OCTOBER 2020

GEOTECHNICAL ENGINEERING REPORT

SCAMMON BAY BULK FUEL UPGRADES

2020

ALASKA ENERGY AUTHORITY

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Geotechnical Engineering Report

for

Scammon Bay Bulk Fuel Upgrades
Scammon Bay, Alaska

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CONTENTS

1.0 INTRODUCTION 1

1.1 Purpose and Scope of Services 1
1.2 Summary 1

2.0 BACKGROUND 2

2.1 Existing Conditions 2
2.2 Proposed Development 2

3.0 SETTING 2

3.1 General Geology 2
3.2 Climatology 4

4.0 SUBSURFACE EVALUATION 4

5.0 LABORATORY TESTING 6

6.0 SUBSURFACE CONDITIONS 6

6.1 Organic Mat 6
6.2 Sand 8
6.3 Garbage 9
6.4 Groundwater 9

7.0 ENGINEERING ANALYSIS AND RECOMMENDATIONS 9

7.1 Site Work 9
7.2 Concrete Pad 11
7.3 Seismic Analysis 11
7.4 Foundations 12
7.5 Gravel Containment Berms 13
7.6 Pipe Support Foundations 13
7.7 Corrosion Potential 13
7.8 Frost Susceptibility 13
7.9 Local Availability of Construction Materials 14
7.10 Drainage 14
7.11 Construction Considerations 14

8.0 REFERENCES 14

9.0 CLOSURE 15

TABLES

Table 1 - Peat Probe Refusal Depths 8
Table 2 - Sand Laboratory Results Summary 8
Table 3 - Aggregate Material Specifications 11
Table 4 - Seismic Design Criteria 12

FIGURES

Figure 1 - Vicinity Map 3
Figure 2 - Borehole Location Map 5
Figure 3 - Moisture Content Summary 7

APPENDICES

Appendix A Limitations

Appendix B Boring Log Key
Frost Design Soil Classification System
Peat and Organic Soil Classification System

Appendix C Hand Auger & Test Pit Logs
Grain Size Distribution Curves

Appendix D Chemical Testing Results

ABBREVIATIONS

DOT&PF…….. Alaska Department of Transportation and Public Facilities

ASTM……ASTM International Standard

AASHTO……..American Association of State Highway Transportation Officials

ADEC……Alaska Department of Environmental Conservation

bgs……Below the existing ground surface

Client……...Alaska Energy Authority

F……Degrees Fahrenheit

HDL……HDL Engineering Consultants, LLC

IBC……..……International Building Code

NFS……..Non-frost susceptible

OSHA……Occupational Safety and Health Administration

psf……..……Pounds per square foot

psi……...Pounds per square inch

Report…..……..……..……Geotechnical Engineering Report

Site…….…… Scammon Bay, Alaska

USACE…….. United States Army Corps of Engineers

USCS……..……Unified Soil Classification System

USGS……United States Geological Survey

1.0 INTRODUCTION

In accordance with the request and authorization of Alaska Energy Authority (Client), HDL Engineering Consultants, LLC (HDL) conducted a geotechnical engineering evaluation of subsurface conditions in the community of Scammon Bay, Alaska (Site) to support bulk fuel system upgrades. The project consists of designing a new bulk fuel storage area including a truck fill dispenser, vehicle dispenser, and containment berms.

This Geotechnical Engineering Report (Report) provides the findings, conclusions, and recommendations that HDL derived from the geotechnical evaluation. This Report is subject to the limitations provided in Appendix A.

1.1 Purpose and Scope of Services

HDL's objectives for this project were to develop geotechnical engineering recommendations for site work, containment berm design, and tank foundations for the proposed tanks. To achieve our objectives, HDL:

- Advanced eleven (11) peat probes
- Completed four (4) hand augers
- Completed six (6) test pits
- Classified soil samples recovered from the hand augers and test pits based on visual observations and prepared boring logs
- Performed geotechnical engineering analyses and developed recommendations
- Prepared this Report, which summarizes HDL's findings from the geotechnical evaluation and provides geotechnical recommendations for the proposed project

1.2 Summary

This section provides a summary of the geotechnical findings and recommendations for the convenience of the non-technical reader. Read the summary in complete context with the remaining Report.

1. Test pits generally encountered an organic mat at the ground surface underlain by layers of sand with varying amounts of gravel, silt, organics, cobbles, boulders, and garbage. Hand augers were performed in the existing gravel cap over an old landfill area and encountered sand and gravel fill from the ground surface to the termination depth.

2. Soft soils were encountered at the peat probe locations and peat probe refusal was generally encountered between 0.3 feet and 1.8 feet below existing ground surface (bgs) with the exception of PP-09, which encountered refusal at a depth of 4.2 feet bgs.

3. Leveling Course placed less than 12 inches below the proposed foundation structures should consist of material passing the 3-inch sieve and meeting the Alaska Department of Transportation and Public Facilities (DOT&PF) Standard Specifications for Highway Construction, Section 703-2.07 for Selected Material Type A.

4. HDL recommends a concrete grade beam foundation system for the tanks. An allowable bearing capacity of 1,400 pounds per square foot (psf) may be used for design of foundations that bear a minimum of 0.5 feet below finished grade. Foundations should be constructed immediately after subgrade preparation to protect the soil bearing surface.

2.0 BACKGROUND

Scammon Bay, Alaska is located on the western coast of Alaska on the southern bank of the Kun River approximately 145 miles northwest of Bethel, Alaska. Figure 1 provides a map of the community location.

2.1 Existing Conditions

The site currently consists of a gravel pad covering an old landfill area and previously undeveloped land. Access to the existing gravel pad is from the road to the south. There are no existing structures or pavement on the site. There is garbage such as vehicles visibly protruding from the northern edge of the existing gravel pad.

2.2 Proposed Development

The proposed development generally consists of the following.

- Three (3) 27,000-gallon diesel bulk fuel tanks
- Four (4) 27,000-gallon gasoline bulk fuel tanks
- One (1) 12,000-gallon dual product dispensing tank
- On-grade secondary containment structure with gravel containment berms
- Dual product vehicle dispenser with concrete pad
- Dual product truck fill dispenser with concrete pad
- Distribution piping for truck fill and vehicle dispensers
- Retail sales building

The new tank farm will be constructed on an approximately 200-foot-wide by 200-foot-long gravel pad partially overlapping the old landfill area.

3.0 SETTING

The following sections provide information about the geologic and climatic setting for the Site.

3.1 General Geology

The project area is located within the Yukon-Kuskokwim coastal lowland section within the Bering shelf, which lies on the western coast of Alaska and joins with the Chukotsk Peninsula of Siberia. Relatively flat topography rising from 100 feet to 300 feet above sea level dotted with numerous lakes and rivers, as well as extensive areas of marsh characterize the Yukon-Kuskokwim coastal lowland section. The western portion also contains low hills and a few volcanic craters and mountains rising to approximately 2,450 feet above sea level. The subsurface generally consists of Quaternary sand and silt to an unknown depth. Cretaceous sedimentary rocks with early Tertiary intrusions characterize the hills. Basalt flows and cinder cones are also present in the

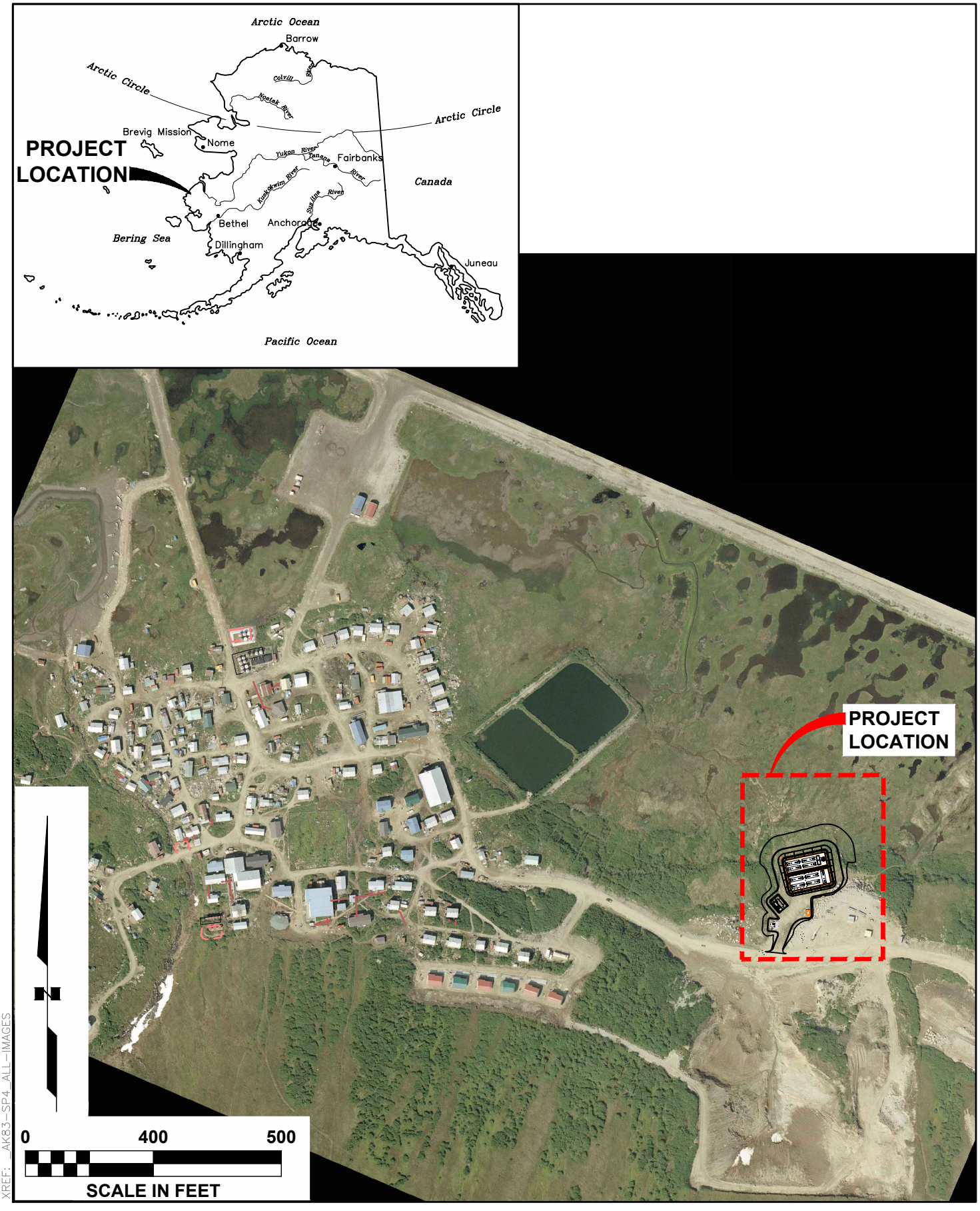

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Figure 1
VICINITY MAP
SCAMMON BAY BULK FUEL UPGRADES
SCAMMON BAY, AK

section. There are no glaciers in the area; however, discontinuous permafrost is present (Wahrhaftig, 1965).

Scammon Bay is located in a region of low seismicity. Based on the United States Geologic Survey (USGS) earthquake catalog, there were no events above Richter Magnitude 5.0 within 100 miles of the Site from 1898 through 2020.

3.2 Climatology

Scammon Bay is characterized by a subarctic climate with generally long, cold winters and short mild summers. Climate data was taken from the weather station in Cape Romanzof, Alaska, approximately 15.5 miles southwest of Scammon Bay. The average temperatures range from a low of 8.3 Fahrenheit (F) to a high of 18.3 F in January and a low of 45.1 F to a high of 53.0 F in July. Average annual precipitation is approximately 25 inches per year with a total annual snowfall of approximately 68 inches (Western Regional Climate Center, 2020).

4.0 SUBSURFACE EVALUATION

HDL performed a subsurface evaluation in Scammon Bay between September 22, 2020 and September 24, 2020 to evaluate the shallow subsurface conditions. The subsurface evaluation consisted of eleven (11) peat probes, four (4) hand augers, and six (6) test pits. An experienced engineering assistant was present during drilling to locate the test holes, log subsurface conditions, and observe groundwater depths, where encountered.

