3rd Review
P21-0100
Oct 2023

LEROY SURVEYORS AND ENGINEERS, INC.

Drainage Report

For the Dos Lagos Lot 'D'
Parcel Number: 0419102107 & 0419106026
303 39th Ave SE
Puyallup, Washington

For

Dos Lagos Asset, LLC
810 E. Pico Blvd, Unit B24
Los Angeles, CA. 90021

By

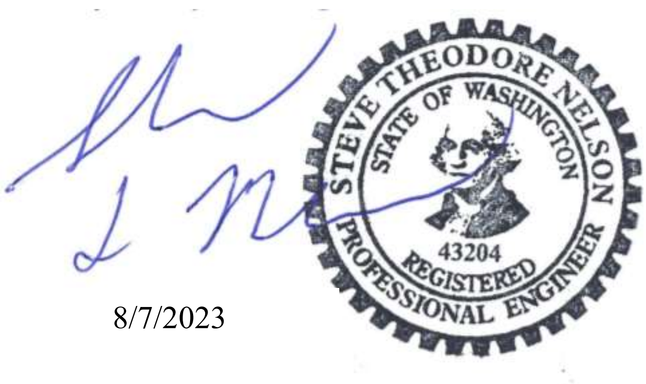
LeRoy Surveyors & Engineers, Inc.
P. O. Box 740
Puyallup, Washington 98371
(253) 848-6608

Contact: Steve T Nelson, P.E.

May 2021
Revised August 2023
Job No: 12896

CONDITIONS (At time of civil application):
1) It must be shown that the underlying soils meet treatment criteria (SSC-6).
2) Register infiltration trench(es) as UIC prior to Occupancy.
3) Include Storm Comp Plan references as exhibits.
[CONDITION-Storm Report-Lot D; Pg 1 of 98]

I hereby state that this Preliminary Drainage Report for the Dos Lagos Lot 'D' Project has been prepared by me or under my supervision and meets the standard of care and expertise which is usual and customary in this community for professional engineers. I understand the City of Puyallup does not and will not assume liability for the sufficiency, suitability, or performance of drainage facilities prepared by me.



8/7/2023

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Section 1 – Proposed Project Overview

Project Name: Dos Lagos Lot 'D' Project

Permit Type: Multi-Family Residential

Permit No: P21-0100

Site Address: 303 39th Ave SE, Puyallup, WA 98374

Parcel Numbers: 0419102107 & 0419106026

Legal Descriptions:

PARCEL #: 0419102107 & 0419106026
Lot 1 and Tract A of City of Puyallup Short Plat No. P-18-0173, recorded under Recording No. 201912305003, in Pierce County, Washington.
Zoning: Urban Center Mixed-use Zone (UCX)
Mixed-use Design Review Overlay Zone (MX-DRO)

The project proposes to construct a 46-unit apartment complex with associated parking on 1.31 acres, located at the corners of 3rd Street SE and 39th Ave SE in Puyallup, Washington, 98374. Figure 1 illustrates the site parcel location within the local vicinity. Associated right-of-way (ROW) improvements will be constructed, including sidewalk and street trees. Access to the site will be from public roads 3rd Street SE and 39th Ave SE. The project is connected to a predevelopment (No. P-20-0088) and requires a completed SEPA checklist.

Stormwater runoff in the existing condition partially infiltrates, while the remainder sheet flows to one of the two drainage basins onsite (Threshold Discharge Areas, TDA) in the existing and developed condition: Black Swamp Basin and Willows Pond Basin. Stormwater runoff quality and quantity impacts from the proposed hard surfaces will be mitigated using porous pavement.

The proposed apartment building will be served by city sewer.

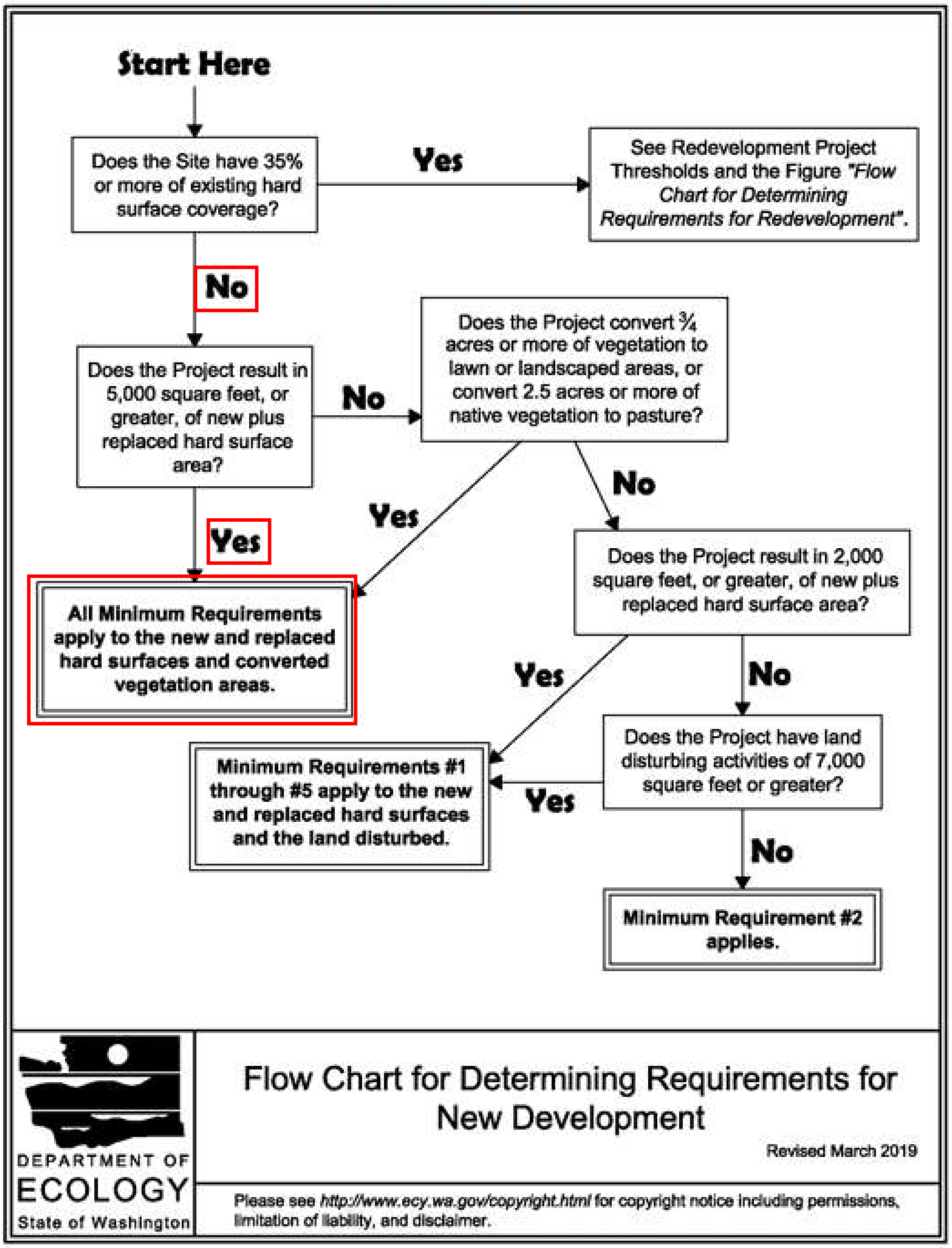
Figure 1: Site Vicinity Map

Minimum Requirements

The project shall comply with the requirements of the 2019 Stormwater Management Manual for Western Washington referred to hereon as 'The Manual', with amendments from City of Puyallup Municipal Code (PMC), Section 21.10. Less than 35% of the site consists of existing impervious coverage, and since more than 5,000 sq. ft. of new impervious surfaces are proposed to be added, minimum requirements 1 through 9 apply. The Washington State Department of Ecology (DOE) flow chart, "Figure I-2.4.1 – Flow Chart for Determining Requirements for New Development," is found in Figure 2 on the following page.

Figure 2: Flow Chart for Determining Requirements for New Development

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



- Minimum Requirement #1: Preparation of Stormwater Site Plans
  - In accordance with Volume 1, Chapter 2, Sections 2.4.1 & 2.5.1 of the Manual, a Stormwater Site Plan is required. This plan will include this Drainage Report, a Stormwater Pollution Prevention Plan (SWPPP), an Operation and Maintenance Manual, and the Site Development Drawings.
- Minimum Requirement #2: Construction Stormwater Pollution Prevention (SWPP)
  - In accordance with Volume 1, Chapter 2, Section 2.5.2, Construction Stormwater Pollution Prevention is required for all projects which replace or add more than 2,000 sq. ft. of impervious surfaces or disturb more than 7,000 sq. ft. of land. A Construction Stormwater Pollution Prevention Plan (SWPPP) is prepared and included as part of the project stormwater site plans with a narrative report included as part of this Drainage Report (See SWPPP in Appendix). The following thirteen (13) elements will be addressed in the SWPP plans and in the narrative report:

    Element 1: Preserve Vegetation/Mark Clearing Limits
    Element 2: Establish Construction Access
    Element 3: Control Flow Rates
    Element 4: Install Sediment Controls
    Element 5: Stabilize Soils
    Element 6: Protect Slopes
    Element 7: Protect Drain Inlets
    Element 8: Stabilize Channels and Outlets
    Element 9: Control Pollutants
    Element 10: Control De-Watering
    Element 11: Maintain BMPs
    Element 12: Manage the Project
    Element 13: Protect Low Impact Development BMPs

- Minimum Requirement #3: Source Control of Pollution
  - The project is a multi-family residential site that will be impacted by vehicular and foot traffic. A significant portion of the impervious surface will be the apartment building roof, which is a non-pollution generating impervious surface (non-PGIS).
- Minimum Requirement #4: Preservation of Natural Drainage Systems and Outfalls
  - Under existing conditions stormwater runoff infiltrates on site or sheet flows north and east into the adjacent protected wetland (see Drainage in Section 2, below). The project proposes to manage stormwater through porous pavement (see Minimum Requirement #5 and Minimum Requirement #7, below).
  - East Willows Pond Basin: For the eastern portion of the site, the most accurate natural outfall on the project site is the adjoining wetland to the north and east of the parcel. This is due to the north-northeasterly sheet flow that occurs in the predeveloped condition.

- West Black Swamp Basin: For the western portion of the site, there is an existing inlet that collects surface water and conveys it through piping to the west. Eventually the piping discharges into a conveyance ditch to the west of the site, which eventually discharges to the Black Swamp Pothole. The City of Puyallup has requested that any stormwater discharge from the western portion of the project site shall comply with Pierce County Pothole Standards.

- Minimum Requirement #5: On-Site Stormwater Management
  - Over 5,000 sq ft of new and replaced hard surfaces will be created, triggering On-Site Stormwater Management requirements. In accordance with Section 1.2.5.5 of the Manual, projects are required to employ On-site Stormwater Management BMPs to infiltrate, disperse, and retain stormwater runoff on-site to the extent feasible without causing flooding or erosion impacts. This project triggers Minimum Requirements #1-9, and therefore must meet the requirements in Table I-2.5.1. The project chooses to utilize List #2. For each surface, the feasibility of the BMP must be evaluated in the order listed. The first BMP deemed feasible for each surface must be used.

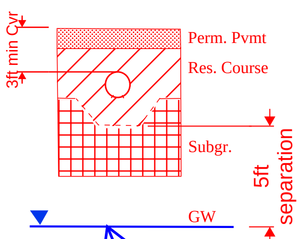
Clarify-pipes under driving surfaces require 3ft min cover (1ft for ductile). Does not appear that there is adequate space in the pavement section to meet separation and cover reqts using perforated pipes. [Storm Report-Lot D; Pg 8 of 98]

CONDITION: Must be registered with Ecology as an UIC prior to Occupancy. [Storm Report-Lot D; Pg 8 of 98]

  - Lawn and Landscaped Areas
    - All lawn and landscaped areas shall be amended per the requirements of BMP T5.13

CONDITION: Per Ecology, this is acceptable provided the roof discharge trench provides 5ft separation to groundwater (3ft with mounding analysis). At the time of civil application, include commentary regarding required separation here. [Storm Report-Lot D; Pg 8 of 98]

  - Roofs
    - Full Dispersion or Downspout Full Infiltration: Infiltration is deemed to be feasible for the proposed roof area. The Building roof will be conveyed to pipes installed in the reservoir course under the porous patio where all runoff will be infiltrated.
    - Bioretention: This BMP is not applicable as an earlier BMP on the list has already been selected.
    - Downspout Dispersion: This BMP is not applicable as an earlier BMP on the list has already been selected.
    - Perforated Stub-Out Connections: This BMP is not applicable as an earlier BMP on the list has already been selected.



To ensure viability of the proposed storm design and prior to Landuse Approval, provide elevation of the restrictive layer (wet-season high groundwater or soil layer) and include the investigation in the geotech section. [Storm Report-Lot D; Pg 8 of 98]

  - Other Hard Surfaces
    - Full Dispersion: This BMP is infeasible because there is insufficient space on-site to sufficiently establish the required dispersion flow path area.
    - Permeable Pavement: This BMP is deemed to be feasible. All parking lot areas will be constructed using permeable pavement.
    - Bioretention: This BMP is not applicable as an earlier BMP on the list has already been selected.
    - Sheet Flow Dispersion or Concentrated Flow Dispersion: This BMP is not applicable as an earlier BMP on the list has already been selected.

- Minimum Requirement #6: Runoff Treatment
  - The project results in more than 5,000 sq. ft. of Pollution-Generating Impervious Surfaces (PGIS) and less than three-quarters (3/4) of an acre of Pollution-Generating Pervious Surfaces (PGPS), therefore quality mitigation is required. The project will utilize porous pavement to achieve runoff treatment.

CONDITION-See Page 1

- Minimum Requirement #7: Flow Control
  - Each Threshold Discharge Area (TDA) within the project must be reviewed to determine if Flow Control is required. Three thresholds are presented below. Responses are provided in bold for both the Willows Pond Basin and Black Swamp Basin. If any of the below thresholds are exceeded, Flow Control is required.
    - TDAs that have a total of 10,000 square feet or more of effective impervious surfaces: **Neither the Willows Pond nor the Black Swamp Basin exceed 10,000 SF of effective impervious surfaces. It should be noted that while there is more than 10,000 SF of impervious surfacing proposed, the majority of this surfacing is considered *ineffective* (due to these areas being completely infiltrated) and thus does not pertain to this threshold.**
    - TDAs that convert ¾ acres or more of native vegetation, pasture, scrub/shrub, or unmaintained non-native vegetation to lawn or landscape, or convert 2.5 acres or more of native vegetation to pasture, and from which there is a surface discharge in a natural or man-made conveyance system from the TDA: T**here is less than ¾ acres of lawn or landscaping proposed in each basin in the developed condition. Additionally, it is not proposed to convert any area to pasture as part of this development. Therefore, this threshold is not exceeded.**
    - TDAs that through a combination of effective hard surfaces and converted vegetation areas cause a 0.15 cubic feet per second (cfs) or greater increase in the 100-year flow frequency as estimated using an approved continuous simulation model and 15-minute time steps. **For the purposes of this calculation, the developed runoff is typically compared to the pre-project (existing) runoff. However, in order to be more conservative and add an extra factor of safety, the developed condition was compared to historical runoff for this project. Analysis of each basin per the requirements of this threshold are presented below:**
      - **Willows Pond Basin: The 100-year historical runoff from the project is 0.119 cfs. The 100-year developed runoff from the project is 0.130 cfs. The project results in a decrease of 0.011 cfs, which is less than the 0.15 cfs increase threshold. The project does not exceed this threshold. Calculations are provided within Appendix A of this report.**

As mentioned on the prior page, it does not appear that there is adequate space in the pavement section to comply with cover and separation requirements. Additional clarification is needed to ensure the proposed design can meet regulations and effectively infiltrate the project runoff to avoid the MR7 threshold.
[Storm Report-Lot D; Pg 9 of 98]

See comment previous page regarding cover and separation requirements. [Storm Report-Lot D; Pg 10 of 98]

- **Black Swamp Basin: The 100-year historical runoff from the project is 0.06617 cfs. The 100-year developed runoff from the project is 0.07109 cfs. The project results in an increase of 0.00492 cfs, which is less than the 0.15 cfs increase threshold. The project does not exceed this threshold. Calculations are provided within Appendix A of this report.**

  - None of the above thresholds are exceeded by either basin. Therefore, the Flow Control standards are not required as part of this project. However, the Flow Control standards are voluntarily met as part of a conservative stormwater design process.

- Minimum Requirement #8: Wetlands Protection

  In the existing condition, runoff and subsurface flows from the eastern portion of the project site (known as the Willows Pond Basin) discharges to Willows Pond (a wetland and stormwater pond) to the northeast. This will be maintained to the maximum extent possible in the developed condition. To avoid excessive hydrologic alteration of the existing wetland, stormwater calculations for the Willows Pond Basin will implement Method 2: Site Discharge Modeling per Volume I, Appendix C of the manual and per discussion with Puyallup Engineering.

  There are two criteria that must be met in order to comply with Method 2:

  - For Criteria 1, the total volume of water into a wetland on a daily basis should not be more than 20% higher or lower than the pre-project volumes.
  - For Criteria 2, the total volume of water into a wetland on a monthly basis should not be more than 15% higher or lower than the pre-project volumes.

Per prior comment...it does not appear that Method 2 is the correct approach. The provided EnCo wetland assessment (Appendix E) categorized the wetland as a Category II, Depressional wetland. Per Ecology Appendix I-C.4, Method 1 must be used to verify the hydroperiod protections. [Storm Report-Lot D; Pg 10 of 98]

The two aforementioned criteria require the developed and existing basins contributing to the wetland to be compared in order to confirm that the wetland hydroperiod may be maintained. It should be noted that all contributing offsite areas were modelled as forest outside of the wetland/pond. It is assumed that all offsite areas already developed (or to be developed in the future) will follow the requirements of the manual and stormwater runoff will not exceed the typical runoff of a forest.

Per meeting on April 11, 2023, the City suggested analyzing the wetland using the overall tributary basin rather than solely the runoff from the project site. To the City's recollection, it was never agreed to forego the Method 1 analysis which is mandated by the Ecology Manual. [Storm Report-Lot D; Pg 10 of 98]

Please refer to Appendices A and E for stormwater calculations and further information.

Per internal discussion, the City is willing to allow the predeveloped forested condition rather than the existing conditions.

- Minimum Requirement #9: Operations and Maintenance

  - To ensure that stormwater control facilities are adequately maintained and operated properly, an Operation and Maintenance Manual is prepared and will be included at time of full submittal.

Section 2 – Existing Conditions Summary

Topography

Topographically, the majority of the site is generally level. The portions of the parcel that abut the public roadways are somewhat inclined from roadway to parcel, about 2 to 3 feet vertically. These features currently allow most stormwater to either infiltrate onsite, or flow into the adjacent wetland, north and east of the site.

Much of the parcel is characterized by a surficial layer of fill, including some debris, to an approximate depth of 3 feet.

Ground Cover

As stated above in 'Topography', a significant portion of the site is made up of fill. The site is covered by grass and blackberries, with deciduous trees and typical northwest understory along the western, northern, and eastern property lines, and a few mature conifers dispersed.

Drainage

Due to the site fill materials, which extend to depths of approximately three (3) feet on the central and eastern portion of the property (see Dos Lagos Geotechnical Report) a composite infiltration rate of 2.33 in/hr was supplied. This infiltration rate was further reduced by correction factors as determined by Ecology Section V-5.4:

$$K_{sat}Design = K_{sat}Initial \times CF_V \times CF_T \times CF_M = \mathbf{1.04\ in/hr.}$$

Where:

??

$K_{sat}Initial$ = 2.33 in/hr.

CF_V = 1.0 (per Geologist's analysis of site variability & number of locations tested)

CF_T = 0.5 (per small-scale PIT method)

CF_M = 0.9 (per DOE standard factor)

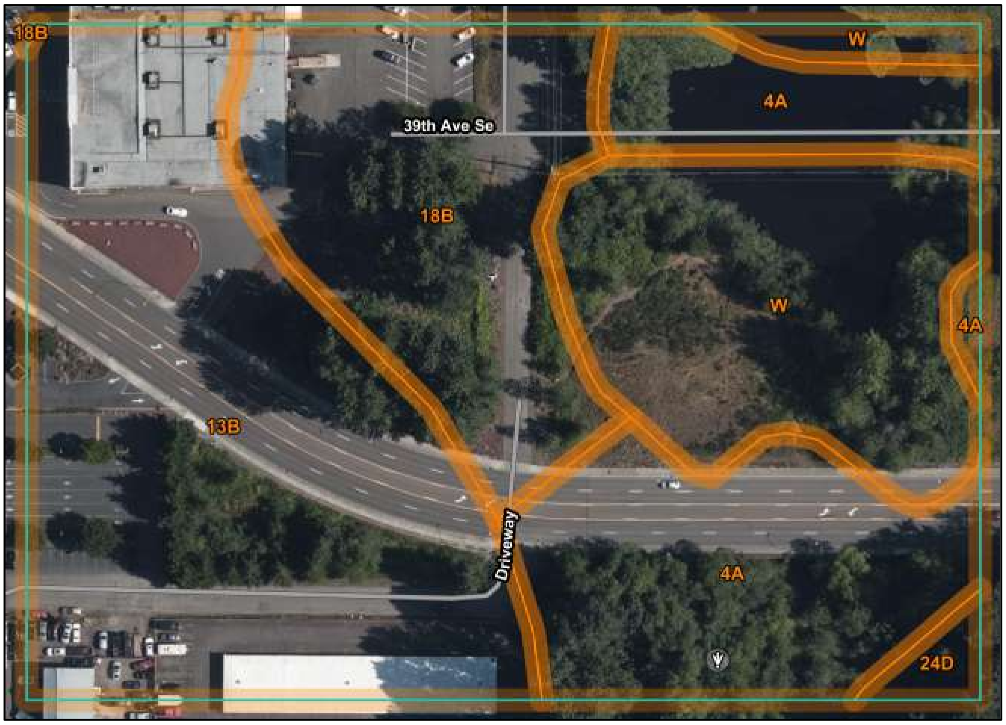
Runoff generally sheet flows north and east across the site, either infiltrating on-site or sheet flowing into the existing adjacent wetland.

