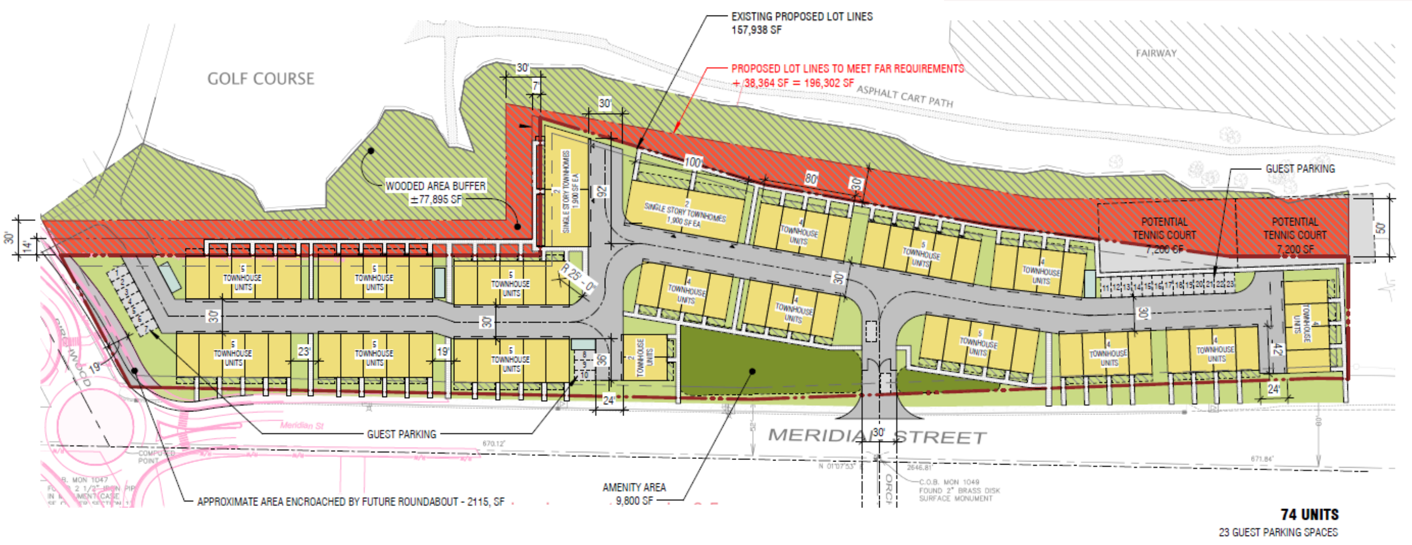
Attachment S

GEOTECHNICAL REPORT
Proposed Townhome Development
Meridian Street and Birchwood Avenue
Bellingham, Washington

PROJECT NO. 21-591
January 2022



Prepared for:

Stream Real Estate LLC

PanGEO INCORPORATED

Geotechnical & Earthquake
Engineering Consultants

PanGEO
INCORPORATED
Geotechnical & Earthquake Engineering Consultants

January 28, 2022
Project No. 21-591

Mr. Marc Angelillo
Stream Real Estate LLC
2607 Second Avenue, Suite 300
Seattle, Washington 98121

Subject: **Geotechnical Report**
Proposed Townhome Development
Meridian Street and Birchwood Avenue, Bellingham, Washington

Dear Mr. Angelillo:

Attached please find our geotechnical report for the proposed development at the above site in Bellingham, Washington. This report documents the subsurface conditions at the site and presents our geotechnical engineering design recommendations for the proposed townhome development.

In general, the test pits excavated at the site encountered 2 to 3½ feet of surficial forest duff/fill and reworked native soils overlying medium dense native sand and gravel. Based on soil conditions and anticipated at-grade finish floor elevations, in our opinion, conventional footings bearing on undisturbed native soils or properly-compacted structural fill placed on undisturbed native soils may be used to support the proposed buildings.

We appreciate the opportunity to work on this project. Please call if there are any questions.

Sincerely,

Siew L. Tan, P.E.
Principal Geotechnical Engineer
(Stan@pangeoinc.com)

3213 Eastlake Avenue East, Suite B
Seattle, WA 98102
Tel (206) 262-0370

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Geotechnical Report
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1.0 INTRODUCTION

This report presents the results of a geotechnical study that was undertaken to support the design and construction of the proposed townhome development in Bellingham, Washington. Our study was performed in general accordance with our mutually agreed-upon scope of work as outlined in our proposal dated December 16, 2021, which was subsequently approved by you on the same day. Our service scope included reviewing readily available geologic and geotechnical data in the site vicinity, conducting a site reconnaissance, excavating eight (8) test pits, and developing the geotechnical design recommendations presented in this report.

2.0 PROJECT AND SITE DESCRIPTION

The project site consists of a wooded area at the southeast portion of the Bellingham Golf and Country Club (see Figure 1, Vicinity Map). The site is approximate 146,520 square feet in size and borders Meridian Street to the east, Birchwood Avenue to the south, a gravel parking to the north, and the Bellingham Golf and Country Club to the west. Multiple dirt and gravel walking paths and trails are present within the site (see Figure 2, Site and Exploration Plan).

Based on the review of the topographic survey prepared by LDES, Inc., dated November 11, 2021, the existing site grade is relatively flat, sloping down slightly from north to south (approximate elevations 103 feet to 91 feet) for a total grade change of about 12 feet across the 1,050-foot-long site. During our site reconnaissance we noted multiple slash and refuse piles up to about 6 feet in height across the site.

According to the City of Bellingham *Geologic Hazards Map*, dated April 2018, the site is mapped in a Medium High Seismic Hazard Area. No other geologic hazards are mapped on the property by the City or Whatcom County.

