# Exhibit 14

# **Drainage Report**

for

# The Farm at Mill Creek

Prepared for

### Eastgate By Vintage, LP

369 San Miguel Drive Suite 135 Newport Beach, CA 92660 (949) 721-6775

Prepared by

### Land Development Consultants, Inc

20210 142<sup>nd</sup> Avenue NE Woodinville, WA 98072 (425) 806-1869



March 8, 2019 Job No: 17-127

# TABLE OF CONTENTS

1	Project Overview
2	Temporary Erosion and Sediment Control
3	Conditions and Requirements Summary
4	Off-site / Upstream and Downstream Analysis
5	Permanent Stormwater Control Plan
6	Conveyance System Analysis and Design
7	Special Reports and Studies
8	Operations and Maintenance Manual

## 1.0 PROJECT OVERVIEW

The proposed The Farm at Mill Creek project is located at 4008 132<sup>nd</sup> ST SE Mill Creek, WA 98012. The project lies within the northwest quarter, Section 33, Township 28 N, Range 5 East, W.M., as shown in Figure 1 (this section).

The existing site contains an old warehouse, various outbuildings, and the remains of a collapsed house, and landscaped area and forest totaling 17.34 acres and is considered a "new development". Of the 17.34 acres 12.50 acres will be developed. The undisturbed area (4.84 acres) is located along the western property boundary and contains a wetland (Wetland A).

The proposed site will be a mixed use retail and commercial development. This commercial development will include retail spaces, driveways, parking lot for all the building, landscaping, and associated utilities. See sheet RD-01 and RD-02 in this section for the proposed site layout.

Existing drainage on the site flows from east to west towards the wetland. There are no areaspecific requirements for either of these watersheds/basins. See Figure 6 in Section 4 for visual representation of the existing basins.

The onsite Basin currently sheet flows to the west to an existing NGPA and wetland. The flow then enters the Penny Creek and flows south eventually entering Thomas Lake. See the Downstream Analysis discussion in Section 4 for more detailed discussion. See Figure 5 in Appendix 4-A for visual representation of the downstream flow path.

According to the USDA web soil survey map, the proposed commercial development area of the site is underlain by Alderwood gravelly sandy loam. See Appendix 1-A for the attached USDA web soil survey map and soil description.

Flow control for the proposed development will be accomplished with a detention vault facility designed according to the City of Mill Creek requirements, and Department of Ecology 2014 Western Washington Storm water Management Manual (DOE Manual). The detention facility will discharge storm water to a biofiltration system (i.e., modular wetland) for enhanced treatment. The modular wetland will discharge flow into a level spreader within the wetland buffer, where storm water will sheet flow into the wetland.







wi\2017\17-127 gateway at m≣ creek\Drawings\construction\171270-RD-PL.dwg Plotted: Mor 08, 2019 -

DISCLAIMMER TOPOGRAPHIC SURVEY INFORMATION CONTAINED ON THESE PLANS HAS BEEN PROVIDED BY DURYEA & ASSOCIATES. LDC, INC. (LAND DEVELOPMENT CONSULTATIS, INC.) ASSUMES NO LIABULT AS TO THE ACCURACY AND COMPLETENESS OF THIS DATA. ANY DISCREPANCIES FOUND BETMEEN WHAT IS SHOWN ON THE PLANS AND WHAT IS NOTED IN THE FIELD SHOULD BE BROUGHT IMMEDIATELY TO THE ATTENTION OF THE ENGINEER.

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Cal 2 Business Days Before You Dig 811 or 1-800-424-5555 Uilties Underground Location Center
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ACCEPTED IN COMPLIANCE WITH CONDITIONS FOR CG2017-0001	S OF APPROVAL
DIRECTOR OF COMMUNITY AND ECONOMIC DEVELOPMENT	DATE

ACCEPTED FOR CONSTRUCTION CITY OF MILL CREEK

# **APPENDIX 1-A**

# SCS SOIL SURVEY MAPPING



Natural Resources Conservation Service Web Soil Survey National Cooperative Soil Survey



# Map Unit Legend

Map Unit Symbol Map Unit Name		Acres in AOI	Percent of AOI
1	Alderwood gravelly sandy loam, 0 to 8 percent slopes	14.0	80.5%
34	Mukilteo muck	3.4	19.5%
Totals for Area of Interest		17.4	100.0%



# Snohomish County Area, Washington

### 1—Alderwood gravelly sandy loam, 0 to 8 percent slopes

### Map Unit Setting

National map unit symbol: 2t625 Elevation: 50 to 800 feet Mean annual precipitation: 25 to 60 inches Mean annual air temperature: 48 to 52 degrees F Frost-free period: 160 to 240 days Farmland classification: Prime farmland if irrigated

### **Map Unit Composition**

Alderwood and similar soils: 85 percent Minor components: 15 percent Estimates are based on observations, descriptions, and transects of the mapunit.

### **Description of Alderwood**

### Setting

Landform: Ridges, hills Landform position (two-dimensional): Summit Landform position (three-dimensional): Crest, talf Down-slope shape: Linear, convex Across-slope shape: Convex Parent material: Glacial drift and/or glacial outwash over dense glaciomarine deposits

### **Typical profile**

A - 0 to 7 inches: gravelly sandy loam Bw1 - 7 to 21 inches: very gravelly sandy loam Bw2 - 21 to 30 inches: very gravelly sandy loam Bg - 30 to 35 inches: very gravelly sandy loam 2Cd1 - 35 to 43 inches: very gravelly sandy loam 2Cd2 - 43 to 59 inches: very gravelly sandy loam

### Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: 20 to 39 inches to densic material
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 18 to 37 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.7 inches)

#### Interpretive groups

Land capability classification (irrigated): None specified Land capability classification (nonirrigated): 4s Hydrologic Soil Group: B

USDA

Other vegetative classification: Limited Depth Soils (G002XN302WA), Limited Depth Soils (G002XF303WA), Limited Depth Soils (G002XS301WA) Hydric soil rating: No

#### **Minor Components**

#### Mckenna

Percent of map unit: 5 percent Landform: Depressions, drainageways Landform position (three-dimensional): Dip Down-slope shape: Concave, linear Across-slope shape: Concave Hydric soil rating: Yes

#### Everett

Percent of map unit: 5 percent Landform: Kames, eskers, moraines Landform position (two-dimensional): Summit, shoulder Landform position (three-dimensional): Crest, interfluve Down-slope shape: Convex Across-slope shape: Convex Hydric soil rating: No

#### Shalcar

Percent of map unit: 3 percent Landform: Depressions Landform position (three-dimensional): Dip Down-slope shape: Concave Across-slope shape: Concave Hydric soil rating: Yes

#### Norma

Percent of map unit: 2 percent Landform: Depressions, drainageways Landform position (three-dimensional): Dip Down-slope shape: Concave, linear Across-slope shape: Concave Hydric soil rating: Yes

# **Data Source Information**

Soil Survey Area: Snohomish County Area, Washington Survey Area Data: Version 17, Nov 22, 2017



# Snohomish County Area, Washington

### 34—Mukilteo muck

### Map Unit Setting

National map unit symbol: 2hyr Elevation: 0 to 1,000 feet Mean annual precipitation: 40 to 70 inches Mean annual air temperature: 48 to 52 degrees F Frost-free period: 150 to 250 days Farmland classification: Prime farmland if drained

#### Map Unit Composition

Mukilteo, drained, and similar soils: 85 percent Minor components: 15 percent Estimates are based on observations, descriptions, and transects of the mapunit.

#### **Description of Mukilteo, Drained**

#### Setting

Landform: Depressions Parent material: Herbaceous organic material

#### Typical profile

- H1 0 to 4 inches: muck
- H2 4 to 35 inches: mucky peat
- H3 35 to 54 inches: mucky peat
- H4 54 to 60 inches: fine sandy loam

#### Properties and qualities

Slope: 0 to 1 percent Depth to restrictive feature: More than 80 inches Natural drainage class: Very poorly drained Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr) Depth to water table: About 0 to 12 inches

Frequency of flooding: None Frequency of ponding: None Available water storage in profile: Very high (about 25.0 inches)

#### Interpretive groups

Land capability classification (irrigated): None specified Land capability classification (nonirrigated): 3w Hydrologic Soil Group: B/D Other vegetative classification: Soils with Few Limitations (G002XN502WA) Hydric soil rating: Yes

#### **Minor Components**

### Terric medisaprists, undrained

Percent of map unit: 5 percent

USDA

Landform: Depressions Other vegetative classification: Wet Soils (G002XN102WA) Hydric soil rating: Yes

#### Orcas

Percent of map unit: 5 percent Landform: Depressions Other vegetative classification: Wet Soils (G002XN102WA) Hydric soil rating: Yes

#### Mukilteo, undrained

Percent of map unit: 5 percent Other vegetative classification: Wet Soils (G002XN102WA) Hydric soil rating: Yes

## **Data Source Information**

Soil Survey Area: Snohomish County Area, Washington Survey Area Data: Version 17, Nov 22, 2017



# 2.0 TEMPORARY EROSION AND SEDIMENT CONTROL

### Temporary Erosion and Sediment Control

A Stormwater Pollution Prevention Plan (SWPPP) will be provided prior to construction. The SWPPP report is modeled under the guidelines of Volume II, Section 3.0 of the 2014 DOE Manual. Construction SWPPP Elements #1 through #12 are addressed below.