The site is in the aquifer recharge area.

Soils

Soil mapping was conducted using the United States Department of Agriculture Natural Resources Conservation Service (NRCS, The Survey) website. The site position within the NRCS soil map is illustrated in Figure 3 below. The soil map for all properties can also be found in the geotechnical report, along with soil descriptions and soil logs, in Appendix D.

Figure 3: Site Position in NRCS soil mapping (excerpt)



Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
4A	Bellingham silty clay loam	2.2	22.4%
13B	Everett very gravelly sandy loam, 0 to 8 percent slopes	3.6	37.0%
18B	Indianola loamy sand, 0 to 5 percent slopes	1.9	19.3%
24D	Neilton gravelly loamy sand, 8 to 25 percent slopes	0.1	1.1%
W	Water	2.0	20.2%
Totals for Area of Interest		**9.7**	**100.0%**

Section 3 – Off-Site Analysis Report

Upstream Analysis

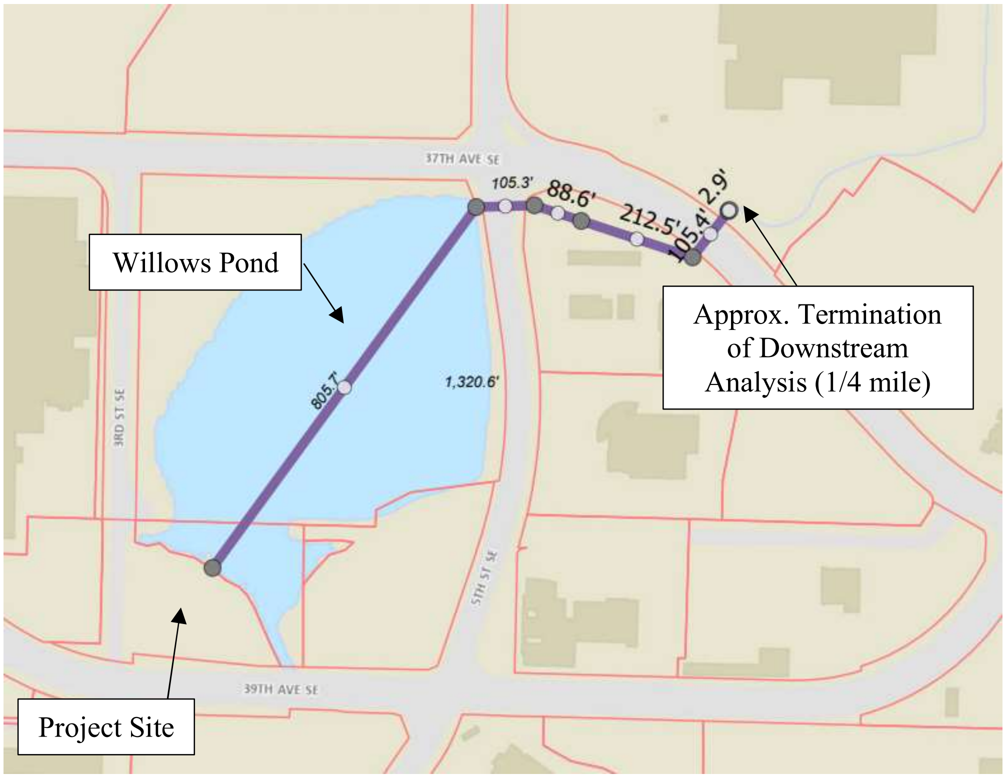
Virtually all stormwater originates on the property itself as precipitation. There is no relevant upstream analysis.

Downstream Analysis

A downstream (offsite) analysis has been completed by LS&E for this project. Offsite analysis study area definition maps are shown below. As there are two basins present as part of this project, two downstream analyses were completed.

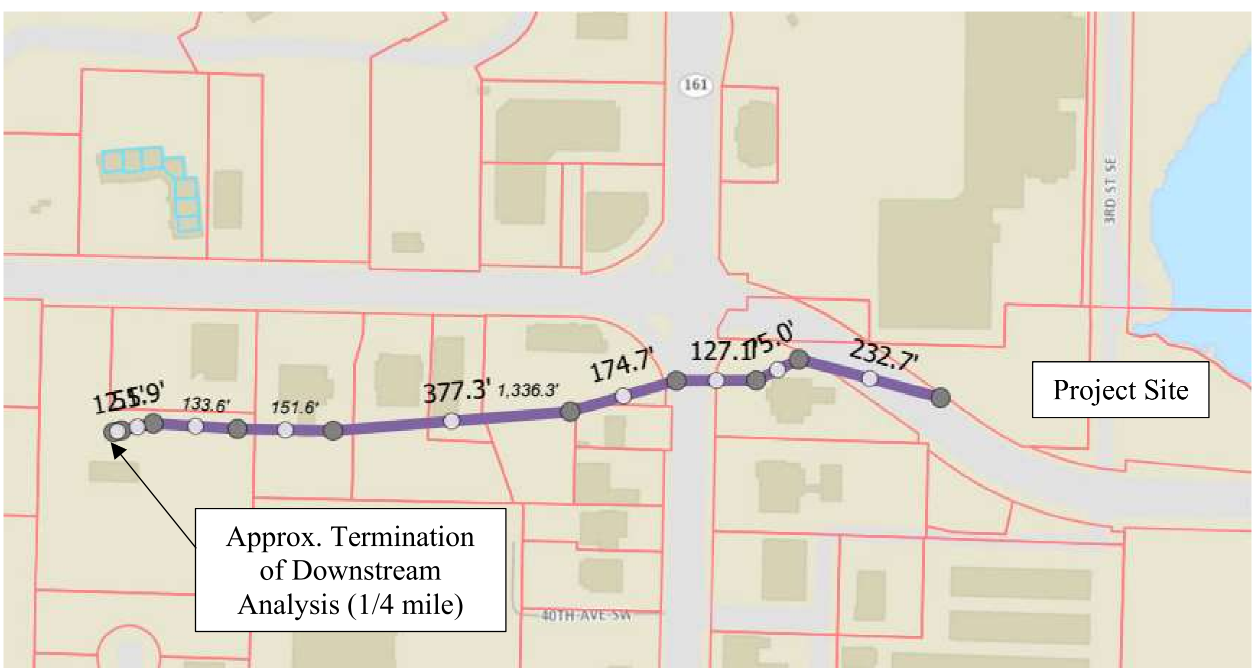
- East Willows Pond Basin: The study area for this project extends approximately ¼ mile to a portion of the unnamed stream that is released from Willow's Pond, just north of its crossing under 37th Ave SE. This stream eventually drains into Bradley Lake, then downstream for an unspecified distance (see Figure 4).

Figure 4: Willows Pond Basin Downstream Analysis Map



- West Black Swamp Basin: For the western portion of the site, there is an existing inlet that collects surface water and conveys it through piping to the west. Eventually the piping discharges into a conveyance ditch to the west of the site, which eventually discharges to the Pierce County Black Swamp Pothole.

Figure 5: Black Swamp Basin Downstream Analysis Map



No adverse impacts to downstream waters are anticipated as stormwater runoff from new hard surfaces will first be infiltrated through porous pavement before routing to the appropriate basin. These facilities have been sized using the MGSFlood continuous runoff model program.

Section 4 – Flow Control and Water Quality Facility Analysis and Design

Part A – Existing Site Hydrology

This project site is located in northwestern Pierce County at 303 39th Ave SE in the City of Puyallup in an area of existing commercial development. The site parcels comprise approximately 2.30 acres, with 0.99 acres of that existing within the parcel to the west of 3rd St SE. These parcels are bordered by commercial businesses and Willow's Pond to the north, multiple commercial developments to the west, a portion of Willow's Pond and associated wetland to the east, and 39th Ave SE to the South. Access to the project site will be a new driveway, located at the existing entrance to 3rd Street SE.

Existing topography is variable across the site. West of the roadway, the topography slopes gently toward the east. However, a portion of the site is collected by an existing inlet on Parcel 0419102107 and piped west as part of the Black Swamp Basin. East of the roadway the topography mostly slopes in the east-southeast, with more pronounced slopes found near the perimeter. The northeast portion of parcel 0419106026 consists of wetland and water. The existing ground cover for the majority of the site consists of grasses, mature deciduous trees, a few conifers, and typical northwest understory. Current stormwater runoff from the project site primarily sheet flows toward the adjacent wetland.

Multiple stormwater calculations are required in order to fully analyze stormwater runoff for the site. The first set of stormwater calculations require the developed condition to be compared to the historical on-site conditions in order to confirm that the Flow Control standard is met (per MR#7). A separate calculation was run for each of the two basins. The below table presents the reviewer with the historic areas:

Predeveloped Historic Threshold Discharge Areas Drainage Basin Land Use Breakdown

Actual Surface Description	Area	Surface Modeled As
West Black Swamp Basin - On-Site	45,265 SF (1.039 AC)	Type C Forest
East Willows Pond Basin - On-Site	56,729 SF (1.302 AC)	Type C Forest
East Willows Pond Basin - Frontage	6,123 SF (0.141 AC)	Type C Forest
Total Area	**108,117 (2.482 AC)**	

The second stormwater calculation requires the developed and existing basins contributing to the Wetland to be compared in order to confirm that the wetland hydroperiod may be maintained (see MR#8). It should be noted that while areas are presented for both basins in the below table, only the east Willows Pond portion of the site is considered as tributary to the wetland and therefore considered as part of the calculation. Additionally, all contributing offsite areas were modelled as forest outside of the wetland/pond. It is assumed that all offsite areas already developed (or to be developed in the future) will follow the requirements of the manual and stormwater runoff will not exceed the typical runoff of a forest.

The TDA and land-use breakdown is information that was determined using the March 6,2013 City of Puyallup Comprehensive Storm Drainage Plan prepared by Brown and Caldwell. Specifically, Table 5-1 and Figure 5-1 were used to determine that of the 420 acres contributing to the Willows Pond/Bradley Lake basin area approximately 203 acres specifically contributes to the TDA that the project site is located in.

The below table presents the reviewer with the predeveloped existing areas:

East Willows Pond - Predeveloped Existing Threshold Discharge Areas Drainage Basin Land Use Breakdown

Actual Surface Description	Area	Surface Modeled As
Project Areas		
Pavement	6,488 SF (0.149 AC)	Roads
Frontage Sidewalk & Access	2,228 SF (0.051 AC)	Sidewalk
Pasture	39,107 SF (0.898 AC)	Type C Pasture
Forest	15,029 SF (0.345 AC)	Type C Forest
Non-Project Basin Areas		
Type A/B Forest	5,947,073 SF (136.526 AC)	Type A/B Forest
Type C Forest	2,375,767 SF (54.540 AC)	Type C Forest
Pond	455,855 SF (10.465 AC)	Pond
Total Area	**8,841,547 SF (202.974 AC)**	

West Black Swamp Predeveloped Existing Threshold Discharge Areas Drainage Basin Land Use Breakdown

Actual Surface Description	Area	Surface Modeled As
Adjacent Lot Pave./Landscaping*	10,363 SF (0.238 AC)	N/A
Pasture	34,902 SF (0.802 AC)	Type C Pasture
Total Area	**45,265 (1.039 AC)**	

Part B – Developed Site Hydrology

As noted previously, multiple stormwater calculations are required in order to fully analyze stormwater runoff for the site. The first set of stormwater calculation requires the developed condition to be compared to the historical project conditions in order to confirm that the Flow Control Standard is met (see MR#7). The below table presents the reviewer with the developed project areas:

Post Developed Threshold Discharge Areas Drainage Basin Land Use Breakdown

Actual Surface Description	Area (SF)	Surface Modeled As
West Black Swamp Basin		
Paving	18,492 SF (0.425 AC)	Porous Pavement
Sidewalks & Associated Curb	788 SF (0.018 AC)	Sidewalk => Porous Pave.
Dog Park	376 SF (0.009 AC)	Type C Pasture
Lawn/Landscape	15,246 SF (0.350 AC)	Type C Pasture
Adjacent Lot Pave./Landscaping*	10,363 SF (0.238 AC)	N/A

*It should be noted that the existing pavement, landscaping, and access serving the adjacent property north of the site are not within the project scope and will not be altered. Due to this, these areas serving the adjacent site (denoted with asterisks) were not considered as part of the stormwater calculations.

See comments under MR5 and MR7.
[Storm Report-Lot D; Pg 16 of 98]

Actual Surface Description	Area (SF)	Surface Modeled As
East Willows Pond Basin		
Paving	11,320 SF (0.260 AC)	Porous Pavement
Pedestrian Crossings	1,145 SF (0.026 AC)	Roadway => Porous Pave.
Building Roof	18,398 SF (0.422 AC)	Roof => Porous Patio
Trash Area Roof	216 SF (0.005 AC)	Roof => Porous Pave.
Patio	6,380 SF (0.146 AC)	Porous Pave.
Lawn/Landscape	18,518 SF (0.426 AC)	Type C Pasture
North Site Access	1,483 SF (0.034 AC)	Roads=> Porous Pave.
Site Sidewalk	2,200 SF (0.051 AC)	Sidewalk=> Porous Pave.
Frontage Sidewalk	2,218 SF (0.051 AC)	Porous Pave.
South Frontage Access	974 SF (0.022 AC)	Roadway
Total Area	**108,117 (2.482 AC)**	

The second stormwater calculation requires the developed and existing basins contributing to the Wetland to be compared in order to confirm that the wetland hydroperiod may be maintained (see MR#8). It should be noted that only the areas for the east Willows Pond portion of the site are considered as tributary to the wetland and therefore considered as part of the calculation. Additionally, all contributing offsite areas were modelled as forest outside of the wetland/pond. It is assumed that all offsite areas already developed (or to be developed in the future) will follow the requirements of the manual and stormwater runoff will not exceed the typical runoff of a forest.

The TDA and land-use breakdown is information that was determined using the March 6,2013 City of Puyallup Comprehensive Storm Drainage Plan prepared by Brown and Caldwell. Specifically, Table 5-1 and Figure 5-1 were used to determine that of the 420 acres contributing to the Willows Pond/Bradley Lake basin area approximately 203 acres specifically contributes to the TDA that the project site is located in.

CONDITION: At time of civil, include references as exhibits in the storm report.

The below table presents the reviewer with the predeveloped existing areas:

Developed Threshold Discharge Area Drainage Basin Land Use Breakdown for Wetland

Actual Surface Description	Area (AC)	Surface Modeled As
Project Areas		
Please refer to the previous table under Part B for an analysis of the Willows Pond project areas.		
Non-Project Basin Areas		
Type A/B Forest	5,947,073 SF (136.526 AC)	Type A/B Forest
Type C Forest	2,375,767 SF (54.540 AC)	Type C Forest
Pond	455,855 SF (10.465 AC)	Pond
Total Area	**8,841,547 SF (202.974 AC)**	

Part C – Performance Standards

This project meets the following performance standards:

- **MR6 Water Quality Standards**: The project is required to construct runoff treatment BMPs in order to treat runoff from pollution-generating surfaces. The project proposes porous pavement to treat runoff from pollution-generating surfaces. Please refer to the MR6 and Part E sections for further information regarding this standard and appendix A for calculations.
- **MR7 Flow Control Standards**: The project volunteers to meet the Flow Control Standards as part of the design. In order to meet this standard, stormwater discharges shall match developed discharge durations to pre-developed durations for the range of pre-developed discharge rates from 50% of the 2-year peak flow up to the full 50-year peak flow. The project proposes to infiltrate a majority of the proposed impervious surfaces, meeting this standard. Please refer to the MR7 and Part D sections for further information regarding this standard and appendix A for calculations.

- **MR8 Wetland Standards**: The project is required to maintain flows to the existing wetland to the maximum extent possible as part of the site development. This is achieved by an analysis of the wetland basin and a comparison of the existing and proposed developed flows to it. Please refer to MR8 for further information regarding this standard and appendix A for calculations.

Part D – Flow Control System

Flow control is provided within projects to reduce the impacts of stormwater runoff from hard surfaces and land cover conversions. In order to meet this standard, stormwater discharges shall match developed discharge durations to pre-developed durations for the range of pre-developed discharge rates from 50% of the 2-year peak flow up to the full 50-year peak flow. In order to meet this standard, the project proposes to infiltrate a majority of the proposed impervious surfaces.

A table comparing the Willows Pond Basin's historical and developed runoff is presented below:

Years	Historical Discharge (CFS)	Developed Discharge (CFS)
2-Year	0.03614	0.01913
5-Year	0.05724	0.02962
10-Year	0.07125	0.04177
25-Year	0.09552	0.06998
50-Year	0.108	0.08388
100-Year	0.119	0.130

Table. Willows Pond - Comparison of Historical and Developed Runoff

A table comparing the Black Swamp Basin's historical and developed runoff is presented below:

Years	Historical Discharge (CFS)	Developed Discharge (CFS)
2-Year	0.02009	0.01113
5-Year	0.03181	0.01975
10-Year	0.03960	0.02648
25-Year	0.05309	0.04375
50-Year	0.05991	0.04866
100-Year	0.06617	0.07109

Table. Black Swamp - Comparison of Historical and Developed Runoff

Please refer to the MR7 for further information regarding this standard and appendix A for calculations.

Part E – Water Quality System

This project must address water quality as it proposes more than the 5,000 PGHS square foot threshold. The proposed porous pavement will provide water quality mitigation and has been sized to infiltrate 100% of the tributary areas. Water quality mitigation will occur within the soils underlying the pervious paving and storage base material. Sampling for CEC's has been completed and is in process. The results will be provided for review when we have them.

Stormwater calculations are presented within Appendix A.

There are no special requirements for source control or oil control for this project. Per City of Puyallup – City Standard, 204.9 – Oil Control/Spill Containment, multi-family properties shall include, at a minimum, a spill control device shall be located upstream of any onsite water quality or flow control facility.

Part F – Conveyance System Design and Analysis

Conveyance system analysis to be provided in final draft.

Section 5 – Special Reports and Studies

- A geotechnical report entitled *Dos Lagos Asset, LLC Geotechnical Soil Observation Report* was completed by LS&E and a copy is submitted with this report in Appendix D.
- A wetland report entitled *Wetland 1 Hydroperiod and Water Quality Analysis* was completed by Enco Environmental Corporation for the neighboring Affinity at Puyallup project and is submitted with this report in Appendix E.

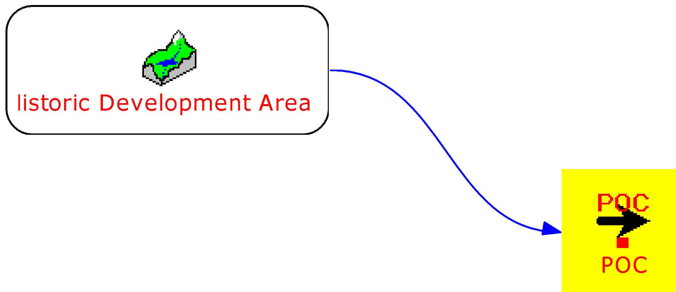
Section 6 – Other Permits

- Temporary Construction Easement (No Auditor File Number (AFN) currently available).
- A SEPA Environmental Checklist will be required.