We understand that the proposed development consists of removing the existing wooded area and construct eighteen (18) buildings that will house a total of 74 townhome units. We envisage that site grading for the proposed project will include stripping and removal of slash and refuse piles prior to cuts and fill of less than 4 feet for the foundation construction. Detailed plans are not available currently.

The conclusions and recommendations outlined and provided in this report are based on our understanding of the proposed development, which is in turn based on the project information provided. If the above project description is incorrect, or the project information changes, we should be consulted to review the recommendations contained in this study and make modifications, if needed.

3.0 SUBSURFACE EXPLORATIONS

Eight test pits (TP-1 through TP-8) were excavated at the project site on January 8, 2022. The test pits were excavated to between 10 and 13 feet below the existing grade. The approximate test pit locations are shown on the attached Figure 2.

The relative in-situ density of cohesionless soils, or the relative consistency of fine-grained soils, was estimated from the excavating action of the excavator, probing the sidewalls with a ½-inch diameter steel rod, and the stability of the test pit sidewalls. Where soil contacts were gradual or undulating, the average depth of the contact was recorded in the log.

The test pits were backfilled with the excavated soils. The backfill was tamped with the excavator bucket and the ground surface leveled. The backfill was not compacted to the requirements of structural fill. During construction of the project, the earthwork contractor should locate the test pits, remove the loose backfill and replace it with properly compacted structural fill.

A geologist from our firm was present throughout the explorations to assist in sampling, and to document the soil samples obtained from the explorations and perform the infiltration tests. The summary test pit logs are included in Appendix A.

4.0 SITE GEOLOGY AND SUBSURFACE CONDITIONS

4.1 SITE GEOLOGY

Based on review of *The Geologic Map of the Bellingham 1:100,000 Quadrangle* (Lapen, 2000), the project site is underlain by Glacial Outwash of the Sumas Stade (Geologic Map Unit *Qgos*).

Glacial Outwash, Sumas Stade is described by Lapen as a loose, recessional outwash, moderately to well-sorted gravel with local boulders, sandy gravel, minor gravelly medium to coarse sand, and rare sand to silt.

4.2 SOIL CONDITIONS

For a detailed description of the subsurface conditions encountered at each exploration location, please refer to our summary exploration logs provided in Appendix A. The stratigraphic contacts indicated on the logs represent the approximate depth to boundaries between soil units. Actual transitions between soil units may be more gradual or occur at different elevations. The descriptions of groundwater conditions and depths are likewise approximate. The following is a generalized description of the soils encountered in the test pits.

> ***UNIT 1:*** **Fill** – Undocumented fill was encountered to depths of approximately 2 to 3½ feet in each test pit. The fill generally consisted of a loose, duffy silty fine, cobble, trace organics (roots and rootlets), and trash debris.

> ***UNIT 2***: **Glacial Outwash, Sumas Stade –** Below the fill, each test pits encountered a medium dense, well-graded sand with variable amounts of gravel and cobble. Test pits TP-1, TP-2, TP-3, encountered an approximate 1- to 2-foot-thick layer of fine-grained soils ranging from silty sand to clayey silt beginning at approximately 7-foot below grade. This layer generally slopes down to the north and was not encountered in test pits TP-4 though TP-8. All test pits terminated within this unit.

Our subsurface descriptions are based on the conditions encountered at the time of our exploration. Soil conditions between our exploration locations may vary from those encountered. The nature and extent of variations between our exploratory locations may not become evident until construction. If variations do appear, PanGEO should be requested to reevaluate the recommendations in this report and to modify or verify them in writing prior to proceeding with earthwork and construction.

4.3 GROUNDWATER

Groundwater was not encountered in our test pits at the time of our exploration. As part of our study, we obtained a water well report from the Department of Ecology, documenting the installation of an irrigation well at the Bellingham Golf and Country Club. At the time of exploration, July 1992, static groundwater level was noted to be 29.8 feet below ground surface. This well report is attached in Appendix B of this report.

It should be noted that groundwater elevations may fluctuate depending on the seasonal rainfall, local subsurface and groundwater conditions, and other factors. In general, the water level is the highest and the seepage rate in the greatest during the winter and early spring (typically October through May).

5.0 GEOTECHNICAL RECOMMENDATIONS

5.1 Seismic Site Class

We anticipate the seismic design of the buildings will be based on the 2018 International Building Code (IBC). The 2018 IBC seismic design parameters are in part based on the site soil conditions and site classifications defined in Chapter 20 of ASCE 7-16. Based on the site soil conditions and the type of proposed development (i.e., up to three story wood frame buildings), it is our opinion that Site Class D (stiff soil) is appropriate for this project.

5.2 Soil Liquefaction

The site is mapped as a medium high seismic hazard area in accordance with the City of Bellingham Geologic Hazards Map due to presence of loose to medium dense outwash sand and gravel mapped in the area. Liquefaction occurs when saturated sand and silt are subjected to cyclic loading. This causes the porewater pressure to increase in the soil, thereby reducing the inter-granular stresses. As the inter-granular stresses are reduced, the shearing resistance of the soil decreases. If pore pressures develop to the point where the effective stresses acting between the grains become zero, the soil particles will be in suspension and behave like a viscous fluid. Typically, loose to medium dense, saturated, cohesionless soils that have a low enough permeability to prevent drainage during cyclic loading have the greatest potential for liquefaction; dense soils with high silt or clay contents have a lesser potential. Soil liquefaction may cause the temporary loss/reduction of foundation capacity and ground settlement.

