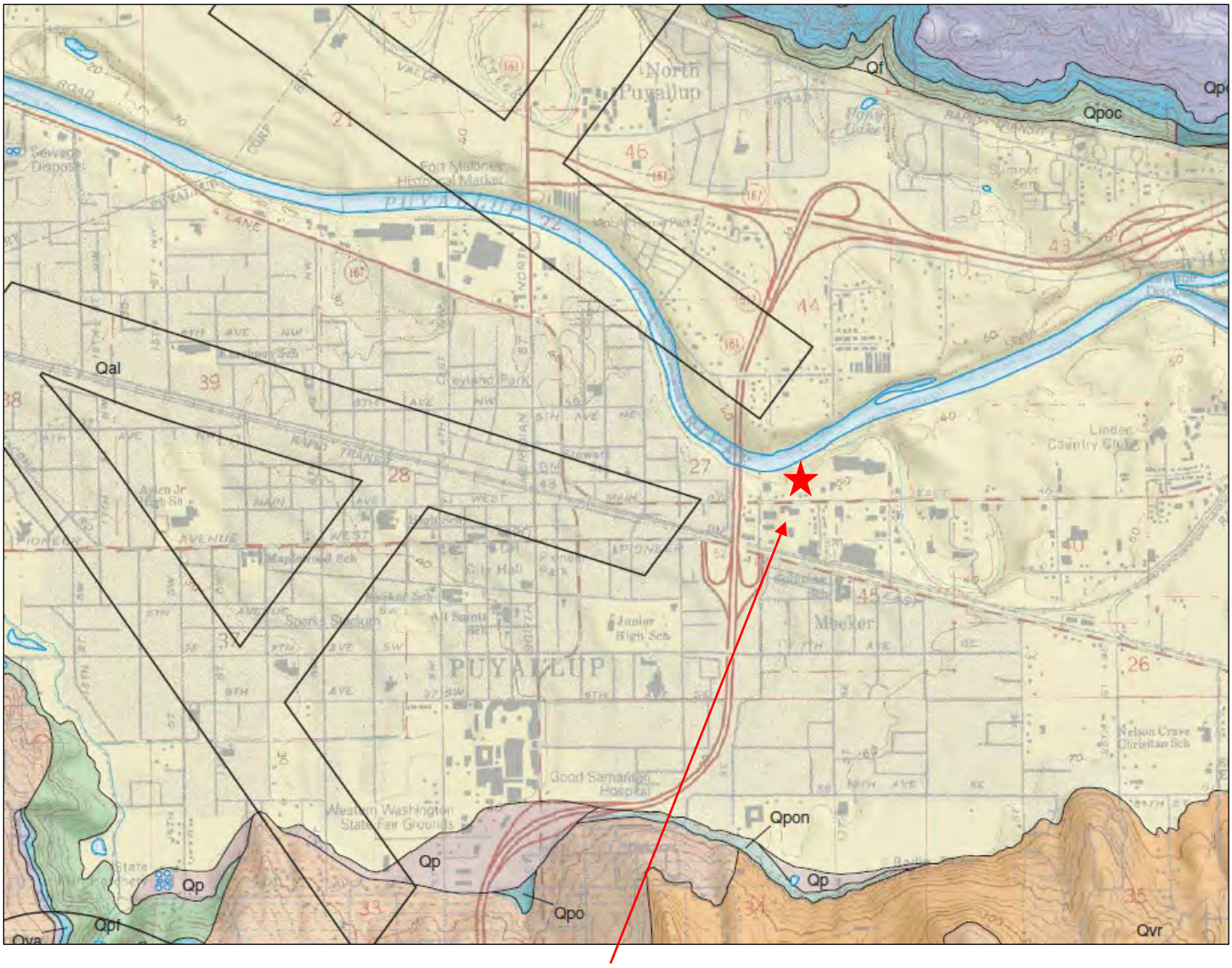
NRCS Soils Map

Proposed Taco Time
1115 & 1129 East Main
Puyallup, Washington
PN: 7845100032 & 0420271171



Approximate Site Location

Excerpt from the draft *Geologic Map of the Puyallup 7.5-Minute Quadrangle, Washington*
By Troost, K.G. (in review)

Qal	Alluvium

Not to Scale

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Geologic Map

Proposed Taco Time
1115 & 1129 East Main
Puyallup, Washington
PN: 7845100032 & 0420271171

DocID: TacoTimeNorthwest.EMainSt.F	September 2022	Figure 5

Appendix A

Subsurface Explorations

SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP SYMBOL	GROUP NAME
COARSE GRAINED SOILS More than 50% Retained on No. 200 Sieve	GRAVEL More than 50% Of Coarse Fraction Retained on No. 4 Sieve	CLEAN GRAVEL	GW	WELL-GRADED GRAVEL, FINE TO COARSE GRAVEL
			GP	POORLY-GRADED GRAVEL
		GRAVEL WITH FINES	GM	SILTY GRAVEL
			GC	CLAYEY GRAVEL
	SAND More than 50% Of Coarse Fraction Passes No. 4 Sieve	CLEAN SAND	SW	WELL-GRADED SAND, FINE TO COARSE SAND
			SP	POORLY-GRADED SAND
		SAND WITH FINES	SM	SILTY SAND
			SC	CLAYEY SAND
FINE GRAINED SOILS More than 50% Passes No. 200 Sieve	SILT AND CLAY Liquid Limit Less than 50	INORGANIC	ML	SILT
			CL	CLAY
		ORGANIC	OL	ORGANIC SILT, ORGANIC CLAY
	SILT AND CLAY Liquid Limit 50 or more	INORGANIC	MH	SILT OF HIGH PLASTICITY, ELASTIC SILT
			CH	CLAY OF HIGH PLASTICITY, FAT CLAY
		ORGANIC	OH	ORGANIC CLAY, ORGANIC SILT
HIGHLY ORGANIC SOILS			PT	PEAT

NOTES:

1. Field classification is based on visual examination of soil in general accordance with ASTM D2488-90.
2. Soil classification using laboratory tests is based on ASTM D2487-90.
3. Description of soil density or consistency are based on interpretation of blow count data, visual appearance of soils, and or test data.

SOIL MOISTURE MODIFIERS:

Dry- Absence of moisture, dry to the touch

Moist- Damp, but no visible water

Wet- Visible free water or saturated, usually soil is obtained from below water table

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Unified Soils Classification System

Proposed Taco Time
1115 & 1129 East Main
Puyallup, Washington
PN: 7845100032 & 0420271171

Test Pit/ Open Standpipe Piezometer TP/OSP-1

Location: North of existing structure
Approximate Elevation: 47'

Depth (ft)			Soil Type	Soil Description
0	-	¾	-	Topsoil/rootzone
¾	-	5¼	SM	Brown silty SAND with significant amounts of cement fragments, some metal, and trace organics (Undocumented fill) (medium dense, moist)
5¼	-	10½	ML	Brown-grey sandy SILT (alluvium deposits) (stiff, moist)

Terminated at 10½ feet below ground surface.
Mottling observed at approximately 5¼ feet below existing ground surface
No significant caving observed at the time of excavation.
No seepage observed at the time of excavation.

Test Pit/ Open Standpipe Piezometer TP/OSP-2

Location: East-central portion of site
Approximate Elevation: 49

Depth (ft)			Soil Type	Soil Description
0	-	¾	-	Topsoil/rootzone
¾	-	1¾	SP-SM	Brown poorly graded SAND with some silt and gravel (Weathered Alluvium) (loose to medium dense, moist)
1¾	-	10	SM	Grey silty fine SAND (Alluvium) (medium dense, moist)

Terminated at 10 feet below ground surface.
Mottling observed at approximately 5 feet below existing ground surface
No significant caving observed at the time of excavation.
No seepage observed at the time of excavation.

Logged by: DC **Excavated on: October 14, 2021**

Test Pit/Open Standpipe Piezometer TP/OSP-3

Location: Southeast portion of site
Approximate Elevation: 54'

Depth (ft)			Soil Type	Soil Description
0	-	1	-	Topsoil/rootzone
1	-	7	ML	Brown-grey sandy SILT (medium dense, moist) (alluvium)
7	-	9½	ML	Brown-grey sandy SILT (Stiff, moist) (alluvium deposits)

Terminated at 9½ feet below ground surface.
Mottling observed at approximately 4 feet below existing ground surface
No significant caving observed at the time of excavation.
No seepage observed at the time of excavation.

