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OGDEN POINT RESIDENCE

LIMITED DRAINAGE REPORT Mercer Island, Washington

3675 West Mercer Way
Mercer Island, WA 98040

Issued: November 9, 2017

Prepared For:

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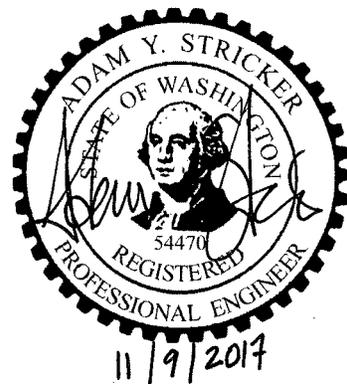


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1 EXECUTIVE SUMMARY

The purpose of this Limited Drainage Report is to provide a drainage summary of the proposed design conditions and conveyance calculations for the Ogden Point Residence (project). The project is a single-family residential redevelopment that proposes to construct two new single-family residences and accessory dwelling unit (ADU) in place of an existing single-family residence within the City of Mercer Island. The project consists of three existing lots of an existing short plat, with parcel numbers 3623500275 3623500274 and 3623500274, which have the physical addresses of 3675 West Mercer Way, Mercer Island, WA 98040. These three lots will be consolidated into two separate lots through a lot line revision. These new lots, Lot 1 and Lot 2, will both develop a new single family residence with Lot 1 having an additional ADU. The combined area of the two proposed lots is 51,454 sq. ft. or 1.18 acres.

Although the proposed developments for Lot 1 and Lot 2 will have separate building permit applications, this drainage report will address the combined stormwater impacts of both sites.

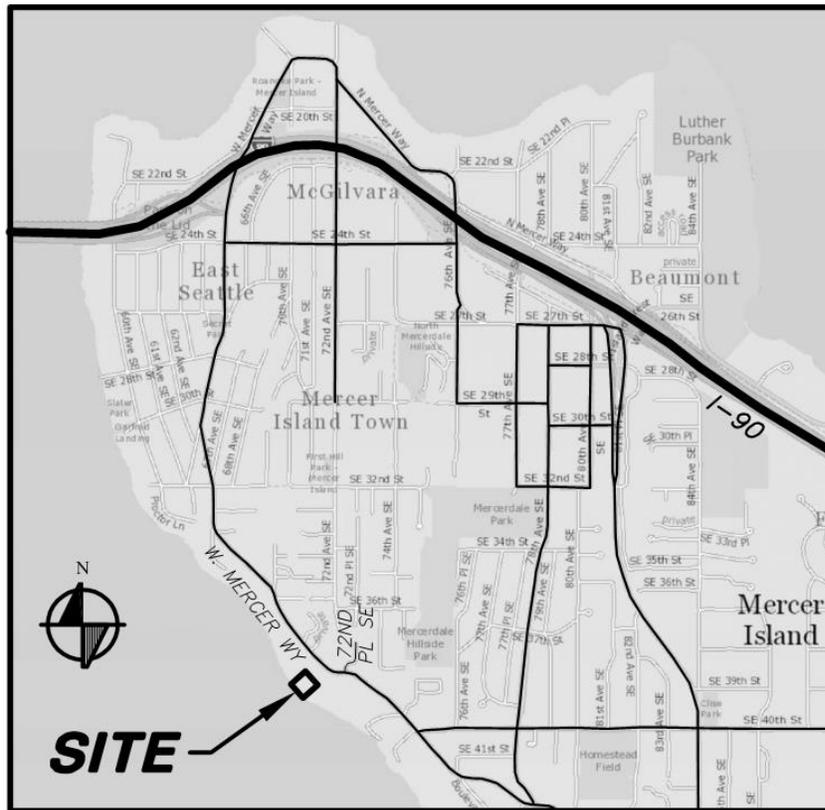
More generally, the site is located in a portion of the Southwest $\frac{1}{4}$ of the Southwest $\frac{1}{4}$ of Section 12, Township 24 North, Range 4 East, W.M., King County, Washington.

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VICINITY MAP
NOT TO SCALE

The Ogden Point Residence is a redevelopment project and is required to comply with Minimum Requirements 1-10 of the 2012 Department of Ecology Stormwater Manual for Western Washington (DOE Manual). See Section 2 of this report for an outline of the Minimum Requirements in Chapter 2 of Volume I of the DOE Manual, and how they have been addressed for this project.