**Element #1 - Mark Clearing Limits:** All clearing limits will be delineated with high visibility plastic fence or silt fence. See sheets ER-01 and ER-02 of the construction plans for locations and details.

**Element #2 - Establish Construction Access:** Stabilized construction accesses will be installed as shown on the construction plans. See sheets ER-01 and ER-02 of the construction plans for locations and details.

**Element #3 - Control Flow Rates:** Detention of construction period runoff will be provided by proposed permanent detention Pond A, located at the northern portions of the proposed development. The pond has been designed with a temporary riser/control structure to provide flow control for construction-period runoff. See sheets ER-01 and ER-02 of the plans for location and details of the drainage system, temporary sediment pond design specifics and other flow and sediment control BMP's.

**Element #4 - Install Sediment Controls:** Silt fence, check dams, inlet protection, and detention Ponds A and B will be utilized to contain sediments within the project's clearing limits. See sheets ER-01and ER-02 of the plans for locations and details.

**Element #5 - Stabilize Soils:** Exposed soils will be stabilized as specified in the Grading and Erosion Control Notes. See sheet ER-03 of the plans for applicable notes and details.

**Element #6 - Protect Slopes:** Slopes are moderate to steep on the subject property. Slopes shall be protected as specified under Element #5.

**Element #7 - Protect Drain Inlets:** Storm drain inlet protection will be utilized to contain sediments within the project's clearing limits. See sheets ER-01 and ER-02 of the plans for locations and details.

**Element #8 - Stabilize Channels and Outlets**: Conveyance swales shall be stabilized with check dams, as well as mulch, seeding if necessary. See sheets ER-01 and ER-02 of the plans for locations and details.

**Element #9 - Control Pollutants:** Pollutants shall be controlled as specified in the Pollutant Control Notes. See sheet ER-03 of the plans for notes.

**Element #10 - Control De-Watering:** Disposal options for de-watering water are as specified in the De-Watering Control Notes. See sheet ER-03 of the plans for notes.

**Element #11 - Maintain BMPs:** Maintenance of the BMPs is specified within the Construction Sequence and Grading and Erosion Control Notes. See sheets ER-01 and ER-02 of the plans for the Construction Sequence and notes.

**Element #12: Manage the Project:** The Grading and Erosion Control Notes specify seasonal work limitations. Maintenance of the BMPs is specified within the Construction Sequence and Grading and Erosion Control Notes. See Erosion Control Plans for the Construction Sequence and note

# **APPENDIX 2-A**

# Temporary Stormwater Pond Sizing Chart

Temporary Se	ediment Pond Sizing	Land Development	t Consultants,	Consultants, Inc.		
Calculations		20210 142nd Avenue NE         Tel: (425) 806-186           Woodinville, WA 98072         Fax: (425) 482-286				
Project Name:	Gateway at Mill Creek		Project No.	17-127		
Description:	Temporary Sediment F	Pond	Date:	3/9/2019		
			Calc. By:	JMT		
Facility Description: Temporary		Sediment Pond				

Obtain the discharge from the hydrologic calculations of the peak flow for the 2-year runoff event. The 10-year peak flow shall be used if the project size, expected timing and duration of construction, or downstream conditions warrant a higher level of protection.

10 - yr peak flow =	9.95 cfs
	- based WWHM 701 data series

Determine the required surface area as follows:

 $SA = 2 x \frac{10 - yr peak flow}{0.00096}$ 

SA = 20,729 s.f.

Determine the required orifice area as follows:

A <sub>s</sub> = Provided surface area =	21,600	s.f.
h = Head of water above orifice =	3.5	ft.
T = dewatering time =	24	hrs.
g = acceleration of gravity =	32.2	ft/s
$A_0 = \frac{A_s (2h)^{0.5}}{0.6 \times 3600 \text{ T g}^{0.5}} =$	0.194	s.f.

Convert the required orifice area to the required orifice diameter:

$$D = 13.54 \times A_0^{0.5} = 5.968$$
 in

Required orifice diameter = 6 in

# 3.0 CONDITIONS AND REQUIREMENTS SUMMARY

### Existing Conditions Summary

The existing site contains an old warehouse, various outbuildings, the remains of a collapsed house, landscaped areas and forest totaling 17.37 acres. The undisturbed area (4.84 acres) is located along the western property boundary and contains a wetland (Wetland A). See Figure 6, Existing Condition Map in Section 4 for visual representation of existing hydrology.

### **Requirements Summary**

This project is designed under the 2014 Ecology Manual as modified by the Western Washington Phase II Municipal Stormwater Permit (DOE Manual). This project will be considered a newdevelopment; all area subject to water quantity and quality controls will be modeled as forested.

Approximately 12.96 acres will be disturbed with the proposed development and will be subject to Minimum Requirements 1-10.

The minimum requirements are addressed as follows:

### Requirement #1: Preparation of Stormwater Site Plans

This drainage report, and the construction documents contains all of information and requirements for Stormwater Site Plans listed in Chapter 3, Volume I of the 2014 Ecology Manual.

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

The temporary stormwater pond sizing can be found in appendix 2-A. A construction SWPPP will be completed as a separate document.

### Requirement #3: Source Control of Pollution

There are no hazardous materials proposed to be on site that would require the use of source control BMPs.

### Requirement #4: Preservation of Natural Drainage System and Outfalls

Natural drainage patterns will be maintained and discharges from the project site will occur at the natural location. The proposed discharge of the site's runoff will not cause significant adverse impact to downstream receiving waters and down gradient properties. The proposed runoff control facilities will provide the required flow control and water quality treatment.

### Requirement #5: On-Site Stormwater Management

The existing on-site soils are cemented glacial-till, and the infiltration rate identified (approximately 0.05 in/hr) by geotechnical analysis is insufficient to support bio-retention, downspout infiltration, pervious paving, and all other standard LID BMP's with the exception of BMP T5.13 (soils amendment of non-impervious covered soils). See discussion of infiltration feasibility within the Geotechnical Report produced by Terra Associates, Inc. dated August 9, 2018 and PIT test results from Terra Associates, Inc. Dated November 15, 2018. BMPT5.13 will be implemented on all disturbed ground area to be landscaped.

### Requirement #6: Runoff Treatment

A modular wetland will be used to provide enhanced treatment for the site. The modular wetland will be sized for a treatment facility located downstream of detention, utilizing the 2-year, mitigated flow rate. Oil control is not required as this site does not meet the criteria for a high use site, as ADT generated does not exceed 100 trips per 1000 SF of commercial space. The site is proposing approximately 120,000 SF of commercial space, and based on the TIA, gross trips are expected to be 6,112, which equates to approximately 51 trips per 1000 SF of commercial space. See section 5.4 for additional discussion of treatment facilities.

### Requirement #7: Flow Control

See Section 5 of this report for detailed discussion on site hydrology, detention designs, and modeling results.

### Requirement #8: Wetlands Protection

The wetland portion of the site will be preserved and disturbance will be limited to areas outside of the wetland boundary. A boardwalk is proposed to be constructed within the wetland to provide pedestrian connectivity, however, disturbance associated with the boardwalk will be kept to a minimum. See geotechnical report and critical areas study for additional information.

### Requirement #9: Basin/Watershed Plans

There are no basin/watershed plans applicable to the basins within which the site exists.

### Requirement #10: Operation and Maintenance Plan

A Maintenance and Operations Manual has been created for this project. Please refer to Appendix 8-A in Section 8 for this document

# 4.0 OFF-SITE ANALYSIS

A downstream analysis for the Farm Mill Creek site was performed in March 2018. Figure 1 of this document contains an exhibit showing the general vicinity of the project site. There is also an outline of the downstream flow path Appendix 4-A. The downstream flow path was examined for a quarter mile past each basin's property line.

### Upstream Basin

The upstream basin is comprised of an adjacent development, where the detention pond is currently located on the subject property. The existing upstream basin is approximately 3.82acres and is located to the east of the subject property. The project proposes demolishing the existing detention pond and routing the adjacent property's storm water runoff into the proposed vault within the Farm at Mill Creek development. See Figure 6.0 for the location of the upstream basin in relation to the subject property.

### **Downstream Analysis**

The existing site contains an old warehouse, various outbuildings, and the remains of a collapsed house, and landscaped area and wetland/ NGPA area. Onsite storm water flow within the existing and developed condition flows from east to the west (Image #1) to the existing wetland with the existing NGPA onsite (Image #2). Flows from the onsite wetland then flow south paralleling 35<sup>th</sup> AVE SE through parcel #'s 01135400099100, #28053300206800 (Image #3), #20853300300200 for approximately 3,000 ft within a series of wetlands and waterways until discharging into Thomas Lake. The Downstream system is not expected to be impacted by the development. Per the critical areas report there is no anticipated adverse effect from the sites discharge on the downstream system. See Figure 5, Downstream Analysis Map, in Appendix 4-A for a detailed map of the downstream flow paths and visual depiction of photo locations.



Image #1: Looking west on the subject property towards the NGPA and onsite wetland.



Image #2: Looking south on the south side of HWY 96 towards the NGPA.



Image #3: Looking south at the adjoining wetland paralleling 35<sup>th</sup> AVE SE from the pedestrian walkway connecting 134<sup>th</sup> PL SE and 35<sup>th</sup> AVE SE.