Logged by: DC **Excavated on: October 14, 2021**

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Test Pit Logs

Proposed Taco Time
1115 & 1129 East Main
Puyallup, Washington
PN: 7845100032 & 0420271171

Pilot Infiltration Test PIT-1

Location: Parking Lot Infiltration Gallery
Approximate Elevation: 49'

Depth (ft)			Soil Type	Soil Description
0	-	¾	-	Topsoil/rootzone
¾	-	1¾	SM	Dark Brown silty SAND (loose to medium dense, moist) (weathered alluvium)
1¾	-	5½	ML	Brown-grey sandy SILT (alluvium deposits) (medium stiff, moist)
5½	-	7½	SM	Brown-grey silty SAND (alluvium deposits) (medium dense, moist)

Terminated at 7½ feet below ground surface (BGS)
Mottling observed at approximately 2 feet below existing ground surface
No significant caving observed at the time of excavation.
No seepage observed at the time of excavation.

Pilot Infiltration Test PIT-2

Location: Roof Infiltration Trench
Approximate Elevation: 53

Depth (ft)			Soil Type	Soil Description
0	-	¾	-	Topsoil/rootzone
¾	-	2	SP-SM	Brown poorly graded SAND with some silt and gravel (Weathered Alluvium) (loose to medium dense, moist)
2	-	7¾	SM	Brown-grey silty SAND (alluvium deposits) (medium dense, moist)

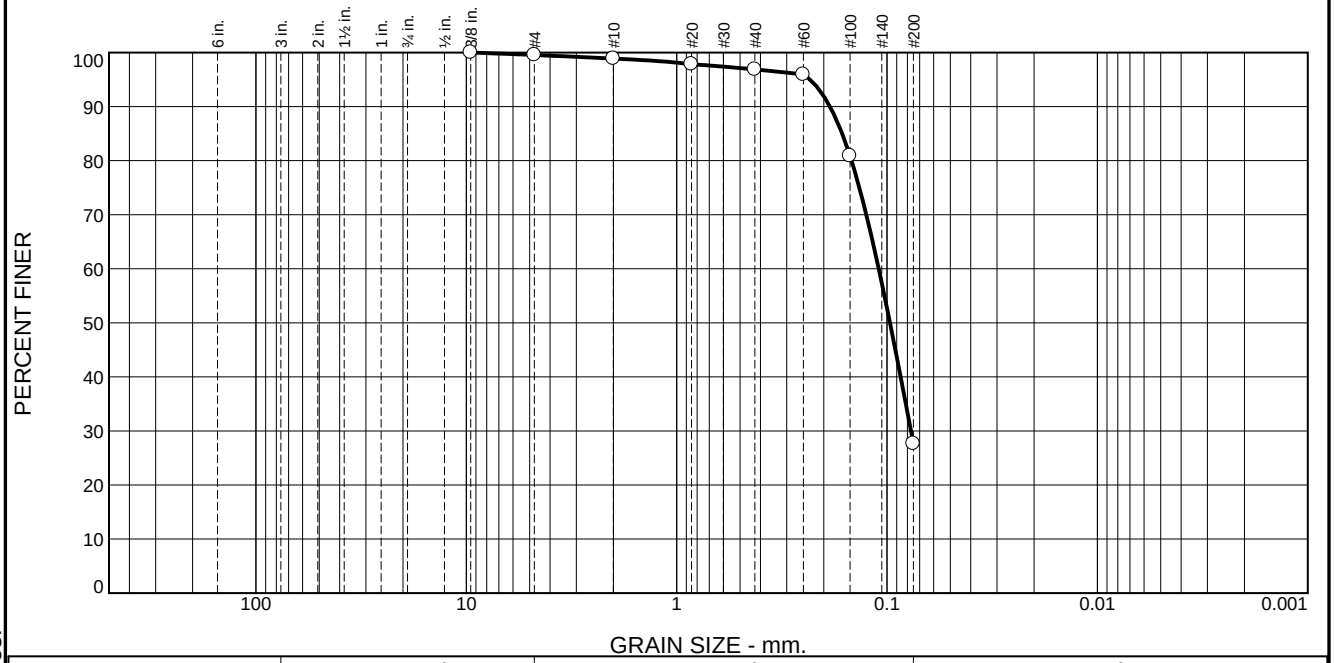
Terminated at 7¾ feet below ground surface (BGS)
Mottling observed at approximately7 feet below existing ground surface
No significant caving observed at the time of excavation.
No seepage observed at the time of excavation.

Logged by: DC **Excavated on: July 6, 2022**

Appendix B

Laboratory results

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.5	0.6	2.0	69.2	27.7	

Test Results (ASTM D 6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
0.375	100.0		
#4	99.5		
#10	98.9		
#20	97.8		
#40	96.9		
#60	95.9		
#100	80.9		
#200	27.7		

* (no specification provided)

Material Description

Silty SAND (SM)

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-2-4(0)

Coefficients

D_{90}= 0.1868 D_{85}= 0.1634 D_{60}= 0.1095
D_{50}= 0.0969 D_{30}= 0.0770 D_{15}=
D_{10}= C_u= C_c=

Remarks

Natural Moisture: 5.7%

Date Received: 10/19/21 **Date Tested:** 10/19/21

Tested By: MAW

Checked By: KEB

Title: PM

Location: TP-2, S-1 **Date Sampled:** 10/19/21
Sample Number: 102580 **Depth:** 4'

GeoResources, LLC

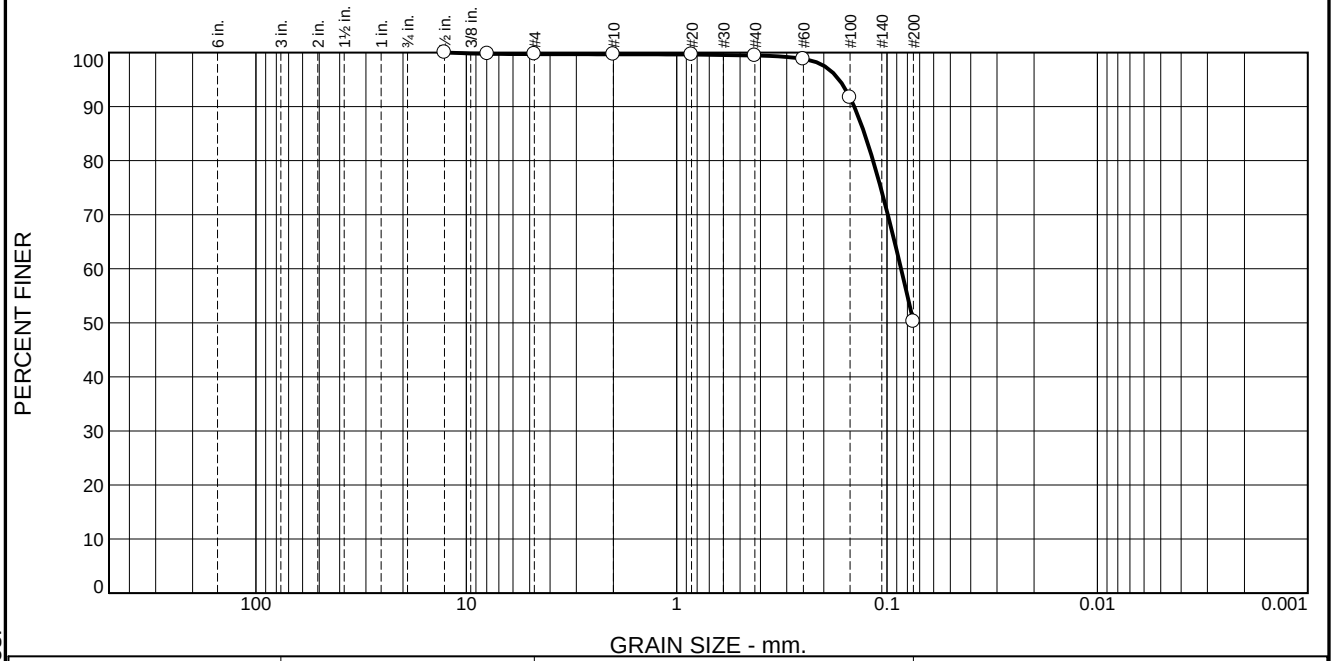
Fife, WA

Client: Taco Time Northwest
Project: Proposed Taco Time

Project No: TacoTimeNorthwest.EMainSt **Figure** B-1

Tested By: _____ **Checked By:** _____

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.3	0.0	0.3	49.1	50.3	

Test Results (ASTM D 6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.5	100.0		
.3125	99.8		
#4	99.7		
#10	99.7		
#20	99.6		
#40	99.4		
#60	98.8		
#100	91.7		
#200	50.3		

* (no specification provided)

Material Description

Sandy SILT (ML)

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= ML **AASHTO (M 145)=** A-4(0)

Coefficients

D_{90}= 0.1432 D_{85}= 0.1279 D_{60}= 0.0858
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Natural Moisture: 15.3%

Date Received: 10/19/21 **Date Tested:** 10/19/21

Tested By: MAW

Checked By: KEB

Title: PM

Location: TP-3 S-1
Sample Number: 102581 **Depth:** 3'

