


ALASKA LNG PROJECT	DOCKET NO. CP17-____-000 RESOURCE REPORT NO. 13 LNG APPENDICES PART 15 OF 19	Doc No: USAKE-PT-SRREG-00- 000006-000 APRIL 14, 2017 REVISION: 0
	PUBLIC	

Part 15 of 19 of Appendices for Resource Report No. 13 LNG

	RR13 APPENDIX TABLE OF CONTENTS	USAI-PE-SRREG-00-000013-000-B 14 APRIL 2017 REVISION: 1
	PUBLIC	APPENDIX COVERSHEET

J.5 - Marine Geotechnical Report

Document Number:	Description:	Revision:	Appendix:
USAL-FG-GRZZZ-00-002015-011	LNG Facilities Marine Geotechnical Data Report	Rev 0	Public

Confidential

Alaska LNG



LNG FACILITIES MARINE GEOTECHNICAL DATA REPORT

USAL-FG-GRZZZ-90-002015-011

Rev	Date	Revision Description		Originator		Reviewer / Endorser	Response Code	Approver	
A	18-Dec-15	Issued for Review		S. Jung / B. Binatli		P. Wong	3	A. S. Shethji / T. A. Posey	
0	20-Jun-16	Issued for Use		S. Jung / B. Binatli				A. S. Shethji / T. A. Posey	
Document Control No.	Country	Facility	Originator	Discipline	Type	Sub-Type	Location	Sequence	Identifier
	US	AL	FG	G	R	ZZZ	90	002015	011



FUGRO CONSULTANTS, INC.

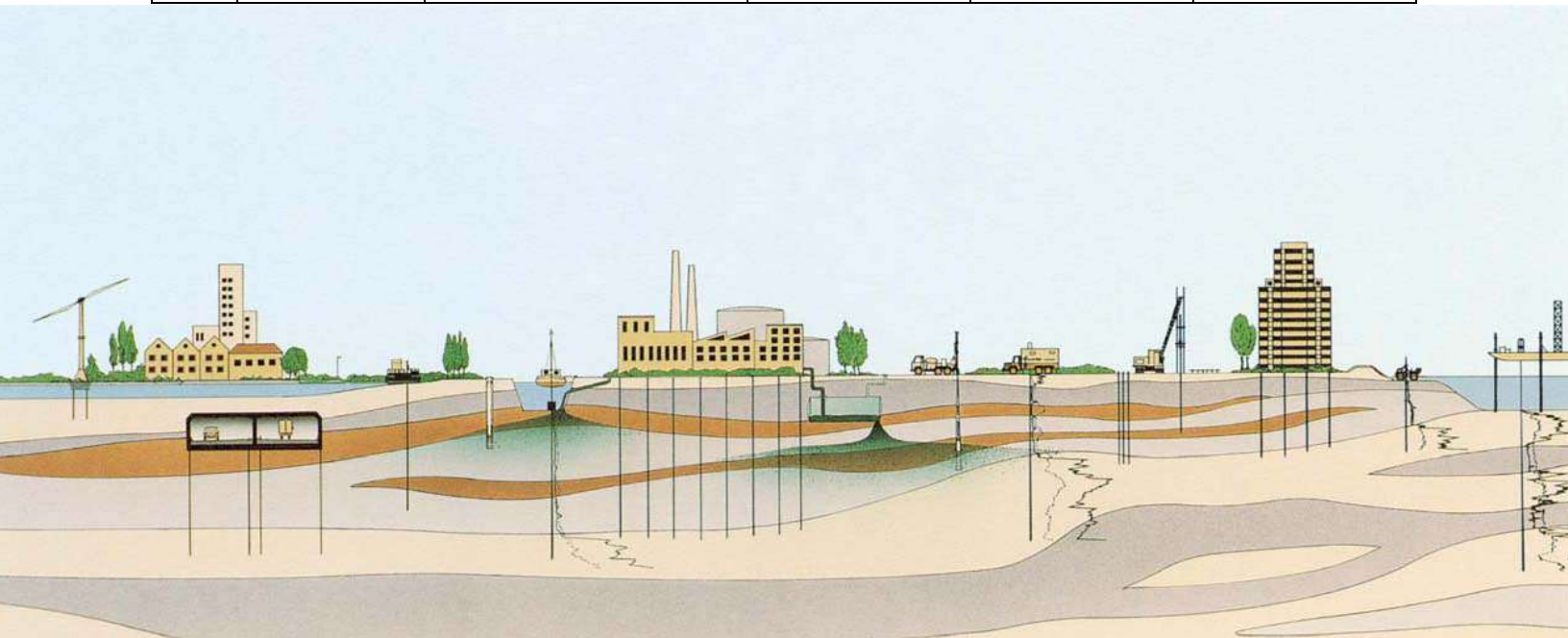
Alaska LNG

LNG FACILITIES MARINE GEOTECHNICAL DATA REPORT MARINE LNG FACILITIES ALASKA LNG PROJECT NIKISKI, ALASKA

AKLNG DOCUMENT NO. USAL-FG-GRZZZ-90-002015-011

REPORT NO. 04.10140334-9
EXXONMOBIL ALASKA LNG LLC (EMALL)
HOUSTON, TEXAS

Rev	Date	Revision Description	Originator	Reviewer	Approver
A	18-Dec-15	Issued for Review	S. Jung/ B. Binatli	A. S. Shethji	T. A. Posey
0	20-Jun-16	Issued for Use	S. Jung/ B. Binatli	A. S. Shethji	T. A. Posey



6100 Hillcroft (77081)
Houston, Texas 77274
Tel: (713) 369-5400
P.O Box 740010
Fax: (713) 369-5518

AKLNG Document No. USAL-FG-GRZZZ-90-002015-011
Fugro Report No. 04.101400334-9
June 20, 2016

ExxonMobil Alaska LNG LLC (EMALL)
10613 W. Sam Houston Pkwy N, Suite 500
Houston, TX, 77064

Attention: Patrick Wong
Geotechnical Engineer/Technical POC

Marine Geotechnical Data Report
Marine LNG Facilities
Alaska LNG Project
Nikiski, Alaska

Fugro Consultants, Inc. (Fugro) is pleased to present this geotechnical data report for the marine facilities of the Alaska LNG Project (AKLNG) located in Nikiski, Alaska. Our services were authorized under Service Work Order No. AKLNG-FUG-US-003 Rev 0, dated February 5, 2015 in accordance with the Service Agreement No. A2275592 between Fugro and ExxonMobil Global Services Company, dated October 29, 2012. Fugro has been performing geophysical and geotechnical site investigation (G&G) for the proposed AKLNG Project since August 2014.

Marine geotechnical investigation was performed between August 2015 and November 2015. This report presents the field and laboratory test results for the marine field investigation performed to support the 2015 G&G program.

We appreciate the opportunity to be of service to EMALL. Please call us at (713) 369-5400 if you have any questions or comments concerning this report, or when we may be of further assistance.

Sincerely,

FUGRO CONSULTANTS, INC.
TBPE Firm Registration No. 299

Baret Binatli, E.I.T.
Project Professional

Sochan Jung, P. E. (Texas)
Senior Project Professional

Abhishek S. Shethji, P.E. (Texas)
Project Manager

Thomas A. Posey, P.E. (Alaska)
Engineering Manager

Copies Submitted: Aconex Document Control System

AS/SJ/BB/TAP (R:\04100\2014 Projects\04.10140334 - Phase 2 Alaska LNG Project\15_Reporting\15 Marine Integrated Report\USAL-FG-GRZZZ-90-002015-012-n_A LNG Marine Integrated Report)

TABLE OF CONTENTS

	<u>Page</u>
1.0 INTRODUCTION	1-1
1.1 Project Description	1-1
1.2 Purpose and Scope	1-4
1.3 Applicability of Report	1-5
1.4 Limitations	1-5
1.5 Unit Conversions and Datums	1-5
2.0 GEOTECHNICAL FIELD EXPLORATION	2-1
2.1 General	2-1
2.2 Staging Area	2-1
2.3 Vessels and Equipment	2-2
2.4 Permits	2-2
2.5 Preplanning	2-2
2.6 Notifications	2-3
2.7 Equipment Inspections	2-3
2.8 Hazard Studies	2-4
2.9 Geotechnical Borings	2-4
2.9.1 JUB Logistics	2-4
2.9.2 Surveying and Positioning	2-5
2.9.3 Water Depth and Seabed Elevation	2-6
2.9.4 Drilling and Sampling	2-6
2.10 SPT Hammer Energy Calibration	2-8
2.11 PS Suspension Logging Test	2-9
2.11.1 PS Suspension Logging Method	2-9
2.11.2 Data Processing	2-12
2.12 Tier 1 (T1) and Tier 2 (T2) Sediment Sampling	2-14
2.13 Borehole Completion	2-15
2.14 Sample Storage and Shipping	2-15
2.15 Drill Cuttings and Discharge and Discharge	2-16
3.0 LABORATORY TESTING	3-1
3.1 General	3-1
3.2 Classification Tests	3-1
3.3 Maximum and Minimum Index Density Tests	3-1
3.4 Unconsolidated-Undrained Triaxial Compression Tests (UU)	3-2
3.5 Consolidated Undrained Triaxial Tests (CIUTX)	3-2
3.6 Ko-Consolidated Static Undrained Direct Simple Shear Tests (cKoU-DSS)	3-2

3.7 Compressibility Tests	3-3
3.8 Resonant Column Tests.....	3-3
3.9 Cyclic Direct Simple Shear Tests	3-3
3.10 Corrosion Potential Tests	3-3
3.11 Summary of Laboratory Tests	3-4
4.0 GENERAL SITE AND SUBSURFACE CONDITIONS.....	4-1
4.1 General Site Conditions	4-1
4.2 Regional Geology and Geomorphology	4-1
4.3 Site Geology.....	4-1
4.4 Regional Seismicity	4-2
4.5 Subsurface Conditions	4-2
4.6 Artesian Water Conditions	4-3
4.7 Variations	4-4
5.0 REFERENCES.....	5-1

ILLUSTRATIONS

	<u>Plate</u>
Vicinity Map.....	1
Overall Site Plan	2
Plan of Exploration.....	3
Site Bathymetry Map.....	4
Generalized Subsurface Cross Sections	
1-1'	5
2-2'	6
3-3'	7
4-4'	8
A-A'	9
B-B'	10
C-C''	11
D-D'	12
E-E'	13

APPENDICES

Plate

APPENDIX A

Summary of Field Exploration	A1-1
Drilling and Sampling Equipment Schematics	A2-1 and A2-2
Vessel Specifications	A3-1 thru A3-11

APPENDIX B

Log of Borings	B1-1 thru B1-29
Key to Terms and Symbols	B1-30
Starfix Mean Positioning Reports	B2-1 thru B2-29
APDES Daily Visual Observation Forms	B3-1 thru B3-78
Static Sheen Test Results	B4-1 thru B4-29

APPENDIX C

SPT Hammer Energy Calibrations	C-1 thru C-57
--------------------------------------	---------------

APPENDIX D

PS Logging Testing Equipment and Specifications	D1-1 and D1-2
PS Logging Test Results	D2 thru D10

APPENDIX E – LABORATORY TEST RESULTS

Summary of Laboratory Test Results	E1-1 thru E1-33
Grain Size Distribution Curves	E2-1 thru E2-35
Plasticity Charts	E3-1 thru E3-49
Unconsolidated Undrained (UU-TX) Triaxial Compression Test Results...	E4-1 thru E4-18
Consolidated Undrained Triaxial (CIU-TX) Compression Test Results.....	E5-1 thru E5-6
Ko-Consolidated Undrained Direct Simple Shear	E6-1 thru E6-6
One-Dimensional Consolidation Test Results	E7-1 thru E7-25
Resonant Column Test Results	E8-1 thru E8-6
Cyclic Direct Simple Shear Test Results	E9-1 thru E9-4
Corrosion Test Results	E10-1 thru E10-12

APPENDIX F

Method Statements	F-1 thru F-162
-------------------------	----------------

1.0 INTRODUCTION

1.1 Project Description

The Alaska Gasline Development Corporation, BP Alaska LNG LLC, ConocoPhillips Alaska LNG Company, and ExxonMobil Alaska LNG LLC (Applicants and also referred as EMALL in this report) plan to construct one integrated liquefied natural gas (LNG) Project (Project) with interdependent facilities for the purpose of liquefying supplies of natural gas from Alaska, in particular from the Point Thomson Unit (PTU) and Prudhoe Bay Unit (PBU) production fields on the Alaska North Slope (North Slope), for export in foreign commerce and opportunities for in-state deliveries of natural gas.

The Natural Gas Act (NGA), 15 U.S.C. § 717a(11) (2006), and Federal Energy Regulatory Commission (FERC) regulations, 18 C.F.R. § 153.2(d) (2014), define “LNG terminal” to include “all natural gas facilities located onshore or in State waters that are used to receive, unload, load, store, transport, gasify, liquefy, or process natural gas that is exported to a foreign country from the United States.” With respect to this Project, the “LNG Terminal” includes the following: a liquefaction facility (Liquefaction Facility) in Southcentral Alaska; an approximately 804-mile gas pipeline (Mainline); a gas treatment plant (GTP) on the North Slope; an approximately 62-mile gas transmission line connecting the GTP to the PTU gas production facility (PTU Gas Transmission Line or PTTL); and an approximately 1-mile gas transmission line connecting the GTP to the PBU gas production facility (PBU Gas Transmission Line or PBTL). All of these facilities are essential to export natural gas in foreign commerce.

These components are shown in Resource Report No. 1, Figure 1.1 - 1, as well as the maps found in Appendices A and B of Resource Report No. 1. Their current basis for design is described as follows.

The new Liquefaction Facility would be constructed on the eastern shore of Cook Inlet just south of the existing Agrium fertilizer plant on the Kenai Peninsula, approximately 3 miles southwest of Nikiski and 8.5 miles north of Kenai ([Plate 1](#)). The Liquefaction Facility would include the structures, equipment, underlying access rights, and all other associated systems for final processing and liquefaction of natural gas, as well as storage and loading of LNG, including terminal facilities and auxiliary marine vessels used to support Marine Terminal operations (excluding LNG carriers [LNGCs]). The Liquefaction Facility would include three liquefaction trains combining to process up to approximately 20 million metric tons per annum (MMTPA) of LNG. Two 240,000-cubic-meter tanks would be constructed to store the LNG. The Liquefaction Facility would be capable of accommodating two LNG carriers. The size of LNGCs that the Liquefaction Facility would accommodate range between 125,000 – 216,000-cubic-meter vessels.

In addition to the Liquefaction Facility, the LNG Terminal would include the following interdependent facilities:

- **Mainline:** A new 42-inch-diameter natural gas pipeline approximately 804 miles in length would extend from the Liquefaction Facility to the GTP on the North Slope, including the structures, equipment, and all other associated systems. The Mainline would include up to eight compressor stations; one standalone heater station, one heater station co-located with a compressor station, and six cooling stations associated with six of the compressor stations; four meter stations; 53 mainline block valves; one pig launcher facility at the GTP meter station, one pig receiver facility at the Nikiski meter station, and eight combined pig launcher and receiver facilities at each of the compressor stations; and associated infrastructure facilities. Associated infrastructure facilities would include additional temporary work spaces, access roads, helipads, construction camps, pipe storage areas, material extraction sites, and material disposal sites. Along the Mainline route, there would be at least five gas interconnection points to allow for future in-state deliveries of natural gas. The approximate locations of three of the gas interconnection points have been tentatively identified by the State of Alaska as follows: MP 475 to serve Fairbanks, MP 763 to serve the Matanuska-Susitna Valley and Anchorage, and MP 804 to serve the Kenai Peninsula. The size and location of the remainder of interconnection points are unknown at this time. None of the potential third-party facilities used to condition, if required, or move natural gas away from these off-take interconnection points are part of the Project. Potential third-party facilities will be addressed in the Cumulative Impacts analysis found in Appendix L of Resource Report No. 1.
- **GTP:** A new GTP and associated facilities in the Prudhoe Bay area would receive natural gas from the PBU Gas Transmission Line and the PTU Gas Transmission Line. The GTP would treat/process the natural gas for delivery into the Mainline. There would be custody transfer, verification, and process metering between the GTP and PBU for fuel gas, propane make-up, and byproducts. All of these would be on the GTP or PBU pads.
- **PBU Gas Transmission Line:** A new 60-inch natural gas transmission line would extend approximately 1 mile from the outlet flange of the PBU gas production facility to the inlet flange of the GTP. The PBU Gas Transmission Line would include one-meter station on the GTP pad.
- **PTU Gas Transmission Line:** A new 32-inch natural gas transmission line would extend approximately 62 miles from the outlet flange of the PTU gas production facility to the inlet flange of the GTP. The PTU Gas Transmission Line would include one-meter station on the GTP pad, four MLBVs, and two pig launcher and receiver facilities—one each at the PTU and GTP pads.

Existing State of Alaska transportation infrastructure would be used during the construction of these new facilities including ports, airports, roads, railroads, and airstrips (potentially including previously abandoned airstrips). A preliminary assessment of potential new infrastructure and modifications or additions to these existing in-state facilities will be provided in Appendix L of Resource Report No.1. The Liquefaction Facility, Mainline, and GTP would require the construction of modules that may or may not take place at existing or new manufacturing facilities in the United States. EMALL's Draft Resource Report No. 1, Appendix A, contains maps of the Project footprint. Appendices B and E of Resource Report No. 1 depict the footprint, plot plans of the aboveground facilities, and typical layout of above-ground facilities.

AKLNG contracted Fugro to investigate the site conditions of the onshore LNG facilities, marine LNG Terminal, and marine pipeline corridors. [Plate 1](#) and [Plate 2](#) show the overview of overall project facilities described above and the proposed location of the onshore facilities, marine terminal area, and the pipeline corridors of the proposed LNG plant. More details regarding the project can be found in document USAKE-PT-SRREG-00-0001 released by AKLNG.

The summary of the reports developed as a part of site investigation are listed in [Table 1.1](#).

Table 1.1: Summary of Reports

Report Title	AKLNG Document Number	Fugro Report Number
Project Execution Plan for 2015 Onshore and Marine G&G Program	USAL-FG-GRZZZ-00-002015-002	04.10140334-1
LNG Facilities Onshore Geologic Field Mapping Report	USAL-FG-GRZZZ-00-002015-004	04.10140334-2
Pipeline Marine Geophysical Survey Report - Route 1	USAP-FG-GRZZZ-10-002015-013	04.10140334-3
Pipeline Marine Geophysical Survey Report - Route 2	USAP-FG-GRZZZ-10-002015-014	04.10140334-4
LNG Facilities Marine Geophysical Survey Report	USAL-FG-GRZZZ-90-002015-010	04.10140334-5
LNG Facilities Probabilistic Seismic Hazard Analysis (PSHA) Report	USAL-FG-GRHAZ-00-002015-001	04.10140334-6
LNG Facilities Onshore Geophysical Survey Report	USAL-FG-GRZZZ-00-002015-005	04.10140334-7
LNG Facilities Onshore Geotechnical Data Report	USAL-FG-GRZZZ-00-002015-006	04.10140334-8

Report Title	AKLNG Document Number	Fugro Report Number
LNG Facilities Marine Geotechnical Data Report	USAL-FG-GRZZZ-90-002015-011	04.10140334-9
LNG Facilities Geologic Hazard Report	USAL-FG-GRHAZ-00-002015-002	04.10140334-10
LNG Facilities Onshore Groundwater Monitoring Well Installation Report	USAL-FG-GRZZZ-00-002015-007	04.10140334-11
LNG Facilities Onshore Hydrogeologic Report	USAL-FG-GRZZZ-00-002015-008	04.10140334-12
LNG Facilities Seismic Engineering Report	USAL-FG-GRZZZ-00-002015-003	04.10140334-13
LNG Facilities Onshore Integrated Site Characterization and Geotechnical Engineering	USAL-FG-GRZZZ-00-002015-009	04.10140334-14
LNG Facilities Marine Integrated Site Characterization and Geotechnical Engineering	USAL-FG-GRZZZ-90-002015-012	04.10140334-15

This report presents the geotechnical data collected during our 2015 G&G Program.

1.2 Purpose and Scope

The main purpose of this study was:

- to explore and evaluate subsurface conditions in the vicinity of the proposed marine LNG facilities for the AKLNG project, and
- to provide geotechnical and geophysical input for a site model and design of the marine LNG facilities.

Following is a brief summary of the field investigation program completed for this study. Additionally, detailed summary of the completed borings including their as-built coordinates, elevations, actual completion depths, etc. is presented on [Plate A1-1](#) in [Appendix A](#) of this report.

- Supervision and management of various field operations including but not limited to, seabed hazard evaluation; evaluating various site moves; and SIMOPS with other marine operations;
- Drilling a total of twenty-five (25) marine geotechnical soil borings with depths ranging from 47.1 ft to 305.4 ft and collecting geotechnical samples.
- Drilling a total of four (4) marine soil borings for sediment chemical testing (i.e. Tier 1 and Tier 2 sediment characterization) purposes with depths ranging from 18.5 ft to 20.5 ft and collecting samples.

- Performing field and laboratory tests on the selected samples to evaluate geotechnical engineering properties of subsurface soils;
- Performing nine (9) PS Logging tests measuring seismic shear wave velocities to a maximum depth of 292 ft below mudline;
- Generalizing subsurface soil stratigraphy based on the collected subsurface data;
- Assessing groundwater conditions when observable; and
- Preparing this geotechnical report summarizing our factual findings.

1.3 Applicability of Report

We have prepared this factual report for EMALL for use as geotechnical input for the design of the proposed Alaska LNG project. The scope of the explorations and tests performed in this report are for the Alaska LNG Project only. The tests were selected or developed based on our understanding of the project as described in this report and our discussions with Client representatives and their Contractors. The information presented in this report is intended to be used for the design of the project. Additional studies will be needed to complete the FEED level and final design stages of the project once the location of the structure/equipment and detailed loading conditions are available.

1.4 Limitations

Fugro makes no claim or representation concerning any activity or condition falling outside the specified purposes to which this report is directed. We have conducted our work using the standard level of care and diligence normally practiced by recognized engineering firms now performing similar services under similar circumstances. We intend for this report, including all illustrations, to be used in its entirety. The information presented in this report may not apply to locations not explored by borings or areas outside the project boundaries. This information should be made available to prospective users for information only, and not as a warranty of subsurface conditions.

1.5 Unit Conversions and Datums

The recommendations presented herein are based on the Imperial Unit System. [Table 1.2](#) provides a quick reference for conversion from Imperial Units to SI.

Table 1.2: Conversion Units

From Imperial System	To SI System	Divide by
Kips – k	Kilo Newtons – kN	0.224809
Kips – k	Mega Newtons – MN	224.809
Pounds/foot ² - psf	Kilo Newtons/meter ² – kN/m ² (kPa)	20.885
Pounds/foot ³ - pcf	Kilo Newtons/meter ³ – kN/m ³	6.3659
Feet – ft	Meters – m	3.2808
Inches – in.	Millimeters – mm	0.03937

All coordinates are reported in Zones AK3 AK4 AK5 North, NAD83 (NSRS 2007), and are in feet. Bathymetric elevations for marine areas are referenced to MLLW. The following formula is used to convert the elevations from MLLW to NAVD88:

- Elevation, in feet (NAVD88) = Elevation, in ft (MLLW) – 7.32 ft

Elevations presented in this report, and the corresponding illustrations and engineering plates are all referenced to the MLLW datum, unless noted otherwise.

2.0 GEOTECHNICAL FIELD EXPLORATION

2.1 General

Our scope of services for the geotechnical and geophysical program were based on Exhibit A – Scope of Work Document No. USAL-PL-GBZZZ-00-000001-000 dated June 29, 2015 (SOW). Our field exploration plan was generally based on the information provided to us in the above-listed document, however, the proposed scope of work was revised multiple times based on our discussion with AKLNG. A detailed project execution plan (PEP) providing our field procedures, Safety, Security, Health, and Environment (SSHE) plans, and quality plan for the proposed G&G program was submitted to AKLNG for review on March 2, 2015 (Fugro Document No. 04.10140334-1, AKLNG Document No. USAL-FG-GPZZZ-00-000002-000). Hazard Identification (HAZID) workshops were conducted based on our draft execution plan along with representatives from various technical disciplines, subcontractors, field SSHE representatives, site managers, and project manager. Based on the workshop discussions a revised work execution plan was submitted on April 6, 2015. Readiness review meetings were also conducted before commencing the fieldwork. Additional revisions were needed as the field work progressed and a final copy of the work execution plan was submitted on August 23, 2015. Additionally, a one-day site induction meeting was conducted with every individual working on the site for this project by Fugro/AKLNG SSHE representatives.

Overall the field services for the marine geotechnical program consisted of drilling and sampling geotechnical borings to support geotechnical engineering evaluations, conducting drive sampling, (an alternative sampling method to collect material for chemical evaluation of dredge material), and performing PS logging within selected borings. Geotechnical field services were completed between August 18, 2015 and November 4, 2015.

Summary of the completed borings are provided on [Plates A1-1](#) in [Appendix A](#). Locations of soil borings, drive sampling, and PS logging locations are presented on [Plate 3](#) and [Plate 4](#) of this report. A detailed description of our equipment/vessel details and methodologies about the exploration activities are described in our PEP. Additionally, various method statements were prepared and submitted to AKLNG as a part of the proposed fieldwork. Copies of all the submitted method statements are presented in [Appendix F](#) of this report that provide details on equipment/vessels and methods used in the field to complete the marine geotechnical investigation. A brief description of various field activities is provided in the following sections of this report.

2.2 Staging Area

The field activities for the entire geotechnical and geophysical program were based in Nikiski, Alaska utilizing office, warehouse facilities and dockside space and assistance provided by ASRC (Arctic Slope Regional Corporation). Crew, material, and soil sample transfers were performed along the beach area adjacent to the ASRC Rig Tenders quay. ASRC facilities were strategically

located within close proximity of field operations and aided support in providing continuity with field operations.

2.3 Vessels and Equipment

Marine geotechnical drilling operations were conducted from Fugro's purpose-built "Skate 3" jack-up barge (JUB) using a Comacchio MC1200 drill rig. Crew transfers were conducted using a landing craft vessel, "My Marie", (LCV) or as a secondary means JUB's dedicated rigid inflatable boat (RIB). Material and soil sample transfers between the JUB and beach area adjacent to the ASRC Rig Tender Quay were also executed by the LCV.

A tug boat, "Norman O", was also present full time on site during the operations, to assist the JUB with the moves between locations due to the strong tidal currents on site. The tug boat also acted as the security vessel to ensure the JUB is not boarded or vandalized when unattended.

Specifications for the vessels and equipment used for the marine geotechnical investigation are presented in [Appendix A](#).

2.4 Permits

Permits for marine drilling activities for 2015 geotechnical investigation in Cook Inlet were conducted under United State Army Corp of Engineers Nationwide Permit #6 (AKLNG Document No. USAI-P2-SGPER-00-000001-003) and Alaska Pollutant Discharge Elimination System (APDES) Permit AK0062278 (AKLNG Document No. USAI-P2-SGPER-00-000002-003). Permits were obtained by AKLNG and were delivered to Fugro through Aconex document control portal. A permit deconstruction process was conducted by AKLNG to clearly communicate the requirements of the permits with Fugro crews prior to start of work.

2.5 Preplanning

Prior to the commencement of the field activities, a thorough planning was performed by Fugro and AKLNG representatives using multiple safety and quality tools, and conducting various assessment and analyzes. As mentioned above, Fugro developed a PEP including Emergency Response Plan (ERP), Environmental Management Plan (EMP), Method Statements for major operations and assisted AKLNG for developing the Best Management Practices Plan (BMPP). In addition, the below listed meetings were performed periodically to ensure the preparedness for the field activities:

- a) Hazard Identification (HAZID): Meetings performed and HAZID forms reviewed in order to identify and rate the risks/hazards and agree what controls could be put in place to eliminate or reduce the potentiality of the hazards to an acceptable level (see Fugro PEP, AKLNG Document No. USAL-FG-GPZZZ-00-000002-000).
- b) Readiness Review Meeting: Meetings were held to test the preparedness of each item crucial for the work execution via an official checklist. The checklist was compiled by AKLNG Site Manager with the aid of the lead names for each task.

- c) Webmapper Updates: Webmapper is an online GIS viewing and plotting tool developed by EXP (a subcontractor to AKLNG) that gives the ability to explore, visualize and share GIS information. All project mapping information is uploaded to Webmapper in order to receive the final approvals from AKLNG. This tool was used before, during and after the field operations to ensure the effective data sharing between multiple entities involved with the project.

2.6 Notifications

Due to the complexity of the work in Cook Inlet waters a notification procedure was established including Notice to Mariners, Notifications to Local Emergency Services and Set Net Leaseholders in the proximity of the project area.

- a) Notice to Mariners: A notice to mariners (NTM) was issued to the United States Coastguard to advise mariners of important matters affecting navigational safety, including location of the works area, details of the marine vessels that will be operating within the area and required navigational exclusion areas from the operational marine plant.
- b) Set Net Lease Holders: It was identified that within the LNG area there are several set net fishing leases which have subsea equipment that would pose a hazard to the JUB. Through coordination with the lease holders the project team was able to;
 - i. Locate the subsea equipment and formulate a digital model that was entered into the JUB navigation and positioning system. This allowed the JUB to plan the movement/transit routes between locations avoiding the subsea equipment and orientate the JUB to prevent damage to subsea equipment when jacking up.
 - ii. Reach agreement with the lease holders to place marker buoys onto the subsea equipment to aid safe navigation of the JUB assist vessels.
- c) Local Emergency Services: Due to the remote location and challenges face in casualty management from marine vessels early coordination with the local Emergency Services was vital in the planning of the project. Through a number of meetings with the local Fire Chief a workable Emergency Management Plan was developed for the project. Furthermore, all the local fire fighters and paramedics visited the JUB for familiarization tours of the JUB.

2.7 Equipment Inspections

Upon the completion of the mobilization of all marine equipment an independent marine inspector (Ron Bennet) that was approved by AKLNG was contracted to investigate whether the vessels were in compliance with all marine regulations and safe to conduct the marine operations planned. The inspector coordinated with the USCG, INSB and AKLNG Safety Security Health and Environment representatives (SHHE) to ensure that any project specific requirements were met.

In addition to the third party inspection, Port State Inspection was also required for the foreign marine vessels that wish to enter or work in US ports or waters for the purpose of verifying that the competency of the master and officers on board, and the condition of the ship and its equipment comply with the requirements of international conventions (e.g. SOLAS). Hence, an inspection was performed by United States Coastguard (USCG) prior to start of the field program.

2.8 Hazard Studies

Earthquake integrity for the JUB was established using a combination of natural period specific hazard curves and a structural analysis of the JUB. Additionally, a thorough, all party, risk analysis was initiated, and additional mitigation measures were implemented to reduce the risk.

Also, prior to commencing the works, a desktop study was performed to identify any potential subsea obstacles or hazards utilizing the bathymetry, side scan, and magnetometer data collected by Fugro during the 2014 G&G program. Additionally, as mentioned earlier with the assistance from set-net lease holders, marker buoys were placed onto the subsea equipment and a map indicating the locations of the clump weights was developed for navigation of the JUB and the support vessels. Bathymetry and clump weight location datasets were uploaded to the navigation systems of the vessels for continued evaluation of the target locations for the duration of the site investigation.

2.9 Geotechnical Borings

A total of twenty five (25) marine geotechnical borings were drilled during the 2015 site investigation program (see [Plate 3](#) for boring locations). The 2015 marine boring program was conducted between August 18, 2015 and November 4, 2015.

Drilling and sampling equipment schematics, rig specifications and pictures are presented in [Appendix A](#).

Field activities related to geotechnical borings, drilling and sampling methods, geophysical borehole testing and borehole completion are discussed herein.

Method Statements (MS) were prepared for each major activity as part of the preplanning of the field activities. The MS documents for this project are included in [Appendix F](#) of this report.

2.9.1 JUB Logistics. The JUB, comprises seven pontoons, four leg bearing assemblies, and four 36 m (118 ft) long legs, and was mobilized to the ASRC dock in modules via land transportation. The assembly took place at the ASRC dockside using a 300-ton crane and multiple loaders available at ASRC Rig Tenders Terminal, upon a thorough equipment and material check, between August 1, 2015 and August 16, 2015.

Historical data and forecasts related to currents, wave heights, weather conditions, including wind speed and directions were evaluated to plan the moves between locations using several websites, such as National Oceanic Atmospheric Administration (NOAA, marine.weather.gov), Windfinder (www.windfinder.com) and Alaska Ocean Observing System (www.aos.org). The boring priority

list provided by AKLNG was also considered while development of the movement plan. However, the Barge Master was the final responsible person for coordinating positioning of the jack-up depending the actual weather conditions. Once on location the JUB was jacked above the water level to allow a safe working operation. The JUB was elevated above seabed to an elevation equal to at least water depth plus the maximum tidal variation plus the maximum expected wave height (Hmax) plus a safety margin. The JUB was also equipped with a Valeport 106 current meter which recorded the actual currents (see [Appendix A](#) for specifications).

Following completion of the drilling, sampling, and testing of each location, equipment was sea-fastened for the move, and the rig was jacked down for movement to the subsequent location. Due to the significant tidal swing and strong current characteristics of the Cook Inlet all moves were performed during slack tides.

The JUB is self-propelled by means of a hydraulic thruster, however a tug boat, "Norman O", was used for the majority of the moves between locations due to the strong tidal currents in Cook Inlet. Before the transit initiates, the vessel masters of the jack-up and tow vessel carried out a risk assessment including the factors such as tide, wind and wave direction and magnitude, weather, and tow distance, navigational requirements, access limitations at the work area (e.g. clump weights close to the beach locations) and stability of the equipment involved. Whilst towing the tug Captain and Bargemaster communicated frequently via VHF/UHF radio to assess progress and monitoring weather conditions.

Crew or cargo transfer was carried on with an LCV (see [Section 2.3](#)) between the beach adjacent to the ASRC Quay and the JUB. Sample boxes were unloaded when weather and tidal conditions are suitable, and ideally at times of high water or when the jack up is on the water (legs in the sea bed) so as to minimize the distance for the transfer. All sample box transfers were take place using the LCV for details about sample storage and shipping (see [Section 2.14](#)).

The field services for the Skate 3 were performed on a 24-hour basis using two crews. Crew transfer was conducted aboard the JUB using an LCV or as a secondary means the dedicated rigid inflatable boat (RIB) captained by the on-shift Bargemaster or qualified coxswain. Transfers were conducted from the beach area adjacent to the ASRC Quay and from the dockside depending on the tide level at Nikiski.

Crew transfers comprised crew embarking on to the landing craft (maximum 8 people), transferring to the JUB and disembarking via the fixed access ladder on the leg of the JUB.

Further details of the crew change procedure are given in the crew change method statement [Appendix F](#) including limiting factors.

2.9.2 Surveying and Positioning. Once JUB was jacked-up on location, a GPS system (Fugro Starfix Positioning System) was used to record the location of the exploration at the start of each drilling. Coordinates of the actual locations were reported in the NAD83 NRS2007 and WGS84 coordinate systems.

Surveyed as-built coordinates and elevations for the marine explorations are presented in [Appendix A](#), also included on the respective boring logs and “Starfix Mean Positioning Report” documents presented in [Appendix B](#). Once the Skate 3 was close to the borehole location, the Bargemaster maneuvered the platform onto location by spinning on one spud leg with assistance from thrusters. The tug remained nearby until all four legs of the platform were spudded and no further assistance was required.

Before the drilling operations started, the Skate 3 was elevated to an appropriate level, with adequate clearance above sea-level, to allow for the safe operations, considering the anticipated sea state and tidal conditions. Positioning reports were generated for each location, they are presented in [Appendix B](#).

2.9.3 Water Depth and Seabed Elevation. Once the platform was positioned at a location, water depth measurements were taken prior to the commencement of drilling operations. Seafloor elevations were then calculated and referenced to datum NAVD88. Measured and calculated elevations are presented in [Appendix A](#), including point data interpolated using Fugro 2014 bathymetry data.

2.9.4 Drilling and Sampling. The drilling operations were conducted using a Comacchio MC1200 drill rig with Fugro designed CR2 drill derrick mounted on the Skate 3 JUB. The borings were performed through the centre of a 400 mm diameter moon pool. Schematics of drill equipment and methods that were implemented during drilling and sampling are in presented in [Appendix A](#).

Drilling Methods. Wet rotary drilling techniques were used for the marine site investigation, comprising the use of two sizes of conductor casing, drilling rods (NWX) and Geobor S coring barrel.

Upon positioning at each boring location a conductor casing was run from deck level to the sea floor to serve as a conduit for the coring string. A 7-in OD conductor casing was solely used initially during the drilling of the twelve (12) borings, however due to the existence of the strong currents a slaked 12-inch OD conductor casing was added to provide additional stability to the smaller sections operating inside while drilling in strong currents. The penetration of the 12-in OD casing ranged between 0.3 ft and 3.0 ft below the seafloor under self-weight at the other 13 boring locations.

Wet rotary drilling was accomplished by advancing a rotating drill pipe into the subsurface with the Comacchio MC1200 drill rig. The 7-in OD casing pipe assembly was fitted with a Terracore drill bit at the bottom that allowed the drill string to progress downward into the subsurface. Once reached the required sampling depth the NWX rod string was then deployed with the appropriate sampler attached to the tip. When hard/dense strata were encountered Geobor S wireline casing with appropriate drill bit was lowered down inside the 7-in OD casing for borehole advancement and sampling by coring. When recovery was not achieved with coring, non-coring device (NCD), such as drag bit or tri-cone, was used for borehole advancement until the next sampling interval.

PS Suspension Logging tests were performed at 9 borehole locations after completion of geotechnical sampling ([Section 2.11 PS Suspension Logging Test](#)). As the measurement point on the logging probe is approximately 12.5 feet above its base, it is customary to drill 15 ft to 20 ft deeper than the last geotechnical sampling interval (referred to as a “rat hole”) to facilitate deployment of the logging probe. The rat holes were drilled without sampling using Geobor S coring and if necessary NCD drilling techniques.

To adhere to the permit requirements, the mud was recirculated while drilling. As the drill pipe progressed into the subsurface, drilling fluid was pumped from the mud tank, through the top drive mechanism, down the pipe, through the drill bit, and up the annulus of the drilled hole (space between the pipe and the drilled hole) where it returned back into the mud tank.

Drilling fluid, consisted primarily of sea water and Guar Gum, was used in the rotary and core drilling process to cool the bit, remove the cuttings from the drill hole, and to stabilize the boring walls during the drill process. The water was pumped from the sea into the holding tank aboard the deck of the jack-up by a submersible pump suspended from the drilling deck into the ocean. When required, environmentally friendly guar gum drilling additives was added to the water to stabilize the borehole and provide for circulation during the drilling and coring process. The additives were mixed on-board in the mud tank on an as-needed basis.

The returning drill flush was re-circulated through an on-board system that utilised a “mudslayer” (mud management unit and settlement tank installed on the JUB) to remove all solids and a settlement tank with internal weir system. Once cleaned the drill flush was pumped into either a holding tank for return into the drill string or a drilling mud tank depending on the requirements of the ground being drilled. The drilling fluids were then collected in a baffled mud tank adjacent to the moon pool secured to the side of the JUB. Upon completion of the boring the drilling fluids and excess cuttings were stored in 55-gallon drums on-board the JUB.

Sampling Methods. Sampling was performed continuously at (2.5-ft intervals) within the upper 40 feet, at 5 feet intervals to a depth of 100 feet, and at 10 feet intervals below 100 feet of depth and at changes in soil stratification, to termination depth of each boring, as per the requirements outlined in AKLNG SOW and Fugro PEP.

Undisturbed samples of cohesive soils were obtained by pushing a 3-in OD, thin-wall tube (Shelby) about 3 ft or to refusal, whichever occurred first. The field procedure for cohesive soil sampling was conducted in general accordance with the Standard Practice for Thin-Walled Tube Sampling of Soils (ASTM D1587). Pocket penetrometer and/or hand Torvane readings were generally conducted in the recovered soil materials exposed in the bottom ends of the tube samples where appropriate and when possible. The readings are reported on the respective boring logs presented in [Appendix B](#) and on the summary of test results in [Appendix E](#).

- Pocket Penetrometer Tests. This test is performed by slowly pressing a small flat-ended cylindrical metal rod (6.3 mm diameter) into the flat surface of the soil sample through a spring until it is embedded a predetermined depth within the sample. The resistance to

penetration is recorded by the spring that is calibrated to read the unconfined compressive strength of the soil based on spring compression.

- Torvane Tests. In the Torvane test, a small hand-operated device, consisting of a metal disc with thin, radial vanes projecting from one face, is pressed against the flat surface of the soil until the vanes are fully embedded. The device is then rotated through a torsion spring until the soil is sheared. The device is calibrated to indicate the undrained shear strength of the soil directly from the rotation of the torsion spring.

Disturbed soil samples were obtained by driving a 2-in OD split-barrel standard penetration test (SPT) sampler in general accordance with the Standard Penetration Test (SPT) procedure described in ASTM D1586. The SPT N-values, defined as the number of blows required for a 140 lbs hammer falling 30 in to drive the split-barrel sampler the final 12 in of the 18 in sampling interval, are recorded during sampling and are presented on the boring logs presented in [Appendix B](#).

Once hard/dense soil conditions were encountered triple-tube Geobor S 146 mm OD (5¾ in OD) wireline coring assembly was deployed and drilling was accomplished by rotary drilling procedures in general accordance with the Standard Practice for Diamond Core Drilling for Site Investigation (ASTM D2113) to achieve the sampling depths per above mentioned requirements. The wireline core assembly allows quick retrieval of the inner core barrel from the downhole core/drill string using a hydraulically operated wireline winch and an overshot retrieval tool. The hard/dense soils were generally continuously cored at 5-ft intervals to total depth. However, depending upon the soil characteristics (e.g. presence of cobbles, boulders affecting recovery) and in order to achieve the desired sampling depths, some core runs were shortened. Full core runs 5 ft were re-established as conditions permitted. When desired sampling depth was reached NWY assembly with SPT or thin wall tube was run inside the Geobor string for further sampling. Additional samples (i.e. grab samples) were saved from the cores collected as part of Geobor drilling techniques in order to refine the stratum descriptions. Both the driller and the engineer/geologist on shift generated accurate logs of all activities performed, observations during drilling and all recovered soil samples.

2.10 SPT Hammer Energy Calibration

Fugro performed energy measurements on two hammers that were utilized to collect Standard Penetration Test (SPT) samples. The purpose of SPT energy calibration described herein was to determine the average energy transferred from the exploration rig hammer to the drilling rods during SPT sampling. The energy testing methods were performed in accordance with the ASTM D4633 Standard Test Method for Energy Measurement of Dynamic Penetrometers. SPT-N values reported herein are field values. The measured energy may then be used to correct the measured SPT N-values to a standardized energy level, typically 60% of the theoretical energy (N_{60}). [Appendix C](#) provided details and the results of the SPT automatic hammer calibration tests.

2.11 PS Suspension Logging Test

PS Suspension Logging data was acquired within the nine (9) marine borings (MB-03, MB-06, MB-13, MB-17, MB-19, MB-21, MB-22, MB-23 and MB-27) to measure the in-situ compression and shear wave velocities. This data can be used to assess the dynamic soil properties to assist with determining the low strain dynamic soil properties and for site response models. PS Suspension Logging Method.

The data was acquired with Robertson Geologging PS suspension Logging probe (specifications provided in [Appendix D](#)), a Robertson Geologging 500 m (1640 ft) winch, Micrologger logging console, and the Robertson Geologging Digital Suspension Logging software.

2.11.1 PS Suspension Logging Method. The PS suspension logging tool is a single probe that contains a seismic source and two sets of receivers, separated by a 1 meter (3.28 feet) interval. The probe is operated within uncased borings and during data collection, three individual shots are recorded on separate data channels, which are optimized for positive and negative polarity shear waves and compression waves, respectively. The operator can view the data in real-time and if needed, can record multiple files at each test depth or stack multiple shots in order to increase the signal to noise ratio and facilitate identification of the compression and shear wave arrivals at each of the receivers. By analyzing the relative differences in the arrival times of the shear and compression waves at the two sets of receivers, the velocity of the 1-meter soil column between the receivers can be calculated.

The main advantage of the PS suspension logging method, when compared to other more traditional velocity measurements, is that the source is local to the receivers; which both eliminates the need for additional equipment on the seafloor and reduces most depth-related limitations. The main drawback is that as the measurements are recorded within an open-hole, borehole stability is therefore critical for the success of the method.

The PS suspension logging was conducted promptly after the completion of the geotechnical drilling and sampling. For all borings, the logging was conducted in multiple, separate logging runs, after removing sections of the drill casing. The amount of casing removed was based on the drillers' observations and preliminary geotechnical soils classification tests, in an attempt to maintain boring stability. Where weak strata were identified, the casing was withdrawn so that the base of the casing was 5 – 10 feet below the weak strata and the lower, open hole section of the boring was logged. Additional casing was then removed and the probe re-lowered into the boring to a target depth that overlaps the first logging run below the weak strata, and logging was continued.

For each logging run, the PS suspension logging probe was deployed by rigging the wireline cable through a sheave suspended from derrick of the drill rig. The probe was lowered into the drill casing until the cable-head of the probe was at the top of the casing. At this point, the logging

system depth reference was set relative to the mudline, which was calculated by using the deck height above the mudline (provided by the barge-master) and the height of the casing above deck. The probe was then lowered to the base of the target section of the boring and data was recorded while withdrawing the probe and temporarily holding it stationary at each test elevation.

The data recorded was assessed in real-time by the operator and (where necessary) adjustments to the number of individual stacks, record length and sample interval were made in order to adequately capture the compression and shear wave arrivals. In many instances, multiple files were recorded at each test elevation until the operator was satisfied that clear, consistent compression and shear wave arrivals were recorded.

Prior to withdrawing the probe from the boring, the depth reference point was reoccupied to ensure the depth measurements were within tolerance. In order to correct the depth of the wireline measurements, the offset from the cable-head to the probe measurement point (from manufacturer specifications) was applied using post-processing software.

Further details of the PS suspension logging method is provided under the method statement in [Appendix F](#) of this report.

A summary of the borings survey with the PS suspension logging method and the individual logging runs conducted are summarized in [Table 2.1](#), below. The log depths provided are all referenced to the measurement point of the probe, which is approximately 12.5 feet above its base and 8 feet below the cable-head. Therefore, it is customary for the log start depth to be 15 – 20 feet shallower than the drilled depth of the borings and the log end depth to be 5 – 10 feet shallower than the casing depth.

Table 2.1: Summary of PS Suspension Logging Tests

Boring	Drilled Depth (ft)	Logging Run	Casing Depth (ft)	Log Start Depth (ft)	Log End Depth (ft)	Comments
MB-03	162.7	1	112.9	144.7	107.6	-
		2	64.0	114.2	58.1	-
		3	35.1	41.0	27.6	Wireline went slack at 42.6ft depth; possible hole collapse
MB-06	149.3	1	88.6	128.9	81.0	Wireline went slack at 132.2ft depth; possible hole collapse
		2	39.4	65.0	37.2	After removing 7" casing, boring collapsed at 80.7ft depth
MB-13	164.0	1	101.4	142.4	93.2	After removing 7" casing, boring collapsed at 144.3ft depth

Boring	Drilled Depth (ft)	Logging Run	Casing Depth (ft)	Log Start Depth (ft)	Log End Depth (ft)	Comments
		2	32.5	96.5	24.3	-
MB-17	213.2	1	111.5	165.7	104.7	Wireline went slack at 166.7ft depth; possible hole collapse
		2	92.2	120.1	86.9	-
		3	61.0	96.8	55.4	-
		4	33.1	63.6	53.5	-
		5	13.1	60.0	-6.6	-
MB-19	167.3	1	91.9	132.7	83.5	Wireline went slack at 150.3ft depth; possible hole collapse
		2	23.0	79.6	15.6	-
MB-21	164.0	1	125.6	150.3	118.8	Wireline went slack at 151.6ft depth; possible hole collapse
		2	96.8	137.8	89.9	-
		3	49.5	96.5	46.9	-
		4	13.1	56.6	3.9	-
MB-22	151.2	1	26.6	63.4	17.5	Wireline went slack at 77.4ft depth; possible hole collapse
MB-23	305.4	1	265.7	292.0	258.8	-
		2	220.1	264.4	213.2	-
		3	169.9	222.4	163.0	-
		4	112.2	140.1	103.7	Wireline went slack at 143.0ft depth; possible hole collapse
		5	78.7	113.2	73.5	-
		6	35.8	70.2	30.5	Wireline went slack at 72.5ft depth; possible hole collapse
		7	12.5	27.6	8.9	-

Boring	Drilled Depth (ft)	Logging Run	Casing Depth (ft)	Log Start Depth (ft)	Log End Depth (ft)	Comments
MB-27	164.0	1	87.6	148.6	79.7	Wireline went slack at 150.3ft depth; possible hole collapse
		2	23.0	30.3	15.6	Wireline went slack at 44.5ft depth; possible hole collapse

From [Table 2.1](#) above, it is apparent that the PS suspension logging operations for this project were challenging, as for many of the individual logging runs, the wireline went slack prior to reaching the target depth, suggesting possible collapse of the borings. These possible collapses occurred predominantly at localized depths within sand or gravel strata. This is likely to be a direct result of the restrictions imposed by the permit requirements, which excluded the use of heavy drill muds that are customarily used to maintain the integrity of the boring wall in granular materials.

2.11.2 Data Processing. Analysis of the PS suspension logging data was carried out using the Robertson Geologging PS Log Analysis software package in which all of the data files recorded were individually assessed. During this process, many of the data files recorded in close proximity (within 5 – 10 feet) of the bottom of the drill casing (and therefore affected by mechanical vibrations from the jack-up barge) were omitted. Similarly, where multiple files were recorded at the same test elevation, the initial suspect measurements were discarded. For the remaining files at all test elevations, compression and shear wave arrivals times for each receiver were identified and the difference used to compute the respective interval velocities. These interval velocities have been presented on [Plates D2-1 & D2-2, D3-1 & D3-2, ...](#), through [Plates D10-1 & D10-2](#) for borings MB-03, MB-06, MB-13, MB-17, MB-19, MB-21, MB-22, MB-23 and MB-27, respectively.

Prior to using the computed interval velocities in further analyses, it is important to gain an understanding of the possible limitations and uncertainties associated with the PS suspension logging technique. For the compression wave velocities, it is worth considering that the measurements are taken within a fluid-filled boring. As compressional waves can transmit through fluids, a pressure wave will travel from the source to the receivers through the borehole annulus (between the probe and the wall of the boring) and within the flushed and/or invaded zone of the borehole formation. This pressure wave will propagate at the velocity of the drill fluid, which for guar gum, is on the order of 5,000 – 5,500 ft/s and will prohibit the detection of any slower compression waves travelling within the (uninvaded) borehole formation. Therefore, should the calculated P-wave velocity be within this range, it is likely that it is due to compression waves travelling within the borehole annulus (or within the flushed and/or invaded zone) and rather than being representative of the borehole formation. To illustrate, the P-wave velocities from boring MB-21 between -80 and -140 ft elevation ([Plate D7-1](#)) appear to be within this range and therefore may not be representative of the surrounding formation.

As shear waves do not propagate within fluids, the above observation does not affect the calculated shear wave velocities. However, as the shear waves travel within the borehole wall and surrounding formation, they sample a combination of the flushed, invaded and uninvaded zones surrounding the boring; due to drilling disturbance, the shear wave velocity of the flushed and invaded zones may theoretically be lower than the uninvaded formation. Therefore, should the thickness of the flushed and invaded zones be appreciable, the PS suspension logging technique may yield anomalously low velocities. Although no data was available to assess the flushed and invaded zones for this project, as previously mentioned, the permit requirements prohibited the use of heavy drilling muds and therefore the thickness of the mud cake was likely to have been minimal. For permeable strata (sands and gravels), this in turn means the thickness of the flushed and invaded zones may have been appreciable.

When reviewing the shear wave interval velocities, it has been noted that within permeable strata a certain degree of scatter is observed within the data. To illustrate, this scatter can be observed in the S-wave velocities from boring MB-23 below -176 ft elevation ([Plate D9-2](#)) where the strata were predominantly sands with some silts and occasional gravels. It is considered unlikely that this scatter is due to measurement errors, as for test elevation where multiple data files were recorded, the velocities are generally within 200 ft/s of each other (note the 'pairs' of data points between 145 and 165 ft depth). The scatter has therefore been associated with the formation. Whether it is the presence of the flushed and/or invaded zone being of appreciable thickness (resulting in anomalously low velocities) or the presence of frequent cobbles and boulders in close proximity to the boring (resulting in anomalously high velocities), or a combination of both, is unknown from the PS suspension logging data alone.

In order to obtain an understanding of the (low strain) dynamic soil properties, the established interval velocities were used to calculate the Poisson's ratio, shear modulus, Young's modulus and bulk modulus for each test interval, using the following equations:

Poisson's ratio	$\nu = \frac{V_p^2 - 2V_s^2}{2(V_p^2 - V_s^2)}$
Shear modulus	$G_{\max} = \rho V_s^2$
Young's modulus	$E = 2G_{\max}(1 + \nu)$
Bulk modulus	$K = \frac{E}{3(1 - 2\nu)}$

Where V_p = Compression wave velocity

V_s = Shear wave velocity

ρ = Submerged unit weight

The calculated Poisson's ratios are presented on [Plates D2-3, D3-3,...](#), etc. through [Plates D10-3](#). Profiles of the assumed submerged unit weight values (inferred from the laboratory tests conducted on the soil samples and literature review) have been presented on [Plates D2-4, D3-4,...](#), etc. through [Plates D10-4](#). The calculated shear modulus, Young's and bulk modulus values are presented on [Plates D2-5 – D2-7, Plates D3-5 – D3-7,...](#), etc. through [Plates D10-5 – D10-7](#) for borings MB-03, MB-06, MB-13, MB-17, MB-19, MB-21, MB-22, MB-23 and MB-27, respectively.

It should be appreciated that the Poisson's ratio, low strain shear, Young's and bulk modulus values have all been calculated using the compression and shear wave velocities derived from the PS suspension logging data, under the assumption that each subsurface interval is homogeneous and isotropic. Similarly, the calculated dynamic soil properties are representative of soil behavior at (very) low strains and are typically 1 – 2 orders of magnitude greater than those calculated from static pressure meter or dilatometer tests. Finally, due to the uncertainties associated with the velocities measured the PS suspension logging technique (outlined above), similar uncertainties existing within the calculated dynamic soil properties presented.

2.12 Tier 1 (T1) and Tier 2 (T2) Sediment Sampling

Two locations, DS-4 and DS-5 (See [Plate 3](#)), were selected by AKLNG to conduct the T1/T2 sampling at the proposed marine test pit location to assist for the future dredging work. Initially, 2015 Marine Site Investigation SOW included marine Vibracore sampling for dredge material testing purposes. However, due to the operational difficulties with deployment of the Vibracore equipment (i.e. challenging tides and weather conditions in Cook Inlet in late season), alternative sampling methods were sought for collection of "Tier 1 and Tier 2 sediment characterization" (T1/T2) samples from Skate 3 JUB.

Field execution of the T1/T2 sampling included:

- U-100 Hammer sampler. 18-in long and approximately 4-in ID PVC liner was driven into the seabed with a downhole drive hammer (U-100) attached to a winch wire, then retrieved to deck. The remaining material was cleaned out of the hole to the next sampling interval with a 7-in bailer, then the sampler was deployed again. This method is referred as "Drive Sampling".
- Core barrel. Samples were collected in 5 ft long and approximately 4-in ID PVC liner that was inserted in triple-tube Geobor S 5¾ in OD wireline coring assembly. This method is referred as "Core Sampling".

Once on location, the 12-in OD conductor casing was deployed and set into the seabed to stabilize the drilling environment. Once the conductor casing was set, the 7-in OD casing was deployed to the sea bed. The 18-in long PVC sampling tube was inserted into the ground with drive sampler (U-100 hammer sampler).

Drive sampling was performed up to at least 15.5 ft, every 2 ft with 0.5 ft gaps between samples when no refusal was encountered. When drive sampling refused due to dense/hard material or cobbles/boulders, sampling was carried on with continuous core sampling.

In order to prevent contamination of the soils, no drilling fluid was used or circulated during T1/T2 sampling operations. In addition, all liners and cutting shoes were decontaminated on the JUB with a “cleaning fluid mix”, consisted of Alconox powder and potable water that was supplied from ASRC Rig Tenders, and then triple rinsed.

As the preferred method (i.e. drive sampling) does not provide continuous samples, each sampling location was supplied with a pair of borings. A second boring, adjacent to the first one, was performed with the same method, but with an offset in sampling depths in order to fill the information gaps (i.e. 0.5 ft) between drive samples in the first boring. Boring locations for DS-4A/DS-4B and DS-5A/DS-5B are shown on [Plate 3](#) and associated boring logs for DS-4A/DS-4B and DS-5A/DS-5B are presented in [Appendix B](#).

It should be noted that field recorded soil observations presented on the logs for DS-4A/4B and DS-5A/5B were refined based on the soil descriptions and the results of the laboratory tests performed by CH2M on individual and combined soil samples, obtained from explorations DS-4A and DS-4B. CH2M laboratory results and interpreted soil descriptions are presented in document USAL-CH-JRZZZ-90-000032-000 Test Pit Dredge Material Characterization Report (Rev.0).

2.13 Borehole Completion

As per the permits listed in [Section 2.4](#), the marine borings were not backfilled and the borings were allowed to cave-in once the drilling and sampling was completed.

Artesian conditions were encountered in Boring MB-24 and hence backfilling using cement and bentonite was performed. Details about the conditions encountered in MB-24 and subsequent plugging/backfilling activities were submitted to AKLNG in a memorandum (AKLNG Document No. USAL-FG-GRZZZ-90-002015-017).

2.14 Sample Storage and Shipping

Fugro’s field geotechnical engineer visually classified and logged the recovered soil samples collected at each boring location. The recovered samples were labeled and transported to the Fugro onsite laboratory. The following outlines our general procedure for sample storage and shipping:

- Soil samples were immediately logged, sealed, and labelled with project number, date, depth, boring number, etc. upon collection.
- All disturbed samples were photographed in color, packaged, and labeled for further storage and shipping. Shelby tubes were capped and sealed with electric tape, and placed in appropriate containers for storage and shipment.

- Transportation was provided by the jack-up's support vessel (LCV) and occurred at regular intervals throughout the drilling scope. Additionally, Shelby tubes were further sealed with wax at the on-site laboratory for further storage and shipping.

A portion of the samples were tested at the onsite laboratory located at ASRC Rig Tenders facility in Nikiski, Alaska and then the soil samples were packaged for shipment to the Fugro's laboratory located in Houston, Texas under chain-of-custody documentation. Laboratory tests conducted at the onsite laboratory in Nikiski, Alaska are marked with a superscript "a" in the summary of test results presented in [Appendix E](#).

2.15 Drill Cuttings and Discharge

The drilling mud used was collected, re-conditioned and re-used through a mudslayer mud management unit and settlement tank installed on the JUB. As mentioned earlier, all reconditioned drilling fluids were pumped into the settlement tank that included 3 No., 55-gallon collection barrels, separated by baffles. Any remaining silt was allowed to filter and settle at the base of the barrels. Once the barrels were full, or moving of the JUB is required, they were collected by the JUB's LCV. The barrels were lifted using the on-board crane and placed onto the LCV deck and then transferred to ASRC for further disposal. For information on how this waste is disposed, please refer to MS005 Spoil Removal in [Appendix F](#).

As per the APDES discharge permit requirements daily observations on drilling fluid losses and deck drainage discharge were calculated and documented by onboard geologist/engineer using a form created by AKLNG and Fugro. Additionally, Static sheen tests were performed at the end of each exploration. APDES daily observation and static sheen test forms are presented in [Appendix B](#).

3.0 LABORATORY TESTING

3.1 General

The laboratory-testing program was designed to evaluate pertinent engineering properties of the foundation soils. All laboratory testing was performed at Fugro laboratories located in Nikiski, Alaska and Houston, Texas.

A majority of the basic laboratory tests (e.g., water content, particle size, Atterberg Limits) were assigned by the Field Geotechnical Engineer after logging the borings at the time of drilling. Soil samples were initially transported to the Fugro laboratory at Nikiski. Some selected tests were performed at Nikiski laboratory and all the remaining samples were then shipped to Fugro laboratory located in Houston, Texas. Laboratory tests conducted at the onsite laboratory in Nikiski, Alaska are marked with a superscript “a” in the summary of test results presented in [Appendix E](#). Additional laboratory tests, including advanced testing (e.g., triaxial, consolidation, monotonic and cyclic shear tests etc.), were assigned by Fugro Geotechnical Engineers in Houston. Critical samples were examined through X-ray Radiography prior to laboratory testing to determine sample disturbance and homogeneity. Classification tests, triaxial unconsolidated-undrained compression (UU) tests, consolidation tests, corrosion potential tests were performed on selected soil samples. Further testing will be performed based on the engineering evaluations and calculations (including resonant column, monotonic and cyclic shear tests etc.), and results will be provided in the final version of this report.

The following sections present a brief description of the soil tests performed on the selected samples. Laboratory tests were performed in general accordance with ASTM standards and are summarized in [Table 3.1](#).

3.2 Classification Tests

The classification tests included tests for natural water content, specific gravity, liquid and plastic limits (collectively termed Atterberg Limits), sieve analysis, material finer than the No. 200 sieve (percent fines), and hydrometer tests. These tests aid in classifying the soils and are used to correlate the results of other tests performed on samples taken from different borings and/or different depths. The results of these tests are presented on the boring logs in [Appendix B](#) and in summary of test results tables in [Appendix E](#) on [Plates E1-1](#) through [E1-33](#). Grain size curves and plasticity charts are also presented in [Appendix E](#) of this report, on [Plates E2-1](#) through [E2-35](#) and [E3-1](#) through [E3-49](#) respectively.

3.3 Maximum and Minimum Index Density Tests

Maximum index density, maximum unit weight and minimum index density tests were performed on oven-dried soil samples per ASTM standards D4253 and D4254, respectively. The results from the maximum and minimum dry density tests were used in calculating target molding dry density

(based on the estimated target in-situ relative density) of the soil samples prepared for the direct simple shear tests. The results of the minimum and maximum density tests are presented in summary of test results tables in [Appendix E](#), on [Plates E1-1](#) through [E1-45](#).

3.4 Unconsolidated-Undrained Triaxial Compression Tests (UU)

The undrained shear strength was evaluated for selected undisturbed samples of cohesive soils by performing unconsolidated-undrained (UU) triaxial compression tests (ASTM D2850). The natural water content and dry unit weights were determined as routine parts of the laboratory strength tests. The results of the laboratory undrained shear strength tests, along with the field estimates of undrained shear strength, are presented on the boring logs in [Appendix B](#) and in summary tables in [Appendix E](#) on [Plates E1-1](#) through [E1-33](#). The UU Triaxial Compression test curves are presented on [Plates E4-1](#) through [E4-18](#) in [Appendix E](#).

3.5 Consolidated Undrained Triaxial Tests (CIUTX)

Consolidated-undrained (CU) triaxial compression tests with pore pressure measurements were performed as part of the testing program. The specimen was mounted in the triaxial cell after being extruded from the tube. Specimen saturation was achieved by applying back pressure and then the samples were isotropically consolidated to the desired effective stresses. The effective consolidation stresses were determined based on the estimated in-situ effective stress at the particular sample depth. The specimen was then loaded in a multistage format, allowing the specimen to approach failure at the first two effective confining stresses, and failing the sample at the final effective confining stress. The natural water content and dry unit weights were determined as routine parts of the CU triaxial compression tests. The CU Triaxial Compression test results are presented on [Plates E5-1](#) through [E5-6](#) in [Appendix E](#).

3.6 Ko-Consolidated Static Undrained Direct Simple Shear Tests (cKoU-DSS)

The K_0 consolidated, undrained static direct simple shear test was performed using strain-controlled loading in general accordance with ASTM Test Method D6528, using GEOTAC apparatus (designed by Trautwein). The in-situ relative densities of the selected samples were estimated based on SPT (N) blow-counts. The target dry density of a sample was determined based on this estimated in-situ relative density and the results of the maximum and minimum dry density for that specific sample.

The test specimen had a diameter of about 66.5 mm (2.62 in.) and height of about 19 mm (0.75 in.). Drainage is allowed on the top and bottom boundaries during consolidation. During shear, the volume of the test specimen was kept constant by keeping the specimen's height constant. As a result, undrained conditions (no volume change) were maintained during shearing. Therefore, it can be assumed that the change in vertical stress is equivalent to the change in pore water pressure (PWP), which can be considered that the sample is either expanding (dilating) or contracting (compressing) in size via the pore water pressure.

The specimen was incrementally consolidated to the target stress level, with the final effective- vertical stress ($\sigma'_{v,c}$) maintained constant for about 24 hours (curing or simulated aging) or one log cycle of time past the time to reach 90 percent consolidation (t_{90}). The sample was then sheared at a strain rate of about 5 %/hr.

The direct simple shear test results are presented on [Plates E6-1 through E6-6](#) in [Appendix E](#).

3.7 Compressibility Tests

The compressibility characteristics of select undisturbed samples of cohesive soils were determined by completing one-dimensional incremental consolidation and one-dimensional Constant Rate of Strain (CRS) tests per ASTM D2435 and D4186 standards, respectively. Each test was performed with a rebound-reload cycle. Natural moisture content, Atterberg limits, percent fines, and dry unit weight of the soil samples were also determined as part of our consolidation testing.

The results of the consolidation tests are presented on [Plates E7-1 through E7-24](#) in [Appendix E](#).

3.8 Resonant Column Tests

The resonant column test is the most commonly used laboratory test for characterizing the shear modulus and the material damping ratio of the soils at small strains. It subjects hollow cylindrical specimens to harmonic torsional or axial loading by an electromagnetic loading system. The results of these tests will be used to evaluate the site response characteristics of the proposed marine site of the LNG facilities by measuring the cyclic behaviors of the marine soils.

The results of the consolidation tests are presented on [Plates E8-1 through E8-6](#) in [Appendix E](#).

3.9 Cyclic Direct Simple Shear Tests

Strain-controlled cyclic direct simple shear (CDSS) test is performed to evaluate the degradation of shear modulus and increase of material damping ratio of soils at large strains. It subjects solid cylindrical specimens to stress similar to earthquake loading conditions applied to the top and the bottom of the soil specimen. The results of these tests will be used to evaluate the liquefaction characteristics of the soils existing at the proposed marine site of the LNG facilities by measuring the soil properties under cyclic loading. These tests are in progress and results will be presented in the final version of this report.

The results of the consolidation tests are presented on [Plates E9-1 through E9-4](#) in [Appendix E](#).

3.10 Corrosion Potential Tests

The corrosion potential of the soils at the site was evaluated using a series of laboratory tests including pH, sulfate ion concentration, chloride ion concentration, and electrical resistivity. Samples from various depths and locations were selected for testing. The corrosion potential test results are presented in summary tables in [Appendix E](#) on [Plates E1-1 through E1-33](#) on Summary of Test Results tables, and on laboratory sheets presented on [Plates E10-1 through E10-12](#).

3.11 Summary of Laboratory Tests

The laboratory tests were performed in general accordance with ASTM standards and are presented in [Table 3.1](#) along with the quantity of each test type performed.

Table 3.1: Summary of Laboratory Tests

Laboratory Test	Testing Standard	Quantity
Water Content	ASTM D2216	762
Atterberg Limits	ASTM D4318	356
Sieve Analysis	ASTM D422	204
Hydrometer	ASTM D422	22
Percent Finer than No. 200 Sieve	ASTM D1140	340
Unconsolidated-Undrained Triaxial Compression (Intact)	ASTM D2850	108
Unconsolidated-Undrained Triaxial Compression (Remolded)	ASTM D2850	46
Consolidated-Undrained Triaxial Compression	ASTM D4767	6
Maximum & Minimum Index Density	ASTM D4253 / ASTM D4254	4
One-Dimensional CRS Consolidation	ASTM D4186	22
One-Dimensional Incremental Consolidation	ASTM D2435	2
Direct Simple Shear	ASTM D6528	6
Resonant Column	ASTM D4015	6
Cyclic Direct Simple Shear	ASTM D6528 & D3999	4
X-Ray Radiography	ASTM D4452	49
pH of Soil	ASTM D4972	12
Sulfate Ion Concentration	ASTM D516	12
Chloride Ion Concentration	ASTM D512	12
Electrical Resistivity	ASTM G57	3
	ASTM G187	9

4.0 GENERAL SITE AND SUBSURFACE CONDITIONS

4.1 General Site Conditions

The proposed project site lies on the north-central coastline of the Kenai Peninsula, approximately two miles west of the town of Nikiski. The proposed marine LNG terminal site is located on the Cook Inlet adjacent to the western margin of the Kenai Peninsula, a low relief plain of Quaternary glacial and glaciofluvial deposits. Coastal bluffs are approximately 100 to 120 feet tall. The region is moderately to heavily developed, with industrial facilities (such as docks, trestles, storage tanks) located at the northern edge of the potential project boundary, as well as residential and small business buildings in the remaining areas of the project site.

The following sections present information on regional geology and geomorphology, regional seismicity, site geology, and site specific subsurface and groundwater conditions.

4.2 Regional Geology and Geomorphology

Large glaciers, flowing south from the Alaska Range, covered most of the Cook Inlet during the last major glaciation, leaving deposits of glacial moraine and outwash across the Cook Inlet and the Kenai Peninsula (Reger et al., 2007). The last major glacial advance to extend across the Cook Inlet was the Naptowne glaciation, which included four advances, or stades, named from oldest to youngest: Moosehorn, Killey, Skilak, and Elemndorf. Mapping by Reger et al, (2007) shows that only the Moosehorn (at 27,000 to 32,000 years before present) and Killey (at 17,500 to 18,500 years before present) stades of the Naptowne glaciation extended across the 5-mile site radius. Deposits and landforms associated with these advances include alternating swaths of northeast-trending kettle lakes and closed depressions, the largest of which include Bernice Lake and Island Lake, outwash plains, as well as coarse grained ice-proximal sediments and finer-grained ice-distal sediments.

The dominant structural feature in the Cook Inlet is a series of fault-cored folds, known as the Cook Inlet folds, well-expressed in the Tertiary marine sediments which underlie the Quaternary deposits (Koehler et al., 2012). The Cook Inlet faults and folds are sub-parallel and generally trend north-northeast. Tertiary sediment fills the Cook Inlet forearc basin to depths of approximately 20,000 feet in the site area.

4.3 Site Geology

In the marine LNG terminal area, erosion by waves and currents has removed the Killey deposits, resulting in a sea floor underlain primarily by Moosehorn and pre-Moosehorn Quaternary deposits. These consist of fine-grained glacially derived subestuarine sediments, sandy and gravelly glacial outwash deposits, and poorly sorted bouldery to gravelly glacial till deposits.

The Quaternary deposits overlie an erosional surface cut on gently folded Tertiary marine sediments, a surface referred to as the Quaternary/Tertiary unconformity. Immediately below the

unconformity lies the Pliocene Sterling Formation, the youngest in the sequence of Tertiary formations filling the Cook Inlet basin. The Sterling Formation sediments are described as well-sorted, fine to coarse-grained sands that are rich in volcanic lithic fragments, quartz, and feldspars (McElmoyl, 2013). They may include conglomerate beds, thin seams of coal, and clays.

Borings drilled in the marine terminal area penetrate the Moosehorn and pre-Moosehorn Quaternary deposits. Locally, currents have deposited waves and ridges of sand and silt, forming a mantle of very young sediment over the older deposits. Large boulders are scattered across the sea floor, likely a lag from erosion of the upper beds of the Moosehorn deposit which contains large glacial drop-stones.

The marine terminal site is located on the east limb of the Middle Ground Shoal anticline, one of the larger of the Cook Inlet folds. Bedding in the Tertiary deposits beneath the site dips gently to the east-southeast on the limb of this fold.

4.4 Regional Seismicity

The study region is located at the active convergent margin between the North American Plate (Southern Alaska block) and the Pacific Plate. The study region, centered in Cook Inlet basin, is characterized by high rates of seismicity and relatively frequent moderate ($> M 5.0$ to 5.9) to great ($> M 8.0$) earthquakes. This includes the 1964 moment magnitude (M_w , or M) 9.2 Great Alaskan or Good Friday earthquake, the largest recorded event in Alaska.

Earthquakes with accompanying fault displacement, ground deformation, and secondary effects such as earthquake-induced liquefaction and tsunamis are among the known geologic hazards of the region. Paleoseismic investigations indicate seven to ten great earthquakes took place on the Prince William Sound segment of the Aleutian megathrust in the last 4,000 to 6,000 years (Carver and Plafker, 2008; Shennan et al., 2014). The 1964 $M_{9.2}$ Great Alaskan earthquake caused extensive damage and surface deformation throughout the Cook Inlet, including 0.9 feet of subsidence recorded at a standard U.S. Coast and Geodetic Survey tide-gage station near Nikiski (Foster and Karlstrom, 1967).

4.5 Subsurface Conditions

The subsurface conditions presented in this section are mainly based on the soil conditions encountered in twenty-five (25) marine geotechnical borings and T1/T2 sediment samples during the 2015 G&G program. In addition to the information obtained from the borings and the results of the laboratory tests, the results of PS Logging tests, and the information obtained from the geophysical surveys was also reviewed.

Based on the as-built boring elevations obtained from bathymetry data collected by Fugro (2014), the seabed elevations varies from about El. -40.3 ft MLLW to about El. -7.7 ft MLLW. [Plate 4](#) presents a color coded bathymetry map, indicating the areas of low and the high grades at the site.

Based on the information obtained from the borings drilled for this site investigation, generalized cross sections were prepared and presented on [Plates 5](#) through [13](#). The orientations of all the cross section profile lines are shown on [Plates 3](#) and [4](#) of this report. Cross sections were selected based on the completed boring locations and considering the available proposed marine LNG facilities layout provided by AKLNG. Please note that an integrated interpretation of the cross sections based on the geotechnical and geophysical data will be presented later in the LNG Facilities Marine Integrated Site Characterization and Engineering Report (See [Table 1.1](#)).

The generalized subsurface cross sections illustrate the horizontal and vertical variation of the geology across the entire site. Stratigraphy, material descriptions, index properties and strengths of the soil materials are presented on each of the boring logs presented in [Appendix B](#) on [Plates B-1](#) through [B-29](#).

4.6 Artesian Water Conditions

Artesian conditions were observed in one offshore boring, MB-24. At this location two artesian conditions were encountered, one during drilling and one during borehole closure activities, both related to the confining pressure of two distinct clay layers. The upper confining layer comprised a 16.5-foot-thick layer of hard clay interspersed with subangular gravel layers. The upper confining layer began at the submerged mudline and was underlain by a sand and gravel aquifer possessing a hydraulic head that rose about 3.5 feet above the base of the confining layer. The lower confining layer, observed to be 13 feet of hard clay with subangular gravel, was penetrated and revealed a flowing artesian condition. The flowing artesian condition possessed a hydraulic head which rose about 8 feet above the barge/skate deck (about 129 feet above the base of the confining layer). The water in both artesian conditions were observed to be fresh water. Further details related to artesian conditions are provided in a memorandum submitted to AKLNG with document number USAL-FG-GRZZZ-90-002015-017 and Fugro Hydrogeologic report (See [Table 1.1](#)).

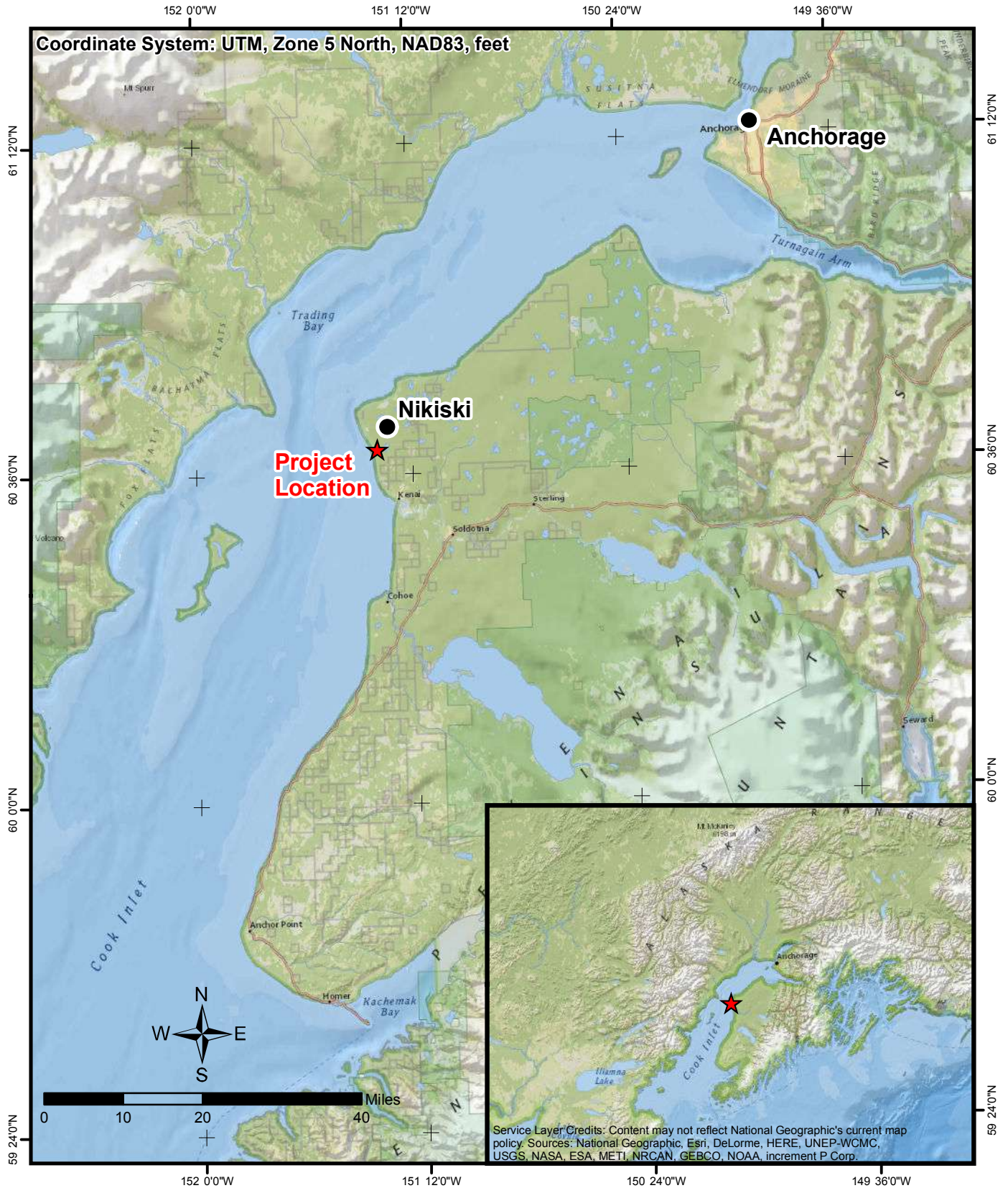
4.7 Variations

Our interpretations of soil and groundwater conditions, as described in this report, are based on the boring logs from our field exploration, the results of the completed laboratory tests, geophysical surveys, our discussions with AKLNG and our experience with similar projects. Although we have allowed for minor variations in the subsurface conditions, the data provided may not be appropriate for subsurface conditions other than those reported herein. It is possible that undisclosed variations in soil conditions may occur outside the boring locations. We recommend performing careful review of subsurface conditions during engineering analysis and design to verify our generalized subsurface interpretations. Should variations from our interpretations be found, we recommend that we be notified and authorized to evaluate what, if any, revisions should be made to our recommendations.

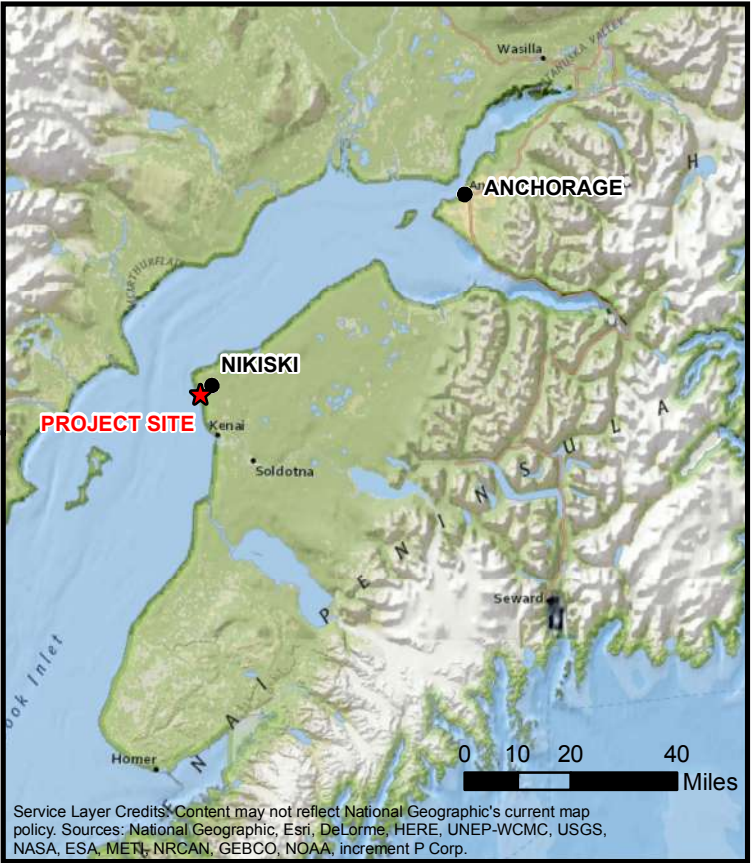
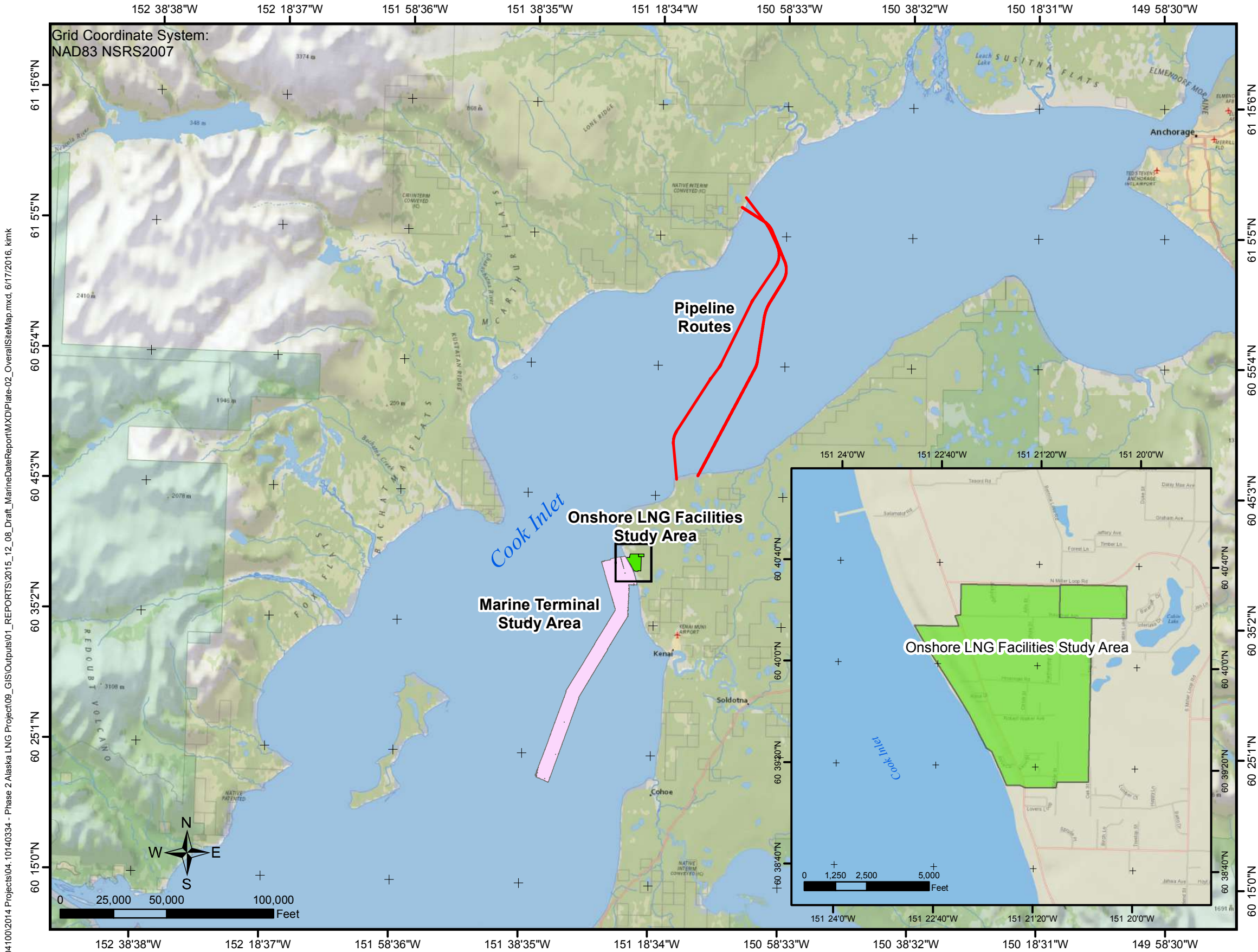
5.0 REFERENCES

- Carver, G., and Plafker, G., 2008, Paleoseismicity and neotectonics of the Aleutian subduction zone – An overview, in Freymueller, J.T., et al., eds., *Active Tectonics and Seismic Potential of Alaska: American Geophysical Union Geophysical Monograph 179*, p. 43-63.
- Foster, H.L., and Karlstrom, N.V., 1967, Ground Breakage and Associated Effects in the Cook Inlet Area, Alaska, Resulting from the March 27, 1964, Earthquake, U. S. Geological Survey Professional Paper, 543-F.
- Haeussler, P. J., Bruhn, R.L. and Pratt, T.L., 2000, Potential seismic hazards and tectonics of upper Cook Inlet basin, Alaska, based on analysis of Pliocene and younger deformation, *Geological Society of America Bulletin*, 112, p 1414-1429.
- Koehler, R.D., Farrell, R. E., Burns, P.A.C. and Combellick, R. A., 2012, Quaternary faults and folds in Alaska: A digital database: Alaska Division of Geological & Geophysical Surveys Miscellaneous Publication 141, 31 p., 1 sheet, scale 1: 3,700,000.
- McElmoyl, C., 2013, Cannery Loop field, Cook Inlet region, Kenai Borough, Alaska, south-central Alaska, in D. M. Stone and D. M. Hite, ed., *Oil and gas fields of the Cook Inlet basin, Alaska: American Association of Petroleum Geologists Memoir 104*, p. 193-224.
- Reger, R.D., Sturmman, A.G., Berg, E.E., and Burns, P.A.C., 2007, A guide to the late Quaternary history of northern and western Kenai Peninsula, Alaska: Division of Geological and Geophysical Surveys Guidebook 8, 120 p., 6 plates.
- Shellenbaum, D.P., Gregersen L.S., and Delaney, P.R., 2010, Top Mesozoic unconformity depth map of the Cook Inlet Basin, Alaska, Alaska Division of Geological and Geophysical Surveys, Report of Investigations 2010-2, Sheet 1 of 1.
- Shennan I., Bruhn, R., Barlow, N., Good, K., and Hocking E., 2014, Late Holocene great earthquakes in the eastern part of the Aleutian megathrust: *Quaternary Science Reviews*, v. 28, p. 6-13.

