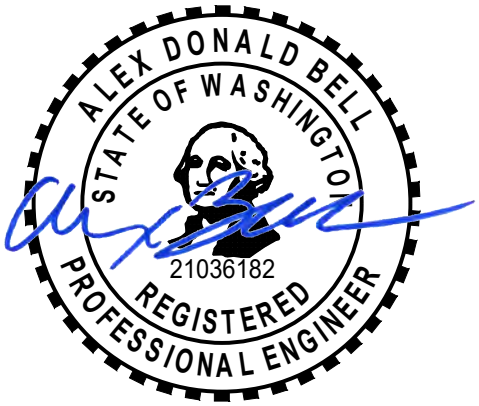
STORMWATER SITE PLAN

Gayteway Business Park – Building F

20015 67th Avenue N.E.
Arlington, WA 98223



01/07/2022

City/County File No. TBD

Prepared for:
Gayteway Business Park
P.O. Box 1727
Bellevue, WA 98009

January 7, 2022
Our Job No. 21334

Stormwater Site Plan

Barghausen Consulting Engineers, Inc.

Gayteway Business Park – Building F

Arlington, Washington

Our Job No. 21334

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APPENDICES

Tab 1.0

1.0 PROJECT OVERVIEW

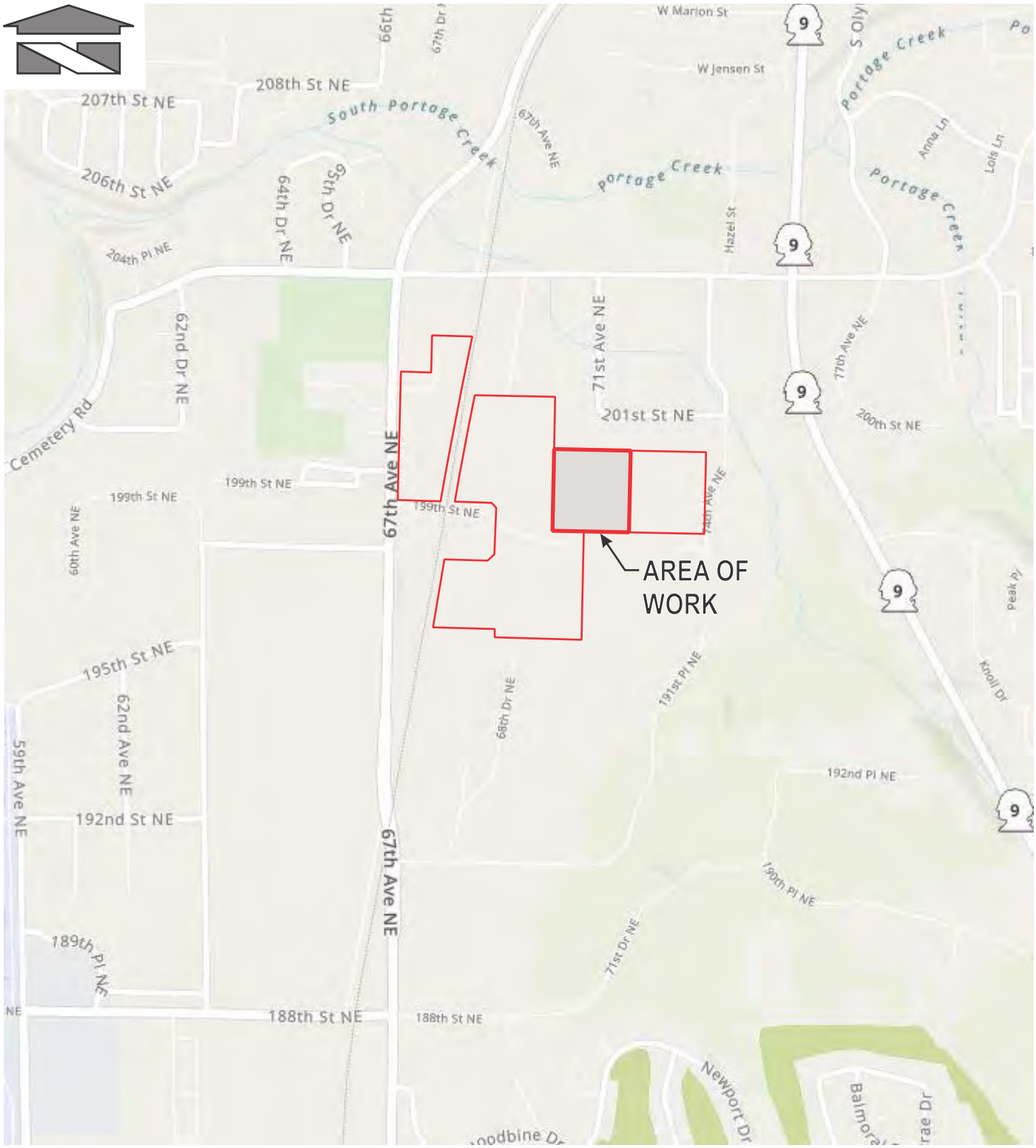
The proposed new development consists of a new industrial building located at 20015 67th Avenue Northeast Arlington WA, 98223. The development is located within Parcel number 31051400200700 and is part of a 54-acre parcel which encompasses the west and east side of the Northern Pacific Railroad. Construction activities includes site clearing, grading, paving, structures, utilities, drainage, road improvements, and landscaping. Please refer to the Assessor's Map included in this report for additional detail.

The existing site is primarily a dirt lot with surrounding fencing that will be demolished for proposed developments. Currently the project site, overall site topography is relatively flat, typically 0% to 2% with steep slopes on the south and east side of the site as steep as 30%. Soils on site have high infiltration rate and groundwater is not expected to be encountered based on groundwater data available in the surrounding site area. Refer to the Existing Conditions Map, Sensitive Areas Map, FEMA Map and Soil Survey Map included in this report for more details.

The project proposes to add a new office/warehouse/manufacturing/building with ADA parking, pavement, drainage, and associated utilities. Based on the 2019 Washington State Department of Ecology Surface Water Management Manual for Western Washington (SWMMWW) Figure I-3.1, the project will include more than 5,000 sf of new plus replaced impervious areas. Therefore, the project will meet Minimum Requirements #1-9. Refer to the Minimum Flow Chart included in this report for additional information.

On-site drainage improvements include new catch basins, conveyance structures, proprietary runoff treatment facilities and a Stormtech Chamber System for infiltration. Stormwater infiltration will be provided for the proposed parking and roof drainage runoff. Basin Runoff Treatment will be provided for the pavement areas prior to discharge to infiltration galleries.

Figure 1.1
Vicinity Map



REFERENCE: MapQuest (2020)

Scale:
Horizontal: **N.T.S.** Vertical: **N/A**

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Arlington, Washington

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Title:
VICINITY MAP

DATE: 09/17/21

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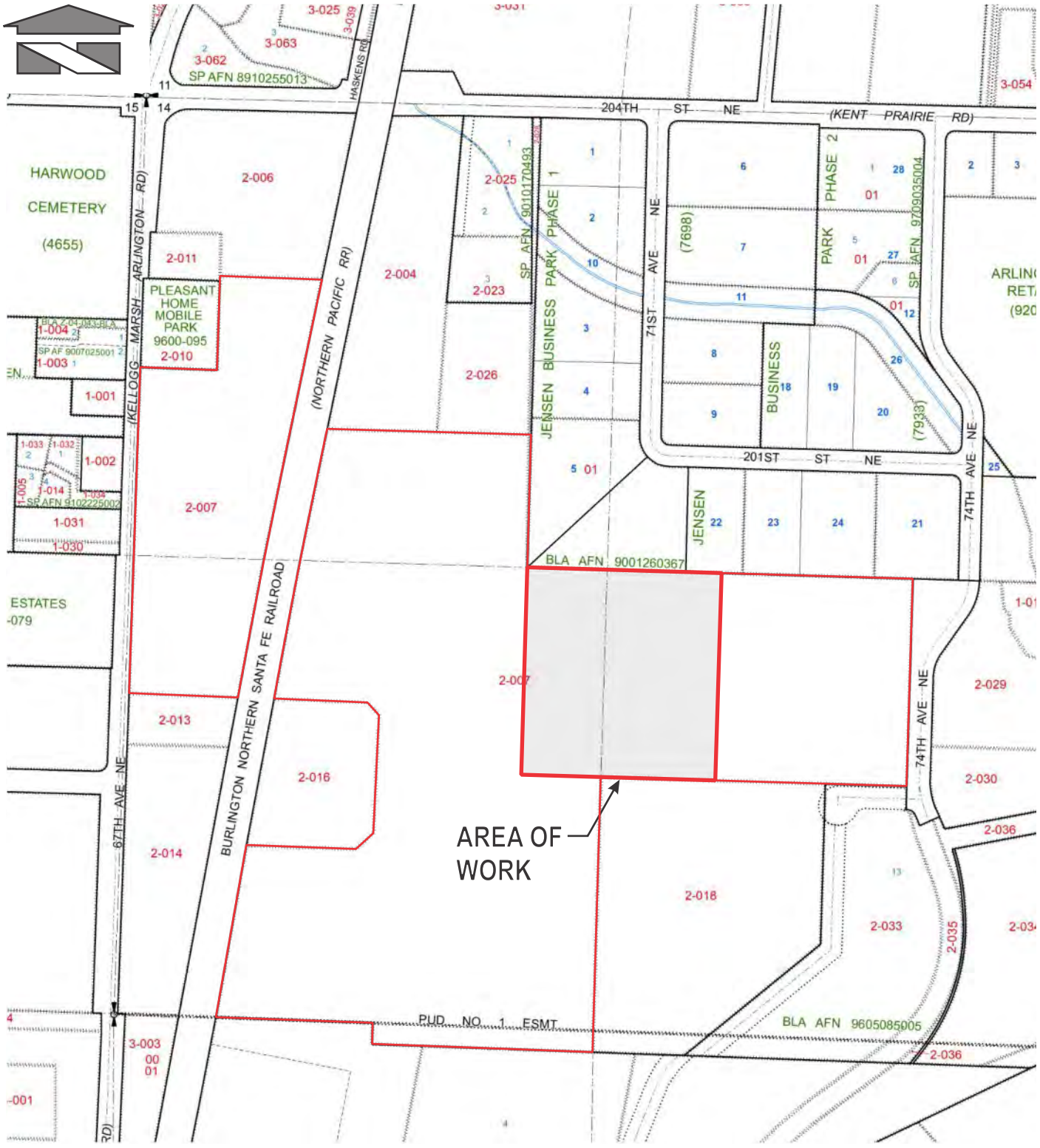
Figure 1.2
Soil Survey Map



REFERENCE: Snohomish County Department of Assessments (April 2020)

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Arlington, Washington

Job Number
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Title:
ASSESSOR MAP

DATE: 09/17/21

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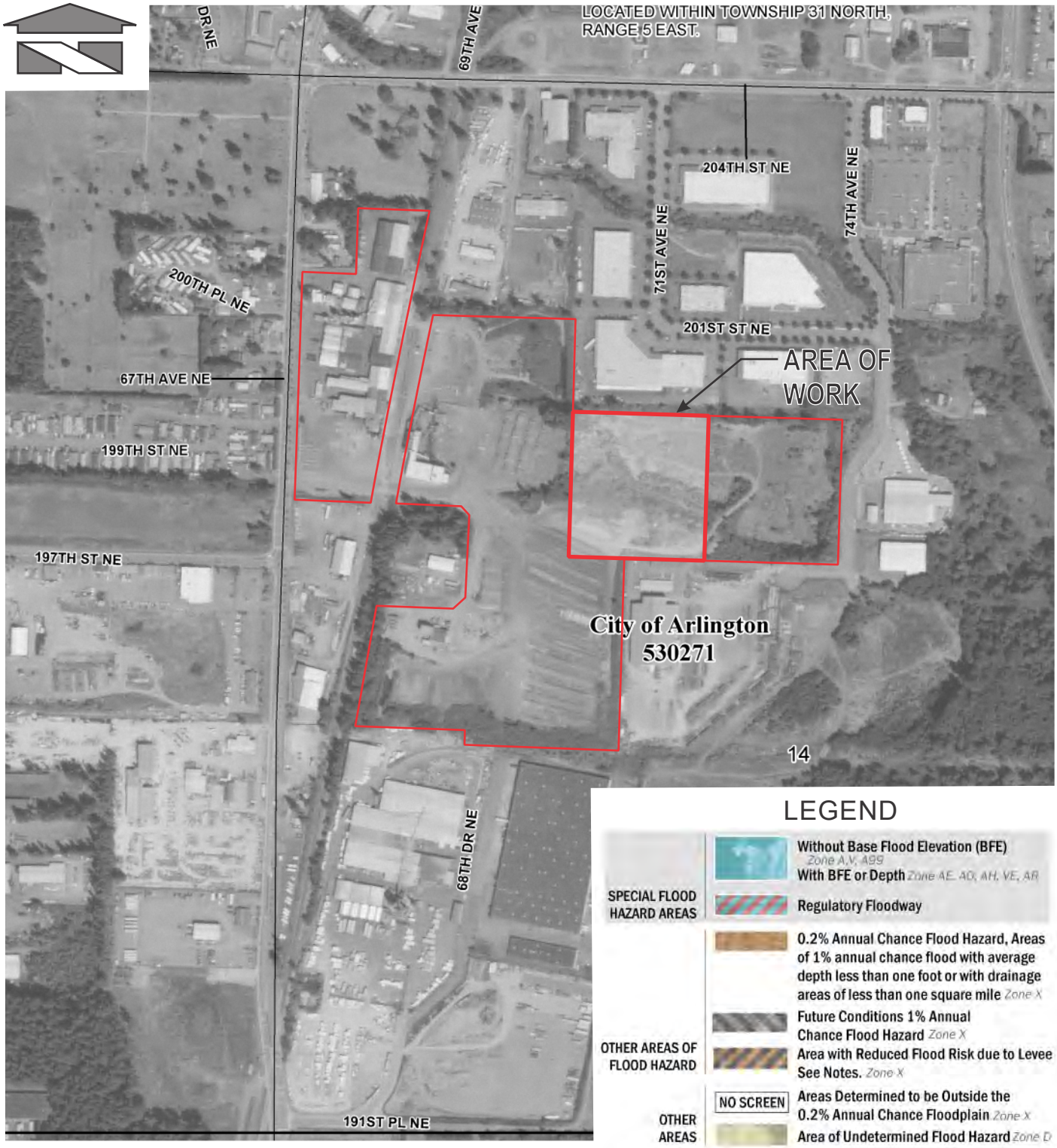
Figure 1.3
Sensitive Areas
Map



REFERENCE: Federal Emergency Management Agency (Portion of Map 53061C0392F, June 2020)

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Title:
FEMA MAP

DATE: 09/17/21

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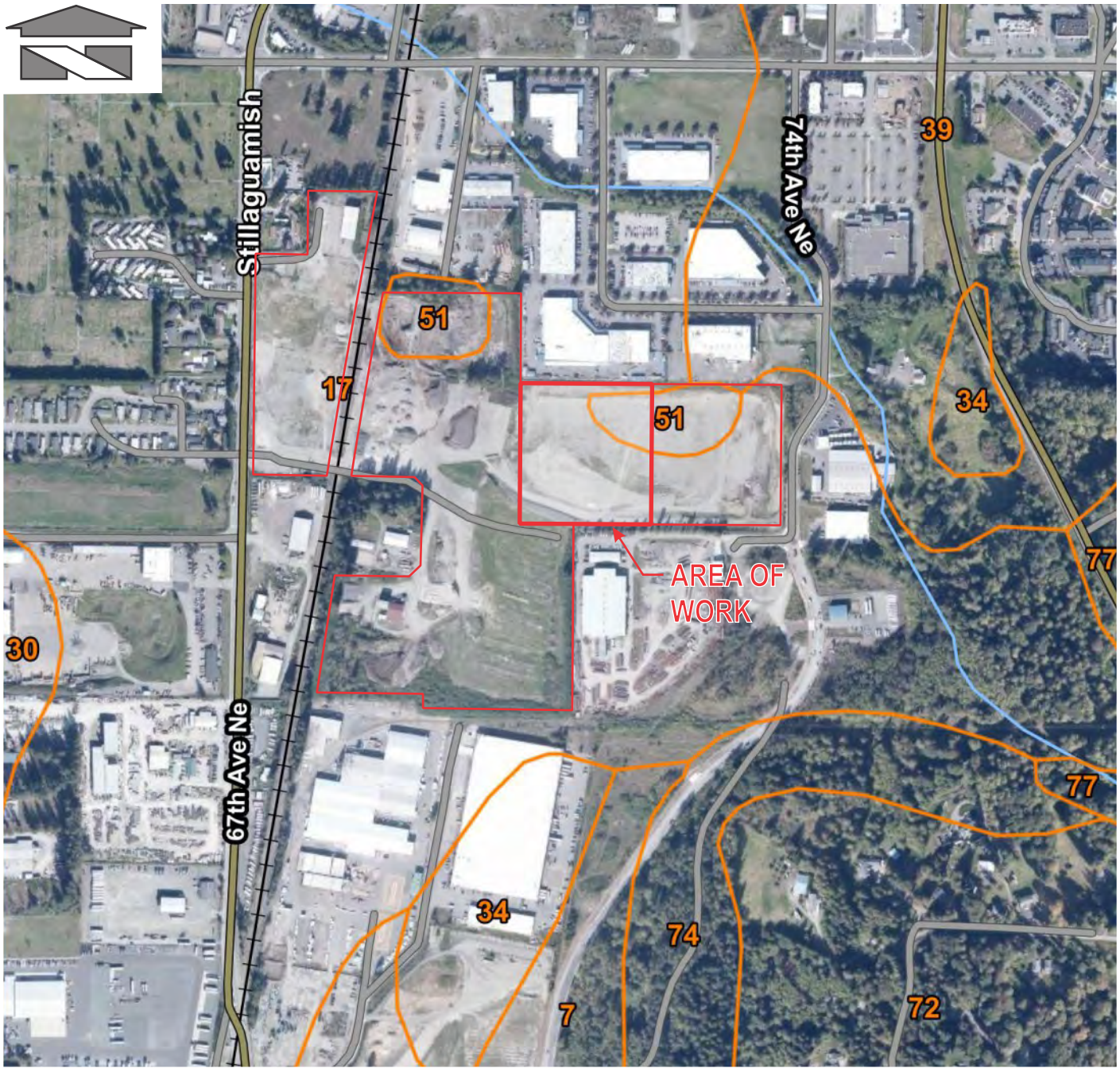
Figure 1.4
Assessor's Map



REFERENCE: USDA, Natural Resources Conservation Service

LEGEND:		HSG
17	= Everett very gravelly sandy loam, 0-8% slopes	A
51	= Pits	-

Scale:
Horizontal: **N.T.S.** Vertical: **N/A**

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Arlington, Washington

Job Number
21334

Title:
SOIL SURVEY MAP

DATE: 09/17/21

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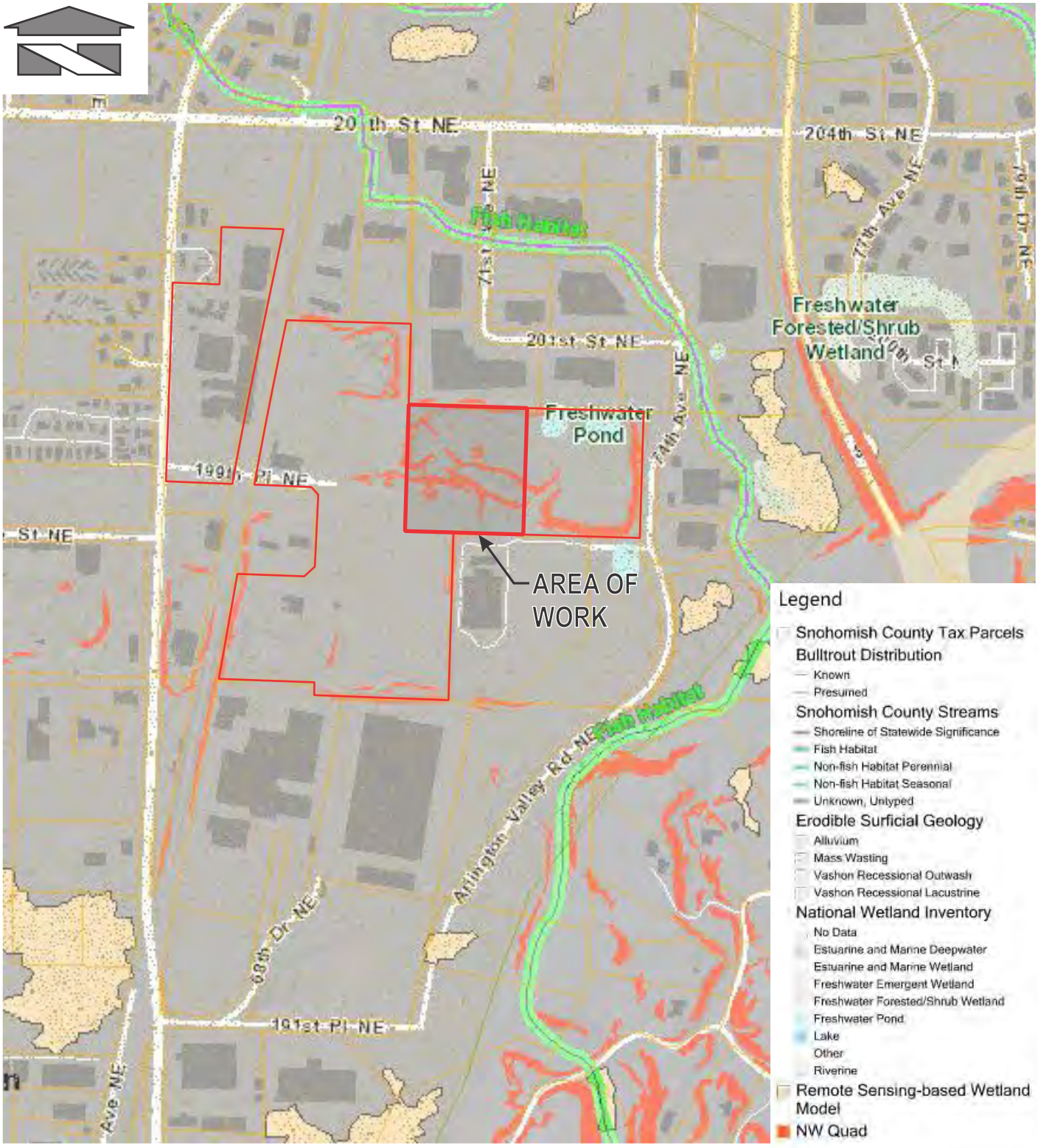
Figure 1.5
FEMA Map



REFERENCE: Snohomish County PDS Map Portal (2020)

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Title:
SENSITIVE AREAS MAP

DATE: 09/17/21

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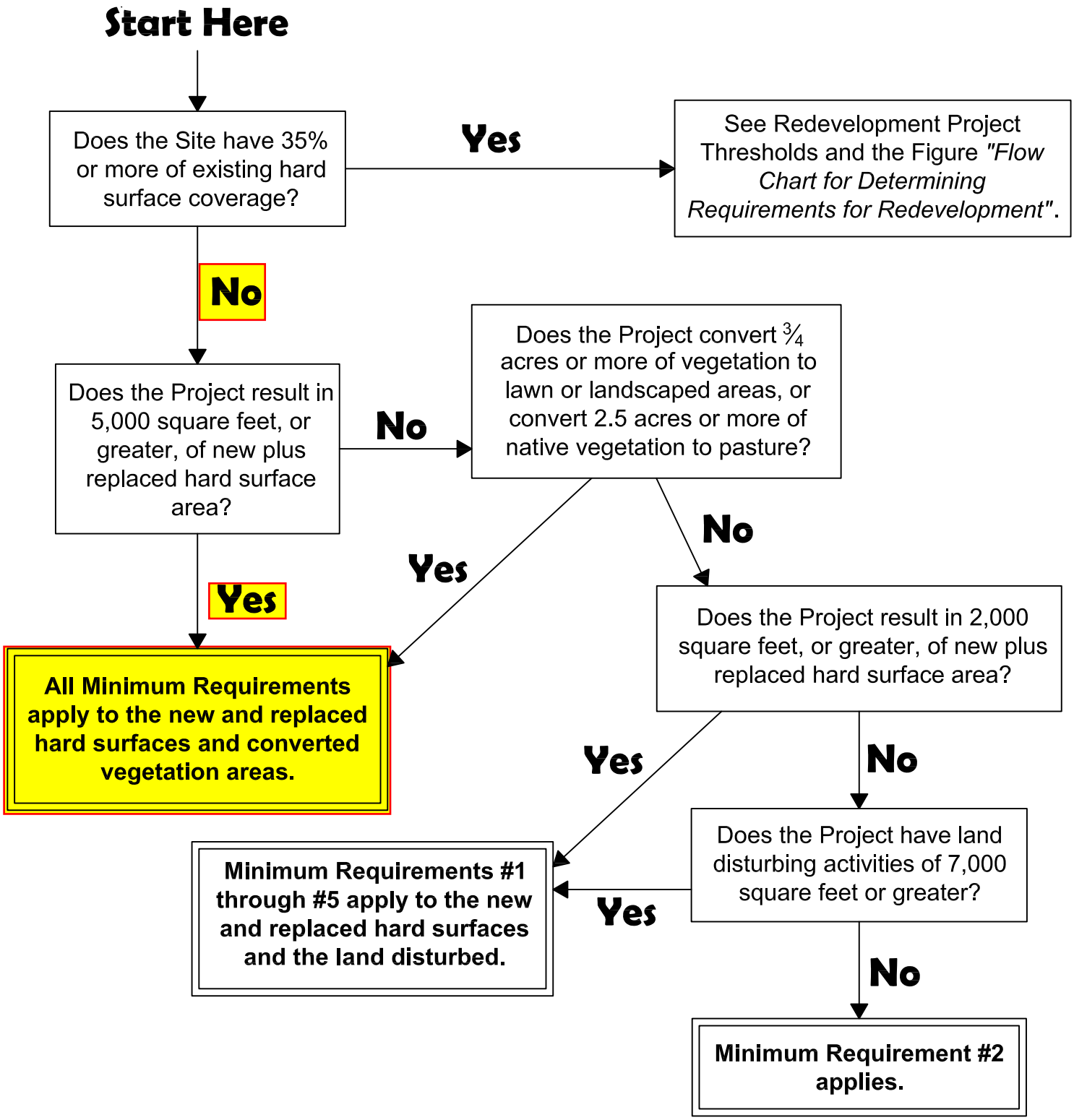
Figure 1.6
Minimum
Requirements
Flow Chart



DEPARTMENT OF ECOLOGY
State of Washington

Flow Chart for Determining Requirements for New Development

Revised March 2019

Tab 2.0

2.0 CONDITIONS AND REQUIREMENTS SUMMARY

This section contains the following information:

2.1 Analysis of the Minimum Requirements

2.1 Analysis of the Minimum Requirements

MINIMUM REQUIREMENTS	HOW PROJECT HAS ADDRESSED REQUIREMENT
No. 1: Preparation of Stormwater Site Plans	This Minimum Requirement has been fulfilled by the preparation and completion of this Stormwater Site Plan.
No. 2: Construction Stormwater Pollution Prevention (SWPP)	A completed Construction Stormwater Pollution Prevention Plan (SWPPP) is prepared under a separate cover and will be submitted together with this report for Construction Permit submittal. A Department of Ecology Construction Stormwater Permit will be obtained prior to construction.
No. 3: Source Control of Pollution	The proposed business park site is a relatively low pollution generator. Covered dumpsters are one example of source control that will be provided in the developed condition. General source control pollution prevention plans and a storm operation and maintenance manual will be included with the final permit submittal.
No. 4: Preservation of Natural Drainage Systems and Outfalls	The proposed design will preserve the natural drainage system of the site and will maintain 100% retention of site runoff since the proposed site will infiltrate fully.
No. 5: On-site Stormwater Management	As required by the 2019 SWMMWW, On-Site Stormwater Management is required where feasible based on site conditions. Infiltration galleries will be proposed to retain on-site development runoff. On-site management requirements are met by fully infiltrating stormwater runoff on site. BMP T5.13 Post Construction Soil Quality and Depth will be required for all disturbed area that will remain pervious. Refer to the Flow Chart for Determining MR#5 Requirements included in this report for additional detail.

No. 6: Runoff Treatment	The proposed business park will trigger Basic Treatment requirements for all pollution generating surfaces. See the Runoff Treatment Flow Chart in this report for additional detail. Based on Section III-1.2 of the 2019 SWMMWW, enhanced treatment BMPs are only required when 1) the project directly discharges to fresh waters designated for aquatic life 2) stormwater runoff discharges to conveyance systems that are tributary to fresh waters designated for aquatic life use or 3) stormwater is infiltrated within ¼ mile of a fresh water designated for aquatic life use. Basic Treatment will be provided for the pollution generating surfaces via Bayfilter treatment cartridges prior to discharge to the infiltration chamber galleries. Refer to the Calculations included in this report for additional detail. The roof runoff will bypass the treatment system since it is not a pollution generating surface. The Bayfilter system will be constructed upstream of the infiltration gallery, thereby providing pretreatment prior to the infiltration facility. See the Developed Site Hydrology section of this report for more details.
No. 7: Flow Control	Infiltration chambers are proposed to retain and infiltrate all stormwater runoff generated on site. Two infiltration galleries have been designed to accommodate the on-site roof and pavement areas. The systems consist of Stormtech MC-3500 Chambers and are sized for their respective sub-basins to retain and infiltrate 100% of half the 2-year storm through the 50-year storm as required by the 2019 SWMMWW. Refer to Section 5 and the calculations included in this report for additional detail.
No. 8: Wetlands Protection	There are no documented wetlands recorded on-site.
No. 9: Operation and Maintenance	The drainage facility for this project will be a private facility, owned and maintained by the Owner. An Operation and Maintenance Manual is provided in Section 9.0 of this Stormwater Site Plan.

Tab 3.0

3.0 EXISTING CONDITIONS SUMMARY

The 5.80-acre site is part of a 54-acre parcel which encompasses the west and east side of the Northern Pacific Railroad. The existing property was previously used for lumber operations and currently the site is vacant and clear of any existing structures. The site primarily consists of exposed soil. See the existing conditions map included in this report for additional detail.

The existing site topography is generally flat and slopes centrally. Typical slopes range from 0% to 2%. In the southwest corner of the site, the site steeply slopes upward offsite with slopes as steep as 30%. The site receives an incidental amount of drainage from adjacent properties. There is no existing storm drainage system; runoff sheet flows over the project site and infiltrates completely due to project site with high infiltration soils.

The project is not located within the 100-year floodplain and no wetlands are known onsite or nearby. There is a fish habitat 1,300 feet east of the project site. The project site is within the Stillaguamish River basin. Portage Creek is approximately a quarter mile downstream of the site to the north.

The existing soils are classified as gravelly sandy loam at 0-8% and pits according to the National Cooperative Soil Survey by the USDA Natural Resources Conservation Service. These soils belong to the Hydraulic Soil Group ‘A’. A geotechnical report is currently not available for this site, but one for an adjacent site was available. All soil data and groundwater data used in this report are from available data to this site and surrounding areas.

Tab 4.0

4.0 OFF-SITE ANALYSIS REPORT

The property slopes to the east and north at slopes greater than 30%. The site receives an incidental amount drainage from adjacent properties.

There is a recently permitted and currently in construction building to the east, Building G. The Building G site and the access road to the south have been hydrologically isolated from the proposed Building F site. Based on available data, there are no drainage complaints in the area.

There is no existing storm drainage system on site. Due to the site's high infiltration rate, all stormwater runoff is presumed to infiltrate through the soil. Based on available data, there are no drainage complaints in the area.

Tab 5.0

5.0 PERMANENT STORMWATER CONTROL PLAN

This section contains the following information:

5.1 Existing Site Hydrology

5.2 Developed Site Hydrology

5.3 Performance Standards and Goals

5.4 Low Impact Development Features

5.5 Flow Control System

5.6 Water Quality System

5.7 Conveyance System Analysis and Design

5.1 Existing Site Hydrology

Predeveloped Basins

The Predeveloped Basin tributary to the Drainage Facility can be broken down as follows:

Impervious	Pervious	Total Area
0	5.80	5.80[1]

Notes:

1. Existing Till Forest

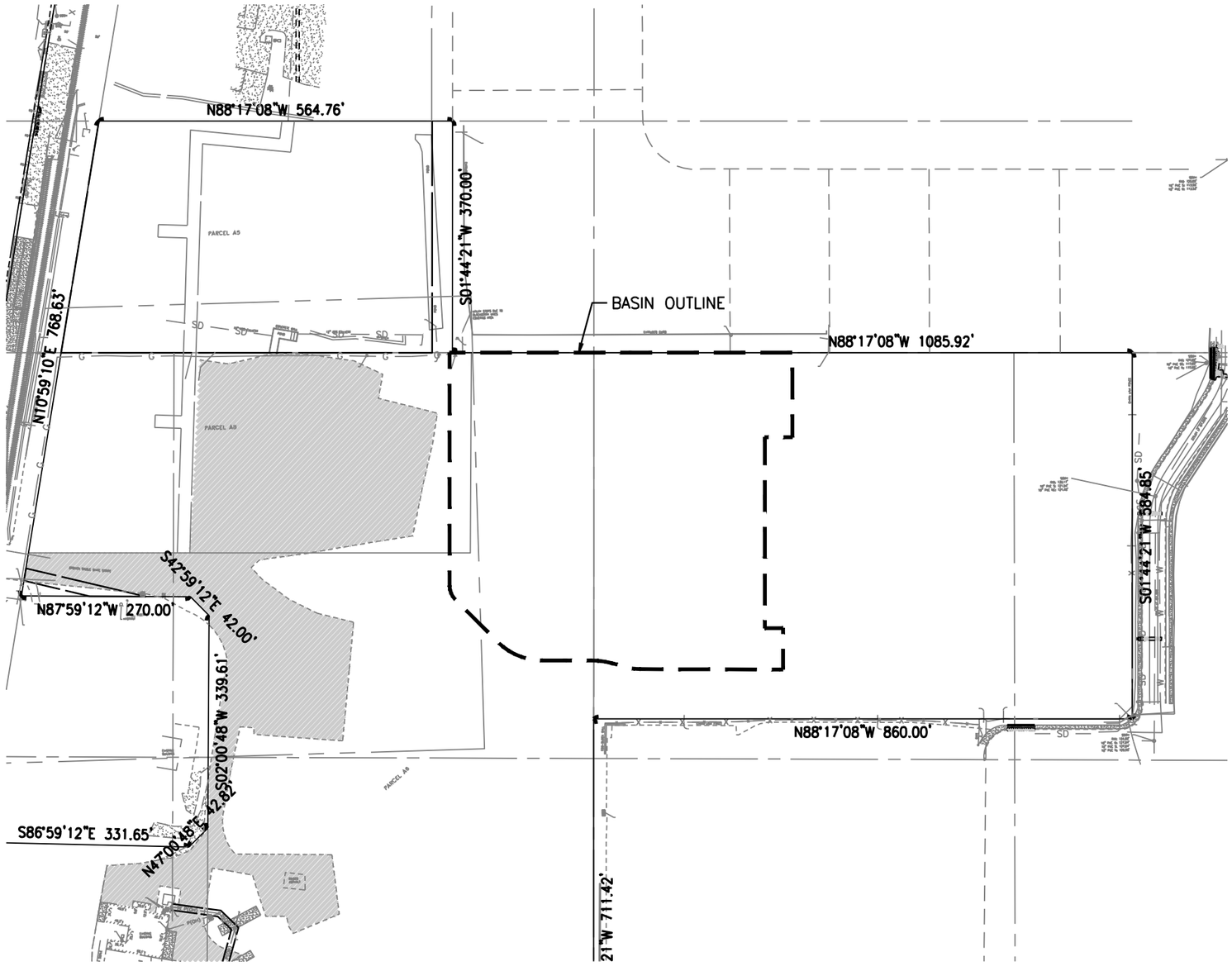
The existing 5.80-acre site consists mostly of exposed soils that are classified as gravelly sandy loam, 0-8% and Pits. Currently the project site, overall site topography is relatively flat, typically 0% to 2% with steep slopes on the south and east side of the site as steep as 30%. Based on the available topography maps and adjacent developments, there are no significant contributing basin areas.

Stormwater runoff generated on site sheet flows across the project site and infiltrates on site due to high infiltration soils on site. See the existing condition map for additional information.

Figure 5.1.1
Existing
Condition Map

AREA

TOTAL AREA: 252,704 SF (5.80 AC)
PERVIOUS SURFACES: 252,704 (5.80 AC)



N

0 100' 200' 400'

SCALE: 1"=200'

Designed WLG Drawn WLG Checked JC Approved CJ Date 08/23/21	Scale: Horizontal 1"=200' Vertical N/A	**Barghausen Consulting Engineers, Inc.** 18215 72nd Avenue South Kent, WA 98032 425.251.6222 barghausen.com	For: GAYTEWAY BUSINESS PARK LLC PO BOX 1727 BELLEVUE, WA 98009	Title: *EXISTING DRAINAGE BASIN MAP*	Job Number 21334 Sheet 1 of 1

P:\21000s\21334\exhibit\Building F Drainage Exhibits\21334 Building F – Pre-Developed Drainage Basin Map.dwg 8/23/2021 2:35 PM ABELL

5.2 Developed Site Hydrology

Developed Basins

The Developed Basin tributary to the Drainage Facility can be broken down as follows:

Impervious	Pervious	Total Area
5.13	0.67	5.80

Notes:
1. Roads and Sidewalks – Mod Slope

In the developed condition, the site will contain a new office/warehouse/manufacturing/building, an infiltration gallery using Stormtech Chambers, ADA parking, pavements, and associated utilities. Catch basins and an underground pipe conveyance system will be installed to convey stormwater runoff from the developed site to the infiltration gallery on the north side of the site.

Underground infiltration is provided by Stormtech Chambers and are designed to retain and infiltrate all development runoff. The Infiltration gallery on the northern side of the site collects all stormwater runoff from pavement areas and the roof. Runoff will infiltrate into the native Everett Very Gravelly Sandy Loam soils, with a conservative design infiltration rate of 10 in/hr. Additional infiltration tests will be performed at the start of site construction.

A bayfilter was sized using the water quality flow rates from WWHM and proposed upstream of the infiltration gallery to provide treatment to pollution generating surfaces. The infiltration gallery was also sized in WWHM to ensure 100% infiltration rate. We will meet LID Duration Control per Stormwater Management requirements as a result of the on-site underground infiltration gallery. These calculations are included in the report for additional information.

The facility has been designed to provide the required flow control and water quality per the 2019 SWWDMM. Refer to the attached Proposed Drainage Map for further details on conveyance.

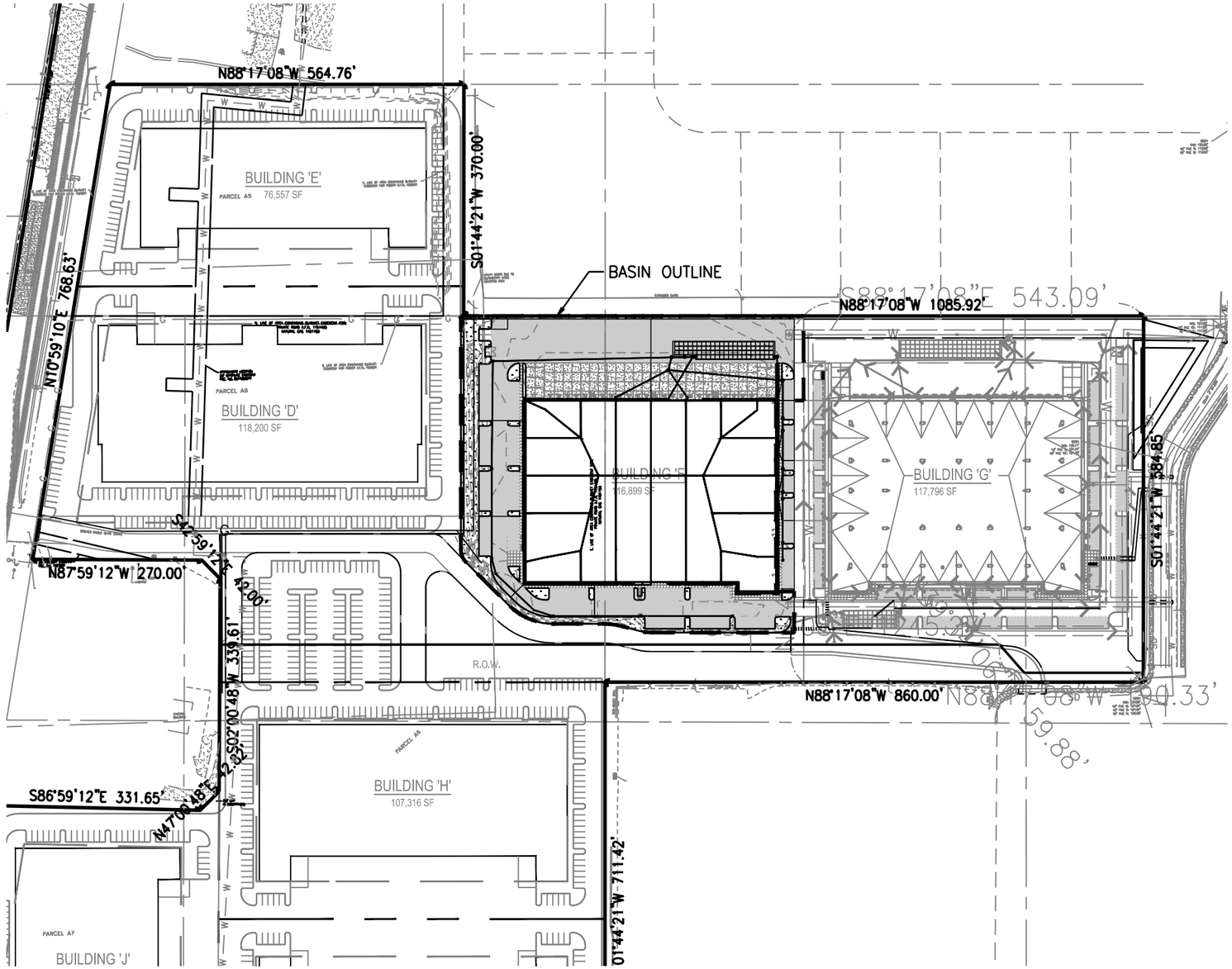
Figure 5.2.1
Developed
Basin Map

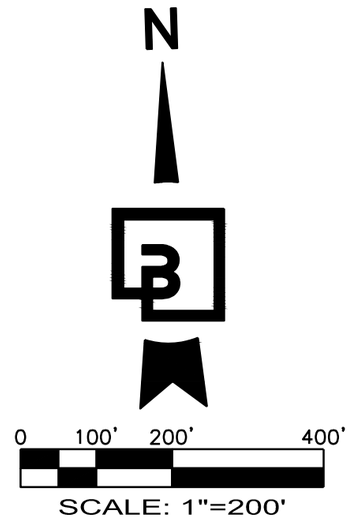
AREA

INFILTRATION GALLERY

TOTAL AREA = 252,704 SF (5.80 AC)

- IMPERVIOUS (NON-ROOF) AREA = 106,365 SF (2.44 AC)
- ROOF AREA = 117,235 SF (2.69 AC)
- PERVIOUS AREA = 29,104 SF (0.67 AC)





Designed WLG Drawn WLG Checked JC Approved CJ Date 8/23/21	Scale: Horizontal 1"=200' Vertical N/A	**Barghausen Consulting Engineers, Inc.** 18215 72nd Avenue South Kent, WA 98032 425.251.6222 barghausen.com	For: GAYTEWAY BUSINESS PARK LLC PO BOX 1727 BELLEVUE, WA 98009	Title: *DEVELOPED DRAINAGE BASIN MAP*	Job Number 21334 Sheet 1 of 1

P:\21000s\21334\exhibit\Building F Drainage Exhibits\21334 Building F – Developed Drainage Basin Map.dwg 11/30/2021 3:32 PM ABELL

5.3 Performance Standards and Goals

The proposed project is required to comply with the runoff treatment and flow control standards set forth by the 2019 SWMMWW.

Since the project proposes to add over 5,000 square feet of new plus replaced impervious surface, the project requires water quality treatment. The project is required to provide basic treatment and oil control. To provide water quality, the design flow rate shall be the flow rate at or below which 91% of the total runoff volume, as estimated by an approved continuous runoff model (WWHM) will be treated. In addition, the site will achieve the goals of no ongoing or recurring visible sheen, and to have a 24-hour average Total Petroleum Hydrocarbon (TPH) concentration no greater than 10 mg/l, and a maximum of 15 mg/l for a discrete sample. See the Runoff Treatment Flowchart included in this report for additional information.

Stormwater discharges shall match developed discharge durations to pre-developed durations from the range of pre-developed discharge rates from 50% of the 2-year peak flow up to the full 50-year peak flow. The pre-developed conditions shall match the forested land cover in the continuous simulation model.

Figure 5.3.1 Drainage Facility – Runoff Treatment Facility Selection Flow Chart

Figure III-1.1: Runoff Treatment BMP Selection Flow Chart

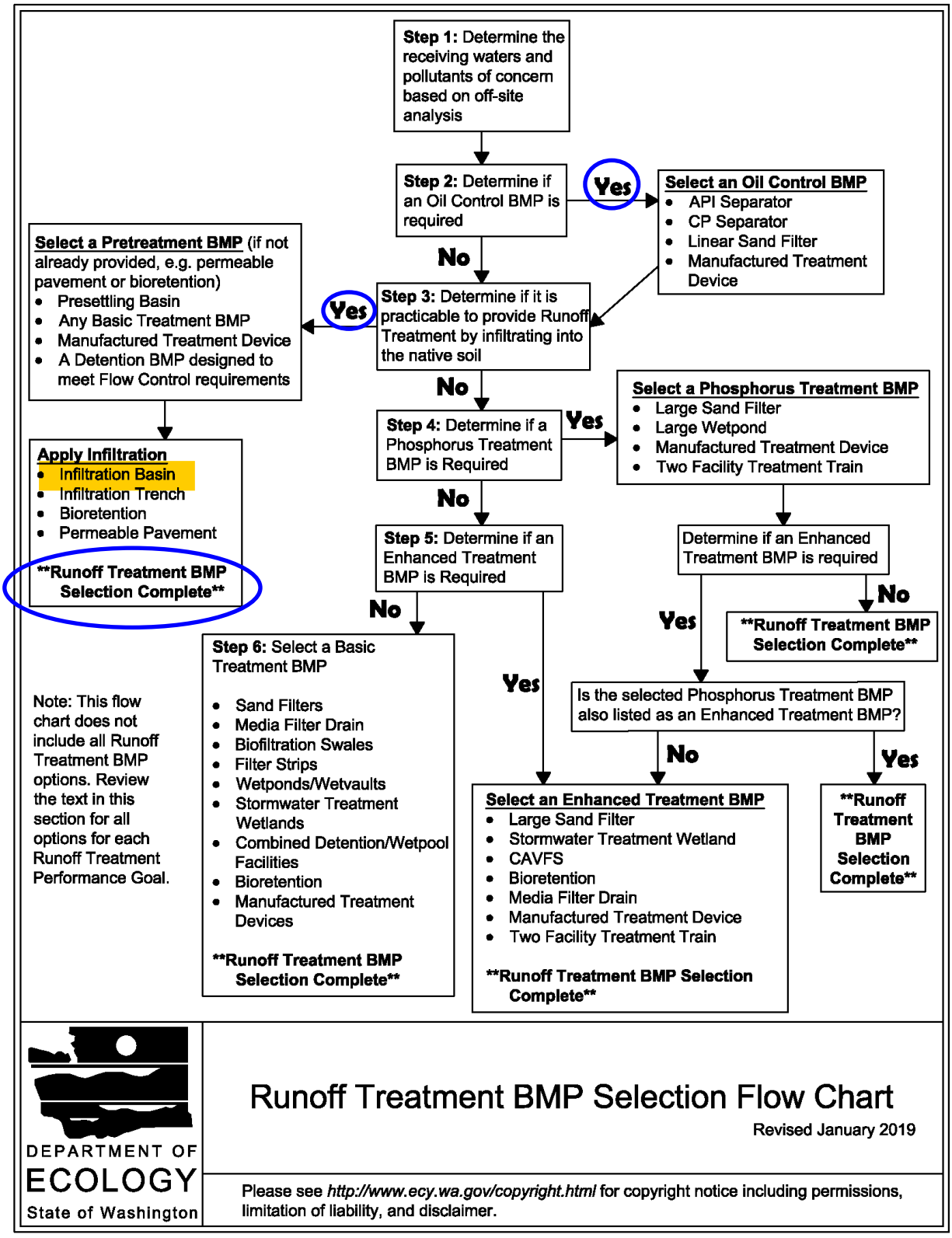
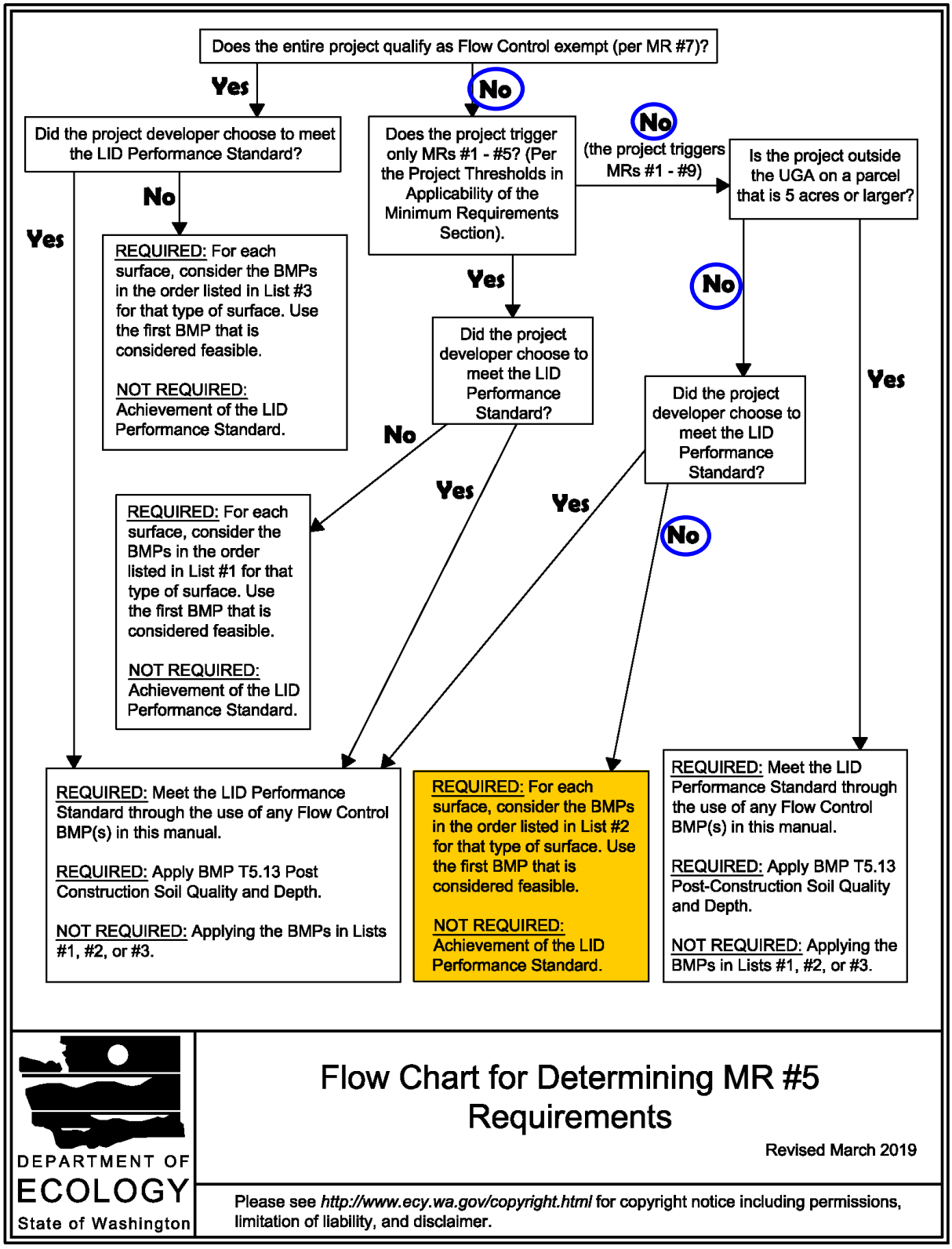


Figure 5.3.2
Flow Chart for Determining MR#5 Requirements

Figure I-3.3: Flow Chart for Determining MR #5 Requirements



5.4 Low Impact Development Features

LID is not proposed with this project.

