July 2, 2018

Barbara and Herb Wuensch
3310 43rd Street NW
Gig Harbor, WA 98335

Re: Wuensch Short Plat

Dear Barbara and Herb:

This letter presents a drainage plan for the proposed Wuensch Short Plat located at 14455 Sunrise Drive NE in Bainbridge Island, Washington. The proposed project includes construction of a single family residence and a driveway.

EXISTING CONDITIONS

The existing property is approximately 2.5 acres (ac) in size. There is an existing access driveway (4,450 square feet, sf) along the southern property line leading to a house (4,962 sf) near the western property line. The remaining area of the property is mostly native trees and landscaping around the house and driveway.

Soils on site are mapped as approximately 95% Hartline gravelly sandy loam and 5% Kapowsin gravelly sandy loam by the United States Department of Agriculture's (USDA's) National Resource Conservation Service (NRCS) Web Soil Survey. A site visit was conducted on 8/4/17 where a soil sample was collected from a location near the northeastern corner of the property. We found silty sand to a depth over 3 feet (ft); a grain size analysis on this sample shows that onsite infiltration is feasible.

The site generally slopes to the east with entirely moderate (5 to 15%) slopes

DOWNSTREAM ANALYSIS.

Storm water runoff from the property drains in a dispersed manner through dense vegetation with no observed channelization of runoff from the site. Eventually, runoff from uphill and downhill of the site are collected in the uphill swale along Sunrise Drive (see Drainage Map below). The Sunrise Drive swale conveys runoff south, through several 12-inch driveway culverts, and enters a 12-inch storm drain after approximately 400 ft. This storm drain conveys runoff across Sunrise Drive to the east, and outlets into a rock swale on private property. From this point, runoff meanders to the northeast for approximately 2,000 ft before discharging into Puget Sound.

PROPOSED DRAINAGE SYSTEM

The proposed project will result in the construction of a house (roof area = 2,537 sf), and a driveway (exposed area = 2,843 sf) (see on site Drainage Map). Since the project creates more than 5,000 sf of new and replaced hard surface area, minimum requirements #1 through #9 of the Department of Ecology's Stormwater Management Manual for Western Washington (SWMMWW), 2014 edition, will apply. Table 2 below illustrates how each minimum requirement will be met. Due to the proposed

layout's proximity to the down slope side of the property, full dispersion is not feasible (see LID Assessment below), however the soil is favorable for infiltration.

We propose to infiltrate the proposed house, proposed driveway, and a portion of the existing driveway via a rain garden to be constructed along the eastern property boundary, near the northeast corner. With a design infiltration rate of 0.97 inches/hour (see Hydraulic Conductivity Calculation below), we found that a rain garden with a bottom area of 1,089 sf will achieve 99.84% infiltration of all inflows to the facility (see Drainage System Calculations below). Any overflows will disperse into forest vegetation just down slope to the east. The existing driveway will connect to the northeastern rain garden via a grass swale constructed just down slope to the northeast. The grass swale conveys water south and then east, crossing the proposed driveway via a 12-inch high-density polyethylene (HDPE) pipe, and then enters another grass swale that conveys runoff north and into the proposed rain garden. The proposed driveway either sheets flows directly into this grass swale, or the rain garden itself. The proposed roof downspout drainage system will connect to the rain garden via a 4-inch polyvinylchloride (PVC) pipe coming from the northeast corner of the proposed house, and discharging onto a rock pad at the bottom of the rain garden.

All disturbed landscape areas on site will be amended to meet the requirements of BMP T5.13 Post-Construction Soil Quality and Depth.

The Department of Ecology's Western Washington Hydrology Model (WWHM) 2012 edition was used to model the proposed drainage system and the onsite existing conditions. The increase in the 100-year storm event volumetric flow rate actually decrease by 0.26 cubic feet per second (cfs) between the existing and proposed conditions (see Basin Flow Calculations below).

See Table 1 below to see a breakdown of the change in size of land types for the proposed short plat.

Table 1
Area Changes

Areas	sf	ac
New Impervious	5,380	0.124
Converted to Landscaping	20,088	0.461
Pollution Generating Impervious Surface	7,293	0.167
Total Effective Impervious Surface	14,792	0.340

ONSITE UTILITIES

Water:

The project site is located within the Kitsap Public Utility District's North Bainbridge Group A water system area. We propose that the house will connect to this system via a new water meter to be located next to the existing water meter in the southeast corner of the property, with a water line running directly to the southeastern corner of the proposed house.

Sanitation:

The project will construct two septic drainfields on site. These drainfields are approximately 1,800 sf in size and are located west of the proposed house and driveway.

Other:

Power and telecommunication utilities will be designed by others.

EROSION CONTROL

The Contractor will be responsible for maintaining erosion control facilities on the site during construction and for ensuring that sediment does not leave the site. The general principles of construction pollution prevention are:

- Retain native vegetation
- Prevent erosion rather than treat sediment-laden water.
- Employ site specific best management practices (BMPs)
- Divert upslope runoff around disturbed areas
- Phase construction operations to reduce the total amount of disturbance at one time
- Amend soils before seeding
- Minimize the slope lengths and steepness of disturbed areas
- Reduce runoff velocities
- Prevent the tracking of sediment off site
- Employ BMPs that address not only erosion but also other potential pollutants.

Table 3 below describes a number of BMPs which we believe are the minimum required to prevent erosion. It should be noted that other measures may be needed to minimize the movement of sediment and shall be put in place as needed. To prevent erosion the contractor should take special care to ensure that exposed soils are covered by mulch, plastic, sod, or some other form of source control. Clearing limits should be contained by clearing limits fencing and silt fencing. The contractor should install and maintain fencing along these limits and ensure that disturbance outside of these limits does not occur unless needed. If the contractor needs to employ additional BMPs, they should reference the *SWMMWW*, 2014 edition for additional information.

Very truly yours,

BROWNE WHEELER ENGINEERS, INC.

