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CITY OF MONROE

Storm Drainage Report and Stormwater Pollution Prevention Plan Measures

Prepared in Support of:

Edelbrock Property

Permit Number _____

Property Address:

16731 Tye Street SE

Monroe, WA 98272

Parcel # 00865400000500

Prepared by:

Tony Dubin, P.E.

Dubin Environmental

Report Date:

July 9, 2025

DUBIN Environmental

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1. Project Overview

The owner of 16731 Tye Street SE plans to construct a new building for truck storage and office space on the property. The property is located in a commercial and industrial neighborhood in the northwest part of Monroe, near Lake Tye. The site currently has gravel surfacing and is used for truck and equipment storage.

In addition to this drainage report, Dubin Environmental has prepared the following building permit support documents:

1. Stormwater site plan and details,
2. Erosion and sediment control plan and details
3. Elevation certificate

This drainage report also includes a Construction Stormwater Pollution Prevention Plan (SWPPP) narrative. Figure 1 shows the project location.

Figure 1. 16731 Tye Street SE Property

2. Existing Conditions

This section describes existing conditions that affect development and stormwater management on the property.

Topography

The property is located on the north side of Tye Street SE, to the east of Fryelands Boulevard SE and Lake Tye. The property grades gently northward with elevations ranging from 33 to 36 feet (NAVD88) except for the north edge of the property, which slopes downward to a drainage ditch that conveys water westward toward Lake Tye, One-foot contours are shown on the stormwater site plan (see Sheet C-01).

Soils

PanGeo conducted a geotechnical evaluation and soils exploration in July 2020. The findings in a report dated are included here as Appendix A. PanGeo excavated four test pits and documented a combination of crushed rock base material underlain by 6 ½ feet of "medium dense to dense, brown to gray, silty, gravelly fine sand fill with cobbles. Below the fill, the "uppermost native soil was a bed of soft, brown peat, roughly 1 to 1 ½ feet thick underlain by "loose to medium dense, non-plastic to slightly plastic silt with some fine sand.

The test pits were dug in July and no groundwater was observed at the maximum depth of 9 ½ feet. However, the geotechnical engineer noted "we anticipate that groundwater could be present at a shallower depth during the wet winter months."

Based on these observations, Dubin Environmental does not recommend attempting stormwater infiltration.

Land cover

The property is currently a gravel yard used by a trucking company with related structures and uses (e.g., fuel storage, maintenance equipment). The adjacent parcel to the east (address, parcel number) is owned by an Edelbrock family member, and together they host trucking business activities. There is a fringe of landscaping along the street frontage and wild vegetation along the drainage ditch (north of the fence line), but otherwise, the property land cover is entirely gravel and used for business activities.

Adjacent Land Uses

The parcels along Tye Street SE contain commercial and industrial uses with an automotive maintenance shop to the east and an office and warehouse space to the west. The neighborhood is fully developed and served by City of Monroe utilities.

Critical and Sensitive Areas

Monroe and Snohomish County GIS maps and the geotechnical report were reviewed to identify any potential critical and sensitive areas on the property:

- Wetlands: none
- Streams: none
- Steep slopes: none
- Erosion hazard: none listed in geotechnical report
- Seismic hazard: none listed in geotechnical report
- Landslide hazard areas: none listed in geotechnical report
- **Flood hazard**: a portion of the property is within a Zone AE flood hazard area on the FEMA map, which became effective on 6/19/2020. The base flood elevation (BFE) is 35 feet (NAVD88) and the proposed building will be at least 1 foot above the BFE.

4. Proposed Conditions and Minimum Requirements

This section describes the proposed site development, hard surface areas, and minimum project requirements, based on the 2019 Stormwater Manual for Western Washington (Ecology Manual).

Table 1 lists the proposed hard surfaces that must be mitigated by this project and specifies whether they are pollution-generating hard surfaces (PGHS) or non-PGHS. Please see Sheet C-01 for the locations of these surfaces. Table 2 summarizes all proposed land disturbances on the property. Figure I-3.2 from the Ecology Manual was consulted to determine which stormwater controls apply to this project (Figure 2). Because the new hard surface plus exceeds 5,000 square feet, minimum requirements #1 through #9 all apply to this project. Section 5 documents how the minimum requirements will be met.

Table 1. 16731 Tye Street SE New and Replaced Hard Surface Summary

No.	Surface	Permeable	New/Replaced	PGHS	Area (sf)
1	Building roof	No	Replaced	No	8,022
2	Asphalt parking area	No	Replaced	Yes	9,191
3	Concrete pad	No	Replaced	Yes	1,500
				New Plus Replaced Hard Surface Area (sf):	18,713

Table 2. 16731 Tye Street SE Land Area Summary

Summary of Areas for Stormwater Management	
Total new + replaced hard surface	18,713 sf
Total new + replaced landscaped	3,844 sf
Total disturbed area	46,140 sf
Total undisturbed area	5,696 sf
Parcel total area	51,836 sf

Note: The total disturbed area consists of new and replaced hard surfaces and landscaping, plus the grading activities in the gravel yard to the north of the proposed building and parking area.

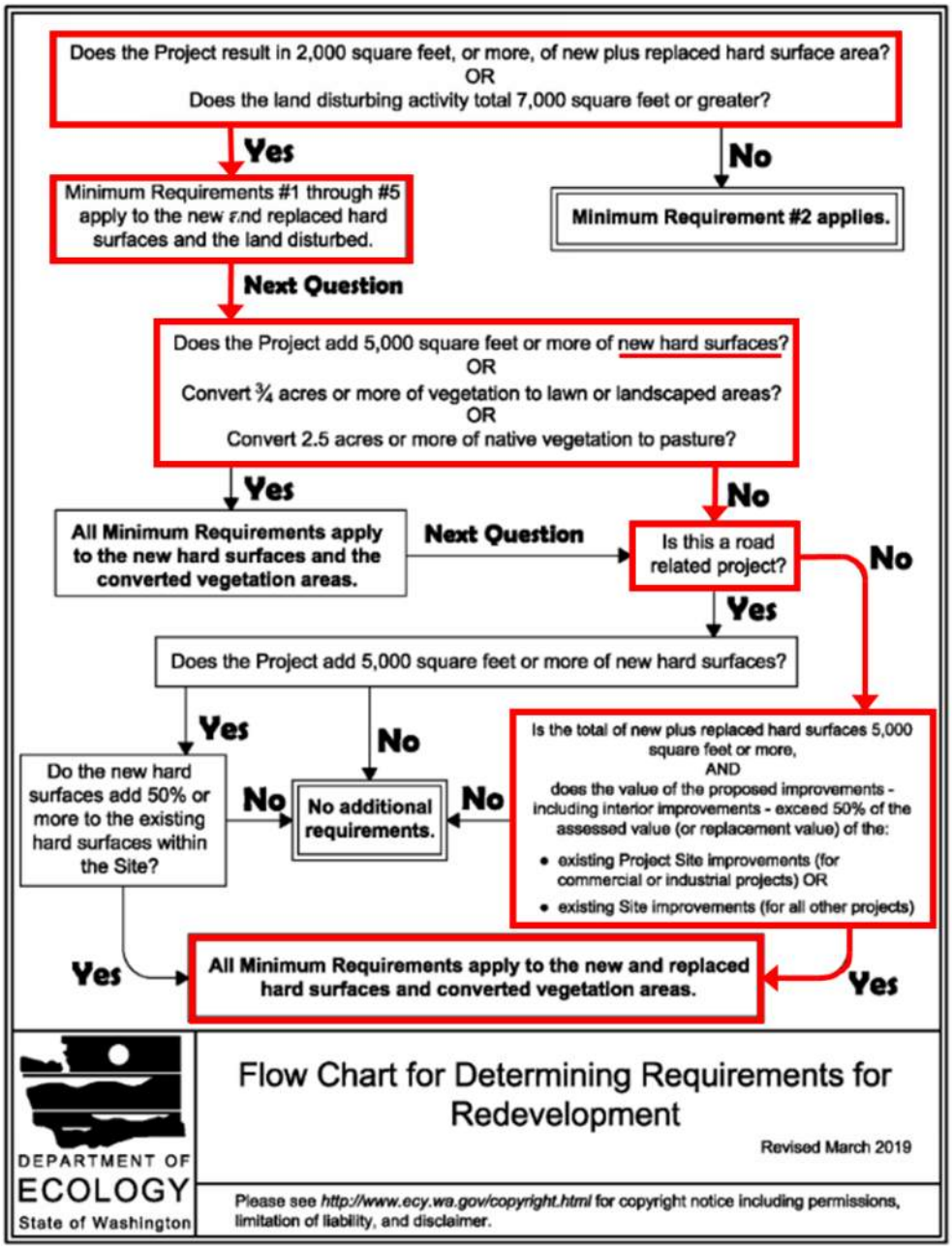


Figure 2. Minimum Requirements from the Ecology Manual

5. Permanent Stormwater Control Plan

This section describes how the 16731 Tye Street SE project will meet minimum requirements #1 through #9.