5.5 Flow Control System

Stormwater discharges shall match developed discharge durations to pre-developed durations for the range of pre-developed discharge rates from 50% of the 2-year peak flow up to the full 50-year peak flow. The pre-developed condition to be matched shall be a forested land cover. See infiltration calculations provided in the report for more details.

Figure 5.5.1 Infiltration Sizing Calculations

WWHM2012

PROJECT REPORT

General Model Information

Project Name:	2021-08-23 Buiding F SSD Table
Site Name:	Gayteway
Site Address:	
City:	Arlington
Report Date:	11/30/2021
Gage:	Everett
Data Start:	1948/10/01
Data End:	2009/09/30
Timestep:	15 Minute
Precip Scale:	1.200
Version Date:	2019/09/13
Version:	4.2.17

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year
High Flow Threshold for POC1:	50 Year

Landuse Basin Data
Predeveloped Land Use

Site

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
A B, Forest, Mod	5.8
Pervious Total	5.8

Impervious Land Use	acre
Impervious Total	0
Basin Total	5.8

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Parking Lot

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
A B, Lawn, Mod	0.67
Pervious Total	0.67

Impervious Land Use	acre
ROOF TOPS FLAT	2.69
DRIVEWAYS FLAT	2.44
Impervious Total	5.13
Basin Total	5.8

Element Flows To:

Surface	Interflow	Groundwater
SSD Table 1	SSD Table 1	

Routing Elements
Predeveloped Routing

Mitigated Routing

SSD Table 1

Depth: 6.5 ft.
Element Flows To:
Outlet 1 Outlet 2

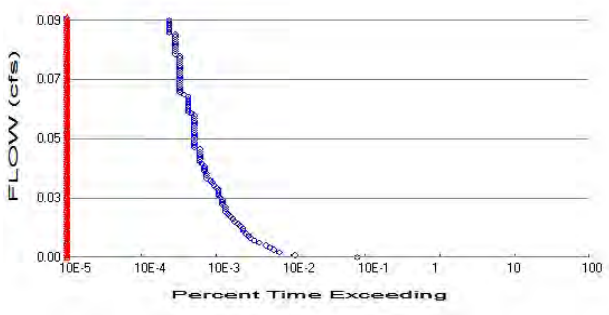
SSD Table Hydraulic Table

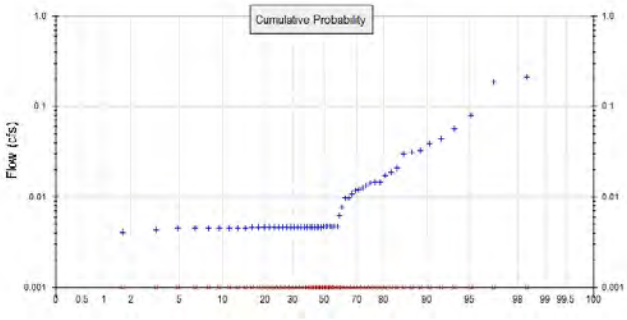
Stage (feet)	Area (ac.)	Volume (ac-ft.)	Manual	Infilt/ Recharge	NotUsed	NotUsed	NotUsed
0.000	0.100	0.000	0.000	1.008	0.000	0.000	0.000
0.083	0.100	0.003	0.000	1.008	0.000	0.000	0.000
0.167	0.100	0.007	0.000	1.008	0.000	0.000	0.000
0.250	0.100	0.010	0.000	1.008	0.000	0.000	0.000
0.333	0.100	0.013	0.000	1.008	0.000	0.000	0.000
0.417	0.100	0.017	0.000	1.008	0.000	0.000	0.000
0.500	0.100	0.020	0.000	1.008	0.000	0.000	0.000
0.583	0.100	0.024	0.000	1.008	0.000	0.000	0.000
0.667	0.100	0.027	0.000	1.008	0.000	0.000	0.000
0.750	0.100	0.030	0.000	1.008	0.000	0.000	0.000
0.833	0.100	0.038	0.000	1.008	0.000	0.000	0.000
0.917	0.100	0.045	0.000	1.008	0.000	0.000	0.000
1.000	0.100	0.053	0.000	1.008	0.000	0.000	0.000
1.083	0.100	0.060	0.000	1.008	0.000	0.000	0.000
1.167	0.100	0.067	0.000	1.008	0.000	0.000	0.000
1.250	0.100	0.075	0.000	1.008	0.000	0.000	0.000
1.333	0.100	0.082	0.000	1.008	0.000	0.000	0.000
1.417	0.100	0.089	0.000	1.008	0.000	0.000	0.000
1.500	0.100	0.096	0.000	1.008	0.000	0.000	0.000
1.583	0.100	0.104	0.000	1.008	0.000	0.000	0.000
1.667	0.100	0.111	0.000	1.008	0.000	0.000	0.000
1.750	0.100	0.118	0.000	1.008	0.000	0.000	0.000
1.833	0.100	0.125	0.000	1.008	0.000	0.000	0.000
1.917	0.100	0.132	0.000	1.008	0.000	0.000	0.000
2.000	0.100	0.139	0.000	1.008	0.000	0.000	0.000
2.083	0.100	0.146	0.000	1.008	0.000	0.000	0.000
2.167	0.100	0.153	0.000	1.008	0.000	0.000	0.000
2.250	0.100	0.160	0.000	1.008	0.000	0.000	0.000
2.333	0.100	0.166	0.000	1.008	0.000	0.000	0.000
2.417	0.100	0.173	0.000	1.008	0.000	0.000	0.000
2.500	0.100	0.180	0.000	1.008	0.000	0.000	0.000
2.583	0.100	0.187	0.000	1.008	0.000	0.000	0.000
2.667	0.100	0.193	0.000	1.008	0.000	0.000	0.000
2.750	0.100	0.200	0.000	1.008	0.000	0.000	0.000
2.833	0.100	0.206	0.000	1.008	0.000	0.000	0.000
2.917	0.100	0.212	0.000	1.008	0.000	0.000	0.000
3.000	0.100	0.219	0.000	1.008	0.000	0.000	0.000
3.083	0.100	0.225	0.000	1.008	0.000	0.000	0.000
3.167	0.100	0.231	0.000	1.008	0.000	0.000	0.000
3.250	0.100	0.237	0.000	1.008	0.000	0.000	0.000
3.333	0.100	0.243	0.000	1.008	0.000	0.000	0.000
3.417	0.100	0.249	0.000	1.008	0.000	0.000	0.000
3.500	0.100	0.255	0.000	1.008	0.000	0.000	0.000
3.583	0.100	0.260	0.000	1.008	0.000	0.000	0.000
3.667	0.100	0.266	0.000	1.008	0.000	0.000	0.000

3.750	0.100	0.271	0.000	1.008	0.000	0.000	0.000
3.833	0.100	0.276	0.000	1.008	0.000	0.000	0.000
3.917	0.100	0.281	0.000	1.008	0.000	0.000	0.000
4.000	0.100	0.286	0.000	1.008	0.000	0.000	0.000
4.083	0.100	0.291	0.000	1.008	0.000	0.000	0.000
4.167	0.100	0.295	0.000	1.008	0.000	0.000	0.000
4.250	0.100	0.299	0.000	1.008	0.000	0.000	0.000
4.333	0.100	0.302	0.000	1.008	0.000	0.000	0.000
4.417	0.100	0.306	0.000	1.008	0.000	0.000	0.000
4.500	0.100	0.309	0.000	1.008	0.000	0.000	0.000
4.583	0.100	0.313	0.000	1.008	0.000	0.000	0.000
4.667	0.100	0.316	0.000	1.008	0.000	0.000	0.000
4.750	0.100	0.319	0.000	1.008	0.000	0.000	0.000
4.833	0.100	0.323	0.000	1.008	0.000	0.000	0.000
4.917	0.100	0.326	0.000	1.008	0.000	0.000	0.000
5.000	0.100	0.329	0.000	1.008	0.000	0.000	0.000
5.083	0.100	0.333	0.000	1.008	0.000	0.000	0.000
5.167	0.100	0.336	0.000	1.008	0.000	0.000	0.000
5.250	0.100	0.340	0.000	1.008	0.000	0.000	0.000
5.333	0.100	0.343	0.000	1.008	0.000	0.000	0.000
5.417	0.100	0.346	0.000	1.008	0.000	0.000	0.000
5.500	0.100	0.350	0.000	1.008	0.000	0.000	0.000
5.583	0.100	0.353	0.000	1.008	0.000	0.000	0.000
5.667	0.100	0.356	0.000	1.008	0.000	0.000	0.000
5.750	0.100	0.360	0.000	1.008	0.000	0.000	0.000
5.833	0.100	0.363	0.000	1.008	0.000	0.000	0.000
5.917	0.100	0.366	0.000	1.008	0.000	0.000	0.000
6.000	0.100	0.370	0.000	1.008	0.000	0.000	0.000
6.083	0.100	0.373	0.000	1.008	0.000	0.000	0.000
6.167	0.100	0.377	0.000	1.008	0.000	0.000	0.000
6.250	0.100	0.380	0.000	1.008	0.000	0.000	0.000
6.333	0.100	0.383	0.000	1.008	0.000	0.000	0.000
6.417	0.100	0.387	0.000	1.008	0.000	0.000	0.000
6.500	0.100	0.390	0.000	1.008	0.000	0.000	0.000

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 5.8
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.67
Total Impervious Area: 5.13

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.007469
5 year	0.018159
10 year	0.031229
25 year	0.059213
50 year	0.092681
100 year	0.142012

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

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1949	0.005	0.000
1950	0.019	0.000
1951	0.013	0.000
1952	0.005	0.000
1953	0.005	0.000
1954	0.044	0.000
1955	0.033	0.000
1956	0.005	0.000
1957	0.005	0.000
1958	0.005	0.000

1959	0.014	0.000
1960	0.012	0.000
1961	0.030	0.000
1962	0.005	0.000
1963	0.005	0.000
1964	0.021	0.000
1965	0.005	0.000
1966	0.005	0.000
1967	0.013	0.000
1968	0.005	0.000
1969	0.005	0.000
1970	0.005	0.000
1971	0.031	0.000
1972	0.005	0.000
1973	0.005	0.000
1974	0.017	0.000
1975	0.004	0.000
1976	0.015	0.000
1977	0.005	0.000
1978	0.006	0.000
1979	0.015	0.000
1980	0.005	0.000
1981	0.005	0.000
1982	0.010	0.000
1983	0.005	0.000
1984	0.005	0.000
1985	0.011	0.000
1986	0.057	0.000
1987	0.038	0.000
1988	0.005	0.000
1989	0.004	0.000
1990	0.005	0.000
1991	0.005	0.000
1992	0.005	0.000
1993	0.005	0.000
1994	0.004	0.000
1995	0.008	0.000
1996	0.080	0.000
1997	0.186	0.000
1998	0.005	0.000
1999	0.005	0.000
2000	0.012	0.000
2001	0.004	0.000
2002	0.005	0.000
2003	0.003	0.000
2004	0.005	0.000
2005	0.005	0.000
2006	0.213	0.000
2007	0.005	0.000
2008	0.010	0.000
2009	0.005	0.000

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.2129	0.0000
2	0.1862	0.0000
3	0.0796	0.0000

4	0.0569	0.0000
5	0.0443	0.0000
6	0.0384	0.0000
7	0.0328	0.0000
8	0.0314	0.0000
9	0.0297	0.0000
10	0.0207	0.0000
11	0.0189	0.0000
12	0.0173	0.0000
13	0.0147	0.0000
14	0.0147	0.0000
15	0.0143	0.0000
16	0.0135	0.0000
17	0.0126	0.0000
18	0.0121	0.0000
19	0.0119	0.0000
20	0.0109	0.0000
21	0.0098	0.0000
22	0.0097	0.0000
23	0.0077	0.0000
24	0.0062	0.0000
25	0.0047	0.0000
26	0.0047	0.0000
27	0.0047	0.0000
28	0.0047	0.0000
29	0.0047	0.0000
30	0.0047	0.0000
31	0.0047	0.0000
32	0.0047	0.0000
33	0.0047	0.0000
34	0.0046	0.0000
35	0.0046	0.0000
36	0.0046	0.0000
37	0.0046	0.0000
38	0.0046	0.0000
39	0.0046	0.0000
40	0.0046	0.0000
41	0.0046	0.0000
42	0.0046	0.0000
43	0.0046	0.0000
44	0.0046	0.0000
45	0.0046	0.0000
46	0.0046	0.0000
47	0.0046	0.0000
48	0.0046	0.0000
49	0.0046	0.0000
50	0.0046	0.0000
51	0.0046	0.0000
52	0.0046	0.0000
53	0.0045	0.0000
54	0.0045	0.0000
55	0.0045	0.0000
56	0.0045	0.0000
57	0.0045	0.0000
58	0.0045	0.0000
59	0.0043	0.0000
60	0.0040	0.0000
61	0.0032	0.0000

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0037	1654	0	0	Pass
0.0046	242	0	0	Pass
0.0055	151	0	0	Pass
0.0064	128	0	0	Pass
0.0073	112	0	0	Pass
0.0082	99	0	0	Pass
0.0091	81	0	0	Pass
0.0100	69	0	0	Pass
0.0109	61	0	0	Pass
0.0118	58	0	0	Pass
0.0127	53	0	0	Pass
0.0136	50	0	0	Pass
0.0145	49	0	0	Pass
0.0154	45	0	0	Pass
0.0163	42	0	0	Pass
0.0172	38	0	0	Pass
0.0181	36	0	0	Pass
0.0190	33	0	0	Pass
0.0199	31	0	0	Pass
0.0208	29	0	0	Pass
0.0217	29	0	0	Pass
0.0226	29	0	0	Pass
0.0235	26	0	0	Pass
0.0244	26	0	0	Pass
0.0253	26	0	0	Pass
0.0262	24	0	0	Pass
0.0271	23	0	0	Pass
0.0280	23	0	0	Pass
0.0289	23	0	0	Pass
0.0298	22	0	0	Pass
0.0307	20	0	0	Pass
0.0316	19	0	0	Pass
0.0325	18	0	0	Pass
0.0334	16	0	0	Pass
0.0343	16	0	0	Pass
0.0352	16	0	0	Pass
0.0361	15	0	0	Pass
0.0370	15	0	0	Pass
0.0379	15	0	0	Pass
0.0388	14	0	0	Pass
0.0397	13	0	0	Pass
0.0406	13	0	0	Pass
0.0415	13	0	0	Pass
0.0424	13	0	0	Pass
0.0433	13	0	0	Pass
0.0442	13	0	0	Pass
0.0451	11	0	0	Pass
0.0460	11	0	0	Pass
0.0469	11	0	0	Pass
0.0478	11	0	0	Pass
0.0487	11	0	0	Pass
0.0496	11	0	0	Pass
0.0505	11	0	0	Pass

0.0514	11	0	0	Pass
0.0523	11	0	0	Pass
0.0531	11	0	0	Pass
0.0540	11	0	0	Pass
0.0549	11	0	0	Pass
0.0558	11	0	0	Pass
0.0567	11	0	0	Pass
0.0576	10	0	0	Pass
0.0585	9	0	0	Pass
0.0594	9	0	0	Pass
0.0603	9	0	0	Pass
0.0612	9	0	0	Pass
0.0621	9	0	0	Pass
0.0630	9	0	0	Pass
0.0639	9	0	0	Pass
0.0648	8	0	0	Pass
0.0657	7	0	0	Pass
0.0666	7	0	0	Pass
0.0675	7	0	0	Pass
0.0684	7	0	0	Pass
0.0693	7	0	0	Pass
0.0702	7	0	0	Pass
0.0711	7	0	0	Pass
0.0720	7	0	0	Pass
0.0729	7	0	0	Pass
0.0738	7	0	0	Pass
0.0747	7	0	0	Pass
0.0756	7	0	0	Pass
0.0765	7	0	0	Pass
0.0774	7	0	0	Pass
0.0783	7	0	0	Pass
0.0792	7	0	0	Pass
0.0801	6	0	0	Pass
0.0810	6	0	0	Pass
0.0819	6	0	0	Pass
0.0828	6	0	0	Pass
0.0837	6	0	0	Pass
0.0846	6	0	0	Pass
0.0855	6	0	0	Pass
0.0864	6	0	0	Pass
0.0873	6	0	0	Pass
0.0882	5	0	0	Pass
0.0891	5	0	0	Pass
0.0900	5	0	0	Pass
0.0909	5	0	0	Pass
0.0918	5	0	0	Pass
0.0927	5	0	0	Pass

Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume:	0.5216 acre-feet
On-line facility target flow:	0.9379 cfs.
Adjusted for 15 min:	0.9379 cfs.
Off-line facility target flow:	0.5307 cfs.
Adjusted for 15 min:	0.5307 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 Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
SSD Table 1 POC	☐	904.93			☐	100.00			
Total Volume Infiltrated		904.93	0.00	0.00		100.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Passed

POC 2

POC #2 was not reported because POC must exist in both scenarios and both scenarios must have been run.

POC 3

POC #3 was not reported because POC must exist in both scenarios and both scenarios must have been run.

Model Default Modifications

Total of 0 changes have been made.

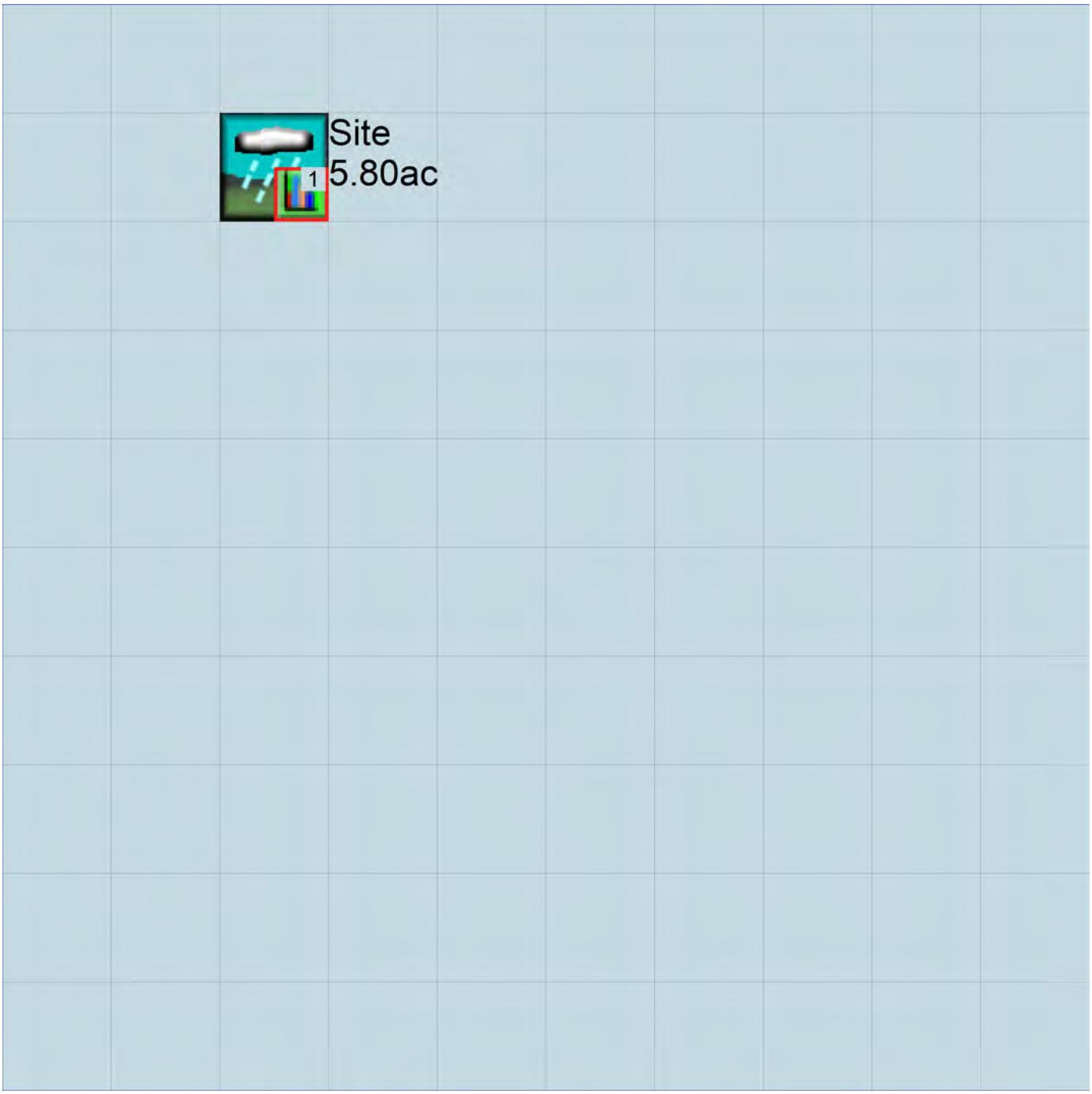
PERLND Changes

No PERLND changes have been made.

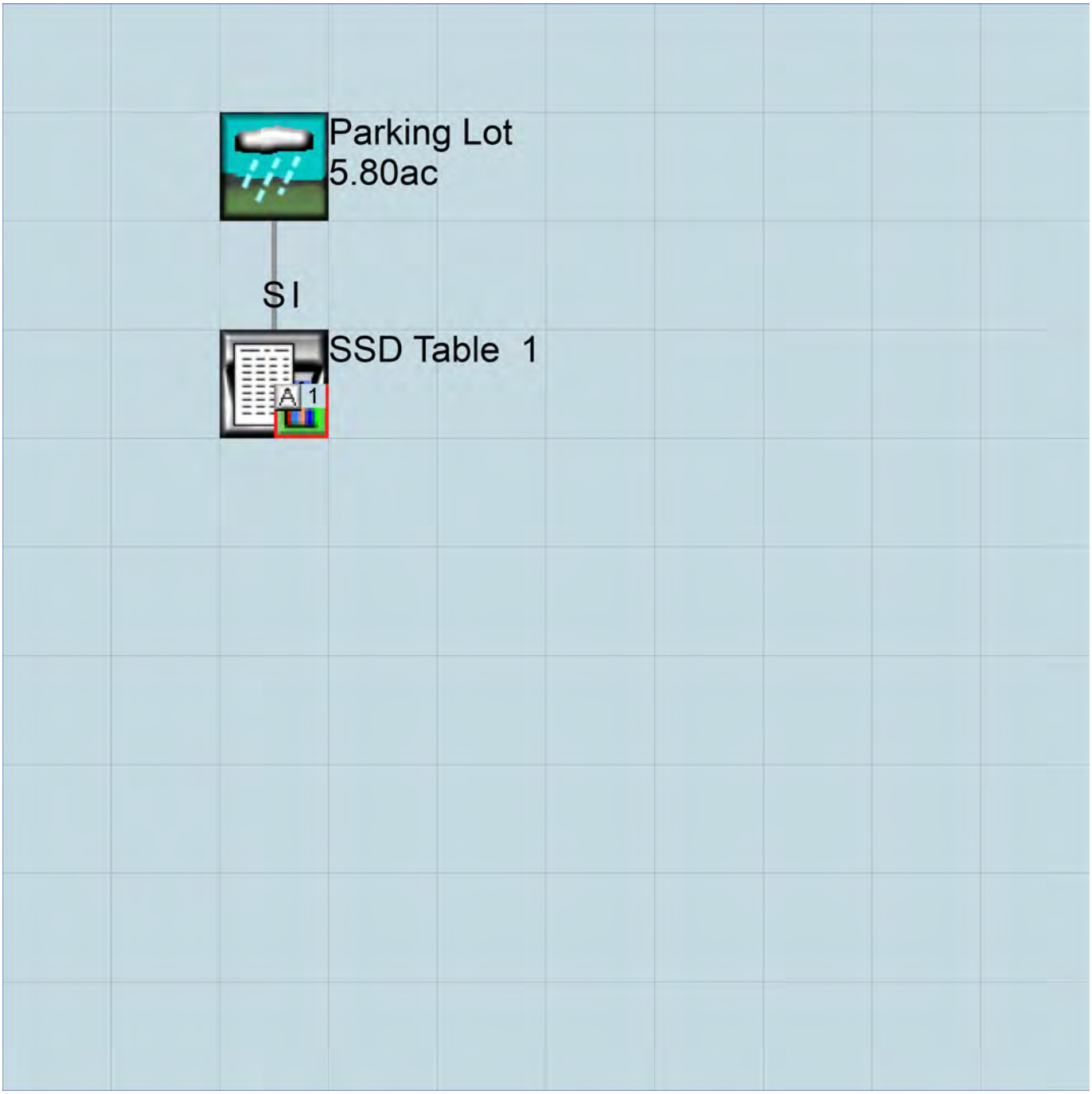
IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01        END    2009 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                   UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   2021-08-23 Buiding F SSD Table.wdm
MESSU       25   Pre2021-08-23 Buiding F SSD Table.MES
            27   Pre2021-08-23 Buiding F SSD Table.L61
            28   Pre2021-08-23 Buiding F SSD Table.L62
            30   POC2021-08-23 Buiding F SSD Table1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND       2
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Site                        MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                       in  out           ***
    2     A/B, Forest, Mod        1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
    2         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
    2         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO
```

```
  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
    2         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
    2               0         5         2       400       0.1       0.3     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
    2              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
    2          0.2       0.5      0.35         0       0.7       0.7
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
    2              0         0         0         0         3         1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
  END IWAT-STATE1
```

```
END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Site***
PERLND   2                        5.8     COPY   501     12
PERLND   2                        5.8     COPY   501     13

******Routing******
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG           ***
                                       in  out                              ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ******************* PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                  ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *      *  *  *  *  *        ***
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><--------><--------> ***
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                     ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><---><---><---><---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1.2            PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1.2            IMPLND   1 999 EXTNL  PREC
```

```
WDM      1 EVAP     ENGL    0.76           PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.76           IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    501 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01        END    2009 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                   UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   2021-08-23 Buiding F SSD Table.wdm
MESSU       25   Mit2021-08-23 Buiding F SSD Table.MES
            27   Mit2021-08-23 Buiding F SSD Table.L61
            28   Mit2021-08-23 Buiding F SSD Table.L62
            30   POC2021-08-23 Buiding F SSD Table1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND       8
      IMPLND       4
      IMPLND       5
      RCHRES       1
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        SSD Table  1               MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                          in  out           ***
    8     A/B, Lawn, Mod          1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
    8         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
```

```
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
    8         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
    8         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
    8             0         5       0.8       400       0.1       0.3     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
    8             0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
    8          0.1       0.5      0.25         0       0.7      0.25
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
             ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
    8             0         0         0         0         3         1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                   in  out           ***
    4      ROOF TOPS/FLAT         1    1    1   27    0
    5      DRIVEWAYS/FLAT         1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    4         0    0    1    0    0    0
    5         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    4         0    0    4    0    0    0    1    9
    5         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    4         0    0    0    0    0
    5         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
```

```
    4            400      0.01       0.1       0.1
    5            400      0.01       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    4              0         0
    5              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    4              0         0
    5              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Parking Lot***
PERLND   8                       0.67     RCHRES   1      2
PERLND   8                       0.67     RCHRES   1      3
IMPLND   4                       2.69     RCHRES   1      5
IMPLND   5                       2.44     RCHRES   1      5

******Routing******
PERLND   8                       0.67     COPY     1     12
IMPLND   4                       2.69     COPY     1     15
IMPLND   5                       2.44     COPY     1     15
PERLND   8                       0.67     COPY     1     13
RCHRES   1                          1     COPY   501     17
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<----------------><---> User T-series  Engl Metr LKFG             ***
                                        in  out                             ***
    1     SSD Table  1            2    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
    1         1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ******************* PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
    1         4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  HYDR-PARM1
```

```
    RCHRES  Flags for each HYDR Section                                    ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
           FG FG FG FG  possible  exit  *** possible  exit      possible  exit
            *  *  *  *    *  *  *  *  *      *  *  *  *  *         ***
    1       0  1  0  0    4  5  0  0  0       0  0  0  0  0        2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
    1              1      0.01       0.0       0.0       0.5       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                       ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
         *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
    1           0         4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
  FTABLE      1
   79    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)     (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.100000  0.000000  0.000000  0.000000
  0.083000  0.100000  0.003000  0.000000  1.008333
  0.167000  0.100000  0.007000  0.000000  1.008333
  0.250000  0.100000  0.010000  0.000000  1.008333
  0.333000  0.100000  0.013000  0.000000  1.008333
  0.417000  0.100000  0.017000  0.000000  1.008333
  0.500000  0.100000  0.020000  0.000000  1.008333
  0.583000  0.100000  0.024000  0.000000  1.008333
  0.667000  0.100000  0.027000  0.000000  1.008333
  0.750000  0.100000  0.030000  0.000000  1.008333
  0.833000  0.100000  0.038000  0.000000  1.008333
  0.917000  0.100000  0.045000  0.000000  1.008333
  1.000000  0.100000  0.053000  0.000000  1.008333
  1.083000  0.100000  0.060000  0.000000  1.008333
  1.167000  0.100000  0.067000  0.000000  1.008333
  1.250000  0.100000  0.075000  0.000000  1.008333
  1.333000  0.100000  0.082000  0.000000  1.008333
  1.417000  0.100000  0.089000  0.000000  1.008333
  1.500000  0.100000  0.096000  0.000000  1.008333
  1.583000  0.100000  0.104000  0.000000  1.008333
  1.667000  0.100000  0.111000  0.000000  1.008333
  1.750000  0.100000  0.118000  0.000000  1.008333
  1.833000  0.100000  0.125000  0.000000  1.008333
  1.917000  0.100000  0.132000  0.000000  1.008333
  2.000000  0.100000  0.139000  0.000000  1.008333
  2.083000  0.100000  0.146000  0.000000  1.008333
  2.167000  0.100000  0.153000  0.000000  1.008333
  2.250000  0.100000  0.160000  0.000000  1.008333
  2.333000  0.100000  0.166000  0.000000  1.008333
  2.417000  0.100000  0.173000  0.000000  1.008333
  2.500000  0.100000  0.180000  0.000000  1.008333
  2.583000  0.100000  0.187000  0.000000  1.008333
  2.667000  0.100000  0.193000  0.000000  1.008333
  2.750000  0.100000  0.200000  0.000000  1.008333
  2.833000  0.100000  0.206000  0.000000  1.008333
  2.917000  0.100000  0.212000  0.000000  1.008333
  3.000000  0.100000  0.219000  0.000000  1.008333
  3.083000  0.100000  0.225000  0.000000  1.008333
  3.167000  0.100000  0.231000  0.000000  1.008333
  3.250000  0.100000  0.237000  0.000000  1.008333
  3.333000  0.100000  0.243000  0.000000  1.008333
  3.417000  0.100000  0.249000  0.000000  1.008333
```

```
  3.500000  0.100000  0.255000  0.000000  1.008333
  3.583000  0.100000  0.260000  0.000000  1.008333
  3.667000  0.100000  0.266000  0.000000  1.008333
  3.750000  0.100000  0.271000  0.000000  1.008333
  3.833000  0.100000  0.276000  0.000000  1.008333
  3.917000  0.100000  0.281000  0.000000  1.008333
  4.000000  0.100000  0.286000  0.000000  1.008333
  4.083000  0.100000  0.291000  0.000000  1.008333
  4.167000  0.100000  0.295000  0.000000  1.008333
  4.250000  0.100000  0.299000  0.000000  1.008333
  4.333000  0.100000  0.302000  0.000000  1.008333
  4.417000  0.100000  0.306000  0.000000  1.008333
  4.500000  0.100000  0.309000  0.000000  1.008333
  4.583000  0.100000  0.313000  0.000000  1.008333
  4.667000  0.100000  0.316000  0.000000  1.008333
  4.750000  0.100000  0.319000  0.000000  1.008333
  4.833000  0.100000  0.323000  0.000000  1.008333
  4.917000  0.100000  0.326000  0.000000  1.008333
  5.000000  0.100000  0.329000  0.000000  1.008333
  5.083000  0.100000  0.333000  0.000000  1.008333
  5.167000  0.100000  0.336000  0.000000  1.008333
  5.250000  0.100000  0.340000  0.000000  1.008333
  5.333000  0.100000  0.343000  0.000000  1.008333
  5.417000  0.100000  0.346000  0.000000  1.008333
  5.500000  0.100000  0.350000  0.000000  1.008333
  5.583000  0.100000  0.353000  0.000000  1.008333
  5.667000  0.100000  0.356000  0.000000  1.008333
  5.750000  0.100000  0.360000  0.000000  1.008333
  5.833000  0.100000  0.363000  0.000000  1.008333
  5.917000  0.100000  0.366000  0.000000  1.008333
  6.000000  0.100000  0.370000  0.000000  1.008333
  6.083000  0.100000  0.373000  0.000000  1.008333
  6.167000  0.100000  0.377000  0.000000  1.008333
  6.250000  0.100000  0.380000  0.000000  1.008333
  6.333000  0.100000  0.383000  0.000000  1.008333
  6.417000  0.100000  0.387000  0.000000  1.008333
  6.500000  0.100000  0.390000  0.000000  1.008333
  END FTABLE  1
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1.2            PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1.2            IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    0.76           PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.76           IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
RCHRES   1 HYDR   RO     1 1        1      WDM   1008 FLOW     ENGL      REPL
RCHRES   1 HYDR   O      1 1        1      WDM   1010 FLOW     ENGL      REPL
RCHRES   1 HYDR   O      2 1        1      WDM   1011 FLOW     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1009 STAG     ENGL      REPL
COPY     1 OUTPUT MEAN   1 1     48.4      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    801 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>             <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK        2
PERLND     PWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    2

  MASS-LINK        3
PERLND     PWATER IFWO       0.083333      RCHRES         INFLOW IVOL
```

```
  END MASS-LINK    3

  MASS-LINK        5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    5

  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15

  MASS-LINK       17
RCHRES     OFLOW  OVOL   1                 COPY           INPUT  MEAN
  END MASS-LINK   17


END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

```
ERROR/WARNING ID:   341   6

DATE/TIME: 1960/10/23 10:45

RCHRES:     1

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB().  To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows.  This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS         V1         V2        VOL
79 1.6858E+04 1.6988E+04 1.7148E+04
```

```
ERROR/WARNING ID:   341   5

DATE/TIME: 1960/10/23 10:45

RCHRES:     1

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated.  If extrapolation was small, no problem.
Remedy; extend ftable.  Relevant data are:

A          B          C      RDEP1      RDEP2  COUNT
0.0000E+00 8712.0     -1.935E+04    2.2207  2.2207E+00      2
```

```
ERROR/WARNING ID:   341   6

DATE/TIME: 1960/10/23 11: 0

RCHRES:     1

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB().  To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows.  This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS         V1         V2        VOL
79 1.6858E+04 1.6988E+04 1.8471E+04
```

```
ERROR/WARNING ID:   341   5

DATE/TIME: 1960/10/23 11: 0

RCHRES:     1

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated.  If extrapolation was small, no problem.
Remedy; extend ftable.  Relevant data are:

A          B          C      RDEP1      RDEP2  COUNT
0.0000E+00 8712.0     -1.076E+05   12.348     12.348        2
```

```
ERROR/WARNING ID:   341   6

DATE/TIME: 1960/10/23 11:15

RCHRES:     1
```

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB(). To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows. This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS	V1	V2	VOL
79	1.6858E+04	1.6988E+04	1.9420E+04

ERROR/WARNING ID: 341 5

DATE/TIME: 1960/10/23 11:15

RCHRES: 1

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated. If extrapolation was small, no problem.
Remedy; extend ftable. Relevant data are:

A	B	C	RDEP1	RDEP2	COUNT
0.0000E+00	8712.0	-1.708E+05	19.604	1.9604E+01	2

ERROR/WARNING ID: 341 6

DATE/TIME: 1960/10/23 11:30

RCHRES: 1

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB(). To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows. This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS	V1	V2	VOL
79	1.6858E+04	1.6988E+04	2.0119E+04

ERROR/WARNING ID: 341 5

DATE/TIME: 1960/10/23 11:30

RCHRES: 1

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated. If extrapolation was small, no problem.
Remedy; extend ftable. Relevant data are:

A	B	C	RDEP1	RDEP2	COUNT
0.0000E+00	8712.0	-2.174E+05	24.957	2.4957E+01	2

ERROR/WARNING ID: 341 6

DATE/TIME: 1960/10/23 11:45

RCHRES: 1

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB(). To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows. This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS	V1	V2	VOL
79	1.6858E+04	1.6988E+04	2.0160E+04

ERROR/WARNING ID: 341   5

DATE/TIME: 1960/10/23 11:45

RCHRES: 1

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated. If extrapolation was small, no problem.
Remedy; extend ftable. Relevant data are:

A	B	C	RDEP1	RDEP2	COUNT
0.0000E+00	8712.0	-2.202E+05	25.273	2.5273E+01	2

ERROR/WARNING ID: 341   6

DATE/TIME: 1960/10/23 12: 0

RCHRES: 1

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB(). To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows. This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS	V1	V2	VOL
79	1.6858E+04	1.6988E+04	2.0246E+04

ERROR/WARNING ID: 341   5

DATE/TIME: 1960/10/23 12: 0

RCHRES: 1

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated. If extrapolation was small, no problem.
Remedy; extend ftable. Relevant data are:

A	B	C	RDEP1	RDEP2	COUNT
0.0000E+00	8712.0	-2.259E+05	25.931	2.5931E+01	2

ERROR/WARNING ID: 341   6

DATE/TIME: 1960/10/23 12:15

RCHRES: 1

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB(). To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows. This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS	V1	V2	VOL
79	1.6858E+04	1.6988E+04	2.0068E+04

ERROR/WARNING ID: 341   5

DATE/TIME: 1960/10/23 12:15

RCHRES: 1

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).

Probably ftable was extrapolated. If extrapolation was small, no problem.
Remedy; extend ftable. Relevant data are:

A	B	C	RDEP1	RDEP2	COUNT
0.0000E+00	8712.0	-2.140E+05	24.565	2.4565E+01	2

ERROR/WARNING ID: 341   6

DATE/TIME: 1960/10/23 12:30

RCHRES: 1

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB(). To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows. This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS	V1	V2	VOL
79	1.6858E+04	1.6988E+04	1.9666E+04

ERROR/WARNING ID: 341   5

DATE/TIME: 1960/10/23 12:30

RCHRES: 1

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated. If extrapolation was small, no problem.
Remedy; extend ftable. Relevant data are:

A	B	C	RDEP1	RDEP2	COUNT
0.0000E+00	8712.0	-1.872E+05	21.493	2.1493E+01	2

ERROR/WARNING ID: 341   6

DATE/TIME: 1960/10/23 12:45

RCHRES: 1

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB(). To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows. This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS	V1	V2	VOL
79	1.6858E+04	1.6988E+04	1.9122E+04

ERROR/WARNING ID: 341   5

DATE/TIME: 1960/10/23 12:45

RCHRES: 1

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated. If extrapolation was small, no problem.
Remedy; extend ftable. Relevant data are:

A	B	C	RDEP1	RDEP2	COUNT
0.0000E+00	8712.0	-1.510E+05	17.331	17.331	2

ERROR/WARNING ID: 341   6

DATE/TIME: 1960/10/23 13: 0

RCHRES: 1

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB(). To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows. This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS	V1	V2	VOL
79	1.6858E+04	1.6988E+04	1.8484E+04

ERROR/WARNING ID: 341   5

DATE/TIME: 1960/10/23 13: 0

RCHRES: 1

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated. If extrapolation was small, no problem.
Remedy; extend ftable. Relevant data are:

A	B	C	RDEP1	RDEP2	COUNT
0.0000E+00	8712.0	-1.084E+05	12.443	1.2443E+01	2

ERROR/WARNING ID: 341   6

DATE/TIME: 1960/10/23 13:15

RCHRES: 1

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB(). To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows. This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS	V1	V2	VOL
79	1.6858E+04	1.6988E+04	1.7775E+04

ERROR/WARNING ID: 341   5

DATE/TIME: 1960/10/23 13:15

RCHRES: 1

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated. If extrapolation was small, no problem.
Remedy; extend ftable. Relevant data are:

A	B	C	RDEP1	RDEP2	COUNT
0.0000E+00	8712.0	-6.115E+04	7.0187	7.0187E+00	2

ERROR/WARNING ID: 341   6

DATE/TIME: 1960/10/23 13:30

RCHRES: 1

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB(). To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows. This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS V1 V2 VOL
79 1.6858E+04 1.6988E+04 1.7035E+04

ERROR/WARNING ID: 341 5

DATE/TIME: 1960/10/23 13:30

RCHRES: 1

Calculation of relative depth, using Newton's method of successive approximations, converged to an invalid value (not in range 0.0 to 1.0). Probably ftable was extrapolated. If extrapolation was small, no problem. Remedy; extend ftable. Relevant data are:

A B C RDEP1 RDEP2 COUNT
0.0000E+00 8712.0 -1.180E+04 1.3543 1.3543E+00 2

ERROR/WARNING ID: 341 6

DATE/TIME: 2007/12/ 3 12:45

RCHRES: 1

The volume of water in this reach/mixed reservoir is greater than the value in the "volume" column of the last row of RCHTAB(). To continue the simulation the table has been extrapolated, based on information contained in the last two rows. This will usually result in some loss of accuracy. If depth is being calculated it will also cause an error condition. Relevant data are:

NROWS V1 V2 VOL
79 1.6858E+04 1.6988E+04 1.7096E+04

ERROR/WARNING ID: 341 5

DATE/TIME: 2007/12/ 3 12:45

RCHRES: 1

Calculation of relative depth, using Newton's method of successive approximations, converged to an invalid value (not in range 0.0 to 1.0). Probably ftable was extrapolated. If extrapolation was small, no problem. Remedy; extend ftable. Relevant data are:

A B C RDEP1 RDEP2 COUNT
0.0000E+00 8712.0 -1.589E+04 1.8235 1.8235E+00 2

ERROR/WARNING ID: 341 6

DATE/TIME: 2007/12/ 3 13: 0

RCHRES: 1

The volume of water in this reach/mixed reservoir is greater than the value in the "volume" column of the last row of RCHTAB(). To continue the simulation the table has been extrapolated, based on information contained in the last two rows. This will usually result in some loss of accuracy. If depth is being calculated it will also cause an error condition. Relevant data are:

NROWS V1 V2 VOL
79 1.6858E+04 1.6988E+04 1.7412E+04

ERROR/WARNING ID: 341 5

DATE/TIME: 2007/12/ 3 13: 0

RCHRES: 1

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated. If extrapolation was small, no problem.
Remedy; extend ftable. Relevant data are:

A	B	C	RDEP1	RDEP2	COUNT
0.0000E+00	8712.0	-3.693E+04	4.2384	4.2384E+00	2

ERROR/WARNING ID: 341   6

DATE/TIME: 2007/12/ 3 13:15

RCHRES: 1

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB(). To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows. This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS	V1	V2	VOL
79	1.6858E+04	1.6988E+04	1.7521E+04

ERROR/WARNING ID: 341   5

DATE/TIME: 2007/12/ 3 13:15

RCHRES: 1

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated. If extrapolation was small, no problem.
Remedy; extend ftable. Relevant data are:

A	B	C	RDEP1	RDEP2	COUNT
0.0000E+00	8712.0	-4.425E+04	5.0787	5.0787	2

ERROR/WARNING ID: 341   6

DATE/TIME: 2007/12/ 3 13:30

RCHRES: 1

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB(). To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows. This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS	V1	V2	VOL
79	1.6858E+04	1.6988E+04	1.7333E+04

ERROR/WARNING ID: 341   5

DATE/TIME: 2007/12/ 3 13:30

RCHRES: 1

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated. If extrapolation was small, no problem.
Remedy; extend ftable. Relevant data are:

A	B	C	RDEP1	RDEP2	COUNT
0.0000E+00	8712.0	-3.169E+04	3.6375	3.6375E+00	2

ERROR/WARNING ID: 341   6

DATE/TIME: 2007/12/ 3 13:45

RCHRES: 1

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB(). To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows. This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS	V1	V2	VOL
79	1.6858E+04	1.6988E+04	1.7048E+04

ERROR/WARNING ID: 341   5

DATE/TIME: 2007/12/ 3 13:45

RCHRES: 1

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated. If extrapolation was small, no problem.
Remedy; extend ftable. Relevant data are:

A	B	C	RDEP1	RDEP2	COUNT
0.0000E+00	8712.0	-1.271E+04	1.4591	1.4591E+00	2

Disclaimer

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Project:

Chamber Model -	MC-3500	
Units -	**Imperial**	
Number of Chambers -	83	
Number of End Caps -	8	
Voids in the stone (porosity) -	40	%
Base of Stone Elevation -	0.00	ft
Amount of Stone Above Chambers -	24	in
Amount of Stone Below Chambers -	9	in
Area of system -	4400	sf