Date Sampled: 10/19/21

GeoResources, LLC

Fife, WA

Client: Taco Time Northwest
Project: Proposed Taco Time

Project No: TacoTimeNorthwest.EMainSt **Figure** B-2

Tested By: _____ **Checked By:** _____

APPENDIX C

Filterra GULD

WASHINGTON STATE DEPARTMENT OF ECOLOGY

June 2020

GENERAL USE LEVEL DESIGNATION FOR BASIC (TSS), ENHANCED, PHOSPHORUS & OIL TREATMENT

For

CONTECH Engineered Solutions Filterra®

Ecology's Decision:

Based on Contech's submissions, including the Final Technical Evaluation Reports, dated August 2019, March 2014, December 2009, and additional information provided to Ecology dated October 9, 2009, Ecology hereby issues the following use level designations:

1. A General Use Level Designation for Basic, Enhanced, Phosphorus, and Oil Treatment for the Filterra® system constructed with a minimum media thickness of 21 inches (1.75 feet), at the following water quality design hydraulic loading rates:

Treatment	Infiltration Rate (in/hr) for use in Sizing
Basic	175
Phosphorus	100
Oil	50
Enhanced	175

2. The Filterra is not appropriate for oil spill-control purposes.
3. Ecology approves Filterra systems for treatment at the hydraulic loading rates listed above, and sized based on the water quality design flow rate for an off-line system. Calculate the water quality design flow rates using the following procedures:

- Western Washington: for treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute flow rate as calculated using the latest version of the Western Washington Hydrology Model or other Ecology-approved continuous runoff model.
- Eastern Washington: For treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute flow rate as calculated using one of the three flow rate based methods described in Chapter 2.7.6 of the Stormwater Management Manual for Eastern Washington (SWMMEW) or local manual.
- Entire State: For treatment installed downstream of detention, the water quality design flow rate is the full 2-year release rate of the detention facility.

4. This General Use Level Designation has no expiration date, but Ecology may revoke or amend the designation, and is subject to the conditions specified below.

Ecology's Conditions of Use:

Filterra systems shall comply with these conditions shall comply with the following conditions:

1. Design, assemble, install, operate, and maintain the Filterra systems in accordance with applicable Contech Filterra manuals and this Ecology Decision.
2. The minimum size filter surface-area for use in Washington is determined by using the design water quality flow rate (as determined in this Ecology Decision, Item 3, above) and the Infiltration Rate from the table above (use the lowest applicable Infiltration Rate depending on the level of treatment required). Calculate the required area by dividing the water quality design flow rate (cu-ft/sec) by the Infiltration Rate (converted to ft/sec) to obtain required surface area (sq-ft) of the Filterra unit.
3. Each site plan must undergo Contech Filterra review before Ecology can approve the unit for site installation. This will ensure that design parameters including site grading and slope are appropriate for use of a Filterra unit.
4. Filterra media shall conform to the specifications submitted to and approved by Ecology and shall be sourced from Contech Engineered Solutions, LLC with no substitutions.
5. Maintenance includes removing trash, degraded mulch, and accumulated debris from the filter surface and replacing the mulch layer. Use inspections to determine the site-specific maintenance schedules and requirements. Follow maintenance procedures given in the most recent version of the Filterra Operation and Maintenance Manual.
6. Maintenance: The required maintenance interval for stormwater treatment devices is often dependent upon the degree of pollutant loading from a particular drainage basin. Therefore, Ecology does not endorse or recommend a "one size fits all" maintenance cycle for a particular model/size of manufactured treatment device.
    - Contech designs Filterra systems for a target maintenance interval of 6 months in the Pacific Northwest. Maintenance includes removing and replacing the mulch layer above the media along with accumulated sediment, trash, and captured organic materials therein, evaluating plant health, and pruning the plant if deemed necessary.
    - Conduct maintenance following manufacturer's guidelines.
7. Filterra systems come in standard sizes.
8. Install the Filterra in such a manner that flows exceeding the maximum Filterra operating rate are conveyed around the Filterra mulch and media and will not resuspend captured sediment.
9. Discharges from the Filterra units shall not cause or contribute to water quality standards violations in receiving waters.

Approved Alternate Configurations

Filterra Internal Bypass - Pipe (FTIB-P)

1. The Filterra® Internal Bypass – Pipe allows for piped-in flow from area drains, grated inlets, trench drains, and/or roof drains. Design capture flows and peak flows enter the structure through an internal slotted pipe. Filterra® inverted the slotted pipe to allow design flows to drop through to a series of splash plates that then disperse the design flows over the top surface of the Filterra® planter area. Higher flows continue to bypass the slotted pipe and convey out the structure.
2. To select a FTIB-P unit, the designer must determine the size of the standard unit using the sizing guidance described above.

Filterra Internal Bypass – Curb (FTIB-C)

1. The Filterra® Internal Bypass –Curb model (FTIB-C) incorporates a curb inlet, biofiltration treatment chamber, and internal high flow bypass in one single structure. Filterra® designed the FTIB-C model for use in a "Sag" or "Sump" condition and will accept flows from both directions along a gutter line. An internal flume tray weir component directs treatment flows entering the unit through the curb inlet to the biofiltration treatment chamber. Flows in excess of the water quality treatment flow rise above the flume tray weir and discharge through a standpipe orifice; providing bypass of untreated peak flows. Americast manufactures the FTIB-C model in a variety of sizes and configurations and you may use the unit on a continuous grade when a single structure providing both treatment and high flow bypass is preferred. The FTIB-C model can also incorporate a separate junction box chamber to allow larger diameter discharge pipe connections to the structure.
2. To select a FTIB-C unit, the designer must determine the size of the standard unit using the sizing guidance described above.

Filterra® Shallow

1. The Filterra Shallow provides additional flexibility for design engineers and designers in situations where various elevation constraints prevent application of a standard Filterra configuration. Engineers can design this system up to six inches shallower than any of the previous Filterra unit configurations noted above.
2. Ecology requires that the Filterra Shallow provide a media contact time equivalent to that of the standard unit. This means that with a smaller depth of media, the surface area must increase.
3. To select a Filterra Shallow System unit, the designer must first identify the size of the standard unit using the modeling guidance described above.
4. Once the size of the standard Filterra unit is established using the sizing technique described above, use information from the following table to select the appropriate size Filterra Shallow System unit.

Shallow Unit Basic, Enhanced, Phosphorus, and Oil Treatment Sizing

Standard Depth	Equivalent Shallow Depth
4x4	4x6 or 6x4
4x6 or 6x4	6x6
4x8 or 8x4	6x8 or 8x6
6x6	6x10 or 10x6
6x8 or 8x6	6x12 or 12x6
6x10 or 10x6	13x7

Notes:
1. Shallow Depth Boxes are less than the standard depth of 3.5 feet but no less than 3.0 feet deep (TC to INV).

Applicant: Contech Engineered Solutions, LLC.

Applicant's Address: 11815 NE Glenn Widing Drive
Portland, OR 97220

Application Documents:

- State of Washington Department of Ecology Application for Conditional Use Designation, Americast (September 2006)
- Quality Assurance Project Plan Filterra® Bioretention Filtration System Performance Monitoring, Americast (April 2008)
- Quality Assurance Project Plan Addendum Filterra® Bioretention Filtration System Performance Monitoring, Americast (June 2008)
- Draft Technical Evaluation Report Filterra® Bioretention Filtration System Performance Monitoring, Americast (August 2009)
- Final Technical Evaluation Report Filterra® Bioretention Filtration System Performance Monitoring, Americast (December 2009)
- Technical Evaluation Report Appendices Filterra® Bioretention Filtration System Performance Monitoring, Americast, (August 2009)
- Memorandum to Department of Ecology Dated October 9, 2009 from Americast, Inc. and Herrera Environmental Consultants
- Quality Assurance Project Plan Filterra® Bioretention System Phosphorus treatment and Supplemental Basic and Enhanced Treatment Performance Monitoring, Americast (November 2011)
- Filterra® letter August 24, 2012 regarding sizing for the Filterra® Shallow System.
- University of Virginia Engineering Department Memo by Joanna Crowe Curran, Ph. D dated March 16, 2013 concerning capacity analysis of Filterra® internal weir inlet tray.
- Terraphase Engineering letter to Jodi Mills, P.E. dated April 2, 2013 regarding Terraflume Hydraulic Test, Filterra® Bioretention System and attachments.
- Technical Evaluation Report, Filterra® System Phosphorus Treatment and Supplemental Basic Treatment Performance Monitoring. March 27th, 2014.
- State of Washington Department of Ecology Application for Conditional Use Level Designation, Contech Engineered Solutions (May 2015)

- Quality Assurance Project Plan Filterra® Bioretention System, Contech Engineered Solutions (May 2015)
- Filterra Bioretention System Armco Avenue General Use Level Designation Technical Evaluation Report, Contech Engineered Solutions (August 2019)

Applicant's Use Level Request:

General Level Use Designation for Basic (175 in/hr), Enhanced (175 in/hr), Phosphorus (100 in/hr), and Oil Treatment (50 in/hr).