Minimum Requirement #1: Preparation of Stormwater Site Plans

The stormwater site plan and details have been prepared to document how drainage will be managed per City of Monroe requirements (Sheets C-01, C-03). The site plan has been submitted along with this drainage report.

Minimum Requirement #2: Construction Stormwater Pollution Prevention

An Erosion and Sediment Control engineering plan (Sheet C-02) has been prepared along with the stormwater site plan and this drainage report. Additionally, this report includes a Construction Stormwater Pollution Prevention Plan (SWPPP) narrative in Section 8. Construction best management practices (BMPs) details are included on Sheet C-04 to supplement to Construction SWPPP narrative.

The control measures will be implemented to prevent erosion, sediment transport, and off-site discharge of sediment-laden stormwater flows.

Minimum Requirement #3: Source Control of Pollution

Stormwater pollution source control measures are selected and documented in CSWPPP and shown on the Erosion and Sediment Control plan and details (Sheet C-02, C-04).

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

The Monroe online GIS system was consulted to determine the natural drainage course. The property slopes northward and the overall vicinity slopes westward toward Lake Tye (Figure 3). Currently, the project site's stormwater combines with stormwater from the adjacent property at 16755 Tye Street SE in shared drainage piping and then is conveyed through the Purcell property at 16779 Tye Street SE to the public drainage system that carries surface water to Lake Tye. The gray arrows in Figure 3 show the current drainage configuration.

The proposed project will maintain the natural discharge to Lake Tye while also simplifying the drainage pattern (see blue arrows in Figure 3). Stormwater from the project site and 16755 Tye Street SE will continue to share a stormwater drainage system. However, the storm drainage system will discharge to a bioretention system on the north part of the project, discharge to a public drainage ditch for conveyance to Lake Tye.

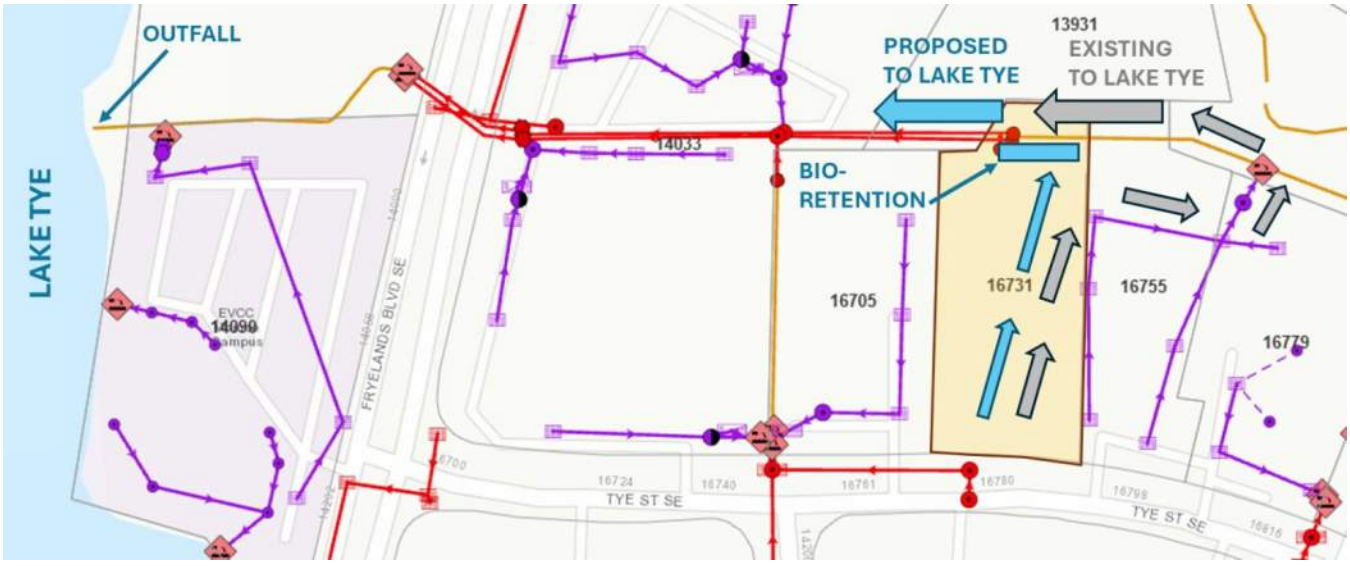


Figure 3. Existing Drainage Systems to Lake Tye

Minimum Requirement #5: Onsite Stormwater Management

Lawn and Landscaped Areas

The landscaping project elements will restore the existing lawn and restore other landscape areas with native plantings, as appropriate. The landscaped areas will comply with the Post-Construction Soil Quality and Depth guidance and BMP T5.13 in Chapter 5 of Volume V of the 2019 Ecology Manual. See the project landscape site plan for more detail.

Hard Surface Areas

List #2 from the Ecology Manual Table I-3.2 was conducted to identify candidate onsite stormwater management options:

Dispersion BMPs are not feasible because there is no available vegetated flow path for stormwater dispersion.

Infiltration-based BMPs are not feasible due to the potential for elevated groundwater (see geotech report in Appendix A).

Bioretention is feasible along the north side of the property between the truck yard and the drainage ditch. Please see the MR #6 section for a description of the bioretention sizing.

All stormwater from the project site and the adjacent 16755 Tye Street SE property will be routed to a bioretention system.

Minimum Requirement #6: Runoff Treatment

The proposed design will route all new and replaced hard surface areas and the existing gravel yard area to the north of the proposed building to an oil water separator and bioretention system for water quality treatment (see Sheets C-01 and C-03 for facility locations and details). Because the shared drainage system that serves the adjacent 16755 Tye Street SE property will remain in service, the bioretention has been sized to treat stormwater from this property as well. Table 3 lists the areas that will drain to the water quality treatment system and Figure 4 shows the locations.

Table 3. List of Tributary Areas to Water Quality Treatment System

No.	Surface	Area (sf)
1	Building roof[A]	8,022
2	Asphalt parking area[B]	7,880
3	Concrete pad	1,500
4	Existing gravel yard[C]	22,149
5	16755 Tye Street SE[C]	29,233
	Tributary Area (sf):	68,784

A. The roof is not a pollution-generating surface, but is combined with other runoff to avoid constructing a separate, parallel storm drainage system

B. The calculated area excludes the driveway apron that slopes southward back toward Tye Street SE

C. The calculated areas include only the portions of these properties that drain northward. Therefore, the existing parking area on 16755 Tye Street SE is excluded, because the survey indicates collected stormwater is conveyed to the public drainage system in Tye Street SE.