Note: See Figure 5, Downstream Analysis Map, in Appendix 4-A for a detailed map of the downstream flow paths and visual depiction of photo locations

# **APPENDIX 4-A**

# DOWNSTREAM ANALYSIS MAP



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N 		www.IDCcorp.con			

5.0

# 5.0 PERMANENT STORMWATER CONTROL PLAN

The drainage analysis was modeled using the Western Washington Hydrology Model (WWHM) software. This continuous runoff methodology was used as outlined in the 2014 Department of Ecology Stormwater Management Manual for Western Washington (DOE Manual).

### 5.1 Pre-developed Site Hydrology

As discussed in the Project Overview (Section 1), The existing site contains an old warehouse, various outbuildings, the remains of a collapsed house, landscaped areas, forest and wetlands totaling 17.37 acres. Runoff in the pre-developed conditions flows from the eastern portion of the site to the western portion of the site containing a wetland (Wetland A) approximately 4.84 acres in size. See Figure 6.0 in this section for the Existing Condition Map.

### Upstream Basin

The upstream basin is comprised of an adjacent development, where the detention pond is located on the subject property. The project proposes demolishing the existing detention pond and routing the adjacent property's storm water runoff into the proposed vault within the Farm at Mill Creek development.

### Pre-developed flows:

The pre-developed condition for the onsite Basin was modeled as forested as outlined in the City 2014 DOE Storm Water Management Manual for Western Washington.

**Onsite Basin** 

Forested12.96 AcresUndisturbed Wetland/NGPA4.84 Acres



	EXISTING BA	ASIN AREAS TAL <u>12.96 AC</u> 12.96 AC -SITE TOTAL 4.84 AC AM BASIN TOTAL 3.17 AC 0.65 AC 3.82 AC	15th ANNIVERSARY SOURCE INFORMATION	EDDC     Surveying Surveying     Surveying Surveying     Surveying Surveying     Surveying Surveying       Surveying     Surveying     Surveying     Description       Surveying     Figure tring     Surveying     Surveying       Engineering     Planning     Surveying     Surveying       20210 142nd Avenue NE     Ph. 425.806.1869     This Data Has a StatED VERTICAL       Woodinville, WA 8072     F. 425.482.2893     ACCUPACY OF APPROXIMATELY 1 FOOT.
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### 5.2 Developed Site Hydrology

The total amount of developed and disturbed area is approximately 12.96 acres. The developed commercial site includes a combination of commercial and residential buildings, roadways, parking lots for all the building, landscaping, and associated utilities. 12.96 acres of this onsite developed and disturbed area will be subject to the water quality and flow control. The upstream basin is developed with drive aisles, parking, landscape/lawn areas, and apartment buildings. See Figure 6.1 in this section for the Developed Conditions Map.

Runoff from the onsite basins and the upstream basin will be routed to an underground detention vault located within the central/western portion of the site. Release from the underground detention will discharge to a modular wetland unit to provide enhanced water quality treatment prior to discharge into the wetland via level spreaders.

### **Developed Conditions:**

The proposed developed conditions include constructing multiple commercial and mixed-use buildings along with associated parking lots and a conveyance system. The land use employed is from the 2014 DOE Stormwater Management Manual for Western Washington. The undisturbed wetland area has been excluded from modeling, since it will be left in its current state and will be protected by an NGPA. The new pervious areas are modeled as pasture as allowed by the SWMMWW for soils treated with BMP T5.13. The existing pervious areas in the upstream basin are modeled as lawn.

The areas used to model the detention vault can be found on the following page.

### **Onsite Basin**

Impervious	11.29 Acres
Pervious	1.14 Acres
Total	12.43 Acres

### By Pass Basin

Impervious	0.16 Acres
Pervious	0.37 Acres
Total	0.53 Acres

# Upstream Basin

Impervious	3.17 Acres
Pervious	0.65 Acres
Total	3.82 Acres



arm at Mill Creek Developed Conditions Map.mxd | MOD: 3/8/2019 | ifa

J	DEVELOPED BASIN ON-SITE BASIN TO VAULT IMPERVIOUS PERVIOUS TOTAL = TOTAL ONSITE BASIN ARE	11.29 AC 11.29 AC 1.14 AC 12.43 AC EA		ORMATION DESCRIPTION	S GENERATED FROM TH LIDAR (KING COUNTY). LHAS A STATED VERTICAL Y OF APPROXIMATELY 1 FOOT.
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### 5.3 Flow Control System

Detention calculations were performed using the Western Washington Hydrology Model. The proposed detention facility consisting of detention vault was designed in conformance with the 2014 DOE Storm Water Manual for Western Washington. The stormwater calculations and all supporting documents are included in Appendix 5-A of this report.

Below are the design results and mitigated release rates for the onsite basin detention facility:

### Modeled Detention Facility (Vault)

Width and Length:	17.5' x 1955'
Effective Storage Depth:	7.5'
Riser Height:	6.5'
Riser Diameter:	18"
Number Orifices:	3
Orifice 1 Diameter: 1.72"	Elevation: 0 ft
Orifice 2 Diameter: 3.34"	Elevation: 5.65 ft
Orifice 3 Diameter: 1.25"	Elevation: 6.05 ft
Notch:	No

# **APPENDIX 5-A**

# HYDROLOGIC MODELING

CALCULATIONS AND DETENTION VAULT SIZING OUTPUT FROM WWHM2012

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Scheme Upstream Sub-Basin	Subbasin Name: onsite Sub-Basin Sufface Interflow Flows To : Area in Basin Available Pervious Acres	Groundwater ✓ Show Only Selected Available Impervious Acres
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	Subbasin Name: Bypass Sub-Basin     Surface     Interflow     Flows To :     Area in Basin     Available Pervious Acres	Groundwater
	C, Forest, Flat	

WWHM2012 20190309 6.5ft riser	States 100	
File Edit View Help Summary Report		
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SCENARIOS	Subbasin Name: onsite Sub-Basin	Designate as Bypass for POC:
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Run Scenario	Available Pervious Acres	Available Impervious Acres
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Commercial Toolbox	Surface Int	erflow Groundwater
	Flows Io:	
	Area in Basin	Show Only Selected
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#### WWHM2012 20190309 6.5ft riser