☑ Include Perimeter Stone in Calculations

Min. Area - 4400 sf min. area

Height of System (inches)	Incremental Single Chamber (cubic feet)	Incremental Single End Cap (cubic feet)	Incremental Chambers (cubic feet)	Incremental End Cap (cubic feet)	Incremental Stone (cubic feet)	Incremental Ch, EC and Stone (cubic feet)	Cumulative System (cubic teet)	Elevation (feet)
78	0.00	0.00	0.00	0.00	146.67	146.67	16990.44	6.50
77	0.00	0.00	0.00	0.00	146.67	146.67	16843.77	6.42
76	0.00	0.00	0.00	0.00	146.67	146.67	16697.11	6.33
75	0.00	0.00	0.00	0.00	146.67	146.67	16550.44	6.25
74	0.00	0.00	0.00	0.00	146.67	146.67	16403.77	6.17
73	0.00	0.00	0.00	0.00	146.67	146.67	16257.11	6.08
72	0.00	0.00	0.00	0.00	146.67	146.67	16110.44	6.00
71	0.00	0.00	0.00	0.00	146.67	146.67	15963.77	5.92
70	0.00	0.00	0.00	0.00	146.67	146.67	15817.11	5.83
69	0.00	0.00	0.00	0.00	146.67	146.67	15670.44	5.75
68	0.00	0.00	0.00	0.00	146.67	146.67	15523.77	5.67
67	0.00	0.00	0.00	0.00	146.67	146.67	15377.11	5.58
66	0.00	0.00	0.00	0.00	146.67	146.67	15230.44	5.50
65	0.00	0.00	0.00	0.00	146.67	146.67	15083.77	5.42
64	0.00	0.00	0.00	0.00	146.67	146.67	14937.11	5.33
63	0.00	0.00	0.00	0.00	146.67	146.67	14790.44	5.25
62	0.00	0.00	0.00	0.00	146.67	146.67	14643.77	5.17
61	0.00	0.00	0.00	0.00	146.67	146.67	14497.11	5.08
60	0.00	0.00	0.00	0.00	146.67	146.67	14350.44	5.00
59	0.00	0.00	0.00	0.00	146.67	146.67	14203.77	4.92
58	0.00	0.00	0.00	0.00	146.67	146.67	14057.11	4.83
57	0.00	0.00	0.00	0.00	146.67	146.67	13910.44	4.75
56	0.00	0.00	0.00	0.00	146.67	146.67	13763.77	4.67
55	0.00	0.00	0.00	0.00	146.67	146.67	13617.11	4.58
54	0.06	0.00	4.82	0.00	144.74	149.56	13470.44	4.50
53	0.19	0.01	16.11	0.08	140.19	156.38	13320.88	4.42
52	0.29	0.01	24.40	0.08	136.88	161.35	13164.50	4.33
51	0.40	0.02	33.50	0.16	133.20	166.86	13003.15	4.25
50	0.69	0.04	57.04	0.32	123.72	181.08	12836.28	4.17
49	1.03	0.05	85.35	0.40	112.37	198.12	12655.20	4.08
48	1.25	0.07	103.71	0.56	104.96	209.23	12457.09	4.00
47	1.42	0.09	118.04	0.72	99.16	217.93	12247.86	3.92
46	1.57	0.10	130.57	0.80	94.12	225.49	12029.93	3.83
45	1.71	0.12	141.69	0.96	89.61	232.26	11804.44	3.75
44	1.83	0.14	151.77	1.12	85.51	238.40	11572.18	3.67
43	1.94	0.16	160.83	1.28	81.82	243.94	11333.79	3.58
42	2.04	0.18	169.39	1.44	78.34	249.16	11089.85	3.50
41	2.13	0.20	177.18	1.60	75.16	253.93	10840.69	3.42
40	2.22	0.21	184.61	1.68	72.15	258.44	10586.75	3.33
39	2.31	0.24	191.46	1.92	69.31	262.70	10328.31	3.25
38	2.38	0.26	197.94	2.08	66.66	266.68	10065.62	3.17
37	2.46	0.27	204.10	2.16	64.16	270.43	9798.94	3.08
36	2.53	0.29	209.84	2.32	61.80	273.96	9528.51	3.00
35	2.59	0.32	215.28	2.56	59.53	277.37	9254.55	2.92
34	2.66	0.33	220.45	2.64	57.43	280.52	8977.18	2.83
33	2.72	0.35	225.35	2.80	55.41	283.56	8696.66	2.75
32	2.77	0.37	230.02	2.96	53.48	286.45	8413.10	2.67
31	2.82	0.39	234.45	3.12	51.64	289.21	8126.65	2.58
30	2.88	0.41	238.66	3.28	49.89	291.83	7837.44	2.50
29	2.92	0.43	242.70	3.44	48.21	294.35	7545.61	2.42
28	2.97	0.45	246.50	3.60	46.63	296.73	7251.26	2.33
27	3.01	0.46	250.03	3.68	45.18	298.89	6954.53	2.25
26	3.05	0.48	253.42	3.84	43.76	301.02	6655.63	2.17
25	3.09	0.49	256.82	3.92	42.37	303.11	6354.61	2.08
24	3.13	0.51	259.84	4.08	41.10	305.02	6051.50	2.00
23	3.17	0.52	262.75	4.16	39.90	306.81	5746.48	1.92
22	3.20	0.54	265.55	4.32	38.72	308.59	5439.67	1.83
21	3.23	0.54	268.18	4.32	37.67	310.17	5131.08	1.75
20	3.26	0.56	270.70	4.48	36.60	311.77	4820.91	1.67
19	3.29	0.57	273.09	4.56	35.61	313.26	4509.14	1.58
18	3.32	0.58	275.39	4.64	34.65	314.69	4195.88	1.50
17	3.34	0.58	277.56	4.64	33.79	315.99	3881.19	1.42
16	3.37	0.60	279.60	4.80	32.91	317.30	3565.20	1.33
15	3.39	0.60	281.58	4.80	32.12	318.49	3247.90	1.25
14	3.41	0.61	283.41	4.88	31.35	319.64	2929.41	1.17
13	3.44	0.61	285.27	4.88	30.61	320.76	2609.77	1.08

Figure 5.5.2
Flow Control
Calculations

BARGHAUSEN CONSULTING ENGINEERS - PIPE FLOW CALCULATOR
using the Rational Method & Manning Formula
Type IA SCS rainfall event **100** YEAR STORM

JOB NAME Gayteway - Building F
JOB#: 21334
Date : 9/22/2021

NOTE: ENTER DEFAULTS AND STORM DATA BEFORE BEGINNING

DEFAULTS C= 0.9 n= 0.012 d= 12 Tc= 5

A= Contributing Area (Ac)
C= Runoff Coefficient
Tc= Time of Concentration (min)
I= Intensity at Tc (in/hr)
d= Diameter of Pipe (in)
L= Length of Pipe (ft)
D= Water Depth at Qd (in)
Qd= Design Flow (cfs)
Qf= Full Capacity Flow (cfs)
Vd= Velocity at Design Flow (fps)
Vf= Velocity at Full Flow (fps)
s= Slope of pipe (%)
n= Manning Roughness Coefficient
Tt= Travel Time at Vd (min)

COEFFICIENTS FOR THE RATIONAL METHOD "Ir"-EQUATION

STORM	Ar	Br
2YR	1.58	0.58
10YR	2.44	0.64
25YR	2.66	0.65
50YR	2.75	0.65
100YR	2.61	0.63

PRECIP= **3.6** (100year storm)
Ar= **2.61**
Br= **0.63**

	FROM	TO	A	s	L	d	Tc	n	C	SUM A	A*C	SUM A*C	I	Qd	Qf	**Qd/Qf**	D/d	D	Vf	Vd	Tt
TRUE																					
FALSE	CB#1	CB#2	0.42	0.50	139	12	5.0	0.012	0.9	0.42152	0.38	0.38	3.41	1.29	2.73	**0.474**	0.485	5.82	3.48	3.46	0.67
FALSE	CB#2	SDCO#1	0.12	0.50	77	12	5.7	0.012	0.9	0.54358	0.11	0.49	3.15	1.54	2.73	**0.565**	0.537	6.44	3.48	3.57	0.36
FALSE	SDCO#1	CB#3	0.00	0.50	51	12	6.0	0.012	0.9	0.54358	0.00	0.49	3.03	1.48	2.73	**0.543**	0.525	6.30	3.48	3.54	0.24
FALSE	CB#3	CB#4	0.16	0.50	149	12	6.3	0.012	0.9	0.70428	0.14	0.63	2.96	1.87	2.73	**0.687**	0.608	7.29	3.48	3.74	0.66
FALSE	CB#4	CB#5	0.23	0.55	171	12	6.9	0.012	0.9	0.92999	0.20	0.84	2.77	2.32	2.86	**0.811**	0.684	8.20	3.65	4.05	0.70
TRUE																					
FALSE	CB#19	CB#5	0.01	1.12	66	8	5.0	0.012	0.9	0.00995	0.01	0.01	3.41	0.03	1.38	**0.022**	0.104	0.83	3.97	1.62	0.68
TRUE																					
FALSE	CB#5	OIL CONTROL TEE	0.94	0.50	285	12	5.0	0.012	0.9	0.93994	0.85	0.85	3.41	2.88	2.73	**1.057**	0.883	10.59	3.48	3.93	1.21
TRUE																					
FALSE	CB#6	CB#18	0.83	1.00	95	12	5.0	0.012	0.9	0.82825	0.75	0.75	3.41	2.54	3.86	**0.659**	0.594	7.13	4.92	5.25	0.30
TRUE																					
FALSE	CB#16	CB#18	0.65	1.79	53	12	5.0	0.012	0.9	0.64858	0.58	0.58	3.41	1.99	5.16	**0.385**	0.430	5.16	6.58	6.15	0.14
TRUE																					
FALSE	CB#8	CB#9	0.04	0.50	28	8	5.0	0.012	0.9	0.03673	0.03	0.03	3.41	0.11	0.93	**0.122**	0.237	1.90	2.65	1.78	0.26
FALSE	CB#9	CB#10	0.02	0.50	70	8	5.3	0.012	0.9	0.06087	0.02	0.05	3.30	0.18	0.93	**0.195**	0.296	2.37	2.65	2.04	0.57
FALSE	CB#10	CB#11	0.02	0.50	11	8	5.8	0.012	0.9	0.07797	0.02	0.07	3.09	0.22	0.93	**0.235**	0.328	2.62	2.65	2.16	0.08
FALSE	CB#11	CB#12	0.02	0.50	37	12	5.9	0.012	0.9	0.09508	0.02	0.09	3.07	0.26	2.73	**0.096**	0.208	2.50	3.48	2.16	0.29
FALSE	CB#12	CB#13	0.01	0.50	61	12	6.2	0.012	0.9	0.10771	0.01	0.10	2.98	0.29	2.73	**0.106**	0.221	2.65	3.48	2.25	0.45
FALSE	CB#13	CB#14	0.03	0.50	20	12	6.7	0.012	0.9	0.13617	0.03	0.12	2.85	0.35	2.73	**0.128**	0.242	2.91	3.48	2.36	0.14
FALSE	CB#14	CB#15	0.02	0.50	61	12	6.8	0.012	0.9	0.15785	0.02	0.14	2.81	0.40	2.73	**0.146**	0.257	3.08	3.48	2.47	0.41
FALSE	CB#15	CB#18	0.02	1.38	184	12	7.2	0.012	0.9	0.17572	0.02	0.16	2.71	0.43	4.53	**0.094**	0.206	2.47	5.78	3.56	0.86
TRUE																					
FALSE	CB#18	OIL CONTROL TEE	1.65	10.97	21	12	5.0	0.012	0.9	1.65256	1.49	1.49	3.41	5.07	12.78	**0.397**	0.438	5.25	16.28	15.34	0.02
TRUE																					

FALSE	OIL CONTROL TEE	BAYFILTER	2.59	1.00	21	16	5.0	0.012	0.9	2.5925	2.33	2.33	3.41	7.95	8.31	**0.957**	0.777	12.43	5.96	6.73	0.05
FALSE	BAYFILTER	CB#7	0.00	1.00	12	16	5.0	0.012	0.9	2.5925	0.00	2.33	3.40	7.93	8.31	**0.954**	0.776	12.41	5.96	6.73	0.03
TRUE																					
FALSE	SDCO#2	SDCO#3	0.22	1.00	56	8	5.0	0.012	0.9	0.21855	0.20	0.20	3.41	0.67	1.31	**0.512**	0.507	4.06	3.75	3.78	0.25
FALSE	SDCO#3	SDCO#4	0.18	1.00	56	8	5.2	0.012	0.9	0.39803	0.16	0.36	3.31	1.18	1.31	**0.905**	0.740	5.92	3.75	4.24	0.22
FALSE	SDCO#4	SDCO#5	0.08	1.00	63	12	5.5	0.012	0.9	0.48202	0.08	0.43	3.22	1.40	3.86	**0.362**	0.416	4.99	4.92	4.53	0.23
FALSE	SDCO#5	SDCO#6	0.00	1.00	83	12	5.7	0.012	0.9	0.48202	0.00	0.43	3.14	1.36	3.86	**0.353**	0.410	4.92	4.92	4.50	0.31
FALSE	SDCO#6	SDCO#7	0.15	1.00	60	12	6.0	0.012	0.9	0.62999	0.13	0.57	3.04	1.72	3.86	**0.446**	0.469	5.63	4.92	4.81	0.21
FALSE	SDCO#7	SDCO#8	0.15	1.00	60	12	6.2	0.012	0.9	0.78051	0.14	0.70	2.97	2.09	3.86	**0.541**	0.524	6.28	4.92	5.00	0.20
FALSE	SDCO#8	SDCO#9	0.14	1.00	60	12	6.4	0.012	0.9	0.92125	0.13	0.83	2.91	2.42	3.86	**0.626**	0.582	6.99	4.92	5.22	0.19
FALSE	SDCO#9	SDCO#10	0.07	1.00	33	12	6.6	0.012	0.9	0.98911	0.06	0.89	2.86	2.55	3.86	**0.660**	0.595	7.13	4.92	5.25	0.10
FALSE	SDCO#10	SDCO#11	0.05	1.00	63	12	6.7	0.012	0.9	1.04247	0.05	0.94	2.83	2.66	3.86	**0.689**	0.609	7.31	4.92	5.29	0.20
FALSE	SDCO#11	SDCO#12	0.00	2.88	56	12	6.9	0.012	0.9	1.04247	0.00	0.94	2.78	2.61	6.55	**0.398**	0.439	5.27	8.34	7.87	0.12
FALSE	SDCO#12	SDCO#13	0.14	1.00	56	12	7.0	0.012	0.9	1.17948	0.12	1.06	2.75	2.92	3.86	**0.757**	0.650	7.80	4.92	5.41	0.17
FALSE	SDCO#13	SDCO#14	0.15	2.04	56	12	7.2	0.012	0.9	1.33375	0.14	1.20	2.71	3.25	5.51	**0.590**	0.551	6.62	7.02	7.29	0.13
FALSE	SDCO#14	CB#7	0.15	1.69	77	12	7.3	0.012	0.9	1.48802	0.14	1.34	2.68	3.59	5.02	**0.715**	0.626	7.51	6.39	6.95	0.18
TRUE																					
FALSE	SDCO#15	SDCO#16	0.22	1.00	56	8	5.0	0.012	0.9	0.21855	0.20	0.20	3.41	0.67	1.31	**0.512**	0.507	4.06	3.75	3.78	0.25
FALSE	SDCO#16	SDCO#17	0.18	1.00	53	8	5.2	0.012	0.9	0.39803	0.16	0.36	3.31	1.18	1.31	**0.905**	0.740	5.92	3.75	4.24	0.21
FALSE	SDCO#17	SDCO#18	0.11	1.00	15	12	5.5	0.012	0.9	0.50666	0.10	0.46	3.23	1.47	3.86	**0.381**	0.428	5.13	4.92	4.59	0.05
FALSE	SDCO#18	SDCO#19	0.00	1.00	66	12	5.5	0.012	0.9	0.50666	0.00	0.46	3.21	1.46	3.86	**0.379**	0.426	5.11	4.92	4.58	0.24
FALSE	SDCO#19	SDCO#20	0.00	1.00	98	12	5.7	0.012	0.9	0.50666	0.00	0.46	3.12	1.42	3.86	**0.369**	0.419	5.03	4.92	4.54	0.36
FALSE	SDCO#20	SDCO#21	0.14	1.00	60	12	6.1	0.012	0.9	0.65066	0.13	0.59	3.00	1.76	3.86	**0.456**	0.475	5.70	4.92	4.84	0.21
FALSE	SDCO#21	SDCO#22	0.15	1.00	60	12	6.3	0.012	0.9	0.80118	0.14	0.72	2.94	2.12	3.86	**0.550**	0.528	6.34	4.92	5.02	0.20
FALSE	SDCO#22	SDCO#23	0.14	1.00	60	12	6.5	0.012	0.9	0.94192	0.13	0.85	2.89	2.45	3.86	**0.634**	0.585	7.02	4.92	5.22	0.19
FALSE	SDCO#23	SDCO#24	0.07	1.00	33	12	6.7	0.012	0.9	1.01328	0.06	0.91	2.83	2.58	3.86	**0.670**	0.598	7.18	4.92	5.26	0.10
TRUE																					
FALSE	SDCO#25	SDCO#26	0.13	1.00	56	6	5.0	0.012	0.9	0.13473	0.12	0.12	3.41	0.41	0.61	**0.680**	0.603	3.62	3.10	3.32	0.28
FALSE	SDCO#26	SDCO#24	0.05	1.13	63	6	5.3	0.012	0.9	0.18459	0.04	0.17	3.29	0.55	0.65	**0.847**	0.705	4.23	3.29	3.69	0.28
TRUE																					
FALSE	SDCO#24	CB#17	1.20	7.12	67	12	5.0	0.012	0.9	1.19787	1.08	1.08	3.41	3.67	10.30	**0.357**	0.413	4.95	13.12	12.04	0.09

5.6 Water Quality System

The development will trigger Basic Treatment for all pollution generating surfaces. Bayfilter treatment cartridges will be placed in a manhole upstream to the infiltration gallery after stormwater is conveyed through a manhole oil control structure. Therefore, stormwater will go through pretreatment prior to the infiltration facility. Calculations and the Bayfilter General Use Level Designation Letter from the WA Department of Ecology are provided in this report for additional detail.

Figure 5.6.1
Bayfilter DOE
General Use
Designation
Letter

WASHINGTON STATE DEPARTMENT OF ECOLOGY

July 2019

GENERAL USE LEVEL DESIGNATON FOR BASIC (TSS) AND PHOSPHORUS TREATMENT

For

BaySaver Technologies, LLC
BayFilter™ System
using Enhanced Media Cartridges (EMC)

Ecology's Decision:

1. **Based on BaySaver Technologies' application submissions, Ecology hereby issues a General Use Level Designation (GULD) for Basic and Phosphorus Treatment for the BayFilter™ System using Enhanced Media Cartridges (EMC).**

   - **Sized at a hydraulic loading rate of no greater than 0.50 gallons per minute (gpm) per square foot (sq ft.) of filter area.**
     - **45 gpm (0.10 cfs) per cartridge (example dimensions 28-inch diameter, 30-inches tall (90 sq ft filter area))**
     - **75 gpm (0.167 cfs) per cartridge (example dimensions 39-inch diameter, 30-inches tall (150 sq ft filter area))**
       - **Canisters that provide 0.50 gpm per sq ft filter area, regardless of dimensions meet this requirement**
   - **Using BaySaver's EMC Media Blend of Zeolite, Perlite, and Activated Alumina. Specifications of media shall match the specifications provided by the manufacturer and approved by Ecology.**

2. **Ecology approves use of BayFilter™ Enhanced Media Cartridges for treatment at the above flow rates per cartridge. Designers shall calculate the water quality design flow rates using the following procedures:**

   - **Western Washington: For treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute flow rate as calculated using the latest version of the Western Washington Hydrology Model or other Ecology-approved continuous runoff model.**

- **Eastern Washington: For treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute flow rate as calculated using one of the three methods described in Chapter 2.2.5 of the Stormwater Management Manual for Eastern Washington (SWMMEW) or local manual.**

- **Entire State: For treatment installed downstream of detention, the water quality design flow rate is the full 2-year release rate of the detention facility.**

3. **The GULD has no expiration date, but it may be amended or revoked by Ecology, and is subject to the conditions specified below.**

<u>Ecology's Conditions of Use:</u>

BayFilter™ units shall comply with these conditions:

1. **Design, assemble, install, operate, and maintain BayFilter™ units in accordance with BaySaver Technologies' applicable manuals and documents and the Ecology Decision.**

2. **Maintenance: The required inspection/maintenance interval for stormwater treatment devices is often dependent upon the efficiency of the device and the degree of pollutant loading from a particular drainage basin. Therefore, Ecology does not endorse or recommend a "one size fits all" maintenance cycle for a particular model/size of manufactured filter treatment device.**

    - **BaySaver recommends that the following be considered during the design application of the BayFilter Cartridge systems:**
        - **Water Quality Flow Rate**
        - **Anticipated Pollutant Load**
        - **Maintenance Frequency**

    - **A BayFilter System tested adjacent to construction activity required maintenance after 4-months of operation. Monitoring personnel observed construction washout in the device during the testing period; the construction activity may have resulted in a shorter maintenance interval.**

    - **Ecology has found that pre-treatment device prior to the BayFilter system can provide a reduction in pollutant loads on these systems, thereby extending the maintenance interval.**

    - **Test results provided to Ecology from other BayFilter Systems, including the above mentioned system that was evaluated again after construction activities had been completed, have indicated the BayFilter System typically has longer maintenance intervals, sometimes exceeding 12-months.**

- **The BayFilter system contains filter fabric that is highly oleophilic (oil absorptive). When sufficient quantities of oils are present in the runoff, the oil and subsequent sediment particles may become attached to the fabric. As a result, it may compromise the maintenance interval of the BayFilter system. Oil control BMP's should be installed upstream of BayFilter installations if warranted, and/or the BayFilter system should be inspected after any known oil spill or release.**

- **Owners/operators must inspect BayFilter systems for a minimum of twelve months from the start of post-construction operation to determine site-specific inspection/maintenance schedules and requirements. Owners/operators must conduct inspections monthly during the wet season, and every other month during the dry season. (According to the SWMMWW, the wet season in western Washington is October 1 to April 30. According to SWMMEW, the wet season in eastern Washington is October 1 to June 30.) After the first year of operation, owners/operators must conduct inspections based on the findings during the first year of inspections or the manufacturer's anticipated maintenance interval, whichever is more frequent.**

- **Conduct inspections by qualified personnel, follow manufacturer's guidelines, and must use methods capable of determining either a decrease in treated effluent flowrate and/or a decrease in pollutant removal ability.**

3. **When inspections are performed, the following findings typically serve as maintenance triggers:**
   - **Accumulated vault sediment depths exceed an average of 2 inches, or**
   - **Accumulated sediment depths on the tops of the cartridges exceed an average of 0.5 inches, or**
   - **Standing water remains in the vault between rain events.**
   - **Bypass during storms smaller than the design storm.**
   - **Note: If excessive floatables (trash and debris) are present, perform minor maintenance consisting of gross solids removal, not cartridge replacement.**

4. **Discharges from the BayFilter™ units shall not cause or contribute to water quality standards violations in receiving waters.**

Applicant: Advanced Drainage Systems - BaySaver
Applicant's Address: 4640 Trueman Blvd
Hilliard, Ohio 43065

Application Documents:

- *Technical Evaluation Report BayFilter™ System Woodinville Sammamish River Outfall*, Woodinville, Washington and Appendices A through M (March 2, 2017)
- *Technical Evaluation Report BayFilter System, Grandview Place Apartments*, Vancouver, Washington and Appendices A through O (May 18, 2011)
- *Washington State Department of Ecology Technology Assessment Protocol – Environmental BayFilter™ Conditional Use Designation Application* (March 2007)
- *BaySaver Technologies, Inc. BayFilter™ System Washington State Technical and Design Manual, Version 1.1* (December 2006)
- *Efficiency Assessment of BaySeparator and Bay filter Systems in the Richard Montgomery High School* January 6.2009.
- *Evaluation of MASWRC Sample Collection, Sample Analysis, and Data Analysis*, December 27, 2008
- Letter from Mid-Atlantic Stormwater Research Center to BaySaver Technologies, In. dated October 22, 2009.
- Letter from Mid-Atlantic Stormwater Research Center to BaySaver Technologies, In. dated November 5, 2009.
- Maryland Department of the Environment letter to BaySaver Technologies dated Jan. 13, 2008 regarding approval of BayFilter as a standalone BMP for Stormwater treatment.
- NJCAT letter to BaySaver Technologies dated June 18, 2009 regarding Interim Certification.

Applicant's Use Level Request:

- General use level designation as a basic, enhanced, and phosphorus treatment device in accordance with Ecology's Stormwater Management Manual for Western Washington.

Applicant's Performance Claims:

- Removes and retains 80% of TSS based on laboratory testing using Sil-Co-Sil 106 as a laboratory stimulant.
- Removes 42% of dissolved Copper and 38% of dissolved Zinc.
- Expected to remove 50% of the influent phosphorus load.

Ecology's Recommendations:

- BaySaver Technologies, Inc. has shown Ecology, through laboratory and field testing, that the BayFilter™ System using Enhanced Media Cartridges (EMC) (as a single treatment facility) is capable of attaining Ecology's Basic and Phosphorus Treatment goals.
- Ecology should provide BaySaver Technologies, Inc. with the opportunity to demonstrate, through additional laboratory and field-testing, whether the BayFilter™ System using Enhanced Media Cartridges (EMC) (as a single treatment facility) can attain Ecology's Enhanced Treatment goals.

Findings of Fact:

- BaySaver conducted field monitoring of a BayFilter™ using EMC at a site in Woodinville, WA between November 2013 and March 2015. BaySaver sized the system at a hydraulic loading rate of 0.50 gpm/sq. ft. The manufacturer collected flow-weighted influent and effluent composite samples during 12 storm events.
    - Influent TSS concentrations from sampled storm events ranged from 17 to 140 mg/L. For all samples, the upper 95 percent confidence limit (UCL) of the mean effluent concentration was less than 10 mg/L. For influent concentrations greater than 100 mg/L (n=2) the removal efficiency was greater than 80%.
    - Influent total phosphorus concentrations from sampled storm events ranged from 0.073 to 0.320 mg/L. A bootstrap estimate of the lower 95 percent confidence limit (LCL95) of the mean total phosphorus reduction was 64 percent.
    - BaySaver inspected the system regularly, however they did not need maintenance during the 18 month evaluation period.

- Based on field testing in Vancouver, WA, at a flow rate less than or equal to 30 gpm per canister, the BayFilter™ system demonstrated a total suspended solids removal efficiency of greater than 80% for influent concentrations between 100 and 200 mg/l and an effluent concentration < 20 mg/l for influent concentration < 100 mg/l.

- Based on laboratory testing, at a flowrate of 30 GPM per filter, the BayFilter™ system demonstrated a total suspended solids removal efficiency of 81.5% using Sil-Co-Sil 106 with an average influent concentration of 268 mg/L and zero initial sediment loading.

- Based on laboratory testing, at a flowrate of 30 GPM per filter, the BayFilter™ system demonstrated a dissolved phosphorus removal efficiency of 55% using data from the Richard Montgomery High School field-testing. The average influent concentration was 0.31 mg/L phosphorus and zero initial sediment loading.

- Based on data from field-testing at Richard Montgomery High School in Rockville, MD the BayFilter system demonstrated a Cu removal efficiency of 51% and 41% for total and dissolved Cu respectively. Average influent concentrations are 41.6 µg/l total and 17.5 µg/l dissolved.

- Based on data from field-testing at Richard Montgomery High School in Rockville, MD the BayFilter system demonstrated a Zn removal efficiency of 45% and 38% for total and dissolved Cu, respectively. Average influent concentrations are 354 µg/l total and 251 µg/l dissolved, respectively.

Other BayFilter™ Related Issues to be Addressed By the Company:

1. The Washington State field test results submitted in the TER do not yet show whether the BayFilter™ system can reliably attain 30% removal of dissolved Cu or 60% removal of dissolved Zn found on local highways, parking lots, and other high-use areas at the design operating rate.
2. BaySaver Technologies, Inc. should test a variety of operating rates to establish conservative design flow rates.
3. The manufacturer should continue to monitor the system to measure bypass and to calculate if the system treats 91% of the volume of the total annual runoff volume.
4. The manufacturer should test the system under normal operating conditions, with a partially pollutant filled settling basin. Results obtained for "clean" systems may not be representative of typical performance.
5. Conduct field-testing at sites that are indicative of the treatment goals.
6. BaySaver should continue monitoring the system for a longer period to help establish a maintenance period and to obtain data from additional qualified storms. Conduct testing to obtain information about maintenance requirements in order to come up with a maintenance cycle.
7. Conduct loading tests on the filter to determine maximum treatment life of the system.
8. Conduct testing to determine if oils and grease affect the treatment ability of the filter. This should include a determination of how oil and grease may affect the ion-exchange capacity of the system if BaySaver wishes to make claims for phosphorus removal.
9. BaySaver should develop easy-to-implement methods of determining when a BayFilter system requires maintenance (cleaning and filter replacement).
10. BaySaver must update their O&M documents to include information and instructions on the "24-hour draw-down" method to determine if cartridges need replacing.

Technology Description: Download at www.BaySaver.com

Contact Information:

Applicant: Brian Rustia
Advanced Drainage Systems - BaySaver
4640 Trueman Blvd
Hilliard, Ohio 43065
(866) 405-9292
brian.rustia@ads-pipe.com

Applicant website: www.BaySaver.com

Ecology web link: http://www.ecy.wa.gov/programs/wq/stormwater/newtech/index.html

Ecology: Douglas C. Howie, P.E.
Department of Ecology
Water Quality Program
(360) 407-6444
douglas.howie@ecy.wa.gov

Revision History

Date	Revision
April 2008	Original use-level-designation document
February 2010	Revision
August 2011	GULD awarded for Basic Treatment
April 2012	Maintenance requirements updated.
August 2012	Revised design storm criteria
December 2012	Revised contact information and document formatting
December 2013	Revised expiration and submittal dates
December 2014	Revised Inspection/maintenance discussion, Updated cartridge descriptions
January 2015	Revised discussion for flow rate controls
December 2015	Revised Expiration date
January 2016	Revised Manufacturer Contact Information and expiration date
January 2017	Revised Expiration, QAPP and TER due dates
April 2017	Approved GULD designation for Basic and Phosphorus Treatment
December 2017	Removed CULD for Enhanced Treatment at request of Manufacturer
July 2019	Revised Applicant Contact Information

Figure 5.6.2
Water Quality Calculations

WWHM2012

PROJECT REPORT

General Model Information

Project Name:	2021-08-23 Buiding F WQ
Site Name:	Gayteway
Site Address:	
City:	Arlington
Report Date:	11/30/2021
Gage:	Everett
Data Start:	1948/10/01
Data End:	2009/09/30
Timestep:	15 Minute
Precip Scale:	1.200
Version Date:	2019/09/13
Version:	4.2.17

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year
High Flow Threshold for POC1:	50 Year

Landuse Basin Data
Predeveloped Land Use

Site

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
A B, Forest, Mod	5.8
Pervious Total	5.8

Impervious Land Use	acre
Impervious Total	0
Basin Total	5.8

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Parking Lot

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Lawn, Mod	0.67
Pervious Total	0.67
Impervious Land Use	acre
DRIVEWAYS FLAT	2.44
Impervious Total	2.44
Basin Total	3.11

Roof areas removed as they are non-pollution generating and bypass water quality unit

Element Flows To:

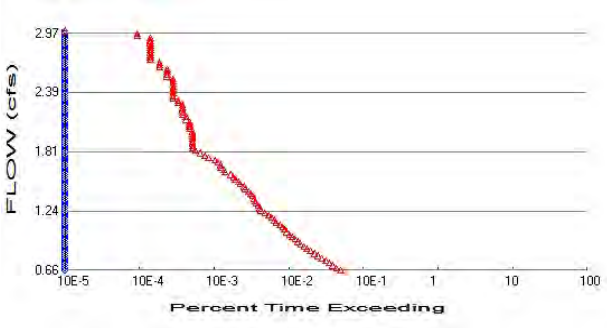
Surface	Interflow	Groundwater

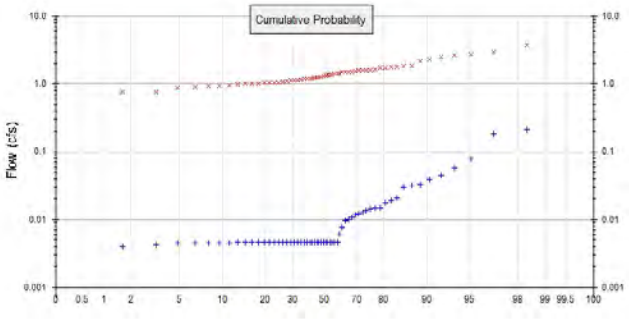
Routing Elements
Predeveloped Routing

Mitigated Routing

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 5.8
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.67
Total Impervious Area: 2.44

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.007469
5 year	0.018159
10 year	0.031229
25 year	0.059213
50 year	0.092681
100 year	0.142012

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	1.316111
5 year	1.781282
10 year	2.121531
25 year	2.589599
50 year	2.966957
100 year	3.369724

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1949	0.005	1.390
1950	0.019	1.557
1951	0.013	1.610
1952	0.005	1.234
1953	0.005	1.572
1954	0.044	2.173
1955	0.033	1.593
1956	0.005	0.688
1957	0.005	1.208
1958	0.005	2.933

1959	0.014	1.181
1960	0.012	1.187
1961	0.030	3.774
1962	0.005	1.487
1963	0.005	1.709
1964	0.021	0.942
1965	0.005	1.134
1966	0.005	1.136
1967	0.013	2.528
1968	0.005	1.336
1969	0.005	2.628
1970	0.005	1.030
1971	0.031	1.411
1972	0.005	1.817
1973	0.005	1.493
1974	0.017	1.819
1975	0.004	1.439
1976	0.015	1.003
1977	0.005	1.022
1978	0.006	0.757
1979	0.015	1.732
1980	0.005	1.129
1981	0.005	1.022
1982	0.010	1.049
1983	0.005	1.378
1984	0.005	1.267
1985	0.011	1.782
1986	0.057	1.774
1987	0.038	1.502
1988	0.005	1.226
1989	0.004	1.287
1990	0.005	0.980
1991	0.005	1.248
1992	0.005	1.214
1993	0.005	0.939
1994	0.004	1.096
1995	0.008	0.925
1996	0.080	1.489
1997	0.186	1.595
1998	0.005	1.660
1999	0.005	0.754
2000	0.012	2.695
2001	0.004	0.907
2002	0.005	0.881
2003	0.003	1.207
2004	0.005	2.278
2005	0.005	1.054
2006	0.213	1.436
2007	0.005	1.383
2008	0.010	1.055
2009	0.005	1.057

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.2129	3.7745
2	0.1862	2.9331
3	0.0796	2.6954

4	0.0569	2.6283
5	0.0443	2.5281
6	0.0384	2.2782
7	0.0328	2.1729
8	0.0314	1.8191
9	0.0297	1.8168
10	0.0207	1.7824
11	0.0189	1.7738
12	0.0173	1.7317
13	0.0147	1.7089
14	0.0147	1.6598
15	0.0143	1.6101
16	0.0135	1.5947
17	0.0126	1.5928
18	0.0121	1.5723
19	0.0119	1.5573
20	0.0109	1.5019
21	0.0098	1.4926
22	0.0097	1.4894
23	0.0077	1.4875
24	0.0062	1.4392
25	0.0047	1.4362
26	0.0047	1.4105
27	0.0047	1.3899
28	0.0047	1.3835
29	0.0047	1.3781
30	0.0047	1.3359
31	0.0047	1.2867
32	0.0047	1.2674
33	0.0047	1.2477
34	0.0046	1.2340
35	0.0046	1.2257
36	0.0046	1.2139
37	0.0046	1.2084
38	0.0046	1.2074
39	0.0046	1.1875
40	0.0046	1.1814
41	0.0046	1.1358
42	0.0046	1.1341
43	0.0046	1.1291
44	0.0046	1.0960
45	0.0046	1.0573
46	0.0046	1.0546
47	0.0046	1.0541
48	0.0046	1.0490
49	0.0046	1.0302
50	0.0046	1.0224
51	0.0046	1.0220
52	0.0046	1.0027
53	0.0045	0.9799
54	0.0045	0.9421
55	0.0045	0.9392
56	0.0045	0.9254
57	0.0045	0.9067
58	0.0045	0.8809
59	0.0043	0.7568
60	0.0040	0.7542
61	0.0032	0.6884

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0037	0	1061	n/a	Fail
0.0046	0	935	n/a	Fail
0.0055	0	830	n/a	Fail
0.0064	0	744	n/a	Fail
0.0073	0	665	n/a	Fail
0.0082	0	586	n/a	Fail
0.0091	0	527	n/a	Fail
0.0100	0	472	n/a	Fail
0.0109	0	418	n/a	Fail
0.0118	0	372	n/a	Fail
0.0127	0	343	n/a	Fail
0.0136	0	308	n/a	Fail
0.0145	0	282	n/a	Fail
0.0154	0	259	n/a	Fail
0.0163	0	237	n/a	Fail
0.0172	0	218	n/a	Fail
0.0181	0	201	n/a	Fail
0.0190	0	189	n/a	Fail
0.0199	0	177	n/a	Fail
0.0208	0	163	n/a	Fail
0.0217	0	145	n/a	Fail
0.0226	0	137	n/a	Fail
0.0235	0	126	n/a	Fail
0.0244	0	115	n/a	Fail
0.0253	0	102	n/a	Fail
0.0262	0	91	n/a	Fail
0.0271	0	87	n/a	Fail
0.0280	0	83	n/a	Fail
0.0289	0	78	n/a	Fail
0.0298	0	76	n/a	Fail
0.0307	0	73	n/a	Fail
0.0316	0	70	n/a	Fail
0.0325	0	66	n/a	Fail
0.0334	0	62	n/a	Fail
0.0343	0	56	n/a	Fail
0.0352	0	54	n/a	Fail
0.0361	0	48	n/a	Fail
0.0370	0	45	n/a	Fail
0.0379	0	41	n/a	Fail
0.0388	0	39	n/a	Fail
0.0397	0	36	n/a	Fail
0.0406	0	30	n/a	Fail
0.0415	0	29	n/a	Fail
0.0424	0	26	n/a	Fail
0.0433	0	26	n/a	Fail
0.0442	0	24	n/a	Fail
0.0451	0	22	n/a	Fail
0.0460	0	18	n/a	Fail
0.0469	0	16	n/a	Fail
0.0478	0	14	n/a	Fail
0.0487	0	12	n/a	Fail
0.0496	0	11	n/a	Fail
0.0505	0	11	n/a	Fail

0.0514	0	11	n/a	Fail
0.0523	0	11	n/a	Fail
0.0531	0	11	n/a	Fail
0.0540	0	11	n/a	Fail
0.0549	0	11	n/a	Fail
0.0558	0	11	n/a	Fail
0.0567	0	10	n/a	Fail
0.0576	0	10	n/a	Fail
0.0585	0	10	n/a	Fail
0.0594	0	10	n/a	Fail
0.0603	0	9	n/a	Fail
0.0612	0	9	n/a	Fail
0.0621	0	8	n/a	Fail
0.0630	0	8	n/a	Fail
0.0639	0	8	n/a	Fail
0.0648	0	8	n/a	Fail
0.0657	0	8	n/a	Fail
0.0666	0	7	n/a	Fail
0.0675	0	7	n/a	Fail
0.0684	0	6	n/a	Fail
0.0693	0	6	n/a	Fail
0.0702	0	6	n/a	Fail
0.0711	0	6	n/a	Fail
0.0720	0	6	n/a	Fail
0.0729	0	6	n/a	Fail
0.0738	0	6	n/a	Fail
0.0747	0	6	n/a	Fail
0.0756	0	6	n/a	Fail
0.0765	0	5	n/a	Fail
0.0774	0	5	n/a	Fail
0.0783	0	5	n/a	Fail
0.0792	0	5	n/a	Fail
0.0801	0	4	n/a	Fail
0.0810	0	4	n/a	Fail
0.0819	0	4	n/a	Fail
0.0828	0	3	n/a	Fail
0.0837	0	3	n/a	Fail
0.0846	0	3	n/a	Fail
0.0855	0	3	n/a	Fail
0.0864	0	3	n/a	Fail
0.0873	0	3	n/a	Fail
0.0882	0	3	n/a	Fail
0.0891	0	3	n/a	Fail
0.0900	0	3	n/a	Fail
0.0909	0	3	n/a	Fail
0.0918	0	2	n/a	Fail
0.0927	0	2	n/a	Fail

The development has an increase in flow durations from 1/2 Predeveloped 2 year flow to the 2 year flow or more than a 10% increase from the 2 year to the 50 year flow.
The development has an increase in flow durations for more than 50% of the flows for the range of the duration analysis.

Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume:	0.2955 acre-feet
On-line facility target flow:	0.4746 cfs.
Adjusted for 15 min:	0.4746 cfs.
Off-line facility target flow:	0.2686 cfs.
Adjusted for 15 min:	0.2686 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 Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
Total Volume Infiltrated		0.00	0.00	0.00		0.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Failed

POC 2

POC #2 was not reported because POC must exist in both scenarios and both scenarios must have been run.

POC 3

POC #3 was not reported because POC must exist in both scenarios and both scenarios must have been run.

Model Default Modifications

Total of 0 changes have been made.

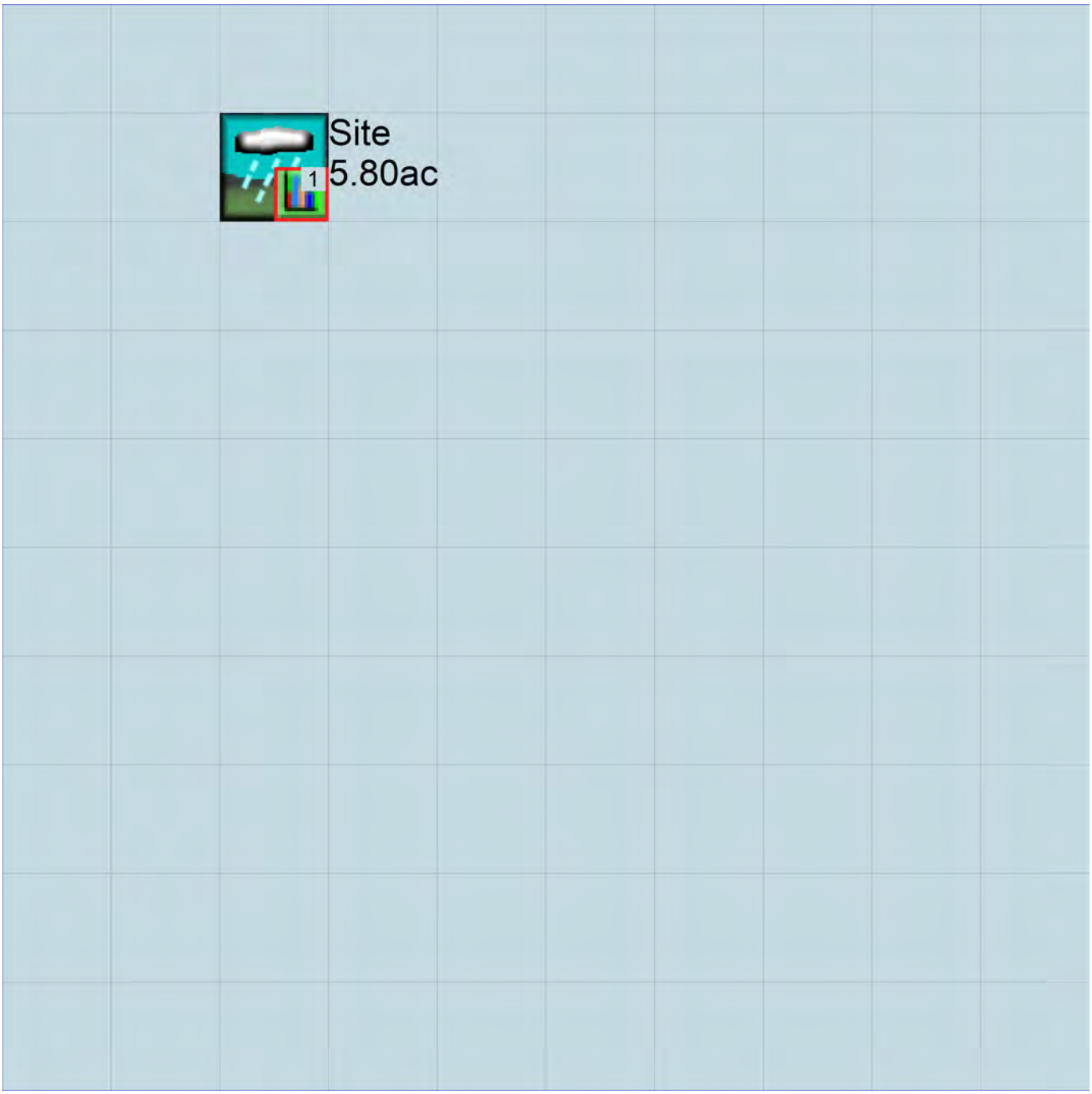
PERLND Changes

No PERLND changes have been made.

IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic

Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01        END    2009 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                   UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   2021-08-23 Buiding F WQ.wdm
MESSU       25   Pre2021-08-23 Buiding F WQ.MES
            27   Pre2021-08-23 Buiding F WQ.L61
            28   Pre2021-08-23 Buiding F WQ.L62
            30   POC2021-08-23 Buiding F WQ1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND       2
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Site                        MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                         User  t-series Engl Metr ***
                                      in  out           ***
    2     A/B, Forest, Mod        1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
    2         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
    2         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO
```

```
  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
    2         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
    2               0         5         2       400       0.1       0.3     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
    2              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
    2          0.2       0.5      0.35         0       0.7       0.7
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
             ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
    2              0         0         0         0         3         1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
  END IWAT-STATE1
```

```
END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Site***
PERLND   2                        5.8     COPY   501     12
PERLND   2                        5.8     COPY   501     13

******Routing******
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG           ***
                                       in  out                              ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ******************* PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                  ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *      *  *  *  *  *        ***
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                     ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1.2            PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1.2            IMPLND   1 999 EXTNL  PREC
```

```
WDM      1 EVAP     ENGL    0.76           PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.76           IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    501 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01        END    2009 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM        26   2021-08-23 Buiding F WQ.wdm
MESSU      25   Mit2021-08-23 Buiding F WQ.MES
           27   Mit2021-08-23 Buiding F WQ.L61
           28   Mit2021-08-23 Buiding F WQ.L62
           30   POC2021-08-23 Buiding F WQ1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND       8
      IMPLND       5
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Parking Lot                MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                       in  out           ***
    8     A/B, Lawn, Mod          1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
    8         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
    8         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO
```

```
  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
    8         0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
    8             0         5       0.8       400       0.1       0.3     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
    8             0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
    8          0.1       0.5      0.25         0       0.7      0.25
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
             ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
    8             0         0         0         0         3         1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
    5      DRIVEWAYS/FLAT         1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    5         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    5         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    5         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    5            400      0.01       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    5             0         0
```

```
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    5             0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Parking Lot***
PERLND   8                        0.67     COPY   501     12
PERLND   8                        0.67     COPY   501     13
IMPLND   5                        2.44     COPY   501     15

******Routing******
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                 ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG            ***
                                           in  out                           ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                      ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *       *  *  *  *  *         ***
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                         ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit       for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
```

```
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1.2            PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1.2            IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    0.76           PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.76           IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY     1 OUTPUT MEAN   1 1     48.4      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    801 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15


END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

Disclaimer

Legal Notice

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5.7 Conveyance System Analysis and Design

Conveyance calculations are provided in Figure 5.7.1.

