PRELIMINARY STORMWATER SITE PLAN
FOR
PORTAGE CREEK VILLAGE
ARLINGTON, WASHINGTON

JANUARY 28, 2022
REV APRIL 12, 2022

HARMSEN

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360-794-7811

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603 South First Street
Mount Vernon, WA 98273
360-336-9199

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840 SE 8TH Avenue, Ste. 102
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360-675-5973

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MR 1: PREPARATION OF STORMWATER SITE PLANS

DRAINAGE PLAN DESCRIPTION

This Stormwater Site Plan has been prepared for a proposed 2 building multi-family development on tax parcel 00776800002300, see Figure 1: Vicinity Map for the location of the project.

The property consists of one parcel generally rectangular in extent with a panhandle to the south that reaches Portage Street. The panhandle has been previously developed as 81st Dr NE. The 1.42-acre site is otherwise undeveloped. Krueger Creek runs through the southern portion of the parcel from east to west and the property already contains a protected buffer from previous development of a larger parent lot.

As stated, the panhandle is 81st Dr NE. This portion of the roadway will be upgraded with new curb, the roadway section will remain, and a planter and sidewalk will be added to the east replacing an existing walk at the edge of pavement. Once past the panhandle, and north of an existing trail easement, a planter and sidewalk will be added to the west side. 81st Dr NE will then be extended north as new construction with 29 foot of width (for parallel parking on the west), curb on both sides as well as landscape strip and sidewalk on both sides. A hammerhead turnaround for emergency services is provided at the new access to the development. The on-site development is to construct 2 multifamily buildings to the north with parking to the south, see Figure 3: Developed Conditions for the layout.

The topographic map of the site shows that the ground generally descends northeast to southwest from approximately elevation 140 in the northeast corner to 132 in the southwest corner. Ground cover is trees and undercover in the protected area, blackberries and pasture grasses in the central area that was cleared at one time in the past and changing over to trees and underbrush near the north boundary. See Figure 2: Existing Conditions for a graphic depiction of the current site conditions.

METHODOLOGY

The 2014 Department of Ecology Stormwater Manual as adopted by the City of Arlington was used as the basis of design. The site has the following characteristics:

- Approximately 0.40 ac disturbed area.
- Less than 35% existing impervious. A new development site.
- The project will result in greater than 5,000 sf of new impervious.

This requires the drainage system to meet Minimum Requirements 1-9.

SOILS DESCRIPTION

According to the geotechnical report prepared by Palmer Geotechnical Consultants, Inc titled *Geotechnical Report – Carey Project* and dated July 21, 2021, the soils underlying the site are sandy gravels and gravelly sands. Groundwater was not encountered. The Geotech has given an initial design infiltration rate of 3 inches per hour.

CRITICAL AREAS
Krueger Creek runs through the site along the southern boundary. It crosses under 81st Dr NE and continues to the west. A Preservation Zone was established by the Plat of Kent Prairie Estates. No work is proposed in the Preservation Zone.

Krueger Creek flows into Portage Creek to the west which is listed as a Category 4A as part of the Stillaguamish River Watershed Multiparameter TMDL. The TMDL specifically covers fecal coliform, dissolved oxygen, pH, Arsenic and Mercury.

MR 2: SWPPP NARRATIVE

With less than 1 acre of disturbance, a Department of Ecology Construction Stormwater Permit will not be required.

A separate SWPPP narrative based on the DOE template will be provided with the construction documents.

MR 3: WATER POLLUTION SOURCE CONTROL

Source control will consist of both construction BMP's and long-term source controls. The temporary measures will be included in the SWPPP. Permanent Source Control will be as follows:

- Container storage of wastes;
- Vegetation management;
- Cleaning of paved surfaces;
- Storm drainage maintenance.