Based on the results of our test pits and groundwater level measured in the well at the golf club, it is our opinion that the risk of soil liquefaction is low. In the event that soil liquefaction occurs, the effects of soil liquefaction should not significantly manifest at the ground surface due to a thick crust of non-liquefiable soils between the footings and the groundwater table.

5.3 BUILDING FOUNDATION

5.3.1 General

In our opinion, the proposed structures may be supported on conventional footings bearing on the undisturbed native soils, or properly compacted fill placed on the undisturbed native soils. The upper 2 to 3 feet of fill and undisturbed soils encountered in the test pits should be completely removed from the proposed building footprints and below all foundation elements.

The native soil depths in the vicinity of our test pits are approximate. The actual amount of over-excavation required will need to be determined during construction based on actual soil conditions found at the proposed footing locations and elevations.

In designing the footings, the shape of footings will need to be considered regarding the available space for temporary excavations. Where space may be limited for an unsupported open cut, it may be necessary to use L-shaped perimeter footings to conserve space and to allow the temporary excavations to be made within the property limits.

5.3.2 Allowable Bearing Pressure

We recommend that an allowable soil bearing pressure of 3,000 pounds per square feet (psf) be used to size the footings, bearing on properly compacted native soil, or structural fill placed on the properly compacted native soils. Continuous and individual spread footings should have minimum widths of 18 and 24 inches, respectively. Footings should be placed at least 18 inches below final exterior grade. Interior footings should be placed at least 12 inches below the top of slab.

5.3.3 Foundation Performance

Total and differential settlements are anticipated to be within tolerable limits for foundation designed and constructed as discussed above. For the proposed buildings supported by conventional footings bearing on competent native soils and structural fill, the building settlement under static loading conditions is estimated to be approximately one inch, and differential settlement should be on the order of about ½ inch. Most settlement should occur during construction as loads are applied.

5.3.4 Lateral Resistance

Lateral forces from wind or seismic loading may be resisted by a combination of passive earth pressures acting against the embedded portions of the foundations and walls, and by friction acting on the base of the foundations. Passive resistance values may be determined using an equivalent fluid weight of 300 pounds per cubic foot (pcf). This value includes a factor safety of at least 1.5 assuming that densely compacted structural fill will be placed adjacent to the sides of the foundation. A friction coefficient of 0.35 may be used to determine the frictional resistance at the base of the foundation. This coefficient includes a factor of safety of approximately 1.5. Unless covered by pavements or slabs, the passive resistance in the upper 12 inches of soil should be neglected.

5.3.5 Perimeter Footing Drains

Footing drains should be installed around the perimeter of the building, at or just below the invert of the footings. The footing drains should consist of 4-inch diameter, schedule 40 PVC or SDR 35, perforated pipe embedded in washed drain rock/pea gravel and wrapped in filter fabric. Under no circumstances should roof downspout drain lines be connected to the footing drain systems. Roof downspouts must be separately tightlined to appropriate discharge locations. Cleanouts should be installed at strategic locations to allow for periodic maintenance of the footing drain and downspout tightline systems.

5.3.6 Footing Subgrade Preparation and Protection

All footing subgrades should be carefully prepared. The adequacy of footing subgrade should be verified by a representative of PanGEO, prior to placing forms or rebar. The footing subgrade should be in a firm/dense condition prior to concrete pour. Any over-excavations in the footing areas should be backfilled with compacted structural fill or recompacted native soils.

5.4 CONCRETE SLAB-ON-GRADE

The floor slabs for the proposed buildings may be constructed using conventional concrete slab-on-grade floor construction. The floor slabs should be supported on competent native soil or compacted structural fill or recompacted native soils. Any loose soils at the slab subgrade should be either recompacted to a dense condition or over-excavated to expose dense undisturbed native soils. Over-excavation should be replaced with compacted structural fill or recompacted native soils.

Interior concrete slab-on-grade floors should be underlain by a capillary break consisting of at least of 4 inches of pea gravel or compacted ¾-inch, clean crushed rock (less than 3 percent fines). The capillary break material should also 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. The capillary break should be placed on the subgrade that has been compacted to a dense and unyielding condition. A 10-mil polyethylene vapor barrier should also be placed directly below the slab. We also recommend that construction joints be incorporated into the floor slab to control cracking.

5.5 Pavement Design

We anticipate that new asphalt paving will be used for proposed parking and driveway areas. If the driveway and parking areas will support primarily automobile traffic with only occasional heavy truck traffic, we recommend using a pavement section consisting of a minimum of 3 inches of hot mix asphalt overlying 6 inches of Crushed Surfacing Base Course (WSDOT 9-03.09(3)).

Before placing the Crushed Surfacing Base Course (CSBC), the pavement subgrade should be compacted to a dense and unyielding conditions. We recommend that the pavement subgrade be proof-rolled with a fully loaded dump truck. Any soft and yielding areas should be removed and replaced with properly compacted structural fill.

It should be noted that actual pavement performance will depend on a number of factors, including the actual traffic loading conditions. A thicker pavement section than recommended above will reduce the amount of pavement maintenance required and will increase the number of years that the pavement will remain serviceable before an overlay is needed.

6.0 CONSTRUCTION CONSIDERATIONS

6.1 Demolition & Site Preparation

We envisage site preparation for the proposed project includes stripping and clearing of surface vegetation and refuse, and excavations to the design subgrade. All organics as well as debris and concrete rubble should be removed from the site prior to the start of excavations or grading. All stripped surface materials should be properly disposed off-site or be "wasted" on site in non-structural landscaping areas.

Following site clearing and excavations, the adequacy of the subgrade where foundations, slabs, or pavements are to be placed should be verified by a representative of PanGEO. The subgrade soil in the improvement areas, if recompacted and still yielding, should be over-excavated and replaced with compacted structural fill.