HDL advanced eleven (11) peat probes, designated PP-01 through PP-11, to a maximum depth of 4.2 feet bgs. The peat probe is a 7/8-inch diameter, multi-sectioned, steel soil probe with a “T” handle that is pushed manually until reasonable exertion will no longer advance the rods. HDL advanced four (4) hand augers, designated HA-01 through HA-04, to a maximum depth of 2.5 feet bgs using a 3-inch diameter hand auger and a post hole digger. HDL completed six (6) test pits, designated TP-01 through TP-06, to a maximum depth of 11.5 feet bgs with a Case CX80C excavator with the assistance of a local operator. HDL also recovered a sample of the quarry wall material at the local material source.

HDL described the recovered soils in the field in accordance with ASTM International Standard (ASTM) D2488. HDL assigned frost design classifications, as appropriate, in general accordance with the Frost Design Soil Classification provided in Appendix B using the DOT&PF methodology. Descriptions for organic soils were in general accordance with the Peat, Organic Soil Classification System presented in Appendix B. The hand auger and test pit logs are included in Appendix C.

HDL performed the fieldwork in general accordance with the procedures outlined in the DOT&PF “Alaska Geotechnical Procedures Manual”. We located the explorations in the field using a recreational grade GPS. Figure 2 shows the approximate peat probe, hand auger, test pit locations.

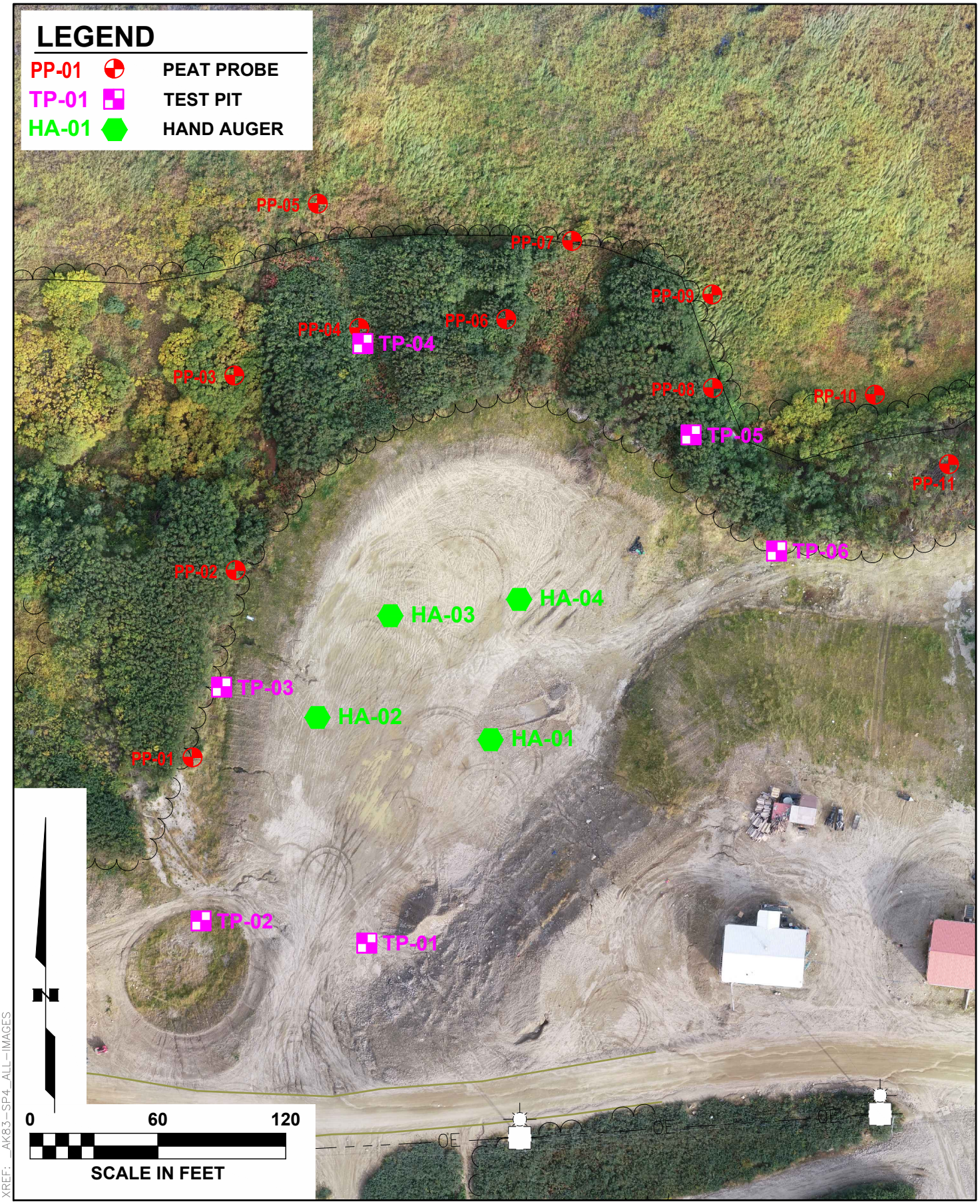

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Figure 2
EXPLORATION LOCATION MAP
SCAMMON BAY BULK FUEL UPGRADES
SCAMMON BAY, AK

5.0 LABORATORY TESTING

HDL conducted laboratory testing of the soil samples at our re:Source (formerly AMRL) accredited and United States Army Corps of Engineers (USACE) validated laboratory. These tests verified or modified the field classifications and provided additional data to support the geologic interpretation. HDL conducted the following tests on select samples.

- Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass (ASTM D2216)
- Particle-Size Analysis of Soils (ASTM D422)
- Particle-Size Distribution (Gradation) of Fine-Grained Soils Using Sedimentation (ASTM D7928)

One (1) soil sample was selected for chemical analyses to measure pH, resistivity, chloride and sulfate content. Chemical analyses were performed by SGS North America, Inc. and were performed in accordance with United States Environmental Protection Agency methods SW9045D, SM19, 2510A, and SW9056A, respectively.

The boring logs and grain size distribution curves provided in Appendix C present the results of the laboratory testing. Results of the chemical analyses are provided in Appendix D.

6.0 SUBSURFACE CONDITIONS

In general, hand augers over the old landfill area encountered sand and gravel fill. The subsurface conditions encountered in the test pits generally consisted of a thin organic mat overlying sand with varying amounts of silt, gravel, organics, cobbles, boulders, and occasional garbage. The following sections summarize the subsurface conditions encountered and the logs presented in Appendix C provide detailed information. Figure 3 provides a summary of the measured moisture contents.

6.1 Organic Mat

Peat probes PP-01 through PP-08, PP-10, and PP-11 encountered refusal at depths ranging from 0.3 feet to 1.8 feet bgs. Peat probe PP-09 encountered refusal at a depth of approximately 4.2 feet bgs. Peat Probe refusal depths can be seen below in Table 1. Hand augers were performed in the gravel fill covering the old community landfill site and did not encounter an organic mat. Test pits TP-02 through TP-06 encountered an organic mat at the surface that ranged from 0.2 feet to 0.6 feet thick. Detailed information may be found on the logs presented in Appendix C.

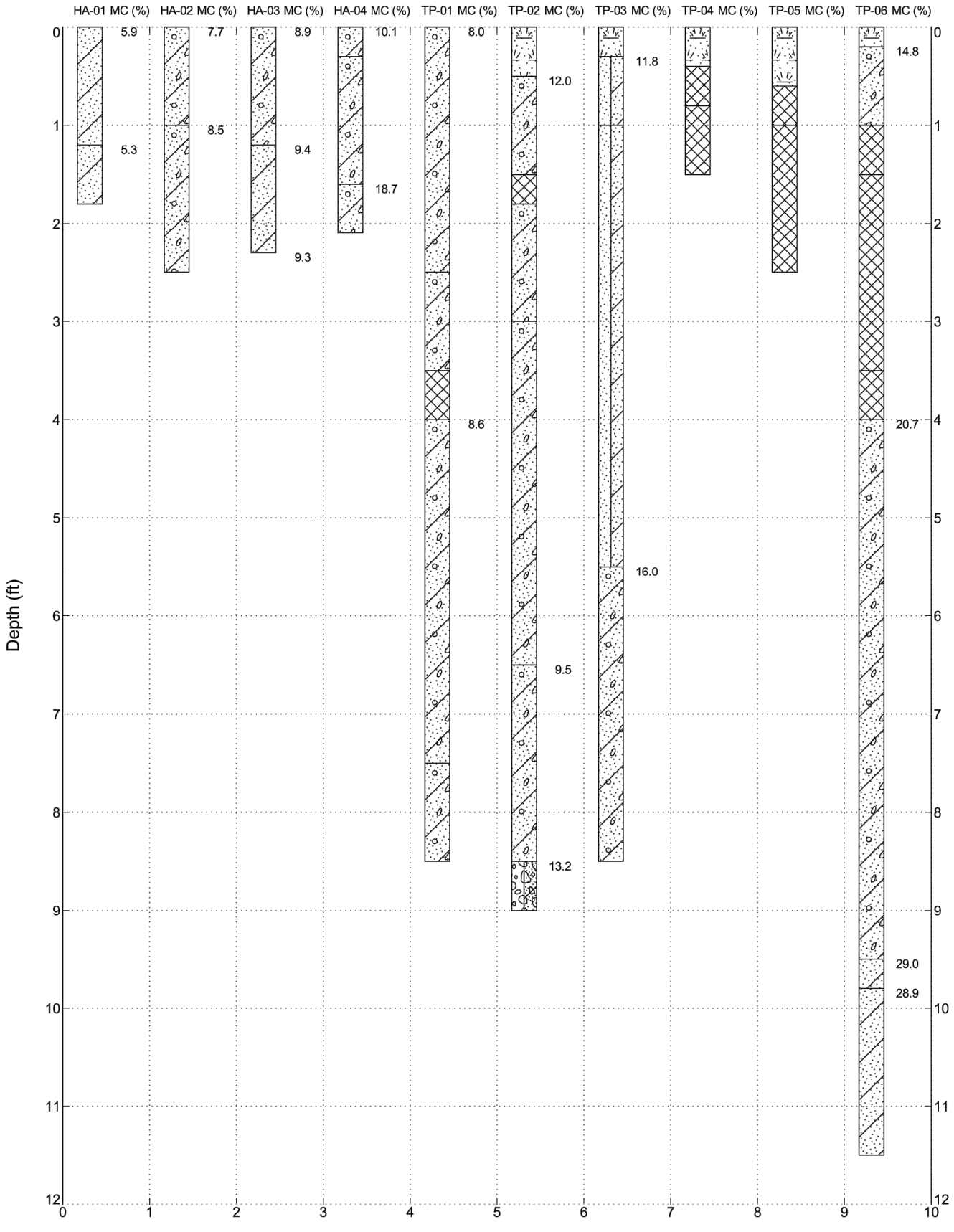

Figure 3
MOISTURE CONTENT SUMMARY
SCAMMON BAY BULK FUEL UPGRADES
SCAMMON BAY, AK

Table 1 –Peat Probe Refusal Depths

Peat Probe Number	Refusal Depth (feet)
PP-01	0.5
PP-02	0.8
PP-03	1.0
PP-04	0.3
PP-05	1.8
PP-06	0.4
PP-07	0.8
PP-08	0.8
PP-09	4.1
PP-10	1.7
PP-11	1.6

6.2 Sand

Poorly graded sand was encountered at the surface in TP-01 and HA-01 through HA-04 and beneath the organic mat in TP-02 through TP-06. The sand layers included varying amounts of gravel, silt, organics, cobbles, boulders, and garbage and generally extended to the termination depth. Based on a sample from TP-01, the measured pH was 6.70, chloride content was 0.00 mg/kg, sulfate content was 4.55 mg/kg, and the resistivity was 254 ohm-m. Table 2 summarizes the laboratory results for this stratum.

