Drainage Report

For the Dos Lagos Lot 'C'
Parcel Number: 0419106030
4202 5th St 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
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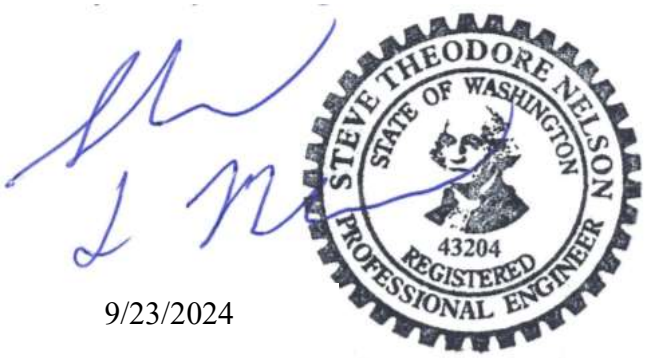
Contact: Steve T Nelson, P.E.

April 2021
Revised July 2024
Revised September 2024
Job No: 12896

I hereby state that this Preliminary Drainage Report for the Dos Lagos Lot 'C' 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.



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Section 1 – Proposed Project Overview

Project Name: Dos Lagos Lot 'C' Project

Permit Type: Multi-Family Residential

Permit No: P21-0099

Site Address: 4202 5th St SE, Puyallup, WA 98374

Parcel Numbers: 0419106030

Legal Descriptions:

PARCEL #: 0419106030
Tract A and Lot 1 of City of Puyallup Short Plat No. P-18-0175, recorded December 30, 2019 under Recording No. 201912305005, 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 50-unit apartment complex with associated parking on 1.34 acres, located at the corner of 5th Street SE and 43rd 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 road 5th Street SE. The project is connected to a predevelopment application (No. P-20-0088) and requires a completed SEPA checklist.

Stormwater runoff in the existing condition partially infiltrates, while the remainder sheet flows to the adjacent wetland. There is one drainage basin onsite (Threshold Discharge Area, TDA) in the existing and developed condition. Stormwater runoff quality and quantity impacts from the proposed hard surfaces will be mitigated using porous pavement.

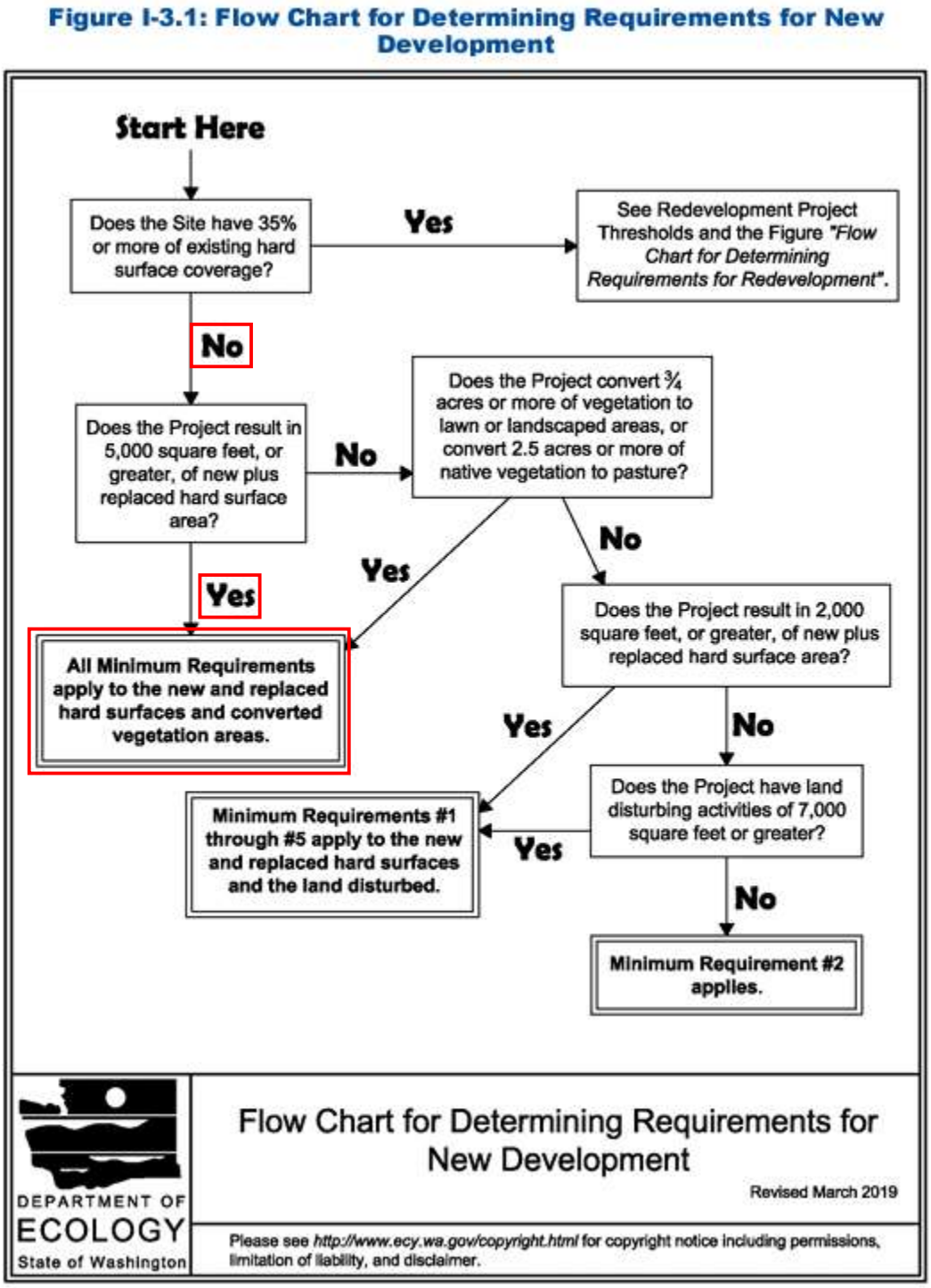
The proposed apartment building will be served by city sewer.

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. The Dos Lagos Lot 'C' Project is a new development project and proposes to add approximately 51,043 sq. ft. of new hard surfaces. 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



- 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 west into the adjacent wetland (see Drainage in Section 2, below). The project proposes to manage stormwater through porous pavement, amended soils, pervious walkways, and the use of a detention system for the proposed roof areas (see Minimum Requirement #5 and Minimum Requirement #7, below).

- The natural outfall on the project site is the adjoining wetland to the north of the parcel. This is due to the north-northwesterly sheet flow that occurs in the predeveloped condition. Additionally, an existing drainage system conveys stormwater runoff from the existing right-of-way to an existing swale/ditch, which then drains to an existing conveyance pipe, which empties to the wetland buffer.

- 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.
  - Lawn and Landscaped Areas
    - All lawn and landscaped areas shall be amended per the requirements of BMP T5.13
  - Roofs
    - Full Dispersion or Downspout Full Infiltration: Infiltration is deemed to be infeasible due to the shallow infiltrative soils. Separation cannot be maintained from the high ground water for the proposed roof area.
    - Bioretention: This BMP is not applicable due to limited developable space and competing needs for parking, landscape, and other city requirements. Likewise, the project would be required to maintain a 3-foot separation from the bottom of the infiltration facility as it is not feasible to limit the total impervious flowing to a bioretention facility to below 5,000 square feet due to the competing city required needs (landscape, parking, fire, sewer, etc.).
    - Downspout Dispersion: This BMP is infeasible because there is insufficient space on-site to sufficiently establish the required dispersion flow path area.
    - Perforated Stub-Out Connections: This BMP is not feasible due to shallow infiltrative soils.
    - Therefore, the project is proposing to utilize stormwater detention for the roof areas and a portion of the paving as due to the detention vaults those areas cannot be pervious pavement.
  - 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. Permeable paving will be utilized for parking as well as walkways, patios and sidewalks. It should be noted that some standard paving will be utilized and conveyed to the detention system. A minimum of 1.5' of separation is provided between the proposed bottom of permeable pavement and restrictive layer. This was confirmed through Winter Groundwater Monitoring. Refer to Appendix D and the Preliminary Storm, Sewer, and Water Plans for further information regarding the Winter Monitoring and confirmation of separation.
- Bioretention: This BMP is not applicable due to limited developable space and competing needs for parking, landscape, and other city requirements. Likewise, the project would be required to maintain a 3-foot separation from the bottom of the infiltration facility as it is not feasible to limit the total impervious flowing to a bioretention facility to below 5,000 square feet due to the competing city required needs (landscape, parking, fire, sewer, etc.).
- Sheet Flow Dispersion or Concentrated Flow Dispersion: This BMP is infeasible because there is insufficient space on-site to sufficiently establish the required dispersion flow path area.

- 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 and the underlying soils to achieve runoff quality treatment. A minimum of 1.5' of separation is provided between the proposed bottom of permeable pavement and restrictive layer. This was confirmed through Winter Groundwater Monitoring. Refer to Appendix D and the Preliminary Storm, Sewer, and Water Plans for further information regarding the Winter Monitoring and confirmation of separation. Additionally, where standard pavement is utilized and directed to the detention system a cartridge style filter will provide quality treatment.
- 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 with responses bolded. 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: **Due to the limited depth of infiltrative soils the project will utilize detention to control stormwater runoff from the roof areas and a portion of the parking area, which results in greater than 10,000 square feet of effective impervious and thus this threshold is exceeded.**

- 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 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. The 100-year historical runoff from the project is 0.129 cfs. The 100-year developed runoff from the project is 0.0.119 cfs. The project results in a decrease of 0.01 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.**

  - Since the project exceeds one or more of the above thresholds the project is required to meet Flow Control standards.

- Minimum Requirement #8: Wetlands Protection

  In the existing condition, runoff and subsurface flows from the project site discharge to the wetland north of the project site. This will be maintained to the maximum extent possible in the developed condition. Per an e-mail provided by Mark Higginson on November 13, 2023, the Willows Pond is categorized as Category III, with a Habitat Score of 4 per a 3rd party consultant (refer to Appendix E). Therefore, for this submittal we have prepared it in accordance with Method 2: Site Discharge Modeling was implemented per Volume I, Appendix C of the manual.

  Two criteria 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.

  The previously mentioned criteria require the developed and existing basins contributing to the wetland to be compared to confirm that the wetland hydroperiod may be maintained. It should be noted that all contributing offsite areas, beyond the proposed project site and existing pond, were modelled as

forested. The area of the project site was modelled as existing conditions as these areas are clearly ascertained. The reason for this deviation from the standard methodology is multi-pronged:

1) It is assumed that all offsite areas already developed or to be developed in the future have or will follow the requirements of the manual and stormwater runoff will not exceed the typical runoff of a forested condition.
2) This approach is more conservative and therefore will meet unknowns of the over 200 acres of area that contain differing soils with many varied runoff considerations.
3) This approach is more defined than attempting to estimate all existing pervious and impervious areas and the varied methods of dispersion/infiltration and mitigation that has or will occur.

Please refer to Appendices A and E for stormwater calculations and further information; however the project, under developed conditions, meets the Criteria stated above with no days or months out of compliance.

- 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 with a slight grade to the north and west. The extreme southern and western portions of the parcel are characterized by slight depressions, apparently built for area drainage and overflow purposes, with a vertical relief of approximately 4 to 6 feet. These features currently allow offsite stormwater to flow into the adjacent wetland, north of the site.

The eastern portion of the parcel is characterized by a surficial layer of fill, including some debris, to an approximate depth of 3 feet. A small portion of this fill is crushed gravel, apparently for the purpose of parking, in some locations. The fill covers an area of approximately 13,300 sf with a vertical relief of approximately 3 feet. The extent of the area used for parking, including the area graveled, can be seen in the 2019 WAOCIO Pierce County GIS imagery.

Ground Cover

As stated above in 'Topography', a large portion of the site is made up of fill and used as parking. The remainder of the site is covered by grass and blackberries, with deciduous trees and typical northwest understory along the northern property line, and a few conifers in the southwestern portion.

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 by the project Geologist. This infiltration rate was further reduced by correction factors as determined by Ecology Section V-5.4:

$$K_{sat}Design = K_{sat}Initial \times CF_V \times CF_T \times CF_M = \mathbf{0.52\ in/hr.}$$

Where:

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

$CF_V = 0.5$ (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)

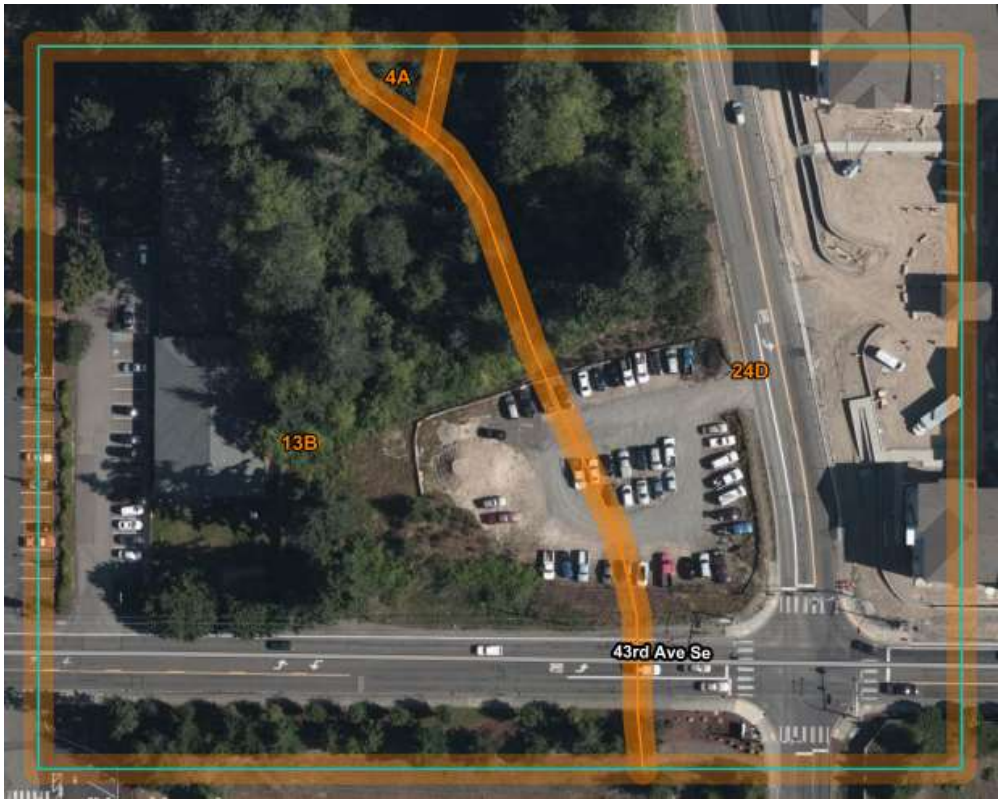
The site's natural drainage pattern has been altered in the southern portion of the site, mostly located within the 43rd Ave SE ROW. This consists of a man-made drainage ditch/swale, which appears to overflow along the western parcel boundary, then into the wetland adjacent to the northern property boundary. For the remainder of the site, stormwater runoff generally sheet flows north and west across the site 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	0.0	0.8%
13B	Everett very gravelly sandy loam, 0 to 8 percent slopes	3.4	54.9%
24D	Neilton gravelly loamy sand, 8 to 25 percent slopes	2.7	44.3%
Totals for Area of Interest		**6.2**	**100.0%**

As part of the geotechnical analysis, seasonal groundwater levels were established for the site. This information was used to confirm that there was sufficient separation between the proposed facilities and groundwater. Refer to the Dos Lagos Lot C Plans for additional information regarding the following Table.

Description	TP#10	TP#11
Top of Pavement	443.00	443.00
Bottom of 12” Storage Reservoir	441.33	441.33
Top of Seasonal Ground Water Level	435.00	434.00
Separation (1.5’ Min Required)	6.33’ Provided	7.33’ Provided

Table. Seasonal Groundwater Comparison

Section 3 – Off-Site Analysis Report

Upstream Analysis

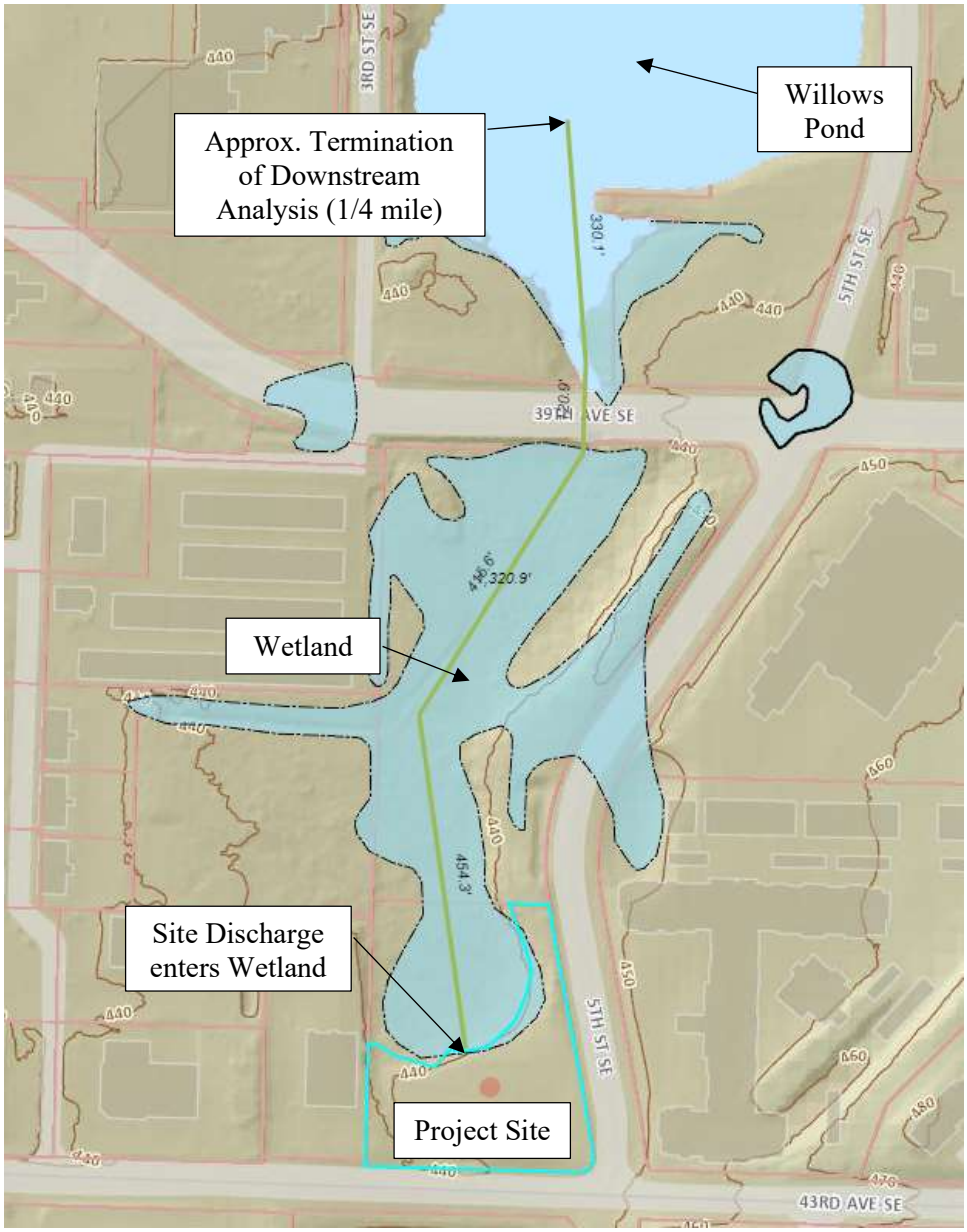
Stormwater from 5th Street SE and 43rd Ave SE are collected by various catch basins and conveyed through the site via existing swale, culvert, and stormwater conveyance pipes, arriving at the wetland. Some stormwater in this upstream conveyance originates from the development directly east of the site (Affinity assisted living). The downstream analysis on that project, approved by the City, outlines this conveyance.

