

Captains Bay Road Waterline  
EXHIBIT 01



**GEOTECHNICAL REPORT**

**For**

**Captains Bay Road  
Unalaska, Alaska**

Prepared for:  
**City of Unalaska**

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September 2018

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## ABBREVIATIONS

AK DOT&PF .....	Alaska Department of Transportation and Public Facilities
ASTM.....	ASTM International Standard
bgs.....	Below the existing ground surface
HDL.....	HDL Engineering Consultants, LLC
Report .....	Geotechnical Engineering Report
Site .....	Portion of Captains Bay Road and Pyramid Creek Road, Unalaska, Alaska
USACE.....	United States Army Corps of Engineers
USCS.....	Unified Soil Classification System

# GEOTECHNICAL ENGINEERING REPORT

## CAPTAINS BAY ROAD

### UNALASKA, ALASKA

## 1.0 INTRODUCTION

In accordance with the request and authorization of the City of Unalaska, HDL Engineering Consultants, LLC (HDL) conducted a geotechnical engineering evaluation for the paving and utility extensions along Captains Bay Road in Unalaska, Alaska (Site). The project generally consists of upgrading the power, water, and wastewater utilities. The project also includes lighting, pathway, road alignment, and paving improvements. The findings and conclusions that HDL derived from the geotechnical evaluation are provided in this Geotechnical Engineering Report (Report). This Report is subject to the limitations provided in Appendix A.

### 1.1 Purpose and Scope of Services

HDL's objective for this project was to conduct a geotechnical evaluation and develop geotechnical design recommendations for the roadway surfacing, cuts and fills, utilities, and structures. To achieve our objective, HDL:

- Coordinated a geotechnical subsurface exploration program that consisted of forty-two (42) test pits up to 9 feet deep;
- Classified select soil samples recovered from the test pits based on field observations and prepared test pit logs;
- Conducted laboratory tests on select samples to determine the particle size distribution, moisture content, and organic content; and,
- Prepared this Report, which summarizes HDL's findings from the geotechnical evaluation for the proposed project.

### 1.2 Summary

Geotechnical findings for the proposed paving and utility extensions are summarized below. The summary is provided for the convenience of the non-technical reader and must be read in complete context with the remaining Report.

1. Test pits excavated at the Site generally encountered a layer of surface course underlain by shot rock fill. In general, the surface course ranged in thickness from 0.2 feet to 3 feet. The shot rock fill generally extended to the termination depth.
2. Based on the measured fines content of the tested soils, the surface course ranges from non-frost susceptible to highly frost susceptible (NFS to F3).

3. Bedrock was encountered in some test pits. Bedrock will likely be encountered in portions of the project area.
4. Groundwater was not encountered in the test pits during the geotechnical investigation. However, previous geotechnical investigations in the area did encounter groundwater at varying depths. The groundwater levels along Captains Bay Road are assumed to correlate closely to ocean levels.

## 2.0 BACKGROUND

The proposed project is located in the northern region of the Island of Unalaska bordering Captains Bay. The Site location is shown in Figure 1 – Vicinity Map.

### 2.1 Existing Conditions

The Site consists of Captains Bay Road which runs alongside Captains Bay and approximately 500 feet of Pyramid Creek Road. Captains Bay Road is generally flat with a gravel surface course and shot rock subbase overlying occasional old beach deposits and bedrock. Rock cliffs are present on the inland side of the road while the bay side is armored with stone. Captains Bay Road is a transportation route for multiple businesses and experiences substantial truck traffic. Pyramid Road intersects Captains Bay Road on the north east side of the Westward Facility and has a gravel surface. The road is steep and experiences significant vehicle and pedestrian traffic.

### 2.2 Proposed Improvements

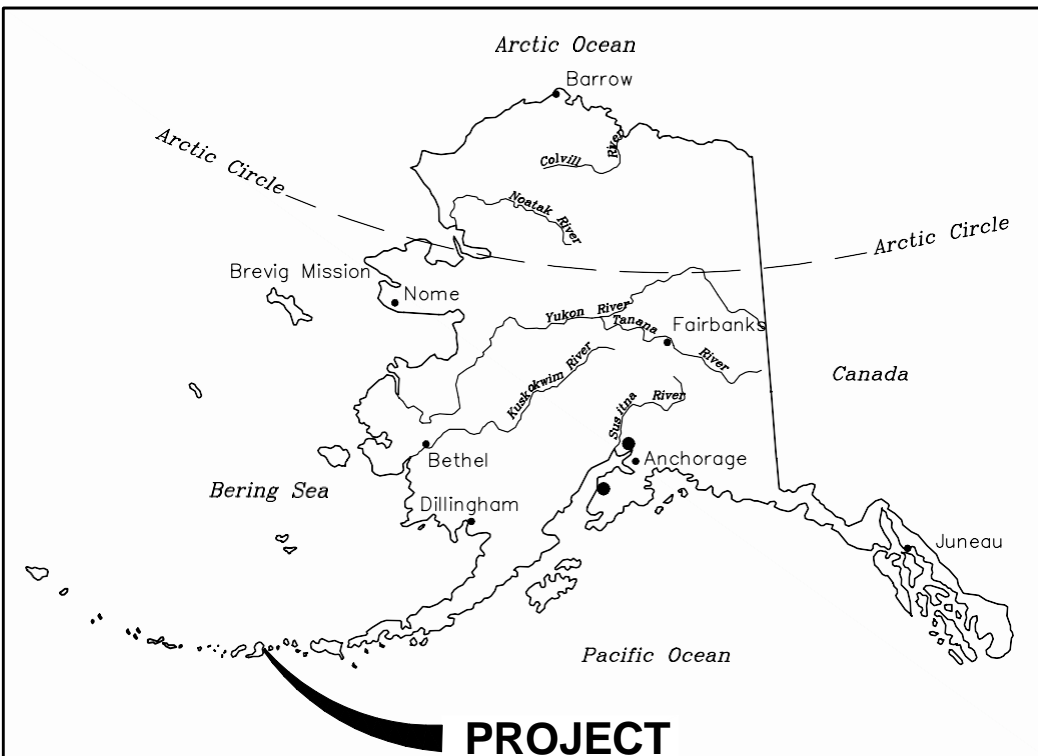
The project generally consists of upgrading the power, water, and wastewater utilities. The project also includes lighting, pathway, road alignment, and paving improvements. The project area extends from the Captains Bay Road and Airport Beach Road intersection to the Offshore Systems Facility, which is located roughly 13,696 feet southwest of Airport Beach Road. The project includes paving all or portions of Captains Bay Road and approximately 500 feet of Pyramid Creek Road. Approximately 6,696 linear feet of utility work and improvements is anticipated from the Westward Facility near the Pyramid Road intersection to the Offshore Systems Facility. The layout of the road and the test pit locations are shown in Figures 2 through 5, Test Pit Location Map (A-D).

## 3.0 PREVIOUS GEOTECHNICAL STUDIES

HDL reviewed geotechnical data available from previously completed evaluations in the area. Summaries of the data reviewed are provided below.

- *Soil Investigation for The Proposed Unalaska Sewerage System, Unalaska, Alaska, Rodney P. Kinney Associates, March 1982*

Eighty (80) test pits were excavated to depths ranging from 1 foot to 16 feet below the existing ground surface (bgs) in Unalaska between September and October of 1981. Sixteen (16) of those test pits were located along the proposed project area. The test pits in the project area generally encountered a layer of sand and gravel fill to depths ranging



**PROJECT  
LOCATION**

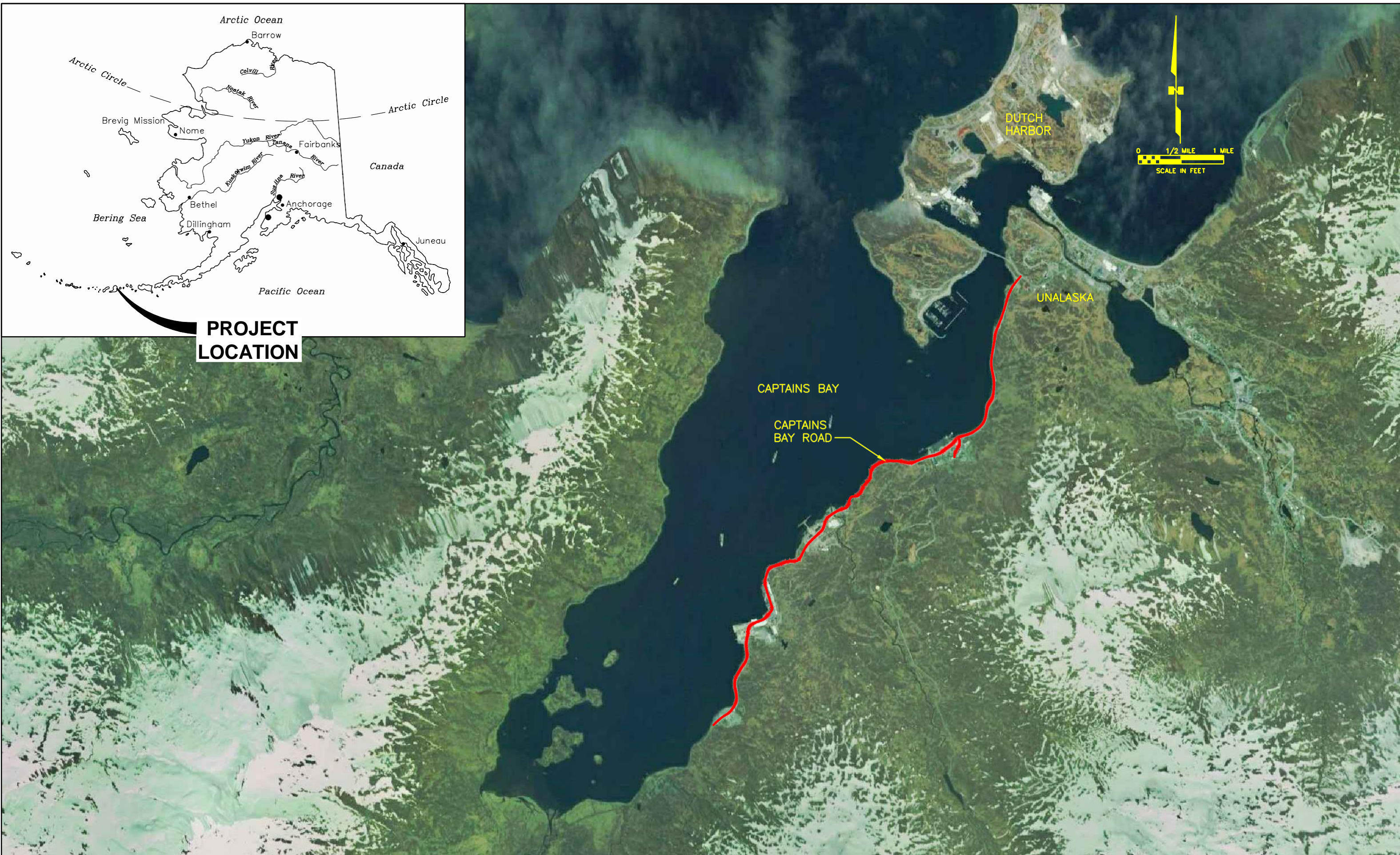


FIGURE 1  
VICINITY MAP  
CAPTAINS BAY ROAD  
UNALASKA, ALASKA

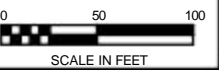


FIGURE 2  
TEST PIT LOCATION MAP A  
CAPTAINS BAY ROAD  
UNALASKA, ALASKA





FIGURE 3  
TEST PIT LOCATION MAP B  
CAPTAINS BAY ROAD  
UNALASKA, ALASKA

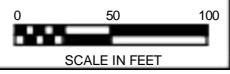
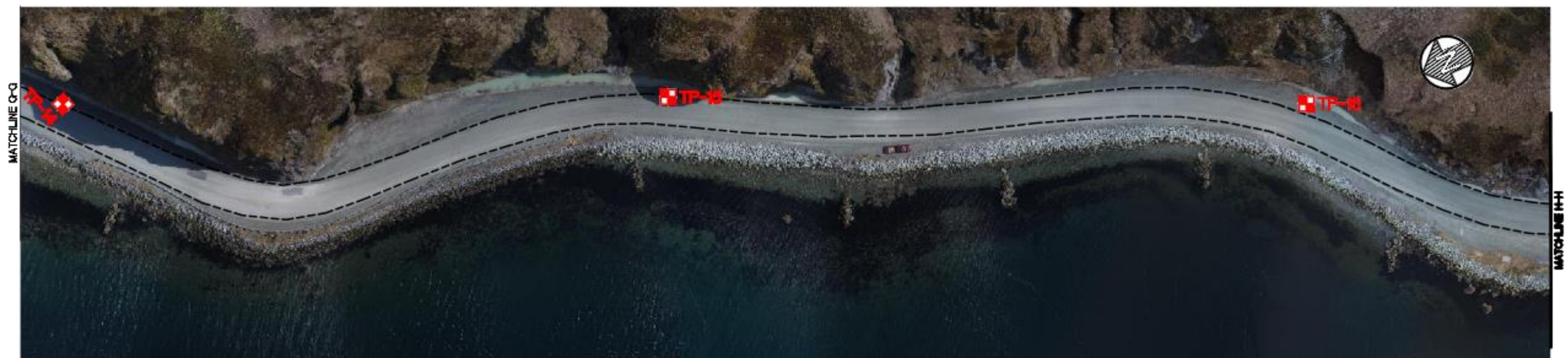
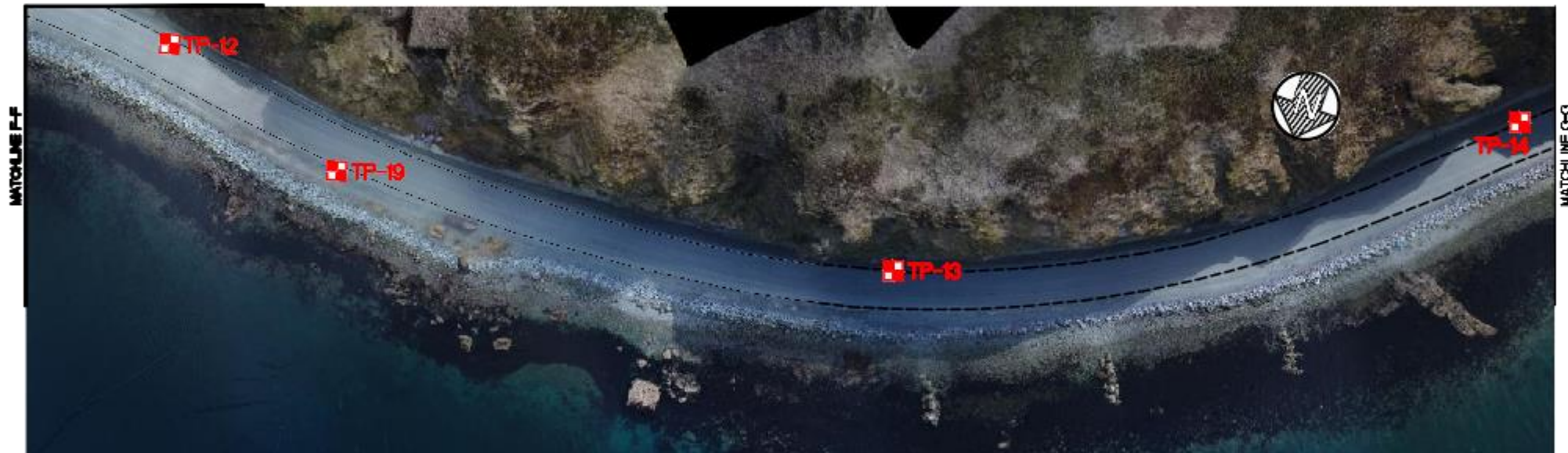
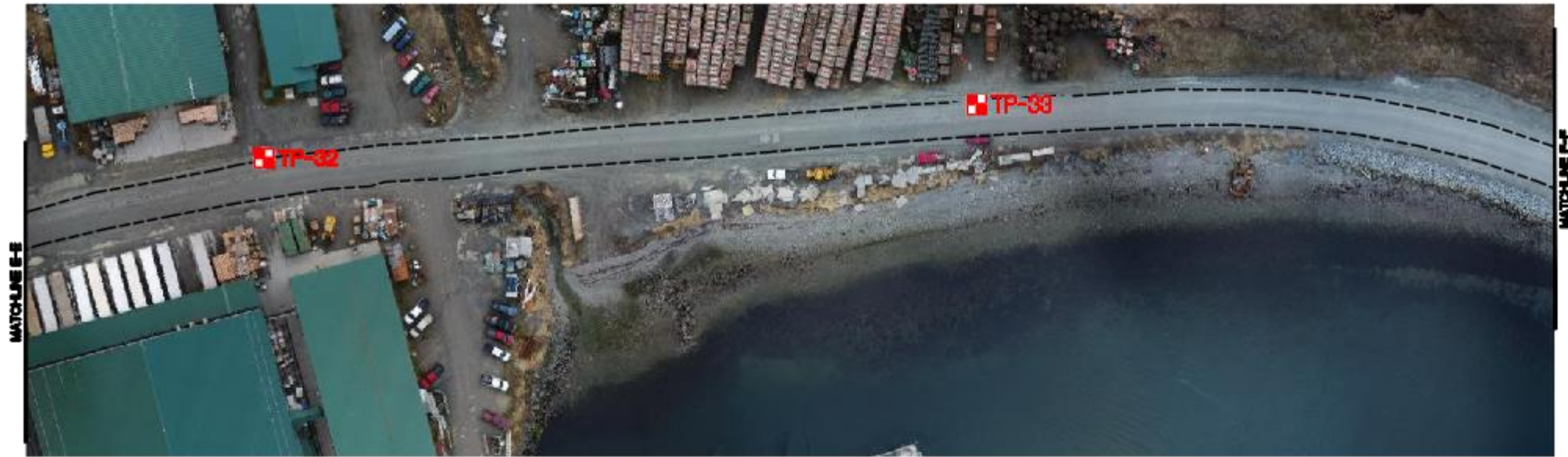


FIGURE 4  
TEST PIT LOCATION MAP C  
CAPTAINS BAY ROAD  
UNALASKA, ALASKA

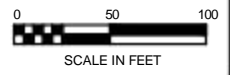


FIGURE 5  
TEST PIT LOCATION MAP D  
CAPTAINS BAY ROAD  
UNALASKA, ALASKA

from 1 foot to 10 feet bgs. The soils encountered beneath the fill generally consisted of gravelly sand, silt, and boulders extending to the termination depth. Bedrock was encountered during excavation in 12 of the 16 test pits at depths ranging between 1 foot and 10 feet bgs. Groundwater was encountered during excavation in 12 of the 16 test pits at depths ranging between 3 feet and 10 feet bgs. A copy of the test pit logs and test pit location map is provided in Appendix B.