ILLUSTRATIONS



VICINITY MAP
 MARINE LNG FACILITIES
 ALASKA LNG PROJECT
 NIKISKI, ALASKA



KEY MAP

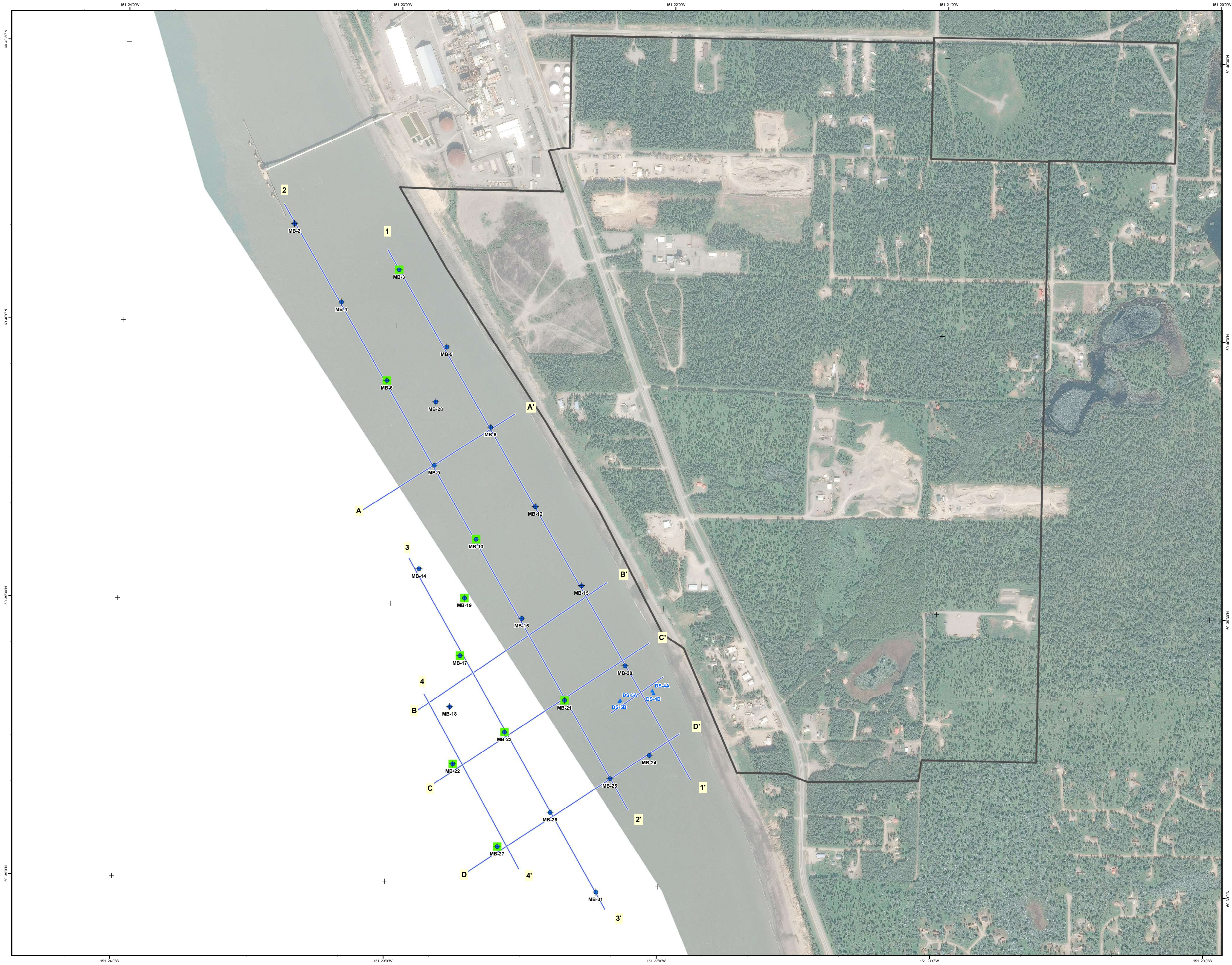
LEGEND

- Onshore LNG Facilities Study Area
- Marine Terminal Study Area
- Pipeline Routes

NOTE:

- Onshore LNG Facilities Study Area boundary provided by AKLNG.

OVERALL SITE MAP
MARINE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA



LEGEND

GEOTECHNICAL EXPLORATIONS

- Boring, 50 ft (2015) ■ PS Logging
● Boring, 150 ft (2015) ▲ Driving sample
● Boring, 300 ft (2015)

CROSS SECTION LINES

— Cross-Sections

PROJECT SITE LAYERS

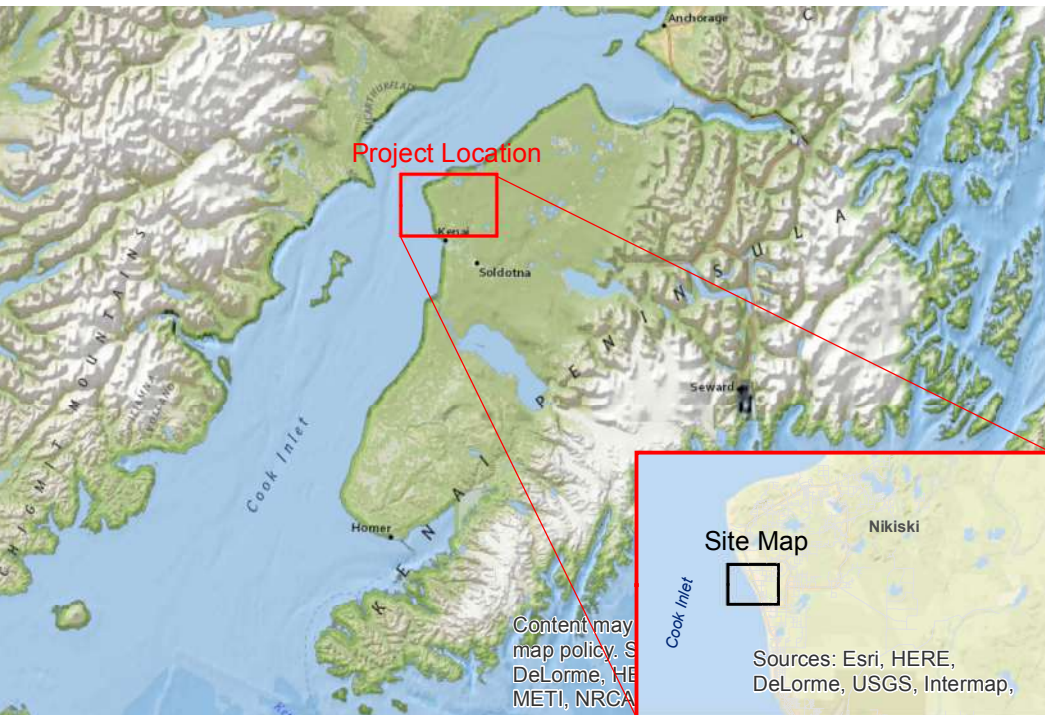
▭ Onshore LNG Facilities Study Area

Borings	Elevation (Bathymetry, ft)	As-Built Coordinates		Depth, ft
		Latitude, deg	Longitude, deg	
MB-2	-35.20927051	60.66965211	-151.3896234	47.08005
MB-3	-23.11798596	60.66833486	-151.3831777	162.7297
MB-4	-36.37104769	60.66732889	-151.3866673	151.8045
MB-5	-18.94378263	60.66605106	-151.3801799	151.6076
MB-6	-33.94408401	60.66501117	-151.3837913	149.2782
MB-8	-16.69768887	60.66367342	-151.3773987	206.2336
MB-9	-28.75020309	60.66249628	-151.3807907	152.5591
MB-12	-16.60124407	60.66132147	-151.3745672	152.5591
MB-13	-25.09004623	60.66030914	-151.3781419	164.042
MB-14	-39.02458243	60.65939	-151.3815911	150.7546
MB-15	-12.91684981	60.65898078	-151.3716587	153.0512
MB-16	-21.84606951	60.65796353	-151.375254	153.3793
MB-17	-36.92019195	60.65681081	-151.3789824	213.2546
MB-18	-38.33002852	60.65527456	-151.3795423	135.1706
MB-19	-32.28145307	60.65854333	-151.3787739	167.3228
MB-20	-10.7709344	60.65661392	-151.3688918	152.5591
MB-21	-17.91284247	60.65553589	-151.3725419	164.042
MB-22	-40.32755977	60.65356186	-151.379286	151.2467
MB-23	-29.44684041	60.65454731	-151.3761715	305.4462
MB-24	-11.37266852	60.65393967	-151.3673068	85.62992
MB-25	-17.1716445	60.6532235	-151.3696789	51.1811
MB-26	-25.13459308	60.65216953	-151.373279	52.62467
MB-27	-39.86321515	60.65111592	-151.3764673	164.042
MB-28	-29.22148	60.66439822	-151.3807829	52.3294
MB-31	-24.56827344	60.64981225	-151.3703904	51.83727
DS-4A	-7.737298777	60.65588414	-151.3671943	20.50525
DS-4B	-7.676001719	60.65580844	-151.3671202	18.53675
DS-5A	-11.80285437	60.65557886	-151.3691476	19.2
DS-5B	-11.98181557	60.65554508	-151.3691974	19.2

Notes:

1. Base imagery provided by EXP Geomatics (EXP).
2. Onshore LNG Facility boundary provided by EMALL.
3. As-built coordinates of marine exploration locations was recorded by Fugro Starfix Positioning System.
See next for more details.

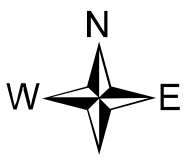
Confidential
LNG Facilities Marine Geotechnical Data Report
USAL-FG-GRZZZ-00-002015-011 Rev.0
20-Jun-16



This document may only be used for the purpose for which it was commissioned and in accordance with the terms of engagement for that commission. Unauthorized use of this document in any form whatsoever is prohibited.

GEODETIC INFORMATION

PROJECTION: Transverse_Mercator
FALSE EASTING: 1640416.66666666
FALSE NORTHING: 0.0
CENTRAL MERIDIAN: -150.0
SCALE FACTOR: 0.9999
LATITUDE OF ORIGIN: 54.0
LINEAR UNIT: US Foot
SPHEROID: GRS 1980
SEMI-MAJOR AXIS: 6378137.000
SEMI-MINOR AXIS: 6356752.314140356
INVERSE FLATTENING: 298.257222101



Coordinate Grid: NAD 1983 (NRS 2007).
Degrees Minutes Seconds



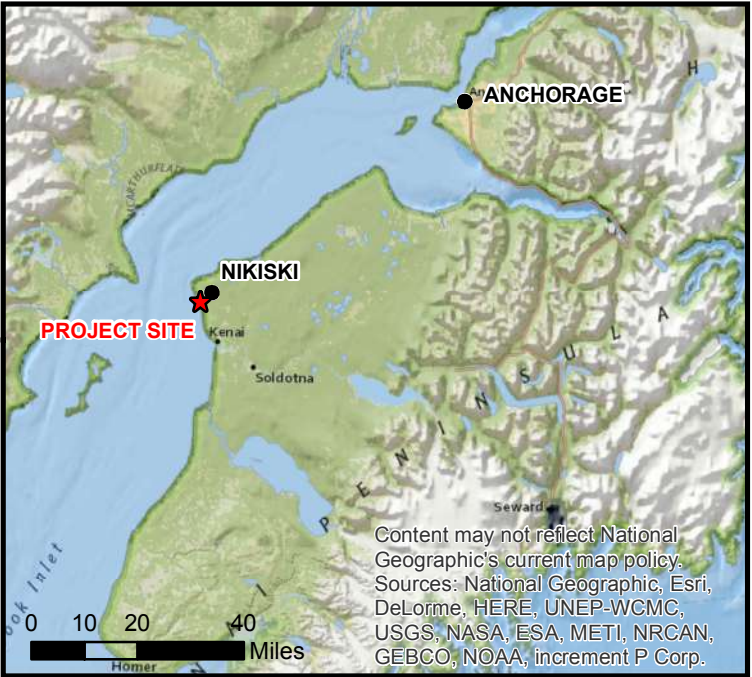
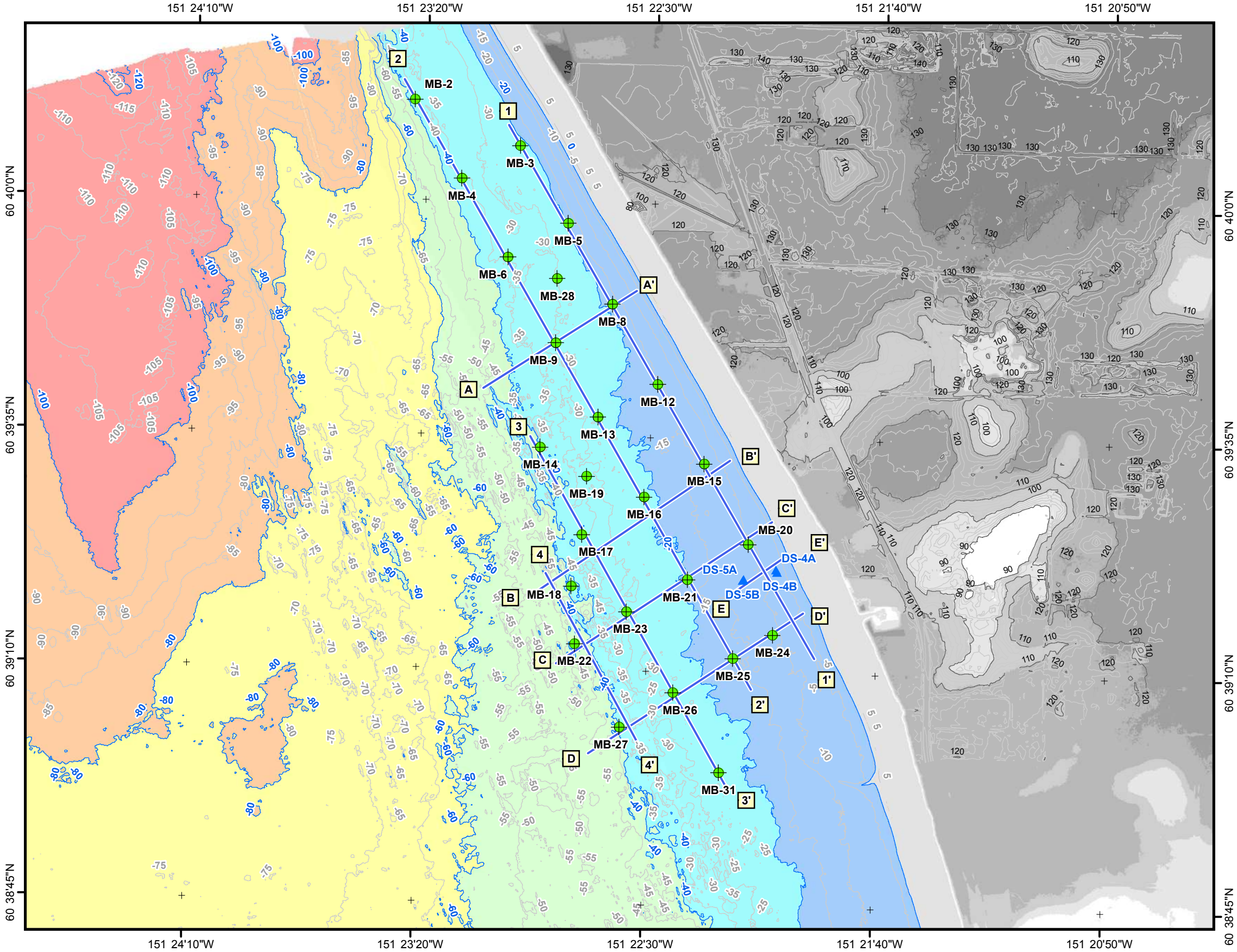
FUGRO CONSULTANTS, INC.
6100 Hillcroft Ave.
Houston, Texas 77081
Tel: 713.369.5400
Fax: 713.369.5518
www.fugroconsultants.com

PLAN OF EXPLORATION
MARINE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA

0 500 1,000
Feet

REV NO:	DATE:	DESCRIPTION:	DRAWN:	CHKD:	APPR:
0	12/03/2015	Marine Plan of Exploration	KIMK		
JOB NUMBER:			04.10140334-9 DRAWING NO. PLATE 3		

R:\04100\2014 Projects\04.10140334 - Phase 2 Alaska LNG Project\09_GIS\Outputs\01_REPORTS\2015_12_08_Draft_MarineDataReport\MXD\Plate-04_SiteTopographyMap.mxd, 6/17/2016, kimk



KEY MAP

LEGEND

- Completed
- Driving sample
- Cross-Sections

TOPOGRAPHY (NAVD88, Feet)

Source: LiDAR Digital Elevation Model (DEM), (KPB, 2008) & Contour lines (McLane, 2015)

- Major Contour interval is 10 feet
- Minor Contour interval is 2 feet

BATHYMETRY (MLLW, Feet)

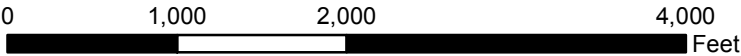
Source: Multibeam (Fugro, 2014)

- Major contour interval is 20 feet.
- Minor contour interval is 5 feet.

-123 - 100ft
-99.9 - -80ft
-79.9 - -60ft
-59.9 - -40ft
-39.9 - -20ft
-19.9 - 0ft

NOTES:

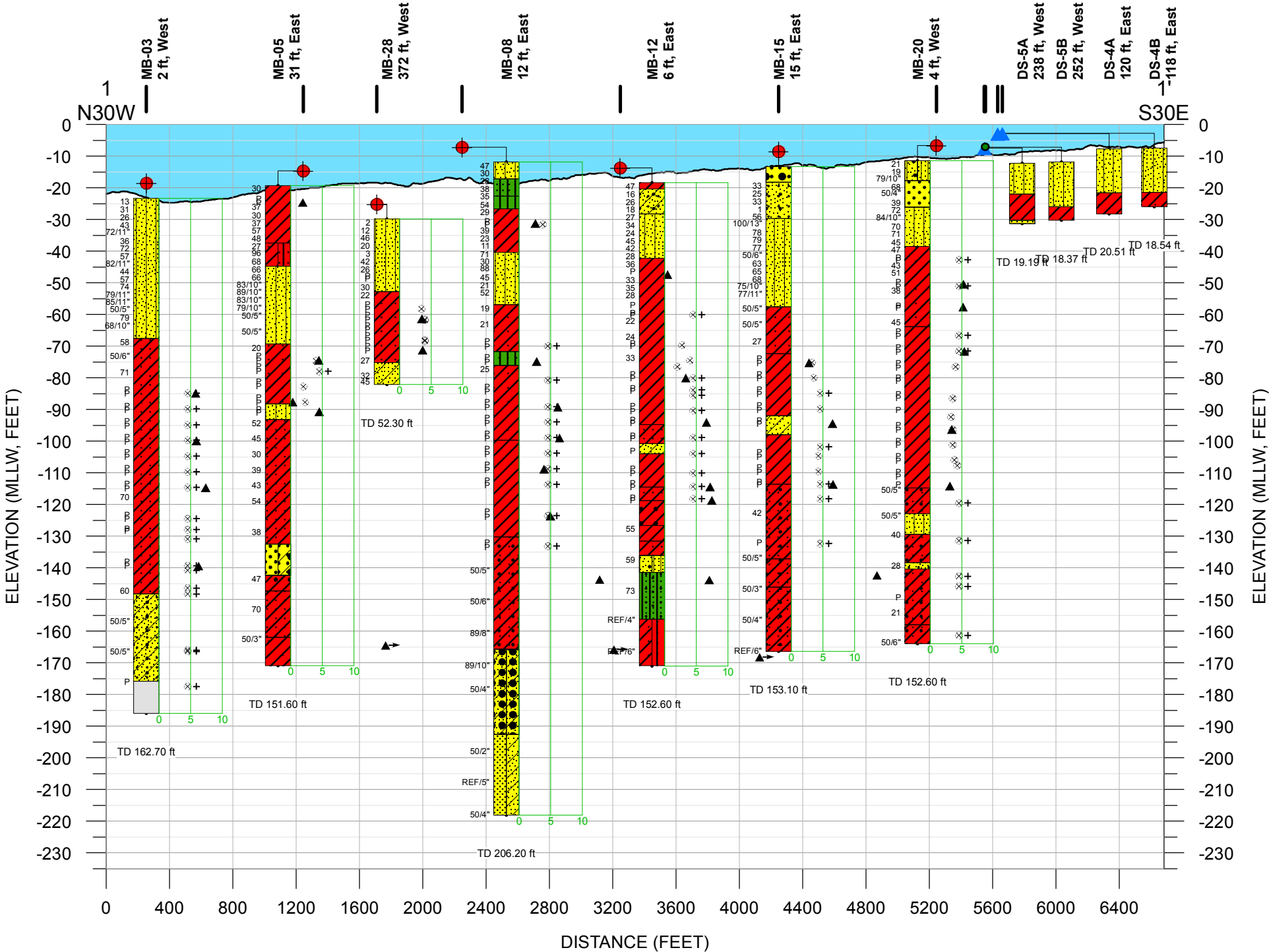
- Topography contour lines provided by McLane Consulting, Inc. (2015).
- Bathymetry contour lines based on data collected by Fugro (2014 & 2015).
- As-built coordinates of marine exploration locations was recorded by Fugro Starfix Positioning System.



Grid Coordinate System: NAD83 NSRS2007



SITE TOPOGRAPHY MAP
MARINE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA



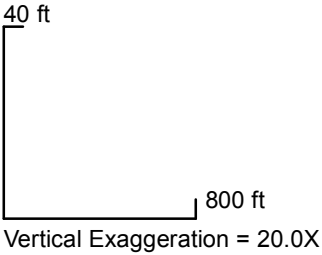
LEGEND

GEOTECHNICAL EXPLORATIONS

- Marine Boring (2015)
- Bathymetry, MLLW, Feet
- Drive Sampling

SOIL DESCRIPTIONS

- Lean Clay (CL)
- Lean Clay with Gravel (CL)
- Sandy Lean Clay (CL)
- Lean Clay with Sand (CL)
- Sandy Lean Clay with Gravel (CL)
- Clayey Gravel (GC)
- Silty Gravel (GM)
- Gravel (GP)
- Gravel (GW)
- Silt (ML)
- Sandy Silt (ML)
- Sandy Silt with Gravel (ML)
- Silt with Sand (ML)
- Clayey Sand (SC)
- Clayey Sand with Gravel (SC)
- Silty Sand (SM)
- Sand (SP)
- Sand with Silt (SP-SM)
- Sand with Gravel (SW)
- Sand with Clay and Gravel (SW-SC)
- Sand with Silt and Gravel (SW-SM)
- Rat Hole for PS Logging



UNDRAINED SHEAR STRENGTH (S_u)

- ▲ Unconsolidated Undrained Triaxial
- ⊕ Torvane
- ⊗ Pocket Penetrometer
- + Soil Strength Exceeds Instrument's Maximum Measurable Strength.

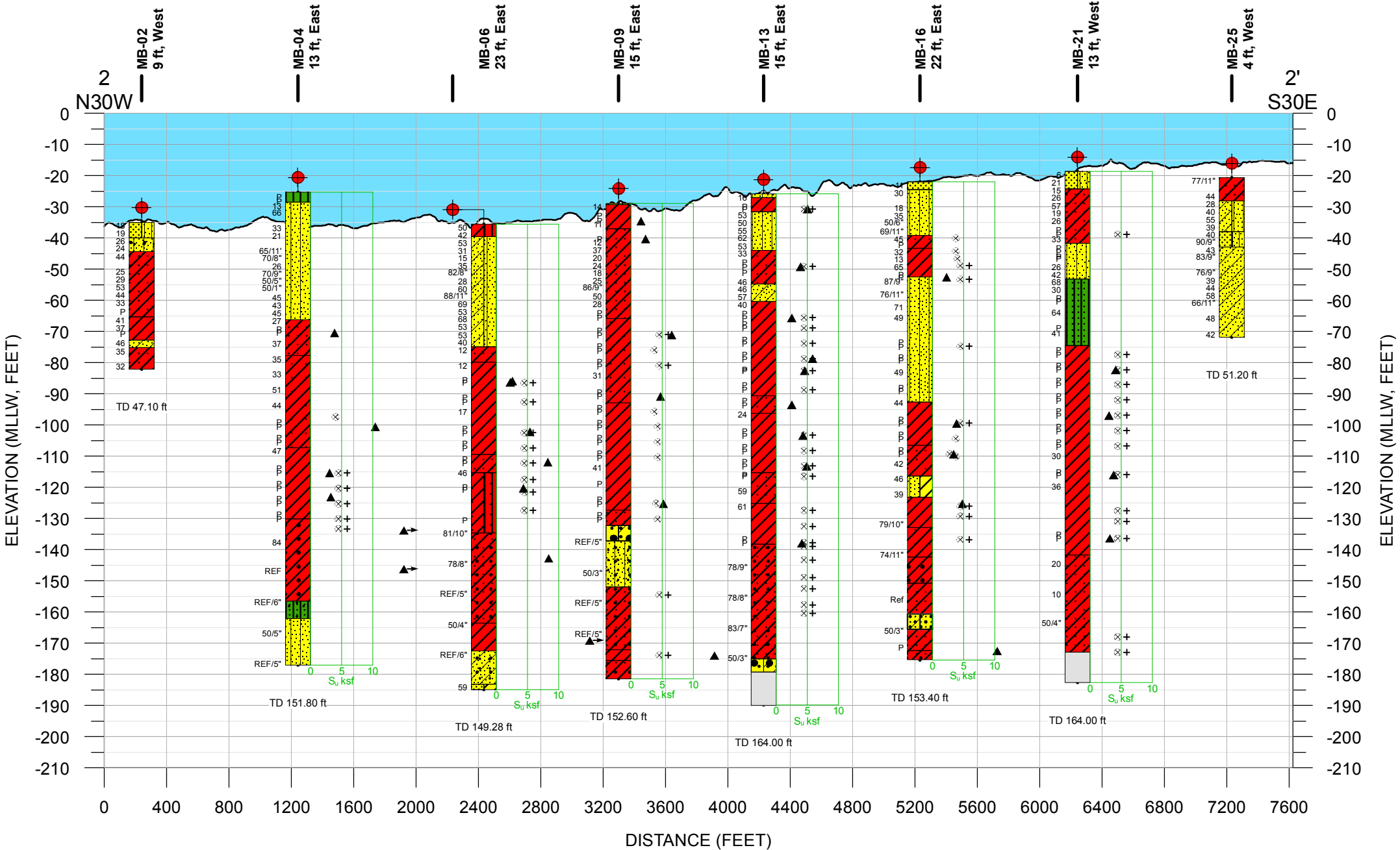
TUBE AND SPT SAMPLES

Symbol	Description
P	Push thin-walled 3" tube.
20	Number of blows to produce 12" of penetration after the initial 6" of seating.
86/11"	Number of blows required to produce the indicated penetration after an initial 6" seating.
Ref/3"	50 blows produced the indicated penetration during the initial 6" interval.

- NOTES :**
- 1) Bathymetry data collected by Fugro in 2014 and 2015. Elevation is referenced to MLLW.
 - 2) As-Built coordinates of marine exploration locations was recorded by Fugro Starfix Positioning System.
 - 3) As-built elevations of the exploration locations are referenced to MLLW and calculated using bathymetry data (Fugro 2014 & 2015).
 - 4) See Plate 3 and Plate 4 for location of explorations and cross section lines.
 - 5) The following formula is used to convert the elevations from MLLW to NAVD88 for marine LNG Facilities area : EL in feet (NAVD88) = EL in feet (MLLW) - 7.32ft

SUBSURFACE CROSS SECTION 1 - 1'
MARINE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA

R:\04100\2014 Projects\04.10140334 - Phase 2 Alaska LNG Project\09_GIS\Outputs\01_REPORTS\2015_12_08_Draft_MarineDataReport\MXD\Plate-05_XSect_1.mxd, 6/21/2016, kimk



LEGEND

GEOTECHNICAL EXPLORATIONS

- Marine Boring (2015)
- Bathymetry, MLLW, Feet

SOIL DESCRIPTIONS

- Lean Clay (CL)
- Lean Clay with Gravel (CL)
- Sandy Lean Clay (CL)
- Lean Clay with Sand (CL)
- Sandy Lean Clay with Gravel (CL)
- Clayey Gravel (GC)
- Silty Gravel (GM)
- Gravel (GP)
- Gravel with Clay and Sand (GP-GC-S)
- Gravel (GW)
- Silt (ML)
- Sandy Silt (ML)
- Sandy Silt with Gravel (ML)
- Silt with Sand (ML)
- Clayey Sand (SC)
- Clayey Sand with Gravel (SC)
- Silty Sand (SM)
- Sand (SP)
- Sand with Silt (SP-SM)
- Sand (SW)
- Sand with Gravel (SW)
- Rat Hole for PS Logging

UNDRAINED SHEAR STRENGTH (S_u)

- ▲ Unconsolidated Undrained Triaxial
- ⊕ Torvane
- ⊗ Pocket Penetrometer
- + Soil Strength Exceeds Instrument's Maximum Measurable Strength.

TUBE AND SPT SAMPLES

P Push thin-walled 3" tube.

20 Number of blows to produce 12" of penetration after the initial 6" of seating.

86/11" Number of blows required to produce the indicated penetration after an initial 6" seating.

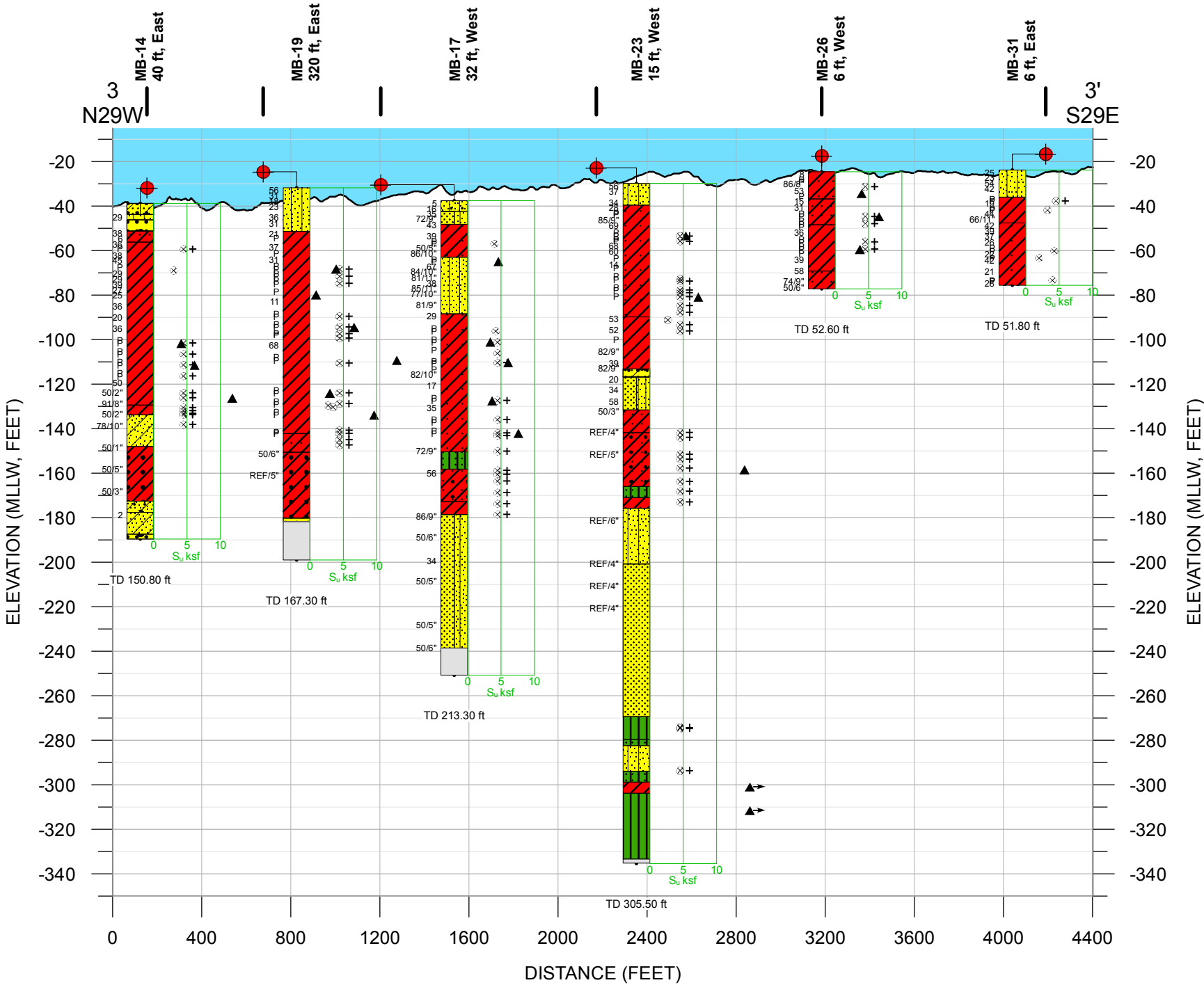
Ref/3" 50 blows produced the indicated penetration during the initial 6" interval.

NOTES :

- Bathymetry data collected by Fugro in 2014 and 2015. Elevation is referenced to MLLW.
- As-Built coordinates of marine exploration locations was recorded by Fugro Starfix Positioning System.
- As-built elevations of the exploration locations are referenced to MLLW and calculated using bathymetry data (Fugro 2014 & 2015).
- See Plate 3 and Plate 4 for location of explorations and cross section lines.
- The following formula is used to convert the elevations from MLLW to NAVD88 for marine LNG Facilities area : EL in feet (NAVD88) = EL in feet (MLLW) - 7.32ft



SUBSURFACE CROSS SECTION 2 - 2'
MARINE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA

R:\04100\2014 Projects\04.10140334 - Phase 2 Alaska LNG Project\09_GIS\Outputs\01_REPORTS\2015_12_08_Draft_MarineDataReport\MXD\Plate-06_XSect_2.mxd, 6/21/2016, kimk





















LEGEND

GEOTECHNICAL EXPLORATIONS





-  Marine Boring (2015)
-  Bathymetry, MLLW, Feet

SOIL DESCRIPTIONS

-  Lean Clay (CL)
-  Lean Clay with Gravel (CL)
-  Sandy Lean Clay (CL)
-  Lean Clay with Sand (CL)
-  Sandy Lean Clay with Gravel (CL)
-  Clayey Gravel with Sand (GC)
-  Gravel (GP)
-  Gravel (GW)
-  Silt (ML)
-  Sandy Silt (ML)
-  Clayey Sand (SC)
-  Clayey Sand with Gravel (SC)
-  Silty Sand (SM)
-  Silty Sand with Gravel (SM)
-  Sand (SP)
-  Sand with Silt (SP-SM)
-  Sand with Clay and Gravel (SP-SC)
-  Rat Hole for PS Logging

60 ft
600 ft
Vertical Exaggeration = 10.0X

UNDRAINED SHEAR STRENGTH (S_u)

-  Unconsolidated Undrained Triaxial
-  Torvane
-  Pocket Penetrometer
-  Soil Strength Exceeds Instrument's Maximum Measurable Strength.

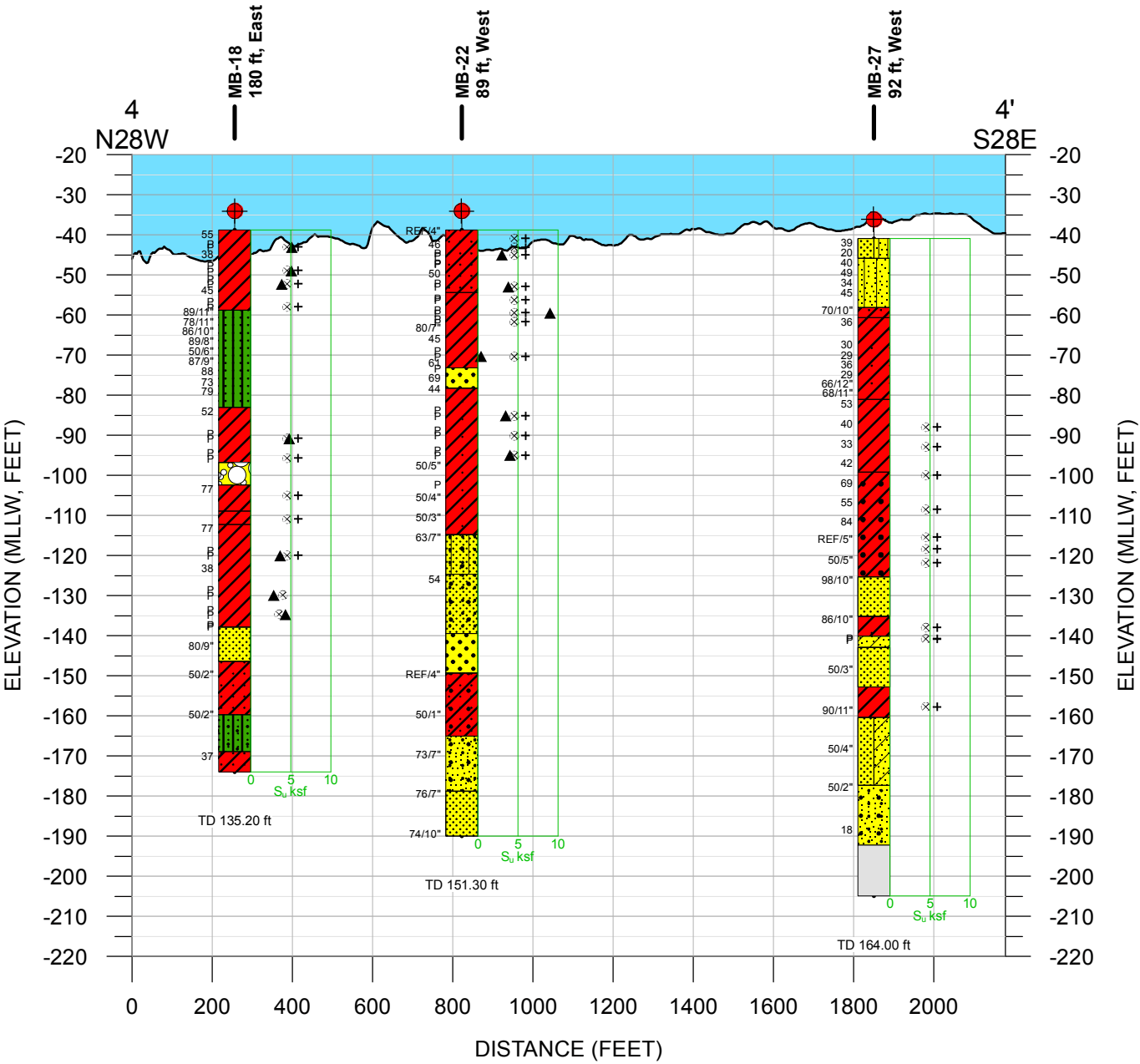
TUBE AND SPT SAMPLES

- P Push thin-walled 3" tube.
- 20 Number of blows to produce 12" of penetration after the initial 6" of seating.
- 86/11" Number of blows required to produce the indicated penetration after an initial 6" seating.
- Ref/3" 50 blows produced the indicated penetration during the initial 6" interval.

NOTES :

- 1) Bathymetry data collected by Fugro in 2014 and 2015. Elevation is referenced to MLLW.
- 2) As-Built coordinates of marine exploration locations was recorded by Fugro Starfix Positioning System.
- 3) As-built elevations of the exploration locations are referenced to MLLW and calculated using bathymetry data (Fugro 2014 & 2015).
- 4) See Plate 3 and Plate 4 for location of explorations and cross section lines.
- 5) The following formula is used to convert the elevations from MLLW to NAVD88 for marine LNG Facilities area : EL in feet (NAVD88) = EL in feet (MLLW) - 7.32ft

SUBSURFACE CROSS SECTION 3 - 3'
MARINE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA



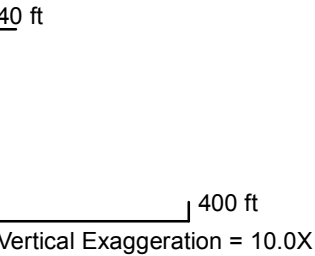
LEGEND

GEOTECHNICAL EXPLORATIONS

- Marine Boring (2015)
- Bathymetry, MLLW, Feet

SOIL DESCRIPTIONS

- Lean Clay (CL)
- Lean Clay with Gravel (CL)
- Sandy Lean Clay (CL)
- Sandy Lean Clay with Gravel (CL)
- Lean Clay with Sand (CL)
- Granite Boulder (COBBLE)
- Gravel (GP)
- Sandy Silt (ML)
- Sandy Silt with Gravel (ML)
- Silt with Sand (ML)
- Clayey Sand (SC)
- Clayey Sand with Gravel (SC)
- Silty Sand (SM)
- Sand with Silt (SP-SM)
- Sand (SP)
- Sand with Gravel (SP)
- Sand with Gravel (SW)
- Rat Hole for PS Logging



UNDRAINED SHEAR STRENGTH (S_u)

- ▲ Unconsolidated Undrained Triaxial
- ⊕ Torvane
- ⊗ Pocket Penetrometer
- + Soil Strength Exceeds Instrument's Maximum Measurable Strength.

TUBE AND SPT SAMPLES

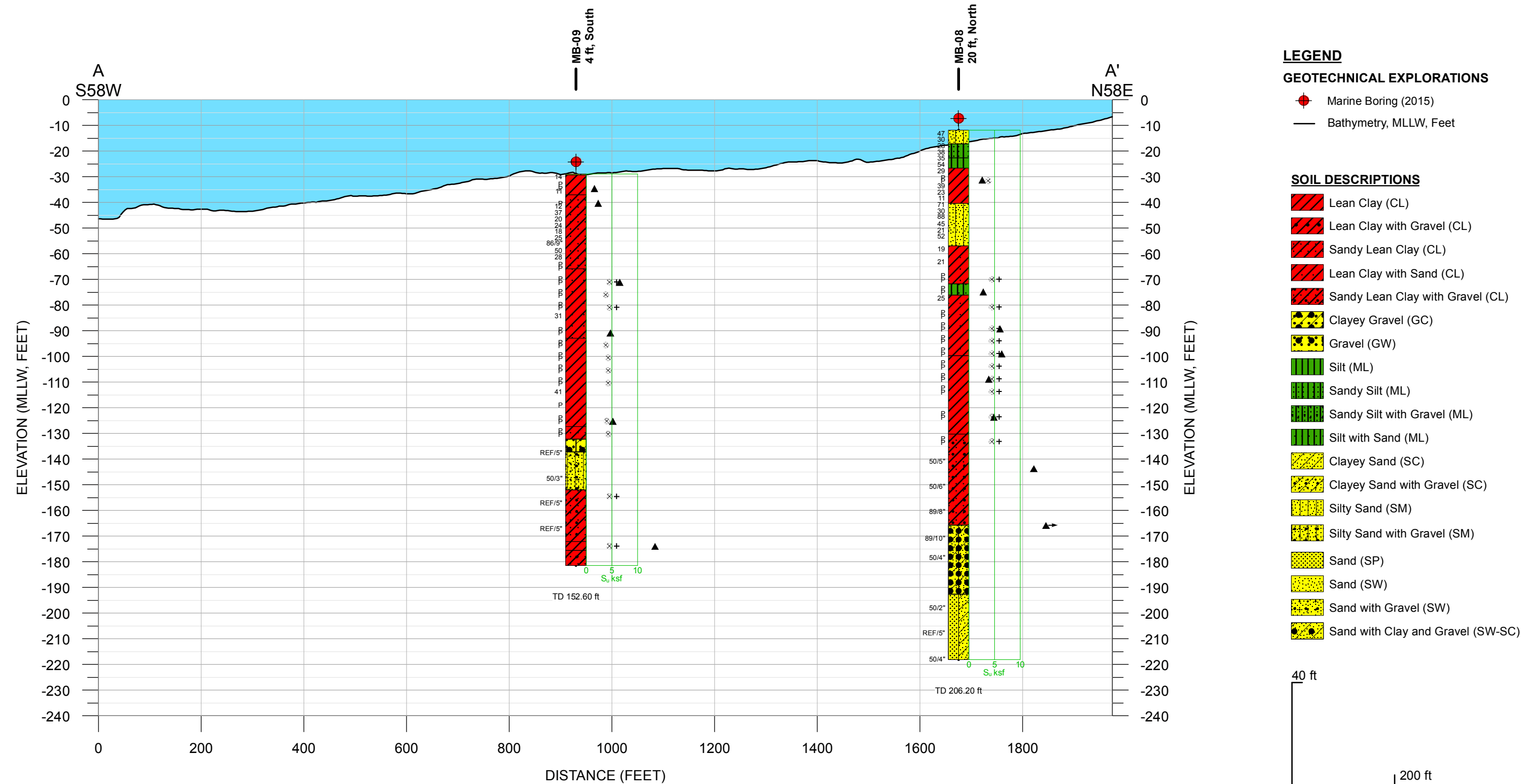
- P Push thin-walled 3" tube.
- 20 Number of blows to produce 12" of penetration after the initial 6" of seating.
- 86/11" Number of blows required to produce the indicated penetration after an initial 6" seating.
- Ref/3" 50 blows produced the indicated penetration during the initial 6" interval.

NOTES :

- 1) Bathymetry data collected by Fugro in 2014 and 2015. Elevation is referenced to MLLW.
- 2) As-Built coordinates of marine exploration locations was recorded by Fugro Starfix Positioning System.
- 3) As-built elevations of the exploration locations are referenced to MLLW and calculated using bathymetry data (Fugro 2014 & 2015).
- 4) See Plate 3 and Plate 4 for location of explorations and cross section lines.
- 5) The following formula is used to convert the elevations from MLLW to NAVD88 for marine LNG Facilities area : EL in feet (NAVD88) = EL in feet (MLLW) - 7.32ft

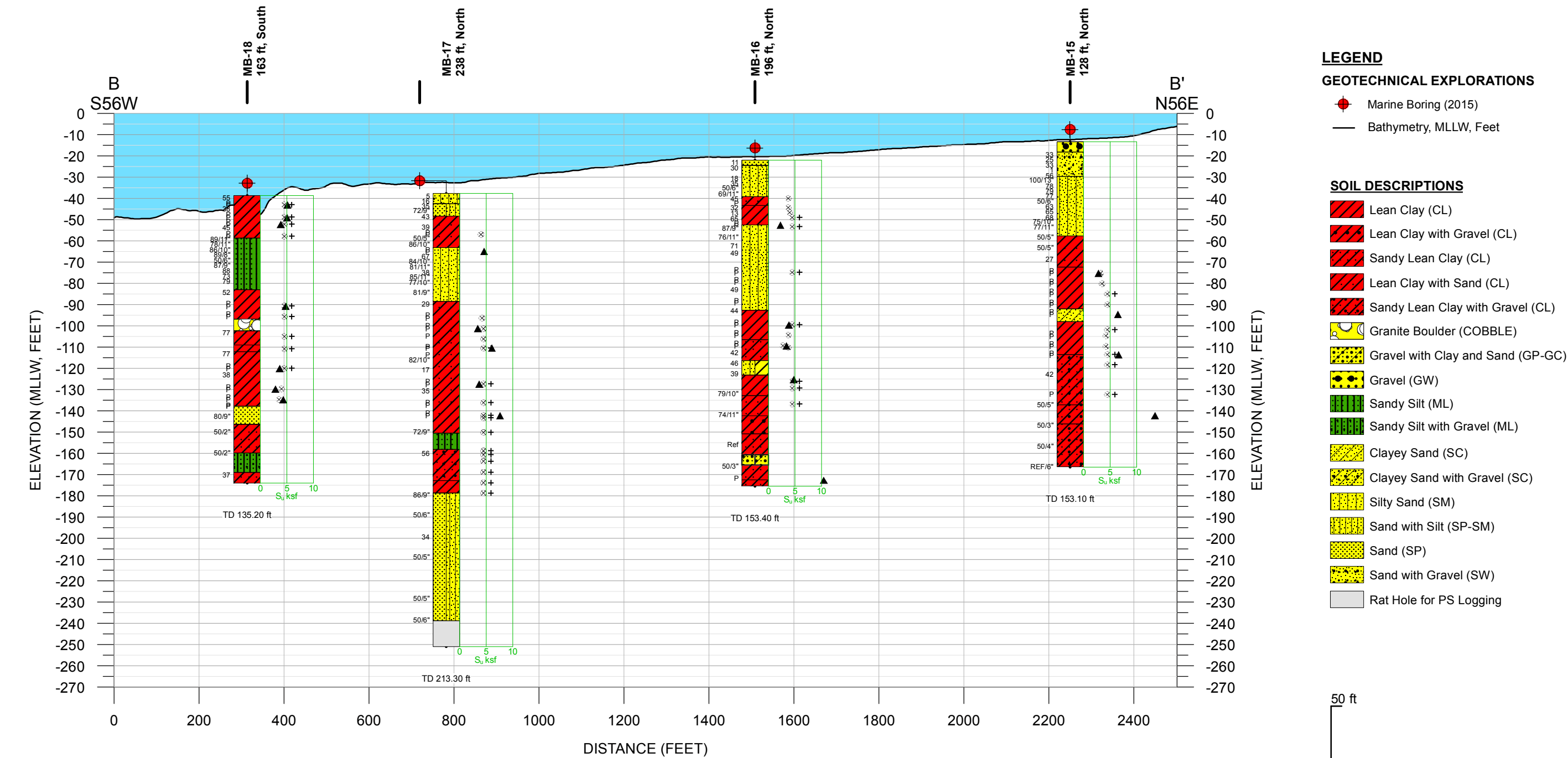
SUBSURFACE CROSS SECTION 4 - 4'
MARINE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA

R:\04100\2014 Projects\04.10140334 - Phase 2 Alaska LNG Project\09_GIS\Outputs\01_REPORTS\2015_12_08_Draft_MarineDataReport\MXD\Plate-09_XSect_A.mxd, 6/20/2016, kimk

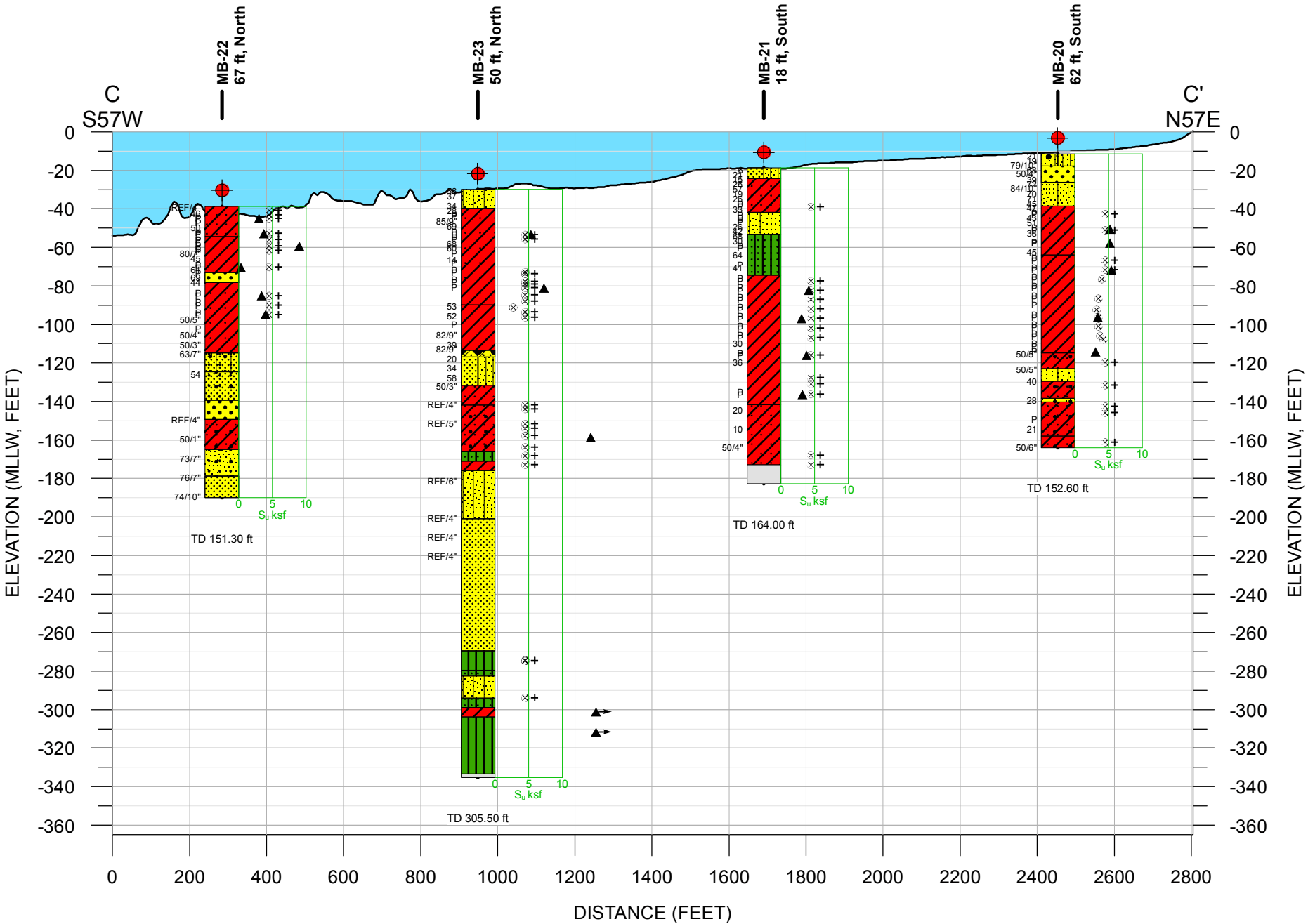


SUBSURFACE CROSS SECTION A - A'
MARINE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA

R:\04100\2014 Projects\04.10140094 - AKLNG05_GIS\Outputs\01_REPORTS\2015_04_21_Final_Geotechnical_Report\MXD\Plate-05_Xsect_A.mxd, 6/21/2016, kmmk



SUBSURFACE CROSS SECTION B - B'
ONSHORE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA



LEGEND

GEOTECHNICAL EXPLORATIONS

- Marine Boring (2015)
- Bathymetry, MLLW, Feet

SOIL DESCRIPTIONS

- Lean Clay (CL)
- Sandy Lean Clay (CL)
- Lean Clay with Sand (CL)
- Sandy Lean Clay with Gravel (CL)
- Clayey Gravel with Sand (GC)
- Gravel (GP)
- Silt (ML)
- Sandy Silt (ML)
- Silty Sand (SM)
- Sand with Silt (SP-SM)
- Sand (SP)
- Sand with Gravel (SP)
- Sand with Gravel (SW)
- Sand with Silt and Gravel (SW-SM)
- Rat Hole for PS Logging

60 ft
400 ft
Vertical Exaggeration = 6.7X

UNDRAINED SHEAR STRENGTH (S_u)

- ▲ Unconsolidated Undrained Triaxial
- ⊕ Torvane
- ⊗ Pocket Penetrometer
- + Soil Strength Exceeds Instrument's Maximum Measurable Strength.

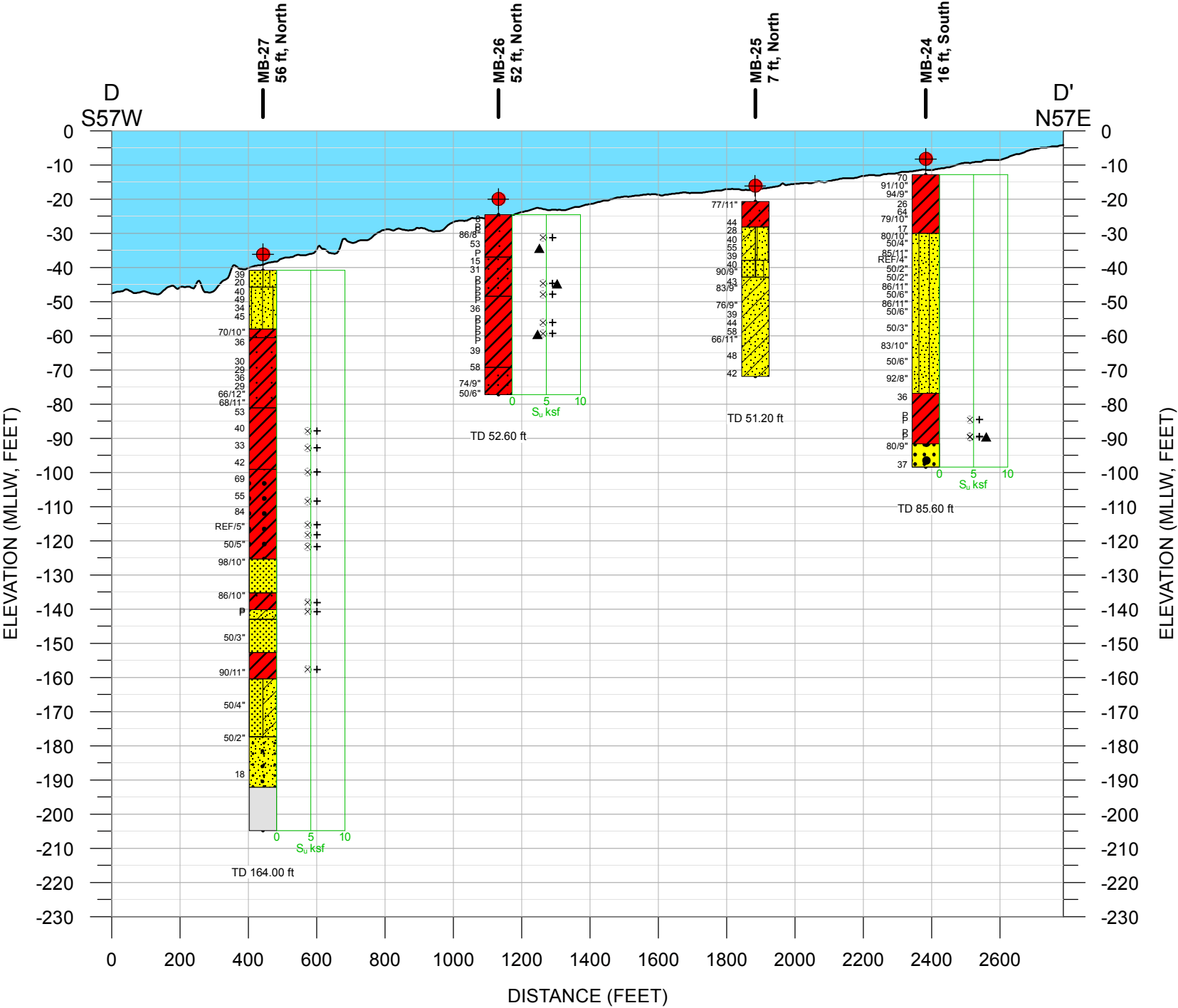
TUBE AND SPT SAMPLES

- P Push thin-walled 3" tube.
- 20 Number of blows to produce 12" of penetration after the initial 6" of seating.
- 86/11" Number of blows required to produce the indicated penetration after an initial 6" seating.
- Ref/3" 50 blows produced the indicated penetration during the initial 6" interval.

NOTES :

- 1) Bathymetry data collected by Fugro in 2014 and 2015. Elevation is referenced to MLLW.
- 2) As-Built coordinates of marine exploration locations was recorded by Fugro Starfix Positioning System.
- 3) As-built elevations of the exploration locations are referenced to MLLW and calculated using bathymetry data (Fugro 2014 & 2015).
- 4) See Plate 3 and Plate 4 for location of explorations and cross section lines.
- 5) The following formula is used to convert the elevations from MLLW to NAVD88 for marine LNG Facilities area : EL in feet (NAVD88) = EL in feet (MLLW) - 7.32ft

SUBSURFACE CROSS SECTION C - C'
MARINE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA

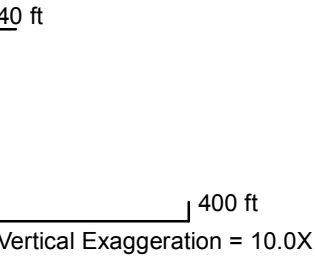


LEGEND
GEOTECHNICAL EXPLORATIONS

- Marine Boring (2015)
- Bathymetry, MLLW, Feet

SOIL DESCRIPTIONS

- Lean Clay (CL)
- Lean Clay with Gravel (CL)
- Sandy Lean Clay (CL)
- Lean Clay with Sand (CL)
- Gravel (GW)
- Clayey Sand (SC)
- Silty Sand (SM)
- Sand with Silt (SP-SM)
- Sand (SP)
- Sand with Gravel (SW)
- Rat Hole for PS Logging



UNDRAINED SHEAR STRENGTH (S_u)

- ▲ Unconsolidated Undrained Triaxial
- ⊕ Torvane
- ⊗ Pocket Penetrometer
- + Soil Strength Exceeds Instrument's Maximum Measurable Strength.

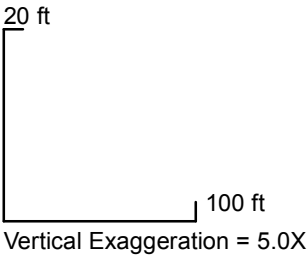
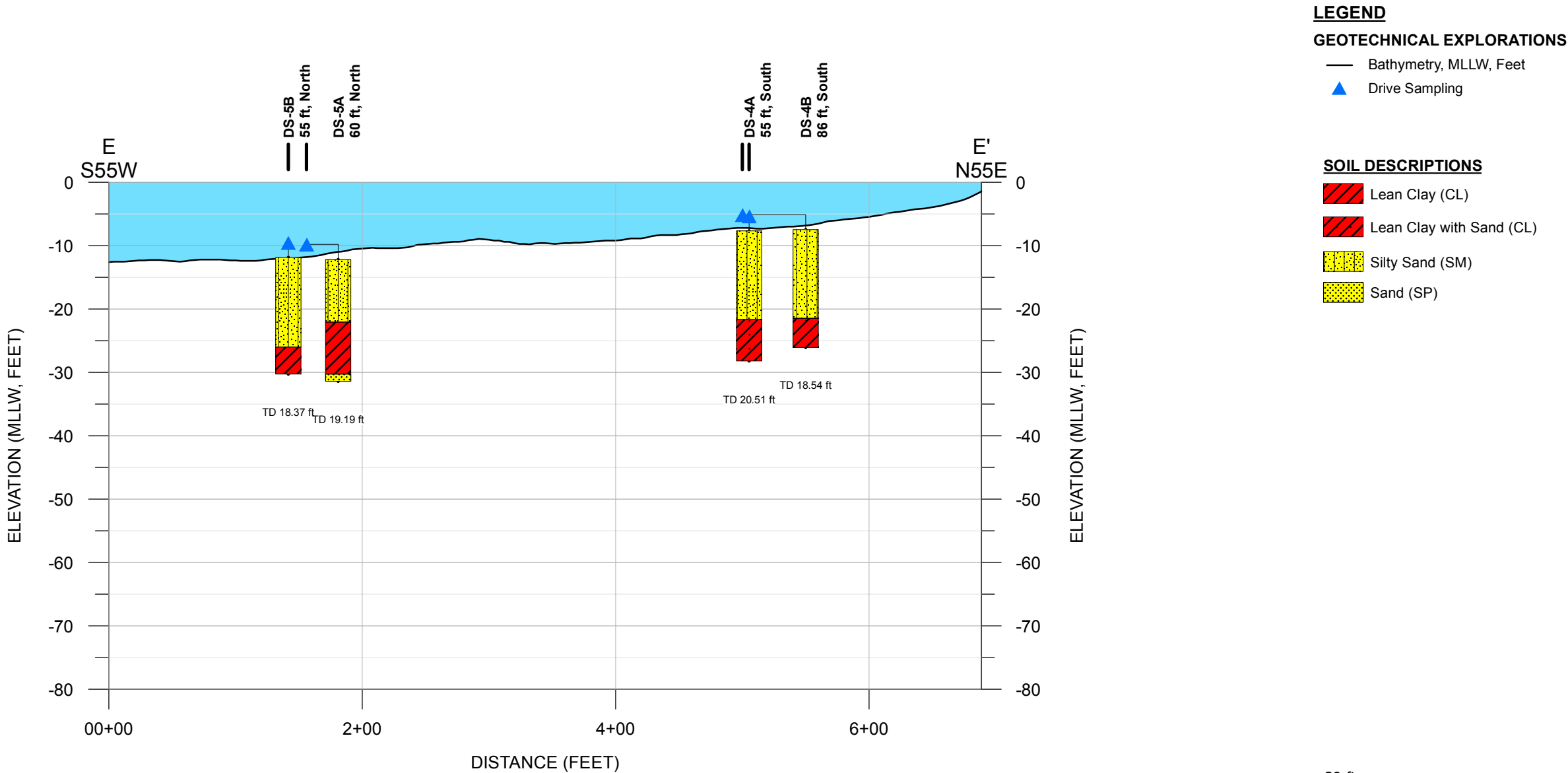
TUBE AND SPT SAMPLES

- P Push thin-walled 3" tube.
- 20 Number of blows to produce 12" of penetration after the initial 6" of seating.
- 86/11" Number of blows required to produce the indicated penetration after an initial 6" seating.
- Ref/3" 50 blows produced the indicated penetration during the initial 6" interval.

NOTES :

- 1) Bathymetry data collected by Fugro in 2014 and 2015. Elevation is referenced to MLLW.
- 2) As-Built coordinates of marine exploration locations was recorded by Fugro Starfix Positioning System.
- 3) As-built elevations of the exploration locations are referenced to MLLW and calculated using bathymetry data (Fugro 2014 & 2015).
- 4) See Plate 3 and Plate 4 for location of explorations and cross section lines.
- 5) The following formula is used to convert the elevations from MLLW to NAVD88 for marine LNG Facilities area : EL in feet (NAVD88) = EL in feet (MLLW) - 7.32ft

SUBSURFACE CROSS SECTION D - D'
MARINE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA



UNDRAINED SHEAR STRENGTH (S_u)

- ▲ Unconsolidated Undrained Triaxial
- ⊕ Torvane
- ⊗ Pocket Penetrometer
- + Soil Strength Exceeds Instrument's Maximum Measurable Strength.

TUBE AND SPT SAMPLES

P	Push thin-walled 3" tube.
20	Number of blows to produce 12" of penetration after the initial 6" of seating.
86/11"	Number of blows required to produce the indicated penetration after an initial 6" seating.
Ref/3"	50 blows produced the indicated penetration during the initial 6" interval.

NOTES :

- 1) Bathymetry data collected by Fugro in 2014 and 2015. Elevation is referenced to MLLW.
- 2) As-Built coordinates of marine exploration locations was recorded by Fugro Starfix Positioning System.
- 3) As-built elevations of the exploration locations are referenced to MLLW and calculated using bathymetry data (Fugro 2014 & 2015).
- 4) See Plate 3 and Plate 4 for location of explorations and cross section lines.
- 5) The following formula is used to convert the elevations from MLLW to NAVD88 for marine LNG Facilities area : EL in feet (NAVD88) = EL in feet (MLLW) - 7.32ft

SUBSURFACE CROSS SECTION E - E'
MARINE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA

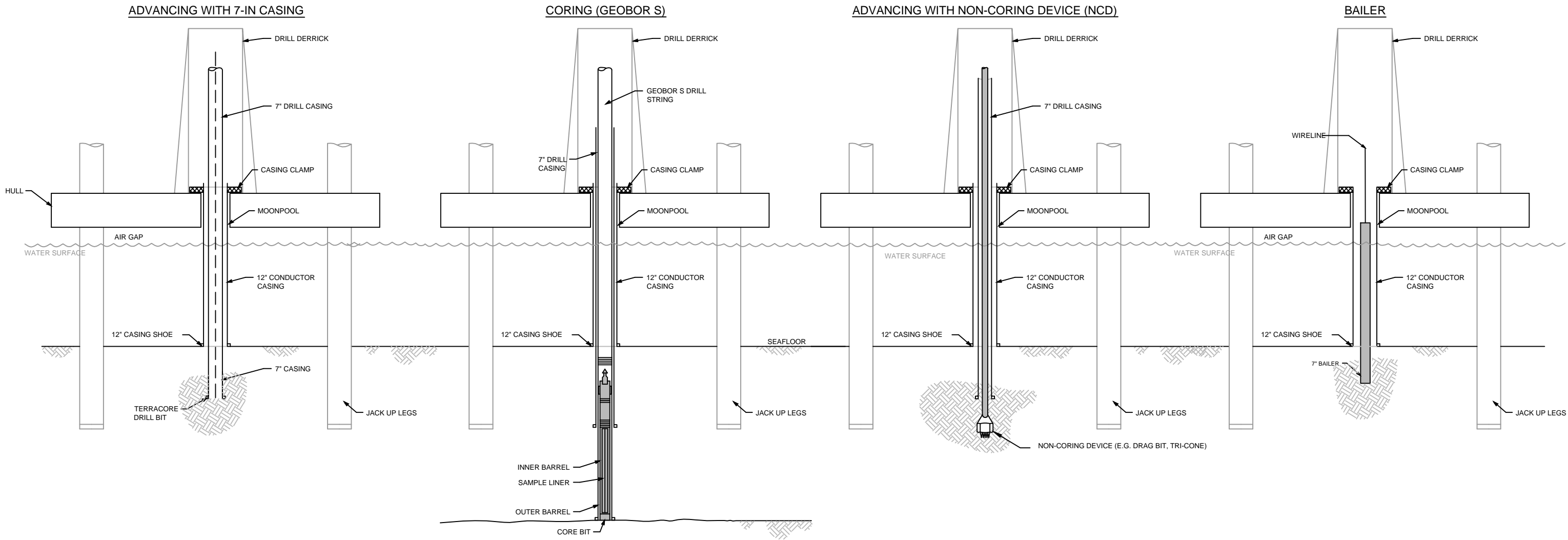
APPENDIX A

Summary of Explorations

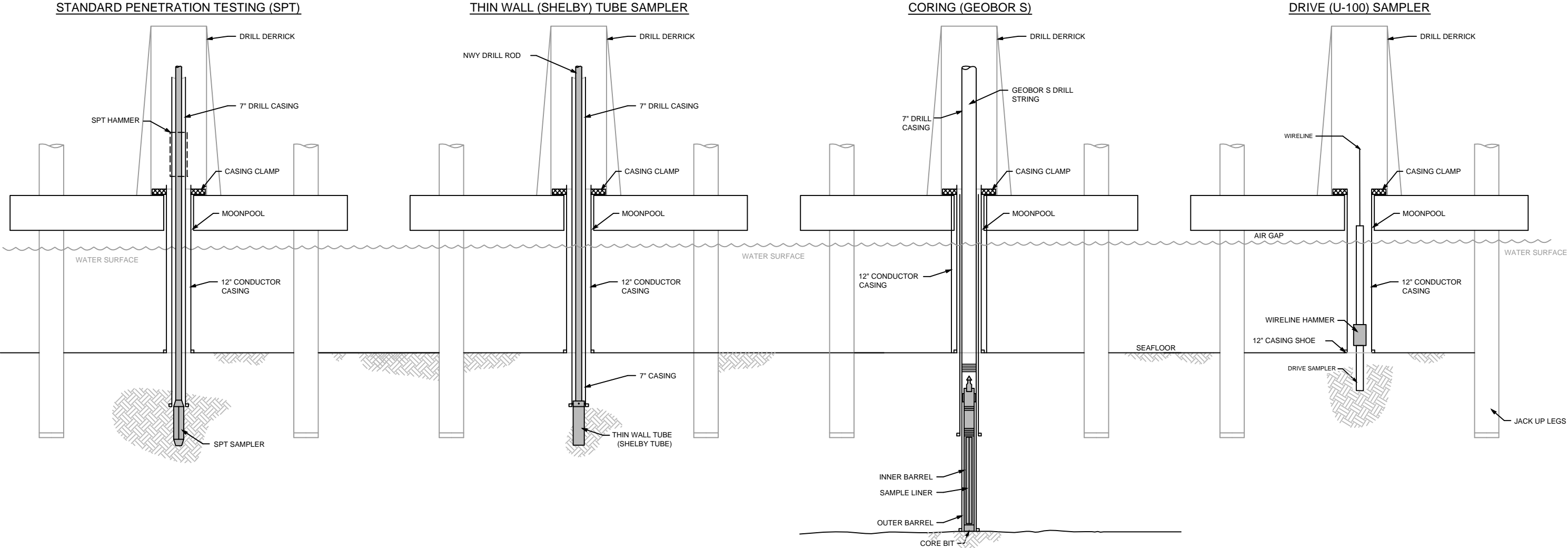
Drilling and Sampling Schematics

Vessel Specifications

SUMMARY OF FIELD OPERATION																							
Exploration							Coordinates and Elevations													Drilling Status			
Explorations (Completed)	Type	Area	PS-Logging	SPT Hammer	12-in Casing Depth (ft)	7-in Casing Depth (ft)	Proposed Coordinates (NAD83) and Elevation			Actual Coordinates (NAD83)		Mudline Elevation								Proposed Depth (ft)	Actual Depth (ft)	Date Started	Date Completed
							Latitude (deg)	Longitude (deg)	Elev (ft, MLLW)	Latitude (deg)	Longitude (deg)	Deck to Mudline (ft)	Water Depth (ft)	Date and Time (Time of Measurement)		Starfix Deck Level (ft, MLLW)	Mudline Elevation based on Starfix Deck Level (ft, MLLW)	Mudline Elevation based on Tide Level (ft, MLLW)	Mudline Elevation based on Bathymetry (ft, MLLW)				
MB-02	Boring	Marine Terminal		SPT-09 / SPT-02	-	47.1	60.66968565	-151.38955043	-34.0	60.66965211	-151.38962336	60.37	48.6	12-Sep-15	2:05	25.20	-35.2	-35.0	-35.2	50	47.1	11-Sep-15	12-Sep-15
MB-03	Boring	Marine Terminal	X	SPT-02	3	36.9	60.66837816	-151.38310777	-22.2	60.66833486	-151.38317767	51.51	39.4	23-Oct-15	16:10	27.89	-23.6	-23.3	-23.1	150	162.7	23-Oct-15	27-Oct-15
MB-04	Boring	Marine Terminal		SPT-09	-	85.3	60.66733148	-151.38670417	-36.3	60.66732889	-151.38666733	61.02	44.6	20-Aug-15	5:10	26.15	-34.9	-36.3	-36.4	150	151.8	20-Aug-15	21-Aug-15
MB-05	Boring	Marine Terminal		SPT-09	-	68.9	60.66602656	-151.38026536	-19.7	60.66605106	-151.38017992	46.26	29.2	18-Aug-15	3:58	25.46	-20.8	-19.4	-18.9	150	151.6	18-Aug-15	19-Aug-15
MB-06	Boring	Marine Terminal	X	SPT-02	23.6	64	60.66498006	-151.38386173	-34.9	60.66501117	-151.38379131	63.32	51.2	16-Sep-15	16:55	28.54	-34.8	-35.6	-33.9	150	149.3	16-Sep-15	18-Sep-15
MB-08	Boring	Marine Terminal		SPT-09	-	139.1	60.66367207	-151.37741997	-16.8	60.66367342	-151.37739867	41.01	26.9	23-Aug-15	13:00	25.95	-15.1	-11.8	-16.7	300	206.2	23-Aug-15	25-Aug-15
MB-09	Boring	Marine Terminal		SPT-09	-	78.7	60.66264565	-151.38096312	-29.7	60.66249628	-151.38079069	54.13	36.9	25-Aug-15	21:30	27.56	-26.6	-28.9	-28.8	150	152.6	25-Aug-15	28-Aug-15
MB-12	Boring	Marine Terminal		SPT-09	-	54.1	60.66132056	-151.37457866	-16.7	60.66132147	-151.37456722	48.56	35.4	21-Aug-15	23:05	23.95	-24.6	-18.4	-16.6	150	152.6	21-Aug-15	23-Aug-15
MB-13	Boring	Marine Terminal	X	SPT-09	1.6	23.8	60.66027548	-151.37817623	-25.0	60.66030914	-151.37814189	52.49	32.8	2-Oct-15	12:30	26.12	-26.4	-26.0	-25.1	150	164.0	2-Oct-15	4-Oct-15
MB-14	Boring	Marine Terminal		SPT-02	1.6	59.9	60.65936928	-151.38157163	-38.8	60.65939000	-151.38159111	63.32	54.8	21-Oct-15	14:15	23.65	-39.7	-38.9	-39.0	50	150.8	21-Oct-15	23-Oct-15
MB-15	Boring	Marine Terminal		SPT-09	-	55.8	60.65896617	-151.37173437	-13.2	60.65898078	-151.37165869	39.37	30.5	3-Sep-15	10:23	25.49	-13.9	-13.3	-12.9	150	153.1	3-Sep-15	4-Sep-15
MB-16	Boring	Marine Terminal		SPT-09	-	79.6	60.65791979	-151.37533010	-21.9	60.65796353	-151.37525403	45.93	39.0	5-Sep-15	0:05	22.64	-23.3	-22.0	-21.8	150	153.4	5-Sep-15	7-Sep-15
MB-17	Boring	Marine Terminal	X	SPT-02	2.3	38.5	60.65685945	-151.37897324	-36.8	60.65681081	-151.37898244	62.34	51.2	18-Sep-15	17:30	25.56	-36.8	-37.6	-36.9	150	213.3	18-Oct-15	20-Oct-15
MB-18	Boring	Marine Terminal		SPT-09	1.6	58.1	60.65531462	-151.37951053	-38.7	60.65527456	-151.37954225	67.91	48.2	19-Sep-15	17:00	29.40	-38.5	-38.7	-38.3	300	135.2	19-Sep-15	21-Sep-15
MB-19	Boring	Marine Terminal	X	SPT-09	1.6	37.7	60.65856157	-151.37877812	-32.2	60.65854333	-151.37877392	61.68	47.9	9-Oct-15	18:00	28.97	-32.7	-31.8	-32.3	150	167.3	9-Oct-15	11-Oct-15
MB-20	Boring	Marine Terminal		SPT-09	-	57.4	60.65661431	-151.36889362	-10.8	60.65661392	-151.36889178	35.43	19.7	7-Sep-15	10:09	24.31	-11.1	-11.4	-10.8	150	152.6	7-Sep-15	8-Sep-15
MB-21	Boring	Marine Terminal	X	SPT-02	1.6	36.7	60.65556812	-151.37248932	-18.2	60.65553589	-151.37254192	51.18	39.4	16-Oct-15	18:25	31.99	-19.2	-18.7	-17.9	150	164.0	16-Oct-15	17-Oct-15
MB-22	Boring	Marine Terminal	X	SPT-09	1	1.3	60.65354222	-151.37931635	-40.5	60.65356186	-151.37928597	67.91	55.8	5-Oct-15	12:30	26.87	-41.0	-38.8	-40.3	150	151.2	5-Oct-15	7-Oct-15
MB-23	Boring	Marine Terminal	X	SPT-09 / SPT-02	1.6	37.7	60.65451384	-151.37609289	-28.2	60.65454731	-151.37617150	51.18	42.3	12-Oct-15	14:00	22.01	-29.2	-29.8	-29.4	150	305.4	12-Oct-15	15-Oct-15
MB-24	Boring	Marine Terminal		SPT-02	0.3	64	60.65394631	-151.36724314	-11.4	60.65393967	-151.36730675	49.21	34.1	27-Oct-15	15:20	36.38	-12.8	-12.8	-11.4	150	85.6	27-Oct-15	2-Nov-15
MB-25	Boring	Marine Terminal		SPT-09	-	51.2	60.65321625	-151.36964880	-17.1	60.65322350	-151.36967892	33.79	18.7	9-Sep-15	9:30	16.37	-17.4	-17.3	-17.2	50	51.2	9-Sep-15	9-Sep-15
MB-26	Boring	Marine Terminal		SPT-09	-	52.6	60.65215172	-151.37327709	-25.4	60.65216953	-151.37327900	52.82	43.0	9-Sep-15	17:50	27.92	-24.9	-24.6	-25.1	50	52.6	10-Sep-15	11-Sep-15
MB-27	Boring	Marine Terminal	X	SPT-09	1.6	37.7	60.65108266	-151.37650592	-39.7	60.65111592	-151.37646725	67.26	57.4	7-Oct-15	15:55	24.93	-42.3	-40.8	-39.9	150	164.0	7-Oct-15	9-Oct-15
MB-28	Boring	Marine Terminal		SPT-09	1.6	52.3	60.66436151	-151.38083773	-29.1	60.66439822	-151.38078286	61.35	42.7	11-Oct-15	13:40	31.73	-29.6	-29.9	-29.2	50	52.3	11-Oct-15	12-Oct-15
MB-31	Boring	Marine Terminal		SPT-09	-	51.8	60.64981415	-151.37039894	-24.6	60.64981225	-151.37039036	49.54	41.0	11-Sep-15	6:06	24.48	-25.1	-23.8	-24.6	50	51.8	11-Sep-15	11-Sep-15
DS-4A	Boring	Marine Terminal		-	1.6	4.11	60.65585278	-151.36719444	-7.8	60.65588414	-151.36719431	32.81	15.1	2-Nov-15	16:15	24.44	-8.4	-7.7	-7.7	19	20.5	2-Nov-15	2-Nov-15
DS-4B	Boring	Marine Terminal		-	1.3	1.6	60.65585278	-151.36719444	-7.8	60.65580844	-151.36712022	33.14	18.0	3-Nov-15	0:15	25.00	-8.1	-7.5	-7.7	19	18.5	3-Nov-15	3-Nov-15
DS-5A	Boring	Marine Terminal		-	1.3	19.19	60.65559167	-151.36910000	-11.7	60.65557886	-151.36914764	34.12	29.5	4-Nov-15	12:40	20.96	-13.2	-12.2	-11.8	19	19.2	4-Nov-15	4-Nov-15
DS-5B	Boring	Marine Terminal		-	1.3	16.4	60.65559167	-151.36910000	-11.7	60.65554508	-151.36919739	34.45	18.4	4-Nov-15	18:05	21.69	-12.8	-11.9	-12.0	19	19.2	4-Nov-15	4-Nov-15



**SCHEMATIC FOR BOREHOLE ADVANCEMENT
MARINE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA
(NOT TO SCALE)**



**SCHEMATIC FOR BOREHOLE SAMPLING
MARINE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA
(NOT TO SCALE)**



FUGRO SEACORE SKATE 3

The Skate 3 range consists of medium sized, high payload, container transportable jack-up platforms. These platforms have a low international transport cost coupled with high performance capabilities.

Skate 3's modular design means that jack-ups can be provided in a variety of sizes, with deck areas ranging from 178 m² to 238.1 m² and the capability of operating in water depths between 1-30m. Each craft in the Skate range has a rapid deck elevating system and is equipped with 4 legs mounted externally to provide maximum stability.

All pontoon components and equipment are designed around the container freight concept. The pontoons double as containers in which the jack-up legs, power units and all other ancillary equipment are housed. This allows cost-effective international transportation by road, rail or container ship. Assembly and

commissioning of the jack-up is achieved in under two shifts.

The jack-ups can be fitted with one of the range of Fugro Seacore hydraulic thrusters to provide self propulsion. In compact configurations, these fast elevating, self propelled jack-up craft are ideal for confined intertidal areas, where swift, accurate moving and positioning is required. In their larger configuration Skate 3 jack-ups are capable of working safely in exposed open seas.

For maximum safety, they are equipped with rigid steel bulwarks and 110V fluorescent lights providing full inboard and outboard illumination for 24 hour working.

All Fugro Seacore jack-ups are equipped with VHF radios, life saving and first aid equipment, and high-speed, outboard driven personnel launches.

Operated and maintained exclusively by Fugro Seacore's trained and experienced marine engineers, the Skate 3 jack-up is a versatile, stable, self-elevating platform for overwater work.



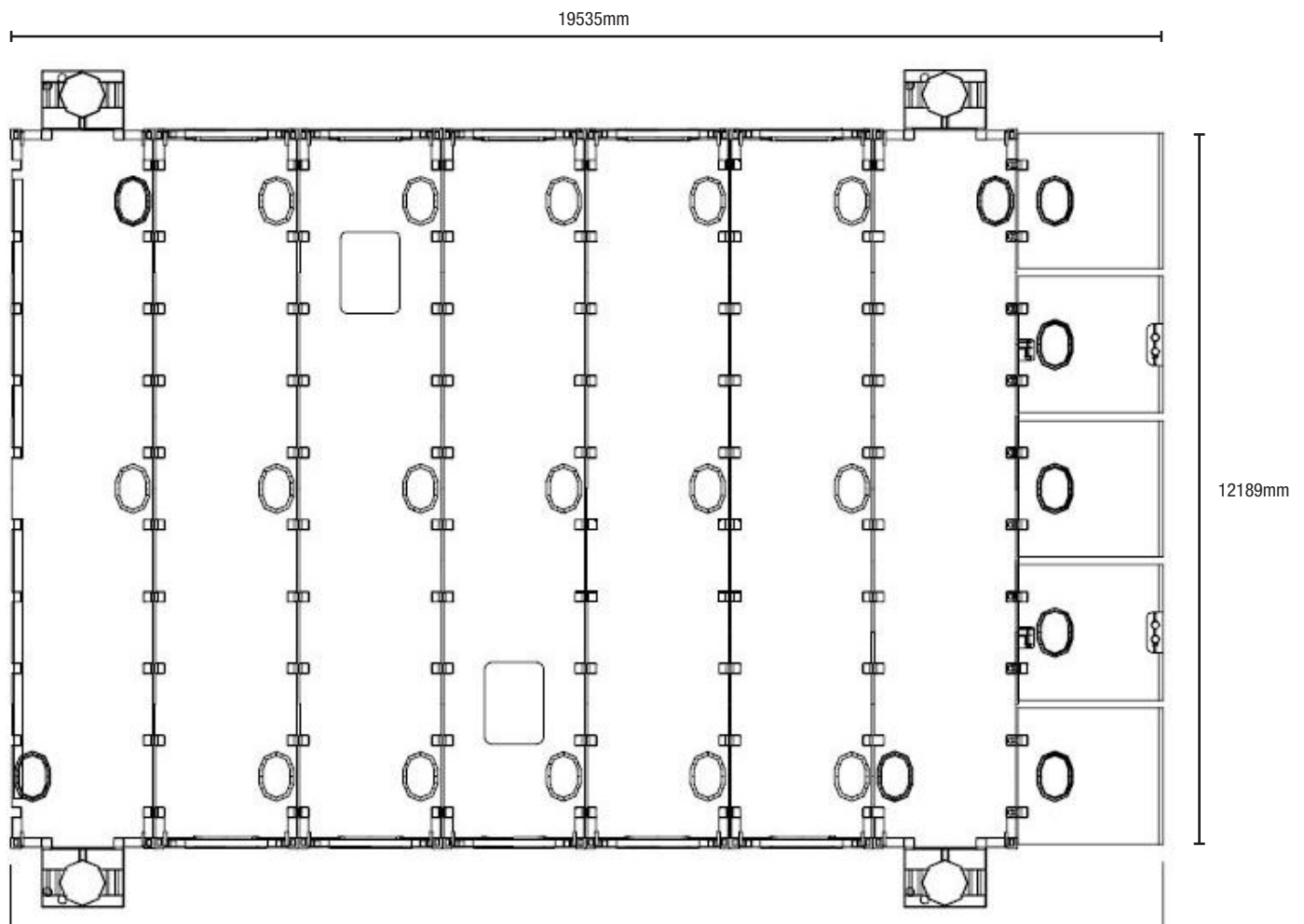
Skate 3 on site in Uruguay.



SPECIFICATIONS

Skate 3 Jack Up Barge

Max Separation:	32m
Working Draft:	0.985m
No. of Containers	7
Deck Area:	238.1 sq m
Leg Size:	762mm
Elevating System:	Hydraulic Ram & Duo Pin Rack
Accommodation	Workshop/canteen container



Fugro Seacore Ltd

Bickland Industrial Park

Falmouth

Cornwall

TR11 4TA

T +44 (0) 1326 254 500

E info@seacore.com

www.seacore.com



FUGRO SEACORE COMACCHIO MC1200

The MCS 1200 is a hydraulic skid mounted drilling rig capable of operating all rotary and/or rotary percussive drilling systems.

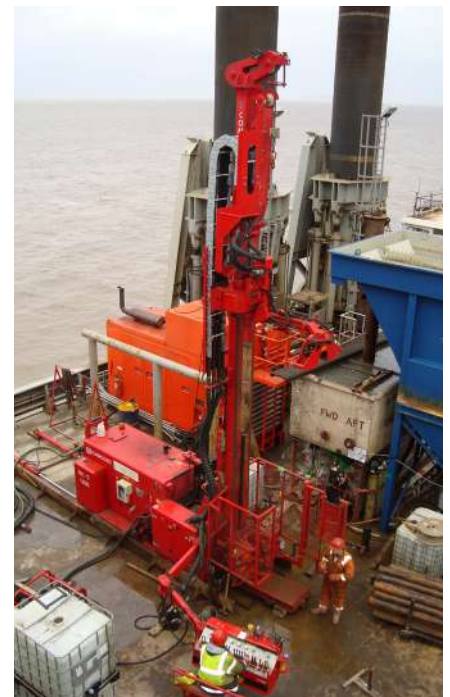
During the design stage Fugro Seacore worked closely with Comacchio to ensure the development of fully integrated drilling unit capable of withstanding both the complex and rigorous nature of marine works. For example the MCS 1200 has a unique triple holding clamp and breakout arrangement for handling the various casings required, these are complimented by a set of hydraulically adjusted drill string centralisers.