Downstream Analysis

A downstream (offsite) analysis has been completed by LS&E for this project. An offsite analysis study area definition map (Figure 4) is shown below. The study area for this project extends to approximately ¼ mile to the approximate center of the water body known as Willow's Pond. This pond eventually drains into Bradley Lake, then downstream for an unspecified distance.

No adverse impacts to downstream wetland/waters are anticipated as stormwater runoff from proposed pollution-generating impervious surfaces will be infiltrated through porous pavement, pervious walkways, and detention system before flowing laterally through the sub-surface soils into the wetland and via storm drainage system.

Figure 4: Downstream Analysis Map



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 4202 5th Street SE in the City of Puyallup in an area of existing commercial development. The site parcel comprises approximately 2.252 acres however the disturbed area of work is 1.567 acres including onsite and offsite work. The parcel is bordered by existing undeveloped property to the north, a childcare facility to the west, 5th Street E and a neighboring assisted living facility across the

street to the east, and 43rd Ave SE and a large YMCA facility to the South. Access to the project site will be a new driveway, located at or near the existing gravel driveway, off of 5th Street SE.

Existing topography slopes gently toward the north-northwest with grades near level. Slight depressions exist in the southwestern and western portions of the parcel with city drainage pipes and overflow characteristics, intended to flow to the adjacent wetland. The existing ground cover for the majority of the site consists of mature deciduous trees and conifers, and typical northwest understory. This is generally surrounding the area that exhibited fill material and existing crushed gravel parking surface. Current stormwater runoff from the project site primarily sheet flows through native vegetation towards the adjacent wetland. Any infiltration that may occur in the area of proposed development is assumed to flow to the adjacent wetland via subsurface lateral flow basins.

Two stormwater calculations are required in order to fully analyze stormwater runoff for the site. The first stormwater calculation requires 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). The below table presents the reviewer with the historic areas:

Predeveloped Historic Threshold Discharge Area Drainage Basin Land Use Breakdown

Actual Surface Description	Area (AC)	Surface Modeled As
On-Site	57,040 SF (1.309 AC)	Type C Forest
Off-Site incl. path to 39th Ave SE	11,217 SF (0.258 AC)	Type C Forest
Total Area	**68,257 SF (1.567 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 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 below table presents the reviewer with the predeveloped existing areas:

Predeveloped Existing Threshold Discharge Area Drainage Basin Land Use Breakdown for Wetland

Actual Surface Description	Area (AC)	Surface Modeled As
Project Areas		
On-Site Pasture	29,508 SF (0.677 AC)	Type C Pasture
On-Site Till Forest	20,391 SF (0.468 AC)	Type C Forest
On-Site Gravel	7,141 SF (0.164 AC)	Roads - Impervious
Off-site Lawn	9,674 SF (0.222 AC)	Type C Pasture
Off-site Gravel	1,170 SF (0.027 AC)	Roads - Impervious
Off-site Sidewalk	373 SF (0.009 AC)	Sidewalks - Impervious
Non-Project Basin Areas		
Type A/B Forest	5,947,944 SF (136.546 AC)	Type A/B Forest
Type C Forest	2,369,490 SF (54.396 AC)	Type C Forest
Pond	455,855 SF (10.465 AC)	Pond
Total Area	**8,841,546 SF (202.974 AC)**	

Part B – Developed Site Hydrology

As noted previously, two stormwater calculations are required in order to fully analyze stormwater runoff for the site. The first 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 Area Drainage Basin Land Use Breakdown

Actual Surface Description	Area (SF)	Surface Modeled As
On-site Roof	15,996 SF (0.367 AC)	Roof => Detention.
On-site Dumpster Roof	220 SF (0.005 AC)	Roof => Detention.
Std Parking/Curb	8,008 SF (0.184 AC)	Road => Detention
Pervious Parking South	3,713 SF (0.085 AC)	Porous Pave.
Std Parking – Run-on Park So.	1,663 SF (0.038 AC)	Parking => Porous Pave.
Curbing – Run-on Park So.	119 SF (0.002 AC)	Parking => Porous Pave.
Pervious Parking North	2,862 SF (0.066 AC)	Porous Pave.
Std Parking – Run-on Park No.	1,362 SF (0.031 AC)	Parking => Porous Pave.
Pervious Sidewalk	1,663 SF (0.038 AC)	Porous Pave.
Pervious Patio	1,297 SF (0.030 AC)	Porous Pave.
Landscape – Bypass Amended Soil	19,648 SF (0.452 AC)	Pasture.
Stairs - Bypass	163 SF (0.004 AC)	Impervious - Sidewalk
Wall - Bypass	326 SF (0.007 AC)	Impervious - Sidewalk.
Offsite Pervious Sidewalk	7,197 SF (0.165 AC)	Porous Pave.
Offsite Drive Access - Bypass	951 SF (0.022 AC)	Roads
Offsite LS - Bypass Amended Soil	389 SF (0.009 AC)	Pasture
Offsite Pervious Asphalt Pathway	2,680 SF (0.062 AC)	Porous Pave.
Total Area	**68,257 SF (1.567 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 all contributing offsite areas, beyond the proposed project site and existing pond, were modelled as forested. The area of the project site was modelled as existing conditions as these areas are clearly ascertained. Refer to Section 1, Minimum Requirement #8, of this report, for additional information.

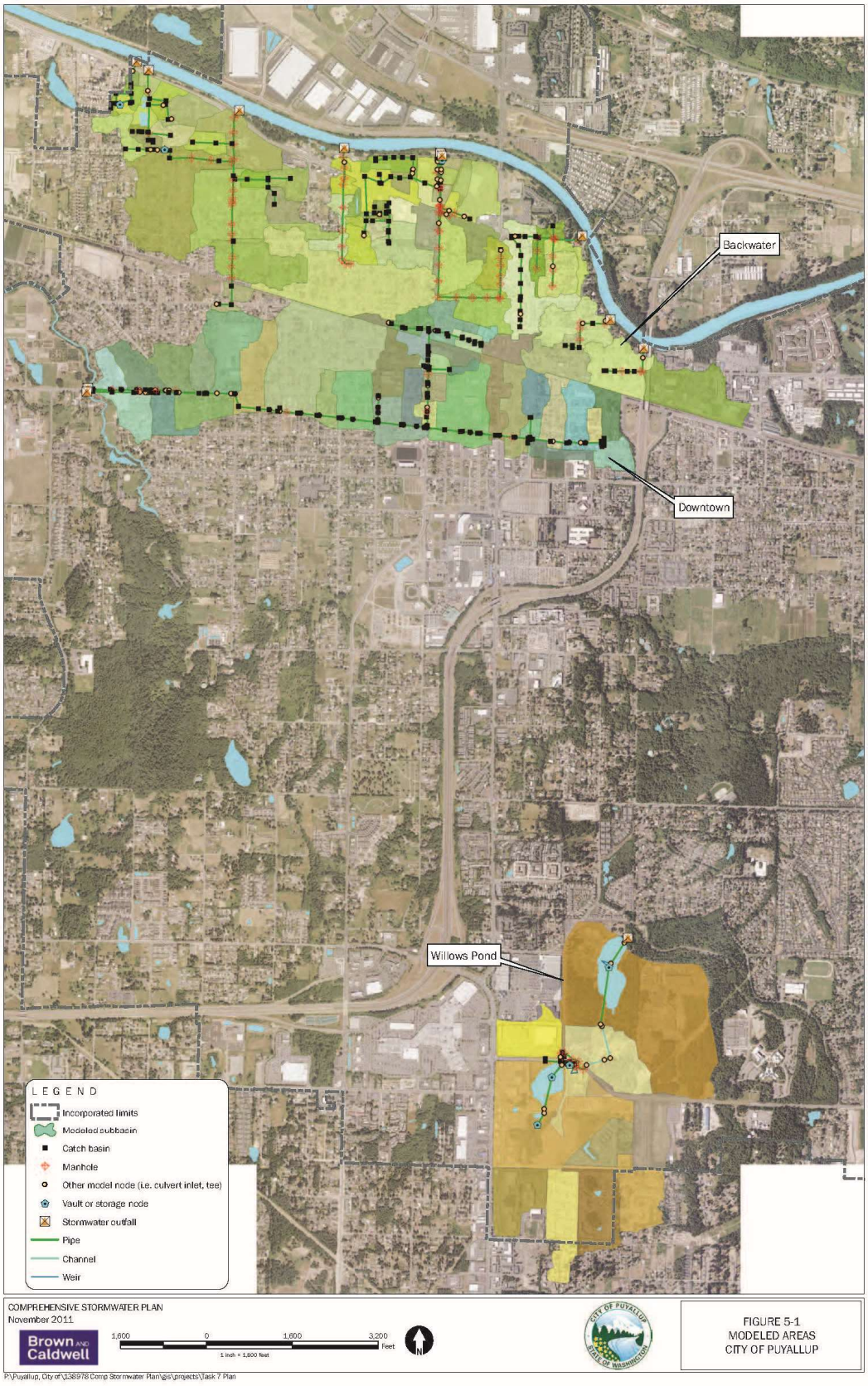
The TDA and land-use breakdown is information that was determined using the March 6,2013 City of Puyallup Comprehensive Storm Drainage Plan prepared by Brown and Caldwell. Specifically, Table 5-1 and Figure 5-1 were used to determine that of the 420 acres contributing to the Willows Pond/Bradley Lake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

5.2.2 Hydraulics Model

The sections below summarize the work related to the SWMM hydraulics model development. Additional information is provided in Appendix C. Hydraulic models require substantial levels of information about drainage infrastructure in order to accurately simulate water levels throughout the drainage network (e.g., pipe invert elevations, diameters, ground surface elevations at manholes). Surveying to collect the requisite data is expensive. Therefore, infrastructure data collection and model construction activities were focused on the parts of the city that experience drainage problems. Separate models were developed for three known problem areas, as outlined in Appendix C, listed in Table 5-1, and shown on Figure 5-1.

Table 5-1. Models Developed

Model name	Number of subbasins	Basin area, acres	Outfall location
Backwater	59	642	Puyallup River
Downtown	40	431	Clarks Creek
Willows Pond	16	420	Bradley Lake


Backwater
Downtown
Willows Pond
LEGEND
Incorporated limits
Modeled subbasin
Catch basin
Manhole
Other model node (i.e. culvert inlet, tee)
Vault or storage node
Stormwater outfall
Pipe
Channel
Weir
COMPREHENSIVE STORMWATER PLAN
November 2011
Brown AND Caldwell
1,600 0 1,600 3,200 Feet
1 inch = 1,600 feet
N
CITY OF PUYALLUP STATE OF WASHINGTON
FIGURE 5-1
MODELED AREAS
CITY OF PUYALLUP
P:\Puyallup, City of\138978 Comp Stormwater Plan\gis\projects\Task 7 Plan

The table below, presents the reviewer with the predeveloped existing areas outside of the project area:

Developed Threshold Discharge Area Drainage Basin Land Use Breakdown outside of project area for Wetland Calculation

Actual Surface Description	Area (AC)	Surface Modeled As
Project Areas		
Please refer to the previous table under Part B for an analysis of the project areas.		
Non-Project Basin Areas		
Type A/B Forest	5,947,944 SF (136.546 AC)	Type A/B Forest
Type C Forest	2,369,490 SF (54.396 AC)	Type C Forest
Pond	455,855 SF (10.465 AC)	Pond
Total Area	**8,773,289 SF (201.407 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 to treat runoff from pollution-generating surfaces. The project proposes both porous pavement and a cartridge-style filter 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 is required to meet the Flow Control Standards as part of the design. 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 some impervious surfaces, where feasible, and use stormwater detention to meet 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. 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 following table compares the historical and developed runoff:

Years	Historical Discharge (CFS)	Developed Discharge (CFS)
2-Year	0.03925	0.03006
5-Year	0.06216	0.04637
10-Year	0.07737	0.06103
25-Year	0.104	0.08057
50-Year	0.117	0.09702
100-Year	0.129	0.134

Table. Comparison of Historical and Developed Runoff

Please refer to Section 1, Minimum Requirement #7, of this report, 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 for a portion of the PGHS and cartridge-style filters will address other portions of standard pavement. Final sizing and type of cartridge style filter will be addressed during the Construction Document phase of the project and will be in accordance with Puyallup and the DOE standards. Porous pavement 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 has been provided in the Appendix under the Title, *Cation Exchange and Organic Matter Soil Test Dos Lagos Project*.

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.
- As provided by the City of Puyallup the *Third-Party Review of Willow Pond Multi-family Residential Puyallup WA* dated October 20, 2023, completed by Confluence Environmental Company is submitted with this report in Appendix E. The critical areas study report rated Wetland A as a Category III wetland with a habitat score of 4.
- A geotechnical report entitled *Cation Exchange and Organic Matter Soil Test Dos Lagos Project* was completed by LS&E and a copy is submitted with this report in Appendix D.

Section 6 – Other Permits

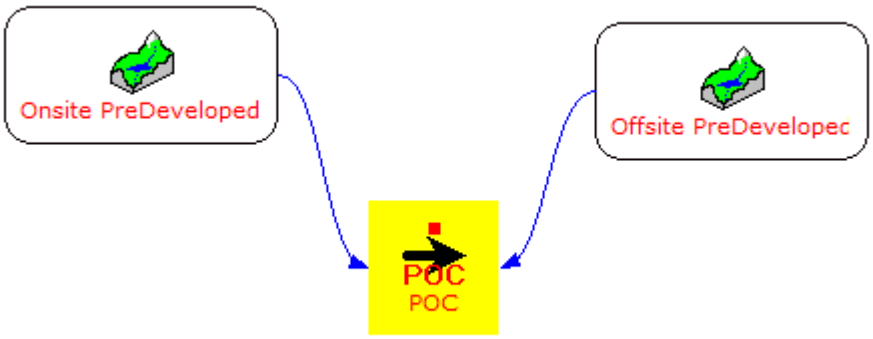
- Temporary Construction Easement (No Auditor File Number (AFN) currently available).
- A SEPA Environmental Checklist will be required.

