PRELIMINARY STORMWATER SITE PLAN
FOR
CASCADE MIXED USE
ARLINGTON, WASHINGTON

SEPTEMBER 3, 2021
REV APRIL 12, 2022

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MR 1: PREPARATION OF STORMWATER SITE PLANS

DRAINAGE PLAN DESCRIPTION

This Stormwater Site Plan has been prepared for a proposed four-story mixed-use building with retail/commercial space and surface parking on the ground floor with additional underground parking. The project site is currently undeveloped and involves the construction of the building on the site. Figure 1: Vicinity Map depicts the location of the project.

The property consists of one parcel (31052100307300) located north of 172nd St NE on a private access and totaling 80,399 SF or 1.85 acres. The site is currently undeveloped. Unopened right of way with a gravel trail/access bounds the north frontage, a private drive, commercial buildings and parking lots bounds the south frontage, a Best Western Hotel bounds the east, and several multi-family buildings bound the west.

Access for the proposed development will be from 173rd St NE and 172nd St NE between 3617 and 3533. The proposed development is to construct a four-story mixed-use building with retail/commercial space and surface parking on the ground floor with additional underground parking, see Figure 3: Developed Conditions for the layout.

The topographic map of the site shows that the ground ranges from 124 to 126 feet in elevation. 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 1.85 ac disturbed area.
- Greater than 35% existing impervious (gravel). A redevelopment site.
- The project will result in approximately 62,300 sf of new impervious area (pavement & roof on existing gravel is new impervious).
- The project will result in approximately 0 sf of replaced impervious area.
- The project has a value greater than 50% of the existing conditions.

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

SOILS DESCRIPTION

According to the geotechnical report prepared by Geo Group Northwest, Inc titled *Geotechnical Engineering Investigation* and dated June 17, 2021, the soils underlying the site are medium dense sand. Piezometer measurements place high groundwater at 119.58. CEC calculations indicated <5 while infiltration testing indicated a design rate of 9 inches per hour.

A mounding analysis was prepared by Riley Group which indicates that groundwater mounding will not impede infiltration.

CRITICAL AREAS
There are no critical areas on or near the site. A review of the Department of Ecology 303d list does not indicate a downstream listing.

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

There are no natural drainage systems in the local area. Given the sandy soils, most precipitation would infiltrate. Therefore, infiltration of runoff from the development is proposed.

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 surfaced need restoration.

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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:

> 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 were tested for Cation Exchange Capacity and the two samples measured 10.8 and 11.3. Both were greater than 5 CEC and therefore the soil does have the ability to filter runoff. No further treatment requirements are proposed.

MR 7: FLOW CONTROL

Flow control is required for the site development. The major system will be placed under the parking lot access to the east of the building. It is sized to handle the access, the parking, and the roof area which constitute the majority of the site impervious.

The conceptual trench has the following characteristics:

Total Bottom Area	4,200 sf (20 ft x 210 ft)
Storage Depth	1.5 ft
Porosity of Rock	0.35
Detention Volume	2,205 cf

With those parameters, the trench infiltrates 100% of the tributary basin. The depth has been kept to a minimum to provide clearance from the groundwater. Estimated bottom of trench is 122.58 with the measured high groundwater at 119.58. A mounding analysis is provided under separate cover. That analysis indicates that groundwater mounding does not impede the infiltration of runoff from the designed trench.

Smaller systems will be used around the building for landscaping areas and for the proposed play area. These have not been sized as this time as those areas are on flux, however, there is room for these facilities and the combination of small basins and BMP T5.13 amended topsoil will not require large systems.