7/2/18

Table 2
Summary of Stormwater Minimum Requirements

Minimum Requirement	Comment
1. Stormwater site plan	A stormwater site plan is presented.
2. Construction stormwater pollution prevention	See Table 3 below for an explanation of how pollution will be prevented during construction.
3. Source control of pollutants	Not applicable. No sensitive water bodies exist within the downstream flow path.
4. Preservation of natural drainage systems and outfalls	All stormwater that is not infiltrated in the proposed rain garden will continue to discharge from the property at the same locations and in a similar manner as it does in its current condition.
5. On-site stormwater management	Runoff generated from all impervious areas will be infiltrated via a rain garden. Disturbed areas on site will be amended to meet the design guidelines of BMP T5.13: Post-Construction Soil Quality and Depth. These BMPs are a part of Low Impact Development (LID) List #2.
6. Runoff treatment	Runoff from all impervious surfaces will be conveyed to a rain garden that treats all inflows (see Off-site Flow Calculations below).
7. Flow control	The project results in a decrease of off-site runoff by 0.26 cubic feet per second (see Off-site Flow Calculations below)
8. Wetlands protection	Not applicable. Site runoff never comes into contact with a wetland.
9. Operation and maintenance (O&M)	An O&M manual will be provided for the final building permit submittal.

Table 3
Elements of Construction Storm water Pollution Prevention

Element	Comment
1. Preserve Vegetation/Mark Clearing Limits	The disturbed area will be contained by high-visibility sediment fencing down slope of the construction site, and clearing limit fencing upslope. Efforts will be made to minimize the disturbed area in order to preserve vegetation.
2. Establish Construction Access	Not applicable. The existing access gravel driveway will prevent the tracking of sediment onto the public right-of-way.
3. Control Flow Rates	Not applicable. Very little to no grading will be done for this project. If flow rates become an issue, straw wattles may be used to slow down storm water runoff.
4. Install Sediment Controls	Runoff from exposed soil areas will have to flow through sediment fencing before flowing the native vegetation off-site.
5. Stabilize Soils	Exposed soils will be covered by mulch, plastic, sod, or some other form of source control.
6. Protect Slopes	Exposed slopes will be covered in the same manner as exposed soils above.
7. Protect Drain Inlets	Not applicable.
8. Stabilize Channels and Outlets	Not applicable. Temporary onsite conveyance channels are not used for this project.
9. Control Pollutants	All pollutants shall be handled and disposed of in a manner that does not cause contamination of storm water. Any onsite temporary storage areas will be located away from high vehicular traffic areas.
10. Control Dewatering	If needed, discharge water in a manner that ensures it is safely cleaned before being discharged (i.e.: discharge slowly through a discharge bad at the base of the slope in a vegetated area), and in a manner that does not cause erosion.
11. Maintain BMPs	BMPs will be checked weekly and immediately after storm event, and addition materials will be kept onsite for maintenance and emergencies.
12. Manage the Project	Project phasing will be used to prevent soils from being exposed for extended periods of time, and erosion and sediment control (ESC) materials will be kept on-hand for maintenance and emergency situations.
13. Protect Low Impact Development BMPs	All heavy equipment will be kept off soils existing under LID facilities that have been excavated during construction. Prevent compaction of the rain garden by excluding both construction and foot traffic. Coordinate will employees of Utilities and Contractors to ensure protection of the rain garden during construction.

TOPOGRAPHIC INFORMATION SHOWN FROM KITSAP COUNTY PUD LIDAR AERIAL SURVEY, 2-FT CONTOURS, NAVD88.

N

SCALE: 1 = 300'

0 150 300 600

DRAINAGE MAP
WUENSCH SHORT PLAT

BROWNE • WHEELER
ENGINEERS, INC
241 ERICKSEN AVENUE NE
BAINBRIDGE ISLAND, WA 98110
P 206.842.0605 INFO@BrowneWheeler.COM

FILE NAME: DRAINAGE MAP.DWG PLOT DATE: 7/2/2018 3:21 PM PLOT DEVICE: DWG TO PDF.PC3 PAGE SETUP: ---- PLOTTED BY: BRYAN

ENGINEERING CALCULATIONS

Applicable Minimum Requirements: #1 through #9
List #2

Lawn and Landscaped ares:

Priority	BMP	Feasible	Infeasible	N/A	Justification
1	T5.13: Post-Construction Soil Quality and Depth	X			

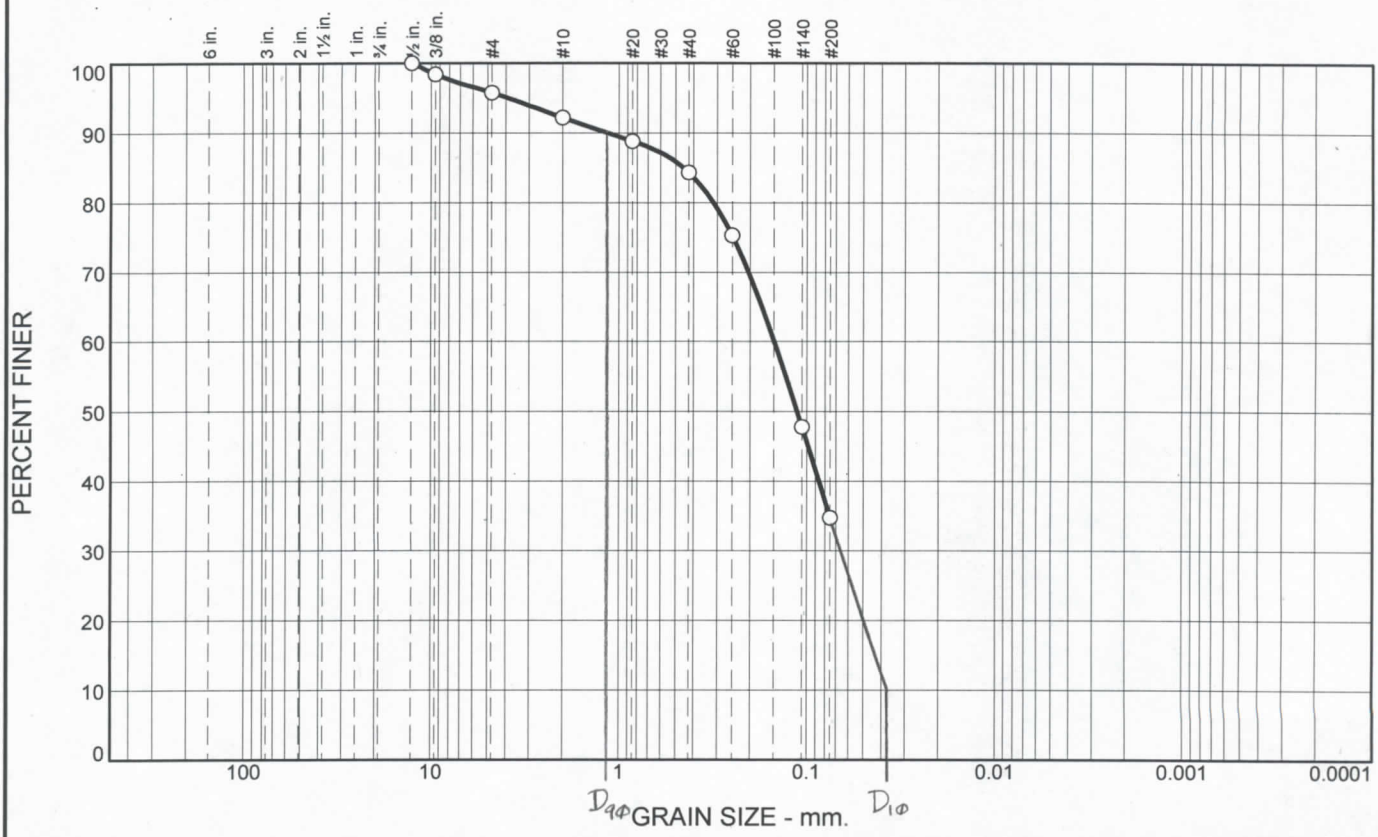
Roof areas:

Priority	BMP	Feasible	Infeasible	N/A	Justification
1	T5.30: Full Dispersion		X		100-foot flow path requirement cannot be met
1	T5.10A: Downspout Full Infiltration		X		Insufficient space to fit infiltration system and driveway rain garden
2	T7.30: Bioretention Cells, Swales, and Planter Boxes	X			
2	T5.14A: Rain Gardens				
3	T5.10B: Downspout Dispersion Systems				
4	T5.10C: Perforated Stub-out Connections				

Other Hard Surface areas:

Priority	BMP	Feasible	Infeasible	N/A	Justification
1	T5.30: Full Dispersion		X		100-foot flow path requirement cannot be met
2	T7.30: Bioretention Cells, Swales, and Planter Boxes	X			
2	T5.15: Permeable Pavements				
2	T5.14A: Rain Gardens				
3	T5.11: Concentrated Flow Dispersion				
3	T5.12: Sheet Flow Dispersion				

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	4.3	60.9	34.8		SM	A-2-4(0)	NP	NV

SIEVE inches size	PERCENT FINER ○		
.5	100.0		
.375	98.4		
	GRAIN SIZE		
D_{60}	0.1490		
D_{30}			
D_{10}	0.036		
	COEFFICIENTS		
C_C			
C_u			

SIEVE number size	PERCENT FINER ○		
#4	95.7		
#10	92.2		
#20	88.8		
#40	84.4		
#60	75.3		
#140	47.8		
#200	34.8		

Material Description

○ silty sand

REMARKS:

○ Classification based on grainsize only

$D_{90} \approx 1.1$ mm

○ Sample Number: TP-1

Phoenix Soil Research

Kingston, WA

Client: Browne Wheeler Engineers, Inc

Project: Wuinch Short Plat

Project No.: PSR17-40-0804 Figure 1

Soil Grain Size Analysis Method

SWMMWW 2012 - Vol. III, 3.3.6 Design Saturated Hydraulic Conductivity - Guidelines and Criteria

Determing K_{sat}(initial):

$\log_{10}(K_{sat}) = -1.57 + 1.90D_{10} + 0.015D_{60} - 0.013D_{90} - 2.08f_{fines}$

- D_{10}, D_{60}, D_{90} = grain sizes in mm for which 10, 60, and 90 percent of the samples is more fine.

- f_{fines} = the fraction of soil (be weight) that passes the #200 seive
- K_{sat} is in cm/s (*measured (initial) rate)

Sample	TP1
D_{10} [mm]	0.036
D_{60} [mm]	0.149
D_{90} [mm]	1.1
f_{fines}	0.348
K_{sat}(initial) [cm/s]	0.0058
K_{sat}(initial) [in/hr]	8.20

Determining Correction Factor (CF):
Total Correction Factor, $CF_T = CF_v \times CF_t \times CF_m$

*See Table III-3.3.1 Correction Factors to be Used With In-Situ Saturated Hydraulic Conductivity Measurements to Estimate Design Rates

CF_v	0.33	*assumed
CF_t	0.4	
CF_m	0.9	
CF_T	0.1188	

Determining K_{sat}(design):

$K_{sat}(design) = K_{sat}(initial) \times CF_T$

K_{sat}(design)	**0.97**	**in/hr**

EXISTING RAIN GARDEN

Contributing basin area:		sf	ac
	Upslope lawn	5,468	0.126
	Existing house roof	4,962	0.114
	Total	10,429	0.239
Minimum size requirements:			
	5% of contributing impervious area	248	sf
+	2% of contributing pervious area	109	sf
	Total minimum ponding area	357	sf
	Assumed shape	square	
	Pond side lengths (square root of pond area)	18.9062	ft
	Side slopes	3	:1 (H:V)
	Max. ponding depth	1	ft
	Bottom area side lengths (sloped from max pond depth)	12.9062	ft
	Minimum Bottom area size (bottom area side lengths squared)	167	sf
Modelled rain garden			
	Calculated Infiltration Rate (TP1)	0.97	in/hr
	Bottom side lengths (L)	20.00	ft
	Bottom area (L*L)	**400**	**sf**
	Percent of total inflow volume infiltrated	**99.99**	**%**

*See attached WWHM 2012 Recharge Model pictures.