6.2 TEST PIT BACKFILL

The test pits excavated for this study were backfilled with the excavated soils. The backfill was tamped with the excavator bucket and the ground surface leveled. The backfill was not compacted to the requirements of structural fill. During construction of the project, the earthwork contractor should locate the test pits, remove the loose backfill and replace it with properly compacted structural fill or recompacted native soils.

6.3 MATERIAL REUSE

In the context of this report, structural fill is defined as compacted fill placed under footings, concrete stairs and landings, and slabs, or other load-bearing areas. The native site soils generally consist of mostly sand and gravel and may be retained on site for use as structural backfill. If imported structural fill is needed, it should consist of a well-graded granular material, such as WSDOT CSBC, Gravel Borrow or approved equivalent.

If use of the on-site soil is planned, the excavated soil should be stockpiled and protected with plastic sheeting to prevent softening from rainfall in the wet season.

6.4 TEMPORARY EXCAVATIONS

As currently envisaged, excavations on the order of about 4 feet may be needed for the foundation construction. All temporary excavations should be performed in accordance with Part N of WAC (Washington Administrative Code) 296-155. The contractor is responsible for maintaining safe excavation slopes and/or shoring.

For planning purposes, the temporary unsupported excavation may be sloped as steep as 1.5H:1V (Horizontal:Vertical). The cut slopes may also need to be flattened in the wet seasons and should be covered with plastic sheets. We also recommend that heavy construction equipment, building materials, excavated soil, and vehicular traffic should not be allowed within a distance equal to 1/3 the slope height from the top of any excavation.

6.4 STRUCTURAL FILL PLACEMENT AND COMPACTION

Structural fill should be moisture conditioned to within about 3 percent of optimum moisture content, placed in loose, horizontal lifts less than 12 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.

Depending on the type of compaction equipment used and depending on the type of fill material, it may be necessary to decrease the thickness of each lift to achieve adequate compaction. PanGEO can provide additional recommendations regarding structural fill and compaction during construction.

6.5 PERMANENT CUT AND FILL SLOPES

Based on the anticipated soil that will be exposed in the planned excavation, we recommend permanent cut and fill slopes be constructed no steeper than 2H:1V (Horizontal:Vertical).

6.6 EROSION AND DRAINAGE CONSIDERATIONS

Surface runoff can be controlled during construction by careful grading practices. Typically, this includes the construction of shallow, up-grade perimeter ditches or low earthen berms to collect runoff and prevent water from entering the excavation. All collected water should be directed to a positive and permanent discharge system such as an approved City storm sewer.

It should be noted that the site soils are prone to surficial erosion. Special care should be taken to avoid surface water on open cut excavations. As previously mentioned in Section 7.3, we recommend that the exposed temporary slopes be covered with plastic sheeting.

Permanent control of surface water and roof runoff should be incorporated in the final grading design. In addition to these sources, irrigation and rainwater infiltrating into landscape and planter areas adjacent to paved areas or building walls should also be controlled. All collected runoff should be directed into conduits that carry the water away from the pavement or structure and into approved City storm drain systems or other appropriate outlets. Adequate surface gradients should be incorporated into the grading design such that surface runoff is directed away from structures.

6.7 WET EARTHWORK RECOMMENDATIONS

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

- All surface of the foundation subgrade should be protected against inclement weather. It is the contractor's responsibility to protect the footing subgrade from disturbance. One option is to place a 2- to 3-inch-thick layer of lean-mix concrete on the footing subgrade as soon as the subgrade is exposed.
- 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.
- 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.

7.0 ADDITIONAL SERVICES

To confirm that our recommendations are properly incorporated into the design and construction of the proposed development, PanGEO should be retained to conduct a review of the final project plans and specifications, and to monitor the construction of geotechnical elements. Modifications to our recommendations presented in this report may be necessary, based on the actual conditions encountered during construction.

8.0 LIMITATIONS

We have prepared this report for use by Stream Real Estate LLC and the project design team. Recommendations contained in this report are based on a site reconnaissance, review of pertinent subsurface information, and 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 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 at the site 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.

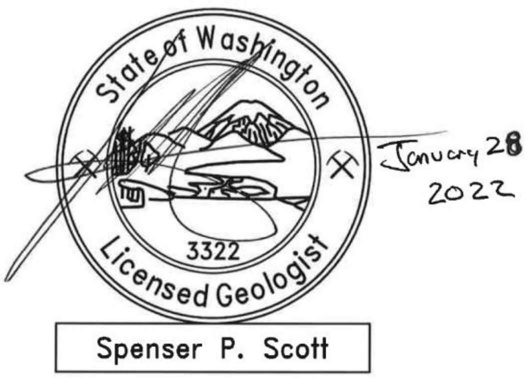
This report has been prepared for planning and design purposes for specific application to the proposed project in accordance with the generally accepted standards of local practice at the time this report was written. No warranty, express or implied, is made.

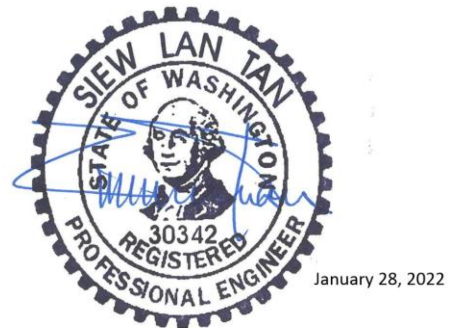
This report may be used only by the client and for the purposes stated, within a reasonable time from its issuance. Land use, site conditions (both off and on-site), or other factors including advances in our understanding of applied science, may change over time and could materially affect our findings. 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.