The main mast is equipped with a crane boom and a drill string manipulator arm that enables drill rods and casings to be manoeuvred to and from the working deck with minimal manual intervention.

The main power supply is fully silenced and the hydraulics operate a closed system with bio-degradable oil.

The control console is deployed on a multi positional arm enabling the driller an uninterrupted view of all drilling activities and all rotating parts are guarded within a fully interlocked cage.

The MCS 1200 is suitable for all aspects of rotary soil investigations, core drilling as well as specialised civil engineering works such as micropiles, anchors and ground consolidation works.





SPECIFICATIONS

Power Pack:

Diesel Engine:	New generation 132 Kw DEUTZ diesel engine series 2012
Engine power:	132Kw (180HP)/ 2300 rpm
Main Pump:	2 x 190 lt/min / 2 x 50,2 gal/min
Oil tank:	400Lt / 105,6 gal
Fuel tank:	350lt / 92,5 gal

Mast

Feed stroke:	4.750/7.200/10.200mm
Total length:	7.100/9.550/12.550 mm/ 23,3/31,3/41,2 ft
Feed force:	7.000 daN/ 15,736 lbs
Retract force:	7,000 daN/ 15,736 lbs

Clamps:

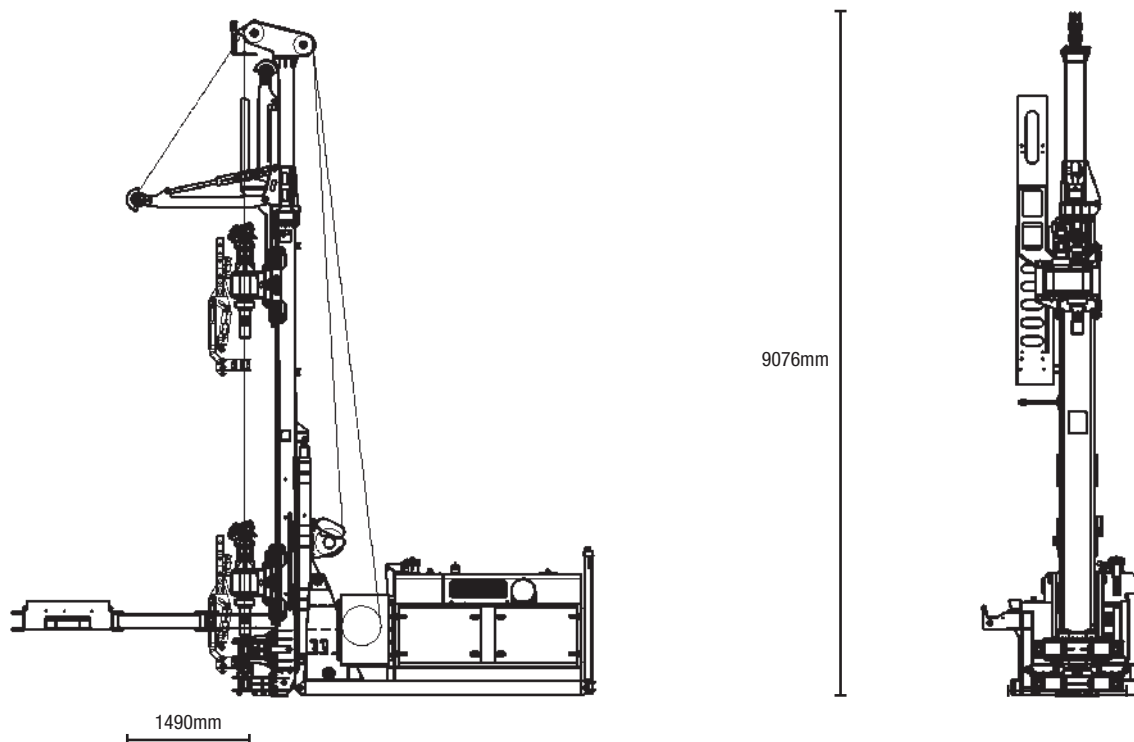
Min Handling:	45mm / 1,8 in
Max Handling:	360mm /14,1 in
Clamping force:	280KN / 62,946 lbs
Breaking torque:	3.500 daNm / 25,814 lb ft

Rotary Head:

Gears:	6
Max torque:	1,230 daNm/ 9,072 lb-ft
Max speed:	340 (550) rpm
Head passage:	93mm/3,6 in
Swivel passage:	2"

Winch:

Max line pull:	2.000daN / 4,496 lbs
Drum capacity:	50mt / 164 ft
Rope speed:	30mt/min / 98 ft/min
Rope diameter:	10mn / 0,39 in



Fugro Seacore Ltd

Bickland Industrial Park
 Falmouth
 Cornwall
 TR11 4TA
 T +44 (0) 1326 254 500
 E info@seacore.com
 www.seacore.com



FUGRO SEACORE CR2 MARINE DRILL

Fugro Seacore's specialised inshore marine drilling mast CR2 is a multi-purpose, twin 'A' frame mast measuring 12m x 2.1m. It is designed to reduce the unproductive, labour intensive operations normally associated with overwater drilling.

Cable tool boring is carried out using a 2.5 tonne freefall winch. The use of the hydraulic rod/casing clamp replaces time consuming, conventionally bolted clamps.

Deck mounted mechanical bailing tippers allow removal of spoil from drilling tools in a productive, but safe, operative manner.

If required insitu testing equipment, rods, conductor casings etc., can be vertically stacked within the mast in 9 metre lengths. These are handled by a 5T hydraulic winch. The CR2 incorporates a high powered Dando 500 hydraulic power swivel for rotary drilling and coring.

For rotary open-hole drilling the boreholes are excavated without conductor or liner casings. Stability of the unlined holes is provided by drilling muds which are guar-based, non toxic and bio-degradable.

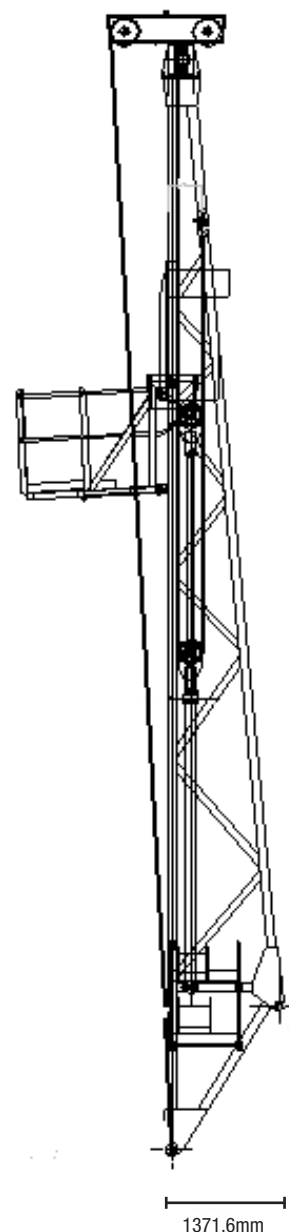
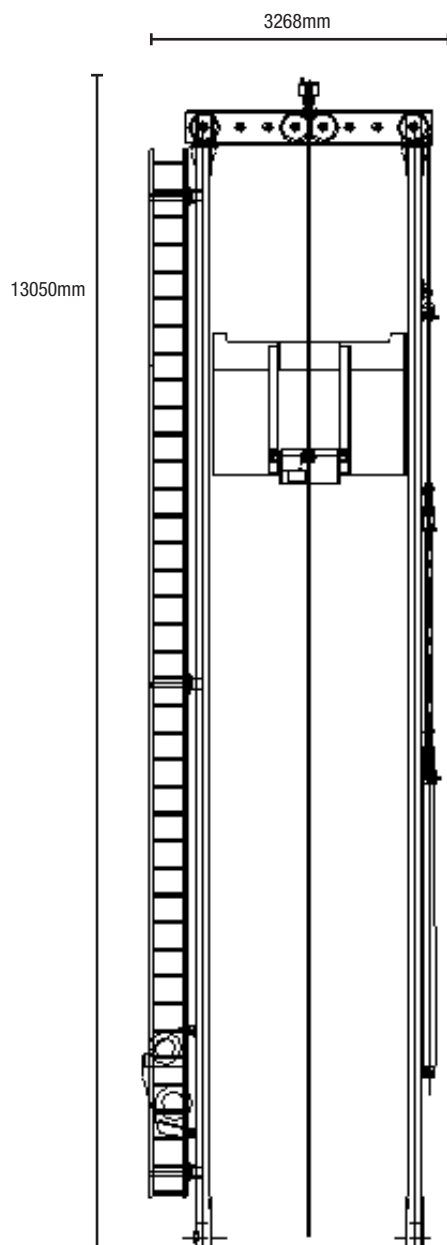
Conventional or wireline cores can be carried in a variety of sizes.



CR2 Marine Drill at Barrow OWF



SPECIFICATIONS



Fugro Seacore Ltd

Bickland Industrial Park

Falmouth

Cornwall

TR11 4TA

T +44 (0) 1326 254 500

E info@seacore.com

www.seacore.com

GEOBOR-S



GEOBOR-S triple tube wireline drilling system which has been specially developed for high quality geotechnical investigations of soil and rock formations

In its 30 years of drilling experience, Fugro Seacore has examined and tested many methods of coring - aiming to minimise core disturbance and maximise core recovery.

GEOBOR-S System

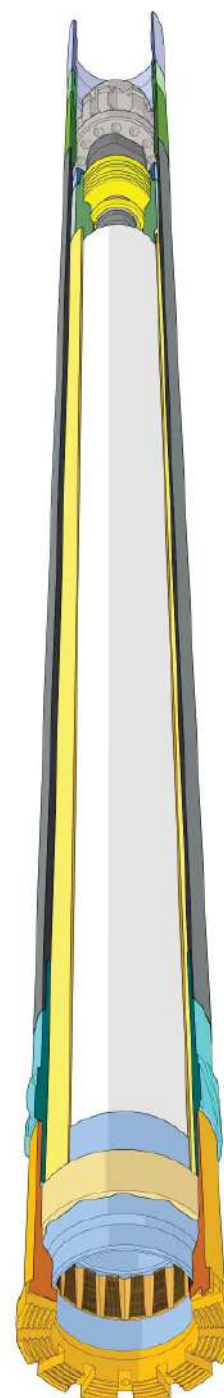
Our experience leads us to recommend the use of GEOBOR-S triple tube wireline drilling system, which has been specially developed for core drilling and undisturbed sampling in a wide variety of soil and rock formations. The GEOBOR-S is a "triple tube" core barrel which cuts an "S" size core sample. It has a plastic core liner, which is seated within the inner barrel assembly, considerably reducing friction between the core and the inner tube and enhancing core recovery.

Sample Recovery

A nominal 102 mm diameter core sample is recovered from this system, generally in 1.5 m lengths. This larger diameter enhances drilling performance whilst obtaining high quality core samples, for soil and rock testing.

We provide a wide range of coring bits including, for example, annular and face discharge, surface set and impregnated diamond bits, saw tooth and tungsten carbide etc.

The core barrel itself is designed for flushing with water, mud or air, and can easily be adapted for most soil and rock conditions by the use of an appropriate core bit or non coring devise.





Core Liner

The core liner is a rigid, transparent PVC tube with a wall thickness of approximately 1 mm, that fits snugly inside the GEOBOR-S core barrel inner tube, trimmed to 1.5 m lengths. This is provided for all coring works.

The core samples are recovered within the core line tube and removed from the inner barrel between each consecutive run. The sample can be retained within the core line tube sealed at both ends and placed into the core box. This minimises handling induced core disturbance, both on the drill deck, and during subsequent transport of the core sample to the onshore core store and testing laboratories.

From our experience the combination of the GEOBOR-S system used with core liners:

- reduces coring and transport induced disturbance
- maintains sample quality
- significantly enhances recovery especially in mixed formations

Furthermore, we monitor the effectiveness of the various bit types throughout drilling, selecting bits appropriate to varying ground conditions as each borehole progresses. This allows us to maximise core quality and recovery in an appropriate and cost effective manner. **Four methods** can be used:

1. In medium to hard formations most suitable for soil conditions, all types of core bits can be used depending on the formation
2. For coring in soft soil formations, only TC-set bits are used and the bit consist of two parts (pilot and reamer)
3. For coring in very soft or loose formations, only TC-set bits are used. The bit is in two parts as in method two but one core lifter is extended to run 25 mm in front of the bit.
4. For coring in very soft, loose formations with varying layers. The spring-loaded inner tube assembly is extended to run in front of the bit, but is retractable for optimized adaptation to the consistency and density of the ground.

Other Advantages

The advantages of wireline coring over conventional coring (using drill rods and core barrels) are:

- separate temporary lining casing for borehole stabilization may not be required
- the drill string is more rigid
- the core barrel may be recovered without the need to remove the outer drill rod, thus the disturbance to the borehole wall is minimized
- the small annulus between the drill pipe and borehole wall requires significantly lower volumes of flush fluid compared to conventional drilling to achieve adequate uphole velocity for removal of cuttings from the hole. As a consequence, erosion of the formation (particularly at the bit face) is reduced.

Technical Specifications

	Metric	Imperial
Hole diameter, method 1-4	146.0 mm	5.75 in
Hole diameter, method 2-3	150.0 mm	5.90 in
Drill bit outer diameter	145.6 / 149.6 mm	5.73 / 5.90 in
Drill rod outer diameter	139.7 mm	5.58 in
Bit kerf, method 1	21.8 mm	0.86 in
Bit kerf, method 2-3	23.8 mm	0.94 in
Core diameter	102.0 mm	4.05 in
Hole area (od 146/150)	167.3 / 176.7 cm ²	26.0 / 27.4 in ²
Core area	81.7 cm ²	12.7 in ²
Cutting area in % of hole area	51.7 %	51.7 %

Fugro Seacore Ltd

Bickland Industrial Park
Falmouth
Cornwall
TR11 4TA
Telephone: + 44 (0) 1326 254500
Email: info@seacore.com



MODEL 106 Current Meter



The Model 106 Current Meter is a light weight, cost effective impeller current meter, designed for real time current measurement or short to medium term autonomous deployments. Titanium construction ensures durability, and the optional temperature and pressure sensors increase the versatility of the instrument. Ideal for use in rivers and coastal applications, or from small boats, the Model 106 is simple to use with either the Windows based PC software supplied, or an optional dedicated display unit.

Sensors

Speed

Type: High Impact Styrene Impeller
 Size: 125mm diameter by 270mm pitch
 Range: 0.03 to 5m/s
 Accuracy: $\pm 1.5\%$ of reading above 0.15m/s
 $\pm 0.004\text{m/s}$ below 0.15m/s

Direction

Type: Flux gate compass
 Range: 0 to 360°
 Accuracy: $\pm 2.5^\circ$
 Resolution: 0.5°

Temperature

Type: Thermistor
 Range: -5 to 35°C
 Accuracy: $\pm 0.2^\circ\text{C}$
 Resolution: 0.01°C

Pressure

Type: Strain Gauge Transducer
 Range: 50, 100, 200 or 500 dBar
 Accuracy: $\pm 0.2\%$ Range.
 Resolution: 0.025% Range

Data Acquisition

The current meter works on a basic 1 second cycle, during which the impeller counts are taken and a single compass heading reading is made. From this, East and North velocity vectors are calculated, which are then summed over the averaging period. The additional parameters of temperature and pressure (if fitted) are sampled once every sample period, and averaged over the averaging period.

Data Recovery

Direct to PC via communications port. Maximum RS232 data rate of 19200 baud.

Switching On/Off

The meters are switched on and off through software control, either by the DataLog™ software or by using the Model 8008 CDU. However, for autonomous, self recording operation the 106 is supplied with a subconn switch cap which fits in place of a direct cable connection.

Display Unit

The Model 106 may be used with a dedicated display unit for real time operations allowing instrument setup and data display.

Size: 244 x 193 x 94mm, 2kg
 Protection: IP67 (10 secs @ 0.3m)

Memory

512 Kbyte Solid State Memory. Each parameter record uses 2 bytes. As an example, this gives a duration of over 1 week with full parameter sampling every 10 seconds, or 220 days with sampling every 5 minutes.



Power

Internal: 1 x D cell. 1.5v alkaline cell gives approximately 30 days at 10 second sample rate, or 56 days at 5 minute sample rate. 3.6v Lithium cell gives approximately 90 days at 10 second sample rate, or 180 days at 5 minute sample rate.
 External: For external supply, 12-20v DC is required. Power can also be taken from the Model 8008 CDU.

Communications

Fitted with Subconn MCBH10F (Brass)
 RS232 to PC over cable lengths up to 200m.
 Digital Current Loop to Model 8008 CDU, or to PC over longer cable lengths (requires additional adaptor).

Physical

Instrument

Materials: Titanium, acetal and ABS plastic
 Size: 640mm x 50mm Ø, (tail 133mm wide x 270mm high)
 Weight: 3kg (air), 2kg (water)
 Depth Rating: 500m

Shipping

Model 106 Size: 84 x 42 x 39cm
 Model 106 Weight: 17kg
 50m Cable Size: 42 x 33 x 49cm
 50m Cable Weight: 11kg

Software

System is supplied with DataLog™ Windows based PC software, for instrument setup, data extraction and display of tabular and graphical data plots. DataLog is license free.

Ordering

0106001SC Model 106 Self Recording/Direct Reading unit, fitted with speed and direction sensors. Supplied with communications lead (3m Y lead), switch cap, set of tools, operating manual, software and system transit case.
 0106003SC As 0106001SC plus Temperature option
 0106004SCXX As 0106001SC plus Depth option
 0106005SCXX As 0106001SC plus Temperature & Depth option (XX denotes pressure transducer range)
 0105005SC Control Display Unit set, comprising deck lead and Model 8008 CDU.



Tug Specification Sheet

GENERAL INFO

Name: "Norman O"
Official No: 525967
Gross Tons: 96 GRT
Net Tons: 65 NRT
Fuel Capacity: 20,000 gals #2 Diesel
Potable Water: 1,500 gals
Main Engine: 1,500 HP Tier 3 Cummins
Props: SS 72" dia X 50/54"pitch

DECK

Bow Winch: Foss
Tow Winch: Almon Johnson 1600'
1 3/8" Tow Wire
Anchor: 1500 lb, 7 Shots Chain

COMMUNICATIONS

Satellite Phone #0693 (866) 866-9836
Satellite Email n/a
Cell Phone (907) 617-4742

HULL

Type of Vessel: 1500 HP Twin Screw
Length: 75'
Beam: 24'
Draft: 10'
Builder: Albina Shipyard
Year Built: 1970
Hull: Steel

NAVIGATION

Radar : 2 - Furuno
GPS: 2
AIS: 1
SS Radio: 1
VHF Radios: 3
Auto pilot: 1
Computers: 2
w/electronic charts & currents





Sundog Charters
2026 Arlington Drive
Anchorage, AK 99517
Sundogcharters.com
info@sundogcharters.com



VESSEL PARTICULARS

LENGTH OVERALL 42'
 BEAM 10.5'
 DRAFT 3'
 22' X 9.5 FOREWARD WORK DECK
 30 KNOT CRUISING SPEED
 200 GALLON FUEL CAPACITY
 200 MILE RANGE
 6,000 LB CARGO CAPACITY
 LANDING CRAFT STYLE BOW GATE

EXTERNAL EQUIPMENT

FORTRESS 60LB ANCHOR
 ELECTRIC WINDLESS
 FRANCIS 250 WATT SPOTT LIGHT
 2) 250 WATT WORK LIGHTS
 DAVIT ARM
 ALUMINUM BOARDING STEPS WITH HANDRAILS
 HYDRAULIC LIFTING A-FRAME-1,000 LB CAPACITY

INTERIOR

RED DOT CABIN HEATER (FROM ENGINE COOLING SYSTEM)
 WALLAS 2 BURNER STOVE/CABIN HEATER
 DEEP STAINLESS STEEL SINK, 85 GALLONS POTABLE WATER
 PAR MARINE TOILET WITH 18 GALLON HOLDING TANK
 MICROWAVE OVEN
 DINETTE SEATING FOR 4
 OVERNIGHT ACCOMODATIONS FOR 2
 26" TV MONITOR
 FREEDOM MARINE 3,000 WATT, 140 AMP INVERTER
 30 AMP SHORE POWER CONNECTION
 XANTREX 30 AMP MAIN BREAKER

MACHINERY

(2) JOHN DEERE 6068 SFM 50 DIESELS, 310 HP EACH
 BORG WARNER VELVET DRIVE REDUCTION GEARS, 1:1 RATIO
 (2) ULTRAJET 305 HT JET DRIVES WITH HYDRAULIC BUCKET CONTROLS
 DUAL RACOR 75/1000 FUEL FILTERS/WATER SEPERATORS
 (2) 65 AMP ALTERNATORS
 NEXT GENERATION UCM 5.5 KW GENERATOR
 (2) RULE 2000 12 VOLT BILGE PUMPS
 SEA STAR/TELEFLEX HYDRAULIC STEERING
 DUAL CONTROL STATIONS, CABIN AND FOREDECK
 MORSE DUAL LEVER CABLE CONTROL LEVERS

ELECTRONICS

GARMIN GPS MAP 4210 PLOTTER/ SOUNDER/RADAR
 COBRA VHF MARINE RADIO WITH DSC
 GARMIN VHF200 VHF MARINE RADIO

SAFETY

8 PERSON OFFSHORE LIFERAFT
 20" THROW RING
 8 IMMERSION SUITS
 8 TYPE I PFD'S
 406 MHZ EPIRB
 DAY/NIGHT DISTRESS SIGNALS

Vessel Documentation #123188
 EIN: 47-2974096
 Duns # 07-978-4508

EASILY CUSTOM MODIFIED TO FOR CLIENT NEEDS FOR SPECIFIC PROJECTS

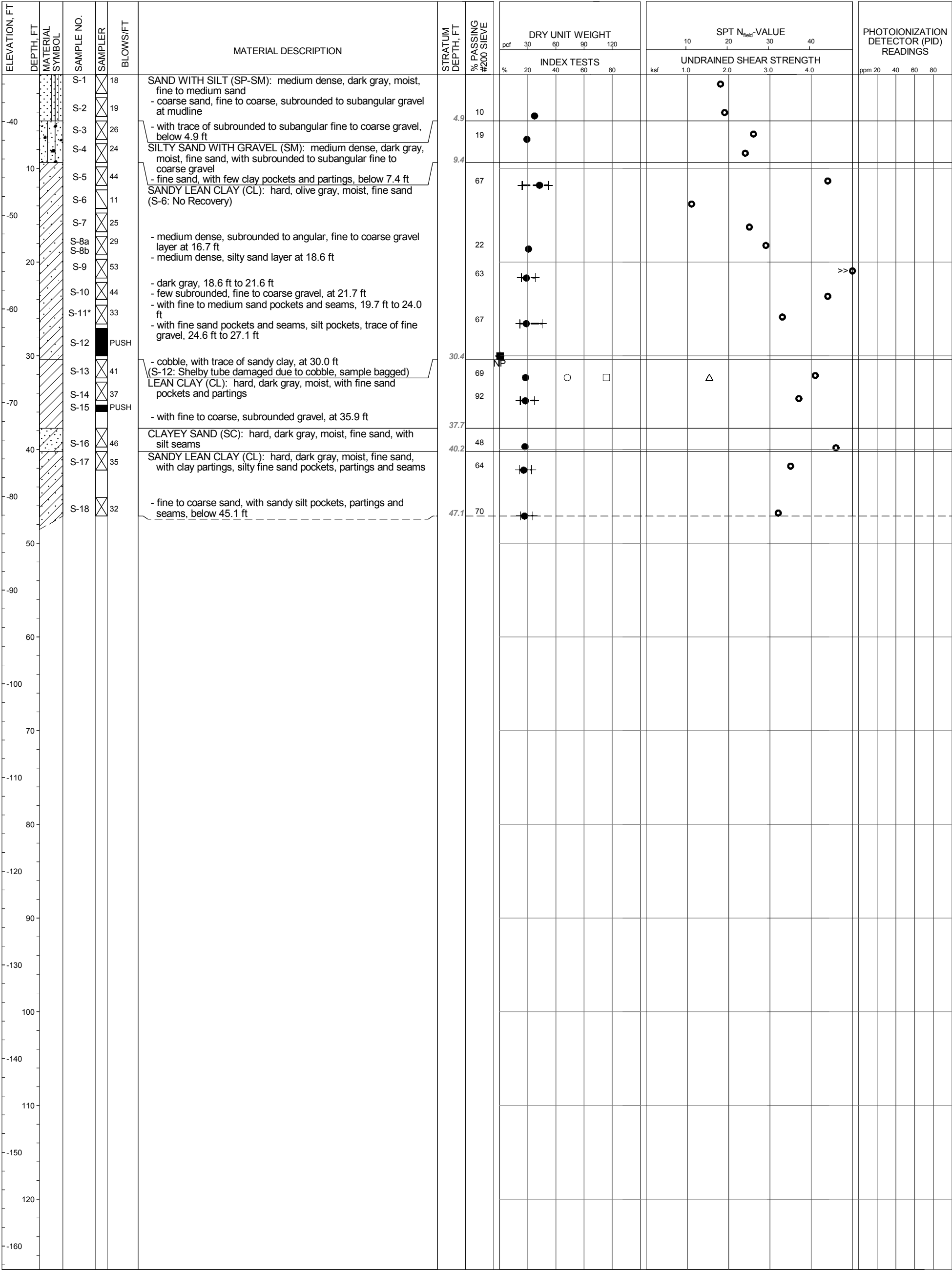
THIS SPECIFICATION IS PRELIMINARY AND SUBJECT TO CHANGE WITHOUT NOTICE. EXACT TANK CAPACITIES, RANGES, DECK CARGO CAPACITY AND OTHER FIGURES THAT HAVE BEEN CALCULATED MAY CHANGE WHEN THE ACTUAL VESSEL IS DELIVERED

APPENDIX B

Boring Logs

Starfix Mean Positioning Reports

APDES Daily Observation and Static Sheen Test Forms



NOTES:

1) The log and data presented are a simplification of actual conditions encountered at the time of sampling at the exploration location. Subsurface conditions may differ at other locations and with the passage of time.

2) For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.

3) DN = Driller's Note

4) in sample no indicates different SPT hammer used below the depth.

COMPLETION DEPTH: 47.1 ft
COORDINATES: W 151.389623 N 60.669652 (GCS, NAD 1983, NSRS2007, degrees)
MUDLINE ELEVATION: -35.00 ft (rel. MLLW datum)
EXPLORATION START DATE: 9/11/2015
COMPLETION DATE: 9/12/2015
LOGGED BY: J. Greenwald/A. Fee

CLASSIFICATION TESTS

● Water Content
□ Dry Unit Weight
○ Submerged Unit Weight
■ Non-Plastic

Plastic Limit Liquid Limit

+

STRENGTH TESTS

⊗ Pocket Penetrometer
⊕ Torvane
⊖ Remote Vane
◆ Miniature Vane
▲ Unconsolidated Undrained Triaxial
■ Unconfined Compression

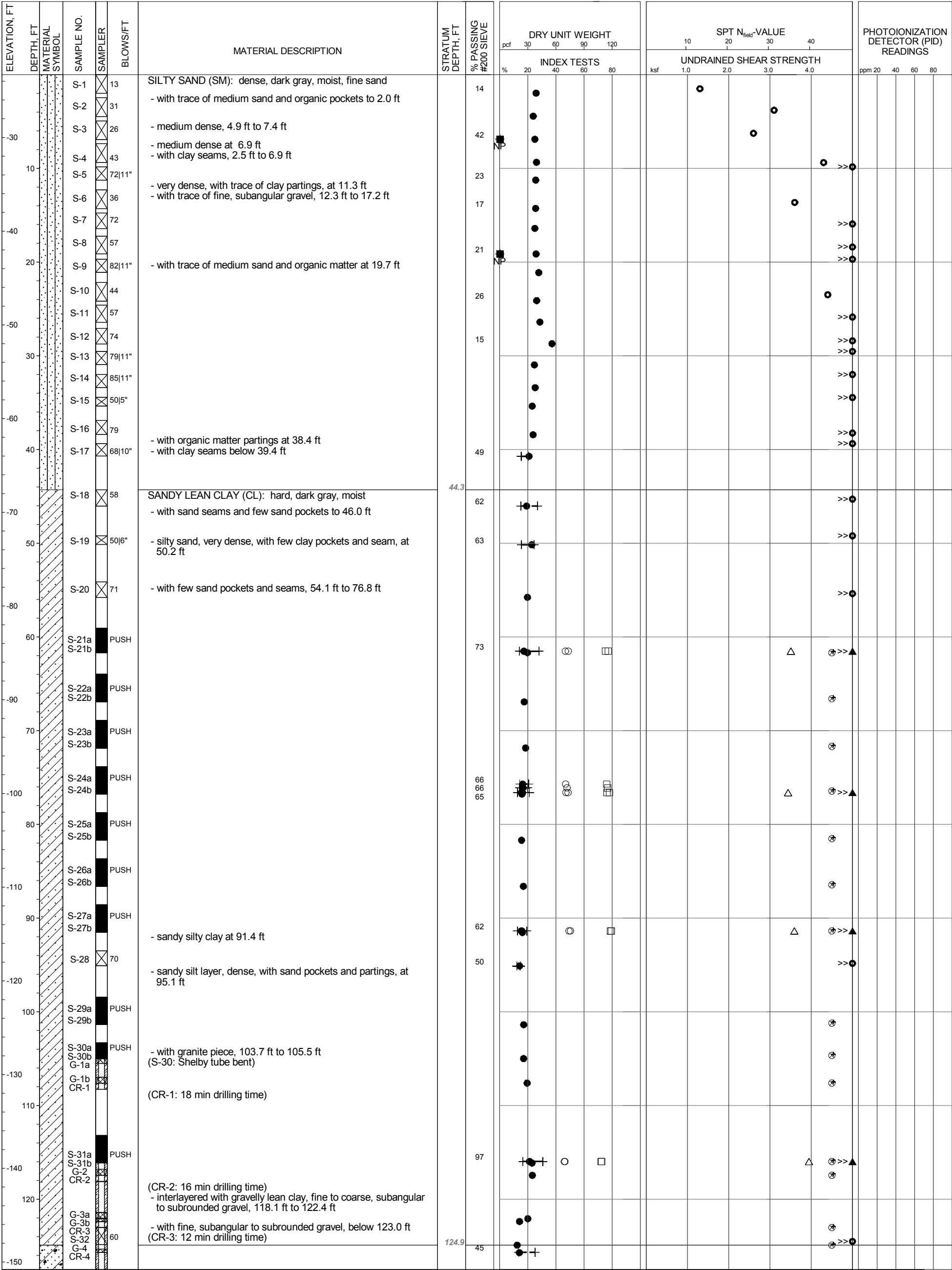
◇ Residual Vane
◇ Open symbols indicate remolded tests

● SPT N_{Field}-Value
» Exceeds Data Scale
WOR - Weight of Rod
WOH - Weight of Hammer
▽ PID

DRILLING COMPANY: Fugro
DRILLER: T. Wills/J. Wilson
VESSEL: SKATE 3A
SPT HAMMER: SPT-09 to 24.0 ft
SPT-02 to 47.1 ft
BACKFILL: N/A
DRILLING METHOD:
HOLLOW STEM AUGER: N/A
WET ROTARY: 0 to 47.1 ft
CASING: 7" -dia. to 47.1 ft

PLATE B1-1

BORING LOG MB-02
MARINE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA



NOTES:

1) The log and data presented are a simplification of actual conditions encountered at the time of sampling at the exploration location. Subsurface conditions may differ at other locations and with the passage of time.

2) For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.

3) DN = Driller's Note

4) in sample no indicates different SPT hammer used below the depth.

COMPLETION DEPTH: 162.7 ft
COORDINATES: W151.383178 N60.668335 (GCS, NAD 1983, NSRS2007, degrees)
MUDLINE ELEVATION: -23.30 ft (rel. MLLW datum)
EXPLORATION START DATE: 10/23/2015
COMPLETION DATE: 10/27/2015
LOGGED BY: S. Pant/ E. Pulido

CLASSIFICATION TESTS

● Water Content
□ Dry Unit Weight
○ Submerged Unit Weight
■ Non-Plastic

Plastic Limit Liquid Limit

+

STRENGTH TESTS

⊗ Pocket Penetrometer
◇ Torvane
◇ Remote Vane
◆ Miniature Vane
▲ Unconsolidated Undrained Triaxial
■ Unconfined Compression

◇ Residual Vane
◇ Open symbols indicate remolded tests

● SPT N_{Field}-Value
>> Exceeds Data Scale
WOR - Weight of Rod
WOH - Weight of Hammer
▽ PID

DRILLING COMPANY: Fugro
DRILLER: R. Smith/ M. Bray
VESSEL: SKATE 3A
SPT HAMMER: SPT-02 to 162.7 ft
BACKFILL: N/A
DRILLING METHOD
HOLLOW STEM AUGER: N/A
WET ROTARY: 0 to 162.7 ft
CASING: 12" -dia. to 3.0 ft, 7" -dia. to 36.9 ft

BORING LOG MB-03
MARINE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA

ELEVATION, FT	DEPTH, FT	MATERIAL SYMBOL	SAMPLE NO.	SAMPLER	BLOWS/FT	MATERIAL DESCRIPTION	STRATUM DEPTH, FT	% PASSING #200 SIEVE	DRY UNIT WEIGHT	SPT N _{field} VALUE	PHOTOIONIZATION DETECTOR (PID) READINGS
									pcf		
									306090120	10203040	
									%	ksf	ppm
									20406080	1.02.03.04.0	20406080
	130		S-33	50 5"		CLAYEY SAND WITH GRAVEL (SC): very dense, dark gray, moist, with fine to coarse, subangular to subrounded gravel and subrounded to subangular cobbles (CR-4: 12 min drilling time)		69			>>
	140		G-5 CR-5	50 5"		(CR-5: 11 min drilling time)		66			
	140		S-34	50 5"		- with few fine, subangular to subrounded gravel, below 142.7 ft		42			
	150		G-6 CR-6			(CR-6: 8 min drilling time)		43			
	150		G-7 CR-7			(CR-7: 6 min drilling time)	152.6				
	150					Sampling ended at 152.6 ft					
	150					Rat hole for P.S logging drilled to 162.7 ft	162.7				
	160										
	170										
	180										
	190										
	200										
	210										
	220										
	230										
	240										
	250										
	260										
	270										
	280										
	290										
	300										
	310										
	320										
	330										
	340										
	350										
	360										
	370										
	380										
	390										
	400										
	410										
	420										
	430										
	440										
	450										
	460										
	470										
	480										
	490										
	500										
	510										
	520										
	530										
	540										
	550										
	560										
	570										
	580										
	590										
	600										
	610										
	620										
	630										
	640										
	650										
	660										
	670										
	680										
	690										
	700										
	710										
	720										
	730										
	740										
	750										
	760										
	770										
	780										
	790										
	800										
	810										
	820										
	830										
	840										
	850										
	860										
	870										
	880										
	890										
	900										
	910										
	920										
	930										
	940										
	950										
	960										
	970										
	980										
	990										
	1000										

NOTES:

1) The log and data presented are a simplification of actual conditions encountered at the time of sampling at the exploration location. Subsurface conditions may differ at other locations and with the passage of time.

2) For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.

3) DN = Driller's Note

4) in sample no indicates different SPT hammer used below the depth.

COMPLETION DEPTH: 162.7 ft

COORDINATES: W 151.383178 N 60.668335 (GCS, NAD 1983, NSRS2007, degrees)

MUDLINE ELEVATION: -23.30 ft (rel. MLLW datum)

EXPLORATION START DATE: 10/23/2015

COMPLETION DATE: 10/27/2015

LOGGED BY: S. Pant/ E. Pulido

CLASSIFICATION TESTS

● Water Content

□ Dry Unit Weight

○ Submerged Unit Weight

■ Non-Plastic

Plastic Limit

Liquid Limit

+

STRENGTH TESTS

⊗ Pocket Penetrometer

◇ Torvane

◇ Remote Vane

◆ Miniature Vane

▲ Unconsolidated Undrained Triaxial

■ Unconfined Compression

◇ Residual Vane

◇ Open symbols indicate remolded tests

● SPT N_{Field}-Value

>> Exceeds Data Scale

WOR - Weight of Rod

WOH - Weight of Hammer

▽ PID

DRILLING COMPANY: Fugro

DRILLER: R. Smith/ M. Bray

VESSEL: SKATE 3A

SPT HAMMER: SPT-02 to 162.7 ft

BACKFILL: N/A

DRILLING METHOD

HOLLOW STEM AUGER: N/A

WET ROTARY: 0 to 162.7 ft

CASING: 12" -dia. to 3.0 ft, 7" -dia. to 36.9 ft

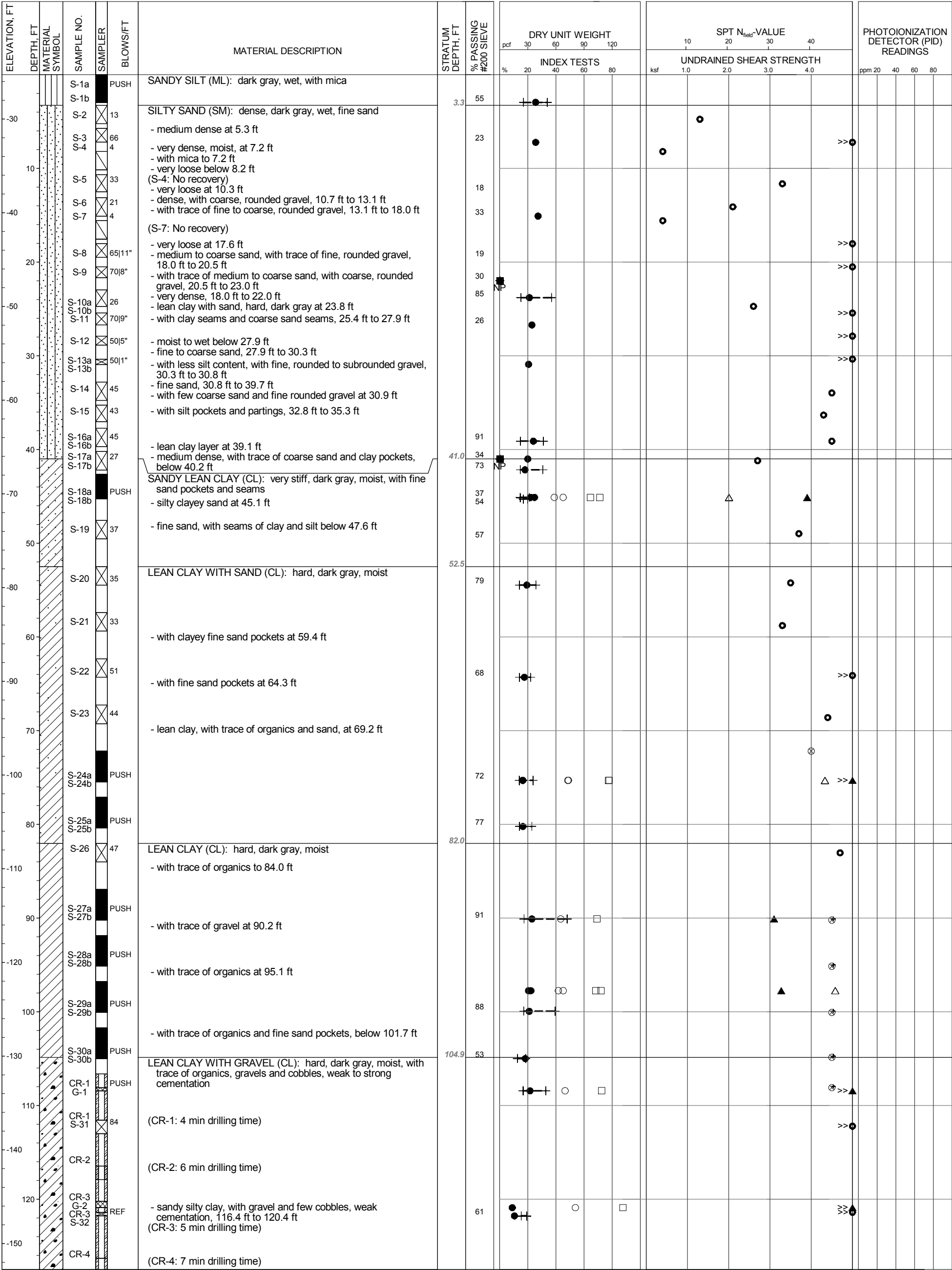
BORING LOG MB-03

MARINE LNG FACILITIES

ALASKA LNG PROJECT

NIKISKI, ALASKA

PLATE B1-2b



NOTES:
1) The log and data presented are a simplification of actual conditions encountered at the time of sampling at the exploration location. Subsurface conditions may differ at other locations and with the passage of time.
2) For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.
3) DN = Driller's Note
4) in sample no indicates different SPT hammer used below the depth.

COMPLETION DEPTH: 151.8 ft
COORDINATES: W151.386667 N60.667329 (GCS, NAD 1983, NSRS2007, degrees)
MUDLINE ELEVATION: -25.26 ft (rel. MLLW datum)
EXPLORATION START DATE: 8/20/2015
COMPLETION DATE: 8/21/2015
LOGGED BY: J. Greenwald/A. Fee

CLASSIFICATION TESTS
● Water Content
□ Dry Unit Weight
○ Submerged Unit Weight
■ Non-Plastic
Plastic Limit
Liquid Limit

STRENGTH TESTS
⊗ Pocket Penetrometer
◇ Torvane
◇ Remote Vane
◆ Miniature Vane
▲ Unconsolidated Undrained Triaxial
■ Unconfined Compression
◇ Residual Vane
◇ Open symbols indicate remolded tests

● SPT N_{Field}-Value
>> Exceeds Data Scale
WOR - Weight of Rod
WOH - Weight of Hammer
▽ PID

DRILLING COMPANY: Fugro
DRILLER: T.Wills/H. Russell
VESSEL: SKATE 3A
SPT HAMMER: SPT-09 to 151.8 ft
BACKFILL: N/A
DRILLING METHOD
HOLLOW STEM AUGER: N/A
WET ROTARY: 0 to 151.8 ft
CASING: 7" -dia. to 85.3 ft

BORING LOG MB-04
MARINE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA

ELEVATION, FT	DEPTH, FT	MATERIAL SYMBOL	SAMPLE NO.	SAMPLER	BLOWS/FT	MATERIAL DESCRIPTION	STRATUM DEPTH, FT	% PASSING #200 SIEVE	DRY UNIT WEIGHT					SPT N _{field} VALUE					PHOTOIONIZATION DETECTOR (PID) READINGS				
									INDEX TESTS					UNDRAINED SHEAR STRENGTH									
									pcf	30	60	90	120	%	20	40	60	80	ksf	1.0	2.0	3.0	4.0
	130		CR-5 G-3	REF 6"		- with many gravel and cobbles, 121.8 ft to 126.3 ft LEAN CLAY WITH GRAVEL (CL): hard, dark gray, moist, with trace of organics, gravels and cobbles, weak to strong cementation (CR-5: 4 min drilling time)	131.2	61															
	-160		S-33 CR-6 G-6			GRAVELLY SILT WITH SAND (ML): very dense, dark gray, moist, subrounded to rounded gravel, with cobbles, weak cementation (CR-6: 4 min drilling time)		49															
			CR-6 G-7a G-7b CR-7			(CR-6: 4 min drilling time) - silt below 136.2 ft SILTY SAND (SM): very dense, dark gray, wet, with trace of fine, subrounded gravel (CR-7: 3 min drilling time) - with fine sand below 141.1 ft (CR-7: No recovery)	136.8	88															
	140		S-34	50 5"		(CR-7: 3 min drilling time) - with fine sand below 141.1 ft (CR-7: No recovery)		39															
	-170		CR-8			(CR-8: 3 min drilling time) (CR-8: No recovery)																	
	150		CR-9 S-35	REF 5"		(CR-9: 3 min drilling time)	151.8	22															
	-180																						
	160																						
	-190																						
	170																						
	-200																						
	180																						
	-210																						
	190																						
	-220																						
	200																						
	-230																						
	210																						
	-240																						
	220																						
	-250																						
	230																						
	-260																						
	240																						
	-270																						
	250																						
	-280																						

NOTES:

1) The log and data presented are a simplification of actual conditions encountered at the time of sampling at the exploration location. Subsurface conditions may differ at other locations and with the passage of time.

2) For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.

3) DN = Driller's Note

4) in sample no indicates different SPT hammer used below the depth.

COMPLETION DEPTH: 151.8 ft
COORDINATES: W 151.386667 N 60.667329 (GCS, NAD 1983, NSRS2007, degrees)
MUDLINE ELEVATION: -25.26 ft (rel. MLLW datum)
EXPLORATION START DATE: 8/20/2015
COMPLETION DATE: 8/21/2015
LOGGED BY: J. Greenwald/A. Fee

CLASSIFICATION TESTS

● Water Content
□ Dry Unit Weight
○ Submerged Unit Weight
■ Non-Plastic

Plastic Limit Liquid Limit

+

STRENGTH TESTS

⊗ Pocket Penetrometer
◇ Torvane
◇ Remote Vane
◆ Miniature Vane
▲ Unconsolidated Undrained Triaxial
■ Unconfined Compression

◇ Residual Vane
◇ Open symbols indicate remolded tests

● SPT N_{Field}-Value
>> Exceeds Data Scale
WOR - Weight of Rod
WOH - Weight of Hammer
▽ PID

DRILLING COMPANY: Fugro
DRILLER: T.Wills/H. Russell
VESSEL: SKATE 3A
SPT HAMMER: SPT-09 to 151.8 ft
BACKFILL: N/A
DRILLING METHOD
HOLLOW STEM AUGER: N/A
WET ROTARY: 0 to 151.8 ft
CASING: 7" -dia. to 85.3 ft

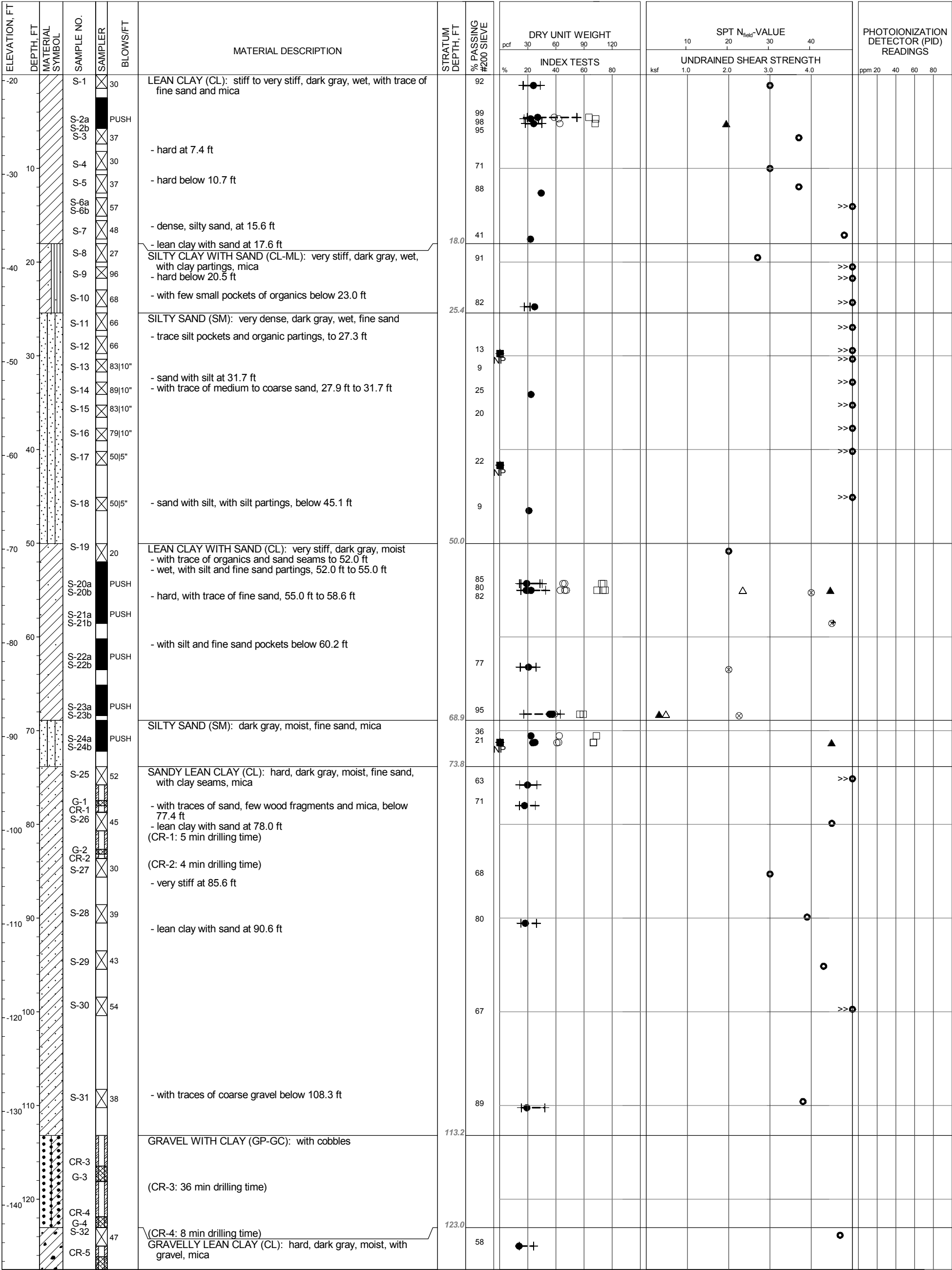
BORING LOG MB-04

MARINE LNG FACILITIES

ALASKA LNG PROJECT

NIKISKI, ALASKA

PLATE B1-3b



NOTES:
1) The log and data presented are a simplification of actual conditions encountered at the time of sampling at the exploration location. Subsurface conditions may differ at other locations and with the passage of time.
2) For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.
3) DN = Driller's Note
4) in sample no indicates different SPT hammer used below the depth.

COMPLETION DEPTH: 151.6 ft
COORDINATES: W151.380180 N60.666051 (GCS, NAD 1983, NSRS2007, degrees)
MUDLINE ELEVATION: -19.36 ft (rel. MLLW datum)
EXPLORATION START DATE: 8/18/2015
COMPLETION DATE: 8/19/2015
LOGGED BY: J. Greenwald/A. Fee

CLASSIFICATION TESTS
● Water Content
□ Dry Unit Weight
○ Submerged Unit Weight
■ Non-Plastic
+ Plastic Limit
+ Liquid Limit

STRENGTH TESTS
⊗ Pocket Penetrometer
◇ Torvane
◇ Remote Vane
◆ Miniature Vane
▲ Unconsolidated Undrained Triaxial
■ Unconfined Compression
◇ Residual Vane
◇ Open symbols indicate remolded tests

● SPT N_{Field}-Value
>> Exceeds Data Scale
WOR - Weight of Rod
WOH - Weight of Hammer
▽ PID

DRILLING COMPANY: Fugro
DRILLER: Z.Smart/H.Russell
VESSEL: SKATE 3A
SPT HAMMER: SPT-09 to 151.6 ft
BACKFILL: N/A
DRILLING METHOD
HOLLOW STEM AUGER: N/A
WET ROTARY: 0 to 151.6 ft
CASING: 7" -dia. to 68.9 ft

BORING LOG MB-05
MARINE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA

ELEVATION, FT	DEPTH, FT	MATERIAL SYMBOL	SAMPLE NO.	SAMPLER	BLOWS/FT	MATERIAL DESCRIPTION	STRATUM DEPTH, FT	% PASSING #200 SIEVE	DRY UNIT WEIGHT pcf 30 60 90 120	SPT N _{field} VALUE 10 20 30 40	PHOTOIONIZATION DETECTOR (PID) READINGS ppm 20 40 60 80
									INDEX TESTS % 20 40 60 80	UNDRAINED SHEAR STRENGTH ksf 1.0 2.0 3.0 4.0	
-130			G-5			(CR-5: 7 min drilling time) SANDY LEAN CLAY (CL): very dense, dark gray, moist, with sand and gravel, mica	128.0	63	<div><div></div><div></div><div></div><div></div></div>		
-150			G-6 CR-6 S-33 G-7 CR-7	70		(CR-6: 7 min drilling time) - wet, fine to coarse sand, fine to coarse, subrounded to rounded gravel, 134.8 ft to 137.8 ft		62	<div><div></div><div></div><div></div><div></div></div>		>>
-160			G-8 CR-8			- coarse sand, with fine, subrounded to rounded gravel, moderate to strong cementation below 137.8 ft (CR-7: 10 min drilling time)		66	<div><div></div><div></div><div></div><div></div></div>		
-170			S-34 G-9 CR-9	50 3"		LEAN CLAY WITH SAND (CL): hard, dark gray, moist, coarse sand, with fine, rounded gravel, moderate cementation (CR-8: 12 min drilling time) - fine to coarse, rounded to subrounded gravel, medium to coarse sand, strong cementation, 143.4 ft to 144.4 ft - medium to coarse sand, fine to coarse, rounded to subrounded gravel, strong cementation below 144.4 ft (CR-9: 5 min drilling time)	142.7	73 100	<div><div></div><div></div><div></div><div></div></div>		>>
-150			G-10a G-10b CR-10 S-35	REF 4"		(CR-10: 11 min drilling time)	151.6	40	<div><div></div><div></div><div></div><div></div></div>		>>
-180											
-190											
-200											
-210											
-220											
-230											
-240											
-250											
-260											
-270											

NOTES:

1) The log and data presented are a simplification of actual conditions encountered at the time of sampling at the exploration location. Subsurface conditions may differ at other locations and with the passage of time.

2) For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.

3) DN = Driller's Note

4) in sample no indicates different SPT hammer used below the depth.

COMPLETION DEPTH: 151.6 ft
COORDINATES: W 151.380180 N 60.666051 (GCS, NAD 1983, NSRS2007, degrees)
MUDLINE ELEVATION: -19.36 ft (rel. MLLW datum)
EXPLORATION START DATE: 8/18/2015
COMPLETION DATE: 8/19/2015
LOGGED BY: J. Greenwald/A. Fee

CLASSIFICATION TESTS

● Water Content
□ Dry Unit Weight
○ Submerged Unit Weight
■ Non-Plastic

Plastic Limit Liquid Limit

+

STRENGTH TESTS

⊗ Pocket Penetrometer
⊕ Torvane
⊖ Remote Vane
◆ Miniature Vane
▲ Unconsolidated Undrained Triaxial
■ Unconfined Compression

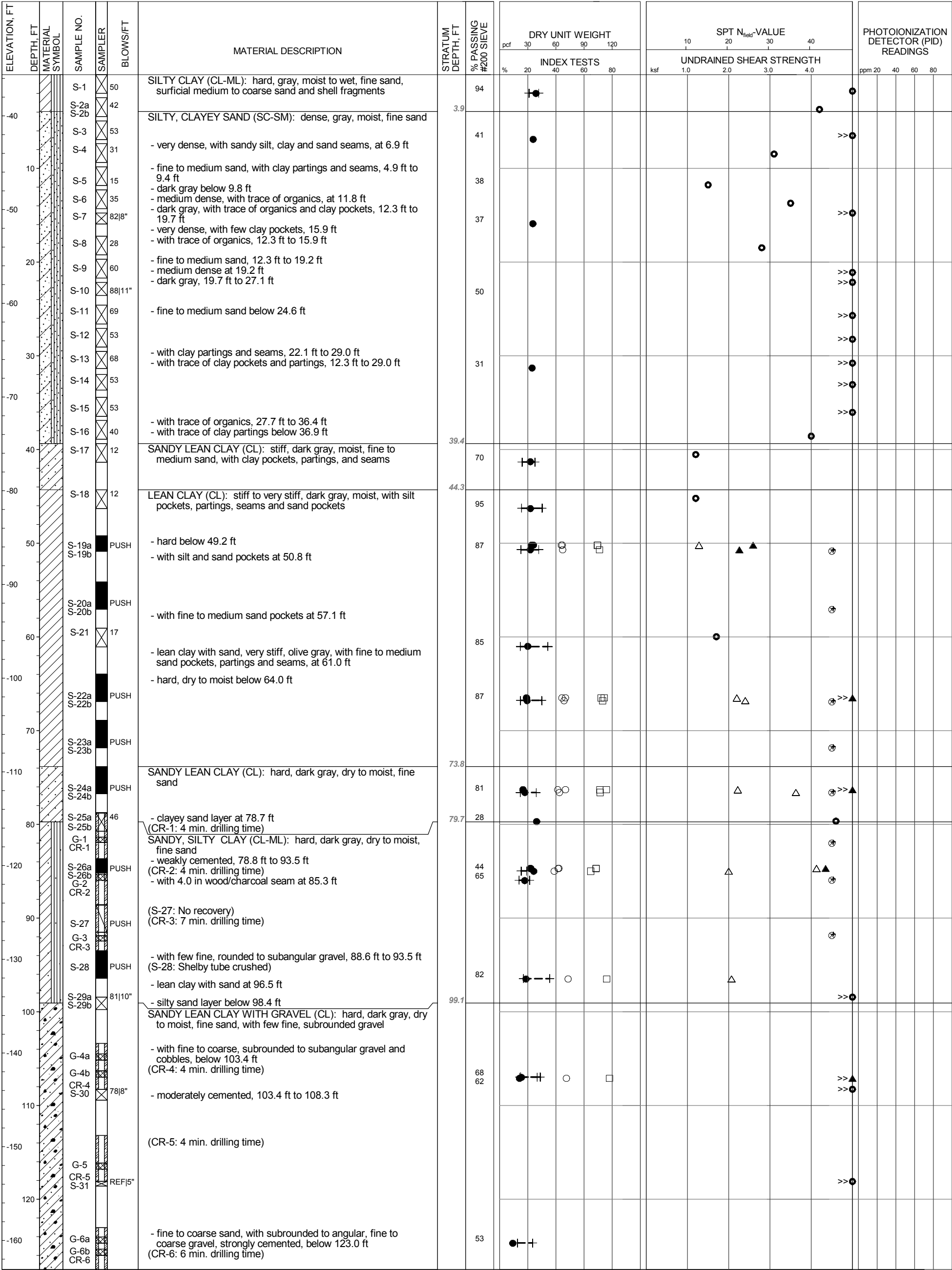
◇ Residual Vane
◇ Open symbols indicate remolded tests

● SPT N_{Field}-Value
>> Exceeds Data Scale
WOR - Weight of Rod
WOH - Weight of Hammer
▽ PID

DRILLING COMPANY: Fugro
DRILLER: Z.Smart/H.Russell
VESSEL: SKATE 3A
SPT HAMMER: SPT-09 to 151.6 ft
BACKFILL: N/A
DRILLING METHOD
HOLLOW STEM AUGER: N/A
WET ROTARY: 0 to 151.6 ft
CASING: 7" -dia. to 68.9 ft

BORING LOG MB-05
MARINE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA

PLATE B1-4b



NOTES:

1) The log and data presented are a simplification of actual conditions encountered at the time of sampling at the exploration location. Subsurface conditions may differ at other locations and with the passage of time.

2) For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.

3) DN = Driller's Note

4) in sample no indicates different SPT hammer used below the depth.

COMPLETION DEPTH: 149.28 ft

COORDINATES: W 151.383791 N 60.665011 (GCS, NAD 1983, NSRS2007, degrees)

MUDLINE ELEVATION: -35.60 ft (rel. MLLW datum)

EXPLORATION START DATE: 9/16/2015

COMPLETION DATE: 9/18/2015

LOGGED BY: J. Greenwald/A. Fee

CLASSIFICATION TESTS

● Water Content

□ Dry Unit Weight

○ Submerged Unit Weight

■ Non-Plastic

Plastic Limit

Liquid Limit

+

STRENGTH TESTS

⊗ Pocket Penetrometer

⊕ Torvane

⊖ Remote Vane

◆ Miniature Vane

▲ Unconsolidated Undrained Triaxial

■ Unconfined Compression

◇ Residual Vane

◇ Open symbols indicate remolded tests

● SPT N_{Field}-Value

>> Exceeds Data Scale

WOR - Weight of Rod

WOH - Weight of Hammer

▽ PID

DRILLING COMPANY: Fugro

DRILLER: R. Smith/ A. Cook

VESSEL: SKATE 3A

SPT HAMMER: SPT-02 to 149.3 ft

BACKFILL: N/A

DRILLING METHOD

HOLLOW STEM AUGER: N/A

WET ROTARY: 0 to 149.3 ft

CASING: 12" -dia. 23.6 ft, 7" -dia. to 64.0 ft

BORING LOG MB-06

MARINE LNG FACILITIES

ALASKA LNG PROJECT

NIKISKI, ALASKA

PLATE B1-5a



ELEVATION, FT	DEPTH, FT	MATERIAL SYMBOL	SAMPLE NO.	SAMPLER	BLOWS/FT	MATERIAL DESCRIPTION	STRATUM DEPTH, FT	% PASSING #200 SIEVE	DRY UNIT WEIGHT	SPT N _{field} VALUE	PHOTOIONIZATION DETECTOR (PID) READINGS
									pcf 30 60 90 120	10 20 30 40	
									INDEX TESTS	UNDRAINED SHEAR STRENGTH	ppm 20 40 60 80
								% 20 40 60 80	ksf 1.0 2.0 3.0 4.0		
	130		S-32	50 4"		LEAN CLAY (CL): hard, dark gray, dry to moist, with fine to coarse sand, with trace of fine to coarse, subrounded gravel (CR-7: 5 min. drilling time)	128.0	88	● -- +		>>●
	170		G-7 CR-7 G-8a			- fine sand, with trace of fine gravel, to 128.8 ft - with trace of cobbles, with sandy silt and silty sand seams and moderate cementaion, 128.0 ft to 132.9 ft - with sand seams, 132.9 ft to 137.8 ft (CR-8: 6 min. drilling time)		89	● -- + ○ □		>>▲
	140		G-8b CR-8			CLAYEY SAND WITH GRAVEL (SC): very dense, dark gray, moist to wet, fine to coarse sand, fine to coarse, subrounded gravel, with clay pockets and sand pockets and seams, (CR-9: 4 min. drilling time)	137.0	30	● +		>>●
	180		S-33 G-9a G-9b CR-9	REF 6"		(CR-10: 5 min. drilling time) (CR-10: No recovery)		37	● +		
	150		CR-10			SAND WITH CLAY (SW-SC): very dense, gray, moist to wet, fine to medium sand, with trace of silt and coarse sand	147.6				>>●
	150		S-34	59		NOTE: Core-barrel stuck in Geobor after Sample S-35; Pull Geobor to deck to free barrel; End borehole after verbal confirmation. PS Logging was performed without additional rat hole drilling.	149.3	10	●		>>●
	190										
	160										
	200										
	170										
	210										
	180										
	220										
	190										
	230										
	200										
	240										
	210										
	250										
	220										
	260										
	230										
	270										
	240										
	280										
	250										
	290										

NOTES:

1) The log and data presented are a simplification of actual conditions encountered at the time of sampling at the exploration location. Subsurface conditions may differ at other locations and with the passage of time.

2) For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.

3) DN = Driller's Note

4) in sample no indicates different SPT hammer used below the depth.

COMPLETION DEPTH: 149.28 ft
COORDINATES: W 151.383791 N 60.665011 (GCS, NAD 1983, NSRS2007, degrees)
MUDLINE ELEVATION: -35.60 ft (rel. MLLW datum)
EXPLORATION START DATE: 9/16/2015
COMPLETION DATE: 9/18/2015
LOGGED BY: J. Greenwald/A. Fee

CLASSIFICATION TESTS

● Water Content
□ Dry Unit Weight
○ Submerged Unit Weight
■ Non-Plastic

Plastic Limit Liquid Limit

+ - - - - +

STRENGTH TESTS

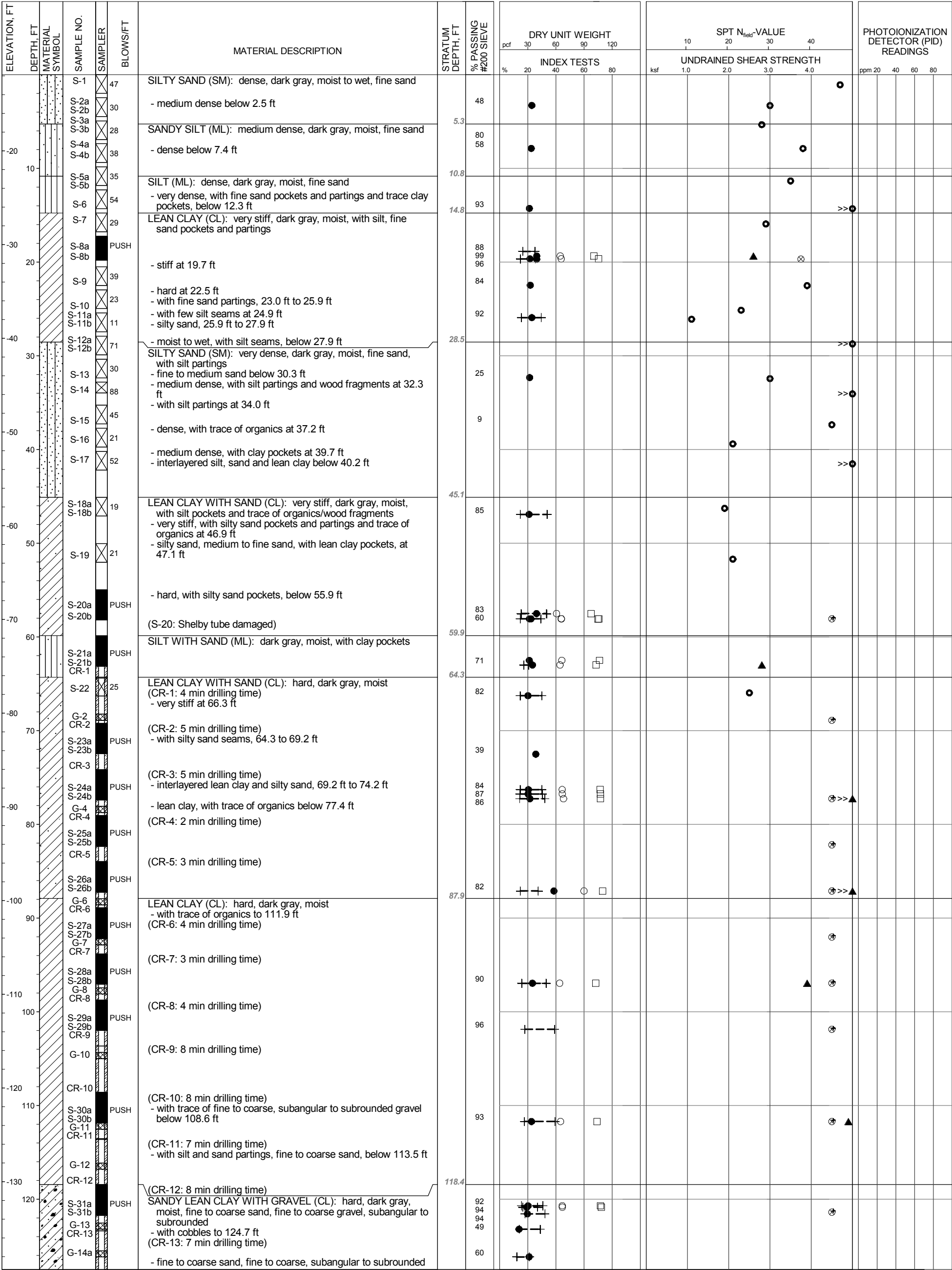
⊗ Pocket Penetrometer
◇ Torvane
◇ Remote Vane
◆ Miniature Vane
▲ Unconsolidated Undrained Triaxial
■ Unconfined Compression

◇ Residual Vane
◇ Open symbols indicate remolded tests

● SPT N_{Field}-Value
>> Exceeds Data Scale
WOR - Weight of Rod
WOH - Weight of Hammer
▽ PID

DRILLING COMPANY: Fugro
DRILLER: R. Smith/ A. Cook
VESSEL: SKATE 3A
SPT HAMMER: SPT-02 to 149.3 ft
BACKFILL: N/A
DRILLING METHOD
HOLLOW STEM AUGER: N/A
WET ROTARY: 0 to 149.3 ft
CASING: 12" -dia. 23.6 ft, 7" -dia. to 64.0 ft

BORING LOG MB-06
MARINE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA



NOTES:
1) The log and data presented are a simplification of actual conditions encountered at the time of sampling at the exploration location. Subsurface conditions may differ at other locations and with the passage of time.
2) For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.
3) DN = Driller's Note
4) in sample no indicates different SPT hammer used below the depth.

COMPLETION DEPTH: 206.2 ft
COORDINATES: W151.377399 N60.663673 (GCS, NAD 1983, NSRS2007, degrees)
MUDLINE ELEVATION: -11.88 ft (rel. MLLW datum)
EXPLORATION START DATE: 8/23/2015
COMPLETION DATE: 8/25/2015
LOGGED BY: J. Greenwald/A. Fee

CLASSIFICATION TESTS
● Water Content
□ Dry Unit Weight
○ Submerged Unit Weight
■ Non-Plastic
+ Plastic Limit
+ Liquid Limit

STRENGTH TESTS
⊗ Pocket Penetrometer
◇ Torvane
◇ Remote Vane
◆ Miniature Vane
▲ Unconsolidated Undrained Triaxial
■ Unconfined Compression
◇ Residual Vane
◇ Open symbols indicate remolded tests

● SPT N_{Field}-Value
» Exceeds Data Scale
WOR - Weight of Rod
WOH - Weight of Hammer
▽ PID

DRILLING COMPANY: Fugro
DRILLER: J. Wilson/T. Wills
VESSEL: SKATE 3A
SPT HAMMER: SPT-09 to 206.2 ft
BACKFILL: N/A
DRILLING METHOD
HOLLOW STEM AUGER: N/A
WET ROTARY: 0 to 206.2 ft
CASING: 7" -dia. to 139.1 ft

BORING LOG MB-08
MARINE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA

ELEVATION, FT	DEPTH, FT	MATERIAL SYMBOL	SAMPLE NO.	SAMPLER	BLOWS/FT	MATERIAL DESCRIPTION	STRATUM DEPTH, FT	% PASSING #200 SIEVE	DRY UNIT WEIGHT					SPT N _{field} VALUE					PHOTOIONIZATION DETECTOR (PID) READINGS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
									INDEX TESTS					UNDRAINED SHEAR STRENGTH																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
									pcf	30	60	90	120	ksf	1.0	2.0	3.0	4.0																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
									%	20	40	60	80																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										

NOTES:

1) The log and data presented are a simplification of actual conditions encountered at the time of sampling at the exploration location. Subsurface conditions may differ at other locations and with the passage of time.

2) For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.

3) DN = Driller's Note

4) in sample no indicates different SPT hammer used below the depth.

COMPLETION DEPTH: 206.2 ft
COORDINATES: W 151.377399 N 60.663673 (GCS, NAD 1983, NSRS2007, degrees)
MUDLINE ELEVATION: -11.88 ft (rel. MLLW datum)
EXPLORATION START DATE: 8/23/2015
COMPLETION DATE: 8/25/2015
LOGGED BY: J. Greenwald/A. Fee

CLASSIFICATION TESTS

● Water Content
□ Dry Unit Weight
○ Submerged Unit Weight
■ Non-Plastic

Plastic Limit Liquid Limit

+

STRENGTH TESTS

⊗ Pocket Penetrometer
⊕ Torvane
⊖ Remote Vane
◆ Miniature Vane
▲ Unconsolidated Undrained Triaxial
▣ Unconfined Compression

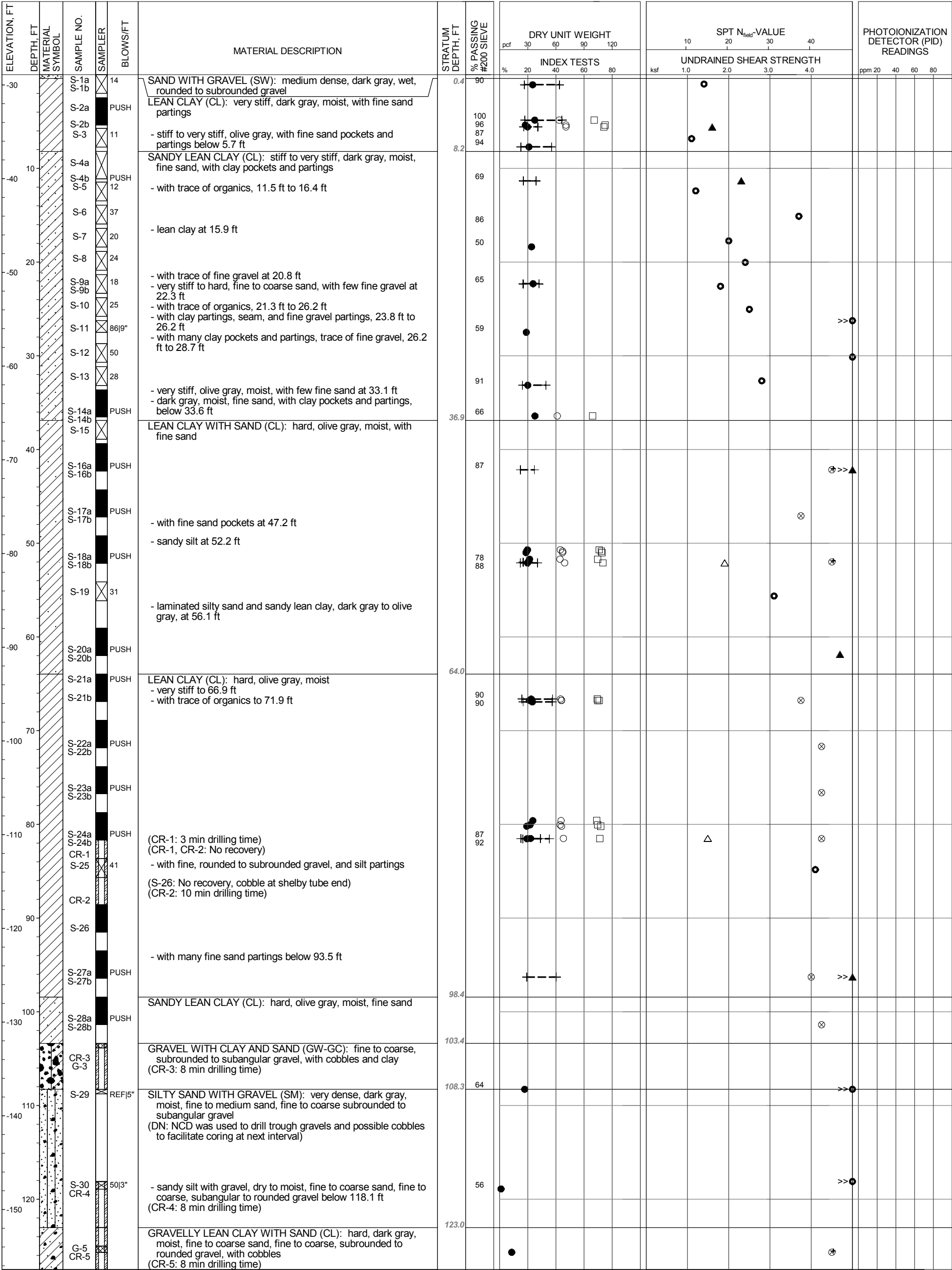
◇ Residual Vane
◇ Open symbols indicate remolded tests

● SPT N_{Field}-Value
>> Exceeds Data Scale
WOR - Weight of Rod
WOH - Weight of Hammer
▽ PID

DRILLING COMPANY: Fugro
DRILLER: J. Wilson/T. Wills
VESSEL: SKATE 3A
SPT HAMMER: SPT-09 to 206.2 ft
BACKFILL: N/A
DRILLING METHOD
HOLLOW STEM AUGER: N/A
WET ROTARY: 0 to 206.2 ft
CASING: 7" -dia. to 139.1 ft

BORING LOG MB-08
MARINE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA

PLATE B1-6b



NOTES:

1) The log and data presented are a simplification of actual conditions encountered at the time of sampling at the exploration location. Subsurface conditions may differ at other locations and with the passage of time.

2) For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.

3) DN = Driller's Note

4) in sample no indicates different SPT hammer used below the depth.

COMPLETION DEPTH: 152.6 ft

COORDINATES: W 151.380791 N 60.662496 (GCS, NAD 1983, NSRS2007, degrees)

MUDLINE ELEVATION: -28.90 ft (rel. MLLW datum)

EXPLORATION START DATE: 8/25/2015

COMPLETION DATE: 8/28/2015

LOGGED BY: J. Greenwald/A. Fee

CLASSIFICATION TESTS

● Water Content

□ Dry Unit Weight

○ Submerged Unit Weight

■ Non-Plastic

Plastic Limit

Liquid Limit

+

STRENGTH TESTS

⊗ Pocket Penetrometer

⊕ Torvane

⊖ Remote Vane

◆ Miniature Vane

▲ Unconsolidated Undrained Triaxial

■ Unconfined Compression

◇ Residual Vane

◇ Open symbols indicate remolded tests

● SPT N_{Field}-Value

>> Exceeds Data Scale

WOR - Weight of Rod

WOH - Weight of Hammer

▽ PID

DRILLING COMPANY: Fugro

DRILLER: T. Wills/J. Wilson

VESSEL: SKATE 3A

SPT HAMMER: SPT-09 to 152.6 ft

BACKFILL: N/A

DRILLING METHOD

HOLLOW STEM AUGER: N/A

WET ROTARY: 0 to 152.6 ft

CASING: 7" -dia. to 78.7 ft

BORING LOG MB-09

MARINE LNG FACILITIES

ALASKA LNG PROJECT

NIKISKI, ALASKA

PLATE B1-7a



ELEVATION, FT	DEPTH, FT	MATERIAL SYMBOL	SAMPLE NO.	SAMPLER	BLOWS/FT	MATERIAL DESCRIPTION	STRATUM DEPTH, FT	% PASSING #200 SIEVE	DRY UNIT WEIGHT	SPT N _{field} VALUE	PHOTOIONIZATION DETECTOR (PID) READINGS
									pcf	1020	
									%	ksf	ppm
	130		S-31	REF[5"		- clayey sand with gravel, very dense, 126.5 ft to 129.4 ft		17			>>●
	-160		CR-6			GRAVELLY LEAN CLAY WITH SAND (CL): hard, dark gray, moist, fine to coarse sand, fine to coarse, subrounded to rounded gravel, with cobbles		65	●+—+●		
			G-6			- clayey sand with gravel at 128.4 ft			●		
			G-7			- sandy lean clay, with gravels and cobbles below 129.4 ft (CR-6: 10 min drilling time)					
			CR-7			- oxidation staining at 130.4 ft (CR-7: 10 min drilling time)					>>●
	140		S-32	REF[5"							
	-170		G-8			(CR-8: 10 min drilling time)					
			CR-8				143.2				
			G-9a			LEAN CLAY (CL): hard, dark gray, moist		99	+●—+○□		⊗>>▲
			G-9b			(CR-9: 10 min drilling time)					
			CR-9				146.7				
	150		G-10a			GRAVELLY LEAN CLAY WITH SAND (CL): hard, dark gray, moist to wet, fine to coarse sand, fine to coarse, subrounded to subangular gravel, with sand pockets and seams, with cobbles			●		
	-180		G-10b			(CR-10: 10 min drilling time)					
			CR-10			(DN: Possible sand below 150.9 ft . Unable to perform SPT to validate due to weather and tide conditions)	152.6				
	160										
	-190										
	170										
	-200										
	180										
	-210										
	190										
	-220										
	200										
	-230										
	210										
	-240										
	220										
	-250										
	230										
	-260										
	240										
	-270										
	250										
	-280										

NOTES:

1) The log and data presented are a simplification of actual conditions encountered at the time of sampling at the exploration location. Subsurface conditions may differ at other locations and with the passage of time.

2) For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.

3) DN = Driller's Note

4) in sample no indicates different SPT hammer used below the depth.

COMPLETION DEPTH: 152.6 ft

COORDINATES: W 151.380791 N 60.662496 (GCS, NAD 1983, NSRS2007, degrees)

MUDLINE ELEVATION: -28.90 ft (rel. MLLW datum)

EXPLORATION START DATE: 8/25/2015

COMPLETION DATE: 8/28/2015

LOGGED BY: J. Greenwald/A. Fee

CLASSIFICATION TESTS

● Water Content

□ Dry Unit Weight

○ Submerged Unit Weight

■ Non-Plastic

Plastic Limit Liquid Limit

+-----+

STRENGTH TESTS

⊗ Pocket Penetrometer

◇ Torvane

◇ Remote Vane

◆ Miniature Vane

▲ Unconsolidated Undrained Triaxial

▣ Unconfined Compression

◇ Residual Vane

◇ Open symbols indicate remolded tests

● SPT N_{Field}-Value

>> Exceeds Data Scale

WOR - Weight of Rod

WOH - Weight of Hammer

▽ PID

DRILLING COMPANY: Fugro

DRILLER: T. Wills/J. Wilson

VESSEL: SKATE 3A

SPT HAMMER: SPT-09 to 152.6 ft

BACKFILL: N/A

DRILLING METHOD

HOLLOW STEM AUGER: N/A

WET ROTARY: 0 to 152.6 ft

CASING: 7" -dia. to 78.7 ft

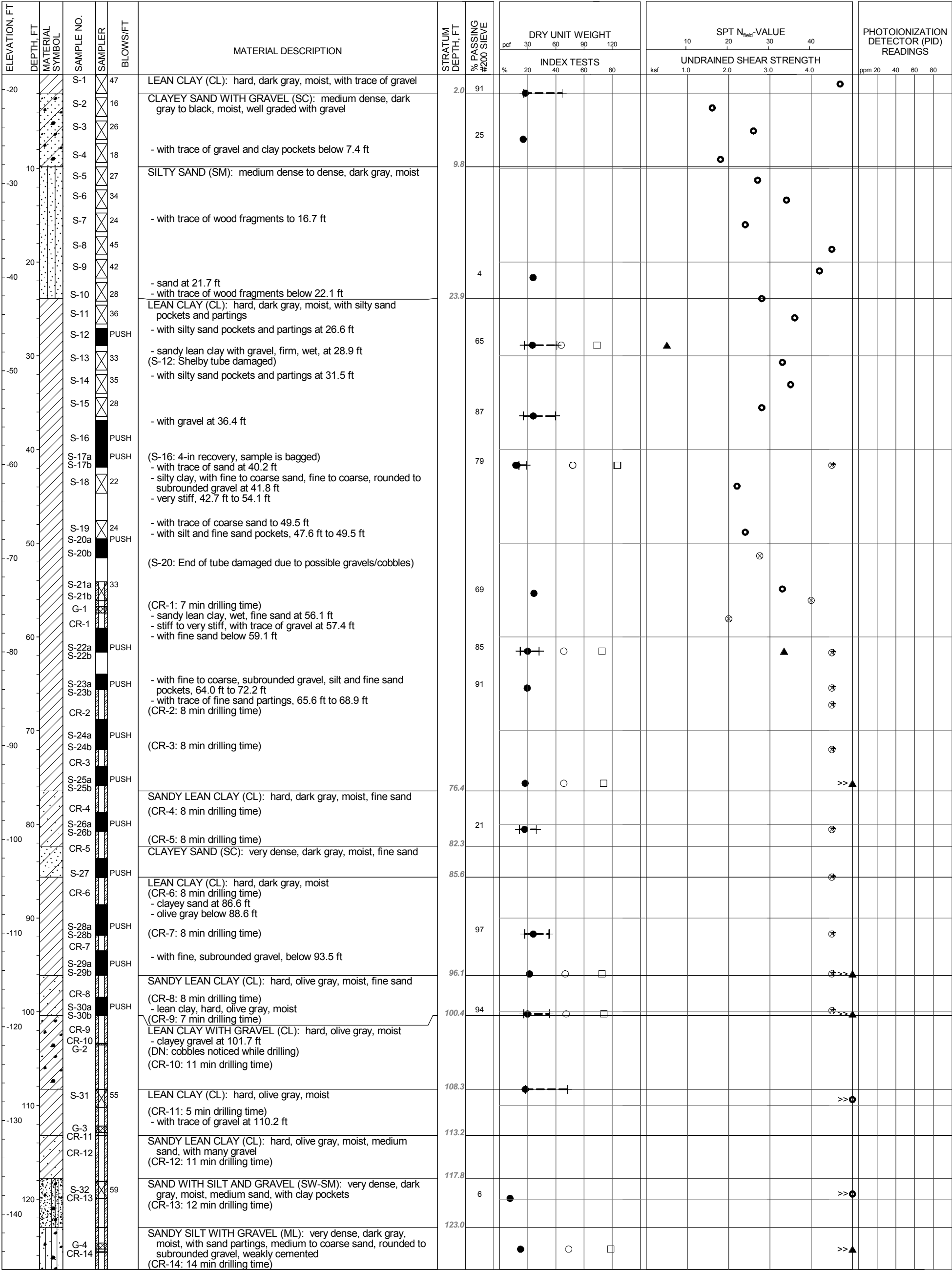
BORING LOG MB-09

MARINE LNG FACILITIES

ALASKA LNG PROJECT

NIKISKI, ALASKA

PLATE B1-7b



NOTES:

1) The log and data presented are a simplification of actual conditions encountered at the time of sampling at the exploration location. Subsurface conditions may differ at other locations and with the passage of time.

2) For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.

3) DN = Driller's Note

4) in sample no indicates different SPT hammer used below the depth.