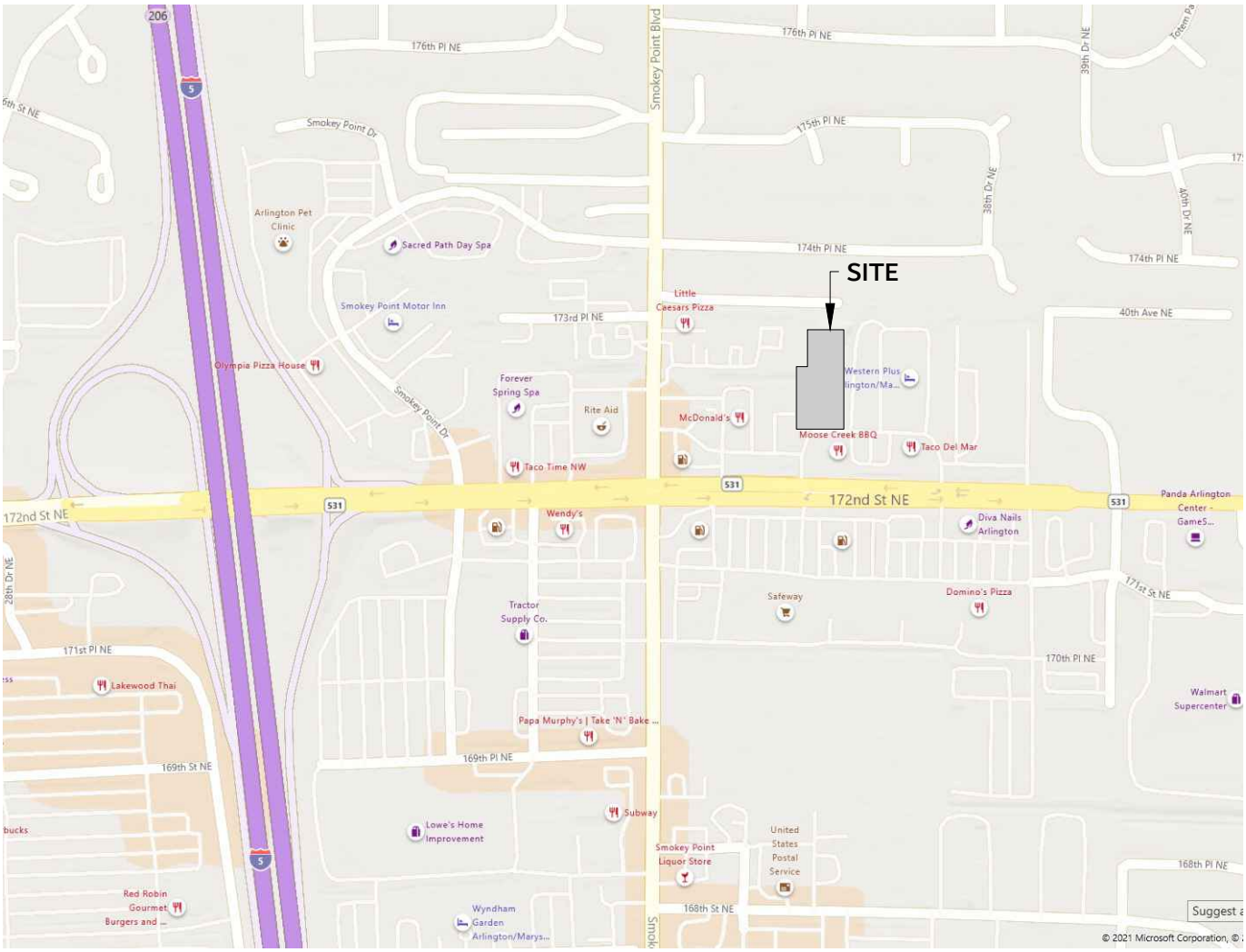
MR 8: WETLANDS PROTECTION

There are no wetlands on or near the site.