We appreciate the opportunity to be of service.

Sincerely,





Spenser P. Scott, L.G.
Staff Geologist

Siew L. Tan, P.E.
Principal Geotechnical Engineer

9.0 REFERENCES

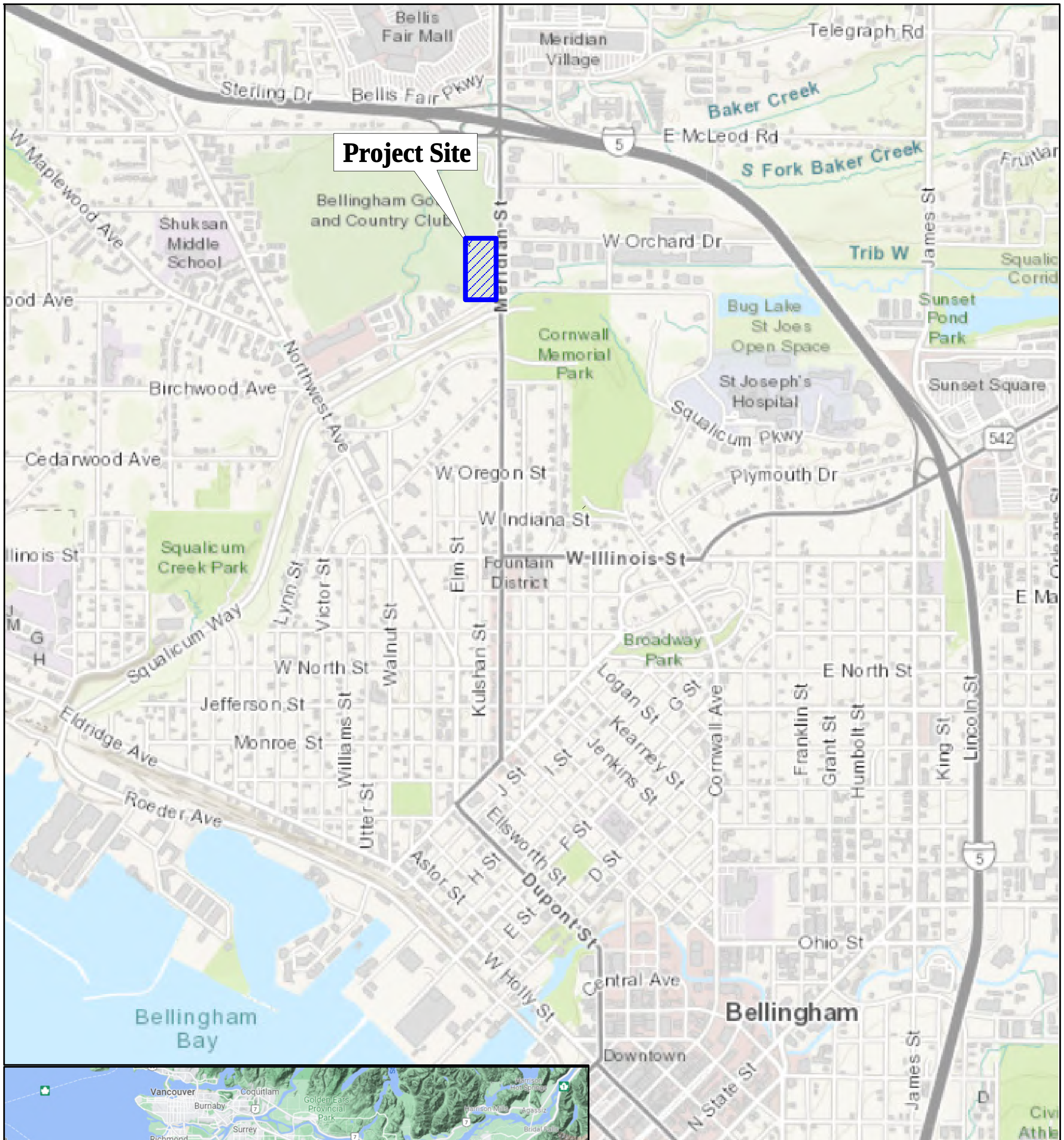
ASTM D2488-17, *Standard Practice for Description and Identification of Soils (Visual-Manual Procedures),* ASTM International, West Conshohocken, PA, 2017, www.astm.org.

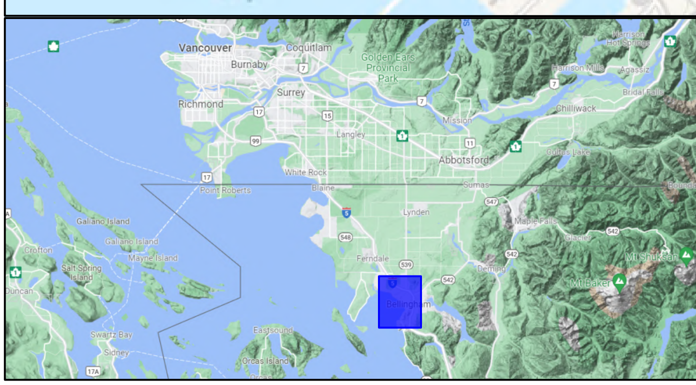
International Code Council, 2018, *International Building Code (IBC)*.

Lapen, T. J., 2000, *Geologic Map of The Bellingham 1:100,000 Quadrangle, Washington* – Washington Division of Geology and Earth Resources, Open File Report 2000-5, scale 1:100,000.

Washington Administrative Code (WAC), 2021, Chapter 296-155 - *Safety Standards for Construction Work, Part N - Excavation, Trenching, and Shoring*, Olympia, Washington.