COMPLETION DEPTH: 152.6 ft
COORDINATES: W151.374567 N60.661322 (GCS, NAD 1983, NSRS2007, degrees)
MUDLINE ELEVATION: -18.41 ft (rel. MLLW datum)
EXPLORATION START DATE: 8/21/2015
COMPLETION DATE: 8/23/2015
LOGGED BY: J. Greenwald/A. Fee

CLASSIFICATION TESTS

● Water Content
□ Dry Unit Weight
○ Submerged Unit Weight
■ Non-Plastic

Plastic Limit Liquid Limit

+

STRENGTH TESTS

⊗ Pocket Penetrometer
⊕ Torvane
⊖ Remote Vane
◆ Miniature Vane
▲ Unconsolidated Undrained Triaxial
■ Unconfined Compression

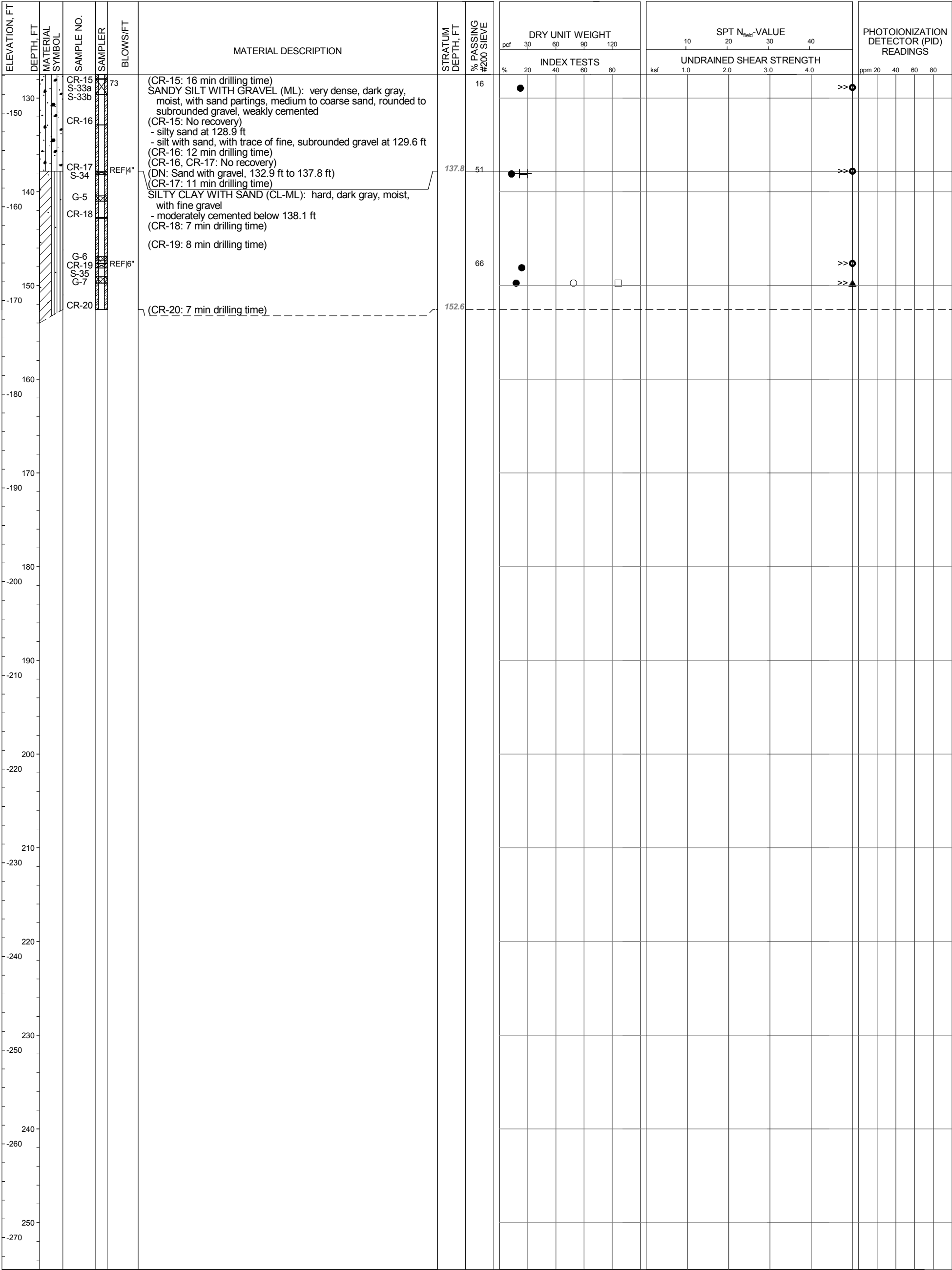
◇ Residual Vane
◇ Open symbols indicate remolded tests

● SPT N_{Field}-Value
» Exceeds Data Scale
WOR - Weight of Rod
WOH - Weight of Hammer
▽ PID

DRILLING COMPANY: Fugro
DRILLER: T. Wills/H. Russell
VESSEL: SKATE 3A
SPT HAMMER: SPT-09 to 152.6 ft
BACKFILL: N/A
DRILLING METHOD
HOLLOW STEM AUGER: N/A
WET ROTARY: 0 to 152.6 ft
CASING: 7" -dia. to 54.1 ft

BORING LOG MB-12
MARINE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA

PLATE B1-8a



NOTES:

1) The log and data presented are a simplification of actual conditions encountered at the time of sampling at the exploration location. Subsurface conditions may differ at other locations and with the passage of time.

2) For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.

3) DN = Driller's Note

4) in sample no indicates different SPT hammer used below the depth.

COMPLETION DEPTH: 152.6 ft
COORDINATES: W 151.374567 N 60.661322 (GCS, NAD 1983, NSRS2007, degrees)
MUDLINE ELEVATION: -18.41 ft (rel. MLLW datum)
EXPLORATION START DATE: 8/21/2015
COMPLETION DATE: 8/23/2015
LOGGED BY: J. Greenwald/A. Fee

CLASSIFICATION TESTS

● Water Content
□ Dry Unit Weight
○ Submerged Unit Weight
■ Non-Plastic

Plastic Limit Liquid Limit

+

STRENGTH TESTS

⊗ Pocket Penetrometer
◇ Torvane
◇ Remote Vane
◆ Miniature Vane
▲ Unconsolidated Undrained Triaxial
■ Unconfined Compression

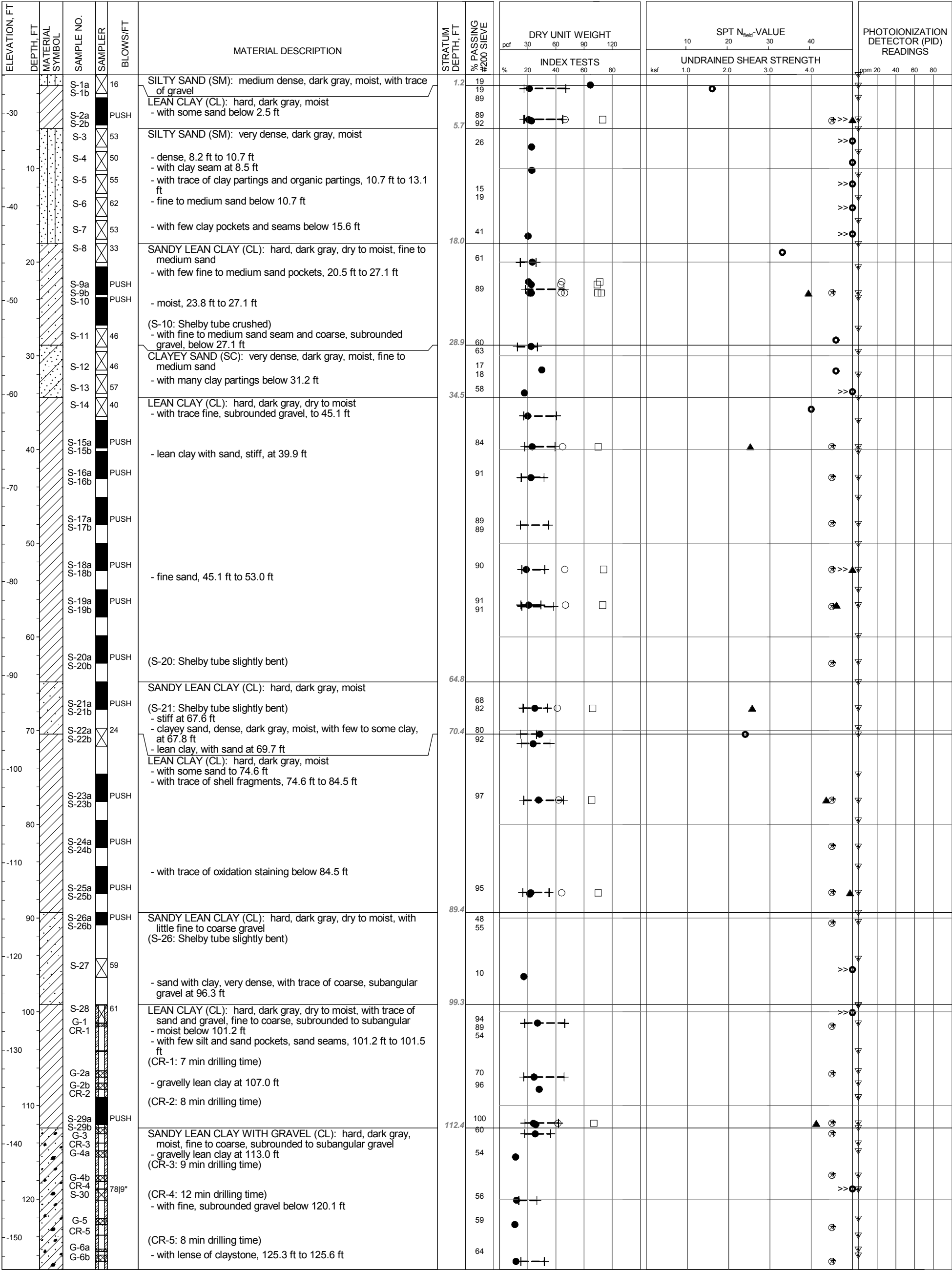
◇ Residual Vane
◇ Open symbols indicate remolded tests

● SPT N_{Field}-Value
>> Exceeds Data Scale
WOR - Weight of Rod
WOH - Weight of Hammer
▽ PID

DRILLING COMPANY: Fugro
DRILLER: T. Wills/H. Russell
VESSEL: SKATE 3A
SPT HAMMER: SPT-09 to 152.6 ft
BACKFILL: N/A
DRILLING METHOD
HOLLOW STEM AUGER: N/A
WET ROTARY: 0 to 152.6 ft
CASING: 7" -dia. to 54.1 ft

BORING LOG MB-12
MARINE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA

PLATE B1-8b



NOTES:

- 1) The log and data presented are a simplification of actual conditions encountered at the time of sampling at the exploration location. Subsurface conditions may differ at other locations and with the passage of time.
- 2) For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.
- 3) DN = Driller's Note
- 4) in sample no indicates different SPT hammer used below the depth.

COMPLETION DEPTH: 164 ft
COORDINATES: W 151.378142 N 60.660309 (GCS, NAD 1983, NSRS2007, degrees)
MUDLINE ELEVATION: -25.90 ft (rel. MLLW datum)
EXPLORATION START DATE: 10/2/2015
COMPLETION DATE: 10/3/2015
LOGGED BY: S. Pant/ A. Fee

CLASSIFICATION TESTS

- Water Content
□ Dry Unit Weight
○ Submerged Unit Weight
■ Non-Plastic
+ Plastic Limit
+ Liquid Limit

STRENGTH TESTS

- ⊗ Pocket Penetrometer
⊕ Torvane
⊖ Remote Vane
◆ Miniature Vane
▲ Unconsolidated Undrained Triaxial
■ Unconfined Compression
◇ Residual Vane
◇ Open symbols indicate remolded tests

- SPT N_{Field}-Value
>> Exceeds Data Scale
WOR - Weight of Rod
WOH - Weight of Hammer
▽ PID

DRILLING COMPANY: Fugro
DRILLER: R. Smith/ A. Cook
VESSEL: SKATE 3A
SPT HAMMER: SPT-09 to 164.0 ft
BACKFILL: N/A
DRILLING METHOD
HOLLOW STEM AUGER: N/A
WET ROTARY: 0 to 164.0 ft
CASING: 12" -dia. to 1.6 ft, 7" -dia. to 23.8 ft

BORING LOG MB-13
MARINE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA



ELEVATION, FT	DEPTH, FT	MATERIAL SYMBOL	SAMPLE NO.	SAMPLER	BLOWS/FT	MATERIAL DESCRIPTION	STRATUM DEPTH, FT	% PASSING #200 SIEVE	DRY UNIT WEIGHT	SPT N _{field} VALUE	PHOTOIONIZATION DETECTOR (PID) READINGS
									pcf 30 60 90 120	10 20 30 40	
									INDEX TESTS	UNDRAINED SHEAR STRENGTH	
									% 20 40 60 80	ksf 1.0 2.0 3.0 4.0	ppm 20 40 60 80
	130		CR-6 S-31		78 8"	SANDY LEAN CLAY WITH GRAVEL (CL): hard, dark gray, moist, fine to coarse, subrounded to subangular gravel (CR-6: 8 min drilling time)					>>●▽
			G-7			- dry to moist below 128.8 ft		70	●		●▽
	-160		CR-7			(CR-7: 9 min drilling time)					●▽
			G-8						●		●▽
	140		CR-8 S-32		83 7"	(CR-8: 11 min drilling time)		75 78	●		>>●▽
			G-9			- lean clay, with sand and trace of gravel, at 139.9 ft			●		●▽
	-170		CR-9 G-10a			(CR-9: 13 min drilling time)					●▽
			G-10b					61	●		●▽
	150		CR-10 S-33		50 3"	(CR-10: 13 min drilling time)	149.2		●		>>●▽
			CR-11			- lean clay, hard, dark gray at 148.5 ft			●		
	-180					GRAVEL WITH CLAY (GW-GC): fine to coarse, subangular to subrounded gravel	153.4		●		
						(CR-11: 15 min drilling time)					
						Sampling ended at 153.4 ft					
						Rat hole for P.S logging drilled to 164.0 ft					
	-190						164.0				
	160										
	-190										
	170										
	-200										
	180										
	-210										
	190										
	-220										
	200										
	-230										
	210										
	-240										
	220										
	-250										
	230										
	-260										
	240										
	-270										
	250										
	-280										

NOTES:

1) The log and data presented are a simplification of actual conditions encountered at the time of sampling at the exploration location. Subsurface conditions may differ at other locations and with the passage of time.

2) For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.

3) DN = Driller's Note

4) in sample no indicates different SPT hammer used below the depth.

COMPLETION DEPTH: 164 ft
COORDINATES: W151.378142 N60.660309 (GCS, NAD 1983, NSRS2007, degrees)
MUDLINE ELEVATION: -25.90 ft (rel. MLLW datum)
EXPLORATION START DATE: 10/2/2015
COMPLETION DATE: 10/3/2015
LOGGED BY: S. Pant/ A. Fee

CLASSIFICATION TESTS

● Water Content
□ Dry Unit Weight
○ Submerged Unit Weight
■ Non-Plastic

Plastic Limit Liquid Limit

+

STRENGTH TESTS

⊗ Pocket Penetrometer
⊕ Torvane
⊖ Remote Vane
◆ Miniature Vane
▲ Unconsolidated Undrained Triaxial
■ Unconfined Compression

◇ Residual Vane
◇ Open symbols indicate remolded tests

● SPT N_{Field}-Value
>> Exceeds Data Scale
WOR - Weight of Rod
WOH - Weight of Hammer
▽ PID

DRILLING COMPANY: Fugro
DRILLER: R. Smith/ A. Cook
VESSEL: SKATE 3A
SPT HAMMER: SPT-09 to 164.0 ft
BACKFILL: N/A
DRILLING METHOD
HOLLOW STEM AUGER: N/A
WET ROTARY: 0 to 164.0 ft
CASING: 12" -dia. to 1.6 ft, 7" -dia. to 23.8 ft

BORING LOG MB-13
MARINE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA

DRILLING COMPANY: Fugro
DRILLER: R. Smith/ M. Bray
VESSEL: SKATE 3A
SPT HAMMER: SPT-02 to 150.8 ft
BACKFILL: N/A
DRILLING METHOD
HOLLOW STEM AUGER: N/A
WET ROTARY: 0 to 150.8 ft
CASING: 12" -dia. to 1.6 ft, 7" -dia. to 59.9 ft



ELEVATION, FT	DEPTH, FT	MATERIAL SYMBOL	SAMPLE NO.	SAMPLER	BLOWS/FT	MATERIAL DESCRIPTION	STRATUM DEPTH, FT	% PASSING #200 SIEVE	DRY UNIT WEIGHT					SPT N _{field} VALUE					PHOTOIONIZATION DETECTOR (PID) READINGS				
									pcf					10 20 30 40					ppm 20 40 60 80				
									INDEX TESTS					UNDRAINED SHEAR STRENGTH									
									%	20	40	60	80	ksf	1.0	2.0	3.0	4.0					
-130			G-7 CR-7 S-34 G-8a		50 3"	GRAVELLY LEAN CLAY (CL): hard, dark gray, dry to moist, fine, subangular to subrounded gravel (CR-7: 8 min drilling time) - lean clay, with few sand pockets and seams, 128.8 ft to 129.9 ft		11	●										>>●				
-170			G-8b CR-8			- sand, very dense, fine, 129.9 ft to 130.6 ft - with few sand pockets below 130.6 ft (CR-8: 13 min drilling time)	133.7																
-140			G-9 CR-9			CLAYEY SAND WITH GRAVEL (SC): very dense, dark gray, moist, fine to coarse, subangular to subrounded gravel with trace of cobbles (CR-9: 3 min drilling time)	138.6	48	●	○	□				△								
-180			S-35	2		CLAYEY SAND (SC): very loose, dark gray, dry to moist, fine to medium sand (CR-10: No recovery)		16		●				●									
-150			CR-10																				
-190			S-36 CR-11 G-11		67 10"	(S-36: No recovery) (CR-10: 3 min drilling time) GRAVEL (GW): dark gray, moist, fine to coarse, subangular to subrounded gravel (CR-11: 2 min drilling time)	148.5												>>●				
-150.8							150.8																
-200																							
-210																							
-180																							
-220																							
-190																							
-230																							
-200																							
-240																							
-210																							
-250																							
-220																							
-260																							
-230																							
-270																							
-240																							
-280																							
-250																							
-290																							

NOTES:

1) The log and data presented are a simplification of actual conditions encountered at the time of sampling at the exploration location. Subsurface conditions may differ at other locations and with the passage of time.

2) For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.

3) DN = Driller's Note

4) in sample no indicates different SPT hammer used below the depth.

COMPLETION DEPTH: 150.8 ft
COORDINATES: W 151.381591 N 60.659390 (GCS, NAD 1983, NSRS2007, degrees)
MUDLINE ELEVATION: -38.94 ft (rel. MLLW datum)
EXPLORATION START DATE: 10/21/2015
COMPLETION DATE: 10/23/2015
LOGGED BY: S. Pant/ E. Pulido

CLASSIFICATION TESTS

● Water Content
□ Dry Unit Weight
○ Submerged Unit Weight
■ Non-Plastic

Plastic Limit Liquid Limit

+

STRENGTH TESTS

⊗ Pocket Penetrometer
◇ Torvane
◇ Remote Vane
◆ Miniature Vane
▲ Unconsolidated Undrained Triaxial
■ Unconfined Compression

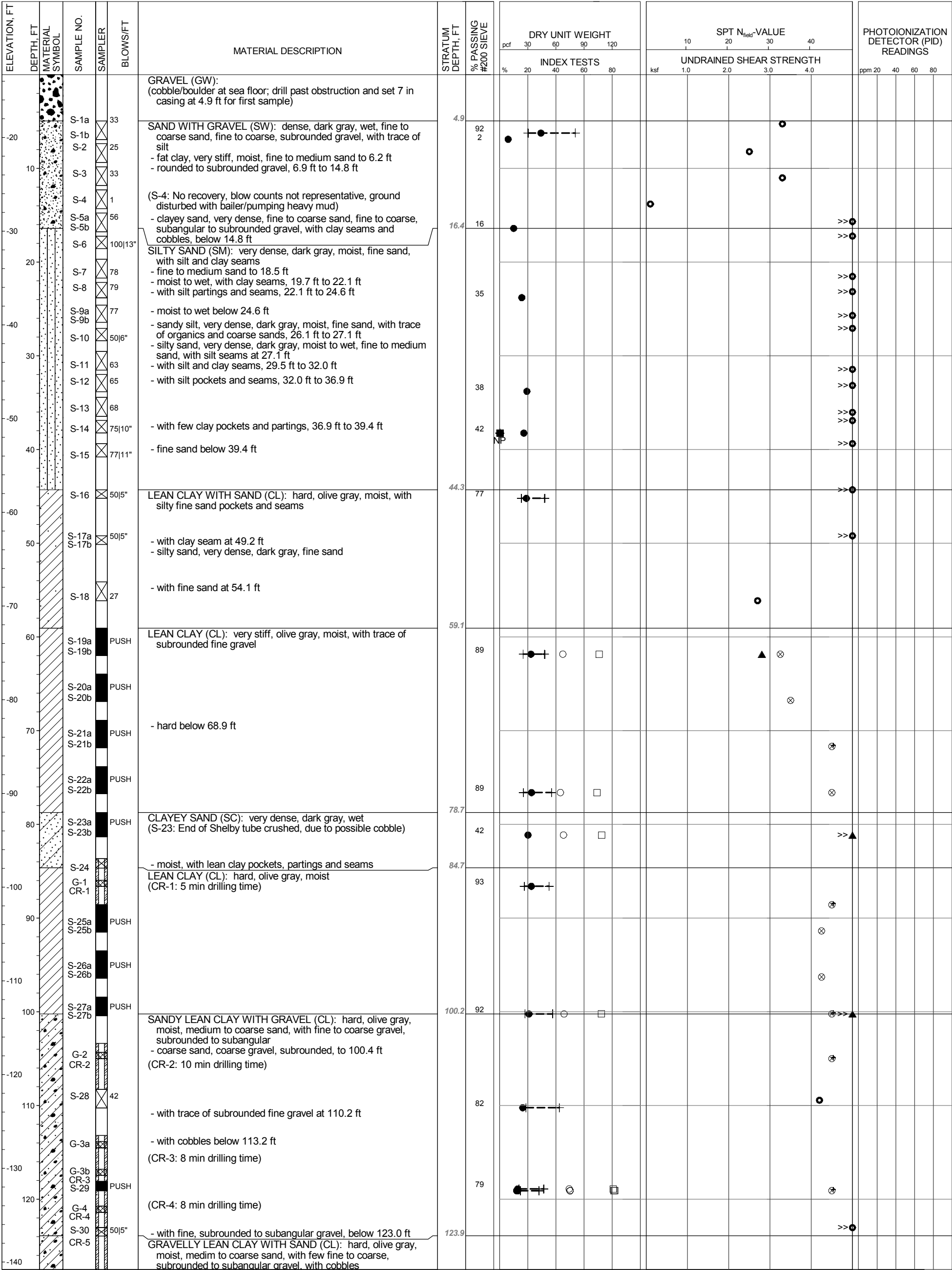
◇ Residual Vane
◇ Open symbols indicate remolded tests

● SPT N_{Field}-Value
>> Exceeds Data Scale
WOR - Weight of Rod
WOH - Weight of Hammer
▽ PID

DRILLING COMPANY: Fugro
DRILLER: R. Smith/ M. Bray
VESSEL: SKATE 3A
SPT HAMMER: SPT-02 to 150.8 ft
BACKFILL: N/A
DRILLING METHOD
HOLLOW STEM AUGER: N/A
WET ROTARY: 0 to 150.8 ft
CASING: 12" -dia. to 1.6 ft, 7" -dia. to 59.9 ft

BORING LOG MB-14
MARINE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA

PLATE B1-10b



NOTES:

1) The log and data presented are a simplification of actual conditions encountered at the time of sampling at the exploration location. Subsurface conditions may differ at other locations and with the passage of time.

2) For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.

3) DN = Driller's Note

4) in sample no indicates different SPT hammer used below the depth.

COMPLETION DEPTH: 153.1 ft
COORDINATES: W151.371659 N60.658981 (GCS, NAD 1983, NSRS2007, degrees)
MUDLINE ELEVATION: -13.30 ft (rel. MLLW datum)
EXPLORATION START DATE: 9/3/2015
COMPLETION DATE: 9/4/2015
LOGGED BY: J. Greenwald/A. Fee

CLASSIFICATION TESTS

● Water Content
□ Dry Unit Weight
○ Submerged Unit Weight
■ Non-Plastic

Plastic Limit Liquid Limit

STRENGTH TESTS

⊗ Pocket Penetrometer
◇ Torvane
◇ Remote Vane
◆ Miniature Vane
▲ Unconsolidated Undrained Triaxial
■ Unconfined Compression

◇ Residual Vane
◇ Open symbols indicate remolded tests

● SPT N_{Field}-Value
>> Exceeds Data Scale
WOR - Weight of Rod
WOH - Weight of Hammer
▽ PID

DRILLING COMPANY: Fugro
DRILLER: H. Russel/T. Wills
VESSEL: SKATE 3A
SPT HAMMER: SPT-09 to 153.1 ft
BACKFILL: N/A
HOLLOW STEM AUGER: N/A
WET ROTARY: 0 to 153.1 ft
CASING: 7" -dia. to 55.8 ft

BORING LOG MB-15
MARINE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA

PLATE B1-11a

ELEVATION, FT	DEPTH, FT	MATERIAL SYMBOL	SAMPLE NO.	SAMPLER	BLOWS/FT	MATERIAL DESCRIPTION	STRATUM DEPTH, FT	% PASSING #200 SIEVE	DRY UNIT WEIGHT					SPT N _{field} VALUE					PHOTOIONIZATION DETECTOR (PID) READINGS			
									pcf					10 20 30 40					ppm			
									INDEX TESTS					UNDRAINED SHEAR STRENGTH								
									%	20	40	60	80	ksf	1.0	2.0	3.0	4.0				
	130		G-6			(CR-5: 11 min drilling time) GRAVELLY LEAN CLAY WITH SAND (CL): hard, olive gray, moist, medim to coarse sand, with few fine to coarse, subrounded to subangular gravel, with cobbles		76	●	+		○	□						>>	▲		
			CR-6			(CR-6: 7 min drilling time)	132.9												>>	●		
	-150		S-31 G-7 CR-7		50 3"	SANDY LEAN CLAY WITH GRAVEL (CL): hard, olive gray, moist (CR-7: 7 min drilling time)		54	●	+									>>			
	140		G-8a			- fine to coarse sand, with fine to coarse, subrounded gravel below 139.8 ft		60	●	+									>>	●		
			G-8b CR-8 S-32		50 4"	- with cobbles, 139.8 ft to 140.4 ft (CR-8: 6 min drilling time)																
	-160		G-9			(CR-9: 6 min drilling time)																
	150		CR-9																			
			G-10 CR-10 S-33		REF 6"	(CR-10: 6 min drilling time)	153.1	69	●	-	-	+							>>	●		
	-170																					
	160																					
	-180																					
	170																					
	-190																					
	180																					
	-200																					
	190																					
	-210																					
	200																					
	-220																					
	210																					
	-230																					
	220																					
	-240																					
	230																					
	-250																					
	240																					
	-260																					
	250																					

NOTES:

1) The log and data presented are a simplification of actual conditions encountered at the time of sampling at the exploration location. Subsurface conditions may differ at other locations and with the passage of time.

2) For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.

3) DN = Driller's Note

4) in sample no indicates different SPT hammer used below the depth.

COMPLETION DEPTH: 153.1 ft
COORDINATES: W 151.371659 N60.658981 (GCS, NAD 1983, NSRS2007, degrees)
MUDLINE ELEVATION: -13.30 ft (rel. MLLW datum)
EXPLORATION START DATE: 9/3/2015
COMPLETION DATE: 9/4/2015
LOGGED BY: J. Greenwald/A. Fee

CLASSIFICATION TESTS

● Water Content
□ Dry Unit Weight
○ Submerged Unit Weight
■ Non-Plastic

Plastic Limit Liquid Limit

+

STRENGTH TESTS

⊗ Pocket Penetrometer
◇ Torvane
◇ Remote Vane
◆ Miniature Vane
▲ Unconsolidated Undrained Triaxial
■ Unconfined Compression

◇ Residual Vane
◇ Open symbols indicate remolded tests

● SPT N_{Field}-Value
>> Exceeds Data Scale
WOR - Weight of Rod
WOH - Weight of Hammer
▽ PID

DRILLING COMPANY: Fugro
DRILLER: H. Russel/T. Wills
VESSEL: SKATE 3A
SPT HAMMER: SPT-09 to 153.1 ft
BACKFILL: N/A
DRILLING METHOD
HOLLOW STEM AUGER: N/A
WET ROTARY: 0 to 153.1 ft
CASING: 7" -dia. to 55.8 ft

BORING LOG MB-15
MARINE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA

PLATE B1-12a

ELEVATION, FT	DEPTH, FT	MATERIAL SYMBOL	SAMPLE NO.	SAMPLER	BLOWS/FT	MATERIAL DESCRIPTION	STRATUM DEPTH, FT	% PASSING #200 SIEVE	DRY UNIT WEIGHT					SPT N _{field} VALUE					PHOTOIONIZATION DETECTOR (PID) READINGS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
									pcf					10 20 30 40																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
									INDEX TESTS					UNDRAINED SHEAR STRENGTH																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
									%					ksf					ppm																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
									20 40 60 80					1.0 2.0 3.0 4.0					20 40 60 80																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
-150			CR-7			(CR-7: No recovery)	128.8																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				</

NOTES:

1) The log and data presented are a simplification of actual conditions encountered at the time of sampling at the exploration location. Subsurface conditions may differ at other locations and with the passage of time.

2) For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.

3) DN = Driller's Note

4) in sample no indicates different SPT hammer used below the depth.

COMPLETION DEPTH: 153.4 ft

COORDINATES: W 151.375254 N 60.657964 (GCS, NAD 1983, NSRS2007, degrees)

MUDLINE ELEVATION: -22.00 ft (rel. MLLW datum)

EXPLORATION START DATE: 9/5/2015

COMPLETION DATE: 9/7/2015

LOGGED BY: J. Greenwald/A. Fee

CLASSIFICATION TESTS

● Water Content

□ Dry Unit Weight

○ Submerged Unit Weight

■ Non-Plastic

Plastic Limit Liquid Limit

+

STRENGTH TESTS

⊗ Pocket Penetrometer

⊕ Torvane

⊖ Remote Vane

◆ Miniature Vane

▲ Unconsolidated Undrained Triaxial

▣ Unconfined Compression

◇ Residual Vane

◇ Open symbols indicate remolded tests

● SPT N_{Field}-Value

» Exceeds Data Scale

WOR - Weight of Rod

WOH - Weight of Hammer

▽ PID

DRILLING COMPANY: Fugro

DRILLER: T. Wills/H. Russell

VESSEL: SKATE 3A

SPT HAMMER: SPT-09 to 153.4 ft

BACKFILL: N/A

DRILLING METHOD

HOLLOW STEM AUGER: N/A

WET ROTARY: 0 to 153.4 ft

CASING: 7" -dia. to 79.6 ft

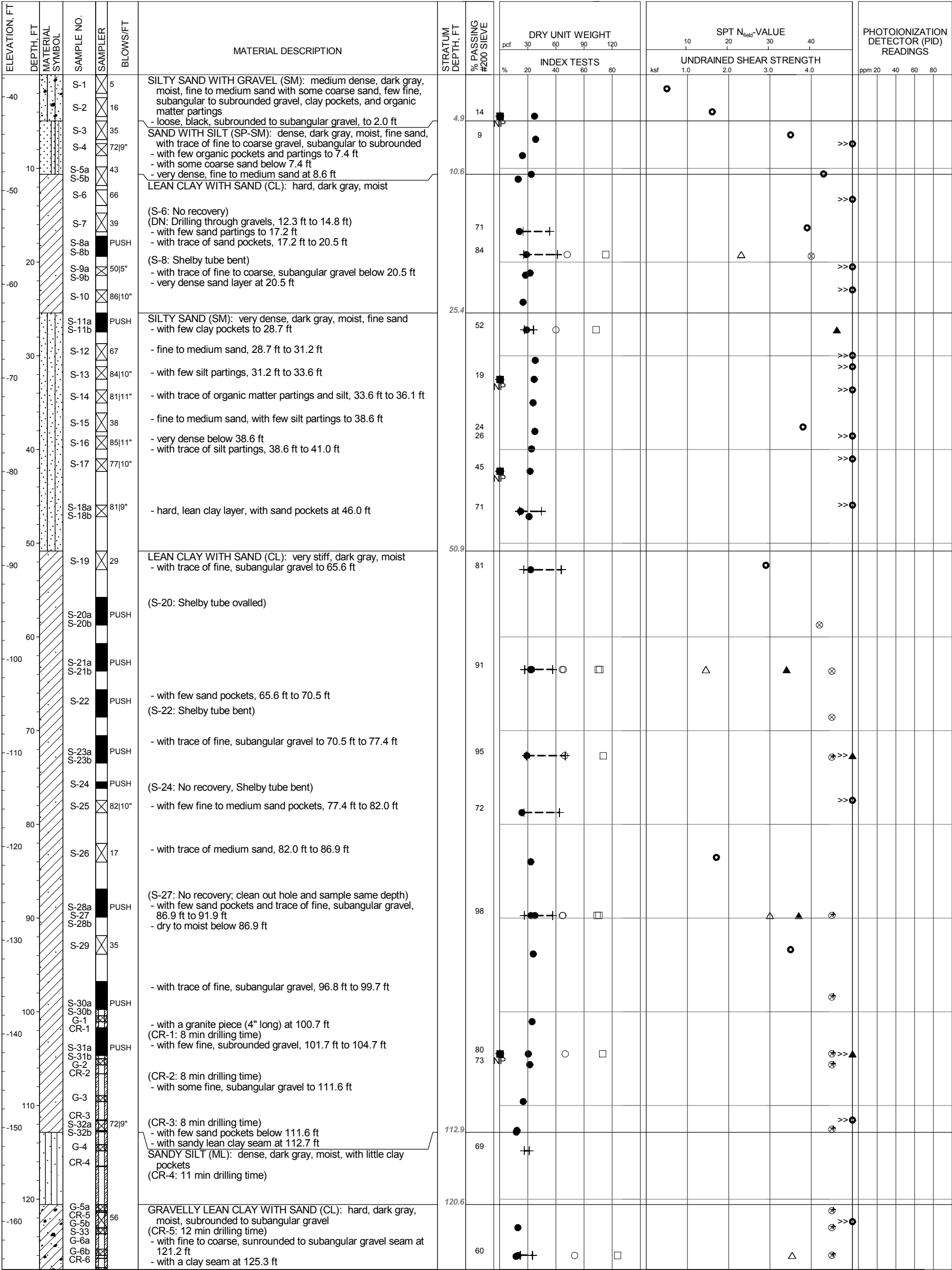
BORING LOG MB-16

MARINE LNG FACILITIES

ALASKA LNG PROJECT

NIKISKI, ALASKA

PLATE B1-12b



NOTES:

1) The log and data presented are a simplification of actual conditions encountered at the time of sampling at the exploration location. Subsurface conditions may differ at other locations and with the passage of time.

2) For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.

3) DN = Driller's Note

4) In sample no indicates different SPT hammer used below the depth.

COMPLETION DEPTH: 213.3 ft

COORDINATES: W151.378982 N60.656811 (GCS, NAD 1983, NSRS2007, degrees)

MUDLINE ELEVATION: -37.63 ft (rel. MLLW datum)

EXPLORATION START DATE: 10/18/2015

COMPLETION DATE: 10/20/2015

LOGGED BY: S. Pant/ E. Pulido

CLASSIFICATION TESTS

● Water Content

□ Dry Unit Weight

○ Submerged Unit Weight

■ Non-Plastic

Plastic Limit

Liquid Limit

+

STRENGTH TESTS

⊗ Pocket Penetrometer

⊕ Torvane

⊖ Remote Vane

◆ Miniature Vane

▲ Unconsolidated Undrained Triaxial

■ Unconfined Compression

◇ Residual Vane

◇ Open symbols indicate remolded tests

● SPT N_{Field}-Value

>> Exceeds Data Scale

WOR - Weight of Rod

WOH - Weight of Hammer

▽ PID

DRILLING COMPANY: Fugro

DRILLER: R. Smith/ M. Bray

VESSEL: SKATE 3A

SPT HAMMER: SPT-02 to 213.3 ft

BACKFILL: N/A

DRILLING METHOD

HOLLOW STEM AUGER: N/A

WET ROTARY: 0 to 213.3 ft

CASING: 12" -dia. to 2.3 ft, 7" -dia. to 38.5 ft

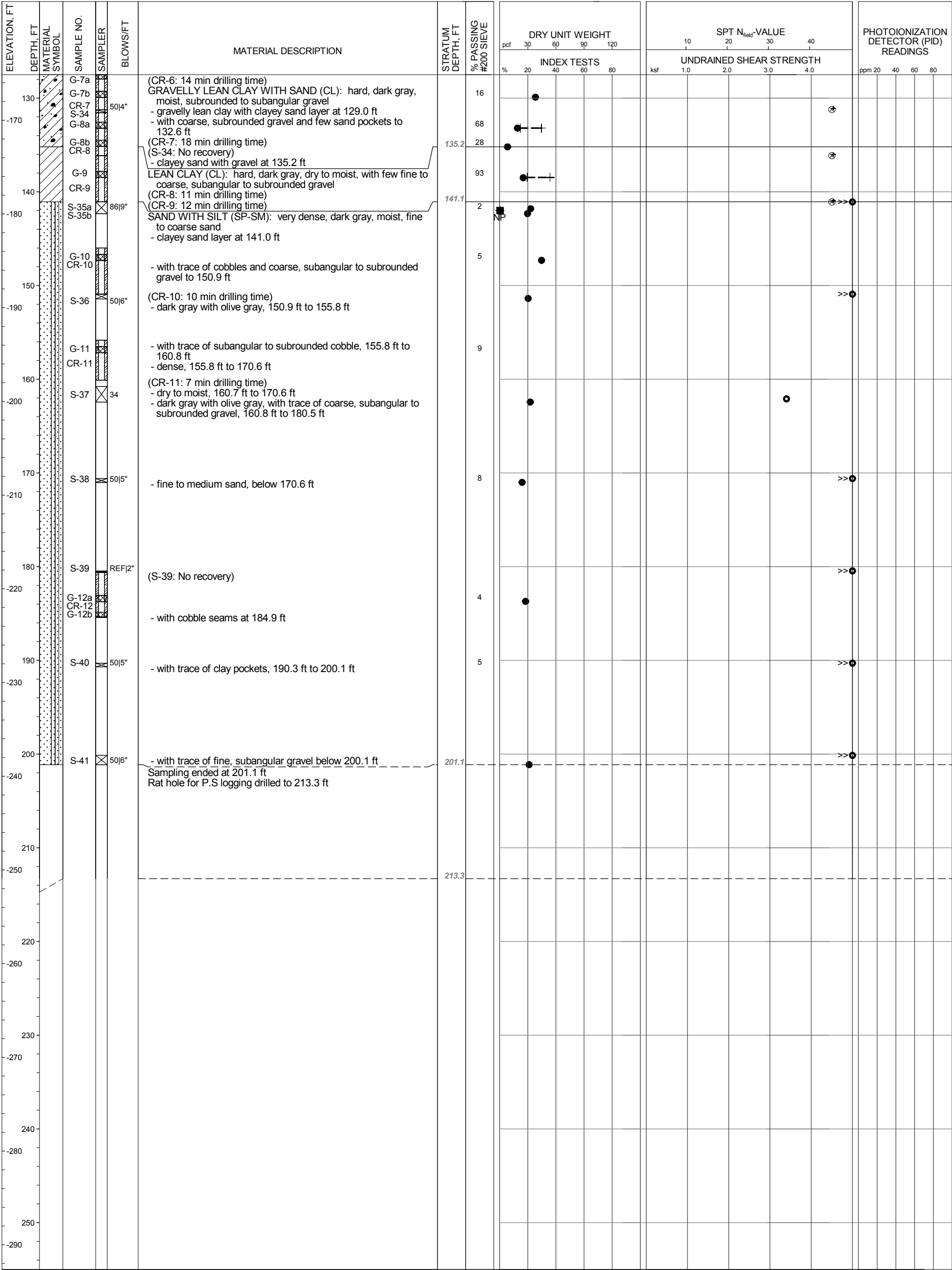
BORING LOG MB-17

MARINE LNG FACILITIES

ALASKA LNG PROJECT

NIKISKI, ALASKA

PLATE B1-13a



- NOTES:

1) The log and data presented are a simplification of actual conditions encountered at the time of sampling at the exploration location. Subsurface conditions may differ at other locations and with the passage of time.

2) For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.

3) DN = Driller's Note

4) in sample no indicates different SPT hammer used below the depth.
- CLASSIFICATION TESTS

● Water Content

□ Dry Unit Weight

○ Submerged Unit Weight

■ Non-Plastic

Plastic Limit

Liquid Limit

+
- STRENGTH TESTS

⊗ Pocket Penetrometer

⊕ Torvane

⊖ Remote Vane

◆ Miniature Vane

▲ Unconsolidated Undrained Triaxial

■ Unconfined Compression

◇ Residual Vane

◇ Open symbols indicate remolded tests

● SPT N_{Field}-Value

>> Exceeds Data Scale

WOR - Weight of Rod

WOH - Weight of Hammer

▽ PID

COMPLETION DEPTH: 213.3 ft
COORDINATES: W 151.378982 N60.656811 (GCS, NAD 1983, NSRS2007, degrees)
MUDLINE ELEVATION: -37.63 ft (rel. MLLW datum)
EXPLORATION START DATE: 10/18/2015
COMPLETION DATE: 10/20/2015
LOGGED BY: S. Pant/ E. Pulido

BORING LOG MB-17
MARINE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA

DRILLING COMPANY: Fugro
DRILLER: R. Smith/ M. Bray
VESSEL: SKATE 3A
SPT HAMMER: SPT-02 to 213.3 ft
BACKFILL: N/A
DRILLING METHOD
HOLLOW STEM AUGER: N/A
WET ROTARY: 0 to 213.3 ft
CASING: 12" -dia. to 2.3 ft, 7" -dia. to 38.5 ft

PLATE B1-14a



ELEVATION, FT	DEPTH, FT	MATERIAL SYMBOL	SAMPLE NO.	SAMPLER	BLOWS/FT	MATERIAL DESCRIPTION	STRATUM DEPTH, FT	% PASSING #200 SIEVE	DRY UNIT WEIGHT	SPT N _{field} VALUE	PHOTOIONIZATION DETECTOR (PID) READINGS
									pcf 30 60 90 120	10 20 30 40	
									INDEX TESTS	UNDRAINED SHEAR STRENGTH	
									% 20 40 60 80	ksf 1.0 2.0 3.0 4.0	ppm 20 40 60 80
	130		S-31		37	GRAVELLY SILT WITH SAND (ML): very dense, dark gray, wet, fine sand, with fine to coarse, subangular to subrounded gravel, with silt pockets (CR-6: 30 min drilling time)	130.2				
	-170		G-7			SANDY LEAN CLAY (CL): hard, olive gray, moist, with fine to coarse sand pockets, partings, seams and few fine to coarse, subrounded gravel		70			
			CR-7			- dry to moist, with trace of fine to coarse sand, and fine, subrounded gravel, below 130.3 ft (CR-7: 30 min drilling time)	135.2				
	140										
	-180										
	150										
	-190										
	160										
	-200										
	170										
	-210										
	180										
	-220										
	190										
	-230										
	200										
	-240										
	210										
	-250										
	220										
	-260										
	230										
	-270										
	240										
	-280										
	250										
	-290										

NOTES:

1) The log and data presented are a simplification of actual conditions encountered at the time of sampling at the exploration location. Subsurface conditions may differ at other locations and with the passage of time.

2) For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.

3) DN = Driller's Note

4) in sample no indicates different SPT hammer used below the depth.

COMPLETION DEPTH: 135.2 ft

COORDINATES: W 151.379542 N 60.655275 (GCS, NAD 1983, NSRS2007, degrees)

MUDLINE ELEVATION: -38.70 ft (rel. MLLW datum)

EXPLORATION START DATE: 9/19/2015

COMPLETION DATE: 9/21/2015

LOGGED BY: J. Greenwald/A. Fee

CLASSIFICATION TESTS

● Water Content

□ Dry Unit Weight

○ Submerged Unit Weight

■ Non-Plastic

Plastic Limit Liquid Limit

+

STRENGTH TESTS

⊗ Pocket Penetrometer

⊕ Torvane

◇ Remote Vane

◆ Miniature Vane

▲ Unconsolidated Undrained Triaxial

■ Unconfined Compression

◇ Residual Vane

◇ Open symbols indicate remolded tests

● SPT N_{Field}-Value

» Exceeds Data Scale

WOR - Weight of Rod

WOH - Weight of Hammer

▽ PID

DRILLING COMPANY: Fugro

DRILLER: R. Smith/ A. Cook

VESSEL: SKATE 3A

SPT HAMMER: SPT-09 to 135.2 ft

BACKFILL: N/A

DRILLING METHOD

HOLLOW STEM AUGER: N/A

WET ROTARY: 0 to 135.2 ft

CASING: 12" -dia. to 1.6 ft, 7" -dia. to 58.1 ft

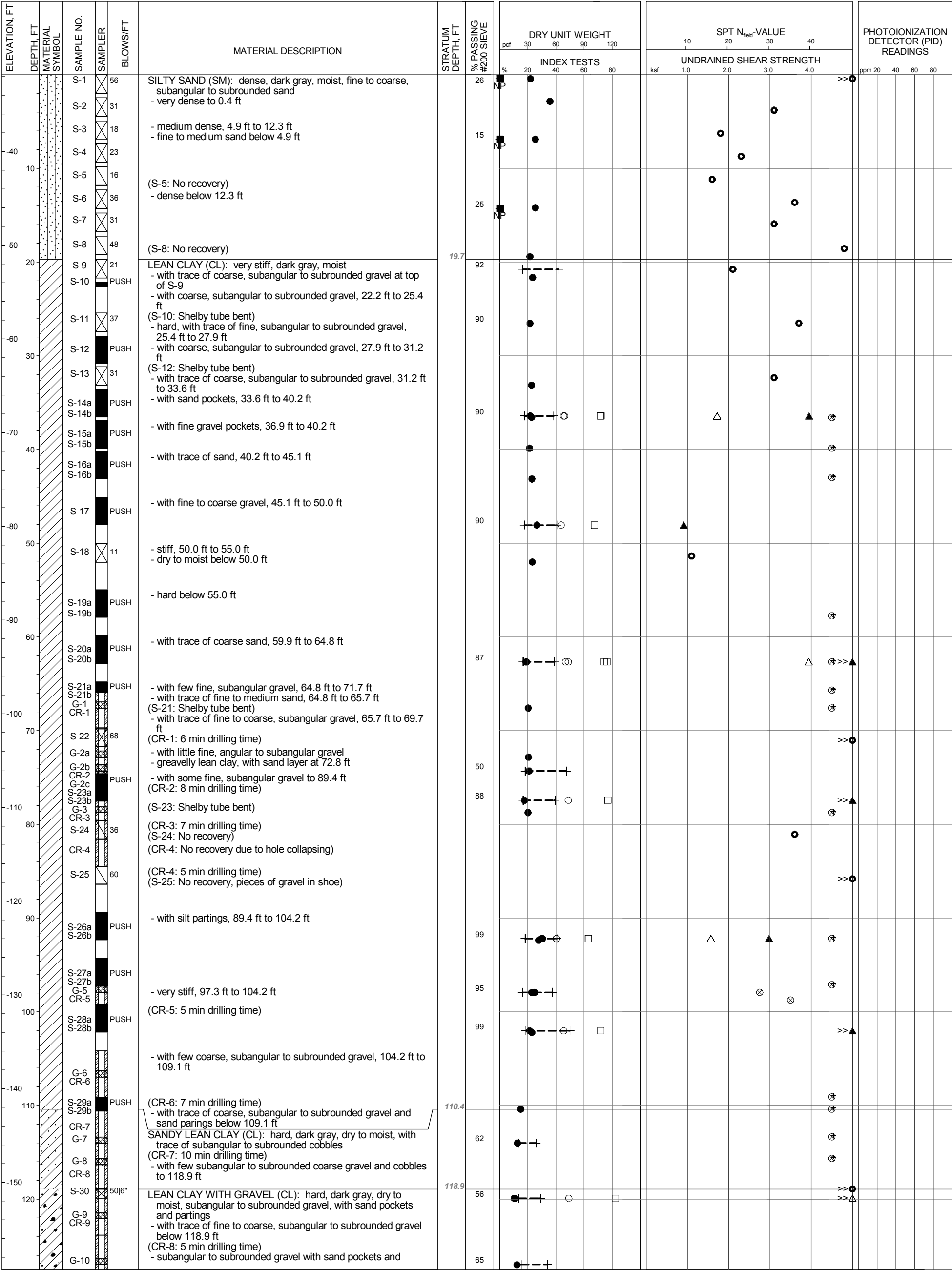
BORING LOG MB-18

MARINE LNG FACILITIES

ALASKA LNG PROJECT

NIKISKI, ALASKA

PLATE B1-14b





ELEVATION, FT	DEPTH, FT	MATERIAL SYMBOL	SAMPLE NO.	SAMPLER	BLOWS/FT	MATERIAL DESCRIPTION	STRATUM DEPTH, FT	% PASSING #200 SIEVE	DRY UNIT WEIGHT					SPT N _{field} VALUE					PHOTOIONIZATION DETECTOR (PID) READINGS				
									pcf					10 20 30 40									
									INDEX TESTS					UNDRAINED SHEAR STRENGTH					ppm 20 40 60 80				
-160			CR-10 S-31	REF15"		partings			% 20 40 60 80					ksf 1.0 2.0 3.0 4.0					>>●				
130			G-11 CR-11			(CR-9: 7 min drilling time) LEAN CLAY WITH GRAVEL (CL): hard, dark gray, dry to moist, subangular to subrounded gravel, with sand pockets and partings	73		● — + ○ □										>>△				
-170			G-12 CR-12			(CR-10: 7 min drilling time) (CR-11: 6 min drilling time) - with trace of cobbles below 133.7 ft - lean clay layer at 136.5 ft - with trace of cobbles to 138.6 ft	93		●														
140			G-13 CR-13			(CR-12: 9 min drilling time)																	
-180			G-14 CR-14			- with subangular to subrounded cobbles below 143.5 ft (CR-13: 5 min drilling time)	148.5																
150			G-15 CR-15			(CR-14: 6 min drilling time) GRAVEL (GP): dark gray, dry to moist, subrounded to subangular gravel with clay seams (CR-15: 2 min drilling time) Sampling ended at 150.1 ft Rat hole for P.S logging drilled to 167.3 ft	150.1																
-190																							
160																							
-200							167.3																
170																							
-210																							
180																							
-220																							
190																							
-230																							
200																							
-240																							
210																							
-250																							
220																							
-260																							
230																							
-270																							
240																							
-280																							
250																							

NOTES:

1) The log and data presented are a simplification of actual conditions encountered at the time of sampling at the exploration location. Subsurface conditions may differ at other locations and with the passage of time.

2) For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.

3) DN = Driller's Note

4) in sample no indicates different SPT hammer used below the depth.

COMPLETION DEPTH: 167.3 ft
COORDINATES: W 151.378774 N60.658543 (GCS, NAD 1983, NSRS2007, degrees)
MUDLINE ELEVATION: -31.80 ft (rel. MLLW datum)
EXPLORATION START DATE: 10/9/2015
COMPLETION DATE: 10/11/2015
LOGGED BY: S. Pant/ E. Pulido

CLASSIFICATION TESTS

● Water Content
□ Dry Unit Weight
○ Submerged Unit Weight
■ Non-Plastic

Plastic Limit Liquid Limit

— — — — —

STRENGTH TESTS

⊗ Pocket Penetrometer
⋄ Torvane
⋄ Remote Vane
◆ Miniature Vane
▲ Unconsolidated Undrained Triaxial
■ Unconfined Compression

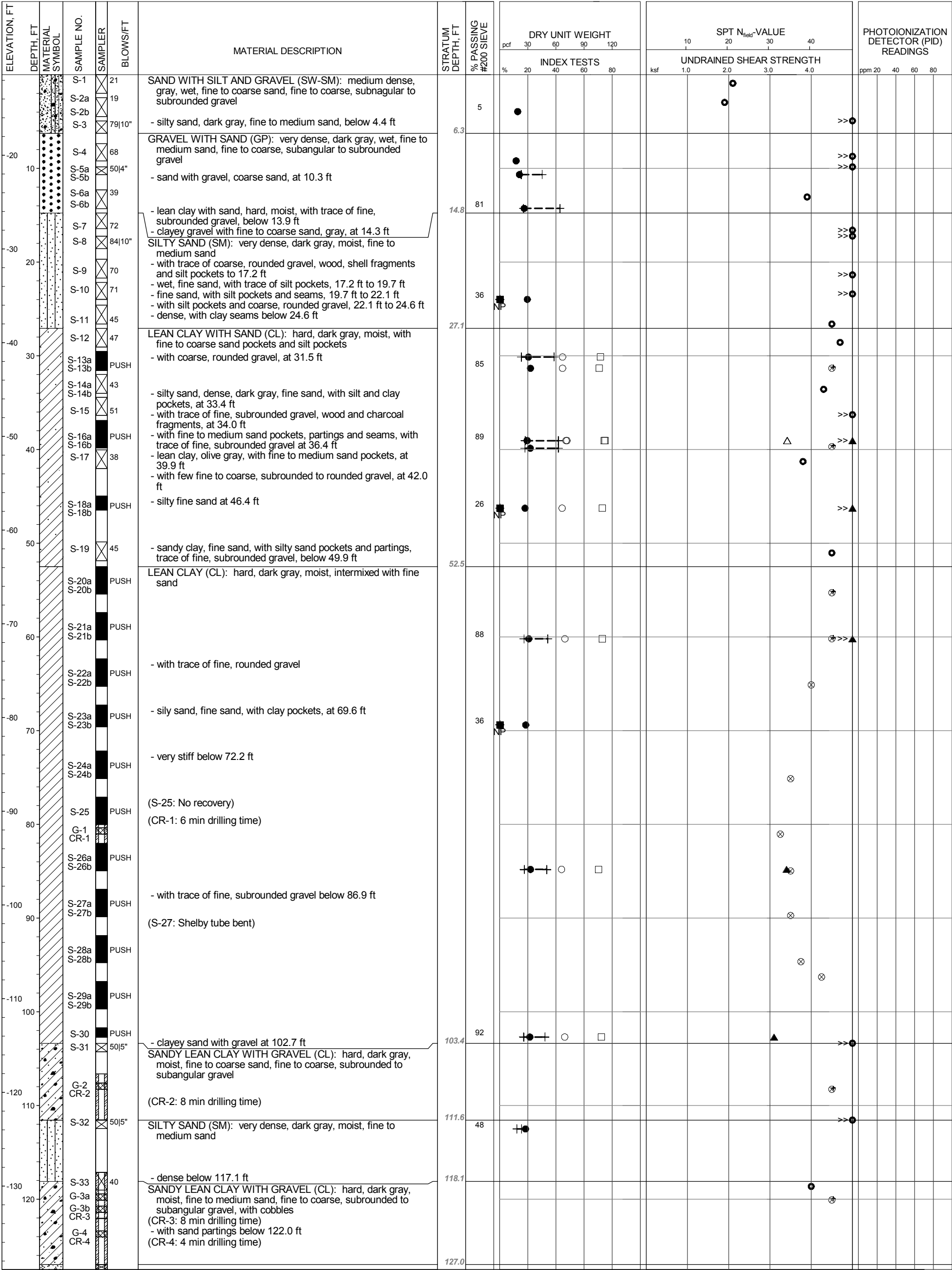
⋄ Residual Vane
⋄ Open symbols indicate remolded tests

● SPT N_{Field}-Value
>> Exceeds Data Scale
WOR - Weight of Rod
WOH - Weight of Hammer
▽ PID

DRILLING COMPANY: Fugro
DRILLER: R. Smith/ A. Cook
VESSEL: SKATE 3A
SPT HAMMER: SPT-09 to 167.3 ft
BACKFILL: N/A
DRILLING METHOD
HOLLOW STEM AUGER: N/A
WET ROTARY: 0 to 167.3 ft
CASING: 12" -dia. to 1.6 ft, 7" -dia. to 37.7 ft

BORING LOG MB-19
MARINE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA

PLATE B1-15b



NOTES:

- 1) The log and data presented are a simplification of actual conditions encountered at the time of sampling at the exploration location. Subsurface conditions may differ at other locations and with the passage of time.
- 2) For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.
- 3) DN = Driller's Note
- 4) in sample no indicates different SPT hammer used below the depth.

COMPLETION DEPTH: 152.6 ft
COORDINATES: W151.368892 N60.656614 (GCS, NAD 1983, NSRS2007, degrees)
MUDLINE ELEVATION: -11.40 ft (rel. MLLW datum)
EXPLORATION START DATE: 9/7/2015
COMPLETION DATE: 9/8/2015
LOGGED BY: J. Greenwald/A. Fee

CLASSIFICATION TESTS

- Water Content
□ Dry Unit Weight
○ Submerged Unit Weight
■ Non-Plastic
+ Plastic Limit
+ Liquid Limit

STRENGTH TESTS

- ⊗ Pocket Penetrometer
◇ Torvane
◇ Remote Vane
◆ Miniature Vane
▲ Unconsolidated Undrained Triaxial
■ Unconfined Compression
◇ Residual Vane
◇ Open symbols indicate remolded tests

- SPT N_{Field}-Value
>> Exceeds Data Scale
WOR - Weight of Rod
WOH - Weight of Hammer
▽ PID

DRILLING COMPANY: Fugro
DRILLER: J. Wilson/T. Wills
VESSEL: SKATE 3A
SPT HAMMER: SPT-09 to 152.6 ft
BACKFILL: N/A
DRILLING METHOD
HOLLOW STEM AUGER: N/A
WET ROTARY: 0 to 152.6 ft
CASING: 7" -dia. to 57.4 ft

BORING LOG MB-20
MARINE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA



ELEVATION, FT	DEPTH, FT	MATERIAL SYMBOL	SAMPLE NO.	SAMPLER	BLOWS/FT	MATERIAL DESCRIPTION	STRATUM DEPTH, FT	% PASSING #200 SIEVE	DRY UNIT WEIGHT					SPT N _{field} VALUE				PHOTOIONIZATION DETECTOR (PID) READINGS			
									pcf					10 20 30 40				ppm 20 40 60 80			
									INDEX TESTS					UNDRAINED SHEAR STRENGTH							
-140			S-34		28	SAND WITH GRAVEL (SW): medium dense, dark gray, moist to wet, medium to coarse sand, fine to coarse, subrounded to subangular gravel	128.9	2													
130			G-5 CR-5			SANDY LEAN CLAY WITH GRAVEL (CL): hard, dark gray, moist, fine to medium sand, fine to coarse, subrounded to subangular gravel, with cobbles (CR-5: 5 min drilling time) (CR-6: 3 min drilling time)															
			G-6 CR-6																		
-150			S-35		PUSH																
140			S-36		21	- very stiff, fine to coarse sand, fine, subrounded to subangular gravel below 141.7 ft - with clay seam at 142.7 ft (CR-7: 3 min drilling time)	146.7	51													
			G-7 CR-7																		
-160			G-8 CR-8 S-37		50 1/6"	SANDY, SILTY CLAY WITH GRAVEL (CL-ML): hard, dark gray, moist, fine to medium sand, fine to coarse, subrounded to subangular gravel, strongly cementation (CR-8: 4 min drilling time)	152.6	65													
150																					
-170																					
160																					
-180																					
170																					
-190																					
180																					
-200																					
190																					
-210																					
200																					
-220																					
210																					
-230																					
220																					
-240																					
230																					
-250																					
240																					
-260																					
250																					

NOTES:

1) The log and data presented are a simplification of actual conditions encountered at the time of sampling at the exploration location. Subsurface conditions may differ at other locations and with the passage of time.

2) For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.

3) DN = Driller's Note

4) in sample no indicates different SPT hammer used below the depth.

COMPLETION DEPTH: 152.6 ft
COORDINATES: W 151.368892 N 60.656614 (GCS, NAD 1983, NSRS2007, degrees)
MUDLINE ELEVATION: -11.40 ft (rel. MLLW datum)
EXPLORATION START DATE: 9/7/2015
COMPLETION DATE: 9/8/2015
LOGGED BY: J. Greenwald/A. Fee

CLASSIFICATION TESTS

● Water Content
□ Dry Unit Weight
○ Submerged Unit Weight
■ Non-Plastic

Plastic Limit Liquid Limit

+

STRENGTH TESTS

⊗ Pocket Penetrometer
⊕ Torvane
⊖ Remote Vane
◆ Miniature Vane
▲ Unconsolidated Undrained Triaxial
■ Unconfined Compression

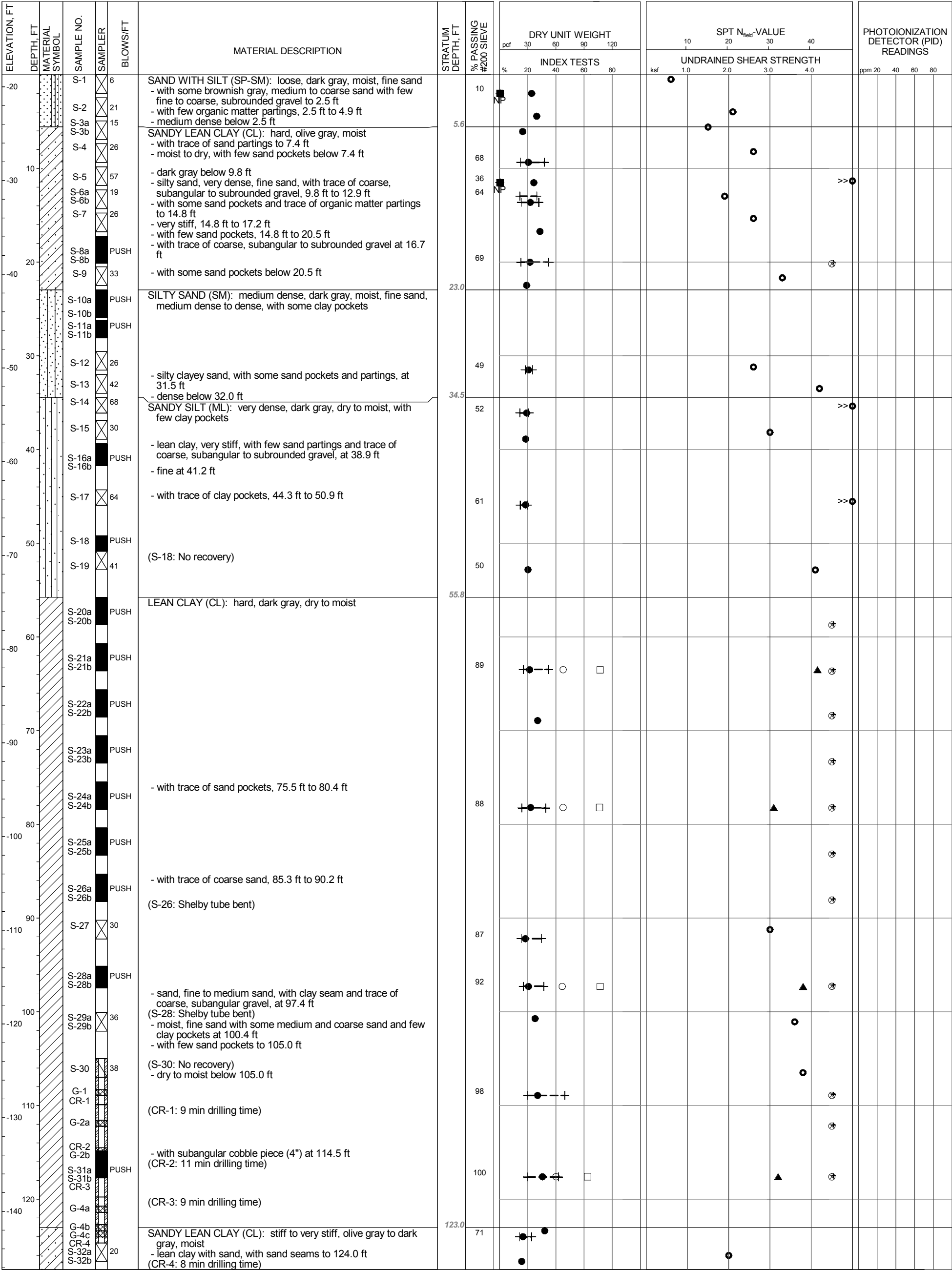
◇ Residual Vane
◇ Open symbols indicate remolded tests

● SPT N_{Field}-Value
>> Exceeds Data Scale
WOR - Weight of Rod
WOH - Weight of Hammer
▽ PID

DRILLING COMPANY: Fugro
DRILLER: J. Wilson/T. Wills
VESSEL: SKATE 3A
SPT HAMMER: SPT-09 to 152.6 ft
BACKFILL: N/A
DRILLING METHOD
HOLLOW STEM AUGER: N/A
WET ROTARY: 0 to 152.6 ft
CASING: 7" -dia. to 57.4 ft

BORING LOG MB-20
MARINE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA

PLATE B1-16b



- NOTES:**

1) The log and data presented are a simplification of actual conditions encountered at the time of sampling at the exploration location. Subsurface conditions may differ at other locations and with the passage of time.

2) For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.

3) DN = Driller's Note

4) in sample no indicates different SPT hammer used below the depth.
- CLASSIFICATION TESTS**

● Water Content
□ Dry Unit Weight
○ Submerged Unit Weight
■ Non-Plastic

Plastic Limit Liquid Limit

+
- STRENGTH TESTS**

⊗ Pocket Penetrometer
◇ Torvane
◇ Remote Vane
◆ Miniature Vane
▲ Unconsolidated Undrained Triaxial
■ Unconfined Compression

◇ Residual Vane
◇ Open symbols indicate remolded tests

● SPT N_{Field}-Value
>> Exceeds Data Scale
WOR - Weight of Rod
WOH - Weight of Hammer
▽ PID

COMPLETION DEPTH: 164 ft
COORDINATES: W 151.372542 N 60.655536 (GCS, NAD 1983, NSRS2007, degrees)
MUDLINE ELEVATION: -18.70 ft (rel. MLLW datum)
EXPLORATION START DATE: 10/16/2015
COMPLETION DATE: 10/17/2015
LOGGED BY: S. Pant/ E. Pulido

BORING LOG MB-21
MARINE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA

DRILLING COMPANY: Fugro
DRILLER: R. Smith/ A. Cook
VESSEL: SKATE 3A
SPT HAMMER: SPT-02 to 164.0 ft
BACKFILL: N/A
DRILLING METHOD
HOLLOW STEM AUGER: N/A
WET ROTARY: 0 to 164.0 ft
CASING: 12" -dia. to 1.6 ft, 7" -dia. to 36.7 ft



ELEVATION, FT	DEPTH, FT	MATERIAL SYMBOL	SAMPLE NO.	SAMPLER	BLOWS/FT	MATERIAL DESCRIPTION	STRATUM DEPTH, FT	% PASSING #200 SIEVE	DRY UNIT WEIGHT	SPT N _{field} VALUE	PHOTOIONIZATION DETECTOR (PID) READINGS
									pcf 30 60 90 120	10 20 30 40	
									INDEX TESTS % 20 40 60 80	UNDRAINED SHEAR STRENGTH ksf 1.0 2.0 3.0 4.0	ppm 20 40 60 80
	130					- sand, medium dense, fine to medium, 124.7 to 126.0 ft - with clay partings at 125.9 ft SANDY LEAN CLAY (CL): stiff to very stiff, olive gray to dark gray, moist					
-150			S-33	10		- olive gray below 126.0 ft to 136.5 ft	57		+	+	
-160			S-34	50 4"		- hard, dark gray, dry to moist below 144.4 ft - with trace coarse, subangular to subrounded gravel, 144.4 ft to 145.2 ft - with few coarse, subangular to subrounded gravel, 145.2 ft to 146.0 ft - with few coarse, subangular to subrounded gravel and trace of subrounded cobble below 149.3 ft (CR-5: 7 min drilling time) (CR-6: 4 min drilling time)	63				>>●
-170			G-5 CR-5						●	+	●
-180			G-6 CR-6				154.2		●	○	□
						Sampling ended at 154.2 ft Rat hole for P.S logging drilled to 164.0 ft					●>>△
							164.0				
-190											
-200											
-210											
-220											
-230											
-240											
-250											
-260											
-270											

NOTES:

1) The log and data presented are a simplification of actual conditions encountered at the time of sampling at the exploration location. Subsurface conditions may differ at other locations and with the passage of time.

2) For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.

3) DN = Driller's Note

4) in sample no indicates different SPT hammer used below the depth.

COMPLETION DEPTH: 164 ft
COORDINATES: W 151.372542 N60.655536 (GCS, NAD 1983, NSRS2007, degrees)
MUDLINE ELEVATION: -18.70 ft (rel. MLLW datum)
EXPLORATION START DATE: 10/16/2015
COMPLETION DATE: 10/17/2015
LOGGED BY: S. Pant/ E. Pulido

CLASSIFICATION TESTS

● Water Content
□ Dry Unit Weight
○ Submerged Unit Weight
■ Non-Plastic

Plastic Limit Liquid Limit

+

STRENGTH TESTS

⊗ Pocket Penetrometer
⊕ Torvane
⊖ Remote Vane
◆ Miniature Vane
▲ Unconsolidated Undrained Triaxial
■ Unconfined Compression

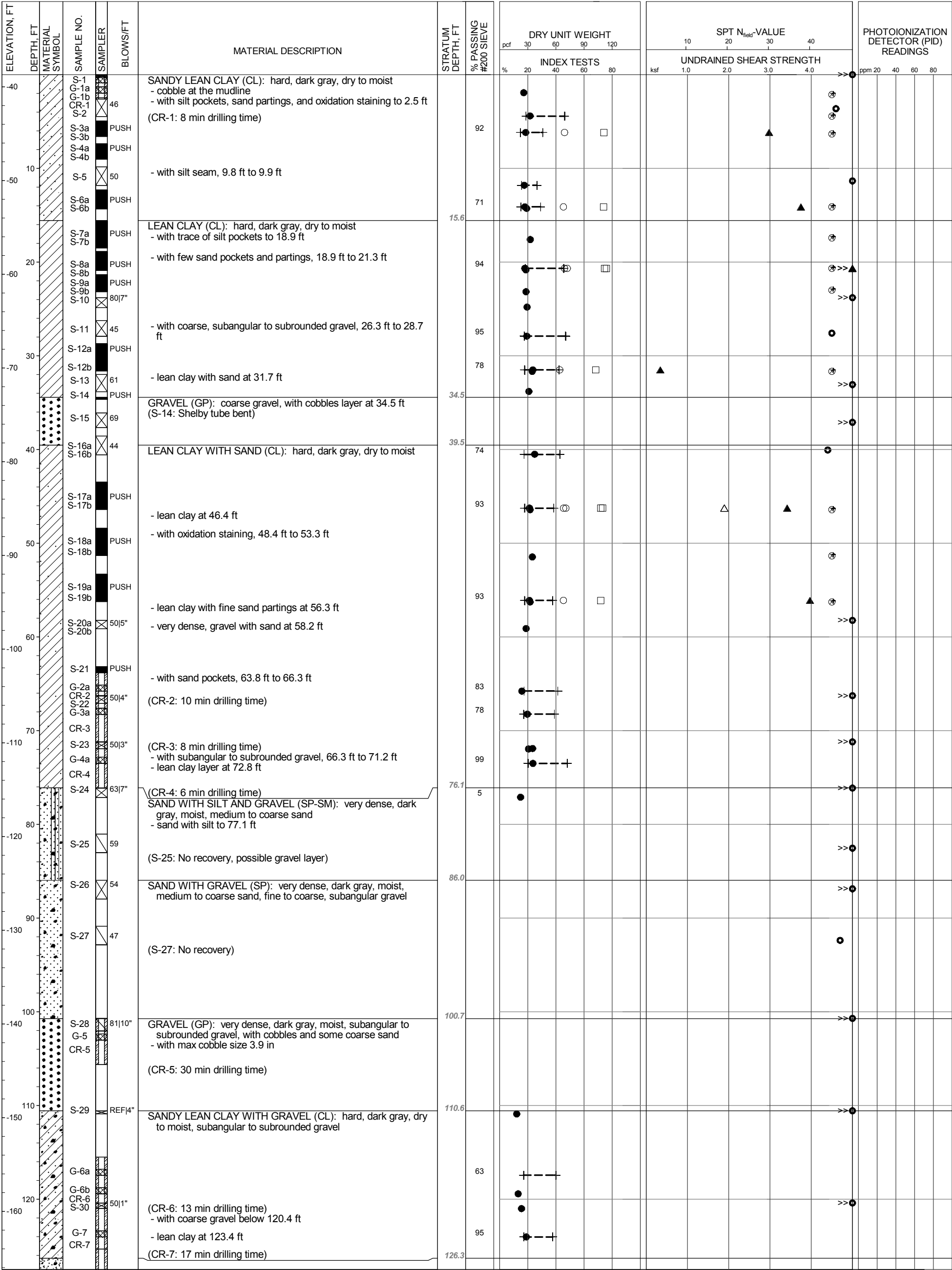
◇ Residual Vane
◇ Open symbols indicate remolded tests

● SPT N_{Field}-Value
>> Exceeds Data Scale
WOR - Weight of Rod
WOH - Weight of Hammer
▽ PID

DRILLING COMPANY: Fugro
DRILLER: R. Smith/ A. Cook
VESSEL: SKATE 3A
SPT HAMMER: SPT-02 to 164.0 ft
BACKFILL: N/A
DRILLING METHOD
HOLLOW STEM AUGER: N/A
WET ROTARY: 0 to 164.0 ft
CASING: 12" -dia. to 1.6 ft, 7" -dia. to 36.7 ft

BORING LOG MB-21
MARINE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA

PLATE B1-17b



NOTES:

1) The log and data presented are a simplification of actual conditions encountered at the time of sampling at the exploration location. Subsurface conditions may differ at other locations and with the passage of time.

2) For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.

3) DN = Driller's Note

4) in sample no indicates different SPT hammer used below the depth.

COMPLETION DEPTH: 151.3 ft
COORDINATES: W151.379286 N60.653562 (GCS, NAD 1983, NSRS2007, degrees)
MUDLINE ELEVATION: -38.70 ft (rel. MLLW datum)
EXPLORATION START DATE: 10/5/2015
COMPLETION DATE: 10/7/2015
LOGGED BY: S. Pant/ E. Pulido

CLASSIFICATION TESTS

● Water Content
□ Dry Unit Weight
○ Submerged Unit Weight
■ Non-Plastic

Plastic Limit Liquid Limit

+

STRENGTH TESTS

⊗ Pocket Penetrometer
⊕ Torvane
⊖ Remote Vane
◆ Miniature Vane
▲ Unconsolidated Undrained Triaxial
■ Unconfined Compression

◇ Residual Vane
◇ Open symbols indicate remolded tests

● SPT N_{Field}-Value
>> Exceeds Data Scale
WOR - Weight of Rod
WOH - Weight of Hammer
▽ PID

DRILLING COMPANY: Fugro
DRILLER: R. Smith/ A. Cook
VESSEL: SKATE 3A
SPT HAMMER: SPT-09 to 151.2 ft
BACKFILL: N/A
DRILLING METHOD
HOLLOW STEM AUGER: N/A
WET ROTARY: 0 to 151.3 ft
CASING: 12" -dia. to 1.0 ft, 7" -dia. to 1.3 ft

BORING LOG MB-22
MARINE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA

PLATE B1-18a



ELEVATION, FT	DEPTH, FT	MATERIAL SYMBOL	SAMPLE NO.	SAMPLER	BLOWS/FT	MATERIAL DESCRIPTION	STRATUM DEPTH, FT	% PASSING #200 SIEVE	DRY UNIT WEIGHT					SPT N _{field} VALUE					PHOTOIONIZATION DETECTOR (PID) READINGS				
									pcf					10 20 30 40									
									INDEX TESTS					UNDRAINED SHEAR STRENGTH					ppm 20 40 60 80				
									%	20	40	60	80	ksf	1.0	2.0	3.0	4.0					
130	-170		G-8 CR-8 S-31		73 7"	SAND WITH GRAVEL (SW): very dense, dark gray, dry to moist, subangular to subrounded gravel (CR-8: 7 min drilling time) - with clay pockets, 130.25 ft to 132.9 ft (DN: cobbles 130.2ft to 136.1 ft)		16											>>				
140	-180		S-32		76 7"	SAND (SP): very dense, dark gray, dry to moist, fine to medium sand (DN: cobbles 143.7 ft to 146.3 ft)	140.1	3											>>				
150	-190		S-33		74 10"	- sand with clay, with trace of coarse gravel, below 149.9 ft	151.3	9											>>				
160	-200																						
170	-210																						
180	-220																						
190	-230																						
200	-240																						
210	-250																						
220	-260																						
230	-270																						
240	-280																						
250	-290																						

NOTES:

1) The log and data presented are a simplification of actual conditions encountered at the time of sampling at the exploration location. Subsurface conditions may differ at other locations and with the passage of time.

2) For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.

3) DN = Driller's Note

4) in sample no indicates different SPT hammer used below the depth.

COMPLETION DEPTH: 151.3 ft
COORDINATES: W 151.379286 N60.653562 (GCS, NAD 1983, NSRS2007, degrees)
MUDLINE ELEVATION: -38.70 ft (rel. MLLW datum)
EXPLORATION START DATE: 10/5/2015
COMPLETION DATE: 10/7/2015
LOGGED BY: S. Pant/ E. Pulido

CLASSIFICATION TESTS

● Water Content
□ Dry Unit Weight
○ Submerged Unit Weight
■ Non-Plastic

Plastic Limit Liquid Limit

+

STRENGTH TESTS

⊗ Pocket Penetrometer
⊕ Torvane
⊖ Remote Vane
◆ Miniature Vane
▲ Unconsolidated Undrained Triaxial
■ Unconfined Compression

◇ Residual Vane
◇ Open symbols indicate remolded tests

● SPT N_{Field}-Value
>> Exceeds Data Scale
WOR - Weight of Rod
WOH - Weight of Hammer
▽ PID

DRILLING COMPANY: Fugro
DRILLER: R. Smith/ A. Cook
VESSEL: SKATE 3A
SPT HAMMER: SPT-09 to 151.2 ft
BACKFILL: N/A
DRILLING METHOD
HOLLOW STEM AUGER: N/A
WET ROTARY: 0 to 151.3 ft
CASING: 12" -dia. to 1.0 ft, 7" -dia. to 1.3 ft

BORING LOG MB-22
MARINE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA

COMPLETION DEPTH: 305.5 ft
COORDINATES: W151.376172 N60.654547 (GCS, NAD 1983, NSRS2007, degrees)
MUDLINE ELEVATION: -29.90 ft (rel. MLLW datum)
EXPLORATION START DATE: 10/12/2015
COMPLETION DATE: 10/15/2015
LOGGED BY: S. Pant/ E. Pulido

● Water Content
 □ Dry Unit Weight
 ○ Submerged Unit Weight
 ■ Non-Plastic

Plastic Limit Liquid Limit

+-----+

⊗	Pocket Penetrometer	◇	Residual Vane
⊕	Torvane	◇	Open symbols indicate
⊖	Remote Vane	△	remolded tests
◆	Miniature Vane		
▲	Unconsolidated Undrained Triaxial		
■	Unconfined Compression		

- SPT N_{Field}-Value
- » Exceeds Data Scale
- WOR - Weight of Rod
- WOH - Weight of Hammer
- ▼ PID

ELEVATION, FT	DEPTH, FT	MATERIAL SYMBOL	SAMPLE NO.	SAMPLER	BLOWS/FT	MATERIAL DESCRIPTION	STRATUM DEPTH, FT	% PASSING #200 SIEVE	DRY UNIT WEIGHT	SPT N _{field} VALUE	UNDRAINED SHEAR STRENGTH	PHOTOIONIZATION DETECTOR (PID) READINGS
									pcf 30 60 90 120	10 20 30 40	ksf 1.0 2.0 3.0 4.0	ppm 20 40 60 80
									INDEX TESTS			
									% 20 40 60 80			
	-160130		G-16a			SANDY LEAN CLAY WITH GRAVEL (CL): hard, dark gray, dry to moist, fine, subangular gravel, with moderate cementation		91	● — ○ — □ — □			⊕ >>
			CR-16			(CR-16: 25 min drilling time)		69	— — —			
			G-16b			- with silt and sand partings, below 131.2 ft		76	● — —			⊕
			G-17					57	● —			⊕
			CR-17			(CR-17: 25 min drilling time)	136.2					
			G-18a			SANDY SILT (ML): very dense, dark gray, moist, fine, subangular gravel, with slight cementation						⊕
	-170140		G-18b									
			CR-18			(CR-18: 26 min drilling time)	141.1					
			G-19			LEAN CLAY WITH SAND (CL): hard, dark gray, dry to moist, fine, subangular gravel, with silt and few sand partings		77	— — ●			⊕
			CR-19			(CR-19: 28 min drilling time)	146.0					
			G-20			SILTY SAND (SM): dark gray, moist, with few fine, subangular to subrounded gravel, trace of fine sand		17	●			
	-180150		CR-20			(CR-20: 16 min drilling time)						>> ●
			S-32	REF 6"		- very dense, with trace of fine, subangular gravel, with clay pockets, below 150.9 ft						
	-190160		S-33	REF 5"		(S-33: No recovery)						>> ●
	-200170		S-34	REF 4"		- olive gray, sandy lean clay layer at 170.6 ft	170.9					>> ●
			G-21			SAND (SP): very dense, dark gray, moist, fine to medium sand - with trace of coarse, subangular to subrounded gravel to 180.8 ft		51 7	— ●			
			CR-21			(CR-21: 7 min drilling time)						
	-210180		G-22			(CR-22: 2 min drilling time)						>> ●
			CR-22			- olive gray with dark gray, 180.5 ft to 195.2 ft						
			S-35	REF 4"		- with few coarse, subangular to subrounded gravel, 180.8 ft to 185.4 ft						
			G-23			(CR-23: 7 min drilling time)						
			CR-23			- with trace of coarse, subangular to subrounded gravel, 185.4 ft to 200.1 ft						
	-220190		G-24			(CR-24: 10 min drilling time)						>> ●
			CR-24			(S-36: No recovery)						
			S-36	REF 4"		- with trace of cobble, 190.3 ft to 195.2 ft		4				
			G-25			(CR-25: 10 min drilling time)						
			CR-25									
	-230200		G-26			(CR-26: 8 min drilling time)						
			CR-26			- olive gray with dark gray, 200.1 ft to 219.8 ft						
			G-27			(CR-27: 3 min drilling time)						
			CR-27			- with trace of coarse, subangular to subrounded gravel, 205.1 ft to 219.8 ft						
	-240210		G-28			(CR-28: 4 min drilling time)						
			CR-28									
	-250220		G-29			(CR-29: 8 min drilling time)		6	●			
			CR-29			- with few fine, subangular gravel, 219.8 ft to 229.7 ft						
			G-30			- gray, medium sand below 219.8 ft						
			CR-30			(CR-30: 12 min drilling time)						
	-260230		G-31			(CR-31: 16 min drilling time)		6				
			CR-31									
	-270240		G-32a			SILT (ML): very dense, dark gray, dry to moist	239.5	99 99	■ — ●			
			G-32b			(CR-32: 22 min drilling time)						⊕
			CR-32									
	-280250		G-33a			- with trace of fine to medium sand below 249.3 ft	249.7	65	■ — ●			
			G-33b			SANDY SILT (ML): very dense, dark gray, dry to moist						
			CR-33			SILTY SAND (SM): very dense, dark gray, dry to moist, medium sand	252.6					

NOTES:

1) The log and data presented are a simplification of actual conditions encountered at the time of sampling at the exploration location. Subsurface conditions may differ at other locations and with the passage of time.

2) For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.

3) DN = Driller's Note

4) in sample no indicates different SPT hammer used below the depth.

COMPLETION DEPTH: 305.5 ft
COORDINATES: W151.376172 N60.654547 (GCS, NAD 1983, NSRS2007, degrees)
MUDLINE ELEVATION: -29.90 ft (rel. MLLW datum)
EXPLORATION START DATE: 10/12/2015
COMPLETION DATE: 10/15/2015
LOGGED BY: S. Pant/ E. Pulido

CLASSIFICATION TESTS

● Water Content
□ Dry Unit Weight
○ Submerged Unit Weight
■ Non-Plastic

Plastic Limit Liquid Limit

— — — — —

STRENGTH TESTS

⊗ Pocket Penetrometer
⊕ Torvane
⊖ Remote Vane
◆ Miniature Vane
▲ Unconsolidated Undrained Triaxial
■ Unconfined Compression

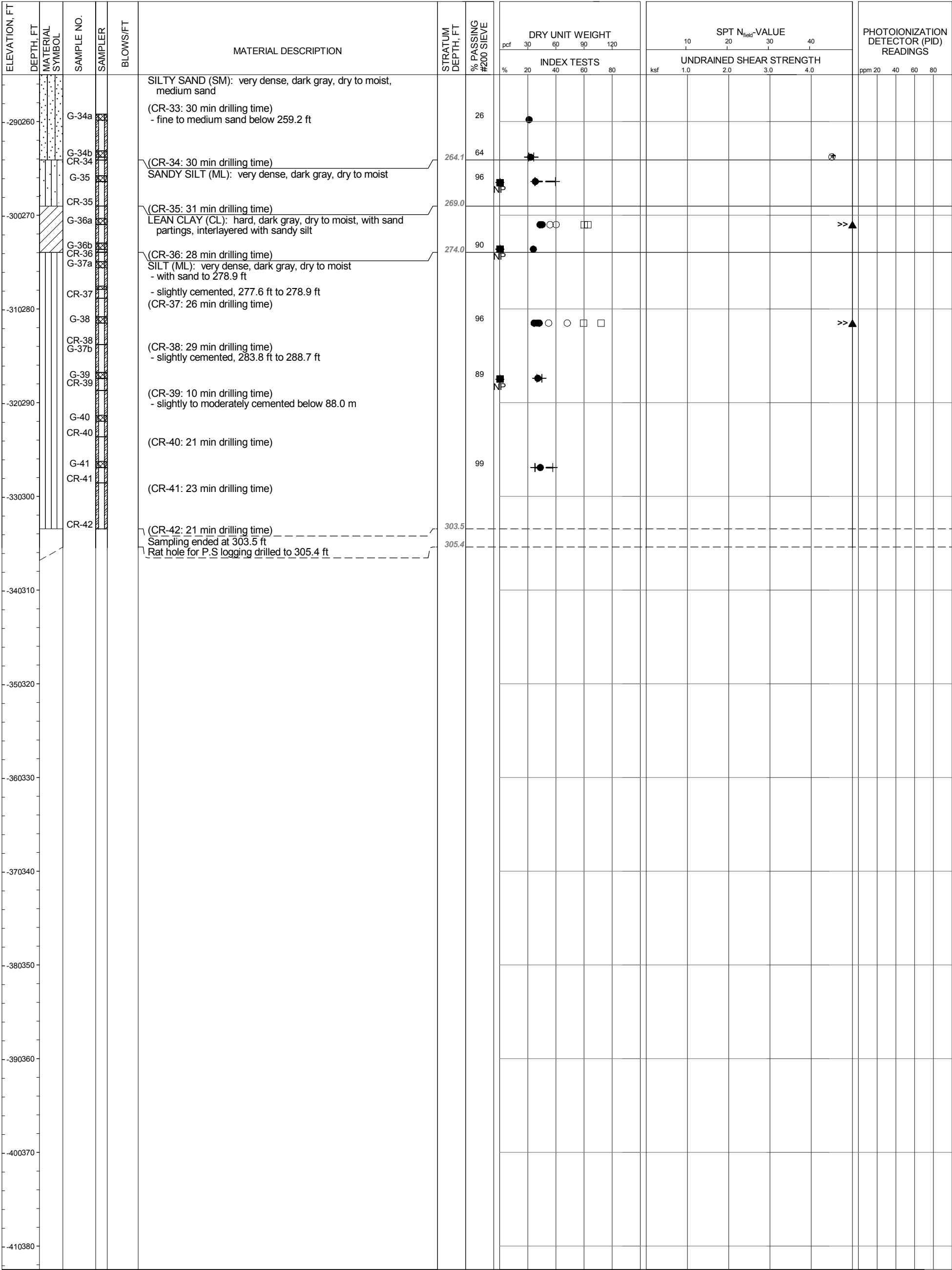
◇ Residual Vane
◇ Open symbols indicate remolded tests

● SPT N_{Field}-Value
>> Exceeds Data Scale
WOR - Weight of Rod
WOH - Weight of Hammer
▽ PID

DRILLING COMPANY: Fugro
DRILLER: R. Smith/ A. Cook
VESSEL: SKATE 3A
SPT HAMMER: SPT-09 to 7.4 ft
SPT-02 7.4 ft to 305.5 ft
BACKFILL: N/A
DRILLING METHOD
HOLLOW STEM AUGER: N/A
WET ROTARY: 0 to 305.5 ft
CASING: 12" -dia. to 1.6 ft, 7" -dia. to 37.7 ft

BORING LOG MB-23
MARINE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA

PLATE B1-19b



NOTES:

1) The log and data presented are a simplification of actual conditions encountered at the time of sampling at the exploration location. Subsurface conditions may differ at other locations and with the passage of time.

2) For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.

3) DN = Driller's Note

4) in sample no indicates different SPT hammer used below the depth.