MR 4: PRESERVATION OF NATURAL DRAINAGE

Krueger Creek runs east to west through the south portion of the site. It crosses under Portage St/210th Pl NE through an arch culvert (approximately 9 ft wide with the crown 2 feet above the stream bed). The flow continues to the west crossing under Olympic Pl NE through a countersunk CMP culvert approximately 6 foot in diameter. After Olympic, Krueger Creek joins Portage Creek and continues to the west under SR 9.

The site has granular soils and under forested conditions would largely infiltrate runoff with any excess runoff sheet flowing to Krueger Creek. In the developed condition, the proposal is to infiltrate all of the developed runoff with upstream flows being bypassed around the site to a level spreader draining to Krueger Creek. This will preserve the natural condition.

MR 5: ON-SITE STORMWATER MANAGEMENT

As the site is located in the City of Arlington and will be required to meet MR #1-9, it can achieve MR 5 requirement either through the use of List #2 or by meeting the Low Impact Development Performance Standard. Meeting the Performance Standard is proposed.

See MR 7 for the infiltration system design.

LAWN AND LANDSCAPED AREAS:

BMP T5.13 Post Construction Soil Quality and Depth will be implemented on disturbed and landscaped areas. It is expected that most disturbed soil will be covered with new impervious. Select site topsoil will be used for those small areas where pervious surfaces need restoration.

MR 6: RUNOFF TREATMENT REQUIREMENTS

With more than 5,000 sf of pollution generating impervious surface the site requires runoff treatment. Per Figure 2.1 – Treatment Facility Selection Flow Chart, the site requires the following measures:

Pollutants of Concern: As mentioned earlier, a downstream water is part of a TMDL for fecal coliform, dissolved oxygen, pH, Arsenic and Mercury. Review of the TMDL document Stillaguamish River Watershed Multiparameter TMDL did not give specific measures for a multifamily residential site that go beyond the standard requirements mentioned below.

Oil Control: The site does not meet the threshold of 100 vehicles per day/1,000 sf of building area.

Infiltration for Treatment: The soils are sandy and gravelly and will not meet the CEC requirements.

Phosphorous Control: There is no indication in the downstream TMDL or on-site that would require special phosphorous controls.

Enhanced Treatment: The project is a commercial/multifamily site that will infiltrate within ¼ mile of a stream. Enhanced Treatment is required.

Enhanced Treatment will be provided through a pre-manufactured filter system such as a Filterra from Contech or a Biopod from Oldcastle. Both of Washington DOE GULD for Enhanced Treatment. Final sizing of the facilities will follow manufacturer's requirements based on the tributary basin and will be provided with the final report, to be prepared with the construction permits.

MR 7: FLOW CONTROL

Flow control is required for the site development. Given the granular nature of the soils and the supporting infiltration rate from the geotechnical report, the proposal is to infiltrate runoff. The system will be placed under the parking lot access to the south of the building. It is sized to handle the access, the parking, and the roof area which constitute the majority of the site impervious surfaces.

The conceptual trench has the following characteristics:

Total Bottom Area	1,700 sf (17ft x 100 ft)
Storage Depth	3.0 ft
Void Ratio of Rock	0.35
Infiltration Rate	3 in/hr
Detention Volume	1,786 cf

With those parameters, the trench infiltrates 99.99% of the tributary basin with any additional stored within the parking lot edge.

Upstream flow will bypass the system and be level spread to the critical area preservation zone.

The new sidewalk along the existing pavement of 81st Dr NE is below the site and has an existing storm system. The new sidewalk replaces an existing walk adjacent to the street. The new sidewalk will flow across a planter treated with BMP T5.13 amended soils which will assist with infiltration and attenuation of the flow. Since the walk replaces and existing, no calculations have been performed.

MR 8: WETLANDS PROTECTION

There is no work proposed in the Preservation Zone. Site runoff is proposed to be infiltrated without connection to the stream system.

MR 9: OPERATION AND MAINTENANCE MANUAL

An Operations and Maintenance Manual will be provided with the construction documents.