Figure 5.7.1
Conveyance
Calculations

BARGHAUSEN CONSULTING ENGINEERS - PIPE FLOW CALCULATOR

using the Rational Method & Manning Formula

Type IA SCS rainfall event **100** YEAR STORM

JOB NAME Gayteway - Building F

JOB#: 21334

Date : 1/7/2022

NOTE: ENTER DEFAULTS AND STORM DATA BEFORE BEGINNING

DEFAULTS C= 0.9 n= 0.012 d= 12 Tc= 5

Tc CALC: L = 260, FPS = 2, INTIAL = 10, Tt = 12.167

A= Contributing Area (Ac)
C= Runoff Coefficient
Tc= Time of Concentration (min)
I= Intensity at Tc (in/hr)
d= Diameter of Pipe (in)
L= Length of Pipe (ft)
D= Water Depth at Qd (in)

Qd= Design Flow (cfs)
Qf= Full Capacity Flow (cfs)
Vd= Velocity at Design Flow (fps)
Vf= Velocity at Full Flow (fps)
s= Slope of pipe (%)
n= Manning Roughness Coefficient
Tt= Travel Time at Vd (min)

COEFFICIENTS FOR THE RATIONAL METHOD "Ir"-EQUATION

STORM	Ar	Br
2YR	1.58	0.58
10YR	2.44	0.64
25YR	2.66	0.65
50YR	2.75	0.65
100YR	2.61	0.63

PRECIP= **3.6** (100year storm)
Ar= **2.61**
Br= **0.63**

TRUE	FROM	TO	A	s	L	d	Tc	n	C	SUM A	A*C	SUM A*C	I	Qd	Qf	**Qd/Qf**	D/d	D	Vf	Vd	Tt	Flow Ratio
FALSE	CB#1	CB#2	0.21	0.50	147	12	5.0	0.012	0.9	0.21	0.19	0.19	3.41	0.65	2.73	**0.237**	0.330	3.96	3.48	2.84	0.86	
FALSE	CB#2	CB#3	0.21	0.50	139	12	5.0	0.012	0.9	0.21076	0.19	0.19	3.41	0.65	2.73	**0.237**	0.330	3.96	3.48	2.84	0.82	
FALSE	CB#3	SDCO#1	0.12	1.53	32	12	5.8	0.012	0.9	0.33282	0.11	0.30	3.10	0.93	4.77	**0.195**	0.296	3.55	6.08	4.68	0.11	
FALSE	SDCO#1	SDCO#2	0.00	0.79	84	12	5.9	0.012	0.9	0.33282	0.00	0.30	3.06	0.92	3.43	**0.267**	0.354	4.25	4.37	3.70	0.38	
FALSE	SDCO#2	CB#4	0.00	0.77	26	12	5.9	0.012	0.9	0.33282	0.00	0.30	3.06	0.92	3.39	**0.271**	0.357	4.28	4.31	3.67	0.12	
FALSE	CB#4	CB#5	0.16	0.79	143	12	6.3	0.012	0.9	0.49353	0.14	0.44	2.94	1.31	3.43	**0.381**	0.428	5.13	4.37	4.08	0.58	
FALSE	CB#5	CB#6	0.23	0.50	171	12	6.9	0.012	0.9	0.71923	0.20	0.65	2.78	1.80	2.73	**0.661**	0.595	7.14	3.48	3.71	0.77	
TRUE																						
FALSE	CB#6	OIL CONTROL TEE	0.24	0.50	285	12	5.0	0.012	0.9	0.23566	0.21	0.21	3.41	0.72	2.73	**0.265**	0.352	4.22	3.48	2.94	1.62	
TRUE																						
FALSE	CB#7	CB#19	0.83	0.50	95	12	5.0	0.012	0.9	0.82825	0.75	0.75	3.41	2.54	2.73	**0.931**	0.757	9.08	3.48	3.93	0.40	
TRUE																						
FALSE	CB#17	CB#19	0.65	0.50	53	12	5.0	0.012	0.9	0.64858	0.58	0.58	3.41	1.99	2.73	**0.729**	0.634	7.61	3.48	3.80	0.23	
TRUE																						
FALSE	CB#9	CB#10	0.04	0.50	28	8	5.0	0.012	0.9	0.03673	0.03	0.03	3.41	0.11	0.93	**0.122**	0.237	1.90	2.65	1.78	0.26	
FALSE	CB#10	CB#11	0.02	0.50	70	8	5.3	0.012	0.9	0.06087	0.02	0.05	3.30	0.18	0.93	**0.195**	0.296	2.37	2.65	2.04	0.57	
FALSE	CB#11	CB#12	0.02	0.50	11	8	5.8	0.012	0.9	0.07797	0.02	0.07	3.09	0.22	0.93	**0.235**	0.328	2.62	2.65	2.16	0.08	
FALSE	CB#12	CB#13	0.02	0.50	37	12	5.9	0.012	0.9	0.09508	0.02	0.09	3.07	0.26	2.73	**0.096**	0.208	2.50	3.48	2.16	0.29	
FALSE	CB#13	CB#14	0.01	0.50	61	12	6.2	0.012	0.9	0.10771	0.01	0.10	2.98	0.29	2.73	**0.106**	0.221	2.65	3.48	2.25	0.45	
FALSE	CB#14	CB#15	0.03	0.50	20	12	6.7	0.012	0.9	0.13617	0.03	0.12	2.85	0.35	2.73	**0.128**	0.242	2.91	3.48	2.36	0.14	
FALSE	CB#15	CB#16	0.02	0.50	61	12	6.8	0.012	0.9	0.15785	0.02	0.14	2.81	0.40	2.73	**0.146**	0.257	3.08	3.48	2.47	0.41	
FALSE	CB#16	CB#19	0.02	1.32	184	12	7.2	0.012	0.9	0.17572	0.02	0.16	2.71	0.43	4.43	**0.097**	0.209	2.51	5.65	3.52	0.87	

TRUE																						
FALSE	CB#18	OIL CONTROL TEE	1.65	16.69	21	12	5.0	0.012	0.9	1.65256	1.49	1.49	3.41	5.07	15.76	**0.322**	0.389	4.67	20.09	17.91	0.02	
TRUE																						
FALSE	OIL CONTROL TEE	BAYFILTER	1.89	0.50	21	18	5.0	0.012	0.9	1.88821	1.70	1.70	3.41	5.79	8.04	**0.720**	0.629	11.32	4.56	4.96	0.07	
FALSE	BAYFILTER	CB#7	0.00	3.22	12	18	5.0	0.012	0.9	1.88821	0.00	1.70	3.40	5.78	20.41	**0.283**	0.365	6.56	11.56	9.95	0.02	
TRUE																						
FALSE	SDCO#3	SDCO#4	0.22	0.89	56	8	5.0	0.012	0.9	0.21855	0.20	0.20	3.41	0.67	1.23	**0.543**	0.525	4.20	3.54	3.61	0.26	
FALSE	SDCO#4	SDCO#5	0.18	0.50	56	12	5.3	0.012	0.9	0.39803	0.16	0.36	3.30	1.18	2.73	**0.434**	0.462	5.54	3.48	3.38	0.28	
FALSE	SDCO#5	SDCO#6	0.08	0.50	63	12	5.5	0.012	0.9	0.48202	0.08	0.43	3.20	1.39	2.73	**0.508**	0.505	6.06	3.48	3.50	0.30	
FALSE	SDCO#6	SDCO#7	0.00	0.50	83	12	5.8	0.012	0.9	0.48202	0.00	0.43	3.09	1.34	2.73	**0.492**	0.495	5.94	3.48	3.48	0.40	
FALSE	SDCO#7	SDCO#8	0.15	0.50	60	12	6.2	0.012	0.9	0.62999	0.13	0.57	2.97	1.68	2.73	**0.617**	0.579	6.95	3.48	3.68	0.27	
FALSE	SDCO#8	SDCO#9	0.15	1.00	60	12	6.5	0.012	0.9	0.78051	0.14	0.70	2.89	2.03	3.86	**0.526**	0.515	6.18	4.92	4.98	0.20	
FALSE	SDCO#9	SDCO#10	0.14	1.00	60	12	6.7	0.012	0.9	0.92125	0.13	0.83	2.83	2.35	3.86	**0.609**	0.565	6.78	4.92	5.16	0.19	
FALSE	SDCO#10	SDCO#11	0.07	1.00	33	12	6.9	0.012	0.9	0.98911	0.06	0.89	2.78	2.48	3.86	**0.642**	0.588	7.06	4.92	5.23	0.11	
FALSE	SDCO#11	SDCO#12	0.05	1.00	63	12	7.0	0.012	0.9	1.04247	0.05	0.94	2.76	2.59	3.86	**0.670**	0.598	7.18	4.92	5.26	0.20	
FALSE	SDCO#12	SDCO#13	0.00	2.88	56	12	7.2	0.012	0.9	1.04247	0.00	0.94	2.71	2.54	6.55	**0.388**	0.432	5.18	8.34	7.82	0.12	
FALSE	SDCO#13	SDCO#14	0.14	1.00	56	12	7.3	0.012	0.9	1.17948	0.12	1.06	2.68	2.85	3.86	**0.737**	0.639	7.66	4.92	5.38	0.17	
FALSE	SDCO#14	SDCO#15	0.15	4.27	56	12	7.5	0.012	0.9	1.33375	0.14	1.20	2.64	3.17	7.97	**0.398**	0.438	5.26	10.16	9.58	0.10	
FALSE	SDCO#15	CB#8	0.15	3.25	77	12	7.6	0.012	0.9	1.48802	0.14	1.34	2.62	3.51	6.96	**0.504**	0.503	6.03	8.86	8.92	0.14	
TRUE																						
FALSE	SDCO#16	SDCO#17	0.22	1.82	56	8	5.0	0.012	0.9	0.21855	0.20	0.20	3.41	0.67	1.77	**0.380**	0.427	3.41	5.06	4.72	0.20	
FALSE	SDCO#17	SDCO#18	0.18	0.50	53	12	5.2	0.012	0.9	0.39803	0.16	0.36	3.33	1.19	2.73	**0.437**	0.464	5.57	3.48	3.39	0.26	
FALSE	SDCO#18	SDCO#19	0.11	0.50	15	12	5.5	0.012	0.9	0.50666	0.10	0.46	3.23	1.47	2.73	**0.539**	0.522	6.27	3.48	3.53	0.07	
FALSE	SDCO#19	SDCO#20	0.00	0.50	66	12	5.5	0.012	0.9	0.50666	0.00	0.46	3.20	1.46	2.73	**0.535**	0.520	6.24	3.48	3.53	0.31	
FALSE	SDCO#20	SDCO#21	0.00	0.50	98	12	5.8	0.012	0.9	0.50666	0.00	0.46	3.09	1.41	2.73	**0.517**	0.509	6.11	3.48	3.51	0.47	
FALSE	SDCO#21	SDCO#22	0.14	0.50	60	12	6.3	0.012	0.9	0.65066	0.13	0.59	2.94	1.72	2.73	**0.632**	0.584	7.01	3.48	3.69	0.27	
FALSE	SDCO#22	SDCO#23	0.15	0.50	60	12	6.6	0.012	0.9	0.80118	0.14	0.72	2.87	2.07	2.73	**0.758**	0.650	7.80	3.48	3.82	0.26	
FALSE	SDCO#23	SDCO#24	0.14	0.50	60	12	6.8	0.012	0.9	0.94192	0.13	0.85	2.80	2.37	2.73	**0.870**	0.720	8.64	3.48	3.91	0.26	
FALSE	SDCO#24	SDCO#25	0.07	4.00	33	12	7.1	0.012	0.9	1.01328	0.06	0.91	2.73	2.49	7.72	**0.323**	0.391	4.69	9.83	8.78	0.06	
TRUE																						
FALSE	SDCO#26	SDCO#27	0.13	0.50	56	6	5.0	0.012	0.9	0.13473	0.12	0.12	3.41	0.41	0.43	**0.962**	0.782	4.69	2.19	2.47	0.38	
FALSE	SDCO#27	SDCO#25	0.05	0.50	63	8	5.4	0.012	0.9	0.18459	0.04	0.17	3.26	0.54	0.93	**0.585**	0.548	4.39	2.65	2.75	0.38	
TRUE																						
FALSE	SDCO#25	CB#18	1.20	8.03	67	12	5.0	0.012	0.9	1.19787	1.08	1.08	3.41	3.67	10.93	**0.336**	0.401	4.81	13.93	12.62	0.09	

Tab 6.0

6.0 CONSTRUCTION STORMWATER POLLUTION PREVENTION PLAN

A SWPPP has been prepared and submitted with this project under a separate cover. The following is a list of the thirteen SWPPP elements and how they have been addressed for this project:

Element #1 - Preserve Vegetation / Mark Clearing Limits: Clearing Limits will be delineated on the engineering plans and will be flagged in the field.

Element #2 - Establish Construction Access: A stabilized gravel construction entrance will be shown on the engineering plans.

Element #3 - Control Flow Rates: A temporary sediment pond will be shown on the engineering plans. Once the permanent infiltration facilities are constructed the temporary sediment ponds can be removed. The permanent facilities can be used throughout the remainder of construction.

Element #4 - Install Sediment Controls: Silt fence will be shown on the engineering plans for perimeter protection. In addition, temporary ditches to divert runoff to the sediment pond will be shown on the engineering plans.

Element #5 - Stabilize Soils: Cover measures will be addressed in the TESC notes on the engineering plans.

Element #6 - Protect Slopes: Runoff will be diverted away from the site steep slopes during and after construction. Any erosion on the site steep slopes will be rectified immediately.

Element #7 - Protect Permanent Drain Inlets: A detail for catch basin inserts will be shown on the final engineering plans along with a note specifying that they be installed once the permanent storm system is completed. A note will also be included that the contractor shall keep public roadways clear of dirt and debris.

Element #8 - Stabilize Channels and Outlets: Notes regarding outfall protection will be shown on the engineering plans. Temporary ditches shall be armored with rip rap for slopes greater than 5 percent.

Element #9 - Control Pollutants: A note will be added to the engineering plans that the contractor shall dispose of all pollutants and waste materials in a safe and timely manner.

Element #10 - Control Dewatering: Dewatering is not expected during this project.

Element #11 - Maintain Best Management Practices Once the engineering plans are completed the contractor shall maintain all erosion control measures in accordance with Snohomish County Standards and manufactures recommendations. In addition, the contractor shall maintain a stockpile of erosion control materials onsite.

Element #12 - Manage the Project: Once the engineering plans are completed, the clearing, grading, and seasonal work shall be performed in accordance with Snohomish County Code. The contractor shall inspect, maintain, and repair all BMPs as needed to assure continued performance of their intended function. In addition to the engineering plans the contractor will be required to follow and maintain the Construction SWPPP which has been prepared according to Department of Ecology NPDES requirements. The completed SWPPP and TESC Plans will be provided during Final Engineering Review.

Element #13 – Protect Low Impact Development BMPs: LID is not proposed during this project.

Tab 7.0

7.0 SPECIAL REPORTS AND STUDIES

Special Studies and reports included in this report's appendices are listed below:

- Geotechnical Engineering Study by Sondergaard Geoscience, PLLC., dated November 6, 2020
- Preliminary Infiltration Evaluation be Sondergaard Geoscience, PLLC., dated August 6, 2020
- Soil Infiltration Rate by Sondergaard Geoscience, PLLC., Dated October 30, 2020

Tab 8.0

8.0 OTHER PERMITS

This section will be updated with any subsequent submittal.

Tab 9.0

9.0 OPERATIONS AND MAINTENANCE MANUAL

An Operations and Maintenance Manual is provided in this section.

Tab 10.0

10.0 DECLARATION OF COVENANT FOR PRIVATELY MAINTAINED FLOW CONTROL AND TREATMENT FACILITIES

A declaration of covenant for privately maintained flow control and treatment facilities will be provided in a later submittal if required.

Tab 11.0

11.0 DECLARATION OF COVENANT FOR PRIVATELY MAINTAINED ON-SITE STORMWATER MANAGEMENT BMPS

A declaration of covenant for privately maintained on-site stormwater management BMPs will be provided with a later submittal if required.

Tab 12.0

12.0 BOND QUANTITIES WORKSHEET

A completed Bond Quantities Worksheet is included in this section.

Figure 12.1
Bond Quantities Worksheet

CONTRUCTION PLAN REVIEW & INSPECTION FEE WORKSHEET

Community & Economic Development Department
City of Arlington • 18204 59th Avenue NE • Arlington WA 98223 • (360) 403-3551

This form is to be completed and submitted with Type I , Type II Type III Construction Permit Application.

1) Based on permit type requested (Type I, Type II or Type III), complete the form as follows:
   - Type I permits complete all sections.
   - Type II permits complete as follows:
     - Grading Only - Complete Temporary Erosion and Sediment Control (TESC).
     - Stormwater Drainage Only - Complete the Temporary Erosion and Sediment Control and Stormwater Drainage Section for Public or Private
   - Type III permits complete the Temporary Erosion and Sediment Control (TESC).
2) The developer shall enter the quantities shown on the construction drawings into the Construction Calculation Worksheet. This document is used to determine the amount of plan reivew and inspection fees due to the city.
3) Excel will auto-calculate the relevant fields and subtotals throughout the document. Only the 'Quantity' columns should be completed.
4) The summary page calculates the fees due at intake for Civil and Stormwater Drainage construction permits only. This does not include fees for Grading or those required by other departments or agencies. Grading fees are based on Cubic Yard Quantity and shall be calculated at time of permit submittal. Grading fees shall be paid at permit submittal.
5) If an item that is part of your project does not exist in the spreadsheet complete the Write-In-Items section with the item, quantity and associated unit cost. There are a few unit prices that are blank, please complete them accordingly.
6) Inspection fees shall be calculated for Private Development during the review process and shall be paid upon permit issuance.

PROJECT COSTS	PUBLIC TOTAL	PRIVATE TOTAL	TOTAL PROJECT COST
		$ 1,237,657.60	$ 1,237,657.60

Verify formula, totals do not match

PLAN REVIEW & INSPECTION FEES			
PLAN REVIEW & INSPECTION FEE	(6% of Project Value)	$ -	
GRADING FEE (4)	(Cubic Yard)	$ -	
Review fees due at time of submittal		Total Review Fees Due	$ -

An Assurance Device such as a Performance Bond or Assignment of Funds needs to be on file with the City of Arlington prior to permit issuance. The Assurance Device shall be 150% of the Construction Calculation Worksheet which are as follows:

- Road and Alley *(Public)*
- Stormwater Drainage and Grading *(Public)*
- Utilities *(Public)*
- Temporary Erosion and Sediment Control *(Public and Private)*

ASSURANCE DEVICE				
Base Calculation of Performance Device		$ 63,036.25		
PERFORMANCE DEVICE	150%		Amount Due	$ 94,554.38
Base Calculation of Maintenance Device		$ 43,750.00		
MAINTENANCE DEVICE	20%		Amount Due	$ 8,750.00

CONSTRUCTION CALCULATION WORKSHEET

TEMPORARY EROSION & SEDIMENT CONTROL			*Include Public Improvements & Private Development*		
Description	Unit Price	Unit	Quantity	Cost	Reference #
Backfill & compaction-embankment	$ 6.50	CY		$ -	
Check dams	$ 78.00	EACH	16	$ 1,248.00	BMP C207
Catch Basin Protection	$ 35.50	EACH	2	$ 71.00	
Crushed surfacing 1 1/4" minus	$ 18.00	TON		$ -	WSDOT 9-03.9(3)
Ditching	$ 8.00	CY		$ -	
Excavation-bulk	$ 3.00	CY		$ -	
Fence, silt	$ 2.00	LF	1069	$ 2,138.00	BMP C233
Fence, Temporary (NGPA)	$ 2.00	LF	1972	$ 3,944.00	
Geotextile Fabric	$ 2.50	SY		$ -	
Hay Bale Silt Trap	$ 0.50	EACH		$ -	
Hydroseeding	$ 4,200.00	ACRE		$ -	BMP C120
Interceptor Swale / Dike	$ 1.00	LF	1378	$ 1,378.00	
Jute Mesh	$ 2.00	SY		$ -	BMP C122
Level Spreader	$ 1.75	LF		$ -	
Mulch, by hand, straw, 3" deep	$ 3.00	SY		$ -	BMP C121
Mulch, by machine, straw, 2" deep	$ 1.00	SY		$ -	BMP C121
Piping, temporary, CPP, 6"	$ 12.50	LF		$ -	
Piping, temporary, CPP, 8"	$ 19.00	LF		$ -	
Piping, temporary, CPP, 12"	$ 24.00	LF		$ -	
Plastic covering, 6mm thick, sandbagged	$ 3.00	SY		$ -	BMP C123
Rip Rap, machine placed; slopes	$ 50.00	CY		$ -	WSDOT 9-13.1(2)
Rock Construction Entrance, 50'x15'x1'	$ 1,800.00	EACH		$ -	BMP C105
Rock Construction Entrance, 100'x15'x1'	$ 3,600.00	EACH	1	$ 3,600.00	BMP C105
Sediment pond riser assembly	$ 3,050.00	EACH	1	$ 3,050.00	BMP C241
Sediment trap, 5' high berm	$ 21.00	LF		$ -	BMP C240
Sed. trap, 5' high, riprapped spillway berm section	$ 79.00	LF		$ -	BMP C240
Seeding, by hand	$ 1.00	SY		$ -	BMP C120
Sodding, 1" deep, level ground	$ 8.00	SY		$ -	BMP C120
Sodding, 1" deep, sloped ground	$ 9.50	SY		$ -	BMP C120
TESC Supervisor	$ 84.00	HR		$ -	
Water truck, dust control	$ 130.00	HR		$ -	BMP C140
WRITE-IN-ITEMS					
	$ -			$ -	
	$ -			$ -	
	$ -			$ -	

SUBTOTAL (TESC Only):	$ 15,429.00
MOBILIZATION 10%:	$ 1,542.90
CONTINGENCY 15%:	$ 2,314.35
TOTAL:	$ 19,286.25

CONSTRUCTION CALCULATION WORKSHEET

STORMWATER DRAINAGE			Public	Public Improvements	Private	Private Development
Description	Unit Price	Unit	Quantity	Cost	Quantity	Cost
Access Road, Retention / Detention	$ 26.00	SY		$ -		$ -
* (CBs include frame and lid)						
Beehive	$ 90.00	EACH		$ -		$ -
CB Type I	$ 1,650.00	EACH		$ -	11	$ 18,150.00
CB Type IL	$ 1,850.00	EACH		$ -		$ -
CB Type II, 48" Dia	$ 2,550.00	EACH		$ -	8	$ 20,400.00
for additional depth over 4'	$ 650.00	FT		$ -	19	$ 12,350.00
CB Type II, 54" Dia	$ 2,700.00	EACH		$ -	1	$ 2,700.00
for additional depth over 4'	$ 600.00	FT		$ -	4	$ 2,400.00
CB Type II, 60" Dia	$ 2,900.00	EACH		$ -		$ -
for additional depth over 4'	$ 750.00	FT		$ -		$ -
CB Type II, 72" Dia	$ 4,000.00	EACH		$ -		$ -
for additional depth over 4'	$ 900.00	FT		$ -		$ -
Through-curb Inlet Framework (Add)	$ 550.00	EACH		$ -		$ -
Cleanout, PVC, 4"	$ 200.00	EACH		$ -		$ -
Cleanout, PVC, 6"	$ 250.00	EACH		$ -	26	$ 6,500.00
Cleanout, PVC, 8"	$ 300.00	EACH		$ -		$ -
Culvert, Box __ ft x __ ft	$ -	LS		$ -		$ -
Culvert, PVC, 4"	$ 12.00	LF		$ -		$ -
Culvert, PVC, 6"	$ 17.00	LF		$ -		$ -
Culvert, PVC, 8"	$ 19.00	LF		$ -	330	$ 6,270.00
Culvert, PVC, 12"	$ 30.00	LF		$ -	2596	$ 77,880.00
Culvert, CMP, 8"	$ 23.00	LF		$ -		$ -
Culvert, CMP, 12"	$ 35.00	LF		$ -		$ -
Culvert, CMP, 15"	$ 42.00	LF		$ -		$ -
Culvert, CMP, 18"	$ 47.00	LF		$ -		$ -
Culvert, CMP, 24"	$ 69.00	LF		$ -		$ -
Culvert, CMP, 30"	$ 100.00	LF		$ -		$ -
Culvert, CMP, 36"	$ 150.00	LF		$ -		$ -
Culvert, CMP, 48"	$ 194.00	LF		$ -		$ -
Culvert, CMP, 60"	$ 310.00	LF		$ -		$ -
Culvert, CMP, 72"	$ 400.00	LF		$ -		$ -
Culvert, Concrete, 8"	$ 36.00	LF		$ -		$ -
Culvert, Concrete, 12"	$ 43.00	LF		$ -		$ -
Culvert, Concrete, 15"	$ 52.00	LF		$ -		$ -
Culvert, Concrete, 18"	$ 55.00	LF		$ -		$ -
Culvert, Concrete, 24"	$ 85.00	LF		$ -		$ -
Culvert, Concrete, 30"	$ 136.00	LF		$ -		$ -
Culvert, Concrete, 36"	$ 165.00	LF		$ -		$ -
Culvert, Concrete, 42"	$ 196.00	LF		$ -		$ -
Culvert, Concrete, 48"	$ 210.00	LF		$ -		$ -
Culvert, CPP, 6"	$ 16.00	LF		$ -		$ -
Culvert, CPP, 8"	$ 22.00	LF		$ -		$ -
Culvert, CPP, 12"	$ 28.00	LF		$ -		$ -
Culvert, CPP, 15"	$ 34.00	LF		$ -		$ -
Culvert, CPP, 18"	$ 39.00	LF		$ -		$ -

CONSTRUCTION CALCULATION WORKSHEET

Culvert, CPP, 24"	$ 49.00	LF		$ -		$ -
Culvert, CPP, 30"	$ 62.00	LF		$ -		$ -
Culvert, CPP, 36"	$ 69.00	LF		$ -		$ -
Ditching	$ 12.00	CY		$ -		$ -
Flow Dispersal Trench (1,436 base+)	$ 40.00	LF		$ -		$ -
French Drain (3' depth)	$ 39.00	LF		$ -		$ -
Geotextile, laid in trench, polypropylene	$ 5.00	SY		$ -		$ -
Infiltration pond testing	$ 125.00	HR		$ -		$ -
Mid-tank Access Riser, 48" dia, 6' deep	$ 2,025.00	EACH		$ -		$ -
Pipe, High Density Water Pipe (HDWP)	$ 160.00	LF		$ -		$ -
Pipe, C900	$ 90.00	LF		$ -		$ -
Pond Overflow Spillway	$ 18.00	SY		$ -		$ -
Restrictor/Oil Separator, 12"	$ 1,500.00	EACH		$ -		$ -
Restrictor/Oil Separator, 15"	$ 1,550.00	EACH		$ -		$ -
Restrictor/Oil Separator, 18"	$ 1,680.00	EACH		$ -		$ -
Riprap, placed	$ 52.00	CY		$ -		$ -
Tank End Reducer (36" Dia)	$ 1,280.00	EACH		$ -		$ -
Thru-Inlet at CB	$ 150.00	EACH		$ -		$ -
Trash Rack, 12"	$ 320.00	EACH		$ -		$ -
Trash Rack, 15"	$ 325.00	EACH		$ -		$ -
Trash Rack, 18"	$ 350.00	EACH		$ -		$ -
Trash Rack, 21"	$ 375.00	EACH		$ -		$ -
WRITE-IN-ITEMS						
Culvert, PVC, 18"	$ 50.00	LF		$ -	33	$ 1,650.00
Culvert, PVC, 24"	$ 65.00	LF		$ -	24	$ 1,560.00
Bayfilter	$ 6,500.00	EACH		$ -	1	
Stormtech End Cap	$ 500.00	EACH		$ -	8	
Stormtech Chamber	$ 800.00	EACH		$ -	68	$ 54,400.00
			SUBTOTAL:	$ -		$ 204,260.00
			MOBILIZATION 10%:	$ -		
			CONTINGENCY 15%:	$ -		
			TOTAL:	$ -		$ 204,260.00

CONSTRUCTION CALCULATION WORKSHEET

TEMPORARY EROSION & SEDIMENT CONTROL			*Include Public Improvements & Private Development*		
Description	Unit Price	Unit	Quantity	Cost	Reference #
Backfill & compaction-embankment	$ 6.50	CY		$ -	
Check dams	$ 78.00	EACH	16	$ 1,248.00	BMP C207
Catch Basin Protection	$ 35.50	EACH	2	$ 71.00	
Crushed surfacing 1 1/4" minus	$ 18.00	TON		$ -	WSDOT 9-03.9(3)
Ditching	$ 8.00	CY		$ -	
Excavation-bulk	$ 3.00	CY		$ -	
Fence, silt	$ 2.00	LF	1069	$ 2,138.00	BMP C233
Fence, Temporary (NGPA)	$ 2.00	LF	1972	$ 3,944.00	
Geotextile Fabric	$ 2.50	SY		$ -	
Hay Bale Silt Trap	$ 0.50	EACH		$ -	
Hydroseeding	$ 4,200.00	ACRE		$ -	BMP C120
Interceptor Swale / Dike	$ 1.00	LF	1378	$ 1,378.00	
Jute Mesh	$ 2.00	SY		$ -	BMP C122
Level Spreader	$ 1.75	LF		$ -	
Mulch, by hand, straw, 3" deep	$ 3.00	SY		$ -	BMP C121
Mulch, by machine, straw, 2" deep	$ 1.00	SY		$ -	BMP C121
Piping, temporary, CPP, 6"	$ 12.50	LF		$ -	
Piping, temporary, CPP, 8"	$ 19.00	LF		$ -	
Piping, temporary, CPP, 12"	$ 24.00	LF		$ -	
Plastic covering, 6mm thick, sandbagged	$ 3.00	SY		$ -	BMP C123
Rip Rap, machine placed; slopes	$ 50.00	CY		$ -	WSDOT 9-13.1(2)
Rock Construction Entrance, 50'x15'x1'	$ 1,800.00	EACH		$ -	BMP C105
Rock Construction Entrance, 100'x15'x1'	$ 3,600.00	EACH	1	$ 3,600.00	BMP C105
Sediment pond riser assembly	$ 3,050.00	EACH	1	$ 3,050.00	BMP C241
Sediment trap, 5' high berm	$ 21.00	LF		$ -	BMP C240
Sed. trap, 5' high, riprapped spillway berm section	$ 79.00	LF		$ -	BMP C240
Seeding, by hand	$ 1.00	SY		$ -	BMP C120
Sodding, 1" deep, level ground	$ 8.00	SY		$ -	BMP C120
Sodding, 1" deep, sloped ground	$ 9.50	SY		$ -	BMP C120
TESC Supervisor	$ 84.00	HR		$ -	
Water truck, dust control	$ 130.00	HR		$ -	BMP C140
WRITE-IN-ITEMS					
	$ -			$ -	
	$ -			$ -	
	$ -			$ -	

SUBTOTAL (TESC Only):	$ 15,429.00
MOBILIZATION 10%:	$ 1,542.90
CONTINGENCY 15%:	$ 2,314.35
TOTAL:	$ 19,286.25

CONSTRUCTION CALCULATION WORKSHEET

STORMWATER DRAINAGE			Public	Public Improvements	Private	Private Development
Description	Unit Price	Unit	Quantity	Cost	Quantity	Cost
Access Road, Retention / Detention	$ 26.00	SY		$ -		$ -
* (CBs include frame and lid)						
Beehive	$ 90.00	EACH		$ -		$ -
CB Type I	$ 1,650.00	EACH		$ -	11	$ 18,150.00
CB Type IL	$ 1,850.00	EACH		$ -		$ -
CB Type II, 48" Dia	$ 2,550.00	EACH		$ -	8	$ 20,400.00
for additional depth over 4'	$ 650.00	FT		$ -	19	$ 12,350.00
CB Type II, 54" Dia	$ 2,700.00	EACH		$ -	1	$ 2,700.00
for additional depth over 4'	$ 600.00	FT		$ -	4	$ 2,400.00
CB Type II, 60" Dia	$ 2,900.00	EACH		$ -		$ -
for additional depth over 4'	$ 750.00	FT		$ -		$ -
CB Type II, 72" Dia	$ 4,000.00	EACH		$ -		$ -
for additional depth over 4'	$ 900.00	FT		$ -		$ -
Through-curb Inlet Framework (Add)	$ 550.00	EACH		$ -		$ -
Cleanout, PVC, 4"	$ 200.00	EACH		$ -		$ -
Cleanout, PVC, 6"	$ 250.00	EACH		$ -	26	$ 6,500.00
Cleanout, PVC, 8"	$ 300.00	EACH		$ -		$ -
Culvert, Box __ ft x __ ft	$ -	LS		$ -		$ -
Culvert, PVC, 4"	$ 12.00	LF		$ -		$ -
Culvert, PVC, 6"	$ 17.00	LF		$ -		$ -
Culvert, PVC, 8"	$ 19.00	LF		$ -	330	$ 6,270.00
Culvert, PVC, 12"	$ 30.00	LF		$ -	2596	$ 77,880.00
Culvert, CMP, 8"	$ 23.00	LF		$ -		$ -
Culvert, CMP, 12"	$ 35.00	LF		$ -		$ -
Culvert, CMP, 15"	$ 42.00	LF		$ -		$ -
Culvert, CMP, 18"	$ 47.00	LF		$ -		$ -
Culvert, CMP, 24"	$ 69.00	LF		$ -		$ -
Culvert, CMP, 30"	$ 100.00	LF		$ -		$ -
Culvert, CMP, 36"	$ 150.00	LF		$ -		$ -
Culvert, CMP, 48"	$ 194.00	LF		$ -		$ -
Culvert, CMP, 60"	$ 310.00	LF		$ -		$ -
Culvert, CMP, 72"	$ 400.00	LF		$ -		$ -
Culvert, Concrete, 8"	$ 36.00	LF		$ -		$ -
Culvert, Concrete, 12"	$ 43.00	LF		$ -		$ -
Culvert, Concrete, 15"	$ 52.00	LF		$ -		$ -
Culvert, Concrete, 18"	$ 55.00	LF		$ -		$ -
Culvert, Concrete, 24"	$ 85.00	LF		$ -		$ -
Culvert, Concrete, 30"	$ 136.00	LF		$ -		$ -
Culvert, Concrete, 36"	$ 165.00	LF		$ -		$ -
Culvert, Concrete, 42"	$ 196.00	LF		$ -		$ -
Culvert, Concrete, 48"	$ 210.00	LF		$ -		$ -
Culvert, CPP, 6"	$ 16.00	LF		$ -		$ -
Culvert, CPP, 8"	$ 22.00	LF		$ -		$ -
Culvert, CPP, 12"	$ 28.00	LF		$ -		$ -
Culvert, CPP, 15"	$ 34.00	LF		$ -		$ -
Culvert, CPP, 18"	$ 39.00	LF		$ -		$ -

CONSTRUCTION CALCULATION WORKSHEET

Culvert, CPP, 24"	$ 49.00	LF		$ -		$ -
Culvert, CPP, 30"	$ 62.00	LF		$ -		$ -
Culvert, CPP, 36"	$ 69.00	LF		$ -		$ -
Ditching	$ 12.00	CY		$ -		$ -
Flow Dispersal Trench (1,436 base+)	$ 40.00	LF		$ -		$ -
French Drain (3' depth)	$ 39.00	LF		$ -		$ -
Geotextile, laid in trench, polypropylene	$ 5.00	SY		$ -		$ -
Infiltration pond testing	$ 125.00	HR		$ -		$ -
Mid-tank Access Riser, 48" dia, 6' deep	$ 2,025.00	EACH		$ -		$ -
Pipe, High Density Water Pipe (HDWP)	$ 160.00	LF		$ -		$ -
Pipe, C900	$ 90.00	LF		$ -		$ -
Pond Overflow Spillway	$ 18.00	SY		$ -		$ -
Restrictor/Oil Separator, 12"	$ 1,500.00	EACH		$ -		$ -
Restrictor/Oil Separator, 15"	$ 1,550.00	EACH		$ -		$ -
Restrictor/Oil Separator, 18"	$ 1,680.00	EACH		$ -		$ -
Riprap, placed	$ 52.00	CY		$ -		$ -
Tank End Reducer (36" Dia)	$ 1,280.00	EACH		$ -		$ -
Thru-Inlet at CB	$ 150.00	EACH		$ -		$ -
Trash Rack, 12"	$ 320.00	EACH		$ -		$ -
Trash Rack, 15"	$ 325.00	EACH		$ -		$ -
Trash Rack, 18"	$ 350.00	EACH		$ -		$ -
Trash Rack, 21"	$ 375.00	EACH		$ -		$ -
WRITE-IN-ITEMS						
Culvert, PVC, 18"	$ 50.00	LF		$ -	33	$ 1,650.00
Culvert, PVC, 24"	$ 65.00	LF		$ -	24	$ 1,560.00
Bayfilter	$ 6,500.00	EACH		$ -	1	
Stormtech End Cap	$ 500.00	EACH		$ -	8	
Stormtech Chamber	$ 800.00	EACH		$ -	68	$ 54,400.00
			SUBTOTAL:	$ -		$ 204,260.00
			MOBILIZATION 10%:	$ -		
			CONTINGENCY 15%:	$ -		
			TOTAL:	$ -		$ 204,260.00

CONSTRUCTION CALCULATION WORKSHEET

GENERAL ITEMS			Public Improvements		Private Development	
Description	Unit Price	Unit	Quantity	Cost	Quantity	Cost
Backfill & Compaction- embankment	$ 8.00	CY		$ -	12485	$ 99,880.00
Backfill & Compaction- trench	$ 11.00	CY		$ -		$ -
Clear/Remove Brush, by hand (acre)	$ 2,363.00	ACRE		$ -		$ -
Bollards - fixed	$ 325.00	EACH		$ -		$ -
Bollards - removable	$ 600.00	EACH		$ -		$ -
Clearing/Grubbing/Tree Removal	$ 6,000.00	ACRE		$ -		$ -
Excavation - bulk	$ 2.50	CY		$ -	2935	$ 7,337.50
Excavation - Trench	$ 5.00	CY		$ -		$ -
Fencing, cedar, 6' high	$ 25.00	LF		$ -		$ -
Fencing, chain link, 4'	$ 19.50	LF		$ -		$ -
Fencing, chain link, vinyl coated, 6' high	$ 18.00	LF		$ -		$ -
Fencing, chain link, gate, vinyl coated, 2	$ 1,563.00	EACH		$ -		$ -
Fencing, split rail, 3' high	$ 14.00	LF		$ -		$ -
Fill & compact - common barrow	$ 27.00	CY		$ -		$ -
Fill & compact - gravel base	$ 30.00	CY		$ -		$ -
Fill & compact - screened topsoil	$ 45.00	CY		$ -		$ -
Gabion, 12" deep, stone filled mesh	$ 62.00	SY		$ -		$ -
Gabion, 18" deep, stone filled mesh	$ 86.00	SY		$ -		$ -
Gabion, 36" deep, stone filled mesh	$ 152.00	SY		$ -		$ -
Grading, fine, by hand	$ 2.00	SY		$ -		$ -
Grading, fine, with grader	$ 1.25	SY		$ -		$ -
Guard Post	$ 90.00	EACH		$ -		$ -
Monuments	$ 104.00	EACH		$ -		$ -
Sensitive Areas Sign	$ 20.00	EACH		$ -		$ -
Sodding, 1" deep, sloped ground	$ 10.00	SY		$ -		$ -
Topsoil Type A (imported)	$ 30.00	CY		$ -		$ -
Traffic control crew (2 flaggers)	$ 98.00	HR		$ -		$ -
Trail, 4" chipped wood	$ 9.00	SY		$ -		$ -
Trail, 4" crushed cinder	$ 10.00	SY		$ -		$ -
Trail, 4" top course	$ 9.50	SY		$ -		$ -
Wall, retaining, concrete	$ 66.00	SF		$ -		$ -
Wall, rockery	$ 13.00	SF		$ -		$ -
WRITE-IN-ITEMS						
	$ -			$ -		$ -
	$ -			$ -		$ -
	$ -			$ -		$ -
			Subtotal	$ -	**Subtotal**	$ 107,217.50

CONSTRUCTION CALCULATION WORKSHEET

STREET IMPROVEMENT			Public Improvements		Private Development	
Description	Unit Price	Unit	Quantity	Cost	Quantity	Cost
AC Grinding, 4' wide machine < 1000sy	$ 35.00	SY		$ -		$ -
AC Grinding, 4' wide machine 1000-2000	$ 8.50	SY		$ -		$ -
AC Grinding, 4' wide machine > 2000sy	$ 2.50	SY		$ -		$ -
AC Removal/Disposal/Repair	$ 60.00	SY		$ -		$ -
Barricade, Type I	$ 36.00	LF		$ -		$ -
Barricade Type II	$ 25.00	LF		$ -		$ -
Barricade, Type III (Permanent)	$ 55.00	LF		$ -		$ -
Conduit, 2"	$ 5.00	LF		$ -		$ -
Curb & Gutter, rolled	$ 20.00	LF		$ -		$ -
Curb & Gutter, vertical	$ 15.00	LF		$ -		$ -
Curb and Gutter, demolition and disposa	$ 20.00	LF		$ -		$ -
Curb, extruded asphalt	$ 5.00	LF		$ -		$ -
Curb, extruded concrete	$ 4.50	LF		$ -	3484	$ 15,678.00
Guard Rail	$ 30.00	LF		$ -		$ -
Sawcut, asphalt, 3" depth	$ 3.50	LF		$ -		$ -
Sawcut, concrete, per 1" depth	$ 3.00	LF		$ -		$ -
Sealant, asphalt	$ 2.00	LF		$ -		$ -
Shoulder, gravel, 4" thick	$ 11.00	SY		$ -		$ -
Sidewalk, 4" thick	$ 40.00	SY		$ -	802	$ 32,080.00
Sidewalk, 4" thick, demolition and dispos	$ 36.00	SY		$ -		$ -
Sidewalk, 6" thick	$ 45.00	SY		$ -		$ -
Sidewalk, 6" thick, demolition and dispos	$ 45.00	SY		$ -		$ -
Signs	$ -	LS		$ -		$ -
Sign, Handicap	$ 100.00	EACH		$ -	7	$ 700.00
Striping, per stall	$ 7.50	EACH		$ -	139	$ 1,042.50
Street Light System	$ -	LS		$ -		$ -
Traffic Signal	$ -	LS		$ -		$ -
Traffic Signal Modification	$ -	LS		$ -		$ -
Striping, thermoplastic, (for crosswalk)	$ 3.50	SF		$ -		$ -
Striping, 4" reflectorized line	$ 0.40	LF		$ -		$ -
AC Patching/Trenching Restoration	$ 100.00	TON		$ -		$ -
Controlled Density Fill (CDF)	$ 90.00	CY		$ -		$ -
WRITE-IN-ITEMS						
Curb wall	$ -	LF		$ -	15.61	$ -
	$ -			$ -		$ -
	$ -			$ -		$ -
			Subtotal	$ -	**Subtotal**	$ 49,500.50

CONSTRUCTION CALCULATION WORKSHEET

STREET SURFACING/PAVEMENT			Public Improvements		Private Development	
Description	Unit Price	Unit	Quantity	Cost	Quantity	Cost
Asphalt Overlay, 1.5" AC	$ 12.00	SY		$ -		$ -
Asphalt Overlay, 2" AC	$ 15.00	SY		$ -		$ -
Asphalt Road 2", First 2500 SY	$ 10.00	SY		$ -		$ -
Asphalt Road 2", Qty. over 2500SY	$ 9.00	SY		$ -		$ -
Asphalt Road 3", First 2500 SY	$ 15.00	SY		$ -		$ -
Asphalt Road 3", Qty. over 2500 SY	$ 13.00	SY		$ -		$ -
Asphalt Road 5", First 2500 SY	$ 22.00	SY		$ -		$ -
Asphalt Road 5", Qty. Over 2500 SY	$ 22.00	SY		$ -		$ -
Asphalt Road 6", First 2500 SY	$ 25.00	SY		$ -		$ -
Asphalt Road 6", Qty. Over 2500 SY	$ 24.00	SY		$ -		$ -
Asphalt Treated Base, 4" thick	$ 14.00	SY		$ -		$ -
Gravel Base Course 2"	$ 7.50	SY		$ -		$ -
Gravel Base Course 4"	$ 15.00	SY		$ -		$ -
Gravel Base Course 6"	$ 22.50	SY		$ -		$ -
Gravel Road, 4" rock, First 2500 SY	$ 15.00	SY		$ -		$ -
Gravel Road, 4" rock, Qty. over 2500 SY	$ 11.00	SY		$ -		$ -
Concrete Road, 5", no base, over 2500 S	$ 22.00	SY		$ -		$ -
Concrete Road, 6", no base, over 2500	$ 32.00	SY		$ -		$ -
Thickened Edge	$ 11.00	LF		$ -		$ -
WRITE-IN-ITEMS						
Asphalt Road 2.5", First 2500 SY	$ 21.74	SY		$ -	2715	$ 59,024.10
Asphalt Road 4", First 2500 SY	$ 32.35	SY		$ -	6257	$ 202,413.95
Concrete Slab, 6", 4" base	$ 68.75	SY			2660	$ 182,875.00
				$ -		$ -
			Subtotal	$ -	**Subtotal**	$ 444,313.05

CONSTRUCTION CALCULATION WORKSHEET

WATER SYSTEM			Public Improvements		Private Development	
Description	Unit Price	Unit	Quantity	Cost	Quantity	Cost
Blowoff	$ 1,800.00	EACH		$ -		$ -
Connection to Existing Water Main	$ 2,000.00	EACH		$ -		$ -
Ductile Iron Watermain, CL 52, 6 Inch Dia	$ 65.00	LF		$ -		$ -
Ductile Iron Watermain, CL 52, 8 Inch Dia	$ 85.00	LF		$ -		$ -
Ductile Iron Watermain, CL 52, 10 Inch Dia	$ 103.00	LF		$ -		$ -
Ductile Iron Watermain, CL 52, 12 Inch Dia.	$ 125.00	LF		$ -		$ -
Gate Valve, 6 inch Dia	$ 250.00	EACH		$ -		$ -
Gate Valve, 8 Inch Dia	$ 380.00	EACH		$ -		$ -
Gate Valve, 10 Inch Dia	$ 425.00	EACH		$ -		$ -
Gate Valve, 12 Inch Dia	$ 500.00	EACH		$ -		$ -
Fire Hydrant Assembly, with Guard Posts	$ 3,000.00	EACH		$ -		$ -
Fire Hydrant Assembly, without Guard Posts	$ 2,500.00	EACH		$ -	1	$ 2,500.00
Air-Vac, 8 Inch Dia	$ 6,000.00	EACH		$ -		$ -
Air-Vac,10 Inch Dia	$ 7,500.00	EACH		$ -		$ -
Air-Vac, 12 Inch Dia	$ 12,000.00	EACH		$ -		$ -
Pressure Reducing Valve Assembly, 8 In. Dia	$ 3,800.00	EACH		$ -		$ -
Pressure Reducing Valve Assembly, 10 In. Di	$ 4,200.00	EACH		$ -		$ -
Pressure Reducing Valve Assembly, 12 In. Di	$ 5,000.00	EACH		$ -		$ -
Valve Marker Post	$ 350.00	EACH		$ -		$ -
WRITE-IN-ITEMS						
Ductile Iron Pipe, 12"	$ 96.43	LF		$ -	1881	$ 181,384.83
Ductile Iron Pipe, 8"	$ 60.68	LF		$ -	70	$ 4,247.60
2" Water Meter	$ 2,028.30	EACH		$ -	2	$ 4,056.60
			Subtotal	$ -	**Subtotal**	$ 192,189.03

CONSTRUCTION CALCULATION WORKSHEET

SANITARY SEWER			Public Improvements		Private Development	
Description	Unit Price	Unit	Quantity	Cost	Quantity	Cost
Connection to Existing Sewer Main	$ -	EACH		$ -		$ -
Clean Outs	$ 500.00	EACH		$ -	3	$ 1,500.00
Grease Interceptor, 500 gallon	$ 6,000.00	EACH		$ -		$ -
Grease Interceptor, 1000 gallon	$ 10,000.00	EACH		$ -		$ -
Grease Interceptor, 1500 gallon	$ 15,000.00	EACH		$ -		$ -
Side Sewer Pipe, PVC. 4 Inch Dia	$ 8.00	LF		$ -		$ -
Side Sewer Pipe, PVC. 6 Inch Dia	$ 12.00	LF		$ -	136	$ 1,632.00
Sewer Pipe, PVC, 8 inch Dia	$ 33.00	LF		$ -	702	$ 23,166.00
Sewer Pipe, PVC, 12 Inch Dia	$ 41.00	LF		$ -		$ -
Sewer Pipe, PVC, ____ Inch Dia	$ -	LF		$ -		$ -
Lift Station (Entire System)	$ -	LS		$ -		$ -
Manhole, 48 Inch Dia	$ 3,000.00	EACH		$ -	2	$ 6,000.00
for additional depth over 4 feet/per foo	$ 532.00	FEET		$ -		$ -
Manhole, 54 Inch Dia	$ 3,500.00	EACH		$ -		$ -
for additional depth over 4 feet/per foo	$ 532.00	FEET		$ -		$ -
Manhole, 60 Inch Dia	$ 3,700.00	EACH		$ -		$ -
for additional depth over 4 feet/per foo	$ 532.00	FEET		$ -		$ -
Manhole, 72 Inch Dia	$ 4,000.00	EACH		$ -		$ -
for additional depth over 4 feet/per foo	$ 625.00	FEET		$ -		$ -
Manhole, 96 Inch Dia	$ 5,000.00	EACH		$ -		$ -
for additional depth over 4 feet/per foo	$ 625.00	FEET		$ -		$ -
Outside Drop	$ -	LS		$ -		$ -
Inside Drop	$ -	LS		$ -		$ -
Pipe, C-900	$ 90.00	LF		$ -		$ -
Pipe, High Density Water Pipe (HDWP)	$ 160.00	LF		$ -		$ -
WRITE-IN-ITEMS						
Backflow preventer	$ 580.00	EACH		$ -	1	$ 580.00
Backflow installation	$ 620.00	EACH		$ -	1	$ 620.00
	$ -			$ -		$ -
			Subtotal	$ -	**Subtotal**	$ 33,498.00

Appendix A

SONDERGAARD GEOSCIENCE, PLLC
13012 65TH Avenue SE
Snohomish, Washington 98296

February 12, 2020
Revised November 6, 2020
Project No. J-0045

GS Venture Partners
P.O. Box 1727
Bellevue, WA 98009

Attention: Chris Gayte

Subject: Geotechnical Engineering Study
Building G
Gayteway Business Park
20015 67th Avenue NE
Arlington, Washington

Dear Mr. Gayte:

As requested, Sondergaard Geosciences, PLLC (SGP) is pleased to present our geotechnical engineering study for the subject site. This study has been prepared for the exclusive use of GS Venture Partners and their agents, for specific application to this project. Within the limitations of scope and schedule, our services have been performed in accordance with generally accepted engineering geology and geotechnical engineering practices in effect in this area at the time our study was prepared. No other warranty, express or implied, is made.

SITE AND PROJECT DESCRIPTION

The subject property consists of a portion of an irregularly-shaped parcel (Snohomish County Parcel Number 31051400200700), with a combined area of approximately 54 acres located at 20015 67th Avenue NE in Arlington, Washington (Figure 1). The subject property of this report (Building E) is comprised of Lots 14 and 15 which are bounded to the east by 74th Avenue NE, to the north and south commercial/industrial development and to the west by Lots 3 and 13 of the new business park. The proposed project that is the subject of this report consist of a 246,280 square feet commercial building with associated parking and utilities.

At the business park site, overall site topography is relatively flat on the west half of the parcel with moderate slopes down to the east toward the east half of the parcel. Lots 14 and 15 lay in a topographic low on the east of the parcel with up sloping ground to the west, east and south.

Extensive clearing and grading of the site to remove vegetation, topsoil and other deleterious material revealed native Recessional Outwash sand and gravel underlay the Building E site prior to filling.

SUBSURFACE CONDITIONS

Structural Fill

Approximately 10 feet of fill consisting of site derived sandy gravel and gravelly sand was placed and compacted on the Building E pad as documented in AESI Field Reports Nos. 1 through 24 attached to this report. This material was placed and compacted as structural fill to a density of at least 95 percent of its maximum dry density as determined by ASTM D 1557. This structural fill is suitable for support of building foundations, pavements and other structures.

Recessional Outwash

Native Recessional Outwash soils underly the structural fills. These soils generally consist of medium dense, moist, oxidized brown to gray, gravelly sand to sandy gravel and scattered cobbles. This unit is suitable for support of structural fills, foundations, slabs and pavements when properly compacted as recommended in this report.