NE RAIN GARDEN

Contributing basin area:		sf	ac
	Pervious Areas	27,716	0.636
	Upslope lawn	27,716	0.636
	Impervious Areas	9,830	0.226
	Existing driveway	4,450	0.102
	Proposed driveway	2,843	0.065
	Proposed house roof	2,537	0.058
	Total	37,546	0.862
Minimum size requirements:			
	5% of contributing impervious area	492	sf
+	2% of contributing pervious area	554	sf
	Total minimum ponding area	1046	sf
	Assumed shape	square	
	Pond side lengths (square root of pond area)	32.3391	ft
	Side slopes	3	:1 (H:V)
	Max. ponding depth	1	ft
	Bottom area side lengths (sloped from max pond depth)	26.3391	ft
	Minimum Bottom area size (bottom area side lengths squared)	694	sf
Minimum bottom area size that achieves 100% infiltration:			
	Calculated Infiltration Rate (TP1)	0.97	in/hr
	Bottom side lengths (L)	33.00	ft
	Bottom area (L*L)	**1089**	**sf**
	Percentage of total inflow volume infiltrated	**99.84**	**%**

*See attached WWHM 2012 Recharge Model pictures.

	sf	ac	% of TSA
Total Site Area (TSA)	108,849	2.499	100.0
Disturbed Area	26,310	0.604	24.2

EXISTING CONDITION	sf	ac	% of TSA
Basin			
Pervious Areas	99,437	2.283	91.4
Forest, mod	68,907	1.582	63.3
Lawn, mod	30,530	0.701	28.0
Impervious Area	9,412	0.216	8.6
Roof	4,962	0.114	4.6
Driveway, mod	4,450	0.102	4.1
Total	108,849	2.499	100.0

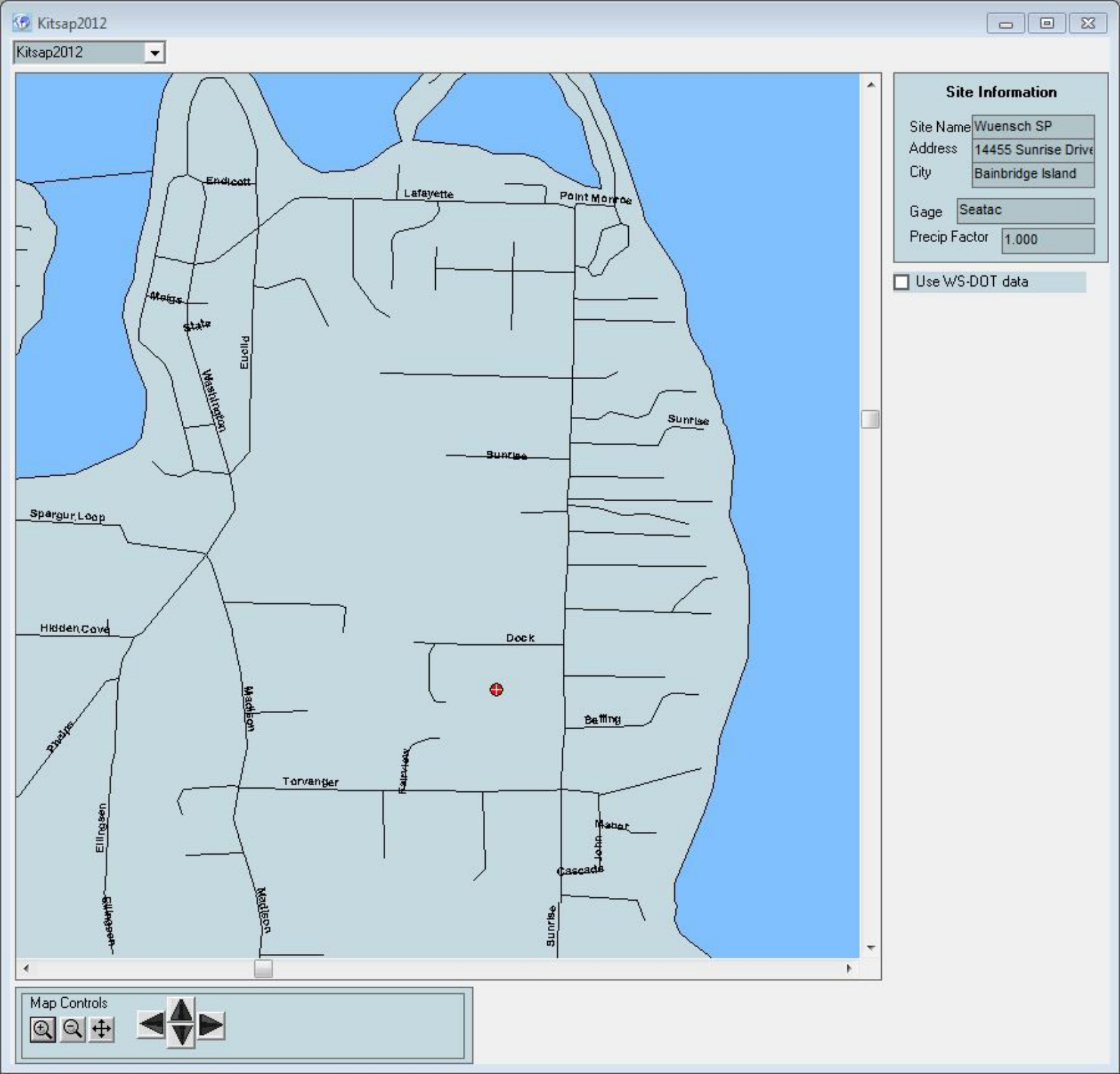
EXISTING CONDITION FOR WWHM	sf	ac	% of TSA
Existing RG Basin			
Pervious Areas	5,468	0.126	5.0
Lawn, mod	5,468	0.126	5.0
Impervious Areas	4,962	0.114	4.6
Roof	4,962	0.114	4.6
Total	10,429	0.239	9.6
Remaining Basin			
Pervious Areas	93,970	2.157	86.3
Forest, mod	68,907	1.582	63.3
Lawn, mod	25,063	0.575	23.0
Impervious Area	4,450	0.102	4.1
Driveway, mod	4,450	0.102	4.1
Total	98,420	2.259	90.4