1.1 Existing Conditions

The existing site consists of a single-family residence with a paved shared private driveway that accesses West Mercer Way. Other site features include two out buildings, two docks and several landscaping features. The remaining site area is primarily open lawn with landscaped shrubs and trees near the existing residences and along the property lines. Site

topography slopes towards the southwest, towards Lake Washington, and has an average slope of 27% which includes the unused steep slope along the east property line. Geotech Consultants Inc. has performed a geotechnical analysis of the site and summarizes their findings in their report *Geotechnical Engineering Study - Proposed Ogden Point Residence* dated January 3, 2017. This report describes in depth the onsite soils but generally found to have sand fill soils over native dense silty soils. Based on this report a till/type D soil classification was used for stormwater design and hydrologic modeling.

The site is bordered to the south west by Lake Washington and is bordered by single family houses on all other sides. Stormwater runoff from the existing residence is collected by roof downspouts and catchbasins and is conveyed to the southeast until it reaches a 6-inch storm outfall into Lake Washington. The remainder of the runoff from the parcel appears to sheet flow into Lake Washington.

There are critical areas on site which include potential slide areas, seismic hazard, steep slopes, erosion and geologic hazard areas. Refer to the Geotech Consultant Inc. report for a detailed description of these areas and the proposed mitigation measures. In general, retaining walls will be used to mitigate the steep slopes and erosion hazard areas and a structural foundation design which includes pin piles will be used to mitigate the seismic and geologic hazard areas.

1.2 Developed Conditions

The developed site proposes to demolish the existing single family residence and onsite driveway and to construct a new single-family residence and ADU on Lot 1 and a new single family residence on Lot 2. The new residences will share an access to the offsite private driveway the accesses West Mercer Way. A cut retaining wall will be constructed at the eastern edge of the development to provide a level grade for the proposed development. Retaining wall design is described by Geotech Consultants Inc. in their aforementioned *Geotechnical Engineering Study and in their report titled Shoring addendum – Proposed Ogden Point Development dated September 9, 2017*. The structural design of this wall is provided by others. The drainage recommendations made by Geotechnical Consultants in their two reports for wall drains and foundation drainage have been incorporated into the stormwater design of this project by providing a conveyance system and an appropriate depth to serve the wall and footing drains. Other site improvements include new water, fire, sewer and dry utility services.

Stormwater mitigation for the project will include the collection and conveyance of the stormwater using a network of area drains, trench drains, catch basins comprised of 4-inch to 8-inch storm pipes to allow for a direct discharge to Lake Washington. An 8-inch outlet to Lake Washington will be constructed at an elevation strictly above the ordinary high water mark of the Lake. Roof and footing drains will be tied to upstream catch basins or yard drains. A water quality catchbasin with stormfilter, which provide basic water quality treatment, will be installed downstream of the motorcourt/driveways, which are the only proposed pollution generating impervious surfaces.

Small areas along the shoreline will not gravity drain to the proposed storm system. This area will sheet flow directly into Lake Washington.

2 Minimum Requirements

The following is an outline of Minimum Requirements 1-10 of the 2012 Department of Ecology Stormwater Manual for Western Washington. Responses to each of the Minimum Requirements are provided below as they pertain to the Ogden Point Residence.

Minimum Requirement #1: Preparation of Stormwater Site Plans

This report, along with *Sheet C3 – Grading and Utility Plan* of the Civil Plan Set, serve as the Stormwater Site Plan for the project.

Minimum Requirement #2: Stormwater Pollution Prevention Plans (SWPPPs)

Sheet C2 –TESC Plan of the Civil Plan Set will serve as the SWPPP for this project. Due to the project's size (greater than one acre of disturbance), a separate NPDES permit to discharge construction runoff is required.

Minimum Requirement #3: Source Control of Pollution

An oil/water separator consisting of a down-turned elbow within the farthest downstream catch basin (CB #1). This project will provide a basic water quality treatment facility consisting of a stormfilter manhole to treat runoff from the motocourt/driveway. The total PGIS area for the project is 6,045 sq. ft.

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

A survey of the existing site revealed one existing 6" storm outfall to Lake Washington. This storm outfall will be utilized for the proposed Ogden Point Residence improvements and will maintain the existing drainage pattern to Lake Washington. The remainder of the site that is not collected by the existing storm system, naturally sheet flows into Lake Washington.

Minimum Requirement #5: On-site Stormwater Management

Stormwater mitigation for the project will include the collection and conveyance of the stormwater using a network of area drains, trench drains, catch basins comprised of 6-inch

to 8-inch storm pipes to allow for a direct discharge to Lake Washington. The Roof and footing drains will be tied into the conveyance system upstream of the stormwater outfall.