Ground Water

Ground water seepage was not encountered during filling and grading operations accomplished at the site from July 14, 2016 to February 28, 2019. It should be noted that the depth and occurrence of ground water seepage at the site likely varies in response to such factors as changes in season, amount of precipitation, location, and site use.

GEOLOLGIC HAZARDS

The following discussion of applicable geologic hazards is based on review of the City of Arlington Municipal Code (AMC) and the geologic, topographic, and ground and surface water conditions as observed and discussed herein. The discussion will be limited to landslide and steep slope hazards, seismic hazards, and erosion hazards.

Slope Hazards and Mitigations

The subject building site has slopes on the south side of the lots that exhibit inclinations of approximately 21 to 25 percent over heights of 70 to 100 feet. These slopes were graded to their existing contour during recent site filling and grading activities. In our opinion, the site slopes do

not meet the criteria of a Landslide Hazard Area according to AMC Part IV Section 20.93.600(b)(2). According to AMC Part IV Section 20.93.600.b(3)(B) the site slopes are classified as moderate. Landslide hazard mitigations are not recommended.

Seismic Hazards and Mitigations

Seismic Hazard Area

Ground water was not encountered during recent site grading and filling activities that raised site grades about 10 feet. Review of well logs on file at the Washington State Department of Ecology indicates that the shallowest ground water in the vicinity of the site occurs at depths of about 30 to 50 feet below the ground surface and that soils below this depth typically consist of clay and silt. In our opinion, the subsurface conditions at the project site do not meet the definition in AMC Part IV Section 20.93.600(b)(4) for a Seismic Hazard Area due to the depth to the shallowest ground water and the density and fine-grained nature of the soils at and below that depth.

However, earthquakes occur in the Puget Lowland with great regularity. The majority of these events are small and are usually not felt by people. However, large earthquakes do occur, as evidenced by the 1949, 7.2-magnitude event; the 1965, 6.5-magnitude event; and the 2001, 6.8-magnitude event. The 1949 earthquake appears to have been the largest in this area during recorded history. Evaluation of return rates indicates that an earthquake of the magnitude between 5.5 and 6.0 is likely within a given 20- to 40-year period.

Generally, there are four types of potential hazards associated with large seismic events: 1) surficial ground rupture, 2) seismically induced landslides, 3) liquefaction, and 4) ground motion. The potential for each of these hazards to adversely impact the proposed project is discussed below.

Surficial Ground Rupture

The project site is located approximately 16 miles southwest of the Devil's Mountain Fault Zone. This fault systems in has been hypothesized to have a reoccurrence interval in excess of several thousand years. Due to the suspected long recurrence interval and distance from the subject site, the potential for surficial ground rupture is considered to be low during the expected life of the proposed development. No mitigation efforts beyond complying with the requirements of the local jurisdictions and the current *International Building Code* (IBC) are recommended for this site.

Seismically Induced Landslides

The potential risk of damage to the proposed structures by seismically induced land sliding is low due to the moderate topography and lack of ground water seepage on the project site, in our opinion.

Liquefaction

Liquefaction is the process of loose, saturated sand losing its internal shear strength when subjected to cyclic loading, as may occur during an earthquake. Due to the lack of a shallow ground water table at the site and the density and fine-grained nature of soils below the ground water at depth, the potential for liquefaction to occur is low, in our opinion.

Ground Motion

It is our opinion that earthquake damage to the proposed structures, when founded on suitable bearing strata in accordance with the recommendations contained herein, will likely be caused by the intensity and acceleration associated with the event. Structural design for the project should follow current IBC standards. The 2015 IBC defines Site Classification by reference to Table 20.3.-1 of the *American Society of Civil Engineers* publication ASCE 7, the current version of which is ASCE 7-10. In our opinion the subsurface conditions at the site are consistent with a Site Classification of "D" as defined in the referenced documents.

Erosion Hazards and Mitigations

Soils that underlie the project site are classified by the USDA Soil Survey as Everett very gravelly sandy loan with 0 to 8 percent slopes and a slight erosion hazard. The subject property does not meet the criteria for an erosion hazard area as defined in AMC Part IV Section 20.93.600(b)(1). The following discussion addresses potential erosion hazards that could develop during construction.

The most effective erosion control measure is the maintenance of adequate ground cover. Maintaining cover measures atop disturbed ground provides the greatest reduction to the potential generation of turbid runoff and sediment transport. During the local wet season (October 1 through March 31), exposed soil should not remain uncovered for more than 2 days unless it is actively being worked. Ground-cover measures can include erosion control matting, plastic sheeting, straw mulch, crushed rock or recycled concrete, or mature hydroseed.

Some fine-grained surface soils are the result of natural weathering processes that have broken down parent materials into their mineral components. These mineral components can have an

inherent electrical charge. Electrically charged mineral fines attract oppositely charged particles and can combine (flocculate) to form larger particles that will settle out of suspension. The sediments produced during the recent glaciation of Puget Sound are, however, most commonly the suspended soils that are carried by site storm water. The fine-grained fraction of the glacially derived soil is referred to as "rock flour," which is primarily a silt-sized particle with no electrical charge. These particles, once suspended in water, may have settling times in periods of months.

Therefore, the flow length within a temporary sediment control trap or pond has virtually no effect on the water quality of the discharge, since silt will not settle out of suspension in the time it takes to flow from one end of the pond to the other. Reduction of turbidity from a construction site is almost entirely a function of cover measures and flow control. Temporary sediment traps and ponds are necessary to control the release rate of the runoff and to provide a catchment for sand-sized and larger soil particles, but are very ineffective at reducing the turbidity of the runoff.

To mitigate the erosion hazards and potential for off-site sediment transport, we recommend the following:

1) The winter performance of a site is dependent on a well-conceived plan for control of site erosion and storm water runoff. It is easier to keep the soil on the ground than to remove it from storm water. The owner and the design team should include adequate ground-cover measures, access roads, and staging areas in the project bid to give the selected contractor a workable site. The selected contractor needs to be prepared to implement and maintain the required measures to reduce the amount of exposed ground. A site maintenance plan should be in place in the event storm water turbidity measurements are greater than the City of Arlington standards.

2) All TESC measures for a given area to be graded or otherwise worked should be installed prior to any activity within that area. The recommended sequence of construction within a given area would be to install sediment traps and/or ponds and establish perimeter flow control prior to starting mass grading.

3) During the wetter months of the year, or when large storm events are predicted during the summer months, each work area should be stabilized so that if showers occur, the work area can receive the rainfall without excessive erosion or sediment transport. The required measures for an area to be "buttoned-up" will depend on the time of year and the duration the area will be left un-worked. During the winter months, areas that are to be left un-worked for more than 2 days should be mulched or covered with plastic. During the summer months, stabilization will usually consist of seal-rolling the subgrade.

Such measures will aid in the contractor's ability to get back into a work area after a storm event. The stabilization process also includes establishing temporary storm water conveyance channels through work areas to route runoff to the approved treatment facilities.

4) All disturbed areas should be revegetated as soon as possible. If it is outside of the growing season, the disturbed areas should be covered with mulch, as recommended in the erosion control plan. Straw mulch provides the most cost-effective cover measure and can be made wind-resistant with the application of a tackifier after it is placed.

5) Surface runoff and discharge should be controlled during and following development. Uncontrolled discharge may promote erosion and sediment transport. Under no circumstances should concentrated discharges be allowed to flow over significant slopes.

6) Soils that are to be reused around the site should be stored in such a manner as to reduce erosion from the stockpile. Protective measures may include, but are not limited to, covering with plastic sheeting, the use of low stockpiles in flat areas, or the use of straw bales/silt fences around pile perimeters. During the period between October 1 and March 31, these measures are required.

7) On-site erosion control inspections and turbidity monitoring should be performed in accordance with City of Arlington requirements. Weekly and monthly reporting to Ecology should be performed on a regularly scheduled basis. TESC monitoring should be part of the weekly construction team meetings. Temporary and permanent erosion control and drainage measures should be adjusted and maintained, as necessary, at the time of construction.

It is our opinion that with the proper implementation of the TESC plans and by field-adjusting appropriate mitigation elements (best management practices) during construction, as recommended by the erosion control inspector, the potential adverse impacts from erosion hazards on the project during construction can be mitigated.

GEOTECHNICAL ENGINEERING RECOMMENDATIONS

The structural fill placed over the native Vashon recessional outwash encountered at the site is suitable for foundation and pavement support. The following sections provide our recommendations for foundation support, support of slab-on-grade floors and pavements.

Site Preparation

Site preparation of planned structural fill pads, building foundations, and other areas should include removal of all vegetation and any other deleterious material that has accumulated on the surface of the building pad since the completion of grading activities. Areas where loose surficial soils exist due to grading/grubbing operations should be recompacted in place, or if this is not feasible due to either soil composition or moisture content, the loose soils should be removed and replaced as subsequently recommended for structural fill placement.

In our opinion, stable construction slopes should be the responsibility of the contractor and should be determined during construction. For estimating purposes, however, we anticipate that temporary, unsupported cut slopes in the structural fill and medium dense native soils may be made at a maximum slope of 1H:1V (Horizontal:Vertical). Additionally, if ground water seepage is observed, the temporary slopes may need to be readjusted. As is typical with earthwork operations, some sloughing and raveling may occur, and cut slopes may have to be adjusted in the field. In addition, WISHA/OSHA regulations should be followed at all times.

Permanent cut slopes in the structural fill or medium dense native sediments must not exceed a 2H:1V inclination. Fill slopes should either be overbuilt and trimmed back to final grade or surface compacted to a specified density.

The structural fill and native soils may be subject to disturbance when wet. The contractor must use care during site preparation and excavation operations so that the underlying soils are not softened. If disturbance occurs, the softened soils should be removed and the area brought to grade with structural fill. Consideration should be given to protecting access and staging areas with an appropriate section of crushed rock or asphalt treated base (ATB).

Foundation Support

Conventional Spread Footings

The foundation bearing stratum consists of structural fill compacted to a firm and unyielding condition and spread footings may be used for foundation support. The documented structural fill placed below foundations consists of non-organic soil, free of deleterious materials compacted to at least 95 percent of the modified Proctor maximum dry density, as determined by *American Society for Testing and Materials* (ASTM): D 1557 and documented in the above referenced AESI field reports. Structural fill below footing areas should extend laterally beyond the footing edges a distance equal to or greater than the depth of the footing but no less than 2 feet. Sediments exposed in footing excavations should be compacted to a firm and unyielding condition prior to footing placement.

For footings founded directly upon structural fill, we recommend that an allowable bearing pressure of 2,500 pounds per square foot (psf) be used for design purposes, including both dead and live loads. An increase of one-third may be used for short-term wind or seismic loading.

Perimeter footings for the proposed buildings should be buried a minimum of 18 inches into the surrounding soil for frost protection. No minimum burial depth is required for interior footings; however, all no footings should be founded on loose soils.

The area bounded by lines extending downward at 1H:1V (Horizontal:Vertical) from any footing must not intersect another footing or intersect a filled area that has not been compacted to at least 95 percent of ASTM:D 1557. In addition, a 1. 5H:1V line extending down from any footing must not daylight because sloughing or raveling may eventually undermine the footing. Thus, footings should not be placed near the edges of steps or cuts in the bearing soils.

All footing areas should be observed by SGP prior to placing concrete to verify that the exposed soils can support the design foundation bearing capacity and that construction conforms with the recommendations in this report. Foundation bearing verification may also be required by the governing municipality.

Structural Fill

If additional structural fill is necessary to establish desired grades, all references to structural fill in this report refer to subgrade preparation, fill type, placement, and compaction of materials as discussed in this section. If a percentage of compaction is specified under another section of this report, the value given in that section should be used. Native soils or imported granular fill, approved by the geotechnical engineer or their representative, or recycled crushed concrete that is less than 3 inches in diameter may be used for structural fill when compacted to a firm and unyielding condition as determined by the geotechnical engineer or engineering geologist.

After stripping, planned excavation, and any required over-excavation have been performed to the satisfaction of the geotechnical engineer/engineering geologist, the upper 12 inches of exposed ground should be recompacted to a firm and unyielding condition. If the subgrade contains too much moisture, adequate recompaction may be difficult or impossible to obtain and should probably not be attempted. In lieu of recompaction, the area to receive fill should be blanketed with washed rock or quarry spalls to act as a capillary break between the new fill and the wet subgrade. Where the exposed ground remains soft and further over-excavation is impractical, placement of an engineering stabilization fabric may be necessary to prevent contamination of the free-draining layer by silt migration from below.

Foundation Walls

All backfill behind foundation walls or around foundation units should be placed as per our recommendations for structural fill and as described in this section of the report. Horizontally backfilled walls, which are free to yield laterally at least 0.1 percent of their height, may be designed to resist active lateral earth pressure represented by an equivalent fluid equal to 35 pounds per cubic foot (pcf). Fully restrained, horizontally backfilled, rigid walls that cannot yield should be designed for an equivalent fluid of 50 pcf. Walls with sloping backfill up to a maximum gradient of 2H:1V should be designed using an equivalent fluid of 55 pcf for yielding conditions or 75 pcf for fully restrained conditions. If parking areas are adjacent to walls, a surcharge equivalent to 2 feet of soil should be added to the wall height in determining lateral design forces.

As required by the 2015 IBC, retaining wall design should include a seismic surcharge pressure in addition to the equivalent fluid pressures presented above. Considering the site soils and the recommended wall backfill materials, we recommend a seismic surcharge pressure of 8H and 10H psf, where H is the wall height in feet for the "active" and "at-rest" loading conditions, respectively. The seismic surcharge should be modeled as a rectangular distribution with the resultant applied at the midpoint of the walls.

The lateral pressures presented above are based on the conditions of a uniform backfill consisting of excavated on-site soils, or imported structural fill compacted to 90 percent of ASTM:D 1557. A higher degree of compaction is not recommended, as this will increase the pressure acting on the walls. A lower compaction may result in settlement of the slab-on-grade or other structures supported above the walls. Thus, the compaction level is critical and must be tested by our firm during placement. Surcharges from adjacent footings or heavy construction equipment must be added to the above values. Perimeter footing drains should be provided for all retaining walls, as discussed under the "Drainage Considerations" section of this report.

It is imperative that proper drainage be provided so that hydrostatic pressures do not develop against the walls. This would involve installation of a minimum 1-foot-wide blanket drain to within 1 foot of finish grade for the full wall height using imported, washed gravel against the walls.

Passive Resistance and Friction Factors

Lateral loads can be resisted by friction between the foundation and the natural glacial soils or supporting structural fill soils, and by passive earth pressure acting on the buried portions of the foundations. The foundations must be backfilled with structural fill and compacted to at least 95

percent of the maximum dry density to achieve the passive resistance provided below. We recommend the following allowable design parameters:

- Passive equivalent fluid = 250 pcf
- Coefficient of friction = 0.35

Drainage Considerations

All perimeter footing walls should be provided with a drain at the base of the footing elevation. Drains should consist of rigid, perforated, polyvinyl chloride (PVC) pipe surrounded by washed pea gravel. The level of the perforations in the pipe should be set at or slightly below the bottom of the footing and the drains should be constructed with sufficient gradient to allow gravity discharge away from the buildings. Roof and surface runoff should not discharge into the footing drain system but should be handled by a separate, rigid, tightline drain. In planning, exterior grades adjacent to foundations should be sloped downward away from the structures to achieve surface drainage.

Pavement Design

The following presents our recommendations for design of asphalt pavement design for lighter loaded car traffic and heavier loaded truck traffic at the above referenced site. All areas to be paved should be crowned or sloped to direct storm water flow to the edges of the roadway and parking areas. The subgrade should then be compacted to a dense and nonyielding condition with a minimum 20-ton vibratory roller. Any fill areas should be tested to verify a minimum compaction of 95 percent of the modified Proctor maximum density or to a firm and unyielding condition as determined by the engineering geologist. Prior to application of the recommended pavement section the areas to be paved should be proof-rolled with a fully loaded, tandem axle dump truck. Any soft or yielding areas identified during proof-rolling should be over-excavated and backfilled with structural fill. Both the compaction of the subgrade and the proof-roll should be witnessed and documented by a representative of SGP. Therefore, upon completion of an approved proof roll as discussed above, the minimum pavement section for this project is as follows:

<u>Parking Areas (Passenger Cars/Light Vehicles)</u>

4” of base course/top course
2.5” Hot Mix Asphalt (HMA) Class ½” aggregate with a PG 58-22 asphalt binder

Drive Lanes /Loading Bays (Trucks/Heavier Vehicles)

6" of base course/top course
4" Hot Mix Asphalt (HMA) Class ½" aggregate with a PG 58-22 asphalt binder

The base course/top course rock should be compacted to a dense and unyielding condition. Base course and top course gravel should conform to Washington State Department of Transportation (WSDOT) Specification 9-03.9(3) for crushed surfacing materials. The HMA should be compacted to a minimum 91 percent of the maximum theoretical specific gravity (Rice's density).

PROJECT DESIGN AND CONSTRUCTION MONITORING

Our report is based on a general project concept provided by the owner. We recommend that SGP be allowed to review this report and update it as needed when a more detailed project plan has been developed. In this way, we can confirm that our earthwork and foundation recommendations have been properly interpreted and implemented in the design. This review is not included in our current scope of work and budget.

We are also available to provide geotechnical recommendations in the event that variations in subsurface conditions become apparent and earthwork monitoring services during construction. The integrity of the foundation system depends on proper site preparation and construction procedures. In addition, engineering decisions may have to be made in the field in the services are not part of this current scope of work. If these services are desired, please let us know, and we will prepare a cost proposal.

After recompaction of the exposed ground is approved, or a free-draining rock course is laid, structural fill may be placed to attain desired grades. Structural fill is defined as non-organic soil, acceptable to the geotechnical engineer/engineering geologist, placed in maximum 8-inch loose lifts with each lift being compacted to 95 percent of ASTM:D-1557. In the case of roadway and utility trench filling, the backfill should be placed and compacted in accordance with local codes and standards. The top of the compacted fill should extend horizontally outward a minimum distance of 3 feet beyond the location of the perimeter footings or roadway edges before sloping down at a maximum angle of 2H:1V.

The contractor should note that any proposed fill soils must be evaluated by SGP prior to their use in fills. This would require that we have a sample of the material at least 72 hours in advance to perform a Proctor test and determine its field compaction standard. Soils in which the amount of fine-grained material (smaller than the No. 200 sieve) is greater than approximately 5 percent (measured on the minus No. 4 sieve size) should be considered moisture-sensitive. Use of moisture-sensitive soil in structural fills should be limited to favorable dry weather and dry subgrade conditions. Construction equipment traversing the site when the soils are wet can cause considerable disturbance.

If fill is placed during wet weather or if proper compaction cannot be obtained, a select import material consisting of a clean, free-draining gravel and/or sand should be used. Free-draining fill consists of non-organic soil with the amount of fine-grained material limited to 5 percent by weight when measured on the minus No. 4 sieve fraction and at least 25 percent retained on the No. 4 sieve.

Slab-on-Grade Floor Support

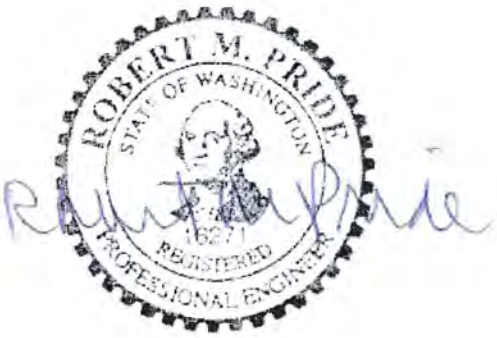
Slab-on-grade floors may be constructed directly on the structural fill placed over the native Recessional Outwash soils. Areas of the slab subgrade that are disturbed (loosened) during construction should be recompacted to an unyielding condition prior to placing the pea gravel, as described below.

In order to control moisture vapor transfer through the slab, slab-on-grade floors should be constructed atop a capillary break consisting of a minimum thickness of 4 inches of washed pea gravel, washed crushed rock or other suitable material approved by the geotechnical engineer or engineering geologist. The capillary break should be overlain by a 10-mil (minimum thickness) plastic vapor retarder.

CLOSURE

We appreciate the opportunity to be of service to you on this project. Should you have any questions regarding this report or other geotechnical aspects of the project, please call us at your earliest convenience.

Sincerely,
SONDERGAARD GEOSCIENCE, PLLC.
Snohomish, Washington



Jon N. Sondergaard, L.G., L.E.G.
Principal Engineering Geologist

Robert M. Pride, P.E.
Professional Engineer

Attachments:
Figure 1: Vicinity Map
Figure 2: Building G Lot Locations
Figure 3: Building G Topography
Figure 4: Building G Layout
AESI Field Reports

SR 532
PIONEER HWY
NORMAN RD
236TH ST NE
252ND ST NE
19TH AVE NE
SR 530
115TH AVE NE
JIM CREEK RD
JORDAN RD
SILL RD
204TH ST NE
CEMETERY RD
SITE
188TH ST NE
ARLINGTON
3RD AVE NE
I-5
172ND ST NE
51ST AVE NE
SMOKEY POINT BLVD
152ND ST NE
FORTY FIVE RD
SR 9
MARYSVILLE
140TH ST NW
140TH ST NE
STIMSON RD
132ND ST NE

VICINITY MAP
GAYTEWAY BUSINESS PARK
ARLINGTON, WASHINGTON

J-0045
FIGURE 1

0 9857ft

BUILDING 'B'

BUILDING 'C'

PARCEL A1

PARCEL A3

PARCEL A2

PARCEL A4

67TH AVENUE NE

NORTHERN PACIFIC RAILROAD

31051400200400

QUIT CLAIM DEED
A.F.N. 2341120
(TO BE VERIFIED)

N 88°17'08" W 564.76'

S 10°59'10" W 1193.04'

S 2°00'48" W 798.89'

S 1°36'55" W 118.02'

N 87°56'54" W 297.07'

N 10°59'10" E 766.63'

456'-0"

78,957 SF
FF= 135.00

120,680 SF
FF= 137.00

370.00'

S 1°44'21" W

CITY OF ARLINGTON
BLA 98-0032
A.F.N. 9805135004

00793300000501

JENSEN BUSINESS PARK
PHASE 2
A.F.N. 9103205006

LOT 23 & LOT 24
00793300002300

LOT 21
00793300002100

SUBJECT SITE

N 88°17'08" W 1085.92'

92'-7 1/2"

816'-0"

246,280 SF
FF= 124.50

584.94'

74TH AVENUE NE

170' ~ 6% = 10'H RAMP

N 88°17'08" W 860.00'

31051400201800
CITY OF ARLINGTON
B.L.A. A.F.N. 9201085001

N 87°59'12" W 270.00'

S 42°28'42" E 42.00'

339.61'

S 2°00'48" W

31051400201300

31051400201600

90' @ 10% = 9'H RAMP

PARCEL A6

S 86°59'12" E 331.65'

N 47°00'48" E 42.43'

514.69'

N 10°59'10" E

89,000 SF
FF= 152.00

SF
FF= 153.0?

SF
FF= 153.0?

711.33'

S 1°44'21" W

N 87°56'54" W 441.57'

60.00'

S 2°00'48" W

N 87°56'54" W 620.43'

60.02'

N 0°28'42" E

31051400303100

31051400300200

S. LINE CALCULATED PER

31051400302400

14

15

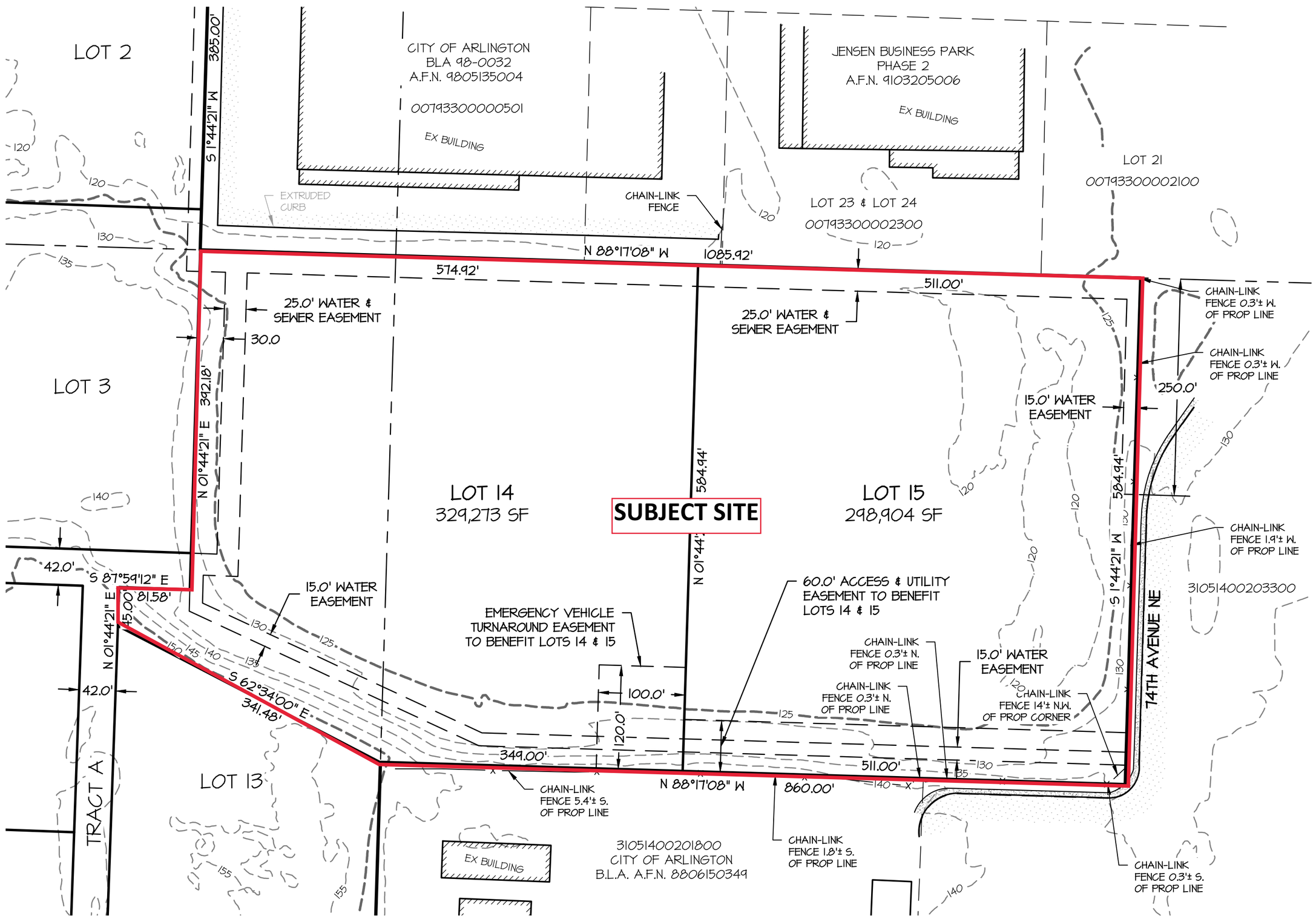
GAYTEWAY BUSINESS PARK
BUILDING G LAYOUT
ARLINGTON, WASHINGTON

GAYTEWAY BUSINESS PARK
-CONCEPT OVERALL DEVELOPMENT PLAN
date: 1/22/19
by: Terraforma Design Group

J-0045G FIGURE 2

GAYTEWAY BUSINESS PARK
CITY OF ARLINGTON BINDING SITE PLAN
FILE NUMBER: _____

A PORTION OF NW1/4 NW1/4, SW1/4 NW1/4, SE1/4 NW1/4 & NW1/4 SW1/4
SECTION 14, TOWNSHIP 31 NORTH, RANGE 05 EAST, W.M.
SNOHOMISH COUNTY, STATE OF WASHINGTON



SHEET INDEX

GAYTEWAY BUSINESS PARK
BUILDING G TOPOGRAPHY
ARLINGTON, WASHINGTON

J-0045G FIGURE 3

LOTS 14&15

A.F.N. _____ REV. 02 JSM 4/10/19

JEROME R. ANDES
STATE OF WASHINGTON
17362
REGISTERED
PROFESSIONAL LAND SURVEYOR

ANDES
LAND SURVEYING, P.S.
1523 TENTH ST,
MARYSVILLE, WA 98270
PHONE: 360-350-5063

DRAWN BY: JSM
CHECKED: JRA
DATE: MARCH 2019

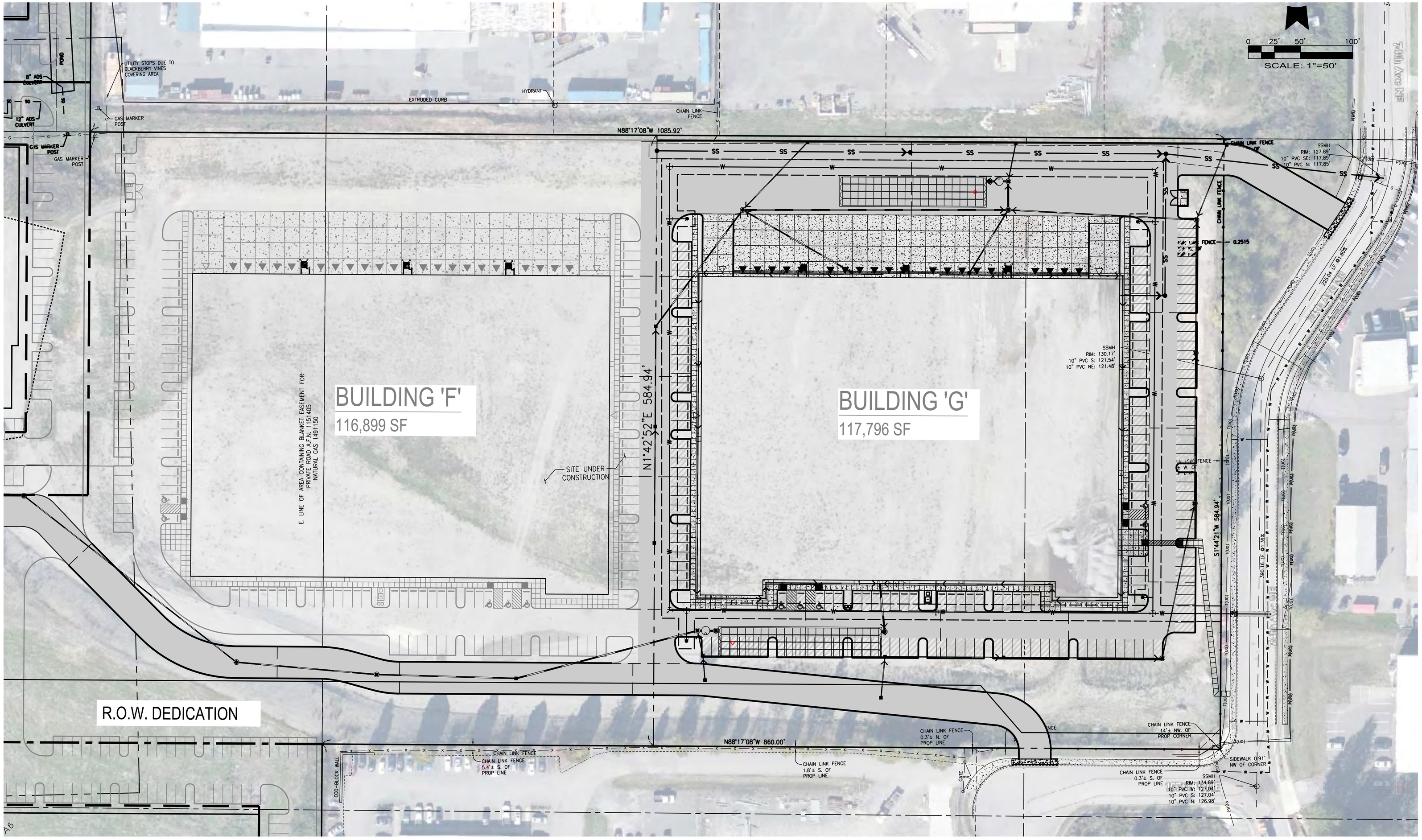
JOB DATA: 3105-14.10
201902
[201805] FB: FILE
3105-14.09 GAYTEWAY BSP 4-10-19B

GAYTEWAY BUSINESS PARK
BINDING SITE PLAN
FOR GAYTEWAY, LLC
FILE NO. _____
A PORTION OF NW1/4 NW1/4, SW1/4 NW1/4, SE1/4 NW1/4 & NW1/4 SW1/4
SECTION 14, TOWNSHIP 31 NORTH, RANGE 05 EAST, W.M.
CITY OF ARLINGTON
SNOHOMISH COUNTY, STATE OF WASHINGTON

GEOTECH MARKUP
FOR

GAYTEWAY BUSINESS PARK

PTN OF THE NE1/4, OF THE SW1/4 OF SEC. 14, TWP. 31 N., RGE 5 EAST, W.M.
CITY OF ARLINGTON, SNOHOMISH COUNTY, STATE OF WASHINGTON



SITE PLAN
GAYTWAY BUSINESS PARK
BUILDING G
ARLINGTON, WASHINGTON

J-0045G FIGURE 4

No.	Date	By	Ckd.	Appr.	Revision

Title: GEOTECH MARKUP

For: GAYTEWAY BUSINESS PARK LLC
PO BOX 1727
BELLEVUE, WA 98009

Scale: Horizontal 1:50 Vertical NA

Designed WLG
Drawn WLG
Checked JC
Approved CJ
Date 8/28/20

Barghausen Consulting Engineers, Inc.
18215 72nd Avenue South
Kent, WA 98032
425.251.6222 **barghausen.com**

Job Number 21334

Sheet 1 of 1

P:\21000s\21334\exhibit\21334-Geotech Markup.dwg 10/15/2020 4:16 PM LGUAN

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earth sciences
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Kirkland, Washington 98033
Phone: 425-827-7701
Fax: 425- 827-5424
www.aesgeo.com

FIELD REPORT

Date	Project Name		Project No.
6 JUL 16	Gayteway Business Park		KE150563A
Location		**Municipality**	**Weather**
20015 67th Avenue NE		Arlington	Clear 70's
Permit No.	**DPD No.**		**Report No.**
1738			1
Engineer/Architect			
Client/Owner			
GS Venture Partners			
General Contractor/Superintendent			
USVET / Chris			
Earthwork /Superintendent			
USVET / Chris			

TO: GS Venture Partners
P.O. Box 1727
Bellevue, WA 98009-1727

ATTN: Chris Gayte

AS REQUESTED BY: Client

THE FOLLOWING WAS NOTED:

AESI was onsite for a pre-construction meeting and sample pick up for Proctor analysis. Upon our arrival, we met with Chris from GS Venture, and Chris from USVET.

Two samples of the on-site material were obtained for a Proctor analysis. The samples were obtained towards the southeast corner and south side of the site.

Both the client and contractor informed us that they would contact AESI to schedule a site visit.

Copies To:

Field Rep: Su-Kiet Lieu

Date Mailed:

Principal / PM: Jon Sondergaard, LEG

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FIELD REPORT

Date	Project Name	Project No.
14 JUL 16	Gayteway Business Park	KE150563A
Location	**Municipality**	**Weather**
20015 67th Avenue NE	Arlington	Clear 80's
Permit No.	**DPD No.**	**Report No.**
1738		2
Engineer/Architect		
Client/Owner		
GS Venture Partners		
General Contractor/Superintendent		
USVET / Chris		
Earthwork /Superintendent		
USVET / Chris		

TO: GS Venture Partners
P.O. Box 1727
Bellevue, WA 98009-1727

ATTN: Chris Gayte

AS REQUESTED BY: Client

THE FOLLOWING WAS NOTED:

AESI was onsite for construction monitoring of earthwork activities. Upon our arrival, we met with Chris from USVET.

Mass Fill:

The earthwork contractor informed us they had placed about 3 to 4 feet of fill along the south side of the proposed building. We observed the subgrade soils along the edge of the fill area consisted of a gravelly sand to sandy gravel that could be penetrated from 1 to 4 inches with a 1/2 inch diameter probe rod. The fill material consisted of a dark brown, silty sand, which the contractor informed us was compacted in about 8 to 12 inch lifts with a roller. We did not observe the compaction process. A sample of the fill material was obtained for a Proctor analysis. Based on the survey stakes, we estimated the fill had been placed to an elevation between 113 to 115 feet.

The contractor inquired about placing fill against the slopes along the west and south sides of the site. We observed the slopes in general were about 45° (1H:1V) with a 4 to 5 feet vertical face at the top. We recommended the contractor bench the slope in phases at the maximum about 4 feet vertically and raise the fill to the top of the vertical cut before benching another 4 feet vertical cut.

Density Readings:

We performed four in place density readings with results that ranged from 95 to 96% of the maximum dry density, according to ASTM D 1557. We were able to penetrate from 2 to 5 inches on the compacted fill material with a 1/2 inch diameter probe rod.

Conclusions:

We informed the contractor the area observed today met the 95% compaction criteria.

Reading No.	Location	Elevation (ft)	Max DD (pcf)	DD (pcf)	MC (%)	Compact (%)
1	Bldg Area, Mid S Area	115	118.0	112.0	10.4	95
2	Bldg Area, S Area	113	118.0	111.9	14.2	95
3	Bldg Area, SSE Area	113	118.0	112.7	15.0	95
4	Bldg Area, SE	113	118.0	113.6	14.3	96

Copies To:

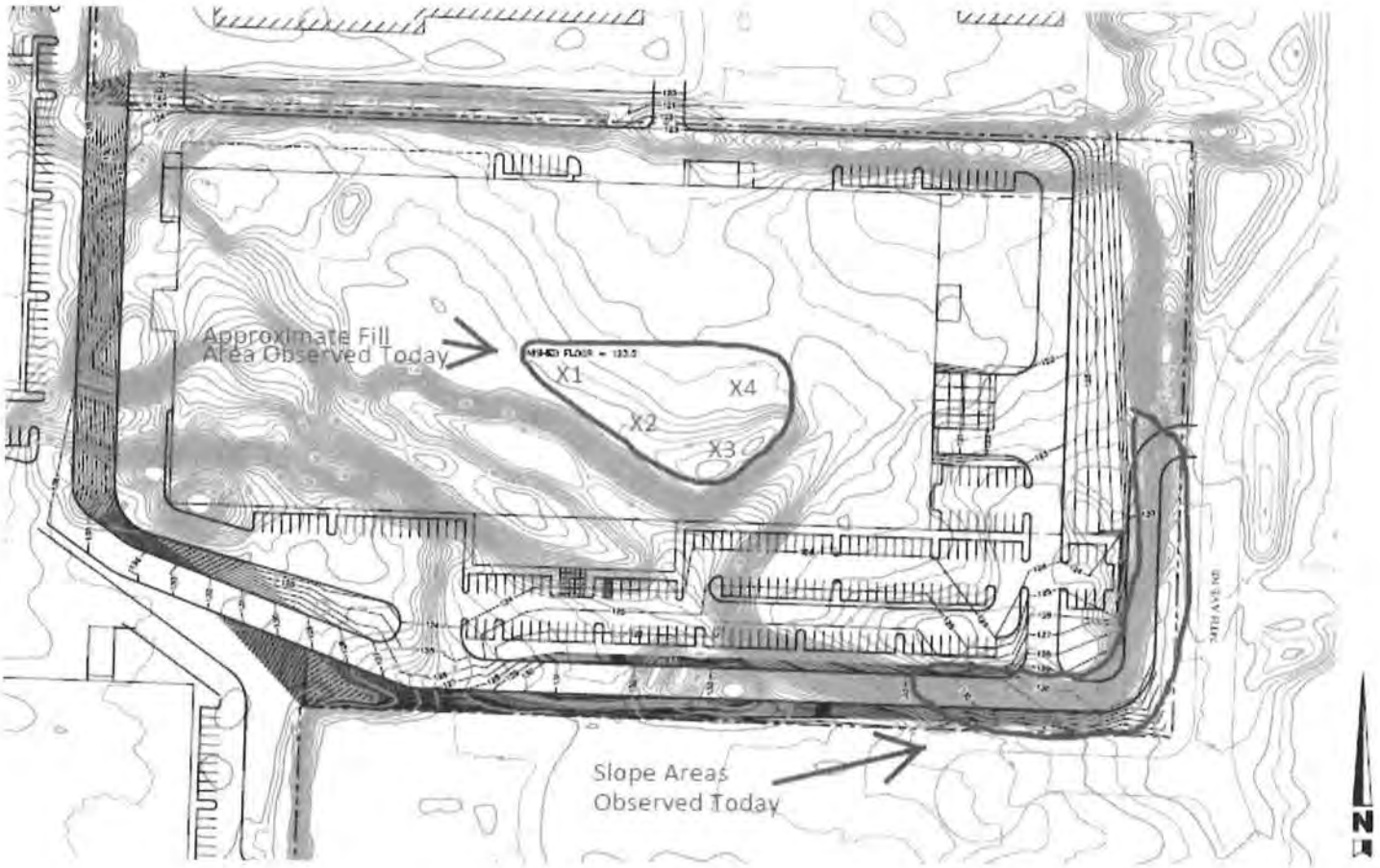
Field Rep: Su-Kiet Lieu

Date Mailed:

Principal / PM: Jon Sondergaard, LEG

AESI FIELD REPORT

To:		Project Name:	Gayteway Business Park
Date:	14 JUL 16	Project No.:	KE150563A
Permit No.		DPD No.	



Copies To:		Field Rep:	Su-Kiet Lieu
Date Mailed:		Principal / PM:	Jon Sondergaard, LEG

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FIELD REPORT

Date	Project Name		Project No.
26 JUL 16	Gayteway Business Park		KE150563A
Location		**Municipality**	**Weather**
20015 67th Avenue NE		Arlington	Clear 80's
Permit No.	**DPD No.**		**Report No.**
1738			3
Engineer/Architect			
Client/Owner			
GS Venture Partners			
General Contractor/Superintendent			
USVET / Chris			
Earthwork /Superintendent			
USVET / Chris			

TO: GS Venture Partners
P.O. Box 1727
Bellevue, WA 98009-1727

ATTN: Chris Gayte

AS REQUESTED BY: Contractor

THE FOLLOWING WAS NOTED:

AESI was onsite for construction monitoring of earthwork activities. Upon our arrival, we met with Chris from USVET.

Mass Fill:

The earthwork contractor informed us they had placed about 4 to 6 feet of fill along the middle and southeast areas of the site. The middle area was within the proposed building footprint and the southeast area was mainly within the proposed parking area. We observed the subgrade soils along the edges of the fill area consisted of a gravelly sand to sandy gravel that could be penetrated from 1 to 4 inches with a 1/2 inch diameter probe rod. Fill material consisted of a sand and gravel for the southeast portion, and sand for the middle portion; which the contractor informed us was compacted in about 8 to 12 inch lifts with a sheeps foot roller. We did not observe the compaction process. A sample of the sand was obtained for a Proctor analysis. Based on the survey stakes, we estimated the fill had been placed to an elevation between 111 and 113 feet at the southeast, and between 114 and 119 feet at the middle.

We observed signs the slope areas along the south and east sides of the site were benched in phases as fill placement occurred. The contractor informed us they had been benching the 1H:1V slope with 4 feet vertical cuts and remaining vegetation along the slope areas would be removed as benching progresses up the slope.

Density Readings:

We performed eight in place density readings with results that ranged from 95 to 98% of the maximum dry density, according to ASTM D 1557. We were able to penetrate from 2 to 5 inches on the compacted fill material with a 1/2 inch diameter probe rod.

Conclusions:

We informed the contractor the area observed today met the 95% compaction criteria.

Reading No.	Location	Elevation (ft)	Max DD (pcf)	DD (pcf)	MC (%)	Compact (%)
1	SE Portion of SE Fill Area	111	128.3	123.0	7.1	96
2	E Portion of SE Fill Area	111	122.1	120.6	6.5	98
3	Mid Portion of SE Fill Area	112	128.3	123.2	6.2	96
4	NW Portion of SE Fill Area	113	122.1	120.7	6.7	98
5	W Portion of SE Fill Area	113	128.3	123.5	4.9	96
6	N Portion of Mid Fill Area	114	103.5	99.8	4.7	96
7	Mid Portion of Mid Fill Area	117	103.5	100.9	5.9	97
8	S Portion of Mid Fill Area	119	122.1	119.9	6.3	98

Copies To:

Field Rep: Su-Kiet Lieu

Date Mailed:

Principal / PM: Jon Sondergaard, LEG

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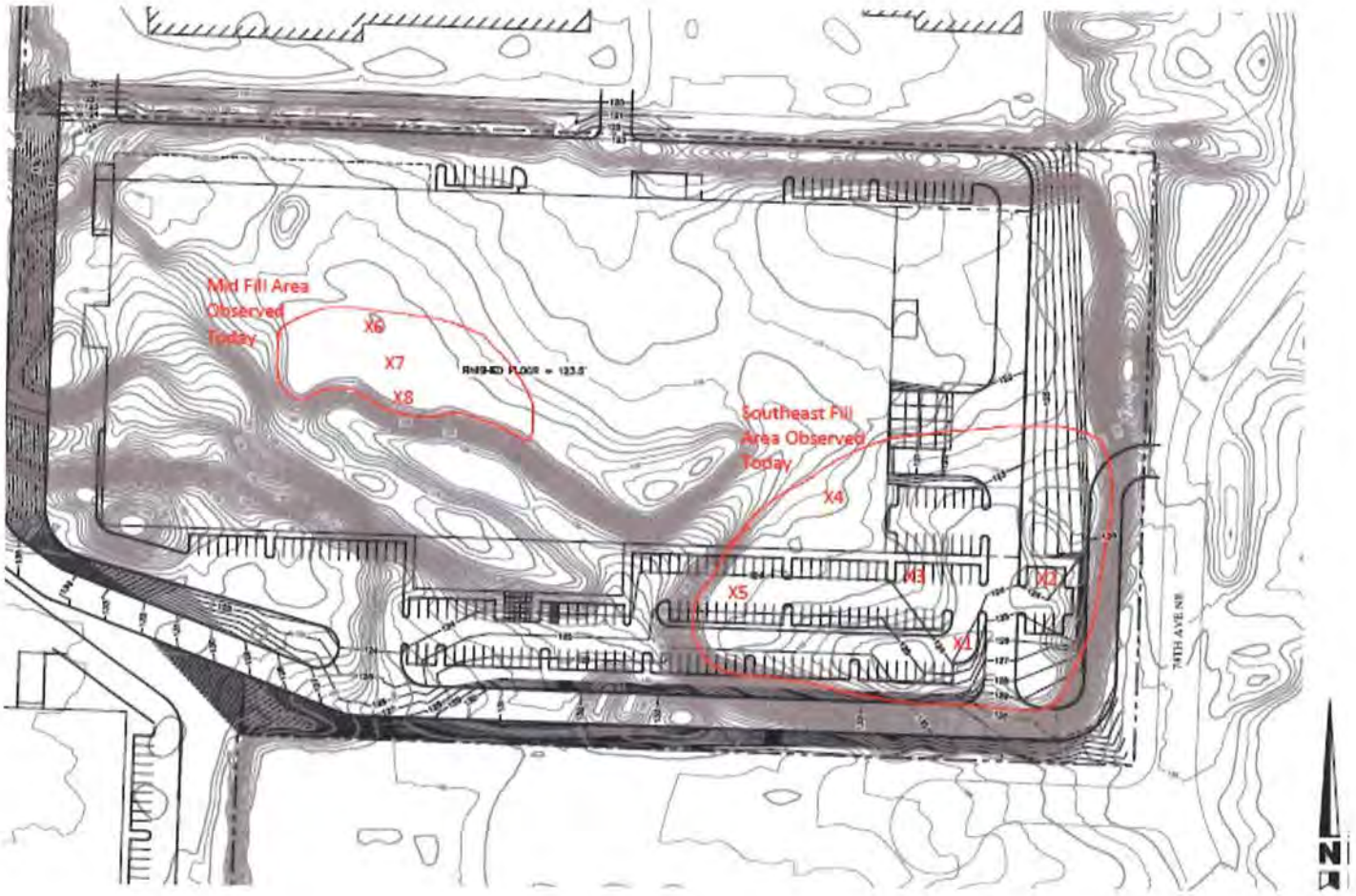
AESI FIELD REPORT

To:		Project Name:	Gayteway Business Park
Date:	26 JUL 16	Project No.:	KE150563A
Permit No.		DPD No.	



Copies To:		Field Rep:	Su-Kiet Lieu
Date Mailed:		Principal / PM:	Jon Sondergaard, LEG

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Fax: 425- 827-5424
www.aesgeo.com

FIELD REPORT

Date	Project Name	Project No.
1 AUG 16	Gayteway Business Park	KE150563A
Location	**Municipality**	**Weather**
20015 67th Avenue NE	Arlington	Clear 80's
Permit No.	**DPD No.**	**Report No.**
1738		4
Engineer/Architect		
Client/Owner		
GS Venture Partners		
General Contractor/Superintendent		
USVET / Chris		
Earthwork /Superintendent		
USVET / Chris		

TO: GS Venture Partners
P.O. Box 1727
Bellevue, WA 98009-1727

ATTN: Chris Gayte

AS REQUESTED BY: Contractor

THE FOLLOWING WAS NOTED:

AESI was onsite for construction monitoring of earthwork activities. Upon our arrival, we met with Chris from USVET.

Mass Fill:

The earthwork contractor informed us they had placed about 1 to 3 feet of fill along the southeast and east areas of the site. Both the southeast and east areas were mainly within the proposed parking areas. We observed the subgrade soils along the edges of the fill area consisted of a gravelly sand to sandy gravel that could be penetrated from 1 to 4 inches with a 1/2 inch diameter probe rod. Fill material consisted of a sand and gravel from the south side of the site. The contractor informed us the fill was compacted in about 8 to 12 inch lifts with a sheeps foot roller. We did not observe the compaction process. Based on the survey stakes, we estimated the fill had been placed to an elevation between 112 and 117 feet at the southeast, and between 111 and 113 feet at the east.