Appendix A

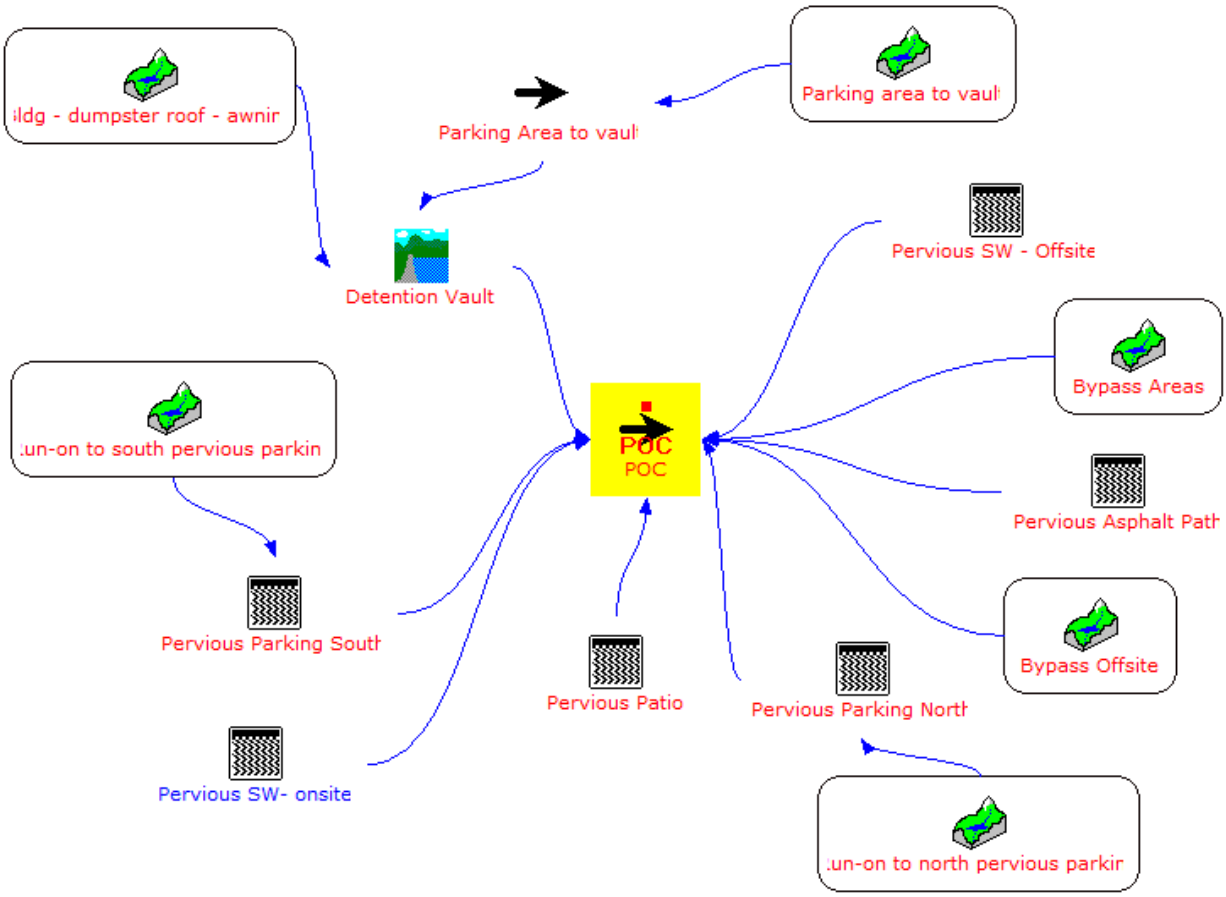
Calculations

DOS LAGOS – LOT C (LSE 12896)
MR7 STORMWATER CALCULATION WILLOWS POND BASIN INCLUDING ONSITE AND OFFSITE

PREDEVELOPED



DEVELOPED



MGS FLOOD
PROJECT REPORT

Program Version: MGSFlood 4.58
Program License Number: 201010005
Project Simulation Performed on: 02/27/2024 12:02 PM
Report Generation Date: 02/27/2024 1:10 PM

Input File Name: Lot C MR7 stormwater calc 20240227.fld
Project Name: Dos Lagos (12896) - Lot C
Analysis Title: Lot C - Willows Pond Basin MR7
Comments: Developed vs Historical

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)	1.567	1.122
Area of Links that Include Precip/Evap (acres)	0.000	0.445
Total (acres)	1.567	1.567

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

---------- Subbasin : Onsite PreDeveloped ----------

	-------Area (Acres) --------
C, Forest, Flat	1.309
Subbasin Total	1.309

---------- Subbasin : Offsite PreDeveloped ----------

	-------Area (Acres) --------
C, Forest, Flat	0.258
Subbasin Total	0.258

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

Number of Subbasins: 6

---------- Subbasin : Bldg - dumpster roof - awning ----------

	-------Area (Acres) --------
ROOF TOPS/FLAT	0.372
Subbasin Total	0.372

---------- Subbasin : Parking area to vault ----------

	-------Area (Acres) --------
PARKING/FLAT	0.184
Subbasin Total	0.184

---------- Subbasin : Run-on to south pervious parking ----------

	-------Area (Acres) --------
SIDEWALKS/FLAT	0.002
PARKING/FLAT	0.038
Subbasin Total	0.040

---------- Subbasin : Run-on to north pervious parking ----------

	-------Area (Acres) --------
PARKING/MOD	0.031
Subbasin Total	0.031

---------- Subbasin : Bypass Areas ----------

	-------Area (Acres) --------
C, Pasture, Flat	0.452
SIDEWALKS/FLAT	0.011
Subbasin Total	0.463

---------- Subbasin : Bypass Offsite ----------

	-------Area (Acres) --------
C, Pasture, Flat	0.009
DRIVEWAYS/FLAT	0.023
Subbasin Total	0.032

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

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

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

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

----------SCENARIO: POSTDEVELOPED
Number of Links: 9

Link Name: Detention Vault
Link Type: Structure
Downstream Link Name: POC

Prismatic Pond Option Used
Pond Floor Elevation (ft) : 437.12
Riser Crest Elevation (ft) : 443.12
Max Pond Elevation (ft) : 443.62
Storage Depth (ft) : 6.00
Pond Bottom Length (ft) : 74.0
Pond Bottom Width (ft) : 34.0
Pond Side Slopes (ft/ft) : Z1= 0.00 Z2= 0.00 Z3= 0.00 Z4= 0.00
Bottom Area (sq-ft) : 2516.
Area at Riser Crest El (sq-ft) : 2,516.
(acres) : 0.058
Volume at Riser Crest (cu-ft) : 15,096.
(ac-ft) : 0.347
Area at Max Elevation (sq-ft) : 2516.
(acres) : 0.058
Vol at Max Elevation (cu-ft) : 16,354.
(ac-ft) : 0.375

Hydraulic Conductivity (in/hr) : 0.00
Massmann Regression Used to Estimate Hydralic Gradient
Depth to Water Table (ft) : 100.00
Bio-Fouling Potential : Low
Maintenance : Average or Better

Riser Geometry
Riser Structure Type : Circular
Riser Diameter (in) : 12.00
Common Length (ft) : 0.000
Riser Crest Elevation : 443.12 ft

Hydraulic Structure Geometry

Number of Devices: 2

---Device Number 1 ---
Device Type : Circular Orifice
Control Elevation (ft) : 437.12
Diameter (in) : 0.38
Orientation : Horizontal
Elbow : No

---Device Number 2 ---
Device Type : Circular Orifice
Control Elevation (ft) : 442.07
Diameter (in) : 1.00
Orientation : Horizontal
Elbow : Yes

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

Link Name: Pervious Parking South
Link Type: Porous Pavement Structure
Downstream Link Name: POC

Pavement Length (ft) : 61.88
Pavement Width (ft) : 60.00
Pavement Slope (ft/ft) : 0.050
Pavement Infiltration Rate (in/hr) : 20.000
Number of Infiltration Cells : 3
Trench Cell Length (ft) : 20.00
Trench Cell Width (ft) : 60.00
Trench Cell Depth (ft) : 1.00
Trench Gravel Porosity (%) : 30.00
Trench Bed Slope (ft/ft) : 0.050
Native Soil Infiltration Rate (in/hr) : 0.520

Link Name: Pervious Parking North
Link Type: Porous Pavement Structure
Downstream Link Name: POC

Pavement Length (ft) : 43.00
Pavement Width (ft) : 66.50
Pavement Slope (ft/ft) : 0.050
Pavement Infiltration Rate (in/hr) : 20.000
Number of Infiltration Cells : 3
Trench Cell Length (ft) : 22.00
Trench Cell Width (ft) : 43.00
Trench Cell Depth (ft) : 1.00
Trench Gravel Porosity (%) : 30.00
Trench Bed Slope (ft/ft) : 0.050
Native Soil Infiltration Rate (in/hr) : 0.520

Link Name: Pervious SW- onsite
Link Type: Porous Pavement Structure
Downstream Link Name: POC

Pavement Length (ft)	: 332.60
Pavement Width (ft)	: 5.00
Pavement Slope (ft/ft)	: 0.015
Pavement Infiltration Rate (in/hr)	: 20.000
Number of Infiltration Cells	: 5
Trench Cell Length (ft)	: 66.52
Trench Cell Width (ft)	: 5.00
Trench Cell Depth (ft)	: 0.67
Trench Gravel Porosity (%)	: 30.00
Trench Bed Slope (ft/ft)	: 0.015
Native Soil Infiltration Rate (in/hr)	: 0.520

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

Pavement Length (ft)	: 80.00
Pavement Width (ft)	: 16.21
Pavement Slope (ft/ft)	: 0.000
Pavement Infiltration Rate (in/hr)	: 20.000
Number of Infiltration Cells	: 1
Trench Cell Length (ft)	: 80.00
Trench Cell Width (ft)	: 16.21
Trench Cell Depth (ft)	: 0.50
Trench Gravel Porosity (%)	: 30.00
Trench Bed Slope (ft/ft)	: 0.000
Native Soil Infiltration Rate (in/hr)	: 0.520

Link Name: Pervious SW - Offsite
Link Type: Porous Pavement Structure
Downstream Link Name: POC

Pavement Length (ft)	: 577.00
Pavement Width (ft)	: 12.47
Pavement Slope (ft/ft)	: 0.015
Pavement Infiltration Rate (in/hr)	: 20.000
Number of Infiltration Cells	: 1
Trench Cell Length (ft)	: 577.00
Trench Cell Width (ft)	: 12.47
Trench Cell Depth (ft)	: 0.67
Trench Gravel Porosity (%)	: 30.00
Trench Bed Slope (ft/ft)	: 0.000
Native Soil Infiltration Rate (in/hr)	: 0.520

Link Name: Pervious Asphalt Path
Link Type: Porous Pavement Structure
Downstream Link Name: POC

Pavement Length (ft)	: 663.00
Pavement Width (ft)	: 4.04
Pavement Slope (ft/ft)	: 0.015
Pavement Infiltration Rate (in/hr)	: 20.000
Number of Infiltration Cells	: 1
Trench Cell Length (ft)	: 663.00
Trench Cell Width (ft)	: 4.00
Trench Cell Depth (ft)	: 0.50
Trench Gravel Porosity (%)	: 30.00
Trench Bed Slope (ft/ft)	: 0.000
Native Soil Infiltration Rate (in/hr)	: 0.520

Link Name: Parking Area to vault
Link Type: Copy
Downstream Link Name: Detention Vault

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

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

************ Subbasin: Onsite PreDeveloped ************

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

Tr (yrs)	Flood Peak (cfs)
2-Year	3.279E-02
5-Year	5.192E-02
10-Year	6.463E-02
25-Year	8.665E-02
50-Year	9.778E-02
100-Year	0.108
200-Year	0.173
500-Year	0.260

************ Subbasin: Offsite PreDeveloped ************

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

Tr (yrs)	Flood Peak (cfs)
2-Year	6.462E-03
5-Year	1.023E-02
10-Year	1.274E-02
25-Year	1.708E-02
50-Year	1.927E-02
100-Year	2.129E-02
200-Year	3.406E-02
500-Year	5.122E-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	3.925E-02
5-Year	6.216E-02
10-Year	7.737E-02
25-Year	0.104
50-Year	0.117
100-Year	0.129
200-Year	0.207
500-Year	0.311

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 6
Number of Links: 9

********** **Subbasin: Bldg - dumpster roof - awning** **********

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

Tr (yrs)	Flood Peak (cfs)
2-Year	0.151
5-Year	0.197
10-Year	0.232
25-Year	0.291
50-Year	0.349
100-Year	0.433
200-Year	0.462
500-Year	0.498

********** **Subbasin: Parking area to vault** **********

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

Tr (yrs)	Flood Peak (cfs)
2-Year	7.487E-02
5-Year	9.736E-02
10-Year	0.115
25-Year	0.144
50-Year	0.172
100-Year	0.214
200-Year	0.228
500-Year	0.246

********** **Subbasin: Run-on to south pervious parking** **********

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

Tr (yrs)	Flood Peak (cfs)
2-Year	1.628E-02
5-Year	2.116E-02
10-Year	2.490E-02
25-Year	3.134E-02
50-Year	3.748E-02
100-Year	4.659E-02
200-Year	4.964E-02
500-Year	5.357E-02

********** **Subbasin: Run-on to north pervious parking** **********

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

Tr (yrs)	Flood Peak (cfs)
2-Year	1.483E-02
5-Year	1.948E-02
10-Year	2.457E-02
25-Year	3.183E-02
50-Year	3.475E-02
100-Year	4.580E-02
200-Year	5.164E-02
500-Year	5.917E-02

********** **Subbasin: Bypass Areas** **********

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

Tr (yrs)	Flood Peak (cfs)
2-Year	1.654E-02
5-Year	2.755E-02
10-Year	3.855E-02
25-Year	6.104E-02
50-Year	7.161E-02
100-Year	9.705E-02
200-Year	0.118
500-Year	0.146

********** **Subbasin: Bypass Offsite** **********

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

Tr (yrs)	Flood Peak (cfs)
2-Year	9.563E-03
5-Year	1.243E-02
10-Year	1.479E-02
25-Year	1.832E-02
50-Year	2.317E-02
100-Year	2.798E-02
200-Year	2.915E-02
500-Year	3.059E-02

********** Link: Detention Vault ********** Link Inflow
Frequency Stats

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

Tr (yrs)	Flood Peak (cfs)
2-Year	0.226
5-Year	0.294
10-Year	0.346
25-Year	0.436
50-Year	0.521
100-Year	0.648
200-Year	0.690
500-Year	0.745

********** Link: Detention Vault ********** Link Outflow 1
Frequency Stats

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

Tr (yrs)	Flood Peak (cfs)
2-Year	6.600E-03
5-Year	7.739E-03
10-Year	2.048E-02
25-Year	2.737E-02
50-Year	2.839E-02
100-Year	2.914E-02
200-Year	2.946E-02
500-Year	2.988E-02

********** Link: Detention Vault ********** Link WSEL Stats

WSEL Frequency Data(ft)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	WSEL Peak (ft)
1.05-Year	439.074
1.11-Year	439.203
1.25-Year	439.498
2.00-Year	440.214
3.33-Year	440.817
5-Year	441.374
10-Year	442.294
25-Year	442.608
50-Year	442.666
100-Year	442.710

********** 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	3.006E-02
5-Year	4.637E-02
10-Year	6.103E-02
25-Year	8.057E-02
50-Year	9.702E-02
100-Year	0.134
200-Year	0.148
500-Year	0.166

********** Link: Pervious Parking South ********** Link Inflow Frequency Stats

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

Tr (yrs)	Flood Peak (cfs)
2-Year	1.628E-02
5-Year	2.116E-02
10-Year	2.490E-02
25-Year	3.134E-02
50-Year	3.748E-02
100-Year	4.659E-02
200-Year	4.964E-02
500-Year	5.357E-02

********** Link: Pervious Parking South ********** 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: Pervious Parking South ********** Link WSEL Stats

WSEL Frequency Data(ft)

(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	WSEL Peak (ft)
1.05-Year	0.457
1.11-Year	0.483
1.25-Year	0.501
2.00-Year	0.567
3.33-Year	0.632
5-Year	0.662
10-Year	0.740
25-Year	0.805
50-Year	0.861
100-Year	0.894

********** Link: Pervious Parking North ********** Link Inflow Frequency Stats

Flood Frequency Data(cfs)

(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	1.483E-02
5-Year	1.948E-02
10-Year	2.457E-02
25-Year	3.183E-02
50-Year	3.475E-02
100-Year	4.580E-02
200-Year	5.164E-02
500-Year	5.917E-02

********** Link: Pervious Parking North ********** 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: Pervious Parking North ********** Link WSEL Stats

WSEL Frequency Data(ft)

(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	WSEL Peak (ft)
1.05-Year	0.494
1.11-Year	0.512
1.25-Year	0.536
2.00-Year	0.609
3.33-Year	0.673
5-Year	0.708
10-Year	0.783
25-Year	0.850
50-Year	0.912
100-Year	0.943

********** Link: Pervious SW- onsite ********** 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: Pervious SW- onsite ********** 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	6.805E-03
200-Year	1.274E-02
500-Year	2.048E-02

********** Link: Pervious SW- onsite ********** Link WSEL Stats
WSEL Frequency Data(ft)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	WSEL Peak (ft)
1.05-Year	0.361
1.11-Year	0.375
1.25-Year	0.393
2.00-Year	0.448
3.33-Year	0.486
5-Year	0.522
10-Year	0.557
25-Year	0.629
50-Year	0.647
100-Year	0.670

********** Link: Pervious Patio ********** 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: Pervious 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	0.000E+00
100-Year	0.000E+00
200-Year	0.000E+00
500-Year	0.000E+00

********** Link: Pervious Patio ********** Link WSEL Stats

WSEL Frequency Data(ft)

(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	WSEL Peak (ft)
1.05-Year	3.921E-02
1.11-Year	3.993E-02
1.25-Year	4.087E-02
2.00-Year	4.514E-02
3.33-Year	5.254E-02
5-Year	5.763E-02
10-Year	8.150E-02
25-Year	0.111
50-Year	0.117
100-Year	0.130

********** Link: Pervious SW - Offsite ********** 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: Pervious SW - Offsite ********** 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: Pervious SW - Offsite ********** Link WSEL Stats

WSEL Frequency Data(ft)

(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	WSEL Peak (ft)
1.05-Year	3.921E-02
1.11-Year	3.993E-02
1.25-Year	4.087E-02
2.00-Year	4.514E-02
3.33-Year	5.254E-02
5-Year	5.763E-02
10-Year	8.150E-02
25-Year	0.111
50-Year	0.117
100-Year	0.130

********** Link: Pervious Asphalt Path ********** 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: Pervious Asphalt Path ********** 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: Pervious Asphalt Path ********** Link WSEL Stats

WSEL Frequency Data(ft)

(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	WSEL Peak (ft)
1.05-Year	3.960E-02
1.11-Year	4.033E-02
1.25-Year	4.128E-02
2.00-Year	4.559E-02
3.33-Year	5.327E-02
5-Year	5.889E-02
10-Year	8.273E-02
25-Year	0.113
50-Year	0.119
100-Year	0.132

********** Link: Parking Area to vault ********** Link Inflow Frequency Stats

Flood Frequency Data(cfs)

(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	7.487E-02
5-Year	9.736E-02
10-Year	0.115
25-Year	0.144
50-Year	0.172
100-Year	0.214
200-Year	0.228
500-Year	0.246

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

Tr (yrs)	Flood Peak (cfs)
2-Year	7.487E-02
5-Year	9.736E-02
10-Year	0.115
25-Year	0.144
50-Year	0.172
100-Year	0.214
200-Year	0.228
500-Year	0.246

*************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:	Onsite PreDeveloped	248.904
Subbasin:	Offsite PreDeveloped	49.058
Link:	POC	0.000
Total:		297.962

