PRELIMINARY DRAFT SUBMITTAL
REVISION 0

GEOTECHNICAL DATA REPORT

STERLING HIGHWAY MP 45-60
SUNRISE TO SKILAK LAKE RD - PHASE 1B (MP 45-46.5)

FEDERAL NO. 0212015/STATE NO. Z530140000

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ACRONYMS AND ABBREVIATIONS

ASTM	ASTM International, Inc.
CR	Central Region DOT&PF
DOT&PF	Department of Transportation and Public Facilities
GDR	Geotechnical Data Report
GPS	global positioning system
HDR	HDR Alaska, Inc.
I.D.	inside diameter
M_L	Richter local magnitude
MP	milepost
NR	Northern Region DOT&PF
O.D.	outside diameter
R&M	R&M Consultants, Inc.
USCS	Unified Soil Classification System

1.0 INTRODUCTION

The Alaska Department of Transportation & Public Facilities (DOT&PF), has initiated a project to improve the Sterling Highway between mileposts (MP) 45 and 60. The DOT&PF contracted HDR Alaska, Inc. (HDR) who subcontracted R&M Consultants, Inc. (R&M) to provide design services, including geotechnical investigations for the portions of the roadway between MP 45 to 46.5 (Phase 1B) and 56 to 58 (Phase 1A). This document details the geotechnical information on surface and subsurface conditions along the Phase 1B portion of the alignment. A location map for the project corridor is presented in Appendix A as Drawing A-01.

1.1 CONTRACT AUTHORIZATION

This study has been conducted under the terms of the Prime Contract No. PO2066 between HDR and DOT&PF and under the terms of the Subconsultant Agreement No. PO1000100041779 between HDR and R&M. This report is in partial fulfillment of Amendment 2 to the subconsultant agreement. Measurements and weights presented in this report are generally shown as U.S. Customary Units.

1.2 CONCEPT PLAN

The Sterling Highway is located on the Kenai Peninsula in Southcentral Alaska, and is the only road connecting communities in the western Kenai Peninsula with the rest of Alaska and the National Highway system. The project begins near Skilak Lake Road at MP 58, shifts away from the existing highway alignment at MP 56 into the foothills on a new alignment to the north of Kenai river and the community of Cooper Landing, rejoins the existing alignment at MP 46.5, and ends near the Sunrise Inn at MP 45. Phase 1B is specific to the section of the project within or adjacent to the current Sterling Highway alignment between MP 46.5 and MP 45.

The Sterling Highway MP 45-60 project will improve highway safety by adding passing lanes and wildlife crossings, widening shoulders, and realigning highway geometry to meet current standards (HDR, 2019).

1.3 SCOPE OF WORK

This investigation was intended to gather data on geologic and geotechnical conditions that could affect site planning, design, and construction of the Phase 1B portion (MP 45 to 46.5) of the Sterling Highway Reconstruction project. Work included drilling and sampling of the subsurface soils and bedrock, laboratory testing of selected samples, and bedrock structure mapping.

R&M prepared the exploration plan for the geotechnical investigation and served a management role during drilling operations. Northern Region (NR) and Central Region (CR) DOT&PF personnel performed drilling and sampling tasks associated with this project including logging of test borings and rock core holes. R&M performed rock mapping tasks, laboratory testing of soil and rock samples, and prepared this geotechnical data report (GDR).

1.4 EXISTING INFORMATION

Due to problem areas identified within the existing Sterling Highway alignment near Cooper Landing, DOT&PF has been preparing for reconstruction and realignment of the Sterling Highway in the project area since at least the early 1980s. A number of reconnaissance level geotechnical

studies and investigations have been carried out in support of this effort focusing on various highway alignments including the current project alignment alternative. Below is a summary of existing geotechnical studies relevant to the Phase 1B portion of the larger project alignment.

1.4.1 RECONNAISSANCE GEOLOGY REPORT, STERLING HIGHWAY MILE 37-60

A reconnaissance geology study was performed at four distinct alignment segments reflecting the existing highway alignment and several alternatives. The report includes general station by station descriptions of soils, rock, geologic hazards, and preliminary construction recommendations in vicinity to various early proposed highway alignments. The report highlighted geotechnical concerns for alignments, resulting in development of additional alternatives for the future highway route (DOT&PF, 1983).

1.4.2 RECONNAISSANCE ENGINEERING GEOLOGY REPORT, STERLING HIGHWAY MILE 37-60

A reconnaissance geology study was conducted by DOT&PF engineering geologists to aid in the construction and environmental planning of the future Sterling Highway reconstruction project covering the wider project area. The report includes general station by station descriptions of soils, rock, geologic hazards, and preliminary construction recommendations in vicinity to the existing highway and the alternative highway alignment crossing the Juneau Creek drainage (DOT&PF, 1989).

1.4.3 RECONNAISSANCE GEOTECHNICAL REPORT, STERLING HIGHWAY MP 37-60

A reconnaissance level geotechnical investigation was conducted by DOT&PF to delineate the presence of rock versus soil in the general vicinity of the current project alignment area including completion of test borings and test pits (DOT&PF, 1991).