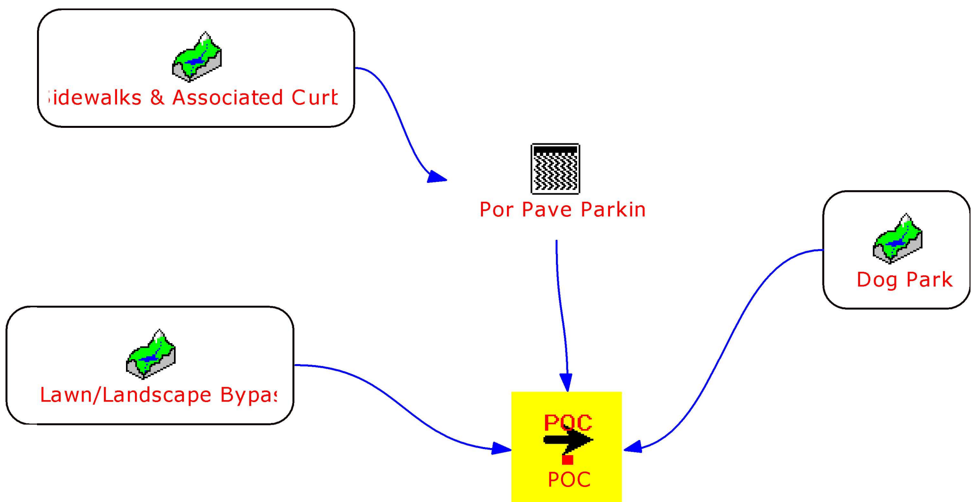
Appendix A

Calculations for Black Swamp and Willows Pond Basins

Lot D - Black Swamp
Historical vs Developed Calculation For MR7
Historical Subbasin



Developed Subbasin



MGS FLOOD
PROJECT REPORT

Program Version: MGSFlood 4.58
Program License Number: 201010005
Project Simulation Performed on: 07/31/2023 12:18 PM
Report Generation Date: 07/31/2023 12:19 PM

Input File Name:	Lot D Black Swamp.fld
Project Name:	12896 - Lot D Black Swamp
Analysis Title:	
Comments:	

PRECIPITATION INPUT

Computational Time Step (Minutes): 15

Extended Precipitation Time Series Selected

Full Period of Record Available used for Routing

Climatic Region Number: 38
Precipitation Station : 910042 Pierce Co. East 42 in 10/01/1939-10/01/2097
Evaporation Station : 911042 Pierce Co. East 42 in

Evaporation Scale Factor : 0.750

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

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

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

Predevelopment/Post Development Tributary Area Summary

	Predeveloped	Post Developed
Total Subbasin Area (acres)	0.802	0.377
Area of Links that Include Precip/Evap (acres)	0.000	0.425
Total (acres)	0.802	0.802

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

Number of Subbasins: 1

---------- Subbasin : Historic Development Area ----------
-------Area (Acres) --------
C, Forest, Flat 0.802

Subbasin Total 0.802

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

Number of Subbasins: 3

---------- Subbasin : Lawn/Landscape Bypass ----------
-------Area (Acres) --------
C, Pasture, Flat 0.350

Subbasin Total 0.350

---------- Subbasin : Dog Park ----------
-------Area (Acres) --------
C, Pasture, Flat 0.009

Subbasin Total 0.009

---------- Subbasin : Sidewalks & Associated Curb ----------

	-------Area (Acres) --------
SIDEWALKS/FLAT	0.018

Subbasin Total 0.018

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

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

Link Name: POC
Link Type: Copy
Downstream Link: None

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

----------------------SCENARIO: POSTDEVELOPED
Number of Links: 2

Link Name: POC
Link Type: Copy
Downstream Link: None

Link Name: Por Pave Parking
Link Type: Porous Pavement Structure
Downstream Link Name: POC

Pavement Length (ft)	: 462.30
Pavement Width (ft)	: 40.00
Pavement Slope (ft/ft)	: 0.000
Pavement Infiltration Rate (in/hr)	: 20.000
Number of Infiltration Cells	: 2
Trench Cell Length (ft)	: 462.30
Trench Cell Width (ft)	: 40.00
Trench Cell Depth (ft)	: 1.00
Trench Gravel Porosity (%)	: 30.00
Trench Bed Slope (ft/ft)	: 0.000
Native Soil Infiltration Rate (in/hr)	: 1.040

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

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

************ Subbasin: Historic Development Area ************

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

Tr (yrs)	Flood Peak (cfs)
2-Year	2.009E-02
5-Year	3.181E-02
10-Year	3.960E-02
25-Year	5.309E-02
50-Year	5.991E-02
100-Year	6.617E-02
200-Year	0.106
500-Year	0.159

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

Tr (yrs)	Flood Peak (cfs)
2-Year	2.009E-02
5-Year	3.181E-02
10-Year	3.960E-02
25-Year	5.309E-02
50-Year	5.991E-02
100-Year	6.617E-02
200-Year	0.106
500-Year	0.159

---------------------SCENARIO: POSTDEVELOPED
Number of Subbasins: 3
Number of Links: 2

************ Subbasin: Lawn/Landscape Bypass ************

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

Tr (yrs)	Flood Peak (cfs)
2-Year	1.085E-02
5-Year	1.925E-02
10-Year	2.582E-02
25-Year	4.265E-02
50-Year	4.744E-02
100-Year	6.931E-02
200-Year	8.460E-02
500-Year	0.104

********** **Subbasin: Dog Park** **********

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

Tr (yrs)	Flood Peak (cfs)
2-Year	2.790E-04
5-Year	4.950E-04
10-Year	6.640E-04
25-Year	1.097E-03
50-Year	1.220E-03
100-Year	1.782E-03
200-Year	2.176E-03
500-Year	2.685E-03

********** **Subbasin: Sidewalks & Associated Curb** **********

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

Tr (yrs)	Flood Peak (cfs)
2-Year	7.324E-03
5-Year	9.524E-03
10-Year	1.120E-02
25-Year	1.410E-02
50-Year	1.687E-02
100-Year	2.096E-02
200-Year	2.234E-02
500-Year	2.411E-02

********** Link: POC ********** Link Inflow Frequency Stats

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

Tr (yrs)	Flood Peak (cfs)
2-Year	1.113E-02
5-Year	1.975E-02
10-Year	2.648E-02
25-Year	4.375E-02
50-Year	4.866E-02
100-Year	7.109E-02
200-Year	8.678E-02
500-Year	0.107

********** Link: Por Pave Parking ********** Link Inflow Frequency Stats

Flood Frequency Data(cfs)

(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	7.324E-03
5-Year	9.524E-03
10-Year	1.120E-02
25-Year	1.410E-02
50-Year	1.687E-02
100-Year	2.096E-02
200-Year	2.234E-02
500-Year	2.411E-02

********** Link: Por Pave Parking ********** Link Outflow 1 Frequency Stats

Flood Frequency Data(cfs)

(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	0.000E+00
5-Year	0.000E+00
10-Year	0.000E+00
25-Year	0.000E+00
50-Year	0.000E+00
100-Year	0.000E+00
200-Year	0.000E+00
500-Year	0.000E+00

********** Link: Por Pave Parking ********** Link WSEL Stats

WSEL Frequency Data(ft)

(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	WSEL Peak (ft)
1.05-Year	4.144E-02
1.11-Year	4.226E-02
1.25-Year	4.384E-02
2.00-Year	4.876E-02
3.33-Year	5.280E-02
5-Year	5.475E-02
10-Year	6.269E-02
25-Year	7.190E-02
50-Year	7.959E-02
100-Year	0.111

***********Groundwater Recharge Summary *************

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

Total Predeveloped Recharge During Simulation

Model Element		Recharge Amount (ac-ft)
Subbasin: Historic Development	152.499	
Link: POC	0.000	
Total:		152.499

Total Post Developed Recharge During Simulation

Model Element		Recharge Amount (ac-ft)
Subbasin: Lawn/Landscape Bypas	61.809	
Subbasin: Dog Park	1.589	
Subbasin: Sidewalks & Associat	0.000	
Link: POC	0.000	
Link: Por Pave Parking	253.532	
Total:		316.930

Total Predevelopment Recharge is Less than Post Developed
Average Recharge Per Year, (Number of Years= 158)
Predeveloped: 0.965 ac-ft/year, Post Developed: 2.006 ac-ft/year

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

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

Number of Links: 1

********** Link: POC **********

2-Year Discharge Rate : 0.020 cfs

15-Minute Timestep, Water Quality Treatment Design Discharge
On-line Design Discharge Rate (91% Exceedance): 0.02 cfs
Off-line Design Discharge Rate (91% Exceedance): 0.01 cfs

Infiltration/Filtration Statistics--------------------
Inflow Volume (ac-ft): 97.52
Inflow Volume Including PPT-Evap (ac-ft): 97.52
Total Runoff Infiltrated (ac-ft): 0.00, 0.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 97.52
Secondary Outflow To Downstream System (ac-ft): 0.00
Volume Lost to ET (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered+ET)/Total Volume: 0.00%

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

Number of Links: 2

********** Link: POC **********

2-Year Discharge Rate : 0.011 cfs

15-Minute Timestep, Water Quality Treatment Design Discharge
On-line Design Discharge Rate (91% Exceedance): 0.01 cfs
Off-line Design Discharge Rate (91% Exceedance): 0.00 cfs

Infiltration/Filtration Statistics--------------------
Inflow Volume (ac-ft): 56.99
Inflow Volume Including PPT-Evap (ac-ft): 56.99
Total Runoff Infiltrated (ac-ft): 0.00, 0.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 56.99
Secondary Outflow To Downstream System (ac-ft): 0.00
Volume Lost to ET (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered+ET)/Total Volume: 0.00%

********** Link: Por Pave Parking **********

15-Minute Timestep, Water Quality Treatment Design Discharge
On-line Design Discharge Rate (91% Exceedance): 0.00 cfs
Off-line Design Discharge Rate (91% Exceedance): 0.00 cfs

Infiltration/Filtration Statistics--------------------
Inflow Volume (ac-ft): 9.01
Inflow Volume Including PPT-Evap (ac-ft): 253.53
Total Runoff Infiltrated (ac-ft): 253.53, 100.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 0.00
Secondary Outflow To Downstream System (ac-ft): 0.00
Volume Lost to ET (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered+ET)/Total Volume: 100.00%

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

Scenario Predeveloped Compliance Link: POC
Scenario Postdeveloped Compliance Link: POC

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

Predevelopment Runoff		Postdevelopment Runoff	
Tr (Years)	Discharge (cfs)	Tr (Years)	Discharge (cfs)
2-Year	2.009E-02	2-Year	1.113E-02
5-Year	3.181E-02	5-Year	1.975E-02
10-Year	3.960E-02	10-Year	2.648E-02
25-Year	5.309E-02	25-Year	4.375E-02
50-Year	5.991E-02	50-Year	4.866E-02
100-Year	**6.617E-02**	**100-Year**	**7.109E-02**
200-Year	0.106	200-Year	8.678E-02
500-Year	0.159	500-Year	0.107

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

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

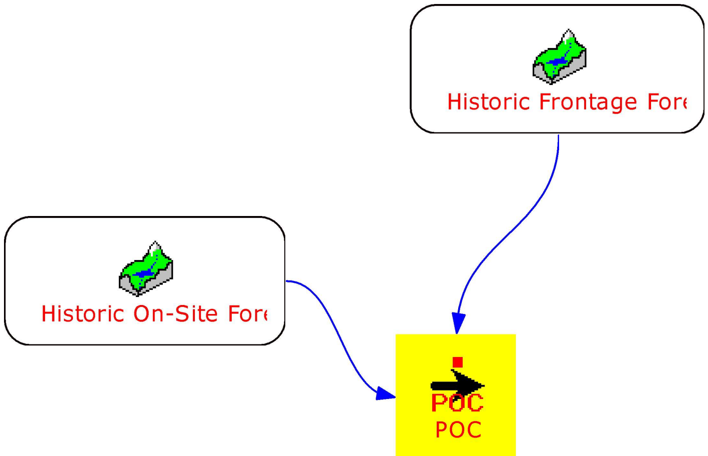
Excursion at Predeveloped 50%Q2 (Must be Less Than or Equal to 0%):	**-86.0%**	**PASS**
Maximum Excursion from 50%Q2 to Q2 (Must be Less Than or Equal to 0%):	**-86.0%**	**PASS**
Maximum Excursion from Q2 to Q50 (Must be less than 10%):	**-18.7%**	**PASS**
Percent Excursion from Q2 to Q50 (Must be less than 50%):	**0.0%**	**PASS**

MEETS ALL FLOW DURATION DESIGN CRITERIA: **PASS**

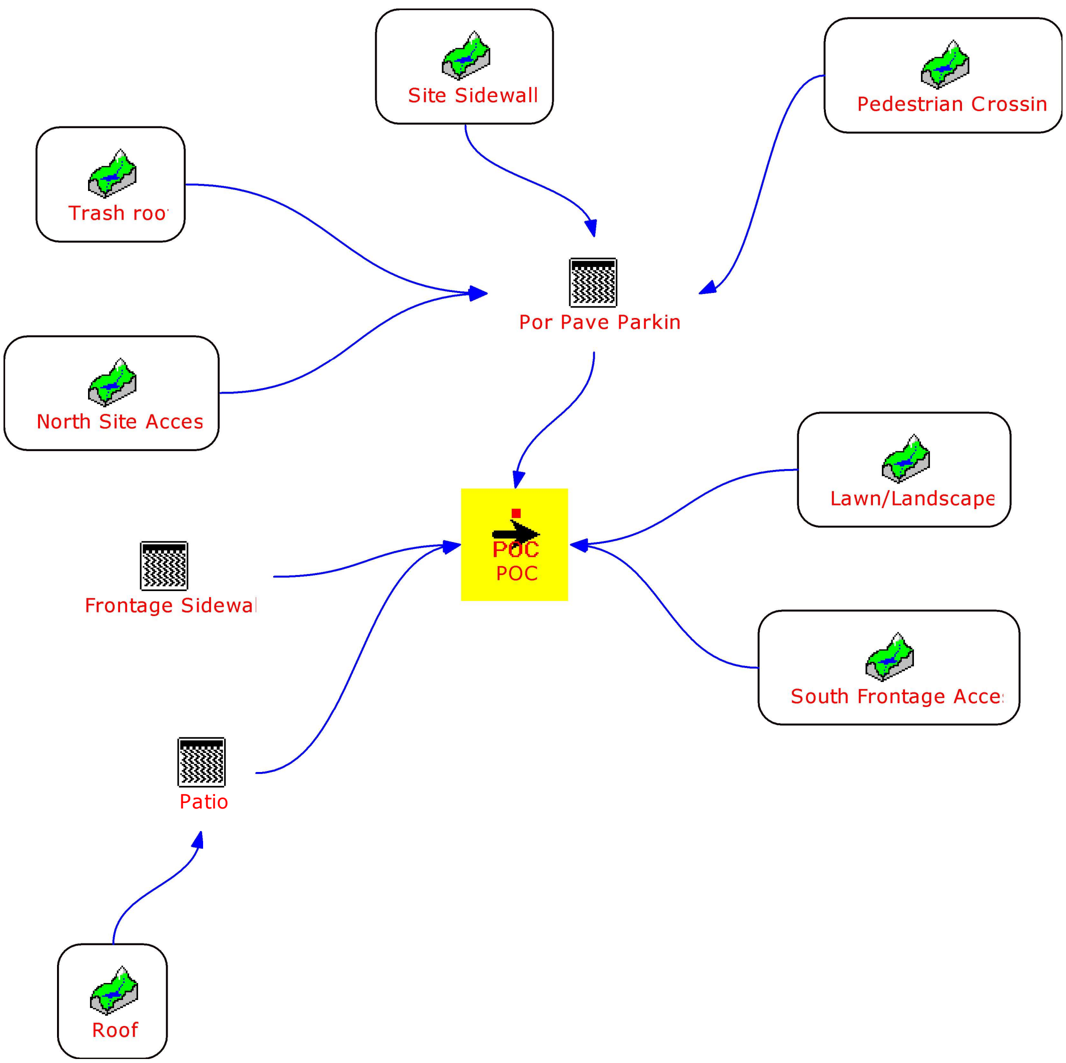
See comments under MR5 and MR7.
[Storm Report-Lot D; Pg 30 of 98]

Lot D – Willows Pond
Historical vs Developed Calculation For MR7

Historical Subbasin



Developed Subbasin



MGS FLOOD
PROJECT REPORT

Program Version: MGSFlood 4.58
Program License Number: 201010005
Project Simulation Performed on: 08/03/2023 8:34 AM
Report Generation Date: 08/03/2023 8:36 AM

Input File Name:	Lot D East Willows Pond MR7 20230417.fld
Project Name:	12896
Analysis Title:	Lot D East Willows Pond
Comments:	

PRECIPITATION INPUT

Computational Time Step (Minutes): 15

Extended Precipitation Time Series Selected

Full Period of Record Available used for Routing

Climatic Region Number:	38
Precipitation Station :	910042 Pierce Co. East 42 in 10/01/1939-10/01/2097
Evaporation Station :	911042 Pierce Co. East 42 in

Evaporation Scale Factor : 0.750

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

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

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

Predevelopment/Post Development Tributary Area Summary

	Predeveloped	Post Developed
Total Subbasin Area (acres)	1.443	0.986
Area of Links that Include Precip/Evap (acres)	0.000	0.457
Total (acres)	1.443	1.443

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

---------- Subbasin : Historic Frontage Forest ----------
-------Area (Acres) --------
C, Forest, Flat 0.141

Subbasin Total 0.141

---------- Subbasin : Historic On-Site Forest ----------
-------Area (Acres) --------
C, Forest, Flat 1.302

Subbasin Total 1.302

---------------------SCENARIO: POSTDEVELOPED
Number of Subbasins: 7

---------- Subbasin : Roof ----------
-------Area (Acres) --------
ROOF TOPS/FLAT 0.422

Subbasin Total 0.422

---------- Subbasin : Lawn/Landscape ----------
-------Area (Acres) --------
C, Pasture, Flat 0.426

Subbasin Total 0.426

---------- Subbasin : Trash roof ----------
-------Area (Acres) --------
ROOF TOPS/FLAT 0.005

Subbasin Total 0.005

---------- Subbasin : Pedestrian Crossings ----------
-------Area (Acres) --------
ROADS/FLAT 0.026

Subbasin Total 0.026

---------- Subbasin : North Site Access ----------
-------Area (Acres) --------
ROADS/FLAT 0.034

Subbasin Total 0.034

---------- Subbasin : Site Sidewalk ----------
-------Area (Acres) --------
SIDEWALKS/FLAT 0.051

Subbasin Total 0.051

---------- Subbasin : South Frontage Access ----------

-------Area (Acres) --------

ROADS/FLAT 0.022

Subbasin Total 0.022

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

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

Number of Links: 1

--

Link Name: POC

Link Type: Copy

Downstream Link: None

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

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

Number of Links: 4

--

Link Name: POC

Link Type: Copy

Downstream Link: None

--

Link Name: Por Pave Parking

Link Type: Porous Pavement Structure

Downstream Link Name: POC

Pavement Length (ft)	: 141.50
Pavement Width (ft)	: 80.00
Pavement Slope (ft/ft)	: 0.000
Pavement Infiltration Rate (in/hr)	: 20.000
Number of Infiltration Cells	: 1
Trench Cell Length (ft)	: 141.50
Trench Cell Width (ft)	: 80.00
Trench Cell Depth (ft)	: 1.00
Trench Gravel Porosity (%)	: 30.00
Trench Bed Slope (ft/ft)	: 0.000
Native Soil Infiltration Rate (in/hr)	: 1.040

Link Name: Frontage Sidewalk
Link Type: Porous Pavement Structure
Downstream Link Name: POC

Pavement Length (ft)	: 277.25
Pavement Width (ft)	: 8.00
Pavement Slope (ft/ft)	: 0.000
Pavement Infiltration Rate (in/hr)	: 20.000
Number of Infiltration Cells	: 1
Trench Cell Length (ft)	: 277.25
Trench Cell Width (ft)	: 8.00
Trench Cell Depth (ft)	: 0.50
Trench Gravel Porosity (%)	: 30.00
Trench Bed Slope (ft/ft)	: 0.000
Native Soil Infiltration Rate (in/hr)	: 1.040

Link Name: Patio
Link Type: Porous Pavement Structure
Downstream Link Name: POC

Pavement Length (ft)	: 106.33
Pavement Width (ft)	: 60.00
Pavement Slope (ft/ft)	: 0.000
Pavement Infiltration Rate (in/hr)	: 20.000
Number of Infiltration Cells	: 1
Trench Cell Length (ft)	: 106.33
Trench Cell Width (ft)	: 60.00
Trench Cell Depth (ft)	: 0.66
Trench Gravel Porosity (%)	: 30.00
Trench Bed Slope (ft/ft)	: 0.000
Native Soil Infiltration Rate (in/hr)	: 1.040

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

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

************ Subbasin: Historic Frontage Forest ************

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

Tr (yrs)	Flood Peak (cfs)
2-Year	3.532E-03
5-Year	5.593E-03
10-Year	6.962E-03
25-Year	9.334E-03
50-Year	1.053E-02
100-Year	1.163E-02
200-Year	1.861E-02
500-Year	2.799E-02

********** **Subbasin: Historic On-Site Forest** **********

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

Tr (yrs)	Flood Peak (cfs)
2-Year	3.261E-02
5-Year	5.165E-02
10-Year	6.429E-02
25-Year	8.619E-02
50-Year	9.725E-02
100-Year	0.107
200-Year	0.172
500-Year	0.258

********** Link: POC ********** Link Outflow 1
Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	3.614E-02
5-Year	5.724E-02
10-Year	7.125E-02
25-Year	9.552E-02
50-Year	0.108
100-Year	0.119
200-Year	0.190
500-Year	0.286

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

Number of Subbasins: 7
Number of Links: 4

********** **Subbasin: Roof** **********

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

Tr (yrs)	Flood Peak (cfs)
2-Year	0.172
5-Year	0.223
10-Year	0.263
25-Year	0.331
50-Year	0.395
100-Year	0.491
200-Year	0.524
500-Year	0.565

************ Subbasin: Lawn/Landscape ************

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

Tr (yrs)	Flood Peak (cfs)
2-Year	1.321E-02
5-Year	2.343E-02
10-Year	3.143E-02
25-Year	5.191E-02
50-Year	5.774E-02
100-Year	8.436E-02
200-Year	0.103
500-Year	0.127

************ Subbasin: Trash roof ************

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

Tr (yrs)	Flood Peak (cfs)
2-Year	2.034E-03
5-Year	2.646E-03
10-Year	3.112E-03
25-Year	3.917E-03
50-Year	4.685E-03
100-Year	5.823E-03
200-Year	6.205E-03
500-Year	6.696E-03

************ Subbasin: Pedestrian Crossings ************

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

Tr (yrs)	Flood Peak (cfs)
2-Year	1.058E-02
5-Year	1.376E-02
10-Year	1.618E-02
25-Year	2.037E-02
50-Year	2.436E-02
100-Year	3.028E-02
200-Year	3.227E-02
500-Year	3.482E-02

************ Subbasin: North Site Access ************

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

Tr (yrs)	Flood Peak (cfs)
2-Year	1.383E-02
5-Year	1.799E-02
10-Year	2.116E-02
25-Year	2.664E-02
50-Year	3.186E-02
100-Year	3.960E-02
200-Year	4.219E-02
500-Year	4.553E-02

************ Subbasin: Site Sidewalk ************

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

Tr (yrs)	Flood Peak (cfs)
2-Year	2.075E-02
5-Year	2.698E-02
10-Year	3.175E-02
25-Year	3.995E-02
50-Year	4.778E-02
100-Year	5.940E-02
200-Year	6.329E-02
500-Year	6.830E-02

************ Subbasin: South Frontage Access ************

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

Tr (yrs)	Flood Peak (cfs)
2-Year	8.952E-03
5-Year	1.164E-02
10-Year	1.369E-02
25-Year	1.723E-02
50-Year	2.061E-02
100-Year	2.562E-02
200-Year	2.730E-02
500-Year	2.946E-02

********** Link: POC ********** Link Outflow 1 Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	1.913E-02
5-Year	2.962E-02
10-Year	4.177E-02
25-Year	6.998E-02
50-Year	8.388E-02
100-Year	0.130
200-Year	0.270
500-Year	0.457

********** Link: Por Pave Parking ********** Link Inflow Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	4.720E-02
5-Year	6.138E-02
10-Year	7.221E-02
25-Year	9.087E-02
50-Year	0.109
100-Year	0.135
200-Year	0.144
500-Year	0.155