FIGURES

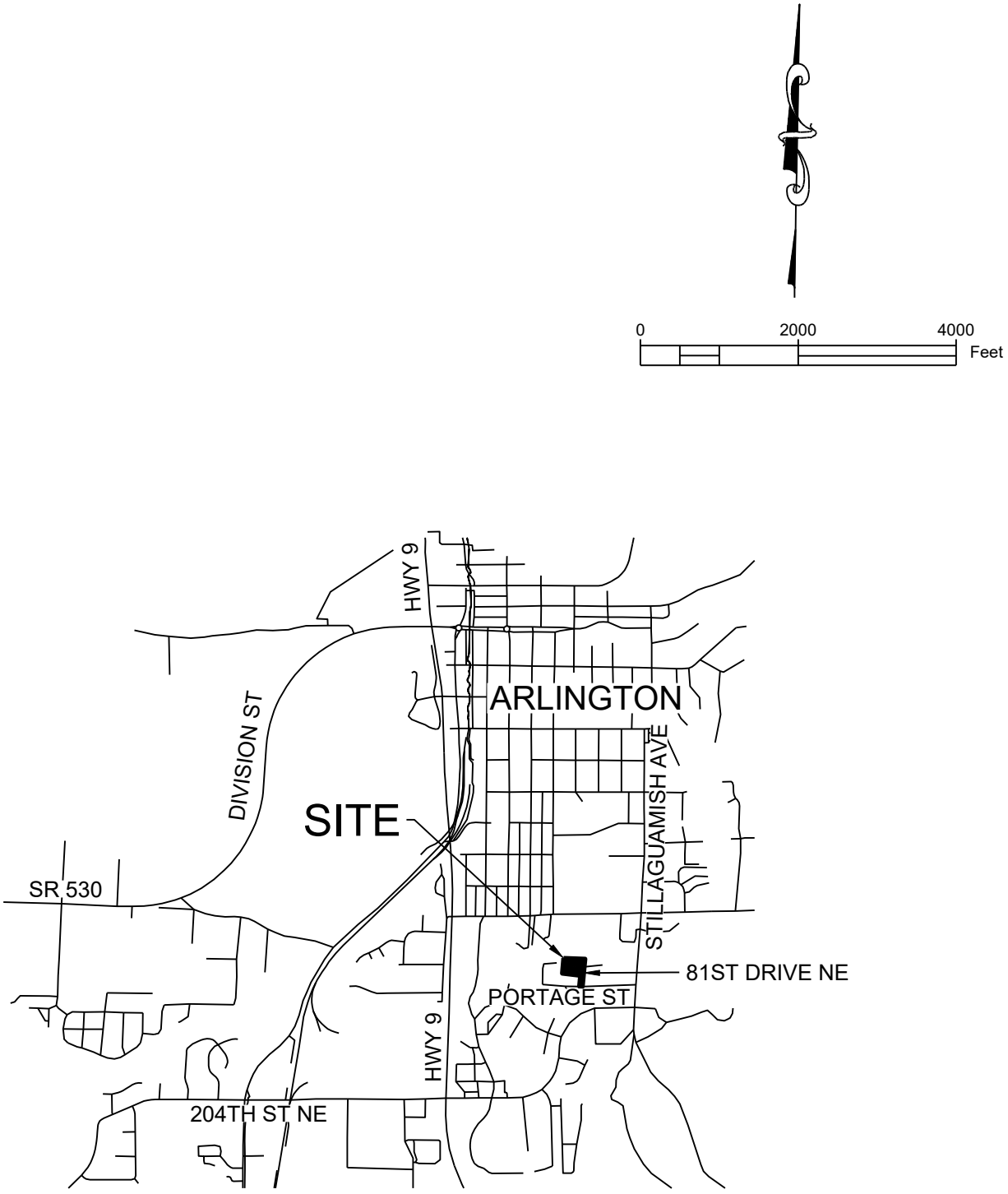

Figure 1 - Vicinity Map

Figure 2 - Existing Conditions

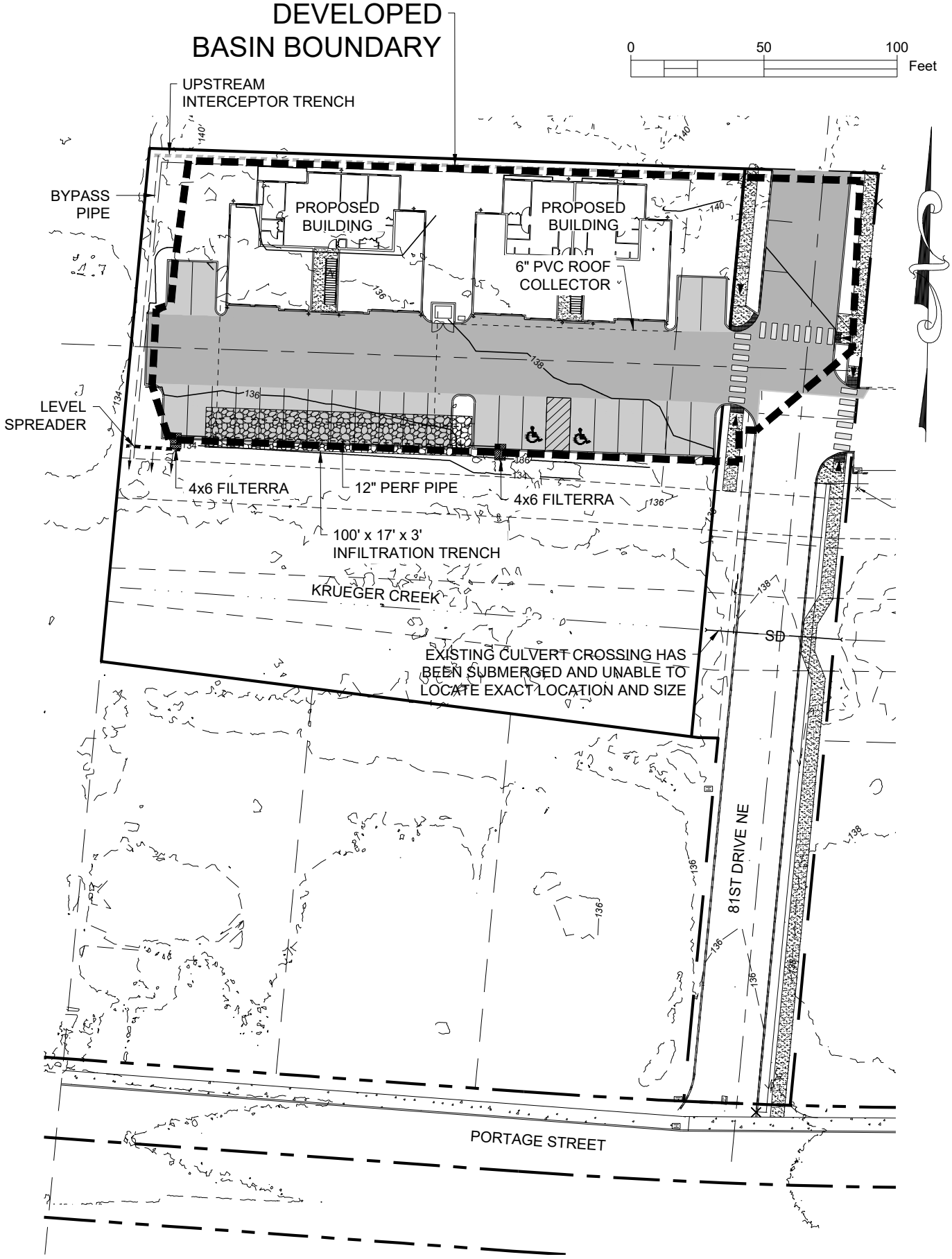

Figure 3 - Developed Conditions

WWHM DATA

WWHM2012
PROJECT REPORT

Project Name: Carey MF
Site Name: Carey Multifamily
Site Address:
City : Arlington
Report Date: 4/14/2022
Gage : Everett
Data Start : 1948/10/01
Data End : 2009/09/30
Precip Scale: 1.20
Version Date: 2019/09/13
Version : 4.2.17