Total Post Developed Recharge During Simulation

Model Element		Recharge Amount (ac-ft)
Subbasin:	Bldg - dumpster roof	0.000
Subbasin:	Parking area to vaul	0.000
Subbasin:	Run-on to south perv	0.000
Subbasin:	Run-on to north perv	0.000
Subbasin:	Bypass Areas	79.822
Subbasin:	Bypass Offsite	1.589
Link:	Detention Vault	0.000
Link:	POC	0.000
Link:	Pervious Parking Sou	69.127
Link:	Pervious Parking Nor	53.456
Link:	Pervious SW- onsite	21.990
Link:	Pervious Patio	17.147
Link:	Pervious SW - Offsit	95.141
Link:	Pervious Asphalt Pat	35.418
Link:	Parking Area to vaul	0.000
Total:		373.691

Total Predevelopment Recharge is Less than Post Developed
Average Recharge Per Year, (Number of Years= 158)
Predeveloped: 1.886 ac-ft/year, Post Developed: 2.365 ac-ft/year

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

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

Number of Links: 1

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

2-Year Discharge Rate : 0.039 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): 190.55
Inflow Volume Including PPT-Evap (ac-ft): 190.55
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): 190.55
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: 9

********** Link: Detention Vault **********

Basic Wet Pond Volume (91% Exceedance): 2670. cu-ft
Computed Large Wet Pond Volume, 1.5*Basic Volume: 4005. cu-ft

2-Year Discharge Rate : 0.007 cfs

15-Minute Timestep, Water Quality Treatment Design Discharge
On-line Design Discharge Rate (91% Exceedance): 0.09 cfs
Off-line Design Discharge Rate (91% Exceedance): 0.05 cfs

Infiltration/Filtration Statistics----------
Inflow Volume (ac-ft): 278.43
Inflow Volume Including PPT-Evap (ac-ft): 278.43
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): 278.36
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: POC **********

2-Year Discharge Rate : 0.030 cfs

15-Minute Timestep, Water Quality Treatment Design Discharge
On-line Design Discharge Rate (91% Exceedance): 999.00 cfs
Off-line Design Discharge Rate (91% Exceedance): 999.00 cfs

Infiltration/Filtration Statistics----------
Inflow Volume (ac-ft): 368.57
Inflow Volume Including PPT-Evap (ac-ft): 368.57
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): 368.57
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: Pervious Parking South **********

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): 20.03
Inflow Volume Including PPT-Evap (ac-ft): 69.13
Total Runoff Infiltrated (ac-ft): 69.13, 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: Pervious Parking North **********

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): 15.65
Inflow Volume Including PPT-Evap (ac-ft): 53.46
Total Runoff Infiltrated (ac-ft): 53.46, 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: Pervious SW- onsite **********
Infiltration/Filtration Statistics----------
Inflow Volume (ac-ft): 0.00
Inflow Volume Including PPT-Evap (ac-ft): 21.99

Total Runoff Infiltrated (ac-ft): 21.99, 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: Pervious Patio **********
Infiltration/Filtration Statistics----------
Inflow Volume (ac-ft): 0.00
Inflow Volume Including PPT-Evap (ac-ft): 17.15
Total Runoff Infiltrated (ac-ft): 17.15, 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: Pervious SW - Offsite **********
Infiltration/Filtration Statistics----------
Inflow Volume (ac-ft): 0.00
Inflow Volume Including PPT-Evap (ac-ft): 95.14
Total Runoff Infiltrated (ac-ft): 95.14, 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: Pervious Asphalt Path **********
Infiltration/Filtration Statistics----------
Inflow Volume (ac-ft): 0.00
Inflow Volume Including PPT-Evap (ac-ft): 35.42
Total Runoff Infiltrated (ac-ft): 35.42, 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: Parking Area to vault **********
2-Year Discharge Rate : 0.075 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  WQ FLOW

Infiltration/Filtration Statistics----------
Inflow Volume (ac-ft): 92.14
Inflow Volume Including PPT-Evap (ac-ft): 92.14
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): 92.14
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%

************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

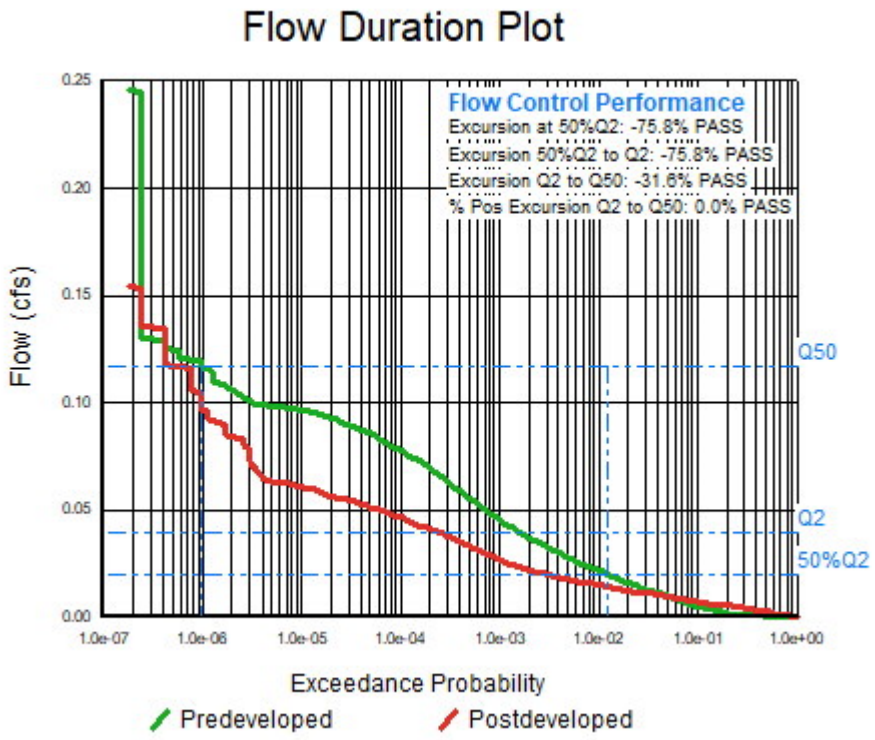
Predevelopment Runoff		Postdevelopment Runoff	
Tr (Years)	Discharge (cfs)	Tr (Years)	Discharge (cfs)
2-Year	3.925E-02	2-Year	3.006E-02
5-Year	6.216E-02	5-Year	4.637E-02
10-Year	7.737E-02	10-Year	6.103E-02
25-Year	0.104	25-Year	8.057E-02
50-Year	0.117	50-Year	9.702E-02
100-Year	0.129	100-Year	0.134
200-Year	0.207	200-Year	0.148
500-Year	0.311	500-Year	0.166

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

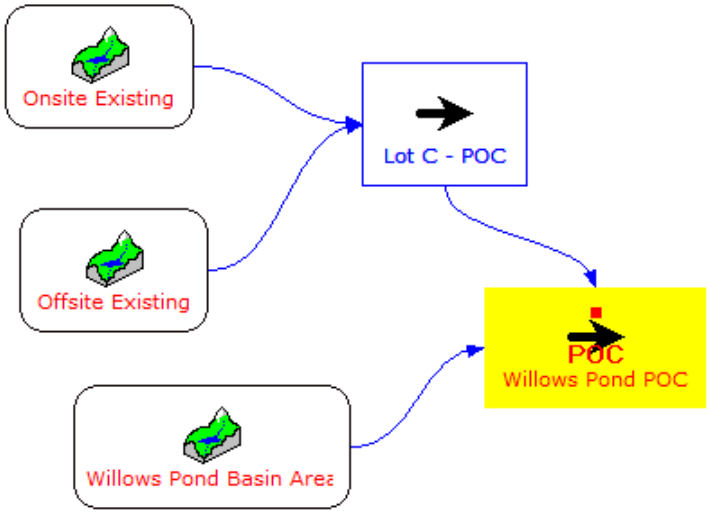
****** Flow Duration Performance ******

Excursion at Predeveloped 50%Q2 (Must be Less Than or Equal to 0%):	-75.8%	PASS
Maximum Excursion from 50%Q2 to Q2 (Must be Less Than or Equal to 0%):	-75.8%	PASS
Maximum Excursion from Q2 to Q50 (Must be less than 10%):	-31.6%	PASS
Percent Excursion from Q2 to Q50 (Must be less than 50%):	0.0%	PASS

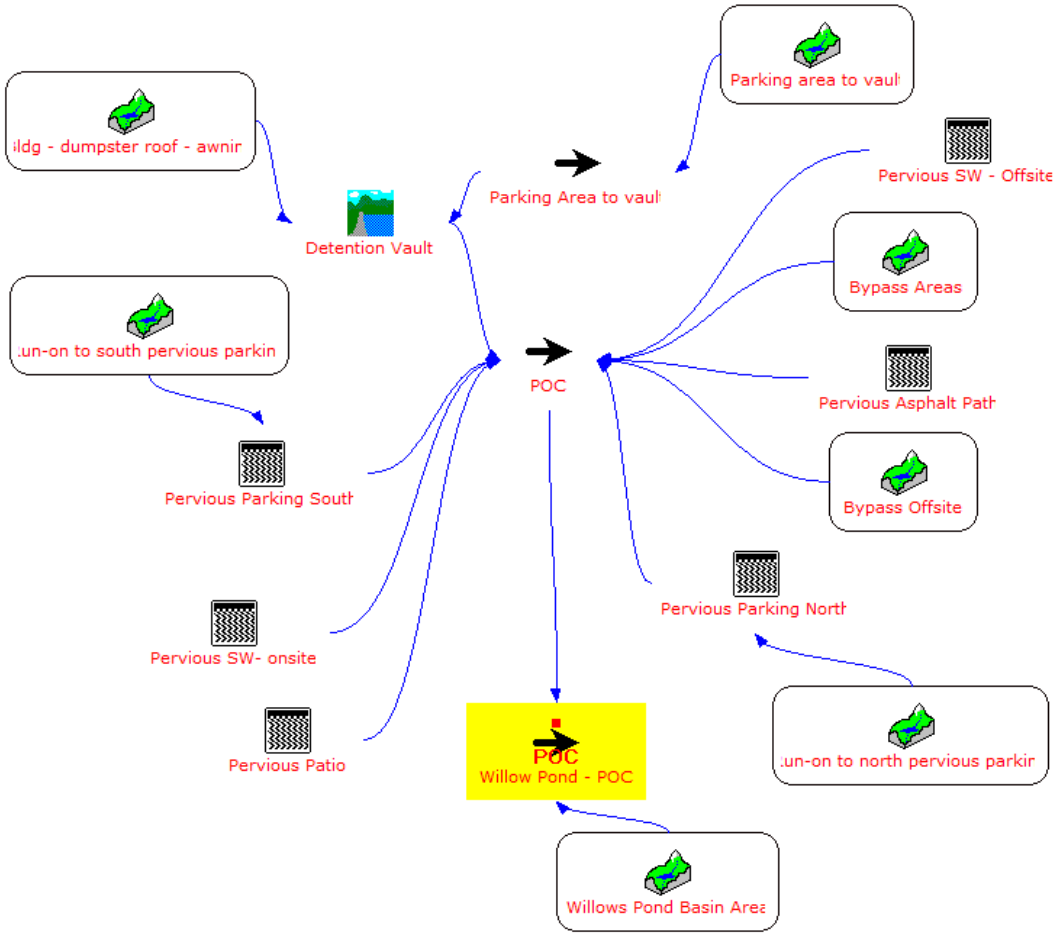
MEETS ALL FLOW DURATION DESIGN CRITERIA: PASS



DOS LAGOS – LOT C (LSE 12896)
MR8 STORMWATER CALCULATION WILLOWS POND BASIN INCLUDING ONSITE AND OFFSITE IMPROVEMENTS
PREDEVELOPED



DEVELOPED



MGS FLOOD
PROJECT REPORT

Program Version: MGSFlood 4.58
Program License Number: 201010005
Project Simulation Performed on: 02/27/2024 5:08 PM
Report Generation Date: 02/27/2024 5:09 PM

Input File Name: Lot C Wetland Calc 20240227.fld
Project Name: 12896 - Dos Lagos Lot C - Willows Pond MR8
Analysis Title: Overall Developed against existing conditions
Comments: Meet MR8. Using existing conditions for the project site but assumed all existing and future sites within the basin will meet forested conditions we used this for developed and undeveloped areas

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	202.528
Area of Links that Include Precip/Evap (acres)	0.000	0.445
Total (acres)	202.974	202.974

----------SCENARIO: EXISTING
Number of Subbasins: 3

---------- Subbasin : Willows Pond Basin Area ----------

	-------Area (Acres) --------
A/B, Forest, Flat	136.546
C, Forest, Flat	54.396
POND	10.465
Subbasin Total	201.407

---------- Subbasin : Offsite Existing ----------

	-------Area (Acres) --------
C, Pasture, Flat	0.222
DRIVEWAYS/FLAT	0.027
SIDEWALKS/FLAT	0.009
Subbasin Total	0.258

---------- Subbasin : Onsite Existing ----------

	-------Area (Acres) --------
C, Forest, Flat	0.468
C, Pasture, Flat	0.677
DRIVEWAYS/FLAT	0.164
Subbasin Total	1.309

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

Number of Subbasins: 7

---------- Subbasin : Willows Pond Basin Area ----------

	-------Area (Acres) --------
A/B, Forest, Flat	136.546
C, Forest, Flat	54.395
POND	10.465
Subbasin Total	201.406

---------- Subbasin : Bldg - dumpster roof - awning ----------

	-------Area (Acres) --------
ROOF TOPS/FLAT	0.372
Subbasin Total	0.372

---------- Subbasin : Parking area to vault ----------

	-------Area (Acres) --------
PARKING/FLAT	0.184
Subbasin Total	0.184

---------- Subbasin : Run-on to south pervious parking ----------

	-------Area (Acres) --------
SIDEWALKS/FLAT	0.002

PARKING/FLAT 0.038

Subbasin Total 0.040

---------- Subbasin : Run-on to north pervious parking ----------
-------Area (Acres) --------
PARKING/MOD 0.031

Subbasin Total 0.031

---------- Subbasin : Bypass Areas ----------
-------Area (Acres) --------
C, Pasture, Flat 0.452
SIDEWALKS/FLAT 0.011

Subbasin Total 0.463

---------- Subbasin : Bypass Offsite ----------
-------Area (Acres) --------
C, Pasture, Flat 0.009
DRIVEWAYS/FLAT 0.023

Subbasin Total 0.032

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

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

Link Name: Lot C - 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: 10

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

Link Name: Detention Vault
Link Type: Structure
Downstream Link Name: POC

Prismatic Pond Option Used
Pond Floor Elevation (ft) : 437.12
Riser Crest Elevation (ft) : 443.12
Max Pond Elevation (ft) : 443.62
Storage Depth (ft) : 6.00
Pond Bottom Length (ft) : 74.0
Pond Bottom Width (ft) : 34.0
Pond Side Slopes (ft/ft) : Z1= 0.00 Z2= 0.00 Z3= 0.00 Z4= 0.00
Bottom Area (sq-ft) : 2516.
Area at Riser Crest El (sq-ft) : 2,516.
(acres) : 0.058
Volume at Riser Crest (cu-ft) : 15,096.
(ac-ft) : 0.347
Area at Max Elevation (sq-ft) : 2516.
(acres) : 0.058
Vol at Max Elevation (cu-ft) : 16,354.
(ac-ft) : 0.375

Hydraulic Conductivity (in/hr) : 0.00
Massmann Regression Used to Estimate Hydralic Gradient
Depth to Water Table (ft) : 100.00
Bio-Fouling Potential : Low
Maintenance : Average or Better

Riser Geometry
Riser Structure Type : Circular
Riser Diameter (in) : 12.00
Common Length (ft) : 0.000
Riser Crest Elevation : 443.12 ft

Hydraulic Structure Geometry

Number of Devices: 2

---Device Number 1 ---
Device Type : Circular Orifice
Control Elevation (ft) : 437.12
Diameter (in) : 0.38
Orientation : Horizontal
Elbow : No

---Device Number 2 ---
Device Type : Circular Orifice
Control Elevation (ft) : 442.07
Diameter (in) : 1.00
Orientation : Horizontal
Elbow : Yes

Link Name: POC
Link Type: Copy
Downstream Link Name: Willow Pond - POC

Link Name: Pervious Parking South
Link Type: Porous Pavement Structure
Downstream Link Name: POC

Pavement Length (ft)	: 61.88
Pavement Width (ft)	: 60.00
Pavement Slope (ft/ft)	: 0.050
Pavement Infiltration Rate (in/hr)	: 20.000
Number of Infiltration Cells	: 3
Trench Cell Length (ft)	: 20.00
Trench Cell Width (ft)	: 60.00
Trench Cell Depth (ft)	: 1.00
Trench Gravel Porosity (%)	: 30.00
Trench Bed Slope (ft/ft)	: 0.050
Native Soil Infiltration Rate (in/hr)	: 0.520

Link Name: Pervious Parking North
Link Type: Porous Pavement Structure
Downstream Link Name: POC

Pavement Length (ft)	: 43.00
Pavement Width (ft)	: 66.50
Pavement Slope (ft/ft)	: 0.050
Pavement Infiltration Rate (in/hr)	: 20.000
Number of Infiltration Cells	: 3
Trench Cell Length (ft)	: 22.00
Trench Cell Width (ft)	: 43.00
Trench Cell Depth (ft)	: 1.00
Trench Gravel Porosity (%)	: 30.00
Trench Bed Slope (ft/ft)	: 0.050
Native Soil Infiltration Rate (in/hr)	: 0.520

Link Name: Pervious SW- onsite
Link Type: Porous Pavement Structure
Downstream Link Name: POC

Pavement Length (ft)	: 332.60
Pavement Width (ft)	: 5.00
Pavement Slope (ft/ft)	: 0.015
Pavement Infiltration Rate (in/hr)	: 20.000
Number of Infiltration Cells	: 5
Trench Cell Length (ft)	: 66.52
Trench Cell Width (ft)	: 5.00
Trench Cell Depth (ft)	: 0.67
Trench Gravel Porosity (%)	: 30.00
Trench Bed Slope (ft/ft)	: 0.015
Native Soil Infiltration Rate (in/hr)	: 0.520