Applicant's Performance Claims:

Field-testing and laboratory testing show that the Filterra® unit is promising as a stormwater treatment best management practice and can meet Ecology's performance goals for basic, enhanced, phosphorus, and oil treatment.

Findings of Fact:

Field Testing 2015-2019

1. Contech completed field testing of a 4 ft. x 4 ft. Filterra® unit at one site in Hillsboro, Oregon from September 2015 to July 2019. Throughout the monitoring period a total of 24 individual storm events were sampled, of which 23 qualified for TAPE sampling criteria.
2. Contech encountered several unanticipated events and challenges that prevented them from collecting continuous flow and rainfall data. An analysis of the flow data from the sampled events, including both the qualifying and non-qualifying events, demonstrated the system treated over 99 % of the influent flows. Peak flows during these events ranged from 25 % to 250 % of the design flow rate of 29 gallons per minute.
3. Of the 23 TAPE qualified sample events, 13 met requirements for TSS analysis. Influent concentrations ranged from 20.8 mg/L to 83 mg/L, with a mean concentration of 46.3 mg/L. The UCL95 mean effluent concentration was 15.9 mg/L, meeting the 20 mg/L performance goal for Basic Treatment.
4. All 23 TAPE qualified sample events met requirements for dissolved zinc analysis. Influent concentrations range from 0.0384 mg/L to 0.2680 mg/L, with a mean concentration of 0.0807 mg/L. The LCL 95 mean percent removal was 62.9 %, meeting the 60 % performance goal for Enhanced Treatment.
5. Thirteen of the 23 TAPE qualified sample events met requirements for dissolved copper analysis. Influent concentrations ranged from 0.00543 mg/L to 0.01660 mg/L, with a mean concentration of 0.0103 mg/L. The LCL 95 mean percent removal was 41.2 %, meeting the 30 % performance goal for Enhanced Treatment.
6. Total zinc concentrations were analyzed for all 24 sample events. Influent EMCs for total zinc ranged from 0.048 mg/L to 5.290 mg/L with a median of 0.162 mg/L. Corresponding effluent EMCs for total zinc ranged from 0.015 mg/L to 0.067 mg/L with a median of

0.029 mg/L. Total event loadings for the study for total zinc were 316.85 g at the influent and 12.92 g at the effluent sampling location, resulting in a summation of loads removal efficiency of 95.9 %.

7. Total copper concentrations were analyzed for all 24 sample events. Influent EMCs for total copper ranged from 0.003 mg/L to 35.600 mg/L with a median value of 0.043 mg/L. Corresponding effluent EMCs for total copper ranged from 0.002 mg/L to 0.015 mg/L with a median of 0.004 mg/L. Total event loadings for total copper for the study were 1,810.06 g at the influent and 1.90 g at the effluent sampling location, resulting in a summation of loads removal efficiency of 99.9 %.

Field Testing 2013

1. Filterra completed field-testing of a 6.5 ft x 4 ft. unit at one site in Bellingham, Washington. Continuous flow and rainfall data collected from January 1, 2013 through July 23, 2013 indicated that 59 storm events occurred. Water quality data was obtained from 22 storm events. Not all the sampled storms produced information that met TAPE criteria for storm and/or water quality data.
2. The system treated 98.9 % of the total 8-month runoff volume during the testing period. Consequently, the system achieved the goal of treating 91 % of the volume from the site. Stormwater runoff bypassed Filterra treatment during four of the 59 storm events.
3. Of the 22 sampled events, 18 qualified for TSS analysis (influent TSS concentrations ranged from 25 to 138 mg/L). The data were segregated into sample pairs with influent concentration greater than and less than 100 mg/L. The UCL95 mean effluent concentration for the data with influent less than 100 mg/L was 5.2 mg/L, below the 20-mg/L threshold. Although the TAPE guidelines do not require an evaluation of TSS removal efficiency for influent concentrations below 100 mg/L, the mean TSS removal for these samples was 90.1 %. Average removal of influent TSS concentrations greater than 100 mg/L (three events) was 85 %. In addition, the system consistently exhibited TSS removal greater than 80 % at flow rates equivalent to a 100 in/hr infiltration rate and was observed at 150 in/hr.
4. Ten of the 22 sampled events qualified for TP analysis. Americast augmented the dataset using two sample pairs from previous monitoring at the site. Influent TP concentrations ranged from 0.11 to 0.52 mg/L. The mean TP removal for these twelve events was 72.6 %. The LCL95 mean percent removal was 66.0, well above the TAPE requirement of 50 %. Treatment above 50 % was evident at 100 in/hr infiltration rate and as high as 150 in/hr. Consequently, the Filterra test system met the TAPE Phosphorus Treatment goal at 100 in/hr. Influent ortho-P concentrations ranged from 0.005 to 0.012 mg/L; effluent ortho-P concentrations ranged from 0.005 to 0.013 mg/L. The reporting limit/resolution for the ortho-P test method is 0.01 mg/L, therefore the influent and effluent ortho-P concentrations were both at and near non-detect concentrations.

Field Testing 2008-2009

1. Filterra completed field-testing at two sites at the Port of Tacoma. Continuous flow and rainfall data collected during the 2008-2009 monitoring period indicated that 89 storm events occurred. The monitoring obtained water quality data from 27 storm events. Not all the sampled storms produced information that met TAPE criteria for storm and/or water quality data.
2. During the testing at the Port of Tacoma, 98.96 to 99.89 % of the annual influent runoff volume passed through the POT1 and POT2 test systems respectively. Stormwater runoff bypassed the POT1 test system during nine storm events and bypassed the POT2 test system during one storm event. Bypass volumes ranged from 0.13 % to 15.3% of the influent storm volume. Both test systems achieved the 91 % water quality treatment-goal over the 1-year monitoring period.
3. Consultants observed infiltration rates as high as 133 in/hr during the various storms. Filterra did not provide any paired data that identified percent removal of TSS, metals, oil, or phosphorus at an instantaneous observed flow rate.
4. The maximum storm average hydraulic loading rate associated with water quality data is <40 in/hr, with the majority of flow rates < 25 in/hr. The average instantaneous hydraulic loading rate ranged from 8.6 to 53 in/hr.
5. The field data showed a removal rate greater than 80 % for TSS with an influent concentration greater than 20 mg/L at an average instantaneous hydraulic loading rate up to 53 in/hr (average influent concentration of 28.8 mg/L, average effluent concentration of 4.3 mg/L).
6. The field data showed a removal rate generally greater than 54 % for dissolved zinc at an average instantaneous hydraulic loading rate up to 60 in/hr and an average influent concentration of 0.266 mg/L (average effluent concentration of 0.115 mg/L).
7. The field data showed a removal rate generally greater than 40 % for dissolved copper at an average instantaneous hydraulic loading rate up to 35 in/hr and an average influent concentration of 0.0070 mg/L (average effluent concentration of 0.0036 mg/L).
8. The field data showed an average removal rate of 93 % for total petroleum hydrocarbon (TPH) at an average instantaneous hydraulic loading rate up to 53 in/hr and an average influent concentration of 52 mg/L (average effluent concentration of 2.3 mg/L). The data also shows achievement of less than 15 mg/L TPH for grab samples. Filterra provided limited visible sheen data due to access limitations at the outlet monitoring location.
9. The field data showed low percentage removals of total phosphorus at all storm flows at an average influent concentration of 0.189 mg/L (average effluent concentration of 0.171 mg/L). We may relate the relatively poor treatment performance of the Filterra system at this location to influent characteristics for total phosphorus that are unique to the Port of Tacoma site. It appears that the Filterra system will not meet the 50 % removal performance goal when the majority of phosphorus in the runoff is expected to be in the dissolved form.

Laboratory Testing

1. Filterra performed laboratory testing on a scaled down version of the Filterra unit. The lab data showed an average removal from 83-91 % for TSS with influents ranging from 21 to 320 mg/L, 82-84 % for total copper with influents ranging from 0.94 to 2.3 mg/L, and 50-61 % for orthophosphate with influents ranging from 2.46 to 14.37 mg/L.
2. Filterra conducted permeability tests on the soil media.
3. Lab scale testing using Sil-Co-Sil 106 showed removals ranging from 70.1 % to 95.5 % with a median removal of 90.7 %, for influent concentrations ranging from 8.3 to 260 mg/L. Filterra ran these laboratory tests at an infiltration rate of 50 in/hr.
4. Supplemental lab testing conducted in September 2009 using Sil-Co-Sil 106 showed an average removal of 90.6 %. These laboratory tests were run at infiltration rates ranging from 25 to 150 in/hr for influent concentrations ranging from 41.6 to 252.5 mg/L. Regression analysis results indicate that the Filterra system's TSS removal performance is independent of influent concentration in the concentration rage evaluated at hydraulic loading rates of up to 150 in/hr.