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

High Flow Threshold for POC 1: 50 year

PREDEVELOPED LAND USE

Name : Basin 1
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Forest, Mod	.6
Pervious Total	**0.6**

Impervious Land Use	acre
Impervious Total	**0**
Basin Total	**0.6**

Element Flows To:

Surface	Interflow	Groundwater

MITIGATED LAND USE

Name : Basin 1
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Lawn, Mod	.09
Pervious Total	**0.09**

Impervious Land Use	acre
ROADS MOD	0.49
Impervious Total	**0.49**
Basin Total	**0.58**

Element Flows To:

Surface	Interflow	Groundwater
Gravel Trench Bed 1	Gravel Trench Bed 1	

Name : Gravel Trench Bed 1
Bottom Length: 100.00 ft.
Bottom Width: 17.00 ft.
Trench bottom slope 1: 0 To 1
Trench Left side slope 0: 0 To 1
Trench right side slope 2: 0 To 1
Material thickness of first layer: 4
Pour Space of material for first layer: 0.35
Material thickness of second layer: 0
Pour Space of material for second layer: 0
Material thickness of third layer: 0
Pour Space of material for third layer: 0
Infiltration On
Infiltration rate: 3
Infiltration safety factor: 1
Total Volume Infiltrated (ac-ft.): 96.405
Total Volume Through Riser (ac-ft.): 0.002
Total Volume Through Facility (ac-ft.): 96.407
Percent Infiltrated: 100
Total Precip Applied to Facility: 0
Total Evap From Facility: 0
Discharge Structure
Riser Height: 3 ft.
Riser Diameter: 12 in.

Element Flows To:

Outlet 1	Outlet 2

Gravel Trench Bed Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.039	0.000	0.000	0.000
0.0444	0.039	0.000	0.000	0.118

0.0889	0.039	0.001	0.000	0.118
0.1333	0.039	0.001	0.000	0.118
0.1778	0.039	0.002	0.000	0.118
0.2222	0.039	0.003	0.000	0.118
0.2667	0.039	0.003	0.000	0.118
0.3111	0.039	0.004	0.000	0.118
0.3556	0.039	0.004	0.000	0.118
0.4000	0.039	0.005	0.000	0.118
0.4444	0.039	0.006	0.000	0.118
0.4889	0.039	0.006	0.000	0.118
0.5333	0.039	0.007	0.000	0.118
0.5778	0.039	0.007	0.000	0.118
0.6222	0.039	0.008	0.000	0.118
0.6667	0.039	0.009	0.000	0.118
0.7111	0.039	0.009	0.000	0.118
0.7556	0.039	0.010	0.000	0.118
0.8000	0.039	0.010	0.000	0.118
0.8444	0.039	0.011	0.000	0.118
0.8889	0.039	0.012	0.000	0.118
0.9333	0.039	0.012	0.000	0.118
0.9778	0.039	0.013	0.000	0.118
1.0222	0.039	0.014	0.000	0.118
1.0667	0.039	0.014	0.000	0.118
1.1111	0.039	0.015	0.000	0.118
1.1556	0.039	0.015	0.000	0.118
1.2000	0.039	0.016	0.000	0.118
1.2444	0.039	0.017	0.000	0.118
1.2889	0.039	0.017	0.000	0.118
1.3333	0.039	0.018	0.000	0.118
1.3778	0.039	0.018	0.000	0.118
1.4222	0.039	0.019	0.000	0.118
1.4667	0.039	0.020	0.000	0.118
1.5111	0.039	0.020	0.000	0.118
1.5556	0.039	0.021	0.000	0.118
1.6000	0.039	0.021	0.000	0.118
1.6444	0.039	0.022	0.000	0.118
1.6889	0.039	0.023	0.000	0.118
1.7333	0.039	0.023	0.000	0.118
1.7778	0.039	0.024	0.000	0.118
1.8222	0.039	0.024	0.000	0.118
1.8667	0.039	0.025	0.000	0.118
1.9111	0.039	0.026	0.000	0.118
1.9556	0.039	0.026	0.000	0.118
2.0000	0.039	0.027	0.000	0.118
2.0444	0.039	0.027	0.000	0.118
2.0889	0.039	0.028	0.000	0.118
2.1333	0.039	0.029	0.000	0.118
2.1778	0.039	0.029	0.000	0.118
2.2222	0.039	0.030	0.000	0.118
2.2667	0.039	0.031	0.000	0.118
2.3111	0.039	0.031	0.000	0.118
2.3556	0.039	0.032	0.000	0.118
2.4000	0.039	0.032	0.000	0.118
2.4444	0.039	0.033	0.000	0.118
2.4889	0.039	0.034	0.000	0.118
2.5333	0.039	0.034	0.000	0.118
2.5778	0.039	0.035	0.000	0.118