Density Readings:

We performed seven in place density readings with results that ranged from 95 to 99% of the maximum dry density, according to ASTM D 1557. We were able to penetrate from 1 to 4 inches on the compacted fill material with a 1/2 inch diameter probe rod.

Conclusions:

We informed the contractor the area observed today met the 95% compaction criteria.

Reading No.	Location	Elevation (ft)	Max DD (pcf)	DD (pcf)	MC (%)	Compact (%)
1	SE Portion of SE Fill Area	114	128.3	121.8	7.0	95
2	SW Portion of SE Fill Area	118	128.3	124.2	8.9	97
3	Mid Portion of SE Fill Area	114	128.3	121.4	9.9	95
4	NW Portion of SE Fill Area	117	128.3	126.6	5.2	99
5	NE Portion of SE Fill Area	112	128.3	125.5	8.3	98
6	S Portion of E Fill Area	111	128.3	121.8	6.9	95
7	N Portion of E Fill Area	113	128.3	121.6	8.4	95

Copies To:

Field Rep: Su-Kiet Lieu

Date Mailed:

Principal / PM: Jon Sondergaard, LEG

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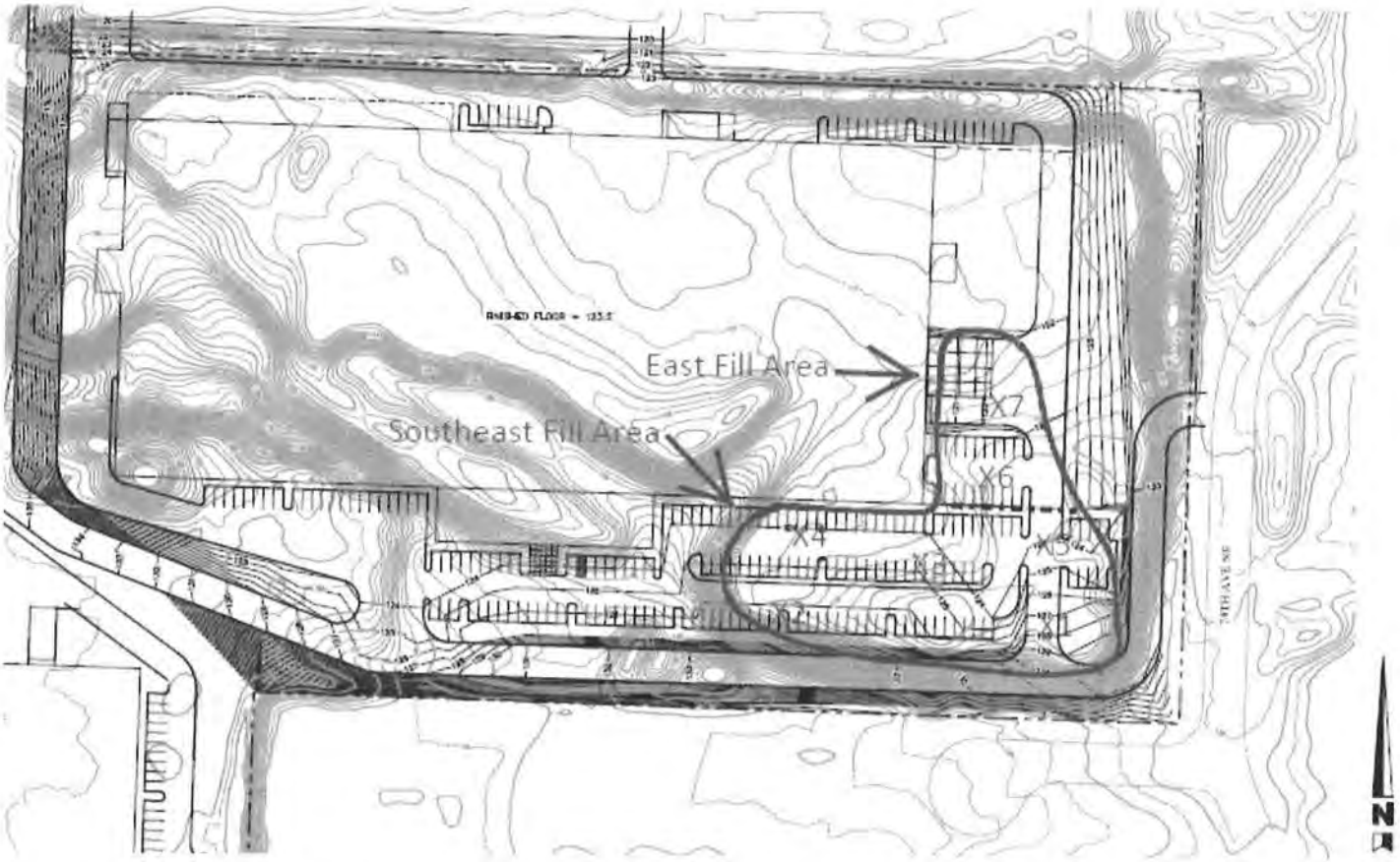
AESI FIELD REPORT

To:		Project Name:	Gayteway Business Park
Date:	1 AUG 16	Project No.:	KE150563A
Permit No.		DPD No.	



Copies To:		Field Rep:	Su-Kiet Lieu
Date Mailed:		Principal / PM:	Jon Sondergaard, LEG

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FIELD REPORT

Date	Project Name		Project No.
4 AUG 16	Gayteway Business Park		KE150563A
Location		**Municipality**	**Weather**
20015 67th Avenue NE		Arlington	Clear 80's
Permit No.	**DPD No.**		**Report No.**
1738			5
Engineer/Architect			
Client/Owner			
GS Venture Partners			
General Contractor/Superintendent			
USVET / Chris			
Earthwork /Superintendent			
USVET / Chris			

TO: GS Venture Partners
P.O. Box 1727
Bellevue, WA 98009-1727
ATTN: Chris Gayte

AS REQUESTED BY: Contractor

THE FOLLOWING WAS NOTED:

AESI was onsite for construction monitoring of earthwork activities. Upon our arrival, we met with Chris from USVET.

Mass Fill:

The earthwork contractor informed us they had placed about 1 to 4 feet of fill along the southeast and east areas of the site. The southeast fill area was under proposed parking and road areas, and the east fill area was within the proposed slope area. We observed the subgrade soils along the edges of the fill area consisted of a gravelly sand to sandy gravel that could be penetrated from 1 to 4 inches with a 1/2 inch diameter probe rod. Fill material for the southeast area consisted of a sand and gravel from the south side of the site, while fill material for the east fill area consisted of a silty sand, with some organics from the north side of the site. The contractor informed us the fill was compacted in about 8 to 12 inch lifts with a sheeps foot roller. We did not observe the compaction process. Based on the survey stakes, we estimated the fill had been placed to an elevation between 111 and 118 feet at the southeast, and between 111 and 117 feet at the east. We recommended to the contractor that the use of soils with some organics was acceptable under the areas that are not slopes, provided the soils with organics are spread throughout the site; however, soils with organics should not be used exclusively on slope areas.

Density Readings:

We performed six in place density readings with results that ranged from 95 to 96% of the maximum dry density, according to ASTM D 1557. We were able to penetrate from 1 to 5 inches on the compacted fill material with a 1/2 inch diameter probe rod.

Conclusions:

We informed the contractor the area southeast area observed today met the 95% compaction criteria. We also recommended the contractor not place soils with organics exclusively on proposed slope areas.

Reading No.	Location	Elevation (ft)	Max DD (pcf)	DD (pcf)	MC (%)	Compact (%)
1	SE Portion of SE Fill Area	116	122.1	115.7	8.3	95
2	S Portion of SE Fill Area	117	128.3	122.5	8.8	95
3	SW Portion of SE Fill Area	118	122.1	116.9	6.4	96
4	W Portion of SE Fill Area	114	122.1	117.3	6.7	96
5	N Portion of SE Fill Area	112	122.1	115.4	8.2	95
6	NE Portion of SE Fill Area	111	122.1	117.4	8.8	96

Copies To: _____ Field Rep: Su-Kiet Lieu

Date Mailed: _____ Principal / PM: Jon Sondergaard, LEG

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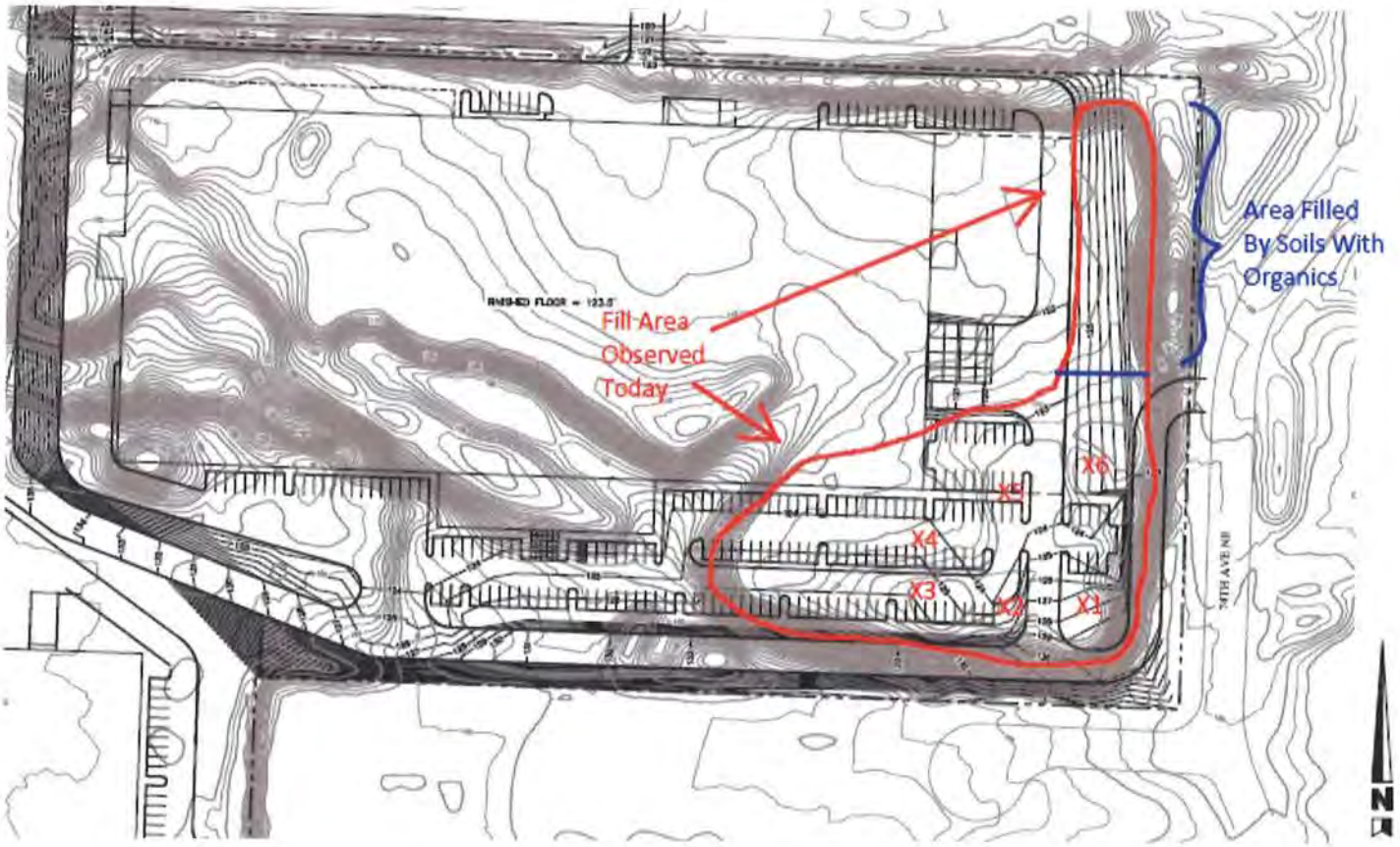
AESI FIELD REPORT

To:		Project Name:	Gayteway Business Park
Date:	4 AUG 16	Project No.:	KE150563A
Permit No.		DPD No.	



Copies To:		Field Rep:	Su-Kiet Lieu
Date Mailed:		Principal / PM:	Jon Sondergaard, LEG

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FIELD REPORT

Date	Project Name	Project No.
16 AUG 16	Gayteway Business Park	KE150563A
Location	**Municipality**	**Weather**
20015 67th Avenue NE	Arlington	Clear 80's
Permit No.	**DPD No.**	**Report No.**
1738		6
Engineer/Architect		
Client/Owner		
GS Venture Partners		
General Contractor/Superintendent		
USVET / Chris		
Earthwork /Superintendent		
USVET / Chris		

TO: GS Venture Partners
P.O. Box 1727
Bellevue, WA 98009-1727
ATTN: Chris Gayte

AS REQUESTED BY: Contractor

THE FOLLOWING WAS NOTED:

AESI was onsite for construction monitoring of earthwork activities. Upon our arrival, we met with Chris from USVET.

Mass Fill:

The earthwork contractor informed us they had placed about 1 to 4 feet of fill along the middle, southeast and east areas of the site. The middle fill area was within the building footprint, the southeast fill area was under proposed parking and road areas, and the east fill area was within the proposed slope area. We observed the subgrade soils along the edges of the fill area consisted of a gravelly sand to sandy gravel that could be penetrated from 1 to 4 inches with a 1/2 inch diameter probe rod. Fill material for the areas observed today consisted of a sand and gravel from the south side of the site. The contractor informed us the fill was compacted in about 4 to 8 inch lifts with a smooth drum roller. We did not observe the compaction process. Based on the survey stakes, we estimated the fill areas observed today had been placed to an elevation between 114 and 120 feet.

The contractor informed us that they were distributing and mixing some of the soils with organics in thin lifts throughout the fill areas to prevent from concentrating organic laden soils under proposed slope areas.

Density Readings:

We performed seven in place density readings with results that ranged from 95 to 97% of the maximum dry density, according to ASTM D 1557. We were able to penetrate from 1 to 5 inches on the compacted fill material with a 1/2 inch diameter probe rod.

Conclusions:

We informed the contractor the fill areas observed today met the 95% compaction criteria.

Reading No.	Location	Elevation (ft)	Max DD (pcf)	DD (pcf)	MC (%)	Compact (%)
1	SE Portion of SE Fill Area	120	128.3	121.3	5.1	95
2	S Portion of SE Fill Area	114	128.3	121.4	5.9	95
3	E Portion of Mid Fill Area	118	128.3	124.1	3.0	96
4	Mid Portion of Mid Fill Area	117	103.5	98.0	12.8	95
5	W Portion of Mid Fill Area	115	122.1	118.2	6.6	97
6	Mid Portion of E Fill Area	114	128.3	122.5	4.9	95
7	S Portion of E Fill Area	116	128.3	122.9	6.3	95

Copies To: _____ Field Rep: Su-Kiet Lieu

Date Mailed: _____ Principal / PM: Jon Sondergaard, LEG

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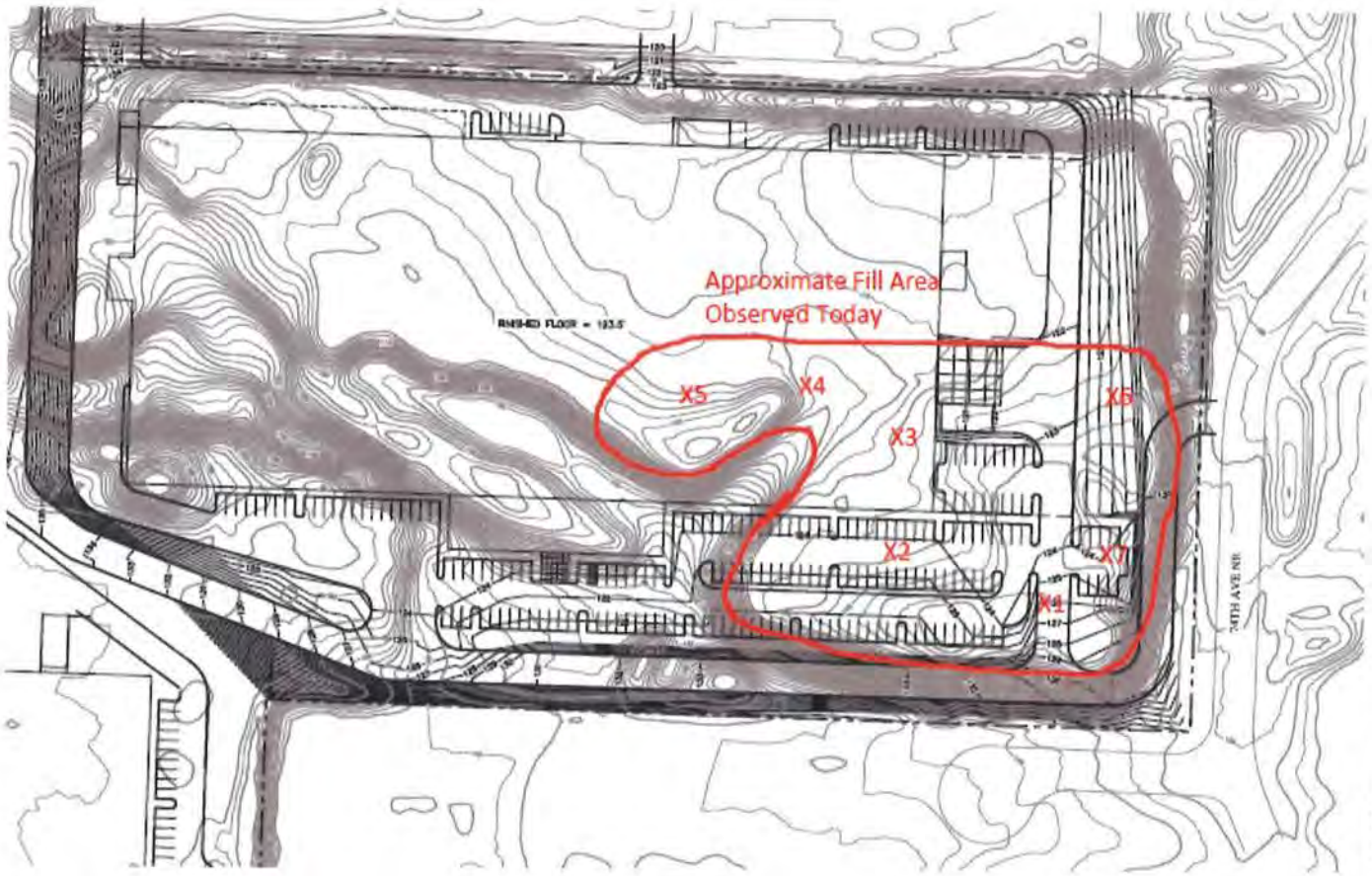
AESI FIELD REPORT

To:		Project Name:	Gayteway Business Park
Date:	16 AUG 16	Project No.:	KE150563A
Permit No.		DPD No.	



Cut/Fill Summary

Name	Cut Factor	Fill Factor	2d Area	Cut	Fill	Net
VOLUME1	1.000	1.000	877452.22 Sq. Ft.	95518.66 Cu. Yd.	78212.44 Cu. Yd.	17306.22 Cu. Yd.<Cut>
Totals			877452.22 Sq. Ft.	95518.66 Cu. Yd.	78212.44 Cu. Yd.	17306.22 Cu. Yd.<Cut>

HALF SIZE SCALE IN FEET

FULL SIZE SCALE IN FEET

Copies To:		Field Rep:	Su-Kiet Lieu
Date Mailed:		Principal / PM:	Jon Sondergaard, LEG

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Fax: 425- 827-5424
www.aesgeo.com

FIELD REPORT

Date	Project Name	Project No.
19 AUG 16	Gayteway Business Park	KE150563A
Location	**Municipality**	**Weather**
20015 67th Avenue NE	Arlington	Clear 80's
Permit No.	**DPD No.**	**Report No.**
1738		7
Engineer/Architect		
Client/Owner		
GS Venture Partners		
General Contractor/Superintendent		
USVET / Chris		
Earthwork /Superintendent		
USVET / Chris		

TO: GS Venture Partners
P.O. Box 1727
Bellevue, WA 98009-1727
ATTN: Chris Gayte

AS REQUESTED BY: Contractor

THE FOLLOWING WAS NOTED:

AESI was onsite for construction monitoring of earthwork activities. Upon our arrival, we met with Chris from USVET.

Mass Fill:

The earthwork contractor informed us they had placed fill along the middle, southeast and east areas of the site. The middle fill area was within the building footprint, the southeast fill area was under proposed parking and road areas, and the east fill area was within the proposed slope area. We observed the contractor was in the process of placing fill along the northwest portions of the site but were informed that they did not intend to compact the area until Monday. Fill material for the areas observed today consisted of a sand and gravel from the south and southwest areas of the site. The contractor informed us the fill was compacted in about 4 to 8 inch lifts with a smooth drum roller. We did not observe the compaction process. Based on the survey stakes, we estimated the fill areas observed today had been placed to an elevation between 115 and 126 feet.

The contractor informed us that they were distributing and mixing some of the soils with organics in thin lifts throughout the fill areas to prevent from concentrating organic laden soils under proposed slope areas. We observed some of the larger sized roots were separated from the fill areas.

Density Readings:

We performed five in place density readings with results that ranged from 95 to 96% of the maximum dry density, according to ASTM D 1557. We were able to penetrate from 1 to 5 inches on the compacted fill material with a 1/2 inch diameter probe rod.

Conclusions:

We informed the contractor the fill areas observed today met the 95% compaction criteria.

Reading No.	Location	Elevation (ft)	Max DD (pcf)	DD (pcf)	MC (%)	Compact (%)
1	SE Portion of SE Fill Area	121	128.3	122.6	5.7	95
2	S Portion of SE Fill Area	121	128.3	123.0	6.8	96
3	SE Portion of SE Fill Area	126	128.3	122.0	6.1	95
4	E Portion of Mid Fill Area	119	122.1	117.2	5.0	96
5	W Portion of Mid Fill Area	115	122.1	115.4	5.1	95

Copies To: _____ Field Rep: Su-Kiet Lieu

Date Mailed: _____ Principal / PM: Jon Sondergaard, LEG

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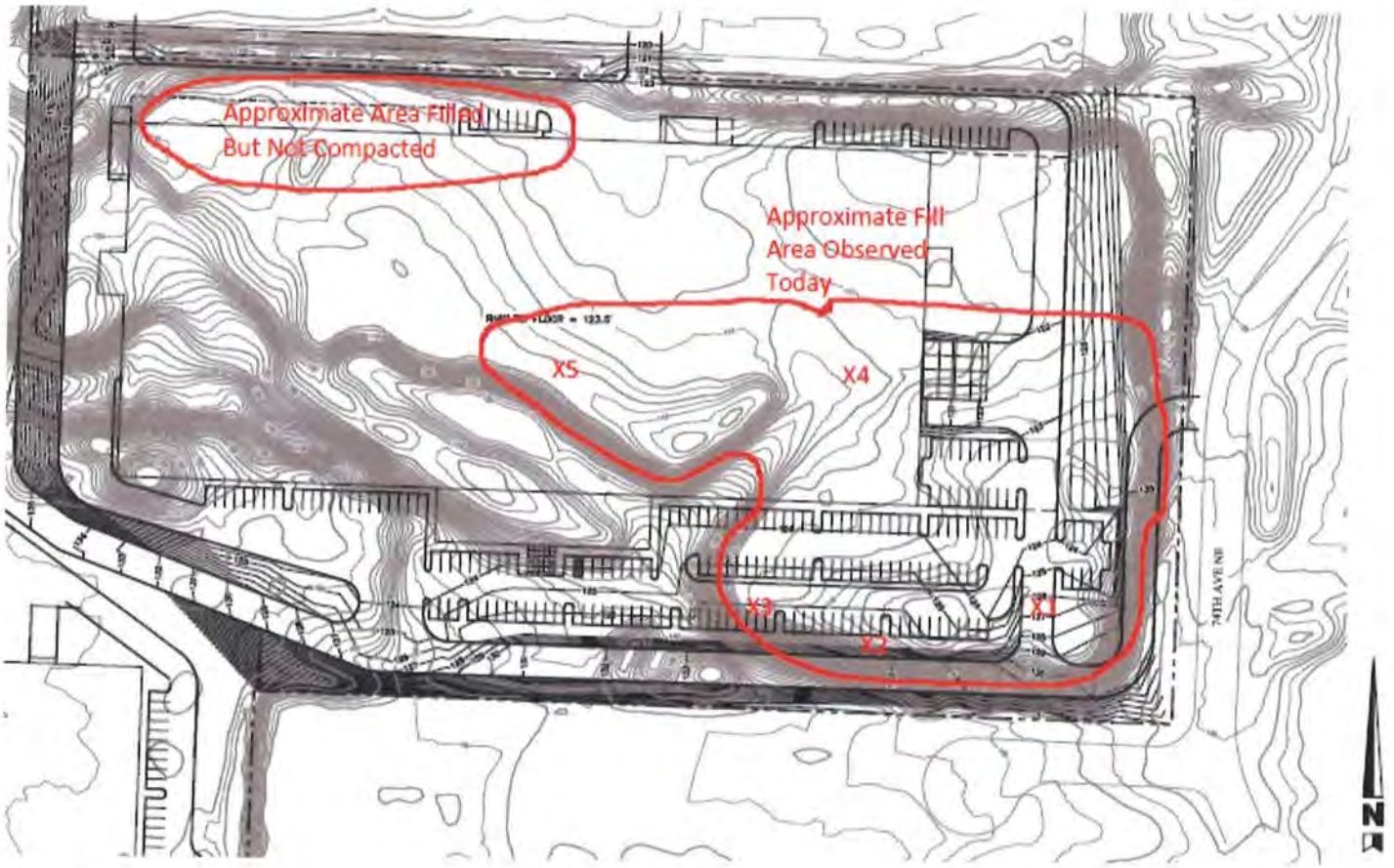
AESI FIELD REPORT

To:
Date: 19 AUG 16
Permit No.

Project Name: Gayteway Business Park
Project No.: KE150563A
DPD No.



Cut/Fill Summary

Name	Cut Factor	Fill Factor	2d Area	Cut	Fill	Net
VOLUME3	1.000	1.000	577452.22 Sq. Ft.	99518.66 Cu. Yd.	78213.44 Cu. Yd.	17106.22 Cu. Yd.<Cut>
Totals			577452.22 Sq. Ft.	99518.66 Cu. Yd.	78213.44 Cu. Yd.	17106.22 Cu. Yd.<Cut>

HALF SIZE SCALE IN FEET
FULL SIZE SCALE IN FEET

Copies To:
Date Mailed:

Field Rep: Su-Kiet Lieu
Principal / PM: Jon Sondergaard, LEG

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Kirkland, Washington 98033
Phone: 425-827-7701
Fax: 425- 827-5424
www.aesgeo.com

FIELD REPORT

Date	Project Name	Project No.
8-23-16	Gayteway Business Park	KE150563A
Location	**Municipality**	**Weather**
20015 67th Avenue NE	Arlington	Clear 80's
Permit No. 1738	**DPD No.**	**Report No.** 8
Engineer/Architect		
Client/Owner GS Venture Partners		
General Contractor/Superintendent USVET / Chris		
Earthwork /Superintendent USVET / Chris		

TO: GS Venture Partners
P.O. Box 1727
Bellevue, WA 98009-1727
ATTN: Chris Gayte

AS REQUESTED BY: Contractor

THE FOLLOWING WAS NOTED:

AESI was onsite part-time, at the request of the client, for construction monitoring of earthwork activities for the "Gayteway Business Park" project. Upon our arrival, we met with Chris from USVET.

Mass Grading

Trending generally north to south, the earthwork contractor continued mass grading processes for the proposed building pad and east parking areas. Using a large excavator, off-road dump truck, and belly load scraper assembly, the contractor placed approximately 2-3' of material (over the course of two days) near the NW and SW corners of the building area. Per prior recommendations, the material (generally brown gravelly SAND with trace silts/excavated from south margins of property) was wet to at/near optimum moisture levels (via large water truck) before being compacted/re-compacted (as recommended) in a series of 8-10" loose lifts via vibrator roller (complete process not observed). The compacted fill appeared firm/unyielding (during time of observation) with corresponding T-probe depths of 2-4" respectively. AESI conducted a series of in place density tests to confirm the specified minimum compaction for the structural area (95% ASTM 1557). The contractor was notified of all density results listed below. See Figure 1.

Density Results

Test #	Location	Depth (ft below fsg)	% Moist	Density (pcf)	Proctor (pcf)	% Compaction
DT1	Grading/See Figure 1	-6	5.3	122	128.3	95.1
DT2	Grading/See Figure 1	-6	6.1	122.6	128.3	95.6
DT3	Grading/See Figure 1	-6	6.3	123.1	128.3	95.9
DT4	Grading/See Figure 1	-6	5.8	122.5	128.3	95.5
DT5	Grading/See Figure 1	-10	6.8	122.1	128.3	95.2
DT6	Grading/See Figure 1	-10	7	122.4	128.3	95.4
DT7	Grading/See Figure 1	-10	6.6	123.2	128.3	96.0
DT8	Grading/See Figure 1	-10	7.3	122.4	128.3	95.4

Copies To: Distribution
Field Rep: Jon D. Hansen, Sr. Staff Geologist

Date Mailed: AUG 26 2016
Principal / PM: Jon Sondergaard, LEG

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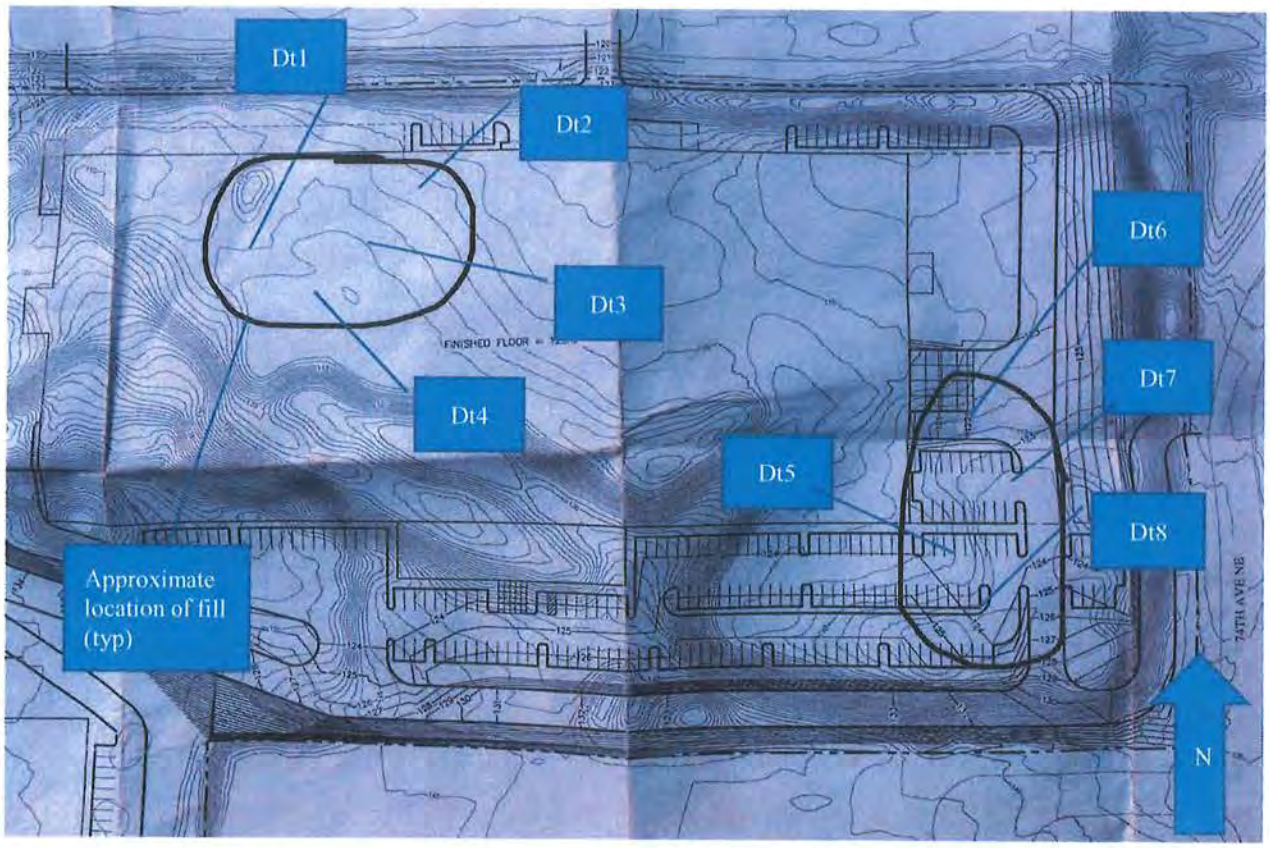
AESI FIELD REPORT

To:		Project Name:	Gayteway Business Park
Date:	8-23-16	Project No.:	KE150563A
Permit No.		DPD No.	

Figure 1



Copies To:		Field Rep:	Su-Kiet Lieu
Date Mailed:		Principal / PM:	Jon Sondergaard, LEG

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Fax: 425- 827-5424
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FIELD REPORT

Date	Project Name		Project No.
8-24-16	Gayteway Business Park		KE150563A
Location		**Municipality**	**Weather**
20015 67th Avenue NE		Arlington	Sunny 70's
Permit No.	**DPD No.**		**Report No.**
1738			9
Engineer/Architect			
Client/Owner			
GS Venture Partners			
General Contractor/Superintendent			
USVET / Chris			
Earthwork /Superintendent			
USVET / Chris			

TO: GS Venture Partners
P.O. Box 1727
Bellevue, WA 98009-1727
ATTN: Chris Gayte

AS REQUESTED BY: Contractor

THE FOLLOWING WAS NOTED:

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Density Results

Test #	Location	Depth (ft below fsg)	% Moist	Density (pcf)	Proctor (pcf)	% Compaction
DT1	Grading/See Figure 1	-4	5.1	116	122.1	95.0
DT2	Grading/See Figure 1	-4	5.5	116.7	122.1	95.6
DT3	Grading/See Figure 1	-5	6.3	116.6	122.1	95.5
DT4	Grading/See Figure 1	-5	5.7	117.1	122.1	95.9
DT5	Grading/See Figure 1	-4	5.3	116.5	122.1	95.4
DT6	Grading/See Figure 1	-4	5.8	117.3	122.1	96.1
DT7	Grading/See Figure 1	-4	5.5	116.4	122.1	95.3

Copies To: Distribution
Field Rep: Jon D. Hansen, Sr. Staff Geologist

Date Mailed: AUG 29 2016
Principal / PM: Jon Sondergaard, LEG

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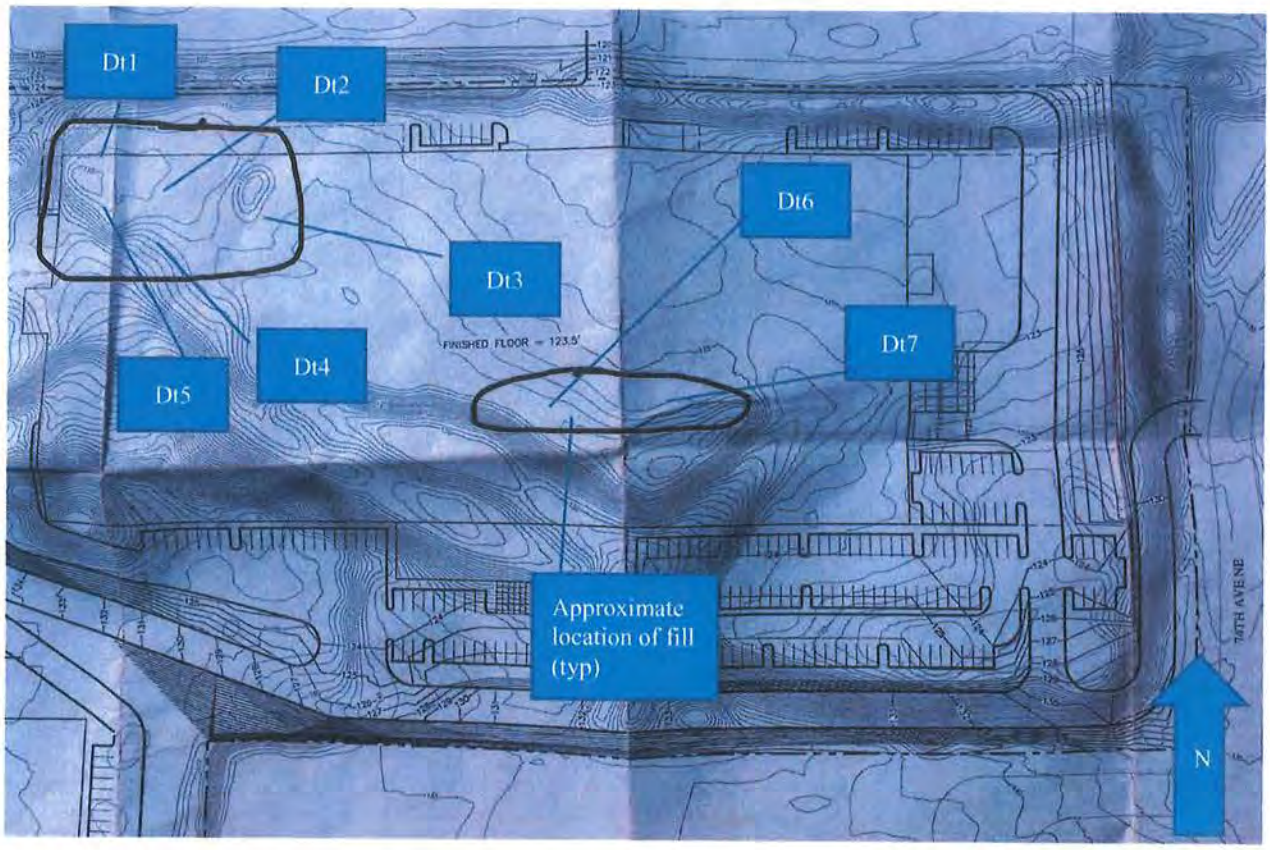
AESI FIELD REPORT

To:		Project Name:	Gayteway Business Park
Date:	8-24-16	Project No.:	KE150563A
Permit No.		DPD No.	

Figure 1



Copies To: _____ Field Rep: Su-Kiet Lieu

Date Mailed: _____ Principal / PM: Jon Sondergaard, LEG

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FIELD REPORT

Date	Project Name		Project No.
8-30-16	Gayteway Business Park		KE150563A
Location		**Municipality**	**Weather**
20015 67th Avenue NE		Arlington	Cloudy 60's
Permit No. 1738	**DPD No.**		**Report No.** 10
Engineer/Architect			
Client/Owner GS Venture Partners			
General Contractor/Superintendent USVET / Chris			
Earthwork /Superintendent USVET / Chris			

TO: GS Venture Partners
P.O. Box 1727
Bellevue, WA 98009-1727
ATTN: Chris Gayte

AS REQUESTED BY: Contractor

THE FOLLOWING WAS NOTED:

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Mass Grading

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Density Results

Test #	Location	Depth (ft below fsg)	% Moist	Density (pcf)	Proctor (pcf)	% Compaction
DT1	Grading/See Figure 1	-3	6.3	116.9	122.1	95.7
DT2	Grading/See Figure 1	-3	6	116.2	122.1	95.2
DT3	Grading/See Figure 1	-8	5.4	116.5	122.1	95.4
DT4	Grading/See Figure 1	-5	7.1	117.4	122.1	96.2
DT5	Grading/See Figure 1	-3	6.8	117	122.1	95.8
DT6	Grading/See Figure 1	-3	6.5	117.4	122.1	96.2
DT7	Grading/See Figure 1	-3	7.3	116.8	122.1	95.7
DT8	Grading/See Figure 1	-2	7.7	116.3	122.1	95.2

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Date Mailed: SEP 06 2016

Field Rep: Jon D. Hansen, Sr. Staff Geologist
Principal / PM: Jon Sondergaard, LEG

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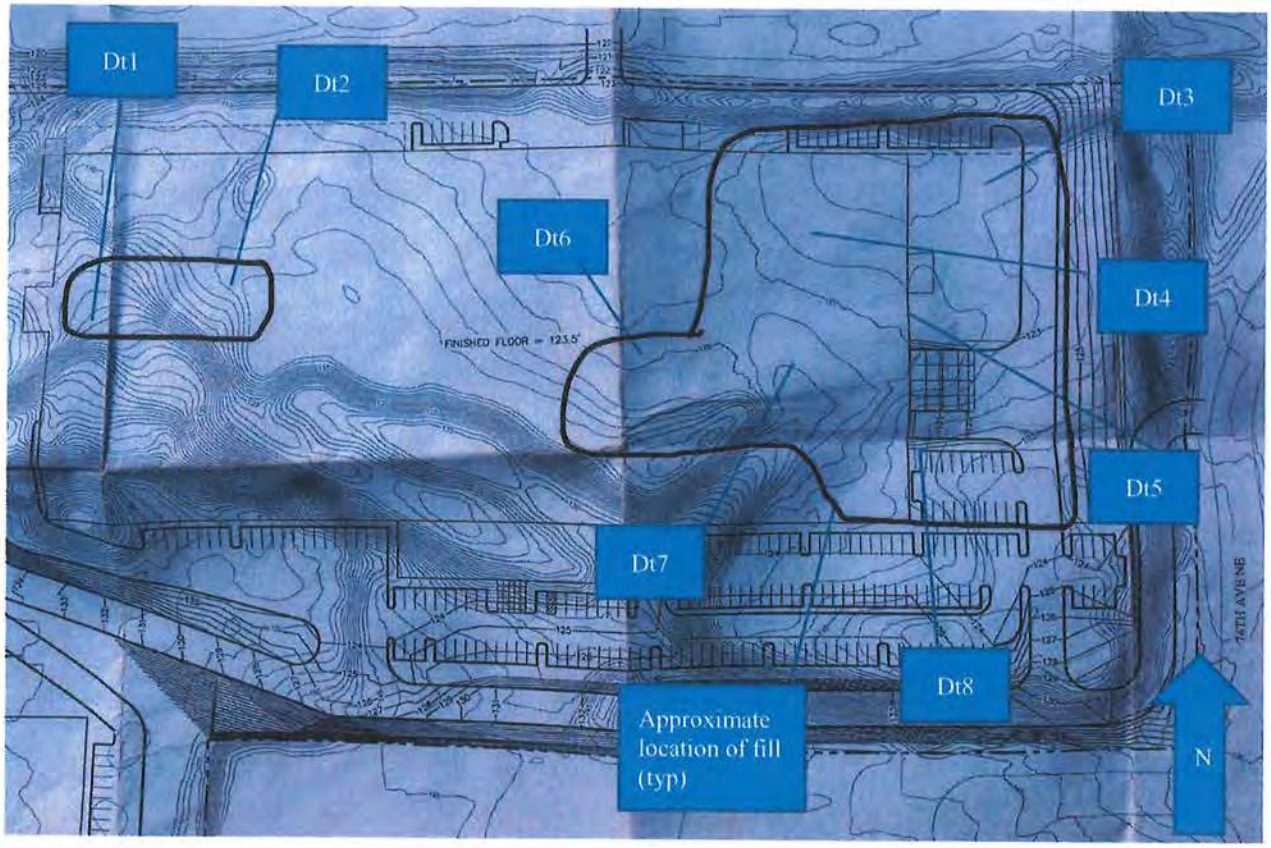
AESI FIELD REPORT

To:		Project Name:	Gayteway Business Park
Date:	8-30-16	Project No.:	KE150563A
Permit No.		DPD No.	

Figure 1



Copies To:		Field Rep:	Su-Kiet Lieu
Date Mailed:		Principal / PM:	Jon Sondergaard, LEG

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FIELD REPORT

Date	Project Name		Project No.
9-1-16	Gayteway Business Park		KE150563A
Location 20015 67th Avenue NE		**Municipality** Arlington	**Weather** Cloudy 60's
Permit No. 1738	**DPD No.**		**Report No.** 11
Engineer/Architect			
Client/Owner GS Venture Partners			
General Contractor/Superintendent USVET / Chris			
Earthwork /Superintendent USVET / Chris			

TO: GS Venture Partners
P.O. Box 1727
Bellevue, WA 98009-1727
ATTN: Chris Gayte

AS REQUESTED BY: Contractor

THE FOLLOWING WAS NOTED:

AESI was onsite part-time, at the request of the client, for construction monitoring of earthwork activities for the "Gayteway Business Park" project. Upon our arrival, we met with Chris from USVET.

Mass Grading

Trending generally north to south, the earthwork contractor continued mass grading processes for the proposed building pad and east parking areas. Using a large excavator, off-road dump truck, and belly load scraper assembly, the contractor placed approximately 2-3' of material (from previous site to now) near the NW and SE portions of the building area. Per prior recommendations, the material (generally brownish gray SAND with trace silts and gravels/excavated from southwest margins of property) was wet to at/near optimum moisture levels (via large water truck) before being compacted/re-compacted (as recommended) in a series of 8-10" loose lifts via vibrator roller (complete process not observed). The compacted fill appeared firm/unyielding (during time of observation) with corresponding T-probe depths of 2-4" respectively. AESI conducted a series of in place density tests to confirm the specified minimum compaction for the structural area (95% ASTM 1557). The contractor was notified of all density results listed below. See Figure 1.

Density Results

Test #	Location	Depth (ft below fsg)	% Moist	Density (pcf)	Proctor (pcf)	% Compaction
DT1	Grading/See Figure 1	-3	6.4	117.1	122.1	95.9
DT2	Grading/See Figure 1	-3	6.9	118.3	122.1	96.9
DT3	Grading/See Figure 1	-3	7.3	117.5	122.1	96.2
DT4	Grading/See Figure 1	-2	7	116.3	122.1	95.2
DT5	Grading/See Figure 1	-2	5.7	116	122.1	95.0
DT6	Grading/See Figure 1	-5	5.1	116.4	122.1	95.3
DT7	Grading/See Figure 1	-2	5.4	116.3	122.1	95.2

*Depths based on available hub elevation data

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Field Rep: Jon D. Hansen, Sr. Staff Geologist
Date Mailed: SEP 15 2016
Principal / PM: Jon Sondergaard, LEG

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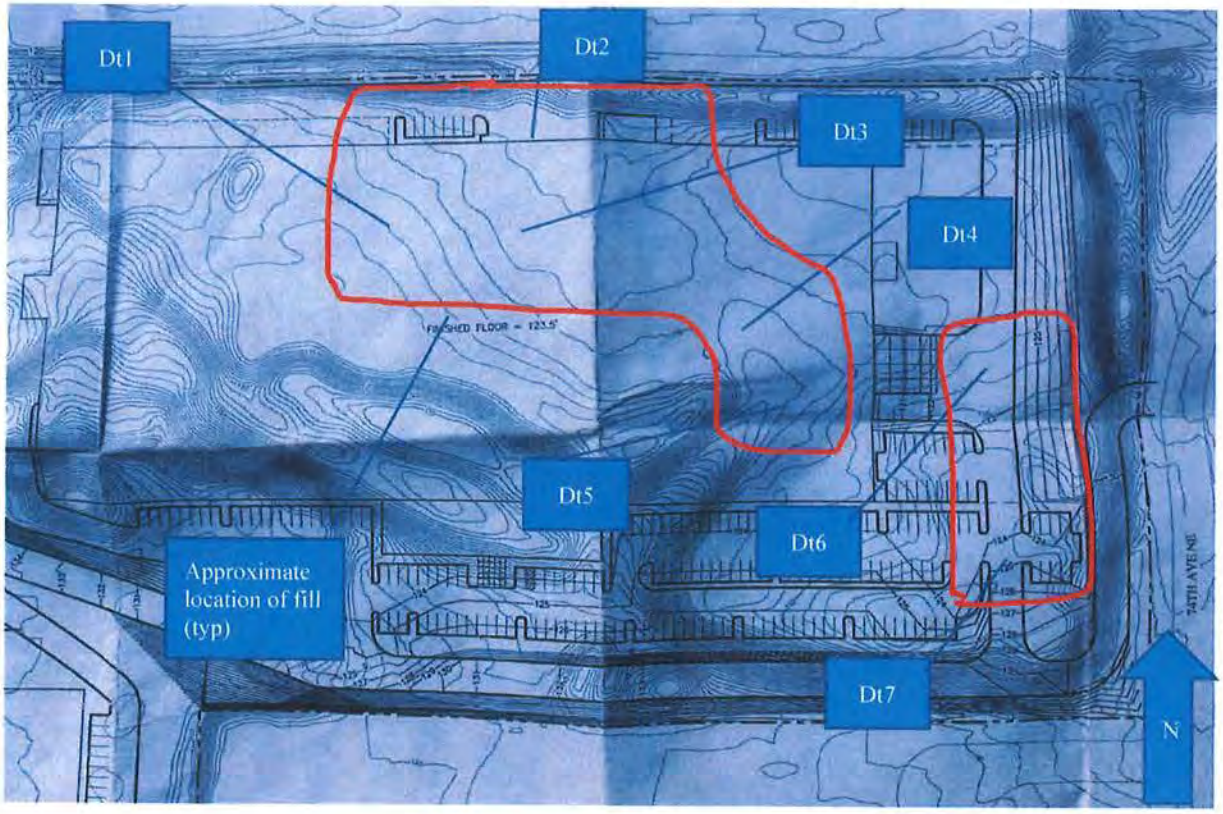
AESI FIELD REPORT

To:		Project Name:	Gayteway Business Park
Date:	8-30-16	Project No.:	KE150563A
Permit No.		DPD No.	