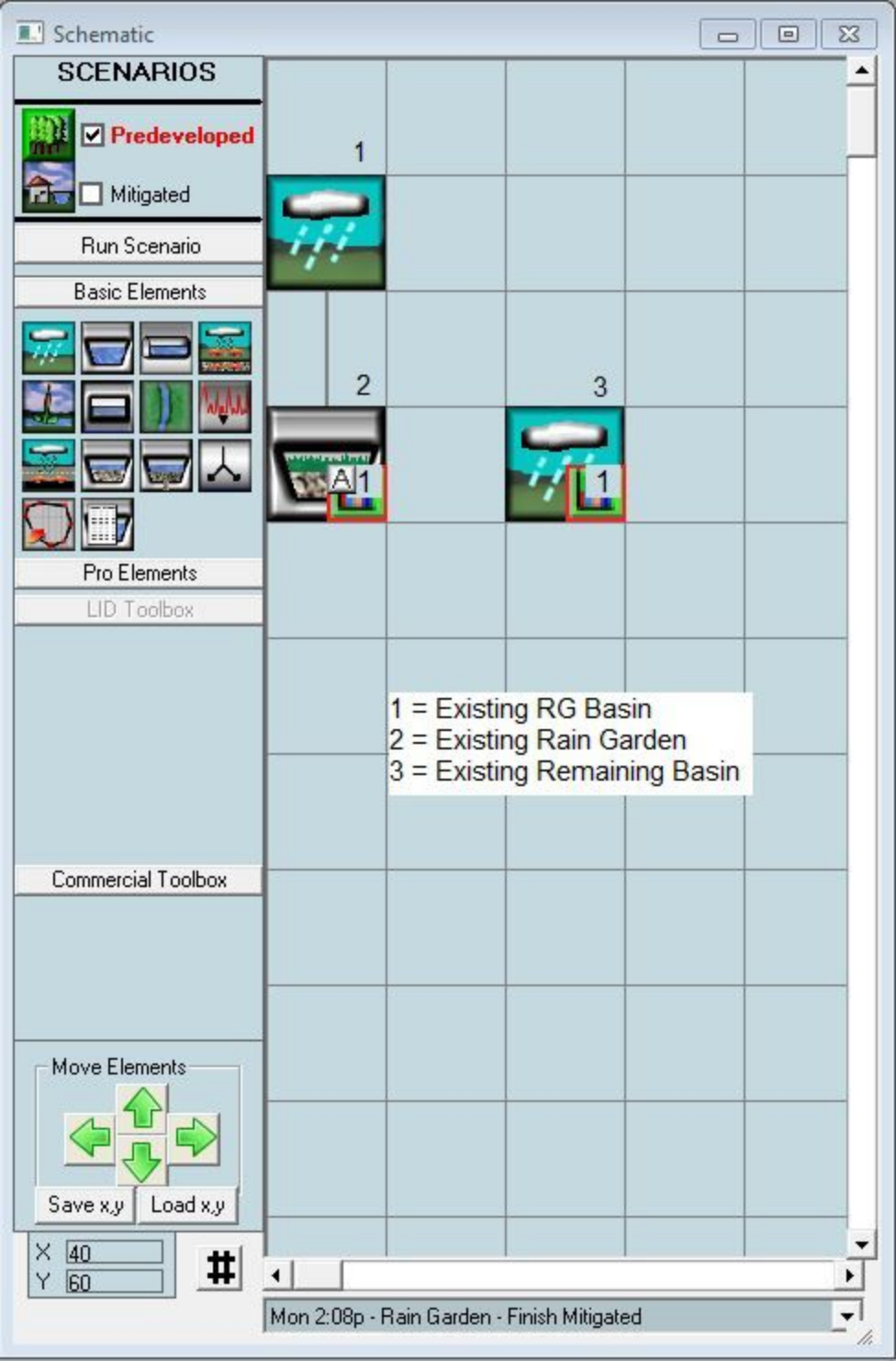
PROPOSED CONDITION		sf	ac	% of TSA
Basin				
	Pervious Areas	94,057	2.159	86.4
	Forest, mod	43,440	0.997	39.9
	Lawn, mod	50,618	1.162	46.5
	Impervious Areas	14,792	0.340	13.6
	Roofs	7,499	0.172	6.9
	Existing	4,962	0.114	4.6
	Proposed	2,537	0.058	2.3
	Driveway, mod	7,293	0.167	6.7
	Existing	4,450	0.102	4.1
	Proposed	2,843	0.065	2.6
	Total	108,849	2.499	100.0

PROPOSED CONDITION FOR WWHM		sf	ac	% of TSA
Existing Rain Garden Basin				
	Pervious Areas	5,468	0.126	5.0
	Lawn, mod	5,468	0.126	5.0
	Impervious Areas	4,962	0.114	4.6
	Roof	4,962	0.114	4.6
	Total	10,429	0.239	9.6
Proposed NE Rain Garden Basin				
	Pervious Areas	25,394	0.583	23.3
	Lawn, mod	25,394	0.583	23.3
	Impervious Areas	9,830	0.226	9.0
	Driveway,mod	7,293	0.167	6.7
	Existing	4,450	0.102	4.1
	Proposed	2,843	0.065	2.6
	Roof, proposed	2,537	0.058	2.3
	Total	35,224	0.809	32.4
Remaining Basin				
	Pervious Areas	63,196	1.451	58.1
	Forest, mod	43,440	0.997	39.9
	Lawn, mod	19,756	0.454	18.2
	Total	63,196	1.451	58.1

100-YEAR STORM FLOW COMPARISON

Existing Condition	0.5899 cfs	
Proposed Condition	0.3367 cfs	
Change	-0.2532 cfs	*Off-site runoff will decrease.