- *Captains Bay Electrical Intertie – Test Pits, Unalaska, Alaska, City of Unalaska DPW, December 2016*

Fifteen (15) test pits were excavated to depths of up to 5 feet bgs along Captains Bay Road in November of 2016. The test pits generally encountered a gravel fill to depths ranging from about 0.5 feet to 3 feet bgs. Shot rock fill consisting of boulders with gravel, silts, sand, and clay was encountered beneath the gravel fill and generally extended to the termination depth. Alluvial talus was encountered beneath the gravel fill and was present to the termination depth in two (2) of the 15 test pits. Weathered bedrock was encountered beneath the gravel fill in one (1) of the 15 test pits at a depth of 2 feet bgs. Beach deposits consisting of sand, gravel, and debris were intermittently encountered in the test pits. No groundwater was encountered in the test pits.

- *Road Improvement Master Plan – Tasks 1, 2, and 3, Unalaska, Alaska, Shannon & Wilson, Inc., February 2010 (Tasks 1 and 2) and April 2011 (Task 3)*

The master plan consisted of evaluating the existing conditions and structural sections of roadway, developing recommendations for improved roadways, and assessing the effects of truck loads on the paved roads. Based on the observations made during Task 1, the paved roads typically experienced four different forms of wear: rutting, joint failure, raveling, and fatigue cracking and potholing. The wear was attributed to poor compaction of the asphalt, poor drainage, heavy truck loads, and tire chain wear. According to local trucking companies, approximately 40,000 to 44,000 annual trips are made to haul fish products from the processing plant to the docks. Approximately 30 to 40 percent of the trips utilize Captains Bay Road.

The master plan recommended a road use classification system based on seasonal truck traffic. The classification system is split into four classes – Class A, Class B, Class C, and Class D. Class A roads would experience the highest volume truck traffic and Class D roads would experience the lightest volume truck traffic. The roadways for this project would be considered Class A. The plan recommended implementing tire chain control regulations or using a gap graded HMA of Type II HMA with hard aggregate for the top two inches of pavement.

The master plan provided recommendations for the different road classes. The recommended structural section for Class A roads consisted of 6 inches of asphalt, 4 inches of base course, 18 inches of Selected Material Type A, and 18 inches of Selected Material Type B.

## 4.0 SETTING

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

### 4.1 General Geology

The project area is located in the Aleutian Islands approximately 800 air miles from Anchorage, Alaska. The geology of Unalaska is characterized by pyroclastic rocks and basalt and andesitic flows overlying the Unalaska formation. The Unalaska formation consists mostly of sedimentary rocks and altered igneous rocks. The Unalaska formation is heavily faulted, contributing to the complex structure of the whole island of Unalaska (Drewes et. Al, 1961).

Unalaska is located in a highly seismic area. A summary of the recorded seismic events within the Aleutian Islands by the Alaska Earthquake Center at the University of Alaska Fairbanks indicated 2,265 seismic events with a Richter Magnitude of 4 or greater. Fourteen (14) of these events had a Richter Magnitude greater than 7. The largest earthquake in this region had a Richter Magnitude of 7.4.

### 4.2 Climatology

The project area is located in a maritime climatic zone which is characterized by mean temperatures generally above freezing and high winds during the fall and winter seasons. Climatology data for Unalaska was collected from climate summary information for Dutch Harbor, which is considered representative of the area. The average low January temperature in the area is 26°F, while the average high August temperature is 59°F. Average annual precipitation is 57 inches, and average annual snowfall is 91 inches (Shulski et. Al, 2007).

## 5.0 SUBSURFACE EXPLORATION

HDL performed subsurface explorations at the Site to evaluate the subsurface conditions. The subsurface evaluation consisted of 42 test pits. An experienced HDL engineer was present during excavation to locate the test pits, collect samples, log subsurface conditions, and observe groundwater depths, where encountered.

Recovered soils were described in the field in general accordance with ASTM International Standard (ASTM) D2488. Samples were collected and delivered to HDL's laboratory for further testing. Soil descriptions were confirmed or modified according to the Unified Soil Classification System (USCS, ASTM D2487) as summarized in Appendix C, based on the laboratory test results.

Forty-two (42) test pits, designated TP-1 through TP-42, were excavated along Captains Bay Road and Pyramid Creek Road. Grab samples were collected onsite by HDL personnel. The test pit logs are included in Appendix D.

Fieldwork was performed in general accordance with the procedures outlined in the Alaska Department of Transportation & Public Facilities (AK DOT&PF) "Alaska Geotechnical Procedures Manual". Test pit locations were surveyed by HDL. Refer to Figures 2 through 5, Test Pit Location Map (A-D), for the location of the test pits.

## 6.0 LABORATORY TESTING

Laboratory testing of the soil samples was conducted at HDL's re:Source (formerly AMRL) accredited and United States Army Corps of Engineers (USACE) validated laboratory. Select laboratory tests were performed on samples recovered from the test pits to confirm and/or modify field classifications. The results of the laboratory tests were incorporated into the test pit logs and grain size distribution curves are provided in Appendix D.

Forty (40) natural moisture content tests were performed in accordance with procedures described in ASTM D2216. Nineteen (19) grain size distribution tests were performed in accordance with procedures described in ASTM D422. Eleven (11) P<sub>200</sub> tests, which measures the amount of material finer than the #200 sieve, were performed in accordance with ASTM D1140. One (1) organic content test was performed as described in ASTM D40.

## 7.0 SUBSURFACE CONDITIONS

In general, surface course was encountered at the ground surface of the test pits followed by shot rock fill. Some test pits encountered beach deposits or weathered bedrock. The subsurface conditions encountered are summarized below, and detailed information may be found on the logs presented in Appendix D.

### 7.1 Surface Course

Surface course was encountered at the surface in 41 of the 42 test pits and was present to depths ranging from 0.2 feet to 3.0 feet bgs. The surface course consisted of primarily gravel and sand with varying amounts of silt. The measured fines content of the surface course ranged from 0.7 percent to 18.7 percent, indicating non-frost susceptible to highly frost susceptible (NFS to F3) soils. A summary of the surface course, including the results of laboratory testing, is provided in Table 1, Surface Course Summary.

**Table 1 – Surface Course Summary**

Test Pit	Thickness	Moisture	Grain Size Distribution		
	(ft)	(%)	% Gr	%Sa	%P200
TP-1	0.3	3.6	52.0	42.9	5.1
	2.7	5.1	--	--	--
TP-2	1.5	3.1	--	--	12.7
TP-3	1.2	2.9	36.7	50.5	12.8
TP-4	1.3	2.8	38.4	47.9	13.7
TP-5	0.3	2.5	41.9	48.1	10.0
TP-6	0.5	--	--	--	--
TP-7	1.0	--	--	--	--
TP-8	0.7	7.7	56.0	32.0	12.0
TP-9	1.3	3.7	46.2	39.2	14.6
TP-10	1.7	--	--	--	--

**Table 1 – Surface Course Summary (continued)**

TP-11	0.7	4.3	45.4	41.9	12.7
TP-12	1.3	--	--	--	--
TP-13	0.8	3.4	45.0	43.4	11.6
TP-14	1.5	--	--	--	--
TP-15	0.3	3.9	41.5	48.4	10.1
TP-16	0.3	--	--	--	--
TP-17	2.0	3.5	42.4	45.0	12.6
TP-18	0.3	--	--	--	--
TP-19	0.8	5.3	48.2	33.7	18.1
TP-20	0.5	--	--	--	--
TP-21	0.7	--	--	--	--
TP-22	0.7	3.2	55.2	38.2	6.6
	0.1	3.5	59.8	39.6	0.7
TP-23	0.2	--	--	--	--
TP-25	1.2	--	--	--	--
TP-26	1.3	3.1	--	--	--
TP-27	1.0	3.0	48.8	41.1	10.1
TP-28	1.0	--	--	--	--
TP-29	0.8	--	--	--	--
TP-30	1.0	--	--	--	--
TP-31	1.3	2.9	53.1	35.3	11.6
TP-32	1.0	--	--	--	--
TP-33	1.0	3.4	55.9	34.0	10.1
TP-34	0.5	3.3	44.5	36.8	18.7
TP-35	0.2	--	--	--	--
TP-36	0.3	9.8	--	--	--
	0.4	4.8	--	--	--
TP-37	1.0	--	--	--	--
TP-38	0.5	5.7	34.0	51.9	14.1
TP-39	3.0	--	--	--	--
TP-40	0.5	5.1	37.5	48.5	14.0
TP-41	0.5	4.1	38.3	49.2	12.5
	1.0	4.5	--	--	--
TP-42	1.0	--	--	--	--

-- Not Tested

## 7.2 Shot Rock Fill

Shot rock fill consisting of boulders, cobbles, gravel, sand, and silt was encountered beneath the surface course in 34 of the 42 test pits. Shot rock fill was not encountered in test pits TP-1, TP-3, TP-16, TP-28, TP-35, TP-36, TP-39, and TP-40. The shot rock fill was encountered at depths ranging

from the surface to 2.0 feet bgs. The shot rock fill ranged in thickness from 1 foot to greater than 7.2 feet. A layer of fibrous organics was encountered below the shot rock fill in TP-33. The organic content of this layer was 10.4%. The select samples of shot rock fill that were tested in the laboratory did not include the cobbles that were present in the field and thus the test results are based on the material excluding the cobbles content. The measured fines content of the shot rock fill excluding the cobbles was 5.9 percent. A summary of the shot rock fill laboratory testing (excluding the cobbles) is provided in Table 2, Shot Rock Fill Laboratory Summary.

**Table 2 – Shot Rock Fill Summary**

Test Pit	Depth	Thickness	Moisture	Grain Size Distribution		
	(ft)	(ft)	(%)	% Gr	%Sa	%P200
TP-3	1.2	0.8	6.7	--	--	--
TP-23	0.8	2.2	5.8	60.6	33.5	5.9
TP-38	0.5	1.5	3.6	--	--	--
	2	1.3	4.6	--	--	--

-- Not Tested

### 7.3 Beach Deposit

Materials that appeared to be old beach deposits were encountered beneath the shot rock fill in TP-15, TP-16, and TP-33. The beach deposits were encountered at depths ranging from 2.5 feet to 3.8 feet bgs. Where encountered, the beach deposits typically extended from the bottom of the shot rock fill to the test pit termination depth. A summary of the beach deposits is provided in Table 3, Beach Deposit Summary.

**Table 3 – Beach Deposit Summary**

Test Pit	Depth	Thickness
	(ft)	(ft)
TP-14	2.5	1.7
TP-15	2.5	≥5.5
TP-16	2.5	≥5.5
TP-33	3.8	≥5.2

-- Not Tested

### 7.4 Bedrock

Weathered bedrock was encountered below the shot rock fill in TP-13 at a depth of 4.0 feet bgs. The weathered bedrock extended from the base of the shot rock fill to the test pit termination depth and was 2 feet thick. Excavator refusal was encountered in test pits TP-13, TP-18, TP-41, and TP-42, respectively. Excavator refusal was interpreted to be competent bedrock.



## 7.5 Groundwater

Groundwater was not encountered in the test pits during the geotechnical investigation. However, previous geotechnical investigations in the area did encounter groundwater at varying depths. Groundwater levels fluctuate depending on season, temperatures, and infiltration. Due to its proximity, the groundwater levels along Captains Bay Road likely correlates to the level of the adjacent ocean.

## 8.0 ROCK OUTCROP RECONNAISSANCE

HDL conducted a reconnaissance of six rock outcrops along Captains Bay Road where road realignment may result in cut slopes. HDL evaluated the location, density, and orientation of fractures on the exposed face of existing rock cuts based on observations from the ground and drone photos. In general, the quality of the rock and the fracture patterns vary widely at the outcrops observed. However, fractures planes with adverse orientations that could result in rock slides or falls into the roadway were present at each outcrop. In addition, overhung rocks were observed at each outcrop. Further details of the reconnaissance are provided in Appendix E, Rock Outcrop Reconnaissance.

## 9.0 REFERENCES

Shulski, Martha, and Gerd Wendler. *The Climate of Alaska*. Fairbanks, AK: University of Alaska, 2007. Print.

Drewes, Harald, Fraser, G.D., Snyder, G.L., and Barnett, H.F. JR. *Geology of Unalaska Island and Adjacent Insular Shelf, Aleutian Islands, Alaska*. Geological Survey Bulletin 1028-S. 1961. Print.

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## 10.0 CLOSURE

This Report has been prepared at the request and authorization of the City of Unalaska and is subject to the limitations provided in Appendix A. Please feel free to contact Doug Simon at (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.

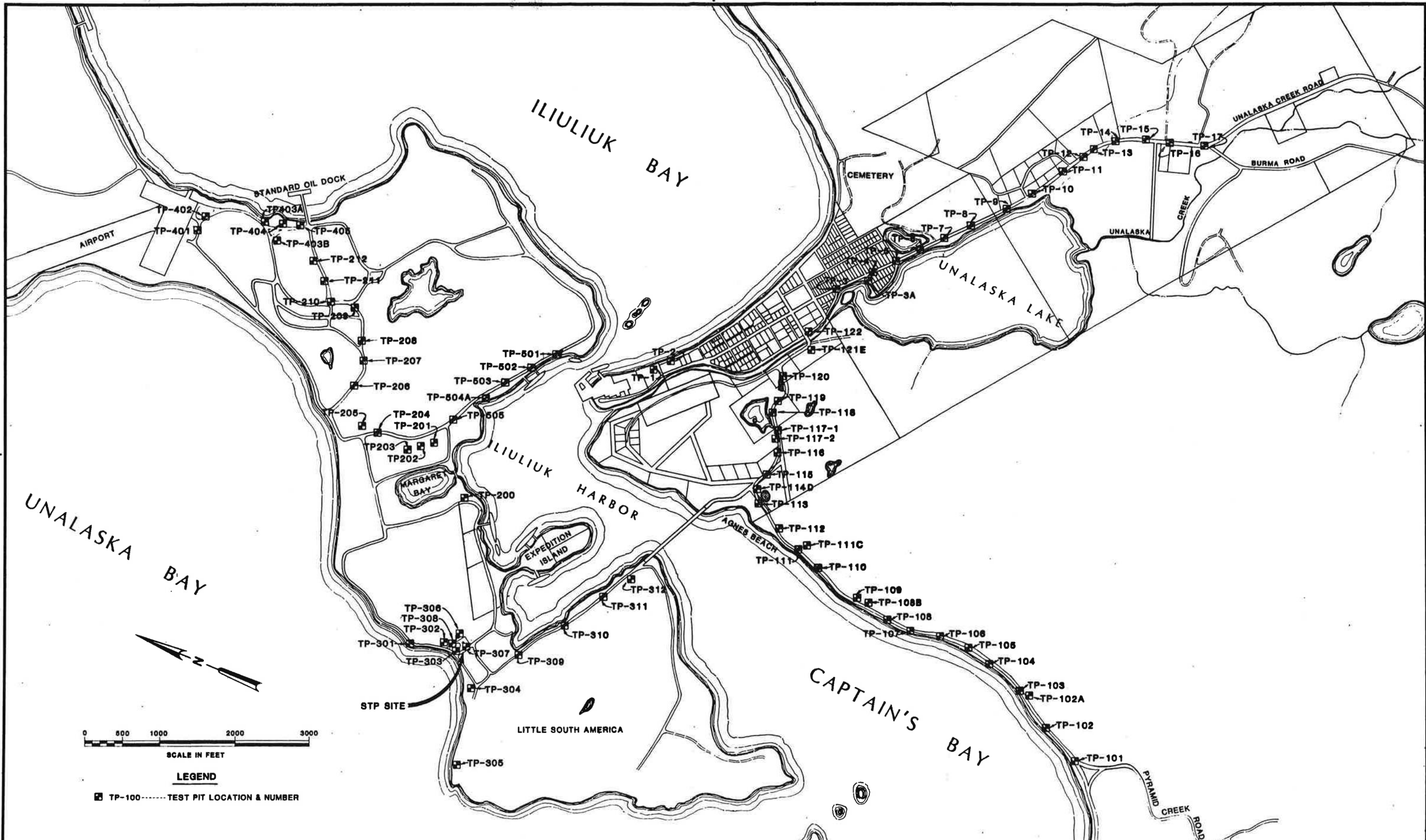
#### Additional Services

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**

RPK Test Pit Location Map (1 page)


RPK Test Pit Logs (16 pages)



**LEGEND**

TP-100..... TEST PIT LOCATION & NUMBER

VERIFY SCALES  
 BAR IS ONE INCH ON ORIGINAL DRAWING.  
 IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

 Rodney P. Kinney Associates  
 P.O. Box 1102 Eagle River, Alaska 99577  
 Consulting Engineers (907) 694-2332

SANITARY SEWER COLLECTION SYSTEM  
 UNALASKA, ALASKA  
**PLATE 1**  
**TEST PIT LOCATION MAP**

SHEET  
**1 OF 2**  
 DATE 11-21-81  
 PROJ. NO. 81-RK-1018







**Rodney P. Kinney Associates**  
 P.O. Box 1102 Eagle River, Alaska 99577  
 Consulting Engineers (907) 894-2332

Date 9/7/81

Name Unalaska Sewerage Study Location Unalaska

Hole No. 102 Gr.El. -- Type of Boring Test Pit Rig 225 Cat

Datum SEE CH2M-Hill Survey Engr E. Graf Wt. Ham. --

DP.	DESCRIPTION	Sq. No.	Pen.	% Rec.	Bl. Cl.	Soil Profile	REMARKS
	Brown gray moist sandy gravel (fill)						
	cobbles to 6 inches	1					
		2					
	Brown to tan moist silty sand (fill)	3	**				
		4	**				
		5					
	Gray moist sandy gravel with boulders to 2 feet (fill)	6					
		7					
		8	**				
	Bedrock at Bottom of Pit @ 8'					 A.T.E.	