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

Pavement Length (ft)	: 80.00
Pavement Width (ft)	: 16.21
Pavement Slope (ft/ft)	: 0.000
Pavement Infiltration Rate (in/hr)	: 20.000
Number of Infiltration Cells	: 1
Trench Cell Length (ft)	: 80.00
Trench Cell Width (ft)	: 16.21
Trench Cell Depth (ft)	: 0.50
Trench Gravel Porosity (%)	: 30.00
Trench Bed Slope (ft/ft)	: 0.000
Native Soil Infiltration Rate (in/hr)	: 0.520

Link Name: Pervious SW - Offsite
Link Type: Porous Pavement Structure
Downstream Link Name: POC

Pavement Length (ft)	: 577.00
Pavement Width (ft)	: 12.47
Pavement Slope (ft/ft)	: 0.015
Pavement Infiltration Rate (in/hr)	: 20.000
Number of Infiltration Cells	: 1
Trench Cell Length (ft)	: 577.00
Trench Cell Width (ft)	: 12.47
Trench Cell Depth (ft)	: 0.67
Trench Gravel Porosity (%)	: 30.00
Trench Bed Slope (ft/ft)	: 0.000
Native Soil Infiltration Rate (in/hr)	: 0.520

Link Name: Pervious Asphalt Path
Link Type: Porous Pavement Structure
Downstream Link Name: POC

Pavement Length (ft)	: 663.00
Pavement Width (ft)	: 4.04
Pavement Slope (ft/ft)	: 0.015
Pavement Infiltration Rate (in/hr)	: 20.000
Number of Infiltration Cells	: 1
Trench Cell Length (ft)	: 663.00
Trench Cell Width (ft)	: 4.00
Trench Cell Depth (ft)	: 0.50
Trench Gravel Porosity (%)	: 30.00
Trench Bed Slope (ft/ft)	: 0.000
Native Soil Infiltration Rate (in/hr)	: 0.520

Link Name: Parking Area to vault
Link Type: Copy
Downstream Link Name: Detention Vault

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

----------SCENARIO: EXISTING
Number of Subbasins: 3
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	5.021
5-Year	6.762
10-Year	7.998
25-Year	10.639
50-Year	12.328
100-Year	13.528
200-Year	16.351
500-Year	20.141

************ Subbasin: Offsite Existing ************

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

Tr (yrs)	Flood Peak (cfs)
2-Year	1.949E-02
5-Year	2.779E-02
10-Year	3.245E-02
25-Year	4.979E-02
50-Year	6.214E-02
100-Year	7.192E-02
200-Year	8.399E-02
500-Year	0.100

************ Subbasin: Onsite Existing ************

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

Tr (yrs)	Flood Peak (cfs)
2-Year	8.924E-02
5-Year	0.124
10-Year	0.145
25-Year	0.216
50-Year	0.259
100-Year	0.290
200-Year	0.360
500-Year	0.455

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

Tr (yrs)	Flood Peak (cfs)
2-Year	0.109
5-Year	0.151
10-Year	0.177
25-Year	0.266
50-Year	0.321
100-Year	0.362
200-Year	0.444
500-Year	0.555

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

Tr (yrs)	Flood Peak (cfs)
2-Year	0.109
5-Year	0.151
10-Year	0.177
25-Year	0.266
50-Year	0.321
100-Year	0.362
200-Year	0.444
500-Year	0.555

********** 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	5.124
5-Year	6.899
10-Year	8.165
25-Year	10.914
50-Year	12.683
100-Year	13.817
200-Year	16.770
500-Year	20.738

----------SCENARIO: DEVELOPED
Number of Subbasins: 7
Number of Links: 10

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

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

Tr (yrs)	Flood Peak (cfs)
2-Year	5.021
5-Year	6.763
10-Year	7.998
25-Year	10.639
50-Year	12.328
100-Year	13.528
200-Year	16.351
500-Year	20.141

********** **Subbasin: Bldg - dumpster roof - awning** **********

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

Tr (yrs)	Flood Peak (cfs)
2-Year	0.151
5-Year	0.197
10-Year	0.232
25-Year	0.291
50-Year	0.349
100-Year	0.433
200-Year	0.462
500-Year	0.498

********** **Subbasin: Parking area to vault** **********

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

Tr (yrs)	Flood Peak (cfs)
2-Year	7.487E-02
5-Year	9.736E-02
10-Year	0.115
25-Year	0.144
50-Year	0.172
100-Year	0.214
200-Year	0.228
500-Year	0.246

********** **Subbasin: Run-on to south pervious parking** **********

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

Tr (yrs)	Flood Peak (cfs)
2-Year	1.628E-02
5-Year	2.116E-02
10-Year	2.490E-02
25-Year	3.134E-02
50-Year	3.748E-02
100-Year	4.659E-02
200-Year	4.964E-02
500-Year	5.357E-02

********** **Subbasin: Run-on to north pervious parking** **********

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

Tr (yrs)	Flood Peak (cfs)
2-Year	1.483E-02
5-Year	1.948E-02
10-Year	2.457E-02
25-Year	3.183E-02
50-Year	3.475E-02
100-Year	4.580E-02
200-Year	5.164E-02
500-Year	5.917E-02

********** **Subbasin: Bypass Areas** **********

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

Tr (yrs)	Flood Peak (cfs)
2-Year	1.654E-02
5-Year	2.755E-02
10-Year	3.855E-02
25-Year	6.104E-02
50-Year	7.161E-02
100-Year	9.705E-02
200-Year	0.118
500-Year	0.146

********** **Subbasin: Bypass Offsite** **********

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

Tr (yrs)	Flood Peak (cfs)
2-Year	9.563E-03
5-Year	1.243E-02
10-Year	1.479E-02
25-Year	1.832E-02
50-Year	2.317E-02
100-Year	2.798E-02
200-Year	2.915E-02
500-Year	3.059E-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	5.087
5-Year	6.879
10-Year	8.186
25-Year	10.812
50-Year	12.666
100-Year	13.959
200-Year	16.752
500-Year	20.504

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

Tr (yrs)	Flood Peak (cfs)
2-Year	0.226
5-Year	0.294
10-Year	0.346
25-Year	0.436
50-Year	0.521
100-Year	0.648
200-Year	0.690
500-Year	0.745

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

Tr (yrs)	Flood Peak (cfs)
2-Year	6.600E-03
5-Year	7.739E-03
10-Year	2.048E-02
25-Year	2.737E-02
50-Year	2.839E-02
100-Year	2.914E-02
200-Year	2.946E-02
500-Year	2.988E-02

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

Tr (yrs)	WSEL Peak (ft)
1.05-Year	439.074
1.11-Year	439.203
1.25-Year	439.498
2.00-Year	440.214
3.33-Year	440.817
5-Year	441.374
10-Year	442.294
25-Year	442.608
50-Year	442.666
100-Year	442.710

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

Tr (yrs)	Flood Peak (cfs)
2-Year	9.895E-02
5-Year	0.157
10-Year	0.202
25-Year	0.272
50-Year	0.368
100-Year	0.428
200-Year	0.447
500-Year	0.470

********** 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	9.895E-02
5-Year	0.157
10-Year	0.202
25-Year	0.272
50-Year	0.368
100-Year	0.428
200-Year	0.447
500-Year	0.470

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

Tr (yrs)	Flood Peak (cfs)
2-Year	1.628E-02
5-Year	2.116E-02
10-Year	2.490E-02
25-Year	3.134E-02
50-Year	3.748E-02
100-Year	4.659E-02
200-Year	4.964E-02
500-Year	5.357E-02

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

Tr (yrs)	Flood Peak (cfs)
2-Year	2.881E-02
5-Year	5.307E-02
10-Year	6.372E-02
25-Year	8.987E-02
50-Year	0.109
100-Year	0.139
200-Year	0.140
500-Year	0.142

********** Link: Pervious Parking South ********** Link WSEL Stats

WSEL Frequency Data(ft)

(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	WSEL Peak (ft)
1.05-Year	0.943
1.11-Year	0.999
1.25-Year	1.000
2.00-Year	1.000
3.33-Year	1.000
5-Year	1.000
10-Year	1.000
25-Year	1.000
50-Year	1.000
100-Year	1.000

********** Link: Pervious Parking North ********** Link Inflow Frequency Stats

Flood Frequency Data(cfs)

(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	1.483E-02
5-Year	1.948E-02
10-Year	2.457E-02
25-Year	3.183E-02
50-Year	3.475E-02
100-Year	4.580E-02
200-Year	5.164E-02
500-Year	5.917E-02

********** Link: Pervious Parking North ********** Link Outflow 1 Frequency Stats

Flood Frequency Data(cfs)

(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	2.976E-02
5-Year	4.710E-02
10-Year	5.843E-02
25-Year	9.310E-02
50-Year	0.103
100-Year	0.135
200-Year	0.137
500-Year	0.138

********** Link: Pervious Parking North ********** Link WSEL Stats

WSEL Frequency Data(ft)

(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	WSEL Peak (ft)
1.05-Year	1.000
1.11-Year	1.000
1.25-Year	1.000
2.00-Year	1.000
3.33-Year	1.000
5-Year	1.000
10-Year	1.000
25-Year	1.000
50-Year	1.000
100-Year	1.000

********** Link: Pervious SW- onsite ********** 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: Pervious SW- onsite ********** Link Outflow 1 Frequency Stats

Flood Frequency Data(cfs)

(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	2.285E-02
5-Year	3.386E-02
10-Year	4.271E-02
25-Year	5.032E-02
50-Year	5.608E-02
100-Year	7.389E-02
200-Year	8.885E-02
500-Year	0.109

********** Link: Pervious SW- onsite ********** Link WSEL Stats
WSEL Frequency Data(ft)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	WSEL Peak (ft)
1.05-Year	0.670
1.11-Year	0.670
1.25-Year	0.670
2.00-Year	0.670
3.33-Year	0.670
5-Year	0.670
10-Year	0.670
25-Year	0.670
50-Year	0.670
100-Year	0.670

********** Link: Pervious Patio ********** 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: Pervious 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	0.000E+00
100-Year	0.000E+00
200-Year	0.000E+00
500-Year	0.000E+00

********** Link: Pervious Patio ********** Link WSEL Stats

WSEL Frequency Data(ft)

(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	WSEL Peak (ft)
1.05-Year	3.921E-02
1.11-Year	3.993E-02
1.25-Year	4.087E-02
2.00-Year	4.514E-02
3.33-Year	5.254E-02
5-Year	5.763E-02
10-Year	8.150E-02
25-Year	0.111
50-Year	0.117
100-Year	0.130

********** Link: Pervious SW - Offsite ********** 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: Pervious SW - Offsite ********** 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: Pervious SW - Offsite ********** Link WSEL Stats

WSEL Frequency Data(ft)

(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	WSEL Peak (ft)
1.05-Year	3.921E-02
1.11-Year	3.993E-02
1.25-Year	4.087E-02
2.00-Year	4.514E-02
3.33-Year	5.254E-02
5-Year	5.763E-02
10-Year	8.150E-02
25-Year	0.111
50-Year	0.117
100-Year	0.130

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

Tr (yrs)	WSEL Peak (ft)
1.05-Year	3.960E-02
1.11-Year	4.033E-02
1.25-Year	4.128E-02
2.00-Year	4.559E-02
3.33-Year	5.327E-02
5-Year	5.889E-02
10-Year	8.273E-02
25-Year	0.113
50-Year	0.119
100-Year	0.132

********** Link: Parking Area to vault ********** Link Inflow
Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	7.487E-02
5-Year	9.736E-02
10-Year	0.115
25-Year	0.144
50-Year	0.172
100-Year	0.214
200-Year	0.228
500-Year	0.246

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

Tr (yrs)	Flood Peak (cfs)
2-Year	7.487E-02
5-Year	9.736E-02
10-Year	0.115
25-Year	0.144
50-Year	0.172
100-Year	0.214
200-Year	0.228
500-Year	0.246

*************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	53027.570
Subbasin: Offsite Existing	39.205
Subbasin: Onsite Existing	208.546
Link: Lot C - POC	0.000
Link: Willows Pond POC	0.000
Total:	53275.320

Total Post Developed Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: Willows Pond Basin A	53027.380
Subbasin: Bldg - dumpster roof	0.000
Subbasin: Parking area to vaul	0.000
Subbasin: Run-on to south perv	0.000
Subbasin: Run-on to north perv	0.000
Subbasin: Bypass Areas	79.822
Subbasin: Bypass Offsite	1.589
Link: Willow Pond - POC	0.000
Link: Detention Vault	0.000
Link: POC	0.000
Link: Pervious Parking Sou	68.307
Link: Pervious Parking Nor	52.549
Link: Pervious SW- onsite	19.652
Link: Pervious Patio	17.147
Link: Pervious SW - Offsit	95.141
Link: Pervious Asphalt Pat	35.418
Link: Parking Area to vaul	0.000
Total:	53397.010

Total Predevelopment Recharge is Less than Post Developed
Average Recharge Per Year, (Number of Years= 158)
Predeveloped: 337.186 ac-ft/year, Post Developed: 337.956 ac-ft/year

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

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

Number of Links: 2

********** Link: Lot C - POC **********

2-Year Discharge Rate : 0.109 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): 299.78
Inflow Volume Including PPT-Evap (ac-ft): 299.78
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): 299.78
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 : 5.124 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): 12193.78
Inflow Volume Including PPT-Evap (ac-ft): 12193.78
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): 12193.78
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: 10

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

2-Year Discharge Rate : 5.087 cfs

15-Minute Timestep, Water Quality Treatment Design Discharge
On-line Design Discharge Rate (91% Exceedance): 1.95 cfs
Off-line Design Discharge Rate (91% Exceedance): 1.09 cfs

Infiltration/Filtration Statistics----------
Inflow Volume (ac-ft): 12266.71
Inflow Volume Including PPT-Evap (ac-ft): 12266.71
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): 12266.71
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: Detention Vault **********

Basic Wet Pond Volume (91% Exceedance): 2670. cu-ft
Computed Large Wet Pond Volume, 1.5*Basic Volume: 4005. cu-ft

2-Year Discharge Rate : 0.007 cfs

15-Minute Timestep, Water Quality Treatment Design Discharge
On-line Design Discharge Rate (91% Exceedance): 0.09 cfs
Off-line Design Discharge Rate (91% Exceedance): 0.05 cfs

Infiltration/Filtration Statistics----------
Inflow Volume (ac-ft): 278.43
Inflow Volume Including PPT-Evap (ac-ft): 278.43
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): 278.36
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: POC **********

2-Year Discharge Rate : 0.099 cfs

15-Minute Timestep, Water Quality Treatment Design Discharge
On-line Design Discharge Rate (91% Exceedance): 999.00 cfs
Off-line Design Discharge Rate (91% Exceedance): 999.00 cfs

Infiltration/Filtration Statistics----------
Inflow Volume (ac-ft): 372.63
Inflow Volume Including PPT-Evap (ac-ft): 372.63
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): 372.63
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: Pervious Parking South **********

2-Year Discharge Rate : 0.029 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): 20.03
Inflow Volume Including PPT-Evap (ac-ft): 69.13
Total Runoff Infiltrated (ac-ft): 68.31, 100.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 0.82
Secondary Outflow To Downstream System (ac-ft): 0.00
Volume Lost to ET (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered+ET)/Total Volume: 98.81%

********** Link: Pervious Parking North **********

2-Year Discharge Rate : 0.030 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): 15.65
Inflow Volume Including PPT-Evap (ac-ft): 53.46
Total Runoff Infiltrated (ac-ft): 52.55, 100.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 0.91
Secondary Outflow To Downstream System (ac-ft): 0.00
Volume Lost to ET (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered+ET)/Total Volume: 98.30%

********** Link: Pervious SW- onsite **********

Infiltration/Filtration Statistics----------
Inflow Volume (ac-ft): 0.00
Inflow Volume Including PPT-Evap (ac-ft): 21.99
Total Runoff Infiltrated (ac-ft): 19.65, 100.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 2.34
Secondary Outflow To Downstream System (ac-ft): 0.00
Volume Lost to ET (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered+ET)/Total Volume: 89.37%

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

Infiltration/Filtration Statistics----------
Inflow Volume (ac-ft): 0.00
Inflow Volume Including PPT-Evap (ac-ft): 17.15
Total Runoff Infiltrated (ac-ft): 17.15, 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: Pervious SW - Offsite **********

Infiltration/Filtration Statistics----------
Inflow Volume (ac-ft): 0.00
Inflow Volume Including PPT-Evap (ac-ft): 95.14
Total Runoff Infiltrated (ac-ft): 95.14, 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: Pervious Asphalt Path **********

Infiltration/Filtration Statistics----------
Inflow Volume (ac-ft): 0.00
Inflow Volume Including PPT-Evap (ac-ft): 35.42
Total Runoff Infiltrated (ac-ft): 35.42, 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: Parking Area to vault **********

2-Year Discharge Rate : 0.075 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 ⇦ WQ FLOW

Infiltration/Filtration Statistics----------
Inflow Volume (ac-ft): 92.14
Inflow Volume Including PPT-Evap (ac-ft): 92.14
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): 92.14
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%

**********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	5.124	2-Year	5.087
5-Year	6.899	5-Year	6.879
10-Year	8.165	10-Year	8.186
25-Year	10.914	25-Year	10.812
50-Year	12.683	50-Year	12.666
100-Year	13.817	100-Year	13.959
200-Year	16.770	200-Year	16.752
500-Year	20.738	500-Year	20.504