2.6222	0.039	0.035	0.000	0.118
2.6667	0.039	0.036	0.000	0.118
2.7111	0.039	0.037	0.000	0.118
2.7556	0.039	0.037	0.000	0.118
2.8000	0.039	0.038	0.000	0.118
2.8444	0.039	0.038	0.000	0.118
2.8889	0.039	0.039	0.000	0.118
2.9333	0.039	0.040	0.000	0.118
2.9778	0.039	0.040	0.000	0.118
3.0222	0.039	0.041	0.035	0.118
3.0667	0.039	0.041	0.182	0.118
3.1111	0.039	0.042	0.389	0.118
3.1556	0.039	0.043	0.637	0.118
3.2000	0.039	0.043	0.907	0.118
3.2444	0.039	0.044	1.183	0.118
3.2889	0.039	0.044	1.447	0.118
3.3333	0.039	0.045	1.683	0.118
3.3778	0.039	0.046	1.879	0.118
3.4222	0.039	0.046	2.029	0.118
3.4667	0.039	0.047	2.138	0.118
3.5111	0.039	0.048	2.251	0.118
3.5556	0.039	0.048	2.347	0.118
3.6000	0.039	0.049	2.439	0.118
3.6444	0.039	0.049	2.528	0.118
3.6889	0.039	0.050	2.614	0.118
3.7333	0.039	0.051	2.697	0.118
3.7778	0.039	0.051	2.777	0.118
3.8222	0.039	0.052	2.856	0.118
3.8667	0.039	0.052	2.932	0.118
3.9111	0.039	0.053	3.006	0.118
3.9556	0.039	0.054	3.078	0.118
4.0000	0.039	0.054	3.149	0.118

ANALYSIS RESULTS

Stream Protection Duration

Predeveloped Landuse Totals for POC #1
Total Pervious Area:0.6
Total Impervious Area:0

Mitigated Landuse Totals for POC #1
Total Pervious Area:0.09
Total Impervious Area:0.49

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.000773
5 year	0.001878
10 year	0.003231

25 year	0.006126
50 year	0.009588
100 year	0.014691

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0
5 year	0
10 year	0
25 year	0
50 year	0
100 year	0