Washington State Department of Transportation, 2022, *Standard Specifications for Road, Bridge and Municipal Construction, M 41-10, Washington State Department of Transportation.*





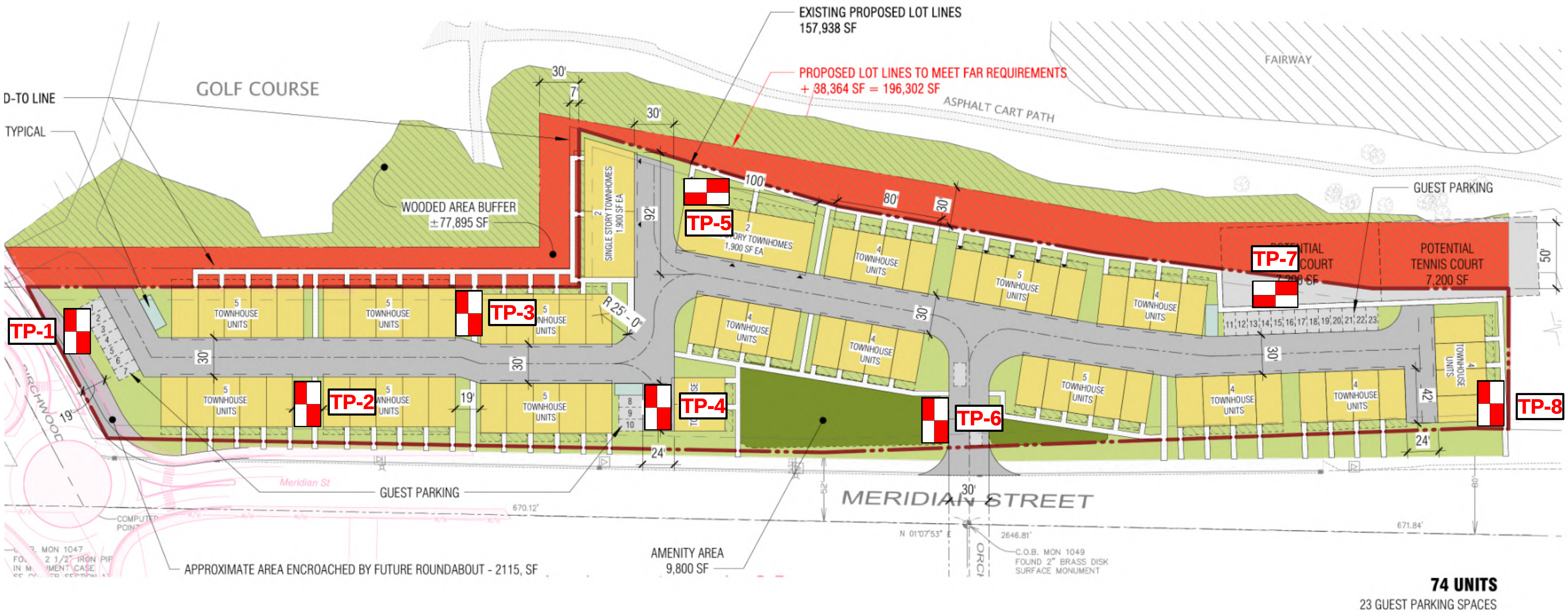
Base Map: ESRI Topographic

NORTH

Not to Scale

PanGEO INCORPORATED	**Proposed Townhome Development** **Intersection of Meridian Street and Birchwood Avenue** **Bellingham, Washington**	**VICINITY MAP**	
		Project No. **21-591**	Figure No. **1**

21-591 Fig 1 - Vicinity Map.grf 1/26/22 (11:34:01) SPS



RESIDENTIAL (20' BAY)
ACCESS DRIVE
SURFACE WALK
WOODED AREA

Legend:

Approximate Test Pit Location
PanGEO, Inc., January 2022

Approx. Scale:
1 inch = 80 feet

Base map modified from Stream Bellingham Feasibility - Option A by Board & Vellum, dated December 10, 2021

PanGEO INCORPORATED	**Proposed Townhome Development Intersection of Meridian Street and Birchwood Avenue Bellingham, Washington**	**SITE AND EXPLORATION PLAN**
		Project No. **21-591** Figure No. **2**

21-591 Fig 2 Site and Exploration Plan.grf 1/26/22 (11:41:59) SPS

APPENDIX A

SUMMARY TEST PIT LOGS

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	**Fissured:**	Breaks along defined planes
Laminated:	Layers of soil typically 0.05 to 1mm thick, max. 1 cm	**Slickensided:**	Fracture planes that are polished or glossy
Lens:	Layer of soil that pinches out laterally	**Blocky:**	Angular soil lumps that resist breakdown
Interlayered:	Alternating layers of differing soil material	**Disrupted:**	Soil that is broken and mixed
Pocket:	Erratic, discontinuous deposit of limited extent	**Scattered:**	Less than one per foot
Homogeneous:	Soil with uniform color and composition throughout	**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

PanGEO INCORPORATED
Phone: 206.262.0370

Terms and Symbols for Boring and Test Pit Logs

Figure A-1

Test Pit No. TP-1

Approximate ground surface elevation (NAVD88): 92 feet

Coordinates (Washington State Plane - North): 652532, 1241785

Depth (ft)	Material Description
0 – 2	Duffy topsoil above loose, dark brown to orange-brown, silty fine SAND; trace gravel, roots and rootlets, some trash debris; disrupted texture, iron-oxide staining; non-plastic, moist **[Fill]**
2 – 8	Medium dense, gray-brown, well-graded SAND; some gravel; trace rootlets; non-plastic, moist
8 – 9	Medium dense, gray-brown; silty fine SAND; rootlets; iron-oxide staining; non-plastic, moist
9 – 10	Medium dense, gray-brown, well-graded SAND with GRAVEL; trace cobble; non-plastic, moist **[Glacial Outwash, Sumas Stade - Qgos]**

Photo TP-1 (left): Shows TP-1 at approximately 10 feet in depth

Photo TP-1 (right): Shows spoils from TP-1 at approximately 8 feet in depth

TP-1 was terminated approximately 10 feet below grade.