Table 2 –Sand Laboratory Results Summary

Test Hole	Depth	Grain Size Distribution		
	(ft)	% Gr	%Sa	%P200
TP-01	0.0	16.8	64.4	18.8
TP-02	0.5	33.3	50.3	16.4
TP-02	6.5	19.5	65.0	15.5
TP-03	0.3	4.1	84.7	11.2
TP-03	5.5	30.9	55.2	13.9
TP-06	0.2	17.1	57.4	25.5
TP-06	4.0	25.0	40.0	35.0
TP-06	9.8	5.3	47.0	47.7
HA-02	0.0	17.2	67.4	15.4
HA-03	0.0	15.6	67.9	16.5
HA-03	1.2	7.5	73.3	19.2
HA-04	0.0	23.2	59.7	17.1

-- Not Tested

6.3 Garbage

Garbage was encountered in test pits TP-01, TP-02, and TP-04 through TP-06 at depths ranging from 0.8 feet to 3.5 feet bgs. The garbage ranged in thickness from 0.3 feet to 3.0 feet in TP-01, TP-02, and TP-06. Garbage extended to the test pit termination depth in TP-04 and TP-05. Garbage consisted mostly of soil mixed with household waste including plastic bags, food wrappers, aluminum cans, etc. Test pits TP-04 and TP-05 encountered garbage that included large metal pieces and car parts.

6.4 Groundwater

Free groundwater was not encountered in the hand augers, but was encountered in test pits TP-02 through TP-04 at depths ranging from 1.5 feet to 8.5 feet bgs. Groundwater levels at the Site may fluctuate depending on the season, temperature, and precipitation. Groundwater levels during construction may be higher or lower than those encountered.

7.0 ENGINEERING ANALYSIS AND RECOMMENDATIONS

There are several components to the geotechnical analysis and recommendations. These include site preparation, seismic considerations, settlement, frost susceptibility, and construction considerations. The following sections provide geotechnical recommendations for site work and foundations.

7.1 Site Work

The following sections provide a summary of geotechnical considerations for the Site development.

7.1.1 Site Preparation

HDL recommends the undisturbed portions of the Site be cleared and grubbed prior to the onset of construction. If soft or unstable soils or other deleterious materials are encountered during construction, the materials should be removed and replaced with compacted Fill. We recommend that the exposed subgrade be proof-rolled to provide a level, firm, uniform surface prior to the placement of Fill.

The bottom of all excavations should be compacted to a density of at least 95 percent of the maximum density as determined by the Modified Proctor compaction procedure (ASTM D1557). Excavations should be dewatered and protected from adjacent runoff. The subgrade soils may become difficult to compact if they are exposed to additional rainfall or runoff.

Fill placed less than 12 inches below the proposed footings should be low- to non-frost susceptible (F1 to NFS) gravel or non-frost susceptible sand (NFS) meeting the requirements for Selected Material, Type A. The onsite soils generally do not meet these requirements.

In areas of the proposed project where existing grade needs to be raised, fill meeting the requirements of Selected Material, Type B should be used. Fill meeting the requirements

described in this report should support a side slope of 2:1 around the gravel pad. Erosion control measures such as seeding should be incorporated to protect the side slopes from undue erosion.

Sliver fills should be should be benched into the existing slope. The bench should be as wide as needed to support compaction equipment and should tie a minimum of 2 feet into the existing slope. The edges of the embankment should be constructed with slopes that have a horizontal to vertical relationship of 2 to 1 (2H:1V) or flatter.

Areas used for vehicle traffic including fuel trucks should be surfaced with a minimum of 8 inches aggregate meeting requirements for Surface Course, E-1 as described in Section 7.1.2.

Fill should be placed in lifts not to exceed 10 to 12 inches loose thickness, and compacted to a density of at least 95 percent of the maximum dry density as determined by ASTM D1557. During fill placement, we also recommend that large cobbles or boulders with dimensions in excess of 2/3 the lift thickness be removed.

7.1.2 Aggregate Materials

The Fill should be a reasonably well graded mineral soil meeting the requirements of DOT&PF Standard Specifications for Highway Construction, Section 703-2.07 for Selected Material, Type B. The driving surface of the proposed project should consist of material meeting the DOT&PF Standard Specifications for Highway Construction, Section 703 for Surface Course, Gradation E-1. The Bedding Material and Leveling Course should consist of material passing the 3-inch sieve and meeting the DOT&PF Standard Specifications for Highway Construction, Section 703-2.07 for Selected Material, Type A. Aggregate gradation requirements are detailed in Table 3.

The drain rock material placed over the geogrid should consist of rounded or sub-rounded, clean, uniform, gravel. Table 3 details gradation requirements for the drain rock. Production of drain rock from the local material source would require significant processing and produce significant waste material. Local material is likely not practical for use as a drainage rock material.

The aggregate materials should not contain muck, frozen material, roots, sod or other deleterious matter, and not have a PI greater than six (6) percent.

Table 3 – Aggregate Material Specifications

Sieve	Material			
	Fill	Bedding Material & Leveling Course	Surface Course, E-1	Drain Rock Material
3”	-	100	-	-
1”	-	-	100	100
3/4”	-	-	70-100	90-100
1/2”	-	-	-	50-70
3/8”	-	-	50-85	20-50
No. 4	-	20-60	35-65	0-10
No. 8	-	-	20-50	-
No. 50	-	-	15-30	-
No. 200	0-10	0-6	8-15	0-1

7.2 Concrete Pad

HDL understands that reinforced concrete pads will be constructed for the proposed dual product truck fill and dual product vehicle dispenser. We assume that the subgrade below the structural section will be firm and unyielding. The minimum recommended structural section for the concrete pads are as follows:

6 inches – Reinforced Concrete
30 inches – Selected Material, Type A

The recommended structural section does not provide full frost protection and seasonal movement of the concrete should be expected. This movement may reduce the life of the concrete. The life of the concrete can be increased by increasing the thickness of the structural section.

7.3 Seismic Analysis

The project area is generally in an area of low seismicity. Based on the subsurface conditions encountered, it is our opinion that seismic Site Class “D” as defined in the International Building Code (IBC) is appropriate for the Site. The maximum considered earthquake ground motion spectral response accelerations for short period and for one-second peaks were obtained utilizing the Seismic Design Maps created by Structural Engineers Association of California and California’s Office of Statewide Health Planning and Development. Seismic Design Maps is a web interface that uses USGS web services to retrieve seismic design data; results of which are summarized in Table 4.

Table 4 – Seismic Design Criteria

IBC 2015 Seismic Design Criteria	Value
Spectral Response at Short Periods, S_S	0.215
Spectral Response at 1-Second Period, S_1	0.090
Site Class	D
Site Coefficient F_a	1.600
Site Coefficient F_v	2.400
Site Adjusted Spectral Response at Short Periods, S_{MS}	0.344
Site Adjusted Spectral Response at 1-second Periods, S_{M1}	0.216

7.4 Foundations

Design of a structure's foundation must consider the bearing capacity of the supporting soils, the effects of seasonal frost action, and the expected total and differential settlements. The foundation system must also consider the risk of failure and the cost of construction.

Assuming the proposed fuel tanks will meet the assumptions outlined in this report, we recommend a shallow grade beam foundation system that is continuous and reinforced along the length of the tanks. Foundations should be embedded a minimum of 0.5 feet below finished grade and be a minimum of 18 inches wide for the entire length of the tank.

Foundations should be constructed immediately after subgrade preparation to protect the soil bearing surface. In addition, foundation excavations should be backfilled as soon as possible after foundation construction.

7.4.1 Allowable Bearing Pressures

The proposed fuel tank foundations will bear upon compacted drain rock material. If the soils beneath the proposed foundations are consistent with the requirements provided in this report, an allowable soil bearing capacity of 1,400 psf may be used for design of foundations that bear a minimum of 0.5 feet below finished grade. The above bearing values may be increased by one-third for seismic or wind loading conditions.

7.4.2 Settlement

The total settlements that will develop are dependent upon the actual loads that are applied, the dimensions of the foundations, the density of the supporting soil, and the care with which fills are placed and compacted. We anticipate properly placed and compacted fill placed on previously undisturbed ground will not experience significant settlement. The settlement that does occur will largely be elastic in nature and occur during construction. The old landfill area has the greatest potential for settlement. Based on the reported performance of the existing pad, it appears that settlement would be isolated to smaller pockets, about the size of a car. The grade beams should be designed to bridge over areas of isolated settlement up to 10 feet in diameter. Grade changes should be kept to less than 1 foot to reduce the potential for settlement.

7.5 Gravel Containment Berms

The gravel containment berms for the proposed tank farm should consist of a section of Fill underlain by geogrid and stabilized using lean mix concrete or hard armor concrete blocks. A layer of geogrid should be placed over the existing ground surface prior to the placement of the fill to reduce the potential for differential settlement along the crest. The geogrid should meet the requirements of DOT&PF Standard Specifications for Highway Construction, Section 729-2.04 for Geogrid for Embankment and Roadway Stabilization and Reinforcement.

If lean mix concrete is used to stabilize the berm surface, the gravel containment berm should be covered in 3 inches of lean mix concrete with a minimum compressive strength of 750 pounds per square inch (psi). The concrete will be subject to spalling and cracking due to seasonal movement and frost action.

If hard armor concrete blocks are used for stabilization of the berms, Contech Armorflex articulating concrete blocks should be used. The block should be an open cell block of the class 30-S or approved equivalent.

7.6 Pipe Support Foundations

The distribution piping between the bulk and dispensing tanks will be above-ground as much as the site allows. The above-ground pipes will be supported by braces founded on shallow cast-in-place concrete piers placed on 12 inches of Leveling Course. These braces will be located approximately every 10 feet along the above-ground section of piping. We assume the pipes will be no more than 2 feet above finished grade.

Assuming subsurface conditions along the underground piping sections are similar to those encountered in the test pits, the pipes will be located in sand and gravel with cobbles and boulders. The pipe should be bedded on 3 inches of Bedding Material to protect it from potential damage due to the cobbles and boulders. The pipe should be set in a trench that is a minimum of 2.0 feet bgs. A minimum of 12 inches of Bedding Material should be backfilled over the underground piping. The remainder of the trench can be backfilled using Fill. The Fill and Bedding Materials should meet the requirements described in Section 7.1.2.

7.7 Corrosion Potential

Based on the results of chemical testing, the soils do not appear to be corrosive. We recommend additional analysis by a corrosion engineer if corrosion is a critical design element.

7.8 Frost Susceptibility

Scammon Bay is in a region of moderate freeze and thaw cycles. Highly frost susceptible (F3) soils were encountered within the shallow subsurface at the Site. Leaving the highly frost susceptible soils in place increases the risk of frost related issues. Removing and replacing the highly frost susceptible soils reduces the risk of frost related issues.

7.9 Local Availability of Construction Materials

HDL performed laboratory testing on a sample of the quarry material from the local material source, designated MS-01. The results of the laboratory testing indicate the local material source is capable of producing the Fill recommended in this report. Based on laboratory testing performed on the quarry wall materials, the local material source may be able to meet the requirements for Surface Course and Leveling Course/Bedding Material; however, some processing of the material will likely be required including screening of oversized material. Drainage rock will likely need to be imported. The laboratory testing for the material source sample is presented in Appendix C.

7.10 Drainage

Groundwater was encountered in the test pits at depths ranging from 1.5 feet to 8.5 feet bgs. Based on the hand augers and test pits conducted, groundwater is not likely to be encountered during typical pipe construction on the existing and proposed gravel pad. Dewatering may not be necessary, but the groundwater level will likely vary from that encountered during digging. If groundwater is present in excavations, the soils will be prone to collapse and construction may be difficult.

HDL recommends the site be graded to promote positive drainage away from the structures and compaction of the near surface soils to reduce permeability.

7.11 Construction Considerations

If temporary excavations will be needed to support the pipe construction, we recommend that the trench side slopes, trench bottom conditions, and dewatering efforts be made the responsibility of the contractor. The contractor he is present on a day to day basis and can adjust his efforts to obtain the needed stability and meet the applicable Alaska and Federal Occupational Safety and Health Administration (OSHA) safety regulations. Deviation from the OSHA stipulations requires the approval of a licensed Professional Geotechnical Engineer.

The need for dewatering will depend on the time of year for construction and the depth of the trench. Surface water should be directed away from the excavations. Heavy precipitation may cause soils to become saturated and less stable. The contractor should phase construction to minimize exposure of subgrade soils.