Figure 20



**Rodney P. Kinney Associates**  
 P.O. Box 1102 Eagle River, Alaska 99577  
 Consulting Engineers (907) 894-2332

Date 9/7/81

Name Unalaska Sewerage Study Location Unalaska

Hole No. 102 A Gr.El. -- Type of Boring Test Pit Rlg 225 Cat

Datum SEE CH2M-Hill Survey Engr E. Graf Wt.Ham. --

DP.	DESCRIPTION	Sa. No.	Pen.	% Rec.	Bl. Ct.	Soil Profile	REMARKS
	Brown wet silty sand with occasional organics (fill)						A.T.E.
	<u>with gravel</u>						
	<u>with boulders to 2 feet</u>						
	Bedrock at Bottom of Pit @ 6 1/2'						

Figure 21



**Rodney P. Kinney Associates**  
 P.O. Box 1102 Eagle River, Alaska 99577  
 Consulting Engineers (907) 684-2332

Date 9/7/81

Name Unalaska Sewerage Study Location Unalaska

Hole No. 103 Gr. El. -- Type of Boring Test Pit Rlg 225 Cat

Datum SEE CH2M-Hill Survey Engr E. Graf Wt. Ham. --

DP.	DESCRIPTION	So. No.	Pen.	% Rec.	Bl. Cl.	Soil Profile	REMARKS
	Gray to brown moist gravelly sand (fill)						
	<u>cobbles to 6 inches</u>	1	**				
	↓	2					
	<u>boulders to 2 feet</u>	3					
	↓	4					
		5	**				
	Brown to gray silty gravel (fill)	6					 A.T.E.
		7					
		8					
	Bedrock at Bottom of Pit @ 8' ↗						
	Note: Extreme sloughing at 6 feet due to water inflow.						

Figure 22



**Rodney P. Kinney Associates**  
 P.O. Box 1102 Eagle River, Alaska 99577  
 Consulting Engineers (907) 684-2332

Date 9/7/81

Name Unalaska Sewerage Study Location Unalaska

Hole No. 104 Gr.El. -- Type of Boring Test Pit Rlg 225 Cat

Datum SEE CH2M-Hill Survey Engr E. Graf Wt. Ham. --

DP.	DESCRIPTION	So. No.	Pen.	% Rec.	Bl. Cl.	Soil Profile	REMARKS
	Gray to brown moist sandy gravel (fill) cobble to 6 inches						
	↓						
	boulders to 1 1/2 feet		**				
	shell fragments {						
	↓						
	Bedrock at Bottom of Pit @ 7'						A.T.E.

Figure 23



**Rodney P. Kinney Associates**  
 P.O. Box 1102 Eagle River, Alaska 99577  
 Consulting Engineers (907) 694-2332

Date 9/7/81

Name Unalaska Sewerage Study Location Unalaska

Hole No. 105 Gr.El. -- Type of Boring Test Pit Rig 225 Cat

Datum SEE CH2M-Hill Survey Engr E. Graf Wt. Ham. --

DR	DESCRIPTION	Sa. No.	Pen.	% Rec.	Bl. Ct.	Soil Profile	REMARKS
	Mottled brown moist sand gravel with boulders to 2 feet (fill)						
		1					
		2					
		3	**				
		4					
		5					
		6					
		7					
	Gray sandy gravel with boulders to 1 foot	8	*				 A.T.E.
	Bottom of Pit @ 9'	9					

Figure 24



**Rodney P. Kinney Associates**  
 P.O. Box 1102 Eagle River, Alaska 99577  
 Consulting Engineers (907) 894-2332

Date 9/7/81

Name Unalaska Sewerage Study Location Unalaska

Hole No. 106 Gr. El. -- Type of Boring Test Pit Rig 225 Cat

Datum SEE CH2M-Hill Survey Engr E. Graf Wt. Ham. --

DEPTH	DESCRIPTION	So. No.	Pen.	% Rec.	Bl. Cl.	Soil Profile	REMARKS
1	Brown to gray moist sandy gravel with cobbles (fill)						
2							
3		**					
4							
5		*					
6							
7							
8							
9		**					
10							
	Bottom of Pit @ 10'						

A.T.E.

Figure 25



Rodney P. Kinney Associates  
 P.O. Box 1102 Eagle River, Alaska 99577  
 Consulting Engineers (907) 694-2332

Date 9/7/81

Name Unalaska Sewerage Study Location Unalaska

Hole No. 107 Gr.El. -- Type of Boring Test Pit Rig 225 Cat

Datum SEE CH2M-Hill Survey Engr E. Graf Wt. Ham. --

DEPTH	DESCRIPTION	Sa. No.	Pen.	% Rec.	Bl. Ct.	Soil Profile	REMARKS
1	Gray and brown moist sandy gravel with cobbles and boulders  shell fragments ↓						
2							
3							
4		**					
5							
6	Dark brown wet gravelly sand with shell fragments and cobbles to 6 inches (fill)						
7							
8							
	Bedrock at Bottom of Pit @ 8' ↗						 A.T.E.

Figure 26



Rodney P. Kinney Associates  
 P.O. Box 1102 Eagle River, Alaska 99577  
 Consulting Engineers (907) 694-2332

Date 9/8/81

Name Unalaska Sewerage Study Location Unalaska

Hole No. 108 Gr. El. -- Type of Boring Test Pit Rig 225 Cat

Datum SEE CH2M-Hill Survey Engr E. Graf Wt. Ham. --

DEPTH	DESCRIPTION	So. No.	Pen.	% Rec.	Bl. Cl.	Soil Profile	REMARKS
1	Gray mottled brown moist sandy gravel with cobbles and boulders to 3 feet (fill)						
2							
3		*					
4		**					
5							
6							
7							
8							
9		**					
	Bedrock at Bottom of Pit @ 9'						
	NOTE: Bedrock varies from 3 feet to 9 feet at this location						

A.T.E.

Figure 27





**Rodney P. Kinney Associates**  
 P.O. Box 1102 Eagle River, Alaska 99577  
 Consulting Engineers (907) 684-2332

Date 9/8/81

Name Unalaska Sewerage Study Location Unalaska

Hole No. 108B Gr. El. -- Type of Boring Test Pit Rig 225 Cat

Datum SEE CH2M-Hill Survey Engr. E. Graf Wt. Ham. --

DP.	DESCRIPTION	Sa. No.	Pen.	% Rec.	Bl. Cl.	Soil Profile	REMARKS
	Brown moist sandy silt with organics and cobbles (fill)						
		1					
		2					
	with gravel	3					
	Bedrock at Bottom of Pit @ 3 1/2'						

Figure 28



**Rodney P. Kinney Associates**  
 P.O. Box 1102 Eagle River, Alaska 99577  
 Consulting Engineers (907) 894-2332

Date 9/8/81

Name Unalaska Sewerage Study Location Unalaska

Hole No. 109 Gr. El. -- Type of Boring Test Pit Rig 225 Cat

Datum SEE CH2M-Hill Survey Engr E. Graf Wt. Ham. --

DP.	DESCRIPTION	So. No.	Pen.	% Rec.	Bl. Ct.	Soil Profile	REMARKS
	Gray mottled brown moist sandy gravel with cobbles and boulders to 2 feet (fill) <div style="display: flex; justify-content: space-between;"> <div style="width: 45%; border-left: 1px solid black; border-right: 1px solid black; padding: 0 5px;">             1 2 3 4 5 6 7 8 9 10           </div> <div style="width: 5%; text-align: center;">             **           </div> </div>						
	Bedrock at Bottom of Pit @ 10'						A.T.E.
	NOTE: Bedrock encountered on one side of trench at 3 feet but dropped vertically to 10 feet on Bay side of trench.						

Figure 29



**Rodney P. Kinney Associates**  
 P.O. Box 1102 Eagle River, Alaska 99577  
 Consulting Engineers (907) 884-2332

Date 9/8/81

Name Unalaska Sewerage Study Location Unalaska

Hole No. 110 Gr. El. -- Type of Boring Test Pit Rig 225 Cat

Datum SEE CH2M-Hill Survey Engr E. Graf Wt. Ham. --

DP.	DESCRIPTION	Sa. No.	Pen.	% Rec.	Bl. Cl.	Soil Profile	REMARKS
	Gray mottled brown moist sandy gravel with very loose cobbles and boulders to 2 feet (fill)						
		1					
		2					
		3					
		4					
		5	**				
		6					
		7					
		8					
		9	**				
	Bedrock at Bottom of Pit @ 9'						 A.T.E.

Figure 30



**Rodney P. Kinney Associates**  
 P.O. Box 1102 Eagle River, Alaska 99577  
 Consulting Engineers (907) 694-2332

Date 9/8/81

Name Unalaska Sewerage Study Location Unalaska

Hole No. 111C Gr. El. -- Type of Boring Test Pit Rig 225 Cat

Datum SEE CH2M-Hill Survey Engr. E. Graf Wt. Ham. --


DP.	DESCRIPTION	So. No.	Pen.	% Rec.	Bl. Ct.	Soil Profile	REMARKS
	Brown moist silty gravel with cobbles to 6 inches (fill) <span style="float: right;">1</span>						
	Bedrock at Bottom of Pit @ 1 foot <span style="font-size: 2em;">↖</span>						

Figure 31



**Rodney P. Kinney Associates**  
 P.O. Box 1102 Eagle River, Alaska 99577  
 Consulting Engineers (907) 694-2332

Date 9/8/81

Name Unalaska Sewerage Study Location Unalaska

Hole No. 112 Gr. El. -- Type of Boring Test Pit Rig 225 Cat

Datum SEE CH2M-Hill Survey Engr. E. Graf Wt. Ham. --

DP.	DESCRIPTION	So. No.	Pen.	% Rec.	Bl. Ct.	Soil Profile	REMARKS
	Gray to brown moist sandy gravel with cobbles to 6 inches (fill)						
	Dark brown wet sandy silt						
	Bedrock at Bottom of Pit @ 4'		**				

Figure 33



**Rodney P. Kinney Associates**  
 P.O. Box 1102 Eagle River, Alaska 99577  
 Consulting Engineers (907) 694-2332

Date 9/8/81

Name Unalaska Sewerage Study

Location Unalaska

Hole No. 113 Gr.El. --


Type of Boring Test Pit

Rig 225 Cat

Datum SEE CH2M-Hill Survey

Engr. E. Graf

Wt. Ham. --

DR.	DESCRIPTION	So. No.	Pen.	% Rec.	Bl. Cl.	Soil Profile	REMARKS
	Brown to gray wet sandy gravel with cobbles and boulders to 2 feet (fill)						
	Bottom of Pit @ 6' ↗						

  
 A.T.E.

Figure 34



**Rodney P. Kinney Associates**  
 P.O. Box 1102 Eagle River, Alaska 99577  
 Consulting Engineers (907) 694-2332

Date 9/8/81

Name Unalaska Sewerage Study Location Unalaska

Hole No. 114D Gr. El. -- Type of Boring Test Pit Rig 225 Cat

Datum SEE CH2M-Hill Survey Engr. E. Graf Wt. Ham. --

DP.	DESCRIPTION	Sq. No.	Pen.	% Rec.	Bl. Ct.	Soil Profile	REMARKS
	Brown mottled moist sandy gravel with boulders to 1 1/2 feet (fill)	1					
		2					
	Dark brown silty sand with organics	3					
	Light brown moist to wet silty sand	4					
		5					
		6	*				
		7					
		8					
		9					
		10					
	Bedrock at Bottom of Pit @ 10' →						

A.T.E.

Figure 35

## **APPENDIX C**

Boring Log Key (1 Page)

Frost Design Soil Classification System (1 Page)



# BORING LOG KEY

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

<sup>A</sup>Based on the material passing the 3-in. (75-mm) sieve

<sup>B</sup>If field sample contained cobble or boulders, or both, add "with cobbles or boulders, or both" to group name

<sup>C</sup>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

<sup>D</sup>  $C_u = D_{60}/D_{10}$ ,  $C_c = (D_{30})^2 / (D_{10} \times D_{60})$

<sup>E</sup>If soil contains ≥ 15% sand, add "with sand" to group name

<sup>F</sup>If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM

<sup>G</sup>If fines are organic, add "with organic fines" to group name

<sup>H</sup>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

<sup>I</sup>If soil contains ≥ 15% gravel, add "with gravel" to group name

<sup>J</sup>If Atterberg limits plot in hatched area, soil is a CL-ML, silty clay

<sup>K</sup>If soil contains 15 to < 30% plus No. 200, add "with sand" or "with gravel", whichever is predominant

<sup>L</sup>If soil contains ≥ 30% plus No. 200, predominantly sand, add "sandy" to group name

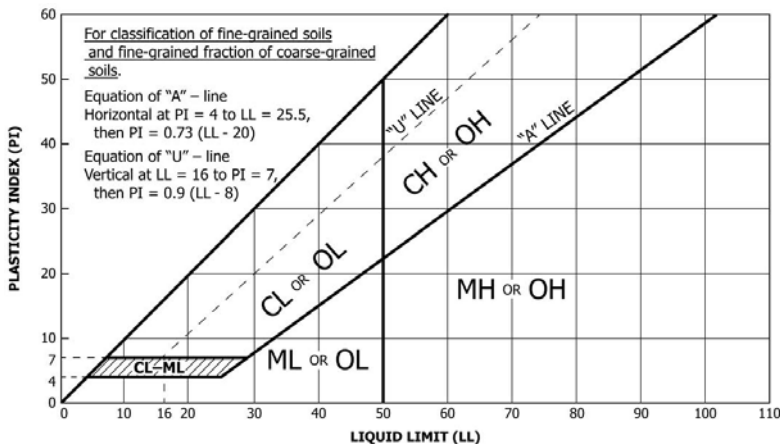
<sup>M</sup>If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name

<sup>N</sup>PI ≥ 4 and plots on or above "A" line

<sup>O</sup>PI < 4 or plots below "A" line

<sup>P</sup>PI plots on or above "A" line

<sup>Q</sup>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 <sup>(1)</sup>	(a) Gravels Crushed Stone Crushed Rock	0-1.5	GW, GP
	(b) Sands	0-3	SW, SP
PFS <sup>(2)</sup>	(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	10-20	GM, GC, GM-GC
	(b) Sands, except very fine silty sands	6-15	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

The USACE standard is based in part on the percentage of material finer than 0.02 mm ( $P_{0.02}$ ). 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, NFS.

## Municipality of Anchorage (MOA) Methodology

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.



## **APPENDIX D**

Test Pit Logs (42 pages)

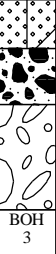
Grain Size Distribution Curves (6 pages)

**PROJECT NUMBER:** 18-028  
**PROJECT:** Captains Bay Road  
**CLIENT:** City of Unalaska

Depth (Feet)	Sample Data			USCS Classification	Frozen Zone	Soil Graphic	Ground Water Data			Geologist: <i>D. Simon/N. Yount</i> Field Crew: <i>Bering Shai</i> Equipment Type: <i>Hitachi EX 300</i> Location: <i>Sewer Main Hole (ARV). Near ARV CAPT 120</i> Lat/Long:	Total Depth: <i>3.0 feet</i> Date: <i>7/31/2018</i>
	Sample Type	Field Number	Sample				Depth in (ft.)				
							Time				
							Date				
							Symbol				
0	GRAB	1		gp			SUBSURFACE MATERIAL				
0.3				gp			Poorly-graded GRAVEL, ( gp); fine; and sand, fine to coarse; little silt; gray, dry, (surface course) P200 =5.1%, Sa =42.9%, Gr =52.0%, Moisture =3.6%				
1	GRAB	2					Poorly-graded GRAVEL, ( gp); fine; some sand, fine to coarse; trace silt; gray, dry, (surface course) Moisture =5.1%				
2											
3						BOH 3	Notes: No groundwater encountered. Terminated test pit at 3 ft bgs.			3.0	



**PROJECT NUMBER:** 18-028  
**PROJECT:** Captains Bay Road  
**CLIENT:** City of Unalaska

Depth (Feet)	Sample Data			USCS Classification	Frozen Zone	Soil Graphic	Ground Water Data			Geologist: <i>D. Simon/N. Yount</i> Field Crew: <i>Bering Shai</i> Equipment Type: <i>Hitachi EX 300</i> Location: <i>Water Main Station</i> Lat/Long:	Total Depth: 3.0 feet Date: 7/31/2018
	Sample Type	Field Number	Sample				Depth in (ft.)				
							Time				
							Date				
							Symbol				
<b>SUBSURFACE MATERIAL</b>											
0	GRAB	1		sw-sm		Well-graded SAND, ( sw-sm); fine to coarse; and gravel, fine; little silt; gray, dry, (surface course)	0.0				
1				gp		Moisture =3.1%	0.7				
2						Poorly-graded GRAVEL, ( gp); fine to coarse; some sand, fine to coarse; trace silt; brown, dry, (surface course)	1.5				
3						COBBLES AND BOULDERS, little gravel, fine to coarse; trace sand fine to coarse; trace silt; brown, dry, boulders up to 18 inches in diameter, (shot rock fill)	3.0				
				BOH 3		Notes: No groundwater encountered. Terminated test pit at 3 ft bgs.					



**PROJECT NUMBER:** 18-028  
**PROJECT:** Captains Bay Road  
**CLIENT:** City of Unalaska

Depth (Feet)	Sample Data			USCS Classification Frozen Zone	Soil Graphic	Ground Water Data			Geologist: <i>D. Simon/N. Yount</i> Field Crew: <i>Bering Shai</i> Equipment Type: <i>Hitachi EX 300</i> Location: <i>Near CP 401</i> Lat/Long:	Total Depth: <i>2.0 feet</i> Date: <i>7/31/2018</i>
	Sample Type	Field Number	Sample			Depth in (ft.)				
						Time				
						Date				
						Symbol				
<b>SUBSURFACE MATERIAL</b>										
0				sw-sm		Well-graded SAND, ( sw-sm); fine to coarse; and gravel, fine; little silt; gray, dry, (surface course)				0.0
1	GRAB	1		gw		P200 =12.8%, Sa =50.5%, Gr =36.7%, Moisture =2.9%				1.2
2	GRAB	2				Well-graded GRAVEL, ( gw); fine to coarse; and cobbles; little sand, fine to coarse; trace silt; brown, dry, cobbles up to 12 inches in diameter (shot rock fill)				
					BOH 2	Moisture =6.7%				
						Notes: No groundwater encountered. Terminated test pit at 2 ft bgs.				