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Ecology web link: http://www.ecy.wa.gov/programs/wq/stormwater/newtech/index.html

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Water Quality Program
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Date	Revision
December 2009	GULD for Basic, Enhanced, and Oil granted, CULD for Phosphorus
September 2011	Extended CULD for Phosphorus Treatment
September 2012	Revised design storm discussion, added Shallow System.
January 2013	Revised format to match Ecology standards, changed Filterra contact information
February 2013	Added FTIB-P system
March 2013	Added FTIB-C system
April 2013	Modified requirements for identifying appropriate size of unit

June 2013	Modified description of FTIB-C alternate configuration
March 2014	GULD awarded for Phosphorus Treatment. GULD updated for a higher flow-rate for Basic Treatment.
June 2014	Revised sizing calculation methods
March 2015	Revised Contact Information
June 2015	CULD for Basic and Enhanced at 100 in/hr infiltration rate
September 2019	GULD for Basic and Enhanced at 175 in/hr infiltration rate
February 2020	Revised sizing language to note sizing based on off-line calculations
June 2020	Added Phosphorus to Filterra Shallow sizing table

APPENDIX D

StormFilter GULD

WASHINGTON STATE DEPARTMENT OF ECOLOGY

April 2017

GENERAL USE LEVEL DESIGNATION FOR BASIC (TSS) TREATMENT

For

CONTECH Engineered Solutions
Stormwater Management StormFilter®
With ZPG Media at 1 gpm/sq ft media surface area

Ecology's Decision:

Based on the CONTECH Engineered Solutions' (CONTECH) application submissions, Ecology hereby issues a General Use Level Designation (GULD) for the Stormwater Management StormFilter® (StormFilter):

1. **As a basic stormwater treatment practice for total suspended solids (TSS) removal,**
   - **Using ZPG™ media (zeolite/perlite/granular activated carbon), with the size distribution described below,**
   - **Sized at a hydraulic loading rate of 1 gpm/ft^2 of media surface area, per Table 1, and**
   - **Internal bypassing needs to be consistent with the design guidelines in CONTECH's current product design manual.**

Table 1. StormFilter Design Flow Rates per Cartridge

Effective Cartridge Height (inches)	12	18	27
Cartridge Flow Rate (gpm/cartridge)	5	7.5	11.3

2. **Ecology approves StormFilter systems containing ZPG™ media for treatment at the hydraulic loading rates shown in Table 1, and sized based on the water quality design flow rate for an off-line system when using an external bypass vault or a treatment vault with an internal bypass. Contech designs their StormFilter systems to maintain treatment of the water quality design flow while routing excess flows around the treatment chamber during periods of peak bypass. The water quality design flow rates are calculated using the following procedures:**
   - **Western Washington: For treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute flow rate as calculated using the latest version of the Western Washington Hydrology Model or other Ecology-approved continuous runoff model.**

- **Eastern Washington: For treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute flow rate as calculated using one of the three methods described in Chapter 2.2.5 of the Stormwater Management Manual for Eastern Washington (SWMMEW) or local manual.**
- **Entire State: For treatment installed downstream of detention, the water quality design flow rate is the full 2-year release rate of the detention facility.**

3. **This designation has no expiration date, but Ecology may amend or revoke it.**

<u>Ecology's Conditions of Use</u>:

The StormFilter with ZPG media shall comply with the following conditions:

1. **Design, install, operate, and maintain the StormFilter with ZPG media in accordance with applicable Contech Engineered Solutions manuals, documents, and the Ecology Decision.**

2. **Install StormFilter systems to bypass flows exceeding the water quality treatment rate. Additionally, high flows will not re-suspend captured sediments. Design StormFilter systems in accordance with the performance goals in Ecology's most recent Stormwater Manual and CONTECH's *Product Design Manual Version 4.1 (April 2006)*, or most current version, unless otherwise specified.**

3. **Owners must follow the design, pretreatment, land use application, and maintenance criteria in CONTECH's Design Manual.**

4. **Pretreatment of TSS and oil and grease may be necessary, and designers shall provide pre-treatment in accordance with the most current versions of the CONTECH's *Product Design Manual (April 2006)* or the applicable Ecology Stormwater Manual. Design pre-treatment using the performance criteria and pretreatment practices provided on Ecology's "Evaluation of Emerging Stormwater Treatment Technologies" website.**

5. **Maintenance: The required maintenance interval for stormwater treatment devices is often dependent upon the degree of pollutant loading from a particular drainage basin. Therefore, Ecology does not endorse or recommend a "one size fits all" maintenance cycle for a particular model/size of manufactured filter treatment device.**

    - **Typically, CONTECH designs StormFilter systems for a target filter media replacement interval of 12 months. Maintenance includes removing accumulated sediment from the vault, and replacing spent cartridges with recharged cartridges.**

- **Indications of the need for maintenance include effluent flow decreasing to below the design flow rate, as indicated by the scumline above the shoulder of the cartridge.**
- **Owners/operators must inspect StormFilter with ZPG media for a minimum of twelve months from the start of post-construction operation to determine site-specific maintenance schedules and requirements. You must conduct inspections monthly during the wet season, and every other month during the dry season. (According to the SWMMWW, the wet season in western Washington is October 1 to April 30. According to SWMMEW, the wet season in eastern Washington is October 1 to June 30). After the first year of operation, owners/operators must conduct inspections based on the findings during the first year of inspections.**
- **Conduct inspections by qualified personnel, follow manufacturer's guidelines, and use methods capable of determining either a decrease in treated effluent flowrate and/or a decrease in pollutant removal ability.**
- **When inspections are performed, the following findings typically serve as maintenance triggers:**
    - **Accumulated vault sediment depths exceed an average of 2 inches, or**
    - **Accumulated sediment depths on the tops of the cartridges exceed an average of 0.5 inches, or**
    - **Standing water remains in the vault between rain events, or**
    - **Bypass occurs during storms smaller than the design storm.**
- **Note: If excessive floatables (trash and debris) are present, perform a minor maintenance consisting of gross solids removal, not cartridge replacement.**

6. **CONTECH shall maintain readily available reports listed under "Application Documents" (above) as public, as well as the documentation submitted with its previous conditional use designation application. CONTECH shall provide links to this information from its corporate website, and make this information available upon request, at no cost and in a timely manner.**

7. **ZPG™ media used shall conform with the following specifications:**

- **Each cartridge contains a total of approximately 2.6 cubic feet of media. The ZPG™ cartridge consists of an outer layer of perlite that is approximately 1.3 cubic feet in volume and an inner layer, consisting of a mixture of 90% zeolite and 10% granular activated carbon, which is approximately 1.3 cubic feet in volume.**

- **Perlite Media: Perlite media shall be made of natural siliceous volcanic rock free of any debris or foreign matter. The expanded perlite shall**

have a bulk density ranging from 6.5 to 8.5 lbs per cubic foot and particle sizes ranging from 0.09" (#8 mesh) to 0.38" (3/8" mesh).

- **Zeolite Media: Zeolite media shall be made of naturally occurring clinoptilolite. The zeolite media shall have a bulk density ranging from 44 to 50 lbs per cubic foot and particle sizes ranging from 0.13" (#6 mesh) to 0.19" (#4 mesh). Additionally, the cation exchange capacity (CEC) of zeolite shall range from approximately 1.0 to 2.2 meq/g.**

- **Granular Activated Carbon: Granular activated carbon (GAC) shall be made of lignite coal that has been steam-activated. The GAC media shall have a bulk density ranging from 28 to 31 lbs per cubic foot and particle sizes ranging from a 0.09" (#8 mesh) to 0.19" (#4 mesh).**

Approved Alternate Configurations

Peak Diversion StormFilter

1. The Peak Diversion StormFilter allows for off-line bypass within the StormFilter structure. Design capture flows and peak flows enter the inlet bay which contains an internal weir. The internal weir allows design flows to enter the cartridge bay through a transfer hole located at the bottom of the inlet bay while the unit routs higher flows around the cartridge bay.
2. To select the size of the Peak Diversion StormFilter unit, the designer must determine the number of cartridges required and size of the standard StormFilter using the site-specific water quality design flow and the **StormFilter Design Flow Rates per Cartridge** as described above.
3. New owners may not install the Peak Diversion StormFilter at an elevation or in a location where backwatering may occur.