For management of garbage during construction activities, refer to the Alaska Department of Environmental Conservation (ADEC) guidelines under AAC Title 8, Chapter 60.

8.0 REFERENCES

Wahrhaftig. 1965. *Physiographic divisions of Alaska.* USGS. October 6, 2020. https://pubs.er.usgs.gov/publication/pp482.

Western Regional Climate Center (WRCC). 2020. Cape Romanzof, Alaska (501318). October 6th, 2020. https://wrcc.dri.edu/cgi-bin/cliMAIN.pl?ak1318

9.0 CLOSURE

This Report has been prepared at the request and authorization of Alaska Energy Authority and is subject to the Limitations provided in Appendix A. Please feel free to contact Doug Simon at dsimon@hdlalaska.com or (907)564-2120 for questions or clarifications.

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APPENDIX A

Limitations (2 pages)

GEOTECHNICAL LIMITATIONS

Use of Report

1. HDL Engineering Consultants, LLC (HDL) prepared this report on behalf of, and for the exclusive use of our Client for the stated purpose(s) and location(s) identified in the Proposal for Services and/or Report. Use of this report, in whole or in part, at other locations, or for other purposes, may lead to inappropriate conclusions; and we do not accept any responsibility for the consequences of such use(s). Further, reliance by any party not expressly identified in the agreement, for any use, without our prior written permission, shall be at that party's sole risk, and without any liability to HDL.

2. If substantial time has elapsed between submission of this report and the start of work at the site, or if conditions have changed because of natural causes or construction operations at or adjacent to the site, we recommend that HDL be retained to review this report to determine the applicability of the conclusions considering the time lapse or changed conditions.

Standard of Care

3. HDL's findings and conclusions are based on the work conducted as part of the Scope of Services set forth in the Proposal for Services and/or Report, and reflect our professional judgment. These findings and conclusions must be considered not as scientific or engineering certainties, but rather as our professional opinions concerning the limited data gathered during the course of our work. If conditions other than those described in this report are found at the subject location(s), or the design has been altered in any way, HDL shall be so notified and afforded the opportunity to revise the report, as appropriate, to reflect the unanticipated changed conditions.

4. HDL's services were performed using the degree of skill and care ordinarily exercised by qualified professionals performing the same type of services, at the same time, under similar conditions, at the same or a similar property. No warranty, expressed or implied, is made.

Subsurface Conditions

5. The generalized soil profile(s) provided in our Report are based on widely-spaced subsurface explorations and are intended only to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized, and were based on our assessment of subsurface conditions. The composition of strata, and the transitions between strata, may be more variable and more complex than indicated. For more specific information on soil conditions at a specific location refer to the exploration logs.

6. Unanticipated soil conditions are commonly encountered and cannot be fully determined by merely taking soil samples or advancing borings. Such unexpected conditions frequently require additional expenditure to attain a properly constructed project. Therefore, some contingency fund is recommended to accommodate such potential extra costs.

7. In preparing this report, HDL relied on certain information provided by the Client, state

and local officials, and other parties referenced therein which were made available to HDL at the time of our evaluation. HDL did not attempt to independently verify the accuracy or completeness of all information reviewed or received during the course of this evaluation.

8. Water level readings have been made in test holes (as described in the Report) and monitoring wells at the specified times and under the stated conditions. These data have been reviewed and interpretations have been made in this Report. Fluctuations in the level of the groundwater occur due to temporal or spatial variations in areal recharge rates, soil heterogeneities, the presence of subsurface utilities, and/or natural or artificially induced perturbations. The water encountered in the course of the work may differ from that indicated in the Report.

9. HDL's services did not include an assessment of the presence of oil or hazardous materials at the property. Consequently, we did not consider the potential impacts (if any) that contaminants in soil or groundwater may have on construction activities, or the use of structures on the property.

10. Recommendations for foundation drainage, waterproofing, and moisture control address the conventional geotechnical engineering aspects of seepage control. These recommendations may not preclude an environment that allows the infestation of mold or other biological pollutants.

Compliance with Codes and Regulations

11. We used reasonable care in identifying and interpreting applicable codes and regulations. These codes and regulations are subject to various, and possibly contradictory, interpretations. Compliance with codes and regulations by other parties is beyond our control.

Additional Services

12. HDL recommends that we be retained to provide services during any future: site observations, design, implementation activities, construction and/or property development/redevelopment. This will allow us the opportunity to: i) observe conditions and compliance with our design concepts and opinions; ii) allow for changes in the event that conditions are other than anticipated; iii) provide modifications to our design; and iv) assess the consequences of changes in technologies and/or regulations.

APPENDIX B

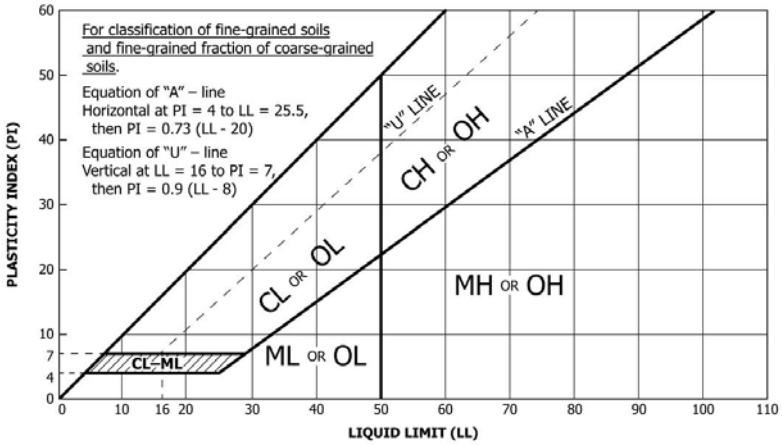
Boring Log Key (1 page)
Frost Design Classification System (1 page)
Peat and Organic Soil Classification System (1 page)

BORING LOG KEY

Summary of the Unified Soil Classification System (from ASTM International Standard D2487)[A]				Soil Classification	
				Group Symbol	Group Name[B]
Coarse-grained Soils (*More than 50% retained on No. 200 sieve*)	Gravels (*More than 50% of coarse fraction retained on No. 4 sieve*)	Gravels with < 5% fines[C]	$C_u \geq 4$ and $1 \leq C_c \leq 3$[D]	GW	Well-graded gravel[E]
			$C_u < 4$ and/or [$C_c < 1$ or $C_c > 3$][D]	GP	Poorly graded gravel[E]
		Gravels with > 12% fines[C]	Fines classify as ML or MH	GM	Silty gravel[E,F,G]
			Fines classify as CL or CH	GC	Clayey gravel[E,F,G]
	Sands (*50% or more of coarse fraction passes No. 4 sieve*)	Sands with < 5% fines[H]	$C_u \geq 6$ and $1 \leq C_c \leq 3$[D]	SW	Well-graded sand[I]
			$C_u < 6$ and/or [$C_c < 1$ or $C_c > 3$][D]	SP	Poorly graded sand[I]
		Sands with > 12% fines[H]	Fines classify as ML or MH	SM	Silty sand[F,G,I]
			Fines classify as CL or CH	SC	Clayey sand[F,G,I]
Fine-grained Soils (*More than 50% passes the No. 200 sieve*)	Silts and Clays (*LL<50*)	Inorganic	PI>7 and plots on or above "A" line[J]	CL	Lean clay[K,L,M]
			PI<4 or plots below "A" line[J]	ML	Silt[K,L,M]
		Organic	LL - Oven dried/LL - Not dried <0.75	OL	Organic clay/silt[K,L,M,N/O]
	Silts and Clays (*LL≥50*)	Inorganic	PI plots on or above "A" line	CH	Fat clay[K,L,M]
			PI plots below "A" line	MH	Elastic silt[K,L,M]
		Organic	LL - Oven dried/LL - Not dried <0.75	OH	Organic clay/silt[K,L,M,P/Q]
Highly Organic Soils	Primarily organic matter, dark in color, and organic odor			PT	Peat

NOTES:
Visual soil descriptions performed in accordance with ASTM D2488
Lowercase USCS abbreviation indicates field classification
Uppercase USCS abbreviation indicates laboratory classification

[A]Based on the material passing the 3-in. (75-mm) sieve
[B]If field sample contained cobble or boulders, or both, add "with cobbles or boulders, or both" to group name
[C]Gravels with 5 to 12% fines require dual symbols:
GW-GM well-graded gravel with silt
GW-GC Well-graded gravel with clay
GP-GM poorly graded gravel with silt
GP-GC poorly graded gravel with clay
[D] $C_u = D_{60}/D_{10}$, $C_c = (D_{30})^2/(D_{10} \times D_{60})$
[E]If soil contains ≥ 15% sand, add "with sand" to group name
[F]If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM
[G]If fines are organic, add "with organic fines" to group name
[H]Sands with 5 to 12% fines require dual symbols:
SW-SM well-graded sand with silt
SW-SC well-graded sand with clay
SP-SM poorly graded sand with silt
SP-SC poorly graded sand with clay
[I]If soil contains ≥15% gravel, add "with gravel" to group name
[J]If Atterberg limits plot in hatched area, soil is a CL-ML, silty clay
[K]If soil contains 15 to < 30% plus No. 200, add "with sand" or "with gravel", whichever is predominant
[L]If soil contains ≥ 30% plus No. 200, predominantly sand, add "sandy" to group name
[M]If soil contains ≥ 30% plus No. 200, predominatly gravel, add "gravelly" to group name
[N]PI ≥ 4 and plots on or above "A" line
[O]PI < 4 or plots below "A" line
[P]PI plots on or above "A" line
[Q]PI plots below "A" line



GRAIN SIZE		
Size Class	Inches	mm
Boulders	>12 inches	>300
Cobbles	3 to 12	75 - 300
Gravel		
Coarse	3/4 - 3	19.0 - 75
Fine	3/16 - 3/4	4.76 - 19.0
Sand		
Coarse	1/16 - 3/16	2.0 - 4.76
Medium	1/64 - 1/16	0.42 - 2.0
Fine	1/256 - 1/64	0.074 - 0.42
Silt and Clay	<1/256	<0.074

SAMPLE TYPES	
Symbol	Description
SS	Split Spoon
MSS	Modified Split Spoon
G	Grab
ST	Shelby Tube
GP	Push Sample
C	Core

SOIL CONSISTENCY		
Description	N-Value	Pocket Pen.
Very Soft	<2	<0.25
Soft	2 - 4	0.25 - 0.5
Medium	4 - 8	0.5 - 1.0
Stiff	8 - 15	1.0 - 2.0
Very Stiff	15 - 30	2.0 - 4.0
Hard	>30	>4.0

RELATIVE SOIL DENSITY	
Description	N-Value
Very Loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	>50

COMPONENT PROPORTION (Visual)	
Term	Range
Trace	0 - 5%
Little	5 - 15%
Some	15 - 30%
And	30 - 50%

FROST DESIGN SOIL CLASSIFICATION

US Army Corps of Engineers (USACE) Methodology

The following frost design soil classification was developed by the USACE for describing the potential frost susceptibility of soils. The standard is published in USACE, EM 1110-3-138, "Pavement Criteria for Seasonal Frost Conditions," April 1984.