Small areas along the shoreline will not gravity drain to the proposed storm system. This area will sheet flow directly into Lake Washington.

Minimum Requirement #6: Runoff Treatment

The total PGIS area for the project is 5,864 sq. ft. and are all considered new hard surfaces, therefore requiring this project to provide runoff treatment per minimum requirement 6. This is residential project that discharges to Lake Washington, which is a basic treatment receiving water. Therefore this project is required to provide basic water quality treatment. Water quality will be provided by a stormfilter catchbasin. A stormfilter sizing letter is attached to this report, along with a tributary area exhibit showing the impervious and pervious areas tributary to the stormfilter and a Western Washington Hydrologic Model 2012 (WWHM) modeling output used to size the stormfilter facility.

Minimum Requirement #7: Flow Control

The project will create more than 500 sq. ft. of impervious surface however runoff from the proposed impervious surfaces will be discharged directly to Lake Washington, a designated receiving water body. Flow control is not required for this project per the Storm Water Flow Control/Detention Design Requirements set forth by Mercer Island.

Minimum Requirement #8: Wetland Protection

Not applicable. There are no mapped wetlands areas on the project site.

Minimum Requirement #9: Basin/Watershed Planning

No special basin and/or watershed specific requirements were revealed during the site resource review.

Minimum Requirement #10: Operation and Maintenance

Operation and Maintenance guidelines for the private stormwater system have been included on the following pages.

3 CONVEYANCE SIZING

The Ogden Point Residence storm conveyance pipes were sized using the 100-year flows calculated using the Rational Method ($Q=CIA$). The project was broken into 2 basins at the critical points in the system. The North basin drains to a system of yard drains and 6" pipes which accept downspout and foundation drain connections. The south basin consists of 8" pipes and collects the motor court, wall drains, downspouts and all of the proposed lot 2 developments. These systems combine at CB#2, which flows to CB#1 and then discharges to Lake Washington via a new 8" outfall. The calculations can be found on the following pages. Assumptions for the calculations are as follows:

North Basin

Total Area	= 0.24 acres
Impervious Coverage	= 0.11 acres
Pervious Coverage	= 0.13 acres
I_{100}	= 2.7 inches/hour (taken from the Renton-Seattle rainfall intensities)
T_c	= 10 minutes

South Basin

Total Area	= 0.78 acres
Impervious Coverage	= 0.27 acres
Pervious Coverage	= 0.51 acres
I_{100}	= 2.7 inches/hour (taken from the Renton-Seattle rainfall intensities)
T_c	= 10 minutes

The calculated Q_{100} for the North Basin was analyzed to be 0.35 cfs. A 6" pipe with a slope of 1.00% has a capacity of 0.61 cfs. All 6" pipes in the North Basin have slopes of 1.0% or greater.

The calculated Q_{100} for the South Basin was analyzed to be 0.48 cfs. An 8" pipe with a slope of 2.0% has a capacity of 1.80 cfs. All 8" pipes in the CB #6 Basin have slopes of 1.4% or greater. Pipe capacities were determined using Manning's equation for pipes with an n value of 0.012. These calculations are attached to this report.

4.6 Maintenance Standards for Drainage Facilities

The facility-specific maintenance standards contained in this section are intended to be conditions for determining if maintenance actions are required as identified through inspection. They are not intended to be measures of the facility's required condition at all times between inspections. In other words, exceedence of these conditions at any time between inspections and/or maintenance does not automatically constitute a violation of these standards. However, based upon inspection observations, the inspection and maintenance schedules shall be adjusted to minimize the length of time that a facility is in a condition that requires a maintenance action.

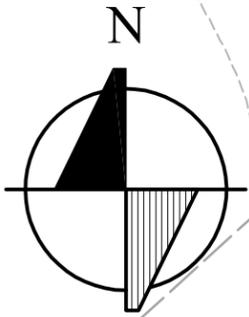
Table 4.5 – Maintenance Standards

No. 5 – Catch Basins

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. (Intent is keep cover from sealing off access to maintenance.)	Cover can be removed by one maintenance person.
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. 6 – Debris Barriers (e.g., Trash Racks)