********** Link: Por Pave Parking ********** Link Outflow 1 Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	0.000E+00
5-Year	0.000E+00
10-Year	0.000E+00
25-Year	0.000E+00
50-Year	0.000E+00
100-Year	0.000E+00
200-Year	0.000E+00
500-Year	0.000E+00

********** Link: Por Pave Parking ********** Link WSEL Stats
WSEL Frequency Data(ft)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	WSEL Peak (ft)
1.05-Year	5.205E-02
1.11-Year	5.364E-02
1.25-Year	5.488E-02
2.00-Year	5.770E-02
3.33-Year	6.101E-02
5-Year	6.267E-02
10-Year	6.641E-02
25-Year	9.011E-02
50-Year	0.112
100-Year	0.122

********** Link: Frontage Sidewalk ********** Link Inflow Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	0.000E+00
5-Year	0.000E+00
10-Year	0.000E+00
25-Year	0.000E+00
50-Year	0.000E+00
100-Year	0.000E+00
200-Year	0.000E+00
500-Year	0.000E+00

********** Link: Frontage Sidewalk ********** Link Outflow 1 Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	0.000E+00
5-Year	0.000E+00
10-Year	0.000E+00
25-Year	0.000E+00
50-Year	0.000E+00
100-Year	0.000E+00
200-Year	0.000E+00
500-Year	0.000E+00

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

Tr (yrs)	WSEL Peak (ft)
1.05-Year	4.015E-02
1.11-Year	4.102E-02
1.25-Year	4.284E-02
2.00-Year	4.829E-02
3.33-Year	5.294E-02
5-Year	5.491E-02
10-Year	6.328E-02
25-Year	7.523E-02
50-Year	0.101
100-Year	0.116

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

Tr (yrs)	Flood Peak (cfs)
2-Year	0.172
5-Year	0.223
10-Year	0.263
25-Year	0.331
50-Year	0.395
100-Year	0.491
200-Year	0.524
500-Year	0.565

********** Link: Patio ********** Link Outflow 1 Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	0.000E+00
5-Year	0.000E+00
10-Year	0.000E+00
25-Year	0.000E+00
50-Year	1.698E-02
100-Year	5.517E-02
200-Year	0.178
500-Year	0.344

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

Tr (yrs)	WSEL Peak (ft)
1.05-Year	0.130
1.11-Year	0.133
1.25-Year	0.139
2.00-Year	0.153
3.33-Year	0.177
5-Year	0.218
10-Year	0.308
25-Year	0.488
50-Year	0.589
100-Year	0.660

***********Groundwater Recharge Summary *************

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

Total Predeveloped Recharge During Simulation

Model Element	Recharge Amount (ac-ft)	
Subbasin: Historic Frontage Fo	26.811	
Subbasin: Historic On-Site For	247.573	
Link: POC	0.000	
Total:		274.384

Total Post Developed Recharge During Simulation

Model Element	Recharge Amount (ac-ft)		
Subbasin: Roof	0.000		
Subbasin: Lawn/Landscape		75.230	
Subbasin: Trash roof	0.000		
Subbasin: Pedestrian Crossings	0.000		
Subbasin: North Site Access	0.000		
Subbasin: Site Sidewalk	0.000		
Subbasin: South Frontage Acces		0.000	
Link: POC	0.000		
Link: Por Pave Parking	207.772		
Link: Frontage Sidewalk	29.328		
Link: Patio	295.672		
Total:			608.003

Total Predevelopment Recharge is Less than Post Developed
Average Recharge Per Year, (Number of Years= 158)
Predeveloped: 1.737 ac-ft/year, Post Developed: 3.848 ac-ft/year

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

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

Number of Links: 1

********** Link: POC **********

2-Year Discharge Rate : 0.036 cfs

15-Minute Timestep, Water Quality Treatment Design Discharge
On-line Design Discharge Rate (91% Exceedance): 0.03 cfs
Off-line Design Discharge Rate (91% Exceedance): 0.02 cfs

Infiltration/Filtration Statistics--------------------
Inflow Volume (ac-ft): 175.47
Inflow Volume Including PPT-Evap (ac-ft): 175.47
Total Runoff Infiltrated (ac-ft): 0.00, 0.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 175.47
Secondary Outflow To Downstream System (ac-ft): 0.00
Volume Lost to ET (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered+ET)/Total Volume: 0.00%

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

Number of Links: 4

********** Link: POC **********

2-Year Discharge Rate : 0.019 cfs

15-Minute Timestep, Water Quality Treatment Design Discharge
On-line Design Discharge Rate (91% Exceedance): 0.01 cfs
Off-line Design Discharge Rate (91% Exceedance): 0.01 cfs

Infiltration/Filtration Statistics--------------------
Inflow Volume (ac-ft): 78.66
Inflow Volume Including PPT-Evap (ac-ft): 78.66
Total Runoff Infiltrated (ac-ft): 0.00, 0.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 78.66
Secondary Outflow To Downstream System (ac-ft): 0.00
Volume Lost to ET (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered+ET)/Total Volume: 0.00%

********** Link: Por Pave Parking **********

15-Minute Timestep, Water Quality Treatment Design Discharge
On-line Design Discharge Rate (91% Exceedance):   0.02 cfs
Off-line Design Discharge Rate (91% Exceedance):   0.01 cfs

Infiltration/Filtration Statistics--------------------
Inflow Volume (ac-ft):   58.09
Inflow Volume Including PPT-Evap (ac-ft):   207.77
Total Runoff Infiltrated (ac-ft):   207.77,   100.00%
Total Runoff Filtered (ac-ft):   0.00,   0.00%
Primary Outflow To Downstream System (ac-ft):   0.00
Secondary Outflow To Downstream System (ac-ft):   0.00
Volume Lost to ET (ac-ft):   0.00
Percent Treated (Infiltrated+Filtered+ET)/Total Volume: 100.00%

********** Link: Frontage Sidewalk **********

Infiltration/Filtration Statistics--------------------
Inflow Volume (ac-ft):   0.00
Inflow Volume Including PPT-Evap (ac-ft):   29.33
Total Runoff Infiltrated (ac-ft):   29.33,   100.00%
Total Runoff Filtered (ac-ft):   0.00,   0.00%
Primary Outflow To Downstream System (ac-ft):   0.00
Secondary Outflow To Downstream System (ac-ft):   0.00
Volume Lost to ET (ac-ft):   0.00
Percent Treated (Infiltrated+Filtered+ET)/Total Volume: 100.00%

********** Link: Patio **********

15-Minute Timestep, Water Quality Treatment Design Discharge
On-line Design Discharge Rate (91% Exceedance):   0.07 cfs
Off-line Design Discharge Rate (91% Exceedance):   0.04 cfs

Infiltration/Filtration Statistics--------------------
Inflow Volume (ac-ft):   211.32
Inflow Volume Including PPT-Evap (ac-ft):   295.68
Total Runoff Infiltrated (ac-ft):   295.67,   100.00%
Total Runoff Filtered (ac-ft):   0.00,   0.00%
Primary Outflow To Downstream System (ac-ft):   0.01
Secondary Outflow To Downstream System (ac-ft):   0.00
Volume Lost to ET (ac-ft):   0.00
Percent Treated (Infiltrated+Filtered+ET)/Total Volume: 100.00%

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

Scenario Predeveloped Compliance Link: POC
Scenario Postdeveloped Compliance Link: POC

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

Predevelopment Runoff		Postdevelopment Runoff	
Tr (Years)	Discharge (cfs)	Tr (Years)	Discharge (cfs)
2-Year	3.614E-02	2-Year	1.913E-02
5-Year	5.724E-02	5-Year	2.962E-02
10-Year	7.125E-02	10-Year	4.177E-02
25-Year	9.552E-02	25-Year	6.998E-02
50-Year	0.108	50-Year	8.388E-02
100-Year	**0.119**	**100-Year**	**0.130**
200-Year	0.190	200-Year	0.270
500-Year	0.286	500-Year	0.457

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

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

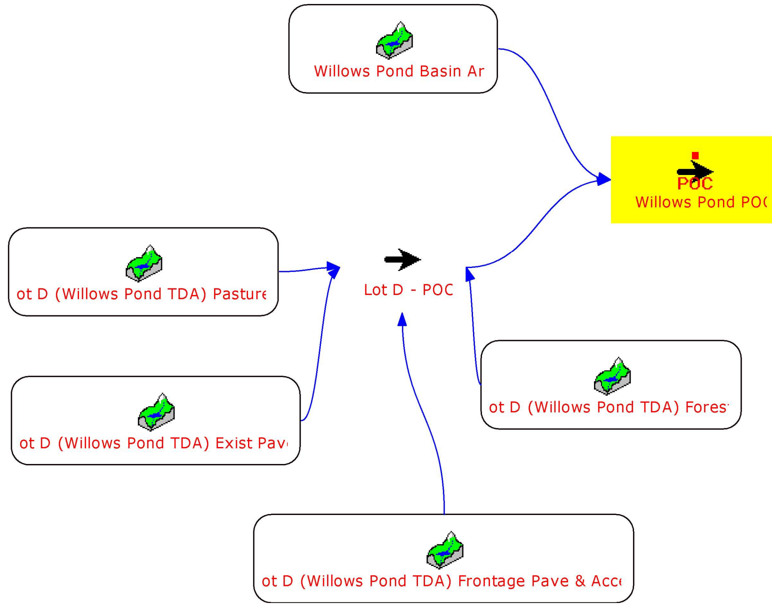
Excursion at Predeveloped 50%Q2 (Must be Less Than or Equal to 0%):	**-95.3%**	**PASS**
Maximum Excursion from 50%Q2 to Q2 (Must be Less Than or Equal to 0%):	**-95.3%**	**PASS**
Maximum Excursion from Q2 to Q50 (Must be less than 10%):	**-37.5%**	**PASS**
Percent Excursion from Q2 to Q50 (Must be less than 50%):	**0.0%**	**PASS**

MEETS ALL FLOW DURATION DESIGN CRITERIA: **PASS**

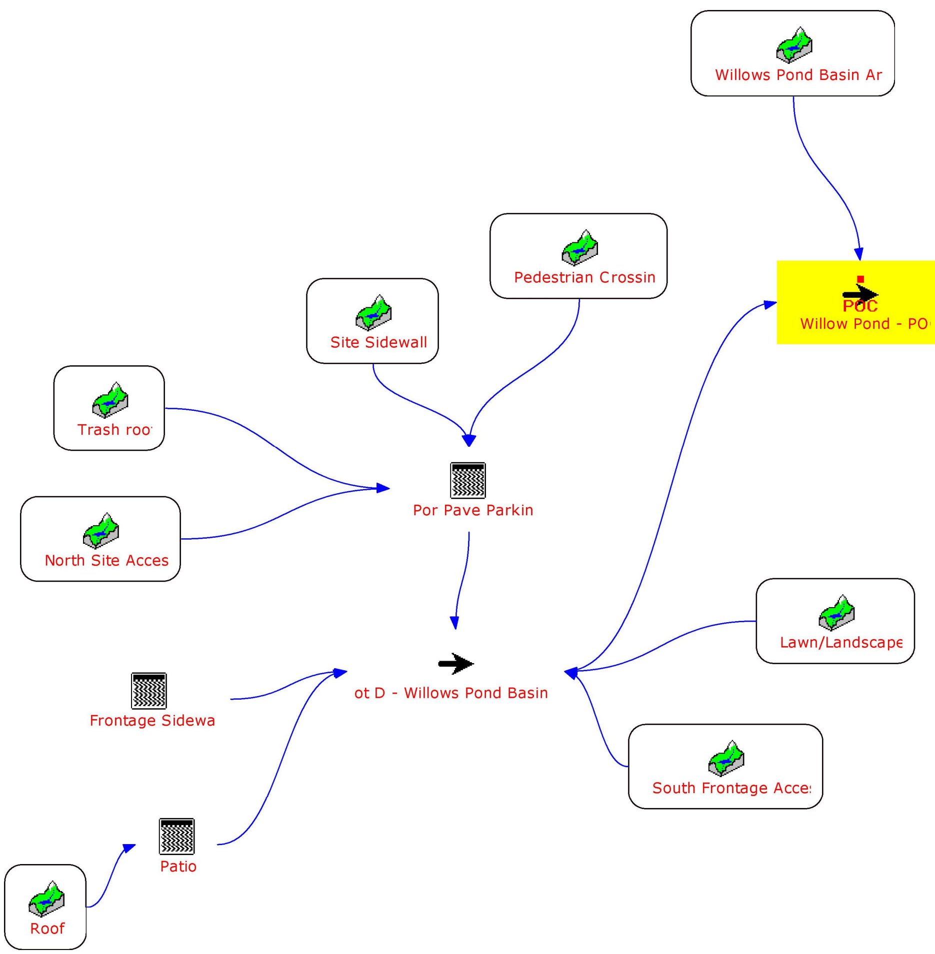
See comments under MR8.
[Storm Report-Lot D; Pg 45 of 98]

Lot D Existing vs Developed Wetland Calculation

Existing Subbasin



Developed Subbasin



MGS FLOOD
PROJECT REPORT

Program Version: MGSFlood 4.58
Program License Number: 201010005
Project Simulation Performed on: 08/03/2023 11:46 AM
Report Generation Date: 08/03/2023 11:46 AM

Input File Name:	Lot D Wetland Calc.fld
Project Name:	12896 - Overall
Analysis Title:	Overall Developed against existing conditions
Comments:	Meet wetland requirements

PRECIPITATION INPUT

Computational Time Step (Minutes): 15

Extended Precipitation Time Series Selected

Full Period of Record Available used for Routing

Climatic Region Number: 38
Precipitation Station : 910042 Pierce Co. East 42 in 10/01/1939-10/01/2097
Evaporation Station : 911042 Pierce Co. East 42 in

Evaporation Scale Factor : 0.750

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

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

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

Predevelopment/Post Development Tributary Area Summary

	Predeveloped	Post Developed
Total Subbasin Area (acres)	202.974	202.517
Area of Links that Include Precip/Evap (acres)	0.000	0.457
Total (acres)	202.974	202.974

---------------------SCENARIO: EXISTING
Number of Subbasins: 5

---------- Subbasin : Willows Pond Basin Area ----------
-------Area (Acres) --------
A/B, Forest, Flat 136.526
C, Forest, Flat 54.540
POND 10.465

Subbasin Total 201.531

---------- Subbasin : Lot D (Willows Pond TDA) Pasture ----------
-------Area (Acres) --------
C, Pasture, Flat 0.898

Subbasin Total 0.898

---------- Subbasin : Lot D (Willows Pond TDA) Exist Pave ----------
-------Area (Acres) --------
ROADS/FLAT 0.149

Subbasin Total 0.149

---------- Subbasin : Lot D (Willows Pond TDA) Frontage Pave & Access ----------
-------Area (Acres) --------
SIDEWALKS/FLAT 0.051

Subbasin Total 0.051

---------- Subbasin : Lot D (Willows Pond TDA) Forest ----------
-------Area (Acres) --------
C, Forest, Flat 0.345

Subbasin Total 0.345

---------------------SCENARIO: DEVELOPED
Number of Subbasins: 8

---------- Subbasin : Willows Pond Basin Area ----------
-------Area (Acres) --------
A/B, Forest, Flat 136.526
C, Forest, Flat 54.540
POND 10.465

Subbasin Total 201.531

---------- Subbasin : Roof ----------
-------Area (Acres) --------
ROOF TOPS/FLAT 0.422

Subbasin Total 0.422

---------- Subbasin : Lawn/Landscape ----------
-------Area (Acres) --------
C, Pasture, Flat 0.426

Subbasin Total 0.426

---------- Subbasin : Trash roof ----------
-------Area (Acres) --------
ROOF TOPS/FLAT 0.005

Subbasin Total 0.005

---------- Subbasin : Pedestrian Crossings ----------
-------Area (Acres) --------
ROADS/FLAT 0.026

Subbasin Total 0.026

---------- Subbasin : North Site Access ----------
-------Area (Acres) --------
ROADS/FLAT 0.034

Subbasin Total 0.034

---------- Subbasin : Site Sidewalk ----------
-------Area (Acres) --------
SIDEWALKS/FLAT 0.051

Subbasin Total 0.051

---------- Subbasin : South Frontage Access ----------
-------Area (Acres) --------
ROADS/FLAT 0.022

Subbasin Total 0.022

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

----------------------SCENARIO: EXISTING
Number of Links: 2

Link Name: Lot D - POC
Link Type: Copy
Downstream Link Name: Willows Pond POC

Link Name: Willows Pond POC
Link Type: Copy
Downstream Link: None

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

-----------------------SCENARIO: DEVELOPED
Number of Links: 5

Link Name: Willow Pond - POC
Link Type: Copy
Downstream Link: None

Link Name: Lot D - Willows Pond Basin
Link Type: Copy
Downstream Link Name: Willow Pond - POC

Link Name: Por Pave Parking
Link Type: Porous Pavement Structure
Downstream Link Name: Lot D - Willows Pond Basin

Pavement Length (ft)	: 141.50
Pavement Width (ft)	: 80.00
Pavement Slope (ft/ft)	: 0.000
Pavement Infiltration Rate (in/hr)	: 20.000
Number of Infiltration Cells	: 1
Trench Cell Length (ft)	: 141.50
Trench Cell Width (ft)	: 80.00
Trench Cell Depth (ft)	: 1.00
Trench Gravel Porosity (%)	: 30.00
Trench Bed Slope (ft/ft)	: 0.000
Native Soil Infiltration Rate (in/hr)	: 1.040

Link Name: Frontage Sidewalk
Link Type: Porous Pavement Structure
Downstream Link Name: Lot D - Willows Pond Basin

Pavement Length (ft)	: 277.25
Pavement Width (ft)	: 8.00
Pavement Slope (ft/ft)	: 0.000
Pavement Infiltration Rate (in/hr)	: 20.000
Number of Infiltration Cells	: 1
Trench Cell Length (ft)	: 277.25
Trench Cell Width (ft)	: 8.00
Trench Cell Depth (ft)	: 0.50
Trench Gravel Porosity (%)	: 30.00
Trench Bed Slope (ft/ft)	: 0.000
Native Soil Infiltration Rate (in/hr)	: 1.040

Link Name: Patio
Link Type: Porous Pavement Structure
Downstream Link Name: Lot D - Willows Pond Basin

Pavement Length (ft)	: 106.33
Pavement Width (ft)	: 60.00
Pavement Slope (ft/ft)	: 0.000
Pavement Infiltration Rate (in/hr)	: 20.000
Number of Infiltration Cells	: 1
Trench Cell Length (ft)	: 106.33
Trench Cell Width (ft)	: 60.00
Trench Cell Depth (ft)	: 0.66
Trench Gravel Porosity (%)	: 30.00
Trench Bed Slope (ft/ft)	: 0.000
Native Soil Infiltration Rate (in/hr)	: 1.040

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

---------------------SCENARIO: EXISTING
Number of Subbasins: 5
Number of Links: 2

*********** Subbasin: Willows Pond Basin Area **********

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

Tr (yrs)	Flood Peak (cfs)
2-Year	5.023
5-Year	6.764
10-Year	8.004
25-Year	10.649
50-Year	12.336
100-Year	13.528
200-Year	16.366
500-Year	20.176

************ Subbasin: Lot D (Willows Pond TDA) Pasture ************

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

Tr (yrs)	Flood Peak (cfs)
2-Year	2.784E-02
5-Year	4.939E-02
10-Year	6.625E-02
25-Year	0.109
50-Year	0.122
100-Year	0.178
200-Year	0.217
500-Year	0.268

************ Subbasin: Lot D (Willows Pond TDA) Exist Pave ************

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

Tr (yrs)	Flood Peak (cfs)
2-Year	6.063E-02
5-Year	7.884E-02
10-Year	9.275E-02
25-Year	0.117
50-Year	0.140
100-Year	0.174
200-Year	0.185
500-Year	0.200

************ Subbasin: Lot D (Willows Pond TDA) Frontage Pave & Access ************

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

Tr (yrs)	Flood Peak (cfs)
2-Year	2.075E-02
5-Year	2.698E-02
10-Year	3.175E-02
25-Year	3.995E-02
50-Year	4.778E-02
100-Year	5.940E-02
200-Year	6.329E-02
500-Year	6.830E-02

********** **Subbasin: Lot D (Willows Pond TDA) Forest** **********

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

Tr (yrs)	Flood Peak (cfs)
2-Year	8.641E-03
5-Year	1.368E-02
10-Year	1.703E-02
25-Year	2.284E-02
50-Year	2.577E-02
100-Year	2.846E-02
200-Year	4.554E-02
500-Year	6.849E-02

********** Link: Lot D - POC ********** Link Inflow
Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	0.108
5-Year	0.147
10-Year	0.175
25-Year	0.258
50-Year	0.313
100-Year	0.360
200-Year	0.431
500-Year	0.525

********** Link: Lot D - POC ********** Link Outflow 1
Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	0.108
5-Year	0.147
10-Year	0.175
25-Year	0.258
50-Year	0.313
100-Year	0.360
200-Year	0.431
500-Year	0.525

********** Link: Willows Pond POC ********** Link Outflow
1 Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	5.125
5-Year	6.899
10-Year	8.165
25-Year	10.915
50-Year	12.684
100-Year	13.817
200-Year	16.772
500-Year	20.742

---------------------SCENARIO: DEVELOPED
Number of Subbasins: 8
Number of Links: 5

********** **Subbasin: Willows Pond Basin Area** **********

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

Tr (yrs)	Flood Peak (cfs)
2-Year	5.023
5-Year	6.764
10-Year	8.004
25-Year	10.649
50-Year	12.336
100-Year	13.528
200-Year	16.366
500-Year	20.176

********** **Subbasin: Roof** **********

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

Tr (yrs)	Flood Peak (cfs)
2-Year	0.172
5-Year	0.223
10-Year	0.263
25-Year	0.331
50-Year	0.395
100-Year	0.491
200-Year	0.524
500-Year	0.565