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Analysis Help


#### WWHM2012 PROJECT REPORT

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Project Name: 20190309 6.5ft riser
Site Name:
Site Address:
City :
Report Date: 3/9/2019
Gage : Everett
Data Start : 1948/10/01
Data End : 2009/09/30
Precip Scale: 1.00
Version Date: 2017/07/05
Version : 4.2.13
```

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

High Flow Threshold for POC 1: 50 year

#### PREDEVELOPED LAND USE

Name : onsite Sub-Basin Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Forest, Flat	12.431
Pervious Total	12.431
Impervious Land Use	acre
Impervious Total	0
Basin Total	12.431

Element	Flows	To:	
Surface			Interflow

Groundwater

Name : upstream Sub-Basin Bypass: No

GroundWater: No

Pervious	Land	Use
C, Fores	t, F]	lat

acre 3.818

3.818
acre
0
3.818

Element Flows To: Surface	Interflow	Groundwater
Name : Bypass Sub-B Bypass: No	asin	
GroundWater: No		
Pervious Land Use C, Forest, Flat	<u>acre</u> .529	
Pervious Total	0.529	
Impervious Land Use	acre	
Impervious Total	0	
Basin Total	0.529	

Element Flows I	'o :	
Surface	Interflow	Groundwater

MITIGATED LAND USE

Name : onsite Sub-Basin Bypass: No

GroundWater: No

-

Pervious Land Use	acre
C, Pasture, Flat	1.139
Pervious Total	1.139

Impervious Land	Use	acre
ROADS FLAT		4.689

ROOF TOPS	FLAT	3.656
SIDEWALKS	FLAT	2.947
Impervious	Total	11.292
Basin Total	L	12.431

Element Flows To: Surface	Interflow	Groundwater
Vault I	Vault I	
Name : upstream Sub- Bypass: No	-Basin	
GroundWater: No		
Pervious Land Use C, Pasture, Flat	<u>acre</u> .648	
Pervious Total	0.648	
Impervious Land Use	acre	
ROADS FLAT	1.295	
ROOF TOPS FLAT	1.203	
SIDEWALKS FLAT	0.672	
Impervious Total	3.17	
Basin Total	3.818	

Element Flows To:		
Surface	Interflow	Groundwater
Vault 1	Vault 1	

Name : Bypass Sub-Basin Bypass: Yes

#### GroundWater: No

Pervious Land Use	acre
C, Pasture, Flat	. 369
Pervious Total	0.369
Impervious Land Use ROADS FLAT	<u>acre</u> 0.16

Impervious Total 0.16

Basin Total 0.529

Element Flows To: Surface Interflow

Groundwater

Name : Vault 1
Width : 1955 ft.
Length : 17.5 ft.
Depth: 7.5 ft.
Discharge Structure
Riser Height: 6.5 ft.
Riser Diameter: 18 in.
Orifice 1 Diameter: 1.71875 in. Elevation: 0 ft.
Orifice 2 Diameter: 3.34375 in. Elevation: 5.65 ft.
Crifice 3 Diameter: 1.25 in. Elevation: 6.05 ft.

Outlet 1 Outlet 2

	Vault 1	Hydraulic Tab	ole	
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.785	0.000	0.000	0.000
0.0833	0.785	0.065	0.023	0.000
0.1667	0.785	0.130	0.032	0.000
0.2500	0.785	0.196	0.040	0.000
0.3333	0.785	0.261	0.046	0.000
0.4167	0.785	0.327	0.051	0.000
0.5000	0.785	0.392	0.056	0.000
0.5833	0.785	0.458	0.061	0.000
0.6667	0.785	0.523	0.065	0.000
0.7500	0.785	0.589	0.069	0.000
0.8333	0.785	0.654	0.073	0.000
0.9167	0.785	0.720	0.076	0.000
1.0000	0.785	0.785	0.080	0.000
1.0833	0.785	0.850	0.083	0.000
1.1667	0.785	0.916	0.086	0.000
1.2500	0.785	0.981	0.089	0.000
1.3333	0.785	1.047	0.092	0.000
1.4167	0.785	1.112	0.095	0.000
1.5000	0.785	1.178	0.098	0.000
1.5833	0.785	1.243	0.100	0.000
1.6667	0.785	1.309	0.103	0.000
1.7500	0.785	1.374	0.106	0.000
1.8333	0.785	1.439	0.108	0.000
1.9167	0.785	1.505	0.111	0.000

2.0000	0.785	1.570	0.113	0.000
2.0833	0.785	1.636	0.115	0.000
2.1667	0.785	1.701	0.118	0.000
2.2500	0.785	1.767	0.120	0.000
2.3333	0.785	1.832	0.122	0.000
2.4167	0.785	1.898	0.124	0.000
2 5000	0 785	1 963	0 126	0 000
2 5833	0 785	2 029	0 128	0 000
2.5055	0.785	2.025	0.120	0.000
2.0007	0.785	2.004	0.132	0.000
2.7500	0.785	2.100	0.13/	0.000
2.0555	0.785	2.225	0.136	0.000
3 0000	0.785	2.250	0.138	0.000
3 0833	0.785	2.330	0.130	0.000
2 1667	0.705	2.421	0.140	0.000
3.1007	0.705	2.407	0.142	0.000
3.2000	0.705	2.552	0.144	0.000
3.3333	0.765	2.010	0.140	0.000
3.416/	0.785	2.683	0.148	0.000
3.5000	0.785	2./48	0.150	0.000
3.5833	0.785	2.814	0.151	0.000
3.666/	0.785	2.879	0.153	0.000
3./500	0./85	2.945	0.155	0.000
3.8333	0.785	3.010	0.157	0.000
3.9167	0.785	3.076	0.158	0.000
4.0000	0.785	3.141	0.160	0.000
4.0833	0.785	3.207	0.162	0.000
4.1667	0.785	3.272	0.163	0.000
4.2500	0.785	3.338	0.165	0.000
4.3333	0.785	3.403	0.166	0.000
4.4167	0.785	3.468	0.168	0.000
4.5000	0.785	3.534	0.170	0.000
4.5833	0.785	3.599	0.171	0.000
4.6667	0.785	3.665	0.173	0.000
4.7500	0.785	3.730	0.174	0.000
4.8333	0.785	3.796	0.176	0.000
4.9167	0.785	3.861	0.177	0.000
5.0000	0.785	3.927	0.179	0.000
5.0833	0.785	3.992	0.180	0.000
5.1667	0.785	4.058	0.182	0.000
5.2500	0.785	4.123	0.183	0.000
5.3333	0.785	4.188	0.185	0.000
5.4167	0.785	4.254	0.186	0.000
5.5000	0.785	4.319	0.188	0.000
5.5833	0.785	4.385	0.189	0.000
5.6667	0.785	4.450	0.230	0.000
5.7500	0.785	4.516	0.288	0.000
5.8333	0.785	4.581	0.323	0.000
5.9167	0.785	4.647	0.351	0.000
6.0000	0.785	4.712	0.375	0.000
6.0833	0.785	4.777	0.405	0.000
6.1667	0.785	4.843	0.431	0.000
6.2500	0.785	4.908	0.454	0.000
6.3333	0.785	4.974	0.475	0.000
6.4167	0.785	5.039	0.494	0.000
6.5000	0.785	5.105	0.512	0.000
6.5833	0.785	5.170	0.912	0.000
6.6667	0.785	5.236	1.620	0.000
	-	-		

6.7500	0.785	5.301	2.500	0.000
6.8333	0.785	5.367	3.459	0.000
6.9167	0.785	5.432	4.404	0.000
7.0000	0.785	5.497	5.245	0.000
7.0833	0.785	5.563	5.913	0.000
7.1667	0.785	5.628	6.387	0.000
7.2500	0.785	5.694	6.717	0.000
7.3333	0.785	5.759	7.128	0.000
7.4167	0.785	5.825	7.456	0.000
7.5000	0.785	5.890	7.769	0.000
7.5833	0.785	5.956	8.071	0.000
7.6667	0.000	0.000	8.361	0.000

#### ANALYSIS RESULTS

Stream Protection Duration

Predeveloped Landuse Totals for POC #1 Total Pervious Area:16.778 Total Impervious Area:0

Mitigated Landuse Totals for POC #1 Total Pervious Area:2.156 Total Impervious Area:14.622

Flow Frequency	Return	Periods for	Predeveloped	1. POC #1
Return Period		Flow(cfs)		
2 year		0.359654		
5 year		0.532339		
10 year		0.650568		
25 year		0.803053		
50 year		0.918413		
100 year		1.035025		
Flow Frequency	Return	Periods for	Mitigated.	POC #1
Flow Frequency Return Period	Return	Periods for <u>Flow(cfs)</u>	Mitigated.	POC #1
Flow Frequency Return Period 2 year	Return	Periods for Flow(cfs) 0.262567	Mitigated.	POC #1
Flow Frequency <u>Return Period</u> 2 year 5 year	Return	Periods for <u>Flow(cfs)</u> 0.262567 0.530625	Mitigated.	POC #1
Flow Frequency Return Period 2 year 5 year 10 year	Return	Periods for <u>Flow(cfs)</u> 0.262567 0.530625 0.815224	Mitigated.	POC #1
Flow Frequency Return Period 2 year 5 year 10 year 25 year	Return	Periods for <u>Flow(cfs)</u> 0.262567 0.530625 0.815224 1.353105	Mitigated.	POC #1
Flow Frequency Return Period 2 year 5 year 10 year 25 year 50 year	Return	Periods for <u>Flow(cfs)</u> 0.262567 0.530625 0.815224 1.353105 1.929424	Mitigated.	POC #1
Flow Frequency Return Period 2 year 5 year 10 year 25 year 50 year 100 year	Return	Periods for <u>Flow(cfs)</u> 0.262567 0.530625 0.815224 1.353105 1.929424 2.705238	Mitigated.	POC #1

Stream Protection DurationAnnual Peaks for Predeveloped and Mitigated.POC #1YearPredevelopedMitigated19490.2030.18119500.3980.21719510.3220.177

1952	0.256	0.187
1953	0.211	0.179
1954	0.796	0.262
1955	0.540	0.552
1956	0.477	1.067
1957	0.529	0.224
1958	0.358	0.236
1959	0.385	0.195
1960	0 342	0 201
1961	0 356	0 429
1962	0 311	0 178
1963	0.375	0.209
1964	0 317	0 167
1965	0 357	0 199
1966	0 194	0 186
1967	0 439	0 219
1968	0 514	0 201
1969	0 386	0.296
1970	0 280	0.189
1971	0 395	0.105
1972	0 351	0.236
1973	0 281	0.205
1974	0.492	0.200
1975	0.492	0.240
1976	0.200	0.196
1977	0.226	0.182
1978	0 281	0 191
1979	0 506	0 223
1980	0 317	0.186
1981	0.259	0.156
1982	0.340	0.223
1983	0.481	0.202
1984	0.353	1.127
1985	0.466	0.775
1986	1.151	3.242
1987	0.512	1.627
1988	0.283	0.258
1989	0.238	0.183
1990	0.372	0.207
1991	0.396	0.216
1992	0.302	0.197
1993	0.197	0.150
1994	0.184	0.222
1995	0.379	0.320
1996	0.658	0.217
1997	1.257	5.144
1998	0.239	0.182
1999	0.346	0.224
2000	0.190	0.368
2001	0.063	0.135
2002	0.363	0.529
2003	0.264	0.181
2004	0.416	0.244
2005	0.306	0.199
2006	0.710	0.625
2007	0.605	0.403
2008	0.963	2.236

Stream	Protection Durat:	ion	
Ranked	Annual Peaks for	Predeveloped and Mitigated.	. POC #1
Rank	Predeveloped	Mitigated	
	1.2570	5.1435	
2	1.1507	3.2421	
3	0.9626	2.2364	
4	0.7960	1.6269	
5	0.7104	1.1270	
6 7	0.6585	1.0667	
/	0.6050	0.8762	
0	0.5395	0.7745	
9	0.5295	0.5521	
11	0.5140	0.5294	
1 2	0.5110	0.1294	
13	0.3003	0.4026	
14	0.4921	0.3683	
15	0.4769	0.3202	
16	0 4664	0.2963	
17	0 4389	0 2623	
18	0.4160	0 2581	
19	0.3978	0.2463	
20	0.3960	0.2445	