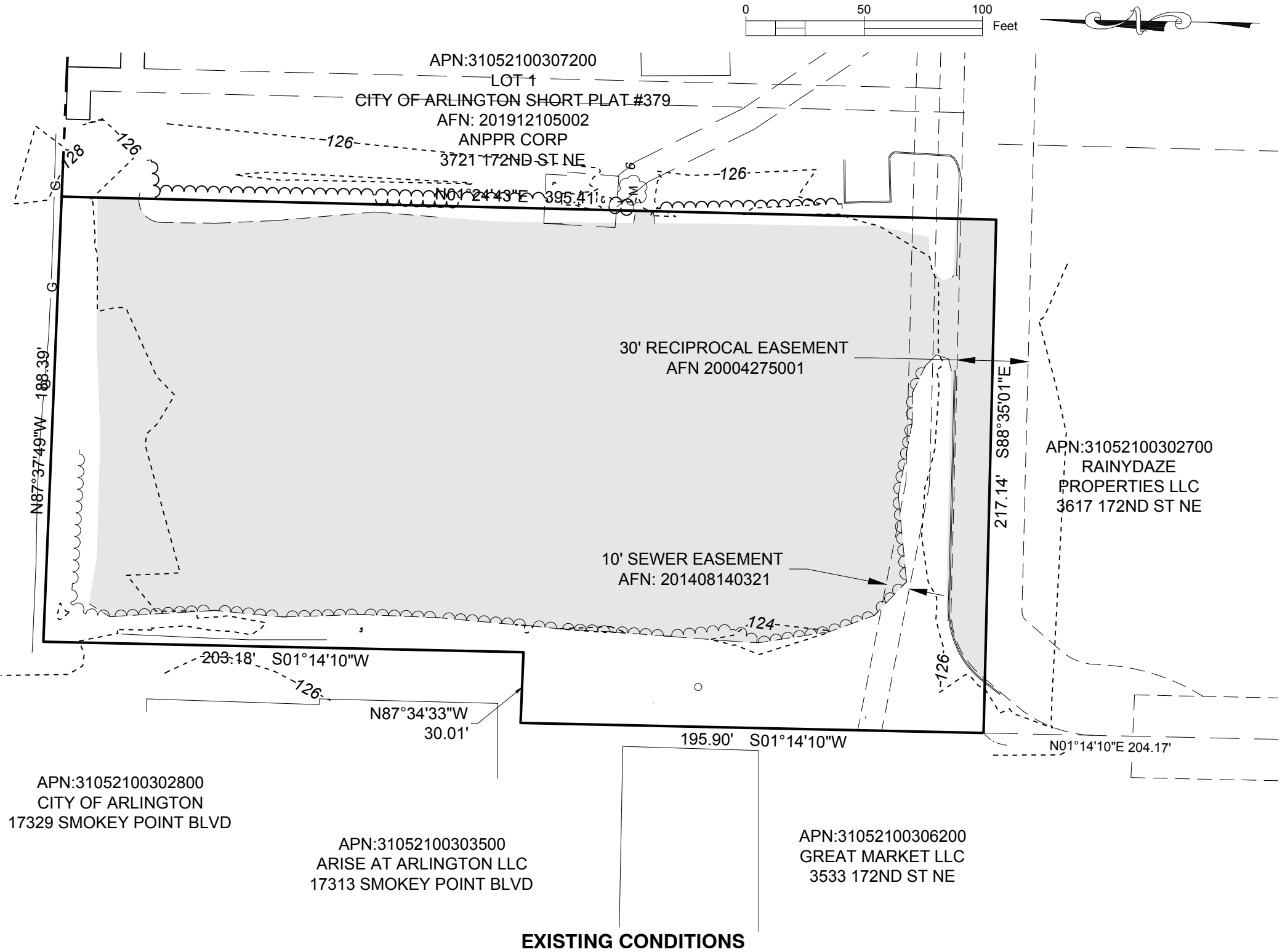
MR 9: OPERATION AND MAINTENANCE MANUAL

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

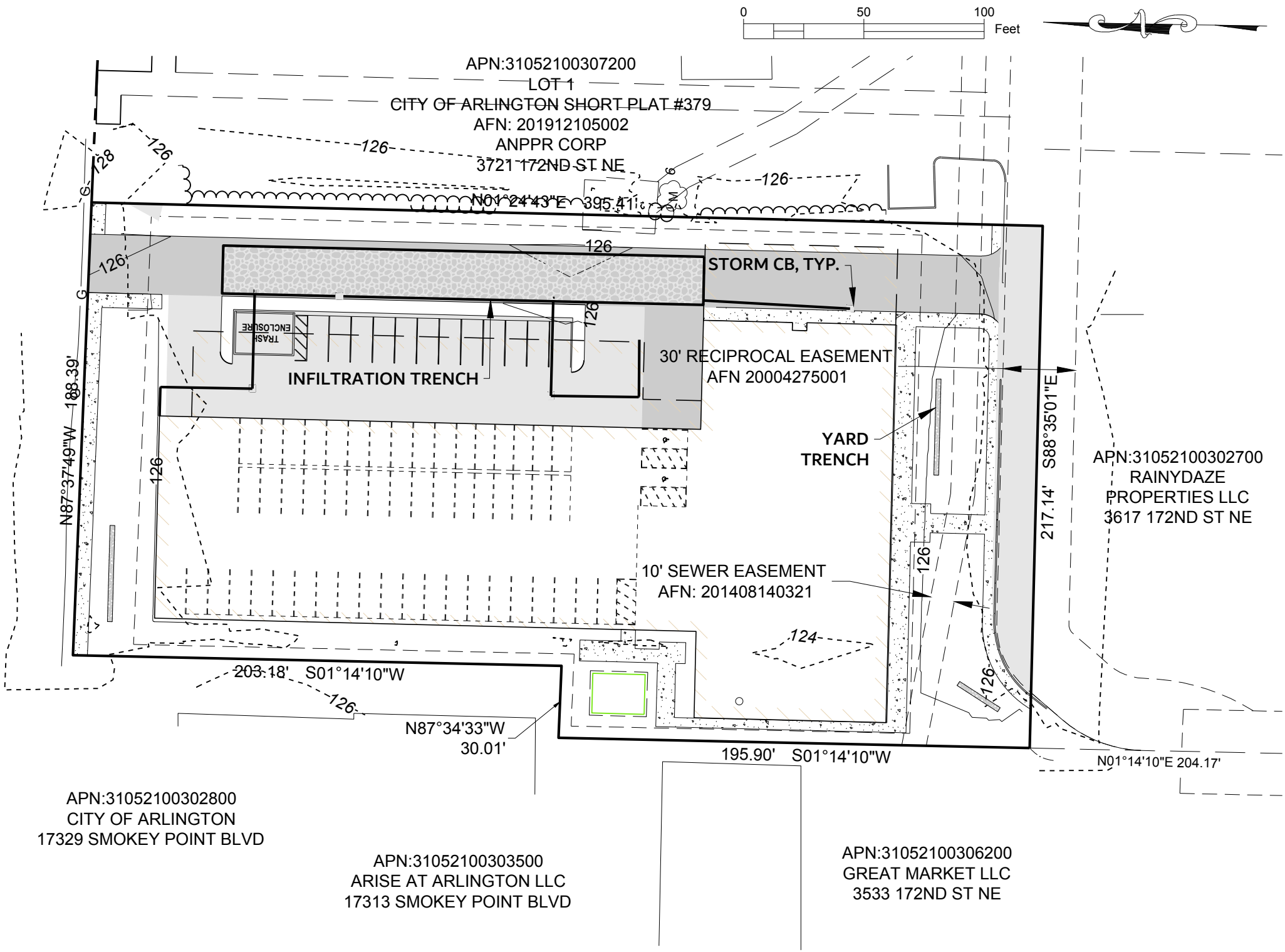
FIGURES



VICINITY MAP



EXISTING CONDITIONS



DEVELOPED CONDITIONS

WWHM2012 DATA

WWHM2012
PROJECT REPORT

Project Name: Cascade Mixed Use
Site Name:
Site Address:
City :
Report Date: 9/3/2021
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, Flat	1.62
Pervious Total	1.62

Impervious Land Use	acre
Impervious Total	0
Basin Total	1.62

Element Flows To:

Surface	Interflow	Groundwater

MITIGATED LAND USE

Name : Basin 1
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Lawn, Flat	.34
Pervious Total	**0.34**

Impervious Land Use	acre
ROADS FLAT	1.28
Impervious Total	**1.28**
Basin Total	**1.62**

Element Flows To:

Surface	Interflow	Groundwater
Gravel Trench Bed 1	Gravel Trench Bed 1	

Name : Gravel Trench Bed 1
Bottom Length: 210.00 ft.
Bottom Width: 20.00 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: 9
Infiltration safety factor: 1
Wetted surface area On
Total Volume Infiltrated (ac-ft.): 284.242
Total Volume Through Riser (ac-ft.): 0.011
Total Volume Through Facility (ac-ft.): 284.253
Percent Infiltrated: 100
Total Precip Applied to Facility: 0
Total Evap From Facility: 0
Discharge Structure
Riser Height: 1.5 ft.
Riser Diameter: 8 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	0.096	0.000	0.000	0.000