**PROJECT NUMBER:** 18-028  
**PROJECT:** Captains Bay Road  
**CLIENT:** City of Unalaska

Depth (Feet)	Sample Data			USCS Classification Frozen Zone	Soil Graphic	Ground Water Data			Geologist: <i>D. Simon/N. Yount</i> Field Crew: <i>Bering Shai</i> Equipment Type: <i>Hitachi EX 300</i> Location: <i>CO #3</i> Lat/Long:	Total Depth: <i>6.2 feet</i> Date: <i>8/1/2018</i>					
	Sample Type	Field Number	Sample			Depth in (ft.)	Time	Date			Symbol				
	0							<b>SUBSURFACE MATERIAL</b>							
	1	GRAB	1					Well-graded SAND, (sw-sm); fine to coarse; and gravel, fine; little silt; gray, dry, (surface course)					0.0		
	2							P200 =13.7%, Sa =47.9%, Gr =38.4%, Moisture =2.8%					1.3		
3					COBBLES AND BOULDERS, some gravel, fine to coarse; little sand, fine to coarse; trace silt; brown, dry, boulders up to 18 inches in diameter, (shot rock fill)										
4															
5															
6															
					BOH 6.2	Notes: No groundwater encountered. Terminated test pit at 6.2 ft bgs.					6.2				



**PROJECT NUMBER:** 18-028  
**PROJECT:** Captains Bay Road  
**CLIENT:** City of Unalaska

Depth (Feet)	Sample Data			USCS Classification Frozen Zone	Soil Graphic	Ground Water Data			Geologist: <i>D. Simon/N. Yount</i> Field Crew: <i>Bering Shai</i> Equipment Type: <i>Hitachi EX 300</i> Location: <i>~200 ft S of C4</i> Lat/Long:	Total Depth: <i>2.5 feet</i> Date: <i>8/1/2018</i>
	Sample Type	Field Number	Sample			Depth in (ft.)				
						Time				
						Date				
						Symbol				
0	GRAB	1		sp-sm		<b>SUBSURFACE MATERIAL</b>				
0.0						Poorly-graded SAND, ( sp-sm); fine to coarse; and gravel, fine to coarse; little silt; gray, dry, (surface course)			0.0	
0.3						P200 =10.0%, Sa =48.1%, Gr =41.9%, Moisture =2.5%			0.3	
1						COBBLES AND BOULDERS, some gravel, fine to coarse; little sand, fine to coarse; brown, dry, boulders up to 18 inches in diameter, (shot rock fill)				
2										
2.5					BOH 2.5	Notes: No groundwater encountered. Terminated test pit at 2.5 ft bgs.			2.5	





**PROJECT NUMBER:** 18-028  
**PROJECT:** Captains Bay Road  
**CLIENT:** City of Unalaska

Depth (Feet)	Sample Data			USCS Classification Frozen Zone	Soil Graphic	Ground Water Data			Geologist: <i>D. Simon/N. Yount</i> Field Crew: <i>Bering Shai</i> Equipment Type: <i>Hitachi EX 300</i> Location: <i>~100 ft N of C5</i> Lat/Long:	Total Depth: <i>2.0 feet</i> Date: <i>8/1/2018</i>
	Sample Type	Field Number	Sample			Depth in (ft.)				
						Time				
						Date				
						Symbol				
0				sw-sm		<b>SUBSURFACE MATERIAL</b>				
0.5						Well-graded SAND, (sw-sm); fine to coarse; and gravel, fine to coarse; little silt; gray, dry, (surface course)			0.0	
1						COBBLES, some gravel, fine to coarse; little sand, fine to coarse; brown, dry, cobbles up to 8 inches in diameter, (shot rock fill)			0.5	
2						Notes: No groundwater encountered. Terminated test pit at 2 ft bgs.			2.0	

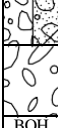



**PROJECT NUMBER:** 18-028  
**PROJECT:** Captains Bay Road  
**CLIENT:** City of Unalaska

Depth (Feet)	Sample Data			USCS Classification Frozen Zone	Soil Graphic	Ground Water Data			Geologist: <i>D. Simon/N. Yount</i> Field Crew: <i>Bering Shai</i> Equipment Type: <i>Hitachi EX 300</i> Location: <i>CO #5</i> Lat/Long:	Total Depth: <i>6.5 feet</i> Date: <i>8/1/2018</i>				
	Sample Type	Field Number	Sample			Depth in (ft.)	Time	Date			Symbol			
	0					sw-sm		SUBSURFACE MATERIAL						
	1							Well-graded SAND, ( sw-sm); fine to coarse; and gravel, fine to coarse; little silt; gray, moist, (surface course)			0.0			
	2							COBBLES AND BOULDERS, little gravel, fine to coarse; little sand, fine to coarse; brown, moist, cobbles up to 24 inches in diameter, (shot rock fill)			1.0			
6					Notes: No groundwater encountered. Terminated test pit at 6.5 ft bgs. Started raining while excavating test pit.			6.5						






**PROJECT NUMBER:** 18-028  
**PROJECT:** Captains Bay Road  
**CLIENT:** City of Unalaska

Depth (Feet)	Sample Data			USCS Classification	Frozen Zone	Soil Graphic	Ground Water Data			Geologist: <i>D. Simon/N. Yount</i> Field Crew: <i>Bering Shai</i> Equipment Type: <i>Hitachi EX 300</i> Location: <i>1-inch ARV</i> Lat/Long:	Total Depth: <i>1.7 feet</i> Date: <i>8/1/2018</i>
	Sample Type	Field Number	Sample				Depth in (ft.)				
							Time				
							Date				
							Symbol				
0							<b>SUBSURFACE MATERIAL</b>				
1	GRAB	1		gp-gm			Poorly-graded GRAVEL, (gp-gm); fine; and sand, fine to coarse; little silt; gray, dry, (surface course)		0.0		
							P200 =12.0%, Sa =32.0%, Gr =56.0%, Moisture =7.7%		0.7		
							COBBLES, some gravel, fine to coarse; little sand, fine to coarse; trace silt; brown, dry, (shot rock fill)		1.7		
						BOH 1.7	Notes: No groundwater encountered. Terminated test pit at 1.6 ft bgs. Over manhole: Poorly-graded gravel, fine to coarse; with cobbles up to 6 inches in diameter; little sand; trace silt, brown, dry				





BUSCS LOG OF TEST PIT 18-028 GINT - MOST RECENT.GPJ\_HDL MODIFIED.GDT 9/7/18

**PROJECT NUMBER:** 18-028  
**PROJECT:** Captains Bay Road  
**CLIENT:** City of Unalaska

Depth (Feet)	Sample Data			USCS Classification Frozen Zone	Soil Graphic	Ground Water Data			Geologist: <i>D. Simon/N. Yount</i> Field Crew: <i>Bering Shai</i> Equipment Type: <i>Hitachi EX 300</i> Location: <i>East side of road at C7</i> Lat/Long:	Total Depth: 2.3 feet Date: 8/1/2018
	Sample Type	Field Number	Sample			Depth in (ft.)				
						Time				
						Date				
						Symbol				
<b>SUBSURFACE MATERIAL</b>										
0				gm		Well-graded GRAVEL, ( gm); fine to coarse; and sand, fine to coarse; little silt; gray, dry, (surface course)				0.0
1	GRAB	1				P200 =14.6%, Sa =39.2%, Gr =46.2%, Moisture =3.7%				1.5
2						COBBLES AND BOULDERS, some gravel, fine to coarse; little sand, fine to coarse; brown, dry, boulders up to 18 inches in diameter, (shot rock fill)				2.5
						Notes: No groundwater encountered. Terminated test pit at 2.3 ft bgs.				



**PROJECT NUMBER:** 18-028  
**PROJECT:** Captains Bay Road  
**CLIENT:** City of Unalaska

Depth (Feet)	Sample Data			USCS Classification	Frozen Zone	Soil Graphic	Ground Water Data			Geologist: <i>D. Simon/N. Yount</i> Field Crew: <i>Bering Shai</i> Equipment Type: <i>Hitachi EX 300</i> Location: <i>South of TP-9</i> Lat/Long:	Total Depth: 2.2 feet Date: 8/1/2018
	Sample Type	Field Number	Sample				Depth in (ft.)				
							Time				
							Date				
							Symbol				
<b>SUBSURFACE MATERIAL</b>											
0				gm			Well-graded GRAVEL, ( gm); fine to coarse; with sand, fine to coarse; little silt; gray, dry, (surface course)			0.0	
1							COBBLES, some gravel, fine to coarse; little sand, fine to coarse; brown, dry, cobbles up to 6 inches in diameter, (shot rock fill)			1.7	
2						BOH 2.2	Notes: No groundwater encountered. Terminated test pit at 2.2 ft bgs.			2.2	





**PROJECT NUMBER:** 18-028  
**PROJECT:** Captains Bay Road  
**CLIENT:** City of Unalaska

Depth (Feet)	Sample Data			USCS Classification Frozen Zone	Soil Graphic	Ground Water Data			Geologist: <i>D. Simon/N. Yount</i> Field Crew: <i>Bering Shai</i> Equipment Type: <i>Hitachi EX 300</i> Location: <i>58 ft S of Hydrant</i> Lat/Long:	Total Depth: <i>2.0 feet</i> Date: <i>8/1/2018</i>
	Sample Type	Field Number	Sample			Depth in (ft.)				
						Time				
						Date				
						Symbol				
<b>SUBSURFACE MATERIAL</b>										
0	GRAB	1		gm		Well-graded GRAVEL, ( gm); fine to coarse; with sand, fine to coarse; little silt; gray, dry, (surface course)				0.0
1						P200 =12.7%, Sa =41.9%, Gr =45.4%, Moisture =4.3%				0.7
2						COBBLES, some gravel, fine to coarse; little sand, fine to coarse; brown, dry, (shot rock fill)				2.0
						Notes: No groundwater encountered. Terminated test pit at 2 ft bgs.				



**PROJECT NUMBER:** 18-028  
**PROJECT:** Captains Bay Road  
**CLIENT:** City of Unalaska

Depth (Feet)	Sample Data			USCS Classification Frozen Zone	Soil Graphic	Ground Water Data			Geologist: <i>D. Simon/N. Yount</i> Field Crew: <i>Bering Shai</i> Equipment Type: <i>Hitachi EX 300</i> Location: <i>West end of Westward</i> Lat/Long:	Total Depth: <i>8.0 feet</i> Date: <i>8/1/2018</i>
	Sample Type	Field Number	Sample			Depth in (ft.)				
						Time				
						Date				
						Symbol				
<b>SUBSURFACE MATERIAL</b>										
0				gm		Well-graded GRAVEL, ( gm); fine to coarse; with sand, fine to coarse; little silt; gray, dry, (surface course)			0.0	
1						COBBLES AND BOULDERS, some gravel, fine to coarse; little sand, fine to coarse; brown, dry, boulders up to 36 inches in diameter, (shot rock fill)			1.3	
2										
3										
4										
5										
6										
7										
8					BOH 8	Notes: No groundwater encountered. Terminated test pit at 8 ft bgs.			8.0	



BUSCS LOG OF TEST PIT 18-028 GINT - MOST RECENT.GPJ\_HDL MODIFIED.GDT 9/7/18

**PROJECT NUMBER:** 18-028  
**PROJECT:** Captains Bay Road  
**CLIENT:** City of Unalaska

Depth (Feet)	Sample Data			USCS Classification Frozen Zone	Soil Graphic	Ground Water Data			Geologist: D. Simon/N. Yount Field Crew: Bering Shai Equipment Type: Hitachi EX 300 Location: West of Westward and TP-12 Lat/Long:	Total Depth: 6.0 feet Date: 8/1/2018	
	Sample Type	Field Number	Sample			Depth in (ft.)					
						Time					
						Date					
						Symbol					
<b>SUBSURFACE MATERIAL</b>											
0	GRAB	1		gw-gm						Well-graded GRAVEL, ( gw-gm); fine to coarse; and sand, fine to coarse; little silt; gray, dry, (surface course) P200 =11.6%, Sa =43.4%, Gr =45.0%, Moisture =3.4%	0.0
1										COBBLES, some gravel, fine to coarse; little sand, fine to coarse; brown, dry, cobbles up to 12 inches in diameter, (shot rock fill)	0.8
2											
3											
4				sw-sm						Well-graded SAND, ( sw-sm); fine to coarse; and gravel, fine to coarse; little silt; brownish red, moist, (weathered bedrock)	4.0
5	GRAB	2								Moisture =8.6%	
6										Notes: No groundwater encountered. Excavator refusal at 6 ft bgs on what appeared to be bedrock. End of test pit.	6.0



BUSCS LOG OF TEST PIT 18-028 GINT - MOST RECENT.GPJ\_HDL MODIFIED.GDT 9/7/18



**PROJECT NUMBER:** 18-028  
**PROJECT:** Captains Bay Road  
**CLIENT:** City of Unalaska

**Geologist:** D. Simon/N. Yount  
**Field Crew:** Bering Shai  
**Equipment Type:** Hitachi EX 300  
**Location:** Northeast of Deadman's Curve  
**Lat/Long:**

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

Depth (Feet)	Sample Data			USCS Classification	Frozen Zone	Soil Graphic
	Sample Type	Field Number	Sample			
0				gw-gm		
1						
2						
3				gp		
4						
5						
6						
7						
8						BOH 8

**SUBSURFACE MATERIAL**

Well-graded GRAVEL, ( gw-gm); fine to coarse; and sand, fine to coarse; little silt; gray, dry, (surface course) 0.0

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COBBLES AND BOULDERS, some gravel, fine to coarse; little sand, fine to coarse; trace silt; brown, dry, boulders up to 16 inches in diameter, (shot rock fill) 1.5

---

Poorly-graded GRAVEL, ( gp); fine to coarse; some sand, fine to coarse; trace silt; trace seashells; brown, dry, tends to cave in, (appeared to be old beach deposit) 2.5

---

COBBLES, and gravel, fine to coarse; some sand, fine to coarse; trace seashells; red, dry, tends to cave in 4.2

---

Notes: 8.0  
No groundwater encountered. Terminated test pit at 8 ft bgs.




**PROJECT NUMBER:** 18-028  
**PROJECT:** Captains Bay Road  
**CLIENT:** City of Unalaska

Depth (Feet)	Sample Data			USCS Classification Frozen Zone	Soil Graphic	Ground Water Data			Geologist: <i>D. Simon/N. Yount</i> Field Crew: <i>Bering Shai</i> Equipment Type: <i>Hitachi EX 300</i> Location: <i>South of Deadman's Curve</i> Lat/Long:	Total Depth: <i>8.0 feet</i> Date: <i>8/2/2018</i>	
	Sample Type	Field Number	Sample			Depth in (ft.)					
						Time					
						Date					
						Symbol					
<b>SUBSURFACE MATERIAL</b>											
0	GRAB	1		sw-sm						0.0	
0.3											0.3
1											
2											
2.5				sw						2.5	
3											
4											
5											
6											
7											
8											
					BOH 8					8.0	
									Notes: No groundwater encountered. Terminated test pit at 8 ft bgs.		



**PROJECT NUMBER:** 18-028  
**PROJECT:** Captains Bay Road  
**CLIENT:** City of Unalaska

Depth (Feet)	Sample Data			USCS Classification Frozen Zone	Soil Graphic	Ground Water Data			Geologist: <i>D. Simon/N. Yount</i> Field Crew: <i>Bering Shai</i> Equipment Type: <i>Hitachi EX 300</i> Location: <i>2nd south of Deadman's Curve</i> Lat/Long:	Total Depth: <i>8.0 feet</i> Date: <i>8/2/2018</i>
	Sample Type	Field Number	Sample			Depth in (ft.)				
						Time				
						Date				
						Symbol				
<b>SUBSURFACE MATERIAL</b>										
0				sw-sm		Well-graded SAND, ( sw-sm); fine to coarse; and gravel, fine; little silt; gray, dry, (surface course)			0.0	
0.3			gw	Well-graded GRAVEL, ( gw); fine to coarse; some sand, fine to coarse; trace silt; trace seashells; red, moist, (appears to be old beach deposit)						
1										
2										
2.5				gw		Well-graded GRAVEL, ( gw); fine to coarse; some sand, fine to coarse; trace silt; trace seashells; red, moist, lots of cobbles up to 12 inches in diameter, (appears to be old beach deposit)				
3										
4										
5										
6										
7										
8					BOH 8	Notes: No groundwater encountered. Terminated test pit at 8 ft bgs. Near shoulder of road. Wood pieces 2 feet bgs on west side. Possibly old wood pipe.			8.0	



**PROJECT NUMBER:** 18-028  
**PROJECT:** Captains Bay Road  
**CLIENT:** City of Unalaska

Depth (Feet)	Sample Data			USCS Classification Frozen Zone	Soil Graphic	Ground Water Data			Geologist: <i>D. Simon/N. Yount</i> Field Crew: <i>Bering Shai</i> Equipment Type: <i>Hitachi EX 300</i> Location: <i>3rd south of Deadman's Curve</i> Lat/Long:	Total Depth: <i>8.0 feet</i> Date: <i>8/2/2018</i>
	Sample Type	Field Number	Sample			Depth in (ft.)				
						Time				
						Date				
						Symbol				
<b>SUBSURFACE MATERIAL</b>										
0				sw-sm		Well-graded SAND, ( sw-sm); fine to coarse; and gravel, fine; little silt; gray, dry, (surface course)				0.0
1	GRAB	1				P200 =12.6%, Sa =45.0%, Gr =42.4%, Moisture =3.5%				
2						<b>COBBLES AND BOULDERS</b> , some gravel, fine to coarse; trace sand, fine to coarse; trace silt; brown, dry, boulders up to 18 inches in diameter, (shot rock fill)				2.0
3										
4										
5										
6										
7										
8					BOH 8					8.0
Notes: No groundwater encountered. Terminated test pit at 8 ft bgs.										