21	0.3947	0.2361	
22	0.3858	0.2358	
23	0.3846	0.2243	
24	0.3790	0.2236	
25	0.3750	0.2231	
26	0.3723	0.2230	
27	0.3633	0.2217	
28	0.3578	0.2191	
29	0.3575	0.2174	
30	0.3560	0.2170	
31	0.3533	0.2164	
32	0.3507	0.2160	
33	0.3456	0.2095	
34	0.3420	0.2070	
35	0.3402	0.2046	
36	0.3218	0.2015	
37	0.3174	0.2013	
38	0.3170	0.2013	
39	0.3107	0.1992	
40	0.3061	0.1987	
41	0.3024	0.1974	
42	0.3010	0.1958	
ч.5 Л.Л	0.2031	0.1908	
44 45	0.2020	0.1892	
-5 46	0.2807	0 1888	
47	0 2804	0 1867	
48	0.2696	0.1864	
49	0.2644	0.1864	
50	0.2588	0.1833	
51	0.2559	0.1825	

# \_\_\_\_\_

52	0.2392	0.1821
53	0.2381	0.1808
54	0.2259	0.1805
55	0.2110	0.1786
56	0.2033	0.1777
57	0.1971	0.1772
58	0.1944	0.1672
59	0.1904	0.1556
60	0.1841	0.1497
61	0.0625	0.1351

Stream Protection Duration POC #1 The Facility PASSED

The Facility PASSED.

#### Flow(cfs) Predev Mit Percentage Pass/Fail 0.1798 22907 22843 99 Pass

0.1/98	22907	22843	99	Pass
0.1873	20604	13460	65	Pass
0.1947	18773	7927	42	Pass
0.2022	16835	6269	37	Pass
0.2097	15278	5627	36	Pass
0.2171	13732	5197	37	Pass
0.2246	12542	4941	39	Pass
0.2321	11298	4712	41	Pass
0.2395	10318	4496	43	Pass
0.2470	9411	4346	46	Pass
0.2544	8491	4205	49	Pass
0.2619	7762	4072	52	Pass
0.2694	6971	3951	56	Pass
0.2768	6378	3852	60	Pass
0.2843	5792	3726	64	Pass
0.2917	5326	3630	68	Pass
0.2992	4864	3489	71	Pass
0.3067	4472	3339	74	Pass
0.3141	4096	3193	77	Pass
0.3216	3728	3074	82	Pass
0.3290	3375	2926	86	Pass
0.3365	3080	2804	91	Pass
0.3440	2787	2654	95	Pass
0.3514	2520	2460	97	Pass
0.3589	2325	2340	100	Pass
0.3663	2114	2192	103	Pass
0.3738	1971	2066	104	Pass
0.3813	1826	1918	105	Pass
0.3887	1711	1822	106	Pass
0.3962	1583	1718	108	Pass
0.4036	1487	1629	109	Pass
0.4111	1398	1551	110	Pass
0.4186	1334	1480	110	Pass
0.4260	1260	1376	109	Pass
0.4335	1201	1295	107	Pass
0.4409	1143	1247	109	Pass
0.4484	1083	1176	108	Pass
0.4559	1029	1119	108	Pass

0.4633	957	1022	106	Pass
0.4708	918	952	103	Pass
0.4782	879	877	99	Pass
0.4857	849	795	93	Pass
0.4932	808	735	90	Pass
0.5006	771	687	89	Pass
0.5081	732	620	84	Pass
0.5155	701	550	78	Pass
0.5230	676	449	66	Pass
0.5305	655	395	60	Pass
0.5379	639	369	57	Pass
0.5454	620	355	57	Pass
0.5529	605	353	58	Pass
0.5603	588	345	58	Pass
0.5678	575	340	59	Pass
0.5752	560	336	60	Pass
0.5827	551	331	60	Pass
0.5902	539	328	60	Pass
0.5976	524	325	62	Pass
0.6051	510	322	63	Pass
0.6125	497	318	63	Pass
0.6200	4/4	314	66	Pass
0.6275	458	310	67	Pass
0.6349	448	308	68	Pass
0.6424	438	306	69	Pass
0.6498	429	303	70	Pass
0.6573	417	301	74	Pass
0.6648	403	300	74	Pass
0.6707	390 205	297	15	Pass
0.0797	202	294	70	Pass
0.0071	362	292	70	Page
0.0940	355	280	78	Lass Dace
0.7021	329	200	79	Pass
0.7055	338	270	80	Pass
0 7244	329	268	81	Pass
0 7319	320	264	82	Pass
0.7394	310	257	82	Pass
0.7468	306	255	83	Pass
0.7543	301	250	83	Pass
0.7617	296	249	84	Pass
0.7692	288	243	84	Pass
0.7767	283	233	82	Pass
0.7841	276	228	82	Pass
0.7916	270	225	83	Pass
0.7990	260	224	86	Pass
0.8065	253	220	86	Pass
0.8140	248	215	86	Pass
0.8214	239	205	85	Pass
0.8289	234	203	86	Pass
0.8363	227	198	87	Pass
0.8438	216	193	89	Pass
0.8513	205	186	90	Pass
0.8587	200	180	90	Pass
0.8662	194	170	87	Pass
0.8737	188	166	88	Pass
0.8811	184	163	88	Pass

0.8886	176	162	92	Pass
0.8960	170	157	92	Pass
0.9035	165	155	93	Pass
0.9110	160	154	96	Pass
0.9184	152	153	100	Pass

Water Quality BMP Flow and Volume for POC #1 On-line facility volume: 0.3169 acre-feet On-line facility target flow: 0.1598 cfs. Adjusted for 15 min: 0.1598 cfs. Off-line facility target flow: 0.1073 cfs. Adjusted for 15 min: 0.1073 cfs.

#### LID Report

LID Technique	Used for	Total Volume	Volume	Infiltration	Cumulative
Percent Water Quality	Percent	Comment			
	Treatment?	Needs	Through	Volume	Volume
Volume	Water Quality				
		Treatment	Facility	(ac-ft.)	Infiltration
Infiltrated	Treated				
		(ac-ft)	(ac-ft)		Credit
Vault 1 POC	N	2126.98			N
0.00					
Total Volume Infiltrated		2126.98	0.00	0.00	0.00
0.00 0%	No Treat. C	redit			
Compliance with LID Standa	ard 8				
Duration Analysis Result =	= Passed				

#### Perlnd and Implnd Changes

No changes have been made.

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### 5.4 Water Quality System

Water quality facilities have been designed to meet the general requirements outlined in the 2014 DOE Manual. The Western Washington Hydrology Model determined the treatment flow rates.

A biofiltration treatment facility referred to as a "modular wetland" will provide enhanced water quality treatment for developed area subject to treatment requirements. It will consist of a pretreatment chamber to remove sediment followed by a larger chamber containing biofiltration media. The modular wetland will provide treatment to stormwater after exiting the detention facility. A generic Modular Wetland detail can be found in Appendix 5-B. Sitespecific details will be provided with construction documents.

The water quality system will be designed/sized by Modular Wetlands to provide enhanced treatment per General Use Level Designation approval by the Department of Ecology (see Appendix 5-B for Modular wetland design sheet). As a treatment facility located downstream of the detention facility, the Modular Wetland will be sized to treat the 2-year release rate from the detention system.

2-Year Release Rate: 0.263 cfs

### **APPENDIX 5-B**

# WATER QUALITY FACILITY DESIGN AND SUPPORTING DOCUMENTS

	86	84	R	PROJECT NUMBE
	MILL CREEK	THE FARM AT		PROJECT NAME
1	EEK, WA	MILL CR	ON	PROJECT LOCATI
1				STRUCTURE ID
1		REQUIRED	TREATMENT	
1	SE RATE (CFS)	2-YEAR RELEA	ASED (CF)	VOLUME BA
	2567	0.26.		
SEE NOTE	N/A		AVAILABLE (FT)	TREATMENT HGL
1	15.8125	IF APPLICABLE	EQUIRED (CFS) –	PEAK BYPASS R
1	DIAMETER	MATERIAL	<i>I.E.</i>	PIPE DATA
1	18"	N/K	401.95	INLET PIPE
1	18"	N/K	401.45	OUTLET PIPE
	DISCHARGE	BIOFILTRATION	PRETREATMENT	
	414.06	414.06	414.06	RIM ELEVATION
1	H–20 DIRECT	H-20 DIRECT	H–20 DIRECT	SURFACE LOAD
1	ø24"	30" X 48"	ø30"	FRAME & COVER
1	5.43		OLUME (CY)	WETLANDMEDIA V
1	PER CONTRACT		DELIVERY METHOD	WETLANDMEDIA D
				ORIFICE SIZE (D

### **INSTALLATION NOTES**

- CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURERS SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURERS CONTRACT.
- 2. UNIT MUST BE INSTALLED ON LEVEL BASE. MANUFACTURER RECOMMENDS A MINIMUM 6" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE TO VERIFY PROJECT ENGINEERS RECOMMENDED BASE SPECIFICATIONS.
- ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE. 3. (PIPES CANNOT INTRUDE BEYOND FLUSH). INVERT OF OUTFLOW PIPE MUST BE FLUSH WITH DISCHARGE CHAMBER FLOOR. ALL GAPS AROUND PIPES SHALL BE SEALED WATER TIGHT WITH A NON-SHRINK GROUT PER MANUFACTURERS STANDARD CONNECTION DETAIL AND SHALL MEET OR EXCEED REGIONAL PIPE CONNECTION STANDARDS.
- CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING 4. PIPES.
- CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL RISERS. 5. MANHOLES. AND HATCHES. CONTRACTOR TO GROUT ALL MANHOLES AND HATCHES TO MATCH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.
- 6. DRIP OR SPRAY IRRIGATION REQUIRED ON ALL UNITS WITH VEGETATION.

### **GENERAL NOTES**

- MANUFACTURER TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
- ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS AND CAPACITIES ARE SUBJECT TO 2. CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS AND ACCESSORIES PLEASE CONTACT MANUFACTURER.



PATENTS OR OTHER PATENTS PENDING



### 6.0 CONVEYANCE SYSTEM ANALYSIS AND DESIGN

### **Conveyance Analysis**

The conveyance system onsite consists of a series of catch basins, area drains, and detention pipe that conveys stormwater across the site. Backwater conveyance analysis and design was conducted using StormShed 3G. A conveyance basin map was created that breaks down impervious and pervious area within the basins, see Figure 7.0. 100-year rainfall data from NOAA Atlas 2 was routed through the backwater model to evaluate the system for compliance, the HGL analysis is provided on the following pages. Based on the Stormshed 3G analysis there is no overtopping of the system during a 100-year storm event; therefore, the system is adequately sized.

### Conveyance Basin Areas:

<b>Basin 1</b> Impervious Lawn	0.85 Acres 0.14 Acres
<i>Basin 2</i> Impervious Lawn	0.30 Acres 0.03 Acres
<i>Basin 3</i> Impervious Lawn	0.39 Acres 0.11 Acres
<i>Basin 4</i> Impervious Lawn	0.09 Acres 0.02 Acres
<i>Basin 5</i> Impervious Lawn	0.42 Acres 0.54 Acres