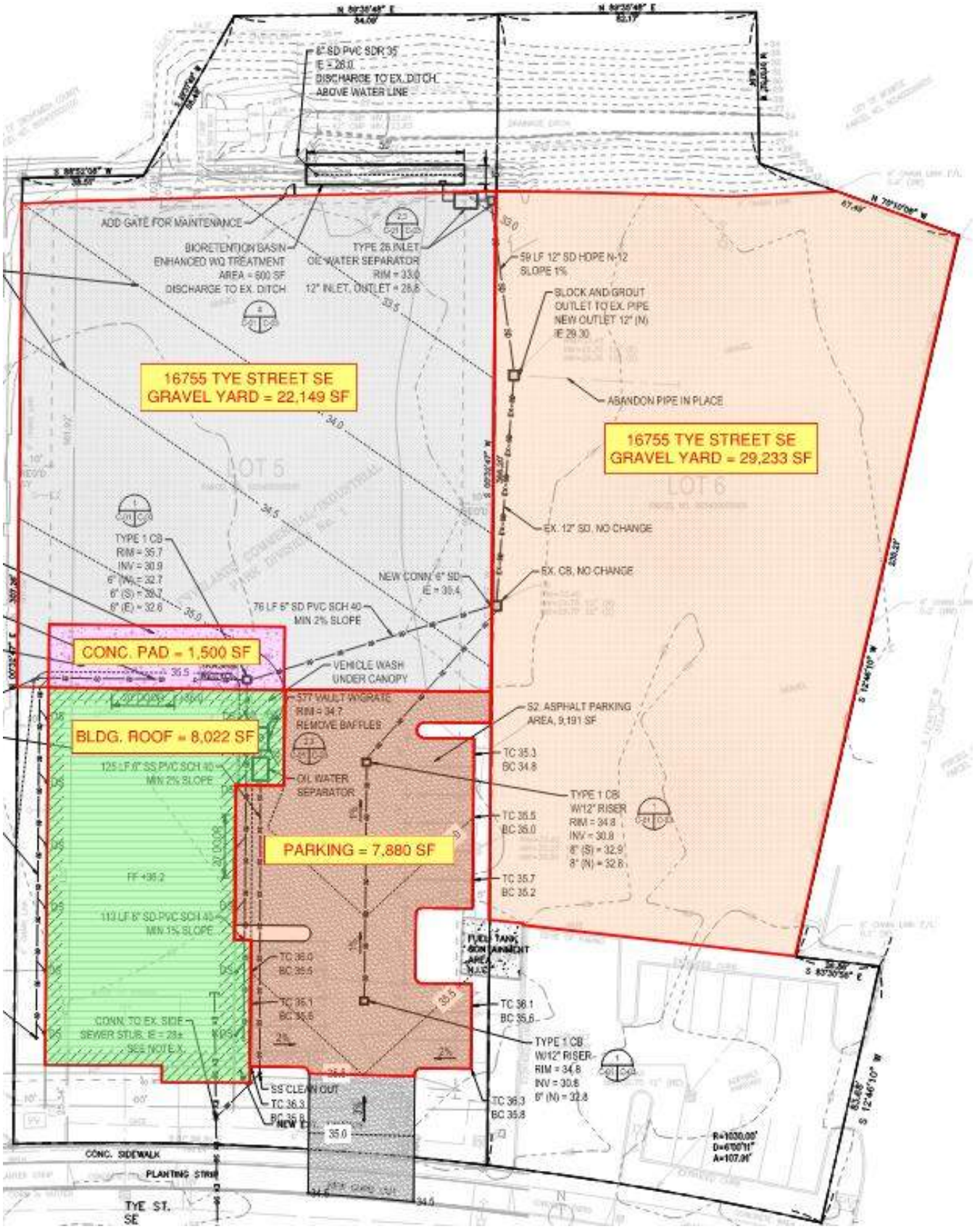


Figure 4. Tributary Area to Bioretention Water Quality Treatment System

Sizing Bioretention for Enhanced Treatment

Volume III, Section I of the Ecology Manual states:

> *Stormwater runoff that filters through the bioretention soil mix will receive Enhanced Treatment. Where bioretention is intended to meet Runoff Treatment requirements for its drainage area, it must be designed, using an approved continuous runoff model, to pass at least 91% of the influent runoff file through the bioretention soil mix.*

An MGS Flood model was constructed to simulate bioretention performance. Table 3 above shows the tributary area characteristics. Table 4 shows the bioretention configuration, which is also represented on Sheets C-01 and C-03.

Table 4. Bioretention Dimensions and Configuration

Bioretention Characteristic	Value
Plan area	240 sf
Side slopes	Vertical
Overflow crest elevation	30.0 feet
Top of mulch	28.7 feet
Top of bioretention media	28.5 feet
Top of gravel (bottom of media)	27.0 feet
Bottom of gravel	26.0 feet
Underdrain elevation	26.2 feet
Underdrain diameter	8 inches

The MGS modeling report is included as Appendix B. The model estimates that 98+ percent of incoming stormwater would receive treatment, which exceeds the enhanced treatment standard.

Minimum Requirement #7: Flow Control

The project site drains to a piped storm drain system that discharges directly to Lake Tye, which is exempt from flow control requirements. Therefore, the project is exempt from minimum requirement #7.

Minimum Requirement #8: Wetlands Protection

There are no identified wetlands on the project site.

Minimum Requirement #9: Operation and Maintenance

Operation, maintenance, and inspection of BMPs can be conducted by the property owner or a drainage contractor. The following activities are recommended:

1. Seasonally remove any accumulated material from the catch basins and oil water separators.
2. Seasonally remove any trash from the bioretention system; inspect monthly for the first year of operation to determine if more frequent trash removal is warranted.
3. Prune plants in the bioretention system, as needed, during the growing season. The selected plants should be drought tolerant and survive without watering during the summer.
4. Conduct video inspection of the storm drainage piping once per 2 to 3 years and clean as needed. The storm drainage design includes multiple access points to facilitate cleaning and inspection.

6. Downstream Analysis

The project site will discharge stormwater to a drainage ditch that is part of Monroe's public storm drainage system. Near the northwest property line, the ditch transitions to twin pipes that vary in diameter from 42 to

54 inches. These pipes convey water approximately 650 feet to the west and then transition to a grass-lined ditch and outfall to Lake Tye. The project will replace impervious surfaces with impervious surfaces and a water quality treatment bioretention basin. The overall effect on stormwater runoff should be a small reduction in flows to the Monroe system. City staff indicated the drainage ditch at the north side of the property is the preferred discharge location, which suggests no downstream capacity limitations.

7. On-Site Stormwater Pipe Capacity

The MGS Flood summary report includes flow recurrences for each hard surface area listed in Table 3 above. The basin flow rates were used to estimate the flow in four key storm drainage pipes (see Figure 5). The Manning's full-pipe flow rate for each pipe (assumed roughness, n = 0.013) was compared to the 100-year flow rate to verify the pipes have sufficient capacity. Table 5 summarizes the results. The pipes all have sufficient capacity to convey the 100-year flow rate.

Table 5. Onsite Stormwater Pipe Hydraulic Calculations

Pipe	Diam (in)	Slope	Tributary	Q100 (cfs)	Capacity (cfs)
1	8	0.038	Parking	0.20	2.36
2	8	0.029	Roof + Conc. pad	0.24	2.06
3	12	0.006	Pipe 1 + Pipe 2 + 0.20 x North gravel + 0.35 x 16755 Tye	0.82	2.70
4	12	0.008	Pipe 1 + Pipe 2 + 0.65 x North gravel + 0.80 x 16755 Tye	1.41	3.29

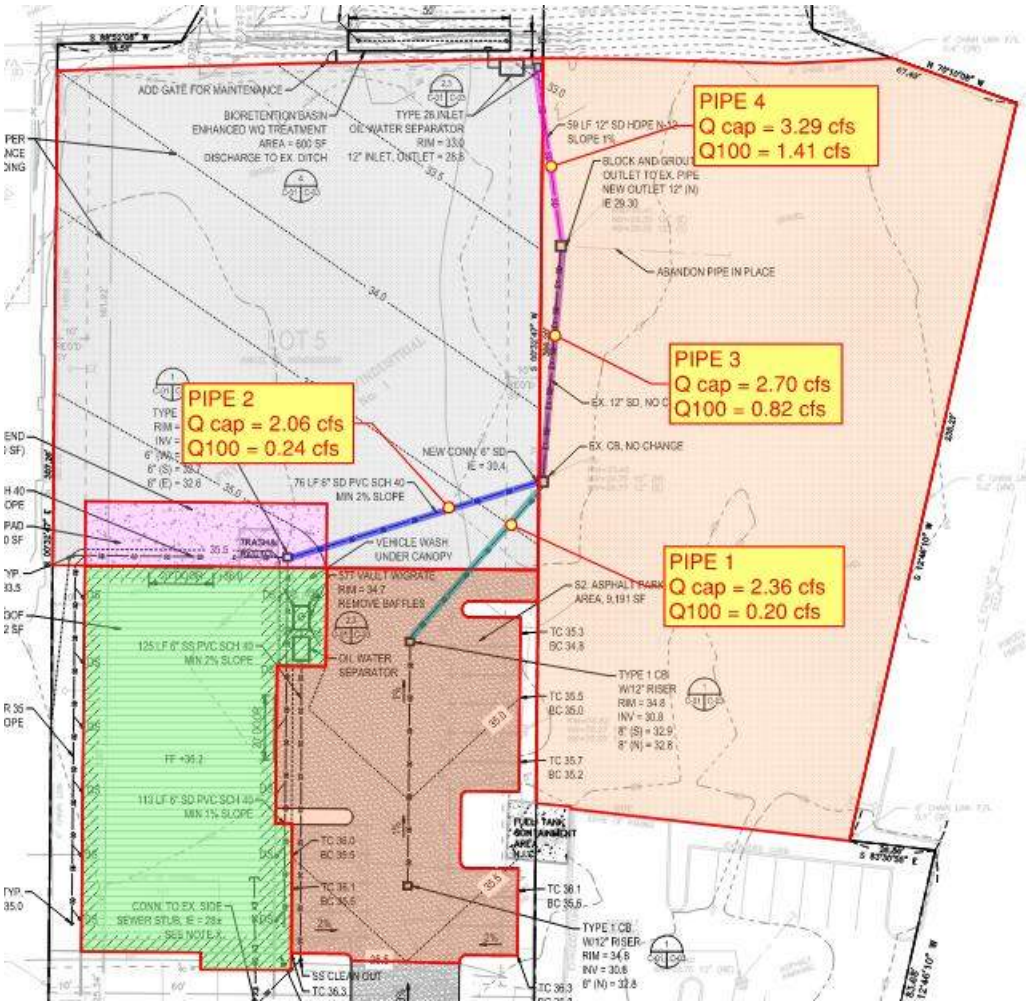


Figure 5. Comparing Pipe Capacity and 100-Year Flow Rate

8. Construction SWPPP Narrative

Sheets C-02 and C-04 show the proposed erosion and sediment controls. Table 6 below lists the thirteen elements of the construction SWPPP narrative. During construction, these controls will prevent sediment-laden runoff from leaving the project site.