**PROJECT NUMBER:** 18-028  
**PROJECT:** Captains Bay Road  
**CLIENT:** City of Unalaska

Depth (Feet)	Sample Data			USCS Classification Frozen Zone	Soil Graphic	Ground Water Data			Geologist: <i>D. Simon/N. Yount</i> Field Crew: <i>Bering Shai</i> Equipment Type: <i>Hitachi EX 300</i> Location: <i>1st east of bridge</i> Lat/Long:	Total Depth: <i>6.0 feet</i> Date: <i>8/2/2018</i>
	Sample Type	Field Number	Sample			Depth in (ft.)				
						Time				
						Date				
						Symbol				
0				sw-sm		<b>SUBSURFACE MATERIAL</b>				
0.0						Well-graded SAND, ( sw-sm); fine to coarse; and gravel, fine; little silt; gray, dry, (surface course)			0.0	
0.3						COBBLES, some gravel, fine to coarse; trace sand, fine to coarse; trace seashells; brown to red, dry to moist, cobbles up to 12 inches in diameter. (shot rock fill)			0.3	
1										
2										
3										
4										
5										
6						<b>Notes:</b> Buried piece of culvert encountered at base of surface course. No groundwater encountered. Excavator refusal at 6 ft bgs on what appeared to be bedrock. Tried to extend the test pit toward the ocean. Encountered warning tape - no conduit. End of test pit.			6.0	



**PROJECT NUMBER:** 18-028  
**PROJECT:** Captains Bay Road  
**CLIENT:** City of Unalaska

Depth (Feet)	Sample Data			USCS Classification	Frozen Zone	Soil Graphic	Ground Water Data			Geologist: <i>D. Simon/N. Yount</i> Field Crew: <i>City of Unalaska</i> Equipment Type: <i>Backhoe</i> Location: <i>Sub-grade electrical conduit</i> Lat/Long:	Total Depth: <i>5.5 feet</i> Date: <i>8/1/2018</i>					
	Sample Type	Field Number	Sample				Depth in (ft.)	Time	Date			Symbol				
	0	GRAB	1					gm				SUBSURFACE MATERIAL				
	1											Well-graded GRAVEL, ( gm); fine to coarse; and sand, fine to coarse; some silt; gray, dry, (surface course) P200 =18.1%, Sa =33.7%, Gr =48.2%, Moisture =5.3%			0.0	0.8
	2											COBBLES, some gravel, fine to coarse; little sand, fine to coarse; brown, dry, cobbles up to 12 inches in diameter, (shot rock fill)				
3																
4																
5						BOH 5.5	Notes: No groundwater encountered. Terminated test pit at 5.5 ft bgs.			5.5						



**PROJECT NUMBER:** 18-028  
**PROJECT:** Captains Bay Road  
**CLIENT:** City of Unalaska



Depth (Feet)	Sample Data			USCS Classification Frozen Zone	Soil Graphic	Ground Water Data			Geologist: <i>N. Yount</i> Field Crew: <i>Bering Shai</i> Equipment Type: <i>Hitachi EX 300</i> Location: <b>Westward SSMH A-1</b> Lat/Long:	Total Depth: 2.7 feet Date: 8/2/2018
	Sample Type	Field Number	Sample			Depth in (ft.)				
						Time				
						Date				
						Symbol				
<b>SUBSURFACE MATERIAL</b>										
0				gw		Well-graded GRAVEL, ( gw); fine to coarse; little sand, fine to coarse; trace silt; gray, dry, (surface course)			0.0	
1						COBBLES, some gravel, fine to coarse; little sand, fine to coarse; brown, dry, cobbles up to 6 inches in diameter, (shot rock fill)			0.5	
2										
					BOH 2.7	Notes: No groundwater encountered. Terminated test pit at 2.7 ft bgs.			2.7	



# LOG OF TEST PIT

TEST PIT # TP-21

PROJECT NUMBER: 18-028  
 PROJECT: Captains Bay Road  
 CLIENT: City of Unalaska

Depth (Feet)	Sample Data			USCS Classification	Frozen Zone	Soil Graphic	Ground Water Data			Geologist: <i>D. Simon/N. Yount</i> Field Crew: <i>Bering Shai</i> Equipment Type: <i>Hitachi EX 300</i> Location: <i>Westward SSMH A-2</i> Lat/Long:	Total Depth: 2.0 feet Date:
	Sample Type	Field Number	Sample				Depth in (ft.)				
							Time				
							Date				
							Symbol				
<b>SUBSURFACE MATERIAL</b>											
0				gw		Well-graded GRAVEL, ( gw); fine to coarse; little sand, fine to coarse; trace silt; gray, dry, (surface course)					0.0
1						COBBLES, some gravel, fine to coarse; little sand, fine to coarse; brown, dry, cobbles up to 8 inches in diameter, (shot rock fill)					0.7
2					BOH 2						2.0
Notes: No groundwater encountered. Terminated test pit at 2 ft bgs.											




**PROJECT NUMBER:** 18-028  
**PROJECT:** Captains Bay Road  
**CLIENT:** City of Unalaska

Depth (Feet)	Sample Data			USCS Classification	Frozen Zone	Soil Graphic	Ground Water Data			Geologist: <i>D. Simon/N. Yount</i> Field Crew: <i>Bering Shai</i> Equipment Type: <i>Volvo BL60</i> Location: <i>Pyramid Road, upper driveway</i> Lat/Long:	Total Depth: <i>3.0 feet</i> Date: <i>8/3/2018</i>
	Sample Type	Field Number	Sample				Depth in (ft.)				
							Time				
							Date				
0							<b>SUBSURFACE MATERIAL</b>				
0	GRAB	1		gp-gm			Poorly-graded GRAVEL, ( gp-gm); fine to coarse; and sand, fine to coarse; little silt; gray, dry, (surface course)			0.0	
1	GRAB	2		gp			P200 =6.6%, Sa =38.2%, Gr =55.2%, Moisture =3.2%			0.7	
1							Poorly-graded GRAVEL, ( gp); fine; and sand, fine to coarse; trace silt; dark brown, dry, (surface course) P200 =0.7%, Sa =39.5%, Gr =59.8%, Moisture =3.5%			0.8	
2							COBBLES, and gravel, fine to coarse; and sand, fine to coarse; trace silt; brown, dry, cobbles up to 10 inches in diameter, (shot rock fill)				
3						BOH 3	Notes: No groundwater encountered. Terminated test pit at 3 ft bgs. Cobbles removed from grain size distribution test. Grain size distribution sample prior to results not corrected for cobbles. Photo log misplaced test pit as "TP-21A"			3.0	




**PROJECT NUMBER:** 18-028  
**PROJECT:** Captains Bay Road  
**CLIENT:** City of Unalaska

Depth (Feet)	Sample Data			USCS Classification	Frozen Zone	Soil Graphic	Ground Water Data			Geologist: <i>D. Simon/N. Yount</i> Field Crew: <i>Bering Shai</i> Equipment Type: <i>Volvo BL60</i> Location: <i>Pyramid, by fuel tanks</i> Lat/Long:	Total Depth: <i>3.0 feet</i> Date: <i>8/3/2018</i>
	Sample Type	Field Number	Sample				Depth in (ft.)				
							Time				
							Date				
							Symbol				
<b>SUBSURFACE MATERIAL</b>											
0				sw-sm			Well-graded SAND, ( sw-sm); fine to coarse; and gravel, fine; little silt; gray, dry, (surface course)	0.0			
0.2				gp			Poorly-graded GRAVEL, ( gp); fine; and sand, fine to coarse; trace silt; dark brown, dry	0.5			
0.8				gp			Poorly-graded GRAVEL, ( gp); fine; and sand, fine to coarse; trace silt; tan, dry COBBLES, and gravel, fine to coarse; and sand, fine to medium; little silt; brown, dry, (shot rock fill)	0.8			
3.0	GRAB	1					P200 =5.9%, Sa =33.5%, Gr =60.6%, Moisture =5.8%				
						BOH 3	Notes: No groundwater encountered. Terminated test pit at 3 ft bgs.				



**PROJECT NUMBER:** 18-028  
**PROJECT:** Captains Bay Road  
**CLIENT:** City of Unalaska

Depth (Feet)	Sample Data			USCS Classification Frozen Zone	Soil Graphic	Ground Water Data			Geologist: <i>D. Simon</i> Field Crew: <i>Bering Shai</i> Equipment Type: <i>Hitachi EX 300</i> <b>Location: At Pyramid/CBR Intersection</b> Lat/Long:	Total Depth: 1.5 feet Date: 8/3/2018
	Sample Type	Field Number	Sample			Depth in (ft.)				
						Time				
						Date				
						Symbol				
0						<b>SUBSURFACE MATERIAL</b>				
1						COBBLES, some gravel, fine to coarse; little sand fine to coarse; trace silt; brown, moist, cobbles up to 12 inches in diameter, significant amounts of debris, (shot rock fill)			0.0	
				BOH 1.5		Notes: No groundwater encountered. Terminated test pit at 1.5 ft bgs due to debris.			1.5	



**PROJECT NUMBER:** 18-028  
**PROJECT:** Captains Bay Road  
**CLIENT:** City of Unalaska




Depth (Feet)	Sample Data			USCS Classification Frozen Zone	Soil Graphic	Ground Water Data			Geologist: <i>D. Simon</i> Field Crew: <i>Bering Shai</i> Equipment Type: <i>Hitachi EX 300</i> Location: <i>Valve where 20" ends (split at Pyramid and CBR)</i> Lat/Long:	Total Depth: <i>6.0 feet</i> Date: <i>8/3/2018</i>
	Sample Type	Field Number	Sample			Depth in (ft.)				
						Time				
						Date				
						Symbol				
<b>SUBSURFACE MATERIAL</b>										
0				sw-sm						Well-graded SAND, ( sw-sm); fine to coarse; and gravel, fine; little silt; gray, dry, (surface course) 0.0
1										COBBLES, some gravel, fine to coarse; little sand, fine to coarse; trace silt; brown, dry, (shot rock fill) 1.2
2										
3										
4										
5										
6										Notes: No groundwater encountered. Terminated test pit at 6 ft bgs. 6.0



# LOG OF TEST PIT

TEST PIT # TP-26

**PROJECT NUMBER:** 18-028  
**PROJECT:** Captains Bay Road  
**CLIENT:** City of Unalaska

Depth (Feet)	Sample Data			USCS Classification Frozen Zone	Soil Graphic	Ground Water Data			Geologist: <i>D. Simon</i> Field Crew: <i>Bering Shai</i> Equipment Type: <i>Hitachi EX 300</i> Location: <i>Northern utilidor by Spur Road</i> Lat/Long:	Total Depth: 5.5 feet Date: 8/4/2018
	Sample Type	Field Number	Sample			Depth in (ft.)				
						Time				
						Date				
						Symbol				
<b>SUBSURFACE MATERIAL</b>										
0				sw-sm		Well-graded SAND, ( sw-sm); fine to coarse; and gravel, fine; little silt; gray, dry, (surface course), thickness varies from 8" to 16"				0.0
1	GRAB	1				Moisture =3.1%				
2						COBBLES, some gravel, fine to coarse; little sand, fine to coarse; trace silt; brown, dry, (shot rock fill)				1.3
3										
4										
5										
					BOH 5.5		Notes:			5.5
						No groundwater encountered. Terminated test pit at 5.5 ft bgs.				

**PROJECT NUMBER:** 18-028  
**PROJECT:** Captains Bay Road  
**CLIENT:** City of Unalaska

Total Depth: 8.2 feet  
Date: 8/4/2018

Geologist: *D. Simon*  
Field Crew: *Bering Shai*  
Equipment Type: *Hitachi EX 300*  
**Location: At 6" water line crossing**  
Lat/Long:

Depth (Feet)	Sample Data			USCS Classification Frozen Zone	Soil Graphic	Ground Water Data			SUBSURFACE MATERIAL		
	Sample Type	Field Number	Sample			Depth in (ft.)			Well-graded SAND, ( sw-sm); fine to coarse; and gravel, fine; little silt; gray, dry, (surface course) P200 =10.1%, Sa =41.1%, Gr =48.8%, Moisture =3.0%	COBBLES AND BOULDERS, some sand, fine to coarse; little gravel, fine to coarse; brown, dry, boulders up to 24 inches in diameter, (shot rock fill)	
						Time					
						Date					
						Symbol					
0	GRAB	1		sw-sm					0.0		
1									1.0		
2											
3											
4											
5											
6											
7											
8											
					BOH 8.2					8.2	

Notes:  
No groundwater encountered. Terminated test pit at 8.2 ft bgs.



**PROJECT NUMBER:** 18-028  
**PROJECT:** Captains Bay Road  
**CLIENT:** City of Unalaska

Depth (Feet)	Sample Data			USCS Classification	Frozen Zone	Soil Graphic	Ground Water Data			Geologist: <i>N. Yount</i> Field Crew: <i>Bering Shai</i> Equipment Type: <i>Hitachi EX 300</i> Location: <b>16" valve E-6</b> Lat/Long:	Total Depth: 1.5 feet Date: 8/4/2018
	Sample Type	Field Number	Sample				Depth in (ft.)				
							Time				
							Date				
							Symbol				
0				sw-sm			SUBSURFACE MATERIAL				
1				gw			Well-graded SAND, ( sw-sm); fine to coarse; and gravel, fine to coarse; little silt; gray, dry, (surface course)			0.0	
							Well-graded GRAVEL, ( gw); fine to coarse; some sand, fine to coarse; tan, dry			1.0	
							Notes: No groundwater encountered. Terminated test pit at 1.5 ft bgs.			1.5	



BUSCS LOG OF TEST PIT 18-028 GINT - MOST RECENT.GPJ\_HDL MODIFIED.GDT 9/7/18

**PROJECT NUMBER:** 18-028  
**PROJECT:** Captains Bay Road  
**CLIENT:** City of Unalaska

Depth (Feet)	Sample Data			USCS Classification Frozen Zone	Soil Graphic	Ground Water Data			Geologist: <i>N. Yount</i> Field Crew: <i>Bering Shai</i> Equipment Type: <i>Hitachi EX 300</i> Location: <b>Sewer manhole A-3</b> Lat/Long:	Total Depth: 2.7 feet Date: 8/4/2018
	Sample Type	Field Number	Sample			Depth in (ft.)				
						Time				
						Date				
						Symbol				
0				sw-sm		SUBSURFACE MATERIAL				
1						Well-graded SAND, ( sw-sm); fine to coarse; and gravel, fine to coarse; little silt; gray, dry, (surface course)			0.0	
2						COBBLES, some gravel, fine to coarse; little sand, fine to coarse; brown, dry, cobbles up to 8 inches in diameter, (shot rock fill)			0.8	
					BOH 2.7	Notes: No groundwater encountered. Terminated test pit at 2.7 ft bgs.			2.7	



BUSCS LOG OF TEST PIT 18-028 GINT - MOST RECENT.GPJ\_HDL MODIFIED.GDT 9/7/18



**PROJECT NUMBER:** 18-028  
**PROJECT:** Captains Bay Road  
**CLIENT:** City of Unalaska

Depth (Feet)	Sample Data			USCS Classification Frozen Zone	Soil Graphic	Ground Water Data			Geologist: <i>D. Simon</i> Field Crew: <i>Bering Shai</i> Equipment Type: <i>Hitachi EX 300</i> Location: <b>14" Utilidor</b> Lat/Long:	Total Depth: 2.5 feet Date: 8/4/2018
	Sample Type	Field Number	Sample			Depth in (ft.)				
						Time				
						Date				
						Symbol				
<b>SUBSURFACE MATERIAL</b>										
0				sw-sm		Well-graded SAND, ( sw-sm); fine to coarse; some gravel, fine to coarse; little silt; gray, dry, (surface course)			0.0	
1						COBBLES, some gravel, fine to coarse; little sand, fine to coarse; trace silt; brown, dry, cobbles up to 12" inches in diameter (shot rock fill)			1.0	
2						Notes: No groundwater encountered. Terminated test pit at 2.5 ft bgs.			2.5	





**PROJECT NUMBER:** 18-028  
**PROJECT:** Captains Bay Road  
**CLIENT:** City of Unalaska

Depth (Feet)	Sample Data			USCS Classification Frozen Zone	Soil Graphic	Ground Water Data			Geologist: <i>D. Simon</i> Field Crew: <i>Bering Shai</i> Equipment Type: <i>Hitachi EX 300</i> Location: <i>24" Utilidor (southern)</i> Lat/Long:	Total Depth: <i>8.4 feet</i> Date: <i>8/4/2018</i>
	Sample Type	Field Number	Sample			Depth in (ft.)				
						Time				
						Date				
						Symbol				
<b>SUBSURFACE MATERIAL</b>										
0				gw-gm						0.0
1	GRAB	1								
2										1.3
3										
4										
5				gp-gm						5.0
6										
7	GRAB	2								
8										
					BOH 8.4					8.4
										Notes: No groundwater encountered. Terminated test pit at 8.4 ft bgs. Found 1 of 2 pipes (unsafe to get second one).



PROJECT NUMBER: 18-028  
PROJECT: Captains Bay Road  
CLIENT: City of Unalaska

Depth (Feet)	Sample Data			USCS Classification	Frozen Zone	Soil Graphic	Ground Water Data			Geologist: <i>D. Simon</i> Field Crew: <i>Bering Shai</i> Equipment Type: <i>Hitachi EX 300</i> Location: <b>Westward - 6" water line</b> Lat/Long:	Total Depth: <i>1.0 feet</i> Date: <i>8/6/2018</i>
	Sample Type	Field Number	Sample				Depth in (ft.)				
							Time				
							Date				
							Symbol				
0				gw-gm			SUBSURFACE MATERIAL				
1							Poorly-graded GRAVEL, ( gw-gm); fine; with sand, fine to coarse; little silt; gray, dry, (surface course)			0.0	
							Notes: No groundwater encountered. Terminated test pit at 1 ft bgs. Encountered power line.			1.0	



**PROJECT NUMBER:** 18-028  
**PROJECT:** Captains Bay Road  
**CLIENT:** City of Unalaska

Total Depth: 9.0 feet  
Date: 8/6/2018

Geologist: *D. Simon*  
Field Crew: *Bering Shai*  
Equipment Type: *Hitachi EX 300*  
Location: *West side of Westward by crab pots*  
Lat/Long:

Depth (Feet)	Sample Data			USCS Classification Frozen Zone	Soil Graphic	Ground Water Data			SUBSURFACE MATERIAL	
	Sample Type	Field Number	Sample			Depth in (ft.)				
						Time				
						Date				
						Symbol				
0	GRAB	1		gw-gm					Well-graded GRAVEL, ( gw-gm); fine; and sand, fine to coarse; little silt; gray, dry, (surface course) P200 =10.1%, Sa =34.0%, Gr =55.9%, Moisture =3.4%	0.0
1								COBBLES, some gravel, fine to coarse; little sand, fine to coarse; trace silt; brown, dry, cobbles up to 12 inches in diameter, (shot rock fill)	1.0	
2								Poorly-graded SAND, ( sp); fine to coarse; little silt; trace gravel, fine to coarse; brown, dry, fibrous organics P200 =14.2%, Sa =85.4%, Gr =0.4%, Moisture =33.5%, Org =10.4%	3.0	
3	GRAB	2		gp				Poorly-graded GRAVEL, ( gp); fine; some sand, fine to coarse; trace silt; brownish red, dry, (appears to be old beach deposit)	3.8	
4										
5										
6										
7										
8										
9										
									Notes: No groundwater encountered. Terminated test pit at 9 ft bgs.	9.0




BUSCS LOG OF TEST PIT 18-028 GINT - MOST RECENT.GPJ\_HDL MODIFIED.GDT 9/7/18

**PROJECT NUMBER:** 18-028  
**PROJECT:** Captains Bay Road  
**CLIENT:** City of Unalaska

Depth (Feet)	Sample Data			USCS Classification	Frozen Zone	Soil Graphic	Ground Water Data			Geologist: <i>D. Simon/N. Yount</i> Field Crew: <i>Bering Shai</i> Equipment Type: <i>Hitachi EX 300</i> Location: <i>North Pacific Fuel diesel line</i> Lat/Long:	Total Depth: <i>5.7 feet</i> Date: <i>8/6/2018</i>
	Sample Type	Field Number	Sample				Depth in (ft.)				
							Time				
							Date				
							Symbol				
<b>SUBSURFACE MATERIAL</b>											
0	GRAB	1		gw-gm		Well-graded GRAVEL, ( gw-gm); fine; and sand, fine to coarse; some silt; gray, dry, (surface course)				0.0	
0.5						P200 =18.7%, Sa =36.8%, Gr =44.5%, Moisture =3.3%					
1						COBBLES, some gravel, fine to coarse; little sand, fine to coarse; tan to gray, dry, cobbles up to 12 inches in diameter, (shot rock fill)					
2											
3											
4											
4.3				gw-gm		Well-graded GRAVEL, ( gw-gm); fine to coarse; and sand, fine to coarse; little silt; dark brown, moist, (tends to cave in)					
5	GRAB	2				P200 =9.7%, Sa =37.8%, Gr =52.5%, Moisture =7.0%					
5.7					BOH 5.7	Notes: No groundwater encountered. Terminated test pit at 5.7 ft bgs.					