<b>Basin 6</b> Impervious Lawn	0.08 Acres 0.00 Acres
<i>Basin 7</i> Impervious Lawn	1.80 Acres 0.10 Acres
<i>Basin 8</i> Impervious Lawn	0.05 Acres 0.00 Acres
<b>Basin 9</b> Impervious Lawn	0.14 Acres 0.02 Acres
<i>Basin 10</i> Impervious Lawn	0.22 Acres 0.02 Acres
<i>Basin 11</i> Impervious Lawn	0.48 Acres 0.00 Acres

### Basin 12

Impervious	0.44 Acres
Lawn	0.05 Acres

### Basin 13

Impervious	0.79 Acres
Lawn	0.08 Acres

### Basin 14 (Upstream Basin)

Impervious	3.17 Acres
Lawn	0.65 Acres



SOURCE INFORMATION	SOURCE AGENCY DESCRIPTION	KING COUNTY GIS PARCEL BOUNDARY	KING COUNTY GIS CONTOURS GENERATED FROM BARE EARTH LIDAR (KING COUNTY). THIS DATA HAS A STATED VERTICAL ACCUPACY OF APPROXIMATELY 1 FOOT.						
THANNIVERSARV		Surveying	Engineering Planning	e, WA 98072 Fx. 425.482.2893	www.LDCcorp.com				
			THE FARM AT MILL CREEK						
PROJECTION: WASHINGTON STATE PLANE, NORTH ZONE, NAD 83 HARN, FEET REVISION: JOB NUMBER: 17-127 DRAWING NAME: 17-127F07 DESIGNER: JTACCHINI DRAWING BY: K.MAO DATE: 08-30-18 SCALE: AS SHOWN JURISDICTION: MILL CREEK FIGURE: 7 <b>∩</b>									



### Appended on: Friday, March 08, 2019 2:57:45 PM

### ROUTEHYD [] THRU [The Farm North] USING [100 year] AND [TYPE1A.RAC] NOTZERO RELATIVE SCS/SBUH

Gravity Analysis using 24 hr duration storm

Reac h ID	Area (ac)	Flow (cfs)	Full Q (cfs)	Full ratio	nDept h (ft)	Depth ratio	Size	nVel (ft/s)	fVel (ft/s)	Infi l Vol (cf)	CBasin / Hyd
P-016	3.852 4	2.833 9	10.687 6	0.265 2	0.5272	0.351 5	18 in Dia m	5.112	6.0479	0.00	Basin 8;UpStrea m

P-015	3.852 4	2.833 9	12.265 7	0.231	0.4898	0.326 5	18 in Dia m	5.6533	6.941	0.00	
P-014	4.015 4	2.955 4	12.027 5	0.245 7	0.5062	0.337 5	18 in Dia m	5.6355	6.8062	0.00	Basin 9
P-013	4.263 7	3.145 3	24.196 1	0.13	0.3651	0.243 4	18 in Dia m	9.4555	13.692 2	0.00	Basin 10
P-012	4.746 3	3.531 3	30.815 3	0.114 6	0.344	0.229 3	18 in Dia m	11.550 8	17.437 9	0.00	Basin 11
P-011	5.228 9	3.917 3	33.699 5	0.116 2	0.3464	0.230 9	18 in Dia m	12.684	19.07	0.00	Basin 11
P-007	0.499 2	0.355 7	3.993	0.089 1	0.2017	0.201 7	12 in Dia m	3.1435	5.0841	0.00	Basin 3
P-008	0.499 2	0.355 7	4.0047	0.088 8	0.2014	0.201 4	12 in Dia m	3.1499	5.0989	0.00	
P-021	0.084 8	0.067 8	4.0302	0.016 8	0.0903	0.090 3	12 in Dia m	1.9262	5.1314	0.00	Basin 6
P-020	1.903 7	1.320 6	8.8496	0.149 2	0.2603	0.260 3	12 in Dia m	8.1238	11.267 6	0.00	Basin 7
P-019	1.903 7	1.320 6	7.2975	0.181	0.288	0.288	12 in Dia m	7.0528	9.2915	0.00	
P-018	1.903 7	1.320 6	8.8252	0.149 6	0.2607	0.260 7	12 in Dia m	8.1067	11.236 6	0.00	
P-017	1.988 5	1.388 5	4.0338	0.344 2	0.4046	0.404 6	12 in Dia m	4.6616	5.136	0.00	
P-009	3.360 4	2.413 3	4.0957	0.589 2	0.5522	0.552 2	12 in Dia m	5.4258	5.2148	0.00	Basin 13
P-010	9.072	6.699 6	12.453	0.538	0.7838	0.522 5	18 in Dia m	7.1713	7.047	0.00	Basin 12

### HGL Analysis

From	To	HG El	App	Bend	Junct Loss	Adjusted HG El	Max El
noue	node	(11)	(11)	(11)	(11)	(11)	(11)
							408.70
CB-18	Intake 2	409.1393	0.0763	0.0989	0.0300	409.1919	415.8500
CB-19	CB-18	415.1566		0.0193		415.1759	419.0300
CB-20	CB-19	421.4957		0.0097		421.5054	425.1800
CB-21	CB-20	423.5890		0.0049		423.5939	429.4100
CB-22	CB-21	423.9188		0.0838		424.0026	431.4300
EX-CB 1	CB-22	424.5743	0.4058	0.2405		424.4090	431.4000
EX-CB 2	EX-CB 1	424.8741				424.8741	431.0200
CB-23	CB-18	409.7727	0.0485	0.0641	0.0093	409.7976	412.5300
CB-29	CB-23	409.8056	0.0032	0.0041		409.8065	412.3600
CB-30	CB-29	409.8182				409.8182	410.0000
CB-24	CB-23	409.9601	0.0439	0.0571	0.0019	409.9752	412.2300
CB-25	CB-24	409.9728				409.9728	410.0000
CB-26	CB-24	412.6823		0.0044		412.6867	416.6700
CB-27	CB-26	416.6869		0.0151		416.7020	420.2700
CB-28	CB-27	421.6822				421.6822	425.4300

### **Conduit Notes**

Reach	HW Depth (ft)	HW/D ratio	Q (cfs)	TW Depth (ft)	Dc (ft)	Dn (ft)	Comment
P-010	6.1423	4.0949	6.70	5.7000	1.0020	0.7838	Outlet Control
P-011	1.0566	0.7044	3.92	5.5919	0.7574	0.3464	SuperCrit flow, Inlet end controls
P-012	0.9957	0.6638	3.53	1.0759	0.7172	0.3440	SuperCrit flow, Inlet end controls
P-013	0.9390	0.6260	3.15	1.0054	0.6751	0.3651	SuperCrit flow, Inlet end controls
P-014	0.9188	0.6125	2.96	0.9439	0.6533	0.5062	SuperCrit flow, Inlet end controls
P-015	1.4443	0.9629	2.83	1.0026	0.6393	0.4898	Outlet Control M1 Backwater

P-016	1.364	41	0.9094	2.83	1.279	0	0.6	393	0.5272	$\frac{O}{Ba}$	utlet Cont ackwater	rol M	1
P-009	5.674	45	5.6745	2.41	5.091	9	0.6	654	0.5522	20	utlet Cont	rol	
P-008	4.53	56	4.5356	0.36	4.527	6	0.2	461	0.2014	0	utlet Cont	rol	
P-007	4.01	82	4.0182	0.36	4.006	5	0.2	461	0.2017	0	utlet Cont	rol	
P-017	4.69	01	4.6901	1.39	4.527	6	0.4	987	0.4040	50	utlet Cont	rol	
P-021	3.82	55	3.8255	0.07	3.825	2	0.1	057	0.0903	3 O	utlet Cont	rol	
P-018	0.682	23	0.6823	1.32	3.825	2	0.4	858	0.260	Su cc	uperCrit flontrols	low, Iı	nlet end
P-019	0.68	59	0.6869	1.32	0.686	7	0.4	858	0.2880	$\int_{cc}$	uperCrit flontrols	low, Iı	nlet end
P-020	0.682	22	0.6822	1.32	0.702	0.7020 0.4		0.4858 0.2		Si cc	SuperCrit flow, Inlet end controls		
Reach ID	Area (ac)	Flow (cfs)	Full Q (cfs)	Full ratio	nDepth (ft)	Dep rati	th io	Siz	e nV (ft	/el /s)	fVel (ft/s)	Infil Vol (cf)	CBasin / Hyd
P-001	0.1147	0.083	7 4.6621	0.0179	0.093	0.09	93	12 i Dia	$\frac{1}{m}$ 2.2	761	5.936	0.00	Basin 4
P-002	1.0729	0.572	4 5.8542	0.0978	0.2112	0.21	12	12 i Dia	$\frac{1}{m}$ 4.7	362	7.4538	0.00	Basin 5
P-006	0.9889	0.737	5 4.0417	0.1825	0.2894	0.28	94	12 i Dia	m 3.9	133	5.1461	0.00	Basin 1
P-005	1.314	0.988	9 4.0374	0.2449	0.3369	0.33	69	12 i Dia	$\frac{1}{m}$ 4.2	534	5.1406	0.00	Basin 2
P-003	2.3869	1.561	3 6.8262	0.2287	0.325	0.32	25	12 i Dia	$\frac{1}{m}$ 7.0	545	8.6914	0.00	
P-004	2.3869	1.561	3 9.1219	0.1712	0.2793	0.27	93	12 i Dia	m 8.7	)09	11.6144	0.00	

### HGL Analysis

From Node	To Node	HG El (ft)	App (ft)	Bend (ft)	Junct Loss (ft)	Adjusted HG El (ft)	Max El (ft)
							408.70
CB-10	Intake 1	408.8029	0.0614	0.0009		408.7425	413.0000
CB-11	CB-10	408.8527	0.0246	0.0010	0.0092	408.8383	412.7600
CB-14	CB-11	408.8607	0.0002	0.0002		408.8608	411.5200
CB-14A	CB-14	408.8611				408.8611	410.0000
CB-12	CB-11	408.8859	0.0137	0.0007		408.8729	410.9700
CB-13	CB-12	408.9226				408.9226	410.0000

### **Conduit Notes**

Reach	HW Depth (ft)	HW/D ratio	Q (cfs)	TW Depth (ft)	Dc (ft)	Dn (ft)	Comment
P-004	5.8029	5.8029	1.56	5.7000	0.5303	0.2793	Outlet Control
P-003	4.8527	4.8527	1.56	4.7425	0.5303	0.3250	Outlet Control
P-002	4.1607	4.1607	0.57	4.1383	0.3144	0.2112	Outlet Control
P-001	2.8611	2.8611	0.08	2.8608	0.1177	0.0930	Outlet Control
P-005	4.1859	4.1859	0.99	4.1383	0.4177	0.3369	Outlet Control
P-006	3.9226	3.9226	0.74	3.8729	0.3585	0.2894	Outlet Control

# 7.0 SPECIAL REPORTS AND STUDIES

- Geotechnical Report dated March 14th, 2018, Revised August 9, 2018 by Terra Associates.
- Infiltration Field Testing dated November 15th, 2018, by Terra Associates.

# 8.0 OPERATIONS AND MAINTENANCE MANUAL

An Operations and Maintenance Manual based on guidance provided in the 2014 Ecology Storm water Manual (unless otherwise noted) is included in Appendix 8-A

### **APPENDIX 8-A**

## **OPERATIONS AND MAINTENANCE MANUAL**

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed	
Storage Area	Plugged Air Vents	One-half of the cross section of a vent is blocked at any point or the vent is damaged.	Vents open and functioning.	
	Debris and Sediment	Accumulated sediment depth exceeds 10% of the diameter of the storage area for 1/2 length of storage vault or any point depth exceeds 15% of diameter.	All sediment and debris removed from storage area.	
		(Example: 72-inch storage tank would require cleaning when sediment reaches depth of 7 inches for more than 1/2 length of tank.)		
	Joints Between Tank/Pipe Section	Any openings or voids allowing material to be transported into facility.	All joint between tank/pipe sections	
		(Will require engineering analysis to determine structural stability).	are sealed.	
	Tank Pipe Bent Out of Shape	Any part of tank/pipe is bent out of shape more than 10% of its design shape. (Review required by engineer to determine structural stability).	Tank/pipe repaired or replaced to design.	
	Vault Structure Includes Cracks in Wall, Bottom, Damage to Frame and/or Top Slab	Cracks wider than 1/2-inch and any evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determines that the vault is not structurally sound.	Vault replaced or repaired to design specifications and is structurally sound.	