COMPLETION DEPTH: 305.5 ft
COORDINATES: W 151.376172 N 60.654547 (GCS, NAD 1983, NSRS2007, degrees)
MUDLINE ELEVATION: -29.90 ft (rel. MLLW datum)
EXPLORATION START DATE: 10/12/2015
COMPLETION DATE: 10/15/2015
LOGGED BY: S. Pant/ E. Pulido

CLASSIFICATION TESTS

● Water Content
□ Dry Unit Weight
○ Submerged Unit Weight
■ Non-Plastic

Plastic Limit Liquid Limit

+

STRENGTH TESTS

⊗ Pocket Penetrometer
⊕ Torvane
⊖ Remote Vane
◆ Miniature Vane
▲ Unconsolidated Undrained Triaxial
■ Unconfined Compression

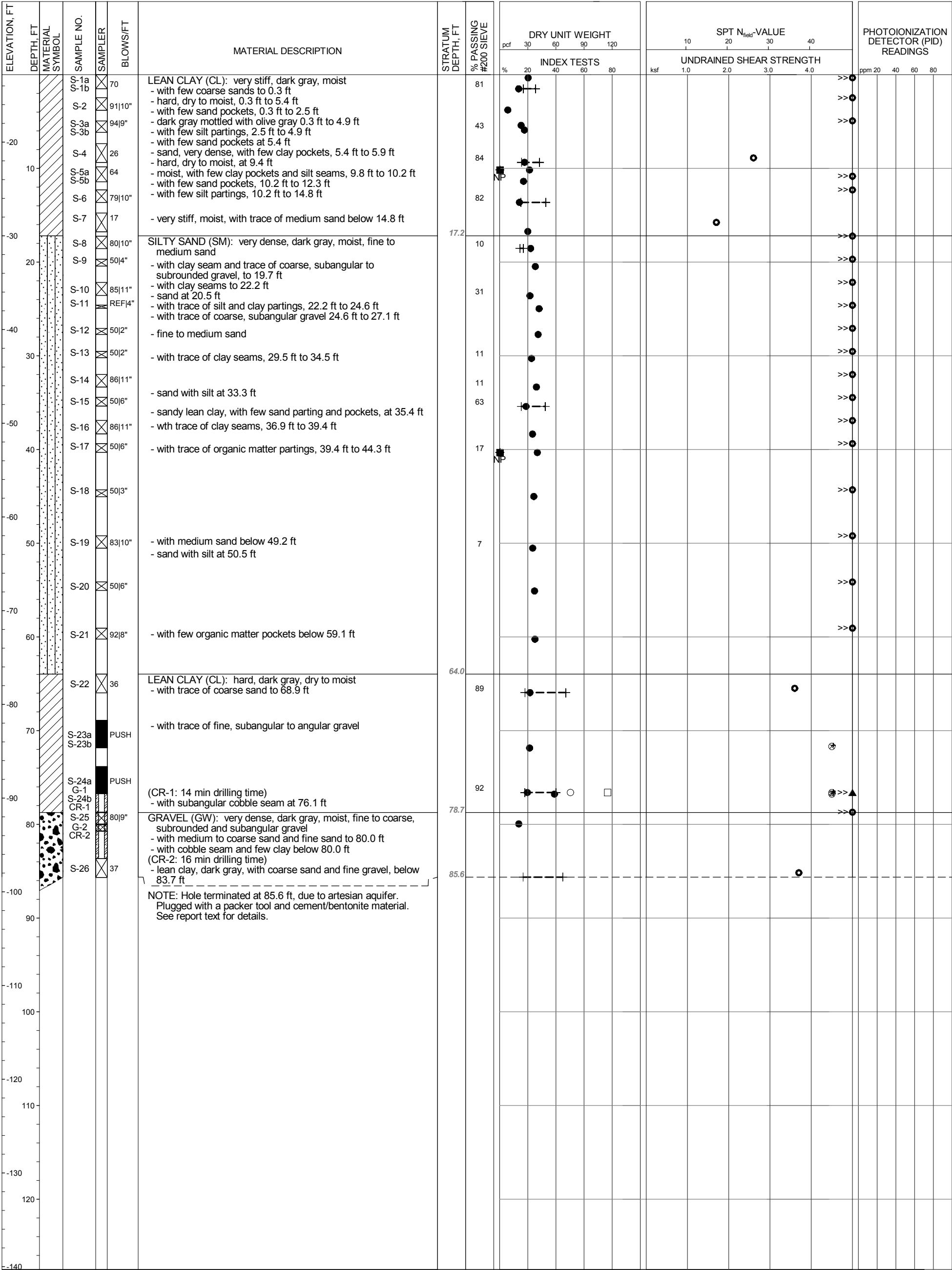
◇ Residual Vane
◇ Open symbols indicate remolded tests

● SPT N_{Field}-Value
>> Exceeds Data Scale
WOR - Weight of Rod
WOH - Weight of Hammer
▽ PID

DRILLING COMPANY: Fugro
DRILLER: R. Smith/ A. Cook
VESSEL: SKATE 3A
SPT HAMMER: SPT-09 to 7.4 ft
SPT-02 7.4 ft to 305.5 ft
BACKFILL: N/A
DRILLING METHOD
HOLLOW STEM AUGER: N/A
WET ROTARY: 0 to 305.5 ft
CASING: 12" -dia. to 1.6 ft, 7" -dia. to 37.7 ft

PLATE B1-19c

BORING LOG MB-23
MARINE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA



NOTES:

1) The log and data presented are a simplification of actual conditions encountered at the time of sampling at the exploration location. Subsurface conditions may differ at other locations and with the passage of time.

2) For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.

3) DN = Driller's Note

4) in sample no indicates different SPT hammer used below the depth.

COMPLETION DEPTH: 85.6 ft

COORDINATES: W 151.367307 N 60.653940 (GCS, NAD 1983, NSRS2007, degrees)

MUDLINE ELEVATION: -12.80 ft (rel. MLLW datum)

EXPLORATION START DATE: 10/27/2015

COMPLETION DATE: 10/28/2015

LOGGED BY: S. Pant/ E. Pulido

CLASSIFICATION TESTS

Water Content

Dry Unit Weight

Submerged Unit Weight

Non-Plastic

Plastic Limit

Liquid Limit

STRENGTH TESTS

Pocket Penetrometer

Torvane

Remote Vane

Miniature Vane

Unconsolidated Undrained Triaxial

Unconfined Compression

Residual Vane

Open symbols indicate remolded tests

SPT N_{Field}-Value

Exceeds Data Scale

WOR - Weight of Rod

WOH - Weight of Hammer

PID

DRILLING COMPANY: Fugro

DRILLER: J. Wilson/J. Barfield

VESSEL: SKATE 3A

SPT HAMMER: SPT-02 to 85.6 ft

BACKFILL: Packer Tool and Cement-Bentonite

DRILLING METHOD

HOLLOW STEM AUGER: N/A

WET ROTARY: 0 to 85.6 ft

CASING: 12" -dia. to 0.3 ft, 7" -dia. to 64.0 ft

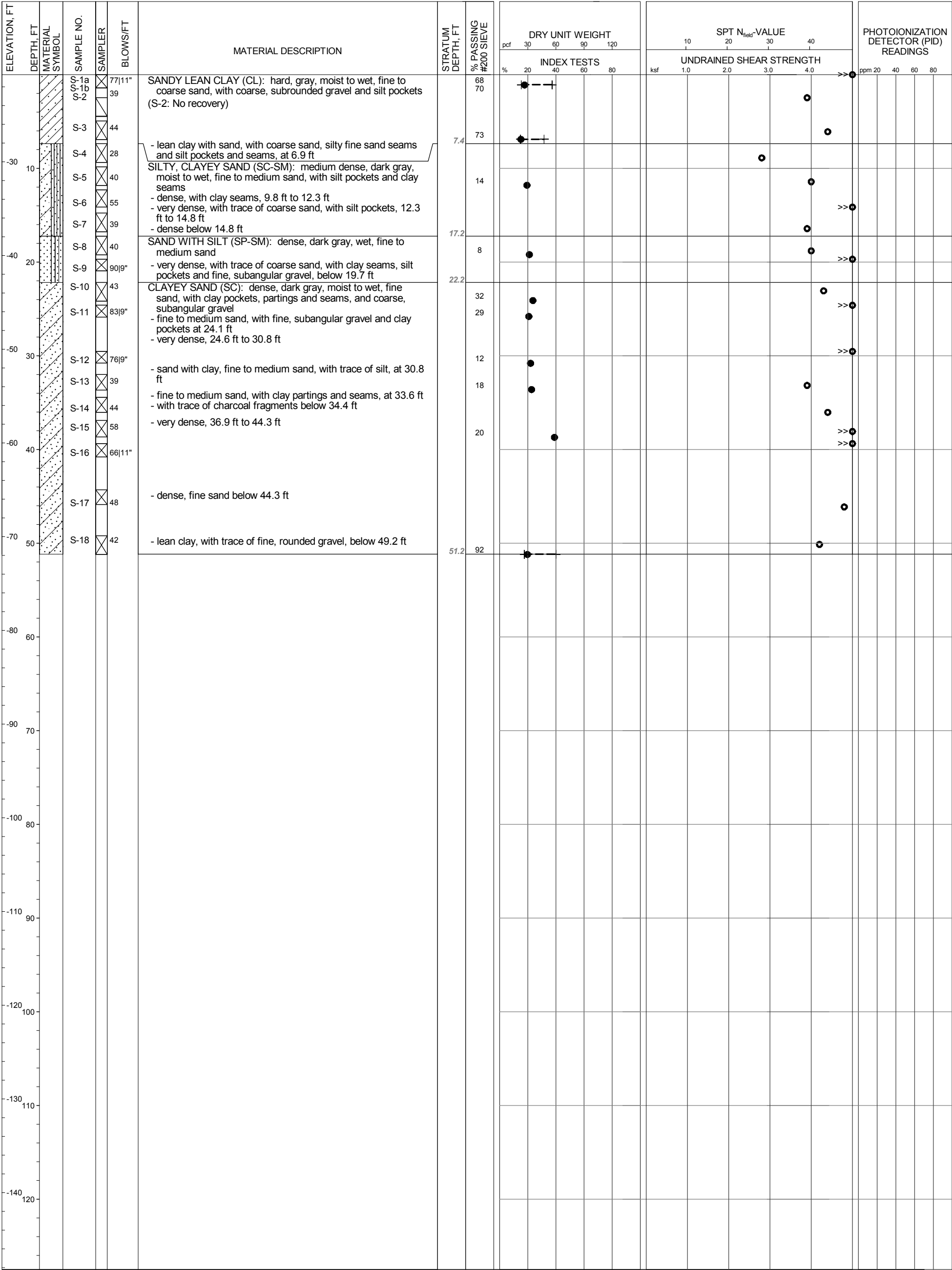
BORING LOG MB-24

MARINE LNG FACILITIES

ALASKA LNG PROJECT

NIKISKI, ALASKA

PLATE B1-20



NOTES:

1) The log and data presented are a simplification of actual conditions encountered at the time of sampling at the exploration location. Subsurface conditions may differ at other locations and with the passage of time.

2) For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.

3) DN = Driller's Note

4) in sample no indicates different SPT hammer used below the depth.

COMPLETION DEPTH: 51.2 ft
COORDINATES: W151.369679 N60.653224 (GCS, NAD 1983, NSRS2007, degrees)
MUDLINE ELEVATION: -20.70 ft (rel. MLLW datum)
EXPLORATION START DATE: 9/9/2015
COMPLETION DATE: 9/9/2015
LOGGED BY: J. Greenwald/A. Fee

CLASSIFICATION TESTS

● Water Content
□ Dry Unit Weight
○ Submerged Unit Weight
■ Non-Plastic

Plastic Limit Liquid Limit

+

STRENGTH TESTS

⊗ Pocket Penetrometer
◇ Torvane
◇ Remote Vane
◆ Miniature Vane
▲ Unconsolidated Undrained Triaxial
■ Unconfined Compression

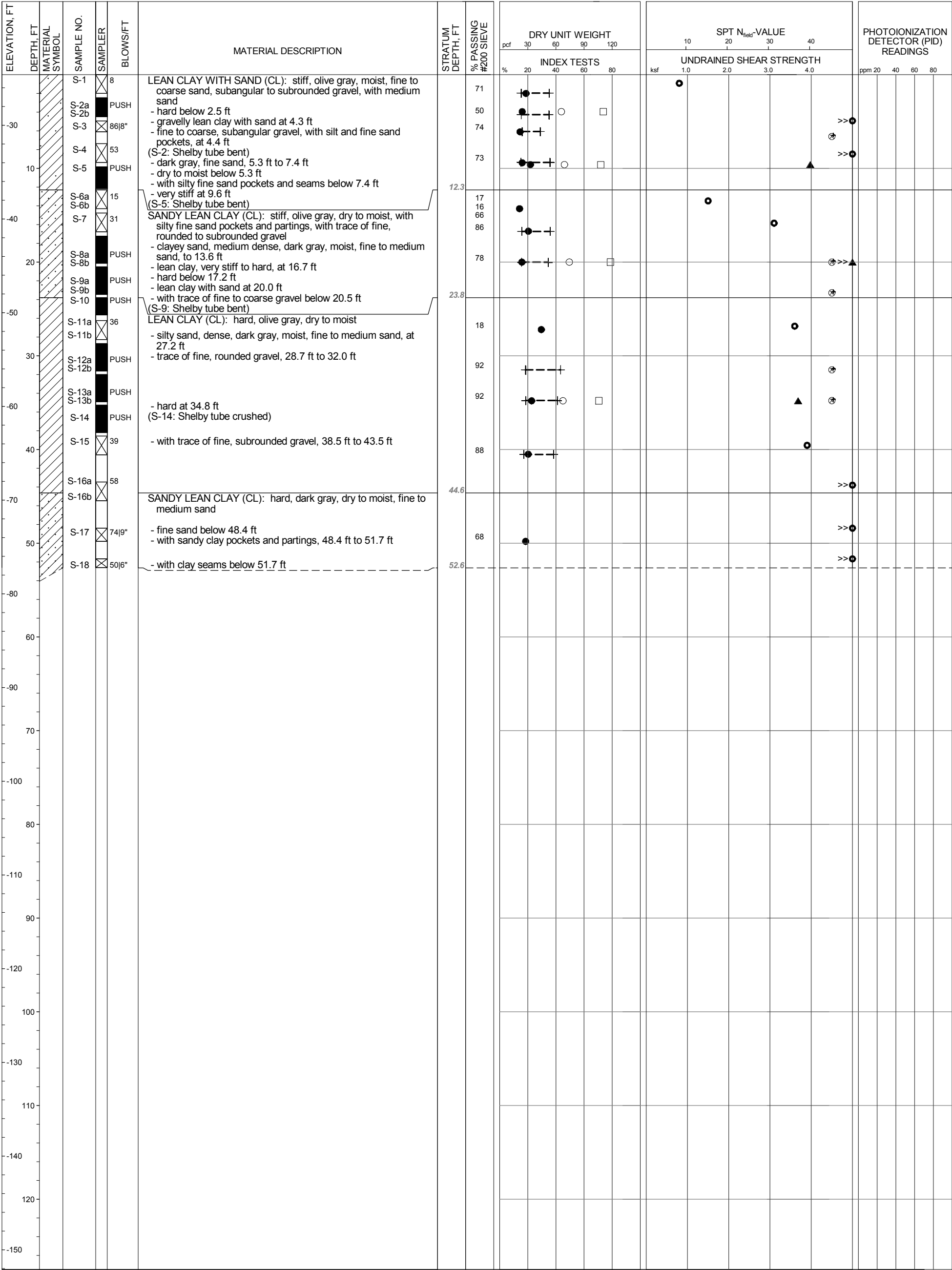
◇ Residual Vane
◇ Open symbols indicate remolded tests

● SPT N_{Field}-Value
>> Exceeds Data Scale
WOR - Weight of Rod
WOH - Weight of Hammer
▽ PID

DRILLING COMPANY: Fugro
DRILLER: H. Russel/T. Wills
VESSEL: SKATE 3A
SPT HAMMER: SPT-09 to 51.2 ft
BACKFILL: N/A
DRILLING METHOD
HOLLOW STEM AUGER: N/A
WET ROTARY: 0 to 51.2 ft
CASING: 7" -dia. to 51.2 ft

BORING LOG MB-25
MARINE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA

PLATE B1-21



NOTES:

1) The log and data presented are a simplification of actual conditions encountered at the time of sampling at the exploration location. Subsurface conditions may differ at other locations and with the passage of time.

2) For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.

3) DN = Driller's Note

4) in sample no indicates different SPT hammer used below the depth.

COMPLETION DEPTH: 52.6 ft

COORDINATES: W 151.373279 N 60.652170 (GCS, NAD 1983, NSRS2007, degrees)

MUDLINE ELEVATION: -24.60 ft (rel. MLLW datum)

EXPLORATION START DATE: 9/11/2015

COMPLETION DATE: 9/11/2015

LOGGED BY: J. Greenwald/A. Fee

CLASSIFICATION TESTS

● Water Content

□ Dry Unit Weight

○ Submerged Unit Weight

■ Non-Plastic

Plastic Limit

Liquid Limit

+

STRENGTH TESTS

⊗ Pocket Penetrometer

⊕ Torvane

⊖ Remote Vane

◆ Miniature Vane

▲ Unconsolidated Undrained Triaxial

▣ Unconfined Compression

◇ Residual Vane

◇ Open symbols indicate remolded tests

● SPT N_{Field}-Value

>> Exceeds Data Scale

WOR - Weight of Rod

WOH - Weight of Hammer

▽ PID

DRILLING COMPANY: Fugro

DRILLER: J. Wilson/T. Wills

VESSEL: SKATE 3A

SPT HAMMER: SPT-09 to 52.6 ft

BACKFILL: N/A

DRILLING METHOD

HOLLOW STEM AUGER: N/A

WET ROTARY: 0 to 52.6 ft

CASING: 7" -dia. to 52.6 ft

BORING LOG MB-26

MARINE LNG FACILITIES

ALASKA LNG PROJECT

NIKISKI, ALASKA

PLATE B1-22

NOTES:	CLASSIFICATION TESTS	STRENGTH TESTS	
1) The log and data presented are a simplification of actual conditions encountered at the time of sampling at the exploration location. Subsurface conditions may differ at other locations and with the passage of time.	<div> <div> <div>□</div> <div>Water Content</div> </div> <div> <div>◻</div> <div>Dry Unit Weight</div> </div> <div> <div>○</div> <div>Submerged Unit Weight</div> </div> <div> <div>■</div> <div>Non-Plastic</div> </div> </div>	<div> <div>⊗</div> <div>Pocket Penetrometer</div> </div> <div> <div>⊗</div> <div>Torvane</div> </div> <div> <div>◇</div> <div>Remote Vane</div> </div> <div> <div>◆</div> <div>Miniature Vane</div> </div> <div> <div>▲</div> <div>Unconsolidated Undrained Triaxial</div> </div> <div> <div>■</div> <div>Unconfined Compression</div> </div>	<div> <div>◇</div> <div>Residual Vane</div> </div> <div> <div>◇</div> <div>Open symbols indicate remolded tests</div> </div> <div> <div>●</div> <div>SPT N_{Field}-Value</div> </div> <div> <div>»</div> <div>Exceeds Data Scale</div> </div> <div> <div>WOR</div> <div>- Weight of Rod</div> </div> <div> <div>WOH</div> <div>- Weight of Hammer</div> </div> <div> <div>▽</div> <div>PID</div> </div>
2) For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.	<div> <div>+</div> <div>Plastic Limit</div> </div> <div> <div>+</div> <div>Liquid Limit</div> </div>		
3) DN = Driller's Note			
4) in sample no indicates different SPT hammer used below the depth.			
COMPLETION DEPTH: 164 ft			DRILLING COMPLETION
COORDINATES: W151.376467 N60.651116 (GCS, NAD 1983, NSRS2007, degrees)			DRILLER: R. Smith
MUDLINE ELEVATION: -40.85 ft (rel. MLLW datum)			VESSEL
EXPLORATION START DATE: 10/7/2015			BA
COMPLETION DATE: 10/9/2015			DRILLING
LOGGED BY: S. Panty / E. Pulido			HOLLOW STEM
			WET ROTARY
			CASING: 12" -dia. to 1.6 ft, 7" -dia.

PLATE B1-23a



ELEVATION, FT	DEPTH, FT	MATERIAL SYMBOL	SAMPLE NO.	SAMPLER	BLOWS/FT	MATERIAL DESCRIPTION	STRATUM DEPTH, FT	% PASSING #200 SIEVE	DRY UNIT WEIGHT	SPT N _{field} VALUE	PHOTOIONIZATION DETECTOR (PID) READINGS
									pcf 30 60 90 120	10 20 30 40	
									INDEX TESTS	UNDRAINED SHEAR STRENGTH	
									% 20 40 60 80	ksf 1.0 2.0 3.0 4.0	ppm 20 40 60 80
-170	130					- lean clay, hard, moist, with few coarse gravel, at 126.6 ft SAND WITH CLAY (SP-SC): very dense, dark gray, dry to moist					
-180	140		S-33	50 2"		SAND WITH GRAVEL (SW): very dense, dark gray, moist - clayey sand with gravel to 137.1 ft	136.5	13			
-190	150		S-34 G-15 CR-15	18		- medium dense below 146.3 ft - with few coarse, subangular to subrounded gravel		6			
						(CR-15: 12 min drilling time) Sampling ended at 151.3 ft Rat hole for P.S logging drilled to 164.0 ft	151.3				
-200	160										
-210	170										
-220	180										
-230	190										
-240	200										
-250	210										
-260	220										
-270	230										
-280	240										
-290	250										

NOTES:

1) The log and data presented are a simplification of actual conditions encountered at the time of sampling at the exploration location. Subsurface conditions may differ at other locations and with the passage of time.

2) For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.

3) DN = Driller's Note

4) in sample no indicates different SPT hammer used below the depth.

COMPLETION DEPTH: 164 ft
COORDINATES: W151.376467 N60.651116 (GCS, NAD 1983, NSRS2007, degrees)
MUDLINE ELEVATION: -40.85 ft (rel. MLLW datum)
EXPLORATION START DATE: 10/7/2015
COMPLETION DATE: 10/9/2015
LOGGED BY: S. Pant/ E. Pulido

CLASSIFICATION TESTS

● Water Content
□ Dry Unit Weight
○ Submerged Unit Weight
■ Non-Plastic

Plastic Limit Liquid Limit

+

STRENGTH TESTS

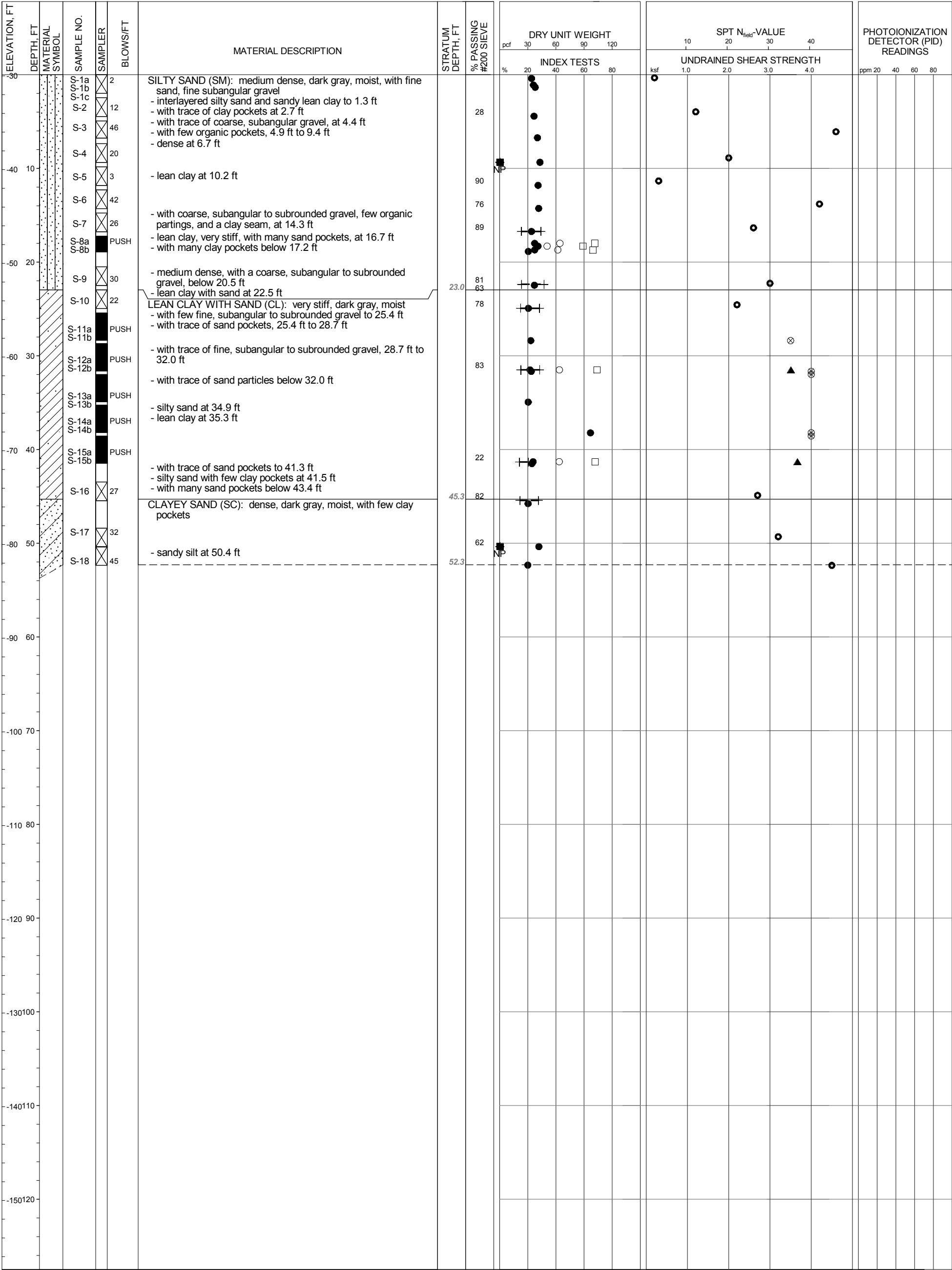
⊗ Pocket Penetrometer
⊕ Torvane
⊖ Remote Vane
◆ Miniature Vane
▲ Unconsolidated Undrained Triaxial
■ Unconfined Compression

◇ Residual Vane
◇ Open symbols indicate remolded tests

● SPT N_{Field}-Value
» Exceeds Data Scale
WOR - Weight of Rod
WOH - Weight of Hammer
▽ PID

DRILLING COMPANY: Fugro
DRILLER: R. Smith/ A. Cook
VESSEL: SKATE 3A
SPT HAMMER: SPT-09 to 164.0 ft
BACKFILL: N/A
DRILLING METHOD
HOLLOW STEM AUGER: N/A
WET ROTARY: 0 to 164.0 ft
CASING: 12" -dia. to 1.6 ft, 7" -dia. to 37.7 ft

BORING LOG MB-27
MARINE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA



NOTES:

1) The log and data presented are a simplification of actual conditions encountered at the time of sampling at the exploration location. Subsurface conditions may differ at other locations and with the passage of time.

2) For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.

3) DN = Driller's Note

4) in sample no indicates different SPT hammer used below the depth.

COMPLETION DEPTH: 52.3 ft

COORDINATES: W151.380783 N60.664398 (GCS, NAD 1983, NSRS2007, degrees)

MUDLINE ELEVATION: -29.86 ft (rel. MLLW datum)

EXPLORATION START DATE: 10/11/2015

COMPLETION DATE: 10/12/2015

LOGGED BY: S. Pant/ E. Pulido

CLASSIFICATION TESTS

Water Content

Dry Unit Weight

Submerged Unit Weight

Non-Plastic

Plastic Limit

Liquid Limit

STRENGTH TESTS

Pocket Penetrometer

Torvane

Remote Vane

Miniature Vane

Unconsolidated Undrained Triaxial

Unconfined Compression

Residual Vane

Open symbols indicate remolded tests

SPT N_{Field}-Value

Exceeds Data Scale

WOR - Weight of Rod

WOH - Weight of Hammer

PID

BORING LOG MB-28

MARINE LNG FACILITIES

ALASKA LNG PROJECT

NIKISKI, ALASKA

DRILLING COMPANY: Fugro

DRILLER: R. Smith/ A. Cook

VESSEL: SKATE 3A

SPT HAMMER: SPT-09 to 52.3 ft

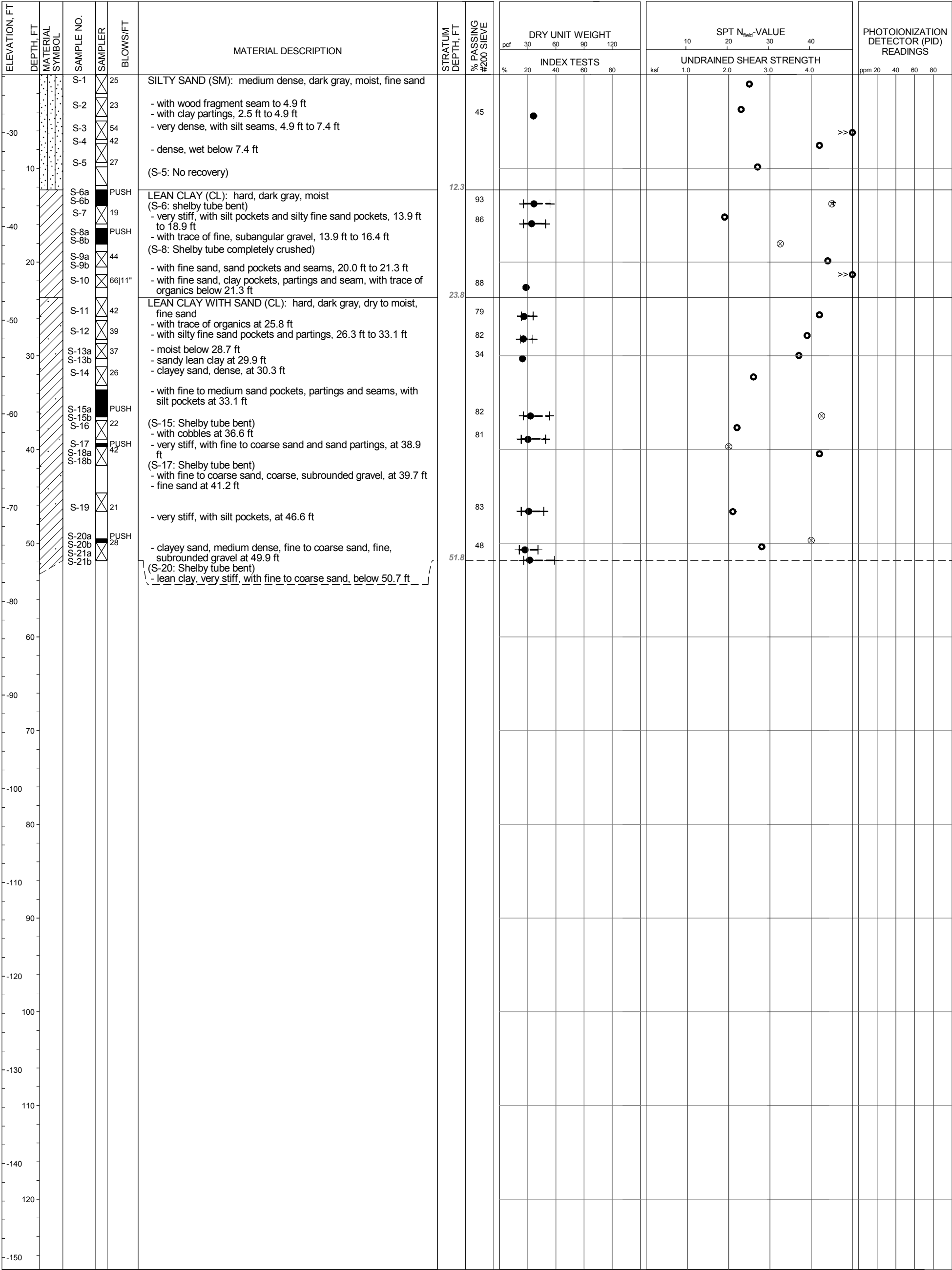
BACKFILL: N/A

DRILLING METHOD

HOLLOW STEM AUGER: N/A

WET ROTARY: 0 to 52.3 ft

CASING: 12" -dia. to 1.6 ft, 7" -dia. to 52.3 ft



NOTES:

1) The log and data presented are a simplification of actual conditions encountered at the time of sampling at the exploration location. Subsurface conditions may differ at other locations and with the passage of time.

2) For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.

3) DN = Driller's Note

4) in sample no indicates different SPT hammer used below the depth.

COMPLETION DEPTH: 51.8 ft
COORDINATES: W 151.370390 N 60.649812 (GCS, NAD 1983, NSRS2007, degrees)
MUDLINE ELEVATION: -23.80 ft (rel. MLLW datum)
EXPLORATION START DATE: 9/11/2015
COMPLETION DATE: 9/11/2015
LOGGED BY: J. Greenwald/A. Fee

CLASSIFICATION TESTS

● Water Content
□ Dry Unit Weight
○ Submerged Unit Weight
■ Non-Plastic

Plastic Limit Liquid Limit

+

STRENGTH TESTS

⊗ Pocket Penetrometer
⊕ Torvane
⊖ Remote Vane
◆ Miniature Vane
▲ Unconsolidated Undrained Triaxial
■ Unconfined Compression

◇ Residual Vane
◇ Open symbols indicate remolded tests

● SPT N_{Field}-Value
>> Exceeds Data Scale
WOR - Weight of Rod
WOH - Weight of Hammer
▽ PID

DRILLING COMPANY: Fugro
DRILLER: T. Wills/H. Russell
VESSEL: SKATE 3A
SPT HAMMER: SPT-09 to 51.8 ft
BACKFILL: N/A
DRILLING METHOD
HOLLOW STEM AUGER: N/A
WET ROTARY: 0 to 51.8 ft
CASING: 7" -dia. to 51.8 ft

BORING LOG MB-31
MARINE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA

PLATE B1-25

NOTES:

- 1) The log and data presented are a simplification of actual conditions encountered at the time of sampling at the exploration location. Subsurface conditions may differ at other locations and with the passage of time.
- 2) For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.
- 3) DN = Driller's Note
- 4) When available, blows are presented for the sampling operations performed with U-100 Hammer sampler.

CLASSIFICATION TESTS

- Water Content
- Dry Unit Weight
- Submerged Unit Weight
- Non-Plastic

Plastic Limit ————— Liquid Limit

STRENGTH TESTS

- ⊗ Pocket Penetrometer
- ◇ Torvane
- ◇ Remote Vane
- ◆ Miniature Vane
- ▲ Unconsolidated Undrained Triaxial
- ▣ Unconfined Compression
- ◇ Residual Vane
- ◇ Open symbols indicate remolded tests

● SPT N_{Field} Value
 >> Exceeds Data Scale
 WOR - Weight of Rod
 WOH - Weight of Hammer
 ▽ PID

DRILLING COMPANY: J. WILSON
 DRILLER: J. WILSON
 VESSEL: J. WILSON

COMPLETION DEPTH: 20.51 ft
COORDINATES: W151.367194 N60.655884 (GCS, NAD 1983, NSRS2007, degrees)
MUDLINE ELEVATION: -7.70 ft (rel. MLLW datum)
EXPLORATION START DATE: 11/2/2015
COMPLETION DATE: 11/2/2015
LOGGED BY: S. Pant/ E. Pulido

NOTES:

- 1) The log and data presented are a simplification of actual conditions encountered at the time of sampling at the exploration location. Subsurface conditions may differ at other locations and with the passage of time.
- 2) For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.
- 3) DN = Driller's Note
- 4) When available, blows are presented for the sampling operations performed with U-100 Hammer sampler.

CLASSIFICATION TESTS

- Water Content
- Dry Unit Weight
- Submerged Unit Weight
- Non-Plastic

Plastic Limit Liquid Limit

+

STRENGTH TESTS

- ⊗ Pocket Penetrometer
- ⊕ Torvane
- ◇ Remote Vane
- ◆ Miniature Vane
- ▲ Unconsolidated Undrained Triaxial
- ▣ Unconfined Compression
- ◇ Residual Vane
- ◇ Open symbols indicate remolded tests
- ⦿ SPT N_{Field} Value
- ⋈ Exceeds Data Scale
- WOR - Weight of Rod
- WOH - Weight of Hammer
- ▽ PID

DRILLING COMPANY: Fugro
 DRILLER: J. Wilson/J. Barfield
 VESSEL: SKATE 3A

DRILLING COMPANY: Fugro
DRILLER: J. Wilson/J. Barfield
VESSEL: SKATE 3A
SPT HAMMER:
BACKFILL: N/A
DRILLING METHOD
HOLLOW STEM AUGER: N/A
WET ROTARY: 0 to 18.54 ft
CASING: 12" -dia. to 1.3 ft, 7" -dia. to 1.6 ft

NOTES:	CLASSIFICATION TESTS	STRENGTH TESTS	
1) The log and data presented are a simplification of actual conditions encountered at the time of sampling at the exploration location. Subsurface conditions may differ at other locations and with the passage of time.	● Water Content	⊗ Pocket Penetrometer	⊕ SPT N _{Field} -Value
2) For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.	□ Dry Unit Weight	⊙ Torvane	≫ Exceeds Data Scale
3) DN = Driller's Note	○ Submerged Unit Weight	◇ Remote Vane	◇ Open symbols indicate remolded tests
4) When available, blows are presented for the sampling operations performed with U-100 Hammer sampler.	■ Non-Plastic	◆ Miniature Vane	WOR - Weight of Rod
		▲ Unconsolidated Undrained Triaxial	WOH - Weight of Hammer
		▣ Unconfined Compression	▽ PID
	Plastic Limit ————— Liquid Limit		
	+		
			DRILLING COMPANY
			DRILLER: J. Wilson
			VESSEL

COMPLETION DEPTH: 19.19 ft
COORDINATES: W151.369148 N60.655579 (GCS, NAD 1983, NSRS2007, degrees)
MUDLINE ELEVATION: -12.20 ft (rel. MLLW datum)
EXPLORATION START DATE: 11/4/2015
COMPLETION DATE: 11/4/2015
LOGGED BY: S. Pant/ E. Pulido

NOTES:	CLASSIFICATION TESTS	STRENGTH TESTS	
1) The log and data presented are a simplification of actual conditions encountered at the time of sampling at the exploration location. Subsurface conditions may differ at other locations and with the passage of time.	● Water Content	⊗ Pocket Penetrometer	⊕ SPT N _{Field} -Value
2) For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.	□ Dry Unit Weight	⊙ Torvane	≫ Exceeds Data Scale
3) DN = Driller's Note	○ Submerged Unit Weight	◇ Remote Vane	◇ Open symbols indicate remolded tests
4) When available, blows are presented for the sampling operations performed with U-100 Hammer sampler.	■ Non-Plastic	◆ Miniature Vane	WOR - Weight of Rod
		▲ Unconsolidated Undrained Triaxial	WOH - Weight of Hammer
		▣ Unconfined Compression	▽ PID
	Plastic Limit ————— Liquid Limit		
	+		
			DRILLING COMPANY
			DRILLER: J. Wilson
			VESSEL

COMPLETION DEPTH: 18.37 ft
COORDINATES: W151.369197 N60.655545 (GCS, NAD 1983, NSRS2007, degrees)
MUDLINE ELEVATION: -11.90 ft (rel. MLLW datum)
EXPLORATION START DATE: 11/4/2015
COMPLETION DATE: 11/4/2015
LOGGED BY: S. Pant/ E. Pulido

SOIL TYPES

	Sandy GRAVEL (GP)		Poorly-Graded SAND with Silt (SP-SM)		Lean CLAY (CL)
	Gravelly Poorly-Graded SAND (SP)		Well-Graded SAND with Silt (SW-SM)		Silty CLAY (CL-ML)
	Gravelly Well-Graded SAND (SW)		SAND with Clay (SP-SC)		Silty CLAY with Sand (CL-ML)
	Poorly-Graded SAND (SP)		Clayey SAND (SC)		Sandy SILT (ML)
	Well-Graded SAND (SW)		Silty SAND (SM)		Topsoil
	Gravelly Poorly-Graded SAND with Silt (SP-SM)		Sandy Lean CLAY (CL)		
	Well-Graded SAND with Silt and Gravel (SW-SM)		Lean CLAY with Sand (CL)		

SAMPLERS

	Grab Sample		Standard Penetration Test (SPT) Sampler		Thin-Walled Shelby Tube Sampler		Drive Sampler (U-100 Hammer)
	Oversized Split-Spoon Sampler (OSPT)		Bailer		Geobore S - Soil Coring		No Recovery

STRENGTH TESTS

⊗ Pocket Penetrometer	● SPT N-Value
⊕ Torvane	»● SPT N-Value Exceeds Data Scale
◇ Remote Vane	▽ PID
◆ Miniature Vane ◇ Residual Vane	◇ △ (Open symbols indicate remolded tests)
▲ Unconsolidated Undrained Triaxial	+ Strength exceeds capacity of measuring device
■ Unconfined Compression (Su)	WOR - Weight of Rods
	WOH - Weight of Hammer

CLASSIFICATION TEST/BLOW COUNTS

● Water Content (%)
□ Unit Dry Weight
○ Submerged Unit Weight
Plastic Limit Liquid Limit
+-----+-----+
■ Non-Plastic

KEY TO TERMS AND SYMBOLS USED ON BORING LOGS

MARINE LNG FACILITIES

ALASKA LNG PROJECT

NIKISKI, ALASKA

STANDARD PENETRATION TEST (SPT)

A 2-in.-OD, 1-3/8-ID split spoon sampler is driven 1.5 ft into undisturbed soil with a 140-pound hammer free falling 30 in. After the sampler is seated 6 in. into undisturbed soil, the number of blows required to drive the sampler the last 12 in. is the Standard Penetration Resistance or "N" value, which is recorded as blows per foot as described below.

STANDARD PENETRATION TEST AND THIN-WALLED SAMPLERS

Samplers were driven with a 140 pound automatic hammer dropped approximately 2-1/2 feet.

20	Number of blows to produce 12" of penetration after the initial 6" of seating.
86/11"	Number of blows required to produce the indicated penetration after an initial 6" seating.
Ref/3"	50 blows produced the indicated penetration during the initial 6" interval.
WOH	Sampler advanced with the weight of the 140 pound hammer.
PUSH	Pushed thin-walled 3" tube.

SOIL GRAIN SIZE

U.S. STANDARD SIEVE

8"	3"	3/4"	#4	#10	#40	#200		
COARSE	FINE	GRAVEL		SAND			SILT	CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE		
152	76.2	19.1	4.76	2.00	0.420	0.074		0.002
SOIL GRAIN SIZE IN MILLIMETERS								

DENSITY OF GRANULAR SOILS

Descriptive Term	*Relative Density, %	Blows Per Foot (SPT)
Very Loose.....	< 15.....	0 to 4
Loose.....	15 to 35.....	4 to 10
Medium Dense.....	35 to 65.....	10 to 30
Dense.....	65 to 85.....	30 to 50
Very Dense.....	> 85.....	> 50

*Estimated from sampler driving record.

Source: Terzaghi and Peck (1967), Soil Mechanics in Engineering Practice, 2nd Ed.

STRENGTH OF COHESIVE SOILS

Term	Undrained Shear Strength, ksf	Blows Per Foot (SPT) (approximate)
Very Soft.....	<0.25.....	0 to 2
Soft.....	0.25 to 0.50.....	2 to 4
Firm.....	0.50 to 1.00.....	4 to 8
Stiff.....	1.00 to 2.00.....	8 to 16
Very Stiff.....	2.00 to 4.00.....	16 to 32
Hard.....	> 4.00.....	> 32

Source: Terzaghi and Peck (1967), Soil Mechanics in Engineering Practice, 2nd Ed.

SOIL STRUCTURE

Slickensided	Having planes of weakness that appear slick and glossy. The degree of slickensidedness depends upon the spacing of slickensides and the ease of breaking along these planes.
Fissured	Containing shrinkage of relief crack, often filled with fine sand or silt, usually more or less vertical.
Pocket	Inclusion of material of different texture that is smaller than the diameter of the sample.
Parting	Inclusion less than 1/8 inch thick extending through the sample.
Seam	Inclusion 1/8 to 3 inches thick extending through the sample.
Layer	Inclusion greater than 3 inches thick extending through the sample.
Laminated	Soil sample composed of alternating partings or seams of different soil types.
Interlayered	Soil sample composed of alternating layers of different soil types.
Intermixed	Soil sample composed of pockets of different soil types and layered or laminated structure is not evident.
Calcareous	Having appreciable quantities of carbonate.

KEY TO TERMS & SYMBOLS USED ON LOGS

MARINE LNG FACILITIES

ALASKA LNG PROJECT

NIKISKI, ALASKA

PLATE B1-30b



Starfix Mean Position Report v5.02.24

Vessel

Vessel Name
 Project Name **AKLNG_150242**
 Project Number **AKLNG_150242**
 Offset Name **MainVessel_CRP**
 Sampling Started **12-Sep-2015 02:07:58 (UTC-07:00)**
 Sampling Ended **12-Sep-2015 02:13:00 (UTC-07:00)**
 Comment **DTM-18.4m, DTW-3.60m at 02:05am, Deck Level Above MLLW-9.85m, MB-02, C1707, 12.09.15**

Results

	<u>Mean</u>	<u>Standard Deviation</u>
Local Latitude	60°40'10.7476"N	
Local Longitude	151°23'22.6441"W	
Ellipsoidal Height	0.00 ftUS	
Local Easting	1391214.02 ftUS	0.04 ftUS
Local Northing	2439289.33 ftUS	0.03 ftUS
Orthometric Height	0.00 ftUS	0.00 ftUS
WGS84 Latitude	60°40'10.7417"N	
WGS84 Longitude	151°23'22.7366"W	
Ellipsoidal Height	1.48 ftUS	
Quality	0.63	0.02 ftUS
Depth	0.00 ftUS	0.00 ftUS
Heading	153.07°G	0.18°

Line Navigation Data

Line Name **N/A**
 Chainage **N/A**
 Cross Track **N/A**

Point Navigation Data

Point Name **MB-02**
 Easting 1391227.35 ftUS
 Northing 2439301.31 ftUS
 Range 17.93 ftUS
 Bearing TO 48.05°G
 FROM 228.05°G

Observations

Used 300 out of 300

Geodetic Parameters

Geodetic Datum **NAD83 NSRS2007**
Ellipsoid **GRS80**
 Semi-Major Axis 6378137.000
 Inverse Flattening 298.2572221010
 Eccentricity^2 0.006694380022901
 DX 1.0058m RX 0.0000 arc seconds
 DY -1.0516m RY 0.0000 arc seconds
 DZ -0.3048m RZ 0.0000 arc seconds
 D Scale 0.0000ppm
 Rotation Convention +RZ=-RLongitude
Projection **Transverse Mercator**
 Grid Name Alaska Zone 4
 Latitude of Origin 54°00'00.0000"N
 Longitude of Origin 150°00'00.0000"W
 False Easting 1640416.667ftUS
 False Northing 0.000ftUS
 Convergence - 1°12'41.5610"
 Calculation Mode Grid



Starfix Mean Position Report v5.02.24

Vessel

Vessel Name
 Project Name **AKLNG_150242**
 Project Number **AKLNG_150242**
 Offset Name **MainVessel_CRP**
 Sampling Started **23-Oct-2015 17:11:17 (UTC-07:00)**
 Sampling Ended **23-Oct-2015 17:16:17 (UTC-07:00)**
 Comment **DTM-15.70m DTW-3.70m at 16.10, Deck level above ML**
LW-8.50m MB03,C1707, 23.10.15

Results

	<u>Mean</u>	<u>Standard Deviation</u>
Local Latitude	60°40'06.0055"N	
Local Longitude	151°22'59.4396"W	
Ellipsoidal Height	0.00 ftUS	
Local Easting	1392359.68 ftUS	0.14 ftUS
Local Northing	2438783.53 ftUS	0.12 ftUS
Orthometric Height	0.00 ftUS	0.00 ftUS
WGS84 Latitude	60°40'05.9997"N	
WGS84 Longitude	151°22'59.5321"W	
Ellipsoidal Height	1.48 ftUS	
Quality	1.47	0.05 ftUS
Depth	0.00 ftUS	0.00 ftUS
Heading	157.45°G	0.30°

Line Navigation Data

Line Name **N/A**
 Chainage **N/A**
 Cross Track **N/A**

Point Navigation Data

Point Name **MB-03**
 Easting 1392372.55 ftUS
 Northing 2438799.09 ftUS
 Range 20.19 ftUS
 Bearing TO 39.59°G
 FROM 219.59°G

Observations

Used 300 out of 300

Geodetic Parameters

Geodetic Datum **NAD83 NSRS2007**
Ellipsoid **GRS80**
 Semi-Major Axis 6378137.000
 Inverse Flattening 298.2572221010
 Eccentricity^2 0.006694380022901
 DX 1.0058m RX 0.0000 arc seconds
 DY -1.0516m RY 0.0000 arc seconds
 DZ -0.3048m RZ 0.0000 arc seconds
 D Scale 0.0000ppm
 Rotation Convention +RZ=-RLongitude
Projection **Transverse Mercator**
 Grid Name Alaska Zone 4
 Latitude of Origin 54°00'00.0000"N
 Longitude of Origin 150°00'00.0000"W
 False Easting 1640416.667ftUS
 False Northing 0.000ftUS
 Convergence - 1°12'21.2722"
 Calculation Mode Grid



Starfix Mean Position Report v5.02.24

Vessel

Vessel Name
Project Name
Project Number AKLNG 150242
Offset Name MainVessel_CRP
Sampling Started 20-Aug-2015 06:06:26 (UTC-07:00)
Sampling Ended 20-Aug-2015 06:11:29 (UTC-07:00)
Comment DTM = 18.60m, DTW = 5.0m, Deck Level Above ***. = -33.28

Results

	<u>Mean</u>	<u>Standard Deviation</u>
Local Latitude	60°40'02.3840"N	
Local Longitude	151°23'12.0024"W	
Ellipsoidal Height	0.00 ftUS	
Local Easting	1391726.15 ftUS	0.03 ftUS
Local Northing	2438429.07 ftUS	0.04 ftUS
Orthometric Height	0.00 ftUS	0.00 ftUS
WGS84 Latitude	60°40'02.3782"N	
WGS84 Longitude	151°23'12.0949"W	
Ellipsoidal Height	1.48 ftUS	
Quality	0.67	0.00 ftUS
Depth	0.00 ftUS	0.00 ftUS
Heading	157.76°G	0.12°

Line Navigation Data

Line Name N/A
Chainage N/A
Cross Track N/A

Point Navigation Data

Point Name MB-04
Easting 1391719.57 ftUS
Northing 2438430.15 ftUS
Range 6.67 ftUS
Bearing TO 279.34°G
FROM 99.34°G

Observations

Used 300 out of 300

Geodetic Parameters

Geodetic Datum NAD83 NSRS2007
Ellipsoid GRS80
Semi-Major Axis 6378137.000
Inverse Flattening 298.2572221010
Eccentricity^2 0.006694380022901
DX 1.0058m RX 0.0000 arc seconds
DY -1.0516m RY 0.0000 arc seconds
DZ -0.3048m RZ 0.0000 arc seconds
D Scale 0.0000ppm
Rotation Convention +RZ=-RLongitude
Projection Transverse Mercator
Grid Name Alaska Zone 4
Latitude of Origin 54°00'00.0000"N
Longitude of Origin 150°00'00.0000"W
False Easting 1640416.667ftUS
False Northing 0.000ftUS
Convergence - 1°12'32.1831"
Calculation Mode Grid



Starfix Mean Position Report v5.02.24

Vessel

Vessel Name **Skate 3**
Project Name **AKLNG Marine GI 2015**
Project Number **04.10140334 (C1707)**
Offset Name **MainVessel_CRP**
Sampling Started **18-Aug-2015 05:02:05 (UTC-07:00)**
Sampling Ended **18-Aug-2015 05:07:07 (UTC-07:00)**
Comment **DTM = 14.10m, DTW = 5.20m, Deck Level Above MLLW = -32.59**

Results

	<u>Mean</u>	<u>Standard Deviation</u>
Local Latitude	60°39'57.7838"N	
Local Longitude	151°22'48.6477"W	
Ellipsoidal Height	0.00 ftUS	
Local Easting	1392879.70 ftUS	0.03 ftUS
Local Northing	2437937.56 ftUS	0.04 ftUS
Orthometric Height	0.00 ftUS	0.00 ftUS
WGS84 Latitude	60°39'57.7779"N	
WGS84 Longitude	151°22'48.7402"W	
Ellipsoidal Height	1.48 ftUS	
Quality	0.79	0.02 ftUS
Depth	0.00 ftUS	0.00 ftUS
Heading	149.93°G	0.21°

Line Navigation Data

Line Name **N/A**
Chainage **N/A**
Cross Track **N/A**

Point Navigation Data

Point Name **MB-05**
Easting **1392864.19 ftUS**
Northing **2437928.93 ftUS**
Range **17.75 ftUS**
Bearing TO **240.91°G**
FROM **60.91°G**

Observations

Used 300 out of 300

Geodetic Parameters

Geodetic Datum **NAD83 NSRS2007**
Ellipsoid **GRS80**
Semi-Major Axis **6378137.000**
Inverse Flattening **298.2572221010**
Eccentricity^2 **0.006694380022901**
DX **1.0058m** RX **0.0000 arc seconds**
DY **-1.0516m** RY **0.0000 arc seconds**
DZ **-0.3048m** RZ **0.0000 arc seconds**
D Scale **0.0000ppm**
Rotation Convention **+RZ=-RLongitude**
Projection **Transverse Mercator**
Grid Name **Alaska Zone 4**
Latitude of Origin **54°00'00.0000"N**
Longitude of Origin **150°00'00.0000"W**
False Easting **1640416.667ftUS**
False Northing **0.000ftUS**
Convergence **- 1°12'11.7655"**
Calculation Mode **Grid**



Starfix Mean Position Report v5.02.24

Vessel

Vessel Name	SkateIIIA
Project Name	AKLNG_150242
Project Number	AKLNG_150242
Offset Name	Rotary
Sampling Started	16-Sep-2015 18:04:53 (UTC-07:00)
Sampling Ended	16-Sep-2015 18:09:59 (UTC-07:00)
Comment	DTM-19.3m, DTW-3.70m at 16:55, Deck Level Above ML LW-10.87m, MB-06, C1707, 16.09.15

Results

	<u>Mean</u>	<u>Standard Deviation</u>
Local Latitude	60°39'54.0402"N	
Local Longitude	151°23'01.6487"W	
Ellipsoidal Height	0.00 ftUS	
Local Easting	1392224.06 ftUS	0.03 ftUS
Local Northing	2437571.13 ftUS	0.05 ftUS
Orthometric Height	0.00 ftUS	0.00 ftUS
WGS84 Latitude	60°39'54.0343"N	
WGS84 Longitude	151°23'01.7412"W	
Ellipsoidal Height	1.48 ftUS	
Quality	0.67	0.04 ftUS
Depth	0.00 ftUS	0.00 ftUS
Heading	138.64°G	0.15°

Line Navigation Data

Line Name	N/A
Chainage	N/A
Cross Track	N/A

Point Navigation Data

Point Name	MB-06
Easting	1392211.19 ftUS
Northing	2437560.03 ftUS
Range	16.99 ftUS
Bearing TO	229.22°G
FROM	49.22°G

Observations

Used 300 out of 300

Geodetic Parameters

Geodetic Datum	NAD83 NSRS2007		
Ellipsoid	GRS80		
Semi-Major Axis	6378137.000		
Inverse Flattening	298.2572221010		
Eccentricity^2	0.006694380022901		
DX	1.0058m	RX	0.0000 arc seconds
DY	-1.0516m	RY	0.0000 arc seconds
DZ	-0.3048m	RZ	0.0000 arc seconds
D Scale	0.0000ppm		
Rotation Convention	+RZ=-RLongitude		
Projection	Transverse Mercator		
Grid Name	Alaska Zone 4		
Latitude of Origin	54°00'00.0000"N		
Longitude of Origin	150°00'00.0000"W		
False Easting	1640416.667ftUS		
False Northing	0.000ftUS		
Convergence	- 1°12'23.0568"		
Calculation Mode	Grid		



Starfix Mean Position Report v5.02.24

Vessel

Vessel Name
Project Name
Project Number AKLNG 150242
Offset Name MainVessel_CRP
Sampling Started 23-Aug-2015 16:42:41 (UTC-07:00)
Sampling Ended 23-Aug-2015 16:47:47 (UTC-07:00)
Comment DTM = 12.50m, DTW = 4.3m, Deck Level Above ***. = -33.08

Results

	<u>Mean</u>	<u>Standard Deviation</u>
Local Latitude	60°39'49.2243"N	
Local Longitude	151°22'38.6352"W	
Ellipsoidal Height	0.00 ftUS	
Local Easting	1393360.26 ftUS	0.16 ftUS
Local Northing	2437058.14 ftUS	0.33 ftUS
Orthometric Height	0.00 ftUS	0.00 ftUS
WGS84 Latitude	60°39'49.2184"N	
WGS84 Longitude	151°22'38.7277"W	
Ellipsoidal Height	1.48 ftUS	
Quality	0.69	0.05 ftUS
Depth	0.00 ftUS	0.00 ftUS
Heading	155.04°G	0.18°

Line Navigation Data

Line Name N/A
Chainage N/A
Cross Track N/A

Point Navigation Data

Point Name MB-08
Easting 1393356.43 ftUS
Northing 2437057.73 ftUS
Range 3.85 ftUS
Bearing TO 263.90°G
FROM 83.90°G

Observations

Used 300 out of 300

Geodetic Parameters

Geodetic Datum NAD83 NSRS2007
Ellipsoid GRS80
Semi-Major Axis 6378137.000
Inverse Flattening 298.2572221010
Eccentricity^2 0.006694380022901
DX 1.0058m RX 0.0000 arc seconds
DY -1.0516m RY 0.0000 arc seconds
DZ -0.3048m RZ 0.0000 arc seconds
D Scale 0.0000ppm
Rotation Convention +RZ=-RLongitude
Projection Transverse Mercator
Grid Name Alaska Zone 4
Latitude of Origin 54°00'00.0000"N
Longitude of Origin 150°00'00.0000"W
False Easting 1640416.667ftUS
False Northing 0.000ftUS
Convergence - 1°12'02.9348"
Calculation Mode Grid



Starfix Mean Position Report v5.02.24

Vessel

Vessel Name
Project Name
Project Number AKLNG 150242
Offset Name MainVessel_CRP
Sampling Started 26-Aug-2015 02:59:25 (UTC-07:00)
Sampling Ended 26-Aug-2015 03:04:27 (UTC-07:00)
Comment DTM = 17.50m, DTW = 3.20m, Deck Level Above MLLW.
= 10.57m

Results

	<u>Mean</u>	<u>Standard Deviation</u>
Local Latitude	60°39'44.9866"N	
Local Longitude	151°22'50.8465"W	
Ellipsoidal Height	0.00 ftUS	
Local Easting	1392742.87 ftUS	0.04 ftUS
Local Northing	2436640.70 ftUS	0.04 ftUS
Orthometric Height	0.00 ftUS	0.00 ftUS
WGS84 Latitude	60°39'44.9807"N	
WGS84 Longitude	151°22'50.9390"W	
Ellipsoidal Height	1.48 ftUS	
Quality	0.64	0.03 ftUS
Depth	0.00 ftUS	0.00 ftUS
Heading	161.18°G	0.18°

Line Navigation Data

Line Name N/A
Chainage N/A
Cross Track N/A

Point Navigation Data

Point Name MB-09
Easting 1392734.64 ftUS
Northing 2436660.46 ftUS
Range 21.41 ftUS
Bearing TO 337.39°G
FROM 157.39°G

Observations

Used 300 out of 300

Geodetic Parameters

Geodetic Datum NAD83 NSRS2007
Ellipsoid GRS80
Semi-Major Axis 6378137.000
Inverse Flattening 298.2572221010
Eccentricity^2 0.006694380022901
DX 1.0058m RX 0.0000 arc seconds
DY -1.0516m RY 0.0000 arc seconds
DZ -0.3048m RZ 0.0000 arc seconds
D Scale 0.0000ppm
Rotation Convention +RZ=-RLongitude
Projection Transverse Mercator
Grid Name Alaska Zone 4
Latitude of Origin 54°00'00.0000"N
Longitude of Origin 150°00'00.0000"W
False Easting 1640416.667ftUS
False Northing 0.000ftUS
Convergence - 1°12'13.5316"
Calculation Mode Grid



Starfix Mean Position Report v5.02.24

Vessel

Vessel Name
Project Name
Project Number AKLNG 150242
Offset Name MainVessel_CRP
Sampling Started 22-Aug-2015 00:05:14 (UTC-07:00)
Sampling Ended 22-Aug-2015 00:10:27 (UTC-07:00)
Comment DTM = 14.80m, DTW = 4.0m, Deck Level Above ***. = -31.08

Results

	<u>Mean</u>	<u>Standard Deviation</u>
Local Latitude	60°39'40.7573"N	
Local Longitude	151°22'28.4420"W	
Ellipsoidal Height	0.00 ftUS	
Local Easting	1393850.09 ftUS	0.03 ftUS
Local Northing	2436187.94 ftUS	0.04 ftUS
Orthometric Height	0.00 ftUS	0.00 ftUS
WGS84 Latitude	60°39'40.7515"N	
WGS84 Longitude	151°22'28.5345"W	
Ellipsoidal Height	1.48 ftUS	
Quality	0.66	0.03 ftUS
Depth	0.00 ftUS	0.00 ftUS
Heading	157.72°G	0.14°

Line Navigation Data

Line Name N/A
Chainage N/A
Cross Track N/A

Point Navigation Data

Point Name MB-12
Easting 1393848.03 ftUS
Northing 2436187.65 ftUS
Range 2.08 ftUS
Bearing TO 261.90°G
FROM 81.90°G

Observations

Used 300 out of 300

Geodetic Parameters

Geodetic Datum NAD83 NSRS2007
Ellipsoid GRS80
Semi-Major Axis 6378137.000
Inverse Flattening 298.2572221010
Eccentricity^2 0.006694380022901
DX 1.0058m RX 0.0000 arc seconds
DY -1.0516m RY 0.0000 arc seconds
DZ -0.3048m RZ 0.0000 arc seconds
D Scale 0.0000ppm
Rotation Convention +RZ=-RLongitude
Projection Transverse Mercator
Grid Name Alaska Zone 4
Latitude of Origin 54°00'00.0000"N
Longitude of Origin 150°00'00.0000"W
False Easting 1640416.667ftUS
False Northing 0.000ftUS
Convergence - 1°11'53.9480"
Calculation Mode Grid



Starfix Mean Position Report v5.02.24

Vessel

Vessel Name
Project Name AKLNG_150242
Project Number AKLNG_150242
Offset Name MainVessel_CRP
Sampling Started 02-Oct-2015 13:31:49 (UTC-07:00)
Sampling Ended 02-Oct-2015 13:36:54 (UTC-07:00)
Comment DTM-16.00m, DTW-6.00m at 12:30, Deck Level Above M
LLW-10.13m, MB-13, C1707, 02.10.15

Results

	<u>Mean</u>	<u>Standard Deviation</u>
Local Latitude	60°39'37.1129"N	
Local Longitude	151°22'41.3108"W	
Ellipsoidal Height	0.00 ftUS	
Local Easting	1393201.18 ftUS	0.03 ftUS
Local Northing	2435831.40 ftUS	0.06 ftUS
Orthometric Height	0.00 ftUS	0.00 ftUS
WGS84 Latitude	60°39'37.1071"N	
WGS84 Longitude	151°22'41.4033"W	
Ellipsoidal Height	1.48 ftUS	
Quality	0.82	0.02 ftUS
Depth	0.00 ftUS	0.00 ftUS
Heading	154.18°G	0.22°

Line Navigation Data

Line Name N/A
Chainage N/A
Cross Track N/A

Point Navigation Data

Point Name MB-13
Easting 1393194.76 ftUS
Northing 2435819.22 ftUS
Range 13.76 ftUS
Bearing TO 207.79°G
FROM 27.79°G

Observations

Used 300 out of 300

Geodetic Parameters

Geodetic Datum NAD83 NSRS2007
Ellipsoid GRS80
Semi-Major Axis 6378137.000
Inverse Flattening 298.2572221010
Eccentricity^2 0.006694380022901
DX 1.0058m RX 0.0000 arc seconds
DY -1.0516m RY 0.0000 arc seconds
DZ -0.3048m RZ 0.0000 arc seconds
D Scale 0.0000ppm
Rotation Convention +RZ=-RLongitude
Projection Transverse Mercator
Grid Name Alaska Zone 4
Latitude of Origin 54°00'00.0000"N
Longitude of Origin 150°00'00.0000"W
False Easting 1640416.667ftUS
False Northing 0.000ftUS
Convergence - 1°12'05.1250"
Calculation Mode Grid



Starfix Mean Position Report v5.02.24

Vessel

Vessel Name
 Project Name
 Project Number AKLNG 150242
 Offset Name MainVessel_CRP
 Sampling Started 21-Oct-2015 15:17:11 (UTC-07:00)
 Sampling Ended 21-Oct-2015 15:22:25 (UTC-07:00)
 Comment DTM-19.30m DTW-2.60m at 14.15, Deck level above ML
 LW-7.21m, MB-14, C1707, 21.10.15

Results

	<u>Mean</u>	<u>Standard Deviation</u>
Local Latitude	60°39'33.8040"N	
Local Longitude	151°22'53.7280"W	
Ellipsoidal Height	0.00 ftUS	
Local Easting	1392575.45 ftUS	0.03 ftUS
Local Northing	2435508.46 ftUS	0.05 ftUS
Orthometric Height	0.00 ftUS	0.00 ftUS
WGS84 Latitude	60°39'33.7981"N	
WGS84 Longitude	151°22'53.8205"W	
Ellipsoidal Height	1.48 ftUS	
Quality	0.65	0.02 ftUS
Depth	0.00 ftUS	0.00 ftUS
Heading	154.12°G	0.33°

Line Navigation Data

Line Name N/A
 Chainage N/A
 Cross Track N/A

Point Navigation Data

Point Name MB-14
 Easting 1392578.78 ftUS
 Northing 2435500.82 ftUS
 Range 8.34 ftUS
 Bearing TO 156.41°G
 FROM 336.41°G

Observations

Used 300 out of 300

Geodetic Parameters

Geodetic Datum NAD83 NSRS2007
 Ellipsoid GRS80
 Semi-Major Axis 6378137.000
 Inverse Flattening 298.2572221010
 Eccentricity^2 0.006694380022901
 DX 1.0058m RX 0.0000 arc seconds
 DY -1.0516m RY 0.0000 arc seconds
 DZ -0.3048m RZ 0.0000 arc seconds
 D Scale 0.0000ppm
 Rotation Convention +RZ=-RLongitude
 Projection Transverse Mercator
 Grid Name Alaska Zone 4
 Latitude of Origin 54°00'00.0000"N
 Longitude of Origin 150°00'00.0000"W
 False Easting 1640416.667ftUS
 False Northing 0.000ftUS
 Convergence - 1°12'15.9118"
 Calculation Mode Grid



Starfix Mean Position Report v5.02.24

Vessel

Vessel Name
 Project Name
 Project Number AKLNG 150242
 Offset Name MainVessel_CRP
 Sampling Started 03-Sep-2015 11:27:41 (UTC-07:00)
 Sampling Ended 03-Sep-2015 11:32:56 (UTC-07:00)
 Comment DML 12.00m DWL 2.70m Deck level above MLLW 9.94m

Results

	<u>Mean</u>	<u>Standard Deviation</u>
Local Latitude	60°39'32.3308"N	
Local Longitude	151°22'17.9713"W	
Ellipsoidal Height	0.00 ftUS	
Local Easting	1394353.91 ftUS	0.16 ftUS
Local Northing	2435321.59 ftUS	0.04 ftUS
Orthometric Height	0.00 ftUS	0.00 ftUS
WGS84 Latitude	60°39'32.3250"N	
WGS84 Longitude	151°22'18.0638"W	
Ellipsoidal Height	1.48 ftUS	
Quality	0.68	0.05 ftUS
Depth	0.00 ftUS	0.00 ftUS
Heading	160.45°G	0.12°

Line Navigation Data

Line Name N/A
 Chainage N/A
 Cross Track N/A

Point Navigation Data

Point Name MB-15
 Easting 1394340.22 ftUS
 Northing 2435316.53 ftUS
 Range 14.59 ftUS
 Bearing TO 249.72°G
 FROM 69.72°G

Observations

Used 300 out of 300

Geodetic Parameters

Geodetic Datum	NAD83 NSRS2007		
Ellipsoid	GRS80		
Semi-Major Axis	6378137.000		
Inverse Flattening	298.2572221010		
Eccentricity^2	0.006694380022901		
DX	1.0058m	RX	0.0000 arc seconds
DY	-1.0516m	RY	0.0000 arc seconds
DZ	-0.3048m	RZ	0.0000 arc seconds
D Scale	0.0000ppm		
Rotation Convention	+RZ=-RLongitude		
Projection	Transverse Mercator		
Grid Name	Alaska Zone 4		
Latitude of Origin	54°00'00.0000"N		
Longitude of Origin	150°00'00.0000"W		
False Easting	1640416.667ftUS		
False Northing	0.000ftUS		
Convergence	- 1°11'44.7203"		
Calculation Mode	Grid		



Starfix Mean Position Report v5.02.24

Vessel

Vessel Name
Project Name
Project Number AKLNG 150242
Offset Name MainVessel_CRP
Sampling Started 05-Sep-2015 13:33:55 (UTC-07:00)
Sampling Ended 05-Sep-2015 13:39:11 (UTC-07:00)
Comment DML 14.00m DWL 2.10m Deck level above MLLW 9.07m

Results

	<u>Mean</u>	<u>Standard Deviation</u>
Local Latitude	60°39'28.6687"N	
Local Longitude	151°22'30.9145"W	
Ellipsoidal Height	0.00 ftUS	
Local Easting	1393701.22 ftUS	0.19 ftUS
Local Northing	2434963.28 ftUS	0.15 ftUS
Orthometric Height	0.00 ftUS	0.00 ftUS
WGS84 Latitude	60°39'28.6628"N	
WGS84 Longitude	151°22'31.0070"W	
Ellipsoidal Height	1.48 ftUS	
Quality	0.63	0.02 ftUS
Depth	0.00 ftUS	0.00 ftUS
Heading	157.45°G	0.14°

Line Navigation Data

Line Name N/A
Chainage N/A
Cross Track N/A

Point Navigation Data

Point Name BH MB16
Easting 1393687.24 ftUS
Northing 2434947.59 ftUS
Range 21.02 ftUS
Bearing TO 221.68°G
FROM 41.68°G

Observations

Used 300 out of 300

Geodetic Parameters

Geodetic Datum NAD83 NSRS2007
Ellipsoid GRS80
Semi-Major Axis 6378137.000
Inverse Flattening 298.2572221010
Eccentricity^2 0.006694380022901
DX 1.0058m RX 0.0000 arc seconds
DY -1.0516m RY 0.0000 arc seconds
DZ -0.3048m RZ 0.0000 arc seconds
D Scale 0.0000ppm
Rotation Convention +RZ=-RLongitude
Projection Transverse Mercator
Grid Name Alaska Zone 4
Latitude of Origin 54°00'00.0000"N
Longitude of Origin 150°00'00.0000"W
False Easting 1640416.667ftUS
False Northing 0.000ftUS
Convergence - 1°11'55.9616"
Calculation Mode Grid



Starfix Mean Position Report v5.02.24

Vessel

Vessel Name
 Project Name
 Project Number AKLNG 150242
 Offset Name MainVessel_CRP
 Sampling Started 18-Oct-2015 18:31:23 (UTC-07:00)
 Sampling Ended 18-Oct-2015 18:36:28 (UTC-07:00)
 Comment DTM-19.00m DTW-3.40m at 17.30, Deck level above ML
 LW-9.79m, MB-17, C1707, 18.10.15

Results

	<u>Mean</u>	<u>Standard Deviation</u>
Local Latitude	60°39'24.5189"N	
Local Longitude	151°22'44.3368"W	
Ellipsoidal Height	0.00 ftUS	
Local Easting	1393023.58 ftUS	0.06 ftUS
Local Northing	2434556.02 ftUS	0.09 ftUS
Orthometric Height	0.00 ftUS	0.00 ftUS
WGS84 Latitude	60°39'24.5131"N	
WGS84 Longitude	151°22'44.4293"W	
Ellipsoidal Height	1.48 ftUS	
Quality	0.65	0.04 ftUS
Depth	0.00 ftUS	0.00 ftUS
Heading	158.46°G	0.60°

Line Navigation Data

Line Name N/A
 Chainage N/A
 Cross Track N/A

Point Navigation Data

Point Name MB-17
 Easting 1393025.61 ftUS
 Northing 2434573.76 ftUS
 Range 17.85 ftUS
 Bearing TO 6.51°G
 FROM 186.51°G

Observations

Used 300 out of 300

Geodetic Parameters

Geodetic Datum NAD83 NSRS2007
 Ellipsoid GRS80
 Semi-Major Axis 6378137.000
 Inverse Flattening 298.2572221010
 Eccentricity^2 0.006694380022901
 DX 1.0058m RX 0.0000 arc seconds
 DY -1.0516m RY 0.0000 arc seconds
 DZ -0.3048m RZ 0.0000 arc seconds
 D Scale 0.0000ppm
 Rotation Convention +RZ=-RLongitude
 Projection Transverse Mercator
 Grid Name Alaska Zone 4
 Latitude of Origin 54°00'00.0000"N
 Longitude of Origin 150°00'00.0000"W
 False Easting 1640416.667ftUS
 False Northing 0.000ftUS
 Convergence - 1°12'07.6147"
 Calculation Mode Grid



Starfix Mean Position Report v5.02.24

Vessel

Vessel Name	SkateIIIA
Project Name	AKLNG_150242
Project Number	AKLNG_150242
Offset Name	Rotary
Sampling Started	19-Sep-2015 18:09:39 (UTC-07:00)
Sampling Ended	19-Sep-2015 18:14:45 (UTC-07:00)
Comment	DTM-20.70m, DTW-6.00m at 17:00, Deck Level Above M LLW-11.13m, MB-18, C1707, 19.09.15

Results

	<u>Mean</u>	<u>Standard Deviation</u>
Local Latitude	60°39'18.9884"N	
Local Longitude	151°22'46.3521"W	
Ellipsoidal Height	0.00 ftUS	
Local Easting	1392911.38 ftUS	0.03 ftUS
Local Northing	2433996.67 ftUS	0.04 ftUS
Orthometric Height	0.00 ftUS	0.00 ftUS
WGS84 Latitude	60°39'18.9825"N	
WGS84 Longitude	151°22'46.4446"W	
Ellipsoidal Height	1.48 ftUS	
Quality	0.66	0.01 ftUS
Depth	0.00 ftUS	0.00 ftUS
Heading	162.25°G	0.12°

Line Navigation Data

Line Name	N/A
Chainage	N/A
Cross Track	N/A

Point Navigation Data

Point Name	MB-18
Easting	1392917.38 ftUS
Northing	2434011.19 ftUS
Range	15.71 ftUS
Bearing TO	22.44°G
FROM	202.44°G

Observations

Used 300 out of 300

Geodetic Parameters

Geodetic Datum	NAD83 NSRS2007		
Ellipsoid	GRS80		
Semi-Major Axis	6378137.000		
Inverse Flattening	298.2572221010		
Eccentricity^2	0.006694380022901		
DX	1.0058m	RX	0.0000 arc seconds
DY	-1.0516m	RY	0.0000 arc seconds
DZ	-0.3048m	RZ	0.0000 arc seconds
D Scale	0.0000ppm		
Rotation Convention	+RZ=-RLongitude		
Projection	Transverse Mercator		
Grid Name	Alaska Zone 4		
Latitude of Origin	54°00'00.0000"N		
Longitude of Origin	150°00'00.0000"W		
False Easting	1640416.667ftUS		
False Northing	0.000ftUS		
Convergence	- 1°12'09.3064"		
Calculation Mode	Grid		



Starfix Mean Position Report v5.02.24

Vessel

Vessel Name
 Project Name AKLNG_150242
 Project Number AKLNG_150242
 Offset Name MainVessel_CRP
 Sampling Started 09-Oct-2015 19:02:28 (UTC-07:00)
 Sampling Ended 09-Oct-2015 19:07:37 (UTC-07:00)
 Comment DTM-18.80m, DTW-4.20m at 18.00, Deck Level Above M
 LLW-8.83m, MB-19, C1707, 09.10.15

Results

	<u>Mean</u>	<u>Standard Deviation</u>
Local Latitude	60°39'30.7560"N	
Local Longitude	151°22'43.5861"W	
Ellipsoidal Height	0.00 ftUS	
Local Easting	1393074.28 ftUS	0.02 ftUS
Local Northing	2435188.42 ftUS	0.04 ftUS
Orthometric Height	0.00 ftUS	0.00 ftUS
WGS84 Latitude	60°39'30.7501"N	
WGS84 Longitude	151°22'43.6786"W	
Ellipsoidal Height	1.48 ftUS	
Quality	0.67	0.03 ftUS
Depth	0.00 ftUS	0.00 ftUS
Heading	162.58°G	0.18°

Line Navigation Data

Line Name N/A
 Chainage N/A
 Cross Track N/A

Point Navigation Data

Point Name MB-19
 Easting 1393073.66 ftUS
 Northing 2435195.10 ftUS
 Range 6.71 ftUS
 Bearing TO 354.75°G
 FROM 174.75°G

Observations

Used 300 out of 300

Geodetic Parameters

Geodetic Datum NAD83 NSRS2007
 Ellipsoid GRS80
 Semi-Major Axis 6378137.000
 Inverse Flattening 298.2572221010
 Eccentricity^2 0.006694380022901
 DX 1.0058m RX 0.0000 arc seconds
 DY -1.0516m RY 0.0000 arc seconds
 DZ -0.3048m RZ 0.0000 arc seconds
 D Scale 0.0000ppm
 Rotation Convention +RZ=-RLongitude
 Projection Transverse Mercator
 Grid Name Alaska Zone 4
 Latitude of Origin 54°00'00.0000"N
 Longitude of Origin 150°00'00.0000"W
 False Easting 1640416.667ftUS
 False Northing 0.000ftUS
 Convergence - 1°12'07.0337"
 Calculation Mode Grid



Starfix Mean Position Report v5.02.24

Vessel

Vessel Name
Project Name
Project Number AKLNG 150242
Offset Name MainVessel_CRP
Sampling Started 07-Sep-2015 11:13:27 (UTC-07:00)
Sampling Ended 07-Sep-2015 11:18:32 (UTC-07:00)
Comment DML 10.8m DWL 4.8m Deck level above MLLWS 9.58m

Results

	<u>Mean</u>	<u>Standard Deviation</u>
Local Latitude	60°39'23.8101"N	
Local Longitude	151°22'08.0104"W	
Ellipsoidal Height	0.00 ftUS	
Local Easting	1394832.20 ftUS	0.03 ftUS
Local Northing	2434446.22 ftUS	0.05 ftUS
Orthometric Height	0.00 ftUS	0.00 ftUS
WGS84 Latitude	60°39'23.8043"N	
WGS84 Longitude	151°22'08.1029"W	
Ellipsoidal Height	1.48 ftUS	
Quality	0.66	0.03 ftUS
Depth	0.00 ftUS	0.00 ftUS
Heading	153.40°G	0.14°

Line Navigation Data

Line Name N/A
Chainage N/A
Cross Track N/A

Point Navigation Data

Point Name BH MB20
Easting 1394831.87 ftUS
Northing 2434446.37 ftUS
Range 0.36 ftUS
Bearing TO 294.09°G
FROM 114.09°G

Observations

Used 300 out of 300

Geodetic Parameters

Geodetic Datum	NAD83 NSRS2007		
Ellipsoid	GRS80		
Semi-Major Axis	6378137.000		
Inverse Flattening	298.2572221010		
Eccentricity^2	0.006694380022901		
DX	1.0058m	RX	0.0000 arc seconds
DY	-1.0516m	RY	0.0000 arc seconds
DZ	-0.3048m	RZ	0.0000 arc seconds
D Scale	0.0000ppm		
Rotation Convention	+RZ=-RLongitude		
Projection	Transverse Mercator		
Grid Name	Alaska Zone 4		
Latitude of Origin	54°00'00.0000"N		
Longitude of Origin	150°00'00.0000"W		
False Easting	1640416.667ftUS		
False Northing	0.000ftUS		
Convergence	- 1°11'35.9363"		
Calculation Mode	Grid		



Starfix Mean Position Report v5.02.24

Vessel

Vessel Name
Project Name AKLNG_150242
Project Number AKLNG_150242
Offset Name MainVessel_CRP
Sampling Started 16-Oct-2015 19:28:02 (UTC-07:00)
Sampling Ended 16-Oct-2015 19:33:02 (UTC-07:00)
Comment DTM-15.60m, DTW-3.60m at 18.25, Deck Level Above M
LLW-9.75m, MB-21, C1707, 16.10.15

Results

	<u>Mean</u>	<u>Standard Deviation</u>
Local Latitude	60°39'19.9292"N	
Local Longitude	151°22'21.1509"W	
Ellipsoidal Height	0.00 ftUS	
Local Easting	1394169.18 ftUS	0.03 ftUS
Local Northing	2434065.89 ftUS	0.03 ftUS
Orthometric Height	0.00 ftUS	0.00 ftUS
WGS84 Latitude	60°39'19.9234"N	
WGS84 Longitude	151°22'21.2434"W	
Ellipsoidal Height	1.48 ftUS	
Quality	0.71	0.03 ftUS
Depth	0.00 ftUS	0.00 ftUS
Heading	159.24°G	0.25°

Line Navigation Data

Line Name N/A
Chainage N/A
Cross Track N/A

Point Navigation Data

Point Name MB-21
Easting 1394178.87 ftUS
Northing 2434077.47 ftUS
Range 15.09 ftUS
Bearing TO 39.90°G
FROM 219.90°G

Observations

Used 300 out of 300

Geodetic Parameters

Geodetic Datum NAD83 NSRS2007
Ellipsoid GRS80
Semi-Major Axis 6378137.000
Inverse Flattening 298.2572221010
Eccentricity^2 0.006694380022901
DX 1.0058m RX 0.0000 arc seconds
DY -1.0516m RY 0.0000 arc seconds
DZ -0.3048m RZ 0.0000 arc seconds
D Scale 0.0000ppm
Rotation Convention +RZ=-RLongitude
Projection Transverse Mercator
Grid Name Alaska Zone 4
Latitude of Origin 54°00'00.0000"N
Longitude of Origin 150°00'00.0000"W
False Easting 1640416.667ftUS
False Northing 0.000ftUS
Convergence - 1°11'47.3468"
Calculation Mode Grid



Starfix Mean Position Report v5.02.24

Vessel

Vessel Name
 Project Name AKLNG_150242
 Project Number AKLNG_150242
 Offset Name MainVessel_CRP
 Sampling Started 05-Oct-2015 14:47:50 (UTC-07:00)
 Sampling Ended 05-Oct-2015 14:52:55 (UTC-07:00)
 Comment DTM-20.70m, DTW-3.70m at 12:30, Deck Level Above M
 LLW-10.36m, MB-22, C1707, 05.10.15

Results

	<u>Mean</u>	<u>Standard Deviation</u>
Local Latitude	60°39'12.8227"N	
Local Longitude	151°22'45.4295"W	
Ellipsoidal Height	0.00 ftUS	
Local Easting	1392944.21 ftUS	0.02 ftUS
Local Northing	2433369.77 ftUS	0.03 ftUS
Orthometric Height	0.00 ftUS	0.00 ftUS
WGS84 Latitude	60°39'12.8168"N	
WGS84 Longitude	151°22'45.5220"W	
Ellipsoidal Height	1.48 ftUS	
Quality	0.60	0.00 ftUS
Depth	0.00 ftUS	0.00 ftUS
Heading	164.64°G	0.16°

Line Navigation Data

Line Name N/A
 Chainage N/A
 Cross Track N/A

Point Navigation Data

Point Name MB-22
 Easting 1392938.61 ftUS
 Northing 2433362.70 ftUS
 Range 9.01 ftUS
 Bearing TO 218.40°G
 FROM 38.40°G

Observations

Used 300 out of 300

Geodetic Parameters

Geodetic Datum NAD83 NSRS2007
 Ellipsoid GRS80
 Semi-Major Axis 6378137.000
 Inverse Flattening 298.2572221010
 Eccentricity^2 0.006694380022901
 DX 1.0058m RX 0.0000 arc seconds
 DY -1.0516m RY 0.0000 arc seconds
 DZ -0.3048m RZ 0.0000 arc seconds
 D Scale 0.0000ppm
 Rotation Convention +RZ=-RLongitude
 Projection Transverse Mercator
 Grid Name Alaska Zone 4
 Latitude of Origin 54°00'00.0000"N
 Longitude of Origin 150°00'00.0000"W
 False Easting 1640416.667ftUS
 False Northing 0.000ftUS
 Convergence - 1°12'08.4294"
 Calculation Mode Grid



Starfix Mean Position Report v5.02.24

Vessel

Vessel Name
Project Name AKLNG_150242
Project Number AKLNG_150242
Offset Name MainVessel_CRP
Sampling Started 12-Oct-2015 15:05:32 (UTC-07:00)
Sampling Ended 12-Oct-2015 15:10:33 (UTC-07:00)
Comment DTM-15.60m, DTW-2.70m at 14.00, Deck Level Above M
LLW-6.71m, MB-23, C1707, 12.10.15

Results

	<u>Mean</u>	<u>Standard Deviation</u>
Local Latitude	60°39'16.3703"N	
Local Longitude	151°22'34.2174"W	
Ellipsoidal Height	0.00 ftUS	
Local Easting	1393510.50 ftUS	0.04 ftUS
Local Northing	2433718.21 ftUS	0.03 ftUS
Orthometric Height	0.00 ftUS	0.00 ftUS
WGS84 Latitude	60°39'16.3645"N	
WGS84 Longitude	151°22'34.3099"W	
Ellipsoidal Height	1.48 ftUS	
Quality	0.69	0.04 ftUS
Depth	0.00 ftUS	0.00 ftUS
Heading	160.27°G	0.17°

Line Navigation Data

Line Name N/A
Chainage N/A
Cross Track N/A

Point Navigation Data

Point Name MB-23
Easting 1393524.35 ftUS
Northing 2433705.68 ftUS
Range 18.67 ftUS
Bearing TO 132.15°G
FROM 312.15°G

Observations

Used 300 out of 300

Geodetic Parameters

Geodetic Datum NAD83 NSRS2007
Ellipsoid GRS80
Semi-Major Axis 6378137.000
Inverse Flattening 298.2572221010
Eccentricity^2 0.006694380022901
DX 1.0058m RX 0.0000 arc seconds
DY -1.0516m RY 0.0000 arc seconds
DZ -0.3048m RZ 0.0000 arc seconds
D Scale 0.0000ppm
Rotation Convention +RZ=-RLongitude
Projection Transverse Mercator
Grid Name Alaska Zone 4
Latitude of Origin 54°00'00.0000"N
Longitude of Origin 150°00'00.0000"W
False Easting 1640416.667ftUS
False Northing 0.000ftUS
Convergence - 1°11'58.6965"
Calculation Mode Grid



Starfix Mean Position Report v5.02.24

Vessel

Vessel Name
 Project Name AKLNG_150242
 Project Number AKLNG_150242
 Offset Name MainVessel_CRP
 Sampling Started 27-Oct-2015 16:19:49 (UTC-07:00)
 Sampling Ended 27-Oct-2015 16:24:51 (UTC-07:00)
 Comment DTM-15.00m DTW-4.60m at 15.20, Deck level above ML
 LW-11.09m MB24,C1707, 27.10.15

Results

	<u>Mean</u>	<u>Standard Deviation</u>
Local Latitude	60°39'14.1828"N	
Local Longitude	151°22'02.3043"W	
Ellipsoidal Height	0.00 ftUS	
Local Easting	1395096.20 ftUS	0.03 ftUS
Local Northing	2433462.93 ftUS	0.03 ftUS
Orthometric Height	0.00 ftUS	0.00 ftUS
WGS84 Latitude	60°39'14.1769"N	
WGS84 Longitude	151°22'02.3967"W	
Ellipsoidal Height	1.48 ftUS	
Quality	0.59	0.01 ftUS
Depth	0.00 ftUS	0.00 ftUS
Heading	159.71°G	0.48°

Line Navigation Data

Line Name N/A
 Chainage N/A
 Cross Track N/A

Point Navigation Data

Point Name MB-24
 Easting 1395107.66 ftUS
 Northing 2433465.13 ftUS
 Range 11.67 ftUS
 Bearing TO 79.16°G
 FROM 259.16°G