Some caving observed at approximately 3 to 6 feet below grade.

No groundwater seepage was encountered during explorations.

Test Pit No. TP-2 Approximate ground surface elevation (NAVD88): 96 feet Coordinates (Washington State Plane - North): 652702, 1241834	
Depth (ft)	Material Description
0 – 2½	Duffy topsoil above loose, dark brown to orange-brown, silty fine SAND; trace gravel, roots and rootlets; disrupted texture, iron-oxide staining; non-plastic, moist **[Fill]**
2½ – 7	Medium dense, gray-brown, well-graded SAND; some gravel near top; trace rootlets; laminated texture; non-plastic, moist
7 – 9	Stiff, gray-brown; SILT; laminated to massive; non-plastic, moist
9 – 10	Medium dense, gray-brown, well-graded SAND with GRAVEL; trace cobble; non-plastic, moist **[Glacial Outwash, Sumas Stade - Qgos]**

Photo TP-2 (left): Shows TP-2 at approximately 10 feet in depth

Photo TP-2 (right): Shows profile of TP-2 at approximately 0 to 6 feet in depth

TP-2 was terminated approximately 10 feet below grade.

Some caving observed at approximately 3 to 6 feet below grade.

No groundwater seepage was encountered during explorations.

Test Pit No. TP-3 Approximate ground surface elevation (NAVD88): 97 feet Coordinates (Washington State Plane - North): 652822, 1241760	
Depth (ft)	Material Description
0 – 2	Duffy topsoil above loose, dark brown to orange-brown, well-graded SAND; trace gravel, trace silt, roots and rootlets; disrupted texture, iron-oxide staining; non-plastic, moist **[Fill]**
2 – 7	Medium dense, gray-brown, well-graded SAND; some gravel, trace rootlets; non-plastic, moist
7 – 10	Medium dense, gray-brown, well-graded SAND; trace gravel, trace iron-oxide staining; non-plastic, moist
10 – 12	Stiff, gray; clayey SILT; massive; trace iron-oxide staining; low-plasticity, moist **[Glacial Outwash, Sumas Stade - Qgos]**

Photo TP-3 (left): Shows TP-3 at approximately 12 feet in depth

Photo TP-3 (right): Shows spoils from TP-3 at approximately 6 feet in depth

TP-3 was terminated approximately 12 feet below grade.

Some caving observed at approximately 0 to 6 feet below grade.

No groundwater seepage was encountered during explorations.

Test Pit No. TP-4

Approximate ground surface elevation (NAVD88): 99 feet

Coordinates (Washington State Plane - North): 652966, 1241833

Depth (ft)	Material Description
0 – 3½	Duffy topsoil above loose, dark brown to orange-brown, silty fine SAND; trace gravel, roots and rootlets; disrupted texture, iron-oxide staining; non-plastic, moist **[Fill]**
3½ – 8½	Medium dense, gray-brown, well-graded SAND with GRAVEL; trace rootlets; non-plastic, moist
8½ – 11	Medium dense, gray-brown, well-graded SAND; trace silt, some gravel; non-plastic, moist **[Glacial Outwash, Sumas Stade - Qgos]**

Photo TP-4 (left): Shows TP-4 at approximately 11 feet in depth

Photo TP-4 (right): Shows spoils from TP-4 at approximately 6 feet in depth

TP-4 was terminated approximately 11 feet below grade.

No caving observed during explorations.

No groundwater seepage was encountered during explorations.

Test Pit No. TP-5

Approximate ground surface elevation (NAVD88): 101 feet

Coordinates (Washington State Plane - North): 653005, 1241670

Depth (ft)	Material Description
0 – 3½	Duffy topsoil above loose, dark brown to orange-brown, silty fine SAND; trace gravel, roots and rootlets, some trash debris; disrupted texture, iron-oxide staining; non-plastic, moist **[Fill]**
3½ – 8	Medium dense, gray-brown, well-graded SAND; some gravel, trace rootlets; non-plastic, moist
8 – 13	Medium dense, gray-brown, well-graded SAND; trace silt, some gravel; non-plastic, moist **[Glacial Outwash, Sumas Stade - Qgos]**

Photo TP-5 (left): Shows TP-5 at approximately 13 feet in depth

Photo TP-5 (right): Shows spoils from TP-5 at approximately 6 feet in depth

TP-5 was terminated approximately 13 feet below grade.

Some caving observed at approximately 3 to 6 feet below grade.

No groundwater seepage was encountered during explorations.

Test Pit No. TP-6 Approximate ground surface elevation (NAVD88): 101 feet Coordinates (Washington State Plane - North): 653171, 1241843	
Depth (ft)	Material Description
0 – 3	Duffy topsoil above loose, dark brown to orange-brown, silty fine SAND; trace gravel, roots and rootlets, some trash debris; disrupted texture, iron-oxide staining; non-plastic, moist **[Fill]**
3 – 6	Medium dense, gray-brown, well-graded SAND with GRAVEL; some cobble, trace rootlets; non-plastic, moist
6 – 10	Medium dense, gray-brown, well-graded SAND; trace gravel; non-plastic, moist **[Glacial Outwash, Sumas Stade - Qgos]**

Photo TP-6 (left): Shows TP-6 at approximately 10 feet in depth

Photo TP-6 (right): Shows spoils from TP-6 at approximately 6 feet in depth

TP-6 was terminated approximately 10 feet below grade.