********** Subbasin: Lawn/Landscape **********

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

Tr (yrs)	Flood Peak (cfs)
2-Year	1.321E-02
5-Year	2.343E-02
10-Year	3.143E-02
25-Year	5.191E-02
50-Year	5.774E-02
100-Year	8.436E-02
200-Year	0.103
500-Year	0.127

********** Subbasin: Trash roof **********

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

Tr (yrs)	Flood Peak (cfs)
2-Year	2.034E-03
5-Year	2.646E-03
10-Year	3.112E-03
25-Year	3.917E-03
50-Year	4.685E-03
100-Year	5.823E-03
200-Year	6.205E-03
500-Year	6.696E-03

********** Subbasin: Pedestrian Crossings **********

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

Tr (yrs)	Flood Peak (cfs)
2-Year	1.058E-02
5-Year	1.376E-02
10-Year	1.618E-02
25-Year	2.037E-02
50-Year	2.436E-02
100-Year	3.028E-02
200-Year	3.227E-02
500-Year	3.482E-02

************ Subbasin: North Site Access ************

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

Tr (yrs)	Flood Peak (cfs)
2-Year	1.383E-02
5-Year	1.799E-02
10-Year	2.116E-02
25-Year	2.664E-02
50-Year	3.186E-02
100-Year	3.960E-02
200-Year	4.219E-02
500-Year	4.553E-02

************ Subbasin: Site Sidewalk ************

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

Tr (yrs)	Flood Peak (cfs)
2-Year	2.075E-02
5-Year	2.698E-02
10-Year	3.175E-02
25-Year	3.995E-02
50-Year	4.778E-02
100-Year	5.940E-02
200-Year	6.329E-02
500-Year	6.830E-02

************ Subbasin: South Frontage Access ************

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

Tr (yrs)	Flood Peak (cfs)
2-Year	8.952E-03
5-Year	1.164E-02
10-Year	1.369E-02
25-Year	1.723E-02
50-Year	2.061E-02
100-Year	2.562E-02
200-Year	2.730E-02
500-Year	2.946E-02

********** Link: Willow Pond - POC ********** Link Outflow 1

Frequency Stats

Flood Frequency Data(cfs)

(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	5.039
5-Year	6.783
10-Year	8.041
25-Year	10.717
50-Year	12.428
100-Year	13.572
200-Year	16.467
500-Year	20.357

********** Link: Lot D - Willows Pond Basin ********** Link Inflow

Frequency Stats

Flood Frequency Data(cfs)

(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	1.913E-02
5-Year	2.962E-02
10-Year	4.177E-02
25-Year	6.998E-02
50-Year	8.388E-02
100-Year	0.130
200-Year	0.270
500-Year	0.457

********** Link: Lot D - Willows Pond Basin ********** Link Outflow 1

Frequency Stats

Flood Frequency Data(cfs)

(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	1.913E-02
5-Year	2.962E-02
10-Year	4.177E-02
25-Year	6.998E-02
50-Year	8.388E-02
100-Year	0.130
200-Year	0.270
500-Year	0.457

********** Link: Por Pave Parking ********** Link Inflow Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	4.720E-02
5-Year	6.138E-02
10-Year	7.221E-02
25-Year	9.087E-02
50-Year	0.109
100-Year	0.135
200-Year	0.144
500-Year	0.155

********** Link: Por Pave Parking ********** Link Outflow 1 Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	0.000E+00
5-Year	0.000E+00
10-Year	0.000E+00
25-Year	0.000E+00
50-Year	0.000E+00
100-Year	0.000E+00
200-Year	0.000E+00
500-Year	0.000E+00

********** Link: Por Pave Parking ********** Link WSEL Stats
WSEL Frequency Data(ft)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	WSEL Peak (ft)
1.05-Year	5.205E-02
1.11-Year	5.364E-02
1.25-Year	5.488E-02
2.00-Year	5.770E-02
3.33-Year	6.101E-02
5-Year	6.267E-02
10-Year	6.641E-02
25-Year	9.011E-02
50-Year	0.112
100-Year	0.122

********** Link: Frontage Sidewalk ********** Link Inflow Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	0.000E+00
5-Year	0.000E+00
10-Year	0.000E+00
25-Year	0.000E+00
50-Year	0.000E+00
100-Year	0.000E+00
200-Year	0.000E+00
500-Year	0.000E+00

********** Link: Frontage Sidewalk ********** Link Outflow 1 Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	0.000E+00
5-Year	0.000E+00
10-Year	0.000E+00
25-Year	0.000E+00
50-Year	0.000E+00
100-Year	0.000E+00
200-Year	0.000E+00
500-Year	0.000E+00

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

Tr (yrs)	WSEL Peak (ft)
1.05-Year	4.015E-02
1.11-Year	4.102E-02
1.25-Year	4.284E-02
2.00-Year	4.829E-02
3.33-Year	5.294E-02
5-Year	5.491E-02
10-Year	6.328E-02
25-Year	7.523E-02
50-Year	0.101
100-Year	0.116

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

Tr (yrs)	Flood Peak (cfs)
2-Year	0.172
5-Year	0.223
10-Year	0.263
25-Year	0.331
50-Year	0.395
100-Year	0.491
200-Year	0.524
500-Year	0.565

********** Link: Patio ********** Link Outflow 1 Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	0.000E+00
5-Year	0.000E+00
10-Year	0.000E+00
25-Year	0.000E+00
50-Year	1.698E-02
100-Year	5.517E-02
200-Year	0.178
500-Year	0.344

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

Tr (yrs)	WSEL Peak (ft)
1.05-Year	0.130
1.11-Year	0.133
1.25-Year	0.139
2.00-Year	0.153
3.33-Year	0.177
5-Year	0.218
10-Year	0.308
25-Year	0.488
50-Year	0.589
100-Year	0.660

***********Groundwater Recharge Summary *************

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

Total Predeveloped Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: Willows Pond Basin A	53048.700
Subbasin: Lot D (Willows Pond	158.584
Subbasin: Lot D (Willows Pond	0.000
Subbasin: Lot D (Willows Pond	0.000
Subbasin: Lot D (Willows Pond	65.601
Link: Lot D - POC	0.000
Link: Willows Pond POC	0.000
Total:	53272.890

Total Post Developed Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: Willows Pond Basin A	53048.700
Subbasin: Roof	0.000
Subbasin: Lawn/Landscape	75.230
Subbasin: Trash roof	0.000
Subbasin: Pedestrian Crossings	0.000
Subbasin: North Site Access	0.000
Subbasin: Site Sidewalk	0.000
Subbasin: South Frontage Acces	0.000
Link: Willow Pond - POC	0.000
Link: Lot D - Willows Pond	0.000
Link: Por Pave Parking	207.772
Link: Frontage Sidewalk	29.328
Link: Patio	295.672
Total:	53656.710

Total Predevelopment Recharge is Less than Post Developed
Average Recharge Per Year, (Number of Years= 158)
Predeveloped: 337.170 ac-ft/year, Post Developed: 339.599 ac-ft/year

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

---------------------SCENARIO: EXISTING

Number of Links: 2

********** Link: Lot D - POC **********

2-Year Discharge Rate : 0.108 cfs

15-Minute Timestep, Water Quality Treatment Design Discharge
On-line Design Discharge Rate (91% Exceedance): 0.04 cfs
Off-line Design Discharge Rate (91% Exceedance): 0.02 cfs

Infiltration/Filtration Statistics--------------------
Inflow Volume (ac-ft): 284.67
Inflow Volume Including PPT-Evap (ac-ft): 284.67
Total Runoff Infiltrated (ac-ft): 0.00, 0.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 284.67
Secondary Outflow To Downstream System (ac-ft): 0.00
Volume Lost to ET (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered+ET)/Total Volume: 0.00%

********** Link: Willows Pond POC **********

2-Year Discharge Rate : 5.125 cfs

15-Minute Timestep, Water Quality Treatment Design Discharge
On-line Design Discharge Rate (91% Exceedance): 1.99 cfs
Off-line Design Discharge Rate (91% Exceedance): 1.11 cfs

Infiltration/Filtration Statistics--------------------
Inflow Volume (ac-ft): 12196.17
Inflow Volume Including PPT-Evap (ac-ft): 12196.17
Total Runoff Infiltrated (ac-ft): 0.00, 0.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 12196.17
Secondary Outflow To Downstream System (ac-ft): 0.00
Volume Lost to ET (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered+ET)/Total Volume: 0.00%

---------------------SCENARIO: DEVELOPED

Number of Links: 5

********** Link: Willow Pond - POC **********

2-Year Discharge Rate : 5.039 cfs

15-Minute Timestep, Water Quality Treatment Design Discharge
On-line Design Discharge Rate (91% Exceedance): 1.96 cfs
Off-line Design Discharge Rate (91% Exceedance): 1.10 cfs

Infiltration/Filtration Statistics--------------------
Inflow Volume (ac-ft): 11990.16
Inflow Volume Including PPT-Evap (ac-ft): 11990.16
Total Runoff Infiltrated (ac-ft): 0.00, 0.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 11990.16
Secondary Outflow To Downstream System (ac-ft): 0.00
Volume Lost to ET (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered+ET)/Total Volume: 0.00%

********** Link: Lot D - Willows Pond Basin **********

2-Year Discharge Rate : 0.019 cfs

15-Minute Timestep, Water Quality Treatment Design Discharge
On-line Design Discharge Rate (91% Exceedance): 0.01 cfs
Off-line Design Discharge Rate (91% Exceedance): 0.01 cfs

Infiltration/Filtration Statistics--------------------
Inflow Volume (ac-ft): 78.66
Inflow Volume Including PPT-Evap (ac-ft): 78.66
Total Runoff Infiltrated (ac-ft): 0.00, 0.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 78.66
Secondary Outflow To Downstream System (ac-ft): 0.00
Volume Lost to ET (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered+ET)/Total Volume: 0.00%

********** Link: Por Pave Parking **********

15-Minute Timestep, Water Quality Treatment Design Discharge
On-line Design Discharge Rate (91% Exceedance): 0.02 cfs
Off-line Design Discharge Rate (91% Exceedance): 0.01 cfs

Infiltration/Filtration Statistics--------------------
Inflow Volume (ac-ft): 58.09
Inflow Volume Including PPT-Evap (ac-ft): 207.77
Total Runoff Infiltrated (ac-ft): 207.77, 100.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 0.00
Secondary Outflow To Downstream System (ac-ft): 0.00
Volume Lost to ET (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered+ET)/Total Volume: 100.00%

********** Link: Frontage Sidewalk **********

Infiltration/Filtration Statistics--------------------
Inflow Volume (ac-ft): 0.00
Inflow Volume Including PPT-Evap (ac-ft): 29.33
Total Runoff Infiltrated (ac-ft): 29.33, 100.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 0.00
Secondary Outflow To Downstream System (ac-ft): 0.00
Volume Lost to ET (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered+ET)/Total Volume: 100.00%

********** Link: Patio **********

15-Minute Timestep, Water Quality Treatment Design Discharge
On-line Design Discharge Rate (91% Exceedance): 0.07 cfs
Off-line Design Discharge Rate (91% Exceedance): 0.04 cfs

Infiltration/Filtration Statistics--------------------
Inflow Volume (ac-ft): 211.32
Inflow Volume Including PPT-Evap (ac-ft): 295.68
Total Runoff Infiltrated (ac-ft): 295.67, 100.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 0.01
Secondary Outflow To Downstream System (ac-ft): 0.00
Volume Lost to ET (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered+ET)/Total Volume: 100.00%

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

Scenario Existing Compliance Link: Willows Pond POC
Scenario Developed Compliance Link: Willow Pond - POC

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

Predevelopment Runoff		Postdevelopment Runoff	
Tr (Years)	Discharge (cfs)	Tr (Years)	Discharge (cfs)
2-Year	5.125	2-Year	5.039
5-Year	6.899	5-Year	6.783
10-Year	8.165	10-Year	8.041
25-Year	10.915	25-Year	10.717
50-Year	12.684	50-Year	12.428
100-Year	**13.817**	**100-Year**	**13.572**
200-Year	16.772	200-Year	16.467
500-Year	20.742	500-Year	20.357

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

***********Wetland Hydrologic Loading Analysis Results *************

Predeveloped Wetland Location: Willows Pond POC, Inflow
Postdeveloped Wetland Location: Willow Pond - POC, Outflow

Days out of Compliance: 0
Months out of Compliance: 0

***********Mean Daily Wetland Inflow (cfs) *************
Must be within 20% for each Day

Month	Predeveloped	Postdeveloped	Percent Difference
Oct-01	3.525E-02	3.462E-02	-1.78%
Oct-02	2.799E-02	2.748E-02	-1.83%
Oct-03	3.845E-02	3.777E-02	-1.75%
Oct-04	4.525E-02	4.445E-02	-1.76%
Oct-05	3.385E-02	3.324E-02	-1.78%
Oct-06	7.015E-02	6.892E-02	-1.75%
Oct-07	5.224E-02	5.132E-02	-1.76%
Oct-08	4.936E-02	4.847E-02	-1.80%
Oct-09	6.139E-02	6.028E-02	-1.82%
Oct-10	5.405E-02	5.305E-02	-1.85%
Oct-11	4.593E-02	4.505E-02	-1.91%

Oct-12	4.864E-02	4.774E-02	-1.83%
Oct-13	4.768E-02	4.680E-02	-1.85%
Oct-14	5.181E-02	5.088E-02	-1.80%
Oct-15	3.799E-02	3.730E-02	-1.82%
Oct-16	3.316E-02	3.255E-02	-1.83%
Oct-17	6.074E-02	5.961E-02	-1.85%
Oct-18	6.010E-02	5.893E-02	-1.94%
Oct-19	6.376E-02	6.250E-02	-1.97%
Oct-20	7.951E-02	7.804E-02	-1.86%
Oct-21	7.679E-02	7.538E-02	-1.83%
Oct-22	7.750E-02	7.608E-02	-1.83%
Oct-23	8.144E-02	7.991E-02	-1.88%
Oct-24	7.228E-02	7.089E-02	-1.93%
Oct-25	7.484E-02	7.343E-02	-1.88%
Oct-26	8.386E-02	8.228E-02	-1.88%
Oct-27	1.015E-01	9.960E-02	-1.89%
Oct-28	9.060E-02	8.886E-02	-1.92%
Oct-29	9.822E-02	9.636E-02	-1.89%
Oct-30	8.496E-02	8.332E-02	-1.93%
Oct-31	1.154E-01	1.133E-01	-1.84%
Nov-01	9.281E-02	9.104E-02	-1.91%
Nov-02	7.895E-02	7.740E-02	-1.96%
Nov-03	1.142E-01	1.120E-01	-1.92%
Nov-04	1.150E-01	1.127E-01	-1.96%
Nov-05	8.312E-02	8.146E-02	-1.99%
Nov-06	8.568E-02	8.403E-02	-1.93%
Nov-07	9.827E-02	9.639E-02	-1.91%
Nov-08	8.789E-02	8.618E-02	-1.95%
Nov-09	1.175E-01	1.152E-01	-1.89%
Nov-10	1.327E-01	1.303E-01	-1.87%
Nov-11	1.486E-01	1.459E-01	-1.86%
Nov-12	1.217E-01	1.194E-01	-1.89%
Nov-13	1.424E-01	1.398E-01	-1.85%
Nov-14	1.292E-01	1.267E-01	-1.91%
Nov-15	1.340E-01	1.315E-01	-1.87%
Nov-16	1.596E-01	1.567E-01	-1.82%
Nov-17	1.675E-01	1.645E-01	-1.82%
Nov-18	1.464E-01	1.437E-01	-1.84%
Nov-19	1.981E-01	1.946E-01	-1.81%
Nov-20	1.708E-01	1.676E-01	-1.85%
Nov-21	1.707E-01	1.676E-01	-1.84%
Nov-22	1.494E-01	1.466E-01	-1.85%
Nov-23	2.172E-01	2.133E-01	-1.78%
Nov-24	2.482E-01	2.438E-01	-1.77%
Nov-25	2.464E-01	2.420E-01	-1.77%
Nov-26	2.147E-01	2.109E-01	-1.77%
Nov-27	2.243E-01	2.204E-01	-1.76%
Nov-28	1.689E-01	1.659E-01	-1.77%
Nov-29	1.929E-01	1.895E-01	-1.75%
Nov-30	2.089E-01	2.053E-01	-1.75%
Dec-01	1.904E-01	1.871E-01	-1.76%
Dec-02	2.077E-01	2.040E-01	-1.76%
Dec-03	2.267E-01	2.227E-01	-1.75%
Dec-04	2.461E-01	2.418E-01	-1.73%
Dec-05	2.261E-01	2.222E-01	-1.73%
Dec-06	2.169E-01	2.131E-01	-1.74%

Dec-07	1.983E-01	1.949E-01	-1.74%
Dec-08	1.878E-01	1.846E-01	-1.72%
Dec-09	1.714E-01	1.684E-01	-1.72%
Dec-10	1.995E-01	1.960E-01	-1.73%
Dec-11	1.941E-01	1.908E-01	-1.73%
Dec-12	1.907E-01	1.874E-01	-1.72%
Dec-13	1.836E-01	1.804E-01	-1.71%
Dec-14	1.857E-01	1.825E-01	-1.71%
Dec-15	2.178E-01	2.141E-01	-1.69%
Dec-16	1.922E-01	1.890E-01	-1.70%
Dec-17	1.976E-01	1.943E-01	-1.71%
Dec-18	1.781E-01	1.751E-01	-1.71%
Dec-19	1.805E-01	1.774E-01	-1.72%
Dec-20	2.131E-01	2.094E-01	-1.72%
Dec-21	2.236E-01	2.198E-01	-1.72%
Dec-22	1.942E-01	1.909E-01	-1.71%
Dec-23	1.864E-01	1.832E-01	-1.70%
Dec-24	1.764E-01	1.734E-01	-1.70%
Dec-25	1.701E-01	1.673E-01	-1.69%
Dec-26	2.180E-01	2.143E-01	-1.68%
Dec-27	2.175E-01	2.139E-01	-1.67%
Dec-28	1.753E-01	1.723E-01	-1.67%
Dec-29	2.168E-01	2.131E-01	-1.67%
Dec-30	2.079E-01	2.044E-01	-1.68%
Dec-31	1.664E-01	1.636E-01	-1.67%
Jan-01	1.834E-01	1.803E-01	-1.67%
Jan-02	2.170E-01	2.134E-01	-1.67%
Jan-03	1.942E-01	1.909E-01	-1.67%
Jan-04	2.027E-01	1.993E-01	-1.67%
Jan-05	1.840E-01	1.809E-01	-1.67%
Jan-06	1.890E-01	1.859E-01	-1.67%
Jan-07	1.952E-01	1.920E-01	-1.67%
Jan-08	1.753E-01	1.723E-01	-1.68%
Jan-09	1.905E-01	1.874E-01	-1.67%
Jan-10	2.047E-01	2.013E-01	-1.67%
Jan-11	1.756E-01	1.727E-01	-1.68%
Jan-12	1.904E-01	1.872E-01	-1.68%
Jan-13	2.046E-01	2.012E-01	-1.67%
Jan-14	2.490E-01	2.448E-01	-1.67%
Jan-15	2.568E-01	2.526E-01	-1.65%
Jan-16	2.289E-01	2.251E-01	-1.65%
Jan-17	2.153E-01	2.117E-01	-1.66%
Jan-18	2.330E-01	2.292E-01	-1.65%
Jan-19	2.456E-01	2.415E-01	-1.64%
Jan-20	2.340E-01	2.301E-01	-1.63%
Jan-21	1.941E-01	1.909E-01	-1.63%
Jan-22	1.830E-01	1.800E-01	-1.65%
Jan-23	2.198E-01	2.162E-01	-1.65%
Jan-24	2.190E-01	2.154E-01	-1.65%
Jan-25	1.966E-01	1.933E-01	-1.65%
Jan-26	1.802E-01	1.772E-01	-1.66%
Jan-27	2.152E-01	2.116E-01	-1.64%
Jan-28	1.827E-01	1.797E-01	-1.64%
Jan-29	1.750E-01	1.721E-01	-1.64%
Jan-30	1.724E-01	1.696E-01	-1.64%
Jan-31	2.143E-01	2.108E-01	-1.64%

Feb-01	2.126E-01	2.091E-01	-1.64%
Feb-02	2.141E-01	2.106E-01	-1.64%
Feb-03	1.883E-01	1.852E-01	-1.63%
Feb-04	1.807E-01	1.777E-01	-1.64%
Feb-05	1.712E-01	1.684E-01	-1.65%
Feb-06	2.192E-01	2.157E-01	-1.64%
Feb-07	2.072E-01	2.038E-01	-1.63%
Feb-08	2.267E-01	2.230E-01	-1.63%
Feb-09	2.117E-01	2.082E-01	-1.63%
Feb-10	2.013E-01	1.980E-01	-1.63%
Feb-11	1.810E-01	1.780E-01	-1.64%
Feb-12	2.210E-01	2.174E-01	-1.64%
Feb-13	2.335E-01	2.297E-01	-1.64%
Feb-14	2.104E-01	2.070E-01	-1.64%
Feb-15	2.254E-01	2.217E-01	-1.63%
Feb-16	2.571E-01	2.529E-01	-1.63%
Feb-17	3.004E-01	2.955E-01	-1.62%
Feb-18	2.850E-01	2.804E-01	-1.62%
Feb-19	2.947E-01	2.899E-01	-1.61%
Feb-20	2.418E-01	2.379E-01	-1.60%
Feb-21	2.136E-01	2.102E-01	-1.61%
Feb-22	1.857E-01	1.827E-01	-1.62%
Feb-23	1.708E-01	1.680E-01	-1.63%
Feb-24	2.097E-01	2.063E-01	-1.63%
Feb-25	2.198E-01	2.162E-01	-1.63%
Feb-26	2.152E-01	2.117E-01	-1.62%
Feb-27	2.279E-01	2.242E-01	-1.61%
Feb-28	2.292E-01	2.255E-01	-1.62%
Mar-01	2.104E-01	2.070E-01	-1.62%
Mar-02	1.894E-01	1.864E-01	-1.63%
Mar-03	2.157E-01	2.122E-01	-1.64%
Mar-04	2.114E-01	2.080E-01	-1.62%
Mar-05	2.135E-01	2.101E-01	-1.62%
Mar-06	1.522E-01	1.497E-01	-1.62%
Mar-07	1.593E-01	1.567E-01	-1.62%
Mar-08	1.758E-01	1.729E-01	-1.63%
Mar-09	2.215E-01	2.178E-01	-1.63%
Mar-10	2.038E-01	2.005E-01	-1.62%
Mar-11	1.868E-01	1.838E-01	-1.62%
Mar-12	2.147E-01	2.112E-01	-1.62%
Mar-13	1.864E-01	1.834E-01	-1.62%
Mar-14	1.917E-01	1.886E-01	-1.62%
Mar-15	1.867E-01	1.837E-01	-1.62%
Mar-16	1.590E-01	1.565E-01	-1.62%
Mar-17	1.727E-01	1.699E-01	-1.62%
Mar-18	1.688E-01	1.660E-01	-1.62%
Mar-19	1.643E-01	1.617E-01	-1.62%
Mar-20	1.580E-01	1.554E-01	-1.62%
Mar-21	1.454E-01	1.430E-01	-1.62%
Mar-22	1.911E-01	1.880E-01	-1.62%
Mar-23	1.948E-01	1.916E-01	-1.63%
Mar-24	1.839E-01	1.809E-01	-1.62%
Mar-25	1.758E-01	1.730E-01	-1.62%
Mar-26	1.794E-01	1.765E-01	-1.62%
Mar-27	1.592E-01	1.566E-01	-1.62%
Mar-28	1.585E-01	1.560E-01	-1.62%