Figure 1



Copies To: _____ Field Rep: ~~Submission~~ Jon Hansen

Date Mailed: _____ Principal / PM: Jon Sondergaard, LEG

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FIELD REPORT

Date	Project Name	Project No.
9-6-16	Gayteway Business Park	KE150563A
Location	**Municipality**	**Weather**
20015 67th Avenue NE	Arlington	Cloudy 60's
Permit No. 1738	**DPD No.**	**Report No.** 12
Engineer/Architect		
Client/Owner GS Venture Partners		
General Contractor/Superintendent USVET / Chris		
Earthwork /Superintendent USVET / Chris		

TO: GS Venture Partners
P.O. Box 1727
Bellevue, WA 98009-1727
ATTN: Chris Gayte

AS REQUESTED BY: Contractor

THE FOLLOWING WAS NOTED:

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Mass Grading

Trending generally north to south, the earthwork contractor continued mass grading processes for the proposed building pad and east parking areas. Using a large excavator, off-road dump truck, and belly load scraper assembly, the contractor placed approximately 1-2' of material (from previous site to now) near the NW and SE portions of the building area. Per prior recommendations, the material (generally brownish gray SAND with trace silts and gravels/excavated from southwest margins of property) was wet to at/near optimum moisture levels (via large water truck) before being compacted/re-compacted (as recommended) in a series of 8-10" loose lifts via vibrator roller (complete process not observed). The compacted fill appeared firm/unyielding (during time of observation) with corresponding T-probe depths of 3-4" respectively. AESI conducted a series of in place density tests to confirm the specified minimum compaction for the structural area (95% ASTM 1557). The contractor was notified of all density results listed below. See Figure 1.

Density Results

Test #	Location	Depth (ft below fsg)	% Moist	Density (pcf)	Proctor (pcf)	% Compaction
DT1	Grading/See Figure 1	-3	6.6	117.2	122.1	96.0
DT2	Grading/See Figure 1	-3	7.1	117	122.1	95.8
DT3	Grading/See Figure 1	-3	6.3	116.3	122.1	95.2
DT4	Grading/See Figure 1	-3	5.7	116.1	122.1	95.1
DT5	Grading/See Figure 1	-3	6.4	117.2	122.1	96.0
DT6	Grading/See Figure 1	-2	5.3	116.8	122.1	95.7
DT7	Grading/See Figure 1	-1	5.5	118.2	122.1	96.8
DT8	Grading/See Figure 1	-1	5.8	117.4	122.1	96.2
DT9	Grading/See Figure 1	-1	6.6	117.9	122.1	96.6

*Depths based on available in-field elevation data

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Date Mailed: SEP 15 2016

Field Rep: Jon D. Hansen, Sr. Staff Geologist
Principal / PM: Jon Sondergaard, LEG

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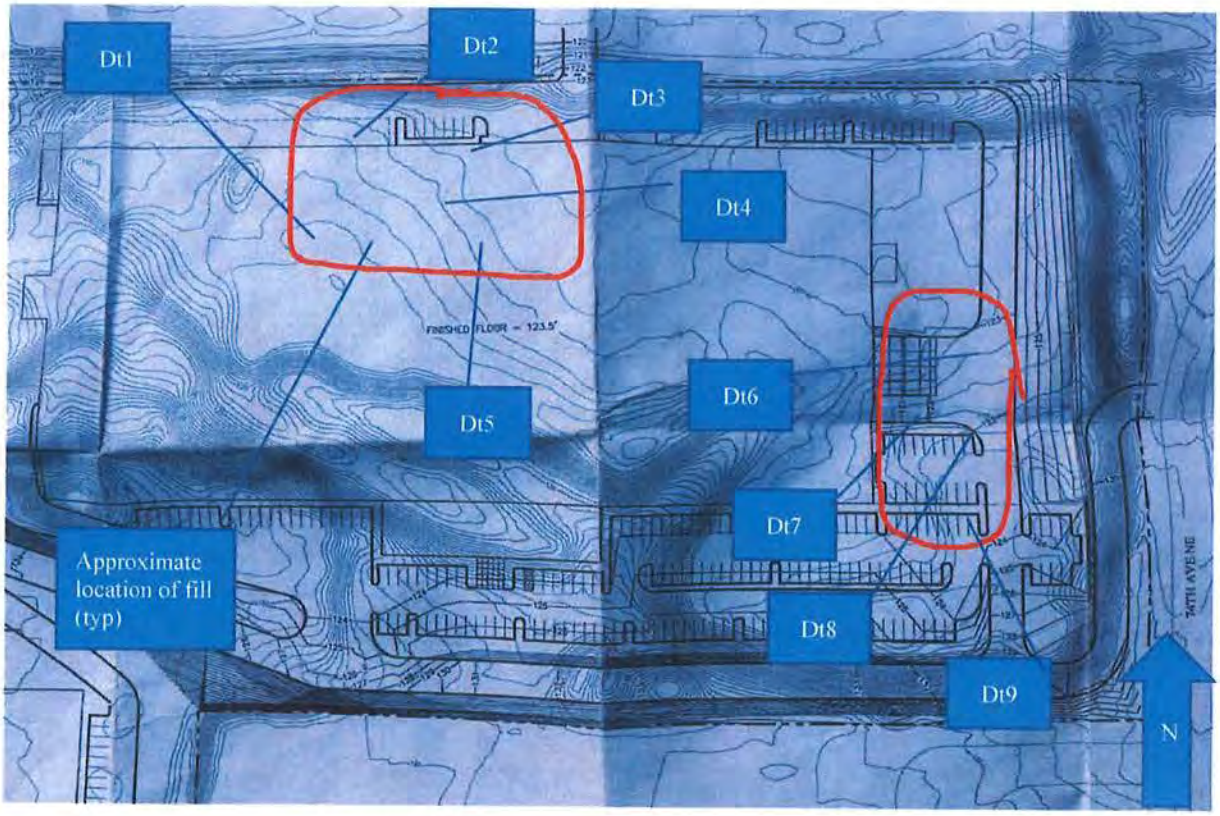
AESI FIELD REPORT

To:		Project Name:	Gayteway Business Park
Date:	9-6-16	Project No.:	KE150563A
Permit No.		DPD No.	

Figure 1



Copies To:		Field Rep:	[redacted] Jon Hanken
Date Mailed:		Principal / PM:	Jon Sondergaard, LEG

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FIELD REPORT

Date	Project Name		Project No.
9-8-16	Gayteway Business Park		KE150563A
Location 20015 67th Avenue NE		**Municipality** Arlington	**Weather** Cloudy 60's
Permit No. 1738	**DPD No.**		**Report No.** 13
Engineer/Architect			
Client/Owner GS Venture Partners			
General Contractor/Superintendent USVET / Chris			
Earthwork /Superintendent USVET / Chris			

TO: GS Venture Partners
P.O. Box 1727
Bellevue, WA 98009-1727
ATTN: Chris Gayte

AS REQUESTED BY: Contractor

THE FOLLOWING WAS NOTED:

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Density Results

Test #	Location	Depth (ft below fsg)	% Moist	Density (pcf)	Proctor (pcf)	% Compaction
DT1	Grading/See Figure 1	-1	7.1	116.2	122.1	95.2
DT2	Grading/See Figure 1	-1	7.7	116	122.1	95.0
DT3	Grading/See Figure 1	-2	5.8	117.4	122.1	96.2
DT4	Grading/See Figure 1	-2	6.2	118.3	122.1	96.9
DT5	Grading/See Figure 1	-2	6	118.1	122.1	96.7
DT6	Grading/See Figure 1	-4	7.1	116.6	122.1	95.5
DT7	Grading/See Figure 1	-4	7.3	117.1	122.1	95.9

*Depths based on available in-field elevation data

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Date Mailed: SEP 15 2016
Field Rep: Jon D. Hansen, Sr. Staff Geologist
Principal / PM: Jon Sondergaard, LEG

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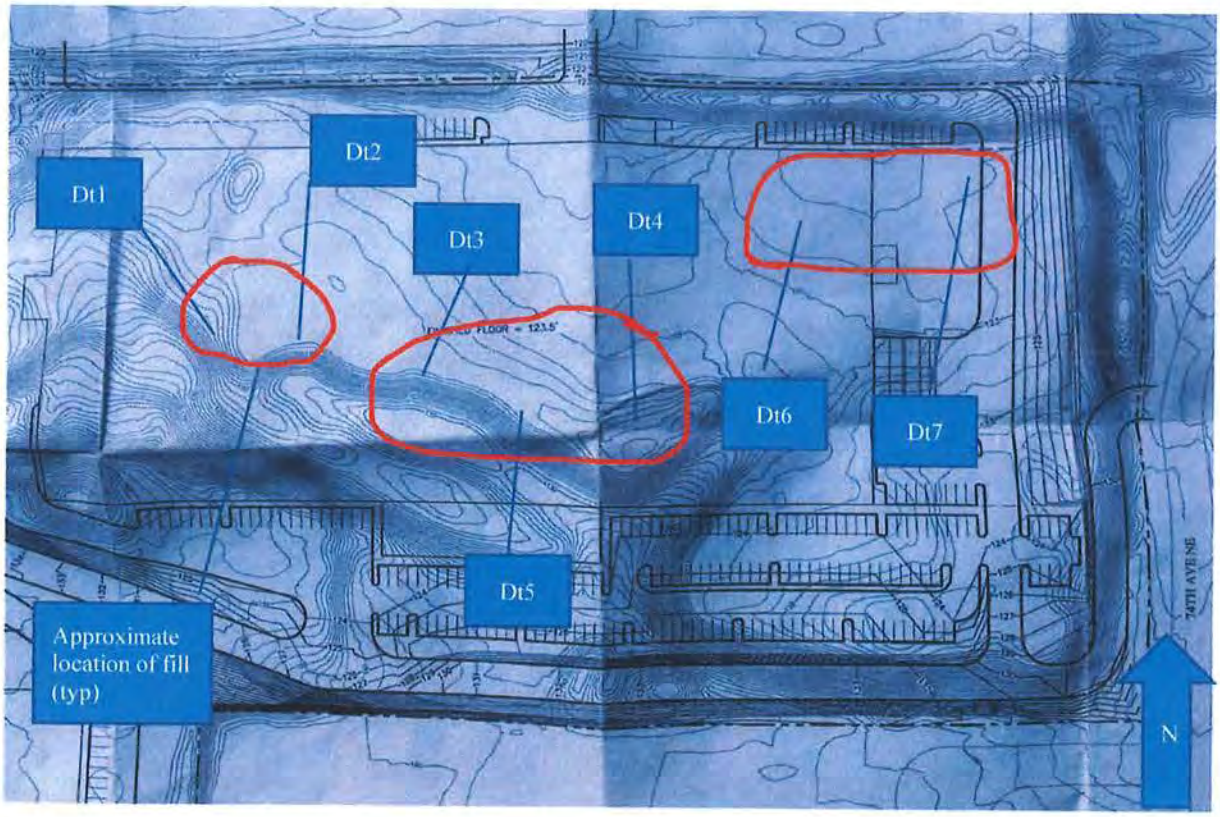
AESI FIELD REPORT

To:		Project Name:	Gayteway Business Park
Date:	9-8-16	Project No.:	KE150563A
Permit No.		DPD No.	

Figure 1



Copies To:

Field Rep: ~~Stanley Lieu~~ Jon Hansen

Date Mailed:

Principal / PM: Jon Sondergaard, LEG

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Kirkland, Washington 98033
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Fax: 425- 827-5424
www.aesgeo.com

FIELD REPORT

Date	Project Name		Project No.
9-13-16	Gayteway Business Park		KE150563A
Location		**Municipality**	**Weather**
20015 67th Avenue NE		Arlington	Sunny 60's
Permit No. 1738	**DPD No.**		**Report No.** 14
Engineer/Architect			
Client/Owner GS Venture Partners			
General Contractor/Superintendent USVET / Chris			
Earthwork /Superintendent USVET / Chris			

TO: GS Venture Partners
P.O. Box 1727
Bellevue, WA 98009-1727
ATTN: Chris Gayte

AS REQUESTED BY: Contractor

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Density Results

Test #	Location	Depth (ft below fsg)	% Moist	Density (pcf)	Proctor (pcf)	% Compaction
DT1	Grading/See Figure 1	-3	6.3	117.7	122.1	96.4
DT2	Grading/See Figure 1	-3	6.1	116.8	122.1	95.7
DT3	Grading/See Figure 1	-3	5.4	116	122.1	95.0
DT4	Grading/See Figure 1	-4	6.8	116.3	122.1	95.2
DT5	Grading/See Figure 1	-4	7.2	117.4	122.1	96.2
DT6	Grading/See Figure 1	-4	7	117.9	122.1	96.6

*Depths based on available in-field elevation data

Copies To: Distribution
Field Rep: Jon D. Hansen, Sr. Staff Geologist
Date Mailed: SEP 15 2016
Principal / PM: Jon Sondergaard, LEG

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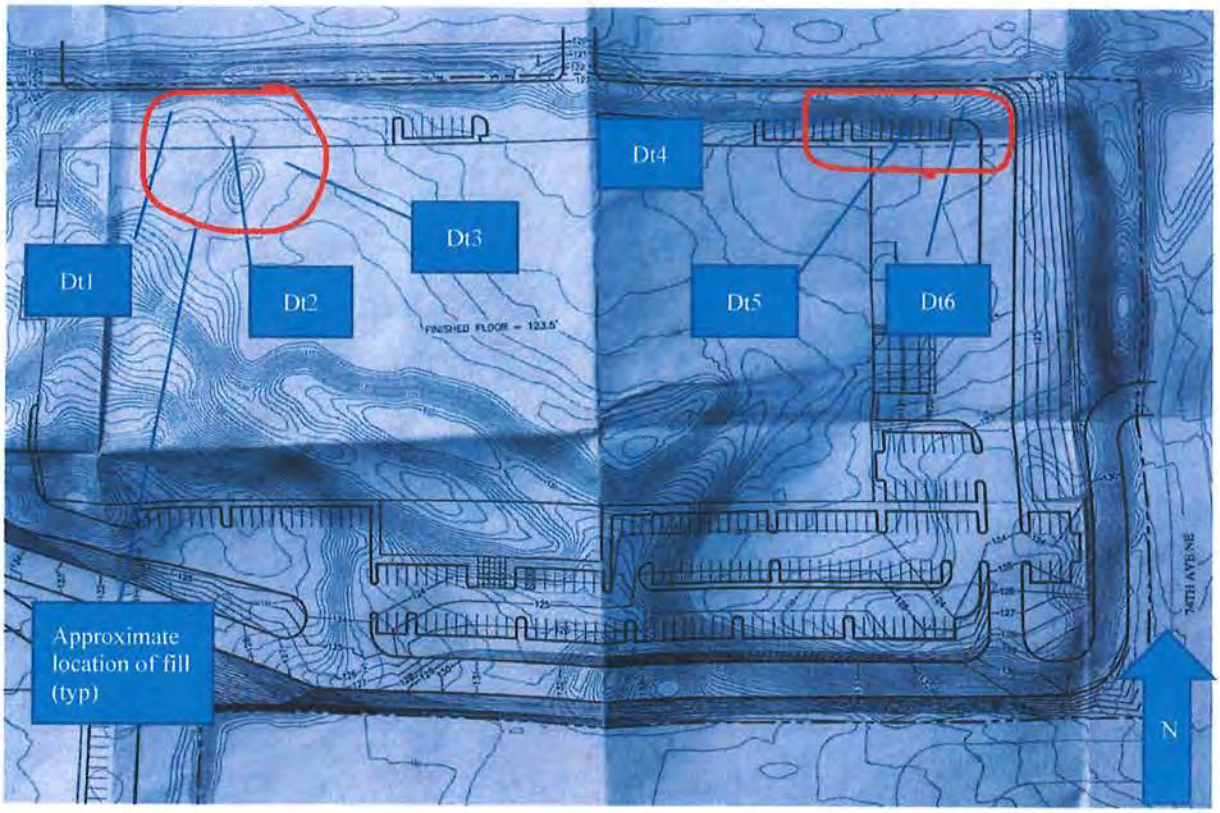
AESI FIELD REPORT

To:		Project Name:	Gayteway Business Park
Date:	9-13-16	Project No.:	KE150563A
Permit No.		DPD No.	

Figure 1



Copies To:		Field Rep:	[redacted] Jon Hansen
Date Mailed:		Principal / PM:	Jon Sondergaard, LEG

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Kirkland, Washington 98033
Phone: 425-827-7701
Fax: 425- 827-5424
www.aesgeo.com

FIELD REPORT

Date	Project Name		Project No.
23 SEP 16	Gayteway Business Park		KE150563A
Location		**Municipality**	**Weather**
20015 67th Avenue NE		Arlington	Cloudy 70's
Permit No. 1738	**DPD No.**		**Report No.** 15
Engineer/Architect			
Client/Owner			
GS Venture Partners			
General Contractor/Superintendent			
USVET / Chris			
Earthwork /Superintendent			
USVET / Chris			

TO: GS Venture Partners
P.O. Box 1727
Bellevue, WA 98009-1727
ATTN: Chris Gayte

AS REQUESTED BY: Contractor

THE FOLLOWING WAS NOTED:

AESI was onsite for construction monitoring of earthwork activities. Upon our arrival, we met with Chris from USVET.

Mass Fill:

The earthwork contractor informed us they had placed fill along the south portion of the site that encompassed part of the building footprint and the proposed south parking areas. The contractor also informed us the fill placed along the south portion of the site was about 0.5 feet below the proposed subgrade elevation from east to west. Fill material for the area observed today consisted of a sand, and a sand and gravel from the south and southwest cut areas of the site. The contractor informed us the fill was compacted in about 4 to 8 inch lifts with a smooth drum roller. We did not observe the compaction process.

Density Readings:

We performed nine in place density readings with results that ranged from 95 to 99% of the maximum dry density, according to ASTM D 1557. We were able to penetrate from 1 to 5 inches on the compacted fill material with a 1/2 inch diameter probe rod.

Conclusions:

We informed the contractor the fill areas observed today met the 95% compaction criteria.

Reading No.	Location	Elevation (ft)	Max DD (pcf)	DD (pcf)	MC (%)	Compact (%)
1	E Portion of S Fill Area	124	128.3	127.4	6.6	99
2	Mid E Portion of S Fill Area	124	128.3	123.5	6.8	96
3	E Mid Portion of S Fill Area	124	122.1	115.7	5.9	95
4	Mid Portion of S Fill Area	124	122.1	115.7	6.1	95
5	W Mid Portion of S Fill Area	124	103.5	102.7	9.2	99
6	Mid W Portion of S Fill Area	124	122.1	116.5	6.5	95
7	NW Portion of S Fill Area	122	103.5	97.9	10.2	95
8	N Portion of S Fill Area	124	122.1	115.4	5.7	95
9	S Portion of S Fill Area	124	122.1	117.2	5.3	96

Copies To:

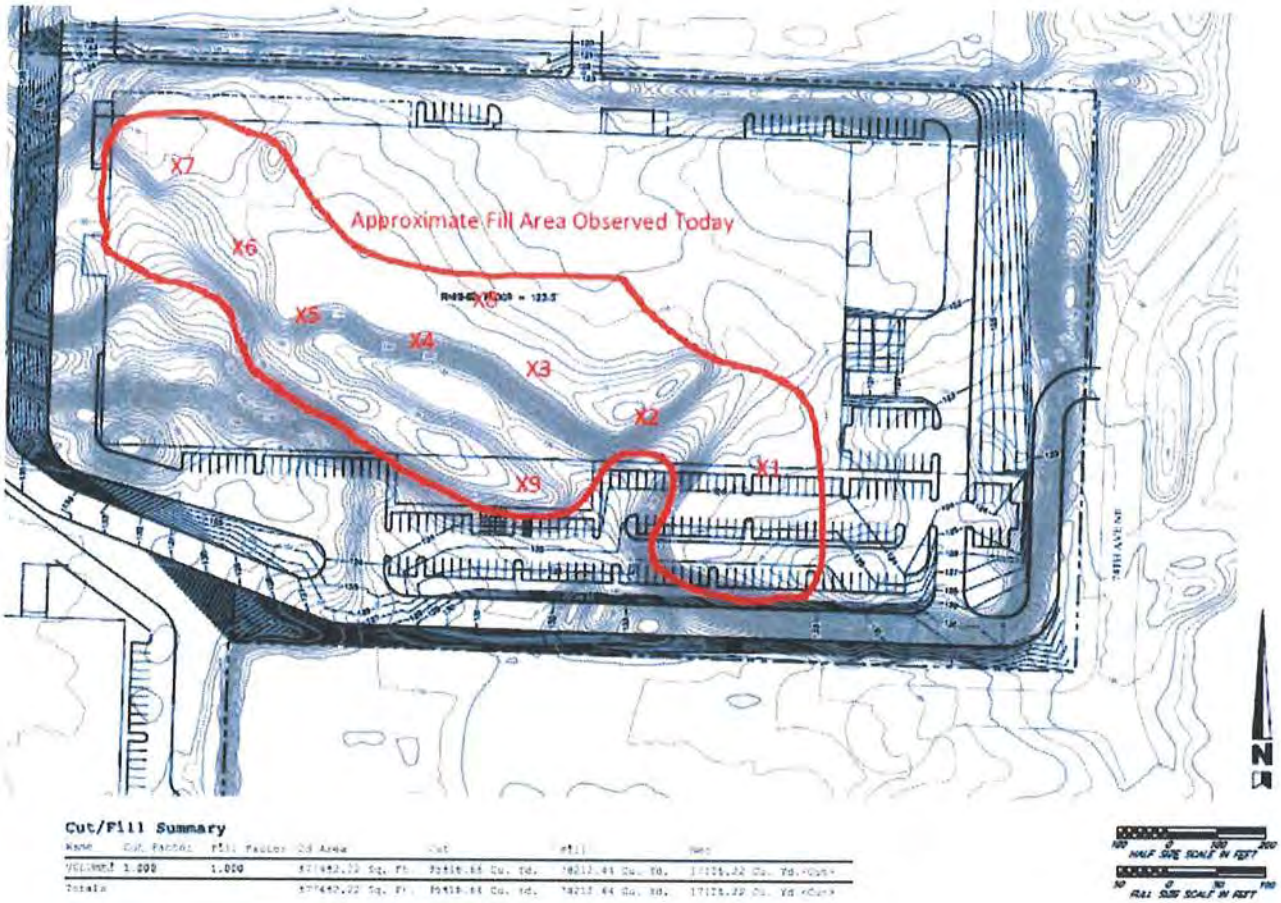
Field Rep: Su-Kiet Lieu

Date Mailed: SEP 27 2016

Principal / PM: Jon Sondergaard, LEG

AESI FIELD REPORT

To:		Project Name:	Gayteway Business Park
Date:	23 SEP 16	Project No.:	KE150563A
Permit No.		DPD No.	



Cut/Fill Summary

Name	Cut Factor	Fill Factor	2D Area	Cut	Fill	Net
Volume1	1.000	1.000	577452.22 Sq. Ft.	35418.66 Cu. Yd.	18213.44 Cu. Yd.	17125.22 Cu. Yd. <Cut>
Totals			577452.22 Sq. Ft.	35418.66 Cu. Yd.	18213.44 Cu. Yd.	17125.22 Cu. Yd. <Cut>

Copies To:		Field Rep:	Su-Kiet Lieu
Date Mailed:		Principal / PM:	Jon Sondergaard, LEG

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FIELD REPORT

Date	Project Name		Project No.
28 SEP 16	Gayteway Business Park		KE150563A
Location		**Municipality**	**Weather**
20015 67th Avenue NE		Arlington	Clear 70's
Permit No. 1738	**DPD No.**		**Report No.** 16
Engineer/Architect			
Client/Owner GS Venture Partners			
General Contractor/Superintendent USVET / Chris			
Earthwork /Superintendent USVET / Chris			

TO: GS Venture Partners
P.O. Box 1727
Bellevue, WA 98009-1727
ATTN: Chris Gayte

AS REQUESTED BY: Contractor

THE FOLLOWING WAS NOTED:

AESI was onsite for construction monitoring of earthwork activities. Upon our arrival, we met with Chris from USVET.

Mass Fill:

The earthwork contractor informed us they had placed fill along the northwest quarter of the proposed building to the proposed subgrade elevation. Fill material for the area observed today consisted of a sand, and a sand and gravel from the south and southwest cut areas of the site. The contractor informed us the fill was compacted in about 4 to 8 inch lifts with a smooth drum roller. We did not observe the compaction process.

Density Readings:

We performed four in place density readings with results that ranged from 95 to 98% of the maximum dry density, according to ASTM D 1557. We were able to penetrate from 1 to 5 inches on the compacted fill material with a 1/2 inch diameter probe rod.

Conclusions:

We informed the contractor the fill areas observed today met the 95% compaction criteria.

Reading No.	Location	Elevation (ft)	Max DD (pcf)	DD (pcf)	MC (%)	Compact (%)
1	E Portion of NW Bldg Area	124	118.5	112.1	5.7	95
2	Mid E Portion of NW Bldg Area	124	128.3	125.8	4.1	98
3	Mid W Portion of NW Bldg Area	124	128.3	124.8	4.9	97
4	W Portion of NW Bldg Area	124	128.3	121.3	5.8	95

Copies To:

Field Rep: Su-Kiet Lieu

Date Mailed: OCT 04 2016

Principal / PM: Jon Sondergaard, LEG

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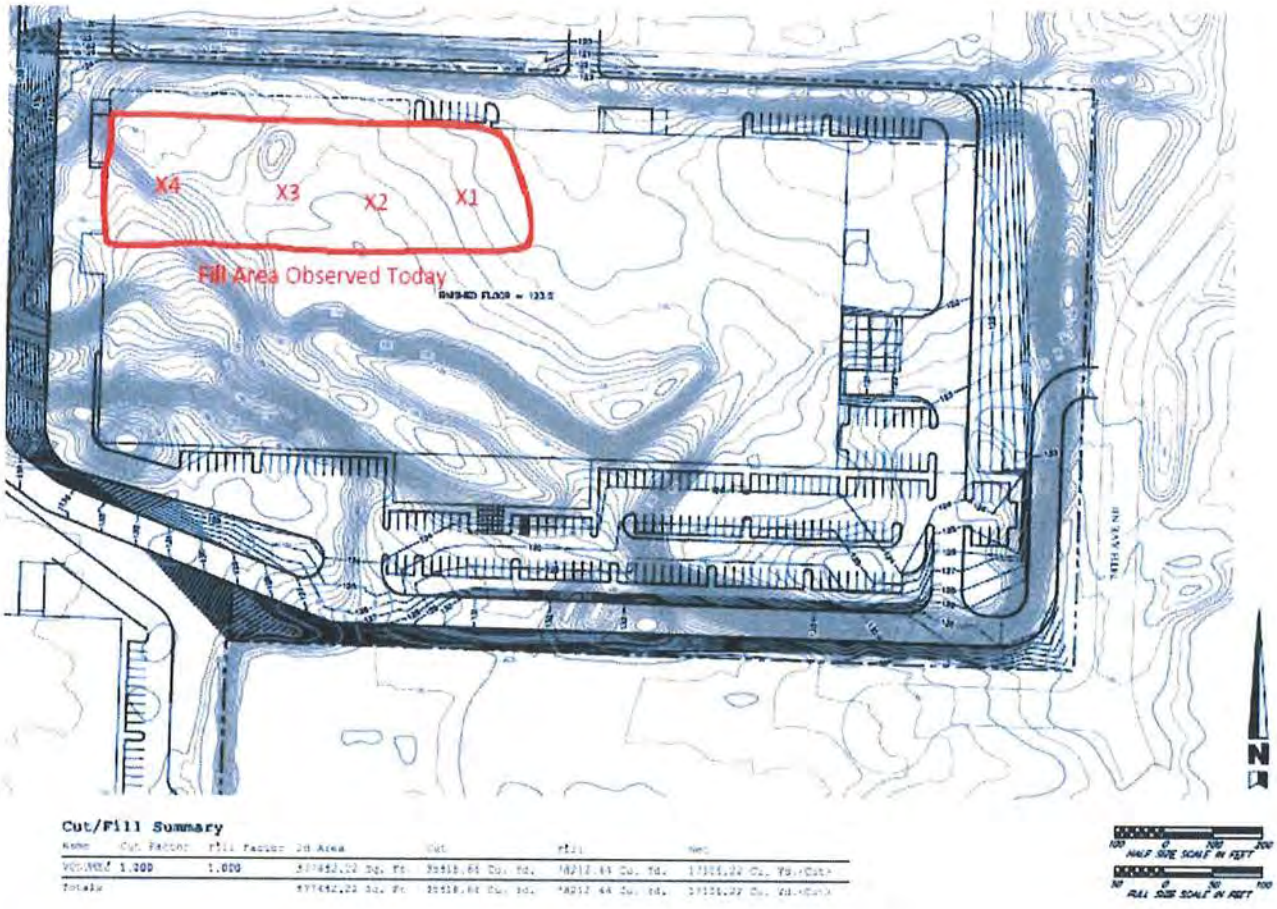
AESI FIELD REPORT

To:		Project Name:	Gayteway Business Park
Date:	28 SEP 16	Project No.:	KE150563A
Permit No.		DPD No.	



Cut/Fill Summary

Name	Cut Factor	Fill Factor	2D Area	Cut	Fill	Net
Volume 1	1.000	1.000	577452.22 Sq. Ft.	35518.64 Cu. Yd.	78212.64 Cu. Yd.	17306.22 Cu. Yd. (Cut)
Totals			577452.22 Sq. Ft.	35518.64 Cu. Yd.	78212.64 Cu. Yd.	17306.22 Cu. Yd. (Cut)

Copies To: _____ Field Rep: Su-Kiet Lieu

Date Mailed: _____ Principal / PM: Jon Sondergaard, LEG

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FIELD REPORT

Date	Project Name	Project No.
3 OCT 16	Gayteway Business Park	KE150563A
Location	**Municipality**	**Weather**
20015 67th Avenue NE	Arlington	Clear 70's
Permit No. 1738	**DPD No.**	**Report No.** 17
Engineer/Architect		
Client/Owner GS Venture Partners		
General Contractor/Superintendent USVET / Chris		
Earthwork /Superintendent USVET / Chris		

TO: GS Venture Partners
P.O. Box 1727
Bellevue, WA 98009-1727
ATTN: Chris Gayte

AS REQUESTED BY: Contractor

THE FOLLOWING WAS NOTED:

AESI was onsite for construction monitoring of earthwork activities. Upon our arrival, we met with Chris from USVET.

Mass Fill:

The earthwork contractor informed us they had placed fill along the driveway area west of the building to the proposed subgrade elevation. Fill material for the area observed today consisted of a sand, and a sand and gravel from the south and southwest cut areas of the site. The contractor informed us the fill was compacted in about 4 to 8 inch lifts with a smooth drum roller. We did not observe the compaction process.

Density Readings:

We performed three in place density readings with results that ranged from 96 to 98% of the maximum dry density, according to ASTM D 1557. We were able to penetrate from 1 to 5 inches on the compacted fill material with a 1/2 inch diameter probe rod.

Conclusions:

We informed the contractor the fill areas observed today met the 95% compaction criteria.

Reading No.	Location	Elevation (ft)	Max DD (pcf)	DD (pcf)	MC (%)	Compact (%)
1	Mid Portion of W Driveway Area	124	128.3	123.5	8.5	96
2	Mid N Portion of W Driveway Area	124	128.3	124.4	4.7	97
3	N Portion of W Driveway Area	124	103.5	101.5	7.2	98

Copies To:

Date Mailed: OCT 06 2016

Field Rep: Su-Kiet Lieu

Principal / PM: Jon Sondergaard, LEG

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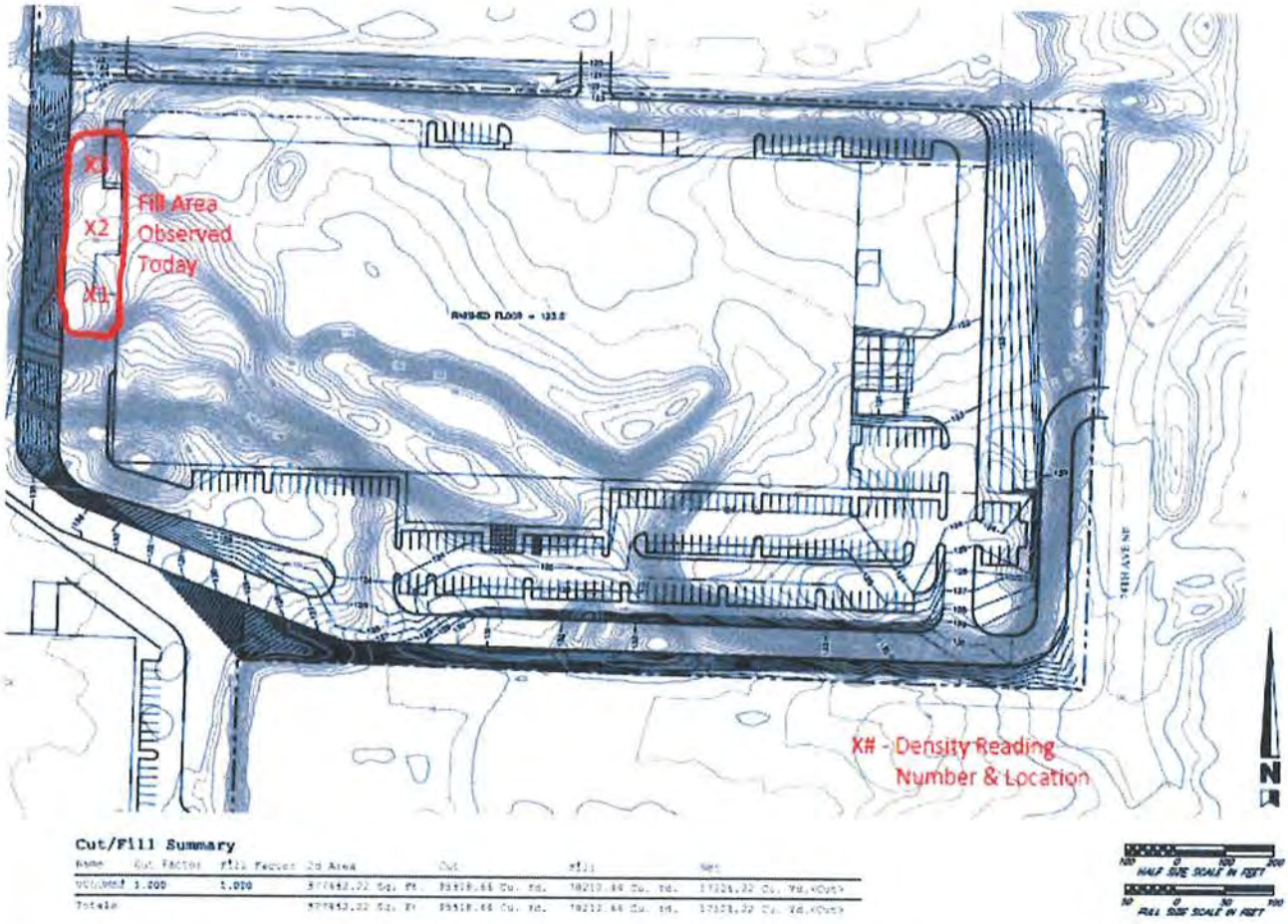
AESI FIELD REPORT

To: _____ Project Name: Gayteway Business Park

Date: 3 OCT 16 Project No.: KE150563A

Permit No. _____ DPD No. _____



Cut/Fill Summary

Name	Cut Factor	Fill Factor	2d Area	Cut	Fill	Net
Volume4	1.000	1.000	577452.22 Sq. Ft.	59518.66 Cu. Yd.	78212.66 Cu. Yd.	17328.22 Cu. Yd.<Cut>
Totals			577452.22 Sq. Ft.	59518.66 Cu. Yd.	78212.66 Cu. Yd.	17328.22 Cu. Yd.<Cut>

HALF SIZE SCALE IN FEET

FULL SIZE SCALE IN FEET

Copies To: _____ Field Rep: Su-Kiet Lieu

Date Mailed: _____ Principal / PM: Jon Sondergaard, LEG

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FIELD REPORT

Date	Project Name		Project No.
5 OCT 16	Gayteway Business Park		KE150563A
Location 20015 67th Avenue NE		**Municipality** Arlington	**Weather** Clear 70's
Permit No. 1738	**DPD No.**		**Report No.** 18
Engineer/Architect			
Client/Owner GS Venture Partners			
General Contractor/Superintendent USVET / Chris			
Earthwork /Superintendent USVET / Chris			

TO: GS Venture Partners
P.O. Box 1727
Bellevue, WA 98009-1727
ATTN: Chris Gayte

AS REQUESTED BY: Contractor

THE FOLLOWING WAS NOTED:

AESI was onsite for construction monitoring of earthwork activities. Upon our arrival, we met with Chris from USVET.

Mass Fill:

The earthwork contractor informed us they had placed fill along the driveway area north of the building to about 2 feet below the proposed subgrade elevation, and the east portion of the building pad to about 1 foot below the proposed subgrade elevation. Fill material for the area observed today consisted of a sand, and a sand and gravel from the south and southwest cut areas of the site. The contractor compacted the fill in about 4 to 8 inch lifts with a smooth drum roller.

Density Readings:

We performed eight in place density readings with results that ranged from 96 to 98% of the maximum dry density, according to ASTM D 1557. We were able to penetrate from 1 to 5 inches on the compacted fill material with a 1/2 inch diameter probe rod.

Conclusions:

We informed the contractor the fill areas observed today met the 95% compaction criteria.

Reading No.	Location	Elevation (ft)	Max DD (pcf)	DD (pcf)	MC (%)	Compact (%)
1	W Portion of N Driveway Area	122	128.3	125.8	5.2	98
2	Mid W Portion of N Driveway Area	122	128.3	125.6	7.1	98
3	Mid Portion of N Driveway Area	122	122.1	115.4	5.9	95
4	NE Portion of E Building Area	123	128.3	124.2	6.3	97
5	E Portion of E Building Area	124	128.3	124.8	6.2	97
6	N Portion of E Building Area	124	128.3	124.1	4.7	97
7	NW Portion of E Building Area	123	122.1	117.6	7.5	96
8	W Portion of E Building Area	123	128.3	124.0	4.4	97

Copies To: _____ Field Rep: Su-Kiet Lieu

Date Mailed: OCT 06 2016 Principal / PM: Jon Sondergaard, LEG

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FIELD REPORT

Date	Project Name		Project No.
10 OCT 16	Gayteway Business Park		KE150563A
Location		**Municipality**	**Weather**
20015 67th Avenue NE		Arlington	Clear 70's
Permit No. 1738	**DPD No.**		**Report No.** 19
Engineer/Architect			
Client/Owner			
GS Venture Partners			
General Contractor/Superintendent			
USVET / Chris			
Earthwork /Superintendent			
USVET / Chris			

TO: GS Venture Partners
P.O. Box 1727
Bellevue, WA 98009-1727
ATTN: Chris Gayte

AS REQUESTED BY: Contractor

THE FOLLOWING WAS NOTED:

AESI was onsite for construction monitoring of earthwork activities. Upon our arrival, we met with Chuck from USVET.

Mass Fill:

The earthwork contractor informed us they had placed fill along the east side of the building to about 1 to 4 feet below the proposed subgrade elevation. Fill material for the area observed today consisted of a sand, and a sand and gravel from the south and southwest cut areas of the site. The contractor compacted the fill in about 4 to 8 inch lifts with a smooth drum roller.

Density Readings:

We performed three in place density readings with results that ranged from 95 to 96% of the maximum dry density, according to ASTM D 1557. We were able to penetrate from 1 to 5 inches on the compacted fill material with a 1/2 inch diameter probe rod.

Conclusions:

We informed the contractor the fill areas observed today met the 95% compaction criteria.

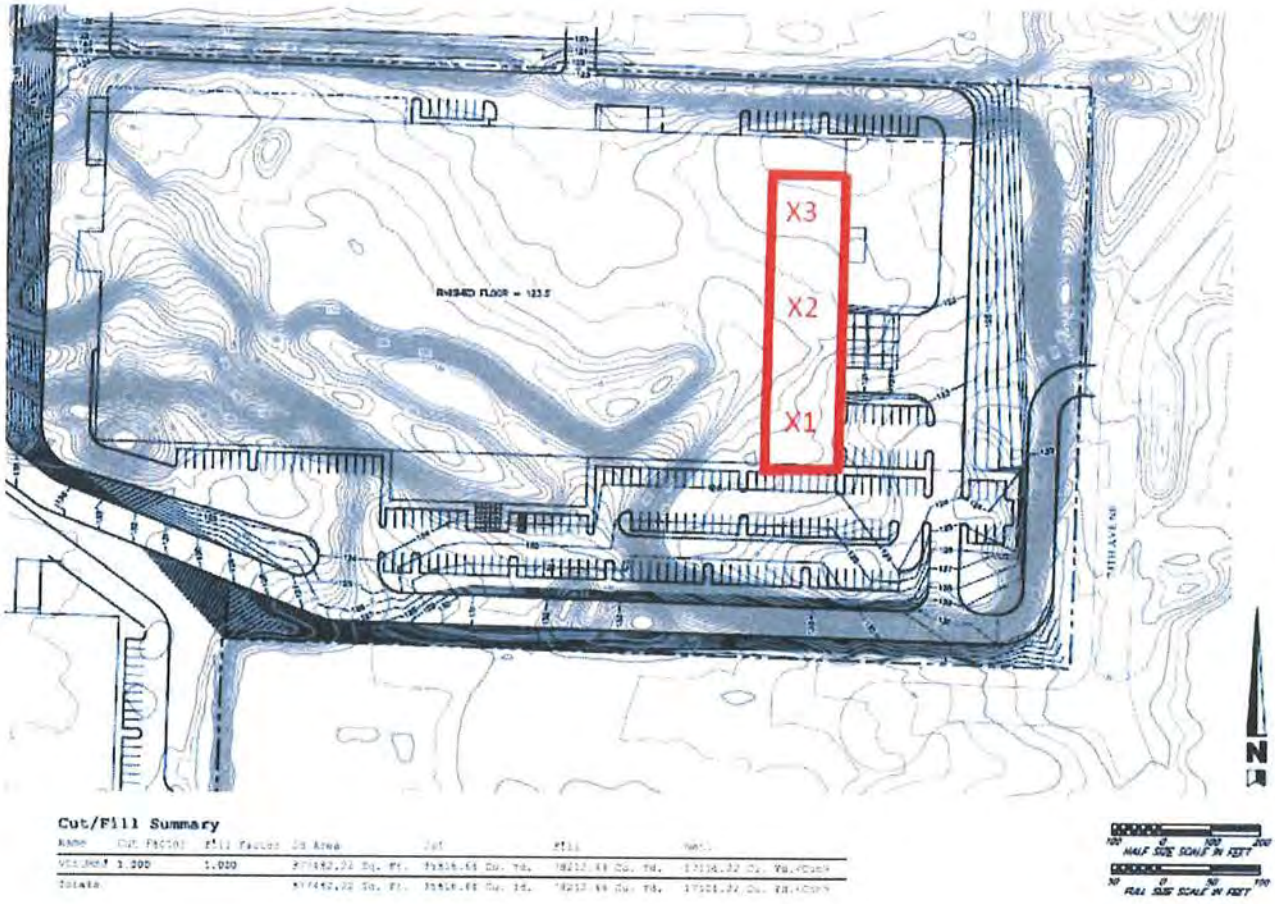
Reading No.	Location	Elevation (ft)	Max DD (pcf)	DD (pcf)	MC (%)	Compact (%)
1	S Portion of E Bldg Area	121	103.5	99.1	9.1	96
2	Mid Portion of E Bldg Area	120	122.1	115.5	6.2	95
3	N Portion of E Bldg Area	119	122.1	116.4	7.2	95

Copies To: _____ Field Rep: Su-Kiet Lieu

Date Mailed: OCT 13 2016 Principal / PM: Jon Sondergaard, LEG

AESI FIELD REPORT

To:		Project Name:	Gayteway Business Park
Date:	10 OCT 16	Project No.:	KE150563A
Permit No.		DPD No.	



Cut/Fill Summary

Name	Cut Factor	Fill Factor	2D Area	Cut	Fill	Net
VOLUME 1.200	1.000	87482.32 Sq. Ft.	3616.68 Cu. Yd.	18232.68 Cu. Yd.	17384.32 Cu. Yd.(Cut)
Totals		87482.32 Sq. Ft.	3616.68 Cu. Yd.	18232.68 Cu. Yd.	17384.32 Cu. Yd.(Cut)

Copies To:		Field Rep:	Su-Kiet Lieu
Date Mailed:		Principal / PM:	Jon Sondergaard, LEG

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FIELD REPORT

Date	Project Name		Project No.
10-13-16	Gayteway Business Park		KE150563A
Location 20015 67th Avenue NE		**Municipality** Arlington	**Weather** Rain 60's
Permit No. 1738	**DPD No.**		**Report No.** 20
Engineer/Architect			
Client/Owner GS Venture Partners			
General Contractor/Superintendent USVET / Chris			
Earthwork /Superintendent USVET / Chris			

TO: GS Venture Partners
P.O. Box 1727
Bellevue, WA 98009-1727
ATTN: Chris Gayte

AS REQUESTED BY: Contractor

THE FOLLOWING WAS NOTED:
AESI was onsite part-time, at the request of the client, for construction monitoring of earthwork activities for the "Gayteway Business Park" project.

Mass Grading
No further work was completed on this task during time of observation. AESI observed construction equipment had been parked and that topsoil was continuing to be screened near the NW corner of the project. As no one was onsite during time of arrival, AESI left a message with the earthwork contractor's foreman (Chris) to get an updated construction schedule.

Copies To: Distribution
Date Mailed: OCT 18 2016
Field Rep: Jon D. Hansen, Sr. Staff Geologist
Principal / PM: Jon Sondergaard, LEG

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FIELD REPORT

Date	Project Name		Project No.
10-13-16	Gayteway Business Park		KE150563A
Location 20015 67th Avenue NE		**Municipality** Arlington	**Weather** Rain 60's
Permit No. 1738	**DPD No.**		**Report No.** 20
Engineer/Architect			
Client/Owner GS Venture Partners			
General Contractor/Superintendent USVET / Chris			
Earthwork /Superintendent USVET / Chris			

TO: GS Venture Partners
P.O. Box 1727
Bellevue, WA 98009-1727
ATTN: Chris Gayte

AS REQUESTED BY: Contractor

THE FOLLOWING WAS NOTED:
AESI was onsite part-time, at the request of the client, for construction monitoring of earthwork activities for the "Gayteway Business Park" project.

Mass Grading
No further work was completed on this task during time of observation. AESI observed construction equipment had been parked and that topsoil was continuing to be screened near the NW corner of the project. As no one was onsite during time of arrival, AESI left a message with the earthwork contractor's foreman (Chris) to get an updated construction schedule.

Copies To: Distribution
Date Mailed: OCT 18 2016
Field Rep: Jon D. Hansen, Sr. Staff Geologist
Principal / PM: Jon Sondergaard, LEG

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FIELD REPORT

Date	Project Name		Project No.
10-25-16	Gayteway Business Park		KE150563A
Location		**Municipality**	**Weather**
20015 67th Avenue NE		Arlington	Rain 50's
Permit No. 1738	**DPD No.**		**Report No.** 21
Engineer/Architect			
Client/Owner			
GS Venture Partners			
General Contractor/Superintendent			
USVET / Chris			
Earthwork /Superintendent			
USVET / Chris			

TO: GS Venture Partners
P.O. Box 1727
Bellevue, WA 98009-1727
ATTN: Chris Gayte

AS REQUESTED BY: Contractor

THE FOLLOWING WAS NOTED:
AESI was onsite part-time, at the request of the client, for construction monitoring of earthwork activities for the "Gayteway Business Park" project.

Mass Grading
Prior to arrival, the earthwork contractor had nearly completed grading processes for the project's SE truck entrance ramp. Using a small dozer, the contractor placed approximately 2-15' (W to E) of fill material (generally brown silty SAND with trace organics/cut from adjacent area) and compacted the material, in a series of 1-2' loose lifts, via large vibratory roller (process not observed). AESI observed the top lift of soil appeared to pump/yield under foot and was notably loose with corresponding T-probe depths of 1-2' respectively. At the recommendation of AESI, the contractor removed the wet fill (typically 2') from the area and re-compacted the underlying fill. AESI noted the underlying fill soils (generally grayish brown gravelly SAND with silt) appeared (during time of observation) firm/unyielding with corresponding T-probe depths of 2-4". AESI conducted a series of in place density tests to confirm the specified minimum compaction for the structural area (95% ASTM 1557). The contractor was notified of all density results listed below. The contractor informed us that they would continue to use material from the adjacent cut (immediately East) and that grades in the area were approximately 3' below finish. Based on prior observations, AESI recommended the contractor remove (as necessary) organic and deleterious content (tree branches, strippings, concrete rubble) from the proposed fill source and limit further saturation of the weather sensitive fill. See Figure 1.