Kitsap2012
Kitsap2012
Site Information
Site Name Wuensch SP
Address 14455 Sunrise Drive
City Bainbridge Island
Gage Seatac
Precip Factor 1.000
Use WS-DOT data
Endicott
Lafayette
Point Monroe
Euclid
Washington
Sunrise
Spargur Loop
Hidden Cove
Dock
Madison
Phelps
Ellingsen
Torvanger
Fairview
Belling
Maher
John
Cascade
Sunrise
Map Controls


Schematic
SCENARIOS
Predeveloped
Mitigated
Run Scenario
Basic Elements
Pro Elements
LID Toolbox
Commercial Toolbox
Move Elements
Save x,y
Load x,y
X 40
Y 60
1
2
3
A1
1
1 = Existing RG Basin
2 = Existing Rain Garden
3 = Existing Remaining Basin
Mon 2:08p - Rain Garden - Finish Mitigated

Existing RG Basin Predeveloped

Subbasin Name: Existing RG Basin

Flows To :

	Surface	Interflow	Groundwater
	Surface Rain Garden	Surface Rain Garden	

Area in Basin

Show Only Selected

Available Pervious	Acres	Available Impervious	Acres
C, Lawn, Mod	.126	ROOF TOPS/FLAT	.114

Pervious Total	0.126	Acres
Impervious Total	0.114	Acres
Basin Total	0.24	Acres

Deselect Zero **Select By:** GO

Existing Rain Garden Predeveloped

Facility Name Existing Rain Garden

	Outlet 1	Outlet 2	Outlet 3
Downstream Connection	0	0	0

Use simple Bioretention Quick Swale

Underdrain Used

Bioretention Bottom Elevation 0

Bioretention Dimensions

Bioretention Length (ft)	20.000
Bioretention Bottom Width (ft)	20.000
Freeboard (ft)	0.500
Over-road Flooding (ft)	0.000
Effective Total Depth (ft)	3
Bottom slope of bioretention.(0-1)	0.000

Sidewall Invert Location.

Front and Back side slope (H/V)	3.000
Left Side Slope (H/V)	3.000
Right Side Slope (H/V)	3.000

Material Layers for

	Layer 1	Layer 2	Layer 3
Depth (ft)	1.500	0.000	0
Soil Layer 1	SMMWW 12 in/hr		
Soil Layer 2	Sand		
Soil Layer 3	GRAVEL		

Edit Soil Types

KSat Safety Factor: None 2 4

Flow Through Underdrain (ac-ft) 0

Total Outflow (ac-ft)

WQ Percent Filtered 99.99

Facility Dimension Diagram

Riser Outlet Structure

Outlet Structure Data

Riser Height Above bioretention surface (ft) 1

Riser Diameter (in) 4

Riser Type Flat

Orifice Number	Diameter (in)	Height (ft)
1	0	0
2	0	0
3	0	0

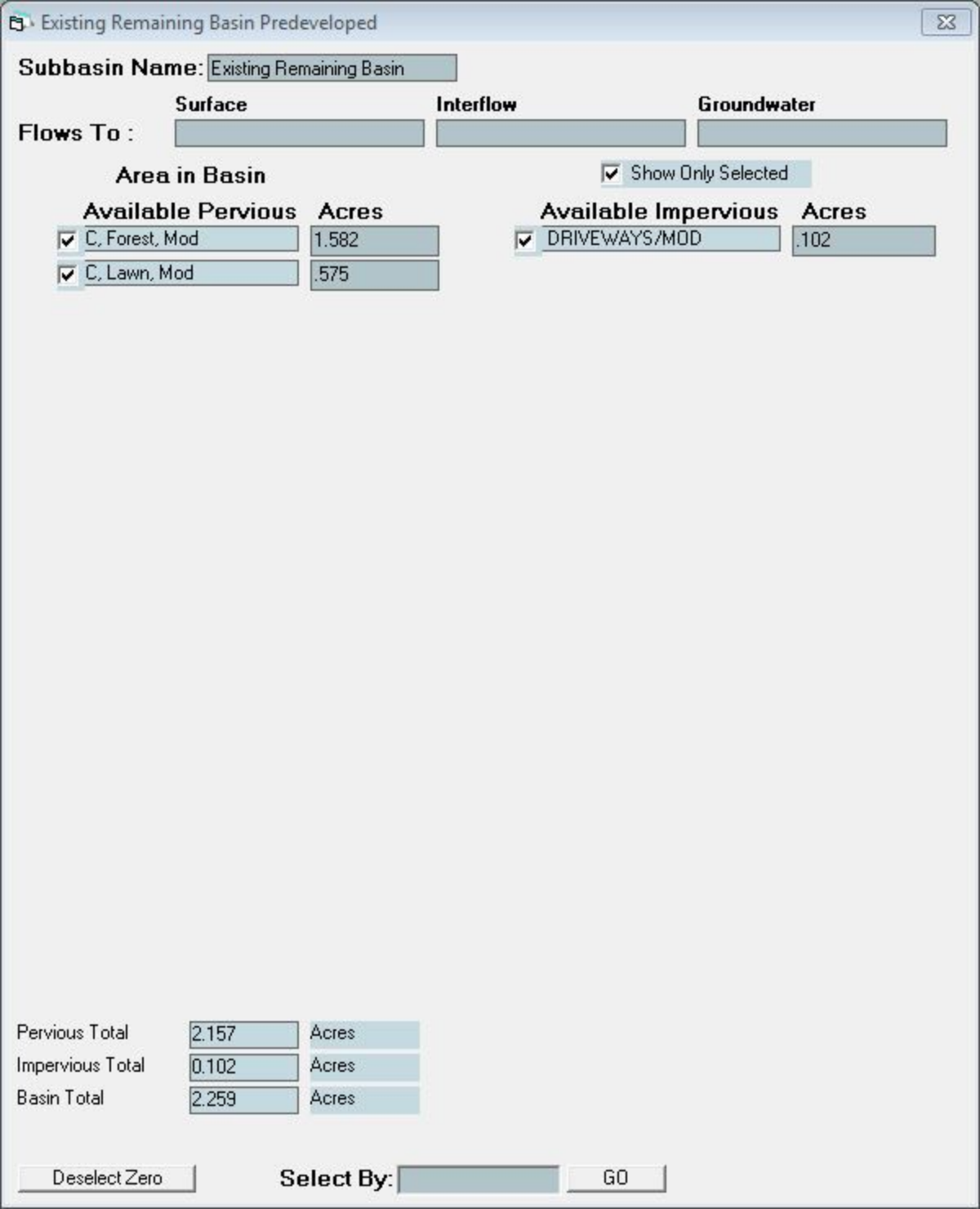
Bioretention Volume at Riser Head (ac-ft) .048