Table 6. Project Construction SWPPP Narrative

Element	Approach/Reference
1) Mark clearing limits or areas of disturbance	The clearing limits and installation location for filter/silt fencing are indicated on the Erosion and Sediment Control plan and details (C-02, C-04).
2) Establish construction access	Sheet C-02 shows that a stabilized construction entrance will be constructed at the entrance to the parking area.
3) Control flow rates	Any runoff from hard surfaces during construction will be mitigated with a) filter/silt fencing and supplemental erosion controls (e.g., wattles, straw, coir logs), and a sediment trap, as needed. See Sheets C-02, C-04.
4) Install sediment controls	Any runoff from hard surfaces during construction will be mitigated with a) filter/silt fencing and supplemental erosion controls (e.g., wattles, straw, coir logs), and a sediment trap, as needed. See Sheets C-02, C-04.
5) Stabilize soils	Exposed soils will be stabilized using methods described in the Erosion and Sediment Control Plan (Sheet C-02).
6) Protect slopes	Cut and fill will be minimized in steep slope areas and soils will be protected as described in the Erosion and Sediment Control Plan (Sheet C-02) and geotechnical report.
7) Protect drain inlets	Existing storm drain inlets will be protected per Ecology BMP C220, as shown on Sheets C-02 and C-04.
8) Stabilize channels and outlets	There are no channels are outlets in the project construction area.
9) Control pollutants	The storage of hazardous chemicals onsite will be minimized during construction by specifying deliveries shortly before materials are used. Any hazardous materials will be enclosed and covered.
10) Control dewatering	No dewatering is expected, based on the soil explorations, and expected timing of construction during the dry season.
11) Maintain BMPs	SWPPP BMPs will be inspected after each rainfall and weekly during dry periods to identify and conduct maintenance and repairs, as needed.
12) Manage the project	The engineering plans and SWPPP narratives will be kept onsite. The project lead will maintain a project log that documents material deliveries, project receipts, and inspections.
13) Protect LID BMPs	The proposed bioretention media and plantings will not be installed until most of the construction is complete.

9. Conclusion

The stormwater management plan and construction SWPPP narrative documented in this report, along with the stormwater site plan (Sheet C-01) and erosion and sediment control plan (Sheet C-02) meet minimum requirements #1 through #9 of the 2019 Ecology Manual, as required by the City of Monroe.

Appendix A: Geotechnical Report

PanGEO INCORPORATED

Engineering Consultants

July 14, 2020
File No. 20-224

Mr. Mike Edelbrock
MICKELO CONSTRUCTION LLC
16731 Tye Street SE
Monroe, WA 98272

Subject: **Geotechnical Report**
16731 Tye Street SE
Monroe, WA

Dear Mr. Edelbrock,

As requested, PanGEO Inc. completed a geotechnical evaluation of the property located at 16731 Tye Street SE in Monroe, Washington (see Figure 1) regarding your plan to construct a new shop building on the site.

Our service scope included reviewing readily available geologic data, conducting a test pit program, and formulating the conclusions presented below.

SITE DESCRIPTION

The parcel is located on the north side of Tye Street SE in Monroe. As shown on Figure 2, the 1.19-acre parcel has a rectangular footprint with a frontage of about 150 feet on Tye Street SE. The parcel is about 300 feet deep, south to north, and is essentially level.

The property is currently an open yard area for the storage of construction equipment and materials (see Plate 1). The site is covered with a layer of crushed rock fill. The site is bordered on the east and west by light industrial / commercial buildings, and by open ground to the north. We understand that you wish to construct an 80 by 100-foot, steel framed, single story shop and office building on the south side of the parcel.

Plate 1- Yard area of the planned shop and office building.

SUBSURFACE CONDITIONS

As part of our study we reviewed geologic maps of the area to better understand the subsurface conditions at the site. In addition, we reviewed on-line databases and in-house records to determine if previous subsurface investigations have been performed in the vicinity of the site.

SITE GEOLOGY

The project area is contained within the Maltby Quadrangle. The Geologic Map of the Maltby Quadrangle (Allen, et al, 2017) shows the project area at the boundary between a peat bog and recessional outwash deposit. Allen et al, (2017) describe the recessional outwash as consisting of sand and pebble to cobble gravel, gray to tan, loose to medium dense, and weakly to well stratified. However, the eastward extension of this same unit into the nearby Monroe Quadrangle (Dragovich, et al, 2011) is described as alluvium. An earlier mapping of the Maltby Quadrangle (Minard, 1985) also describes the unit as alluvium.

SUBSURFACE EXPLORATIONS

Subsurface conditions at the site were explored with four test pits which were excavated at the locations shown on Figure 2 using a trackhoe supplied by Mickelo Construction, LLC. An engineering geologist from our office was present throughout the field exploration program to observe the test pit excavations, extract soil samples as needed, and to document the soil conditions observed. The soils were described in the field in general accordance with ASTM D

2488-00, following the guidelines of the Unified Soil Classification System, as shown on Figure 3. Summary logs from the borings are presented in Figures 4 to 7.

SUBSURFACE CONDITIONS

Based on the test pits, the parcel is underlain by up to nearly a foot of crushed rock base material supported on a geotextile fabric. This in turn is underlain to a depth of roughly 6½ feet by medium dense to dense, brown to gray, silty, gravelly fine sand fill with cobbles. The fill contained scattered amounts of concrete, wood and metal debris. The uppermost native soil was a bed of soft, brown peat, roughly 1 to 1½ feet thick. At depth the test pits encountered loose to medium dense, non-plastic to slightly plastic silt, with some fine sand.

GROUNDWATER

Groundwater was not encountered in the test pits, which were excavated to a maximum depth of 9½ feet. We anticipate that groundwater could be present at a shallower depth during the wet winter months.

GEOTECHNICAL DESIGN RECOMMENDATIONS

SEISMIC DESIGN PARAMETERS

The design parameters for the site should be in conformance with the 2018 edition of the International Building Code (IBC). which specifies a design earthquake having a 2% probability of occurrence in 50 years (return interval of 2,475 years). In our opinion, Site Class D is suitable for use in seismic design

LIQUEFACTION EVALUATION

Regional geologic maps indicate that the site is underlain by recessional outwash deposits or alluvium. These deposits are typically loose to medium dense. As such, when submerged, these soils may be susceptible to liquefaction. However, since the water table at the site is likely at a depth of 10 feet or more, we believe that any potential liquefaction of the underlying alluvium or glacial outwash sediments would have minor effects on the performance of the proposed building (i.e. differential settlements at the ground surface on the order of about 1-inch or less). Consequently, in our opinion, the potential occurrence of liquefaction would not adversely affect the performance of the proposed building.

FOUNDATIONS

The building may be supported on conventional strip and individual footings bearing on existing fill soil that has been compacted to a dense and unyielding condition with a Ho-Pac or jumping jack compactor. If for any reason the existing fill cannot be compacted to a dense and unyielding condition, the footing should be over-excavated by 12 inches, and brought back to grade with 2 lifts of compacted structural fill. The foundations may be designed for an allowable bearing pressure of 2,000 psf with a one-third increase for seismic or transient loads. All footings should be founded a minimum distance of 18 inches below the finished exterior grade for perimeter footings and 12 inches below the finished floor slab for interior footings. All strip footings should have a minimum width of 18 inches and all individual footings should have a minimum width of 24 inches. Any footing over excavation should extend at least 6 inches beyond the face of the footings. Footing excavations should be observed by PanGEO to confirm that the footing subgrade has been adequately prepared.

Lateral forces from wind or seismic loading may be resisted by the combination of passive earth pressures acting against the embedded portions of the footings and by friction acting on the base of the foundations. Passive resistance values may be determined using an equivalent fluid weight of 350 pounds per cubic foot (pcf). This value includes a factor safety of at least 2, assuming that compacted structural fill will be placed adjacent to the sides of the footings. A coefficient friction of 0.5 may be used to determine the frictional resistance at the base of the footings. This coefficient includes a factor safety of approximate 1.5.