FROST GROUP	GENERAL SOIL TYPE	% FINER THAN 0.02 mm BY WEIGHT	TYPICAL USCS SOIL CLASS
NFS(1)	(a) Gravels Crushed Stone Crushed Rock	0-1.5	GW, GP
	(b) Sands	0-3	SW, SP
PFS(2)	(a) Gravels Crushed Stone Crushed Rock	1.5 -3	GW, GP
	(b) Sands	3-10	SW, SP
S1	Gravelly Soils	3-6	GW, GP, GW-GM, GP-GM, GW-GC, GP-GC
S2	Sandy Soils	3-6	SW, SP, SW-SM, SP-SM, SW-SC, SP-SC
F1	Gravelly Soils	6-10	GM, GC, GW-GM, GP-GM, GW-GC, GP-GC
F2	(a) Gravelly Soils	10-20	GW, GP, GW-GM, GP-GM, GW-GC, GP-GC
	(b) Sands	6-15	SM, SW-SM, SP-SM, SC, SW-SC, SP-SC, SM-SC
F3	(a) Gravelly Soils	Over 20	GM, GC, GM-GC
	(b) Sands, except very fine silty sands	Over 15	SM, SC, SM-SC
	(c) Clays, PI>12	--	CL, CH
F4	(a) Silts	--	ML, MH, ML-CL
	(b) Very fine silty sands	Over 15	SM, SC, SM-SC
	(c) Clays, PI<12	--	CL, ML-CL
	(d) Varied clays or other fine-grained banded sediments	--	CL or CH layered with ML, MH, ML-CL, SM, SC, or SM-SC

(1) Non-frost susceptible

(2) Possibly frost susceptible, requires lab test for void ratio to determine frost design soil classificatIon. Gravel with void ratio > 0.25 would be NFS; Gravel with void ratio < 0.25 would be S1; Sands with void ratio > 0.30 would be NFS; Sands with void ratio < 0.30 would be S2 or F2

Alaska Department of Transportation and Public Facilities (DOT&PF) Methodology

As shown above, the USACE standard is based in part on the percentage of material finer than 0.02 mm ($P_{0.02}$). The DOT&PF modifies the USACE standard by referencing the percentage of material finer than the #200 sieve, which is 0.075 mm, (P_{200}) rather than 0.02 mm. As reported in the Alaska Flexible Pavement Guide, the P_{200} value is typically twice that of the $P_{0.02}$; therefore, DOT&PF considers material with less than 6% by weight passing the #200, non-frost susceptible (NFS).

Municipality of Anchorage (MOA) Methodology

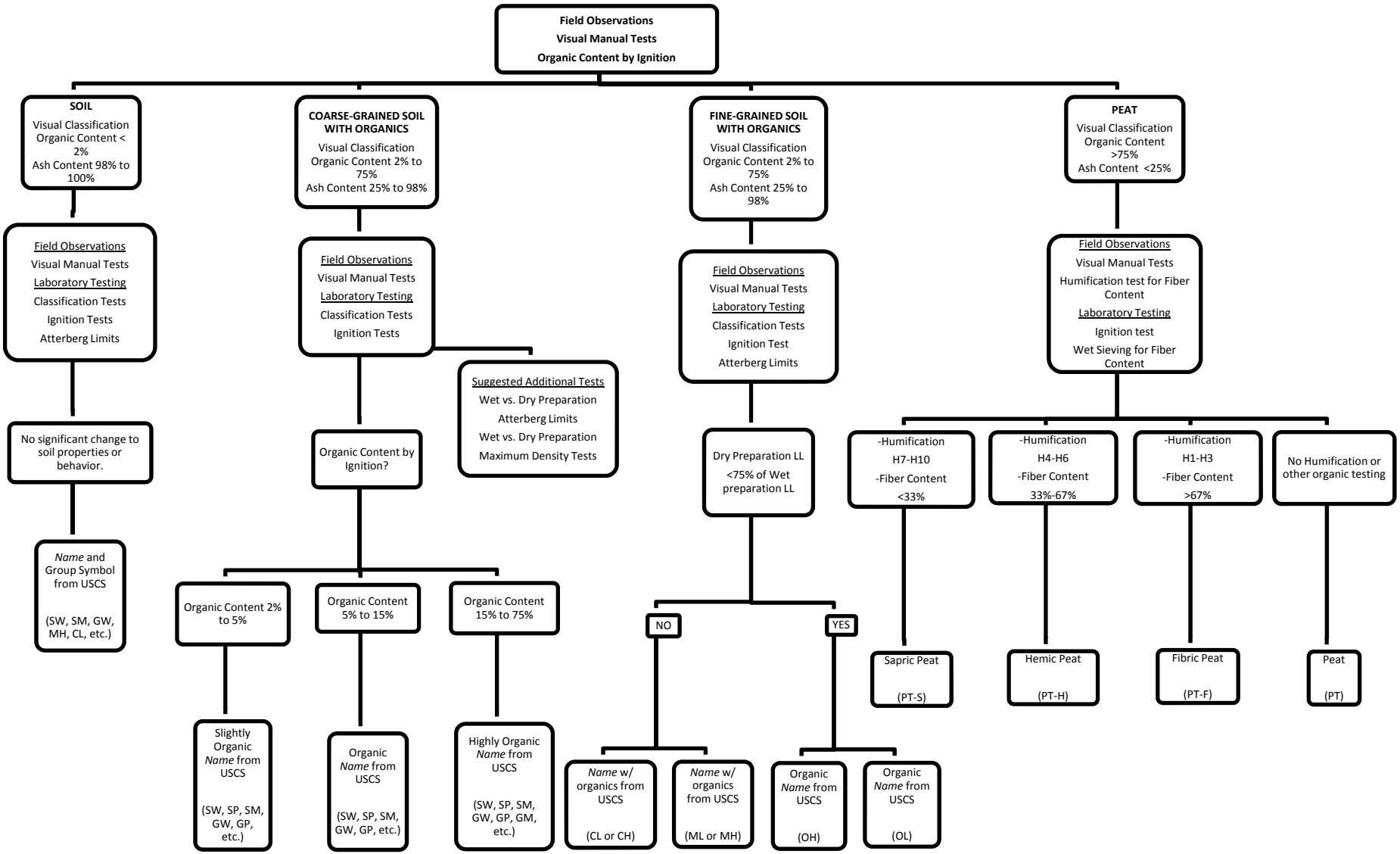
The MOA uses a simplified method based on the USACE methodology noted above. The MOA method is detailed in the Design Criteria Manual and summarized below. Note that the MOA method uses the $P_{0.02}$ value rather than the P_{200} value.

FROST GROUP	SOIL TYPE	PERCENTAGE FINER THAN 0.02 MILLIMETER BY WEIGHT	TYPICAL SOIL TYPES UNDER UNIFIED SOIL CLASSIFICATION SYSTEM
NFS	a. Gravels	0 to 3	GW, GP
	b. Sands	0 to 3	SW, SP
F-1	Gravelly soils	3 to 10	GW, GP, GW-GM, GP-GM
F-2	a. Gravelly soils	10 to 20	GM, GW-GM, GP-GM
	b. Sands	3 to 15	SW, SP, SM, SW-SM, SP
F-3	a. Gravelly soils	Over 20	GM, GC
	b. Sands, except very fine silty sands	Over 15	SM, SC
	c. Clays, PI>12	--	CL, CH
F-4	a. All silts	--	ML, MH
	b. Very fine silty sands	Over 15	SM, SC
	c. Clays, PI<12	--	CL, CL-ML
	d. Varied clays and other fine-grained, banded sediments	--	CL, CL-ML
		--	CL, CH, ML, SM

* Municipality of Anchorage, Project Management & Engineering Department, Design Criteria Manual, January 2007.

PEAT AND ORGANIC SOIL CLASSIFICATION SYSTEM

(Summarized from Alaska Guide for Classification of Peat and Organic Soil)



APPENDIX C

Hand Auger & Test Pit Logs (10 pages)
Grain Size Distribution Curves (3 pages)

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LOG OF BORING

HOLE # HA-01

PROJECT NUMBER : *20-017*
PROJECT : *Scammon Bay Bulk Fuel Upgrades*
CLIENT : *Alaska Energy Authority*

Station / Location: *Southeast quadrant of gravel pad*
Lat/Long: *61.84095/-165.57164*
Elevation:

Equipment Type: *Hand tools*
Drilling Method:
Field Crew:

Total Depth: *1.8 feet*
Date: *9/22/2020*
Geologist: *J.LaBelle*

Depth (Feet)	Sample Data: Sample Type	Number	Blow Count	Sample	Recovery	N-Value	USCS Classification Bonded Zone	Soil Graphic	Ground Water Data			SUBSURFACE MATERIAL	
									Depth in (ft.)				
									Time				
									Date				
									Symbol				
0	GRAB	S-1					sm					SAND, (sm); fine to coarse; some gravel, fine to coarse; little to some silt; brown, dry Moisture =5.9%	0.0
1	GRAB	S-2										large cobbles encountered; difficult digging Moisture =5.3%	1.2
								BOH 1.8				Notes: Terminated hand auger at approximately 1.8 feet bgs due to hand tool refusal on cobbles. No free water encountered.	1.8

A USCS LOG OF TEST HOLE 20-017 SCAMMON BAY BFU.GPJ HDL MODIFIED.GDT 10/15/20

☐ Auto Hammer ☐ Cathead Rope Method ☐ 140 lb. hammer with 30 in. drop ☐ 340 lb. hammer with 30 in. drop

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LOG OF BORING

HOLE # HA-02

PROJECT NUMBER : *20-017*
PROJECT : *Scammon Bay Bulk Fuel Upgrades*
CLIENT : *Alaska Energy Authority*

Station / Location: *Southwest quadrant of gravel pad*
Lat/Long: *61.84098/-165.57211*
Elevation:

Equipment Type: *Hand tools*
Drilling Method:
Field Crew:

Total Depth: *2.5 feet*
Date: *9/23/2020*
Geologist: *J.LaBelle*

Depth (Feet)	Sample Data: Sample Type	Sample Data: Number	Sample Data: Blow Count	Sample Data: Sample	Sample Data: Recovery	Sample Data: N-Value	USCS Classification Bonded Zone	Soil Graphic	Ground Water Data			SUBSURFACE MATERIAL	
									Depth in (ft.)				
									Time				
									Date				
									Symbol				
0	GRAB	S-1					sm					SAND, (sm); fine to coarse; some gravel, fine to coarse; some silt; brown, dry to moist, F3	0.0
												P200 =15.4%, Sa =67.4%, Gr =17.2%, Moisture =7.7%	
1	GRAB	S-2										large cobbles encountered; difficult digging Moisture =8.5%	1.0
2													2.5
								BOH 2.5				Notes: Terminated hand auger at approximately 2.5 feet bgs due to hand tool refusal on cobbles. No free water encountered.	

☐ Auto Hammer ☐ Cathead Rope Method ☐ 140 lb. hammer with 30 in. drop ☐ 340 lb. hammer with 30 in. drop

Sheet Number 1 of 1

A USCS LOG OF TEST HOLE 20-017 SCAMMON BAY BFU.GPJ HDL MODIFIED.GDT 10/15/20

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LOG OF BORING

HOLE # HA-03

PROJECT NUMBER : *20-017*
PROJECT : *Scammon Bay Bulk Fuel Upgrades*
CLIENT : *Alaska Energy Authority*

Station / Location: *Northwest quadrant of gravel pad*
Lat/Long: *61.84111/-165.57191*
Elevation:

Equipment Type: *Hand tools*
Drilling Method:
Field Crew:

Total Depth: *2.3 feet*
Date: *9/23/2020*
Geologist: *J.LaBelle*

Depth (Feet)	Sample Data: Sample Type	Sample Data: Number	Sample Data: Blow Count	Sample Data: Sample	Sample Data: Recovery	Sample Data: N-Value	USCS Classification Bonded Zone	Soil Graphic	Ground Water Data			SUBSURFACE MATERIAL
									Depth in (ft.)			
									Time			
									Date			
									Symbol			
0	GRAB	S-1					sm					SAND, (sm); fine to coarse; some gravel, fine to coarse; some silt; brown, dry to moist, F3 0.0
												P200 =16.5%, Sa =67.9%, Gr =15.6%, Moisture =8.9%
1	GRAB	S-2										1.2
												SAND, fine to coarse; some silt; little gravel, fine to coarse; brown, dry to moist, large cobbles encountered, F3
												P200 =19.2%, Sa =73.3%, Gr =7.5%, Moisture =9.4%
2	GRAB	S-3										Moisture =9.3% 2.3
								BOH 2.3				Notes:
												Terminated hand auger at approximately 2.3 feet bgs due to hand tool refusal on cobbles. No free water encountered.