0.0444	0.096	0.001	0.000	0.875
0.0889	0.096	0.003	0.000	0.875
0.1333	0.096	0.004	0.000	0.875
0.1778	0.096	0.006	0.000	0.875
0.2222	0.096	0.007	0.000	0.875
0.2667	0.096	0.009	0.000	0.875
0.3111	0.096	0.010	0.000	0.875
0.3556	0.096	0.012	0.000	0.875
0.4000	0.096	0.013	0.000	0.875
0.4444	0.096	0.015	0.000	0.875
0.4889	0.096	0.016	0.000	0.875
0.5333	0.096	0.018	0.000	0.875
0.5778	0.096	0.019	0.000	0.875
0.6222	0.096	0.021	0.000	0.875
0.6667	0.096	0.022	0.000	0.875
0.7111	0.096	0.024	0.000	0.875
0.7556	0.096	0.025	0.000	0.875
0.8000	0.096	0.027	0.000	0.875
0.8444	0.096	0.028	0.000	0.875
0.8889	0.096	0.030	0.000	0.875
0.9333	0.096	0.031	0.000	0.875
0.9778	0.096	0.033	0.000	0.875
1.0222	0.096	0.034	0.000	0.875
1.0667	0.096	0.036	0.000	0.875
1.1111	0.096	0.037	0.000	0.875
1.1556	0.096	0.039	0.000	0.875
1.2000	0.096	0.040	0.000	0.875
1.2444	0.096	0.042	0.000	0.875
1.2889	0.096	0.043	0.000	0.875
1.3333	0.096	0.045	0.000	0.875
1.3778	0.096	0.046	0.000	0.875
1.4222	0.096	0.048	0.000	0.875
1.4667	0.096	0.049	0.000	0.875
1.5111	0.096	0.051	0.008	0.875
1.5556	0.096	0.052	0.092	0.875
1.6000	0.096	0.054	0.219	0.875
1.6444	0.096	0.055	0.367	0.875
1.6889	0.096	0.057	0.513	0.875
1.7333	0.096	0.058	0.639	0.875
1.7778	0.096	0.060	0.730	0.875
1.8222	0.096	0.061	0.788	0.875
1.8667	0.096	0.063	0.847	0.875
1.9111	0.096	0.064	0.897	0.875
1.9556	0.096	0.066	0.944	0.875
2.0000	0.096	0.067	0.989	0.875
2.0444	0.096	0.069	1.032	0.875
2.0889	0.096	0.070	1.074	0.875
2.1333	0.096	0.072	1.114	0.875
2.1778	0.096	0.073	1.152	0.875
2.2222	0.096	0.075	1.189	0.875
2.2667	0.096	0.076	1.225	0.875
2.3111	0.096	0.078	1.260	0.875
2.3556	0.096	0.079	1.294	0.875
2.4000	0.096	0.081	1.328	0.875
2.4444	0.096	0.082	1.360	0.875
2.4889	0.096	0.084	1.392	0.875
2.5333	0.096	0.085	1.423	0.875

2.5778	0.096	0.087	1.453	0.875
2.6222	0.096	0.088	1.482	0.875
2.6667	0.096	0.090	1.512	0.875
2.7111	0.096	0.091	1.540	0.875
2.7556	0.096	0.093	1.568	0.875
2.8000	0.096	0.094	1.596	0.875
2.8444	0.096	0.096	1.623	0.875
2.8889	0.096	0.097	1.649	0.875
2.9333	0.096	0.099	1.675	0.875
2.9778	0.096	0.100	1.701	0.875
3.0222	0.096	0.102	1.727	0.875
3.0667	0.096	0.103	1.752	0.875
3.1111	0.096	0.105	1.776	0.875
3.1556	0.096	0.106	1.801	0.875
3.2000	0.096	0.108	1.825	0.875
3.2444	0.096	0.109	1.848	0.875
3.2889	0.096	0.111	1.872	0.875
3.3333	0.096	0.112	1.895	0.875
3.3778	0.096	0.114	1.918	0.875
3.4222	0.096	0.115	1.940	0.875
3.4667	0.096	0.117	1.963	0.875
3.5111	0.096	0.118	1.985	0.875
3.5556	0.096	0.120	2.007	0.875
3.6000	0.096	0.121	2.028	0.875
3.6444	0.096	0.123	2.049	0.875
3.6889	0.096	0.124	2.071	0.875
3.7333	0.096	0.126	2.092	0.875
3.7778	0.096	0.127	2.112	0.875
3.8222	0.096	0.129	2.133	0.875
3.8667	0.096	0.130	2.153	0.875
3.9111	0.096	0.132	2.173	0.875
3.9556	0.096	0.133	2.193	0.875
4.0000	0.096	0.135	2.213	0.875