Footings designed in accordance with the above may experience total settlements of 1 inch under static loading with differential settlement between adjacent columns of about ½ inch. Most settlement should occur during construction.

FLOOR SLABS

Conventional slab on grade construction may be used for the floor slabs. The floor slab may be supported on the existing, dense, crushed rock surfacing, provided the material is clean enough to provide a capillary break function, as described below. All fill underlying the floor slabs should be compacted to firm and unyielding condition with a vibratory roller or HoPac prior to the construction of the floor slab. All floor slabs should be constructed on a minimum 6-inch thick capillary break consisting of free-draining, crushed rock or well-graded gravel compacted to a firm and unyielding condition. The capillary break material should have no more than 10 percent passing the No. 4 sieve and less than 5 percent by weight of the material passing the U.S. Standard No. 100 sieve. City of Seattle Type 22 material meets this gradation requirement. We

also recommend that a 10-mil polyethylene vapor barrier be placed below the slab. Based on the above, the floor slab may be designed using a modulus of subgrade reaction of 150 pci.

STRUCTURAL FILL

WSDOT Gravel Borrow (9-03.14(1)) should be used for structural fill as needed. The structural fill should be moisture conditioned to within about 3 percent of optimum moisture content, placed in loose, horizontal lifts less than 8 inches in thickness, and systematically compacted to a dense and relatively unyielding condition and to at least 95 percent of the maximum dry density, as determined using test method ASTM D 1557.

PAVEMENTS

We recommend using 4" of HMA for any new pavement over the existing crushed rock surfacing. The underlying subgrade should be proof rolled to a dense and unyielding condition before placing the HMA. Any soft areas in the subgrade should be over excavated and replaced with compacted crushed surfacing base course (CSBC) (WSDOT 9-03.9(3)c). Material within the pavement prism should be compacted to 95% of the material's maximum dry density, as determined using test method ASTM D 1557.

EROSION AND DRAINAGE CONSIDERATIONS

The crushed rock surfacing at the site is not susceptible to surface erosion and, therefore, will not require any remedial measures to address erosion control or drainage.

Any paving at the site should be sloped to direct surface runoff away from the building to a suitable outlet. Roof downspouts should also be tightlined to a suitable outlet. Because of the depth of the water table, footing drains are not required for the building foundations.

WET WEATHER EARTHWORK RECOMMENDATIONS

General recommendations relative to earthwork performed in wet weather or in wet conditions are presented below:

- Earthwork should be performed in small areas to minimize subgrade exposure to wet weather. Excavation or the removal of unsuitable soil should be followed promptly by the placement and compaction of clean structural fill. The size and type of construction equipment used may have to be limited to prevent soil disturbance.

- During wet weather, the allowable fines content of the structural fill should be reduced to no more than 5 percent by weight based on the portion passing ¾-inch sieve. The fines should be non-plastic.

- The ground surface within the construction area should be graded to promote run-off of surface water and to prevent the ponding of water.

- Bales of straw and/or geotextile silt fences should be strategically located to control erosion and the movement of soil. Erosion control measures should be installed along all the property boundaries.

- Excavation slopes and soils stockpiled on site should also be covered with plastic sheets.

ADDITIONAL SERVICES

To confirm that our recommendations are properly incorporated into the design and construction of the proposed project, PanGEO should be retained to conduct a review of the final project plans and specifications, and to monitor the construction of geotechnical project elements, such as:

- Review final project plans and specifications;

- Verify implementation of erosion control measures;

- Verify adequacy of prepared footing subgrades;

- Confirm the adequacy of the compaction of structural backfill;

- Other consultation as may be required during construction.

Conditions encountered during construction may differ from the assumptions and recommendations described in this report. Consequently, differing site conditions may require modifications to the recommendations presented in this report.

CLOSURE

We have prepared this report for your use for the proposed site improvements. The recommendations contained in this report are based on a review of available geologic and

geotechnical information, a subsurface test pit program, and on our understanding of the project. The study was performed using a mutually agreed-upon scope of work.

Variations in soil conditions may exist between the locations of the explorations and the actual conditions underlying the site. The nature and extent of soil variations may not be evident until construction occurs. If any soil conditions are encountered that are different from those described in this report, we should be notified immediately to review the applicability of our recommendations. Additionally, we should also be notified to review the applicability of our recommendations if there are any changes in the project scope.

The scope of our work does not include services related to construction safety precautions. Our recommendations are not intended to direct the contractors' methods, techniques, sequences or procedures, except as specifically described in our report for consideration in design. Additionally, the scope of our work specifically excludes the assessment of environmental characteristics, particularly those involving hazardous substances. We are not mold consultants nor are our recommendations to be interpreted as being preventative of mold development. A mold specialist should be consulted for all mold-related issues.

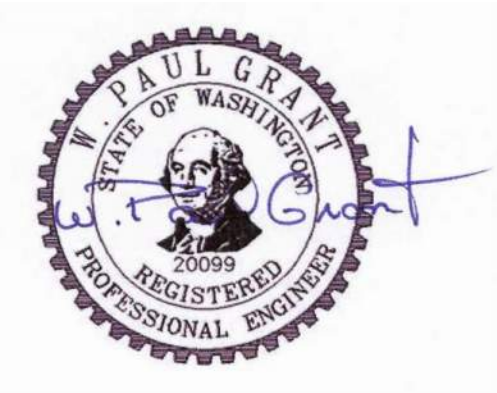
This report has been prepared for planning and design purposes for specific application to the proposed project in accordance with the generally accepted standards of local practice at the time this report was written. No warranty, express or implied, is made.

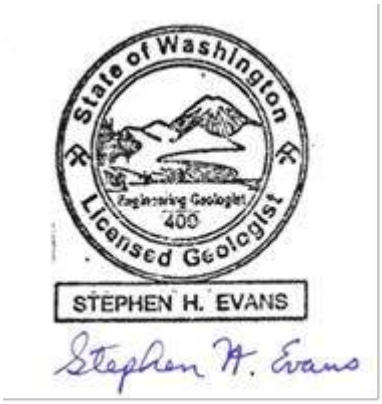
This report may be used only by the client and for the purposes stated, within a reasonable time from its issuance. Land use, site conditions (both off and on-site), or other factors including advances in our understanding of applied science, may change over time and could materially affect our findings. Therefore, this report should not be relied upon after 24 months from its issuance. PanGEO should be notified if the project is delayed by more than 24 months from the date of this report so that we may review the applicability of our conclusions considering the time lapse.

It is the client's responsibility to see that all parties to this project, including the designer, contractor, subcontractors, etc., are made aware of this report in its entirety. The use of information contained in this report for bidding purposes should be done at the contractor's option and risk. Any party other than the client who wishes to use this report shall notify PanGEO of such intended use and for permission to copy this report. Based on the intended use of the report, PanGEO may require that additional work be performed and that an updated report be reissued. Noncompliance with any of these requirements will release PanGEO from any liability resulting from the use this report.

Please call with any questions on this evaluation.

Sincerely,





W. Paul Grant, P.E.
Principal Geotechnical Engineer

Stephen H. Evans, L.E.G.
Senior Engineering Geologist

Attachments:

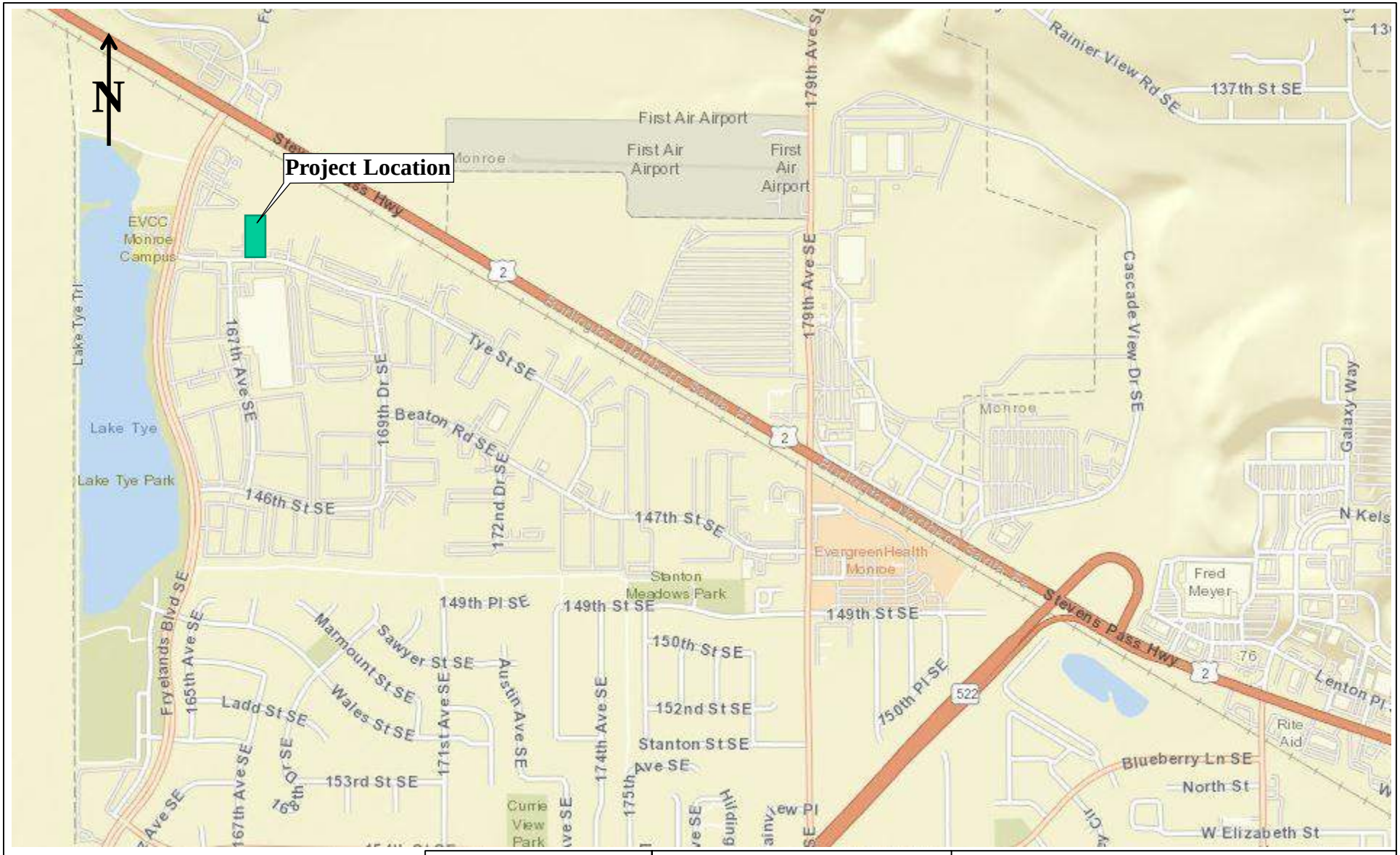
Figure 1 – Vicinity Map
Figure 2 – Site and Exploration Plan
Figure 3 – Terms and Symbols for Boring and Test Pit Logs
Figure 4 – Log of Test Pit No. TP-1
Figure 5 – Log of Test Pit No. TP-2
Figure 6 - Log of Test Pit No. TP-3
Figure 7 – Log of Test Pit No. TP-4

References:

Allen, M. D.; Mavor, S. P.; Tepper, J. H.; Nesbitt, E. A.; Mahan, S. A.; Cakir, Recep; Stoker, B. A.; Anderson, M. L., 2017, *Geologic map of the Maltby 7.5-minute quadrangle, Snohomish and King Counties, Washington*: Washington Geological Survey Map Series 2017-02.

Dragovich, J.D., Anderson, M.L., Mahan, S.A., Koger, C.J., Jennifer H. Saltonstall, J.H., MacDonald, J.H, Jr., Wessel, G.R., Stoker, B.A., Bethel, J.P., Labadie, J.E., Cakir, R., Bowman, J.D., and DuFrane, S.A., 2011, *Geologic Map of the Monroe 7.5-minute Quadrangle, King and Snohomish Counties, Washington*: Washington Division of Geology and Earth Resources Open File Report 2011-1.

Minard, J.P., 1985, *Geologic map of the Maltby Quadrangle, Snohomish and King Counties, Washington*: U.S.G.S. Miscellaneous Field Studies Map MF-1746.



Map not to Scale
Base Map from
Washington DNR

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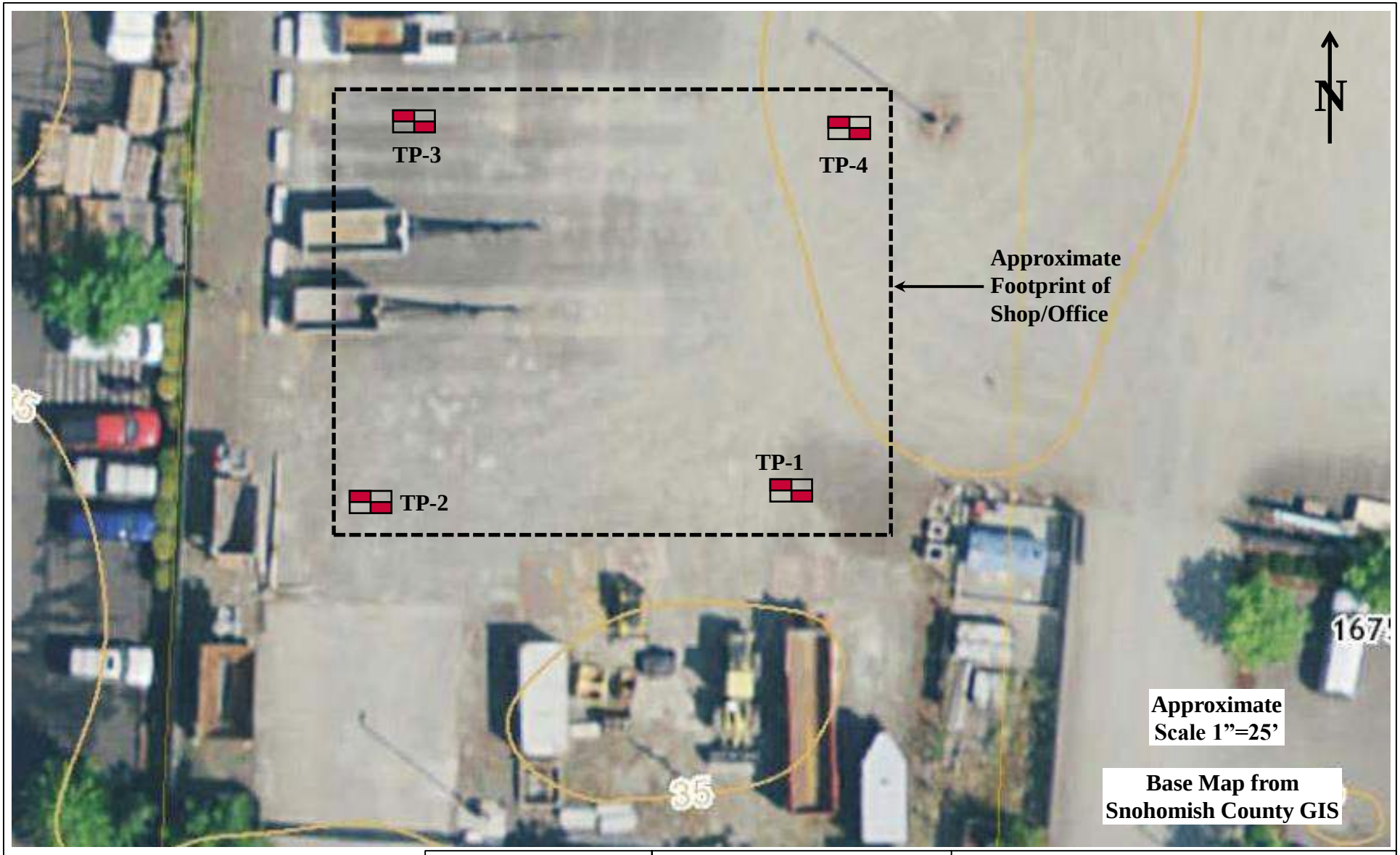
Proposed Shop and Office
16731 Tye Street SE
Monroe, WA

VICINITY MAP

Project No.	Figure No.
20-224.000	1



Legend:

TP-1 PanGEO Test Pit

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16731 Tye Street SE
Monroe, WA

SITE AND EXPLORATION PLAN

Project No.	Figure No.
20-224.000	2

RELATIVE DENSITY / CONSISTENCY

SAND / GRAVEL			SILT / CLAY		
Density	SPT N-values	Approx. Relative Density (%)	Consistency	SPT N-values	Approx. Undrained Shear Strength (psf)
Very Loose	<4	<15	Very Soft	<2	<250
Loose	4 to 10	15 - 35	Soft	2 to 4	250 - 500
Med. Dense	10 to 30	35 - 65	Med. Stiff	4 to 8	500 - 1000
Dense	30 to 50	65 - 85	Stiff	8 to 15	1000 - 2000
Very Dense	>50	85 - 100	Very Stiff	15 to 30	2000 - 4000
			Hard	>30	>4000