Observations

Used 300 out of 300

Geodetic Parameters

Geodetic Datum NAD83 NSRS2007
 Ellipsoid GRS80
 Semi-Major Axis 6378137.000
 Inverse Flattening 298.2572221010
 Eccentricity^2 0.006694380022901
 DX 1.0058m RX 0.0000 arc seconds
 DY -1.0516m RY 0.0000 arc seconds
 DZ -0.3048m RZ 0.0000 arc seconds
 D Scale 0.0000ppm
 Rotation Convention +RZ=-RLongitude
 Projection Transverse Mercator
 Grid Name Alaska Zone 4
 Latitude of Origin 54°00'00.0000"N
 Longitude of Origin 150°00'00.0000"W
 False Easting 1640416.667ftUS
 False Northing 0.000ftUS
 Convergence - 1°11'30.8490"
 Calculation Mode Grid



Starfix Mean Position Report v5.02.24

Vessel

Vessel Name
Project Name
Project Number AKLNG 150242
Offset Name MainVessel_CRP
Sampling Started 09-Sep-2015 10:34:11 (UTC-07:00)
Sampling Ended 09-Sep-2015 10:39:30 (UTC-07:00)
Comment DML 11.30m DWL 4.60m Deck level above MLLW 7.16m

Results

	<u>Mean</u>	<u>Standard Deviation</u>
Local Latitude	60°39'11.6046"N	
Local Longitude	151°22'10.8441"W	
Ellipsoidal Height	0.00 ftUS	
Local Easting	1394665.17 ftUS	0.10 ftUS
Local Northing	2433210.06 ftUS	0.03 ftUS
Orthometric Height	0.00 ftUS	0.00 ftUS
WGS84 Latitude	60°39'11.5988"N	
WGS84 Longitude	151°22'10.9365"W	
Ellipsoidal Height	1.48 ftUS	
Quality	0.70	0.01 ftUS
Depth	0.00 ftUS	0.00 ftUS
Heading	157.30°G	0.10°

Line Navigation Data

Line Name N/A
Chainage N/A
Cross Track N/A

Point Navigation Data

Point Name MB-25
Easting 1394670.52 ftUS
Northing 2433207.30 ftUS
Range 6.02 ftUS
Bearing TO 117.35°G
FROM 297.35°G

Observations

Used 300 out of 300

Geodetic Parameters

Geodetic Datum	NAD83 NSRS2007		
Ellipsoid	GRS80		
Semi-Major Axis	6378137.000		
Inverse Flattening	298.2572221010		
Eccentricity^2	0.006694380022901		
DX	1.0058m	RX	0.0000 arc seconds
DY	-1.0516m	RY	0.0000 arc seconds
DZ	-0.3048m	RZ	0.0000 arc seconds
D Scale	0.0000ppm		
Rotation Convention	+RZ=-RLongitude		
Projection	Transverse Mercator		
Grid Name	Alaska Zone 4		
Latitude of Origin	54°00'00.0000"N		
Longitude of Origin	150°00'00.0000"W		
False Easting	1640416.667ftUS		
False Northing	0.000ftUS		
Convergence	- 1°11'38.2637"		
Calculation Mode	Grid		



Starfix Mean Position Report v5.02.24

Vessel

Vessel Name	SkateIIIA
Project Name	
Project Number	AKLNG 150242
Offset Name	CRP
Sampling Started	10-Sep-2015 18:57:13 (UTC-07:00)
Sampling Ended	10-Sep-2015 19:02:20 (UTC-07:00)
Comment	DML 16.10m : DWL 3.00m at 17:50 10/09/15

Results

	<u>Mean</u>	<u>Standard Deviation</u>
Local Latitude	60°39'07.8103"N	
Local Longitude	151°22'23.8044"W	
Ellipsoidal Height	0.00 ftUS	
Local Easting	1394011.25 ftUS	0.04 ftUS
Local Northing	2432838.34 ftUS	0.03 ftUS
Orthometric Height	0.00 ftUS	0.00 ftUS
WGS84 Latitude	60°39'07.8044"N	
WGS84 Longitude	151°22'23.8969"W	
Ellipsoidal Height	1.48 ftUS	
Quality	0.71	0.03 ftUS
Depth	0.00 ftUS	0.00 ftUS
Heading	150.97°G	0.00°

Line Navigation Data

Line Name	N/A
Chainage	N/A
Cross Track	N/A

Point Navigation Data

Point Name	MB-26
Easting	1394011.46 ftUS
Northing	2432831.83 ftUS
Range	6.52 ftUS
Bearing TO	178.17°G
FROM	358.17°G

Observations

Used 300 out of 300

Geodetic Parameters

Geodetic Datum	NAD83 NSRS2007		
Ellipsoid	GRS80		
Semi-Major Axis	6378137.000		
Inverse Flattening	298.2572221010		
Eccentricity^2	0.006694380022901		
DX	1.0058m	RX	0.0000 arc seconds
DY	-1.0516m	RY	0.0000 arc seconds
DZ	-0.3048m	RZ	0.0000 arc seconds
D Scale	0.0000ppm		
Rotation Convention	+RZ=-RLongitude		
Projection	Transverse Mercator		
Grid Name	Alaska Zone 4		
Latitude of Origin	54°00'00.0000"N		
Longitude of Origin	150°00'00.0000"W		
False Easting	1640416.667ftUS		
False Northing	0.000ftUS		
Convergence	- 1°11'49.5179"		
Calculation Mode	Grid		



Starfix Mean Position Report v5.02.24

Vessel

Vessel Name
Project Name AKLNG_150242
Project Number AKLNG_150242
Offset Name MainVessel_CRP
Sampling Started 07-Oct-2015 16:55:31 (UTC-07:00)
Sampling Ended 07-Oct-2015 17:00:33 (UTC-07:00)
Comment DTM-20.50m, DTW-3.00m at 15.55, Deck Level Above M
LLW-7.599m, MB-27, C1707, 07.10.15

Results

	<u>Mean</u>	<u>Standard Deviation</u>
Local Latitude	60°39'04.0173"N	
Local Longitude	151°22'35.2821"W	
Ellipsoidal Height	0.00 ftUS	
Local Easting	1393431.18 ftUS	0.04 ftUS
Local Northing	2432465.25 ftUS	0.03 ftUS
Orthometric Height	0.00 ftUS	0.00 ftUS
WGS84 Latitude	60°39'04.0114"N	
WGS84 Longitude	151°22'35.3745"W	
Ellipsoidal Height	1.48 ftUS	
Quality	0.66	0.01 ftUS
Depth	0.00 ftUS	0.00 ftUS
Heading	158.01°G	0.14°

Line Navigation Data

Line Name N/A
Chainage N/A
Cross Track N/A

Point Navigation Data

Point Name MB-27
Easting 1393423.99 ftUS
Northing 2432453.24 ftUS
Range 14.00 ftUS
Bearing TO 210.93°G
FROM 30.93°G

Observations

Used 300 out of 300

Geodetic Parameters

Geodetic Datum NAD83 NSRS2007
Ellipsoid GRS80
Semi-Major Axis 6378137.000
Inverse Flattening 298.2572221010
Eccentricity^2 0.006694380022901
DX 1.0058m RX 0.0000 arc seconds
DY -1.0516m RY 0.0000 arc seconds
DZ -0.3048m RZ 0.0000 arc seconds
D Scale 0.0000ppm
Rotation Convention +RZ=-RLongitude
Projection Transverse Mercator
Grid Name Alaska Zone 4
Latitude of Origin 54°00'00.0000"N
Longitude of Origin 150°00'00.0000"W
False Easting 1640416.667ftUS
False Northing 0.000ftUS
Convergence - 1°11'59.4792"
Calculation Mode Grid



Starfix Mean Position Report v5.02.24

Vessel

Vessel Name
Project Name AKLNG_150242
Project Number AKLNG_150242
Offset Name MainVessel_CRP
Sampling Started 11-Oct-2015 14:43:44 (UTC-07:00)
Sampling Ended 11-Oct-2015 14:48:46 (UTC-07:00)
Comment DTM-18.70m, DTW-5.70m at 13.40, Deck Level Above M
LLW-9.67m, MB-28, C1707, 11.10.15

Results

	<u>Mean</u>	<u>Standard Deviation</u>
Local Latitude	60°39'51.8336"N	
Local Longitude	151°22'50.8183"W	
Ellipsoidal Height	0.00 ftUS	
Local Easting	1392758.88 ftUS	0.04 ftUS
Local Northing	2437335.77 ftUS	0.03 ftUS
Orthometric Height	0.00 ftUS	0.00 ftUS
WGS84 Latitude	60°39'51.8277"N	
WGS84 Longitude	151°22'50.9108"W	
Ellipsoidal Height	1.48 ftUS	
Quality	0.57	0.01 ftUS
Depth	0.00 ftUS	0.00 ftUS
Heading	154.35°G	0.13°

Line Navigation Data

Line Name N/A
Chainage N/A
Cross Track N/A

Point Navigation Data

Point Name MB-28
Easting 1392748.76 ftUS
Northing 2437322.56 ftUS
Range 16.64 ftUS
Bearing TO 217.46°G
FROM 37.46°G

Observations

Used 300 out of 300

Geodetic Parameters

Geodetic Datum NAD83 NSRS2007
Ellipsoid GRS80
Semi-Major Axis 6378137.000
Inverse Flattening 298.2572221010
Eccentricity^2 0.006694380022901
DX 1.0058m RX 0.0000 arc seconds
DY -1.0516m RY 0.0000 arc seconds
DZ -0.3048m RZ 0.0000 arc seconds
D Scale 0.0000ppm
Rotation Convention +RZ=-RLongitude
Projection Transverse Mercator
Grid Name Alaska Zone 4
Latitude of Origin 54°00'00.0000"N
Longitude of Origin 150°00'00.0000"W
False Easting 1640416.667ftUS
False Northing 0.000ftUS
Convergence - 1°12'13.5878"
Calculation Mode Grid



Starfix Mean Position Report v5.02.24

Vessel

Vessel Name
Project Name AKLNG_150242
Project Number AKLNG_150242
Offset Name MainVessel_CRP
Sampling Started 11-Sep-2015 08:09:39 (UTC-07:00)
Sampling Ended 11-Sep-2015 08:14:42 (UTC-07:00)
Comment DML 15.10m, DWL 2.60m @ 06:30, Deck level above ML
LW 9.63m C1707 11/09/2015

Results

	<u>Mean</u>	<u>Standard Deviation</u>
Local Latitude	60°38'59.3241"N	
Local Longitude	151°22'13.4053"W	
Ellipsoidal Height	0.00 ftUS	
Local Easting	1394511.54 ftUS	0.04 ftUS
Local Northing	2431966.01 ftUS	0.06 ftUS
Orthometric Height	0.00 ftUS	0.00 ftUS
WGS84 Latitude	60°38'59.3182"N	
WGS84 Longitude	151°22'13.4978"W	
Ellipsoidal Height	1.48 ftUS	
Quality	0.65	0.04 ftUS
Depth	0.00 ftUS	0.00 ftUS
Heading	163.43°G	0.14°

Line Navigation Data

Line Name N/A
Chainage N/A
Cross Track N/A

Point Navigation Data

Point Name MB-31
Easting 1394510.01 ftUS
Northing 2431966.74 ftUS
Range 1.69 ftUS
Bearing TO 295.47°G
FROM 115.47°G

Observations

Used 300 out of 300

Geodetic Parameters

Geodetic Datum NAD83 NSRS2007
Ellipsoid GRS80
Semi-Major Axis 6378137.000
Inverse Flattening 298.2572221010
Eccentricity^2 0.006694380022901
DX 1.0058m RX 0.0000 arc seconds
DY -1.0516m RY 0.0000 arc seconds
DZ -0.3048m RZ 0.0000 arc seconds
D Scale 0.0000ppm
Rotation Convention +RZ=-RLongitude
Projection Transverse Mercator
Grid Name Alaska Zone 4
Latitude of Origin 54°00'00.0000"N
Longitude of Origin 150°00'00.0000"W
False Easting 1640416.667ftUS
False Northing 0.000ftUS
Convergence - 1°11'40.3527"
Calculation Mode Grid



Starfix Mean Position Report v5.02.24

Vessel

Vessel Name
 Project Name
 Project Number AKLNG 150242
 Offset Name MainVessel_CRP
 Sampling Started 02-Nov-2015 17:14:43 (UTC-08:00)
 Sampling Ended 02-Nov-2015 17:19:52 (UTC-08:00)
 Comment DTM-10.00m DTW-5.40m at 16.15, Deck level above ML
 LW-7.45m, D4SD01, C1707, 02.12.15

Results

	<u>Mean</u>	<u>Standard Deviation</u>
Local Latitude	60°39'21.1829"N	
Local Longitude	151°22'01.8995"W	
Ellipsoidal Height	0.00 ftUS	
Local Easting	1395131.15 ftUS	0.04 ftUS
Local Northing	2434173.16 ftUS	0.06 ftUS
Orthometric Height	0.00 ftUS	0.00 ftUS
WGS84 Latitude	60°39'21.1770"N	
WGS84 Longitude	151°22'01.9919"W	
Ellipsoidal Height	1.48 ftUS	
Quality	0.76	0.03 ftUS
Depth	0.00 ftUS	0.00 ftUS
Heading	161.25°G	0.78°

Line Navigation Data

Line Name N/A
 Chainage N/A
 Cross Track N/A

Point Navigation Data

Point Name D4SD01
 Easting 1395130.89 ftUS
 Northing 2434161.70 ftUS
 Range 11.46 ftUS
 Bearing TO 181.32°G
 FROM 1.32°G

Observations

Used 300 out of 300

Geodetic Parameters

Geodetic Datum NAD83 NSRS2007
 Ellipsoid GRS80
 Semi-Major Axis 6378137.000
 Inverse Flattening 298.2572221010
 Eccentricity^2 0.006694380022901
 DX 1.0058m RX 0.0000 arc seconds
 DY -1.0516m RY 0.0000 arc seconds
 DZ -0.3048m RZ 0.0000 arc seconds
 D Scale 0.0000ppm
 Rotation Convention +RZ=-RLongitude
 Projection Transverse Mercator
 Grid Name Alaska Zone 4
 Latitude of Origin 54°00'00.0000"N
 Longitude of Origin 150°00'00.0000"W
 False Easting 1640416.667ftUS
 False Northing 0.000ftUS
 Convergence - 1°11'30.5779"
 Calculation Mode Grid



Starfix Mean Position Report v5.02.24

Vessel

Vessel Name	SkateIIIA
Project Name	
Project Number	AKLNG 150242
Offset Name	Rotary
Sampling Started	03-Nov-2015 01:19:52 (UTC-08:00)
Sampling Ended	03-Nov-2015 01:25:01 (UTC-08:00)
Comment	DTM-10.10m DTW-4.60m at 00:15 Deck level above MLL W-7.62m, D4SD01b, C1707, 03.11.15

Results

	<u>Mean</u>	<u>Standard Deviation</u>
Local Latitude	60°39'20.9104"N	
Local Longitude	151°22'01.6328"W	
Ellipsoidal Height	0.00 ftUS	
Local Easting	1395143.86 ftUS	0.05 ftUS
Local Northing	2434145.23 ftUS	0.05 ftUS
Orthometric Height	0.00 ftUS	0.00 ftUS
WGS84 Latitude	60°39'20.9046"N	
WGS84 Longitude	151°22'01.7253"W	
Ellipsoidal Height	1.48 ftUS	
Quality	0.71	0.03 ftUS
Depth	0.00 ftUS	0.00 ftUS
Heading	153.88°G	0.31°

Line Navigation Data

Line Name	N/A
Chainage	N/A
Cross Track	N/A

Point Navigation Data

Point Name	D4SD01
Easting	1395130.89 ftUS
Northing	2434161.70 ftUS
Range	20.97 ftUS
Bearing TO	321.78°G
FROM	141.78°G

Observations

Used 300 out of 300

Geodetic Parameters

Geodetic Datum	NAD83 NSRS2007		
Ellipsoid	GRS80		
Semi-Major Axis	6378137.000		
Inverse Flattening	298.2572221010		
Eccentricity^2	0.006694380022901		
DX	1.0058m	RX	0.0000 arc seconds
DY	-1.0516m	RY	0.0000 arc seconds
DZ	-0.3048m	RZ	0.0000 arc seconds
D Scale	0.0000ppm		
Rotation Convention	+RZ=-RLongitude		
Projection	Transverse Mercator		
Grid Name	Alaska Zone 4		
Latitude of Origin	54°00'00.0000"N		
Longitude of Origin	150°00'00.0000"W		
False Easting	1640416.667ftUS		
False Northing	0.000ftUS		
Convergence	- 1°11'30.3423"		
Calculation Mode	Grid		



Starfix Mean Position Report v5.02.24

Vessel

Vessel Name
 Project Name
 Project Number AKLNG 150242
 Offset Name MainVessel_CRP
 Sampling Started 04-Nov-2015 13:42:16 (UTC-08:00)
 Sampling Ended 04-Nov-2015 13:47:17 (UTC-08:00)
 Comment DTM-10.40m DTW-1.40m at 12:40 Deck level above MLL
 W-6.39m, D4SD01, C1707, 04.11.15

Results

	<u>Mean</u>	<u>Standard Deviation</u>
Local Latitude	60°39'20.0839"N	
Local Longitude	151°22'08.9315"W	
Ellipsoidal Height	0.00 ftUS	
Local Easting	1394778.42 ftUS	0.04 ftUS
Local Northing	2434068.89 ftUS	0.07 ftUS
Orthometric Height	0.00 ftUS	0.00 ftUS
WGS84 Latitude	60°39'20.0781"N	
WGS84 Longitude	151°22'09.0239"W	
Ellipsoidal Height	1.48 ftUS	
Quality	0.72	0.06 ftUS
Depth	0.00 ftUS	0.00 ftUS
Heading	159.37°G	0.28°

Line Navigation Data

Line Name N/A
 Chainage N/A
 Cross Track N/A

Point Navigation Data

Point Name D5SD01
 Easting 1394787.06 ftUS
 Northing 2434073.39 ftUS
 Range 9.74 ftUS
 Bearing TO 62.49°G
 FROM 242.49°G

Observations

Used 300 out of 300

Geodetic Parameters

Geodetic Datum NAD83 NSRS2007
 Ellipsoid GRS80
 Semi-Major Axis 6378137.000
 Inverse Flattening 298.2572221010
 Eccentricity^2 0.006694380022901
 DX 1.0058m RX 0.0000 arc seconds
 DY -1.0516m RY 0.0000 arc seconds
 DZ -0.3048m RZ 0.0000 arc seconds
 D Scale 0.0000ppm
 Rotation Convention +RZ=-RLongitude
 Projection Transverse Mercator
 Grid Name Alaska Zone 4
 Latitude of Origin 54°00'00.0000"N
 Longitude of Origin 150°00'00.0000"W
 False Easting 1640416.667ftUS
 False Northing 0.000ftUS
 Convergence - 1°11'36.6956"
 Calculation Mode Grid



Starfix Mean Position Report v5.02.24

Vessel

Vessel Name
Project Name
Project Number AKLNG 150242
Offset Name MainVessel_CRP
Sampling Started 04-Nov-2015 19:07:06 (UTC-08:00)
Sampling Ended 04-Nov-2015 19:12:33 (UTC-08:00)
Comment DTM-10.50m DTW-4.90m at 18:05 Deck level above MLL
W-6.61m, D5SD01b, C1707, 04.11.15

Results

	<u>Mean</u>	<u>Standard Deviation</u>
Local Latitude	60°39'19.9623"N	
Local Longitude	151°22'09.1106"W	
Ellipsoidal Height	0.00 ftUS	
Local Easting	1394769.24 ftUS	0.03 ftUS
Local Northing	2434056.73 ftUS	0.03 ftUS
Orthometric Height	0.00 ftUS	0.00 ftUS
WGS84 Latitude	60°39'19.9565"N	
WGS84 Longitude	151°22'09.2031"W	
Ellipsoidal Height	1.48 ftUS	
Quality	0.60	0.01 ftUS
Depth	0.00 ftUS	0.00 ftUS
Heading	170.08°G	0.37°

Line Navigation Data

Line Name N/A
Chainage N/A
Cross Track N/A

Point Navigation Data

Point Name D5SD01
Easting 1394787.06 ftUS
Northing 2434073.39 ftUS
Range 24.40 ftUS
Bearing TO 46.94°G
FROM 226.94°G

Observations

Used 300 out of 300

Geodetic Parameters

Geodetic Datum NAD83 NSRS2007
Ellipsoid GRS80
Semi-Major Axis 6378137.000
Inverse Flattening 298.2572221010
Eccentricity^2 0.006694380022901
DX 1.0058m RX 0.0000 arc seconds
DY -1.0516m RY 0.0000 arc seconds
DZ -0.3048m RZ 0.0000 arc seconds
D Scale 0.0000ppm
Rotation Convention +RZ=-RLongitude
Projection Transverse Mercator
Grid Name Alaska Zone 4
Latitude of Origin 54°00'00.0000"N
Longitude of Origin 150°00'00.0000"W
False Easting 1640416.667ftUS
False Northing 0.000ftUS
Convergence - 1°11'36.8504"
Calculation Mode Grid

Daily Visual Observation Form Rev. 3

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: August 17, 2015 20:55

to

August 18, 2015 08:55

Borehole: MB-05

Borehole:

1 of 1 For Day

Latitude: 1392864.19 ft

Longitude:

2437928.93 ft

Day Shift Observer: Jesse Greenwald 1800-2055

Night Shift Observer

Austin Fee 2055-0855

& Shift Time:

& Shift Time:

Drilling Start Time: 8/18/15 0110

Drilling End Time:

8/18/15 0800

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):	0			370			370
Remaining (gal):	0			0			0
Lost (gal)	0			370			370
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	
	0	0	0	0	0	0	0
Drilling Fluid Lost to Ground (gal):	370						
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time	Pass/Fail	Comments			
	NA	NA	NA	NA			
Discharge Start Time:	NA	Discharge End Time:	NA	Discharge Duration (min.): NA			
Length of Casing (ft): NA	Drilling Fluid Depth Below Top of Casing (ft): NA	Length of Drill Fluid Col. (ft): NA	Casing Dia. (in.): NA	Casing Area (ft ²): NA 7-in. is 0.27 ft ² 12-in. is 0.71 ft ²			
Discharge Vol. (gal.). ~200 gallons max:			k = h * j * 7.481 gal/ft ³				
Observations During Discharge	Oily Sheen (Y/N & Comments)			Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			
	NA			NA			

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	0.28	Volume of Discharge Due to Rainfall (gal.)	m) = 1599.3 448
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Total		
	Day Shift	Night Shift	
	Washdown 1	Washdown 2	Washdown 3
	0	0	0
	Washdown 4	Washdown 5	Washdown 6
	0	0	0
Total Deck Drainage Discharge (gal.) ~2570 gal. max:	448		

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	8/17/15 20:54	N	N
2nd Slack Water	8/18/15 03:02	N	N
3rd Slack Water	NA	—	—
4th Slack Water	NA	—	—

Other Observations, Non-Permitted Discharges, or Comments

The 7" was advanced to 19.85m due to sandy soils.
Drilling fluid lost to a formation (ground).

Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.

Note: Observations were made over a 24 hr period corresponding with personnel shift changes.

Daily Visual Observation Form Rev. 2

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: August 18, 2015 0855 to August 19, 2015 0855
Borehole: MB-05 of 1 For Day
Latitude: 2437988.93 ft Longitude: Easting: 1392864.19 ft
Day Shift Observer: Jesse Greenwald 0855-2025 Night Shift Observer: Austin Fee 2025-0855
& Shift Time: 0855-2025 & Shift Time: 2025-0855
Drilling Start Time: August 18, 2015 0930 Drilling End Time: August 19, 2015

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):	790 gal H ₂ O / 2,380 gal seawater			1,320			4,490
Remaining (gal):	0			0			0
Lost (gal)	3,170 gal			1,320			4,490
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	4,490
	—	—	—	—	—	—	
Drilling Fluid Lost to Ground (gal):	4,490						
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time	Pass/Fail	Comments			
	—	—	—	—			
Discharge Start Time:	Discharge End Time:		Discharge Duration (min.):				
Length of Casing (ft):	Drilling Fluid Depth Below Top of Casing (ft):	Length of Drill Fluid Col. (ft):	Casing Dia. (in.):	Casing Area (ft ²): 7-in. is 0.27 ft ² 12-in. is 0.71 ft ²			
	—	—	—	—			
Discharge Vol. (gal.). ~200 gallons max:			k = h * j * 7.481 gal/ft ³				
Observations During Discharge	Oily Sheen (Y/N & Comments)			Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			
	—			—			

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	Volume of Discharge Due to Rainfall (gal.)	Total
0	0	0
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Day Shift Washdown 1 Washdown 2 Washdown 3 Washdown 4 Washdown 5 Washdown 6	Night Shift Washdown 1 Washdown 2 Washdown 3 Washdown 4 Washdown 5 Washdown 6
	— — — — — —	— — — — — —
Total Deck Drainage Discharge (gal.) ~2570 gal. max:	0	

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	8/18/15 0905	N	N
2nd Slack Water	8/18/15 1508	N	N
3rd Slack Water	8/18/15 2127	N	N
4th Slack Water	8/19/15 0339	N	N

Other Observations, Non-Permitted Discharges, or Comments

The 7" was advanced to 14.85m due to sandy soils
Drilling fluid lost to formation (ground).

Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.

Note: Observations were made over a 24 hr period corresponding with personnel shift changes.

Daily Visual Observation Form Rev. 2

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: 8/19/15 0855-2000 to 8/20/15 07:20
Borehole: MB-05 Borehole: 1 of 2 For Day
Latitude: 2437928.93 ft Longitude: Eastings: 1392864.19 ft
Day Shift Observer: Jesse Greenwald 0855-2030 Night Shift Observer: Austin Fee 2030-0720
& Shift Time: 0855-2030 & Shift Time: 2030-0720
Drilling Start Time: 8/19/15 0855 Drilling End Time: 8/19/15 1320

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):	740 gal			—			740
Remaining (gal):	0			—			0
Lost (gal)	740 gal			—			740
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	
	0	0	0	—	—	—	0
Drilling Fluid Lost to Ground (gal):	740						
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time	Pass/Fail	Comments			
	14:17	14:25	Pass	0% Sheen/Slick.			
Discharge Start Time:	14:25	Discharge End Time:	15:15	Discharge Duration (min.):			
Length of Casing (ft):	55	Drilling Fluid Depth Below Top of Casing (ft):	25	Length of Drill Fluid Col. (ft):	30	Casing Dia. (in.):	7"
						Casing Area (ft ²):	0.27
						7-in. is 0.27 ft ² 12-in. is 0.71 ft ²	
Discharge Vol. (gal.). ~200 gallons max:	60.5 gal			k = h * j * 7.481 gal/ft ³			
Observations During Discharge	Oily Sheen (Y/N & Comments)			Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			
	N —			N —			

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	0	Volume of Discharge Due to Rainfall (gal.)	0
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Total		
	Day Shift	Night Shift	
	Washdown 1	Washdown 2	Washdown 3
	10 min x 12 gpm = 120 gal	—	—
	—	—	—
	—	—	—
	—	—	—
Total Deck Drainage Discharge (gal.) ~2570 gal. max:	120 gal		

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	8/19/15 0949	N —	N —
2nd Slack Water	8/19/15 1546	N —	N —
3rd Slack Water	8/19/15 2202	N —	N —
4th Slack Water			

Other Observations, Non-Permitted Discharges, or Comments

See Daily Observation Form for MB-04 for second portion of 8/19-20/15.

Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.

Note: Observations were made over a 24 hr period corresponding with personnel shift changes.

Daily Visual Observation Form Rev. 2

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: 8/19/15 08:55 to 8/20/15 07:20
Borehole: MB-04 Borehole: 2 of 2 For Day
Latitude: North: 2438430.15 ft Longitude: East: 1391719.57 ft
Day Shift Observer: Jesse Greenwald 0855-20130 Night Shift Observer: Austin Fee 20:30-07:20
& Shift Time: 0855-20130 & Shift Time: 20:30-07:20
Drilling Start Time: 8/20/15 07:05 Drilling End Time: 8/20/15 05:45

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):				264			264
Remaining (gal):				64			64
Lost (gal)				200			264
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	0
Drilling Fluid Lost to Ground (gal):	200 gal						
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time		Pass/Fail	Comments		
	NA						
Discharge Start Time:	NA	Discharge End Time:			Discharge Duration (min.):		
Length of Casing (ft):	NA	Drilling Fluid Depth Below Top of Casing (ft):	Length of Drill Fluid Col. (ft):	Casing Dia. (in.):	Casing Area (ft ²):		
					7-in. is 0.27 ft ² 12-in. is 0.71 ft ²		
Discharge Vol. (gal.). ~200 gallons max:				k = h * j * 7.481 gal/ft ³			
Observations During Discharge	Oily Sheen (Y/N & Comments)			Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			
	NA						

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	Volume of Discharge Due to Rainfall (gal.)	Total
0	0	0
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Day Shift	Night Shift
	Washdown 1	Washdown 2
	Washdown 3	Washdown 4
	Washdown 5	Washdown 6
	5 min x 12 gal/min = 60 gal	
Total Deck Drainage Discharge (gal.) ~2570 gal. max:	60 gal	

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	8/20/15 03:00	No	No
2nd Slack Water	8/20/15 09:03		
3rd Slack Water	8/20/15 15:02		
4th Slack Water	8/20/15 21:05		

Other Observations, Non-Permitted Discharges, or Comments

See Daily Observation Form for MB-05 for first portion of 8/19-20/15.
Stop drilling at 05:45 due to current.

Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.

Note: Observations were made over a 24 hr period corresponding with personnel shift changes.

Daily Visual Observation Form Rev. 2

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: 8/21/15 07:20
Borehole: MB-04
Latitude: N 2438430.15 ft
Day Shift Observer
& Shift Time: J. Greenwald 07:20 - 19:20
Drilling Start Time: 8/21/15 08:20

to 8/22/15 07:20
Borehole: 1 of 2 For Day
Longitude: E 1391719.57 ft
Night Shift Observer
& Shift Time: A. Fee 19:20 - 07:20
Drilling End Time: 8/21/15 11:45

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):	320			NA			320
Remaining (gal):	0			NA			0
Lost (gal)	320			NA			320
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	
	0	0	0	NA	NA	NA	0
Drilling Fluid Lost to Ground (gal):	320						
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time	Pass/Fail	Comments			
	1507	1520	Pass	No slick/sheen.			
Discharge Start Time:	1525	Discharge End Time:	1535	Discharge Duration (min.):			
Length of Casing (ft):	50	Drilling Fluid Depth Below Top of Casing (ft):	6	Length of Drill Fluid Col. (ft):	44	Casing Dia. (in.):	7 in.
						Casing Area (ft ²):	7-in. is 0.27 ft ² 12-in. is 0.71 ft ² 0.27
Discharge Vol. (gal.). ~200 gallons max:			89	k = h * j * 7.481 gal/ft ³			
Observations During Discharge	Oily Sheen (Y/N & Comments)			Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			
	N			N			

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	0	Volume of Discharge Due to Rainfall (gal.)	0
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Total		
	Day Shift	Night Shift	
	Washdown 1	Washdown 2	Washdown 3
	Washdown 4	Washdown 5	Washdown 6
Total Deck Drainage Discharge (gal.) ~2570 gal. max:	0		

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	8/21/15 11:36	N	N
2nd Slack Water	8/21/15 17:20	N	N
3rd Slack Water			
4th Slack Water			
Other Observations, Non-Permitted Discharges, or Comments			
See sheet for MB-12 for second part of day.			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 2

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: 8/21/15 07:20 to 8/22/15 07:20
Borehole: MB-12 Borehole: 2 of 2 For Day
Latitude: N 2436187.65 ft Longitude: E 1393818.03
Day Shift Observer & Shift Time: J. Greenwald 07:20-19:20 Night Shift Observer & Shift Time: A. Fee 19:20-07:20
Drilling Start Time: 8/21/15 22:30 Drilling End Time: 8/22/15 06:45

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):	NA			1850 gal			1850
Remaining (gal):	NA			0 gal			0
Lost (gal)	NA			1850 gal			1850
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	
	NA	NA	NA	NA	NA	NA	0
Drilling Fluid Lost to Ground (gal):	1850 gal						
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time	Pass/Fail	Comments			
Discharge Start Time:		Discharge End Time:		Discharge Duration (min.):			
Length of Casing (ft):	Drilling Fluid Depth Below Top of Casing (ft):	Length of Drill Fluid Col. (ft):	Casing Dia. (in.):	Casing Area (ft ²):			
				7-in. is 0.27 ft ² 12-in. is 0.71 ft ²			
Discharge Vol. (gal.). ~200 gallons max:			k = h * j * 7.481 gal/ft ³				
Observations During Discharge	Oily Sheen (Y/N & Comments)			Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	See MB-04.	Volume of Discharge Due to Rainfall (gal.)	See MB-04.
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Day Shift		Night Shift
	Washdown 1	Washdown 2	Washdown 3
	10-min x 120 gpm = 120 gal		
			10-min x 120 gpm = 120 gal
			120 gal
Total Deck Drainage Discharge (gal.) ~2570 gal. max:	360 gal		

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	8/21/15 23:31	N	N
2nd Slack Water	8/22/15 05:59	N	N
3rd Slack Water			
4th Slack Water			
Other Observations, Non-Permitted Discharges, or Comments			
*See sheet for MB-04 for first part of day. *7" Casing advanced to 11.1m. Drilling fluids lost to formation (ground).			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 2

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: 8/22/15 0700 to 8/23/15 0700
Borehole: MB-12 Borehole: 1 of 1 For Day
Latitude: 60°39'57.7838"N Longitude: 151°22'48.6477"W
Day Shift Observer: J. Greenwald 0700-1900 Night Shift Observer: A. Fee 1900-0700
& Shift Time: & Shift Time:
Drilling Start Time: 8/22/15 0755 Drilling End Time: 0625 8/23/15

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):	980			2640			3,620
Remaining (gal):	0			300			300
Lost (gal)	980			2340			3,320
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	
	0	0	0	0	0	0	0
Drilling Fluid Lost to Ground (gal):	3,320						
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time	Pass/Fail	Comments			
	0643	0651	Pass	No slick/sheen			
Discharge Start Time:	0655	Discharge End Time:	0700	Discharge Duration (min.):			
Length of Casing (ft):	53	Drilling Fluid Depth Below Top of Casing (ft):	13	Length of Drill Fluid Col. (ft):	40	Casing Dia. (in.):	7 in
						Casing Area (ft ²):	0.27
						7-in. is 0.27 ft ² 12-in. is 0.71 ft ²	
Discharge Vol. (gal.). ~200 gallons max:			81		k = h * j * 7.481 gal/ft ³		
Observations During Discharge	Oily Sheen (Y/N & Comments)			Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			
	No			No			

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	0	Volume of Discharge Due to Rainfall (gal.)	0
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Total		
	Day Shift	Night Shift	
	Washdown 1	Washdown 2	Washdown 3
	10 min @ 12 gpm 120 gal	—	—
	5 min @ 12 gpm 60 gal	10 min @ 12 gpm 120 gal	—
Total Deck Drainage Discharge (gal.). ~2570 gal. max:	300		

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	8/22/15 12:45	N	N
2nd Slack Water	8/22/15 18:22	N	N
3rd Slack Water	8/23/15 00:29	N	N
4th Slack Water			
Other Observations, Non-Permitted Discharges, or Comments			
7" Casing advanced to 16.5 m. Drilling fluid lost to formation (ground).			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 2

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: 8/23/15 0700 to 8/24/15 0700
Borehole: MB-12 Borehole: 1 of 2 For Day
Latitude: 60.6613215°N Longitude: 151.3745672°W
Day Shift Observer & Shift Time: J. Greenwald 0700-1900 Night Shift Observer & Shift Time: A. Fee 1900-0700
Drilling Start Time: Drilling Completed Drilling End Time:

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):							
Remaining (gal):							
Lost (gal)							
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	
Drilling Fluid Lost to Ground (gal):							
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time	Pass/Fail	Comments			
				<u>Completed previous day.</u>			
Discharge Start Time:	Discharge End Time:				Discharge Duration (min.):		
Length of Casing (ft):	Drilling Fluid Depth Below Top of Casing (ft):	Length of Drill Fluid Col. (ft):	Casing Dia. (in.):	Casing Area (ft ²):			
				7-in. is 0.27 ft ² 12-in. is 0.71 ft ²			
Discharge Vol. (gal.). ~200 gallons max:			$k = h * j * 7.481 \text{ gal/ft}^3$				
Observations During Discharge	Oily Sheen (Y/N & Comments)			Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			
	<u>Discharge completed previous day.</u>						

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	Volume of Discharge Due to Rainfall (gal.)					
<u>0</u>	<u>0</u>					
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Day Shift	Night Shift	Total			
	Washdown 1	Washdown 2	Washdown 3	Washdown 4	Washdown 5	Washdown 6
Total Deck Drainage Discharge (gal.) ~2570 gal. max:		<u>0</u>				

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	<u>8/23/15 07:06</u>	<u>N</u>	<u>N</u>
2nd Slack Water			
3rd Slack Water			
4th Slack Water			
Other Observations, Non-Permitted Discharges, or Comments			
<u>*Drilling & discharge of drilling fluids already completed. Standing by for move only.</u> <u>*Sheet 1/2 for day. *Move to MB-08 @ 12:00.</u>			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 2

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: 8/23/15 0700
Borehole: M8-08
Latitude: 60.6636734°N
Day Shift Observer
& Shift Time: J. Grunwald 0700-1900
Drilling Start Time: 8/23/15 13:00

to 8/24/15 0700
Borehole: 2 of 2 For Day
Longitude: 151.3773987°W
Night Shift Observer
& Shift Time: A. Fee 1900-0700
Drilling End Time: 8/24/15 0600

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):	370			2640			3010
Remaining (gal):	0			50			50
Lost (gal)	370			2590			2960
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	
	0	0	0	0	0	0	0
Drilling Fluid Lost to Ground (gal):	2960						
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time		Pass/Fail	Comments		
Discharge Start Time:	Discharge End Time:		Discharge Duration (min.):				
Length of Casing (ft):	Drilling Fluid Depth Below Top of Casing (ft):	Length of Drill Fluid Col. (ft):	Casing Dia. (in.):	Casing Area (ft ²): 7-in. is 0.27 ft ² 12-in. is 0.71 ft ²			
Discharge Vol. (gal.). ~200 gallons max:			$k = h * j * 7.481 \text{ gal/ft}^3$				
Observations During Discharge	Oily Sheen (Y/N & Comments)			Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	Volume of Discharge Due to Rainfall (gal.)	Total
See Sheet 1	See Sheet 1	
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Day Shift	Night Shift
	Washdown 1 24 gal	Washdown 2 — Washdown 3 — Washdown 4 10 x 230 gal 120 gal
Total Deck Drainage Discharge (gal.). ~2570 gal. max:		144

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	8/23/15 13:56	N	N
2nd Slack Water	8/23/15 19:30	N	N
3rd Slack Water	8/24/15 01:35	N	N
4th Slack Water	—	—	—
Other Observations, Non-Permitted Discharges, or Comments			
* 7" Casing advanced to 17.5 m. Drilling fluid lost to formation (ground). * Sheet 2/2 for day. Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph. Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 2

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: 8/24/15 0700 to 8/25/15 0700
Borehole: MB-08 of 1 For Day
Latitude: 60.6636734°N Longitude: 151.3773987°W
Day Shift Observer & Shift Time: J. Greenwald 0700-1900 Night Shift Observer & Shift Time: A. Fee 1900-0700
Drilling Start Time: 8/24/15 0745 Drilling End Time: 8/25/15 0645

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes		Day Shift			Night Shift		Total
Created (gal):		900			3000		3900
Remaining (gal):		0			100		100
Lost (gal)		900			2900		3800
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:		Event 1	Event 2	Event 3	Event 4	Event 5	Event 6
		—	—	—	—	—	—
Drilling Fluid Lost to Ground (gal):		3800 gal.					
Drilling Fluid Discharges							
Results of Static Sheen Test		Start Time	End Time	Pass/Fail	Comments		
		—	—	—	NA		
Discharge Start Time:		Discharge End Time:		Discharge Duration (min.):			
Length of Casing (ft):	Drilling Fluid Depth Below Top of Casing (ft):	Length of Drill Fluid Col. (ft):	Casing Dia. (in.):	Casing Area (ft ²):			
—	—	—	—	7-in. is 0.27 ft ² 12-in. is 0.71 ft ²		—	
Discharge Vol. (gal.). ~200 gallons max:				k = h * j * 7.481 gal/ft ³			
Observations During Discharge		Oily Sheen (Y/N & Comments)		Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			
		NA		NA			

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	Volume of Discharge Due to Rainfall (gal.)	Total					
0	1599.3	0					
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Day Shift		Night Shift		Total		
	Washdown 1	Washdown 2	Washdown 3	Washdown 4		Washdown 5	Washdown 6
	—	—	—	15 min x 12 gpm = 180 gal		—	—
Total Deck Drainage Discharge (gal.) ~2570 gal. max:				180 gal.			

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	8/24/15 08:17	N	N
2nd Slack Water	8/24/15 15:02	N	N
3rd Slack Water	8/24/15 20:38	N	N
4th Slack Water	8/25/15 02:50	N	N
Other Observations, Non-Permitted Discharges, or Comments			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 2

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: 8/25/15 0700 to 8/26/15 0708
Borehole: MB-09 Borehole: 2 of 2 For Day
Latitude: 60.86249628 °N Longitude: 151.38079069 °W
Day Shift Observer & Shift Time: J. Greenwald 0700-1400 Night Shift Observer & Shift Time: A. Fee 1900-0700
Drilling Start Time: 8/25/15 2130 Drilling End Time: 8/26/15 0630

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):	N/A			900 gal			a) 900
Remaining (gal):	N/A			0			b) 0
Lost (gal)	N/A			900 gal			c) 900
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	d) 0
	0	0	0	0	0	0	
Drilling Fluid Lost to Ground (gal):	900 gal						
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time	Pass/Fail	Comments			
				NA			
Discharge Start Time:	Discharge End Time:		Discharge Duration (min.):				
Length of Casing (ft):	Drilling Fluid Depth Below Top of Casing (ft):	Length of Drill Fluid Col. (ft):	Casing Dia. (in.):	Casing Area (ft ²): 7-in. is 0.27 ft ² 12-in. is 0.71 ft ²			
Discharge Vol. (gal.). ~200 gallons max:			k = h * j * 7.481 gal/ft ³				
Observations During Discharge	Oily Sheen (Y/N & Comments)		Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)				
	NA		NA				

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	Volume of Discharge Due to Rainfall (gal.)	Total					
See MB-08	See MB-08						
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Day Shift	Total					
	Night Shift						
	Washdown 1		Washdown 2	Washdown 3	Washdown 4	Washdown 5	Washdown 6
							60
Total Deck Drainage Discharge (gal.) ~2570 gal. max:		60 gal.					

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	8/25/15 21:38	N	N
2nd Slack Water	8/26/15 03:41	N	N
3rd Slack Water			
4th Slack Water			
Other Observations, Non-Permitted Discharges, or Comments			
Sheet 2/2 for day.			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 3

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: 8/26/15 0700 to 8/27/15 0700
Borehole: MB-09 Borehole: 1 of 1 For Day
Latitude: 60.66249628 °N Longitude: 151.38079069 °W
Day Shift Observer & Shift Time: A. Fee 0700 - 0700 Night Shift Observer & Shift Time: A. Fee 0700 - 0700
Drilling Start Time: 8/26/15 0800 Drilling End Time: 8/27/15 0515

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):				<u>2640</u>			<u>2640</u>
Remaining (gal):				<u>500</u>			<u>500</u>
Lost (gal)				<u>2140</u>			<u>2140</u>
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	
	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
Drilling Fluid Lost to Ground (gal):	<u>2140 gal</u>						
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time		Pass/Fail	Comments		
					<u>NA</u>		
Discharge Start Time:	Discharge End Time:				Discharge Duration (min.):		
Length of Casing (ft):	Drilling Fluid Depth Below Top of Casing (ft):	Length of Drill Fluid Col. (ft):	Casing Dia. (in.):	Casing Area (ft ²):			
				7-in. is 0.27 ft ² 12-in. is 0.71 ft ²			
Discharge Vol. (gal.). ~200 gallons max:				$k = h * j * 7.481 \text{ gal/ft}^3$			
Observations During Discharge	Oily Sheen (Y/N & Comments)			Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			
	<u>NA</u>			<u>NA</u>			

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	Volume of Discharge Due to Rainfall (gal.)	Total
<u>0.01</u>	<u>16 gal</u>	<u>16 gal</u>
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Day Shift	Night Shift
	Washdown 1	Washdown 2
	<u>1</u>	<u>1</u>
	Washdown 3	Washdown 4
	<u>1</u>	<u>1</u>
	Washdown 5	Washdown 6
	<u>1</u>	<u>1</u>
Total Deck Drainage Discharge (gal.). ~2570 gal. max:	<u>16 gal</u>	

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	<u>8/26 1019</u>	<u>N</u>	<u>N</u>
2nd Slack Water	<u>8/26 1650</u>	<u>N</u>	<u>N</u>
3rd Slack Water	<u>8/26 2231</u>	<u>N</u>	<u>N</u>
4th Slack Water	<u>8/27 0434</u>	<u>N</u>	<u>N</u>
Other Observations, Non-Permitted Discharges, or Comments			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 2

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: 8/27/15 0700

Borehole: MB-09

Latitude: 60.66249628 °N

Day Shift Observer & Shift Time: No Observer (See Below)

Drilling Start Time: No Drilling

to 8/28/15 0700

Borehole: 1 of 1 For Day

Longitude: 151.38079069 °W

Night Shift Observer & Shift Time: No Observer (See Below)

Drilling End Time: No Drilling

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)

Drilling Fluid Volumes	Drilling Fluid Losses (Prior To Discharge)						
	Day Shift			Night Shift			Total
Created (gal):	0			0			a) 0
Remaining (gal):	0			0			b) 0
Lost (gal)	0			0			c) 0
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	d) 0
	0	0	0	0	0	0	
Drilling Fluid Lost to Ground (gal):	e) 0						

Drilling Fluid Discharges

Results of Static Sheen Test	Start Time	End Time	Pass/Fail	Comments
Discharge Start Time:		Discharge End Time:		NA
Length or Casing (ft):	Drilling Fluid Depth Below Top of Casing (ft):	Length of Drill Fluid Col. (ft):	Casing Dia. (in.):	Discharge Duration (min.):
				Casing Area (ft ²):
				7-in. is 0.27 ft ² 12-in. is 0.71 ft ²
Discharge Vol. (gal.). ~200 gallons max:	0			$k = h * j * 7.481 \text{ gal/ft}^3$
Observations	Oily Sheen (Y/N & Comments)		Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)	
During Discharge	NA		NA	

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)		0.01		Volume of Discharge Due to Rainfall (gal.)				16	
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Day Shift			Night Shift				Total	
	Washdown 1	Washdown 2	Washdown 3	Washdown 4	Washdown 5	Washdown 6			
	2							0	
Total Deck Drainage Discharge (gal.) ~2570 gal. max:			16 gal.						

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)

Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	8/27/15 11:04	No drilling/observation. See below.	See below.
2nd Slack Water	8/27/15 17:33		
3rd Slack Water	8/27/15 23:18		
4th Slack Water	8/28/15 05:23		

Other Observations, Non-Permitted Discharges, or Comments

No drilling operations or observations for 8/27/15 0700 to 8/28/15 0700. Skate 3A rig was unmanned due to weather conditions.

Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.

Note: Observations were made over a 24 hr period corresponding with personnel shift changes.

Daily Visual Observation Form Rev. 2

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: 8/28/15 0700 to 8/29/15 0700
Borehole: MB-09/ASRC quayside Borehole: 1 of 1 For Day
Latitude: 60.66249628 °N Longitude: 151.38079069 °W
Day Shift Observer: J. Greenwald 0700-1900 Night Shift Observer: No Night Shift (See Below)
& Shift Time: 0700-1900 & Shift Time: 1205
Drilling Start Time: 8/28/15 0700 Drilling End Time: 8/28/15 1205

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):	290			—			a) 290
Remaining (gal):	0			—			b) 0
Lost (gal)	290			—			c) 290
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	d)
	—	—	—	—	—	—	—
Drilling Fluid Lost to Ground (gal):	290						
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time	Pass/Fail	Comments			
	12:20	12:30	Pass	0% sheen/slick			
Discharge Start Time:	12:50	Discharge End Time:	13:00	Discharge Duration (min.):		10	
Length of Casing (ft):	55	Drilling Fluid Depth Below Top of Casing (ft):	9	Length of Drill Fluid Col. (ft):	46	Casing Dia. (in.):	7
						Casing Area (ft ²):	0.27
						7-in. is 0.27 ft ² 12-in. is 0.71 ft ²	
Discharge Vol. (gal.). ~200 gallons max:			93 gal		k = h * j * 7.481 gal/ft ³		
Observations During Discharge	Oily Sheen (Y/N & Comments)			Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			
	N			N			

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	0	Volume of Discharge Due to Rainfall (gal.)	(m) * 1599.3	0
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.				
	Day Shift			Night Shift
	Washdown 1	Washdown 2	Washdown 3	Washdown 4
	—	—	—	—
	Washdown 5	Washdown 6	Total	
	—	—	—	
Total Deck Drainage Discharge (gal.) ~2570 gal. max:	0			

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	8/28/15 11:46	N	N
2nd Slack Water	8/28/15 18:13	N	N
3rd Slack Water	8/29/15 00:03	See below.	See below.
4th Slack Water	8/29/15 06:09	See below.	See below.
Other Observations, Non-Permitted Discharges, or Comments			
<p>* Rig towed back to ASRC quayside 1735-19:00 on 8/28/15. Rig unmanned 8/28/15 19:00 to 8/29/15. No operations/observations during that time.</p> <p>Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.</p> <p>Note: Observations were made over a 24 hr period corresponding with personnel shift changes.</p>			

Daily Visual Observation Form Rev. 2

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: 8/29/15 0700 to 8/30/15 0700
Borehole: ASRC quayside Borehole: 0 of 0 For Day
Latitude: — Longitude: —
Day Shift Observer: Jimmy Wilson 0700-1900 Night Shift Observer: No Night Shift
& Shift Time: — & Shift Time: —
Drilling Start Time: No drilling Drilling End Time: No drilling

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):	NA			NA			a) —
Remaining (gal):	—			—			b) —
Lost (gal)	—			—			c) —
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	d) —
	NA	—	—	NA	—	—	—
Drilling Fluid Lost to Ground (gal):	NA						
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time	Pass/Fail	Comments			
	NA	—	—	—			
Discharge Start Time:	Discharge End Time:		Discharge Duration (min.):				
Length of Casing (ft):	Drilling Fluid Depth Below Top of Casing (ft):	Length of Drill Fluid Col. (ft):	Casing Dia. (in.):	Casing Area (ft ²):		7-in. is 0.27 ft ² 12-in. is 0.71 ft ²	
	—	—	—	—		—	
Discharge Vol. (gal.). ~200 gallons max:			—		k = h * j * 7.481 gal/ft ³		
Observations During Discharge	Oily Sheen (Y/N & Comments)			Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			
	NA —			NA —			

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	0	Volume of Discharge Due to Rainfall (gal.)	0
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Day Shift		Night Shift
	Washdown 1	Washdown 2	Washdown 3
	0	—	—
Total Deck Drainage Discharge (gal.). ~2570 gal. max:		0 gal	

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	8/29/15 1234	N —	N —
2nd Slack Water	8/29/15 19:02	N —	N —
3rd Slack Water	Rig Unmanned	See Below	See Below
4th Slack Water	Rig Unmanned	See Below	See Below
Other Observations, Non-Permitted Discharges, or Comments			
* Rig at ASRC quayside due to strong tides/currents. No drilling operations. Rig manned during daytime only for routine maintenance			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 2

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: 8/30/15 0700 to 8/31/15 0700
Borehole: ASRC quayside Borehole: 0 of 0 For Day
Latitude: — Longitude: —
Day Shift Observer & Shift Time: Rig unmanned. See below. Night Shift Observer & Shift Time: Rig unmanned. See below.
Drilling Start Time: No drilling Drilling End Time: No drilling

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):	NA			NA			a) —
Remaining (gal):	—			—			b) —
Lost (gal)	—			—			c) = a - b
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	d)
	NA	—	—	NA	—	—	—
Drilling Fluid Lost to Ground (gal):	e) = c - d NA						
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time	Pass/Fail	Comments			
	NA	—	—	—			
Discharge Start Time:	Discharge End Time:		Discharge Duration (min.):				
Length of Casing (ft):	Drilling Fluid Depth Below Top of Casing (ft):	Length of Drill Fluid Col. (ft):	Casing Dia. (in.):	Casing Area (ft ²): 7-in. is 0.27 ft ² 12-in. is 0.71 ft ²			
Discharge Vol. (gal.). ~200 gallons max:			k = h * j * 7.481 gal/ft ³				
Observations During Discharge	Oily Sheen (Y/N & Comments)			Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			
	NA			NA			

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	Volume of Discharge Due to Rainfall (gal.)	Total
0.04	64 gal	64 gal
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Day Shift	Night Shift
	Washdown 1	Washdown 2
	0	—
	Washdown 3	Washdown 4
	—	—
	Washdown 5	Washdown 6
	—	—
Total Deck Drainage Discharge (gal.) ~2570 gal. max:	64 gal.	

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	8/30/15 07:06	Rig unmanned. See below.	Rig unmanned. See below.
2nd Slack Water	8/30/15 13:16	↓	↓
3rd Slack Water	8/30/15 19:41	↓	↓
4th Slack Water	8/31/15 01:38	↓	↓
Other Observations, Non-Permitted Discharges, or Comments			
↓ Rig at ASRC quayside due to strong tides/currents. No drilling operations. Rig unmanned entire day for crew rest day.			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 2

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: 8/31/15 0700 to 9/1/15 0700
Borehole: ASRC quayside Borehole: 0 of 0 For Day
Latitude: _____ Longitude: _____
Day Shift Observer _____ Night Shift Observer _____
& Shift Time: Jimmy Wilson 0700-1900 & Shift Time: No Night Shift
Drilling Start Time: No drilling Drilling End Time: No drilling

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):	<u>NA</u>			<u>NA</u>			a) _____
Remaining (gal):	_____			_____			b) _____
Lost (gal)	_____			_____			c) _____
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	d) _____
	<u>NA</u>	_____	_____	<u>NA</u>	_____	_____	_____
Drilling Fluid Lost to Ground (gal):	<u>NA</u>						
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time		Pass/Fail	Comments		
	<u>NA</u>	_____		_____	_____		
Discharge Start Time:	Discharge End Time:				Discharge Duration (min.):		
Length of Casing (ft):	Drilling Fluid Depth Below Top of Casing (ft):	Length of Drill Fluid Col. (ft):	Casing Dia. (in.):	Casing Area (ft ²):		7-in. is 0.27 ft ² 12-in. is 0.71 ft ²	
Discharge Vol. (gal.). ~200 gallons max:				k = h * j * 7.481 gal/ft ³			
Observations During Discharge	Oily Sheen (Y/N & Comments)			Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			
	<u>NA</u>			<u>NA</u>			

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	Volume of Discharge Due to Rainfall (gal.)	Total
<u>0</u>	<u>0</u>	<u>0</u>
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Day Shift	
	Washdown 1	Washdown 2
	<u>0</u>	_____
Total Deck Drainage Discharge (gal.) ~2570 gal. max:		<u>0 gal.</u>

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	<u>8/31/15 07:54</u>	<u>N</u>	<u>N</u>
2nd Slack Water	<u>8/31/15 13:59</u>	<u>N</u>	<u>N</u>
3rd Slack Water	<u>8/31/15 20:22</u>	<u>Rig Unmanned. See below.</u>	<u>Rig Unmanned. See below.</u>
4th Slack Water	<u>9/1/15 05:23</u>	<u>Rig Unmanned. See below.</u>	<u>Rig Unmanned. See below.</u>
Other Observations, Non-Permitted Discharges, or Comments			
<u>* Rig at ASRC quayside due to strong tides/currents. No drilling operations. Rig manned during daytime only for routine maintenance.</u>			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 2

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: 9/1/15 0700 to 9/2/15 0700
Borehole: ASRC quayside Borehole: 0 of 0 For Day
Latitude: _____ Longitude: _____
Day Shift Observer _____ Night Shift Observer _____
& Shift Time: Jimmy Wilson 0700-1900 & Shift Time: No Night Shift
Drilling Start Time: No drilling Drilling End Time: No drilling

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):	NA /			NA			a) _____
Remaining (gal):	_____			_____			b) _____
Lost (gal)	_____			_____			c) _____
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	d) _____
	NA	_____	_____	NA	_____	_____	_____
Drilling Fluid Lost to Ground (gal):	NA						
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time	Pass/Fail	Comments			
	NA	_____	_____	_____			
Discharge Start Time:	Discharge End Time:		Discharge Duration (min.):				
Length of Casing (ft):	Drilling Fluid Depth Below Top of Casing (ft):	Length of Drill Fluid Col. (ft):	Casing Dia. (in.):	Casing Area (ft ²): 7-in. is 0.27 ft ² 12-in. is 0.71 ft ²			
Discharge Vol. (gal.). ~200 gallons max:			k = h * j * 7.481 gal/ft ³				
Observations During Discharge	Oily Sheen (Y/N & Comments)			Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			
	NA _____			NA _____			

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	Volume of Discharge Due to Rainfall (gal.)	Total
0	m1=1599.3 0	0
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Day Shift	Night Shift
	Washdown 1	Washdown 2
	0	_____
Total Deck Drainage Discharge (gal.) ~2570 gal. max:	0 gal	

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	9/1/15 08:43	N _____	N _____
2nd Slack Water	9/1/15 14:45	N _____	N _____
3rd Slack Water	9/1/15 21:04	Rig Unmanned. See below.	Rig unmanned. See below.
4th Slack Water	9/2/15 03:11	_____	_____
Other Observations, Non-Permitted Discharges, or Comments			
*Rig at ASRC quayside due to strong tides/currents. No drilling operations. Rig manned during daytime only for routine maintenance.			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 3

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: 9/3/15 0700 to 9/4/15 0700
Borehole: MB-15 of 1 For Day
Latitude: 60.65898078 °N Longitude: 151.37165869 °W
Day Shift Observer: J. Greenwald 0700-1900 Night Shift Observer: A. Fee 1900-0700
& Shift Time: & Shift Time:
Drilling Start Time: 9/3/15 10:20 Drilling End Time: 9/4/15 06:30

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):	845			2640			3485
Remaining (gal):	0			300			300
Lost (gal)	845			2340			3185
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	
	—	—	—	—	—	—	—
Drilling Fluid Lost to Ground (gal):	3185 gal						
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time	Pass/Fail	Comments			
	—	—	—	NA			
Discharge Start Time:	Discharge End Time:		Discharge Duration (min.):				
Length of Casing (ft):	Drilling Fluid Depth Below Top of Casing (ft):	Length of Drill Fluid Col. (ft):	Casing Dia. (in.):	Casing Area (ft ²):			
				7-in. is 0.27 ft ² 12-in. is 0.71 ft ²			
Discharge Vol. (gal.). ~200 gallons max:			$k = h * j * 7.481 \text{ gal/ft}^3$				
Observations During Discharge	Oily Sheen (Y/N & Comments)			Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			
	—			—			

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	0.74	Volume of Discharge Due to Rainfall (gal.)	1183 gal
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Day Shift		Night Shift
	Washdown 1	Washdown 2	Washdown 3
	—	—	—
	—	—	10 x 12 gpm 120 gal
Total Deck Drainage Discharge (gal.) ~2570 gal. max:	1303 gal		

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	9/3/15 10:33	N	N
2nd Slack Water	9/3/15 16:25	N	N
3rd Slack Water	9/3/15 22:38	N	N
4th Slack Water	9/4/15 04:55	N	N
Other Observations, Non-Permitted Discharges, or Comments			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 3

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: 9/4/15 0700 to 9/5/15 0700
Borehole: MB-15 Borehole: 1 of 1 For Day
Latitude: 60.65898078°N Longitude: 151.37165869°W
Day Shift Observer: J. Greenwell Night Shift Observer: A. Fee
& Shift Time: 0700-1900 & Shift Time: 1900-0700
Drilling Start Time: 9/4/15 0830 Drilling End Time: 9/4/15 1150

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):	1320						a) 1320
Remaining (gal):	0						b) 0
Lost (gal)	1320						c) 1320
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	d) 0
Drilling Fluid Lost to Ground (gal):	e) 1320						
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time		Pass/Fail	Comments		
	17:11	17:15		Pass	No slick/sheen		
Discharge Start Time:	17:20	Discharge End Time:		17:35	Discharge Duration (min.):		15
Length of Casing (ft):	40	Drilling Fluid Depth Below Top of Casing (ft):	15	Length of Drill Fluid Col. (ft):	25	Casing Dia. (in.):	7
				Casing Area (ft ²):		0.27	
				7-in. is 0.27 ft ²		12-in. is 0.71 ft ²	
Discharge Vol. (gal.). ~200 gallons max:				50 gal		k = h * j * 7.481 gal/ft ³	
Observations During Discharge	Oily Sheen (Y/N & Comments)			Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			
	N			N			

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	Volume of Discharge Due to Rainfall (gal.)
0.12	m) 11599.3 192
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Total
Day Shift	Night Shift
Washdown 1	Washdown 2
Washdown 3	Washdown 4
Washdown 5	Washdown 6
10 min. x 12 gpm 120 gal	
Total Deck Drainage Discharge (gal.) ~2570 gal. max:	n) 120

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	9/4/15 11:25	N	N
2nd Slack Water	9/4/15 17:16	N	N
3rd Slack Water	9/4/15 23:23	N	N
4th Slack Water	9/5/15 05:50	N	N
Other Observations, Non-Permitted Discharges, or Comments			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 3

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: 9/5/15 0700 to 9/6/15 0700
Borehole: MB-16 of 1 For Day
Latitude: 60.49129686°N Longitude: 151.37525403°W
Day Shift Observer: J. Greenwald 0700-1900 Night Shift Observer: A. Fee 1900-0700
& Shift Time: 9/5/15 12:00 & Shift Time: 9/6/15 06:45
Drilling Start Time: 9/5/15 12:00 Drilling End Time: 9/6/15 06:45

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):	950			1900			2850
Remaining (gal):	0			100			100
Lost (gal)	950			1800			2750
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	0
Drilling Fluid Lost to Ground (gal):	2750						
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time		Pass/Fail	Comments		
					NA		
Discharge Start Time:	Discharge End Time:				Discharge Duration (min.):		
Length of Casing (ft):	Drilling Fluid Depth Below Top of Casing (ft):	Length of Drill Fluid Col. (ft):	Casing Dia. (in.):	Casing Area (ft ²):			
				7-in. is 0.27 ft ² 12-in. is 0.71 ft ²			
Discharge Vol. (gal.). ~200 gallons max:					$k = h * j * 7.481 \text{ gal/ft}^3$		
Observations During Discharge	Oily Sheen (Y/N & Comments)			Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			
	NA			NA			

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	0	Volume of Discharge Due to Rainfall (gal.)	$m = 1599.3$
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.			
	Day Shift	Night Shift	
	Washdown 1	Washdown 2	Washdown 3
			500 x 12 gpm (100 gal)
Total Deck Drainage Discharge (gal.) ~2570 gal. max:	60 gal.		

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	9/5/15 12:37	N	N
2nd Slack Water	9/5/15 18:00	N	N
3rd Slack Water	9/6/15 00:28	N	N
4th Slack Water	9/6/15 07:03	N	N
Other Observations, Non-Permitted Discharges, or Comments			
Moved to MB-16 9/5/15 at 11:00 from MB-15. No drilling or discharge at MB-15 today.			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 3

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: 9/6/15 0700
Borehole: MB-16
Latitude: 60.49129626 °N
Day Shift Observer & Shift Time: J. Greenwald - 0700-1900
Drilling Start Time: 9/6/15 0740

to 9/7/15 0700
Borehole: 1 of 1 For Day
Longitude: 151.37525403 °W
Night Shift Observer & Shift Time: A. Fox - 1900-0700
Drilling End Time: 0105 9/7/15

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):	3060 gal			800			(b)
Remaining (gal):	0			0			(b)
Lost (gal)	3060 gal			800			(c) (a) - (b)
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	(c)
	—	—	—	—	—	—	
Drilling Fluid Lost to Ground (gal):							
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time	Pass/Fail	Comments			
	0033	0038	Pass	No sheen observed			
Discharge Start Time:	Discharge End Time:		Discharge Duration (min.):				
Length of Casing (ft): ⁽¹⁾ 50	Drilling Fluid Depth Below Top of Casing (ft): ⁽²⁾ 15	Length of Drill Fluid Col. (ft): ^{(3) = (1) - (2)} 35	Casing Dia. (in.):	7	Casing Area (ft ²): ⁽⁴⁾ 7-in. is 0.27 ft ² 12-in. is 0.71 ft ²	0.27	
Discharge Vol. (gal.). ~200 gallons max:			7 gal		$k = h * j * 7.481 \text{ gal/ft}^3$		
Observations During Discharge	Oily Sheen (Y/N & Comments)		Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)				
	N —————		N —————				

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	Volume of Discharge Due to Rainfall (gal.)	m) = 1599.3					
0.37	592						
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Day Shift			Night Shift			Total
	Washdown 1	Washdown 2	Washdown 3	Washdown 4	Washdown 5	Washdown 6	
	15 min x 12 gpm 180 gal	—	—	10 min x 12 gpm 120 gal	—	—	
Total Deck Drainage Discharge (gal.) ~2570 gal. max:			892				

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	9/6/15 0703	N —————	N —————
2nd Slack Water	9/6/15 13:51	N —————	N —————
3rd Slack Water	9/6/15 19:35	N —————	N —————
4th Slack Water	9/7/15 01:39	N —————	N —————
Other Observations, Non-Permitted Discharges, or Comments			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 3

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: 9/7/15 0700 to 9/8/15 0700
Borehole: MB-20 Borehole: 1 of 1 For Day
Latitude: 60.65661392°N Longitude: 151.36889178°W
Day Shift Observer: J. Gronwald Night Shift Observer: A. Fee
& Shift Time: 0700-1900 & Shift Time: 1900-0700
Drilling Start Time: 9/7/15 07:55 Drilling End Time: 9/8/15 06:40

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):	1003			2640			3643
Remaining (gal):	0			0			0
Lost (gal)	1003			2640			3643
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	0
Drilling Fluid Lost to Ground (gal):	3643						
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time		Pass/Fail	Comments		
					NA		
Discharge Start Time:	Discharge End Time:		Discharge Duration (min.):				
Length of Casing (ft):	Drilling Fluid Depth Below Top of Casing (ft):	Length of Drill Fluid Col. (ft):	Casing Dia. (in.):	Casing Area (ft ²):			
				7-in. is 0.27 ft ² 12-in. is 0.71 ft ²			
Discharge Vol. (gal.). ~200 gallons max:			$k = h * j * 7.481 \text{ gal/ft}^3$				
Observations	Oily Sheen (Y/N & Comments)			Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			
During Discharge	NA			NA			

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	Volume of Discharge Due to Rainfall (gal.)
0	1599.3
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Total
Day Shift	
Washdown 1	Washdown 2
Washdown 3	Washdown 4
Washdown 5	Washdown 6
120 gal	120
Total Deck Drainage Discharge (gal.) ~2570 gal. max:	120 gal

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	9/7/15 08:21	N	N
2nd Slack Water	9/7/15 15:02	N	N
3rd Slack Water	9/7/15 20:47	N	N
4th Slack Water	9/8/15 02:49	N	N
Other Observations, Non-Permitted Discharges, or Comments			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 3

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: 9/8/15 0700 to 9/9/15 0700
Borehole: MB-20 of 1 For Day
Latitude: 60.65661392°N Longitude: 151.3689178°W
Day Shift Observer: J. Greenwald 0700-1900 Night Shift Observer: A. Fee 1900-0700
& Shift Time: J. Greenwald 0700-1900 & Shift Time: A. Fee 1900-0700
Drilling Start Time: Drilling completed. See below. Drilling End Time:

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):	0						0
Remaining (gal):	0						0
Lost (gal)	0						0
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	0
Drilling Fluid Lost to Ground (gal):	0						
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time	Pass/Fail	Comments			
	09:05	09:10	Pass	No slick/sheen.			
Discharge Start Time:	09:40	Discharge End Time:	09:50	Discharge Duration (min.):		10	
Length of Casing (ft):	45	Drilling Fluid Depth Below Top of Casing (ft):	21	Length of Drill Fluid Col. (ft):	24	Casing Dia. (in.):	7
						Casing Area (ft ²):	0.27
						7-in. is 0.27 ft ²	
						12-in. is 0.71 ft ²	
Discharge Vol. (gal.). ~200 gallons max:			48 gal.		k = h * j * 7.481 gal/ft ³		
Observations During Discharge	Oily Sheen (Y/N & Comments)			Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			
	N			N			

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	0.66	Volume of Discharge Due to Rainfall (gal.)	1056																					
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	<table border="1"> <thead> <tr> <th colspan="3">Day Shift</th> <th colspan="3">Night Shift</th> <th>Total</th> </tr> <tr> <th>Washdown 1</th> <th>Washdown 2</th> <th>Washdown 3</th> <th>Washdown 4</th> <th>Washdown 5</th> <th>Washdown 6</th> <th></th> </tr> </thead> <tbody> <tr> <td>10 min x 12 gpm 120 gal</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>120</td> </tr> </tbody> </table>			Day Shift			Night Shift			Total	Washdown 1	Washdown 2	Washdown 3	Washdown 4	Washdown 5	Washdown 6		10 min x 12 gpm 120 gal						120
Day Shift			Night Shift			Total																		
Washdown 1	Washdown 2	Washdown 3	Washdown 4	Washdown 5	Washdown 6																			
10 min x 12 gpm 120 gal						120																		
Total Deck Drainage Discharge (gal.) ~2570 gal. max:	1176																							

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	9/8/15 09:33	N	N
2nd Slack Water	9/8/15 16:03	N	N
3rd Slack Water	9/8/15 21:52	N	N
4th Slack Water	9/9/15 03:50	N	N
Other Observations, Non-Permitted Discharges, or Comments			
MB-20 drilling completed. Pulled casing at slack water.			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 3

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: 9/9/15 0700 to 9/10/15 0700
Borehole: MB-25 of 1 For Day
Latitude: 60.65322350°N Longitude: 151.36967892°W
Day Shift Observer: J. Greenwald 0700-1900 Night Shift Observer: No Night Shift See below.
& Shift Time: 9/9/15 09:25 & Shift Time: 9/9/15 16:20
Drilling Start Time: 9/9/15 09:25 Drilling End Time: 9/9/15 16:20

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes		Day Shift		Night Shift		Total	
Created (gal):		1056				a) 1056	
Remaining (gal):		0				b) 0	
Lost (gal)		1056				c) 1056	
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:		Event 1	Event 2	Event 3	Event 4	Event 5	Event 6
		—	—	—	—	—	0
Drilling Fluid Lost to Ground (gal):		1056 gal					
Drilling Fluid Discharges							
Results of Static Sheen Test		Start Time	End Time	Pass/Fail	Comments		
		16:25	16:30	Pass	0% slick/sheen		
Discharge Start Time:		16:30	Discharge End Time:	16:35	Discharge Duration (min.):		5
Length of Casing (ft):	55	Drilling Fluid Depth Below Top of Casing (ft):	5	Length of Drill Fluid Col. (ft):	50	Casing Dia. (in.):	7
						Casing Area (ft ²):	0.27
						7-in. is 0.27 ft ²	
						12-in. is 0.71 ft ²	
Discharge Vol. (gal.). ~200 gallons max:		101 gal					
		k = h * j * 7.481 gal/ft ³					
Observations During Discharge		Oily Sheen (Y/N & Comments)			Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)		
		N —			N —		

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)		Volume of Discharge Due to Rainfall (gal.)					
0.07		112 gal					
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.		Day Shift		Night Shift		Total	
		Washdown 1	Washdown 2	Washdown 3	Washdown 4	Washdown 5	Washdown 6
		—	—	—	—	—	0
Total Deck Drainage Discharge (gal.) ~2570 gal. max:		112 gal.					

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	9/9/15 10:30	N —	N —
2nd Slack Water	9/9/15 16:54	N —	N —
3rd Slack Water	9/9/15 22:46	Rig Unmanned. See below.	—
4th Slack Water	9/10/15 04:42	Rig Unmanned. See below.	—
Other Observations, Non-Permitted Discharges, or Comments			
* Rig unmanned 9/9/15 17:20 - 9/10/15 0700 due to weather.			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 3

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: 9/10/15 0700 to 9/11/15 0700
Borehole: MB-26 Borehole: 1 of 2 For Day
Latitude: 60.65218953°N Longitude: 151.3732790°W
Day Shift Observer & Shift Time: J. Greenwald 0700-1900 Night Shift Observer & Shift Time: A. Fee 1900-0700
Drilling Start Time: 9/10/15 17:35 Drilling End Time: 9/11/15 0500

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):	250			2200			2450
Remaining (gal):	0			0			0
Lost (gal)	250			2200			2450
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	0
Drilling Fluid Lost to Ground (gal):	2450 gal.						
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time	Pass/Fail	Comments			
	0443	0448	Pass	No sheen or slick			
Discharge Start Time:	0450	Discharge End Time:	0455	Discharge Duration (min.): 5			
Length of Casing (ft): 56	Drilling Fluid Depth Below Top of Casing (ft): 7.9	Length of Drill Fluid Col. (ft): 48.1	Casing Dia. (in.): 7"	Casing Area (ft ²): 7-in. is 0.27 ft ² 12-in. is 0.71 ft ²		0.27	
Discharge Vol. (gal.). ~200 gallons max:			97 gallons		k = h * j * 7.481 gal/ft ³		
Observations During Discharge	Oily Sheen (Y/N & Comments)		Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)				
	N		N				

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	0.13	Volume of Discharge Due to Rainfall (gal.)	11599.3
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	208 gal		
	Day Shift		Night Shift
	Washdown 1	Washdown 2	Washdown 3
	10x12 gpm	120 gpm	
	Total		120
Total Deck Drainage Discharge (gal.). ~2570 gal. max:	328 gal		

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	9/10/15 11:13	N	N
2nd Slack Water	9/10/15 17:34	N	N
3rd Slack Water	9/10/15 23:29	N	N
4th Slack Water			
Other Observations, Non-Permitted Discharges, or Comments			
*Sheet 1/2			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: 9/10/15 0700
Borehole: MB-31
Latitude: 60.64981225°N
Day Shift Observer & Shift Time: Jesse Greenwald 0700-1900
Drilling Start Time: 09/11/2015 0800-

to 9/11/15 0700
Borehole: 2 of 2 For Day
Longitude: -151.37039636
Night Shift Observer & Shift Time: Austin FEE 1900-0700
Drilling End Time: 9/11/15 0700

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes		Day Shift		Night Shift		Total	
Created (gal):				200		200	
Remaining (gal):				0		0	
Lost (gal)				200		200	
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:		Event 1	Event 2	Event 3	Event 4	Event 5	Event 6
Drilling Fluid Lost to Ground (gal):		200					
Drilling Fluid Discharges							
Results of Static Sheen Test		Start Time	End Time	Pass/Fail	Comments		
					NA		
Discharge Start Time:		Discharge End Time:		Discharge Duration (min.):			
Length of Casing (ft):	Drilling Fluid Depth Below Top of Casing (ft):	Length of Drill Fluid Col. (ft):	Casing Dia. (in.):	Casing Area (ft ²):			
				7-in. is 0.27 ft ² 12-in. is 0.71 ft ²			
Discharge Vol. (gal.). ~200 gallons max:			k = h * j * 7.481 gal/ft ³				
Observations During Discharge		Oily Sheen (Y/N & Comments)		Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			
NA				NA			

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	Volume of Discharge Due to Rainfall (gal.)						
See Sheet 1	See Sheet 1						
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Day Shift		Night Shift				Total
	Washdown 1	Washdown 2	Washdown 3	Washdown 4	Washdown 5	Washdown 6	
Total Deck Drainage Discharge (gal.) ~2570 gal. max:		0					

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	9/11/15 05:26	N	N
2nd Slack Water			
3rd Slack Water			
4th Slack Water			
Other Observations, Non-Permitted Discharges, or Comments			
*Sheet 2/2 *No Day Shift Drilling at MB-31 this observation period.			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 3
APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: 9/11/15 0700 to 9/12/15 0700
Borehole: MB-31 of 2 For Day
Latitude: 60.64981225°N
Longitude: 151.37039036°W
Day Shift Observer: J. Greenwald 0700-1900
Night Shift Observer: A. Fee 1900-0700
& Shift Time:
Drilling Start Time: 9/11/15 0820
Drilling End Time: 9/11/15 15:50

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Day Shift				Night Shift			Total
Drilling Fluid Volumes	2300						2300
Created (gal):	2300						0
Remaining (gal):	0						2300
Lost (gal)	2300						0
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	0
Drilling Fluid Lost to Ground (gal):	2300						

Drilling Fluid Discharges					Comments	
Results of Static Sheen Test	Start Time	End Time	Pass/Fail			
	17:08	17:15	Pass	0% slick/sheen		
Discharge Start Time:	17:20	Discharge End Time:	17:30	Discharge Duration (min.):	10	
Length of Casing (ft):	60	Drilling Fluid Depth Below Top of Casing (ft):	6	Length of Drill Fluid Col. (ft):	54	
		Casing Dia. (in.):	7	Casing Area (ft ²):	0.27	
				7-in. is 0.27 ft ²		
				12-in. is 0.71 ft ²		
Discharge Vol. (gal.). ~200 gallons max:			109 gal.	$k = h * j * 7.481 \text{ gal/ft}^3$		
Observations During Discharge			Oily Sheen (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)		
N			N	N		

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	0.05	Volume of Discharge Due to Rainfall (gal.)	80 gal				
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Day Shift						
	Washdown 1	Washdown 2	Washdown 3	Washdown 4	Washdown 5	Washdown 6	Total
							0
Total Deck Drainage Discharge (gal.) ~2570 gal. max:		80 gal					

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	9/11/15 11:49	N	N
2nd Slack Water			
3rd Slack Water			
4th Slack Water			
Other Observations, Non-Permitted Discharges, or Comments			
* Sheen + 1/2			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 3

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: 9/11/15 0700 to 9/12/15 0700
 Borehole: MB-02 Borehole: 2 of 2 For Day
 Latitude: 60.66969211°N Longitude: 151.38962336°W
 Day Shift Observer: J. Greenwell 0700-1900 Night Shift Observer: A. F. 1900-0700
 & Shift Time: 2315 9/11/2015 & Shift Time:
 Drilling Start Time: Drilling End Time:

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):	N/A			600			600
Remaining (gal):	N/A			0			0
Lost (gal)	N/A			600			600
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	
	N/A	N/A	N/A	—	—	—	0
Drilling Fluid Lost to Ground (gal):	600						
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time	Pass/Fail	Comments			
	N/A	N/A	N/A	N/A			
Discharge Start Time:	N/A	Discharge End Time:	N/A	Discharge Duration (min.):		N/A	
Length of Casing (ft):	N/A	Drilling Fluid Depth Below Top of Casing (ft):	N/A	Length of Drill Fluid Col. (ft):	N/A	Casing Dia. (in.):	N/A
						Casing Area (ft ²):	N/A
						7-in. is 0.27 ft ²	
						12-in. is 0.71 ft ²	
Discharge Vol. (gal.). ~200 gallons max:	N/A			k = h * j * 7.481 gal/ft ³			
Observations During Discharge	Oily Sheen (Y/N & Comments)			Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			
	N/A			N/A			

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	Volume of Discharge Due to Rainfall (gal.)
See Sheet 1	See Sheet 1
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	
	Day Shift
	Night Shift
	Total
	Washdown 1
	Washdown 2
	Washdown 3
	Washdown 4
	Washdown 5
	Washdown 6
	60 gal
Total Deck Drainage Discharge (gal.) ~2570 gal. max:	60 gal.

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	9/11/15 18:09	N	N
2nd Slack Water	9/12/15 00:08	N	N
3rd Slack Water	9/12/15 06:06	N	N
4th Slack Water			
Other Observations, Non-Permitted Discharges, or Comments			
* Sheet 2/2			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 3

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: 9/12/15 0700 to 9/13/15 0700
Borehole: MB-02 Borehole: 1 of 1 For Day
Latitude: 60.649812250N Longitude: 151.370390360W
Day Shift Observer: J. Greenwald Night Shift Observer: A. Fee
& Shift Time: 0700-1900 & Shift Time: 1900-0700
Drilling Start Time: 9/12/15 08:15 Drilling End Time: 9/12/15 11:55

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes		Day Shift			Night Shift		Total
Created (gal):		850			NA		850
Remaining (gal):		0			NA		0
Lost (gal)		850			NA		850
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:		Event 1	Event 2	Event 3	Event 4	Event 5	Event 6
		—	—	—	NA	—	—
Drilling Fluid Lost to Ground (gal):		850 gal.					
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time		End Time		Pass/Fail	Comments	
	1205		1210		PASS	0% slick/sheen	
Discharge Start Time:		Discharge End Time:		Discharge Duration (min.):		10	
Length of Casing (ft):	70	Drilling Fluid Depth Below Top of Casing (ft):	30	Length of Drill Fluid Col. (ft):	40	Casing Dia. (in.):	7
						Casing Area (ft ²):	0.27
						7-in. is 0.27 ft ²	
						12-in. is 0.71 ft ²	
Discharge Vol. (gal.). ~200 gallons max:				81 gal		$k = h * j * 7.481 \text{ gal/ft}^3$	
Observations During Discharge	Oily Sheen (Y/N & Comments)				Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)		
	N —————				N —————		

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	0.14	Volume of Discharge Due to Rainfall (gal.)		224 gal		
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Day Shift			Night Shift		
	Washdown 1	Washdown 2	Washdown 3	Washdown 4	Washdown 5	Washdown 6
	—	—	—	—	—	—
Total Deck Drainage Discharge (gal.) ~2570 gal. max:				224 gal.		

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	9/12/15 12:21	N —————	N —————
2nd Slack Water	9/12/15 18:41	N —————	N —————
3rd Slack Water	9/13/15 00:43	N —————	N —————
4th Slack Water	9/13/15 06:44	N —————	N —————
Other Observations, Non-Permitted Discharges, or Comments			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 3

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: 9/14/15 0700 to 9/15/15 0700
Borehole: ASRC Quayside Borehole: 0 of 0 For Day
Latitude: _____ Longitude: _____
Day Shift Observer: Tony Fairway 0700-1900 Night Shift Observer: Mark Bray 1900-0700
& Shift Time: _____ & Shift Time: _____
Drilling Start Time: No Drilling. See Below Drilling End Time: No Drilling. See Below

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):	NA			NA			NA
Remaining (gal):	NA			NA			NA
Lost (gal)	NA			NA			NA
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	
	NA	—	—	NA	—	—	—
Drilling Fluid Lost to Ground (gal):	NA						
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time		Pass/Fail	Comments		
	—	—		—	NA		
Discharge Start Time:	Discharge End Time:				Discharge Duration (min.):		
Length of Casing (ft):	Drilling Fluid Depth Below Top of Casing (ft):	Length of Drill Fluid Col. (ft):	Casing Dia. (in.):	Casing Area (ft ²):			
				7-in. is 0.27 ft ² 12-in. is 0.71 ft ²			
Discharge Vol. (gal.). ~200 gallons max:			k = h * j * 7.481 gal/ft ³				
Observations	Oily Sheen (Y/N & Comments)			Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			
During Discharge	NA			NA			

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	Volume of Discharge Due to Rainfall (gal.)
0.21	336 gal
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Day Shift
	Washdown 1
	Washdown 2
	Washdown 3
	Washdown 4
	Washdown 5
	Washdown 6
Total Deck Drainage Discharge (gal.) ~2570 gal. max:	336 gal

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	9/14/15 07:22	N	N
2nd Slack Water	9/14/15 13:27	N	N
3rd Slack Water	9/14/15 19:42	N	N
4th Slack Water	9/15/15 01:53	N	N
Other Observations, Non-Permitted Discharges, or Comments			
# Rig at ASRC quayside due to weather. No drilling operations.			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 3

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: 9/15/15 0700
Borehole: ASRC quayside
Latitude: _____
Day Shift Observer
& Shift Time: J. Greenwald 0700-1900
Drilling Start Time: No Drilling, See Below.

to 9/16/15 0700
Borehole: 0 of 0 For Day
Longitude: _____
Night Shift Observer
& Shift Time: Rig unmanned. See below
Drilling End Time: No Drilling, See Below.