Applicant: Contech Engineered Solutions

Applicant's Address: 11835 NE Glenn Widing Dr.
Portland, OR 97220

Application Documents:

The applicant's master report, titled, "The Stormwater Management StormFilter Basic Treatment Application for General Use Level Designation in Washington", Stormwater Management, Inc., November 1, 2004, includes the following reports:

- (Public) *Evaluation of the Stormwater Management StormFilter Treatment System: Data Validation Report and Summary of the Technical Evaluation Engineering Report (TEER) by Stormwater Management Inc*., October 29, 2004 Ecology's technology assessment protocol requires the applicant to hire an independent consultant to complete the following work:

1. Complete the data validation report.
2. Prepare a TEER summary, including a testing summary and conclusions compared with the supplier's performance claims.
3. Provide a recommendation of the appropriate technology use level.
4. Work with Ecology to post recommend relevant information on Ecology's website.
5. Provide additional testing recommendations, if needed."
6. This report, authored by Dr. Gary Minton, Ph. D., P.E., Resource Planning Associates, satisfies the Ecology requirement.

- (Public) "Performance of the Stormwater Management StormFilter Relative to the Washington State Department of Ecology Performance Goals for Basic Treatment," is a summary of StormFilter performance that strictly adheres to the criteria listed in the Guidance for Evaluating Emerging Stormwater Treatment Technologies, Technology Assessment Protocol – Ecology (TAPE).
- "Heritage Marketplace Field Evaluation: Stormwater Management StormFilter with ZPG™ Media," is a report showing all of the information collected at Site A as stated in the SMI Quality Assurance Project Plan (QAPP). This document contains detailed information regarding each storm event collected at this site, and it provided a detailed overview of the data and project.
- "Lake Stevens Field Evaluation: Stormwater Management StormFilter with ZPG™ Media," is a report that corresponds to Site E as stated in the SMI QAPP. This document contains detailed information regarding each storm collected at this site, and includes a detailed overview of the data and project.
- (Public) "Evaluation of the Stormwater Management StormFilter for the removal of SIL-CO-SIL 106, a standardized silica product: ZPG™ at 7.5 GPM" is a report that describes laboratory testing at full design flow.
- "Factors Other Than Treatment Performance."
- "State of Washington Installations."
- "Peak Diversion StormFilter" is a technical document demonstrating the Peak Diversion StormFilter system complies with the Stormwater Management Manual for Western Washington Volume V Section 4.5.1.

Above-listed documents noted as "public" are available by contacting CONTECH.

Applicant's Use Level Request:

That Ecology grant a General Use Level Designation for Basic Treatment for the StormFilter using ZPG™ media (zeolite/perlite/granular activated carbon) at a hydraulic loading rate of 1 gpm/ft^2 of media surface area in accordance with Ecology's 2011 *Technical Guidance Manual for Evaluating Emerging Stormwater Treatment Technologies Technology Assessment Protocol – Ecology (TAPE)*.

Applicant's Performance Claim:

The combined data from the two field sites reported in the TER (Heritage Marketplace and Lake Stevens) indicate that the performance of a StormFilter system configured for inline bypass with ZPG™ media and a hydraulic loading rate of 1 gpm/ft^2 of media surface area meets Ecology performance goals for Basic Treatment.

Ecology's Recommendations:

Based on the weight of the evidence and using its best professional judgment, Ecology finds that:

- StormFilter, using ZPG™ media and operating at a hydraulic loading rate of no more than 1 gpm/ft^2 of media surface area, is expected to provide effective stormwater treatment achieving Ecology's Basic Treatment (TSS removal) performance goals. Contech demonstrated this is through field and laboratory testing performed in accordance with the approved protocol. StormFilter is deemed satisfactory with respect to factors other than treatment performance (e.g., maintenance; see the protocol's Appendix B for complete list).

Findings of Fact:

- Influent TSS concentrations and particle size distributions were generally within the range of what Ecology considers "typical" for western Washington (silt-to-silt loam).
- Contech sampled thirty-two (32) storm events at two sites for storms from April 2003 to March 2004, of which Contech deemed twenty-two (22) as "qualified" and were therefore included in the data analysis set.
- Statistical analysis of these 22 storm events verifies the data set's adequacy.
- Analyzing all 22 qualifying events, the average influent and effluent concentrations and aggregate pollutant load reduction are 114 mg/L, 25 mg/L, and 82%, respectively.
- Analyzing all 22 qualifying events based on the *estimated average* flow rate during the event (versus the *measured peak* flow rate), and more heavily weighting those events near the design rate (versus events either far above or well below the design rate) does not significantly affect the reported results.
- For the 7 qualifying events with influent TSS concentrations greater than 100 mg/L, the average influent and effluent concentrations and aggregate pollutant load reduction are 241 mg/L, 34 mg/L, and 89%, respectively. If we exclude the 2 of 7 events that exceed the maximum 300 mg/L specified in Ecology's guidelines, the average influent and effluent concentrations and aggregate pollutant load reduction are 158 mg/L, 35 mg/L, and 78%, respectively.
- For the 15 qualifying events with influent TSS concentrations less than 100 mg/L, the average influent and effluent concentrations and aggregate pollutant load reduction are 55 mg/L, 20 mg/L, and 61%, respectively. If the 6 of 15 events that fall below the minimum 33 mg/L TSS specified in Ecology's guidelines are excluded, the average

influent and effluent concentrations and aggregate pollutant load reduction are 78 mg/L, 26 mg/L, and 67%, respectively.

- For the 8 qualifying events with peak discharge exceeding design flow (ranging from 120 to 257% of the design rate), results ranged from 52% to 96% TSS removal, with an average of 72%.
- Due to the characteristics of the hydrographs, the field results generally reflect flows below (ranging between 20 and 60 percent of) the tested facilities' design rate. During these sub-design flow rate periods, some of the cartridges operate at or near their *individual* full design flow rate (generally between 4 and 7.5 GPM for an 18" cartridge effective height) because their float valves have opened. Float valves remain closed on the remaining cartridges, which operate at their base "trickle" rate of 1 to 1.5 GPM.
- Laboratory testing using U.S. Silica's Sil-Co-Sil 106 fine silica product showed an average 87% TSS removal for testing at 7.5 GPM per cartridge (100% design flow rate).
- Other relevant testing at I-5 Lake Union, Greenville Yards (New Jersey), and Ski Run Marina (Lake Tahoe) facilities shows consistent TSS removals in the 75 to 85% range. *Note that the evaluators operated the I-5 Lake Union at 50%, 100%, and 125% of design flow*.
- SMI's application included a satisfactory "Factors other than treatment performance" discussion.

Note: Ecology's 80% TSS removal goal applies to 100 mg/l and greater influent TSS. Below 100 mg/L influent TSS, the goal is 20 mg/L effluent TSS.

Technology Description:

The Stormwater Management StormFilter® (StormFilter), a flow-through stormwater filtration system, improves the quality of stormwater runoff from the urban environment by removing pollutants. The StormFilter can treat runoff from a wide variety of sites including, but not limited to: retail and commercial development, residential streets, urban roadways, freeways, and industrial sites such as shipyards, foundries, etc.

Operation:

The StormFilter is typically comprised of a vault that houses rechargeable, media-filled, filter cartridges. Various media may be used, but this designation covers only the zeolite-perlite-granulated activated carbon (ZPG™) medium. Stormwater from storm drains percolates through these media-filled cartridges, which trap particulates and may remove pollutants such as dissolved metals, nutrients, and hydrocarbons. During the filtering process, the StormFilter system also removes surface scum and floating oil and grease. Once filtered through the media, the treated stormwater is directed to a collection pipe or discharged to an open channel drainage way.

This document includes a bypass schematic for flow rates exceeding the water quality design flow rate on page 8.

StormFilter Configurations:

Contech offers the StormFilter in multiple configurations: precast, high flow, catch basin, curb inlet, linear, volume, corrugated metal pipe, drywell, and CON/Span form. Most configurations use pre-manufactured units to ease the design and installation process. Systems may be either uncovered or covered underground units.

The typical precast StormFilter unit is composed of three sections: the energy dissipater, the filtration bay, and the outlet sump. As Stormwater enters the inlet of the StormFilter vault through the inlet pipe, piping directs stormwater through the energy dissipater into the filtration bay where treatment will take place. Once in the filtration bay, the stormwater ponds and percolates horizontally through the media contained in the StormFilter cartridges. After passing through the media, the treated water in each cartridge collects in the cartridge's center tube from where piping directs it into the outlet sump by a High Flow Conduit under-drain manifold. The treated water in the outlet sump discharges through the single outlet pipe to a collection pipe or to an open channel drainage way. In some applications where you anticipate heavy grit loads, pretreatment by settling may be necessary.