** 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	3.581E-02	3.471E-02	-3.06%
Oct-02	2.851E-02	2.755E-02	-3.36%
Oct-03	3.892E-02	3.787E-02	-2.69%
Oct-04	4.577E-02	4.457E-02	-2.61%
Oct-05	3.443E-02	3.335E-02	-3.14%
Oct-06	7.091E-02	6.903E-02	-2.64%
Oct-07	5.301E-02	5.134E-02	-3.15%
Oct-08	5.023E-02	4.855E-02	-3.35%
Oct-09	6.236E-02	6.039E-02	-3.16%
Oct-10	5.494E-02	5.318E-02	-3.19%
Oct-11	4.686E-02	4.516E-02	-3.62%
Oct-12	4.940E-02	4.787E-02	-3.10%
Oct-13	4.849E-02	4.692E-02	-3.24%
Oct-14	5.259E-02	5.102E-02	-2.99%
Oct-15	3.884E-02	3.740E-02	-3.73%
Oct-16	3.394E-02	3.263E-02	-3.86%
Oct-17	6.166E-02	5.972E-02	-3.14%
Oct-18	6.109E-02	5.903E-02	-3.38%
Oct-19	6.488E-02	6.263E-02	-3.47%
Oct-20	8.056E-02	7.820E-02	-2.94%
Oct-21	7.813E-02	7.555E-02	-3.30%
Oct-22	7.899E-02	7.625E-02	-3.47%
Oct-23	8.305E-02	8.006E-02	-3.61%
Oct-24	7.373E-02	7.095E-02	-3.77%
Oct-25	7.619E-02	7.354E-02	-3.47%
Oct-26	8.544E-02	8.243E-02	-3.52%
Oct-27	1.031E-01	9.969E-02	-3.33%
Oct-28	9.209E-02	8.885E-02	-3.51%
Oct-29	9.952E-02	9.633E-02	-3.21%
Oct-30	8.627E-02	8.332E-02	-3.43%
Oct-31	1.168E-01	1.134E-01	-2.89%
Nov-01	9.405E-02	9.097E-02	-3.28%
Nov-02	8.023E-02	7.746E-02	-3.45%
Nov-03	1.158E-01	1.122E-01	-3.07%
Nov-04	1.169E-01	1.128E-01	-3.47%
Nov-05	8.466E-02	8.147E-02	-3.76%
Nov-06	8.705E-02	8.414E-02	-3.35%
Nov-07	9.971E-02	9.649E-02	-3.24%
Nov-08	8.927E-02	8.624E-02	-3.39%
Nov-09	1.190E-01	1.154E-01	-3.06%
Nov-10	1.342E-01	1.303E-01	-2.97%
Nov-11	1.502E-01	1.458E-01	-2.92%
Nov-12	1.231E-01	1.193E-01	-3.16%
Nov-13	1.437E-01	1.397E-01	-2.83%
Nov-14	1.306E-01	1.266E-01	-3.06%
Nov-15	1.354E-01	1.314E-01	-2.93%
Nov-16	1.609E-01	1.565E-01	-2.72%

Nov-17	1.689E-01	1.643E-01	-2.71%
Nov-18	1.477E-01	1.435E-01	-2.85%
Nov-19	1.997E-01	1.945E-01	-2.64%
Nov-20	1.721E-01	1.672E-01	-2.83%
Nov-21	1.721E-01	1.673E-01	-2.78%
Nov-22	1.507E-01	1.463E-01	-2.90%
Nov-23	2.185E-01	2.129E-01	-2.55%
Nov-24	2.498E-01	2.434E-01	-2.56%
Nov-25	2.473E-01	2.410E-01	-2.54%
Nov-26	2.156E-01	2.101E-01	-2.58%
Nov-27	2.255E-01	2.198E-01	-2.52%
Nov-28	1.698E-01	1.653E-01	-2.63%
Nov-29	1.939E-01	1.891E-01	-2.46%
Nov-30	2.100E-01	2.049E-01	-2.43%
Dec-01	1.916E-01	1.866E-01	-2.59%
Dec-02	2.089E-01	2.035E-01	-2.56%
Dec-03	2.279E-01	2.223E-01	-2.47%
Dec-04	2.470E-01	2.410E-01	-2.44%
Dec-05	2.268E-01	2.213E-01	-2.43%
Dec-06	2.178E-01	2.124E-01	-2.49%
Dec-07	1.995E-01	1.945E-01	-2.51%
Dec-08	1.890E-01	1.842E-01	-2.50%
Dec-09	1.723E-01	1.681E-01	-2.47%
Dec-10	2.006E-01	1.957E-01	-2.42%
Dec-11	1.951E-01	1.903E-01	-2.43%
Dec-12	1.916E-01	1.870E-01	-2.42%
Dec-13	1.844E-01	1.800E-01	-2.39%
Dec-14	1.865E-01	1.821E-01	-2.39%
Dec-15	2.187E-01	2.137E-01	-2.27%
Dec-16	1.929E-01	1.884E-01	-2.36%
Dec-17	1.986E-01	1.938E-01	-2.39%
Dec-18	1.789E-01	1.747E-01	-2.38%
Dec-19	1.814E-01	1.771E-01	-2.37%
Dec-20	2.140E-01	2.090E-01	-2.33%
Dec-21	2.246E-01	2.193E-01	-2.39%
Dec-22	1.950E-01	1.903E-01	-2.41%
Dec-23	1.873E-01	1.829E-01	-2.34%
Dec-24	1.772E-01	1.730E-01	-2.37%
Dec-25	1.711E-01	1.671E-01	-2.31%
Dec-26	2.188E-01	2.139E-01	-2.22%
Dec-27	2.181E-01	2.132E-01	-2.26%
Dec-28	1.757E-01	1.716E-01	-2.32%
Dec-29	2.178E-01	2.130E-01	-2.20%
Dec-30	2.086E-01	2.038E-01	-2.30%
Dec-31	1.672E-01	1.632E-01	-2.34%
Jan-01	1.840E-01	1.798E-01	-2.26%
Jan-02	2.177E-01	2.129E-01	-2.20%
Jan-03	1.948E-01	1.904E-01	-2.25%
Jan-04	2.034E-01	1.988E-01	-2.26%
Jan-05	1.845E-01	1.804E-01	-2.26%
Jan-06	1.898E-01	1.855E-01	-2.25%
Jan-07	1.957E-01	1.914E-01	-2.24%
Jan-08	1.758E-01	1.718E-01	-2.28%
Jan-09	1.914E-01	1.871E-01	-2.28%
Jan-10	2.055E-01	2.009E-01	-2.21%
Jan-11	1.762E-01	1.722E-01	-2.27%

Jan-12	1.911E-01	1.868E-01	-2.24%
Jan-13	2.054E-01	2.008E-01	-2.22%
Jan-14	2.498E-01	2.444E-01	-2.18%
Jan-15	2.577E-01	2.521E-01	-2.18%
Jan-16	2.296E-01	2.245E-01	-2.21%
Jan-17	2.160E-01	2.112E-01	-2.24%
Jan-18	2.338E-01	2.287E-01	-2.18%
Jan-19	2.462E-01	2.409E-01	-2.14%
Jan-20	2.347E-01	2.296E-01	-2.18%
Jan-21	1.944E-01	1.902E-01	-2.17%
Jan-22	1.835E-01	1.795E-01	-2.15%
Jan-23	2.207E-01	2.160E-01	-2.13%
Jan-24	2.197E-01	2.149E-01	-2.19%
Jan-25	1.971E-01	1.928E-01	-2.22%
Jan-26	1.809E-01	1.769E-01	-2.22%
Jan-27	2.159E-01	2.113E-01	-2.14%
Jan-28	1.831E-01	1.791E-01	-2.21%
Jan-29	1.756E-01	1.718E-01	-2.17%
Jan-30	1.730E-01	1.692E-01	-2.17%
Jan-31	2.150E-01	2.105E-01	-2.09%
Feb-01	2.132E-01	2.086E-01	-2.15%
Feb-02	2.146E-01	2.099E-01	-2.16%
Feb-03	1.887E-01	1.845E-01	-2.19%
Feb-04	1.811E-01	1.772E-01	-2.14%
Feb-05	1.718E-01	1.681E-01	-2.14%
Feb-06	2.200E-01	2.154E-01	-2.09%
Feb-07	2.077E-01	2.032E-01	-2.14%
Feb-08	2.274E-01	2.226E-01	-2.11%
Feb-09	2.123E-01	2.078E-01	-2.11%
Feb-10	2.018E-01	1.975E-01	-2.13%
Feb-11	1.814E-01	1.776E-01	-2.13%
Feb-12	2.219E-01	2.172E-01	-2.09%
Feb-13	2.344E-01	2.294E-01	-2.13%
Feb-14	2.110E-01	2.065E-01	-2.17%
Feb-15	2.260E-01	2.213E-01	-2.10%
Feb-16	2.580E-01	2.525E-01	-2.10%
Feb-17	3.013E-01	2.950E-01	-2.07%
Feb-18	2.859E-01	2.800E-01	-2.08%
Feb-19	2.952E-01	2.890E-01	-2.08%
Feb-20	2.420E-01	2.370E-01	-2.10%
Feb-21	2.141E-01	2.097E-01	-2.08%
Feb-22	1.862E-01	1.822E-01	-2.12%
Feb-23	1.713E-01	1.676E-01	-2.14%
Feb-24	2.106E-01	2.062E-01	-2.08%
Feb-25	2.204E-01	2.157E-01	-2.10%
Feb-26	2.158E-01	2.113E-01	-2.10%
Feb-27	2.285E-01	2.237E-01	-2.09%
Feb-28	2.296E-01	2.248E-01	-2.08%
Mar-01	2.109E-01	2.065E-01	-2.08%
Mar-02	1.898E-01	1.858E-01	-2.11%
Mar-03	2.165E-01	2.120E-01	-2.11%
Mar-04	2.119E-01	2.075E-01	-2.08%
Mar-05	2.141E-01	2.097E-01	-2.08%
Mar-06	1.524E-01	1.491E-01	-2.16%
Mar-07	1.598E-01	1.564E-01	-2.11%
Mar-08	1.764E-01	1.728E-01	-2.06%

Mar-09	2.222E-01	2.176E-01	-2.07%
Mar-10	2.042E-01	1.999E-01	-2.12%
Mar-11	1.872E-01	1.833E-01	-2.09%
Mar-12	2.154E-01	2.110E-01	-2.04%
Mar-13	1.868E-01	1.829E-01	-2.10%
Mar-14	1.922E-01	1.882E-01	-2.08%
Mar-15	1.872E-01	1.834E-01	-2.06%
Mar-16	1.594E-01	1.561E-01	-2.10%
Mar-17	1.731E-01	1.695E-01	-2.05%
Mar-18	1.694E-01	1.659E-01	-2.07%
Mar-19	1.648E-01	1.614E-01	-2.09%
Mar-20	1.584E-01	1.551E-01	-2.08%
Mar-21	1.458E-01	1.427E-01	-2.11%
Mar-22	1.915E-01	1.876E-01	-2.00%
Mar-23	1.952E-01	1.912E-01	-2.05%
Mar-24	1.843E-01	1.803E-01	-2.12%
Mar-25	1.763E-01	1.725E-01	-2.11%
Mar-26	1.797E-01	1.760E-01	-2.08%
Mar-27	1.595E-01	1.562E-01	-2.09%
Mar-28	1.590E-01	1.557E-01	-2.09%
Mar-29	1.908E-01	1.869E-01	-2.05%
Mar-30	1.994E-01	1.952E-01	-2.07%
Mar-31	1.913E-01	1.874E-01	-2.08%
Apr-01	1.585E-01	1.551E-01	-2.12%
Apr-02	1.298E-01	1.270E-01	-2.13%
Apr-03	1.125E-01	1.101E-01	-2.15%
Apr-04	1.376E-01	1.349E-01	-2.00%
Apr-05	1.619E-01	1.587E-01	-2.00%
Apr-06	1.458E-01	1.428E-01	-2.05%
Apr-07	1.209E-01	1.184E-01	-2.07%
Apr-08	1.506E-01	1.475E-01	-2.03%
Apr-09	1.630E-01	1.597E-01	-2.03%
Apr-10	1.401E-01	1.372E-01	-2.06%
Apr-11	1.495E-01	1.465E-01	-2.04%
Apr-12	1.405E-01	1.376E-01	-2.08%
Apr-13	1.112E-01	1.089E-01	-2.13%
Apr-14	1.010E-01	9.889E-02	-2.08%
Apr-15	8.212E-02	8.035E-02	-2.15%
Apr-16	9.387E-02	9.187E-02	-2.13%
Apr-17	1.059E-01	1.036E-01	-2.10%
Apr-18	7.550E-02	7.386E-02	-2.17%
Apr-19	1.167E-01	1.143E-01	-2.00%
Apr-20	1.294E-01	1.267E-01	-2.08%
Apr-21	9.405E-02	9.203E-02	-2.15%
Apr-22	1.060E-01	1.039E-01	-2.02%
Apr-23	1.417E-01	1.388E-01	-2.05%
Apr-24	1.139E-01	1.114E-01	-2.16%
Apr-25	8.764E-02	8.568E-02	-2.23%
Apr-26	7.195E-02	7.035E-02	-2.22%
Apr-27	9.297E-02	9.094E-02	-2.19%
Apr-28	8.795E-02	8.599E-02	-2.23%
Apr-29	8.605E-02	8.421E-02	-2.14%
Apr-30	9.348E-02	9.150E-02	-2.12%
May-01	1.119E-01	1.096E-01	-2.13%
May-02	1.014E-01	9.919E-02	-2.19%
May-03	1.066E-01	1.043E-01	-2.15%

May-04	7.929E-02	7.760E-02	-2.12%
May-05	9.999E-02	9.796E-02	-2.03%
May-06	8.663E-02	8.480E-02	-2.12%
May-07	6.799E-02	6.647E-02	-2.24%
May-08	6.463E-02	6.322E-02	-2.19%
May-09	4.764E-02	4.659E-02	-2.21%
May-10	4.179E-02	4.093E-02	-2.08%
May-11	5.430E-02	5.323E-02	-1.96%
May-12	5.397E-02	5.290E-02	-1.97%
May-13	5.643E-02	5.520E-02	-2.18%
May-14	5.375E-02	5.252E-02	-2.28%
May-15	4.804E-02	4.692E-02	-2.34%
May-16	5.381E-02	5.257E-02	-2.31%
May-17	6.196E-02	6.052E-02	-2.33%
May-18	4.249E-02	4.139E-02	-2.59%
May-19	4.951E-02	4.840E-02	-2.24%
May-20	4.425E-02	4.319E-02	-2.38%
May-21	4.379E-02	4.276E-02	-2.34%
May-22	5.358E-02	5.242E-02	-2.16%
May-23	4.970E-02	4.866E-02	-2.09%
May-24	4.311E-02	4.217E-02	-2.19%
May-25	4.770E-02	4.663E-02	-2.24%
May-26	5.875E-02	5.744E-02	-2.24%
May-27	4.782E-02	4.658E-02	-2.59%
May-28	4.643E-02	4.529E-02	-2.44%
May-29	4.339E-02	4.237E-02	-2.33%
May-30	4.283E-02	4.178E-02	-2.45%
May-31	5.802E-02	5.649E-02	-2.63%
Jun-01	4.641E-02	4.510E-02	-2.82%
Jun-02	3.795E-02	3.693E-02	-2.69%
Jun-03	4.178E-02	4.078E-02	-2.41%
Jun-04	5.320E-02	5.199E-02	-2.27%
Jun-05	3.846E-02	3.757E-02	-2.32%
Jun-06	5.433E-02	5.317E-02	-2.13%
Jun-07	4.244E-02	4.134E-02	-2.59%
Jun-08	3.280E-02	3.187E-02	-2.82%
Jun-09	4.494E-02	4.379E-02	-2.55%
Jun-10	5.549E-02	5.410E-02	-2.51%
Jun-11	3.799E-02	3.703E-02	-2.51%
Jun-12	3.246E-02	3.169E-02	-2.39%
Jun-13	3.397E-02	3.315E-02	-2.42%
Jun-14	3.693E-02	3.603E-02	-2.42%
Jun-15	2.569E-02	2.495E-02	-2.88%
Jun-16	3.481E-02	3.404E-02	-2.22%
Jun-17	3.122E-02	3.044E-02	-2.50%
Jun-18	2.759E-02	2.688E-02	-2.57%
Jun-19	2.022E-02	1.968E-02	-2.70%
Jun-20	2.659E-02	2.598E-02	-2.27%
Jun-21	2.248E-02	2.191E-02	-2.53%
Jun-22	2.236E-02	2.184E-02	-2.33%
Jun-23	2.460E-02	2.402E-02	-2.33%
Jun-24	4.134E-02	4.039E-02	-2.31%
Jun-25	2.484E-02	2.409E-02	-3.01%
Jun-26	2.263E-02	2.202E-02	-2.73%
Jun-27	1.843E-02	1.796E-02	-2.54%
Jun-28	2.806E-02	2.744E-02	-2.20%