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes		Day Shift		Night Shift		Total	
Created (gal):		NA		NA		NA	
Remaining (gal):		NA		NA		NA	
Lost (gal)		NA		NA		NA	
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	
	NA	—	—	NA	—	—	
Drilling Fluid Lost to Ground (gal):		NA					
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time	Pass/Fail	Comments			
	—	—	—	NA			
Discharge Start Time:	Discharge End Time:		Discharge Duration (min.):				
Length of Casing (ft):	Drilling Fluid Depth Below Top of Casing (ft):	Length of Drill Fluid Col. (ft):	Casing Dia. (in.):	Casing Area (ft ²):			
				7-in. is 0.27 ft ² 12-in. is 0.71 ft ²			
Discharge Vol. (gal.). ~200 gallons max:			k = h * j * 7.481 gal/ft ³				
Observations During Discharge	Oily Sheen (Y/N & Comments)		Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)				
	NA		NA				

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	Volume of Discharge Due to Rainfall (gal.)
0.29	464 gal
Volume of Discharge From Deck Washdown (gal.): Estimate based on duration and approximate flow rate during washdowns.	Day Shift
	Washdown 1 Washdown 2 Washdown 3 Washdown 4 Washdown 5 Washdown 6 Total
Total Deck Drainage Discharge (gal.) ~2570 gal. max:	
464 gal	

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	9/15/15 08:02	N	N
2nd Slack Water	9/15/15 14:03	N	N
3rd Slack Water	9/15/15 20:14	Rig unmanned. See below.	Rig unmanned. See below.
4th Slack Water	9/16/15 02:29	↓	↓
Other Observations, Non-Permitted Discharges, or Comments			
# Rig at ASRC due to weather. No drilling operations. Rig manned during daytime only.			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 3
APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: 9/16/15 0700
Borehole: MB-06
Latitude: 60.66501117°N
Day Shift Observer & Shift Time: J. Greenwald 0700-1900
Drilling Start Time: 9/16/15 16:10

to 9/17/15 0700 of For Day
Borehole: 151.38379131°W
Longitude: A. Fee 1900-0700
Night Shift Observer & Shift Time: 9/17/15 0600
Drilling End Time:

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)								
Day Shift				Night Shift			Total	
Drilling Fluid Volumes	210				528			738
Created (gal):	0				0			0
Remaining (gal):	210				528			738
Lost (gal)								
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6		
	—	—	—	—	—	—		
Drilling Fluid Lost to Ground (gal):	738 gal							
Drilling Fluid Discharges								
Results of Static Sheen Test	Start Time	End Time	Pass/Fail	Comments				
			NA	—				
Discharge Start Time:	Discharge End Time:		Discharge Duration (min.):					
Length of Casing (ft):	Drilling Fluid Depth Below Top of Casing (ft):	Length of Drill Fluid Col. (ft):	Casing Dia. (in.):	Casing Area (ft ²): 7-in. is 0.27 ft ² 12-in. is 0.71 ft ²				
Discharge Vol. (gal.). ~200 gallons max:			$k = h * j * 7.481 \text{ gal/ft}^3$					
Observations During Discharge	Oily Sheen (Y/N & Comments)			Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)				
	NA			NA				

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	0.29	Volume of Discharge Due to Rainfall (gal.)						Total
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Day Shift			Night Shift			Total	
	Washdown 1	Washdown 2	Washdown 3	Washdown 4	Washdown 5	Washdown 6		
	—	—	—	5 min x 12 gpm 60 gal	—	—	60	
Total Deck Drainage Discharge (gal.). ~2570 gal. max:	524 gal							

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	9/16/15 08:44	N	N
2nd Slack Water	9/16/15 14:40	N	N
3rd Slack Water	9/16/15 20:48	N	N
4th Slack Water	9/17/15 03:06	N	N
Other Observations, Non-Permitted Discharges, or Comments			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 3

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: 9/18/15 0700 to 9/19/15 0700
Borehole: MB-06 of 1 For Day
Latitude: 60.66501117°N Longitude: 151.38379131°W
Day Shift Observer: J. Greenwald 0700-1900 Night Shift Observer: A. Fee 1900-0700
& Shift Time: 0700-1900 & Shift Time: 1900-0700
Drilling Start Time: 9/18/15 0730 Drilling End Time: 9/18/15 15:55

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):	1600			200			1800
Remaining (gal):	0			0			0
Lost (gal)	1600			200			1800
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	0
Drilling Fluid Lost to Ground (gal):	1800						
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time	Pass/Fail	Comments			
	0305	0310	Pass	No slick/sheen			
Discharge Start Time:	0325	Discharge End Time:	0330	Discharge Duration (min.):		5	
Length of Casing (ft):	65	Drilling Fluid Depth Below Top of Casing (ft):	27	Length of Drill Fluid Col. (ft):	38	Casing Dia. (in.):	12"
						Casing Area (ft ²):	0.71
						7-in. is 0.27 ft ²	
						12-in. is 0.71 ft ²	
Discharge Vol. (gal.). ~200 gallons max:		202		k = h * j * 7.481 gal/ft ³			
Observations During Discharge	Oily Sheen (Y/N & Comments)			Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			
	N			N			

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	0	Volume of Discharge Due to Rainfall (gal.)	(n) = 1599.3
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	0		
	Day Shift		Night Shift
	Washdown 1	Washdown 2	Washdown 3
	6 min x 10 gpm	10 min x 12 gpm	
	60 gal.	120 gal.	
Total Deck Drainage Discharge (gal.) ~2570 gal. max:	180		

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	9/18/15 10:17	N	N
2nd Slack Water	9/18/15 16:05	N	N
3rd Slack Water	9/18/15 22:06	N	N
4th Slack Water	9/19/15 04:27	N	N
Other Observations, Non-Permitted Discharges, or Comments			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 4

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: 9/23/15 0700 to 9/24/15 0700
Borehole: ASRC Quayside Borehole: 0 of 0 For Day
Latitude: _____ Longitude: _____
Day Shift Observer _____ Night Shift Observer _____
& Shift Time: J. Greenwald 0700-1900 & Shift Time: Rig Unmanned
Drilling Start Time: No Drilling Drilling End Time: No Drilling

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):	—			—			a) NA
Remaining (gal):	—			—			b) NA
Lost (gal)	—			—			c) NA
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	d) NA
	—	—	—	—	—	—	
Drilling Fluid Lost to Ground (gal):	NA						
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time	Pass/Fail	Comments			
	—	—	—	NA			
Discharge Start Time:	Discharge End Time:				Discharge Duration (min.):		—
Length of Casing (ft):	Drilling Fluid Depth Below Top of Casing (ft):	Length of Drill Fluid Col. (ft):	Casing Dia. (in.):	Casing Area (ft ²):	7-in. is 0.27 ft ²		
	—	—	—	—	—		
Discharge Vol. (gal.). ~200 gallons max:			k = h * j * 7.481 gal/ft ³				
Observations During Discharge	Oily Sheen (Y/N & Comments)			Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			
	NA			NA			

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	0	Volume of Discharge Due to Rainfall (gal.)	m) ~1559.5 gal
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Day Shift		
	Washdown 1	Washdown 2	Washdown 3
	—	—	—
	Washdown 4	Washdown 5	Washdown 6
	—	—	—
Total Deck Drainage Discharge (gal.) ~2570 gal. max:	0 gal.		

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	9/23/15 08:46	N	N
2nd Slack Water	9/23/15 15:27	N	N
3rd Slack Water	9/23/15 21:10	Rig unmanned	Rig unmanned
4th Slack Water	9/24/15 03:17	↓	↓
Other Observations, Non-Permitted Discharges, or Comments			
* Rig at ASRC quayside due to weather. No drilling operations. Rig manned during day time only.			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 4

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: 9/24/15 0700 to 9/25/15 0700
Borehole: ASRC Quayside Borehole: 0 of 0 For Day
Latitude: _____ Longitude: _____
Day Shift Observer: _____ Night Shift Observer: _____
& Shift Time: T. Fairway 0700-1900 & Shift Time: Rig unmanned
Drilling Start Time: No Drilling Drilling End Time: No Drilling

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes		Day Shift		Night Shift		Total	
Created (gal):		_____		_____		a) NA	
Remaining (gal):		_____		_____		b) NA	
Lost (gal)		_____		_____		c) NA	
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:		Event 1	Event 2	Event 3	Event 4	Event 5	Event 6
		_____	_____	_____	_____	_____	_____
Drilling Fluid Lost to Ground (gal):		NA					
Drilling Fluid Discharges							
Results of Static Sheen Test		Start Time	End Time	Pass/Fail	Comments		
		_____	_____	_____	NA		
Discharge Start Time:		Discharge End Time:		Discharge Duration (min.):		_____	
Length of Casing (ft):	_____	Drilling Fluid Depth Below Top of Casing (ft):	_____	Length of Drill Fluid Col. (ft):	_____	Casing Dia. (in.):	_____
						Casing Area (ft ²):	_____
						7-in. is 0.27 ft ²	_____
Discharge Vol. (gal.). ~200 gallons max:				k = h * j * 7.481 gal/ft ³			
Observations During Discharge		Oily Sheen (Y/N & Comments)		Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			
		NA		NA			

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	0	Volume of Discharge Due to Rainfall (gal.)					
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Day Shift		Night Shift				Total
	Washdown 1	Washdown 2	Washdown 3	Washdown 4	Washdown 5	Washdown 6	
	_____	_____	_____	_____	_____	_____	0
Total Deck Drainage Discharge (gal.) ~2570 gal. max:		0 gal.					

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	9/24/15 09:45	N	N
2nd Slack Water	9/24/15 16:17	N	N
3rd Slack Water	9/24/15 22:05	Rig unmanned.	Rig unmanned.
4th Slack Water	9/25/15 04:14	↓	↓
Other Observations, Non-Permitted Discharges, or Comments			
* Rig at ASRC quayside due to weather. No drilling operations. Rig manned during day time only.			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 4

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: 9/25/15 0700 to 9/26/15 0700
Borehole: ASRC Quayside Borehole: 0 of 0 For Day
Latitude: _____ Longitude: _____
Day Shift Observer: _____ Night Shift Observer: _____
& Shift Time: T. Fairway 0700-1900 & Shift Time: Rig unmanned.
Drilling Start Time: No Drilling Drilling End Time: No Drilling

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes		Day Shift		Night Shift		Total	
Created (gal):		_____		_____		NA	
Remaining (gal):		_____		_____		NA	
Lost (gal)		_____		_____		NA	
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:		Event 1	Event 2	Event 3	Event 4	Event 5	Event 6
		_____	_____	_____	_____	_____	NA
Drilling Fluid Lost to Ground (gal):		NA					
Drilling Fluid Discharges							
Results of Static Sheen Test		Start Time	End Time	Pass/Fail	Comments		
		_____	_____	_____	NA		
Discharge Start Time:		Discharge End Time:		Discharge Duration (min.):		_____	
Length of Casing (ft):	Drilling Fluid Depth Below Top of Casing (ft):	Length of Drill Fluid Col. (ft):	Casing Dia. (in.):	Casing Area (ft ²):	7-in. is 0.27 ft ²		
_____	_____	_____	_____	_____	_____		
Discharge Vol. (gal.). ~200 gallons max:			k = h * j * 7.481 gal/ft ³				
Observations During Discharge		Oily Sheen (Y/N & Comments)		Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			
NA		NA		NA			

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	Volume of Discharge Due to Rainfall (gal.)	Total				
0	0 gal.	0				
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.		Total				
Day Shift		0				
Night Shift						
Washdown 1	Washdown 2	Washdown 3	Washdown 4	Washdown 5	Washdown 6	0
_____	_____	_____	_____	_____	_____	
Total Deck Drainage Discharge (gal.) ~2570 gal. max:						0 gal.

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	9/25/15 10:35	N	N
2nd Slack Water	9/25/15 17:00	N	N
3rd Slack Water	9/25/15 22:55	Rig unmanned.	Rig unmanned.
4th Slack Water	9/26/15 05:06	2	2
Other Observations, Non-Permitted Discharges, or Comments			
Rig at ASRC quayside due to weather. No drilling operations. Rig manned during day time only.			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 4

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: 9/30/2015 0700 to 10/1/2015 0700
Borehole: ASRC Quayside Borehole: 0 of 0 For Day
Latitude: - Longitude: -
Day Shift Observer: Sam Pant Night Shift Observer: rig unmanned
& Shift Time: & Shift Time:
Drilling Start Time: no drilling Drilling End Time: no drilling

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):	-			-			N/A
Remaining (gal):	-			-			N/A
Lost (gal)	-			-			N/A
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	N/A
	-	-	-	-	-	-	
Drilling Fluid Lost to Ground (gal):	N/A						
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time	Pass/Fail	Comments			
	-	-	N/A	N/A			
Discharge Start Time:	-	Discharge End Time:	-	Discharge Duration (min.): -			
Length of Casing (ft):	-	Drilling Fluid Depth Below Top of Casing (ft):	-	Length of Drill Fluid Col. (ft):	-	Casing Dia. (in.):	-
						Casing Area (ft ²): 7-in. is 0.27 ft ²	-
Discharge Vol. (gal.). ~200 gallons max:			-		k = h * j * 7.481 gal/ft ³		
Observations During Discharge	Oily Sheen (Y/N & Comments)			Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			
	-			-			

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	Volume of Discharge Due to Rainfall (gal.)						Total
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Day Shift			Night Shift			Total
	Washdown 1	Washdown 2	Washdown 3	Washdown 4	Washdown 5	Washdown 6	
		-	-	-	-	-	
Total Deck Drainage Discharge (gal.) ~2570 gal. max:			0				

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	9/30/2015 0823	N	N
2nd Slack Water	9/30/2015 1421	N	N
3rd Slack Water	9/30/2015 2028	rig unmanned	rig unmanned
4th Slack Water	10/1/2015 0245	rig unmanned	rig unmanned
Other Observations, Non-Permitted Discharges, or Comments			
Rig at ASRC Quayside due to weather. No drilling ops. Rig manned during day time only.			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 4

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: 10/1/2015 0700 to 10/2/2015 0700
Borehole: ASRC Quayside Borehole: 0 of 0 For Day
Latitude: - Longitude: -
Day Shift Observer: Sam Pant Night Shift Observer: rig unmanned
& Shift Time: no drilling & Shift Time: -
Drilling Start Time: no drilling Drilling End Time: -

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):	-			-			a) N/A
Remaining (gal):	-			-			b) N/A
Lost (gal)	-			-			c) N/A
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	d) N/A
	-	-	-	-	-	-	
Drilling Fluid Lost to Ground (gal):	N/A						
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time		Pass/Fail	Comments		
	-	-		N/A	N/A		
Discharge Start Time:	-	Discharge End Time:		-	Discharge Duration (min.):		
	-			-			
Length of Casing (ft):	Drilling Fluid Depth Below Top of Casing (ft):	Length of Drill Fluid Col. (ft):	Casing Dia. (in.):	Casing Area (ft ²):	7-in. is 0.27 ft ²		
	-	-	-	-			
Discharge Vol. (gal.). ~200 gallons max:		N/A			k = h * j * 7.481 gal/ft ³		
Observations	Oily Sheen (Y/N & Comments)			Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			
During Discharge	-			-			

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	Volume of Discharge Due to Rainfall (gal.)	Total
0.0	0.0	0.0
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Day Shift	Night Shift
	Washdown 1	Washdown 2
	-	-
	Washdown 3	Washdown 4
	-	-
	Washdown 5	Washdown 6
	-	-
Total Deck Drainage Discharge (gal.). ~2570 gal. max:	0.0	

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	10/1/2015 0916	N	N
2nd Slack Water	10/1/2015 1511	N	N
3rd Slack Water	10/1/2015 2114	rig unmanned	rig unmanned
4th Slack Water	10/2/2015 0335	"	"
Other Observations, Non-Permitted Discharges, or Comments			
Rig at ASRC Quayside due to weather. No drilling ops. Rig manned during day time only.			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 4

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: 0700 2/10/2015 to 0700 3/10/2015
Borehole: MB-13 Borehole: 1 of 1 For Day
Latitude: 13 932 01.18 N Longitude: 243 5831.40 W
Day Shift Observer & Shift Time: Sam Pant 0700 2/10/2015 Night Shift Observer & Shift Time: Austin Fee 1900 2/10/2015
Drilling Start Time: 1530 2/10/2015 Drilling End Time: 0700 3/10/2015

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):	—			1056			1056
Remaining (gal):	—			—			—
Lost (gal)	—			1056			1056
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	1056
	—	—	—	—	—	—	
Drilling Fluid Lost to Ground (gal):	1056						
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time		Pass/Fail	Comments		
	—	—		N/A	—		
Discharge Start Time:	Discharge End Time:		Discharge Duration (min.):				
Length of Casing (ft):	Drilling Fluid Depth Below Top of Casing (ft):	Length of Drill Fluid Col. (ft):	Casing Dia. (in.):	Casing Area (ft ²):			
—	—	—	—	7-in. is 0.27 ft ²		—	
Discharge Vol. (gal.). ~200 gallons max:			$k = h * j * 7.481 \text{ gal/ft}^3$				
Observations During Discharge	Oily Sheen (Y/N & Comments)			Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			
	—			—			

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	Volume of Discharge Due to Rainfall (gal.)	Total
0.41	655.7	
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Day Shift	Night Shift
	Washdown 1	Washdown 2
	—	—
	Washdown 3	Washdown 4
	—	5 mph x 12 gpm = 60 gpm
	Washdown 5	Washdown 6
	—	—
Total Deck Drainage Discharge (gal.) ~2570 gal. max:	715.7 gal	

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	2/10/2015 1012	N	N
2nd Slack Water	2/10/2015 1603	N	N
3rd Slack Water	2/10/2015 2204	N	N
4th Slack Water	3/10/2015 0428	N	N
Other Observations, Non-Permitted Discharges, or Comments			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 4

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: 0700 3/10/2015
Borehole: MB-13
Latitude: 60.6603° N
Day Shift Observer & Shift Time: Sam Pant 0700-1900
Drilling Start Time: 0730 3/10/2015

to 0700 4/10/2015
Borehole: 1 of 1 For Day
Longitude: 151.3781° W
Night Shift Observer & Shift Time: Austin Tee/Eduardo Polido 1900-0700
Drilling End Time: 2300 3/10/2015

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes		Day Shift		Night Shift		Total	
Created (gal):		1200		528 gal		a)	
Remaining (gal):		0				b)	
Lost (gal)		1200				c) a-b	
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:		Event 1	Event 2	Event 3	Event 4	Event 5	Event 6
		—	—	—	—	—	d)
Drilling Fluid Lost to Ground (gal):		e) c-d					
Drilling Fluid Discharges							
Results of Static Sheen Test		Start Time	End Time	Pass/Fail	Comments		
		0531 hrs	0540	PASS	NO SHEEN/SUCK PRESENT		
Discharge Start Time:		0600	Discharge End Time:	0601	Discharge Duration (min.):		1
Length of Casing (ft):	52	Drilling Fluid Depth Below Top of Casing (ft):	22	Length of Drill Fluid Col. (ft):	30	Casing Dia. (in.):	7"
						Casing Area (ft ²):	0.27
						7-in. is 0.27 ft ²	
Discharge Vol. (gal.). ~200 gallons max:		61		k = h * j * 7.481 gal/ft ³			
Observations During Discharge		Oily Sheen (Y/N & Comments)		Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			
		N		N			

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	0.59	Volume of Discharge Due to Rainfall (gal.)		m) a * 1599.3		943.5	
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Day Shift			Night Shift			Total
	Washdown 1	Washdown 2	Washdown 3	Washdown 4	Washdown 5	Washdown 6	
	—	—	10 min x 12 gpm = 120 gal	10 min x 12 gpm = 120 gal	—	—	
Total Deck Drainage Discharge (gal.). ~2570 gal. max:		1183.59					

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	3/10/2015 1112	N	N
2nd Slack Water	3/10/2015 1700	N	N
3rd Slack Water	3/10/2015 2259	N	N
4th Slack Water	4/10/2015 0527	N	N
Other Observations, Non-Permitted Discharges, or Comments			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 4

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: 0700 4/10/2015
Borehole: MB-13
Latitude: 60.6603°N
Day Shift Observer & Shift Time: Sam Pant (0700-1900)
Drilling Start Time: no drilling

to 0700 5/10/2015
Borehole: 1 of 1 For Day
Longitude: 151.3781°W
Night Shift Observer & Shift Time: Austin Fee/Eduardo Polido (1900-0700)
Drilling End Time: no drilling

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):	132			100			232
Remaining (gal):	0			0			0
Lost (gal)	132			100			232
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	
	-	-	-	-	-	-	-
Drilling Fluid Lost to Ground (gal):	232						
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time	Pass/Fail	Comments			
	-	-	-	-			
Discharge Start Time:	-	Discharge End Time:	-	Discharge Duration (min.): -			
Length of Casing (ft):	Drilling Fluid Depth Below Top of Casing (ft):	Length of Drill Fluid Col. (ft):	Casing Dia. (in.):	Casing Area (ft²):		7-in. is 0.27 ft²	
	-	-	-	-		-	
Discharge Vol. (gal.). ~200 gallons max:			$k = h * j * 7.481 \text{ gal/ft}^3$				
Observations During Discharge	Oily Sheen (Y/N & Comments)			Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			
	-			-			

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	Volume of Discharge Due to Rainfall (gal.)					
0.01	15.993					
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Total					
Day Shift	Night Shift					
Washdown 1	Washdown 2	Washdown 3	Washdown 4	Washdown 5	Washdown 6	
-	15 min (12 gal) = 180 gal	-	-	-	-	180
Total Deck Drainage Discharge (gal.) ~2570 gal. max:						196

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	04/10/2015 1219	N	N
2nd Slack Water	04/10/2015 1804	N	N
3rd Slack Water	05/10/2015 0300	N	N
4th Slack Water	05/10/2015 0636	N	N
Other Observations, Non-Permitted Discharges, or Comments			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 4

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: 10/5/2015 0700 to 10/6/2015 0700
Borehole: MB-13/MB-22 Borehole: 1 of 1 For Day
Latitude: 60.6603°N Longitude: 151.3781°W
Day Shift Observer: Sam Pant 0700-1400 Night Shift Observer: Eduardo Pulido 1900-0700
& Shift Time:
Drilling Start Time: No drilling at MB-13. MB-22: 1320 10/5/15 Drilling End Time: 0700 10/6/2015

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):	634			528			1162
Remaining (gal):	0			0			0
Lost (gal)	634			528			1162
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	0
	—	—	—	—	—	—	
Drilling Fluid Lost to Ground (gal):	— 1162						
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time		Pass/Fail	Comments		
	—	—		—	—		
Discharge Start Time:	—	Discharge End Time:		—	Discharge Duration (min.):		—
Length of Casing (ft):	—	Drilling Fluid Depth Below Top of Casing (ft):	—	Length of Drill Fluid Col. (ft):	—	Casing Dia. (in.):	—
						Casing Area (ft ²):	—
						7-in. is 0.27 ft ²	
Discharge Vol. (gal.). ~200 gallons max:				k = h * j * 7.481 gal/ft ³			
Observations During Discharge	Oily Sheen (Y/N & Comments)			Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			
	—			—			

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	0.00	Volume of Discharge Due to Rainfall (gal.)	1599.3
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	120		
	Day Shift	Night Shift	
	Washdown 1	Washdown 2	Washdown 3
	—	—	10 min @ 12 gpm = 120 gal
	Washdown 4	Washdown 5	Washdown 6
	—	—	—
Total Deck Drainage Discharge (gal.) ~2570 gal. max:	120 gal		

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	10/5/2015 1328	N	N
2nd Slack Water	10/5/2015 1914	N	N
3rd Slack Water	10/6/2015 0113	N	N
4th Slack Water	—	—	—
Other Observations, Non-Permitted Discharges, or Comments			
No drilling/discharge at MB-13. Jack down at MB-13 and MOVED to MB-22 at 12:00 hrs. All observations reported above pertinent to MB-22			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 4

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: 10/6/2015 0700 to 10/7/2015 0700
Borehole: MB-22 Borehole: 1 of 1 For Day
Latitude: 60-65356186°N Longitude: 151-37928597°W
Day Shift Observer & Shift Time: Sam Pant 0700-1900 Night Shift Observer & Shift Time: Eduardo Pulido 1900-0700
Drilling Start Time: 10/6/2015 0700 Drilling End Time: 10/7/2015 0240

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):	1109			2112			3221
Remaining (gal):	0			0			0
Lost (gal)	1109			2112			3221
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	0
Drilling Fluid Lost to Ground (gal):	3221 gal						
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time		Pass/Fail	Comments		
Discharge Start Time:	Discharge End Time:		Discharge Duration (min.):				
Length of Casing (ft):	Drilling Fluid Depth Below Top of Casing (ft):	Length of Drill Fluid Col. (ft):	Casing Dia. (in.):	Casing Area (ft ²):	7-in. is 0.27 ft ²		
Discharge Vol. (gal.). ~200 gallons max:			$k = h * j * 7.481 \text{ gal/ft}^3$				
Observations During Discharge	Oily Sheen (Y/N & Comments)			Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	0.05	Volume of Discharge Due to Rainfall (gal.)		80 gal			
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Day Shift			Night Shift		Total	
	Washdown 1	Washdown 2	Washdown 3	Washdown 4	Washdown 5		Washdown 6
	—	—	5 min x 12 gpm = 60 gal	—	—	10 min x 12 gpm = 120	180
Total Deck Drainage Discharge (gal.). ~2570 gal. max:			260 gal				

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	10/6/2015 0750	N	N
2nd Slack Water	10/6/2015 1433	N	N
3rd Slack Water	10/6/2015 2024	N	N
4th Slack Water	—	—	—
Other Observations, Non-Permitted Discharges, or Comments			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 4

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: 10/7/2015 0700 to 10/8/2015 0700
Borehole: MB-22 / MB-27 Borehole: 1 of 1 For Day
Latitude: MB-22: 60.65356186°N / MB-27: 60.6511592°N Longitude: MB-22: 151.37928597°W / MB-27: 151.37646725°N
Day Shift Observer: Sampant 0700-1900 Night Shift Observer: Eduardo Pulido 1900-0700
& Shift Time: & Shift Time:
Drilling Start Time: 10/7/2015 1800 hr Drilling End Time:

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):	—			1500			1500
Remaining (gal):	—			0			0
Lost (gal)	—			1500			1500
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	
	—	—	—	—	—	—	—
Drilling Fluid Lost to Ground (gal):	1500 gal						
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time		Pass/Fail	Comments		
	10:55	11:10		Pass	No slick/seen		
Discharge Start Time:	11:20	Discharge End Time:		11:21	Discharge Duration (min.):		1.0
Length of Casing (ft):	69 ft	Drilling Fluid Depth Below Top of Casing (ft):	20 ft	Length of Drill Fluid Col. (ft):	49 ft	Casing Dia. (in.):	7"
						Casing Area (ft ²):	0.27 ft ²
						7-in. is 0.27 ft ²	
Discharge Vol. (gal.). ~200 gallons max:				99 gal		$k = h * j * 7.481 \text{ gal/ft}^3$	
Observations	Oily Sheen (Y/N & Comments)			Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			
During Discharge	N			N			

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	0.35	Volume of Discharge Due to Rainfall (gal.)		560 gal			
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Day Shift			Night Shift		Total	
	Washdown 1	Washdown 2	Washdown 3	Washdown 4	Washdown 5		Washdown 6
	—	—	—	—	—		60 gal
Total Deck Drainage Discharge (gal.) ~2570 gal. max:				620 gal			

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	10/7/2015 0858	N	N
2nd Slack Water	10/7/2015 1530	N	N
3rd Slack Water	10/7/2015 2127	N	N
4th Slack Water	10/8/2015 0323	N	N
Other Observations, Non-Permitted Discharges, or Comments			
MOVED to borehole MB-27 from MB-22 at 14:25. Static Sheen test performed on MB-22 after PS logging completed.			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 4

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: Oct 8, 2015 0700 to Oct 9, 2015 0700
Borehole: MB-27 Borehole: 1 of 1 For Day
Latitude: 60.65111592°N Longitude: 151.37646725°W
Day Shift Observer: Sam Pant 0700-1900 Night Shift Observer: Eduardo Pulido 1900-0700
& Shift Time: & Shift Time:
Drilling Start Time: Oct 8, 2015 0730 Drilling End Time: 0500

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes		Day Shift		Night Shift		Total	
Created (gal):		1056		1321		2377	
Remaining (gal):		-		0		0	
Lost (gal)		1056		1321		2377	
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:		Event 1	Event 2	Event 3	Event 4	Event 5	Event 6
		-	-	-	-	-	-
Drilling Fluid Lost to Ground (gal):		2377 gal					
Drilling Fluid Discharges							
Results of Static Sheen Test		Start Time		End Time		Pass/Fail	
Discharge Start Time:		Discharge End Time:		Discharge Duration (min.):			
Length of Casing (ft):		Drilling Fluid Depth Below Top of Casing (ft):		Length of Drill Fluid Col. (ft):		Casing Dia. (in.):	
Discharge Vol. (gal.). ~200 gallons max:				k = h * j * 7.481 gal/ft ³			
Observations During Discharge		Oily Sheen (Y/N & Comments)		Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	Volume of Discharge Due to Rainfall (gal.)						Total
0.01	16 gal						
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Day Shift			Night Shift			Total
	Washdown 1	Washdown 2	Washdown 3	Washdown 4	Washdown 5	Washdown 6	
	-	-	10 min x 12 gpm = 120 gal	-	-	10 min x 12 gpm = 120 gal	240
Total Deck Drainage Discharge (gal.) ~2570 gal. max:							2569

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	10/8/2015 0953	N	N
2nd Slack Water	10/8/2015 1617	N	N
3rd Slack Water	10/8/2015 2218	N	N
4th Slack Water	10/9/2015 0415	N	N
Other Observations, Non-Permitted Discharges, or Comments			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 4

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: Oct 9, 2015 0700 to Oct 10, 2015 0700
Borehole: MB-27 / MB-19 Borehole: 1 of 1 For Day
Latitude: 60.6511592°N / 60.65854333°N Longitude: 151.37646725°W / 151.37877392°W
Day Shift Observer: Sam Pant 0700-1900 Night Shift Observer: Eduardo Pulido 1900-0700
& Shift Time: 0700-1900 & Shift Time: 1900-0700
Drilling Start Time: 2145 hrs at MB-19 Drilling End Time: 0700 hrs
(no drilling at MB-27)

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):	0			660			660
Remaining (gal):	0			0			0
Lost (gal)	0			660			660
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	660
	-	-	-	-	-	-	
Drilling Fluid Lost to Ground (gal):	660 gal						
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time		Pass/Fail	Comments		
	11:58	12:08		Pass	No slick/sheen		
Discharge Start Time:	12:30	Discharge End Time:		12:31	Discharge Duration (min.):		1
Length of Casing (ft):	68	Drilling Fluid Depth Below Top of Casing (ft):	15	Length of Drill Fluid Col. (ft):	53	Casing Dia. (in.):	7
						Casing Area (ft²):	0.27
						7-in. is 0.27 ft²	
Discharge Vol. (gal.). ~200 gallons max:	107 gal			$k = h * j * 7.481 \text{ gal/ft}^3$			
Observations During Discharge	Oily Sheen (Y/N & Comments)			Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			
	N			N			

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	0	Volume of Discharge Due to Rainfall (gal.)	0
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Total		
	Day Shift	Night Shift	
	Washdown 1	Washdown 2	Washdown 3
	-	-	-
	Washdown 4	Washdown 5	Washdown 6
	-	-	-
	10 min x 12 gpm = 120 gal		
Total Deck Drainage Discharge (gal.). ~2570 gal. max:	120 gal		

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	10/9/2015 1035	N	N
2nd Slack Water	10/9/2015 1655	N	N
3rd Slack Water	10/9/2015 2338	N	N
4th Slack Water	10/10/2015 0500	N	N
Other Observations, Non-Permitted Discharges, or Comments			
No drilling at MB-27. Pulled casing after ps logging completed at MB-27. Then moved to MB-19. Arrived at MB-19 at 1625			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 4

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: Oct 10, 2015 0700 to Oct 11, 2015 0700
Borehole: MB-19 Borehole: 1 of 1 For Day
Latitude: 60.65854333°N Longitude: 151.37877392°W
Day Shift Observer: Sam Pant 0700-1900 Night Shift Observer: Eduardo Pulido 1900-0700
& Shift Time: & Shift Time:
Drilling Start Time: Oct 10, 2015 0730 Drilling End Time: Oct 11, 2015 0050 hrs

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes		Day Shift		Night Shift		Total	
Created (gal):		1003		1189		2192	
Remaining (gal):		0		0		0	
Lost (gal)		1003		1189		2192	
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal/max/event:		Event 1	Event 2	Event 3	Event 4	Event 5	Event 6
		—	—	—	—	—	—
Drilling Fluid Lost to Ground (gal):		2192 gal					
Drilling Fluid Discharges							
Results of Static Sheen Test		Start Time	End Time	Pass/Fail	Comments		
		0638	0654	PASS	NO SLICK/SHEEN		
Discharge Start Time:		0705	Discharge End Time:	0706	Discharge Duration (min.):		1
Length of Casing (ft):	63	Drilling Fluid Depth Below Top of Casing (ft):	16	Length of Drill Fluid Col. (ft):	47	Casing Dia. (in.):	7
				Casing Area (ft ²):	7-in. is 0.27 ft ²		0.27
Discharge Vol. (gal.). ~200 gallons max:		95 gal		$k = h * j * 7.481 \text{ gal/ft}^3$			
Observations During Discharge		Oily Sheen (Y/N & Comments)		Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			
		N		N			

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	0.64	Volume of Discharge Due to Rainfall (gal.)		1,024 gal	
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Day Shift		Night Shift		Total
	Washdown 1	Washdown 2	Washdown 3	Washdown 4	
	—	—	5 min x 12 gpm = 60 gal	—	
Total Deck Drainage Discharge (gal.) ~2570 gal. max:		1,084 gal			

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	10/10/15 1112	N	N
2nd Slack Water	10/10/15 1728	N	N
3rd Slack Water	10/10/15 2338	N	N
4th Slack Water	10/11/15 0541	N	N
Other Observations, Non-Permitted Discharges, or Comments			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 4

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: Oct 12, 15 0700
Borehole: MB-19/MB-28
Latitude: 60.6555433°N / 60.66439822°N
Day Shift Observer & Shift Time: Sam Pant 0700-1900
Drilling Start Time: 10/11/15 1745 hrs

to Oct 12, 15 0700
Borehole: 1 of 1 For Day
Longitude: 151.37877392°W / 151.38078286°W
Night Shift Observer & Shift Time: Eduardo Pulido 1900-0700
Drilling End Time: 10/12/15 0200 hrs

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):	0			661			661
Remaining (gal):	0			0			0
Lost (gal)	0			661			661
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	
	-	-	-	-	-	-	-
Drilling Fluid Lost to Ground (gal):	661 gal						
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time	Pass/Fail	Comments			
	0140	0155	PASS	NO SLICK / SHEEN			
Discharge Start Time:	0230	Discharge End Time:	0231	Discharge Duration (min.): 1			
Length of Casing (ft): 63	Drilling Fluid Depth Below Top of Casing (ft): 19	Length of Drill Fluid Col. (ft): 44	Casing Dia. (in.): 7	Casing Area (ft²): 0.27		7-in. is 0.27 ft²	
Discharge Vol. (gal.). ~200 gallons max:			89 gal		$k = h * j * 7.481 \text{ gal/ft}^3$		
Observations During Discharge	Oily Sheen (Y/N & Comments)			Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			
	N			N			

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	0.01	Volume of Discharge Due to Rainfall (gal.)					
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Day Shift			Night Shift			Total
	Washdown 1	Washdown 2	Washdown 3	Washdown 4	Washdown 5	Washdown 6	
	-	-	-	-	-	5 min - 12 gpm 60 gal	60
Total Deck Drainage Discharge (gal.) ~2570 gal. max:	76 gal						

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	10/11/2015 1146	N	N
2nd Slack Water	10/11/2015 1800	N	N
3rd Slack Water	10/12/2015 0013	N	N
4th Slack Water	10/12/2015 0621	N	N
Other Observations, Non-Permitted Discharges, or Comments			
No drilling at MB-19. Moved to MB-28 from MB-19. Arrived at MB-28 at 12:30.			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 4

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: Oct 12, 2015 0700 hr to Oct 13, 2015 0700 hr
Borehole: MB-28 / MB-23 Borehole: 1 of 1 For Day
Latitude: 60.66434822°N Longitude: 151.38078286°W
Day Shift Observer & Shift Time: Sam Pant 0700-1900 hr Night Shift Observer & Shift Time: Eduardo Pulido 1900-0700 hr
Drilling Start Time: 1030 hrs Drilling End Time: 0700 hrs

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):	0			925			925
Remaining (gal):	-			0			0
Lost (gal)	0			925			925
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	0
Drilling Fluid Lost to Ground (gal):	925 gal						
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time	Pass/Fail	Comments			
Discharge Start Time:	Discharge End Time:			Discharge Duration (min.):			
Length of Casing (ft):	Drilling Fluid Depth Below Top of Casing (ft):	Length of Drill Fluid Col. (ft):	Casing Dia. (in.):	Casing Area (ft ²):		7-in. is 0.27 ft ²	
Discharge Vol. (gal.). ~200 gallons max:			$k = h * j * 7.481 \text{ gal/ft}^3$				
Observations During Discharge	Oily Sheen (Y/N & Comments)			Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	0.00	Volume of Discharge Due to Rainfall (gal.)	1599.3
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Total		
	Day Shift	Night Shift	
	Washdown 1	Washdown 2	Washdown 3
	Washdown 4	Washdown 5	Washdown 6
	-	-	10 min x 12 gpm = 120
Total Deck Drainage Discharge (gal.) ~2570 gal. max:	120 gal		

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	10/12/15 1221	N	N
2nd Slack Water	10/12/15 1831	N	N
3rd Slack Water	10/13/15 0048	N	N
4th Slack Water			
Other Observations, Non-Permitted Discharges, or Comments			
No drilling at MB-28. Moved to MB-23 from MB-28. Arrive at MB-23 at 13:00 hr.			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 4

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: Oct 13, 2015 0700
Borehole: MB-23
Latitude: 60.65454731°N
Day Shift Observer
& Shift Time: Sam Pant 0700-1900
Drilling Start Time: Oct 13, 2015 0730

to Oct 14, 2015 0700
Borehole: 1 of 1 For Day
Longitude: 151.37617150°W
Night Shift Observer
& Shift Time: Eduardo Pulido 1900-0700
Drilling End Time: 0700 hrs

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes		Day Shift		Night Shift		Total	
Created (gal):		630		925		1555	
Remaining (gal):		0		0		0	
Lost (gal)		630		925		1555	
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:		Event 1	Event 2	Event 3	Event 4	Event 5	Event 6
		—	—	—	—	—	—
Drilling Fluid Lost to Ground (gal):		1555					
Drilling Fluid Discharges							
Results of Static Sheen Test		Start Time		End Time		Pass/Fail	Comments
		—		—		—	—
Discharge Start Time:		Discharge End Time:		Discharge Duration (min.):		—	
Length of Casing (ft):	Drilling Fluid Depth Below Top of Casing (ft):	Length of Drill Fluid Col. (ft):	Casing Dia. (in.):	Casing Area (ft²):	7-in. is 0.27 ft²		
Discharge Vol. (gal.). ~200 gallons max:		—		$k = h * j * 7.481 \text{ gal/ft}^3$			
Observations During Discharge		Oily Sheen (Y/N & Comments)			Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)		
		—			—		

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	Volume of Discharge Due to Rainfall (gal.)	Total
0.03	48 gal	180
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.		Total
Day Shift		Night Shift
Washdown 1	Washdown 2	Washdown 3
—	—	10 x 12 gpm 120 gal
Total Deck Drainage Discharge (gal.). ~2570 gal. max:		228 gal

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	10/13/15 0701	N	N
2nd Slack Water	10/13/15 1258	N	N
3rd Slack Water	10/13/15 1904	N	N
4th Slack Water	10/14/15 0123	N	N
Other Observations, Non-Permitted Discharges, or Comments			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 4

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: Oct 14, 2015 0700 to Oct 15, 2015 0700
Borehole: MB-23 Borehole: 1 of 1 For Day
Latitude: 60.65454731°N Longitude: 151.37617150°W
Day Shift Observer: Sant 0700-1900 Night Shift Observer: E. Pulido 1900-0700
& Shift Time: 8:00 0700-1900 & Shift Time: E. Pulido 1900-0700
Drilling Start Time: Oct 14, 2015 0730 Drilling End Time: 10/15/15 0645

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):	660			793			1,453
Remaining (gal):	0			0			0
Lost (gal)	660			793			1,453
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	
	—	—	—	—	—	—	—
Drilling Fluid Lost to Ground (gal):	1,453 gal						
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time	Pass/Fail	Comments			
	—	—	—	—			
Discharge Start Time:	Discharge End Time:		Discharge Duration (min.):				
Length of Casing (ft):	Drilling Fluid Depth Below Top of Casing (ft):	Length of Drill Fluid Col. (ft):	Casing Dia. (in.):	Casing Area (ft²):	7-in. is 0.27 ft²		
Discharge Vol. (gal.). ~200 gallons max:			$k = h * j * 7.481 \text{ gal/ft}^3$				
Observations During Discharge	Oily Sheen (Y/N & Comments)		Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)				
	—		—				

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	Volume of Discharge Due to Rainfall (gal.)						Total
0.01	16 gal						
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Day Shift			Night Shift			Total
	Washdown 1	Washdown 2	Washdown 3	Washdown 4	Washdown 5	Washdown 6	
	—	—	10 x 12 gpm = 120 gal	—	—	5 x 12 gpm = 60 gal	180
Total Deck Drainage Discharge (gal.) ~2570 gal. max:			196 gal				

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	10/14/15 0742	N	N
2nd Slack Water	10/14/15 1336	N	N
3rd Slack Water	10/14/15 1938	N	N
4th Slack Water	10/15/15 0200	N	N
Other Observations, Non-Permitted Discharges, or Comments			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 4

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: Oct 15, 2015, 0700 to Oct 16, 2015 0700
Borehole: MB-23 Borehole: 1 of 1 For Day
Latitude: 60.65454731°N Longitude: 151.37617150°W
Day Shift Observer & Shift Time: S. Pant 0700-1900 Night Shift Observer & Shift Time: E Pulido 1900-0700
Drilling Start Time: Oct 15, 2015, 0730 Drilling End Time: 2330

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):	2007			397			2404
Remaining (gal):	0			0			0
Lost (gal)	2007			397			2404
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	
	—	—	—	—	—	—	0
Drilling Fluid Lost to Ground (gal):	24.04 gal						
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time		Pass/Fail	Comments		
	—	—		—	—		
Discharge Start Time:	Discharge End Time:				Discharge Duration (min.):		
Length of Casing (ft):	Drilling Fluid Depth Below Top of Casing (ft):	Length of Drill Fluid Col. (ft):	Casing Dia. (in.):	Casing Area (ft ²):		7-in. is 0.27 ft ²	
	—	—	—	—		—	
Discharge Vol. (gal.). ~200 gallons max:			$k = h * j * 7.481 \text{ gal/ft}^3$				
Observations During Discharge	Oily Sheen (Y/N & Comments)			Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			
	—			—			

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	Volume of Discharge Due to Rainfall (gal.)	Total
0.05	100	
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Day Shift	Night Shift
	Washdown 1	Washdown 2
	—	—
	10 min x 12 gpm = 120 gal	—
	—	10 min x 12 gpm = 120 gal
	—	—
	—	—
Total Deck Drainage Discharge (gal.). ~2570 gal. max:	340 gal	

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	10/15/15 0825	N	N
2nd Slack Water	10/15/15 1417	N	N
3rd Slack Water	10/15/15 2015	N	N
4th Slack Water	10/16/15 0237	N	N
Other Observations, Non-Permitted Discharges, or Comments			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 4

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: Oct 16, 2015 0700 to Oct 17 2015 0700
Borehole: MB-23/MB-21 Borehole: 1 of 1 For Day
Latitude: 60.65454731°N/60.65553589°N Longitude: 151.37617150°W/151.37254192°W
Day Shift Observer & Shift Time: S. Punt 0700-1900 Night Shift Observer & Shift Time: E. Pulido 1900-0700
Drilling Start Time: 1650 Drilling End Time: 0645

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):	250			528			778
Remaining (gal):	0			0			0
Lost (gal)	250			528			778
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	0
	-	-	-	-	-	-	
Drilling Fluid Lost to Ground (gal):	778						
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time	Pass/Fail	Comments			
	10:30	10:48	Pass	NO slick/sheen			
Discharge Start Time:	11:04	Discharge End Time:	11:05	Discharge Duration (min.): 1 min			
Length of Casing (ft): 53	Drilling Fluid Depth Below Top of Casing (ft): 13	Length of Drill Fluid Col. (ft): 40	Casing Dia. (in.): 7"	Casing Area (ft ²): 0.27		7-in. is 0.27 ft ²	
Discharge Vol. (gal.). ~200 gallons max:			81 gal		k = h * j * 7.481 gal/ft ³		
Observations	Oily Sheen (Y/N & Comments)		Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)				
During Discharge	N		N				

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	0.22	Volume of Discharge Due to Rainfall (gal.)	352																					
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	<table border="1"> <thead> <tr> <th colspan="3">Day Shift</th> <th colspan="3">Night Shift</th> <th>Total</th> </tr> <tr> <th>Washdown 1</th> <th>Washdown 2</th> <th>Washdown 3</th> <th>Washdown 4</th> <th>Washdown 5</th> <th>Washdown 6</th> <th></th> </tr> </thead> <tbody> <tr> <td>-</td> <td>-</td> <td>10 min = 120 gal</td> <td>-</td> <td>-</td> <td>10 min x 12 gal = 120</td> <td>240</td> </tr> </tbody> </table>			Day Shift			Night Shift			Total	Washdown 1	Washdown 2	Washdown 3	Washdown 4	Washdown 5	Washdown 6		-	-	10 min = 120 gal	-	-	10 min x 12 gal = 120	240
Day Shift			Night Shift			Total																		
Washdown 1	Washdown 2	Washdown 3	Washdown 4	Washdown 5	Washdown 6																			
-	-	10 min = 120 gal	-	-	10 min x 12 gal = 120	240																		
Total Deck Drainage Discharge (gal.) ~2570 gal. max:	592 gal																							

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	10/16/15 0911	N	N
2nd Slack Water	10/16/15 1454	N	N
3rd Slack Water	10/16/15 2054	N	N
4th Slack Water	10/17/15 0317	N	N
Other Observations, Non-Permitted Discharges, or Comments			
No drilling at MB-23. Moved from MB-23 to MB-21 Arrive at MB-21 at 14:15			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 4

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: Oct 17, 2015 0700 to Oct 18, 2015 0700
Borehole: MB-21 Borehole: 1 of 1 For Day
Latitude: 60.65553589°N Longitude: 151.37254192°W
Day Shift Observer: S. Pant 0700-1900 Night Shift Observer: E Pulido 1900-0700
& Shift Time: 0700-1900 & Shift Time: 1900-0700
Drilling Start Time: Oct 17, 2015 0730 Drilling End Time: 2140

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):	528			159			687
Remaining (gal):	0			0			0
Lost (gal)	528			159			687
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	0
	-	-	-	-	-	-	
Drilling Fluid Lost to Ground (gal):	687 gal						
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time	Pass/Fail	Comments			
	0340	0352	PASS	NO SLICK / SHEEN			
Discharge Start Time:	0410	Discharge End Time:	0411	Discharge Duration (min.): 1			
Length of Casing (ft): 53	Drilling Fluid Depth Below Top of Casing (ft): 31	Length of Drill Fluid Col. (ft): 22	Casing Dia. (in.): 7"	Casing Area (ft ²): 0.27		7-in. is 0.27 ft ²	
Discharge Vol. (gal.). ~200 gallons max:			44 gal		$k = h * j * 7.481 \text{ gal/ft}^3$		
Observations During Discharge	Oily Sheen (Y/N & Comments)		Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)				
	N		N				

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	0.2	Volume of Discharge Due to Rainfall (gal.)	320 gal																					
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	<table border="1"> <thead> <tr> <th colspan="3">Day Shift</th> <th colspan="3">Night Shift</th> <th>Total</th> </tr> <tr> <th>Washdown 1</th> <th>Washdown 2</th> <th>Washdown 3</th> <th>Washdown 4</th> <th>Washdown 5</th> <th>Washdown 6</th> <th></th> </tr> </thead> <tbody> <tr> <td>-</td> <td>-</td> <td>10 min x 12 gpm = 120 gal</td> <td>-</td> <td>-</td> <td>5 min x 12 gpm = 60 gal</td> <td>180</td> </tr> </tbody> </table>			Day Shift			Night Shift			Total	Washdown 1	Washdown 2	Washdown 3	Washdown 4	Washdown 5	Washdown 6		-	-	10 min x 12 gpm = 120 gal	-	-	5 min x 12 gpm = 60 gal	180
Day Shift			Night Shift			Total																		
Washdown 1	Washdown 2	Washdown 3	Washdown 4	Washdown 5	Washdown 6																			
-	-	10 min x 12 gpm = 120 gal	-	-	5 min x 12 gpm = 60 gal	180																		
Total Deck Drainage Discharge (gal.) ~2570 gal. max:	500 gal																							

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	10/17/15 0959	N	N
2nd Slack Water	10/17/15 1543	N	N
3rd Slack Water	10/17/15 2136	N	N
4th Slack Water	10/18/15 0359	N	N
Other Observations, Non-Permitted Discharges, or Comments			
<p>Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.</p> <p>Note: Observations were made over a 24 hr period corresponding with personnel shift changes.</p>			

Daily Visual Observation Form Rev. 4

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: Oct 18, 2015 0700 to Oct 19, 2015 0700
Borehole: MB-21/MB-17 Borehole: 1 of 1 For Day
Latitude: 60.65553589°N Longitude: 151.37254192°W
Day Shift Observer: S. Pant 0700-1900 Night Shift Observer: E. Pulido 1900-0700
& Shift Time: S. Pant 0700-1900 & Shift Time: E. Pulido 1900-0700
Drilling Start Time: Oct 18, 2015 17:20 Drilling End Time: Oct 19, 2015 0655

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes		Day Shift		Night Shift		Total	
Created (gal):		132		529		661	
Remaining (gal):		0		0		0	
Lost (gal)		132		529		661	
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:		Event 1	Event 2	Event 3	Event 4	Event 5	Event 6
		-	-	-	-	-	-
Drilling Fluid Lost to Ground (gal):		661 gal					
Drilling Fluid Discharges							
Results of Static Sheen Test		Start Time		End Time		Pass/Fail	
		-		-		-	
Discharge Start Time:		Discharge End Time:		-		Discharge Duration (min.):	
Length of Casing (ft):	-	Drilling Fluid Depth Below Top of Casing (ft):	-	Length of Drill Fluid Col. (ft):	-	Casing Dia. (in.):	-
Discharge Vol. (gal.). ~200 gallons max:		-		-		$k = h * j * 7.481 \text{ gal/ft}^3$	
Observations During Discharge		Oily Sheen (Y/N & Comments)			Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)		
		-			-		

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)		Volume of Discharge Due to Rainfall (gal.)					
0.41		656					
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.		Day Shift		Night Shift		Total	
		Washdown 1	Washdown 2	Washdown 3	Washdown 4		Washdown 5
		-	-	-	-	-	60
Total Deck Drainage Discharge (gal.). ~2570 gal. max:		716 gal					

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	10/18/15 1051	N	N
2nd Slack Water	10/18/15 1631	N	N
3rd Slack Water	10/18/15 2223	N	N
4th Slack Water	10/19/15 0448	N	N
Other Observations, Non-Permitted Discharges, or Comments			
NO drilling at MB-21. Moved to MB-17 from MB-21. Arrived at MB-17 at 15:30 Oct 18, 2014.			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 4

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: Oct 19, 2015 0700 to Oct 20, 2015 0700
Borehole: MB-17 Borehole: 1 of 1 For Day
Latitude: 60.656810810N Longitude: 151.378982440W
Day Shift Observer & Shift Time: S. Pant 0700-1900 Night Shift Observer & Shift Time: E. Pulido 1900-0700
Drilling Start Time: Oct 19, 2015 0730 Drilling End Time: Oct 20, 2015 0700

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):	1064			528			1592
Remaining (gal):	0			0			0
Lost (gal)	1064			528			1592
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	0
	—	—	—	—	—	—	
Drilling Fluid Lost to Ground (gal):	1592						
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time		Pass/Fail	Comments		
	—	—		—	—		
Discharge Start Time:	Discharge End Time:		Discharge Duration (min.):				
Length of Casing (ft):	Drilling Fluid Depth Below Top of Casing (ft):	Length of Drill Fluid Col. (ft):	Casing Dia. (in.):	Casing Area (ft ²): 7-in. is 0.27 ft ²			
	—	—	—	—			
Discharge Vol. (gal.). ~200 gallons max:			$k = h * j * 7.481 \text{ gal/ft}^3$				
Observations During Discharge	Oily Sheen (Y/N & Comments)			Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			
	—			—			

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	0	Volume of Discharge Due to Rainfall (gal.)		0			
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Day Shift			Night Shift			Total
	Washdown 1	Washdown 2	Washdown 3	Washdown 4	Washdown 5	Washdown 6	
	—	—	10 min x 12 gpm = 120 gal	—	—	5 min x 12 gpm = 60 gal	
Total Deck Drainage Discharge (gal.). ~2570 gal. max:				180 gal			

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	10/19/15 1148	N	N
2nd Slack Water	10/19/15 1725	N	N
3rd Slack Water	10/19/15 2319	N	N
4th Slack Water	10/19/15 0548	N	N
Other Observations, Non-Permitted Discharges, or Comments			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 4

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: Oct 20, 2015 0700 to Oct 21, 2015 0700
Borehole: MB-17 Borehole: 1 of 1 For Day
Latitude: 60.65681081°N Longitude: 151.37898244°W
Day Shift Observer & Shift Time: S. Pant 0700-1900 Night Shift Observer & Shift Time: E. Pulido 1900-0700
Drilling Start Time: Oct 20, 2015 0730 Drilling End Time: Oct 20, 2015 17:45

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):	2193			0			2193
Remaining (gal):	0			0			0
Lost (gal)	2193			0			2193
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	0
	-	-	-	-	-	-	
Drilling Fluid Lost to Ground (gal): <u>0</u>							
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time	Pass/Fail	Comments			
	0425	0442	PASS	NO SHEEN (SLURRY)			
Discharge Start Time:	0455	Discharge End Time:	0456	Discharge Duration (min.):		1 min	
Length of Casing (ft): 65	Drilling Fluid Depth Below Top of Casing (ft): 18	Length of Drill Fluid Col. (ft): 47	Casing Dia. (in.): 7	Casing Area (ft²): 7-in. is 0.27 ft²		0.27	
Discharge Vol. (gal.). ~200 gallons max:			93 gal		$k = h * j * 7.481 \text{ gal/ft}^3$		
Observations During Discharge	Oily Sheen (Y/N & Comments)		Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)				
	N		N				

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	0	Volume of Discharge Due to Rainfall (gal.)	0
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Total		
	Day Shift	Night Shift	
	Washdown 1	Washdown 2	Washdown 3
	-	5 min 60 gal	10 min 120 gal
		-	-
		-	-
Total Deck Drainage Discharge (gal.) ~2570 gal. max:	180 gal		

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	10/20/15 1251	N	N
2nd Slack Water	10/20/15 1828	N	N
3rd Slack Water	10/21/15 0029	N	N
4th Slack Water	10/21/15 0657	N	N
Other Observations, Non-Permitted Discharges, or Comments			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 4

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: Oct 21, 2015 0700 to Oct 22, 2015 0700
Borehole: MB-17/MB-14 Borehole: 1 of 1 For Day
Latitude: 60.65681081°N/60.65939000°N Longitude: 151.37898244°W/151.3815911°W
Day Shift Observer: S. Pant 0700-1900 Night Shift Observer: E. Pulido 1900-0700
& Shift Time: S. Pant 0700-1900 & Shift Time: E. Pulido 1900-0700
Drilling Start Time: Oct 21, 2015 14:50 Drilling End Time: 0645 Oct 22, 2015

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):	370			660			1030
Remaining (gal):	0			0			0
Lost (gal)	370			660			1030
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	0
	-	-	-	-	-	-	
Drilling Fluid Lost to Ground (gal):	1030 gal						
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time		Pass/Fail	Comments		
	-	-		-	-		
Discharge Start Time:	-	Discharge End Time:		-	Discharge Duration (min.):		-
Length of Casing (ft):	-	Drilling Fluid Depth Below Top of Casing (ft):	-	Length of Drill Fluid Col. (ft):	-	Casing Dia. (in.):	-
						Casing Area (ft ²):	-
						7-in. is 0.27 ft ²	
Discharge Vol. (gal.). ~200 gallons max:				k = h * j * 7.481 gal/ft ³			
Observations During Discharge	Oily Sheen (Y/N & Comments)			Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			
	-			-			

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	0	Volume of Discharge Due to Rainfall (gal.)	0
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Total		
	Day Shift	Night Shift	
	Washdown 1	Washdown 2	Washdown 3
	-	-	10 min x 12 gpm = 120 gal
			-
			-
			5 min x 12 gpm = 60 gal
Total Deck Drainage Discharge (gal.). ~2570 gal. max:	180		

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	10/21/15 1351	N	N
2nd Slack Water	10/21/15 1935	N	N
3rd Slack Water	10/22/15 0143	N	N
4th Slack Water			
Other Observations, Non-Permitted Discharges, or Comments			
No drilling at MB-17. Moved to MB-14 from MB-17. Arrived at MB-14 at 12:45.			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 4

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: Oct 22, 2015 0700 to Oct 23, 2015 0700
Borehole: MB-14 Borehole: 1 of 1 For Day
Latitude: 60.65939000°N Longitude: 151.38159111°W
Day Shift Observer: S. Parn 0700-1400 Night Shift Observer: E. Pulido 1400-0700
& Shift Time: 0700-1400 & Shift Time: 1400-0700
Drilling Start Time: Oct 22, 2015 0730 Drilling End Time: 0330 Oct 23, 2015

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):	740			265			1005
Remaining (gal):	0			0			0
Lost (gal)	740			265			1005
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	0
	-	-	-	-	-	-	
Drilling Fluid Lost to Ground (gal):	100.5 gal						
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time	Pass/Fail	Comments			
	0325	0341	PASS	NO SHEEN / SUCN			
Discharge Start Time:	0420	Discharge End Time:	0421	Discharge Duration (min.):		1 min	
Length of Casing (ft):	65	Drilling Fluid Depth Below Top of Casing (ft):	14	Length of Drill Fluid Col. (ft):	51	Casing Dia. (in.):	7"
						Casing Area (ft ²):	0.27
						7-in. is 0.27 ft ²	
Discharge Vol. (gal.). ~200 gallons max:			103 gal		k = h * j * 7.481 gal/ft ³		
Observations During Discharge	Oily Sheen (Y/N & Comments)			Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			
	N			N			

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	0	Volume of Discharge Due to Rainfall (gal.)	0
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Day Shift		Night Shift
	Washdown 1	Washdown 2	Washdown 3
	-	-	5 min x 12 gpm = 60 gal
		Washdown 4	Washdown 5
		-	-
		Washdown 6	10 min x 12 gpm = 120 gal
			180
Total Deck Drainage Discharge (gal.) ~2570 gal. max:		180 gal	

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	10/22/15 0806	N	N
2nd Slack Water	10/22/15 1447	N	N
3rd Slack Water	10/22/15 2040	N	N
4th Slack Water	10/23/15 0253	N	N
Other Observations, Non-Permitted Discharges, or Comments			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 4

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: Oct 23, 2015 0700 to Oct 24, 2015 0700
Borehole: MB-14/MB-3 Borehole: 1 of 1 For Day
Latitude: 60.65939000°N/60.65166819°N Longitude: 151.38159111°W/151.38317767°W
Day Shift Observer: S. Pant 0700-1900 Night Shift Observer: E. Pulido 1900-0700
& Shift Time: 0700-1900 & Shift Time: 1900-0700
Drilling Start Time: Oct 23, 2015 Drilling End Time: 0630 Oct 24 2015

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes		Day Shift		Night Shift		Total	
Created (gal):		211		528		739	
Remaining (gal):		0		0		0	
Lost (gal)		211		528		739	
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:		Event 1	Event 2	Event 3	Event 4	Event 5	Event 6
		-	-	-	-	-	-
Drilling Fluid Lost to Ground (gal):		739 gal					
Drilling Fluid Discharges							
Results of Static Sheen Test		Start Time		End Time		Pass/Fail	
-		-		-		-	
Discharge Start Time:		Discharge End Time:		Discharge Duration (min.):			
Length of Casing (ft):	-	Drilling Fluid Depth Below Top of Casing (ft):	-	Length of Drill Fluid Col. (ft):	-	Casing Dia. (in.):	-
Discharge Vol. (gal.). ~200 gallons max:						$k = h * j * 7.481 \text{ gal/ft}^3$	
Observations During Discharge		Oily Sheen (Y/N & Comments)			Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)		
-		-			-		

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)		Volume of Discharge Due to Rainfall (gal.)					
0		0					
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Day Shift			Night Shift			Total
	Washdown 1	Washdown 2	Washdown 3	Washdown 4	Washdown 5	Washdown 6	
	-	-	-	-	-	10 min x 12 gpm 120 gal	
Total Deck Drainage Discharge (gal.) ~2570 gal. max:		120 gal					

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	10/23/15 0908	N	N
2nd Slack Water	10/23/15 1538	N	N
3rd Slack Water	10/23/15 2138	N	N
4th Slack Water	10/24/15 0355	N	N
Other Observations, Non-Permitted Discharges, or Comments			
No drilling at MB-14. Moved to MB-3 from MB-14. Arrived at MB-3 at 03:15. 10/23/15.			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 4

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: Oct 24, 2015 0700 to Oct 25, 2015 0700
Borehole: MB-3 Borehole: 1 of 1 For Day
Latitude: 60.65166819°N Longitude: 151.38317767°W
Day Shift Observer: Spart 0700-1500 Night Shift Observer: rig unmanned
& Shift Time: 0700-1500 & Shift Time: no drilling
Drilling Start Time: Oct 24, 2015, 0730 Drilling End Time: no drilling

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):	580			-			580
Remaining (gal):	0			-			0
Lost (gal)	580			-			580
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	-
	-	-	-	-	-	-	-
Drilling Fluid Lost to Ground (gal):	580 gal						
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time		Pass/Fail	Comments		
	-	-		-	-		
Discharge Start Time:	-	Discharge End Time:		-	Discharge Duration (min.):		
	-	-		-	-		
Length of Casing (ft):	-	Drilling Fluid Depth Below Top of Casing (ft):	-	Length of Drill Fluid Col. (ft):	-	Casing Dia. (in.):	-
	-		-		-		-
Discharge Vol. (gal.). ~200 gallons max:				k = h * j * 7.481 gal/ft ³			
Observations		Oily Sheen (Y/N & Comments)		Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			
During Discharge		-		-			

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	0.28	Volume of Discharge Due to Rainfall (gal.)						448
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Day Shift			Night Shift			Total	
	Washdown 1	Washdown 2	Washdown 3	Washdown 4	Washdown 5	Washdown 6		
	-	10 min x 12 gpm = 120 gal	-	-	-	-		
Total Deck Drainage Discharge (gal.). ~2570 gal. max:				568 gal				

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	10/24/15 1003	N	N
2nd Slack Water	10/24/15 1625	rig unmanned	rig unmanned
3rd Slack Water	10/24/15 2231	"	"
4th Slack Water	10/25/15 0450	"	"
Other Observations, Non-Permitted Discharges, or Comments			
Fatigue days off for marine drilling crew from Oct 24, 2015 15:00 to Oct 26, 2015 15:00			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 4

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: Oct 25, 2015 0700
Borehole: MB-3
Latitude: 60.65166819°N
Day Shift Observer
& Shift Time: rig unmanned
Drilling Start Time: no drilling

to Oct 26, 2015 0700
Borehole: 1 of 1 For Day
Longitude: 151.38317767°W
Night Shift Observer
& Shift Time: rig unmanned
Drilling End Time: no drilling

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes		Day Shift		Night Shift		Total	
Created (gal):							
Remaining (gal):							
Lost (gal)							
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:		Event 1	Event 2	Event 3	Event 4	Event 5	Event 6
Drilling Fluid Lost to Ground (gal):							
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time		End Time		Pass/Fail	Comments	
Discharge Start Time:		Discharge End Time:		Discharge Duration (min.):			
Length of Casing (ft):	Drilling Fluid Depth Below Top of Casing (ft):	Length of Drill Fluid Col. (ft):	Casing Dia. (in.):	Casing Area (ft ²):	7-in. is 0.27 ft ²		
Discharge Vol. (gal.). ~200 gallons max:		$k = h * j * 7.481 \text{ gal/ft}^3$					
Observations During Discharge	Oily Sheen (Y/N & Comments)			Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	0.00	Volume of Discharge Due to Rainfall (gal.)						0.00
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Day Shift			Night Shift			Total	
	Washdown 1	Washdown 2	Washdown 3	Washdown 4	Washdown 5	Washdown 6		
Total Deck Drainage Discharge (gal.) ~2570 gal. max:		0.00						

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	10/25/15 1053	rig unmanned	rig unmanned
2nd Slack Water	10/25/15 1709	"	"
3rd Slack Water	10/25/15 2320	"	"
4th Slack Water	10/26/15 0542	"	"
Other Observations, Non-Permitted Discharges, or Comments			
Fatigue days off for marine drilling crew from Oct 24, 2015 15:00 to Oct 26, 2015 15:00			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 4

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: Oct 26, 2015 0700
Borehole: MB-3
Latitude: 60.65166819°N
Day Shift Observer
& Shift Time: S. Pant 1500-1900
Drilling Start Time: Oct 26, 2015 15:00

to Oct 27, 2015 0700
Borehole: 1 of 1 For Day
Longitude: 151.38317767°W
Night Shift Observer
& Shift Time: E. Pulido 1900-0700
Drilling End Time: 0350 hrs

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):	215			185			a) 400
Remaining (gal):	0			0			b) 0
Lost (gal)	215			185			c) 400
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	0
	—	—	—	—	—	—	
Drilling Fluid Lost to Ground (gal):	0						
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time	Pass/Fail	Comments			
	—	—	—	—			
Discharge Start Time:	Discharge End Time:		Discharge Duration (min.):				
Length of Casing (ft):	Drilling Fluid Depth Below Top of Casing (ft):	Length of Drill Fluid Col. (ft):	Casing Dia. (in.):	Casing Area (ft²):	7-in. is 0.27 ft²		
	—	—	—	—	—		
Discharge Vol. (gal.). ~200 gallons max:			k = h * j * 7.481 gal/ft³				
Observations During Discharge	Oily Sheen (Y/N & Comments)		Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)				
	—		—				

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	Volume of Discharge Due to Rainfall (gal.)	Total					
0	0	0					
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Day Shift			Night Shift			Total
	Washdown 1	Washdown 2	Washdown 3	Washdown 4	Washdown 5	Washdown 6	
	—	—	—	—	—	10 MARK 12gpm 120 gal	
Total Deck Drainage Discharge (gal.) ~2570 gal. max:			120 gal				0

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	10/26/15 1141	rig unmanned	rig unmanned
2nd Slack Water	10/26/15 1752	N	N
3rd Slack Water	10/27/15 0007	N	N
4th Slack Water	10/27/15 0632	N	N
Other Observations, Non-Permitted Discharges, or Comments			
- Fatigue days OFF for marine drilling crew from Oct 24, 2015 15:00 to Oct 26, 2015, 15:00.			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 4

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: Oct 27, 2015 0700 to Oct 28, 2015 0700
Borehole: MB-3/MB-24 Borehole: 1 of 1 For Day
Latitude: 60.65166819°N/60.65393967°N Longitude: 151.38317767°W/151.36730675°W
Day Shift Observer & Shift Time: S. Pant 0700-1900 Night Shift Observer & Shift Time: E. Pulido 1900-0700
Drilling Start Time: Oct 27, 2015 15:10 Drilling End Time: Oct 28, 0645

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes		Day Shift		Night Shift		Total	
Created (gal):		449		225		674	
Remaining (gal):		0		0		0	
Lost (gal)		449		225		674	
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:		Event 1	Event 2	Event 3	Event 4	Event 5	Event 6
		-	-	-	-	-	-
Drilling Fluid Lost to Ground (gal):		674 gal					
Drilling Fluid Discharges							
Results of Static Sheen Test		Start Time	End Time	Pass/Fail	Comments		
		08:5	0828	Pass	No slick/sheen		
Discharge Start Time:		08:59	Discharge End Time:	09:00	Discharge Duration (min.):		1
Length of Casing (ft):	53	Drilling Fluid Depth Below Top of Casing (ft):	23	Length of Drill Fluid Col. (ft):	30	Casing Dia. (in.):	7
				Casing Area (ft ²):	7-in. is 0.27 ft ²		0.27
Discharge Vol. (gal.). ~200 gallons max:		61 gal		$k = h * j * 7.481 \text{ gal/ft}^3$			
Observations During Discharge		Oily Sheen (Y/N & Comments)		Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			
		N		N			

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)		Volume of Discharge Due to Rainfall (gal.)		Total			
0		0		0			
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.		Day Shift		Night Shift		Total	
		Washdown 1	Washdown 2	Washdown 3	Washdown 4	Washdown 5	Washdown 6
		-	-	10 min x 12 gpm = 120 gal	-	-	5 min x 12 gpm = 60 gal
Total Deck Drainage Discharge (gal.). ~2570 gal. max:		300 gal					

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	10/27/15 1229	N	N
2nd Slack Water	10/27/15 1835	N	N
3rd Slack Water	10/28/15 0054	N	N
4th Slack Water			
Other Observations, Non-Permitted Discharges, or Comments			
NO drilling at MB-3. Moved to MB-24 from MB-3 Arrived at MB-24 at 12:40.			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 4

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: Oct 28, 2015 0700 to Oct 29, 2015 0700
Borehole: MB-24 Borehole: 1 of 1 For Day
Latitude: 60.65393967°N Longitude: 151.36730675°W
Day Shift Observer: S. Pant 0700-1900 Night Shift Observer: E. Pulido 1900-0700
& Shift Time: 0700-1900 & Shift Time: 1900-0700
Drilling Start Time: Oct 28, 2015 0730 Drilling End Time: Oct 28, 2015 15:50

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):	1057			-			1057
Remaining (gal):	0			-			0
Lost (gal)	1057			-			1057
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	0
	-	-	-	-	-	-	
Drilling Fluid Lost to Ground (gal):	1057 gal						
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time	Pass/Fail	Comments			
	1730	1740	Pass	No slick/sheen			
Discharge Start Time:	Discharge End Time:		Discharge Duration (min.):				
Length of Casing (ft): 50	Drilling Fluid Depth Below Top of Casing (ft): 11	Length of Drill Fluid Col. (ft): 39	Casing Dia. (in.): 7	Casing Area (ft²): 0.27 7-in. is 0.27 ft²			
Discharge Vol. (gal.). ~200 gallons max:			$k = h * j * 7.481 \text{ gal/ft}^3$				
Observations During Discharge	Oily Sheen (Y/N & Comments)		Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)				
	N		N				

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	0.01	Volume of Discharge Due to Rainfall (gal.)	15.993																					
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	<table border="1"> <thead> <tr> <th colspan="3">Day Shift</th> <th colspan="3">Night Shift</th> <th>Total</th> </tr> <tr> <th>Washdown 1</th> <th>Washdown 2</th> <th>Washdown 3</th> <th>Washdown 4</th> <th>Washdown 5</th> <th>Washdown 6</th> <th></th> </tr> </thead> <tbody> <tr> <td>-</td> <td>-</td> <td>5 min x 12 gpm = 60 gal</td> <td>-</td> <td>-</td> <td>-</td> <td>60 gal</td> </tr> </tbody> </table>			Day Shift			Night Shift			Total	Washdown 1	Washdown 2	Washdown 3	Washdown 4	Washdown 5	Washdown 6		-	-	5 min x 12 gpm = 60 gal	-	-	-	60 gal
Day Shift			Night Shift			Total																		
Washdown 1	Washdown 2	Washdown 3	Washdown 4	Washdown 5	Washdown 6																			
-	-	5 min x 12 gpm = 60 gal	-	-	-	60 gal																		
Total Deck Drainage Discharge (gal.). ~2570 gal. max:	75.993 gal																							

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	10/28/15 0722	N	N
2nd Slack Water	10/28/15 1317	N	N
3rd Slack Water	10/28/15 1920	N	N
4th Slack Water	10/28/15 0141	N	N
Other Observations, Non-Permitted Discharges, or Comments			
Aquifer influenced discharge = 60 gal			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 4

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: Oct 29, 2015 0700 to Oct 30, 2015 0700
Borehole: MB-24 Borehole: 1 of 1 For Day
Latitude: 60.653939674N Longitude: 151.36730675°W
Day Shift Observer & Shift Time: S Pant 0700-1900 Night Shift Observer & Shift Time: 1900-0700 E. Pulido
Drilling Start Time: No drilling Drilling End Time: No drilling

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):	0			0			0
Remaining (gal):	-			-			-
Lost (gal)	0			0			0
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	0
Drilling Fluid Lost to Ground (gal):	0						
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time		Pass/Fail	Comments		
Discharge Start Time:	-	Discharge End Time:		-	Discharge Duration (min.):		
Length of Casing (ft):	Drilling Fluid Depth Below Top of Casing (ft):	Length of Drill Fluid Col. (ft):	Casing Dia. (in.):	Casing Area (ft ²):	7-in. is 0.27 ft ²		
Discharge Vol. (gal.). ~200 gallons max:			$k = h * j * 7.481 \text{ gal/ft}^3$				
Observations During Discharge	Oily Sheen (Y/N & Comments)			Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	Volume of Discharge Due to Rainfall (gal.)						Total
0.00	0						0
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Day Shift			Night Shift			Total
	Washdown 1	Washdown 2	Washdown 3	Washdown 4	Washdown 5	Washdown 6	
	-	-	-	-	-	-	-
Total Deck Drainage Discharge (gal.) ~2570 gal. max:							0

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	10/29/15 0814	N	N
2nd Slack Water	10/29/15 1406	N	N
3rd Slack Water	10/29/15 2006	N	N
4th Slack Water	10/30/15 0229	N	N
Other Observations, Non-Permitted Discharges, or Comments			
Aquifer influenced discharge = 110 gal			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 4

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: Oct 30, 2015 0700 to Oct 31, 2015 0700
Borehole: MB-24 Borehole: 1 of 1 For Day
Latitude: 60.65393967°N Longitude: 151.36730675°W
Day Shift Observer: J. Wilson 0700-1900 Night Shift Observer: J. Barfield 1900-0700
& Shift Time: J. Wilson 0700-1900 & Shift Time: J. Barfield 1900-0700
Drilling Start Time: No drilling Drilling End Time: No drilling

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):							
Remaining (gal):							
Lost (gal)							
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	
	-	-	-	-	-	-	-
Drilling Fluid Lost to Ground (gal):							
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time		Pass/Fail	Comments		
Discharge Start Time:	Discharge End Time:				Discharge Duration (min.):		
Length of Casing (ft):	Drilling Fluid Depth Below Top of Casing (ft):	Length of Drill Fluid Col. (ft):	Casing Dia. (In.):	Casing Area (ft ²):		7-in. is 0.27 ft ²	
Discharge Vol. (gal.). ~200 gallons max:			$k = h * j * 7.481 \text{ gal/ft}^3$				
Observations During Discharge	Oily Sheen (Y/N & Comments)			Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	Volume of Discharge Due to Rainfall (gal.)						Total
<u>0.34</u>	<u>543.76</u>						
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Day Shift			Night Shift			Total
	Washdown 1	Washdown 2	Washdown 3	Washdown 4	Washdown 5	Washdown 6	
	-	-	-	-	-	-	
Total Deck Drainage Discharge (gal.) ~2570 gal. max:			<u>543.76</u>				

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	<u>10/30/15 0906</u>	<u>N</u>	<u>N</u>
2nd Slack Water	<u>10/30/15 1457</u>	<u>N</u>	<u>N</u>
3rd Slack Water	<u>10/30/15 2054</u>	<u>N</u>	<u>N</u>
4th Slack Water	<u>10/31/15 0318</u>	<u>N</u>	<u>N</u>
Other Observations, Non-Permitted Discharges, or Comments			
<p>Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.</p> <p>Note: Observations were made over a 24 hr period corresponding with personnel shift changes.</p>			

Daily Visual Observation Form Rev. 4

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: 04/31/2015, 0700 to Nov 1, 2015, 0700
Borehole: MB-24 Borehole: 1 of 1 For Day
Latitude: 60.65393967°N Longitude: 151.36730675°W
Day Shift Observer: S. Pant 0700-1900 Night Shift Observer: E. Pulido 1900-0700
& Shift Time: Drilling Start Time: No drilling Drilling End Time: No drilling

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):							
Remaining (gal):							
Lost (gal)							
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	
Drilling Fluid Lost to Ground (gal):	0						
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time	Pass/Fail	Comments			
Discharge Start Time:	Discharge End Time:		Discharge Duration (min.):				
Length of Casing (ft):	Drilling Fluid Depth Below Top of Casing (ft):	Length of Drill Fluid Col. (ft):	Casing Dia. (in.):	Casing Area (ft ²):		7-in. is 0.27 ft ²	
Discharge Vol. (gal.). ~200 gallons max:			$k = h * j * 7.481 \text{ gal/ft}^3$				
Observations During Discharge	Oily Sheen (Y/N & Comments)			Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	Volume of Discharge Due to Rainfall (gal.)						Total
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Day Shift			Night Shift			60 gal
	Washdown 1	Washdown 2	Washdown 3	Washdown 4	Washdown 5	Washdown 6	
	5 min. @ 12 gpm = 60 gal						
Total Deck Drainage Discharge (gal.). ~2570 gal. max:			60 gal				

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	10/31/15 1000	N	N
2nd Slack Water	10/31/15 1549	N	N
3rd Slack Water	10/31/15 2143	N	N
4th Slack Water	11/01/15 0309	N	N
Other Observations, Non-Permitted Discharges, or Comments			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 4

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: NOV 1, 2015 0700 to NOV 2, 2015 0700
Borehole: MB-24 Borehole: 1 of 1 For Day
Latitude: 60.653939670N Longitude: 151.367306750W
Day Shift Observer: C. Pant 0700-1900 Night Shift Observer:
& Shift Time: E. PUNTO 1900-0700
Drilling Start Time: 15:15-15:52; 16:15-17:21 Drilling End Time: NO DRILLING

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):	205			0			205
Remaining (gal):	-			-			0
Lost (gal)	205			0			205
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	0
	-	-	-	-	-	-	
Drilling Fluid Lost to Ground (gal):	205 gal						
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time	Pass/Fail	Comments			
	-	-	-	-			
Discharge Start Time:	Discharge End Time:		Discharge Duration (min.):				
Length of Casing (ft):	Drilling Fluid Depth Below Top of Casing (ft):	Length of Drill Fluid Col. (ft):	Casing Dia. (in.):	Casing Area (ft ²):		7-in. is 0.27 ft ²	
Discharge Vol. (gal.). ~200 gallons max:			$k = h * j * 7.481 \text{ gal/ft}^3$				
Observations During Discharge	Oily Sheen (Y/N & Comments)		Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)				
	-		-				

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	Volume of Discharge Due to Rainfall (gal.)						Total
0	0						
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Day Shift			Night Shift			Total
	Washdown 1	Washdown 2	Washdown 3	Washdown 4	Washdown 5	Washdown 6	
	5 min x 12 gpm = 60 gal	-	5 min x 12 gpm = 60 gal	-	-	-	120
Total Deck Drainage Discharge (gal.). ~2570 gal. max:			120 gal				

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	11/1/15 0956	N	N
2nd Slack Water	11/1/15 1543	N	N
3rd Slack Water	11/1/15 2136	N	N
4th Slack Water	11/2/15 0403	N	N
Other Observations, Non-Permitted Discharges, or Comments			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 4

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: NOV 2, 2015 0700 to NOV 3, 2015 0700
Borehole: DS-4B Borehole: 2 of 2 For Day
Latitude: 60.65580844°N Longitude: 151.36712022°W
Day Shift Observer & Shift Time: S. Pant 0700-1900 Night Shift Observer & Shift Time: E. Pulido 1900-0700
Drilling Start Time: NOV 3, 2015 0130 Drilling End Time: NOV 3, 2015 0635

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)

Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):	—			150			150
Remaining (gal):	—			0			0
Lost (gal)	—			150			150
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	0
	—	—	—	—	—	—	
Drilling Fluid Lost to Ground (gal):	150 gal						

Drilling Fluid Discharges

Results of Static Sheen Test		Start Time	End Time	Pass/Fail	Comments					
		0625	0635	Pass	No slick/sheen					
Discharge Start Time:		0700	Discharge End Time:		0701	Discharge Duration (min.):	1			
Length of Casing (ft):	36	Drilling Fluid Depth Below Top of Casing (ft):	20	Length of Drill Fluid Col. (ft):	16	Casing Dia. (in.):	7	Casing Area (ft²):	7-in. is 0.27 ft²	0.27
Discharge Vol. (gal.). ~200 gallons max:				32 gal		k = h * j * 7.481 gal/ft³				
Observations During Discharge		Oily Sheen (Y/N & Comments)			Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)					
		N			N					

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	0	Volume of Discharge Due to Rainfall (gal.)					0
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Day Shift			Night Shift			Total
	Washdown 1	Washdown 2	Washdown 3	Washdown 4	Washdown 5	Washdown 6	
Total Deck Drainage Discharge (gal.) ~2570 gal. max:		0					

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)

Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	11/2/15 1106	N	N
2nd Slack Water	11/2/15 1649	N	N
3rd Slack Water	11/2/15 2246	N	N
4th Slack Water	11/3/15 0510	N	N

Other Observations, Non-Permitted Discharges, or Comments

Moved to DS-4B from DS-4A. Jack down at DS-4A at 2310, NOV 2, and arrive and jack up at DS-4B at 0000, NOV 3
see sheet 1 of 2 for discharge at DS-4A.

Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.

Note: Observations were made over a 24 hr period corresponding with personnel shift changes.

Daily Visual Observation Form Rev. 4

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: Nov 3, 2015 0700 to Nov 4, 2015 0700
Borehole: DS-4B Borehole: 1 of 1 For Day
Latitude: 60.65580844°N Longitude: 151.36712022°W
Day Shift Observer: rig unmanned Night Shift Observer: rig unmanned
& Shift Time: no drilling & Shift Time: no drilling
Drilling Start Time: no drilling Drilling End Time: no drilling

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):							a) —
Remaining (gal):							b) —
Lost (gal)							c) = a - b —
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	d) —
Drilling Fluid Lost to Ground (gal):	e) = c - d —						
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time		Pass/Fail	Comments		
	—	—		—	—		
Discharge Start Time:	Discharge End Time:				Discharge Duration (min.):		—
Length of Casing (ft):	Drilling Fluid Depth Below Top of Casing (ft):	Length of Drill Fluid Col. (ft):	Casing Dia. (in.):	Casing Area (ft ²):	7-in. is 0.27 ft ²		
	—	—	—	—	—		
Discharge Vol. (gal.). ~200 gallons max:			k = h * j * 7.481 gal/ft ³ —				
Observations	Oily Sheen (Y/N & Comments)			Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			
During Discharge	—			—			

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	Volume of Discharge Due to Rainfall (gal.)						Total
0.04	m) = f * 1599.3 64						
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Day Shift			Night Shift			Total
	Washdown 1	Washdown 2	Washdown 3	Washdown 4	Washdown 5	Washdown 6	
	—	—	—	—	—	—	
Total Deck Drainage Discharge (gal.) ~2570 gal. max:			n) = m + o 64 gal				

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	11/03/15 1206	rig unmanned	rig unmanned
2nd Slack Water	11/03/15 1752	rig unmanned	rig unmanned
3rd Slack Water	11/03/15 2351	rig unmanned	rig unmanned
4th Slack Water	11/04/15 0613	rig unmanned	rig unmanned
Other Observations, Non-Permitted Discharges, or Comments			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 4

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: Nov 4, 2015 0700 to Nov 5, 2015 0700
Borehole: DS-4B/DS-SA Borehole: 1 of 2 For Day
Latitude: 60.65580844°N/60.65557884°N Longitude: 151.36712022°W/151.36919169°W
Day Shift Observer & Shift Time: S. Pant 0700-1900 Night Shift Observer & Shift Time: E. Pulido 1900-0700
Drilling Start Time: Nov 4, 2015 12:30 Drilling End Time: Nov 4, 2015, 16:30

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes		Day Shift		Night Shift		Total	
Created (gal):		0		-		0	
Remaining (gal):		0		-		0	
Lost (gal)		0		-		0	
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:		Event 1	Event 2	Event 3	Event 4	Event 5	Event 6
		-	-	-	-	-	-
Drilling Fluid Lost to Ground (gal):		0 (refer page 2 of 2 for discharge during Night Shift)					
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time		Pass/Fail	Comments		
	16:10	16:20		Pass	No slick/sheen		
Discharge Start Time:	16:40	Discharge End Time:		16:41	Discharge Duration (min.):		1
Length of Casing (ft):	36	Drilling Fluid Depth Below Top of Casing (ft):	14	Length of Drill Fluid Col. (ft):	22	Casing Dia. (in.):	7
						Casing Area (ft ²):	0.27
						7-in. is 0.27 ft ²	
Discharge Vol. (gal.). ~200 gallons max:		44 gal		$k = h * j * 7.481 \text{ gal/ft}^3$			
Observations During Discharge	Oily Sheen (Y/N & Comments)			Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			
	N			N			

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	Volume of Discharge Due to Rainfall (gal.)						Total
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Day Shift			Night Shift			
	Washdown 1	Washdown 2	Washdown 3	Washdown 4	Washdown 5	Washdown 6	
	10 min x 12 gpm = 120 gal	-	10 min x 12 gpm = 120 gal	-	-	-	
Total Deck Drainage Discharge (gal.) ~2570 gal. max:		240 gal					

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	11/4/15 1252	N	N
2nd Slack Water	11/4/15 1850	N	N
3rd Slack Water	11/5/15 0047	N	N
4th Slack Water			
Other Observations, Non-Permitted Discharges, or Comments			
No drilling at DS-4B moved to DS-SA from DS-4B. Arrive at DS-SA at 11:50. See page 2 of 2 for discharge observation at DS-SB (time 1900, Nov 5, to 0700, Nov 6). No drilling fluid used.			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 4

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: Nov 5, 2015 0700 to Nov 6, 2015 0700
Borehole: DS-5B Borehole: 1 of 1 For Day
Latitude: 60.65554508°N Longitude: 151.36919739°W
Day Shift Observer & Shift Time: rig unmanned Night Shift Observer & Shift Time: rig unmanned
Drilling Start Time: no drilling Drilling End Time: no drilling

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):	-			-			a) -
Remaining (gal):	-			-			b) -
Lost (gal)	-			-			c) = a) - b) -
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	d)
	-	-	-	-	-	-	-
Drilling Fluid Lost to Ground (gal):	e) = c) - d) = 0						
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time	Pass/Fail	Comments			
	-	-	-	-			
Discharge Start Time:	-	Discharge End Time:	-	Discharge Duration (min.): -			
Length of Casing (ft):	-	Drilling Fluid Depth Below Top of Casing (ft):	-	Length of Drill Fluid Col. (ft):	-	Casing Dia. (in.):	-
						Casing Area (ft²):	-
						7-in. is 0.27 ft²	-
Discharge Vol. (gal.). ~200 gallons max:				k = h * j * 7.481 gal/ft³			
Observations During Discharge	Oily Sheen (Y/N & Comments)			Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			
	-			-			

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	0.2	Volume of Discharge Due to Rainfall (gal.)						m) = l) * 1592.3
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Day Shift			Night Shift			Total	
	Washdown 1	Washdown 2	Washdown 3	Washdown 4	Washdown 5	Washdown 6		
	-	-	-	-	-	-		-
Total Deck Drainage Discharge (gal.) ~2570 gal. max:		o) = m) + n) = 320 gal						

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	Nov 5, 2015 0714	rig unmanned	rig unmanned
2nd Slack Water	Nov 5, 2015 1355	"	"
3rd Slack Water	Nov 5, 2015 1958	"	"
4th Slack Water	Nov 6, 2015 0159	"	"
Other Observations, Non-Permitted Discharges, or Comments			
Waiting on weather to improve for Jack up to be able to sail to the dock and demobilize. Rig unmanned. No drilling.			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Daily Visual Observation Form Rev. 4

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Date & Time: Nov 6, 2015 0700 to Nov 7, 2015 0700
Borehole: DS-5B / dockside at ASRC Borehole: 1 of 1 For Day
Latitude: 60.65554508°N / dockside Longitude: 151.36919739°W / dockside
Day Shift Observer & Shift Time: demobing crew only Night Shift Observer & Shift Time: demobing crew only
Drilling Start Time: no drilling Drilling End Time: no drilling

Outfall 001 - Geotechnical Drilling Fluids and Drill Cuttings at the Seafloor

Drilling Fluid Losses (Prior To Discharge)							
Drilling Fluid Volumes	Day Shift			Night Shift			Total
Created (gal):	—			—			a) —
Remaining (gal):	—			—			b) —
Lost (gal)	—			—			c) = a - b
Inadvertent Discharges (gal). Estimate based on duration and approximate flow rate during lost circulation. ~180 gal max/event:	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	d)
	—	—	—	—	—	—	—
Drilling Fluid Lost to Ground (gal):	e) = c - d						0
Drilling Fluid Discharges							
Results of Static Sheen Test	Start Time	End Time	Pass/Fail	Comments			
	—	—	—	—			
Discharge Start Time:	—	Discharge End Time:	—	Discharge Duration (min.):			
	—		—	—			
Length of Casing (ft):	—	Drilling Fluid Depth Below Top of Casing (ft):	—	Length of Drill Fluid Col. (ft):	—	Casing Dia. (in.):	—
	—		—		—		—
Discharge Vol. (gal.). ~200 gallons max:				k = h * j * 7.481 gal/ft ³			
Observations During Discharge		Oily Sheen (Y/N & Comments)		Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)			
		—		—			

Outfall 002 - Deck Drainage

24-hr Rainfall (in.)	Volume of Discharge Due to Rainfall (gal.)
0.0	m) = 1599.3
Volume of Discharge From Deck Washdown (gal.). Estimate based on duration and approximate flow rate during washdowns.	Total
Total Deck Drainage Discharge (gal.) ~2570 gal. max:	n) = m + n

Outfalls 001 & 002

Receiving Water Visual Observations - Daylight Slack Water (Per NOAA current predictions)			
Slack Water	Date & Time	Oily Sheen Detected in Visual Sheen Test (Y/N & Comments)	Floating Solids, Debris, Sludge, Deposits, Foam, Scum, or Residue (Y/N & Comments)
1st Slack Water	Nov 6, 2015 0809	demob crew only	demob crew only
2nd Slack Water	Nov 6, 2015 1439	"	"
3rd Slack Water	Nov 6, 2015 2050	"	"
4th Slack Water	Nov 7, 2015 0254	"	"
Other Observations, Non-Permitted Discharges, or Comments			
Jack up left the location DS-5B at 08:50 and arrived at ASRC dockside at 10:25. Started demobilizing jack up.			
Stop discharge upon observation of oily sheen or residue not related to drill fluids or deck drainage and report to Project Regulatory Advisor, Claire Joseph.			
Note: Observations were made over a 24 hr period corresponding with personnel shift changes.			