Stream Protection Duration

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1949	0.000	0.000
1950	0.002	0.000
1951	0.001	0.000
1952	0.000	0.000
1953	0.000	0.000
1954	0.005	0.000
1955	0.003	0.000
1956	0.000	0.000
1957	0.000	0.000
1958	0.000	0.000
1959	0.001	0.000
1960	0.001	0.000
1961	0.003	0.049
1962	0.000	0.000
1963	0.000	0.000
1964	0.002	0.000
1965	0.000	0.000
1966	0.000	0.000
1967	0.001	0.000
1968	0.000	0.000
1969	0.000	0.000
1970	0.000	0.000
1971	0.003	0.000
1972	0.000	0.000
1973	0.000	0.000
1974	0.002	0.000
1975	0.000	0.000
1976	0.002	0.000
1977	0.000	0.000
1978	0.001	0.000
1979	0.002	0.000
1980	0.000	0.000
1981	0.000	0.000
1982	0.001	0.000
1983	0.000	0.000
1984	0.000	0.000
1985	0.001	0.000
1986	0.006	0.000
1987	0.004	0.000
1988	0.000	0.000

1989	0.000	0.000
1990	0.000	0.000
1991	0.000	0.000
1992	0.000	0.000
1993	0.000	0.000
1994	0.000	0.000
1995	0.001	0.000
1996	0.008	0.000
1997	0.019	0.000
1998	0.000	0.000
1999	0.000	0.000
2000	0.001	0.000
2001	0.000	0.000
2002	0.000	0.000
2003	0.000	0.000
2004	0.000	0.000
2005	0.000	0.000
2006	0.022	0.000
2007	0.000	0.000
2008	0.001	0.000
2009	0.000	0.000

Stream Protection Duration
Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.0220	0.0494
2	0.0193	0.0000
3	0.0082	0.0000
4	0.0059	0.0000
5	0.0046	0.0000
6	0.0040	0.0000
7	0.0034	0.0000
8	0.0032	0.0000
9	0.0031	0.0000
10	0.0021	0.0000
11	0.0020	0.0000
12	0.0018	0.0000
13	0.0015	0.0000
14	0.0015	0.0000
15	0.0015	0.0000
16	0.0014	0.0000
17	0.0013	0.0000
18	0.0013	0.0000
19	0.0012	0.0000
20	0.0011	0.0000
21	0.0010	0.0000
22	0.0010	0.0000
23	0.0008	0.0000
24	0.0006	0.0000
25	0.0005	0.0000
26	0.0005	0.0000
27	0.0005	0.0000
28	0.0005	0.0000
29	0.0005	0.0000
30	0.0005	0.0000
31	0.0005	0.0000

32	0.0005	0.0000
33	0.0005	0.0000
34	0.0005	0.0000
35	0.0005	0.0000
36	0.0005	0.0000
37	0.0005	0.0000
38	0.0005	0.0000
39	0.0005	0.0000
40	0.0005	0.0000
41	0.0005	0.0000
42	0.0005	0.0000
43	0.0005	0.0000
44	0.0005	0.0000
45	0.0005	0.0000
46	0.0005	0.0000
47	0.0005	0.0000
48	0.0005	0.0000
49	0.0005	0.0000
50	0.0005	0.0000
51	0.0005	0.0000
52	0.0005	0.0000
53	0.0005	0.0000
54	0.0005	0.0000
55	0.0005	0.0000
56	0.0005	0.0000
57	0.0005	0.0000
58	0.0005	0.0000
59	0.0004	0.0000
60	0.0004	0.0000
61	0.0003	0.0000

Stream Protection Duration
POC #1
The Facility PASSED

The Facility PASSED.