PROJECT NUMBER: 18-028  
PROJECT: Captains Bay Road  
CLIENT: City of Unalaska

Depth (Feet)	Sample Data			USCS Classification	Frozen Zone	Soil Graphic	Ground Water Data			Geologist: <i>N. Yount</i> Field Crew: <i>Bering Shai</i> Equipment Type: <i>Hitachi EX 300</i> Location: <i>6" water crossing #1 (at shoulder/ditch)</i> Lat/Long:	Total Depth: <i>3.9 feet</i> Date: <i>8/6/2018</i>	
	Sample Type	Field Number	Sample				Depth in (ft.)					
							Time					
							Date					
							Symbol					
<b>SUBSURFACE MATERIAL</b>												
0				sw-sm gw						Well-graded SAND, ( sw-sm); fine to coarse; some gravel, fine to coarse; little silt; gray, dry, (surface course)	0.0 0.2	
1	GRAB	2									Well-graded GRAVEL, ( gw); fine to coarse; some sand, fine to coarse; trace silt; brown, dry	
2	GRAB	1		gp gw-gm							P200 =5.0%, Sa =28.2%, Gr =66.8%, Moisture =8.8%	1.7 1.9
3	GRAB	3									Poorly-graded GRAVEL, ( gp); fine to coarse; little sand, fine to coarse; trace silt; tan, moist	
											P200 =4.3%, Sa =14.5%, Gr =81.2%, Moisture =9.4%	
						BOH 3.9				Well-graded GRAVEL, ( gw-gm); fine to coarse; some sand, fine to coarse; little silt; dark brown, moist		
										P200 =7.4%, Sa =29.5%, Gr =63.1%, Moisture =12.8%	3.9	
										Notes: No groundwater encountered. Terminated test pit at 3.9 ft bgs.		






**PROJECT NUMBER:** 18-028  
**PROJECT:** Captains Bay Road  
**CLIENT:** City of Unalaska

Depth (Feet)	Sample Data			USCS Classification	Frozen Zone	Soil Graphic	Ground Water Data			Geologist: <i>N. Yount</i> Field Crew: <i>Bering Shai</i> Equipment Type: <i>Hitachi EX 300</i> Location: <i>4" water crossing (at shoulder/ditch)</i> Lat/Long:	Total Depth: 3.7 feet Date: 8/7/2018	
	Sample Type	Field Number	Sample				Depth in (ft.)					
							Time					
							Date					
							Symbol					
<b>SUBSURFACE MATERIAL</b>												
0	GRAB	1		gw-gm			Well-graded GRAVEL, ( gw-gm); little sand, fine to coarse; little silt; gray, wet, (surface course)			0.0		
	GRAB	2		gw			Moisture =9.8%			0.3		
1							Well-graded GRAVEL, ( gw); little sand, fine to coarse; trace silt; tan, moist, (surface course)			0.7		
2	GRAB	3		gw-gm			Moisture =4.8%			1.8		
	GRAB	4		gp-gm		COBBLES, with gravel, fine to coarse; little sand, fine to coarse; little silt; brown, moist			2.0			
3						Well-graded GRAVEL, ( gw-gm); fine to coarse; little sand, fine to coarse; little silt; gray, moist						
						BOH 3.7	Moisture =6.3%			3.7		
							Poorly-graded GRAVEL, ( gp-gm); fine to coarse; some sand, fine to coarse; little silt; dark brown, moist					
							P200 =6.3%, Sa =30.0%, Gr =63.7%, Moisture =18.6%					
							Notes: No groundwater encountered. Terminated test pit at 3.7 ft bgs. Test pit excavated across shoulder of the road and ditch. Organics and cobbles present on other side of ditch. Ditch was holding water when excavation began.					



BUSCS LOG OF TEST PIT 18-028 GINT - MOST RECENT.GPJ\_HDL MODIFIED.GDT 9/7/18

**PROJECT NUMBER:** 18-028  
**PROJECT:** Captains Bay Road  
**CLIENT:** City of Unalaska

Depth (Feet)	Sample Data			USCS Classification	Frozen Zone	Soil Graphic	Ground Water Data			Geologist: <i>N. Yount</i> Field Crew: <i>Bering Shai</i> Equipment Type: <i>Hitachi EX 300</i> Location: <i>8" SS crossing #1</i> Lat/Long:	Total Depth: <i>2.3 feet</i> Date: <i>8/7/2018</i>
	Sample Type	Field Number	Sample				Depth in (ft.)				
							Time				
							Date				
							Symbol				
<b>SUBSURFACE MATERIAL</b>											
0				gw		Well-graded GRAVEL, ( gw); fine to coarse; little sand, fine to coarse; trace silt; gray, dry, (surface course)				0.0	
1						COBBLES, some gravel, fine to coarse; little sand, fine to coarse; red, dry, (shot rock fill)				1.0	
2				sw		Well-graded SAND, ( sw); fine to coarse; (pipe bedding material)				1.8	
					BOH 2.3	Notes: No groundwater encountered. Terminated test pit at 2.3 ft bgs.				2.3	





**PROJECT NUMBER:** 18-028  
**PROJECT:** Captains Bay Road  
**CLIENT:** City of Unalaska

Depth (Feet)	Sample Data			USCS Classification	Frozen Zone	Soil Graphic	Ground Water Data			Geologist: <i>N. Yount</i> Field Crew: <i>Bering Shai</i> Equipment Type: <i>Hitachi EX 300</i> Location: <i>North Pacific Fuel waterline</i> Lat/Long:	Total Depth: 3.3 feet Date: 8/7/2018
	Sample Type	Field Number	Sample				Depth in (ft.)				
							Time				
							Date				
							Symbol				
<b>SUBSURFACE MATERIAL</b>											
0	GRAB	1		sm		Well-graded SAND, ( sm); fine to coarse; and gravel, fine to coarse; little silt; gray, dry, (surface course)				0.0	
1	GRAB	2				P200 =14.1%, Sa =51.9%, Gr =34.0%, Moisture =5.7%				0.5	
2						COBBLES, and gravel, fine to coarse; little sand, fine to coarse; red, dry, cobbles up to 8" in diameter, (shot rock fill)				2.0	
3	GRAB	3				Moisture =3.6%				2.0	
						COBBLES, little gravel, fine to coarse; little sand, fine to coarse; little silt; brown, dry, cobbles up to 6" in diameter, (shot rock fill)				3.3	
						Moisture =4.6%				3.3	
					BOH 3.3						
						Notes: No groundwater encountered. Terminated test pit at 3.3 ft bgs.					







**PROJECT NUMBER:** 18-028  
**PROJECT:** Captains Bay Road  
**CLIENT:** City of Unalaska

Depth (Feet)	Sample Data			USCS Classification	Frozen Zone	Soil Graphic	Ground Water Data			Geologist: <i>N. Yount</i> Field Crew: <i>Bering Shai</i> Equipment Type: <i>Hitachi EX 300</i> Location: <i>8" SS crossing #2</i> Lat/Long:	Total Depth: <i>3.0 feet</i> Date: <i>8/7/2018</i>
	Sample Type	Field Number	Sample				Depth in (ft.)				
							Time				
							Date				
							Symbol				
0				gw			SUBSURFACE MATERIAL				
1							Well-graded GRAVEL, ( gw); fine to coarse; little sand, fine to coarse; trace silt; gray, dry, (surface course)			0.0	
2											
3						BOH 3	Notes: No groundwater encountered. Terminated test pit at 3 ft bgs. Test pit excavated across shoulder of the road and ditch. Organics and cobbles present on other side of ditch.			3.0	






PROJECT NUMBER: 18-028  
PROJECT: Captains Bay Road  
CLIENT: City of Unalaska

Depth (Feet)	Sample Data			USCS Classification Frozen Zone	Soil Graphic	Ground Water Data			Geologist: <i>N. Yount</i> Field Crew: <i>Bering Shai</i> Equipment Type: <i>Hitachi EX 300</i> Location: <i>Cliff at S end of westward</i> Lat/Long:	Total Depth: 8.3 feet Date: 8/7/2018
	Sample Type	Field Number	Sample			Depth in (ft.)				
						Time				
						Date				
						Symbol				
<b>SUBSURFACE MATERIAL</b>										
0	GRAB	1		sw		Well-graded SAND, ( sw ); fine to coarse; and gravel, fine to coarse; trace silt; gray, dry, (surface course)			0.0	
1				gw		P200 =14.0%, Sa =48.5%, Gr =37.5%, Moisture =5.1%			0.5	
2	GRAB	2					Well-graded GRAVEL, ( gw ); fine to coarse; some sand, fine to coarse; trace silt; redish gray, dry			
2				gw	P200 =9.0%, Sa =21.7%, Gr =69.3%, Moisture =5.6%			2.0		
3	GRAB	3				Well-graded GRAVEL, ( gw ); fine to coarse; and sand, fine to coarse; tan, dry				
3						Moisture =4.7%				
4						COBBLES AND BOULDERS, little gravel, fine to coarse; little sand, fine to coarse; trace silt; brown, dry, boulders up to 3 feet in diameter			3.3	
5										
6										
7										
8					BOH 8.3	Notes: No groundwater encountered. Terminated test pit at 8.3 ft bgs. Encountered old telephone line and wood pipe around 4 ft bgs.			8.3	



**PROJECT NUMBER:** 18-028  
**PROJECT:** Captains Bay Road  
**CLIENT:** City of Unalaska

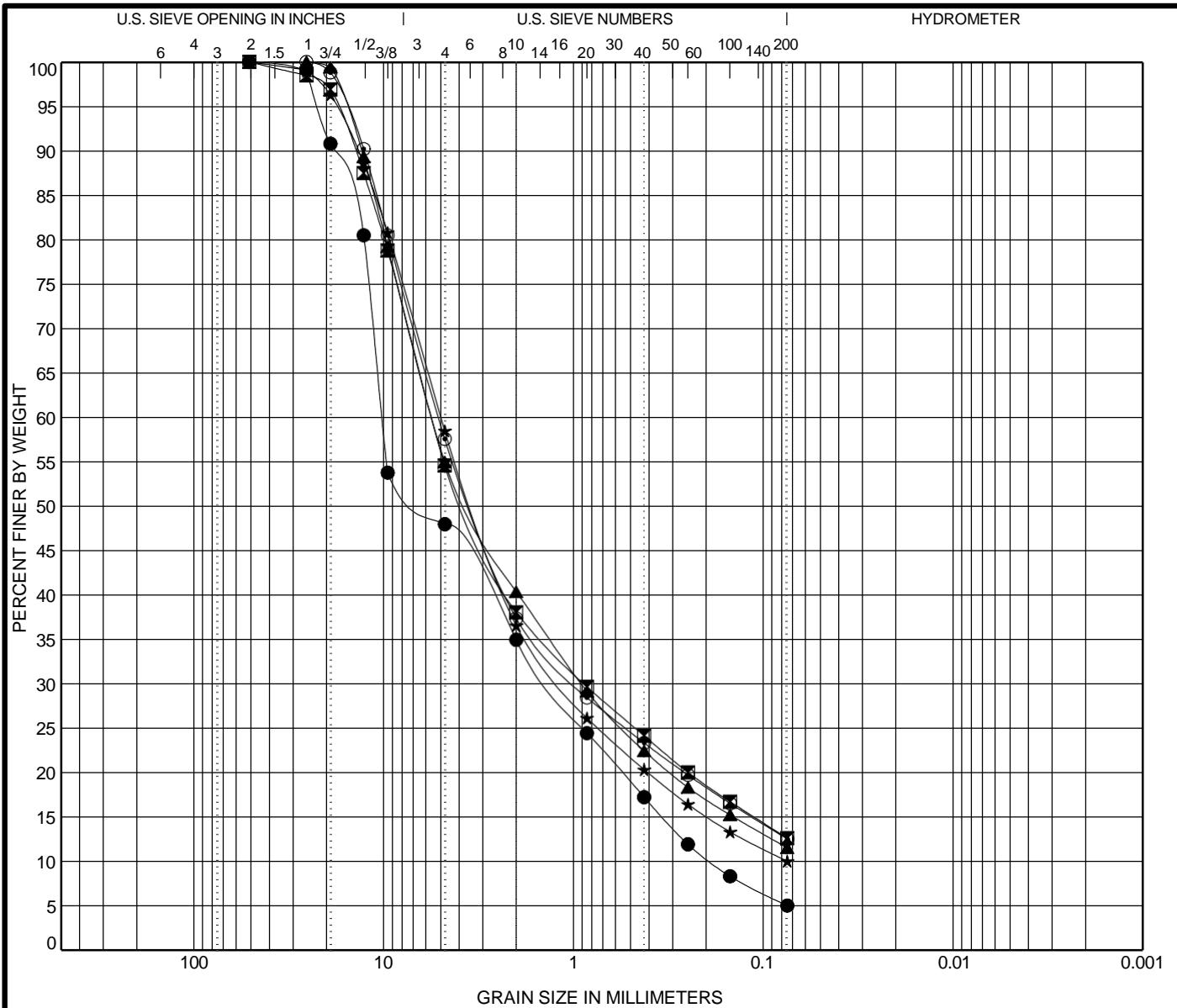
Depth (Feet)	Sample Data			USCS Classification	Frozen Zone	Soil Graphic	Ground Water Data			Geologist: <i>N. Yount</i> Field Crew: <i>Bering Shai</i> Equipment Type: <i>Hitachi EX 300</i> Location: <i>South of North Pacific Fuel</i> Lat/Long:	Total Depth: <i>3.5 feet</i> Date: <i>8/7/2018</i>
	Sample Type	Field Number	Sample				Depth in (ft.)				
							Time				
							Date				
							Symbol				
<b>SUBSURFACE MATERIAL</b>											
0	GRAB	1		sw-sm			Well-graded SAND, ( sw-sm); fine to coarse; and gravel, fine to coarse; little silt; gray, dry, (surface course)			0.0	
1	GRAB	2		gw			P200 =12.5%, Sa =49.2%, Gr =38.3%, Moisture =4.1%			0.5	
2							Well-graded GRAVEL, ( gw); fine to coarse; little sand, fine to coarse; reddish gray, dry, (surface course)			1.5	
3							MOISTURE =4.5%				
							COBBLES AND BOULDERS, some gravel, fine to coarse; little sand, fine to coarse; brown, dry, boulders up to 18 inches in diameter, (shot rock fill)				
						BOH 3.5	Notes: No groundwater encountered. Terminated test pit at 3.5 ft bgs on what appeared to be bedrock.			3.5	



**PROJECT NUMBER:** 18-028  
**PROJECT:** Captains Bay Road  
**CLIENT:** City of Unalaska

Depth (Feet)	Sample Data			USCS Classification Frozen Zone	Soil Graphic	Ground Water Data			Geologist: <i>N. Yount</i> Field Crew: <i>Bering Shai</i> Equipment Type: <i>Hitachi EX 300</i> Location: <i>North of OSI</i> Lat/Long:	Total Depth: <i>6.0 feet</i> Date: <i>8/7/2018</i>
	Sample Type	Field Number	Sample			Depth in (ft.)				
						Time				
						Date				
						Symbol				
<b>SUBSURFACE MATERIAL</b>										
0				gw		Well-graded GRAVEL, ( gw); fine to coarse; little sand, fine to coarse; trace silt; gray, dry, (surface course)				0.0
1						COBBLES, some gravel, fine to coarse; little sand fine to coarse; brown, dry, cobbles up to 8 inches in diameter, (shot rock fill)				1.0
2						COBBLES AND BOULDERS, angular, some gravel, fine to coarse; little sand fine to coarse; tan, dry, cobbles up to 4' in diameter (shot rock fill)				2.0
3										
4										
5										
6										6.0
<p><b>Notes:</b> No groundwater encountered. Terminated test pit at 6 ft bgs on what appeared to be bedrock.</p>										





COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification	Classification	LL	PL	PI	Cc	Cu		
● TP-1 DEPTH 0.2					0.93	53.99		
☒ TP-11 DEPTH 0.4								
▲ TP-13 DEPTH 0.5					2.68	98.63		
★ TP-15 DEPTH 0.2					3.69	67.76		
⊙ TP-17 DEPTH 1.0								
Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● TP-1 DEPTH 0.2	50.8	10.163	1.331	0.188	52.0	42.9	5.1	
☒ TP-11 DEPTH 0.4	50.8	5.545	0.876		45.4	41.9	12.7	
▲ TP-13 DEPTH 0.5	25.4	5.481	0.904		45.0	43.4	11.6	
★ TP-15 DEPTH 0.2	50.8	4.977	1.162		41.5	48.4	10.1	
⊙ TP-17 DEPTH 1.0	25.4	5.108	0.982		42.4	45.0	12.6	