Jun-29	3.879E-02	3.774E-02	-2.72%
Jun-30	1.509E-02	1.456E-02	-3.50%
Jul-01	2.495E-02	2.428E-02	-2.65%
Jul-02	1.480E-02	1.438E-02	-2.84%
Jul-03	2.095E-02	2.041E-02	-2.58%
Jul-04	1.361E-02	1.320E-02	-3.04%
Jul-05	3.188E-02	3.114E-02	-2.31%
Jul-06	8.013E-03	7.623E-03	-4.88%
Jul-07	1.125E-02	1.090E-02	-3.15%
Jul-08	2.918E-02	2.854E-02	-2.19%
Jul-09	2.202E-02	2.149E-02	-2.38%
Jul-10	2.048E-02	2.003E-02	-2.20%
Jul-11	1.602E-02	1.566E-02	-2.26%
Jul-12	1.808E-02	1.759E-02	-2.66%
Jul-13	9.392E-03	9.006E-03	-4.11%
Jul-14	1.055E-02	1.023E-02	-3.07%
Jul-15	1.099E-02	1.066E-02	-3.04%
Jul-16	2.041E-02	1.996E-02	-2.18%
Jul-17	1.529E-02	1.487E-02	-2.78%
Jul-18	1.068E-02	1.034E-02	-3.13%
Jul-19	1.165E-02	1.134E-02	-2.66%
Jul-20	7.585E-03	7.398E-03	-2.46%
Jul-21	1.065E-02	1.037E-02	-2.58%
Jul-22	3.936E-03	3.807E-03	-3.28%
Jul-23	1.500E-03	1.440E-03	-4.02%
Jul-24	2.591E-03	2.533E-03	-2.25%
Jul-25	6.624E-03	6.514E-03	-1.65%
Jul-26	1.605E-02	1.578E-02	-1.73%
Jul-27	8.379E-03	8.199E-03	-2.15%
Jul-28	5.739E-03	5.601E-03	-2.41%
Jul-29	2.732E-03	2.658E-03	-2.72%
Jul-30	2.574E-03	2.511E-03	-2.45%
Jul-31	1.992E-03	1.945E-03	-2.38%
Aug-01	3.104E-03	3.047E-03	-1.85%
Aug-02	1.075E-02	1.055E-02	-1.82%
Aug-03	8.859E-03	8.630E-03	-2.59%
Aug-04	9.930E-03	9.721E-03	-2.11%
Aug-05	4.166E-03	4.045E-03	-2.89%
Aug-06	1.061E-02	1.041E-02	-1.86%
Aug-07	1.658E-02	1.628E-02	-1.82%
Aug-08	4.897E-03	4.748E-03	-3.03%
Aug-09	5.980E-03	5.847E-03	-2.23%
Aug-10	3.083E-03	3.006E-03	-2.51%
Aug-11	4.771E-03	4.679E-03	-1.92%
Aug-12	1.112E-02	1.094E-02	-1.62%
Aug-13	8.036E-03	7.897E-03	-1.73%
Aug-14	1.608E-02	1.580E-02	-1.75%
Aug-15	1.786E-02	1.748E-02	-2.17%
Aug-16	1.460E-02	1.426E-02	-2.30%
Aug-17	1.216E-02	1.185E-02	-2.50%
Aug-18	1.381E-02	1.348E-02	-2.42%
Aug-19	1.507E-02	1.471E-02	-2.43%
Aug-20	9.904E-03	9.603E-03	-3.04%
Aug-21	1.409E-02	1.376E-02	-2.30%
Aug-22	1.084E-02	1.059E-02	-2.39%
Aug-23	2.699E-02	2.648E-02	-1.90%

Aug-24	2.175E-02	2.127E-02	-2.23%
Aug-25	1.970E-02	1.921E-02	-2.46%
Aug-26	1.948E-02	1.896E-02	-2.70%
Aug-27	2.492E-02	2.431E-02	-2.47%
Aug-28	2.266E-02	2.210E-02	-2.50%
Aug-29	2.600E-02	2.527E-02	-2.81%
Aug-30	2.378E-02	2.301E-02	-3.24%
Aug-31	1.709E-02	1.656E-02	-3.12%
Sep-01	3.730E-02	3.637E-02	-2.48%
Sep-02	2.663E-02	2.583E-02	-3.01%
Sep-03	2.137E-02	2.073E-02	-3.00%
Sep-04	2.310E-02	2.251E-02	-2.54%
Sep-05	2.198E-02	2.147E-02	-2.35%
Sep-06	2.041E-02	1.993E-02	-2.37%
Sep-07	1.128E-02	1.097E-02	-2.74%
Sep-08	1.964E-02	1.920E-02	-2.27%
Sep-09	2.764E-02	2.702E-02	-2.26%
Sep-10	2.756E-02	2.688E-02	-2.47%
Sep-11	1.720E-02	1.674E-02	-2.68%
Sep-12	8.634E-03	8.355E-03	-3.23%
Sep-13	2.546E-02	2.499E-02	-1.85%
Sep-14	3.423E-02	3.361E-02	-1.80%
Sep-15	3.711E-02	3.638E-02	-1.98%
Sep-16	3.292E-02	3.213E-02	-2.39%
Sep-17	4.378E-02	4.264E-02	-2.61%
Sep-18	2.997E-02	2.905E-02	-3.09%
Sep-19	4.016E-02	3.916E-02	-2.50%
Sep-20	3.310E-02	3.219E-02	-2.73%
Sep-21	2.399E-02	2.322E-02	-3.21%
Sep-22	3.644E-02	3.540E-02	-2.86%
Sep-23	3.899E-02	3.778E-02	-3.10%
Sep-24	3.258E-02	3.161E-02	-2.98%
Sep-25	1.998E-02	1.928E-02	-3.49%
Sep-26	3.787E-02	3.691E-02	-2.52%
Sep-27	2.995E-02	2.908E-02	-2.91%
Sep-28	3.800E-02	3.684E-02	-3.06%
Sep-29	2.151E-02	2.074E-02	-3.57%
Sep-30	3.510E-02	3.409E-02	-2.89%

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

Must be within 15% for each Month

Month	Predeveloped	Postdeveloped	Percent Difference
Oct	6.406E-02	6.196E-02	-3.28%
Nov	1.535E-01	1.492E-01	-2.82%
Dec	1.994E-01	1.946E-01	-2.39%
Jan	2.046E-01	2.001E-01	-2.20%
Feb	2.204E-01	2.157E-01	-2.11%
Mar	1.846E-01	1.808E-01	-2.08%
Apr	1.167E-01	1.143E-01	-2.09%
May	6.002E-02	5.868E-02	-2.23%
Jun	3.378E-02	3.294E-02	-2.51%
Jul	1.259E-02	1.227E-02	-2.59%
Aug	1.383E-02	1.350E-02	-2.38%
Sep	2.845E-02	2.769E-02	-2.67%

Appendix B

Stormwater Pollution Prevention Plan (SWPPP)

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

Appendix C

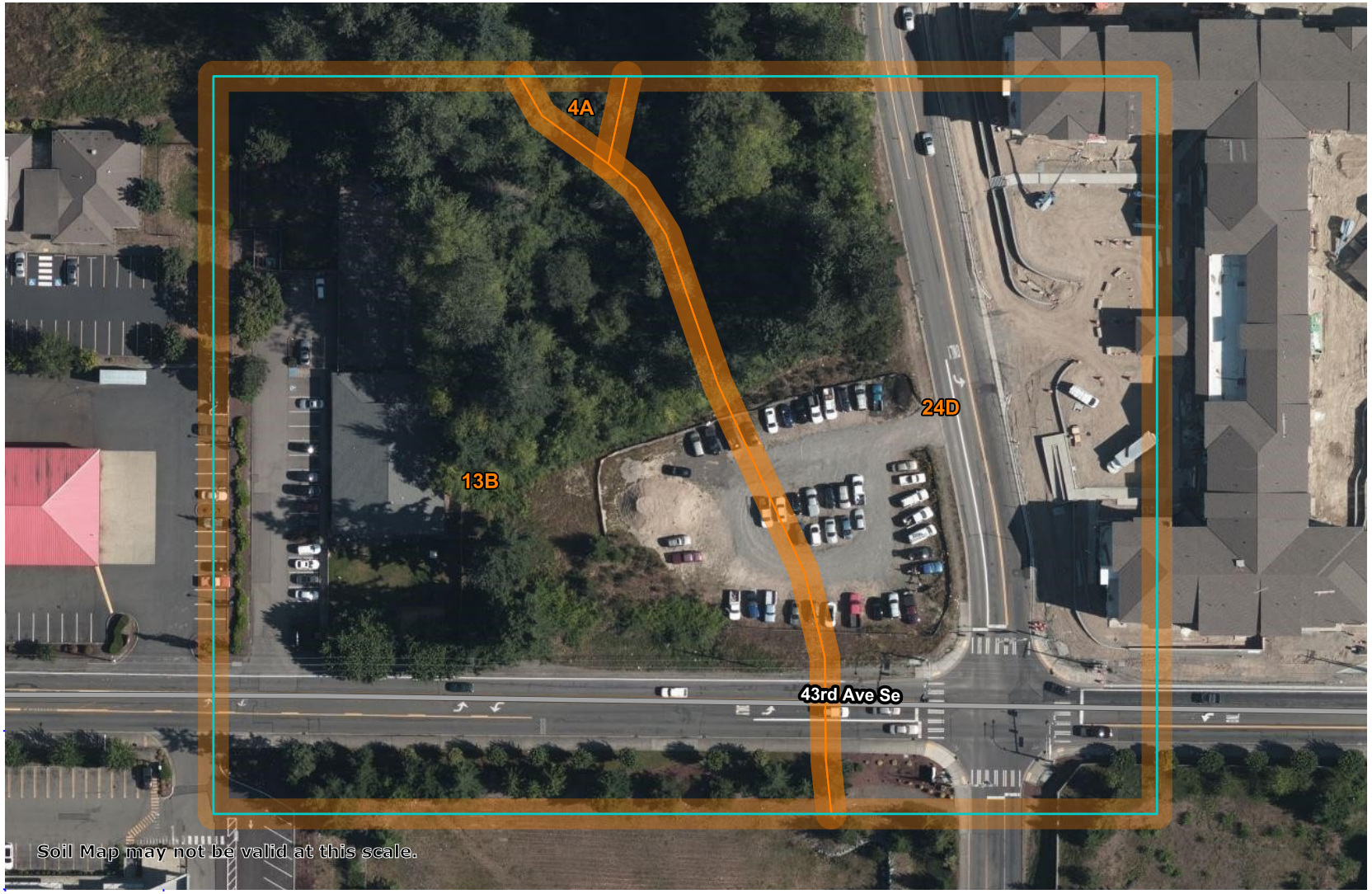
Schedule of Structures

***To be included in formal report**

Appendix D

Soils (NRCS) Data & Geotechnical Evaluation and CEC and Organic Soil Test Report

122° 17'28" W
122° 17'16" W
47° 9'8" N
47° 9'2" N



Map Scale: 1:1,180 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 15 30 60 90

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	0.0	0.8%
13B	Everett very gravelly sandy loam, 0 to 8 percent slopes	3.4	54.9%
24D	Neilton gravelly loamy sand, 8 to 25 percent slopes	2.7	44.3%
Totals for Area of Interest		**6.2**	**100.0%**

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

June 9, 2022
Revised September 23, 2024

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
Wet Season Soil Depth Evaluation: Performed March 25, 2022

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 soil created concern regarding site-wide infiltration feasibility.

This revised report includes additional information in blue italics, specifically to address the City of Puyallup's 4th review, P21-0099 and P21-0100. Our firm conducted a soil depth vertical separation evaluation in the Wet Season (between December 1, 2021, and April 1, 2022). Specifically, we evaluated the test pits / soil profiles on March 25, 2022. The results are presented in Tables 3 on page 9, below.

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 from 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 soil 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 were 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 is shown in Figure 1 below. Figure 2 juxtaposes aerial photographs from 1990 (during the fill operation) and the contemporary setting (2020).

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

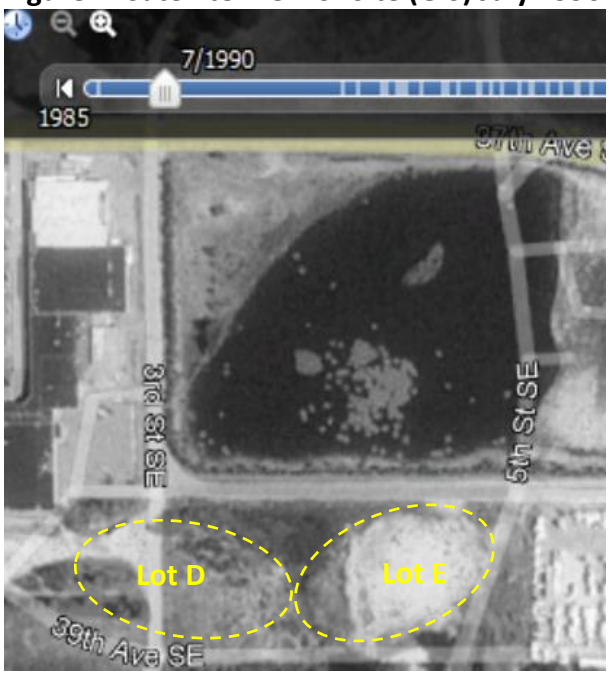
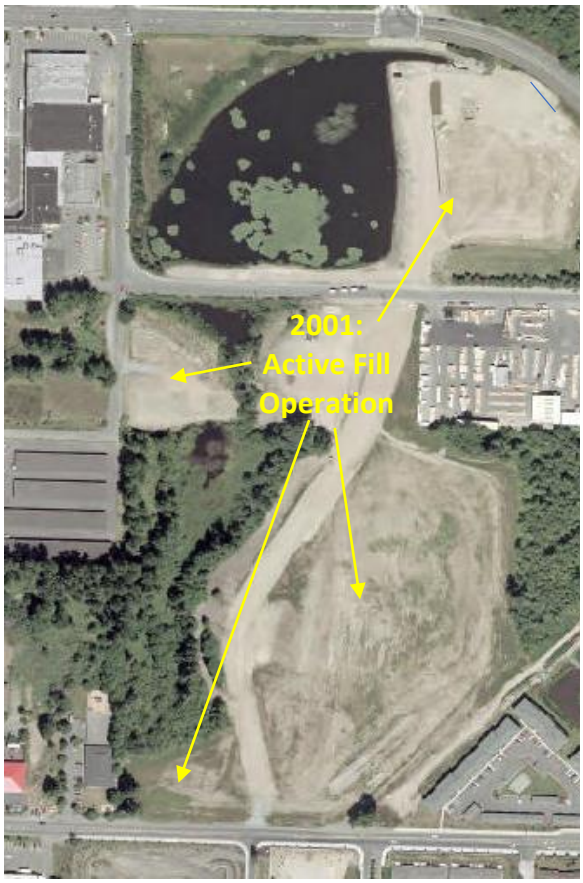
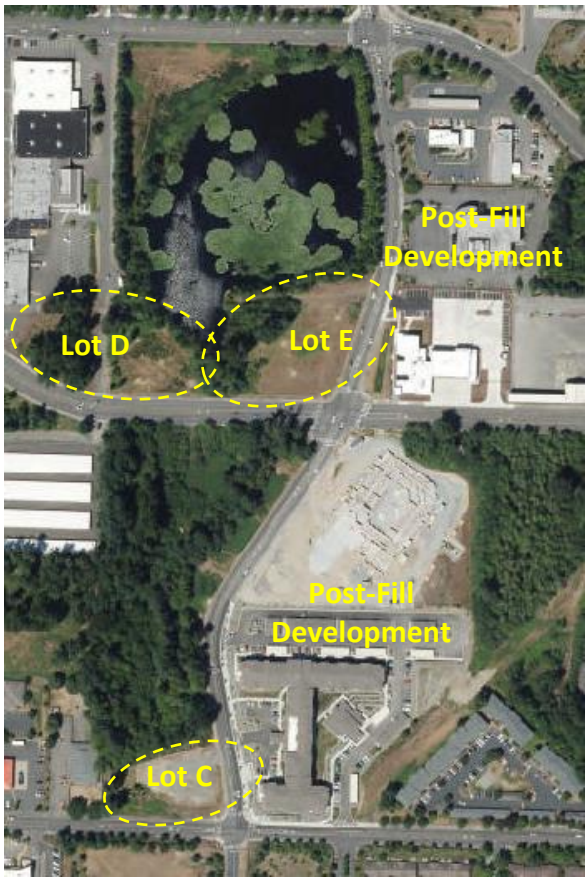


Figure 2: Satellite View of Site (GIS)

2001 **2020**





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Methodology

A Licensed Geologist and representative from our firm oversaw the preparation of the 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.

- A 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.
- The 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 inch 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 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 *Corrected* Infiltration Test PIT (⬢) and Adjacent observation PIT (▲) Locations

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

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

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Table 1: Instantaneous Flow Rate to Maintain Constant Water Level

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, a water level of 8.5" was maintained during the presoak.
- In PIT 2, a water level of 12" was 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, a 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 were completed, the application of water to the PITs was discontinued and a 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 an 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

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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

Wet Season Soil Evaluation

As discussed in the project description, stormwater design projects require wet season review (between Dec. 1 and April 1). This was understood at the outset of this project and was conducted by our firm on March 25, 2022. Table 3 illustrates the soil profile descriptions and available seasonal soil depth above a restrictive layer or groundwater.

Table 3: Wet Season Monitoring Results – March 25, 2022

Test Pit No./ Lot Letter	*Soil Description*	*Depth to Groundwater or Restrictive Layer*
1 / Lot C	*0 – 32 in. Brn fn Sand w/silt, cobbles* *32 - 36 in. Brn fn Sand, mod. dense, mottled* *36 – 71 in. Blue/gray v. fn. sand, dense, mottled - till (dry)*	*32 in.*
2 / Lot C	*0 – 15 in. Brn fn Sand w/silt, cobbles* *15 - 44 in. Brn fn-med Sand w/gravel* *44 – 55 in. Blue/gray v. fn. sand, dense, mottled - till (dry)*	*44 in.*
3 / Lot D	*0 – 30 in. Brn fn Sand w/silt, gravel* *30 – 52 in. Gray fn-med Sand, loose* *52 - 60 in. Gray v. fn.-med. sand, mottled (seep @ 60 in.)*	*52 in.*
4 / Lot D	*0 – 36 in. Brn fn Sand w/silt, cobbles* *36 - 47 in. Brn fn-med Sand w/gravel* *47 – 60 in. Gray/Blue fn. sand, grav, si., dense, mot'd – till (dry)*	*47 in.*
5 / Lot E	*0 – 43 in. Soil and rock fill debris* *43 – 52 in. Brn fn Sand w/gravel, silt* *52 – 62 in. Gray fn.-med. sand, mottled (seep @ 52 in.)*	*52 in.*

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6 / Lot E	*0 – 57 in. Brn fn-med. Sand w/gravel* *57 - 76 in. Dk. Brn fn-med Sand w/silt, organics* *76 - 96 in. Gray/Blue fn. sand, grav., si., dense, mot'd* *(seep at 76)*	*76 in.*

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 must not be compacted. Compaction will damage the soil structure and 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,

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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

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 emplacement of all fills and backfill material. We can provide post-construction letters as needed to summarize our field observations, inspections, and test results.

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.