Show Bioretention Open Table

Native Infiltration Yes

Measured Infiltration Rate (in/hr)	0.97
Reduction Factor (infilt*factor)	1
Use Wetted Surface Area (sidewalls)	Yes
Total Inflow ac-ft	28.929

Total Volume Infiltrated (ac-ft)	28.926
Total Volume Through Riser (ac-ft)	0.003
Total Volume Through Facility(ac-ft)	28.929
Percent Infiltrated	99.99
Precipitation on Facility (acre-ft)	0
Evaporation from Facility (acre-ft)	0


Existing Remaining Basin Predeveloped
Subbasin Name: Existing Remaining Basin
Surface
Interflow
Groundwater
Flows To :
Area in Basin
Show Only Selected
Available Pervious
Acres
C, Forest, Mod
1.582
C, Lawn, Mod
.575
Available Impervious
Acres
DRIVEWAYS/MOD
.102
Pervious Total
2.157
Acres
Impervious Total
0.102
Acres
Basin Total
2.259
Acres
Deselect Zero
Select By:
GO

Schematic

SCENARIOS

Predeveloped

Mitigated

Run Scenario

Basic Elements

Pro Elements

LID Toolbox

Commercial Toolbox

Move Elements

Save x,y

Load x,y

X 30

Y 60

1 = Existing RG Basin
2 = Existing Rain Garden
3 = NE RG Basin
4 = NE Rain Garden
5 = Remaining Proposed Basin

Mon 2:08p - Rain Garden - Finish Mitigated

Existing RG Basin Mitigated

Subbasin Name: Existing RG Basin ☐ Designate as Bypass for POC:

Flows To :

Surface	Interflow	Groundwater
Surface Rain Garden	Surface Rain Garden	

Area in Basin ☑ Show Only Selected

Available Pervious	Acres	Available Impervious	Acres
☑ C, Lawn, Mod	.126	☑ ROOF TOPS/FLAT	.114

Pervious Total	0.126	Acres
Impervious Total	0.114	Acres
Basin Total	0.24	Acres

Deselect Zero **Select By:** GO

Existing Rain Garden Mitigated

Facility Name Existing Rain Garden

	Outlet 1	Outlet 2	Outlet 3
Downstream Connection	0	0	0

☐ **Use simple Bioretention** Quick Swale | Size Water Quality | Size Facility

☐ **Underdrain Used**

Bioretention Bottom Elevation 0

Bioretention Dimensions

Bioretention Length (ft)	20.000
Bioretention Bottom Width (ft)	20.000
Freeboard (ft)	0.500
Over-road Flooding (ft)	0.000
Effective Total Depth (ft)	3
Bottom slope of bioretention.(0-1)	0.000

☐ **Sidewall Invert Location.**

Front and Back side slope (H/V)	3.000
Left Side Slope (H/V)	3.000
Right Side Slope (H/V)	3.000

Material Layers for

	Layer 1	Layer 2	Layer 3
Depth (ft)	1.500	0.000	0
Soil Layer 1	SMMWW 12 in/hr		
Soil Layer 2	Sand		
Soil Layer 3	GRAVEL		

Edit Soil Types

KSat Safety Factor: ○ None ◉ 2 ○ 4

Flow Through Underdrain (ac-ft) 0

Total Outflow (ac-ft)

WQ Percent Filtered 99.99

Facility Dimension Diagram

Riser Outlet Structure

Outlet Structure Data

Riser Height Above bioretention surface (ft) 1

Riser Diameter (in) 4

Riser Type Flat

Orifice Number	Diameter (in)	Height (ft)
1	0	0
2	0	0
3	0	0

Bioretention Volume at Riser Head (ac-ft) .048

Show Bioretention Open Table

Native Infiltration Yes

Measured Infiltration Rate (in/hr)	0.97
Reduction Factor (infilt*factor)	1
Use Wetted Surface Area (sidewalls)	Yes
Total Inflow ac-ft	29.574

Total Volume Infiltrated (ac-ft)	28.926
Total Volume Through Riser (ac-ft)	0.003
Total Volume Through Facility(ac-ft)	28.929
Percent Infiltrated	99.99
Precipitation on Facility (acre-ft)	1.687
Evaporation from Facility (acre-ft)	0.645

NE RG Basin Mitigated

Subbasin Name: NE RG Basin ☐ Designate as Bypass for POC:

Flows To :

	Surface	Interflow	Groundwater
	Surface Rain Garden	Surface Rain Garden	

Area in Basin

☑ Show Only Selected

Available Pervious	Acres	Available Impervious	Acres
☑ C, Lawn, Mod	.583	☑ ROOF TOPS/FLAT	.058
		☑ DRIVEWAYS/MOD	.167

Pervious Total	0.583	Acres
Impervious Total	0.225	Acres
Basin Total	0.808	Acres

Deselect Zero **Select By:** GO

NE Rain Garden Mitigated

Facility Name NE Rain Garden

	Outlet 1	Outlet 2	Outlet 3
Downstream Connection	0	0	0

☐ **Use simple Bioretention** Quick Swale | Size Water Quality | Size Facility

☐ **Underdrain Used**

Bioretention Bottom Elevation 0

Bioretention Dimensions

Bioretention Length (ft)	33.000
Bioretention Bottom Width (ft)	33.000
Freeboard (ft)	0.500
Over-road Flooding (ft)	0.000
Effective Total Depth (ft)	3
Bottom slope of bioretention.(0-1)	0.000

☐ **Sidewall Invert Location.**

Front and Back side slope (H/V)	3.000
Left Side Slope (H/V)	3.000
Right Side Slope (H/V)	3.000

Material Layers for

	Layer 1	Layer 2	Layer 3
Depth (ft)	1.500	0.000	0
Soil Layer 1	SMMWW 12 in/hr		
Soil Layer 2	Sand		
Soil Layer 3	GRAVEL		