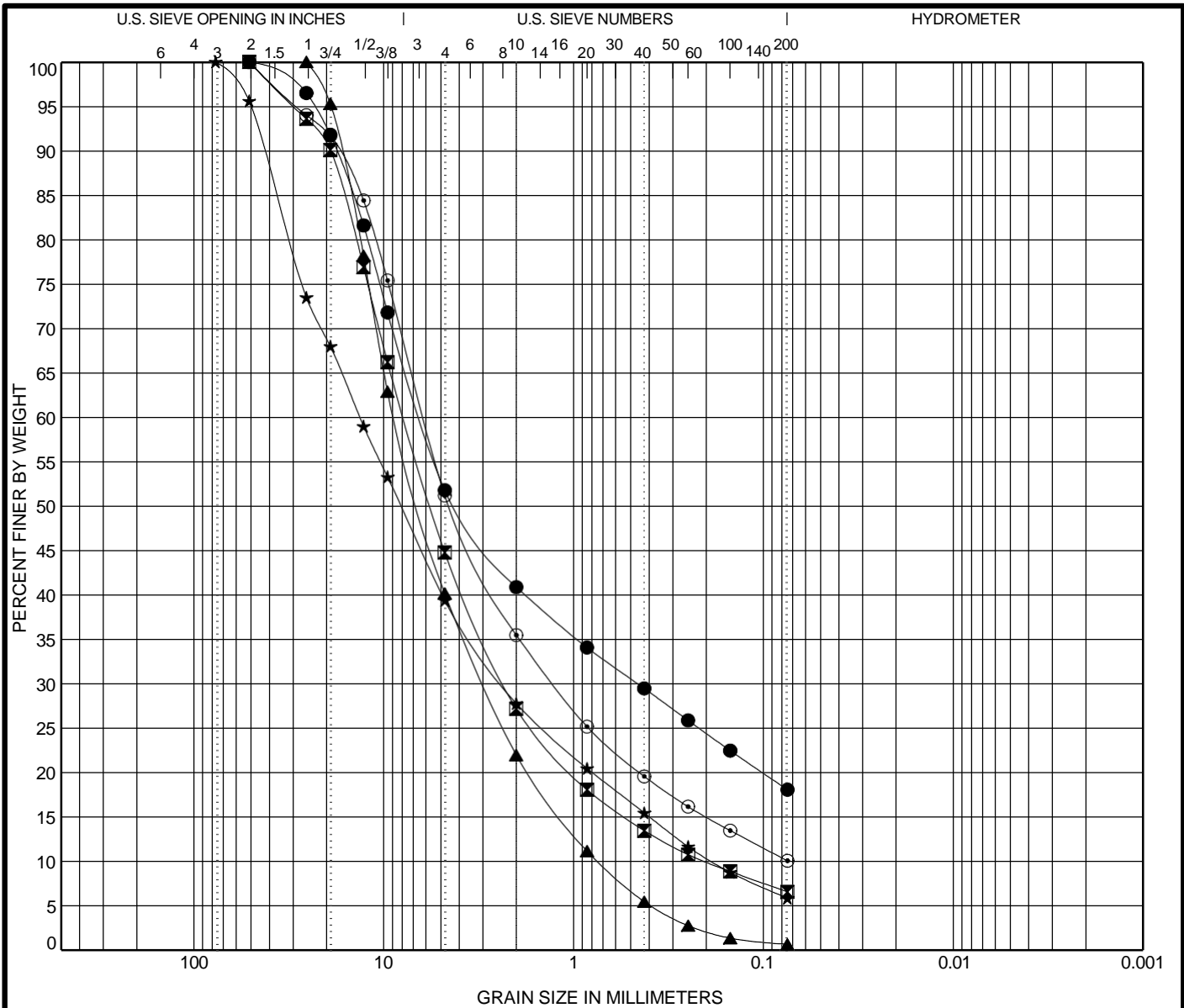


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Project: Captains Bay Road  
 Client: City of Unalaska  
 Project Number: 18-028

U.S. GRAIN SIZE 18-028 GINT - MOST RECENT GPJ HDL MODIFIED.GDT 9/6/18



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification	Classification	LL	PL	PI	Cc	Cu
● TP-19 DEPTH 0.5						
☒ TP-22 DEPTH 0.4					3.36	38.55
▲ TP-22 DEPTH 0.8	<b>WELL-GRADED GRAVEL with SAND(GW)</b>				1.34	11.84
★ TP-23 DEPTH 2.0					2.26	71.67
⊙ TP-27 DEPTH 0.5					3.57	83.17

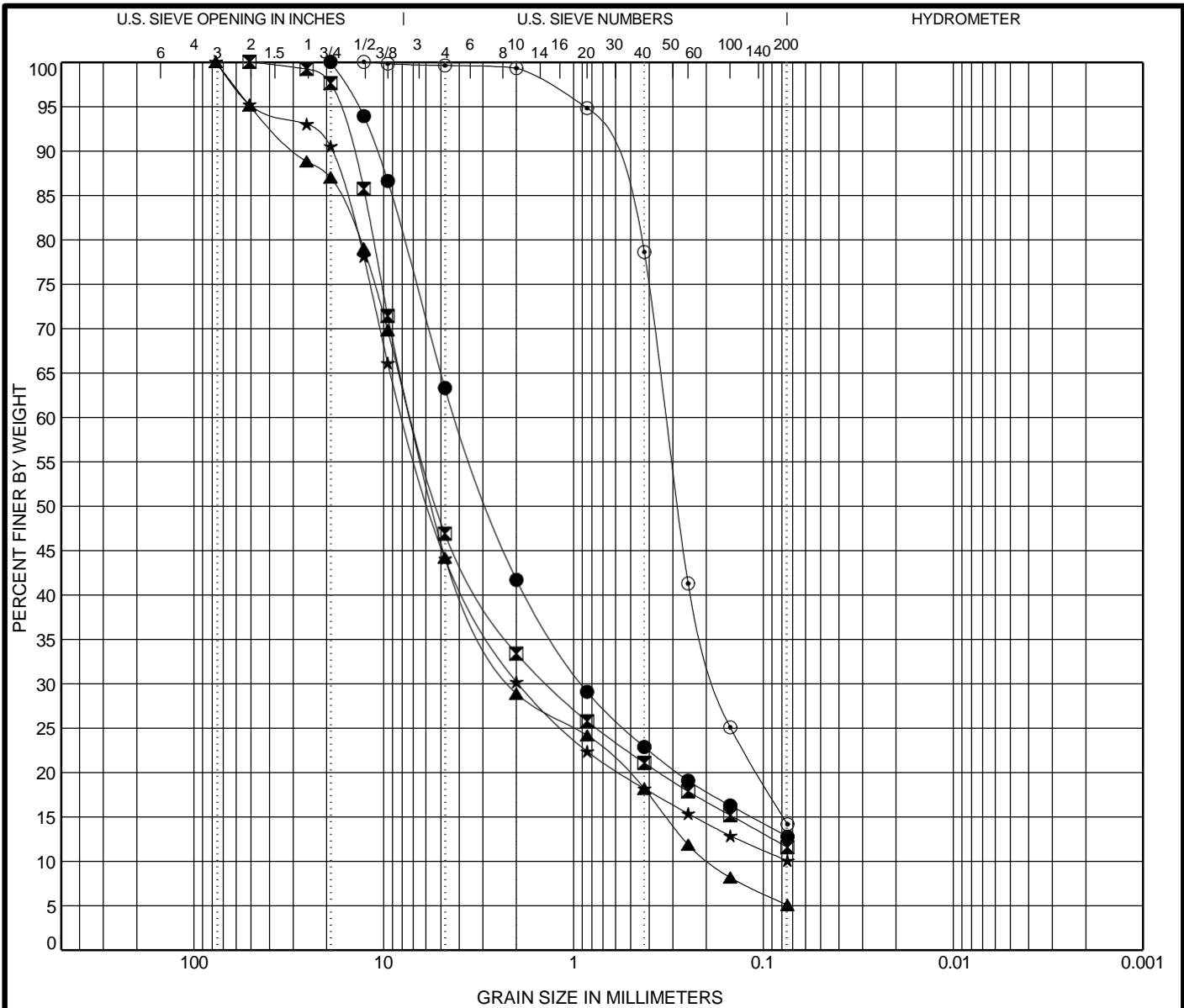
Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● TP-19 DEPTH 0.5	50.8	6.311	0.458		48.2	33.7	18.1	
☒ TP-22 DEPTH 0.4	50.8	7.772	2.295	0.202	55.2	38.2	6.6	
▲ TP-22 DEPTH 0.8	25.4	8.695	2.925	0.735	59.8	39.5	0.7	
★ TP-23 DEPTH 2.0	76.2	13.281	2.357	0.185	60.6	33.5	5.9	
⊙ TP-27 DEPTH 0.5	50.8	6.112	1.266		48.8	41.1	10.1	



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U.S. GRAIN SIZE 18-028 GINT - MOST RECENT GPJ\_HDL\_MODIFIED.GDT 9/6/18



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification	Classification					LL	PL	PI	Cc	Cu
● TP-3 DEPTH 0.8										
☒ TP-31 DEPTH 0.8									4.91	124.85
▲ TP-31 DEPTH 7.0									3.23	37.89
★ TP-33 DEPTH 0.5									6.67	107.14
⊙ TP-33 DEPTH 3.5										
Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay		
● TP-3 DEPTH 0.8	19	4.162	0.904		36.7	50.5	12.8			
☒ TP-31 DEPTH 0.8	50.8	6.881	1.364		53.1	35.3	11.6			
▲ TP-31 DEPTH 7.0	76.2	7.286	2.128	0.192	55.8	39.1	5.1			
★ TP-33 DEPTH 0.5	76.2	7.839	1.957		55.9	34.0	10.1			
⊙ TP-33 DEPTH 3.5	12.7	0.326	0.175		0.4	85.4	14.2			



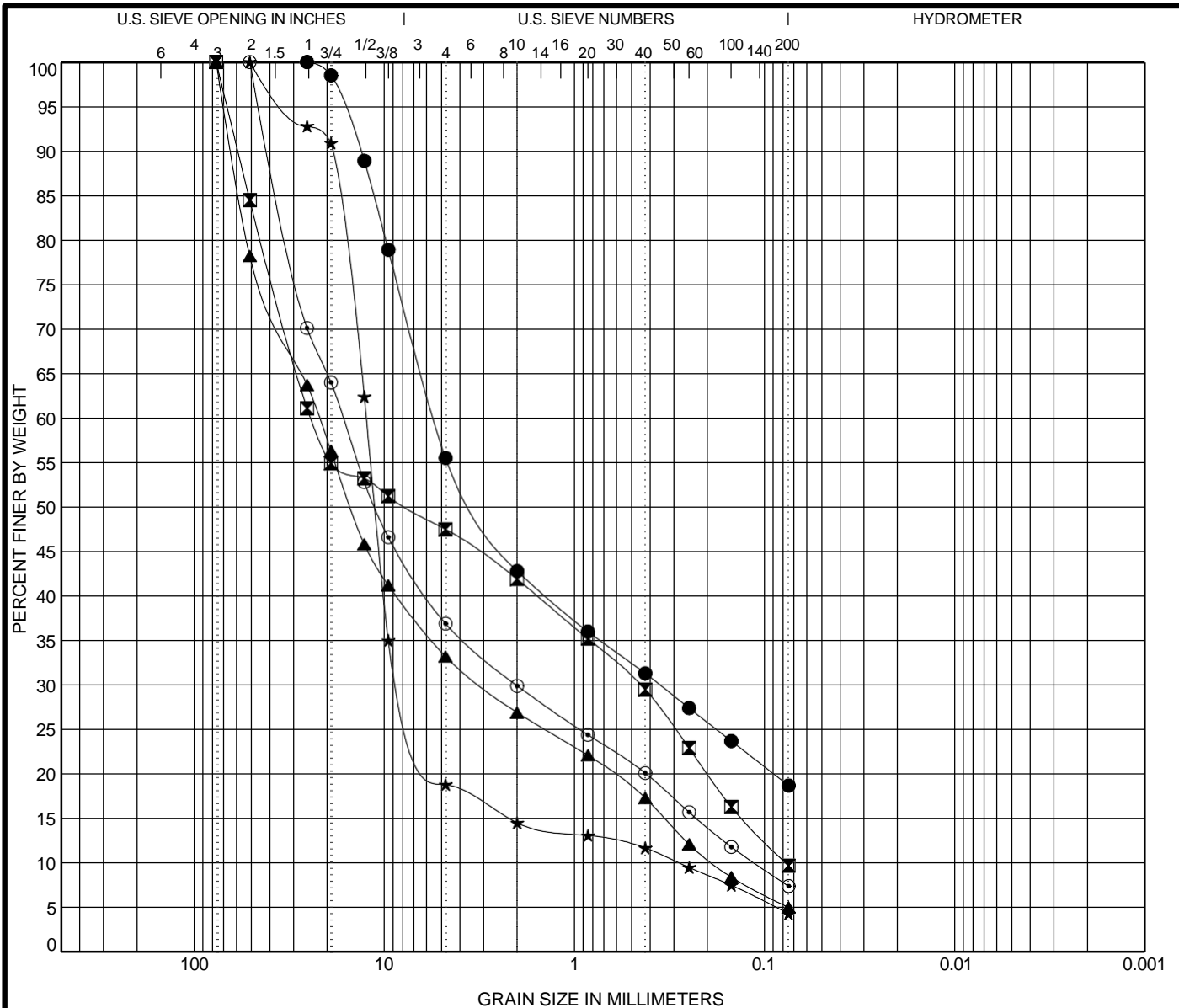
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COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification	Classification	LL	PL	PI	Cc	Cu		
● TP-34 DEPTH 0.3								
☒ TP-34 DEPTH 5.0					0.11	311.69		
▲ TP-35 DEPTH 1.0					2.28	117.43		
★ TP-35 DEPTH 1.8	<b>POORLY GRADED GRAVEL(GP)</b>				16.85	43.90		
◎ TP-35 DEPTH 3.0					2.21	145.66		
Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● TP-34 DEPTH 0.3	25.4	5.427	0.356		44.5	36.8	18.7	
☒ TP-34 DEPTH 5.0	76.2	24.125	0.452	0.077	52.5	37.8	9.7	
▲ TP-35 DEPTH 1.0	76.2	21.968	3.061	0.187	66.8	28.2	5.0	
★ TP-35 DEPTH 1.8	50.8	12.381	7.67	0.282	81.2	14.5	4.3	
◎ TP-35 DEPTH 3.0	50.8	16.454	2.025	0.113	63.1	29.5	7.4	



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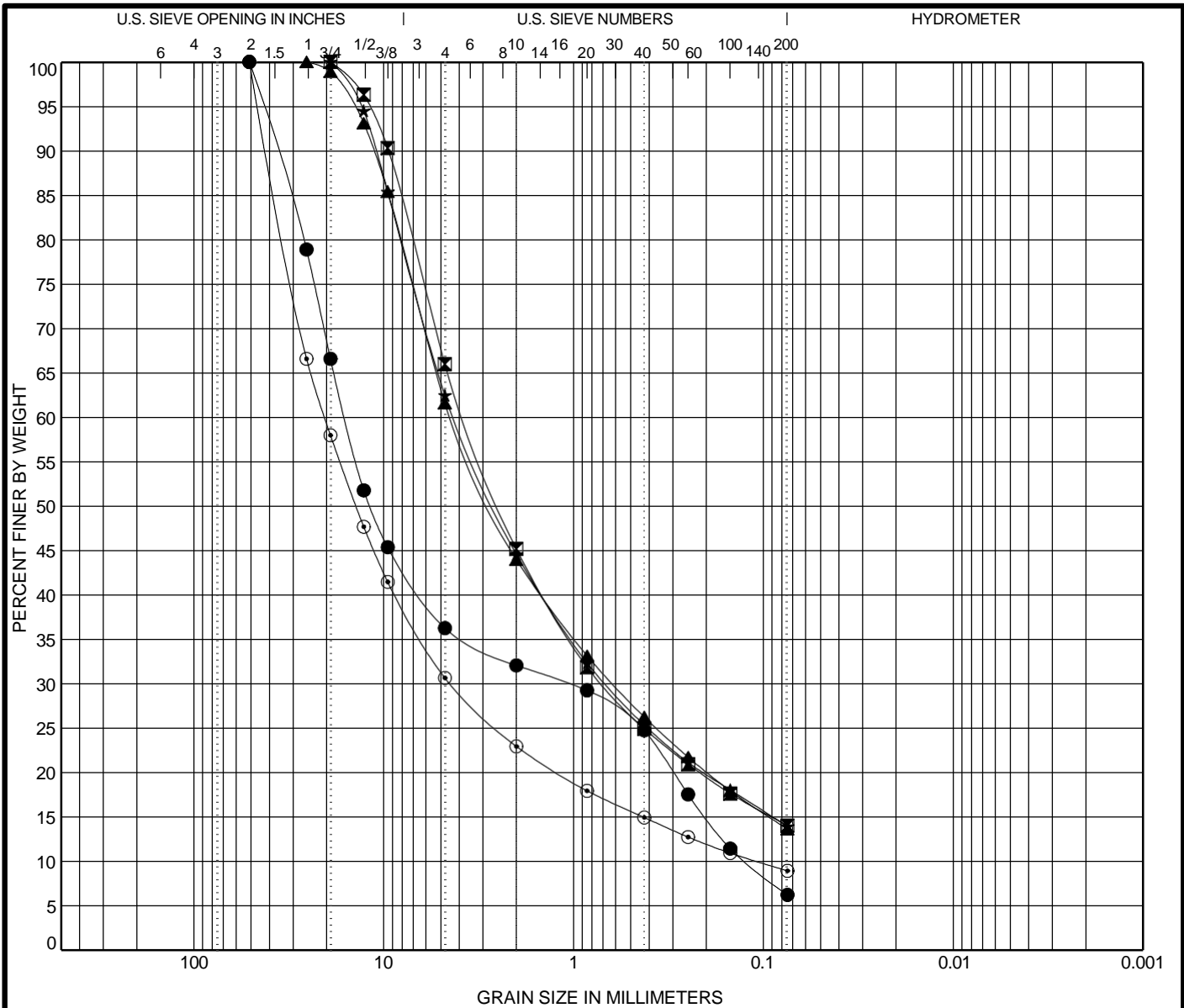
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COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification	Classification	LL	PL	PI	Cc	Cu
● TP-36 DEPTH 2.5					0.57	129.26
☒ TP-38 DEPTH 0.3						
▲ TP-4 DEPTH 0.8						
★ TP-40 DEPTH 0.3						
⊙ TP-40 DEPTH 1.5					8.94	191.65

Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● TP-36 DEPTH 2.5	50.8	15.876	1.053	0.123	63.7	30.0	6.3	
☒ TP-38 DEPTH 0.3	19	3.701	0.702		34.0	51.9	14.1	
▲ TP-4 DEPTH 0.8	25.4	4.391	0.616		38.4	47.9	13.7	
★ TP-40 DEPTH 0.3	19	4.209	0.67		37.5	48.5	14.0	
⊙ TP-40 DEPTH 1.5	50.8	20.327	4.391	0.106	69.3	21.7	9.0	

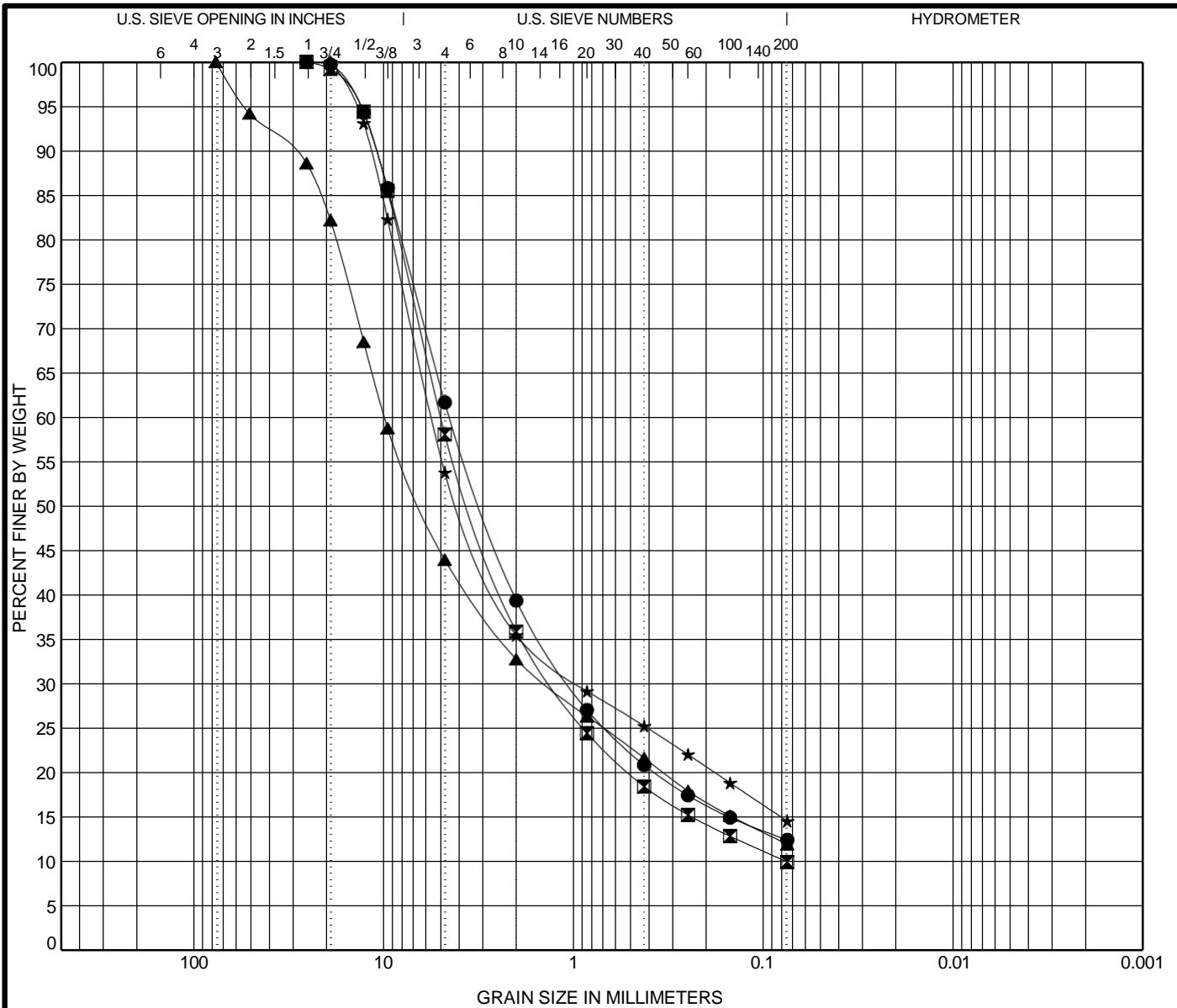


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COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification	Classification	LL	PL	PI	Cc	Cu
● TP-41 DEPTH 0.3						
☒ TP-5 DEPTH 0.2					4.41	66.45
▲ TP-8 DEPTH 0.4					3.95	202.49
★ TP-9 DEPTH 0.8						

Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● TP-41 DEPTH 0.3	25.4	4.447	1.04		38.3	49.2	12.5	
☒ TP-5 DEPTH 0.2	25.4	4.984	1.284	0.075	41.9	48.1	10.0	
▲ TP-8 DEPTH 0.4	76.2	9.847	1.375		56.0	32.0	12.0	
★ TP-9 DEPTH 0.8	19	5.523	0.948		46.2	39.2	14.6	



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## **APPENDIX E**

Rock Outcrop Reconnaissance (12 pages)

# 18-028 Captains Bay Road Rock Outcrop Reconnaissance

Monday, September 3, 2018 9:23 AM

The following are pictures and notes from a reconnaissance of select rock outcrops along Captains Bay Road in Unalaska, Alaska. The outcrops documented correspond to locations where roadway realignment is being considered. The reconnaissance was conducted by Doug Simon, PE with assistance from Nicole Yount, PE.

## Area 1

Approximately Station 214+00 to 217+00.



Photo 1. Wide angle view of Area 1.

### Notes:

1. Subvertical fracture planes in this area. The planes are spaced approximately 2 feet to 4 feet apart. The rock weathers into overhanging blocks.
2. Fracture plane orientated at N80E, 70°N
3. Fracture planes orientated at N5E, 39°W
4. Approximately 3 foot thick band of what appeared to be highly folded or metamorphosed rock.
5. Area between rock columns appears to be weathering more quickly.

East of the areas noted above, the rock appeared to have fewer fractures and be more competent.



Photo 2 (Left). Photo of the fracture planes identified in Photo 1, Note 1.

## **Area 2**

Approximately Station 203+50 to 207+00.



Photo 3. Wide angle view of Area 2.

### Notes:

1. Narrow spire of rock.
2. Spire of rock, wider than the spire indicated by Note 1.
3. Fracture planes in many locations (more than highlighted), that are adversely orientated toward the roadway.

## **Area 3**

Approximately Station 192+00 to 194+00



Photo 4. Wide angle view of Area 3.

### Notes:

1. Sub-horizontal fracture plane that appeared to be dipping 15 degrees toward the east.
2. Fracture plane orientated at N55W, 40°S
3. Fracture plane orientated at N18W, 60°S
4. Fracture plane orientated at N41E, 61°N





Photo 5 (left). Sub-horizontal plane identified in Photo 4, Note 1.

## **Area 4 (Deadman's Curve)**

Approximately Station 146+00 to 150+00.



Photo 6. Eastern portion of rock outcrop along Area 4 (Deadman's Curve).

### Notes:

1. The rock along the eastern portion of Deadman's Curve appeared to be more massive with generally fewer fractures than other outcrops. Observed fractures were not adversely orientated.
2. Fractures noted that appeared to dip back into the face of the rock.

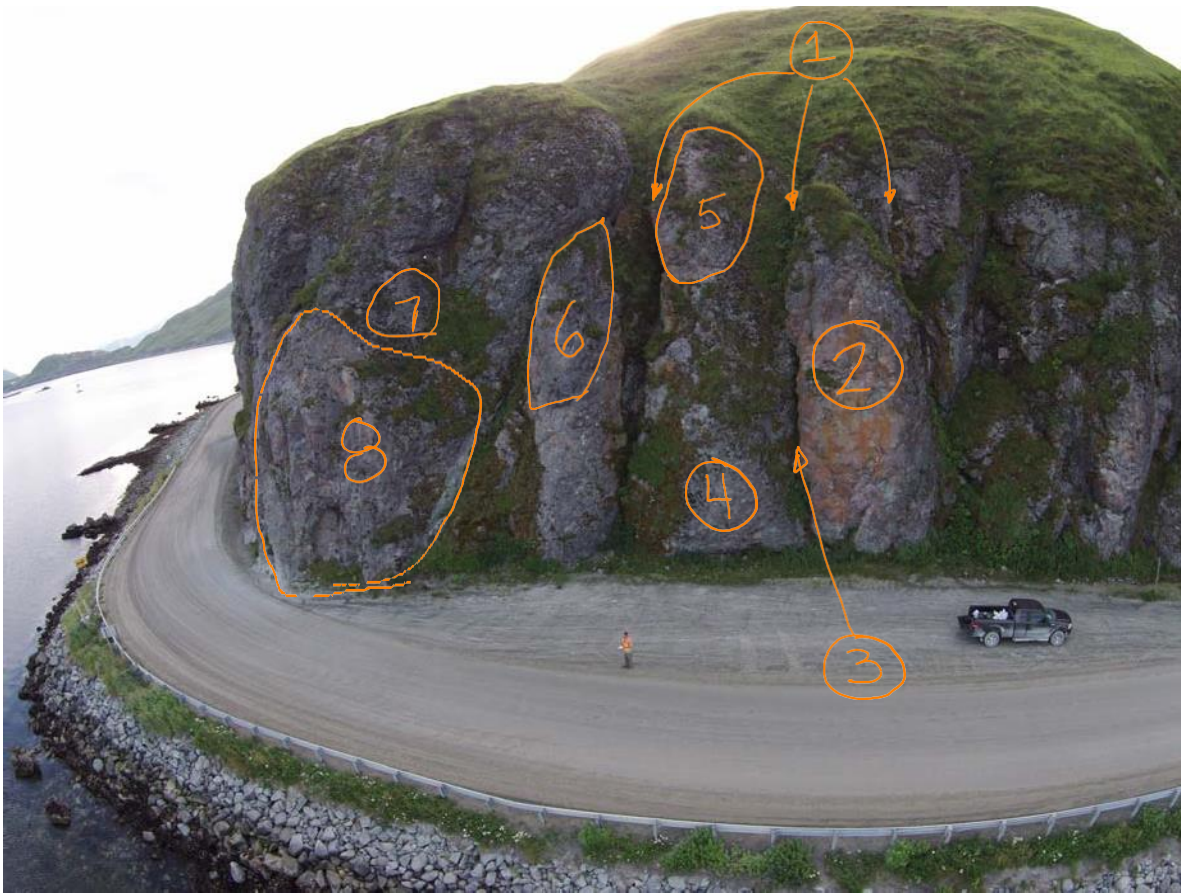


Photo 7. Western portion of Area 4 (Deadman's Curve).

Notes:

1. Series of vertical fracture planes spaced approximately 15 feet to 20 feet apart.
2. Rock generally appears to be massive with limited adverse fracturing. Spalling of the rock was observed.
3. Vertical fracture plane orientated at approximately N55E.
4. Sub-horizontal bedding planes 2 inches to 12 inches thick. Fractures orientated at N60E, 27°S
5. Large, overhung block created by fracture planes.
6. Large, overhung block created by fracture planes.
7. Large, overhung block created by fracture planes.
8. Rock generally appears to be massive with limited adverse fracturing.

## **Area 5**

Approximately Station 142+00 to 145+00.



Photo 8. Wide angle view of Area 5.

### Notes:

1. Rock has fewer fractures in this area. Appears to weather into blocks that are overhanging.
2. Water seeping out of the base of the crevasse.
3. Fractures spaced as closely as 4 inches and orientated at N37W, 65°S.
4. Overhung block with adverse fractures in back of block.
5. Three overhung blocks with adverse fractures in back of the blocks.
6. Large section of rock defined by two adverse fracture planes.
7. Overhung block with adverse fractures in back of block.
8. Signs of more severe weathering at base.



Photo 9 (Left). Looking southwest at a portion of Area 5.

Notes:

1. Overhung block identified in Photo 8, Note 7.
2. Weathering identified in Photo 8, Note 8.

## **Area 6**

Approximately Station 135+00 to 139+50.

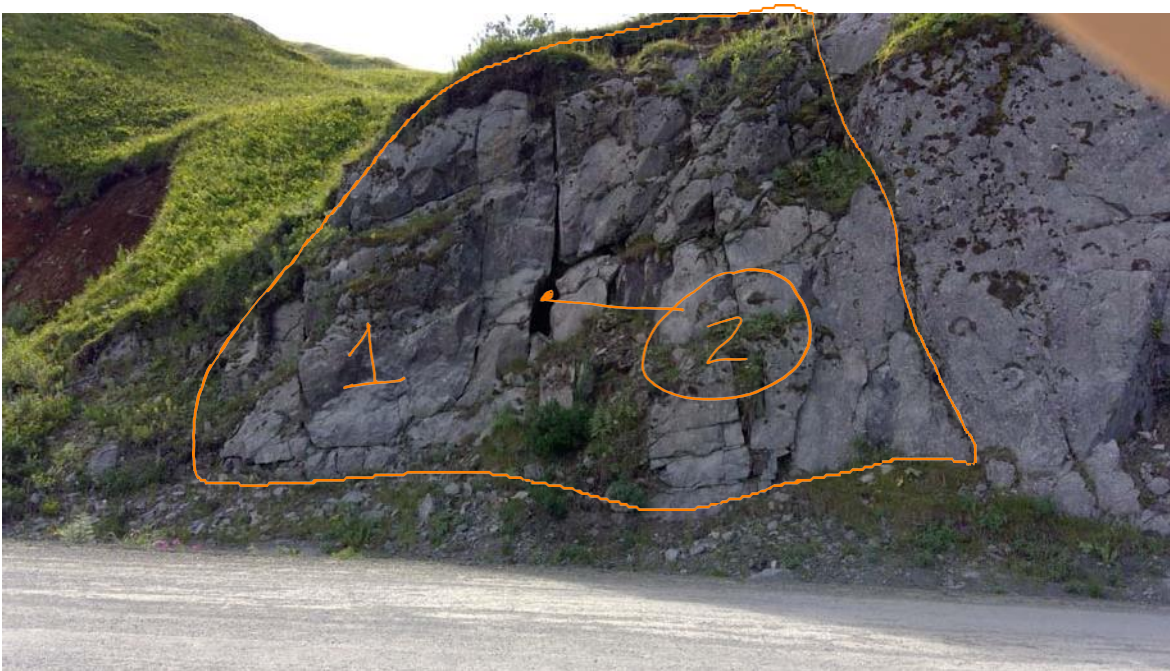


Photo 10. View of the northeastern portion of Area 6.

### Notes:

1. Area very fractured
2. Large opening observed.



Photo 11. Central portion of Area 6.

Notes:

1. Rock is very fractured. Some fractures are oriented adversely.
2. Overhung blocks with adverse fractures along back of blocks.
3. Rock is generally more massive in this area but faster weathering at base leaves rocks above overhanging.



Photo 12. Central portion of Area 6, southwest of the portion shown in Photo 11.

Notes:

1. Fractures create a blocky structure through this area; adversely orientated fractures noted.
2. Fractures orientated at N10W, 35°S.

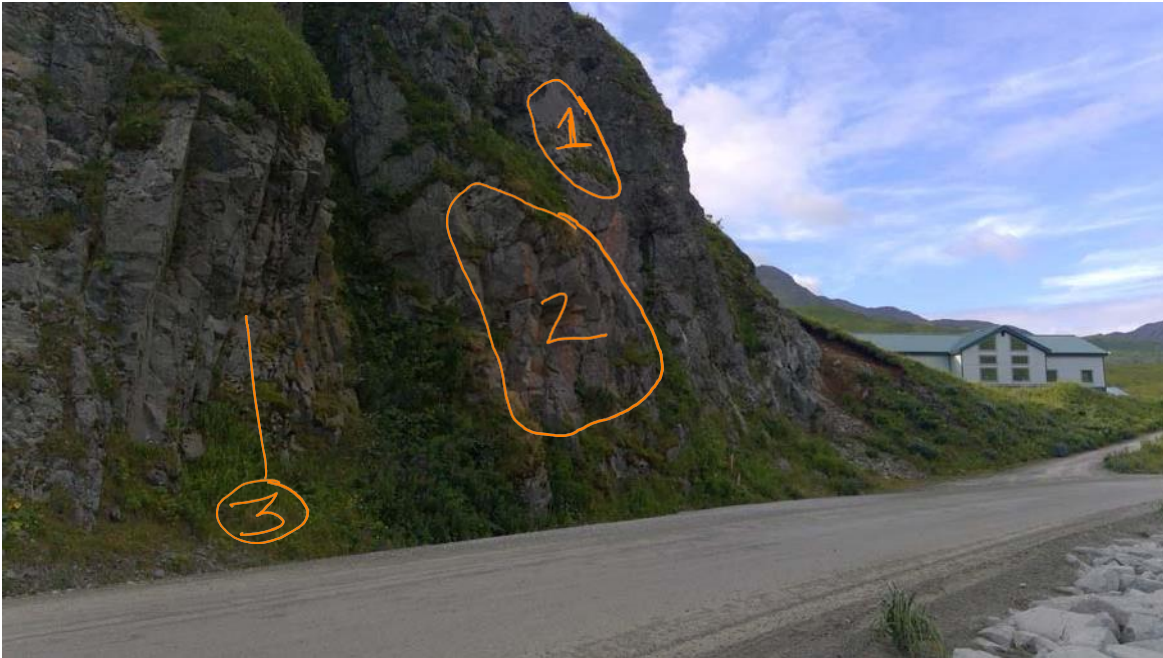


Photo 13. Southwestern portion of Area 6.

Notes:

1. Adversely oriented fracture plane.
2. Overhung rocks with adverse orientation of the fracture planes.
3. Zone with nearly vertical fractures (N40W, 78°N) resulting in overhung blocks from layers that are 8 inches to 18 inches thick.