☐ Auto Hammer ☐ Cathead Rope Method ☐ 140 lb. hammer with 30 in. drop ☐ 340 lb. hammer with 30 in. drop

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LOG OF BORING

HOLE # HA-04

PROJECT NUMBER : *20-017*
PROJECT : *Scammon Bay Bulk Fuel Upgrades*
CLIENT : *Alaska Energy Authority*

Station / Location: *Northeast quadrant of gravel pad*
Lat/Long: *61.84113/-165.57156*
Elevation:

Equipment Type: *Hand tools*
Drilling Method:
Field Crew:

Total Depth: *2.1 feet*
Date: *9/23/2020*
Geologist: *J.LaBelle*

Depth (Feet)	Sample Data: Sample Type	Number	Blow Count	Sample	Recovery	N-Value	USCS Classification Bonded Zone	Soil Graphic	Ground Water Data			SUBSURFACE MATERIAL	
									Depth in (ft.)				
									Time				
									Date				
									Symbol				
0	GRAB	S-1					sm					SAND, (sm); fine to coarse; some gravel, fine to coarse; some silt; brown, dry to moist, F3	0.0
												P200 =17.1%, Sa =59.7%, Gr =23.2%, Moisture =10.1%	0.3
1												cobbles present enocuntered; difficult digging	
	GRAB	S-2										Moisture =18.7%	1.6
2								BOH 2.1					2.1

Notes:
Terminated hand auger at approximately 2.1 feet bgs due to hand tool refusal on cobbles. No free water encountered.

☐ Auto Hammer ☐ Cathead Rope Method ☐ 140 lb. hammer with 30 in. drop ☐ 340 lb. hammer with 30 in. drop

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LOG OF BORING

HOLE # TP-01

PROJECT NUMBER : *20-017*
PROJECT : *Scammon Bay Bulk Fuel Upgrades*
CLIENT : *Alaska Energy Authority*

Station / Location: *East of proposed retail sales building*
Lat/Long: *61.84069/-165.57198*
Elevation:

Equipment Type: *Case CX80C*
Drilling Method:
Field Crew: *City of Scammon Bay*

Total Depth: *8.5 feet*
Date: *9/23/2020*
Geologist: *J. LaBelle*

Ground Water Data		
Depth in (ft.)		
Time		
Date		
Symbol		

Depth (Feet)	Sample Data: Sample Type	Sample Data: Number	Sample Data: Blow Count	Sample Data: Sample	Sample Data: Recovery	Sample Data: N-Value	USCS Classification Bonded Zone	Soil Graphic	SUBSURFACE MATERIAL
0	GRAB	S-1					sm		SAND, (sm); fine to coarse; some gravel, fine to coarse; some silt; brown, dry to moist, large cobbles encountered; excavator chattering while digging, F3 P200 =18.8%, Sa =64.4%, Gr =16.8%, Moisture =8.0%
2.5	GRAB	S-2							little gravel, fine to coarse; gray
3.5									SAND, fine to coarse; little gravel, fine to coarse; some silt; with garbage
4	GRAB	S-3					sm		SAND, (sm); fine to coarse; some to with gravel, fine to coarse; some silt; brown, dry to moist, cobbles encountered Moisture =8.6%
7.5									large boulders present in test pit; excavator chattering while digging
8.5								BOH 8.5	Notes: Terminated test pit at approximately 8.5 feet bgs due to excavator refusal on boulders. No free water encountered.

☐ Auto Hammer ☐ Cathead Rope Method ☐ 140 lb. hammer with 30 in. drop ☐ 340 lb. hammer with 30 in. drop

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LOG OF BORING

HOLE # TP-02

PROJECT NUMBER : *20-017*
PROJECT : *Scammon Bay Bulk Fuel Upgrades*
CLIENT : *Alaska Energy Authority*

Station / Location: *Near truck fill*
Lat/Long: *61.84072/-165.57243*
Elevation:

Equipment Type: *Case CX80C*
Drilling Method:
Field Crew: *City of Scammon Bay*

Total Depth: *9.0 feet*
Date: *9/23/2020*
Geologist: *J. LaBelle*

Ground Water Data		
Depth in (ft.)	8.5	
Time		
Date	9/23/20	9/23/20
Symbol	▽	

Depth (Feet)	Sample Data: Sample Type	Number	Blow Count	Sample	Recovery	N-Value	USCS Classification Bonded Zone	Soil Graphic	SUBSURFACE MATERIAL	
0									ORGANIC MAT	0.0
	GRAB	S-1					sm		SAND, (sm); fine to coarse; with gravel, fine to coarse; some silt; gray, dry to moist, cobbles and boulders encountered, F3 P200 =16.4%, Sa =50.3%, Gr =33.3%, Moisture =12.0%	0.5
1									SAND, fine to coarse; little gravel, fine to coarse; some silt; with garbage	1.5
							sm		SAND, (sm); fine to coarse; some gravel, fine to coarse; some silt; brown, dry to moist, cobbles and boulders encountered	1.8
2										
3									increase in large boulders; difficult digging	3.0
4										
5										
6	GRAB	S-2							moist, F3 P200 =15.5%, Sa =65.0%, Gr =19.5%, Moisture =9.5%	6.5
7										
8										8.5
	GRAB	S-3					gp-gm		Poorly-graded GRAVEL, (gp-gm); fine to coarse; with sand, fine to coarse; little to some silt; brown, wet Moisture =13.2%	9.0
9								BOH 9	Notes: Terminated test pit at approximately 9.0 feet bgs due to free water collapsing hole.	

☐ Auto Hammer ☐ Cathead Rope Method ☐ 140 lb. hammer with 30 in. drop ☐ 340 lb. hammer with 30 in. drop

Sheet Number 1 of 1

A USCS LOG OF TEST HOLE 20-017 SCAMMON BAY BFU.GPJ HDL MODIFIED.GDT 10/15/20

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LOG OF BORING

HOLE # TP-03

PROJECT NUMBER : *20-017*
PROJECT : *Scammon Bay Bulk Fuel Upgrades*
CLIENT : *Alaska Energy Authority*

Station / Location: *Near southwest side of gravel pad*
Lat/Long: *61.84102/-165.57237*
Elevation:

Equipment Type: *Case CX80C*
Drilling Method:
Field Crew: *City of Scammon Bay*

Total Depth: *8.5 feet*
Date: *9/23/2020*
Geologist: *J. LaBelle*

Ground Water Data		
Depth in (ft.)	5.5	
Time		
Date	9/23/20	9/23/20
Symbol	▽	

Depth (Feet)	Sample Data: Sample Type	Number	Blow Count	Sample	Recovery	N-Value	USCS Classification Bonded Zone	Soil Graphic	SUBSURFACE MATERIAL	
0	GRAB	S-1					sp-sm		ORGANIC MAT	0.0
									Poorly-graded SAND, (sp-sm); fine to coarse; little silt; trace gravel, fine to coarse; grayish-brown, dry to moist, F2 P200 =11.2%, Sa =84.7%, Gr =4.1%, Moisture =11.8%	0.3
1									boulders encountered	1.0
2										
3										
4										
5	GRAB	S-2					sm			5.5
6									SAND, (sm); fine to coarse; with gravel, fine to coarse; little silt; brown, wet, boulders and cobbles encountered, F2 P200 =13.9%, Sa =55.2%, Gr =30.9%, Moisture =16.0%	
7										
8								BOH 8.5		8.5
									Notes: Terminated test pit at approximately 8.5 feet bgs due to free water collapsing hole.	

☐ Auto Hammer ☐ Cathead Rope Method ☐ 140 lb. hammer with 30 in. drop ☐ 340 lb. hammer with 30 in. drop

HDL ENGINEERING Consultants LLC

LOG OF BORING

HOLE # TP-04

PROJECT NUMBER : *20-017*
PROJECT : *Scammon Bay Bulk Fuel Upgrades*
CLIENT : *Alaska Energy Authority*

Station / Location: *Near northwest corner of gravel pad*
Lat/Long: *61.84146/-165.57198*
Elevation:

Equipment Type: *Case CX80C*
Drilling Method:
Field Crew: *City of Scammon Bay*

Total Depth: *1.5 feet*
Date: *9/23/2020*
Geologist: *J. LaBelle*

Depth (Feet)	Sample Data: Sample Type	Number	Blow Count	Sample Recovery	N-Value	USCS Classification Bonded Zone	Soil Graphic	Ground Water Data			SUBSURFACE MATERIAL	
								Depth in (ft.)	1.5			
								Time				
								Date	9/23/20	9/23/20		
								Symbol	▽			
0											ORGANIC MAT	0.0
						sp						0.4
											Poorly-graded SAND, (sp); fine to coarse; some gravel, fine to coarse; little silt; brown, dry to moist, with garbage	
1											increase in garbage	0.8
	▽											1.5
							BOH 1.5				Notes: Terminated test pit at approximately 1.5 feet bgs due to presence of garbage.	

☐ Auto Hammer ☐ Cathead Rope Method ☐ 140 lb. hammer with 30 in. drop ☐ 340 lb. hammer with 30 in. drop

Sheet Number 1 of 1

A USCS LOG OF TEST HOLE 20-017 SCAMMON BAY BFU.GPJ HDL MODIFIED.GDT 10/15/20

HDL ENGINEERING Consultants LLC

LOG OF BORING

HOLE # TP-05

PROJECT NUMBER : *20-017*
PROJECT : *Scammon Bay Bulk Fuel Upgrades*
CLIENT : *Alaska Energy Authority*

Station / Location: *Near northeast corner of gravel pad*
Lat/Long: *61.84134/-165.57109*
Elevation:

Equipment Type: *Case CX80C*
Drilling Method:
Field Crew: *City of Scammon Bay*

Total Depth: *2.5 feet*
Date: *9/23/2020*
Geologist: *J. LaBelle*

Depth (Feet)	Sample Data: Sample Type	Number	Blow Count	Sample Recovery	N-Value	USCS Classification Bonded Zone	Soil Graphic	Ground Water Data			SUBSURFACE MATERIAL
								Depth in (ft.)			
								Time			
								Date			
								Symbol			
0											ORGANIC MAT — 0.0
						sp					0.6
1											Poorly-graded SAND, (sp); fine to coarse; some gravel, fine to coarse; little silt; brown, dry to moist, with garbage — 1.0
											increase in garbage
2											2.5
							BOH 2.5				Notes: Terminated test pit at 2.5 feet bgs due to presence of garbage. No free water encountered.

☐ Auto Hammer ☐ Cathead Rope Method ☐ 140 lb. hammer with 30 in. drop ☐ 340 lb. hammer with 30 in. drop

HDL ENGINEERING Consultants LLC

LOG OF BORING

HOLE # TP-06

PROJECT NUMBER : *20-017*
PROJECT : *Scammon Bay Bulk Fuel Upgrades*
CLIENT : *Alaska Energy Authority*

Station / Location: *Near northeast side of gravel pad*
Lat/Long: *61.84119/-165.57086*
Elevation:

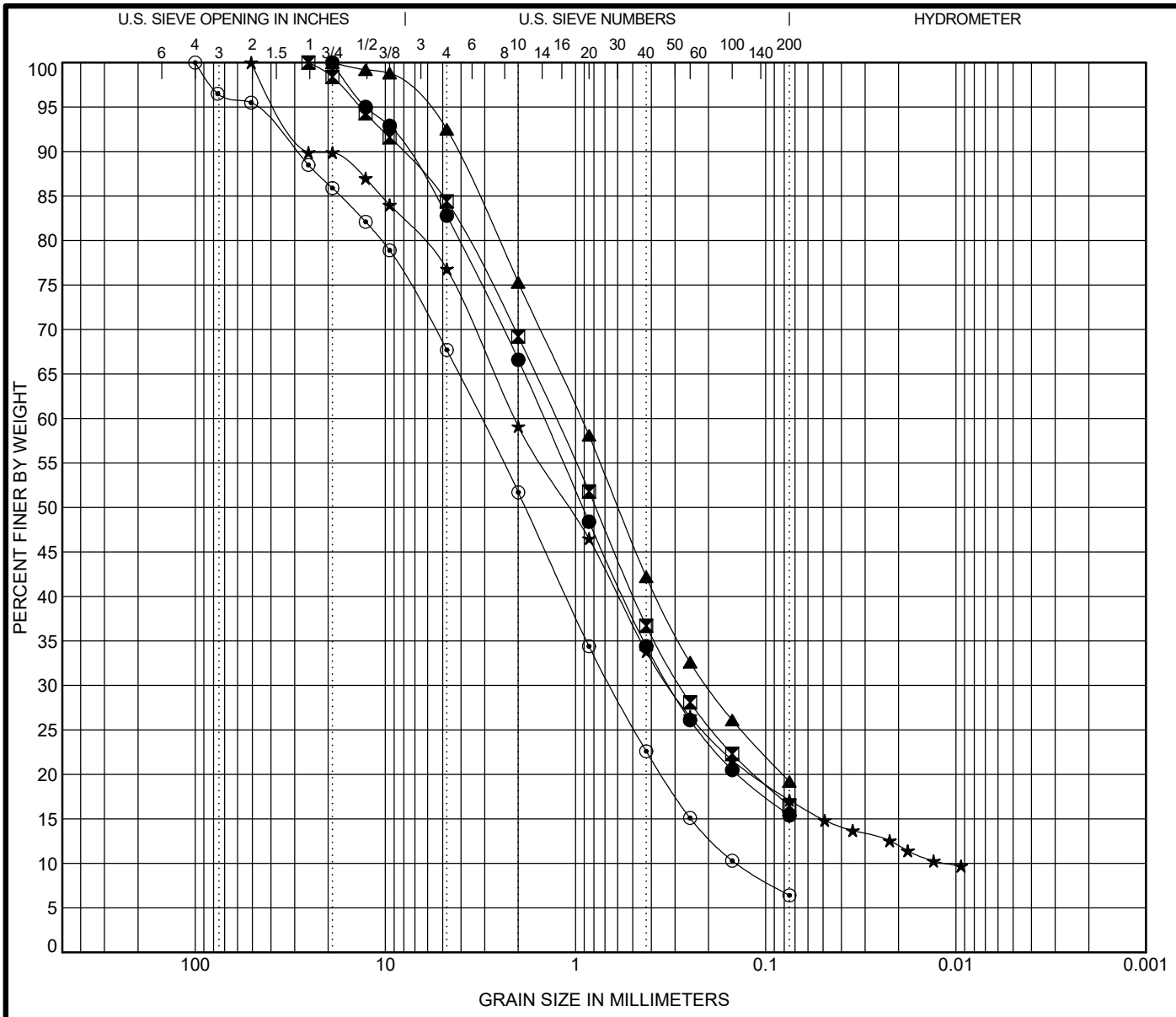
Equipment Type: *Case CX80C*
Drilling Method:
Field Crew: *City of Scammon Bay*

Total Depth: *11.5 feet*
Date: *9/23/2020*
Geologist: *J. LaBelle*

Depth (Feet)	Sample Type	Number	Blow Count	Sample	Recovery	N-Value	USCS Classification Bonded Zone	Soil Graphic	SUBSURFACE MATERIAL
0	GRAB	S-1					sm		ORGANIC MAT 0.0 SAND, (sm); fine to coarse; some gravel, fine to coarse; some silt; brown, dry to moist, F3 0.2 P200 =25.5%, Sa =57.4%, Gr =17.1%, Moisture =14.8%
1							sm		SAND, (sm); fine to coarse; some gravel, fine to coarse; some silt; brown, dry to moist, with garbage 1.0 decrease in garbage 1.5
2									
3									boulders and cobbles encountered 3.5
4	GRAB	S-2					sm		SAND, (sm); fine to coarse; with silt; some gravel, fine to coarse; brown, dry to moist, cobbles and boulders encountered, F3 4.0 P200 =35.0%, Sa =40.0%, Gr =25.0%, Moisture =20.7%
5									
6									
7									
8									
9									
10	GRAB	S-4 S-3					sm		SAND, (sm); fine to coarse; with silt; gray, dry to moist 9.5 Moisture =29.0% 9.8 little gravel, fine to coarse; trace organics; P200 =47.7%, Sa =47.0%, Gr =5.3%, Moisture =28.9%
11								BOH 11.5	11.5 Notes: Terminated test pit at 11.5 feet bgs due to limits of excavator reach. No free water encountered.

Ground Water Data		
Depth in (ft.)		
Time		
Date		
Symbol		

☐ Auto Hammer ☐ Cathead Rope Method ☐ 140 lb. hammer with 30 in. drop ☐ 340 lb. hammer with 30 in. drop



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**HA-02 DEPTH 0.0**						
⊠	**HA-03 DEPTH 0.0**						
▲	**HA-03 DEPTH 1.2**						
★	**HA-04 DEPTH 0.0**					**4.44**	**186.62**
⊙	**MS-01 DEPTH 0.0**					**0.97**	**22.03**

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**HA-02 DEPTH 0.0**	**19**	**1.466**	**0.321**		**17.2**	**67.4**	**15.4**	
⊠	**HA-03 DEPTH 0.0**	**25.4**	**1.272**	**0.281**		**15.6**	**67.9**	**16.5**	
▲	**HA-03 DEPTH 1.2**	**19**	**0.934**	**0.204**		**7.5**	**73.3**	**19.2**	
★	**HA-04 DEPTH 0.0**	**50.8**	**2.09**	**0.322**	**0.011**	**23.2**	**59.7**	**17.1**	
⊙	**MS-01 DEPTH 0.0**	**100**	**3.133**	**0.656**	**0.142**	**28.8**	**61.3**	**6.4**	

HDL ENGINEERING Consultants LLC
3335 Arctic Blvd Ste 100
Anchorage, AK 99503
Telephone: 907-564-2120
Fax: 907-564-2122

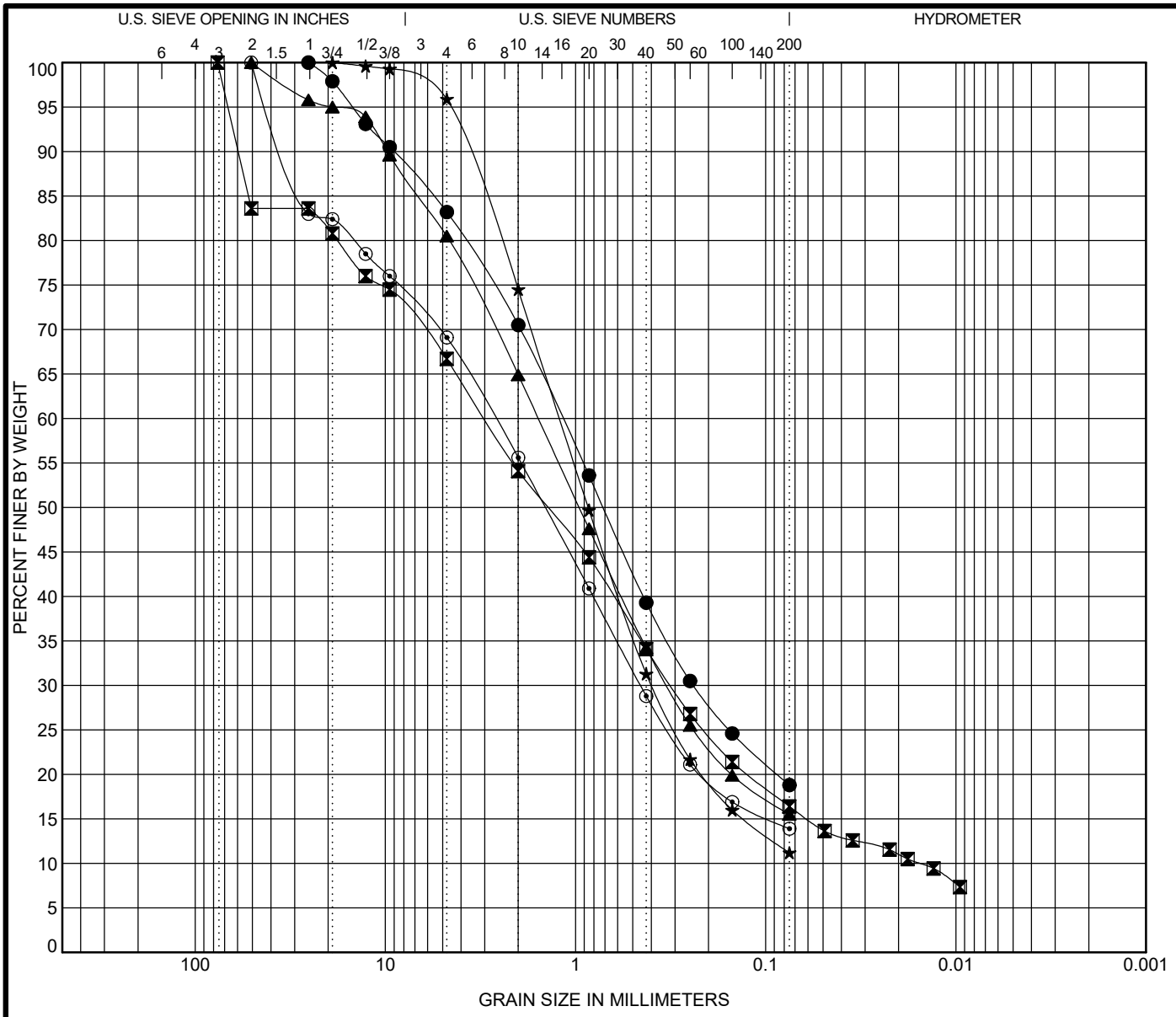
GRAIN SIZE DISTRIBUTION

Project: Scammon Bay Bulk Fuel Upgrades

Client: Alaska Energy Authority

Project Number: 20-017

US GRAIN SIZE 20-017 SCAMMON BAY BFU.GPJ HDL MODIFIED.GDT 10/26/20



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			Classification	LL	PL	PI	Cc	Cu
●	**TP-01**	**DEPTH 0.0**						
⊠	**TP-02**	**DEPTH 0.5**					**2.14**	**193.64**
▲	**TP-02**	**DEPTH 6.5**						
★	**TP-03**	**DEPTH 0.3**					**2.05**	**19.23**
⊙	**TP-03**	**DEPTH 5.5**						

Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TP-01**	**DEPTH 0.0**	**25.4**	**1.175**	**0.239**		**16.8**	**64.4**	**18.8**	
⊠	**TP-02**	**DEPTH 0.5**	**76.2**	**2.999**	**0.315**	**0.015**	**33.3**	**50.3**	**16.4**	
▲	**TP-02**	**DEPTH 6.5**	**50.8**	**1.57**	**0.329**		**19.5**	**65.0**	**15.5**	
★	**TP-03**	**DEPTH 0.3**	**19**	**1.213**	**0.396**		**4.1**	**84.7**	**11.2**	
⊙	**TP-03**	**DEPTH 5.5**	**50.8**	**2.651**	**0.455**		**30.9**	**55.2**	**13.9**	