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS		GROUP DESCRIPTIONS	
Gravel 50% or more of the coarse fraction retained on the #4 sieve. Use dual symbols (eg. GP-GM) for 5% to 12% fines.	GRAVEL (<5% fines)	GW	Well-graded GRAVEL
		GP	Poorly-graded GRAVEL
	GRAVEL (>12% fines)	GM	Silty GRAVEL
		GC	Clayey GRAVEL
Sand 50% or more of the coarse fraction passing the #4 sieve. Use dual symbols (eg. SP-SM) for 5% to 12% fines.	SAND (<5% fines)	SW	Well-graded SAND
		SP	Poorly-graded SAND
	SAND (>12% fines)	SM	Silty SAND
		SC	Clayey SAND
Silt and Clay 50%or more passing #200 sieve	Liquid Limit < 50	ML	SILT
		CL	Lean CLAY
		OL	Organic SILT or CLAY
	Liquid Limit > 50	MH	Elastic SILT
		CH	Fat CLAY
		OH	Organic SILT or CLAY
Highly Organic Soils		PT	PEAT

Notes: 1. Soil exploration logs contain material descriptions based on visual observation and field tests using a system modified from the Uniform Soil Classification System (USCS). Where necessary laboratory tests have been conducted (as noted in the "Other Tests" column), unit descriptions may include a classification. Please refer to the discussions in the report text for a more complete description of the subsurface conditions.

2. The graphic symbols given above are not inclusive of all symbols that may appear on the borehole logs. Other symbols may be used where field observations indicated mixed soil constituents or dual constituent materials.

DESCRIPTIONS OF SOIL STRUCTURES

Layered: Units of material distinguished by color and/or composition from material units above and below

Laminated: Layers of soil typically 0.05 to 1mm thick, max. 1 cm

Lens: Layer of soil that pinches out laterally

Interlayered: Alternating layers of differing soil material

Pocket: Erratic, discontinuous deposit of limited extent

Homogeneous: Soil with uniform color and composition throughout

Fissured: Breaks along defined planes

Slickensided: Fracture planes that are polished or glossy

Blocky: Angular soil lumps that resist breakdown

Disrupted: Soil that is broken and mixed

Scattered: Less than one per foot

Numerous: More than one per foot

BCN: Angle between bedding plane and a plane normal to core axis

COMPONENT DEFINITIONS

COMPONENT	SIZE / SIEVE RANGE	COMPONENT	SIZE / SIEVE RANGE
Boulder:	> 12 inches	Sand	
Cobbles:	3 to 12 inches	Coarse Sand:	#4 to #10 sieve (4.5 to 2.0 mm)
Gravel		Medium Sand:	#10 to #40 sieve (2.0 to 0.42 mm)
Coarse Gravel:	3 to 3/4 inches	Fine Sand:	#40 to #200 sieve (0.42 to 0.074 mm)
Fine Gravel:	3/4 inches to #4 sieve	Silt	0.074 to 0.002 mm
		Clay	<0.002 mm

TEST SYMBOLS

for In Situ and Laboratory Tests listed in "Other Tests" column.

ATT	Atterberg Limit Test
Comp	Compaction Tests
Con	Consolidation
DD	Dry Density
DS	Direct Shear
%F	Fines Content
GS	Grain Size
Perm	Permeability
PP	Pocket Penetrometer
R	R-value
SG	Specific Gravity
TV	Torvane
TXC	Triaxial Compression
UCC	Unconfined Compression

SYMBOLS

Sample/In Situ test types and intervals

- 2-inch OD Split Spoon, SPT (140-lb. hammer, 30" drop)
- 3.25-inch OD Spilt Spoon (300-lb hammer, 30" drop)
- Non-standard penetration test (see boring log for details)
- Thin wall (Shelby) tube
- Grab
- Rock core
- Vane Shear

MONITORING WELL

- Groundwater Level at time of drilling (ATD)
- Static Groundwater Level
- Cement / Concrete Seal
- Bentonite grout / seal
- Silica sand backfill
- Slotted tip
- Slough
- Bottom of Boring

MOISTURE CONTENT

Dry	Dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water

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Terms and Symbols for Boring and Test Pit Logs

Figure 3

Test Pit No. TP-1 Approximate ground surface elevation: 35 feet		
Depth (ft)	**UNIT**	**Material Description**
0 – 0.75	FILL	Dense, gray CRUSHED ROCK base, with geotextile separating fill from underlying fill.
0.75 – 6.5	FILL	Medium dense to dense, dark gray grading to brown, silty, gravelly, fine SAND with cobbles: moist, non-plastic to slightly plastic fines, occasional debris. - 2' becoming cobbly
6.5 – 8.0	PEAT	Soft, dark brown, organic PEAT
8.0 – 9.5	ALLUVIUM	Loose to medium dense, gray, SILT: wet, some fine sand, homogeneous, non-plastic.
TP-1 was terminated approximately 9.5 feet below ground surface on June 24, 2020. Groundwater seepage was not observed.		

Figure 4

Test Pit No. TP-2 Approximate ground surface elevation: 35 feet		
Depth (ft)	**UNIT**	**Material Description**
0 – 0.6	FILL	Dense, gray CRUSHED ROCK base, with geotextile separating fill from underlying fill.
0.6 – 1.4	FILL	Medium dense to dense, brown, silty, gravelly, fine SAND: slightly moist, non-plastic to slightly plastic fines, with cobbles.
1.4 – 6.6	FILL	Medium dense, gray, silty, gravelly, fine SAND with cobbles: slightly moist, trace of debris, layered.
6.6 – 7.3	PEAT	Soft, brown, organic PEAT.
7.3 – 7.5	ALLUVIUM	Loose to medium dense, light brown SILT with clay: very moist, slightly plastic, trace to some fine sand, laminated, homogeneous.
TP-2 was terminated approximately 7.5 feet below ground surface on June 24, 2020. Groundwater seepage was not observed.		

Figure 5

Test Pit No. TP-3 Approximate ground surface elevation: 35 feet		
Depth (ft)	**UNIT**	**Material Description**
0 – 0.9	FILL	Dense, gray CRUSHED ROCK base, with geotextile separating fill from underlying fill.
0.9 – 6.5	FILL	Medium dense to dense, gray, silty, gravelly, fine SAND with cobbles: moist, non-plastic to slightly plastic fines, layered. - 2.4' grassy organics - 5' wood
6.5 – 7.7	PEAT	Soft, dark brown, organic PEAT.
7.7 – 8.0	ALLUVIUM	Loose to medium dense, light green gray SILT: wet, some fine sand, homogeneous, non-plastic to slightly plastic.
TP-3 was terminated at approximately 8.0 feet below ground surface on June 24, 2020. Groundwater seepage was not observed.		

Figure 6

Test Pit No. TP-4 Approximate ground surface elevation: 35 feet		
Depth (ft)	**UNIT**	**Material Description**
0 – 0.5	FILL	Dense, gray CRUSHED ROCK base, with geotextile separating fill from underlying fill.
0.5 – 6.3	FILL	Dense, brown, silty, gravelly, fine SAND with cobbles: slightly moist, non-plastic to slightly plastic fines, layered, breaks in shards, metal debris.
6.3 – 7.4	PEAT	Soft, dark brown, organic PEAT, large wood chunk.
7.4 – 8.2	ALLUVIUM	Loose to medium dense, light green gray SILT: very moist, trace to some fine sand, homogeneous, non-plastic to slightly plastic, layered.
TP-4 was terminated at approximately 8.4 feet below ground surface on June 24, 2020. Groundwater seepage was not observed.		