Mar-29	1.902E-01	1.871E-01	-1.62%
Mar-30	1.989E-01	1.957E-01	-1.61%
Mar-31	1.908E-01	1.877E-01	-1.61%
Apr-01	1.582E-01	1.556E-01	-1.61%
Apr-02	1.296E-01	1.275E-01	-1.62%
Apr-03	1.121E-01	1.103E-01	-1.62%
Apr-04	1.371E-01	1.349E-01	-1.62%
Apr-05	1.616E-01	1.590E-01	-1.61%
Apr-06	1.456E-01	1.433E-01	-1.61%
Apr-07	1.207E-01	1.188E-01	-1.61%
Apr-08	1.501E-01	1.477E-01	-1.62%
Apr-09	1.627E-01	1.600E-01	-1.61%
Apr-10	1.399E-01	1.376E-01	-1.61%
Apr-11	1.492E-01	1.468E-01	-1.62%
Apr-12	1.402E-01	1.379E-01	-1.62%
Apr-13	1.110E-01	1.092E-01	-1.62%
Apr-14	1.007E-01	9.902E-02	-1.63%
Apr-15	8.185E-02	8.052E-02	-1.63%
Apr-16	9.342E-02	9.188E-02	-1.64%
Apr-17	1.055E-01	1.038E-01	-1.62%
Apr-18	7.529E-02	7.407E-02	-1.63%
Apr-19	1.160E-01	1.141E-01	-1.64%
Apr-20	1.291E-01	1.270E-01	-1.62%
Apr-21	9.389E-02	9.236E-02	-1.63%
Apr-22	1.056E-01	1.038E-01	-1.63%
Apr-23	1.412E-01	1.389E-01	-1.62%
Apr-24	1.136E-01	1.118E-01	-1.63%
Apr-25	8.731E-02	8.589E-02	-1.63%
Apr-26	7.162E-02	7.044E-02	-1.65%
Apr-27	9.248E-02	9.094E-02	-1.67%
Apr-28	8.747E-02	8.602E-02	-1.66%
Apr-29	8.571E-02	8.431E-02	-1.63%
Apr-30	9.310E-02	9.157E-02	-1.64%
May-01	1.114E-01	1.096E-01	-1.64%
May-02	1.012E-01	9.954E-02	-1.64%
May-03	1.063E-01	1.045E-01	-1.64%
May-04	7.919E-02	7.790E-02	-1.62%
May-05	9.971E-02	9.808E-02	-1.63%
May-06	8.636E-02	8.494E-02	-1.65%
May-07	6.769E-02	6.657E-02	-1.66%
May-08	6.438E-02	6.331E-02	-1.66%
May-09	4.746E-02	4.668E-02	-1.66%
May-10	4.163E-02	4.094E-02	-1.66%
May-11	5.406E-02	5.317E-02	-1.64%
May-12	5.375E-02	5.287E-02	-1.64%
May-13	5.619E-02	5.526E-02	-1.65%
May-14	5.345E-02	5.255E-02	-1.68%
May-15	4.775E-02	4.694E-02	-1.69%
May-16	5.351E-02	5.261E-02	-1.69%
May-17	6.156E-02	6.051E-02	-1.71%
May-18	4.218E-02	4.145E-02	-1.72%
May-19	4.917E-02	4.834E-02	-1.69%
May-20	4.392E-02	4.317E-02	-1.70%
May-21	4.351E-02	4.278E-02	-1.68%
May-22	5.330E-02	5.241E-02	-1.66%
May-23	4.952E-02	4.871E-02	-1.65%

May-24	4.284E-02	4.213E-02	-1.66%
May-25	4.740E-02	4.661E-02	-1.66%
May-26	5.837E-02	5.739E-02	-1.68%
May-27	4.743E-02	4.661E-02	-1.74%
May-28	4.610E-02	4.532E-02	-1.71%
May-29	4.308E-02	4.235E-02	-1.70%
May-30	4.248E-02	4.174E-02	-1.72%
May-31	5.742E-02	5.641E-02	-1.77%
Jun-01	4.591E-02	4.510E-02	-1.77%
Jun-02	3.763E-02	3.698E-02	-1.74%
Jun-03	4.151E-02	4.080E-02	-1.72%
Jun-04	5.289E-02	5.198E-02	-1.71%
Jun-05	3.827E-02	3.763E-02	-1.68%
Jun-06	5.405E-02	5.313E-02	-1.70%
Jun-07	4.214E-02	4.140E-02	-1.75%
Jun-08	3.243E-02	3.186E-02	-1.79%
Jun-09	4.450E-02	4.371E-02	-1.76%
Jun-10	5.513E-02	5.417E-02	-1.73%
Jun-11	3.777E-02	3.710E-02	-1.76%
Jun-12	3.225E-02	3.168E-02	-1.75%
Jun-13	3.371E-02	3.312E-02	-1.74%
Jun-14	3.664E-02	3.600E-02	-1.74%
Jun-15	2.539E-02	2.493E-02	-1.80%
Jun-16	3.460E-02	3.400E-02	-1.72%
Jun-17	3.093E-02	3.039E-02	-1.74%
Jun-18	2.729E-02	2.681E-02	-1.74%
Jun-19	2.006E-02	1.971E-02	-1.75%
Jun-20	2.638E-02	2.593E-02	-1.71%
Jun-21	2.223E-02	2.184E-02	-1.72%
Jun-22	2.217E-02	2.179E-02	-1.71%
Jun-23	2.440E-02	2.399E-02	-1.70%
Jun-24	4.102E-02	4.032E-02	-1.73%
Jun-25	2.453E-02	2.409E-02	-1.81%
Jun-26	2.240E-02	2.200E-02	-1.79%
Jun-27	1.827E-02	1.794E-02	-1.80%
Jun-28	2.787E-02	2.738E-02	-1.73%
Jun-29	3.835E-02	3.767E-02	-1.75%
Jun-30	1.484E-02	1.456E-02	-1.89%
Jul-01	2.468E-02	2.424E-02	-1.78%
Jul-02	1.463E-02	1.437E-02	-1.80%
Jul-03	2.073E-02	2.036E-02	-1.76%
Jul-04	1.341E-02	1.317E-02	-1.78%
Jul-05	3.161E-02	3.107E-02	-1.72%
Jul-06	7.735E-03	7.589E-03	-1.89%
Jul-07	1.107E-02	1.087E-02	-1.76%
Jul-08	2.891E-02	2.842E-02	-1.69%
Jul-09	2.186E-02	2.149E-02	-1.69%
Jul-10	2.034E-02	2.000E-02	-1.68%
Jul-11	1.592E-02	1.565E-02	-1.70%
Jul-12	1.789E-02	1.757E-02	-1.78%
Jul-13	9.168E-03	8.991E-03	-1.93%
Jul-14	1.039E-02	1.020E-02	-1.82%
Jul-15	1.082E-02	1.063E-02	-1.78%
Jul-16	2.026E-02	1.991E-02	-1.70%
Jul-17	1.509E-02	1.483E-02	-1.72%
Jul-18	1.049E-02	1.031E-02	-1.73%

Jul-19	1.151E-02	1.131E-02	-1.72%
Jul-20	7.511E-03	7.382E-03	-1.72%
Jul-21	1.054E-02	1.035E-02	-1.80%
Jul-22	3.875E-03	3.801E-03	-1.92%
Jul-23	1.466E-03	1.436E-03	-2.02%
Jul-24	2.571E-03	2.526E-03	-1.78%
Jul-25	6.609E-03	6.498E-03	-1.69%
Jul-26	1.601E-02	1.574E-02	-1.68%
Jul-27	8.317E-03	8.177E-03	-1.69%
Jul-28	5.682E-03	5.585E-03	-1.70%
Jul-29	2.695E-03	2.649E-03	-1.70%
Jul-30	2.546E-03	2.502E-03	-1.69%
Jul-31	1.972E-03	1.938E-03	-1.69%
Aug-01	3.090E-03	3.038E-03	-1.69%
Aug-02	1.070E-02	1.052E-02	-1.68%
Aug-03	8.761E-03	8.609E-03	-1.73%
Aug-04	9.865E-03	9.697E-03	-1.70%
Aug-05	4.105E-03	4.034E-03	-1.73%
Aug-06	1.057E-02	1.039E-02	-1.68%
Aug-07	1.651E-02	1.624E-02	-1.68%
Aug-08	4.817E-03	4.735E-03	-1.70%
Aug-09	5.931E-03	5.831E-03	-1.69%
Aug-10	3.048E-03	2.997E-03	-1.69%
Aug-11	4.746E-03	4.666E-03	-1.68%
Aug-12	1.109E-02	1.091E-02	-1.68%
Aug-13	8.010E-03	7.876E-03	-1.68%
Aug-14	1.603E-02	1.576E-02	-1.68%
Aug-15	1.773E-02	1.743E-02	-1.68%
Aug-16	1.447E-02	1.423E-02	-1.68%
Aug-17	1.203E-02	1.182E-02	-1.68%
Aug-18	1.367E-02	1.344E-02	-1.68%
Aug-19	1.492E-02	1.467E-02	-1.70%
Aug-20	9.744E-03	9.577E-03	-1.71%
Aug-21	1.396E-02	1.373E-02	-1.69%
Aug-22	1.074E-02	1.056E-02	-1.69%
Aug-23	2.686E-02	2.641E-02	-1.68%
Aug-24	2.158E-02	2.121E-02	-1.70%
Aug-25	1.950E-02	1.916E-02	-1.71%
Aug-26	1.924E-02	1.891E-02	-1.72%
Aug-27	2.466E-02	2.424E-02	-1.71%
Aug-28	2.242E-02	2.204E-02	-1.71%
Aug-29	2.564E-02	2.520E-02	-1.72%
Aug-30	2.340E-02	2.296E-02	-1.88%
Aug-31	1.683E-02	1.652E-02	-1.86%
Sep-01	3.693E-02	3.628E-02	-1.74%
Sep-02	2.622E-02	2.576E-02	-1.74%
Sep-03	2.104E-02	2.067E-02	-1.75%
Sep-04	2.284E-02	2.244E-02	-1.73%
Sep-05	2.178E-02	2.140E-02	-1.71%
Sep-06	2.022E-02	1.987E-02	-1.72%
Sep-07	1.113E-02	1.094E-02	-1.73%
Sep-08	1.947E-02	1.914E-02	-1.70%
Sep-09	2.741E-02	2.694E-02	-1.73%
Sep-10	2.728E-02	2.681E-02	-1.75%
Sep-11	1.699E-02	1.669E-02	-1.76%
Sep-12	8.476E-03	8.325E-03	-1.78%

Sep-13	2.534E-02	2.492E-02	-1.69%
Sep-14	3.410E-02	3.352E-02	-1.68%
Sep-15	3.690E-02	3.628E-02	-1.68%
Sep-16	3.259E-02	3.204E-02	-1.68%
Sep-17	4.327E-02	4.253E-02	-1.70%
Sep-18	2.947E-02	2.896E-02	-1.73%
Sep-19	3.973E-02	3.905E-02	-1.71%
Sep-20	3.267E-02	3.210E-02	-1.74%
Sep-21	2.356E-02	2.315E-02	-1.75%
Sep-22	3.593E-02	3.531E-02	-1.74%
Sep-23	3.840E-02	3.773E-02	-1.77%
Sep-24	3.211E-02	3.155E-02	-1.75%
Sep-25	1.958E-02	1.923E-02	-1.75%
Sep-26	3.746E-02	3.682E-02	-1.71%
Sep-27	2.950E-02	2.900E-02	-1.71%
Sep-28	3.740E-02	3.674E-02	-1.76%
Sep-29	2.105E-02	2.068E-02	-1.79%
Sep-30	3.460E-02	3.399E-02	-1.76%

***********Mean Monthly Wetland Inflow (cfs) *************

Must be within 15% for each Month

Month	Predeveloped	Postdeveloped	Percent Difference
Oct	6.303E-02	6.186E-02	-1.86%
Nov	1.521E-01	1.494E-01	-1.83%
Dec	1.985E-01	1.951E-01	-1.71%
Jan	2.039E-01	2.005E-01	-1.66%
Feb	2.198E-01	2.162E-01	-1.63%
Mar	1.841E-01	1.811E-01	-1.62%
Apr	1.163E-01	1.145E-01	-1.63%
May	5.972E-02	5.873E-02	-1.67%
Jun	3.350E-02	3.292E-02	-1.74%
Jul	1.246E-02	1.224E-02	-1.74%
Aug	1.370E-02	1.346E-02	-1.71%
Sep	2.810E-02	2.762E-02	-1.73%

Appendix B

Stormwater Pollution Prevention Plan (SWPPP)

***SWPPP to be included in formal report**

Appendix C

Schedule of Structures

***To be included in formal report**

Appendix D

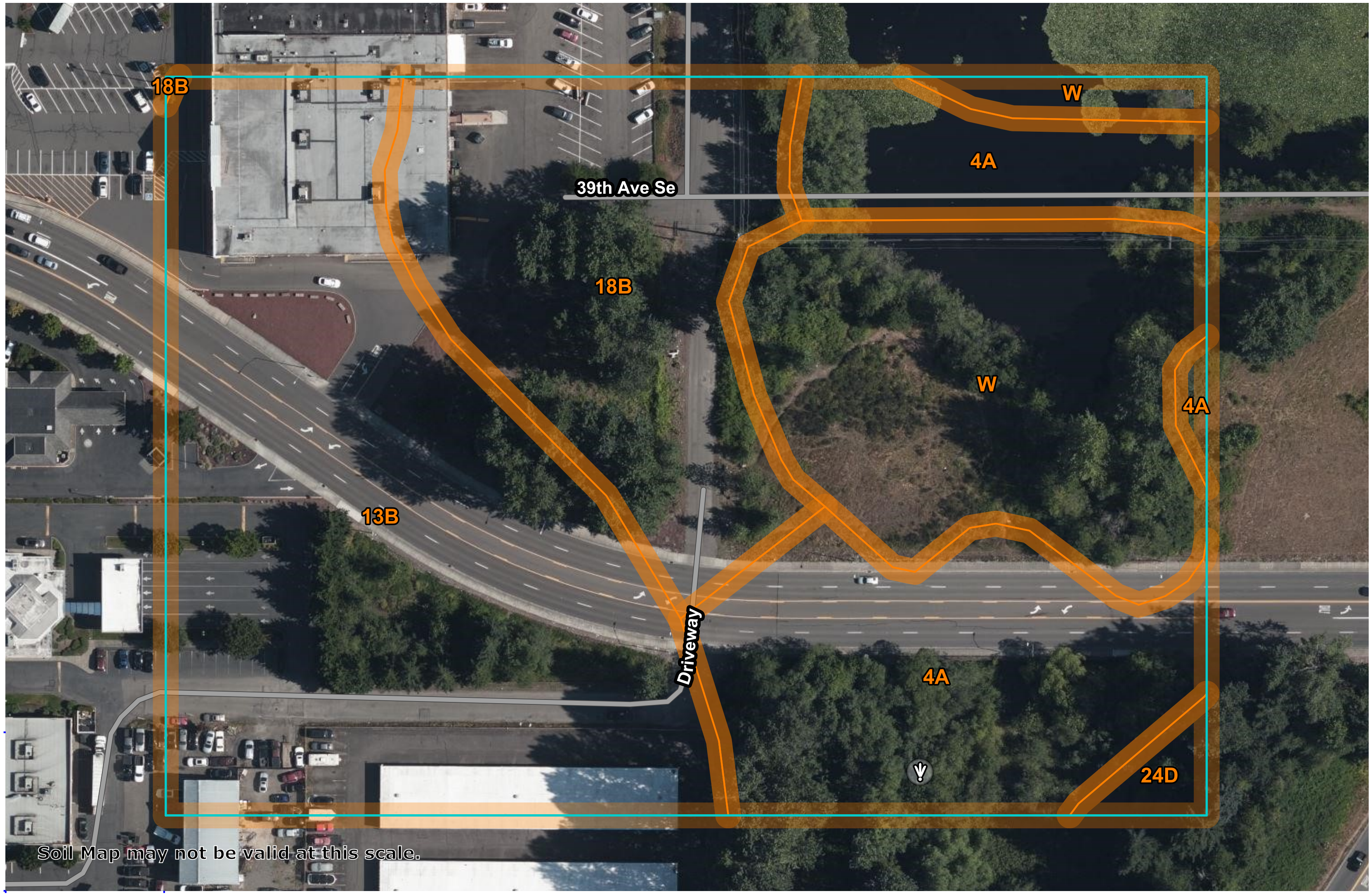
Soils (NRCS) Data & Geotechnical Evaluation

122° 17' 32" W

122° 17' 18" W

47° 9' 18" N

47° 9' 18" N



47° 9' 12" N

47° 9' 12" N

122° 17' 32" W

122° 17' 18" W

Map Scale: 1:1,410 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0, 20, 40, 80, 120

Feet: 0, 50, 100, 200, 300

Map projection: Web Mercator Corner coordinates: WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

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

Water Features

Streams and Canals

Transportation

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

Background

Aerial Photography

MAP INFORMATION

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

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Pierce County Area, Washington
Survey Area Data: Version 16, Jun 4, 2020

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

Date(s) aerial images were photographed: Jul 29, 2018—Jul 22, 2019

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
4A	Bellingham silty clay loam	2.2	22.4%
13B	Everett very gravelly sandy loam, 0 to 8 percent slopes	3.6	37.0%
18B	Indianola loamy sand, 0 to 5 percent slopes	1.9	19.3%
24D	Neilton gravelly loamy sand, 8 to 25 percent slopes	0.1	1.1%
W	Water	2.0	20.2%
Totals for Area of Interest		**9.7**	**100.0%**

Dos Lagos Asset, LLC
810 E. Pico Blvd, Unit B24
Los Angeles, CA. 90021
213-614-8887

June 9, 2022

Supplemental Geotechnical Report
Lot C, D & E
Small Scale Pit Infiltration Test – Permeable Pavement Feasibility
Parcel No.s 0419102118, 0419106024, 0419106025, 0419106026, 0419106028, 0419106030
Site Address – 405 39th Ave SE
LS&E Job No. 12896
Tests Performed: 4/4/2022, 4/7/2022, 4/14/22, 4/15/2022, 4/21/22

Project Description

In support of a redesign to the preliminary stormwater design plans first provided to the City of Puyallup, this document will serve to outline the feasibility for permeable pavements within the project area. The previous updated geotechnical site investigation, dated 4/23/2021, confirmed highly modified subsurface characteristics within the proposed infiltrative horizon for all sites, or lots, related to the Dos Lagos multi-family housing project. Initially, the variability of the in-situ soils created concern regarding site-wide infiltration feasibility.

The land area which comprises the Lots within this project (C, D, and E – hereinafter referred to as “the site”) was originally owned by the City of Puyallup. The purpose of this supplemental report is to provide the results of infiltration PIT testing, and an overview of the soil makeup through the site. It is understood that City conducted a filling operation of the Site around 1990. The fill appears to be derived of native soils from the region that were imported to this site via dump trucks and graded into the terrain we see today. Soil descriptions show a relative consistency in the texture or type of soil (discussed in the original report). The City sold the property to OSLIC Holdings, LLC in 2020. OSLIC’s intended purpose for the purchase is for development purposes.

However, infiltration testing better illustrates the variable permeability of soils throughout the site based on minor differences of each dump truck load of soil. Through this report, we will provide our recommendation for a composite infiltration rate, which is weighted toward the lower rates among the group of tests. This is appropriate given that the soil permeability is variable in short distances vertically and laterally throughout the Site. A permeable pavement section spans a large, three-dimensional infiltration surface. This aggregate reservoir will provide contact with a large variable rate infiltrative surface. A composite rate, weighted toward the lower average is appropriate in our opinion.

Stormwater Options

It is understood that meeting the hydro-period for the adjacent wetland would be virtually impossible utilizing detention and subsequent dispersion, infiltration became the next best priority. Per the 2019 Stormwater Management Manual for Western Washington (SMMWW), Volume V – Chapter 5; a Small-Scale Pilot Infiltration Test is indicated for sites with less than one acre of drainage to proposed infiltration facility (see page 732).