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0004	0	0	0	Pass
0.0005	0	0	0	Pass
0.0006	0	0	0	Pass
0.0007	0	0	0	Pass
0.0008	0	0	0	Pass
0.0009	0	0	0	Pass
0.0009	0	0	0	Pass
0.0010	0	0	0	Pass
0.0011	0	0	0	Pass
0.0012	0	0	0	Pass
0.0013	0	0	0	Pass
0.0014	0	0	0	Pass
0.0015	0	0	0	Pass
0.0016	0	0	0	Pass
0.0017	0	0	0	Pass
0.0018	0	0	0	Pass
0.0019	0	0	0	Pass
0.0020	0	0	0	Pass

0.0021	0	0	0	Pass
0.0022	0	0	0	Pass
0.0022	0	0	0	Pass
0.0023	0	0	0	Pass
0.0024	0	0	0	Pass
0.0025	0	0	0	Pass
0.0026	0	0	0	Pass
0.0027	0	0	0	Pass
0.0028	0	0	0	Pass
0.0029	0	0	0	Pass
0.0030	0	0	0	Pass
0.0031	0	0	0	Pass
0.0032	0	0	0	Pass
0.0033	0	0	0	Pass
0.0034	0	0	0	Pass
0.0035	0	0	0	Pass
0.0035	0	0	0	Pass
0.0036	0	0	0	Pass
0.0037	0	0	0	Pass
0.0038	0	0	0	Pass
0.0039	0	0	0	Pass
0.0040	0	0	0	Pass
0.0041	0	0	0	Pass
0.0042	0	0	0	Pass
0.0043	0	0	0	Pass
0.0044	0	0	0	Pass
0.0045	0	0	0	Pass
0.0046	0	0	0	Pass
0.0047	0	0	0	Pass
0.0048	0	0	0	Pass
0.0048	0	0	0	Pass
0.0049	0	0	0	Pass
0.0050	0	0	0	Pass
0.0051	0	0	0	Pass
0.0052	0	0	0	Pass
0.0053	0	0	0	Pass
0.0054	0	0	0	Pass
0.0055	0	0	0	Pass
0.0056	0	0	0	Pass
0.0057	0	0	0	Pass
0.0058	0	0	0	Pass
0.0059	0	0	0	Pass
0.0060	0	0	0	Pass
0.0061	0	0	0	Pass
0.0061	0	0	0	Pass
0.0062	0	0	0	Pass
0.0063	0	0	0	Pass
0.0064	0	0	0	Pass
0.0065	0	0	0	Pass
0.0066	0	0	0	Pass
0.0067	0	0	0	Pass
0.0068	0	0	0	Pass
0.0069	0	0	0	Pass
0.0070	0	0	0	Pass
0.0071	0	0	0	Pass
0.0072	0	0	0	Pass
0.0073	0	0	0	Pass

0.0074	0	0	0	Pass
0.0075	0	0	0	Pass
0.0075	0	0	0	Pass
0.0076	0	0	0	Pass
0.0077	0	0	0	Pass
0.0078	0	0	0	Pass
0.0079	0	0	0	Pass
0.0080	0	0	0	Pass
0.0081	0	0	0	Pass
0.0082	0	0	0	Pass
0.0083	0	0	0	Pass
0.0084	0	0	0	Pass
0.0085	0	0	0	Pass
0.0086	0	0	0	Pass
0.0087	0	0	0	Pass
0.0088	0	0	0	Pass
0.0088	0	0	0	Pass
0.0089	0	0	0	Pass
0.0090	0	0	0	Pass
0.0091	0	0	0	Pass
0.0092	0	0	0	Pass
0.0093	0	0	0	Pass
0.0094	0	0	0	Pass
0.0095	0	0	0	Pass
0.0096	0	0	0	Pass

Water Quality BMP Flow and Volume for POC #1
On-line facility volume: 0 **acre-feet**
On-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**
Off-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**

LID Report

LID Technique	Used for Treatment?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft.)	Cumulative Volume Infiltration Credit	Percent Water Quality	Percent Volume Infiltrated	Comment Water Quality Treated
Gravel Trench Bed 1 POC	N	87.73			N	100.00		
Total Volume Infiltrated		87.73	0.00	0.00		100.00	0.00	0% No Treat. Credit

Compliance with LID Standard 8
Duration Analysis Result = Passed

Perlnd and Implnd Changes

No changes have been made.