Figure 7

Appendix B: MGS Flood Summary Report

MGS FLOOD
PROJECT REPORT

Program Version: MGSFlood 4.64
Program License Number: 201910003
Project Simulation Performed on: 07/09/2025 8:41 AM
Report Generation Date: 07/09/2025 8:42 AM

Input File Name: Edelbrock WQ Bioretention_Two Lots.fld
Project Name: Edelbrock WQ
Analysis Title: Bioretention Sizing
Comments:

PRECIPITATION INPUT

Computational Time Step (Minutes): 15

Extended Precipitation Time Series Selected

Full Period of Record Available used for Routing

Climatic Region Number: 17
Precipitation Station : 96004805 Puget East 48 in_5min 10/01/1939-10/01/2097
Evaporation Station : 961048 Puget East 48 in MAP

Evaporation Scale Factor : 0.750

HSPF Parameter Region Number: 1
HSPF Parameter Region Name : Ecology Default

********** Default HSPF Parameters Used (Not Modified by User) **********

********** WATERSHED DEFINITION **********

Predevelopment/Post Development Tributary Area Summary

	Predeveloped	Post Developed
Total Subbasin Area (acres)	1.579	1.579
Area of Links that Include Precip/Evap (acres)	0.000	0.006
Total (acres)	1.579	1.585

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 1

---------- Subbasin : 16731, 16755 Existing ----------

	-------Area (Acres) --------
ROADS/FLAT	1.579
Subbasin Total	1.579

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 5

---------- Subbasin : Building Roof ----------

	-------Area (Acres) --------
ROOF TOPS/FLAT	0.184
Subbasin Total	0.184

---------- Subbasin : Parking ----------

	-------Area (Acres) --------
ROADS/FLAT	0.181
Subbasin Total	0.181

---------- Subbasin : Conc. Pad ----------

	-------Area (Acres) --------
ROADS/FLAT	0.034
Subbasin Total	0.034

---------- Subbasin : North Gravel ----------

	-------Area (Acres) --------
ROADS/FLAT	0.509
Subbasin Total	0.509

---------- Subbasin : 16755 Tye St SE ----------

	-------Area (Acres) --------
ROADS/FLAT	0.671
Subbasin Total	0.671

********** **LINK DATA** **********

----------SCENARIO: PREDEVELOPED
Number of Links: 0

********** **LINK DATA** **********

----------SCENARIO: POSTDEVELOPED
Number of Links: 1

Link Name: WQ Bioretention
Link Type: Ecology Bioretention Facility
Downstream Link: None

Floor Elevation (ft)	:	26.00
Riser Crest Elevation (ft)	:	30.00
Storage Depth (ft)	:	4.00
Bottom Length (ft)	:	40.0
Bottom Width (ft)	:	6.0
Bottom Slope (ft/ft)	:	0.000
Side Slopes (ft/ft)	:	Z1= 0.00 Z2= 0.00 Z3= 0.00 Z4= 0.00
Bottom Area (sq-ft)	:	240.
Area at Riser Crest El (sq-ft)	:	240.
(acres)	:	0.006
Volume at Riser Crest (cu-ft)	:	960.
(ac-ft)	:	0.022

Infiltration on Bottom and Sideslopes Selected

Soil Properties

Layer No	Soil Name	Thickness (ft)
1	ASTM 100	0.250
2	SMMWW 12 in/hr (Ecol	1.500
3	GRAVEL	1.000

KSat Safety Factor: None
Native Soil Infiltration Rate (in/hr) : 0.00

Underdrain Present
Underdrain Offset (in): : 2.00
Orifice Diameter (in) : 8.000

Riser Geometry
Riser Structure Type : Circular
Riser Diameter (in) : 12.00
Common Length (ft) : 0.000
Riser Crest Elevation : 30.00 ft

Hydraulic Structure Geometry

Number of Devices: 0

**********FLOOD FREQUENCY AND DURATION STATISTICS**********

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 1
Number of Links: 0

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 5
Number of Links: 1

********** Subbasin: Building Roof **********

Flood Frequency Data (cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	7.844E-02
5-Year	9.887E-02
10-Year	0.120
25-Year	0.147
50-Year	0.178
100-Year	0.205
200-Year	0.221
500-Year	0.242

********** Subbasin: Parking **********

Flood Frequency Data (cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	7.703E-02
5-Year	9.710E-02
10-Year	0.118
25-Year	0.144
50-Year	0.174
100-Year	0.202
200-Year	0.217

500-Year	0.237

********** **Subbasin: Conc. Pad** **********

Flood Frequency Data (cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	1.465E-02
5-Year	1.846E-02
10-Year	2.249E-02
25-Year	2.744E-02
50-Year	3.318E-02
100-Year	3.835E-02
200-Year	4.125E-02
500-Year	4.512E-02

********** **Subbasin: North Gravel** **********

Flood Frequency Data (cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	0.217
5-Year	0.273
10-Year	0.332
25-Year	0.406
50-Year	0.490
100-Year	0.567
200-Year	0.610
500-Year	0.667

********** **Subbasin: 16755 Tye St SE** **********

Flood Frequency Data (cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	0.286
5-Year	0.360
10-Year	0.439
25-Year	0.535
50-Year	0.647
100-Year	0.748
200-Year	0.805
500-Year	0.880

********** Link: WQ Bioretention **********

Link Inflow Frequency Stats
Flood Frequency Data (cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	0.672
5-Year	0.848
10-Year	1.032
25-Year	1.260
50-Year	1.523

100-Year	1.760
200-Year	1.893
500-Year	2.071

********** Link: WQ Bioretention **********

Link WSEL Stats

WSEL Frequency Data(ft)

(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	WSEL Peak (ft)
1.05-Year	30.015
1.11-Year	30.046
1.25-Year	30.061
2.00-Year	30.106
3.33-Year	30.129
5-Year	30.146
10-Year	30.165
25-Year	30.213
50-Year	30.262
100-Year	30.293

*************Groundwater Recharge Summary ***************

Recharge is computed as input to Perlnd Groundwater Plus Infiltration in Structures

Total Predeveloped Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: 16731, 16755 Existin	0.000
Total:	0.000

Total Post Developed Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: Building Roof	0.000
Subbasin: Parking	0.000
Subbasin: Conc. Pad	0.000
Subbasin: North Gravel	0.000
Subbasin: 16755 Tye St SE	0.000
Link: WQ Bioretention	0.000
Total:	0.000

Total Predevelopment Recharge Equals Post Developed
Average Recharge Per Year, (Number of Years= 158)
Predeveloped: 0.000 ac-ft/year, Post Developed: 0.000 ac-ft/year

*************Water Quality Facility Data ***************

----------SCENARIO: PREDEVELOPED

Number of Links: 0

----------SCENARIO: POSTDEVELOPED

Number of Links: 1

********** Link: WQ Bioretention **********

2-Year Discharge Rate : 0.625 cfs

15-Minute Timestep, Water Quality Treatment Design Discharge
On-line Design Discharge Rate (91% Exceedance): 0.27 cfs
Off-line Design Discharge Rate (91% Exceedance): 0.16 cfs

Infiltration/Filtration Statistics--------------------
Inflow Volume Including PPT-Evap (ac-ft): 867.33
Total Runoff Infiltrated (ac-ft): 0.00, -9900.00%
Total Runoff Filtered (ac-ft): 857.31, 98.84%
Primary Outflow To Downstream System (ac-ft): 9.66
Secondary Outflow To Downstream System (ac-ft): 856.73
Volume Lost to ET (ac-ft): 0.37
Percent Treated (Infiltrated+Filtered+ET)/Total Volume: 98.89%

Percent treated exceeds 91% required for enhanced treatment, per Ecology Manual (Dubin).

*************Compliance Point Results ***************

Scenario Predeveloped Compliance Subbasin: 16731, 16755 Existing

Scenario Postdeveloped Compliance Link: WQ Bioretention

***** Point of Compliance Flow Frequency Data *****
Recurrence Interval Computed Using Gringorten Plotting Position

Predevelopment Runoff		Postdevelopment Runoff	
Tr (Years)	Discharge (cfs)	Tr (Years)	Discharge (cfs)
2-Year	0.672	2-Year	0.625
5-Year	0.848	5-Year	0.847
10-Year	1.032	10-Year	0.954
25-Year	1.260	25-Year	1.253
50-Year	1.523	50-Year	1.551
100-Year	1.760	100-Year	1.725
200-Year	1.893	200-Year	1.801
500-Year	2.071	500-Year	1.902

** Record too Short to Compute Peak Discharge for These Recurrence Intervals

Flow duration and LID performance standards do not apply, because the project receiving water is Lake Tye (Dubin).

****** Flow Duration Performance ******
Excursion at Predeveloped 50%Q2 (Must be Less Than or Equal to 0%): -59.1%
PASS
Maximum Excursion from 50%Q2 to Q2 (Must be Less Than or Equal to 0%): -28.7% PASS
Maximum Excursion from Q2 to Q50 (Must be less than 10%): 99999.0% FAIL
Percent Excursion from Q2 to Q50 (Must be less than 50%): 0.0% PASS

FLOW DURATION DESIGN CRITERIA: FAIL

****** LID Duration Performance ******
Excursion at Predeveloped 8%Q2 (Must be Less Than 0%): 11.5% FAIL
Maximum Excursion from 8%Q2 to 50%Q2 (Must be Less Than 0%): 23.0% FAIL

LID DURATION DESIGN CRITERIA: FAIL