Per the SMMWW, Volume V – Chapter 5 (BMP T5.15: Permeable Pavements); projects subject to Minimum Requirements #1 - #9 require a small-scale pilot infiltration test (PIT) to be performed for every 5,000 sq. ft. of proposed permeable pavement, but not less than 1 per site. While the intent of this requirement is understood, the cost and labor required for each PIT (>$5,000 and nearly a full day for multiple professionals) would culminate in a great expense for our client if this requirement was held (~12 PITs conducted, or >$60,000). In our conversations with Mark Higginson, Civil Engineer, City of Puyallup, the number of small-scale PITs conducted may be reduced from the prescriptive requirements set forth in the SMMWW as recommended by a geotechnical professional. It was agreed upon that 2 PITs per site (lot) met the intent of the code, particularly if the geotechnical professional was satisfied by the test process and utilized the lowest, or most conservative, result. Therefore, two PIT locations were chosen to best represent the site, or lot, based upon location of proposed pavement, and the presence of in-situ soils that will remain generally undisturbed through preliminary site design.

An aerial photograph of the site parcels prior to the City's fill project are shown in Figure 1 below. Figure 2 juxtaposes aerial photographs from 1990 (during the fill operation) and the contemporary setting (2020).

Figure 1: Satellite View of Site (GIS) July 1990

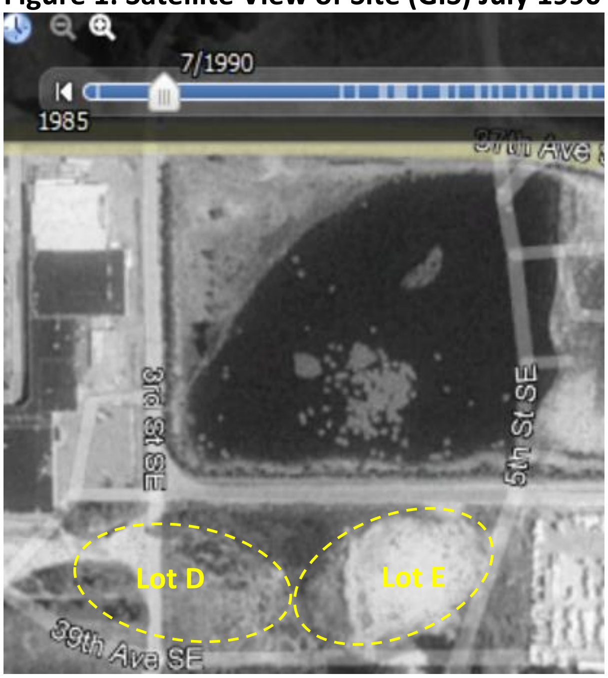
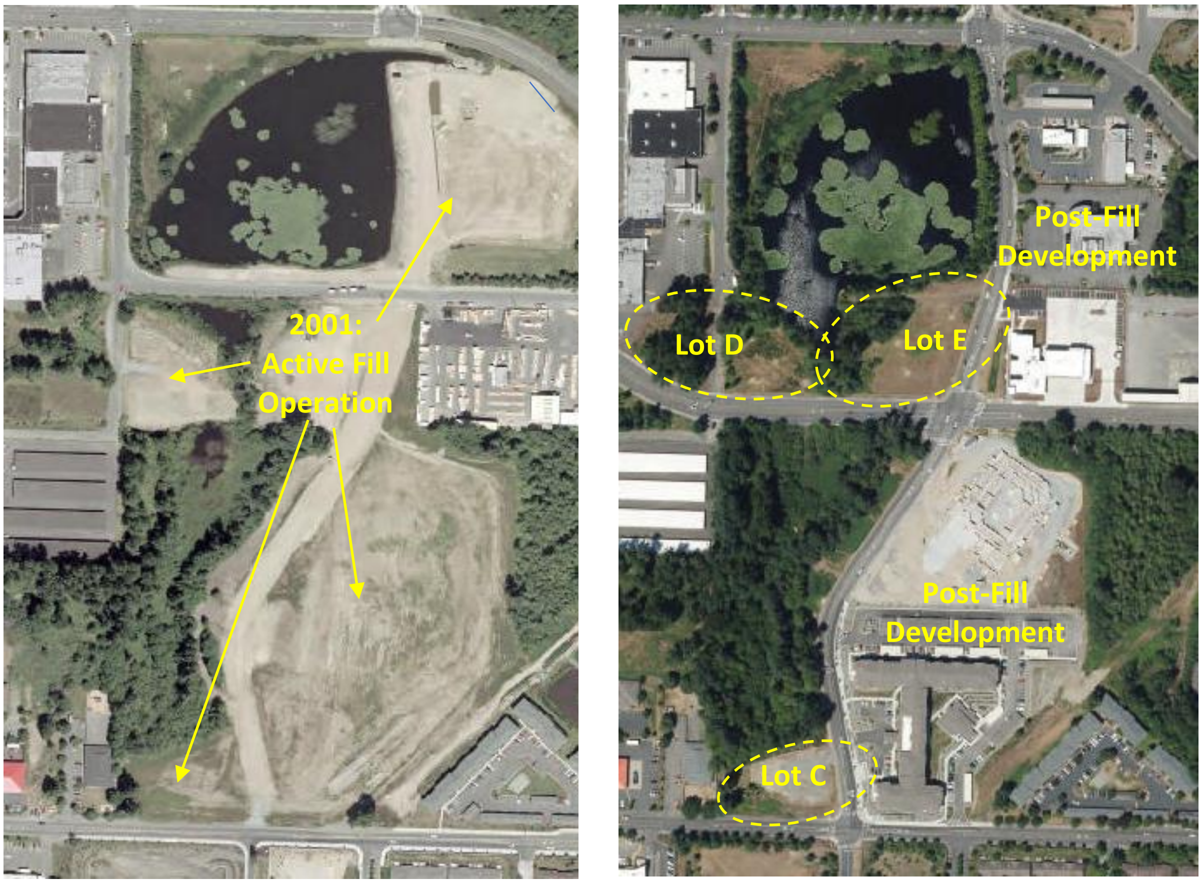


Figure 2: Satellite View of Site (GIS)

2001 **2020**



Methodology

A Licensed Geologist and representative from our firm oversaw the preparation of site and conducted the tests. Excavations measuring 4x4ft i.e., 16 ft^2 were advanced approximately 23 and 22 inches below present grade. Excavated PIT-1 and 2 for Lot C, PIT-3 and 4 for Lot D, PIT-5 and 6 for Lot E respectively. The spoils were set back from the excavation.

- Vertical measuring stake marked in half inch increments was installed.
- A PVC pipe with bell-shaped base and small perforations within the test PIT was used to dissipate water energy and thus limit movement and deposition of silts.
- A large water tank was mobilized with a section of hose that reached the PIT.
- Pre-soaked the PIT by maintaining a standing water head between 6 to 12 inches for 6 hours.
- At the end of soaking period, water was added to the extent to maintain level at 12 inches for 1 hour.
- Volume of water consumed to maintain the level at the same point each time was recorded every 15 minutes. The volume and instantaneous flow rate were determined.
- At 1 hour, water was stopped and the drop rate per inches was recorded every hour until the PIT emptied.

- Finally, a test PIT adjacent to the PIT was excavated to determine if water was mounding laterally. This step is intended for the sites with restrictive layers. The practice of adjacent excavation satisfies the requirement to over-excavate the test PIT to examine the groundwater mounding.

Figure 3: Lot-C Infiltration Test PIT (⬢) and Adjacent observation PIT (▲) Locations

Figure 4: Lot-D Infiltration Test PIT (⬢) and Adjacent observation PIT (▲) Locations

Figure 5: Lot-E Infiltration Test PIT (⬢) and Adjacent observation PIT (▲) Locations

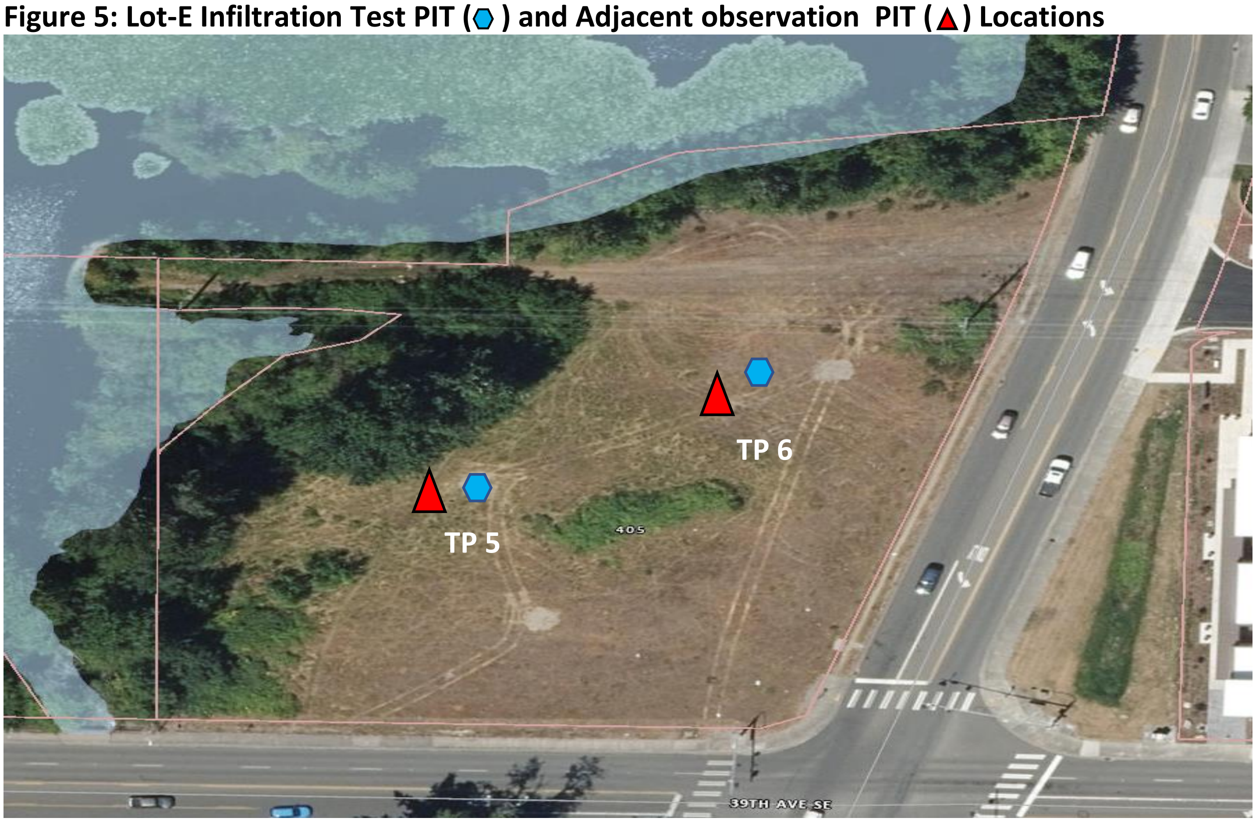


Table 1 illustrates instantaneous flow rate in gal/min to maintain a constant water level in test PITs.

Test PIT Number	Average Cumulative Volume (gallons @ 15min)	Average Instantaneous Flow Rate (gal/min)
1	26.60	1.76
2	1.3	0.08
3	5.05	0.33
4	35	2.33
5	7.43	0.49
6	No presoak success	No presoak success

Lot-C

- In PIT 1, water level of 8.5” was maintained during the presoak.
- In PIT 2, water level of 12” maintained, during the presoak.

Lot-D

- In PIT 3, we maintained PIT level between 6” and 12”.
- In PIT 4, permeability was rapid. Water level was maintained at 1/2” - 1” during presoak, consuming a flow rate of 140gal/hr.

Lot-E

- In PIT 5, water level of 8.5” was maintained during the presoak.
- In PIT 6, no presoak success, hence the drop in water depth after 1.5hr was 0”.

After presoak tests completed, the application of water to the PITs was discontinued and drop in inches/hour was recorded until the PIT emptied. Table 2 illustrates the results.

Table 2: Drain Rate (Infiltration Rate)

Test PIT #	Drain Inches/Hour Until Empty	Average Rate Using *All* Tests: Inches/Hour Until Empty
1	7.87	6.93
2	0.50	
3	1.68	
4	*30	
5	1.58	
6	*Zero infiltration	

*Values exist significantly outside of the grouping of infiltration rates.

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In-Situ Infiltration Rate Determination

As discussed at the beginning of this report, infiltration testing best illustrates the variable permeability of soils throughout the site based on minor differences of each dump truck load of soil. Based on the testing, we can provide a recommendation for a composite infiltration rate, which is weighted toward the five lower rates among the group of tests. This is appropriate given that the soil permeability is variable in short distances vertically and laterally throughout the Site. It is understood that the high rate will still exist in variable locations, although we are not recommending the rate within the averaging in order to assume even more safety factor. It should be understood, the permeable pavement section will span a large, three-dimensional infiltration surface. This aggregate reservoir will provide contact with the entire variable rate infiltrative surface. A composite rate, weighted toward the lower average is appropriate in our opinion.

Average Rate *Minus* Highest Value, Using Lowest Five Values: Inches/Hour
2.33

Figures 6 through 10 provide sampling of the PIT Test photographs.

Figure 6: Infiltration Test in Progress PIT 1, Lot C

Figure 7: Infiltration Test in Progress PIT TEST 2, Lot C

Figure 8: Infiltration Test in Progress PIT 3, Lot D

Figure 9: Infiltration Test in Progress PIT 5, Lot E

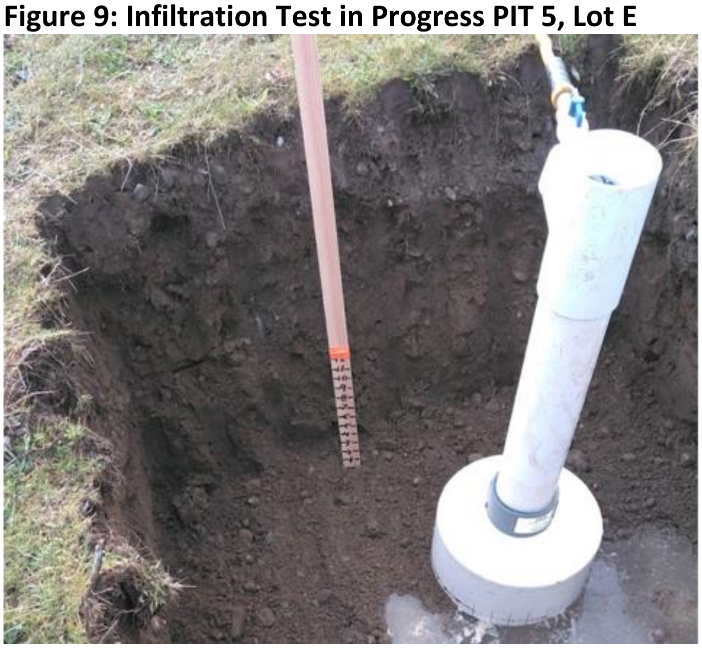

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Figure 10: Infiltration Test in Progress PIT 6, Lot E

Recommendations

Construction Timing: It is ideal to begin the project in the drier months and complete at least the reservoir course for the permeable roadway prior to the rainy season. Preparing and working a soil surface during inclement weather can compress, laminate, or otherwise deform the soil structure such that the expected infiltration capability is altered. In our opinion, the soil structure can be maintained if this recommendation is followed. If circumstances require the project to overlap into the rainy season, it can only be done with close oversight and monitoring of the project by LS&E.

Geotechnical Oversight: The Geotechnical consultant should be contacted for a pre-construction meeting, and for the inspection and evaluation of infiltration surface and building foundation surfaces. We recommend obtaining our observation at the first point of excavation to determine soil moisture conditions.

A representative from LS&E should be present for a second site visit at the completion of excavation surfaces to observe overall subsurface conditions. If, any soft, liquifiable, organic, or structurally unsuitable soils are found, we will mark those areas for removal of poor material and replacement with clean fractured structural fill.

Permeable Pavement Surface Preparation: Unlike traditional road bases, permeable infiltrative surfaces are not to be compacted. Compaction would damage the permeability.

The unifying coefficient of friction of the reservoir rock and permeable pavement will allow uniform compaction whereby the individual reservoir rocks embed into the soil surface and become compacted uniformly and retain permeability. It is the broad support of the 'raft' that will allow the soil infiltrative surface to retain permeability.

Furthermore, geotextile fabrics have been shown to crust and collect fine silts in a two dimensional plain thus clogging the pores and restricting the permeability. Whereas the native soils allow the silts to settle into the pore structure while keeping the pore throat quality intact. We do not recommend geotextile.

Building foundation: Unlike the infiltrative surface for permeable pavement, the building foundation surfaces should be inspected for poor, liquifiable, organic, or otherwise unsuitable soils (and replaced with structural fill); and compacted to a non-yielding condition.

Since this site was filled in 2,001, the expected foundation bearing surfaces at depth have been preloaded for 20 years. We expect bearing capacity to be well established. In our opinion, bearing capacity will meet or exceed 2,000 PSF (based on the latest soil textures we observed during the PIT testing process and per the International Building Code's Table 1806.2 'Presumptive Load-Bearing Values'). See Figure 11 below.

Our geotechnical staff can be available to make foundation soil observations and hand-T-probe tests when appropriate.

Figure 11: 2018 International Building Code (IBC) - Excerpt

TABLE 1806.2
PRESUMPTIVE LOAD-BEARING VALUES

CLASS OF MATERIALS	VERTICAL FOUNDATION PRESSURE (psf)	LATERAL BEARING PRESSURE (psf/ft below natural grade)	LATERAL SLIDING RESISTANCE	
			Coefficient of friction[a]	Cohesion (psf)[b]
1. Crystalline bedrock	12,000	1,200	0.70	—
2. Sedimentary and foliated rock	4,000	400	0.35	—
3. Sandy gravel and gravel (GW and GP)	3,000	200	0.35	—
4. Sand, silty sand, clayey sand, silty gravel and clayey gravel (SW, SP, SM, SC, GM and GC)	2,000	150	0.25	—
5. Clay, sandy clay, silty clay, clayey silt, silt and sandy silt (CL, ML, MH and CH)	1,500	100	—	130

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Recommended Additional Services

Please feel free to contact LS&E for consultation as needed during site development. A pre-construction meeting may be beneficial. Preparation of a letter summarizing all review comments (if required by Pierce County) may be necessary. LS&E is available to check all completed subgrades for footings before concrete is poured to verify their bearing capacity, as well as inspect all trenches prior to backfill. LS&E is available to oversee and inspect compaction of all fills and backfill material. Preparation of a post-construction letter summarizing all field observations, inspections, and test results (if required by Pierce County) can be provided by LS&E in the future.

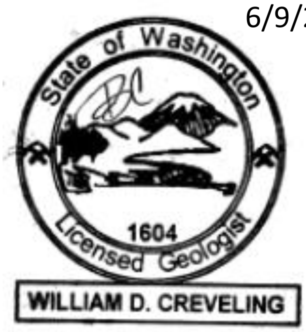
Closure

The information gathered for this report is standard practice and relevant for this type of project. The number and distribution of sampling locations is typical and reliable for obtaining an accurate understanding of the site of this size. The conclusions and recommendations presented in this letter are based on our observations, interpretations, and assumptions regarding shallow subsurface conditions. However, if any variations in the site conditions are discovered later, please contact our office to review and if necessary, modify this report accordingly. We appreciate the opportunity to be of service on this project. If you have any questions regarding this letter or any aspects of the project, please feel free to contact our office.

Respectfully submitted,

LeRoy Surveyors & Engineers, Inc.

6/9/2022



6/9/2022

Bill Creveling, L.G.
Principal Geologist

Damon DeRosa, P.E.
Principal Engineer

Ahtisham Ullah, E.I.T.

Appendix E

EnCo Wetland 1 Hydroperiod and Water Quality Assessment for Neighboring Site

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Mr. John Fisher, Project Manager May 4, 2018
Inland Construction Group
120 West Cataldo Avenue, STE 100
Spokane WA 99201

RE: WETLAND 1 HYDROPERIOD & WATER QUALITY ASSESSMENT
Point Source & Non-Point Source Stormwater Assessment to Wetland 1
Project Name & Address: Affinity at Puyallup, 4211 5th St. SE, Puyallup WA 98374
Current Use: Vacant, Cleared Land **Proposed Land Use**: Senior Center & Amenities
Tax Parcels: 041910-2121 & 2122 on 9.42 Acres

Dear Mr. Fisher:

This letter is written in response to present a qualitative analysis to determine if stormwater management (as designed by the project civil engineer) for the proposed Affinity at Puyallup project will have any adverse impacts to the functionality of **Wetland 1** when compared to the baseline hydroperiods and water quality at the wetland.

1.0 BACKGROUND

Wetland 1 is located contiguous to the west of 5th Street SE. **Wetland 1** is a Category II, palustrine, forested, depressional wetland with a rated moderate water quality function, high hydrologic function, and moderate habitat function. The City approved Wetland Buffer Boundary for **Wetland 1** will be the Prior Grading Line as depicted on EXHIBIT F – Potential Building Envelopes & Access Information – Parcel 1 obtained from the 2.23.09 Old Standard Life Insurance Company Development Agreement (EnCo Wetland Delineation – June 2017).

The direction of surface water flow within the footprint of **Wetland 1** trends downward to the north. **Wetland 1** is directly connected to Willow's Pond via a 28-foot wide by 60-foot long, unrestricted flow regime, box culvert that passes under 39th Avenue SE. It has been determined by the project engineer that the flow of surface water out of Willow's Pond is unrestricted in the sense that no flow control structure is present. This allows water in **Wetland 1** to flow unimpeded and unrestricted to downstream sources. There are two unrestricted culverts that discharge water from **Wetland 1** at the northeast corner of Willow's Pond into a perennial, man-made stream located to the northeast of the pond.

Wetland 1 has four existing hydroperiods as listed below.