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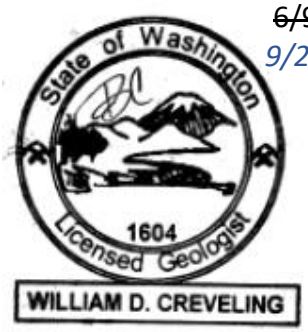
Respectfully submitted,

LeRoy Surveyors & Engineers, Inc.

~~6/9/2022~~
9/23/2024



~~6/9/2022~~
9/23/2024

Bill Creveling, L.G.
Principal Geologist

Damon DeRosa, P.E.
Principal Engineer

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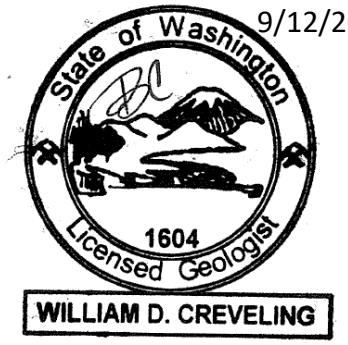
Field Report

Project Name Cation Exchange and Organic Matter Soil Test Dos Lagos Project		**Job #** 12896	**Inspection Report** #1
Parcel No.s 041910-2107, 6026, 6028, and 6030		**Date** September 12, 2023	**Page** 1 of 3
County Pierce	**Permit # -**	**Arrival Time / Date** 10:00 am / August 7, 2023	
Client Dos Lagos Asset, LLC	**LS&E Project Manager** Damon DeRosa, P.E.		
Contractor Moynan Excavating Northwest Agricultural Consultants	**LS&E Field Inspector** Bill Creveling, L.G.		
Weather Dry			
Type of Work Performed Soil Sampling and Testing – CEC + Organic Matter			
Equipment Used Excavator, Sample Collection Containers			

9/12/2023



Project Description

A Licensed Geologist from Leroy Surveyors and Engineers, Inc. collected soil samples in multiple representative areas on the above-mentioned project and commissioned the testing of the samples by an accredited soil laboratory (Northwest Agricultural Consultants). The purpose of the sampling and testing is to verify that an important treatment capability exists within the soil horizons just below the stormwater basal application surface. Specifically, the sample horizons spanned the zone of vertical separation under the proposed permeable pavement and its reservoir elevation.

We submitted the samples for testing of Cation Exchange Capacity (CEC) and Organic Matter content. The CEC test was performed by the lab according to the EPA Method 9081, and the Organic matter test was performed per the ASTM D2974 Method.

Cation exchange capacity (CEC) is a measure of the total negative charges (in milliequivalents) within the soil that adsorb plant nutrient cations such as calcium (Ca2+), magnesium (Mg2+) and potassium (K+). The higher the CEC, the higher the capacity to hold cations. A milliequivalent is the number of ions which total a specific quantity of electrical charges. As such, the CEC is a property of a soil that describes its capacity to supply nutrient cations to the soil solution for plant uptake (University of Georgia Extension).

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The determination of organic percentage per the ASTM D2974 test method can be used to determine the moisture content, ash content, and percent organic matter in soil. Figure 1 illustrates the test locations over the four parcels.

Figure 1: CEC and Organic Soil Sampling Locations (⬢) and Associated Parcel Numbers

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Findings
Table 1 illustrates the results of the CEC and Organic Percentage testing for the 8 sample locations by Northwest Agricultural Consultants.

Table 1: CEC and Organic Percentage – Northwest Agricultural Consultants (8/19/2023)

Sample ID	Organic Matter	Cation Exchange Capacity
A	1.70%	6.5 meq/100g
B	1.47%	5.1 meq/100g
C	3.24%	10.2 meq/100g
D	3.09%	11.8 meq/100g
E	4.08%	11.0 meq/100g
F	1.52%	6.0 meq/100g
G	3.36%	8.1 meq/100g
H	1.71%	9.0 meq/100g
Method	**ASTM D2974**	**EPA 9081**

Conclusion

Permeable Pavement
The soil horizon below the proposed permeable pavement system is ideal for infiltration (see earlier infiltration testing reports) and treatment of pavement runoff. Per the sample results, the soil contains favorable CEC (5.1 to 11.8 mEq/100g) and Organic Percentage (1.47 to 4.08 Percent).

Closure
The information gathered for this report is standard practice and relevant for this type of project. 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.

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Appendix E

Third-Party Review of "Willow Pond Multi-Family Residential Puyallup, WA"

Steve Nelson

From: Mark Higginson <MHigginson@PuyallupWA.gov>
Sent: Monday, November 13, 2023 10:47 AM
To: Steve Nelson
Cc: Damon DeRosa; Bill Creveling; Joshua Thompson; Ken Cook; Chris Beale; Anthony Hulse
Subject: Dos Lagos-Willows Pond Wetland Analysis
Attachments: 23--11-08 FINAL WillowsPond-3rdPartyReviewLetter (Confluence).pdf

Steve,

The city just received a 3rd party consultant confirmation for Willows Pond which categorizes the wetland as **Category III**, with a **Habitat Score of 4**. This means that the MR8 analysis can use Method 2 (versus my prior review comment concerning Method 1). The Planning Dept is checking whether the pond supports "rare, endangered, threatened, or sensitive species; or a breeding population of any native amphibian" which would determine whether the hydroperiod is required…although you have already completed the analysis.

Please disregard my most recent review comments associated with MR8 Method 1.

Hope this helps,

Mark Higginson
Sr Civil Engineer | City of Puyallup | 333 S Meridian | Puyallup, WA 98371
Tel: (253) 841-5559 | Fax:(253) 840-6678 | mhigginson@puyallupwa.gov

Did you know that you can easily submit for a permit online? Introducing CityView, our new online permitting system. Go to the City's website page here for more information. Or, scan this QR code with your phone to learn more.

CONFLUENCE
ENVIRONMENTAL COMPANY

October 20, 2023

Ms. Nabila Comstock, Assistant Planner
City of Puyallup Planning Services
333 South Meridian
Puyallup, WA 98371

Re: Third-Party Review of "Willow Pond Multi-family Residential Puyallup, WA"

Dear Nabila,

This letter summarizes findings and recommendations from Confluence Environmental Company (Confluence) biologists' third-party review of the Willow Pond Multi-family Residential Puyallup, WA: Critical Areas Report and Mitigation Plan (the critical areas study report). The critical areas study report was prepared June 23, 2023, by Land Services Northwest for Dylan and Cedar Hueber to satisfy the critical areas review process required by the City of Puyallup Municipal Code (PMC) 21.06 Critical Areas (Land Services Northwest 2023). This letter report was prepared to summarize our review of the critical areas study report.

COMPLETENESS REVIEW

Confluence found that the critical areas study report was incomplete according to the regulations outlined in PMC 21.06 Critical Areas. The critical areas study report is missing the following information:

- Qualifications of the person(s) preparing the report.
- Clear and concise goals and objectives that the proposed compensation action(s) shall achieve.
- Performance standards for Years 4 and 5.
- A description of how the compensation area(s) will be evaluated to determine if the performance standards are being met.

TECHNICAL REVIEW

The critical areas study report identified 1 wetland, Wetland A. Wetland A is located in the central portion of the site and continues off-site to the south. Confluence only evaluated the wetland flagging and test plots located on-site.

The critical areas study report rated Wetland A as a Category III wetland with a habitat score of 4. According to PMC 21.06.930 and 21.06.840, Category III wetlands with a habitat score of 4 near high intensity land use projects have an 80-foot buffer with a 10-foot buffer building setback. The critical areas study report found this buffer can be reduced to a 60-foot buffer using the impact reducing measures found in PMC 21.06.930.

Confluence conducted site visits on July 31 and September 28, 2023, to evaluate the locations of the boundaries of Wetland A as they were described in the critical areas study report.

Wetlands

Confluence initially conducted a site visit at the property on July 31, 2023, but was not able to confirm the wetland boundary or test plot locations due to missing flags onsite. Additionally, the wetland rating form was not included in the report. Confluence contacted the City of Puyallup and requested that Land Services Northwest revisit the property to rehang flagging for boundaries and test plots and provide the wetland rating form. Land Services Northwest notified the City of Puyallup on September 12, 2023, that they had completed reflagging, and they provided a new version of the critical areas study report with the wetland rating form included.

On September 27, 2023, Confluence revisited the site to confirm the wetland boundary and test plot locations. During the site visit, Confluence used a visual assessment to verify soil, vegetation, and hydrology conditions in the vicinity of wetland boundary flags at Wetland A and test plots TP-3, TP-4, and TP-5. Confluence could not find TP-2, and because TP-1 was located within a homeless encampment, Confluence did not enter the area. Though we were not able to assess test plots TP-1 and TP-2, we observed a topographic break and change in wetland vegetation to upland vegetation along the delineated wetland boundary. Therefore, we concluded that the wetland boundary was accurately delineated.

Confluence found that the Wetland Data Forms in Appendix I were incomplete. Specifically, the wetland data form for TP-4 did not identify which hydric soil indicator was applicable and also did not have the matrix and redox features percentages recorded. Additionally, the latitude and longitude, National Wetland Inventory (NWI) classification, and local relief and landform information were also missing. This incomplete form does not alter the findings of the report or our conclusion that the wetland boundary was accurately delineated.

Wetland Rating

Confluence reviewed the wetland rating form provide by Land Services Northwest on September 12, 2023. We concur with Land Services Northwest's rating of Wetland A as a Category III.

Confluence identified 1 section of the wetland rating form for which we reached a conclusion different from that of Land Services Northwest; however, this difference does not change the wetland score or rating or the report's conclusions. For Section D 1.3 Characteristics and distribution of persistent plants, Land Services Northwest marked "Wetland has persistent, ungrazed, plants >1/2 of area." Confluence observed that >1/2 of Wetland A's area is aquatic bed habitat. According to the Washington Department of Ecology (Ecology) manual (Hruby 2014), only areas with emergent, shrub, or forested Cowardin classifications are to be used to answer the question. Therefore, aquatic bed habitat should not be included in the determination. The shrub and forested portion of the wetland is greater than 10% of the wetland area; therefore, this section should have been scored 1. The critical areas study report also mentioned the "wetland has been recently mowed so less than 95% of the wetland is ungrazed"; however, the mowed areas of the property are outside of the Wetland A boundary.

Streams

Confluence confirmed no streams are located on-site. Confluence did not observe the culvert identified in the critical areas study report from the corner of 37th Avenue Southeast and 5th Street Southeast but saw the presence of drainage features along the eastern side of 5th Street Southeast where the report indicated the outlet was.

Mitigation Plan

Confluence concurs with the impact analysis and concept of the mitigation plan. However, several elements are missing from the mitigation plan (see Completeness Review section, above). Land Services Northwest should review PMC 21.06 and the City of Puyallup mitigation plan checklist to make sure all elements of the mitigation plan are included.

SUMMARY

In summary, Confluence agrees with the conclusions of the 2023 Land Services Report: Wetland A is a category III wetland that has an associated buffer of 80 feet. We also concur that the proposed mitigation meets the mitigation sequencing and impact analysis required in PMC 21. 06. However, the report should be updated to include missing information.

If you have any comments or questions, please feel free to contact me.

Respectfully yours,

KERRIE McARTHUR, PWS, CERP, FP-C
Managing Senior Biologist
206.999.6201
kerrie.mcarthur@confenv.com

AUDREY MICHNIAK, WPIT
Project Biologist I
586.212.1253
audrey.michniak@confenv.com

ATTACHMENTS

City of Puyallup Mitigation Plan Checklist

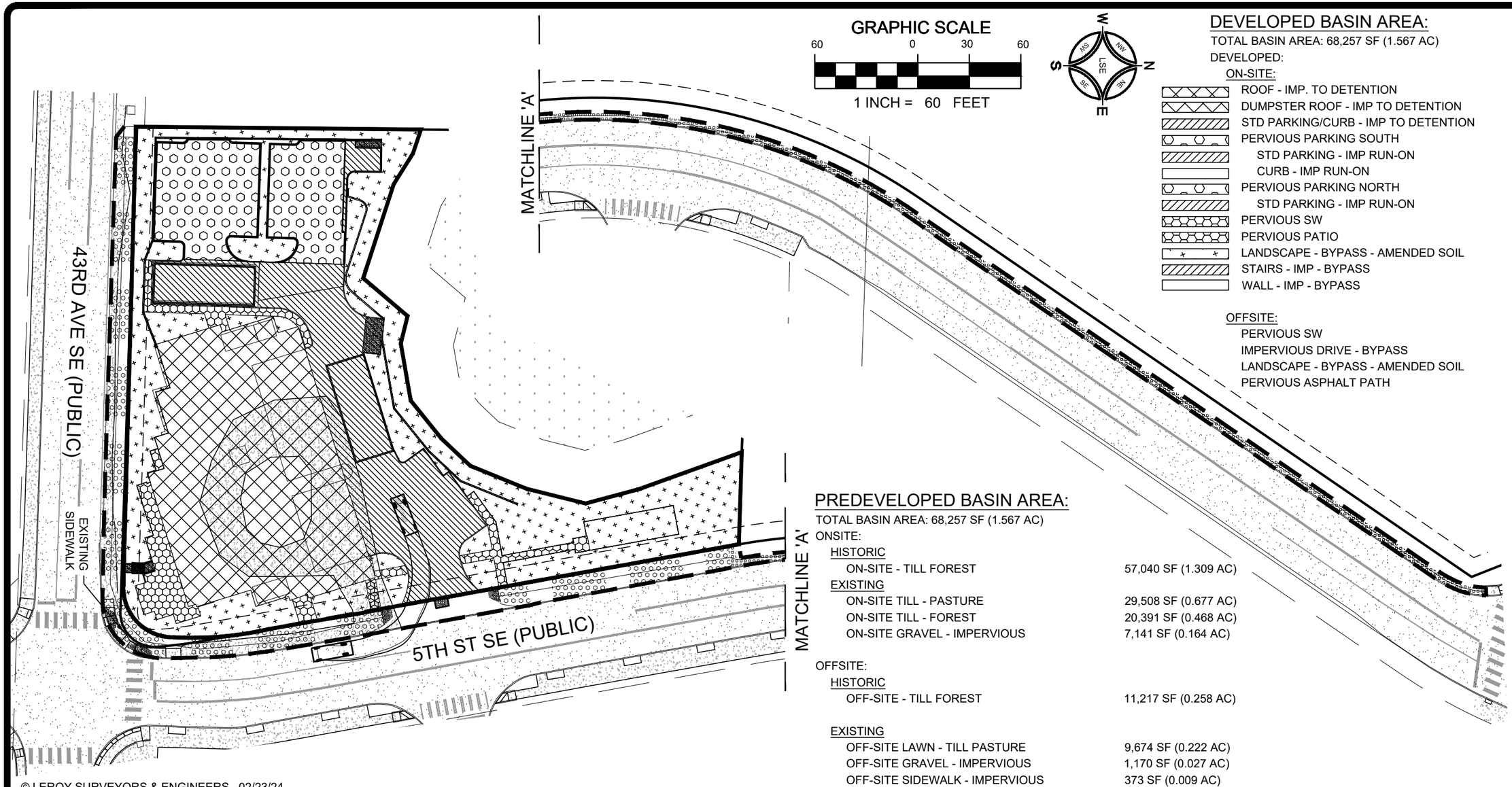
REFERENCES

Hruby, T. 2014. Washington State Wetland Rating System for Western Washington: 2014 Update. (Publication #14-06-029). Olympia, WA: Washington Department of Ecology.

Land Services Northwest. 2023. Willow Pond Multi-family Residential Puyallup, WA: Critical areas report and mitigation plan. Prepared for Dylan and Cedar Huber, Puyallup, Washington, by Land Services Northwest, Olympia, Washington.

Appendix F

Basin Maps



DEVELOPED BASIN AREA:

TOTAL BASIN AREA: 68,257 SF (1.567 AC)

DEVELOPED:

ON-SITE:

ROOF - IMP. TO DETENTION	15,996 SF (0.367 AC)
DUMPSTER ROOF - IMP TO DETENTION	220 SF (0.005 AC)
STD PARKING/CURB - IMP TO DETENTION	8008 SF (0.184 AC)
PERVIOUS PARKING SOUTH	3,713 SF (0.085 AC)
STD PARKING - IMP RUN-ON	1,663 SF (0.038 AC)
CURB - IMP RUN-ON	119 SF (0.002 AC)
PERVIOUS PARKING NORTH	2,862 SF (0.066 AC)
STD PARKING - IMP RUN-ON	1,362 SF (0.031 AC)
PERVIOUS SW	1,663 SF (0.038 AC)
PERVIOUS PATIO	1,297 SF (0.030 AC)
LANDSCAPE - BYPASS - AMENDED SOIL	19,648 SF (0.452 AC)
STAIRS - IMP - BYPASS	163 SF (0.004 AC)
WALL - IMP - BYPASS	326 SF (0.007 AC)

OFFSITE:

PERVIOUS SW	7,197 SF (0.165 AC)
IMPERVIOUS DRIVE - BYPASS	951 SF (0.022 AC)
LANDSCAPE - BYPASS - AMENDED SOIL	389 SF (0.009 AC)
PERVIOUS ASPHALT PATH	2,680 SF (0.062 AC)

PREDEVELOPED BASIN AREA:

TOTAL BASIN AREA: 68,257 SF (1.567 AC)

ONSITE:

HISTORIC

ON-SITE - TILL FOREST	57,040 SF (1.309 AC)

EXISTING

ON-SITE TILL - PASTURE	29,508 SF (0.677 AC)
ON-SITE TILL - FOREST	20,391 SF (0.468 AC)
ON-SITE GRAVEL - IMPERVIOUS	7,141 SF (0.164 AC)

OFFSITE:

HISTORIC

OFF-SITE - TILL FOREST	11,217 SF (0.258 AC)

EXISTING

OFF-SITE LAWN - TILL PASTURE	9,674 SF (0.222 AC)
OFF-SITE GRAVEL - IMPERVIOUS	1,170 SF (0.027 AC)
OFF-SITE SIDEWALK - IMPERVIOUS	373 SF (0.009 AC)

PRE AND POST DEVELOPED BASIN MAP - LOT C

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