Maintenance Components	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Trash and Debris	Trash or debris that is plugging more than 20% of the openings in the barrier.	Barrier cleared to design flow capacity.
Metal	Damaged/ Missing Bars.	Bars are bent out of shape more than 3 inches.	Bars in place with no bends more than 3/4 inch.
		Bars are missing or entire barrier missing.	Bars in place according to design.
		Bars are loose and rust is causing 50% deterioration to any part of barrier.	Barrier replaced or repaired to design standards.
	Inlet/Outlet Pipe	Debris barrier missing or not attached to pipe	Barrier firmly attached to pipe



SCALE: 1" = 30'



- TRIBUTARY PGIS (6,045 SF)
- TRIBUTARY NPGIS (2,762 SF)
- TRIBUTARY PERVIOUS (11,070 SF)



ojs, Nov 09, 2017 - 1:29pm
 P:\LDYB00000002\0400CAD\EC\EXHIBITS\LDYB0002 Stricker 17-1101 stormfilter ex.dwg, Ogdan stormfilter ex

STORMFILTER BASIN EXHIBIT
OGDEN RESIDENCE
 CITY OF MERCER ISLAND, WASHINGTON

NO.	DATE	REVISION	BY	CHK

ADAM STRICKER, PE
 PROJECT MANAGER
 MARY MCDONELL, PLS
 PROJECT SURVEYOR
 ADAM STRICKER, PE
 PROJECT ENGINEER
 PROJECT LANDSCAPE ARCHITECT
 FIRST SUBMITTAL DATE:
 SCALE: HORIZ.: VERT.:

**WWHM2012
PROJECT REPORT**

Project Name: LDBY Stormfilter 17-1101
Site Name:
Site Address:
City :
Report Date: 11/9/2017
Gage : Seatac
Data Start : 1948/10/01
Data End : 2009/09/30
Precip Scale: 1.00
Version Date: 2016/02/25
Version : 4.2.12

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

High Flow Threshold for POC 1: 50 year

PREDEVELOPED LAND USE

Name : TOTAL SITE
Bypass: No

GroundWater: No

<u>Pervious Land Use</u>	<u>acre</u>
C, Lawn, Mod	.25
Pervious Total	0.25
<u>Impervious Land Use</u>	<u>acre</u>
ROADS FLAT	0.2
Impervious Total	0.2
Basin Total	0.45

Element Flows To:

Surface	Interflow	Groundwater
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MITIGATED LAND USE

Name : TOTAL SITE
Bypass: No

GroundWater: No

<u>Pervious Land Use</u>	<u>acre</u>
C, Lawn, Mod	.25
Pervious Total	0.25
<u>Impervious Land Use</u>	<u>acre</u>
ROADS FLAT	0.13
Impervious Total	0.13
Basin Total	0.38

Element Flows To:		
Surface	Interflow	Groundwater

ANALYSIS RESULTS

Stream Protection Duration

Predeveloped Landuse Totals for POC #1
Total Pervious Area:0.25
Total Impervious Area:0.2

Mitigated Landuse Totals for POC #1
Total Pervious Area:0.25
Total Impervious Area:0.13

Flow Frequency Return Periods for Predeveloped. POC #1

<u>Return Period</u>	<u>Flow(cfs)</u>
2 year	0.09653
5 year	0.13149
10 year	0.156661
25 year	0.190836
50 year	0.21806
100 year	0.246835

Flow Frequency Return Periods for Mitigated. POC #1

<u>Return Period</u>	<u>Flow(cfs)</u>
2 year	0.0702
5 year	0.099061
10 year	0.12041
25 year	0.150021
50 year	0.174054
100 year	0.199831

Water Quality BMP Flow and Volume for POC #1
On-line facility volume: 0.0327 acre-feet
On-line facility target flow: 0.0327 cfs.
Adjusted for 15 min: 0.0327 cfs.
Off-line facility target flow: 0.0181 cfs.
Adjusted for 15 min: 0.0181 cfs.

Perlnd and Implnd Changes

No changes have been made.

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Prepared by Mike Gillette on November 3, 2017

Ogden Residence – Stormwater Treatment System

Mercer Island, WA

Information provided:

- Presiding agency = City of Mercer Island

Structure ID	Option #1	Option #2
Water Quality Flow Rate (cfs)	0.033	0.033
Peak Flow Rate (cfs)	< 1.0	< 1.0
Number of cartridges	2	2
Cartridge flow rate (gpm)	7.5	7.5
Media type	ZPG	ZPG
Structure size	Steel Catch Basin	48" Manhole
Approximate Price	\$10,000	\$16,000

**Only one of the above options is required.

Option 1 Notes:

- Depth required from rim to outlet = 2.3' – 4.25'.
- Steel catch basin can have a maximum of two inlets.