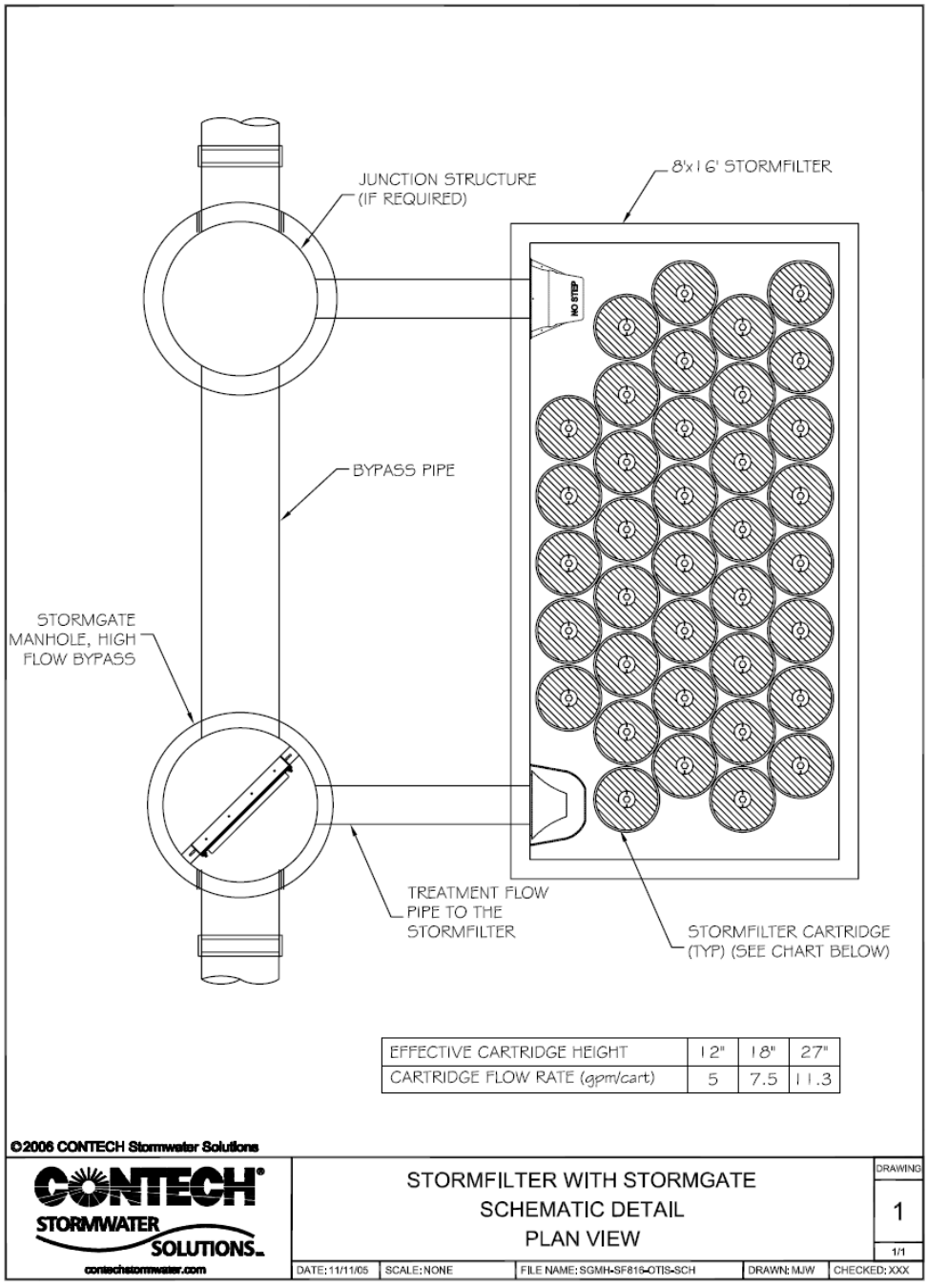

Figure 1. Stormwater Management StormFilter Configuration with Bypass

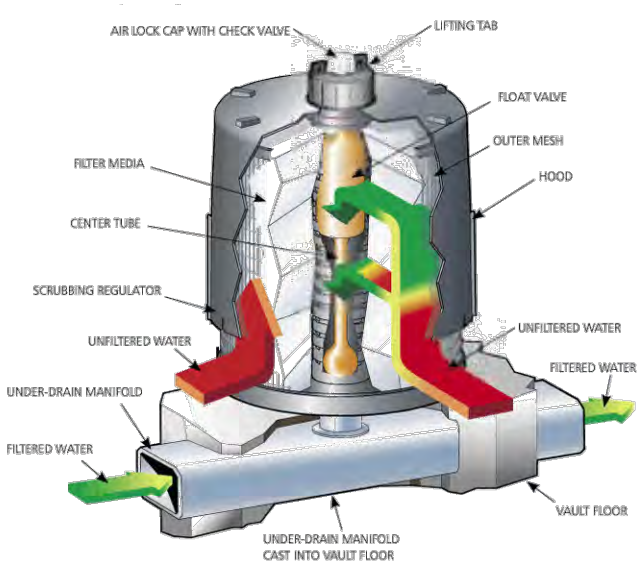

Figure 2. The StormFilter Cartridge

Cartridge Operation:

As the water level in the filtration bay begins to rise, stormwater enters the StormFilter cartridge. Stormwater in the cartridge percolates horizontally through the filter media and passes into the cartridge's center tube, where the float in the cartridge is in a closed (downward) position. As the water level in the filtration bay continues to rise, more water passes through the filter media and into the cartridge's center tube. Water displaces the air in the cartridge and it purges from beneath the filter hood through the one-way check valve located in the cap. Once water fills the center tube there is enough buoyant force on the float to open the float valve and allow the treated water to flow into the under-drain manifold. As the treated water drains, it tries to pull in air behind it. This causes the check valve to close, initiating a siphon that draws polluted water throughout the full surface area and volume of the filter. Thus, water filters through the entire filter cartridge throughout the duration of the storm, regardless of the water surface elevation in the filtration bay. This continues until the water surface elevation drops to the elevation of the scrubbing regulators. At this point, the siphon begins to break and air quickly flows beneath the hood through the scrubbing regulators, causing energetic bubbling between the inner surface of the hood and the outer surface of the filter. This bubbling agitates and cleans the surface of the filter, releasing accumulated sediments on the surface, flushing them from beneath the hood, and allowing them to settle to the vault floor.

Adjustable cartridge flow rate:

Inherent to the design of the StormFilter is the ability to control the individual cartridge flow rate with an orifice-control disc placed at the base of the cartridge. Depending on the treatment requirements and on the pollutant characteristics of the influent stream as

specified in the CONTECH *Product Design Manual*, operators may adjust the flow rate through the filter cartridges. By decreasing the flow rate through the filter cartridges, the influent contact time with the media is increased and the water velocity through the system is decreased, thus increasing both the level of treatment and the solids removal efficiencies of the filters, respectively (de Ridder, 2002).

Recommended research and development:

Ecology encourages CONTECH to pursue continuous improvements to the StormFilter. To that end, CONTECH recommends the following actions:

- Determine, through laboratory testing, the relationship between accumulated solids and flow rate through the cartridge containing the ZPG™ media. **Completed 11/05.**
- Determine the system's capabilities to meet Ecology's enhanced, phosphorus, and oil treatment goals.
- Develop easy-to-implement methods of determining that a StormFilter facility requires maintenance (cleaning and filter replacement).