Edit Soil Types

KSat Safety Factor: ○ None ○ 2 ◉ 4

Flow Through Underdrain (ac-ft) 0

Total Outflow (ac-ft)

WQ Percent Filtered 99.88

Facility Dimension Diagram

Riser Outlet Structure

Outlet Structure Data

Riser Height Above bioretention surface (ft) 1

Riser Diameter (in) 4

Riser Type Flat

Orifice Number	Diameter (in)	Height (ft)
1	0	0
2	0	0
3	0	0

Bioretention Volume at Riser Head (ac-ft) .096

Show Bioretention Open Table

Native Infiltration Yes

Measured Infiltration Rate (in/hr)	0.97
Reduction Factor (infilt*factor)	1
Use Wetted Surface Area (sidewalls)	Yes
Total Inflow ac-ft	86.545

Total Volume Infiltrated (ac-ft)	84.043
Total Volume Through Riser (ac-ft)	0.099
Total Volume Through Facility(ac-ft)	84.142
Percent Infiltrated	99.88
Precipitation on Facility (acre-ft)	4.563
Evaporation from Facility (acre-ft)	2.403

Remaining Proposed Basin Mitigated

Subbasin Name: Remaining Proposed Basin ☑ Designate as Bypass for POC:

Flows To :

Surface	Interflow	Groundwater

Area in Basin

☑ Show Only Selected

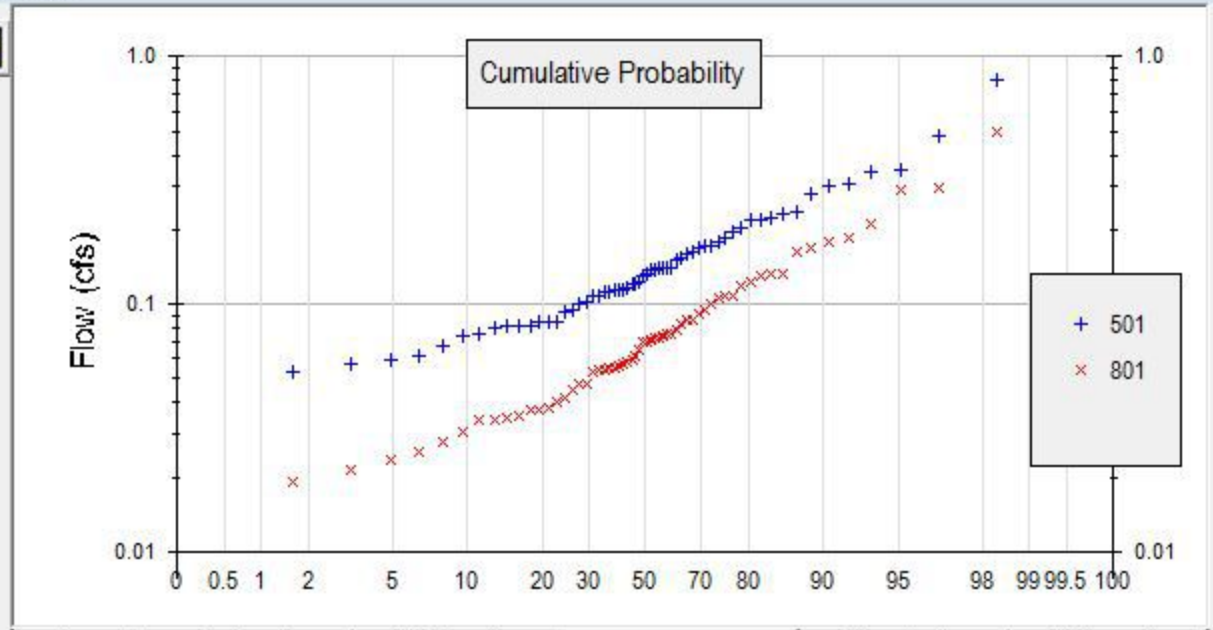
	Available Pervious	Acres
☑	C, Forest, Mod	.997
☑	C, Lawn, Mod	.454

Available Impervious **Acres**

Pervious Total	1.451	Acres
Impervious Total	0	Acres
Basin Total	1.451	Acres

Deselect Zero **Select By:** GO

Analysis



Stream Protection Duration | LID Duration | Flow Frequency | Water Quality | Hydrograph

Wetland Input Volumes | LID Report | Recharge Duration | Recharge Predeveloped | Recharge Mitigated

Analyze datasets Compact WDM | Delete Selected | Monthly FF

501 POC 1 Predeveloped flow
801 POC 1 Mitigated flow

All Datasets | Flow | Stage | Precip | Evap | POC 1

Flood Frequency Method
- (•) Log Pearson Type III 17B
- ( ) Weibull
- ( ) Cunnane
- ( ) Gringorten

Flow Frequency

Flow(cfs)	Predeveloped	Mitigated
2 Year =	0.1286	0.0667
5 Year =	0.2100	0.1224
10 Year =	0.2787	0.1705
25 Year =	0.3850	0.2453
50 Year =	0.4800	0.3120
100 Year =	0.5899	0.3888

Annual Peaks

1949	0.2179	0.1181
1950	0.2248	0.1314
1951	0.1720	0.1234
1952	0.0811	0.0376
1953	0.0575	0.0276
1954	0.1010	0.0474
1955	0.1214	0.0653
1956	0.1378	0.0750
1957	0.1505	0.0787
1958	0.0923	0.0474
1959	0.0843	0.0418
1960	0.1730	0.0946
1961	0.1083	0.0539
1962	0.0530	0.0254
1963	0.1153	0.0560
1964	0.1307	0.0696
1965	0.1408	0.0730
1966	0.0842	0.0372
1967	0.2350	0.1337
1968	0.1388	0.0726
1969	0.1134	0.0572
1970	0.1146	0.0534
1971	0.1411	0.0751
1972	0.1866	0.1050
1973	0.0740	0.0355
1974	0.1407	0.0700
1975	0.1685	0.0911
1976	0.1231	0.0614