Option 2 Notes:

- Depth required from rim to outlet = 5.5'+.
- Precast manhole can have three 8" inlets at 90 degrees apart.
- Drop required from inlet to outlet is 2.3'.

Size and cost estimate:

The StormFilter is a flow-based system, and is therefore sized by calculating the peak water quality flow rate associated with the design storm. The water quality flow rate was calculated by the consulting engineer using WWHM and was provided to Contech Engineered Solutions LLC for the purposes of developing this estimate.

The StormFilter for this site was sized based on the above water quality flow rate. To accommodate this flow rate, Contech Engineered Solutions recommends using (2) – 18" cartridges with ZPG media. The estimated cost of this system is shown in the above table; this estimate includes a complete system delivered to the job site. The final system cost will depend on the actual depth of the units and whether extras like doors rather than castings are specified. The contractor is responsible for setting the StormFilter manhole and all external plumbing.

Typically the StormFilter manhole/catch basin has an internal bypass capacity of 1.0 cfs. Since the peak discharge is not expected to exceed this rate, a high-flow bypass upstream of the StormFilter system is not required.



Determining Number of Cartridges for Flow Based Systems

CONTECH Stormwater Solutions Inc. Engineer:
Date

MSG
11/3/2017

Site Information

Project Name
Project State
Project Location
Drainage Area, Ad
Impervious Area, Ai
Pervious Area, Ap
% Impervious
Runoff Coefficient, Rc
Water quality flow
Peak storm flow

Ogden Residence
Washington
Mercer Island
0.45 ac
0.20 ac
0.25
44%
0.45
0.033 cfs
1.00 cfs

Filter System

Filtration brand
Cartridge height
Specific Flow Rate
Flow rate per cartridge

StormFilter
18 in
1.00 gpm/ft²
7.5 gpm

SUMMARY

Number of Cartridges	2
----------------------	---

LDBY0002 Ogden Residence
Conveyance Calculations
17-1109

North Basin

Tributary Area 0.24 acres
Impervious Coverage 0.11 acres (C = 0.90)
Pervious Coverage 0.13 acres (C = 0.25)

$$\text{"C" Value} = [0.11(0.90) + 0.13(0.25)] / (0.24)$$

$$\text{"C" Value} = 0.55$$

$$I_{100} = 2.7 \text{ in/hr}$$

$$T_c = 10 \text{ minutes}$$

$$Q_{100} = CIA = (0.55)(2.7)(0.24) = 0.35 \text{ cfs}$$

Pipe flow capacity for a 6" pipe @ 1.0% = 0.61 cfs

PASSES

South Basin

Total Area 0.78
Impervious Coverage 0.27 acres (C = 0.90)
Pervious Coverage 0.51 acres (C = 0.25)

$$\text{"C" Value} = [0.27(0.90) + 0.51(0.25)] / (0.78)$$

$$\text{"C" Value} = 0.475$$

$$I_{100} = 2.7 \text{ in/hr}$$

$$T_c = 10 \text{ minutes}$$

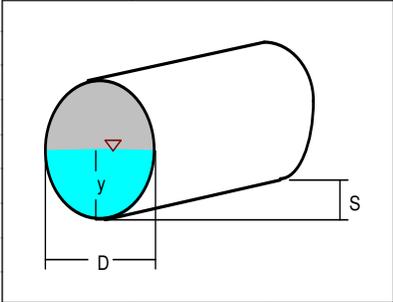
$$Q_{100} = CIA = (.475)(2.7)(.78) = 0.99 \text{ cfs}$$

Pipe flow capacity for an 8" pipe @ 2.0% = 1.80 cfs

PASSES

Note: Tributary areas are conservatively delineated and may include existing and offsite areas. These areas do not reflect only the proposed impervious coverage of the site.

Pipe

	Input	Output					
Q (cfs)	0.00	1.80					
n	0.012	0.012					
d (ft)	0.66	0.66	0	10 / 16	inches		
y (ft)	1.00	0.66					
S (ft/ft)	0.020	0.020					
							
			A (sf)	0.342			
			Pw (ft)	2.073	V (ft/s)	5.268	
			R (ft)	0.165			
			Critical y (ft) =				
			Qmax @ y (ft) =	0.6192			
			Vmax @ y (ft) =	0.5365			
Job:	Ogden		Description:	8" Pipe Capacity			
By:	Adam Stricker		Date:	17-1109			