1. Permanently Flooded or Inundated
2. Seasonally Flooded or Inundated
3. Saturated Only
4. Permanently Flowing Stream in or Adjacent to the Wetland

2.0 WATER QUALITY IMPACTS TO WETLAND 1

2.1 Project Design using the MWS-Linear Modular Wetland System

The information presented in this section has been provided by the project engineer (Bush, Roed & Hitchings, Inc. (BRH), Land Surveyors & Civil Engineers of Seattle WA). The Bio-Clean Modular Wetland Systems, Inc. (MWS) – Linear Modular Wetland treatment system, as chosen by the project engineer, has a Washington Department of Ecology (Ecology) General Use Level Designation (GULD) for water quality treatment under the Emerging Stormwater Treatment Technologies program (TAPE). Per the Ecology GULD permit, the MWS Wetland meets enhanced water quality treatment for stormwater runoff if:

"Sized at a hydraulic loading rate of 1 gallon per minute (gpm) per square foot (SF) of wetland cell area. For moderate pollutant loading rates (low to medium density residential basins), size the Prefilters at 3.0 gpm / SF of cartridge surface area.

The hydraulic loading rate for pollutant generating stormwater that is routed to the proposed Modular Wetland unit is 4.5 gpm prior to entry into the Basin A Detention Vault; as calculated in Western Washington Hydrology Model (WWHM) for the water quality design flow rate. The Modular Wetland will be equipped with an internal bypass weir that will bypass flows above this rate. The proposed 4-foot by 4-foot MWS unit to be installed for the project development provides 23 SF of filter surface area, which exceeds the 4.5 SF required. The MWS unit will have a minimum of 9.45 SF of prefilter media to meet the water quality requirements. The MWS unit contains wetland plants as part of the engineering design.

Discussion

The total flowage of water going into **Wetland 1** from a proposed point source at Stormwater Runoff Point Source A from the Basin A Detention Vault includes all of the stormwater from pollution generating surfaces and from the roof drains as depicted on the **WETLAND CONTRIBUTIONS FIGURE** (Attached).

Measures to be taken to minimize erosion and sediment and to minimize pollutants from entering **Wetland 1** from stormwater generated on the proposed site have reportedly been adequately engineered by BRH. According to BRH, the design of the stormwater site plan conforms to the Washington State Department of Ecology Stormwater

Management Manual for Western Washington, as Amended in December 2014 with amendments listed in Section 21.10 of the Puyallup Municipal Code.

To further protect erosion hazard and sedimentation from reaching **Wetland 1** from the Stormwater Runoff Point Source A, rip rap will be shored up and installed at the outlet.

Based on these factors, it is the professional opinion of this writer that stormwater which discharges into **Wetland 1** from the Basin A Detention Vault at Stormwater Runoff Point Source A will have no effect to the existing water quality of **Wetland 1**.

3.0 HYDROPERIOD IMPACTS TO WETLAND 1

3.1 Project Design using Infiltrating Bio-Retention Swale C – Basin B

The calculated percentage of surface area in SF for generated stormwater (inclusive of landscaping, lots, and roofs) from the project footprint that will enter into the Basin B infiltrating Bio-Retention Swale C is 84 percent (See **WETLAND CONTRIBUTIONS FIGURE**). The Basin B Bio-Retention Swale C mitigation area covers 210,830 SF (4.84 acres). The calculated typical monthly stormwater volumes for existing vs. mitigated by the Basin B Bio-Retention Swale C are shown on the **WETLAND CONTRIBUTIONS FIGURE**.

In summary the current design presents a 16 percent increase in the typical monthly volumes from existing conditions. Volumes are based on the WWHM model wetland analysis. The percent increase for Basin B stormwater is represented by a non-point source discharge (groundwater infiltration) and not by a point source discharge of surface flow of stormwater to **Wetland 1**.

The infiltrating Basin B Bio-Retention Swale C receives stormwater from non-infiltrating Bio-Retention Swales B, D, E, & F. These four non-infiltrating swales will be lined with an impermeable layer of material that will not allow any infiltration to groundwater. Infiltrating Bio-Retention Swale C has been designed to retain all stormwater in its defined catchment basin (Basin B), except for the 100-year storm event. The gravity overflow outlet for this pond is designed to release stormwater, as a point source, only during the 100-year storm event.

Discussion

Based on the project stormwater management design, the water flow component from infiltrating Basin B Bio-Retention Swale C to **Wetland 1** is defined as groundwater. Infiltrating Bio-Retention Swale C is located about 615 feet east of the edge of **Wetland 1**. In relation to **Wetland 1**, this connection is through the movement of groundwater from infiltrating Bio-Retention Swale C toward the northern segment of **Wetland 1** before is passes under 39th Avenue SE via a box culvert. Groundwater discharge to **Wetland 1** from infiltrating Bio-Retention Swale C is a non-point source of discharge.

Groundwater movement beneath the flat to gentle slopes (0 percent to 5 percent) across the project site will not move as fast horizontally in comparison to sites with slopes that exceed 5 percent. This flat to gentle slope condition across the project site slows the movement of groundwater toward **Wetland 1**. Based on the Earth Sciences NW investigation and field observations, the interpreted groundwater flow direction beneath the project site is generally to the northwest toward **Wetland 1** / Willows Pond as shown on the **WETLAND CONTRIBUTING FIGURE**.

The USDA hydrologic soil group identified by Mr. Doug Beyerlein, Licensed Hydrogeologist, from Clear Creek Solutions, LLC on the project site is Group / Category C. Group C is defined as having saturated hydraulic conductivity of the least transmissive layer from less than 10.0 um/s (1.42 in/hr.) to greater than 1.0 um/s (0.14 in/hr.). Group C soils have moderately high runoff potential when thoroughly wet. Water transmission through Group C soils is somewhat restricted. This somewhat restricted soil condition slows the movement of groundwater across the project site to **Wetland 1**.

Based on these factors, it is the professional opinion of this writer that stormwater which percolates into groundwater from the infiltrating Basin B Bio-Retention Swale C will have no effect to the existing hydroperiods of **Wetland 1**.

3.2 Project Design using Detention Vault – Basin A

The calculated percentage of surface area in SF for generated stormwater (inclusive of landscaping, lots, and roofs) from the project footprint that will enter into the three subsurface Basin A Detention Vaults is 16 percent. The Basin A Detention Vault mitigation area covers 39,640 SF (0.91 acre). The detention pipe system in Basin A will hold 10,013 cubic feet (74,897 gallons).

The flow out of the Basin A Detention Vault will be restricted to meet current ECOLOGY stormwater management requirements for Minimum Requirement 7 – Flow Control via the detention pipe system. The maximum flow rate from the Detention Vault has been designed and calculated to be 0.89 CFS for the 100-year storm.

The calculated typical monthly stormwater volumes for existing vs. mitigated by the Basin A Detention Vault are shown on the **WETLAND CONTRIBUTIONS FIGURE**. In summary the current design presents a 29 percent increase in the typical monthly volumes from existing conditions. Volumes are based on the WWHM model wetland analysis. The percent increase for Basin A stormwater is represented by a point source discharge (surface flow) to **Wetland 1**.

The current design presents a 29.0 percent monthly increase of water volume to **Wetland 1** as compared to existing conditions. This calculates out to be an average of 1,788 gallons of water per day that will be directly discharged to **Wetland 1** (See WWHM Wetland Volumes by Basin Table – Attached).

Discussion

Wetland 1 has a downstream unrestricted outlet in the northeast corner of Willow's Pond. The flow of surface water in the wetland out of Willow's Pond is unrestricted in the sense that no control structure is present. There are two culverts that discharge water from the wetland out of Willow's Pond into a man-made, perennial stream located to the northeast of the pond. These 2 unrestricted outlets provide free and fast movement of water out of the entire wetland, resulting in minimal water fluctuations and minimal changes to the existing hydroperiods in the wetland.

The degree of change in height of water storage within **Wetland 1** is minimal as indicated by observing no water marks on the concrete side walls of the 28-foot by 60-foot long box culvert under 39th Avenue SE that flows freely into Willow's Pond. This indicates that the existing hydrology that enters into **Wetland 1** flows relatively fast out of the wetland into the man-made perennial stream located northeast of Willow's Pond without raising the water level to any significance in the wetland. This rapid movement of water out of the wetland provides a very stable height of water storage in the wetland which in turn provides unchanged hydroperiods. Water levels in the wetland do not change to any significant degree during periods of wet weather and increased water inputs into the wetland.

Currently, surface water enters **Wetland 1** from several man-made stormwater runoff features to include three existing engineered stormwater retention ponds, street runoff, sheet flow over surrounding forested and cleared land, and via two stormwater runoff drainage ditches along the adjoining streets (east and west). These sources of water input into **Wetland 1** have not changed the hydroperiods of the wetland over time.

The southern segment of **Wetland 1** contains the best habitat for amphibians, reptiles, and mammals. This area consists of a mixture of saturated only and seasonally flooded or inundated hydroperiods. The dominant vegetation along the east edge of **Wetland 1** in this area is a well-established tree forested community of red alder and black cottonwood with an understory of black twinberry, Douglas spirea, salmonberry, Sitka willow, wild clustered rose, and sweet briar rose. These plants provide very good habitat by providing shade, down wood, and overhanging branches over shallow pools of water in the wetland for amphibians and other animals, especially during the spring months. The hydroperiods in this area will not be affected by stormwater entering **Wetland 1** from Stormwater Runoff Point Source A from the project site because this area is located upslope of this discharge pipe.

The permanently flooded or inundated hydroperiod of **Wetland 1** is located in the northern segment of **Wetland 1**. The hydroperiod in this area will not be affected by stormwater entering **Wetland 1** from Stormwater Runoff Point Source A from the project site because water in this area of the wetland flows rapidly and unrestricted in a northerly direction to Willow's Pond and out the two unrestricted culverts in the northeast corner to the man-made perennial stream.

The permanently flowing stream hydroperiod is located adjacent to the northeast of **Wetland 1**. The hydroperiod in this area will not be affected by stormwater entering **Wetland 1** from Stormwater Runoff Point Source A from the project site because water in this stream flows rapidly and unrestricted to Bradley Lake and points north.

Based on these factors, it is the professional opinion of this writer that stormwater which discharges into **Wetland 1** from the Basin A Detention Vault at Stormwater Runoff Point Source A will have no effect to the existing hydroperiods of **Wetland 1**.

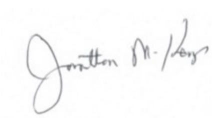
4.0 CONCLUSIONS

It is the professional opinion of this writer that stormwater which discharges into **Wetland 1** from the Basin A Detention Vault at Stormwater Runoff Point Source A will have no effect to the existing water quality of **Wetland 1**.

It is the professional opinion of this writer that stormwater which percolates into groundwater from the infiltrating Basin B Bio-Retention Swale C will have no effect to the existing hydroperiods of **Wetland 1**.

It is the professional opinion of this writer that stormwater which discharges into **Wetland 1** from the Basin A Detention Vault at Stormwater Runoff Point Source A will have no effect to the existing hydroperiods of **Wetland 1**.

Jonathan M. Kemp



Principal, PWS
EnCo Environmental Corporation
Sent via e-mail to John Fisher
Affinity_Wetland_1_Hydroperiod_Assessment_Rpt_May_4_2018

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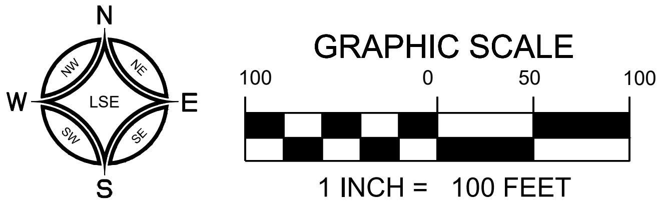
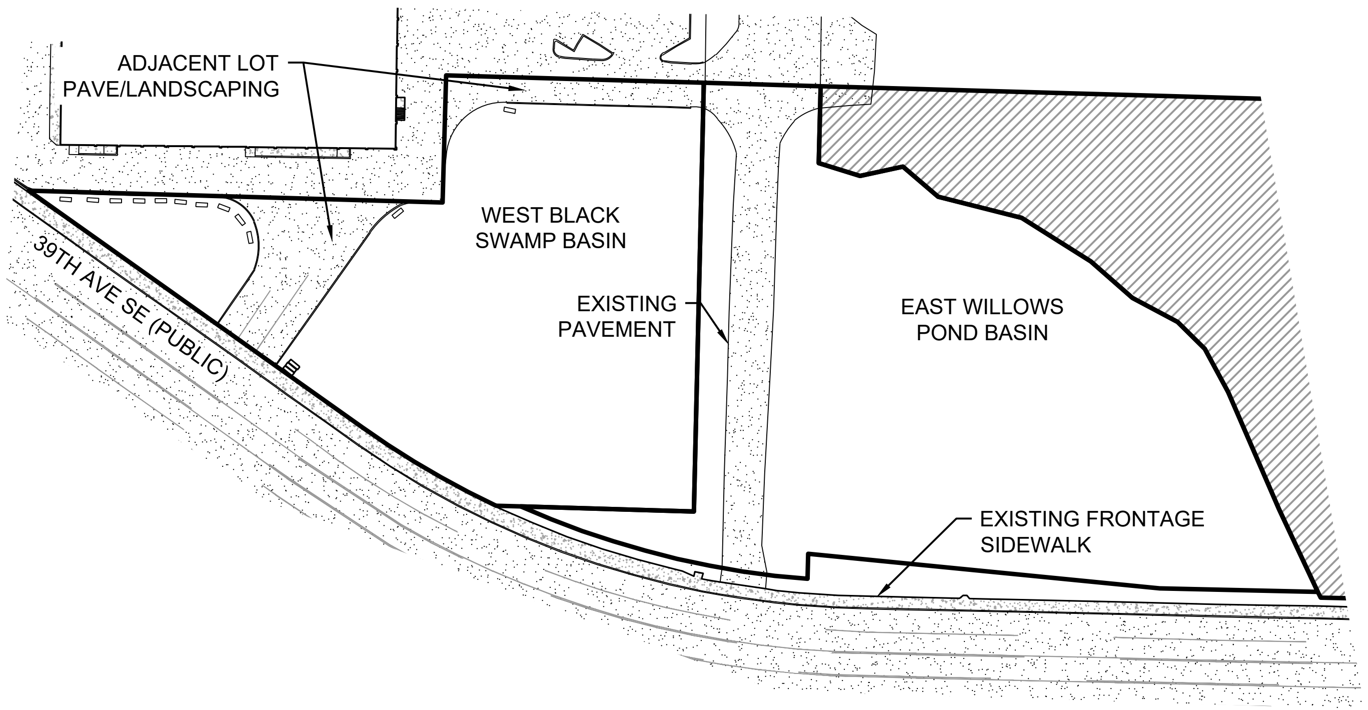
Appendix F

Basin Maps





PREDEVELOPED BASIN AREAS:

COMBINED BASIN AREAS: 108,117 SF (2.482 AC)

HISTORIC	
WEST BLACK SWAMP BASIN TILL FOREST	45,265 SF (1.039 AC)
EAST WILLOWS POND BASIN TILL FOREST	56,729 SF (1.302 AC)
EAST WILLOWS POND BASIN FRONTAGE	6,123 (0.141 AC)
EXISTING - WEST BLACK SWAMP BASIN	
ADJACENT LOT PAVE/LANDSCAPING	10,363 SF (0.238 AC)
PASTURE	34,902 SF (0.802 AC)
EXISTING - EAST WILLOWS POND BASIN	
PAVEMENT	6,488 SF (0.149 AC)
FRONTAGE SIDEWALK & ACCES	2,228 SF (0.051 AC)
PASTURE	39,107 SF (0.898 AC)
TILL FOREST	15,029 SF (0.345 AC)

NOTE:

NO IMPROVEMENTS ARE PROPOSED FOR THE EXISTING PAVEMENT AND ACCESS FOR THE PROPERTY TO THE NORTH OF THE SITE. DUE TO THIS, THE AREAS SERVING THE ADJACENT LOT WITHIN THE BLACK SWAMP BASIN WERE NOT CONSIDERED AS PART OF THE STORMWATER CALCULATIONS FOR THIS PROJECT.

PREDEVELOPED BASIN MAP - LOT D

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CLIENT: DOS LAGOS ASSET, LLC	ENGINEER: STEVE T. NELSON, P.E.	
PHONE NUMBER: (213) 614-8887	CERT. NO.	
ADDRESS: 810 E. PICO BLD, UNIT B24	SUBDIVISION:	
LOS ANGELES, CA 90021	LOT NO.	DRAWN: MDD
PARCEL NO. 0419106026 AND 0419102107	DATE: 8/1/23	JOB NO. 12896

SHEET

8-1-23

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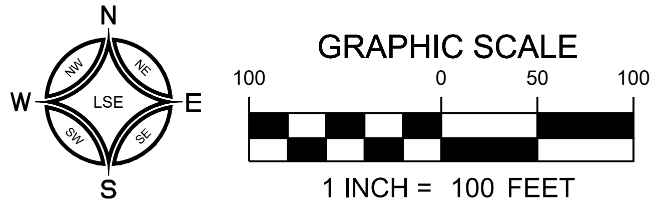

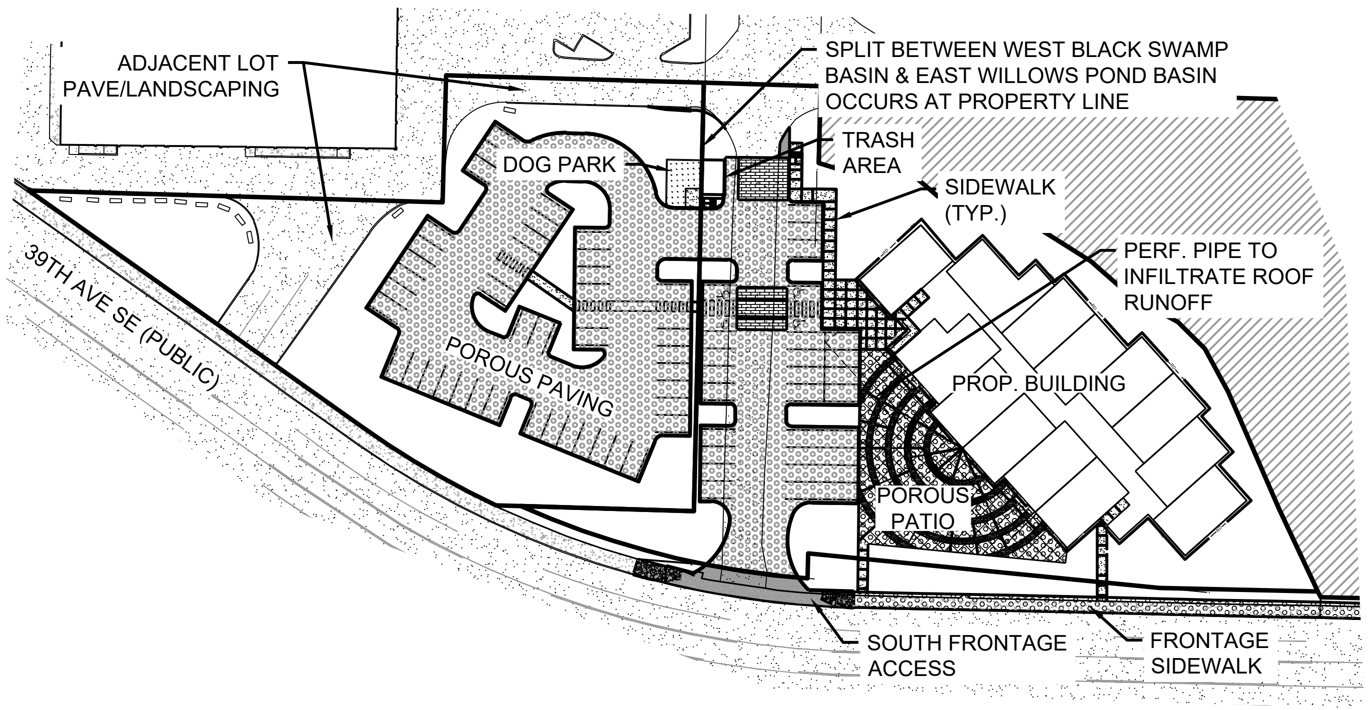

DEVELOPED BASIN AREAS:

BASIN AREA: 108,117 SF (2.482 AC)

PROPOSED WEST BLACK SWAMP BASIN	
PAVING (POROUS)	18,492 SF (0.425 AC)
SIDEWALK & ASSOCIATED CURB	788 SF (0.018 AC)
DOG PARK	376 (0.009 AC)
LAWN/LANDSCAPE	15,246 SF (0.350 AC)
ADJACENT LOT PAVE/LANDSCAPING	10,363 SF (0.238 AC)
PROPOSED EAST WILLOWS POND BASIN	
PAVING (POROUS)	11,320 SF (0.260 AC)
PEDESTRIAN CROSSINGS	1,145 SF (0.026 AC)
BUILDING ROOF	18,398 SF (0.422 AC)
TRASH AREA ROOF	216 SF (0.005 AC)
PATIO (POROUS)	6,380 SF (0.146 AC)
LAWN/LANDSCAPE	18,518 SF (0.425 AC)
NORTH SITE ACCESS	1,483 SF (0.034 AC)
SITE SIDEWALK	2,200 SF (0.051 AC)
FRONTAGE SIDEWALK (POROUS)	2,218 SF (0.051 AC)
SOUTH FRONTAGE ACCESS	974 SF (0.022 AC)

NOTE:
NO IMPROVEMENTS ARE PROPOSED FOR THE EXISTING PAVEMENT AND ACCESS FOR THE PROPERTY TO THE NORTH OF THE SITE. DUE TO THIS, THE AREAS SERVING THE ADJACENT LOT WITHIN THE BLACK SWAMP BASIN WERE NOT CONSIDERED AS PART OF THE STORMWATER CALCULATIONS FOR THIS PROJECT.

DEVELOPED BASIN MAP - LOT D

LEROY
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ADDRESS: 810 E. PICO BLD, UNIT B24	SUBDIVISION:	
LOS ANGELES, CA 90021	LOT NO.	DRAWN: MDD
PARCEL NO. 0419106026 AND 0419102107	DATE: 8/1/23	JOB NO. 12896

SHEET

8-1-23

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