ANALYSIS RESULTS

Stream Protection Duration

Predeveloped Landuse Totals for POC #1
Total Pervious Area:1.62
Total Impervious Area:0

Mitigated Landuse Totals for POC #1
Total Pervious Area:0.34
Total Impervious Area:1.28

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.001859
5 year	0.004033

10 year	0.006469
25 year	0.011298
50 year	0.016696
100 year	0.024218

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	0.001	0.000
1950	0.004	0.000
1951	0.003	0.000
1952	0.001	0.000
1953	0.001	0.000
1954	0.009	0.000
1955	0.007	0.000
1956	0.001	0.000
1957	0.001	0.000
1958	0.001	0.000
1959	0.003	0.000
1960	0.002	0.000
1961	0.006	0.261
1962	0.001	0.000
1963	0.001	0.000
1964	0.004	0.000
1965	0.001	0.000
1966	0.001	0.000
1967	0.003	0.000
1968	0.001	0.000
1969	0.001	0.000
1970	0.001	0.000
1971	0.006	0.000
1972	0.001	0.000
1973	0.001	0.000
1974	0.003	0.000
1975	0.001	0.000
1976	0.003	0.000
1977	0.001	0.000
1978	0.001	0.000
1979	0.003	0.000
1980	0.001	0.000
1981	0.001	0.000
1982	0.002	0.000
1983	0.001	0.000
1984	0.001	0.000
1985	0.002	0.000
1986	0.011	0.000
1987	0.007	0.000

1988	0.001	0.000
1989	0.001	0.000
1990	0.001	0.000
1991	0.001	0.000
1992	0.001	0.000
1993	0.001	0.000
1994	0.001	0.000
1995	0.002	0.000
1996	0.015	0.000
1997	0.040	0.000
1998	0.001	0.000
1999	0.001	0.000
2000	0.002	0.000
2001	0.001	0.000
2002	0.001	0.000
2003	0.001	0.000
2004	0.001	0.000
2005	0.001	0.000
2006	0.043	0.000
2007	0.001	0.000
2008	0.002	0.000
2009	0.001	0.000

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

Rank	Predeveloped	Mitigated
1	0.0431	0.2606
2	0.0401	0.0000
3	0.0146	0.0000
4	0.0114	0.0000
5	0.0089	0.0000
6	0.0075	0.0000
7	0.0068	0.0000
8	0.0063	0.0000
9	0.0061	0.0000
10	0.0042	0.0000
11	0.0038	0.0000
12	0.0034	0.0000
13	0.0029	0.0000
14	0.0029	0.0000
15	0.0027	0.0000
16	0.0026	0.0000
17	0.0025	0.0000
18	0.0024	0.0000
19	0.0024	0.0000
20	0.0022	0.0000
21	0.0020	0.0000
22	0.0019	0.0000
23	0.0015	0.0000
24	0.0013	0.0000
25	0.0013	0.0000
26	0.0013	0.0000
27	0.0013	0.0000
28	0.0013	0.0000
29	0.0013	0.0000
30	0.0013	0.0000

31	0.0013	0.0000
32	0.0013	0.0000
33	0.0013	0.0000
34	0.0013	0.0000
35	0.0013	0.0000
36	0.0013	0.0000
37	0.0013	0.0000
38	0.0013	0.0000
39	0.0013	0.0000
40	0.0013	0.0000
41	0.0013	0.0000
42	0.0013	0.0000
43	0.0013	0.0000
44	0.0013	0.0000
45	0.0013	0.0000
46	0.0013	0.0000
47	0.0013	0.0000
48	0.0013	0.0000
49	0.0013	0.0000
50	0.0013	0.0000
51	0.0013	0.0000
52	0.0013	0.0000
53	0.0013	0.0000
54	0.0013	0.0000
55	0.0013	0.0000
56	0.0013	0.0000
57	0.0013	0.0000
58	0.0012	0.0000
59	0.0012	0.0000
60	0.0011	0.0000
61	0.0009	0.0000

Stream Protection Duration
POC #1
The Facility PASSED

The Facility PASSED.