Static Sheen Test (EPA Method 1617) Reporting Form & Instructions Rev. 2

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Borehole: MB-05 Test #: 1 of 1 ☒ Original Test ☐ Retest
Latitude: Northings: 2437928.93 ft Longitude: Eastings: 1392864.19 ft
Test Results: ☒ Passed ☐ Failed Comments: _____

Date: 8/19/15
Test Operator: J. Greenwald

Step 1: After completion of drilling and sampling, place a new, unused liner (plastic trash bag) into the bucket labeled "Static Sheen Test Container."	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 2: Have the drill crew obtain a 200 mL to 500 mL sample of drilling fluid from the mud pit using the 1 L beaker.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
	Time of Collection: <u>14:03</u>
Step 3: Use the bucket with attached line to retrieve seawater for use in the test. Fill the test container to within 0.5 inch of the top of the container. Proceed without delay to ensure the test water temperature remains close to Cook Inlet water temperature.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 4: Fill a 25-mL disposable pipette with the drilling fluid in the 1 L beaker and discharge into a soil waste bucket. Then measure a 15-mL sample of the drilling fluid for the test. Introduce the drilling fluid to the test container 1 cm below the water surface. Use the pipette to distribute the drilling fluid homogeneously throughout the test container. Discard the pipette.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
	Time of Introduction: <u>14:10</u> Must be <1 hour after Collection.
Step 5: Observe the test container at viewing angles of approximately 60° and 30° from the horizontal. Ensure adequate fluorescent light is positioned above and directed over the entire surface of the test container. Use a lamp if necessary. Observe for patches, streaks, or sheets of "silvery" or "metallic" sheen or gloss, increased reflectivity, visual color, iridescence, or an oil slick on the water surface of the test container. A slick may lack color, a sheen, or iridescence. Do not disturb the surface of the test container in any manner that reduces the size of any sheen or slick.	Start Time of Observations: <u>14:17</u> Must be <1 hour after Introduction.
	Initial Percentage of Surface Covered By Sheen: <u>0</u> % <input checked="" type="checkbox"/> 0%: Test Passed, Proceed to Step 7. <input type="checkbox"/> <50%: Proceed to Step 6. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8.
	Observations: <u>No sheen/slick.</u>
Step 6: If sheen or slick is <50% of the surface, continue observing for just under one hour. If the sheen remains <50%, the test passed. Proceed to Step 7 and discharge drilling fluids before end of one hour observation window. If sheen increases to >50% of the test surface at any time, the test failed and should be stopped. Proceed to Step 8.	End Time of Observations: <u>14:25</u> Must be <1 hour after Introduction.
	Final Percentage of Surface Area Covered By Sheen: <u>0</u> % <input type="checkbox"/> <50%: Test Passed, Proceed to Step 7. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8.
	Observations: <u>No sheen/slick.</u>
Step 7: Indicate above that the test passed. Proceed with discharge of drilling fluids. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse and allow to air dry.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 8: Indicate above that the test failed. Discharge of drilling fluids is not permitted. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse with fresh water and allow to air dry. Continue flushing hole, and retest the drilling fluid until the test passes. Record each test on new sheet.	Completed? <input type="checkbox"/> Yes <input type="checkbox"/> No <u>NA</u>

Static Sheen Test (EPA Method 1617) Reporting Form & Instructions Rev. 2

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Borehole: MB-04 Test #: 1 of 1 ☒ Original Test ☐ Retest
Latitude: N 24 38 43.015 f+ Longitude: E 139 17 19.57 f+

Date: 8/21/15
Test Operator: J. Greenwald

Test Results: ☒ Passed ☐ Failed Comments: _____

Step 1: After completion of drilling and sampling, place a new, unused liner (plastic trash bag) into the bucket labeled "Static Sheen Test Container."	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 2: Have the drill crew obtain a 200 mL to 500 mL sample of drilling fluid from the mud pit using the 1 L beaker.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Time of Collection: <u>1500</u>
Step 3: Use the bucket with attached line to retrieve seawater for use in the test. Fill the test container to within 0.5 inch of the top of the container. Proceed without delay to ensure the test water temperature remains close to Cook Inlet water temperature.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 4: Fill a 25-mL disposable pipette with the drilling fluid in the 1 L beaker and discharge into a soil waste bucket. Then measure a 15-mL sample of the drilling fluid for the test. Introduce the drilling fluid to the test container 1 cm below the water surface. Use the pipette to distribute the drilling fluid homogeneously throughout the test container. Discard the pipette.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Time of Introduction: <u>1505</u> Must be <1 hour after Collection.
Step 5: Observe the test container at viewing angles of approximately 60° and 30° from the horizontal. Ensure adequate fluorescent light is positioned above and directed over the entire surface of the test container. Use a lamp if necessary. Observe for patches, streaks, or sheets of "silvery" or "metallic" sheen or gloss, increased reflectivity, visual color, iridescence, or an oil slick on the water surface of the test container. A slick may lack color, a sheen, or iridescence. Do not disturb the surface of the test container in any manner that reduces the size of any sheen or slick.	Start Time of Observations: <u>1507</u> Must be <1 hour after Introduction. Initial Percentage of Surface Covered By Sheen: <u>0</u> % <input checked="" type="checkbox"/> 0%: Test Passed, Proceed to Step 7. <input type="checkbox"/> <50%: Proceed to Step 6. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8. Observations: <u>No slick/sheen.</u>
Step 6: If sheen or slick is <50% of the surface, continue observing for just under one hour. If the sheen remains <50%, the test passed. Proceed to Step 7 and discharge drilling fluids before end of one hour observation window. If sheen increases to >50% of the test surface at any time, the test failed and should be stopped. Proceed to Step 8.	End Time of Observations: <u>1520</u> Must be <1 hour after Introduction. Final Percentage of Surface Area Covered By Sheen: <u>0</u> % <input type="checkbox"/> <50%: Test Passed, Proceed to Step 7. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8. Observations: <u>No slick/sheen.</u>
Step 7: Indicate above that the test passed. Proceed with discharge of drilling fluids. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse and allow to air dry.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 8: Indicate above that the test failed. Discharge of drilling fluids is not permitted. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse with fresh water and allow to air dry. Continue flushing hole, and retest the drilling fluid until the test passes. Record each test on new sheet.	Completed? <input type="checkbox"/> Yes <input type="checkbox"/> No <u>NA</u>

Static Sheen Test (EPA Method 1617) Reporting Form & Instructions Rev. 2
APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Borehole: MB-12 Test #: 1 of 1 ☒ Original Test ☐ Retest
Latitude: 60° 39' 57.7838" N Longitude: 151° 22' 48.6477" W
Test Results: ☒ Passed ☐ Failed Comments: _____

Date: 8/23/15
Test Operator: Austin Fee

Step 1: After completion of drilling and sampling, place a new, unused liner (plastic trash bag) into the bucket labeled "Static Sheen Test Container."	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 2: Have the drill crew obtain a 200 mL to 500 mL sample of drilling fluid from the mud pit using the 1 L beaker.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Time of Collection: <u>06:40</u>
Step 3: Use the bucket with attached line to retrieve seawater for use in the test. Fill the test container to within 0.5 inch of the top of the container. Proceed without delay to ensure the test water temperature remains close to Cook Inlet water temperature.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 4: Fill a 25-mL disposable pipette with the drilling fluid in the 1 L beaker and discharge into a soil waste bucket. Then measure a 15-mL sample of the drilling fluid for the test. Introduce the drilling fluid to the test container 1 cm below the water surface. Use the pipette to distribute the drilling fluid homogeneously throughout the test container. Discard the pipette.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Time of Introduction: <u>06:42</u> Must be <1 hour after Collection.
Step 5: Observe the test container at viewing angles of approximately 60° and 30° from the horizontal. Ensure adequate fluorescent light is positioned above and directed over the entire surface of the test container. Use a lamp if necessary. Observe for patches, streaks, or sheets of "silvery" or "metallic" sheen or gloss, increased reflectivity, visual color, iridescence, or an oil slick on the water surface of the test container. A slick may lack color, a sheen, or iridescence. Do not disturb the surface of the test container in any manner that reduces the size of any sheen or slick.	Start Time of Observations: <u>06:43</u> Must be <1 hour after Introduction. Initial Percentage of Surface Covered By Sheen: <u>0</u> % <input checked="" type="checkbox"/> 0%: Test Passed, Proceed to Step 7. <input type="checkbox"/> <50%: Proceed to Step 6. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8. Observations: <u>No slick/sheen</u>
Step 6: If sheen or slick is <50% of the surface, continue observing for just under one hour. If the sheen remains <50%, the test passed. Proceed to Step 7 and discharge drilling fluids before end of one hour observation window. If sheen increases to >50% of the test surface at any time, the test failed and should be stopped. Proceed to Step 8.	End Time of Observations: <u>06:51</u> Must be <1 hour after Introduction. Final Percentage of Surface Area Covered By Sheen: <u>0</u> % <input type="checkbox"/> <50%: Test Passed, Proceed to Step 7. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8. Observations: <u>No slick/sheen</u>
Step 7: Indicate above that the test passed. Proceed with discharge of drilling fluids. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse and allow to air dry.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 8: Indicate above that the test failed. Discharge of drilling fluids is not permitted. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse with fresh water and allow to air dry. Continue flushing hole, and retest the drilling fluid until the test passes. Record each test on new sheet.	Completed? <input type="checkbox"/> Yes <input type="checkbox"/> No

Static Sheen Test (EPA Method 1617) Reporting Form & Instructions Rev. 2

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Borehole: MB-08 Test #: 1 of 1 ☒ Original Test ☐ Retest

Latitude: 60.66367342°N Longitude: 151.3773987°W

Date: 8/25/15

Test Operator: J. Greenwall

Test Results: ☒ Passed ☐ Failed Comments: _____

Step 1: After completion of drilling and sampling, place a new, unused liner (plastic trash bag) into the bucket labeled "Static Sheen Test Container."	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 2: Have the drill crew obtain a 200 mL to 500 mL sample of drilling fluid from the mud pit using the 1 L beaker.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Time of Collection: <u>16:55</u>
Step 3: Use the bucket with attached line to retrieve seawater for use in the test. Fill the test container to within 0.5 inch of the top of the container. Proceed without delay to ensure the test water temperature remains close to Cook Inlet water temperature.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 4: Fill a 25-mL disposable pipette with the drilling fluid in the 1 L beaker and discharge into a soil waste bucket. Then measure a 15-mL sample of the drilling fluid for the test. Introduce the drilling fluid to the test container 1 cm below the water surface. Use the pipette to distribute the drilling fluid homogeneously throughout the test container. Discard the pipette.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Time of Introduction: <u>17:00</u> Must be <1 hour after Collection.
Step 5: Observe the test container at viewing angles of approximately 60° and 30° from the horizontal. Ensure adequate fluorescent light is positioned above and directed over the entire surface of the test container. Use a lamp if necessary. Observe for patches, streaks, or sheets of "silvery" or "metallic" sheen or gloss, increased reflectivity, visual color, iridescence, or an oil slick on the water surface of the test container. A slick may lack color, a sheen, or iridescence. Do not disturb the surface of the test container in any manner that reduces the size of any sheen or slick.	Start Time of Observations: <u>17:02</u> Must be <1 hour after Introduction. Initial Percentage of Surface Covered By Sheen: <u>0</u> % <input checked="" type="checkbox"/> 0%: Test Passed, Proceed to Step 7. <input type="checkbox"/> <50%: Proceed to Step 6. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8. Observations: <u>No slick/sheen</u>
Step 6: If sheen or slick is <50% of the surface, continue observing for just under one hour. If the sheen remains <50%, the test passed. Proceed to Step 7 and discharge drilling fluids before end of one hour observation window. If sheen increases to >50% of the test surface at any time, the test failed and should be stopped. Proceed to Step 8.	End Time of Observations: <u>17:15</u> Must be <1 hour after Introduction. Final Percentage of Surface Area Covered By Sheen: <u>0</u> % <input type="checkbox"/> <50%: Test Passed, Proceed to Step 7. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8. Observations: <u>No slick/sheen</u>
Step 7: Indicate above that the test passed. Proceed with discharge of drilling fluids. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse and allow to air dry.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 8: Indicate above that the test failed. Discharge of drilling fluids is not permitted. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse with fresh water and allow to air dry. Continue flushing hole, and retest the drilling fluid until the test passes. Record each test on new sheet.	Completed? <input type="checkbox"/> Yes <input type="checkbox"/> No

Static Sheen Test (EPA Method 1617) Reporting Form & Instructions Rev. 2

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Borehole: MB-09 Test #: 1 of 1 ☒ Original Test ☐ Retest

Latitude: 60.66249628°N Longitude: 151.38079069°W

Date: 8/28/15

Test Operator: J. Greenwalt

Test Results: ☒ Passed ☐ Failed Comments: _____

Step 1: After completion of drilling and sampling, place a new, unused liner (plastic trash bag) into the bucket labeled "Static Sheen Test Container."	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 2: Have the drill crew obtain a 200 mL to 500 mL sample of drilling fluid from the mud pit using the 1 L beaker.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
	Time of Collection: <u>12:15</u>
Step 3: Use the bucket with attached line to retrieve seawater for use in the test. Fill the test container to within 0.5 inch of the top of the container. Proceed without delay to ensure the test water temperature remains close to Cook Inlet water temperature.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 4: Fill a 25-mL disposable pipette with the drilling fluid in the 1 L beaker and discharge into a soil waste bucket. Then measure a 15-mL sample of the drilling fluid for the test. Introduce the drilling fluid to the test container 1 cm below the water surface. Use the pipette to distribute the drilling fluid homogeneously throughout the test container. Discard the pipette.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
	Time of Introduction: <u>12:19</u> Must be <1 hour after Collection.
Step 5: Observe the test container at viewing angles of approximately 60° and 30° from the horizontal. Ensure adequate fluorescent light is positioned above and directed over the entire surface of the test container. Use a lamp if necessary. Observe for patches, streaks, or sheets of "silvery" or "metallic" sheen or gloss, increased reflectivity, visual color, iridescence, or an oil slick on the water surface of the test container. A slick may lack color, a sheen, or iridescence. Do not disturb the surface of the test container in any manner that reduces the size of any sheen or slick.	Start Time of Observations: <u>12:20</u> Must be <1 hour after Introduction.
	Initial Percentage of Surface Covered By Sheen: <u>0</u> % <input checked="" type="checkbox"/> 0%: Test Passed, Proceed to Step 7. <input type="checkbox"/> <50%: Proceed to Step 6. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8.
	Observations: <u>No sheen/slick.</u>
Step 6: If sheen or slick is <50% of the surface, continue observing for just under one hour. If the sheen remains <50%, the test passed. Proceed to Step 7 and discharge drilling fluids before end of one hour observation window. If sheen increases to >50% of the test surface at any time, the test failed and should be stopped. Proceed to Step 8.	End Time of Observations: <u>12:30</u> Must be <1 hour after Introduction.
	Final Percentage of Surface Area Covered By Sheen: <u>0</u> % <input type="checkbox"/> <50%: Test Passed, Proceed to Step 7. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8.
	Observations: <u>No sheen/slick</u>
Step 7: Indicate above that the test passed. Proceed with discharge of drilling fluids. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse and allow to air dry.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 8: Indicate above that the test failed. Discharge of drilling fluids is not permitted. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse with fresh water and allow to air dry. Continue flushing hole, and retest the drilling fluid until the test passes. Record each test on new sheet.	Completed? <input type="checkbox"/> Yes <input type="checkbox"/> No

Static Sheen Test (EPA Method 1617) Reporting Form & Instructions Rev. 2

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Borehole: MB-15 Test #: 1 of 1 ☒ Original Test ☐ Retest

Latitude: 60.65898078°N Longitude: 151.37165869°W

Date: 9/4/15

Test Operator: J. Greenwald

Test Results: ☒ Passed ☐ Failed Comments: _____

Step 1: After completion of drilling and sampling, place a new, unused liner (plastic trash bag) into the bucket labeled "Static Sheen Test Container."	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 2: Have the drill crew obtain a 200 mL to 500 mL sample of drilling fluid from the mud pit using the 1 L beaker.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
	Time of Collection: <u>17:05</u>
Step 3: Use the bucket with attached line to retrieve seawater for use in the test. Fill the test container to within 0.5 inch of the top of the container. Proceed without delay to ensure the test water temperature remains close to Cook Inlet water temperature.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 4: Fill a 25-mL disposable pipette with the drilling fluid in the 1 L beaker and discharge into a soil waste bucket. Then measure a 15-mL sample of the drilling fluid for the test. Introduce the drilling fluid to the test container 1 cm below the water surface. Use the pipette to distribute the drilling fluid homogeneously throughout the test container. Discard the pipette.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
	Time of Introduction: <u>17:10</u> Must be <1 hour after Collection.
Step 5: Observe the test container at viewing angles of approximately 60° and 30° from the horizontal. Ensure adequate fluorescent light is positioned above and directed over the entire surface of the test container. Use a lamp if necessary. Observe for patches, streaks, or sheets of "silvery" or "metallic" sheen or gloss, increased reflectivity, visual color, iridescence, or an oil slick on the water surface of the test container. A slick may lack color, a sheen, or iridescence. Do not disturb the surface of the test container in any manner that reduces the size of any sheen or slick.	Start Time of Observations: <u>17:11</u> Must be <1 hour after Introduction.
	Initial Percentage of Surface Covered By Sheen: <u>0</u> % <input checked="" type="checkbox"/> 0%: Test Passed, Proceed to Step 7. <input type="checkbox"/> <50%: Proceed to Step 6. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8.
	Observations: <u>No slick/sheen</u>
Step 6: If sheen or slick is <50% of the surface, continue observing for just under one hour. If the sheen remains <50%, the test passed. Proceed to Step 7 and discharge drilling fluids before end of one hour observation window. If sheen increases to >50% of the test surface at any time, the test failed and should be stopped. Proceed to Step 8:	End Time of Observations: <u>17:15</u> Must be <1 hour after Introduction.
	Final Percentage of Surface Area Covered By Sheen: <u>0</u> % <input checked="" type="checkbox"/> <50%: Test Passed, Proceed to Step 7. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8.
	Observations: <u>No slick/sheen</u>
Step 7: Indicate above that the test passed. Proceed with discharge of drilling fluids. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse and allow to air dry.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 8: Indicate above that the test failed. Discharge of drilling fluids is not permitted. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse with fresh water and allow to air dry. Continue flushing hole, and retest the drilling fluid until the test passes. Record each test on new sheet.	Completed? <input type="checkbox"/> Yes <input type="checkbox"/> No

Static Sheen Test (EPA Method 1617) Reporting Form & Instructions Rev. 2

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Borehole: MB-16 Test #: 1 of 1 ☒ Original Test ☐ Retest

Date: 7 September 2015

Latitude: 60.49129686°N Longitude: 151.37525403°W

Test Operator: Austin FEE

Test Results: ☒ Passed ☐ Failed

Comments: No sheen observed; Test passed; proceed with discharge

Step 1: After completion of drilling and sampling, place a new, unused liner (plastic trash bag) into the bucket labeled "Static Sheen Test Container."	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 2: Have the drill crew obtain a 200 mL to 500 mL sample of drilling fluid from the mud pit using the 1 L beaker.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Time of Collection: <u>0030</u>
Step 3: Use the bucket with attached line to retrieve seawater for use in the test. Fill the test container to within 0.5 inch of the top of the container. Proceed without delay to ensure the test water temperature remains close to Cook Inlet water temperature.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 4: Fill a 25-mL disposable pipette with the drilling fluid in the 1 L beaker and discharge into a soil waste bucket. Then measure a 15-mL sample of the drilling fluid for the test. Introduce the drilling fluid to the test container 1 cm below the water surface. Use the pipette to distribute the drilling fluid homogeneously throughout the test container. Discard the pipette.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Time of Introduction: <u>0033</u> Must be <1 hour after Collection.
Step 5: Observe the test container at viewing angles of approximately 60° and 30° from the horizontal. Ensure adequate fluorescent light is positioned above and directed over the entire surface of the test container. Use a lamp if necessary. Observe for patches, streaks, or sheets of "silvery" or "metallic" sheen or gloss, increased reflectivity, visual color, iridescence, or an oil slick on the water surface of the test container. A slick may lack color, a sheen, or iridescence. Do not disturb the surface of the test container in any manner that reduces the size of any sheen or slick.	Start Time of Observations: <u>0033</u> Must be <1 hour after Introduction. Initial Percentage of Surface Covered By Sheen: <u>0</u> % <input checked="" type="checkbox"/> 0%: Test Passed, Proceed to Step 7. <input type="checkbox"/> <50%: Proceed to Step 6. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8. Observations: <u>No sheen observed</u>
Step 6: If sheen or slick is <50% of the surface, continue observing for just under one hour. If the sheen remains <50%, the test passed. Proceed to Step 7 and discharge drilling fluids before end of one hour observation window. If sheen increases to >50% of the test surface at any time, the test failed and should be stopped. Proceed to Step 8.	End Time of Observations: <u>0038</u> Must be <1 hour after Introduction. Final Percentage of Surface Area Covered By Sheen: <u>0</u> % <input checked="" type="checkbox"/> <50%: Test Passed, Proceed to Step 7. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8. Observations: <u>No sheen observed</u>
Step 7: Indicate above that the test passed. Proceed with discharge of drilling fluids. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse and allow to air dry.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 8: Indicate above that the test failed. Discharge of drilling fluids is not permitted. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse with fresh water and allow to air dry. Continue flushing hole, and retest the drilling fluid until the test passes. Record each test on new sheet.	Completed? <input type="checkbox"/> Yes <input type="checkbox"/> No

Static Sheen Test (EPA Method 1617) Reporting Form & Instructions Rev. 2

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Borehole: MB-20 Test #: 1 of 1 ☒ Original Test ☐ Retest

Latitude: 60.65661392° N Longitude: 151.36889178° W

Date: 9/8/15

Test Operator: J. Greenwald

Test Results: ☒ Passed ☐ Failed

Comments: No slick/sheen.

Step 1: After completion of drilling and sampling, place a new, unused liner (plastic trash bag) into the bucket labeled "Static Sheen Test Container."	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 2: Have the drill crew obtain a 200 mL to 500 mL sample of drilling fluid from the mud pit using the 1 L beaker.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Time of Collection: <u>09:00</u>
Step 3: Use the bucket with attached line to retrieve seawater for use in the test. Fill the test container to within 0.5 inch of the top of the container. Proceed without delay to ensure the test water temperature remains close to Cook Inlet water temperature.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 4: Fill a 25-mL disposable pipette with the drilling fluid in the 1 L beaker and discharge into a soil waste bucket. Then measure a 15-mL sample of the drilling fluid for the test. Introduce the drilling fluid to the test container 1 cm below the water surface. Use the pipette to distribute the drilling fluid homogeneously throughout the test container. Discard the pipette.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Time of Introduction: <u>09:04</u> Must be <1 hour after Collection.
Step 5: Observe the test container at viewing angles of approximately 60° and 30° from the horizontal. Ensure adequate fluorescent light is positioned above and directed over the entire surface of the test container. Use a lamp if necessary. Observe for patches, streaks, or sheets of "silvery" or "metallic" sheen or gloss, increased reflectivity, visual color, iridescence, or an oil slick on the water surface of the test container. A slick may lack color, a sheen, or iridescence. Do not disturb the surface of the test container in any manner that reduces the size of any sheen or slick.	Start Time of Observations: <u>09:05</u> Must be <1 hour after Introduction. Initial Percentage of Surface Covered By Sheen: <u>0</u> % <input checked="" type="checkbox"/> 0%: Test Passed, Proceed to Step 7. <input type="checkbox"/> <50%: Proceed to Step 6. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8. Observations: <u>No slick/sheen.</u>
Step 6: If sheen or slick is <50% of the surface, continue observing for just under one hour. If the sheen remains <50%, the test passed. Proceed to Step 7 and discharge drilling fluids before end of one hour observation window. If sheen increases to >50% of the test surface at any time, the test failed and should be stopped. Proceed to Step 8.	End Time of Observations: <u>09:10</u> Must be <1 hour after Introduction. Final Percentage of Surface Area Covered By Sheen: <u>0</u> % <input checked="" type="checkbox"/> <50%: Test Passed, Proceed to Step 7. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8. Observations: <u>No slick/sheen.</u>
Step 7: Indicate above that the test passed. Proceed with discharge of drilling fluids. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse and allow to air dry.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 8: Indicate above that the test failed. Discharge of drilling fluids is not permitted. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse with fresh water and allow to air dry. Continue flushing hole, and retest the drilling fluid until the test passes. Record each test on new sheet.	Completed? <input type="checkbox"/> Yes <input type="checkbox"/> No

Static Sheen Test (EPA Method 1617) Reporting Form & Instructions

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Borehole: MB-25 Test #: 1 of 1 ☒ Original Test ☐ Retest

Latitude: 60.65322350°N Longitude: 151.36967892°W

Date: 9/9/15

Test Operator: J. Greenwald

Test Results: ☒ Passed ☐ Failed Comments: _____

Step 1: After completion of drilling and sampling, place a new, unused liner (plastic trash bag) into the bucket labeled "Static Sheen Test Container."	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 2: Have the drill crew obtain a 200 mL to 500 mL sample of drilling fluid from the mud pit using the 1 L beaker.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Time of Collection: <u>16:20</u>
Step 3: Use the bucket with attached line to retrieve seawater for use in the test. Fill the test container to within 0.5 inch of the top of the container. Proceed without delay to ensure the test water temperature remains close to Cook Inlet water temperature.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 4: Fill a 25-mL disposable pipette with the drilling fluid in the 1 L beaker and discharge into a soil waste bucket. Then measure a 15-mL sample of the drilling fluid for the test. Introduce the drilling fluid to the test container 1 cm below the water surface. Use the pipette to distribute the drilling fluid homogeneously throughout the test container. Discard the pipette.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Time of Introduction: <u>16:24</u> Must be <1 hour after Collection.
Step 5: Observe the test container at viewing angles of approximately 60° and 30° from the horizontal. Ensure adequate fluorescent light is positioned above and directed over the entire surface of the test container. Use a lamp if necessary. Observe for patches, streaks, or sheets of "silvery" or "metallic" sheen or gloss, increased reflectivity, visual color, iridescence, or an oil slick on the water surface of the test container. A slick may lack color, a sheen, or iridescence. Do not disturb the surface of the test container in any manner that reduces the size of any sheen or slick.	Start Time of Observations: <u>16:25</u> Must be <1 hour after Introduction. Initial Percentage of Surface Covered By Sheen: <u>0</u> % <input checked="" type="checkbox"/> 0%: Test Passed, Proceed to Step 7. <input type="checkbox"/> <50%: Proceed to Step 6. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8. Observations: <u>No slick/sheen.</u>
Step 6: If sheen or slick is <50% of the surface, continue observing for just under one hour. If the sheen remains <50%, the test passed. Proceed to Step 7 and discharge drilling fluids before end of one hour observation window. If sheen increases to >50% of the test surface at any time, the test failed and should be stopped. Proceed to Step 8.	End Time of Observations: <u>16:30</u> Must be <1 hour after Introduction. Final Percentage of Surface Area Covered By Sheen: <u>0</u> % <input checked="" type="checkbox"/> <50%: Test Passed, Proceed to Step 7. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8. Observations: <u>No slick/sheen.</u>
Step 7: Indicate above that the test passed. Proceed with discharge of drilling fluids. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse and allow to air dry.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 8: Indicate above that the test failed. Discharge of drilling fluids is not permitted. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse with fresh water and allow to air dry. Continue flushing hole, and retest the drilling fluid until the test passes. Record each test on new sheet.	Completed? <input type="checkbox"/> Yes <input type="checkbox"/> No

Static Sheen Test (EPA Method 1617) Reporting Form & Instructions Rev. 2

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Borehole: MB-26 Test #: 1 of 1 ☒ Original Test ☐ Retest

Latitude: 60.65216953°N Longitude: 151.37327900°W

Date: 9/11/2015

Test Operator: Austin Fee

Test Results: ☒ Passed ☐ Failed

Comments: _____

Step 1: After completion of drilling and sampling, place a new, unused liner (plastic trash bag) into the bucket labeled "Static Sheen Test Container."	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 2: Have the drill crew obtain a 200 mL to 500 mL sample of drilling fluid from the mud pit using the 1 L beaker.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Time of Collection: <u>0440</u>
Step 3: Use the bucket with attached line to retrieve seawater for use in the test. Fill the test container to within 0.5 inch of the top of the container. Proceed without delay to ensure the test water temperature remains close to Cook Inlet water temperature.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 4: Fill a 25-mL disposable pipette with the drilling fluid in the 1 L beaker and discharge into a soil waste bucket. Then measure a 15-mL sample of the drilling fluid for the test. Introduce the drilling fluid to the test container 1 cm below the water surface. Use the pipette to distribute the drilling fluid homogeneously throughout the test container. Discard the pipette.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Time of Introduction: <u>0442</u> Must be <1 hour after Collection.
Step 5: Observe the test container at viewing angles of approximately 60° and 30° from the horizontal. Ensure adequate fluorescent light is positioned above and directed over the entire surface of the test container. Use a lamp if necessary. Observe for patches, streaks, or sheets of "silvery" or "metallic" sheen or gloss, increased reflectivity, visual color, iridescence, or an oil slick on the water surface of the test container. A slick may lack color, a sheen, or iridescence. Do not disturb the surface of the test container in any manner that reduces the size of any sheen or slick.	Start Time of Observations: <u>0443</u> Must be <1 hour after Introduction. Initial Percentage of Surface Covered By Sheen: <u>0</u> % <input checked="" type="checkbox"/> 0%: Test Passed, Proceed to Step 7. <input type="checkbox"/> <50%: Proceed to Step 6. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8. Observations: <u>No sheen or slick</u>
Step 6: If sheen or slick is <50% of the surface, continue observing for just under one hour. If the sheen remains <50%, the test passed. Proceed to Step 7 and discharge drilling fluids before end of one hour observation window. If sheen increases to >50% of the test surface at any time, the test failed and should be stopped. Proceed to Step 8.	End Time of Observations: <u>0448</u> Must be <1 hour after Introduction. Final Percentage of Surface Area Covered By Sheen: <u>0</u> % <input checked="" type="checkbox"/> <50%: Test Passed, Proceed to Step 7. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8. Observations: <u>No sheen or slick</u>
Step 7: Indicate above that the test passed. Proceed with discharge of drilling fluids. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse and allow to air dry.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 8: Indicate above that the test failed. Discharge of drilling fluids is not permitted. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse with fresh water and allow to air dry. Continue flushing hole, and retest the drilling fluid until the test passes. Record each test on new sheet.	Completed? <input type="checkbox"/> Yes <input type="checkbox"/> No

Static Sheen Test (EPA Method 1617) Reporting Form & Instructions Rev. 2

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Borehole: MB-31 Test #: 1 of 1 ☒ Original Test ☐ Retest

Latitude: 60.64981225°N Longitude: 151.37039036

Date: 9/11/15

Test Operator: J. Greenwald

Test Results: ☒ Passed ☐ Failed Comments: _____

Step 1: After completion of drilling and sampling, place a new, unused liner (plastic trash bag) into the bucket labeled "Static Sheen Test Container."	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 2: Have the drill crew obtain a 200 mL to 500 mL sample of drilling fluid from the mud pit using the 1 L beaker.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Time of Collection: <u>17:05</u>
Step 3: Use the bucket with attached line to retrieve seawater for use in the test. Fill the test container to within 0.5 inch of the top of the container. Proceed without delay to ensure the test water temperature remains close to Cook Inlet water temperature.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 4: Fill a 25-mL disposable pipette with the drilling fluid in the 1 L beaker and discharge into a soil waste bucket. Then measure a 15-mL sample of the drilling fluid for the test. Introduce the drilling fluid to the test container 1 cm below the water surface. Use the pipette to distribute the drilling fluid homogeneously throughout the test container. Discard the pipette.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Time of Introduction: <u>17:07</u> Must be <1 hour after Collection.
Step 5: Observe the test container at viewing angles of approximately 60° and 30° from the horizontal. Ensure adequate fluorescent light is positioned above and directed over the entire surface of the test container. Use a lamp if necessary. Observe for patches, streaks, or sheets of "silvery" or "metallic" sheen or gloss, increased reflectivity, visual color, iridescence, or an oil slick on the water surface of the test container. A slick may lack color, a sheen, or iridescence. Do not disturb the surface of the test container in any manner that reduces the size of any sheen or slick.	Start Time of Observations: <u>17:08</u> Must be <1 hour after Introduction. Initial Percentage of Surface Covered By Sheen: <u>0</u> % <input checked="" type="checkbox"/> 0%: Test Passed, Proceed to Step 7. <input type="checkbox"/> <50%: Proceed to Step 6. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8. Observations: <u>No slick/sheen.</u>
Step 6: If sheen or slick is <50% of the surface, continue observing for just under one hour. If the sheen remains <50%, the test passed. Proceed to Step 7 and discharge drilling fluids before end of one hour observation window. If sheen increases to >50% of the test surface at any time, the test failed and should be stopped. Proceed to Step 8.	End Time of Observations: <u>17:15</u> Must be <1 hour after Introduction. Final Percentage of Surface Area Covered By Sheen: <u>0</u> % <input checked="" type="checkbox"/> <50%: Test Passed, Proceed to Step 7. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8. Observations: <u>No slick/sheen.</u>
Step 7: Indicate above that the test passed. Proceed with discharge of drilling fluids. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse and allow to air dry.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 8: Indicate above that the test failed. Discharge of drilling fluids is not permitted. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse with fresh water and allow to air dry. Continue flushing hole, and retest the drilling fluid until the test passes. Record each test on new sheet.	Completed? <input type="checkbox"/> Yes <input type="checkbox"/> No

Static Sheen Test (EPA Method 1617) Reporting Form & Instructions Rev. 2

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Borehole: MB-02 Test #: 1 of 1 ☒ Original Test ☐ Retest
Latitude: 60.64981225°N Longitude: 151.37039036°W

Date: 9/12/15
Test Operator: J. Greenwald

Test Results: ☒ Passed ☐ Failed Comments: _____

Step 1: After completion of drilling and sampling, place a new, unused liner (plastic trash bag) into the bucket labeled "Static Sheen Test Container."	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 2: Have the drill crew obtain a 200 mL to 500 mL sample of drilling fluid from the mud pit using the 1 L beaker.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Time of Collection: <u>1157</u>
Step 3: Use the bucket with attached line to retrieve seawater for use in the test. Fill the test container to within 0.5 inch of the top of the container. Proceed without delay to ensure the test water temperature remains close to Cook Inlet water temperature.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 4: Fill a 25-mL disposable pipette with the drilling fluid in the 1 L beaker and discharge into a soil waste bucket. Then measure a 15-mL sample of the drilling fluid for the test. Introduce the drilling fluid to the test container 1 cm below the water surface. Use the pipette to distribute the drilling fluid homogeneously throughout the test container. Discard the pipette.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Time of Introduction: <u>1201</u> Must be <1 hour after Collection.
Step 5: Observe the test container at viewing angles of approximately 60° and 30° from the horizontal. Ensure adequate fluorescent light is positioned above and directed over the entire surface of the test container. Use a lamp if necessary. Observe for patches, streaks, or sheets of "silvery" or "metallic" sheen or gloss, increased reflectivity, visual color, iridescence, or an oil slick on the water surface of the test container. A slick may lack color, a sheen, or iridescence. Do not disturb the surface of the test container in any manner that reduces the size of any sheen or slick.	Start Time of Observations: <u>1205</u> Must be <1 hour after Introduction. Initial Percentage of Surface Covered By Sheen: <u>0</u> % <input checked="" type="checkbox"/> 0%: Test Passed, Proceed to Step 7. <input type="checkbox"/> <50%: Proceed to Step 6. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8. Observations: <u>No slick/sheen.</u>
Step 6: If sheen or slick is <50% of the surface, continue observing for just under one hour. If the sheen remains <50%, the test passed. Proceed to Step 7 and discharge drilling fluids before end of one hour observation window. If sheen increases to >50% of the test surface at any time, the test failed and should be stopped. Proceed to Step 8.	End Time of Observations: <u>1210</u> Must be <1 hour after Introduction. Final Percentage of Surface Area Covered By Sheen: <u>0</u> % <input checked="" type="checkbox"/> <50%: Test Passed, Proceed to Step 7. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8. Observations: <u>No slick/sheen.</u>
Step 7: Indicate above that the test passed. Proceed with discharge of drilling fluids. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse and allow to air dry.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 8: Indicate above that the test failed. Discharge of drilling fluids is not permitted. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse with fresh water and allow to air dry. Continue flushing hole, and retest the drilling fluid until the test passes. Record each test on new sheet.	Completed? <input type="checkbox"/> Yes <input type="checkbox"/> No

Static Sheen Test (EPA Method 1617) Reporting Form & Instructions Rev. 2

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Borehole: MB-06 Test #: 1 of 1 ☒ Original Test ☐ Retest

Date: 9/19/2015

Latitude: 60.66501117°N Longitude: 151.38379131°W

Test Operator: Austin Fee

Test Results: ☒ Passed ☐ Failed Comments: _____

Step 1: After completion of drilling and sampling, place a new, unused liner (plastic trash bag) into the bucket labeled "Static Sheen Test Container."	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 2: Have the drill crew obtain a 200 mL to 500 mL sample of drilling fluid from the mud pit using the 1 L beaker.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Time of Collection: <u>0300</u>
Step 3: Use the bucket with attached line to retrieve seawater for use in the test. Fill the test container to within 0.5 inch of the top of the container. Proceed without delay to ensure the test water temperature remains close to Cook Inlet water temperature.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 4: Fill a 25-mL disposable pipette with the drilling fluid in the 1 L beaker and discharge into a soil waste bucket. Then measure a 15-mL sample of the drilling fluid for the test. Introduce the drilling fluid to the test container 1 cm below the water surface. Use the pipette to distribute the drilling fluid homogeneously throughout the test container. Discard the pipette.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Time of Introduction: <u>0305</u> Must be <1 hour after Collection.
Step 5: Observe the test container at viewing angles of approximately 60° and 30° from the horizontal. Ensure adequate fluorescent light is positioned above and directed over the entire surface of the test container. Use a lamp if necessary. Observe for patches, streaks, or sheets of "silvery" or "metallic" sheen or gloss, increased reflectivity, visual color, iridescence, or an oil slick on the water surface of the test container. A slick may lack color, a sheen, or iridescence. Do not disturb the surface of the test container in any manner that reduces the size of any sheen or slick.	Start Time of Observations: <u>0306</u> Must be <1 hour after Introduction. Initial Percentage of Surface Covered By Sheen: <u>0</u> % <input checked="" type="checkbox"/> 0%: Test Passed, Proceed to Step 7. <input type="checkbox"/> <50%: Proceed to Step 6. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8. Observations: <u>No slick/sheen</u>
Step 6: If sheen or slick is <50% of the surface, continue observing for just under one hour. If the sheen remains <50%, the test passed. Proceed to Step 7 and discharge drilling fluids before end of one hour observation window. If sheen increases to >50% of the test surface at any time, the test failed and should be stopped. Proceed to Step 8.	End Time of Observations: <u>0310</u> Must be <1 hour after Introduction. Final Percentage of Surface Area Covered By Sheen: <u>0</u> % <input checked="" type="checkbox"/> <50%: Test Passed, Proceed to Step 7. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8. Observations: <u>No slick/sheen</u>
Step 7: Indicate above that the test passed. Proceed with discharge of drilling fluids. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse and allow to air dry.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 8: Indicate above that the test failed. Discharge of drilling fluids is not permitted. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse with fresh water and allow to air dry. Continue flushing hole, and retest the drilling fluid until the test passes. Record each test on new sheet.	Completed? <input type="checkbox"/> Yes <input type="checkbox"/> No

Static Sheen Test (EPA Method 1617) Reporting Form & Instructions Rev. 2

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Borehole: MB-18 Test #: 1 of 1 ☒ Original Test ☐ Retest

Latitude: 60.65527456°N Longitude: 151.37954225°W

Date: 9/21/15

Test Operator: J. Greenwald

Test Results: ☒ Passed ☐ Failed Comments: _____

Step 1: After completion of drilling and sampling, place a new, unused liner (plastic trash bag) into the bucket labeled "Static Sheen Test Container."	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 2: Have the drill crew obtain a 200 mL to 500 mL sample of drilling fluid from the mud pit using the 1 L beaker.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
	Time of Collection: <u>1740</u>
Step 3: Use the bucket with attached line to retrieve seawater for use in the test. Fill the test container to within 0.5 inch of the top of the container. Proceed without delay to ensure the test water temperature remains close to Cook Inlet water temperature.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 4: Fill a 25-mL disposable pipette with the drilling fluid in the 1 L beaker and discharge into a soil waste bucket. Then measure a 15-mL sample of the drilling fluid for the test. Introduce the drilling fluid to the test container 1 cm below the water surface. Use the pipette to distribute the drilling fluid homogeneously throughout the test container. Discard the pipette.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
	Time of Introduction: <u>1743</u> Must be <1 hour after Collection.
Step 5: Observe the test container at viewing angles of approximately 60° and 30° from the horizontal. Ensure adequate fluorescent light is positioned above and directed over the entire surface of the test container. Use a lamp if necessary. Observe for patches, streaks, or sheets of "silvery" or "metallic" sheen or gloss, increased reflectivity, visual color, iridescence, or an oil slick on the water surface of the test container. A slick may lack color, a sheen, or iridescence. Do not disturb the surface of the test container in any manner that reduces the size of any sheen or slick.	Start Time of Observations: <u>1745</u> Must be <1 hour after Introduction.
	Initial Percentage of Surface Covered By Sheen: <u>0</u> % <input checked="" type="checkbox"/> 0%: Test Passed, Proceed to Step 7. <input type="checkbox"/> <50%: Proceed to Step 6. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8.
	Observations: <u>No slick/sheen</u>
Step 6: If sheen or slick is <50% of the surface, continue observing for just under one hour. If the sheen remains <50%, the test passed. Proceed to Step 7 and discharge drilling fluids before end of one hour observation window. If sheen increases to >50% of the test surface at any time, the test failed and should be stopped. Proceed to Step 8.	End Time of Observations: <u>1750</u> Must be <1 hour after Introduction.
	Final Percentage of Surface Area Covered By Sheen: <u>0</u> % <input checked="" type="checkbox"/> <50%: Test Passed, Proceed to Step 7. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8.
	Observations: <u>No slick/sheen.</u>
Step 7: Indicate above that the test passed. Proceed with discharge of drilling fluids. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse and allow to air dry.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 8: Indicate above that the test failed. Discharge of drilling fluids is not permitted. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse with fresh water and allow to air dry. Continue flushing hole, and retest the drilling fluid until the test passes. Record each test on new sheet.	Completed? <input type="checkbox"/> Yes <input type="checkbox"/> No

Static Sheen Test (EPA Method 1617) Reporting Form & Instructions Rev. 2

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Borehole: MB-13 Test #: 1 of 1 ☒ Original Test ☐ Retest

Latitude: 60.6603 N Longitude: 151.3781 W

Date: OCT 3 2015

Test Operator: E. PULIDO

Test Results: ☒ Passed ☐ Failed Comments: _____

Step 1: After completion of drilling and sampling, place a new, unused liner (plastic trash bag) into the bucket labeled "Static Sheen Test Container."	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 2: Have the drill crew obtain a 200 mL to 500 mL sample of drilling fluid from the mud pit using the 1 L beaker.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Time of Collection: <u>0525</u>
Step 3: Use the bucket with attached line to retrieve seawater for use in the test. Fill the test container to within 0.5 inch of the top of the container. Proceed without delay to ensure the test water temperature remains close to Cook Inlet water temperature.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 4: Fill a 25-mL disposable pipette with the drilling fluid in the 1 L beaker and discharge into a soil waste bucket. Then measure a 15-mL sample of the drilling fluid for the test. Introduce the drilling fluid to the test container 1 cm below the water surface. Use the pipette to distribute the drilling fluid homogeneously throughout the test container. Discard the pipette.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Time of Introduction: Must be <1 hour after Collection. <u>0530 hrs</u>
Step 5: Observe the test container at viewing angles of approximately 60° and 30° from the horizontal. Ensure adequate fluorescent light is positioned above and directed over the entire surface of the test container. Use a lamp if necessary. Observe for patches, streaks, or sheets of "silvery" or "metallic" sheen or gloss, increased reflectivity, visual color, iridescence, or an oil slick on the water surface of the test container. A slick may lack color, a sheen, or iridescence. Do not disturb the surface of the test container in any manner that reduces the size of any sheen or slick.	Start Time of Observations: Must be <1 hour after Introduction. <u>0531 hrs</u> Initial Percentage of Surface Covered By Sheen: <u>0</u> % <input checked="" type="checkbox"/> 0%: Test Passed, Proceed to Step 7. <input type="checkbox"/> <50%: Proceed to Step 6. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8. Observations: <u>N/A</u>
Step 6: If sheen or slick is <50% of the surface, continue observing for just under one hour. If the sheen remains <50%, the test passed. Proceed to Step 7 and discharge drilling fluids before end of one hour observation window. If sheen increases to >50% of the test surface at any time, the test failed and should be stopped. Proceed to Step 8.	End Time of Observations: Must be <1 hour after Introduction. <u>0540</u> Final Percentage of Surface Area Covered By Sheen: <u>0</u> % <input type="checkbox"/> <50%: Test Passed, Proceed to Step 7. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8. Observations: <u>No sheen/slick</u>
Step 7: Indicate above that the test passed. Proceed with discharge of drilling fluids. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse and allow to air dry.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 8: Indicate above that the test failed. Discharge of drilling fluids is not permitted. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse with fresh water and allow to air dry. Continue flushing hole, and retest the drilling fluid until the test passes. Record each test on new sheet.	Completed? <input type="checkbox"/> Yes <input type="checkbox"/> No

Static Sheen Test (EPA Method 1617) Reporting Form & Instructions Rev. 2

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Borehole: MB-22 Test #: 1 of 1 ☒ Original Test ☐ Retest
Latitude: 60.65356186°N Longitude: 151.37928597°W
Test Results: ☒ Passed ☐ Failed Comments: _____

Date: OCT 7 2015
Test Operator: Sam Pant

Step 1: After completion of drilling and sampling, place a new, unused liner (plastic trash bag) into the bucket labeled "Static Sheen Test Container."	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 2: Have the drill crew obtain a 200 mL to 500 mL sample of drilling fluid from the mud pit using the 1 L beaker.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Time of Collection: <u>10:55</u>
Step 3: Use the bucket with attached line to retrieve seawater for use in the test. Fill the test container to within 0.5 inch of the top of the container. Proceed without delay to ensure the test water temperature remains close to Cook Inlet water temperature.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 4: Fill a 25-mL disposable pipette with the drilling fluid in the 1 L beaker and discharge into a soil waste bucket. Then measure a 15-mL sample of the drilling fluid for the test. Introduce the drilling fluid to the test container 1 cm below the water surface. Use the pipette to distribute the drilling fluid homogeneously throughout the test container. Discard the pipette.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Time of Introduction: <u>11:00</u> Must be <1 hour after Collection.
Step 5: Observe the test container at viewing angles of approximately 60° and 30° from the horizontal. Ensure adequate fluorescent light is positioned above and directed over the entire surface of the test container. Use a lamp if necessary. Observe for patches, streaks, or sheets of "silvery" or "metallic" sheen or gloss, increased reflectivity, visual color, iridescence, or an oil slick on the water surface of the test container. A slick may lack color, a sheen, or iridescence. Do not disturb the surface of the test container in any manner that reduces the size of any sheen or slick.	Start Time of Observations: <u>11:04</u> Must be <1 hour after Introduction. Initial Percentage of Surface Covered By Sheen: <u>0</u> % <input checked="" type="checkbox"/> 0%: Test Passed, Proceed to Step 7. <input type="checkbox"/> <50%: Proceed to Step 6. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8. Observations: <u>No slick/sheen</u>
Step 6: If sheen or slick is <50% of the surface, continue observing for just under one hour. If the sheen remains <50%, the test passed. Proceed to Step 7 and discharge drilling fluids before end of one hour observation window. If sheen increases to >50% of the test surface at any time, the test failed and should be stopped. Proceed to Step 8.	End Time of Observations: <u>11:10</u> Must be <1 hour after Introduction. Final Percentage of Surface Area Covered By Sheen: <u>0</u> % <input checked="" type="checkbox"/> <50%: Test Passed, Proceed to Step 7. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8. Observations: <u>No slick/sheen</u>
Step 7: Indicate above that the test passed. Proceed with discharge of drilling fluids. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse and allow to air dry.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 8: Indicate above that the test failed. Discharge of drilling fluids is not permitted. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse with fresh water and allow to air dry. Continue flushing hole, and retest the drilling fluid until the test passes. Record each test on new sheet.	Completed? <input type="checkbox"/> Yes <input type="checkbox"/> No

Static Sheen Test (EPA Method 1617) Reporting Form & Instructions Rev. 2

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Borehole: M-27 Test #: 1 of 1 ☒ Original Test ☐ Retest
Latitude: 60.65111592°N Longitude: 151.37646725°W
Test Results: ☒ Passed ☐ Failed Comments: _____

Date: OCT 9 2015
Test Operator: Sam Pant

Step 1: After completion of drilling and sampling, place a new, unused liner (plastic trash bag) into the bucket labeled "Static Sheen Test Container."	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 2: Have the drill crew obtain a 200 mL to 500 mL sample of drilling fluid from the mud pit using the 1 L beaker.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Time of Collection: <u>11:55</u>
Step 3: Use the bucket with attached line to retrieve seawater for use in the test. Fill the test container to within 0.5 inch of the top of the container. Proceed without delay to ensure the test water temperature remains close to Cook Inlet water temperature.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 4: Fill a 25-mL disposable pipette with the drilling fluid in the 1 L beaker and discharge into a soil waste bucket. Then measure a 15-mL sample of the drilling fluid for the test. Introduce the drilling fluid to the test container 1 cm below the water surface. Use the pipette to distribute the drilling fluid homogeneously throughout the test container. Discard the pipette.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Time of Introduction: <u>11:58</u> Must be <1 hour after Collection.
Step 5: Observe the test container at viewing angles of approximately 60° and 30° from the horizontal. Ensure adequate fluorescent light is positioned above and directed over the entire surface of the test container. Use a lamp if necessary. Observe for patches, streaks, or sheets of "silvery" or "metallic" sheen or gloss, increased reflectivity, visual color, iridescence, or an oil slick on the water surface of the test container. A slick may lack color, a sheen, or iridescence. Do not disturb the surface of the test container in any manner that reduces the size of any sheen or slick.	Start Time of Observations: <u>12:00</u> Must be <1 hour after Introduction. Initial Percentage of Surface Covered By Sheen: <u>0</u> % <input checked="" type="checkbox"/> 0%: Test Passed, Proceed to Step 7. <input type="checkbox"/> <50%: Proceed to Step 6. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8. Observations: <u>NO SLICK / SHEEN</u>
Step 6: If sheen or slick is <50% of the surface, continue observing for just under one hour. If the sheen remains <50%, the test passed. Proceed to Step 7 and discharge drilling fluids before end of one hour observation window. If sheen increases to >50% of the test surface at any time, the test failed and should be stopped. Proceed to Step 8.	End Time of Observations: <u>12:08</u> Must be <1 hour after Introduction. Final Percentage of Surface Area Covered By Sheen: <u>0</u> % <input checked="" type="checkbox"/> <50%: Test Passed, Proceed to Step 7. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8. Observations: <u>NO SLICK / SHEEN</u>
Step 7: Indicate above that the test passed. Proceed with discharge of drilling fluids. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse and allow to air dry.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 8: Indicate above that the test failed. Discharge of drilling fluids is not permitted. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse with fresh water and allow to air dry. Continue flushing hole, and retest the drilling fluid until the test passes. Record each test on new sheet.	Completed? <input type="checkbox"/> Yes <input type="checkbox"/> No

Static Sheen Test (EPA Method 1617) Reporting Form & Instructions Rev. 2

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Borehole: MB-19 Test #: 1 of 1 ☒ Original Test ☐ Retest
Latitude: 60.65854333°N Longitude: 151.37877392°W
Test Results: ☒ Passed ☐ Failed Comments: N/A

Date: OCT 11 2015
Test Operator: EDUARDO PULIDO

Step 1: After completion of drilling and sampling, place a new, unused liner (plastic trash bag) into the bucket labeled "Static Sheen Test Container."	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 2: Have the drill crew obtain a 200 mL to 500 mL sample of drilling fluid from the mud pit using the 1 L beaker.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Time of Collection: <u>0638</u>
Step 3: Use the bucket with attached line to retrieve seawater for use in the test. Fill the test container to within 0.5 inch of the top of the container. Proceed without delay to ensure the test water temperature remains close to Cook Inlet water temperature.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 4: Fill a 25-mL disposable pipette with the drilling fluid in the 1 L beaker and discharge into a soil waste bucket. Then measure a 15-mL sample of the drilling fluid for the test. Introduce the drilling fluid to the test container 1 cm below the water surface. Use the pipette to distribute the drilling fluid homogeneously throughout the test container. Discard the pipette.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Time of Introduction: <u>0645</u> Must be <1 hour after Collection.
Step 5: Observe the test container at viewing angles of approximately 60° and 30° from the horizontal. Ensure adequate fluorescent light is positioned above and directed over the entire surface of the test container. Use a lamp if necessary. Observe for patches, streaks, or sheets of "silvery" or "metallic" sheen or gloss, increased reflectivity, visual color, iridescence, or an oil slick on the water surface of the test container. A slick may lack color, a sheen, or iridescence. Do not disturb the surface of the test container in any manner that reduces the size of any sheen or slick.	Start Time of Observations: <u>0649</u> Must be <1 hour after Introduction. Initial Percentage of Surface Covered By Sheen: <u>0</u> % <input checked="" type="checkbox"/> 0%: Test Passed, Proceed to Step 7. <input type="checkbox"/> <50%: Proceed to Step 6. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8. Observations: <u>NO SLICK / SHEEN</u>
Step 6: If sheen or slick is <50% of the surface, continue observing for just under one hour. If the sheen remains <50%, the test passed. Proceed to Step 7 and discharge drilling fluids before end of one hour observation window. If sheen increases to >50% of the test surface at any time, the test failed and should be stopped. Proceed to Step 8.	End Time of Observations: <u>0654</u> Must be <1 hour after Introduction. Final Percentage of Surface Area Covered By Sheen: <u>0</u> % <input checked="" type="checkbox"/> <50%: Test Passed, Proceed to Step 7. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8. Observations: <u>NO SLICK / SHEEN</u>
Step 7: Indicate above that the test passed. Proceed with discharge of drilling fluids. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse and allow to air dry.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 8: Indicate above that the test failed. Discharge of drilling fluids is not permitted. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse with fresh water and allow to air dry. Continue flushing hole, and retest the drilling fluid until the test passes. Record each test on new sheet.	Completed? <input type="checkbox"/> Yes <input type="checkbox"/> No

Static Sheen Test (EPA Method 1617) Reporting Form & Instructions Rev. 2

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Borehole: MB-28 Test #: 1 of 1 ☒ Original Test ☐ Retest

Date: OCT 12 2015

Latitude: 60.65859333°N Longitude: 151.37877392°W

Test Operator: EDUARDO RUIZ

Test Results: ☒ Passed ☐ Failed Comments: NO SLICK / SHEEN

Step 1: After completion of drilling and sampling, place a new, unused liner (plastic trash bag) into the bucket labeled "Static Sheen Test Container."	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 2: Have the drill crew obtain a 200 mL to 500 mL sample of drilling fluid from the mud pit using the 1 L beaker.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Time of Collection: <u>0140</u>
Step 3: Use the bucket with attached line to retrieve seawater for use in the test. Fill the test container to within 0.5 inch of the top of the container. Proceed without delay to ensure the test water temperature remains close to Cook Inlet water temperature.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 4: Fill a 25-mL disposable pipette with the drilling fluid in the 1 L beaker and discharge into a soil waste bucket. Then measure a 15-mL sample of the drilling fluid for the test. Introduce the drilling fluid to the test container 1 cm below the water surface. Use the pipette to distribute the drilling fluid homogeneously throughout the test container. Discard the pipette.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Time of Introduction: <u>0145</u> Must be <1 hour after Collection.
Step 5: Observe the test container at viewing angles of approximately 60° and 30° from the horizontal. Ensure adequate fluorescent light is positioned above and directed over the entire surface of the test container. Use a lamp if necessary. Observe for patches, streaks, or sheets of "silvery" or "metallic" sheen or gloss, increased reflectivity, visual color, iridescence, or an oil slick on the water surface of the test container. A slick may lack color, a sheen, or iridescence. Do not disturb the surface of the test container in any manner that reduces the size of any sheen or slick.	Start Time of Observations: <u>0149</u> Must be <1 hour after Introduction. Initial Percentage of Surface Covered By Sheen: <u>0</u> % <input checked="" type="checkbox"/> 0%: Test Passed, Proceed to Step 7. <input type="checkbox"/> <50%: Proceed to Step 6. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8. Observations: <u>NO SLICK / SHEEN</u>
Step 6: If sheen or slick is <50% of the surface, continue observing for just under one hour. If the sheen remains <50%, the test passed. Proceed to Step 7 and discharge drilling fluids before end of one hour observation window. If sheen increases to >50% of the test surface at any time, the test failed and should be stopped. Proceed to Step 8.	End Time of Observations: <u>0155</u> Must be <1 hour after Introduction. Final Percentage of Surface Area Covered By Sheen: <u>0</u> % <input checked="" type="checkbox"/> 50%: Test Passed, Proceed to Step 7. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8. Observations: <u>NO SLICK / SHEEN</u>
Step 7: Indicate above that the test passed. Proceed with discharge of drilling fluids. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse and allow to air dry.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 8: Indicate above that the test failed. Discharge of drilling fluids is not permitted. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse with fresh water and allow to air dry. Continue flushing hole, and retest the drilling fluid until the test passes. Record each test on new sheet.	Completed? <input type="checkbox"/> Yes <input type="checkbox"/> No

Static Sheen Test (EPA Method 1617) Reporting Form & Instructions

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Borehole: MB-23 Test #: 1 of 1 ☒ Original Test ☐ Retest
Latitude: 60.65454731°N Longitude: 151.37617150°W
Test Results: ☒ Passed ☐ Failed Comments: No slick or sheen observed

Date: Oct 16, 2015
Test Operator: S. Pant

Step 1: After completion of drilling and sampling, place a new, unused liner (plastic trash bag) into the bucket labeled "Static Sheen Test Container."	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 2: Have the drill crew obtain a 200 mL to 500 mL sample of drilling fluid from the mud pit using the 1 L beaker.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Time of Collection: <u>10:30</u>
Step 3: Use the bucket with attached line to retrieve seawater for use in the test. Fill the test container to within 0.5 inch of the top of the container. Proceed without delay to ensure the test water temperature remains close to Cook Inlet water temperature.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 4: Fill a 25-mL disposable pipette with the drilling fluid in the 1 L beaker and discharge into a soil waste bucket. Then measure a 15-mL sample of the drilling fluid for the test. Introduce the drilling fluid to the test container 1 cm below the water surface. Use the pipette to distribute the drilling fluid homogeneously throughout the test container. Discard the pipette.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Time of Introduction: <u>10:35</u> Must be <1 hour after Collection.
Step 5: Observe the test container at viewing angles of approximately 60° and 30° from the horizontal. Ensure adequate fluorescent light is positioned above and directed over the entire surface of the test container. Use a lamp if necessary. Observe for patches, streaks, or sheets of "silvery" or "metallic" sheen or gloss, increased reflectivity, visual color, iridescence, or an oil slick on the water surface of the test container. A slick may lack color, a sheen, or iridescence. Do not disturb the surface of the test container in any manner that reduces the size of any sheen or slick.	Start Time of Observations: <u>10:38</u> Must be <1 hour after Introduction. Initial Percentage of Surface Covered By Sheen: <u>0 %</u> <input checked="" type="checkbox"/> 0%: Test Passed, Proceed to Step 7. <input type="checkbox"/> <50%: Proceed to Step 6. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8. Observations: <u>No slick/sheen</u>
Step 6: If sheen or slick is <50% of the surface, continue observing for just under one hour. If the sheen remains <50%, the test passed. Proceed to Step 7 and discharge drilling fluids before end of one hour observation window. If sheen increases to >50% of the test surface at any time, the test failed and should be stopped. Proceed to Step 8.	End Time of Observations: <u>10:48</u> Must be <1 hour after Introduction. Final Percentage of Surface Area Covered By Sheen: <u>0 %</u> <input checked="" type="checkbox"/> <50%: Test Passed, Proceed to Step 7. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8. Observations: <u>No slick/sheen</u>
Step 7: Indicate above that the test passed. Proceed with discharge of drilling fluids. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse and allow to air dry.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 8: Indicate above that the test failed. Discharge of drilling fluids is not permitted. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse with fresh water and allow to air dry. Continue flushing hole, and retest the drilling fluid until the test passes. Record each test on new sheet.	Completed? <input type="checkbox"/> Yes <input type="checkbox"/> No

Static Sheen Test (EPA Method 1617) Reporting Form & Instructions Rev. 2

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Borehole: MB-21 Test #: 1 of 1 ☐ Original Test ☐ Retest
Latitude: 60.655535 89°N Longitude: 151.37254192°W
Test Results: ☒ Passed ☐ Failed Comments: NO SHEEN / SLICK

Date: OCT 18 2015
Test Operator: EDUARDO POLINDO

Step 1: After completion of drilling and sampling, place a new, unused liner (plastic trash bag) into the bucket labeled "Static Sheen Test Container."	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 2: Have the drill crew obtain a 200 mL to 500 mL sample of drilling fluid from the mud pit using the 1 L beaker.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Time of Collection: <u>0340</u>
Step 3: Use the bucket with attached line to retrieve seawater for use in the test. Fill the test container to within 0.5 inch of the top of the container. Proceed without delay to ensure the test water temperature remains close to Cook Inlet water temperature.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 4: Fill a 25-mL disposable pipette with the drilling fluid in the 1 L beaker and discharge into a soil waste bucket. Then measure a 15-mL sample of the drilling fluid for the test. Introduce the drilling fluid to the test container 1 cm below the water surface. Use the pipette to distribute the drilling fluid homogeneously throughout the test container. Discard the pipette.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Time of Introduction: <u>0352</u> Must be <1 hour after Collection.
Step 5: Observe the test container at viewing angles of approximately 60° and 30° from the horizontal. Ensure adequate fluorescent light is positioned above and directed over the entire surface of the test container. Use a lamp if necessary. Observe for patches, streaks, or sheets of "silvery" or "metallic" sheen or gloss, increased reflectivity, visual color, iridescence, or an oil slick on the water surface of the test container. A slick may lack color, a sheen, or iridescence. Do not disturb the surface of the test container in any manner that reduces the size of any sheen or slick.	Start Time of Observations: <u>0354</u> Must be <1 hour after Introduction. Initial Percentage of Surface Covered By Sheen: <u>0</u> % Observations: <u>NO SHEEN / SLICK</u> <input checked="" type="checkbox"/> 0%: Test Passed, Proceed to Step 7. <input type="checkbox"/> <50%: Proceed to Step 6. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8.
Step 6: If sheen or slick is <50% of the surface, continue observing for just under one hour. If the sheen remains <50%, the test passed. Proceed to Step 7 and discharge drilling fluids before end of one hour observation window. If sheen increases to >50% of the test surface at any time, the test failed and should be stopped. Proceed to Step 8.	End Time of Observations: <u>0357</u> Must be <1 hour after Introduction. Final Percentage of Surface Area Covered By Sheen: <u>0</u> % Observations: <u>NO SHEEN / SLICK</u> <input checked="" type="checkbox"/> <50%: Test Passed, Proceed to Step 7. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8.
Step 7: Indicate above that the test passed. Proceed with discharge of drilling fluids. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse and allow to air dry.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 8: Indicate above that the test failed. Discharge of drilling fluids is not permitted. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse with fresh water and allow to air dry. Continue flushing hole, and retest the drilling fluid until the test passes. Record each test on new sheet.	Completed? <input type="checkbox"/> Yes <input type="checkbox"/> No

Static Sheen Test (EPA Method 1617) Reporting Form & Instructions Rev. 2

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Borehole: MB-17 Test #: 1 of 1 ☒ Original Test ☐ Retest
Latitude: 60-65681081° N Longitude: 151.37898244° W
Test Results: ☒ Passed ☐ Failed Comments: NO SHEEN / SLICK

Date: 01/21/2015
Test Operator: EDUARDO PULIDO

Step 1: After completion of drilling and sampling, place a new, unused liner (plastic trash bag) into the bucket labeled "Static Sheen Test Container."	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 2: Have the drill crew obtain a 200 mL to 500 mL sample of drilling fluid from the mud pit using the 1 L beaker.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Time of Collection: <u>0925</u>
Step 3: Use the bucket with attached line to retrieve seawater for use in the test. Fill the test container to within 0.5 inch of the top of the container. Proceed without delay to ensure the test water temperature remains close to Cook Inlet water temperature.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 4: Fill a 25-mL disposable pipette with the drilling fluid in the 1 L beaker and discharge into a soil waste bucket. Then measure a 15-mL sample of the drilling fluid for the test. Introduce the drilling fluid to the test container 1 cm below the water surface. Use the pipette to distribute the drilling fluid homogeneously throughout the test container. Discard the pipette.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Time of Introduction: <u>0438</u> Must be <1 hour after Collection.
Step 5: Observe the test container at viewing angles of approximately 60° and 30° from the horizontal. Ensure adequate fluorescent light is positioned above and directed over the entire surface of the test container. Use a lamp if necessary. Observe for patches, streaks, or sheets of "silvery" or "metallic" sheen or gloss, increased reflectivity, visual color, iridescence, or an oil slick on the water surface of the test container. A slick may lack color, a sheen, or iridescence. Do not disturb the surface of the test container in any manner that reduces the size of any sheen or slick.	Start Time of Observations: <u>0440</u> Must be <1 hour after Introduction. Initial Percentage of Surface Covered By Sheen: <u>0</u> % Observations: <u>NO SHEEN / SLICK</u>
Step 6: If sheen or slick is <50% of the surface, continue observing for just under one hour. If the sheen remains <50%, the test passed. Proceed to Step 7 and discharge drilling fluids before end of one hour observation window. If sheen increases to >50% of the test surface at any time, the test failed and should be stopped. Proceed to Step 8.	End Time of Observations: <u>0442</u> Must be <1 hour after Introduction. Final Percentage of Surface Area Covered By Sheen: <u>0</u> % Observations: <u>NO SHEEN / SLICK</u>
Step 7: Indicate above that the test passed. Proceed with discharge of drilling fluids. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse and allow to air dry.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 8: Indicate above that the test failed. Discharge of drilling fluids is not permitted. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse with fresh water and allow to air dry. Continue flushing hole, and retest the drilling fluid until the test passes. Record each test on new sheet.	Completed? <input type="checkbox"/> Yes <input type="checkbox"/> No

Static Sheen Test (EPA Method 1617) Reporting Form & Instructions Rev. 2

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Borehole: MB-14 Test #: 1 of 1 ☒ Original Test ☐ Retest
Latitude: 60.65939000°N Longitude: 151.3815911°W
Test Results: ☒ Passed ☐ Failed Comments: NO SHEEN / SLICK

Date: OCT 23 2015
Test Operator: EDUARDO DOLINO

Step 1: After completion of drilling and sampling, place a new, unused liner (plastic trash bag) into the bucket labeled "Static Sheen Test Container."	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 2: Have the drill crew obtain a 200 mL to 500 mL sample of drilling fluid from the mud pit using the 1 L beaker.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Time of Collection: <u>0328</u>
Step 3: Use the bucket with attached line to retrieve seawater for use in the test. Fill the test container to within 0.5 inch of the top of the container. Proceed without delay to ensure the test water temperature remains close to Cook Inlet water temperature.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 4: Fill a 25-mL disposable pipette with the drilling fluid in the 1 L beaker and discharge into a soil waste bucket. Then measure a 15-mL sample of the drilling fluid for the test. Introduce the drilling fluid to the test container 1 cm below the water surface. Use the pipette to distribute the drilling fluid homogeneously throughout the test container. Discard the pipette.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Time of Introduction: <u>0331</u> Must be <1 hour after Collection.
Step 5: Observe the test container at viewing angles of approximately 60° and 30° from the horizontal. Ensure adequate fluorescent light is positioned above and directed over the entire surface of the test container. Use a lamp if necessary. Observe for patches, streaks, or sheets of "silvery" or "metallic" sheen or gloss, increased reflectivity, visual color, iridescence, or an oil slick on the water surface of the test container. A slick may lack color, a sheen, or iridescence. Do not disturb the surface of the test container in any manner that reduces the size of any sheen or slick.	Start Time of Observations: <u>0333</u> Must be <1 hour after Introduction. Initial Percentage of Surface Covered By Sheen: <u>0</u> % <input checked="" type="checkbox"/> 0%: Test Passed, Proceed to Step 7. <input type="checkbox"/> <50%: Proceed to Step 6. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8. Observations: <u>NO SHEEN / SLICK</u>
Step 6: If sheen or slick is <50% of the surface, continue observing for just under one hour. If the sheen remains <50%, the test passed. Proceed to Step 7 and discharge drilling fluids before end of one hour observation window. If sheen increases to >50% of the test surface at any time, the test failed and should be stopped. Proceed to Step 8.	End Time of Observations: <u>0341</u> Must be <1 hour after Introduction. Final Percentage of Surface Area Covered By Sheen: <u>0</u> % <input checked="" type="checkbox"/> <50%: Test Passed, Proceed to Step 7. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8. Observations: <u>0341</u>
Step 7: Indicate above that the test passed. Proceed with discharge of drilling fluids. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse and allow to air dry.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 8: Indicate above that the test failed. Discharge of drilling fluids is not permitted. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse with fresh water and allow to air dry. Continue flushing hole, and retest the drilling fluid until the test passes. Record each test on new sheet.	Completed? <input type="checkbox"/> Yes <input type="checkbox"/> No

Static Sheen Test (EPA Method 1617) Reporting Form & Instructions Rev. 2

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Borehole: MB-3 Test #: 1 of 1 ☒ Original Test ☐ Retest
Latitude: 60.65166819°N Longitude: 151.38317767°W

Date: Oct 27, 2015
Test Operator: S. Pant

Test Results: ☒ Passed ☐ Failed Comments: NO slick/sheen

Step 1: After completion of drilling and sampling, place a new, unused liner (plastic trash bag) into the bucket labeled "Static Sheen Test Container."	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 2: Have the drill crew obtain a 200 mL to 500 mL sample of drilling fluid from the mud pit using the 1 L beaker.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Time of Collection: <u>0815</u>
Step 3: Use the bucket with attached line to retrieve seawater for use in the test. Fill the test container to within 0.5 inch of the top of the container. Proceed without delay to ensure the test water temperature remains close to Cook Inlet water temperature.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 4: Fill a 25-mL disposable pipette with the drilling fluid in the 1 L beaker and discharge into a soil waste bucket. Then measure a 15-mL sample of the drilling fluid for the test. Introduce the drilling fluid to the test container 1 cm below the water surface. Use the pipette to distribute the drilling fluid homogeneously throughout the test container. Discard the pipette.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Time of Introduction: <u>0818</u> Must be <1 hour after Collection.
Step 5: Observe the test container at viewing angles of approximately 60° and 30° from the horizontal. Ensure adequate fluorescent light is positioned above and directed over the entire surface of the test container. Use a lamp if necessary. Observe for patches, streaks, or sheets of "silvery" or "metallic" sheen or gloss, increased reflectivity, visual color, iridescence, or an oil slick on the water surface of the test container. A slick may lack color, a sheen, or iridescence. Do not disturb the surface of the test container in any manner that reduces the size of any sheen or slick.	Start Time of Observations: <u>0820</u> Must be <1 hour after introduction. Initial Percentage of Surface Covered By Sheen: <u>0</u> % <input checked="" type="checkbox"/> 0%: Test Passed, Proceed to Step 7. <input type="checkbox"/> <50%: Proceed to Step 6. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8. Observations: <u>NO slick/sheen</u>
Step 6: If sheen or slick is <50% of the surface, continue observing for just under one hour. If the sheen remains <50%, the test passed. Proceed to Step 7 and discharge drilling fluids before end of one hour observation window. If sheen increases to >50% of the test surface at any time, the test failed and should be stopped. Proceed to Step 8.	End Time of Observations: <u>0828</u> Must be <1 hour after introduction. Final Percentage of Surface Area Covered By Sheen: <u>0</u> % <input checked="" type="checkbox"/> <50%: Test Passed, Proceed to Step 7. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8. Observations: <u>NO slick/sheen</u>
Step 7: Indicate above that the test passed. Proceed with discharge of drilling fluids. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse and allow to air dry.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 8: Indicate above that the test failed. Discharge of drilling fluids is not permitted. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse with fresh water and allow to air dry. Continue flushing hole, and retest the drilling fluid until the test passes. Record each test on new sheet.	Completed? <input type="checkbox"/> Yes <input type="checkbox"/> No

Static Sheen Test (EPA Method 1617) Reporting Form & Instructions Rev. 2

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Borehole: MB-24 Test #: 1 of 1 ☐ Original Test ☐ Retest
Latitude: 60.653939670N Longitude: 151.36730675W

Date: Oct 28, 2015

Test Operator: S. Pant

Test Results: ☒ Passed ☐ Failed Comments: No slick/sheen

Step 1: After completion of drilling and sampling, place a new, unused liner (plastic trash bag) into the bucket labeled "Static Sheen Test Container."	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 2: Have the drill crew obtain a 200 mL to 500 mL sample of drilling fluid from the mud pit using the 1 L beaker.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Time of Collection: <u>1730</u>
Step 3: Use the bucket with attached line to retrieve seawater for use in the test. Fill the test container to within 0.5 inch of the top of the container. Proceed without delay to ensure the test water temperature remains close to Cook Inlet water temperature.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 4: Fill a 25-mL disposable pipette with the drilling fluid in the 1 L beaker and discharge into a soil waste bucket. Then measure a 15-mL sample of the drilling fluid for the test. Introduce the drilling fluid to the test container 1 cm below the water surface. Use the pipette to distribute the drilling fluid homogeneously throughout the test container. Discard the pipette.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Time of Introduction: <u>1732</u> Must be <1 hour after Collection.
Step 5: Observe the test container at viewing angles of approximately 60° and 30° from the horizontal. Ensure adequate fluorescent light is positioned above and directed over the entire surface of the test container. Use a lamp if necessary. Observe for patches, streaks, or sheets of "silvery" or "metallic" sheen or gloss, increased reflectivity, visual color, iridescence, or an oil slick on the water surface of the test container. A slick may lack color, a sheen, or iridescence. Do not disturb the surface of the test container in any manner that reduces the size of any sheen or slick.	Start Time of Observations: <u>1733</u> Must be <1 hour after Introduction. Initial Percentage of Surface Covered By Sheen: <u>0</u> % <input checked="" type="checkbox"/> 0%: Test Passed, Proceed to Step 7. <input type="checkbox"/> <50%: Proceed to Step 6. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8. Observations: <u>No slick/sheen</u>
Step 6: If sheen or slick is <50% of the surface, continue observing for just under one hour. If the sheen remains <50%, the test passed. Proceed to Step 7 and discharge drilling fluids before end of one hour observation window. If sheen increases to >50% of the test surface at any time, the test failed and should be stopped. Proceed to Step 8.	End Time of Observations: <u>1740</u> Must be <1 hour after Introduction. Final Percentage of Surface Area Covered By Sheen: <u>0</u> % <input checked="" type="checkbox"/> <50%: Test Passed, Proceed to Step 7. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8. Observations: <u>No slick/sheen</u>
Step 7: Indicate above that the test passed. Proceed with discharge of drilling fluids. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse and allow to air dry.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 8: Indicate above that the test failed. Discharge of drilling fluids is not permitted. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse with fresh water and allow to air dry. Continue flushing hole, and retest the drilling fluid until the test passes. Record each test on new sheet.	Completed? <input type="checkbox"/> Yes <input type="checkbox"/> No

Static Sheen Test (EPA Method 1617) Reporting Form & Instructions *Rev. 2*

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Borehole: DS-4A Test #: 1 of 1 ☒ Original Test ☐ Retest
Latitude: 60.6558414° N Longitude: 151.36719431° W
Test Results: ☒ Passed ☐ Failed Comments: NO SHEEN / SLICK

Date: NOV 2 2015
Test Operator: E. PUJADO

Step 1: After completion of drilling and sampling, place a new, unused liner (plastic trash bag) into the bucket labeled "Static Sheen Test Container."	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 2: Have the drill crew obtain a 200 mL to 500 mL sample of drilling fluid from the mud pit using the 1 L beaker.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Time of Collection: <u>2215</u>
Step 3: Use the bucket with attached line to retrieve seawater for use in the test. Fill the test container to within 0.5 inch of the top of the container. Proceed without delay to ensure the test water temperature remains close to Cook Inlet water temperature.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 4: Fill a 25-mL disposable pipette with the drilling fluid in the 1 L beaker and discharge into a soil waste bucket. Then measure a 15-mL sample of the drilling fluid for the test. Introduce the drilling fluid to the test container 1 cm below the water surface. Use the pipette to distribute the drilling fluid homogeneously throughout the test container. Discard the pipette.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Time of Introduction: <u>2219</u> Must be <1 hour after Collection.
Step 5: Observe the test container at viewing angles of approximately 60° and 30° from the horizontal. Ensure adequate fluorescent light is positioned above and directed over the entire surface of the test container. Use a lamp if necessary. Observe for patches, streaks, or sheets of "silvery" or "metallic" sheen or gloss, increased reflectivity, visual color, iridescence, or an oil slick on the water surface of the test container. A slick may lack color, a sheen, or iridescence. Do not disturb the surface of the test container in any manner that reduces the size of any sheen or slick.	Start Time of Observations: <u>2221</u> Must be <1 hour after Introduction. Initial Percentage of Surface Covered By Sheen: <u>0</u> % <input checked="" type="checkbox"/> 0%: Test Passed, Proceed to Step 7. <input type="checkbox"/> <50%: Proceed to Step 6. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8. Observations: <u>NO SHEEN / SLICK</u>
Step 6: If sheen or slick is <50% of the surface, continue observing for just under one hour. If the sheen remains <50%, the test passed. Proceed to Step 7 and discharge drilling fluids before end of one hour observation window. If sheen increases to >50% of the test surface at any time, the test failed and should be stopped. Proceed to Step 8.	End Time of Observations: <u>2230</u> Must be <1 hour after Introduction. Final Percentage of Surface Area Covered By Sheen: <u>0</u> % <input checked="" type="checkbox"/> <50%: Test Passed, Proceed to Step 7. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8. Observations: <u>NO SHEEN / SLICK</u>
Step 7: Indicate above that the test passed. Proceed with discharge of drilling fluids. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse and allow to air dry.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 8: Indicate above that the test failed. Discharge of drilling fluids is not permitted. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse with fresh water and allow to air dry. Continue flushing hole, and retest the drilling fluid until the test passes. Record each test on new sheet.	Completed? <input type="checkbox"/> Yes <input type="checkbox"/> No

Static Sheen Test (EPA Method 1617) Reporting Form & Instructions Rev. 2

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Borehole: DS-4B Test #: 1 of 1 ☒ Original Test ☐ Retest
Latitude: 60.655808440 N Longitude: 151.36712022°W
Test Results: ☐ Passed ☐ Failed Comments: No slick/sheen

Date: Nov 3, 2015
Test Operator: E. Pulido

Step 1: After completion of drilling and sampling, place a new, unused liner (plastic trash bag) into the bucket labeled "Static Sheen Test Container."	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 2: Have the drill crew obtain a 200 mL to 500 mL sample of drilling fluid from the mud pit using the 1 L beaker.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Time of Collection: <u>0625</u>
Step 3: Use the bucket with attached line to retrieve seawater for use in the test. Fill the test container to within 0.5 inch of the top of the container. Proceed without delay to ensure the test water temperature remains close to Cook Inlet water temperature.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 4: Fill a 25-mL disposable pipette with the drilling fluid in the 1 L beaker and discharge into a soil waste bucket. Then measure a 15-mL sample of the drilling fluid for the test. Introduce the drilling fluid to the test container 1 cm below the water surface. Use the pipette to distribute the drilling fluid homogeneously throughout the test container. Discard the pipette.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Time of Introduction: <u>0626</u> Must be <1 hour after Collection.
Step 5: Observe the test container at viewing angles of approximately 60° and 30° from the horizontal. Ensure adequate fluorescent light is positioned above and directed over the entire surface of the test container. Use a lamp if necessary. Observe for patches, streaks, or sheets of "silvery" or "metallic" sheen or gloss, increased reflectivity, visual color, iridescence, or an oil slick on the water surface of the test container. A slick may lack color, a sheen, or iridescence. Do not disturb the surface of the test container in any manner that reduces the size of any sheen or slick.	Start Time of Observations: <u>0627</u> Must be <1 hour after Introduction. Initial Percentage of Surface Covered By Sheen: <u>0 %</u> <input checked="" type="checkbox"/> 0%: Test Passed, Proceed to Step 7. <input type="checkbox"/> <50%: Proceed to Step 6. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8. Observations: <u>No slick/sheen</u>
Step 6: If sheen or slick is <50% of the surface, continue observing for just under one hour. If the sheen remains <50%, the test passed. Proceed to Step 7 and discharge drilling fluids before end of one hour observation window. If sheen increases to >50% of the test surface at any time, the test failed and should be stopped. Proceed to Step 8.	End Time of Observations: <u>0635</u> Must be <1 hour after Introduction. Final Percentage of Surface Area Covered By Sheen: <u>0 %</u> <input checked="" type="checkbox"/> <50%: Test Passed, Proceed to Step 7. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8. Observations: <u>No slick/sheen</u>
Step 7: Indicate above that the test passed. Proceed with discharge of drilling fluids. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse and allow to air dry.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 8: Indicate above that the test failed. Discharge of drilling fluids is not permitted. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse with fresh water and allow to air dry. Continue flushing hole, and retest the drilling fluid until the test passes. Record each test on new sheet.	Completed? <input type="checkbox"/> Yes <input type="checkbox"/> No

Static Sheen Test (EPA Method 1617) Reporting Form & Instructions Rev. 2

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Borehole: DS-SA Test #: 1 of 1 ☒ Original Test ☐ Retest
Latitude: 60.65557886°N Longitude: 151.36914764°W
Test Results: ☒ Passed ☐ Failed Comments: NO slick/sheen

Date: Nov 4, 2015
Test Operator: S. Pant

Step 1: After completion of drilling and sampling, place a new, unused liner (plastic trash bag) into the bucket labeled "Static Sheen Test Container."	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 2: Have the drill crew obtain a 200 mL to 500 mL sample of drilling fluid from the mud pit using the 1 L beaker.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Time of Collection: <u>16:10</u>
Step 3: Use the bucket with attached line to retrieve seawater for use in the test. Fill the test container to within 0.5 inch of the top of the container. Proceed without delay to ensure the test water temperature remains close to Cook Inlet water temperature.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 4: Fill a 25-mL disposable pipette with the drilling fluid in the 1 L beaker and discharge into a soil waste bucket. Then measure a 15-mL sample of the drilling fluid for the test. Introduce the drilling fluid to the test container 1 cm below the water surface. Use the pipette to distribute the drilling fluid homogeneously throughout the test container. Discard the pipette.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Time of Introduction: <u>16:11</u> Must be <1 hour after Collection.
Step 5: Observe the test container at viewing angles of approximately 60° and 30° from the horizontal. Ensure adequate fluorescent light is positioned above and directed over the entire surface of the test container. Use a lamp if necessary. Observe for patches, streaks, or sheets of "silvery" or "metallic" sheen or gloss, increased reflectivity, visual color, iridescence, or an oil slick on the water surface of the test container. A slick may lack color, a sheen, or iridescence. Do not disturb the surface of the test container in any manner that reduces the size of any sheen or slick.	Start Time of Observations: <u>16:12</u> Must be <1 hour after introduction. Initial Percentage of Surface Covered By Sheen: <u>0 %</u> <input checked="" type="checkbox"/> 0%: Test Passed, Proceed to Step 7. <input type="checkbox"/> <50%: Proceed to Step 6. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8. Observations: <u>NO slick/sheen</u>
Step 6: If sheen or slick is <50% of the surface, continue observing for just under one hour. If the sheen remains <50%, the test passed. Proceed to Step 7 and discharge drilling fluids before end of one hour observation window. If sheen increases to >50% of the test surface at any time, the test failed and should be stopped. Proceed to Step 8.	End Time of Observations: <u>16:20</u> Must be <1 hour after introduction. Final Percentage of Surface Area Covered By Sheen: <u>0 %</u> <input checked="" type="checkbox"/> <50%: Test Passed, Proceed to Step 7. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8. Observations: <u>NO slick/sheen</u>
Step 7: Indicate above that the test passed. Proceed with discharge of drilling fluids. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse and allow to air dry.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 8: Indicate above that the test failed. Discharge of drilling fluids is not permitted. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse with fresh water and allow to air dry. Continue flushing hole, and retest the drilling fluid until the test passes. Record each test on new sheet.	Completed? <input type="checkbox"/> Yes <input type="checkbox"/> No

Static Sheen Test (EPA Method 1617) Reporting Form & Instructions Rev. 2

APDES Permit No.: AK0062278

Project: Alaska LNG Marine Geotechnical Investigation

Borehole: DS-5B Test #: 1 of 1 ☒ Original Test ☐ Retest

Date: NOV 4 2015

Latitude: 60.65554508° N Longitude: 151.36914139° W

Test Operator: E. PULIDO

Test Results: ☒ Passed ☐ Failed Comments: NO SLICK/ SHEEN

Step 1: After completion of drilling and sampling, place a new, unused liner (plastic trash bag) into the bucket labeled "Static Sheen Test Container."	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 2: Have the drill crew obtain a 200 mL to 500 mL sample of drilling fluid from the mud pit using the 1 L beaker.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Time of Collection: <u>2255</u>
Step 3: Use the bucket with attached line to retrieve seawater for use in the test. Fill the test container to within 0.5 inch of the top of the container. Proceed without delay to ensure the test water temperature remains close to Cook Inlet water temperature.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 4: Fill a 25-mL disposable pipette with the drilling fluid in the 1 L beaker and discharge into a soil waste bucket. Then measure a 15-mL sample of the drilling fluid for the test. Introduce the drilling fluid to the test container 1 cm below the water surface. Use the pipette to distribute the drilling fluid homogeneously throughout the test container. Discard the pipette.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Time of Introduction: <u>2302</u> <small>Must be <1 hour after Collection.</small>
Step 5: Observe the test container at viewing angles of approximately 60° and 30° from the horizontal. Ensure adequate fluorescent light is positioned above and directed over the entire surface of the test container. Use a lamp if necessary. Observe for patches, streaks, or sheets of "silvery" or "metallic" sheen or gloss, increased reflectivity, visual color, iridescence, or an oil slick on the water surface of the test container. A slick may lack color, a sheen, or iridescence. Do not disturb the surface of the test container in any manner that reduces the size of any sheen or slick.	Start Time of Observations: <u>2304</u> <small>Must be <1 hour after Introduction.</small> Initial Percentage of Surface Covered By Sheen: <u>0</u> % <input checked="" type="checkbox"/> 0%: Test Passed, Proceed to Step 7. <input type="checkbox"/> <50%: Proceed to Step 6. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8. Observations: <u>NO SLICK/ SHEEN</u>
Step 6: If sheen or slick is <50% of the surface, continue observing for just under one hour. If the sheen remains <50%, the test passed. Proceed to Step 7 and discharge drilling fluids before end of one hour observation window. If sheen increases to >50% of the test surface at any time, the test failed and should be stopped. Proceed to Step 8.	End Time of Observations: <u>2309</u> <small>Must be <1 hour after Introduction.</small> Final Percentage of Surface Area Covered By Sheen: <u>0</u> % <input checked="" type="checkbox"/> <50%: Test Passed, Proceed to Step 7. <input type="checkbox"/> >50%: Test Failed, Proceed to Step 8. Observations: <u>NO SLICK/ SHEEN</u>
Step 7: Indicate above that the test passed. Proceed with discharge of drilling fluids. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse and allow to air dry.	Completed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Step 8: Indicate above that the test failed. Discharge of drilling fluids is not permitted. Discard test fluids and liner. Wash all equipment with soap and water. Triple rinse with fresh water and allow to air dry. Continue flushing hole, and retest the drilling fluid until the test passes. Record each test on new sheet.	Completed? <input type="checkbox"/> Yes <input type="checkbox"/> No