No caving observed during explorations.

No groundwater seepage was encountered during explorations.

Test Pit No. TP-7

Approximate ground surface elevation (NAVD88): 101 feet

Coordinates (Washington State Plane - North): 653410, 1241749

Depth (ft)	Material Description
0 – 3½	Duffy topsoil above loose, dark brown to orange-brown, silty fine SAND; trace gravel, roots and rootlets; disrupted texture, iron-oxide staining; non-plastic, moist **[Fill]**
3½ – 8	Medium dense, gray-brown, well-graded SAND with GRAVEL; trace rootlets; trace iron-oxide staining, non-plastic, moist
8 – 10	Medium dense, gray-brown, well-graded SAND; trace gravel; non-plastic, moist **[Glacial Outwash, Sumas Stade - Qgos]**

Photo TP-7 (left): Shows TP-7 at approximately 10 feet in depth

Photo TP-7 (right): Shows spoils from TP-7 at approximately 6 feet in depth

TP-7 was terminated approximately 10 feet below grade.

Some caving observed at approximately 3 to 5 feet below grade.

No groundwater seepage was encountered during explorations.

Test Pit No. TP-8

Approximate ground surface elevation (NAVD88): 102 feet

Coordinates (Washington State Plane - North): 653600, 1241845

Depth (ft)	Material Description
0 – 2	Duffy topsoil above loose, dark brown to orange-brown, silty fine SAND; trace gravel, roots and rootlets; some trash debris; disrupted texture, iron-oxide staining; non-plastic, moist **[Fill]**
2 – 10	Medium dense, gray-brown, well-graded SAND with GRAVEL; non-plastic, moist • *Decrease in gravel content at about 10 feet below surface* **[Glacial Outwash, Sumas Stade - Qgos]**

Photo TP-8 (left): Shows TP-8 at approximately 10 feet in depth

Photo TP-8 (right): Shows spoils from TP-8 at approximately 6 feet in depth

TP-8 was terminated approximately 10 feet below grade.

No caving observed during explorations.

No groundwater seepage was encountered during explorations.

Date of Test Pit Excavations: January 8, 2021 with a Caterpillar 310 Rubber-Tracked Excavator

Excavations Logged by: S. Scott

APPENDIX B

PREVIOUS SUBSURFACE EXPLORATIONS

3E/2/13K

WATER WELL REPORT
STATE OF WASHINGTON

Start Card No. [redacted]
Water Right Permit No.

(1) OWNER: Name BELLINGHAM GOLF & COUNTRY Address 3729 MERIDIAN BELLINGHAM, WA 98225-

(2) LOCATION OF WELL: County WHATCOM - NW 1/4 SE 1/4 Sec 13 T 38 N., R 2E WM
(2a) STREET ADDRESS OF WELL (or nearest address) 3729 MERIDIAN

(3) PROPOSED USE: IRRIGATION

(4) TYPE OF WORK: Owner's Number of well (If more than one) 3
NEW WELL Method: ROTARY

(5) DIMENSIONS: Diameter of well 6 inches
Drilled 282 ft. Depth of completed well 265 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Dia. from +3 ft. to 265 ft.
WELDED " Dia. from ft. to ft.
" Dia. from ft. to ft.

Perforations: NO
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: NO
Manufacturer's Name
Type Model No.
Diam. slot size from ft. to ft.
Diam. slot size from ft. to ft.

Gravel packed: NO Size of gravel
Gravel placed from ft. to ft.

Surface seal: YES To what depth? 18 ft.
Material used in seal BENTONITE
Did any strata contain unusable water? NO
Type of water? Depth of strata ft.
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ... ft.
Static level 29.8 ft. below top of well Date 07/08/92
Artesian Pressure lbs. per square inch Date
Artesian water controlled by

(9) WELL TESTS: Drawdown is amount water level is lowered below static level.
Was a pump test made? NO If yes, by whom?
Yield: gal./min with ft. drawdown after hrs.

Recovery data

Time	Water Level	Time	Water Level	Time	Water Level

Date of test / /
Bailer test gal/min. ft. drawdown after hrs.
Air test 150 gal/min. w/ stem set at 80 ft. for 1 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? NO

(10) WELL LOG

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change in formation.

MATERIAL	FROM	TO
TOPSOIL	0	1
BROWN SAND & GRAVEL	1	6
BROWN CLAY	6	10
BROWN SAND & GRAVEL	10	14
BROWN CLAY	14	16
BROWN SAND & GRAVEL	16	29
GRAY CLAY	29	40
GRAY CLAY & SAND & GRAVEL	40	154
GRAY SAND & SILT - SEEPAGE	154	157
GRAY CLAY	157	160
GRAY CLAY & GRAVEL & SAND	160	162
GRAY CLAY & SAND & SCATRD. GRAV.	162	181
GRAY GRAVEL & SAND & CLAY	181	264
GRAY SANDSTONE	264	271
GRAY SANDSTONE & WATER	271	275
GRAY SILTSTONE	275	

RECEIVED
JUL 30 1992
DEPT. OF ECOLOGY

Work started 07/07/92 Completed 07/08/92

WELL CONSTRUCTOR CERTIFICATION:
I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME HAYES DRILLING, INC.
(Person, firm, or corporation) (Type or print)

ADDRESS 556 ERSHIG RD. BOW, WA

[SIGNED] Steve Tolbert License No. 762

Contractor's Registration No. HAYESDI106J5 Date 07/16/92

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