		Cracks wider than 1/2-inch at the joint of any inlet/outlet pipe or any evidence of soil particles entering the vault through the walls.	No cracks more than 1/4-inch wide at the joint of the inlet/outlet pipe.	
Manhole	Cover Not in Place	Cover is missing or only partially in place. Any open manhole requires maintenance.	Manhole is closed.	
	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 1/2 inch of thread (may not apply to self-locking lids).	Mechanism opens with proper tools.	
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. Intent is to keep cover from sealing off access to maintenance.	Cover can be removed and reinstalled by one maintenance person.	
	Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, misalignment, not securely attached to structure wall, rust, or cracks.	Ladder meets design standards. Allows maintenance person safe access.	
Catch Basins	See "Catch Basins" (No. 5)	See "Catch Basins" (No. 5).	See "Catch Basins" (No. 5).	

No. 3 – Closed Detention Systems (Tanks/Vaults)

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Trash and Debris (Includes Sediment)	Material exceeds 25% of sump depth or 1 foot below orifice plate.	Control structure orifice is not blocked. All trash and debris removed.
	Structural Damage	Structure is not securely attached to manhole wall.	Structure securely attached to wall and outlet pipe.
		Structure is not in upright position (allow up to 10% from plumb).	Structure in correct position.
		Connections to outlet pipe are not watertight and show signs of rust.	Connections to outlet pipe are water tight; structure repaired or replaced and works as designed.
		Any holesother than designed holesin the structure.	Structure has no holes other than designed holes.
Cleanout Gate	Damaged or Missing	Cleanout gate is not watertight or is missing.	Gate is watertight and works as designed.
		Gate cannot be moved up and down by one maintenance person.	Gate moves up and down easily and is watertight.
		Chain/rod leading to gate is missing or damaged.	Chain is in place and works as designed.
		Gate is rusted over 50% of its surface area.	Gate is repaired or replaced to meet design standards.
Orifice Plate	Damaged or Missing	Control device is not working properly due to missing, out of place, or bent orifice plate.	Plate is in place and works as designed.
	Obstructions	Any trash, debris, sediment, or vegetation blocking the plate.	Plate is free of all obstructions and works as designed.
Overflow Pipe	Obstructions	Any trash or debris blocking (or having the potential of blocking) the overflow pipe.	Pipe is free of all obstructions and works as designed.
Manhole	See "Closed Detention Systems" (No. 3).	See "Closed Detention Systems" (No. 3).	See "Closed Detention Systems" (No. 3).
Catch Basin	See "Catch Basins" (No. 5).	See "Catch Basins" (No. 5).	See "Catch Basins" (No. 5).

### No. 4 – Control Structure/Flow Restrictor

### No. 5 – Catch Basins

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Trash & Debris	Trash or debris which is located immediately in front of the catch basin opening or is blocking inletting capacity of the basin by more than 10%.	No Trash or debris located immediately in front of catch basin or on grate opening.
		Trash or debris (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of six inches clearance from the debris surface to the invert of the lowest pipe.	No trash or debris in the catch basin.
		Trash or debris in any inlet or outlet pipe blocking more than 1/3 of its height.	Inlet and outlet pipes free of trash or debris.
		Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).	No dead animals or vegetation present within the catch basin.
	Sediment	Sediment (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6 inches clearance from the sediment surface to the invert of the lowest pipe.	No sediment in the catch basin
	Structure Damage to Frame and/or	Top slab has holes larger than 2 square inches or cracks wider than 1/4 inch	Top slab is free of holes and cracks.
	Top Slab	into basin).	
		Frame not sitting flush on top slab, i.e., separation of more than 3/4 inch of the frame from the top slab. Frame not securely attached	Frame is sitting flush on the riser rings or top slab and firmly attached.
	Fractures or Cracks in Basin Walls/ Bottom	Maintenance person judges that structure is unsound.	Basin replaced or repaired to design standards.
		Grout fillet has separated or cracked wider than 1/2 inch and longer than 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering catch basin through cracks.	Pipe is regrouted and secure at basin wall.
	Settlement/ Misalignment	If failure of basin has created a safety, function, or design problem.	Basin replaced or repaired to design standards.
	Vegetation	Vegetation growing across and blocking more than 10% of the basin opening.	No vegetation blocking opening to basin.
		Vegetation growing in inlet/outlet pipe joints that is more than six inches tall and less than six inches apart.	No vegetation or root growth present.

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
	Contamination and Pollution	See "Detention Ponds" (No. 1).	No pollution present.
Catch Basin Cover	Cover Not in Place	Cover is missing or only partially in place. Any open catch basin requires maintenance.	Catch basin cover is closed
	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 1/2 inch of thread.	Mechanism opens with proper tools.
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure.	Cover can be removed by one maintenance person.
		(Intent is keep cover from sealing off access to maintenance.)	
Ladder	Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, not securely attached to basin wall, misalignment, rust, cracks, or sharp edges.	Ladder meets design standards and allows maintenance person safe access.
Metal Grates (If Applicable)	Grate opening Unsafe	Grate with opening wider than 7/8 inch.	Grate opening meets design standards.
	Trash and Debris	Trash and debris that is blocking more than 20% of grate surface inletting capacity.	Grate free of trash and debris.
	Damaged or Missing.	Grate missing or broken member(s) of the grate.	Grate is in place and meets design standards.

#### No. 5 – Catch Basins (continued)

Drainage System	Potenti al	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is
General	Obstructions, Including Roots	Root enters or deforms pipe, reducing flow.	Use mechanical methods to remove root if possible. Use of chemicals to remove roots shall be done in accordance with
	Pipe Dented or Broken	Inlet/outlet piping damaged or broken and in need of repair.	Pipe repaired and/or replaced.
	Pipe Rusted or Deteriorated	Any part of the piping that is crushed or deformed more than 20% or any other failure to the piping.	Pipe repaired and/or replaced.
	Sediment & Debris	Sediment depth is greater than 20% of pipe diameter.	Install upstream debris traps (where applicable) then clean pipe and
	Debris barrier or Trash Rack Missing	A debris barrier or trash rack that had been installed on the end of a drainage pipe is missing	Debris barrier or trash rack is replaced.
	Joint/Se al Problem	The joint between pipe sections is separated and/or the seal at the joint is cracked or broken.	The joint and/or seal is repaired so that joint is not separated and is

No. 21 - Conveyance Storm Pipes (Source: 2016 Snohomish County Drainage Manual)



# Maintenance Guidelines for Modular Wetland System - Linear

### Maintenance Summary

- o Remove Trash from Screening Device average maintenance interval is 6 to 12 months.
  - (5 minute average service time).
- Remove Sediment from Separation Chamber average maintenance interval is 12 to 24 months.
  - (10 minute average service time).
- o Replace Cartridge Filter Media average maintenance interval 12 to 24 months.
  - (10-15 minute per cartridge average service time).
- o Replace Drain Down Filter Media average maintenance interval is 12 to 24 months.
  - (5 minute average service time).
- o Trim Vegetation average maintenance interval is 6 to 12 months.
  - (Service time varies).

### System Diagram

Access to screening device, separation chamber and cartridge filter



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# Maintenance Procedures

### Screening Device

- 1. Remove grate or manhole cover to gain access to the screening device in the Pre-Treatment Chamber. Vault type units do not have screening device. Maintenance can be performed without entry.