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0009	0	0	0	Pass
0.0011	0	0	0	Pass
0.0012	0	0	0	Pass
0.0014	0	0	0	Pass
0.0016	0	0	0	Pass
0.0017	0	0	0	Pass
0.0019	0	0	0	Pass
0.0020	0	0	0	Pass
0.0022	0	0	0	Pass
0.0024	0	0	0	Pass
0.0025	0	0	0	Pass
0.0027	0	0	0	Pass
0.0028	0	0	0	Pass
0.0030	0	0	0	Pass
0.0032	0	0	0	Pass
0.0033	0	0	0	Pass
0.0035	0	0	0	Pass

0.0036	0	0	0	Pass
0.0038	0	0	0	Pass
0.0040	0	0	0	Pass
0.0041	0	0	0	Pass
0.0043	0	0	0	Pass
0.0044	0	0	0	Pass
0.0046	0	0	0	Pass
0.0048	0	0	0	Pass
0.0049	0	0	0	Pass
0.0051	0	0	0	Pass
0.0052	0	0	0	Pass
0.0054	0	0	0	Pass
0.0055	0	0	0	Pass
0.0057	0	0	0	Pass
0.0059	0	0	0	Pass
0.0060	0	0	0	Pass
0.0062	0	0	0	Pass
0.0063	0	0	0	Pass
0.0065	0	0	0	Pass
0.0067	0	0	0	Pass
0.0068	0	0	0	Pass
0.0070	0	0	0	Pass
0.0071	0	0	0	Pass
0.0073	0	0	0	Pass
0.0075	0	0	0	Pass
0.0076	0	0	0	Pass
0.0078	0	0	0	Pass
0.0079	0	0	0	Pass
0.0081	0	0	0	Pass
0.0083	0	0	0	Pass
0.0084	0	0	0	Pass
0.0086	0	0	0	Pass
0.0087	0	0	0	Pass
0.0089	0	0	0	Pass
0.0091	0	0	0	Pass
0.0092	0	0	0	Pass
0.0094	0	0	0	Pass
0.0095	0	0	0	Pass
0.0097	0	0	0	Pass
0.0098	0	0	0	Pass
0.0100	0	0	0	Pass
0.0102	0	0	0	Pass
0.0103	0	0	0	Pass
0.0105	0	0	0	Pass
0.0106	0	0	0	Pass
0.0108	0	0	0	Pass
0.0110	0	0	0	Pass
0.0111	0	0	0	Pass
0.0113	0	0	0	Pass
0.0114	0	0	0	Pass
0.0116	0	0	0	Pass
0.0118	0	0	0	Pass
0.0119	0	0	0	Pass
0.0121	0	0	0	Pass
0.0122	0	0	0	Pass
0.0124	0	0	0	Pass
0.0126	0	0	0	Pass

0.0127	0	0	0	Pass
0.0129	0	0	0	Pass
0.0130	0	0	0	Pass
0.0132	0	0	0	Pass
0.0134	0	0	0	Pass
0.0135	0	0	0	Pass
0.0137	0	0	0	Pass
0.0138	0	0	0	Pass
0.0140	0	0	0	Pass
0.0141	0	0	0	Pass
0.0143	0	0	0	Pass
0.0145	0	0	0	Pass
0.0146	0	0	0	Pass
0.0148	0	0	0	Pass
0.0149	0	0	0	Pass
0.0151	0	0	0	Pass
0.0153	0	0	0	Pass
0.0154	0	0	0	Pass
0.0156	0	0	0	Pass
0.0157	0	0	0	Pass
0.0159	0	0	0	Pass
0.0161	0	0	0	Pass
0.0162	0	0	0	Pass
0.0164	0	0	0	Pass
0.0165	0	0	0	Pass
0.0167	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 Water Quality Treatment?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft.)	Cumulative Volume Infiltration Credit	Percent Percent Treated	Comment
Gravel Trench Bed 1 POC	N	258.67			N	100.00	
Total Volume Infiltrated		258.67	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.