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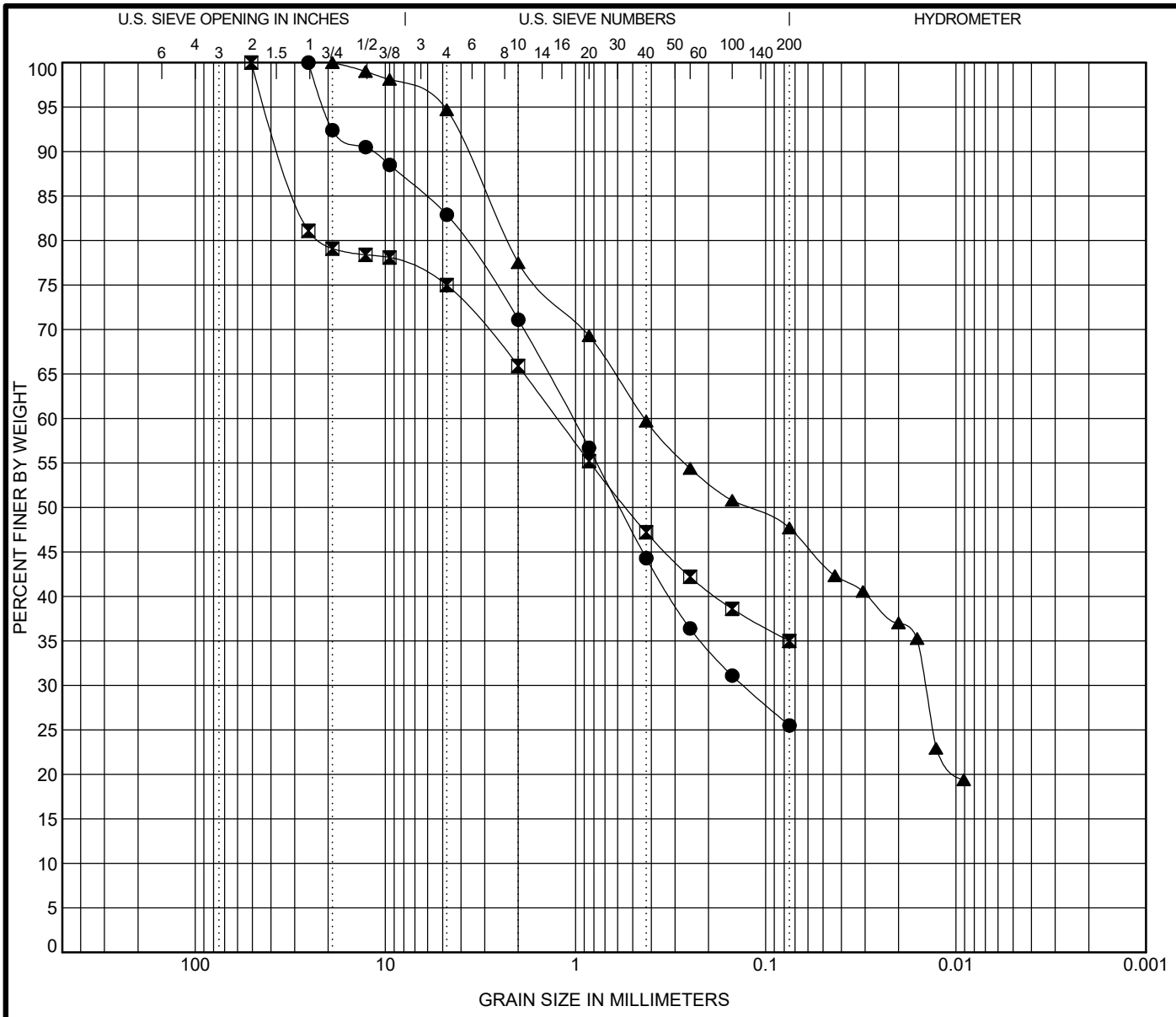
GRAIN SIZE DISTRIBUTION

Project: Scammon Bay Bulk Fuel Upgrades

Client: Alaska Energy Authority

Project Number: 20-017

US GRAIN SIZE 20-017 SCAMMON BAY BFU.GPJ HDL MODIFIED.GDT 10/26/20



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	TP-06	DEPTH 0.2						
⊠	TP-06	DEPTH 4.0						
▲	TP-06	DEPTH 9.8						

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	TP-06	DEPTH 0.2	25.4	1.034	0.131		17.1	57.4	25.5	
⊠	TP-06	DEPTH 4.0	50.8	1.248			25.0	40.0	35.0	
▲	TP-06	DEPTH 9.8	19	0.434	0.014		5.3	47.0	47.7	

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GRAIN SIZE DISTRIBUTION

Project: Scammon Bay Bulk Fuel Upgrades

Client: Alaska Energy Authority

Project Number: 20-017

APPENDIX D

Chemical Testing Results (5 pages)

Laboratory Analysis Report

Jacqueline Labelle
HDL Engineering Consultants, LLC
3335 Arctic Boulevard
Suite 100
Anchorage, Anchorage AK 99503

Work Order:	1205524
	20-017-2B Scammon Bay BFU
Client:	Hattenburg, Dilley & Linnell, LLC (HDL)
Report Date:	October 16, 2020

SGS maintains a formal Quality Assurance/Quality Control (QA/QC) program. A copy of our Quality Assurance Plan (QAP), which outlines this program, is available at your request. The laboratory certification numbers are AK00971 (DW Chemistry & Microbiology) & 17-021 (CS) for ADEC and 2944.01 for DOD ELAP/ISO 17025 (RCRA methods: 1020B, 1311, 3010A, 3050B, 3520C, 3550C, 5030B, 5035A, 6020B, 7470A, 7471B, 8015C, 8021B, 8082A, 8260D, 8270D, 8270D-SIM, 9040C, 9045D, 9056A, 9060A, AK101 and AK102/103). SGS is only certified for the analytes listed on our Drinking Water Certification (DW methods: 200.8, 2130B, 2320B, 2510B, 300.0, 4500-CN-C,E, 4500-H-B, 4500-NO3-F, 4500-P-E and 524.2) and only those analytes will be reported to the State of Alaska for compliance. Except as specifically noted, all statements and data in this report are in conformance to the provisions set forth by the SGS QAP and, when applicable, other regulatory authorities.

*	The analyte has exceeded allowable regulatory or control limits.
!	Surrogate out of control limits.
B	Indicates the analyte is found in a blank associated with the sample.
CCV/CVA/CVB	Continuing Calibration Verification
CCCV/CVC/CVCA/CVCB	Closing Continuing Calibration Verification
CL	Control Limit
DF	Analytical Dilution Factor
DL	Detection Limit (i.e., maximum method detection limit)
E	The analyte result is above the calibrated range.
GT	Greater Than
ICV	Initial Calibration Verification
J	The quantitation is an estimation.
LCS(D)	Laboratory Control Spike (Duplicate)
LLQC/LLIQC	Low Level Quantitation Check
LOD	Limit of Detection (i.e., 1/2 of the LOQ)
LOQ	Limit of Quantitation (i.e., reporting or practical quantitation limit)
LT	Less Than
MB	Method Blank
MS(D)	Matrix Spike (Duplicate)
ND	Indicates the analyte is not detected.
RPD	Relative Percent Difference
TNTC	Too Numerous To Count
U	Indicates the analyte was analyzed for but not detected.

Note: Sample summaries which include a result for "Total Solids" have already been adjusted for moisture content.

SGS Ref.#	1205524001
Client Name	Hattenburg, Dilley & Linnell, LLC (HDL)
Project Name/#	20-017-2B Scammon Bay BFU
Client Sample ID	Fill Material
Matrix	Soil/Solid (dry weight)

Printed Date/Time	10/16/2020 12:16
Collected Date/Time	09/28/2020 10:00
Received Date/Time	10/07/2020 11:14
Technical Director	**Stephen C. Ede**

Sample Remarks:

Parameter	Results	LOQ	Units	Method	Container ID	Allowable Limits	Prep Date	Analysis Date	Init
Characterization									
pH	6.70	0.00100	pH units	SW9045D	A			10/09/20	S.S
Waters Department									
Chloride	ND	2.17	mg/kg	SW9056A	A		10/12/20	10/13/20	EWW
Resistivity	254	0.0200	ohm-m	SM19 2510A	A		10/15/20	10/15/20	EWW
Sulfate	4.55	2.17	mg/kg	SW9056A	A		10/12/20	10/13/20	EWW
Solids									
Total Solids	91.6		%	SM21 2540G	A			10/08/20	H.M

SGS

SGS North America Inc.
CHAIN OF CUSTODY RECORD

1205524

PH 366032 XD

www.us.sgs.com

Instructions: Sections 1 - 5 must be filled out.
Omissions may delay the onset of analysis.

Page ____ of ____

Section 1

CLIENT: HDL ENGINEERING CONSULTANTS

CONTACT: JACQUELINE LABELLE

PHONE #: 708-751-1716

PROJECT NAME: SCAMMON BAY BFU

PROJECT/ PWSID/ PERMIT#: 20-017-2B

REPORTS TO: JACQUELINE LABELLE

E-MAIL: JLABELLE@HDLalaska.com

Profile #:

INVOICE TO: SAME

QUOTE #:

P.O. #:

Section 2

RESERVED for lab use	SAMPLE IDENTIFICATION	DATE mm/dd/yy	TIME HH:MM	MATRIX/ MATRIX CODE	# CONTAINERS	Comp Grab MI (Multi-incremental)	Analysis*										REMARKS/LOC ID
							* pH	x Chloride	x Resistivity	x Sulfate							
1A	Fill Material	09/28/20	10:00 am														

NOTE: *The following analyses require specific method and/or compound list: BTEX, Metals, PFAS

Section 3

Preservative

Section 4

DOD Project? Yes No

Data Deliverable Requirements:

Cooler ID: _____

Section 5

Relinquished By:	Date	Time	Received By:
(1) Jacqueline LaBelle	10/7/20	11:20	
(2)			
(3)	~~Date~~	~~Time~~	~~Received By:~~
(4)	10/7/20	1114	Received For Laboratory By:

Requested Turnaround Time and/or Special Instructions:

* Per client for reference under WO: # 1143542

ma 10/7/20

Temp Blank °C: _____

or Ambient [ ]

Chain of Custody Seal: (Circle)

INTACT BROKEN (ABSENT)

Delivery Method: Hand Delivery [ ] Commerical Delivery [ ]

3 of 5

e-Sample Receipt Form

SGS Workorder #: **1205524** | 1205524

Review Criteria	Condition (Yes, No, N/A)	Exceptions Noted below
Chain of Custody / Temperature Requirements		Yes — Exemption permitted if sampler hand carries/delivers.
Were Custody Seals intact? Note # & location	N/A	
COC accompanied samples?	Yes	
DOD: Were samples received in COC corresponding coolers?	N/A	
N/A **Exemption permitted if chilled & collected <8 hours ago, or for samples where chilling is not required		
Temperature blank compliant* (i.e., 0-6 °C after CF)?	No	Cooler ID: N/A @ Ambient °C Therm. ID: N/A
If samples received without a temperature blank, the "cooler temperature" will be documented instead & "COOLER TEMP" will be noted to the right. "ambient" or "chilled" will be noted if neither is available.		Cooler ID: @ °C Therm. ID:
		Cooler ID: @ °C Therm. ID:
		Cooler ID: @ °C Therm. ID:
		Cooler ID: @ °C Therm. ID:
*If >6°C, were samples collected <8 hours ago?	No	
If <0°C, were sample containers ice free?	N/A	
Note: Identify containers received at non-compliant temperature . Use form FS-0029 if more space is needed.		Proceed with sample above temp
Holding Time / Documentation / Sample Condition Requirements		Note: Refer to form F-083 "Sample Guide" for specific holding times.
Were samples received within holding time?	Yes	
Do samples **match COC**** (i.e.,sample IDs,dates/times collected)?	Yes	
**Note: If times differ <1hr, record details & login per COC.		
***Note: If sample information on containers differs from COC, SGS will default to COC information		
Were analytical requests clear? (i.e., method is specified for analyses with multiple option for analysis (Ex: BTEX, Metals)	No	Analysis filled out by SGS per previous workorder per client
	N/A	***Exemption permitted for metals (e.g,200.8/6020A).
Were proper containers (type/mass/volume/preservative***)used?	Yes	
Volatile / LL-Hg Requirements		
Were Trip Blanks (i.e., VOAs, LL-Hg) in cooler with samples?	N/A	
Were all water VOA vials free of headspace (i.e., bubbles ≤ 6mm)?	N/A	
Were all soil VOAs field extracted with MeOH+BFB?	N/A	

Note to Client: Any "No", answer above indicates non-compliance with standard procedures and may impact data quality.

Additional notes (if applicable):

Sample Containers and Preservatives

Container Id	Preservative	Container Condition	Container Id	Preservative	Container Condition
1205524001-A	No Preservative Required	OK			

Container Condition Glossary

Containers for bacteriological, low level mercury and VOA vials are not opened prior to analysis and will be assigned condition code OK unless evidence indicates than an inappropriate container was submitted.

OK - The container was received at an acceptable pH for the analysis requested.
BU - The container was received with headspace greater than 6mm.
DM - The container was received damaged.
FR - The container was received frozen and not usable for Bacteria or BOD analyses.
IC - The container provided for microbiology analysis was not a laboratory-supplied, pre-sterilized container and therefore was not suitable for analysis.
NC- The container provided was not preserved or was under-preserved. The method does not allow for additional preservative added after collection.
PA - The container was received outside of the acceptable pH for the analysis requested. Preservative was added upon receipt and the container is now at the correct pH. See the Sample Receipt Form for details on the amount and lot # of the preservative added.
PH - The container was received outside of the acceptable pH for the analysis requested. Preservative was added upon receipt, but was insufficient to bring the container to the correct pH for the analysis requested. See the Sample Receipt Form for details on the amount and lot # of the preservative added.
QN - Insufficient sample quantity provided.