- 2. Remove all pollutants collected by the screening device. Removal can be done manually or with the use of a vacuum truck. The hose of the vacuum truck will not damage the screening device.
- 3. Screening device can easily be removed from the Pre-Treatment Chamber to gain access to separation chamber and media filters below. Replace grate or manhole cover when completed.

### Separation Chamber

- 1. Perform maintenance procedures of screening device listed above before maintaining the separation chamber.
- 2. With a pressure washer spray down pollutants accumulated on walls and cartridge filters.
- 3. Vacuum out Separation Chamber and remove all accumulated pollutants. Replace screening device, grate or manhole cover when completed.

### Cartridge Filters

- 1. Perform maintenance procedures on screening device and separation chamber before maintaining cartridge filters.
- 2. Enter separation chamber.
- 3. Unscrew the two bolts holding the lid on each cartridge filter and remove lid.
- 4. Remove each of 4 to 8 media cages holding the media in place.
- 5. Spray down the cartridge filter to remove any accumulated pollutants.
- 6. Vacuum out old media and accumulated pollutants.
- 7. Reinstall media cages and fill with new media from manufacturer or outside supplier. Manufacturer will provide specification of media and sources to purchase.
- 8. Replace the lid and tighten down bolts. Replace screening device, grate or manhole cover when completed.

### Drain Down Filter

- 1. Remove hatch or manhole cover over discharge chamber and enter chamber.
- 2. Unlock and lift drain down filter housing and remove old media block. Replace with new media block. Lower drain down filter housing and lock into place.
- 3. Exit chamber and replace hatch or manhole cover.

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# Maintenance Notes

- 1. Following maintenance and/or inspection, it is recommended the maintenance operator prepare a maintenance/inspection record. The record should include any maintenance activities performed, amount and description of debris collected, and condition of the system and its various filter mechanisms.
- 2. The owner should keep maintenance/inspection record(s) for a minimum of five years from the date of maintenance. These records should be made available to the governing municipality for inspection upon request at any time.
- 3. Transport all debris, trash, organics and sediments to approved facility for disposal in accordance with local and state requirements.
- 4. Entry into chambers may require confined space training based on state and local regulations.
- 5. No fertilizer shall be used in the Biofiltration Chamber.
- 6. Irrigation should be provided as recommended by manufacturer and/or landscape architect. Amount of irrigation required is dependent on plant species. Some plants may require irrigation.



# **Maintenance Procedure Illustration**

### **Screening Device**

The screening device is located directly under the manhole or grate over the Pre-Treatment Chamber. It's mounted directly underneath for easy access and cleaning. Device can be cleaned by hand or with a vacuum truck.



#### Separation Chamber

The separation chamber is located directly beneath the screening device. It can be quickly cleaned using a vacuum truck or by hand. A pressure washer is useful to assist in the cleaning process.







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### Cartridge Filters

The cartridge filters are located in the Pre-Treatment chamber connected to the wall adjacent to the biofiltration chamber. The cartridges have removable tops to access the individual media filters. Once the cartridge is open media can be easily removed and replaced by hand or a vacuum truck.







### Drain Down Filter

The drain down filter is located in the Discharge Chamber. The drain filter unlocks from the wall mount and hinges up. Remove filter block and replace with new block.



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## **Trim Vegetation**

Vegetation should be maintained in the same manner as surrounding vegetation and trimmed as needed. No fertilizer shall be used on the plants. Irrigation per the recommendation of the manufacturer and or landscape architect. Different types of vegetation requires different amounts of irrigation.









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## **Inspection Form**



Modular Wetland System, Inc. P. 760.433-7640 F. 760-433-3176 E. Info@modularwetlands.com

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Project Name									For Office Use On	For Office Use Only		
Project Address										(Reviewed By)		
Owner / Management Company												
Contact Phone ( ) -								(Date) Office personnel to complete section to the left.				
Inspector Name					Date	/	/		Time		AM / PM	
Type of Inspection Routine Follow Up Complaint Storm Storm Event in Last 72-hours? No Yes										/es		
Weather Condition	eather Condition Additional Notes											
Inspection Checklist												
Modular Wetland System Type (Curb, Grate or UG Vault): Size (22', 14' or etc.):												
Structural Integrity: Yes							No	Comments				
Damage to pre-treatment access cover (manhole cover/grate) or cannot be opened using normal lifting pressure? Damage to discharge chamber access cover (manhole cover/grate) or cannot be opened using normal lifting pressure?												
Does the MWS unit show signs of structural deterioration (cracks in the wall, damage to frame)?												
Is the inlet/outlet pipe or drain down pipe damaged or otherwise not functioning properly?												
Working Condition:												
Is there evidence of illicit discharge or excessive oil, grease, or other automobile fluids entering and clogging the unit?												
Is there standing water in inappro	opriate areas	after a dry p	eriod?									
Is the filter insert (if applicable) at	t capacity and	d/or is there	an accumulat	tion of deb	ris/trash on th	e shelf sys	stem?					
Does the depth of sediment/trash/debris suggest a blockage of the inflow pipe, bypass or cartridge filter? If yes, specify which one in the comments section. Note depth of accumulation in in pre-treatment chamber.									Depth:			
Does the cartridge filter media need replacement in pre-treatment chamber and/or discharge chamber?								Chamber:				
Any signs of improper functioning	g in the disch	arge chambe	er? Note issu	ies in com	ments section							
Other Inspection Items:												
Is there an accumulation of sediment/trash/debris in the wetland media (if applicable)?												
Is it evident that the plants are alive and healthy (if applicable)? Please note Plant Information below.												
Is there a septic or foul odor coming from inside the system?												
Waste:	Yes	No		R	Recommended Maintenance			Plant Information				
Sediment / Silt / Clay				No Clean	ing Needed					Damage to Plants		
Trash / Bags / Bottles				Schedule	Maintenance	as Planne	ed			Plant Replacement		
Green Waste / Leaves / Foliage				Needs Im	imediate Main	enance				Plant Trimming		

Additional Notes:



## **Maintenance Report**



Modular Wetland System, Inc. P. 760.433-7640 F. 760-433-3176 E. Info@modularwetlands.com

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## Cleaning and Maintenance Report Modular Wetlands System



Project N	For Of	or Office Use Only							
Project Address									
Owner / I	Management Company					(Date)			
Contact				Phone (	)	-	Office	Office personnel to complete section to the left.	
Inspector Name				Date	/	_/	Time	AM / PM	
Type of Inspection  Routine  Follow Up Complaint				Storm		Storm Event in	Last 72-hours?	] No 🔲 Yes	
Weather Condition				Additional Notes					
Site Map #	GPS Coordinates of Insert	Manufacturer / Description / Sizing	Trash Accumulation	Foliage Accumulation	Sediment Accumulation	Total Debris Accumulation	Condition of Media 25/50/75/100 (will be changed @ 75%)	Operational Per Manufactures' Specifications (If not, why?)	
	Lat: Long:	MWS Catch Basins							
		MWS Sedimentation Basin							
		Media Filter Condition							
	Plant Condition       Drain Down Media       Condition       Discharge Chamber       Condition								
		Drain Down Pipe Condition							
		Inlet and Outlet Pipe Condition							
Commen	ts:								