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Ecology web link: http://www.ecy.wa.gov/programs/wq/stormwater/newtech/index.html

Ecology Contact: Douglas C. Howie, P.E.
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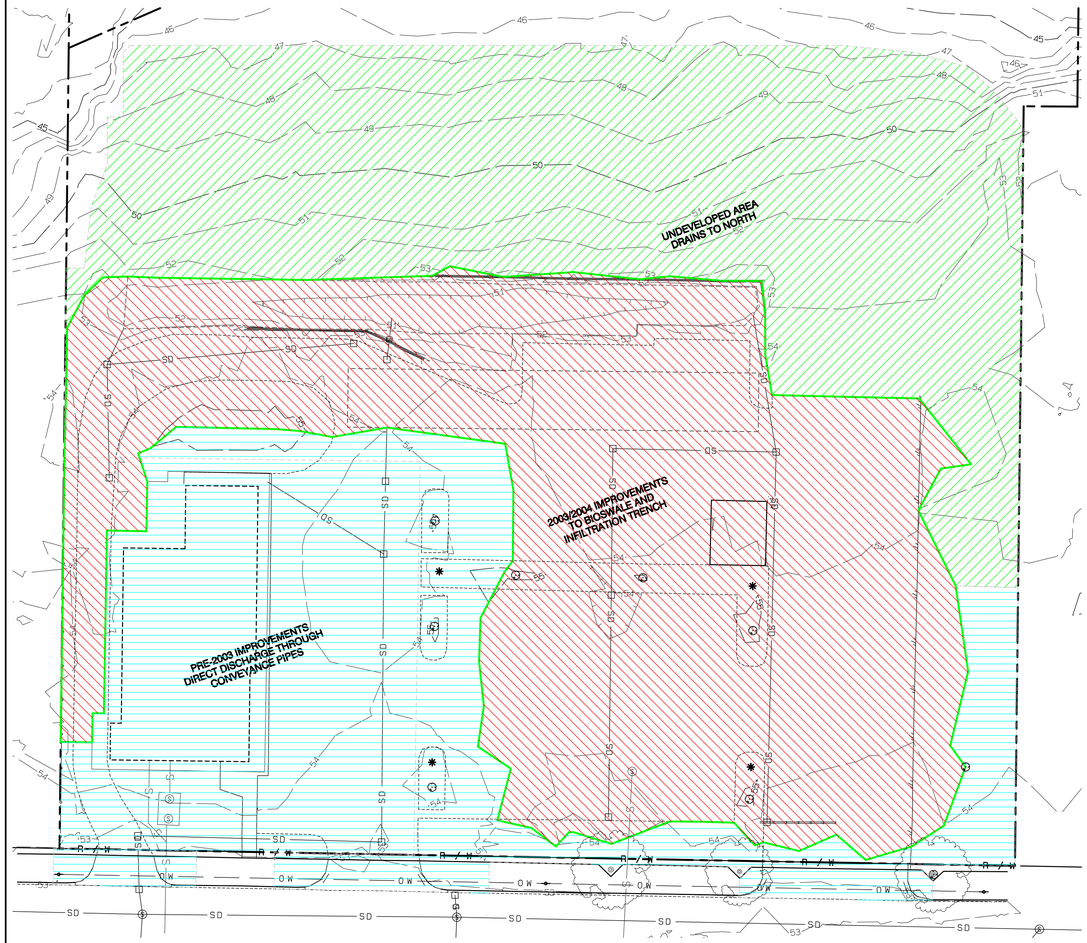
Revision History

Date	Revision
Jan 2005	Original Use Level Designation
Dec 2007	Revision
May 2012	Maintenance requirements updated
November 2012	Design Storm and Maintenance requirements updated
January 2013	Updated format to match Ecology standard format
September 2014	Added Peak Diversion StormFilter Alternate Configuration
November 2016	Revised Contech contact information
April 2017	Revised sizing language to note sizing based on Off-line calculations

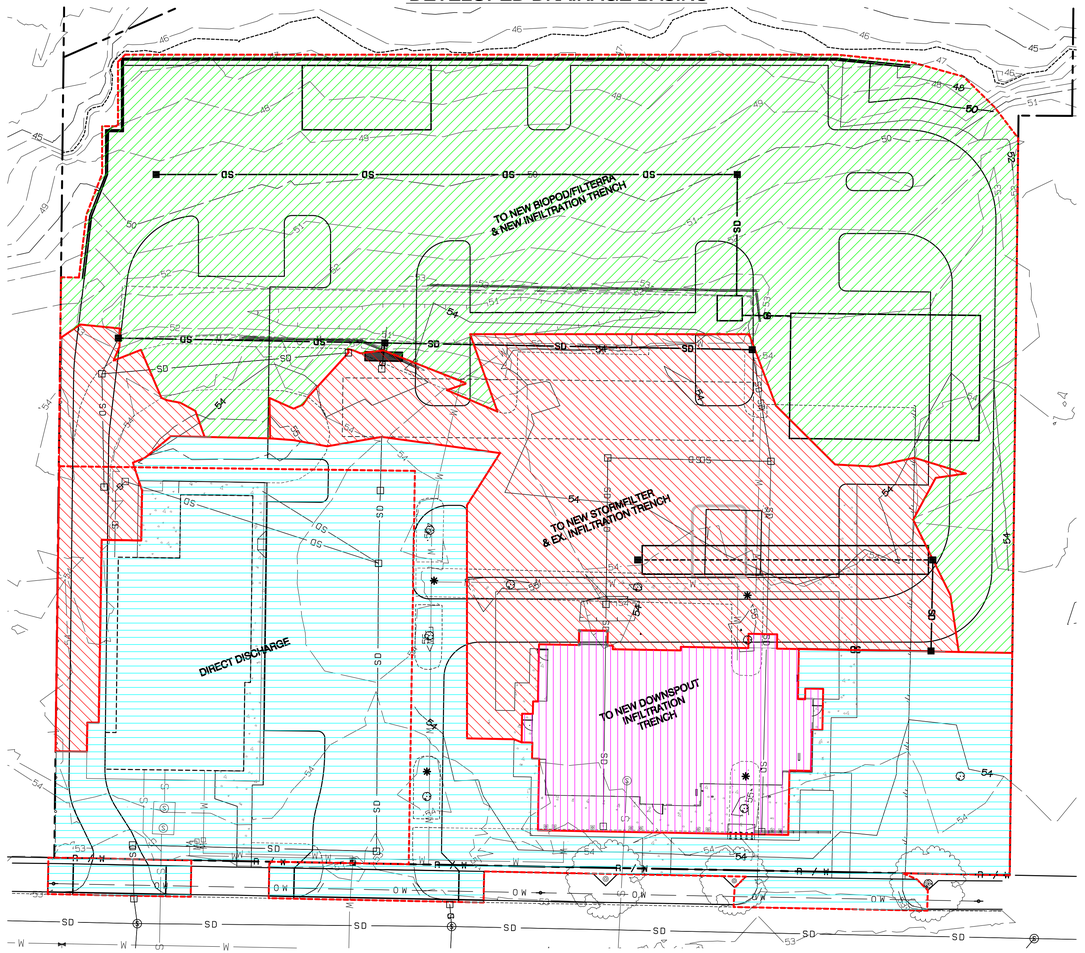
Taco Time

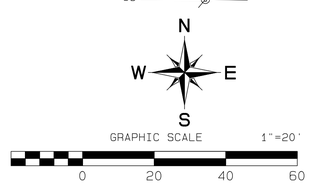
Section 27, Township 20 N, Range 4 E, Willamette Meridian, Pierce County, Washington

EXISTING DRAINAGE BASINS



DEVELOPED DRAINAGE BASINS





EXISTING		
EXISTING TO NORTH-POC 1	sf	acre
C, Forest, Flat	3662	0.0841
C, Forest, Mod	15745	0.3615
C, Lawn, Flat	586	0.0135
Total	19993	0.4590

PRE-2003 IMPROVEMENTS		
DIRECT DISCHARGE TO SOUTH POC 2		
Existing	Area (sf)	acre
C, Lawn, Flat	7639	0.1754
Roof	3625	0.0832
Paving	8532	0.1959
Walk	197	0.0045
Total Impervious	12354	0.2836
Total	19993	0.4590

2003/2004 IMPROVEMENTS		
TO BIOSWALE AND INFILTRATION POC 2		
Existing	Area (sf)	acre
C, Lawn, Flat	5278	0.1212
Paving	19303	0.4431
Total	24581	0.5643

DEVELOPED		
TO NEW FILTERRA &		
INFILTRATION TRENCH - POC 1	sf	acre
C, Lawn, Flat	7303	0.1677
Roof	648	0.0149
Paving, Flat	16962	0.3894
Total Impervious	17610	0.4043
Total	24913	0.5719

TO ROOF		
DOWNSPOUT INFIL.	sf	acre
Roof	3941	0.0905

DIRECT DISCHARGE-POC 2		
	sf	acre
C, Lawn, Flat	5099	0.1171
Roof	3625	0.0832
Paving	5674	0.1303
Walk	2888	0.0663
Total Impervious	12187	0.2798
Total	17286	0.3968

TO STORMFILTER &		
EX. INFILTRATION-	sf	acre
C, Lawn, Flat	3353	0.0770
Paving, Flat	9564	0.2196
Walk, Flat	589	0.0135
Total Impervious	10153	0.2331
Total	13506	0.3101

New plus replaced hard surface area needs to be recorded for all basins. and added in table. Use table from preliminary site plan. [Storm Report, Pg 137]

ROBERT A. TRIVITT
STATE OF WASHINGTON
REGISTERED PROFESSIONAL ENGINEER
7/14/2023

AZURE GREEN CONSULTANTS
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REVISION	DATE
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JOB NO. 2935 2023
DATE 7/14/2023
DESIGNED BY: Paul Green
DRAWN BY: Rob Trivitt
CHECKED BY: JIA Job
APPROVED BY: Paul Green

Drainage Basin Map

Taco Time

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DRAWING
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SHEET 1
OF 1