Density Results

Test #	Location	Depth (ft below fsg)	% Moist	Density (pcf)	Proctor (pcf)	% Compaction
DT1	Grading/See Figure 1	-3	8.2	119.4	122.1	97.8
DT2	Grading/See Figure 1	-3	7.7	120.2	122.1	98.4
DT3	Grading/See Figure 1	-3	8.9	117	122.1	95.8
DT4	Grading/See Figure 1	-3	8.3	118.2	122.1	96.8
DT5	Grading/See Figure 1	-3	8.6	118.5	122.1	97.1

*Depths based on available in-field elevation data

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Field Rep: Jon D. Hansen, Sr. Staff Geologist
Date Mailed: NOV 01 2016
Principal / PM: Jon Sondergaard, LEG

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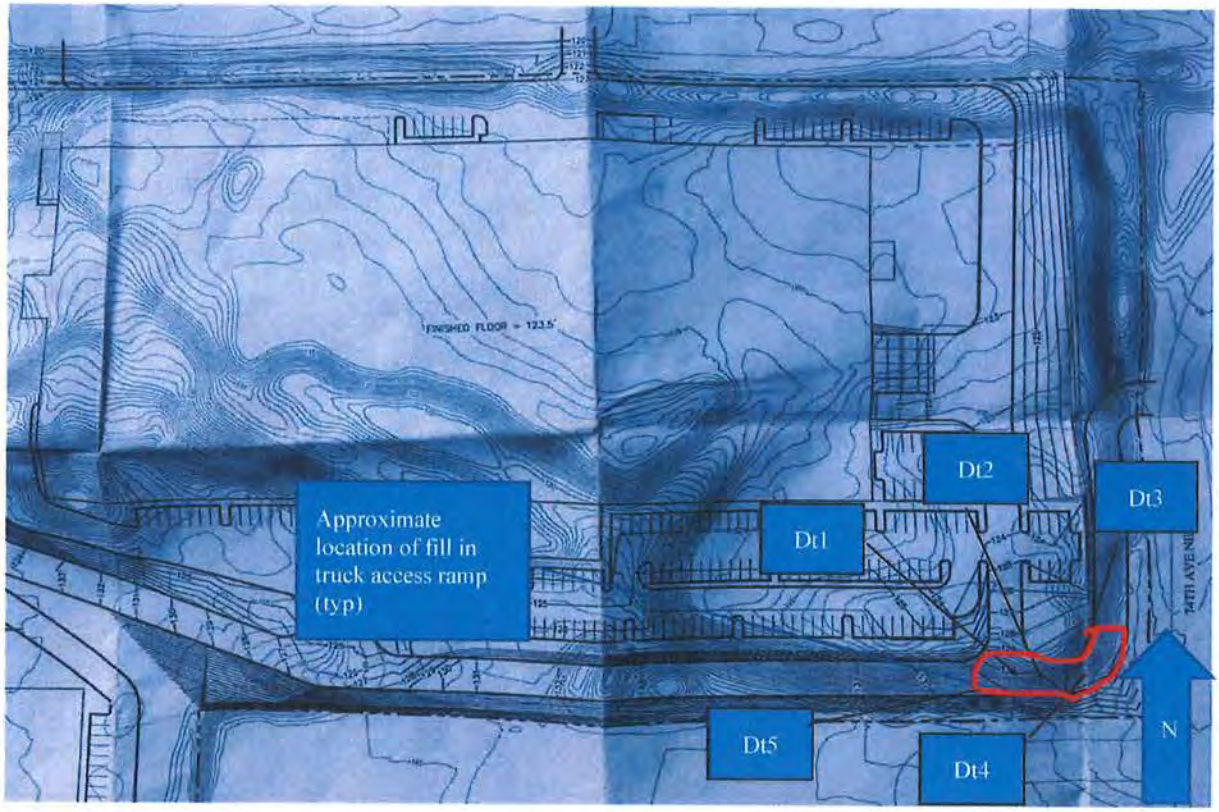
AESI FIELD REPORT

To:		Project Name:	Gayteway Business Park
Date:	10-25-16	Project No.:	KE150563A
Permit No.		DPD No.	

Figure 1



Copies To: _____ Field Rep: ~~Sig Kiel Lieu~~ W

Date Mailed: _____ Principal / PM: Jon Sondergaard, LEG

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FIELD REPORT

Date	Project Name		Project No.
10-26-16	Gayteway Business Park		KE150563A
Location 20015 67th Avenue NE		**Municipality** Arlington	**Weather** Rain 50's
Permit No. 1738	**DPD No.**		**Report No.** 22
Engineer/Architect			
Client/Owner GS Venture Partners			
General Contractor/Superintendent USVET / Chris			
Earthwork /Superintendent USVET / Chris			

TO: GS Venture Partners
P.O. Box 1727
Bellevue, WA 98009-1727
ATTN: Chris Gayte

AS REQUESTED BY: Contractor

THE FOLLOWING WAS NOTED:
AESI was onsite part-time, at the request of the client, for construction monitoring of earthwork activities for the "Gayteway Business Park" project.

Fine Grading (Building Pad)
Trending generally south to north, the earthwork contractor continued fine grading processes for the proposed building pad area. Using a large finish blade scraper, the contractor cut approximately 2-4" of previously placed/compacted/tested structural fill (generally gray SAND with few gravels and trace silts) from the area and pushed the material into a small stockpile along the eastern margins of the pad. The material was re-compacted, in a series of passes, via large vibratory roller, and appeared (during time of observation) firm/unyielding with corresponding T-probe depths of 4". Due to continued heavy rain, the contractor elected to temporarily discontinue fine grading processes and informed AESI that they would resume work on the building pad and previously observed truck access ramp when weather improved. Additionally, the contractor informed us that a recent grading plan change had called for the truck access entrance location to be changed, the adjacent slope to be steepened, and the east parking area to be expanded with the potential addition of a small wall. See Figure 1.

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Field Rep: Jon D. Hansen, Sr. Staff Geologist
Date Mailed: NOV 02 2016
Principal / PM: Jon Sondergaard, LEG

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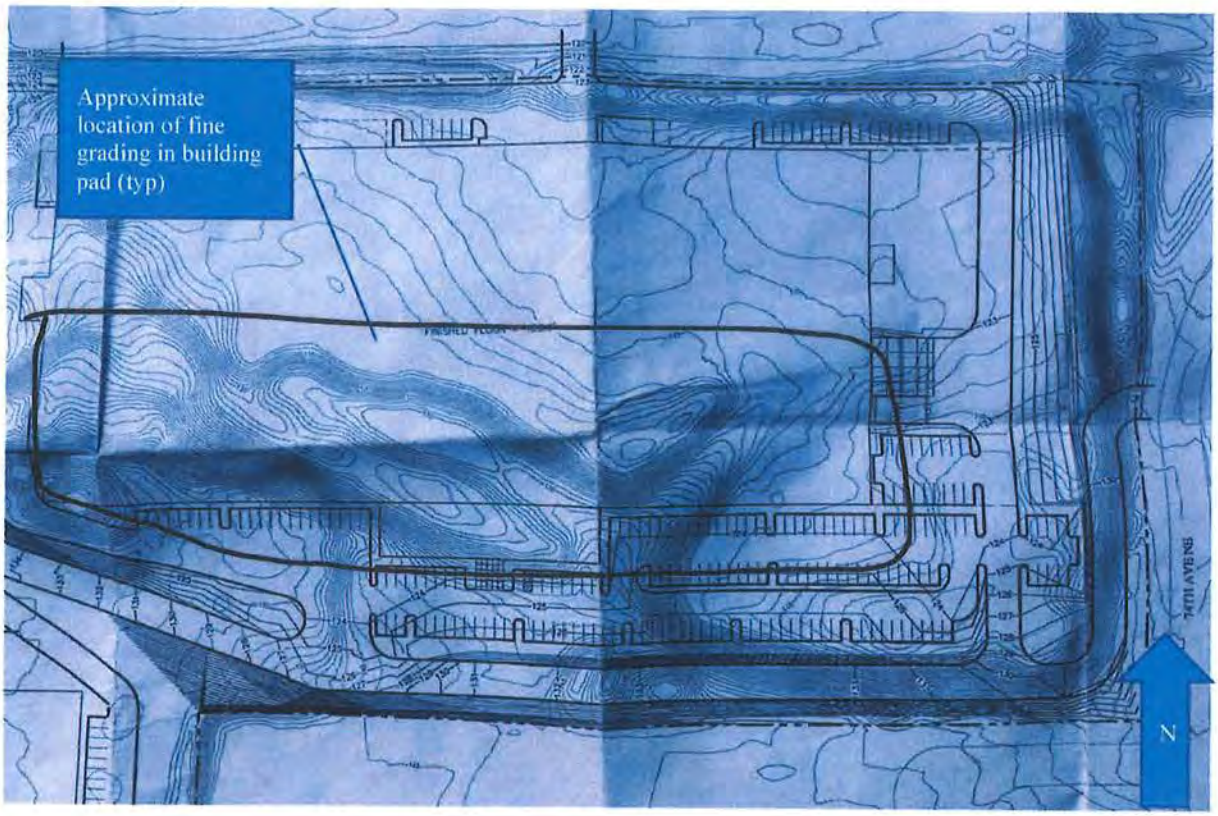
AESI FIELD REPORT

To:		Project Name:	Gayteway Business Park
Date:	10-26-16	Project No.:	KE150563A
Permit No.		DPD No.	



Copies To:		Field Rep:	~~Su-Kiet Lieu~~
Date Mailed:		Principal / PM:	Jon Sondergaard, LEG

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FIELD REPORT

Date	Project Name		Project No.
11-7-16	Gayteway Business Park		KE150563A
Location		**Municipality**	**Weather**
20015 67th Avenue NE		Arlington	Cloudy 50's
Permit No. 1738	**DPD No.**		**Report No.** 23
Engineer/Architect			
Client/Owner			
GS Venture Partners			
General Contractor/Superintendent			
USVET / Chris			
Earthwork /Superintendent			
USVET / Chris			

TO: GS Venture Partners
P.O. Box 1727
Bellevue, WA 98009-1727
ATTN: Chris Gayte

AS REQUESTED BY: Contractor

THE FOLLOWING WAS NOTED:
AESI was onsite part-time, at the request of the client, for construction monitoring of earthwork activities for the "Gayteway Business Park" project.

Mass Grading
Prior to arrival, the earthwork contractor had completed fine grading processes for the proposed building pad and had completed re-compaction processes of all loosened/disturbed soils. With one exception, AESI noted the re-compacted soils (generally gray SAND with little gravel and trace silt/previously placed/compacted during fill processes) appeared firm/unyielding (during time of observation) with corresponding T-probe depths of 3-4" respectively. AESI conducted a series of in place density tests on the re-compacted structural fill to confirm the specified minimum compaction (95% ASTM 1557). The contractor was notified of all density results listed below. During time of observation, AESI noted a localized area of ponded water near the south margins of the building pad that appeared to contain relatively loose silty soil beneath. As the soil dries out, AESI recommended the loose soils be re-compacted to the above compaction specification (as possible) or removed/replaced with suitable structural fill (as needed). See Figure 1.

Density Results

Test #	Location	Depth (ft below fsg)	% Moist	Density (pcf)	Proctor (pcf)	% Compaction
DT1	Grading/See Figure 1	approx fsg	7.1	117.4	122.1	96.2
DT2	Grading/See Figure 1	approx fsg	6.9	117.7	122.1	96.4
DT3	Grading/See Figure 1	approx fsg	7.5	116.3	122.1	95.2
DT4	Grading/See Figure 1	approx fsg	7	117.2	122.1	96.0
DT5	Grading/See Figure 1	approx fsg	8.3	116.1	122.1	95.1
DT6	Grading/See Figure 1	approx fsg	7.7	117.2	122.1	96.0
DT7	Grading/See Figure 1	approx fsg	8.1	116.6	122.1	95.5

*Depths based on available in-field elevation data

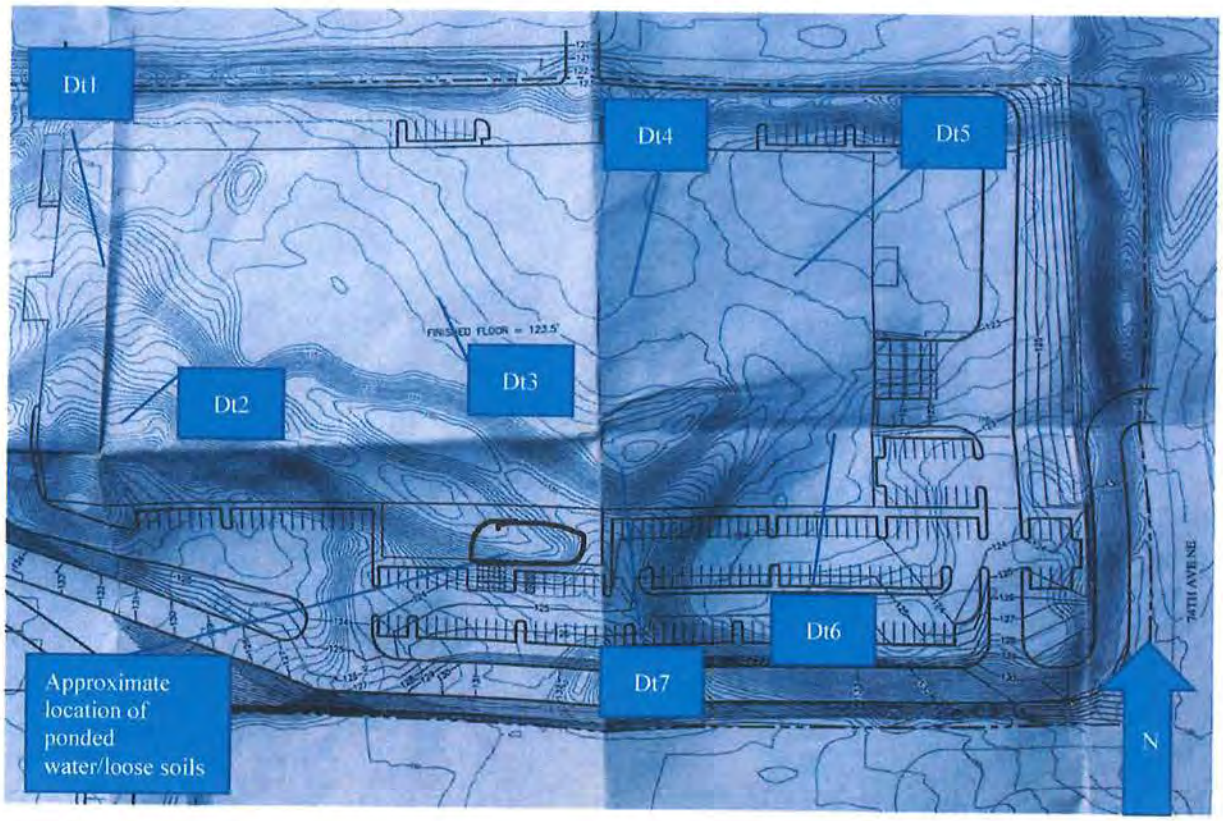
Copies To: Distribution
Field Rep: Jon D. Hansen, Sr. Staff Geologist
Date Mailed: NOV 15 2016
Principal / PM: Jon Sondergaard, LEG

AESI FIELD REPORT

To:
Date: 11-7-16
Permit No.

Project Name: Gayteway Business Park
Project No.: KE150563A
DPD No.

Figure 1



Copies To:
Date Mailed:

Field Rep: ~~Su-Kiet Lieu~~ Jon Hansen
Principal / PM: Jon Sondergaard, LEG

This document is considered a DRAFT until signed or initialed by an AESI Principal or Project Manager

associated
earth sciences
incorporated

911 Fifth Avenue
Kirkland, Washington 98033
Phone: 425-827-7701
Fax: 425- 827-5424
www.aesgeo.com

FIELD REPORT

Date	Project Name		Project No.
2-28-19	Gayteway Business Park		150563E001
Location 20015 67th Avenue NE		**Municipality** Arlington	**Weather** Clear 40's
Permit No. 1738	**DPD No.**		**Report No.** 24
Engineer/Architect			
Client/Owner GS Venture Partners			
General Contractor/Superintendent USVET / Chris			
Earthwork /Superintendent USVET / Chris			

TO: GS Venture Partners
P.O. Box 1727
Bellevue, WA 98009-1727
ATTN: Chris Gayte

AS REQUESTED BY: Contractor

THE FOLLOWING WAS NOTED:
AESI was onsite part-time, at the request of the client, for construction monitoring of earthwork activities for the "Gayteway Business Park" project. Upon arrival, we met with Chris of USVET.

Mass Grading
Prior to arrival, the earthwork contractor had continued mass grading processes near the east end of the site. The earthwork contractor informed us that they had placed approximately 5-7' (north to south) of fill material over the southeast corner of the site (proposed parking area) and that the adjacent east cut slope had been re-graded to an approximately 2H:1V inclination. The contractor noted the fill had been placed in a series of lifts, and compacted via vibratory roller (process not observed). Additionally, the earthwork contractor noted the fill had come from several different local sources over the course of approximately 1-2 years. AESI observed the fill material exposed at the surface generally consisted of gray silty gravelly SAND with trace cobbles and appeared firm/unyielding (during our time of observation) with corresponding T-probe depths of 1-3". In an effort to observe at depth soil conditions; AESI recommended a series of potholes be dug in the new fill area, soil samples be collected (as necessary for proctor analysis), and that density testing be conducted. As no equipment was available during our time of observation, AESI and the earthwork contractor will schedule the above recommended excavations for next week. See Figure 1.

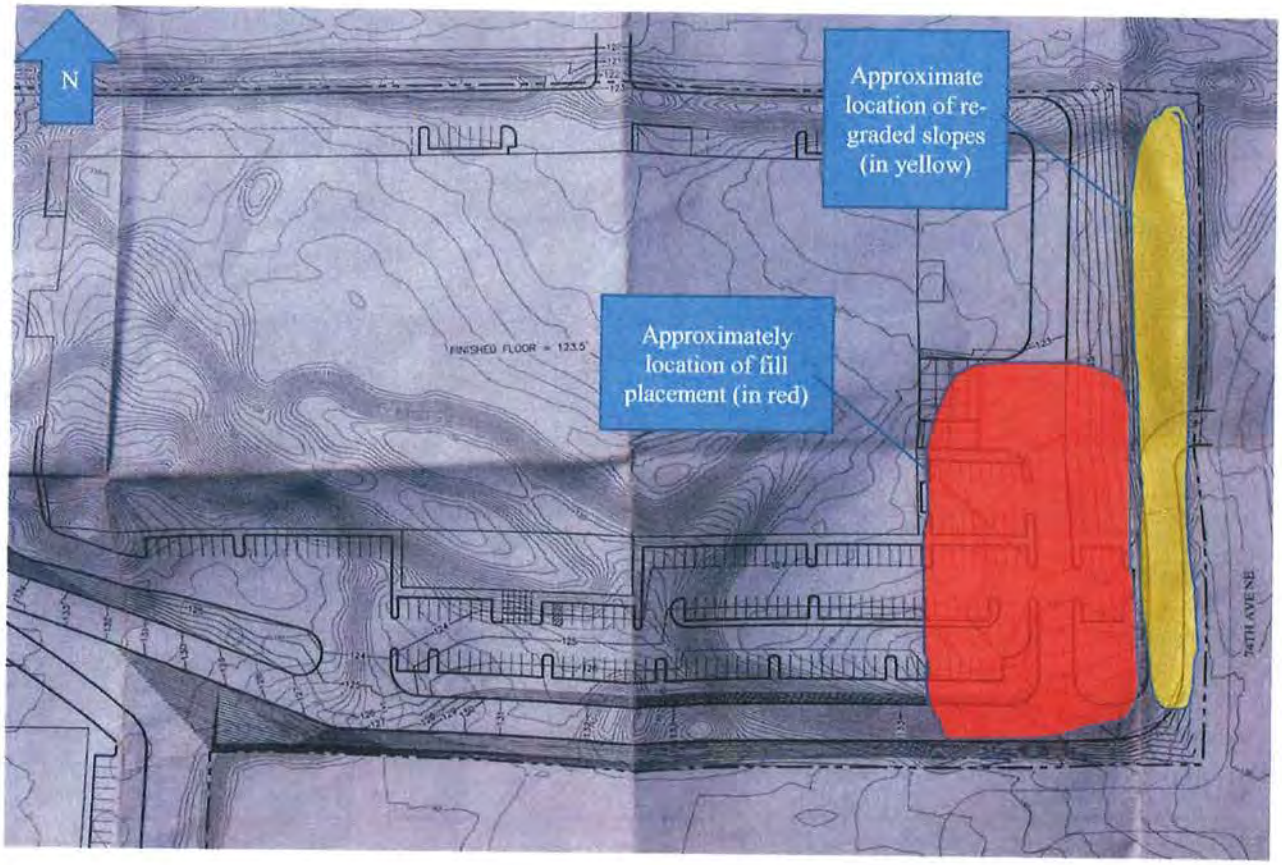
Copies To: Distribution
Field Rep: Jon D. Hansen, Sr. Staff Geologist
Date Mailed: 7-15-19
Principal / PM: Matt Miller, P.E.

This document is considered a DRAFT until signed or initialed by an AESI Principal or Project Manager

AESI FIELD REPORT

To:		Project Name:	Gayteway Business Park
Date:	2-28-19	Project No.:	150563E001
Permit No.		DPD No.	

Figure 1



Copies To:		Field Rep:	Jon D. Hansen, Sr. Staff Geologist
Date Mailed:		Principal / PM:	Matt Miller, P.E.

Appendix B

SONDERGAARD GEOSCIENCE, PLLC
13012 65TH Avenue SE
Snohomish, Washington 98296

August 6, 2020
Project No. J-0045

GS Venture Partners
P.O. Box 1727
Bellevue, WA 98009

Attention: Chris Gayte

Subject: Preliminary Infiltration Evaluation
Buildings D,E,F,G,H,I
Gayteway Business Park
20015 67th Avenue NE
Arlington, Washington

Dear Mr. Gayte:

As requested, Sondergaard Geosciences, PLLC (SGP) is pleased to present our preliminary evaluation for the on-site infiltration of stormwater at the subject site. This study has been prepared for the exclusive use of Gs Venture Partners and their agents, for specific application to this project. Within the limitations of scope and schedule, our services have been performed in accordance with generally accepted engineering geology practices in effect in this area at the time our study was prepared. No other warranty, express or implied, is made.

SITE SOILS

As determined through the completion of 21 exploration pits (SGP, 2020)[1] and documentation of fill placement at the Building E site, the native soils underlying the site generally consist of medium dense, moist, brown to gray sandy gravel, gravelly sand and sand interpreted to be Vashon-age recessional outwash. Documented, engineered, fill soils placed at the Building E site to raise the grades 10 to 20 feet also consist of recessional outwash soils derived from on-site grading activities. Building B and C constructed west of the subject property as part of the Gayteway Business Park development are also underlain by similar recessional outwash soils. The on-site infiltration of site generated storm water was successfully implemented for these two buildings.

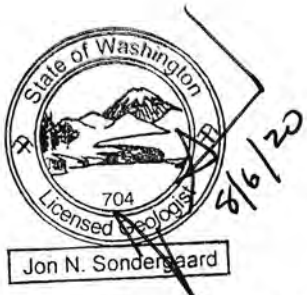
[1] SGP (2020), *Geotechnical Engineering Study, Buildings D,F,G and H, Gayteway Business Park, 20015 67th Avenue NE, Arlington, Washington, April 29, 2020.*

In our opinion, the on-site infiltration of site generated stormwater is feasible for structures constructed on the subject property. Previous testing of similar soils at the Building B and C locations yielded recommend soil infiltration rates of approximately 24 inches per hour at that site. We anticipate that similar conditions exist at the subject property. Additional testing and analyses will be performed at the subject site once building desings, layouts and proposed infiltration locations are determined.

CLOSURE

We appreciate the opportunity to be of service to you on this project. Should you have any questions regarding this report or other geotechnical aspects of the project, please call us at your earliest convenience.

Sincerely,
SONDERGAARD GEOSCIENCE, PLLC.
Snohomish, Washington



Jon N. Sondergaard, L.G., L.E.G.
Principal Engineering Geologist

Appendix C

SONDERGAARD GEOSCIENCE, PLLC
13012 65TH Avenue SE
Snohomish, Washington 98296

October 30, 2020
Project No. J-0045

Gayteway LLC
P.O. Box 1727
Bellevue, WA 98009

Attention: Chris Gayte

Subject: Soil Infiltration Rate
Building G
Gayteway Business Park
20015 67th Avenue NE
Arlington, Washington

Dear Mr. Gayte:

As requested, Sondergaard Geosciences, PLLC (SGP) is pleased to present our recommendations for soil infiltration rate for the subject site. This study has been prepared for the exclusive use of Gayteway LLC and their agents, for specific application to this project. Within the limitations of scope and schedule, our services have been performed in accordance with generally accepted engineering geology practices in effect in this area at the time our study was prepared. No other warranty, express or implied, is made. This report has been revised to reflect comments received from the City of Arlington.

SITE AND PROJECT DESCRIPTION

The subject property consists of an irregularly-shaped parcel (Snohomish County Parcel Number 31051400200700), with a combined area of approximately 54 acres located at 20015 67th Avenue NE in Arlington, Washington (Figure 1). The subject property is bounded to the east, south and north by commercial/industrial development and to the west by 67th Avenue NE. The proposed project that is the subject of this report is located on the northeast portion of the property.

At the project site, overall site topography is relative flat. The subject site formerly was occupied by a lumber mill that has since be demolished. The project site is clear of vegetation Based on our discussions with you, we understand that plans for the current project include the construction of one concrete tilt-up structure totaling approximately 117,796 square feet (Building G).

SUBSURFACE EXPLORATION

The project area consists of a building pad (formerly Building E) constructed by the placement and compaction of structural fill over native recessional outwash deposits as documented in our geotechnical report dated February 12, 2020. Four exploration pits (INF-1 thru INF-4) were completed at the site by SGP on October 20, 2020 for the purpose of characterizing the soils for the on-site infiltration of storm water. The exploration pits were continuously observed and logged by an engineering geologist. Descriptions of the soils encountered at the site are provided below.

Structural Fill

Approximately 10 to 20 feet of fill mostly consisting of site derived sandy gravel and gravelly sand recessional outwash was placed and compacted on the Building G pad. Portions of the upper few feet of fill consisted of imported granular material. This material was placed and compacted as structural fill to a density of at least 95 percent of its maximum dry density as determined by ASTM D 1557. This structural fill is suitable for support of building foundations, pavements and other structures.

Recessional Outwash

Native Recessional Outwash soils underly the structural fills. These soils generally consist of medium dense, moist, oxidized brown to gray, gravelly sand to sandy gravel and scattered cobbles. This unit is suitable for support of structural fills, foundations, slabs and pavements when properly compacted as recommended in this report.

Ground Water

Ground water seepage was not encountered in the exploration pits advanced for this report in October 2020 which were completed to depths of approximately 11 to 15 feet below the existing site grade. It should be noted that the depth and occurrence of ground water seepage at the site likely varies in response to such factors as changes in season, amount of precipitation, location, and site use.

SGP collected 4 soil samples for grain size analyses at two planned infiltration locations and depths (Figure 1) identified by the project civil engineer. At the depths specified, all infiltration would be into the granular structural fill soils derived from native recessional outwash deposits.

Infiltration

We understand that the on-site infiltration of site generated storm water is the preferred method for the disposal of storm water. Because the soils underlying the site consist of unconsolidated recessional outwash or fill derived from these soils, the methods outlined in the 2014 Surface Water Management Manual for Western Washington, Volume III, Section 3.3.6(3) Soil Grain Size Analysis Method were used to determine the soil infiltration rate. The recommended uncorrected infiltration rates based upon grain size analyses of soil samples collected at each proposed infiltration location and performed in accordance with ASTM Method D422 are presented in Table 1 below:

Table 1. Soil Infiltration Rate

Infiltration Area	Sample No.	Depth (ft)	Ksat (cm/sec)	Uncorrected Infiltration Rate (in/hr)
1	INF-1	8	6.24×10^{-2}	88
1	INF-2	8	4.94×10^{-2}	70
2	INF-3	10	2.89×10^{-2}	41
2	INF-4	10	4.15×10^{-2}	59

Averaging the results from for the two infiltration areas results in the following average uncorrected soil infiltration rates:

Area 1 = 79 in/hr
Area 2 = 50 in/hr

As per the 2014 SWMMWW correction factors are applied to the uncorrected infiltration rate to account for site variability (CFv), test method (CFt) and siltation and bio-buildup (CFm). For this site the following correction factors should be applied:

CFv = 0.6
CFt = 0.4
Cfm = 0.9

Applying these correction factors to the uncorrected infiltration rates determined above results in a recommended, long term design infiltration rates as follow:

Area 1 = 17 in/hr
Area 2 = 11 in/hr

CLOSURE

We appreciate the opportunity to be of service to you on this project. Should you have any questions regarding this report or other geotechnical aspects of the project, please call us at your earliest convenience.

Sincerely,
SONDERGAARD GEOSCIENCE, PLLC.
Snohomish, Washington

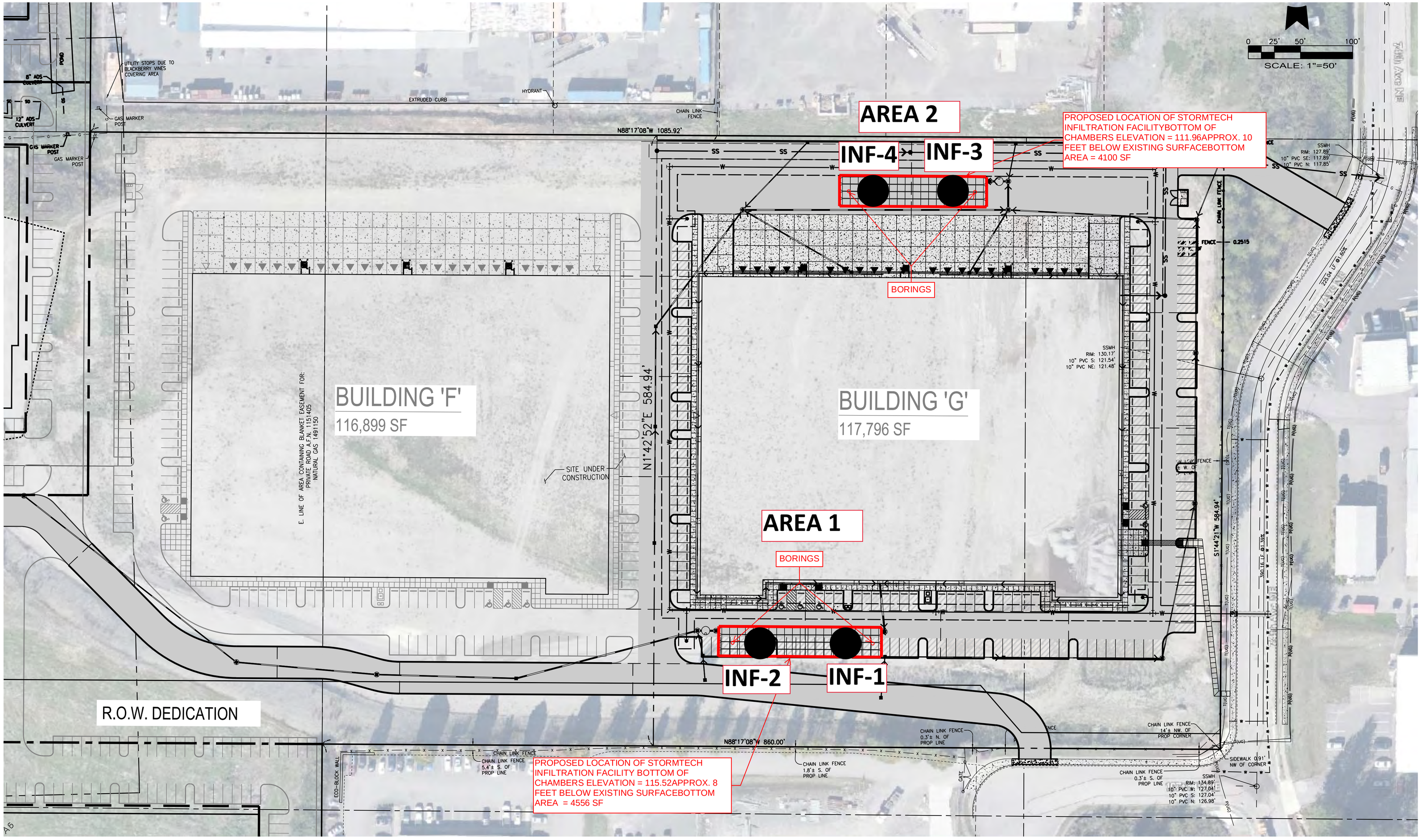
Jon N. Sondergaard, L.G., L.E.G.
Principal Engineering Geologist

Attachments: Figure 1: Infiltration Soil Sample Locations
Grain Size Analyses

GEOTECH MARKUP
FOR

GAYTEWAY BUSINESS PARK

PTN OF THE NE1/4, OF THE SW1/4 OF SEC. 14, TWP. 31 N., RGE 5 EAST, W.M.
CITY OF ARLINGTON, SNOHOMISH COUNTY, STATE OF WASHINGTON



SAMPLE LOCATION MAP
GAYTWAY BUSINESS PARK
BUILDING G
ARLINGTON, WASHINGTON

J-045 FIGURE 1

No.	Date	By	Chkd.	Appr.	Revision

Title: GEOTECH MARKUP

For: GAYTEWAY BUSINESS PARK LLC
PO BOX 1727
BELLEVUE, WA 98009

Barghausen Consulting Engineers, Inc.
18215 72nd Avenue South
Kent, WA 98032
425.251.6222 **barghausen.com**

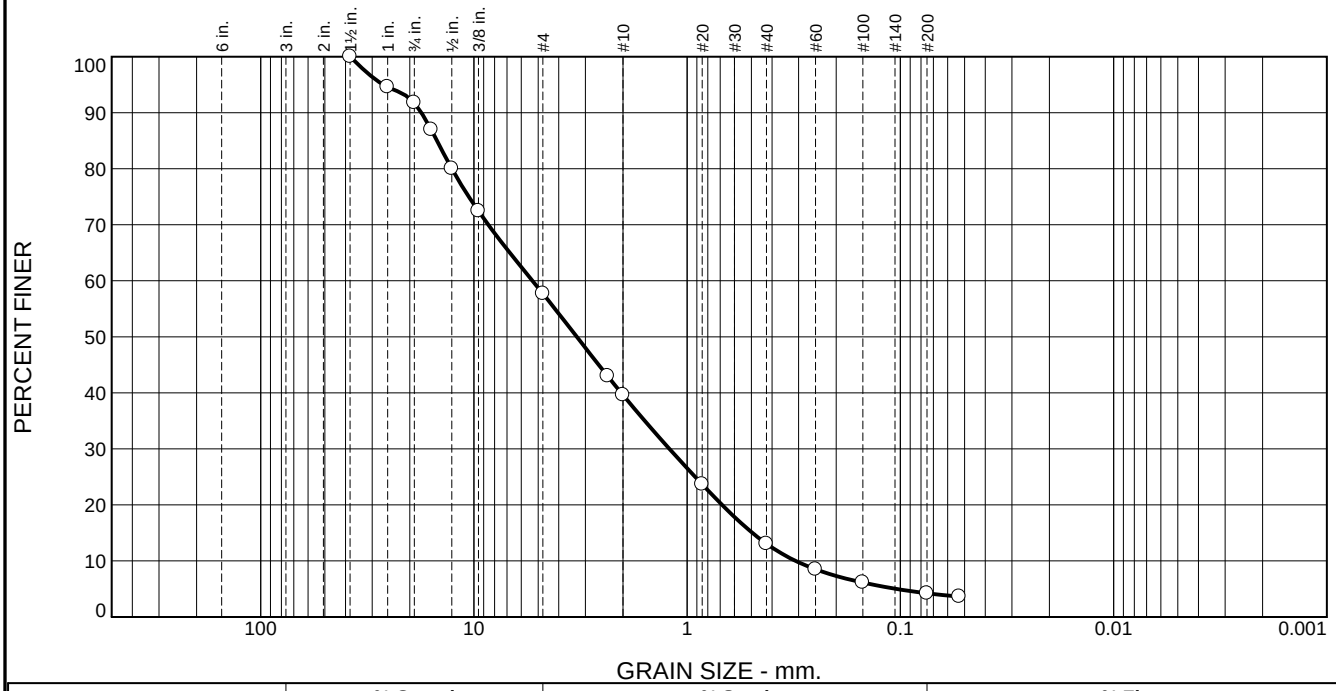
Designed	WLG	Scale:	Horizontal
Drawn	WLG		1:50
Checked	JC		Vertical
Approved	CJ		NA
Date	8/28/20		

Job Number 21334

Sheet 1 of 1

P:\21000s\21334\exhibit\21334-Geotech Markup.dwg 10/15/2020 4:16 PM LGUAN

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	8.2	34.1	18.1	26.5	8.9	4.2	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1-1/2"	100.0		
1"	94.6		
3/4"	91.8		
5/8"	87.0		
1/2"	80.0		
3/8"	72.5		
#4	57.7		
#8	43.0		
#10	39.6		
#20	23.7		
#40	13.1		
#60	8.5		
#100	6.1		
#200	4.2		
#270	3.6		

* (no specification provided)

Material Description

poorly graded sand with gravel

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=**

Classification

USCS (D 2487)= SP **AASHTO (M 145)=** A-1-a

Coefficients

D_{90}= 17.6242 D_{85}= 14.9044 D_{60}= 5.3159
D_{50}= 3.2930 D_{30}= 1.2111 D_{15}= 0.4944
D_{10}= 0.3100 C_u= 17.15 C_c= 0.89

Remarks

Date Received: 10/22/2020 **Date Tested:** 10/26/2020

Tested By: NAS

Checked By: MM

Title:

Location: Onsite - Gayteway Business Park
Sample Number: INF-1

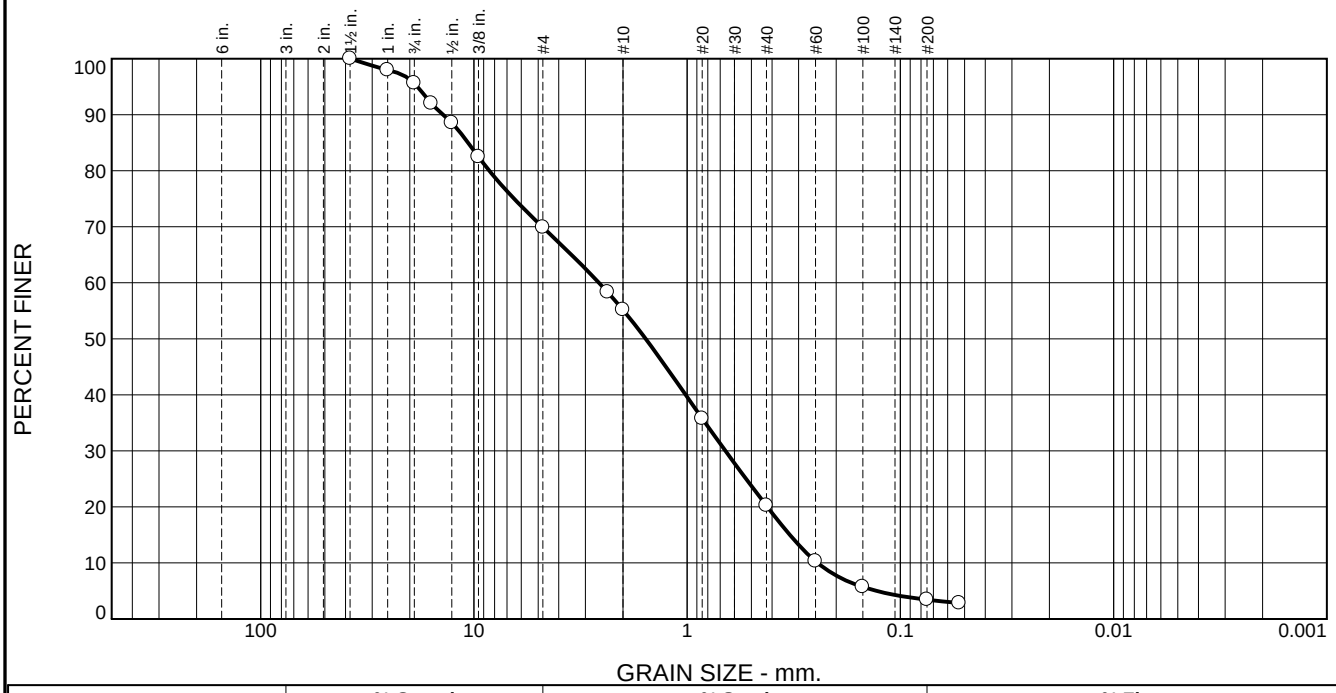
Date Sampled: 10/20/2020

associated earth sciences incorporated

Client: Jon Sondergaard
Project: Jon Sondergaard

Project No: 20180046 E001 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	4.4	25.7	14.7	35.0	16.8	3.4	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1-1/2"	100.0		
1"	98.0		
3/4"	95.6		
5/8"	92.0		
1/2"	88.6		
3/8"	82.5		
#4	69.9		
#8	58.3		
#10	55.2		
#20	35.8		
#40	20.2		
#60	10.3		
#100	5.7		
#200	3.4		
#270	2.8		

* (no specification provided)

Material Description

poorly graded sand with gravel

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SP **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 13.9487 D_{85}= 10.6574 D_{60}= 2.5916
D_{50}= 1.5663 D_{30}= 0.6615 D_{15}= 0.3300
D_{10}= 0.2448 C_u= 10.59 C_c= 0.69

Remarks

trace organics

Date Received: 10/22/2020 **Date Tested:** 10/26/2020

Tested By: NAS

Checked By: MM

Title:

Location: Onsite - Gayteway Business Park
Sample Number: INF-2

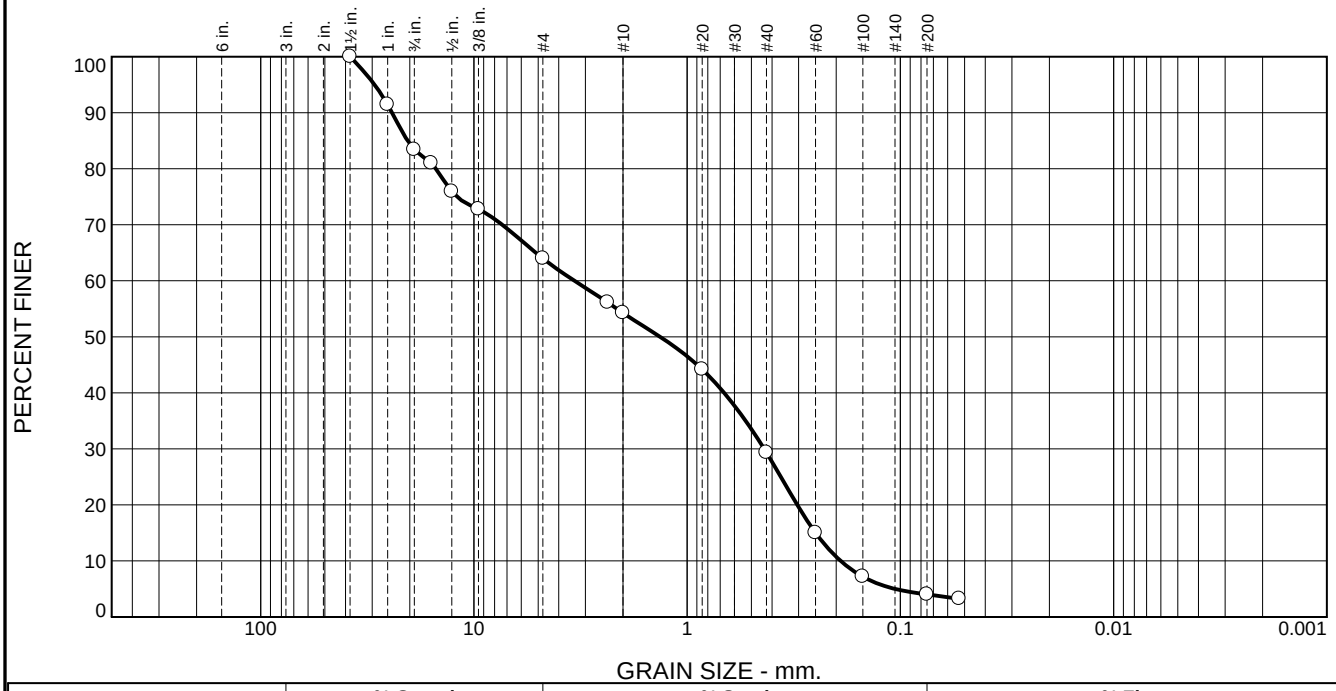
Date Sampled: 10/20/2020

associated earth sciences incorporated

Client: Jon Sondergaard
Project: Jon Sondergaard

Project No: 20180046 E001 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	16.6	19.4	9.7	25.0	25.3	4.0	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1-1/2"	100.0		
1"	91.4		
3/4"	83.4		
5/8"	81.0		
1/2"	75.9		
3/8"	72.8		
#4	64.0		
#8	56.1		
#10	54.3		
#20	44.2		
#40	29.3		
#60	15.0		
#100	7.2		
#200	4.0		
#270	3.2		

* (no specification provided)

Material Description

poorly graded sand with gravel

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=**

Classification

USCS (D 2487)= SP **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 24.2160 D_{85}= 20.4863 D_{60}= 3.3761
D_{50}= 1.3399 D_{30}= 0.4354 D_{15}= 0.2499
D_{10}= 0.1906 C_u= 17.71 C_c= 0.29

Remarks

Date Received: 10/22/2020 **Date Tested:** 10/26/2020

Tested By: NAS

Checked By: MM

Title:

Location: Onsite - Gayteway Business Park
Sample Number: INF-3

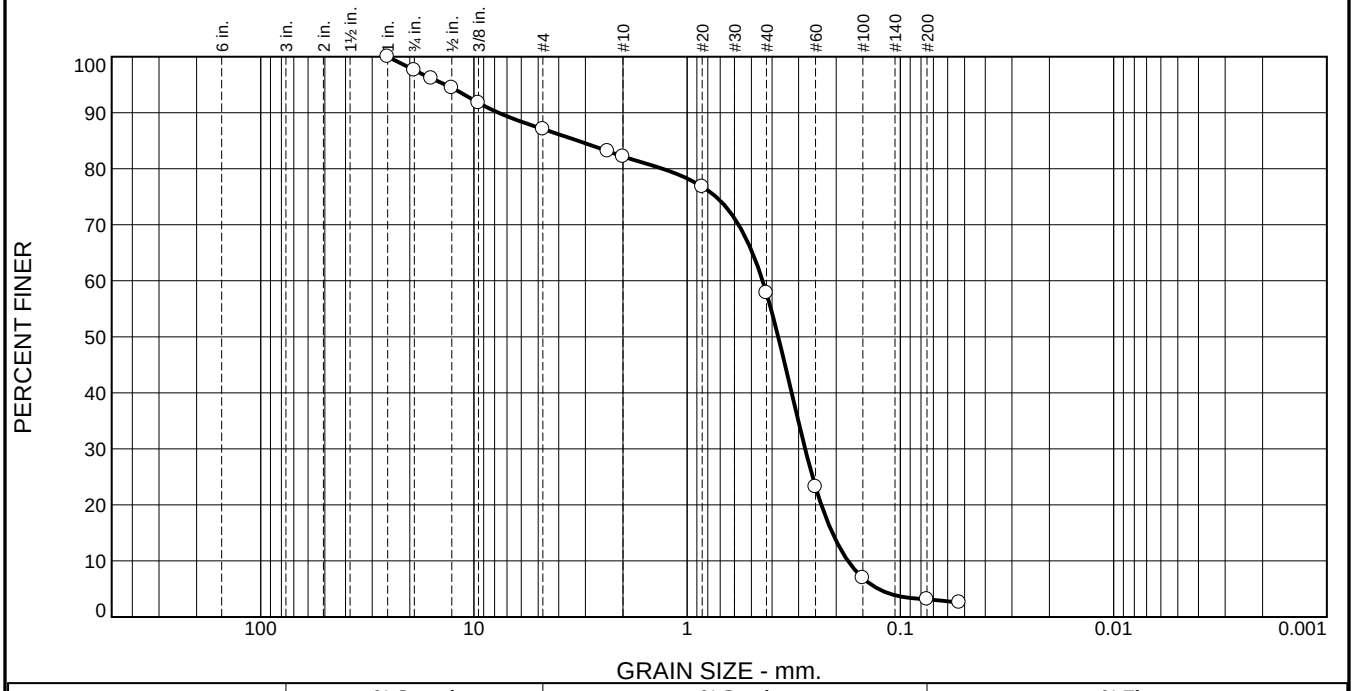
Date Sampled: 10/20/2020

associated earth sciences incorporated

Client: Jon Sondergaard
Project: Jon Sondergaard

Project No: 20180046 E001 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	2.4	10.5	4.9	24.3	54.8	3.1	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
3/4"	97.6		
5/8"	96.1		
1/2"	94.5		
3/8"	91.8		
#4	87.1		
#8	83.1		
#10	82.2		
#20	76.8		
#40	57.9		
#60	23.2		
#100	7.0		
#200	3.1		
#270	2.6		

* (no specification provided)

Material Description

poorly graded sand

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=**

Classification

USCS (D 2487)= SP **AASHTO (M 145)=** A-3

Coefficients

D_{90}= 7.6784 D_{85}= 3.2590 D_{60}= 0.4425
D_{50}= 0.3740 D_{30}= 0.2797 D_{15}= 0.2086
D_{10}= 0.1762 C_u= 2.51 C_c= 1.00

Remarks

Date Received: 10/22/2020 **Date Tested:** 10/26/2020

Tested By: NAS

Checked By: MM

Title:

Location: Onsite - Gayteway Business Park
Sample Number: INF-4

Date Sampled: 10/20/2020

associated earth sciences incorporated

Client: Jon Sondergaard
Project: Jon Sondergaard

Project No: 20180046 E001 **Figure**