2.0 REGIONAL SETTING

2.1 LOCATION

The Sterling Highway MP 45-60 Reconstruction Project is situated in the central Kenai Peninsula in Southcentral Alaska (Figure 1) and entirely within the Kenai River drainage. The project traverses mountainous terrain from the beginning of project at the right bank of the upper Kenai River above its confluence with Skilak Lake, across the lower Juneau Creek Drainage, to the end of the project at near Quartz Creek at the north shore of Kenai Lake.

2.2 REGIONAL GEOLOGY

The project is situated near the western edge of the Kenai-Chugach Mountains physiographic province (Wahrhaftig, 1965). The geology in the project vicinity has been mapped as unconsolidated, poorly differentiated, Holocene age alluvial fan and floodplain, landslide, and glacial-fluvial deposits comprised of variable boulders, cobbles, gravel, sand, silt, and clay; over Cretaceous age sedimentary rocks (Tysdal and Case, 1979). The depth of bedrock is highly variable ranging from areas with thick soil cover near fan deposits to areas with thin soil cover and sporadic bedrock outcrops at the surface.

Bedrock in the Phase 1B portion of the project has been mapped belonging to one distinct rock unit, the Valdez Group, consisting of interbedded sandstone and siltstone altered by cataclastic deformation (Tysdal and Case 1979). Rocks are Late Cretaceous in origin and beds are thin to thick (Bradley and Wilson, 1998).

During the Pleistocene, glaciers covered the entirety of the Kenai Peninsula and there are numerous glacial deposits mapped near the project alignment. These deposits generally consist of tills, end moraines, lateral moraines, and glacial outwash deposits (Coulter et al., 1965). This area is considered to generally be free of permafrost (Ferrians, 1965). A few small isolated masses of permafrost may occur at high altitudes, and in lowland areas where ground insulation is high and ground insolation is low, especially near the border of a permafrost region.

2.3 GENERAL SEISMICITY

This portion of the Kenai Peninsula is characterized by very-high seismicity associated with the subduction of the Pacific plate under the North American plate; the interface appears to be about 15 to 19 miles below the Cooper Landing area. Since 1899, 46 earthquakes of local magnitude (M_L) $\geq$ 6 (seven with $M_L \geq 7$) have been catalogued[1] with epicenters closer than an approximate 125 miles radius of Cooper Landing (USGS, 2020). In addition, the 1964 Great Alaska Earthquake (moment magnitude 9.2; epicenter about 90 miles to the northeast) produced severe seismic shaking lasting about four minutes, numerous ground fissures, and some surface warping and approximately four to six feet of subsidence from tectonic displacements (Foster & Karlstrom, 1967; Plafker, 1969) in the Cooper Landing area.

[1] http://www.earthquake.usgs.gov

2.4 CLIMATE

The climate in the project vicinity is characterized by generally moderate temperatures with high winds and precipitation. Table 2-1 summarizes some of the climate data recorded at Cooper Landing, at the eastern portion of the project.

TABLE 2-1: LOCAL CLIMATE DATA

Characteristic	Cooper Landing[a] (1975 -2012)
Mean Annual Air Temperature, ˚F	36.0
Mean Monthly Temperature, ˚F (Min / Max)	17.2 (Jan) / 57.1 (July)
Extreme Daily Air Temperature, ˚F (Low / High)	-40 (January) / 90 (July)
Mean Annual Precipitation, inches	21.07
Mean Monthly Precipitation, inches (Min / Max)	0.62 (April) / 2.83 (September)
Extreme Monthly Precipitation, inches	9.09 (November)
Mean Total Snowfall, inches (Annual / Max Monthly)	47.0 / 10.1 (December)
Extreme Monthly Snowfall, inches	38.0 (November)

NOTES:
[a]: http://www.wrcc.dri.edu/summary/climsmak.html

Daily mean air temperatures were assumed to vary in a sinusoidal pattern with an amplitude of about 20.0 ˚F about a mean of 36.0 ˚F for thermal evaluations. This model produces mean air freeze and thaw indices of approximately 1,640 and 3,100 ˚F-Days, respectively. Further, the design air freeze and thaw indices, as the average three coldest and warmest seasons over the previous 30 years, are estimated to be about 2,825 and 3,765 ˚F-Days, respectively.

3.0 GENERAL SITE CONDITIONS

3.1 TOPOGRAPHY

Topography in the project vicinity generally consists of mountainous terrain, with discrete massive mountains 5 to 10 miles across and 3,000 to 6,000 feet in altitude, separated by a reticulate system of through valleys and passes one-half to one mile wide that are eroded along joints and cleavage. The entire area has been heavily glaciated, and the topography is characterized by horns, arêtes, cirques, U-shaped valleys and passes, rock-basin lakes, and grooved and mamillated topography. (Wahrhaftig, 1965). The project alignment is routed through valleys on the lower flanks of these mountains.

3.2 SURFACE DRAINAGE

Drainage in vicinity to the project generally flows southward from the mountains, and is routed in natural channels and conveyed in ditches along the highway embankments to culverts located sporadically along the existing highway. Drainage from the road surface generally occurs via sheet flow down embankments and into the surrounding soils. Much of this water infiltrates the surrounding soils with some flowing to nearby channels and ditches to the Kenai Lake which bounds the southern limits of the project area.

3.3 VEGETATION

Vegetation within this section of highway consists of coastal western hemlock-Sitka spruce biotic community (AEIDC, 1976).

In the coastal western hemlock-Sitka spruce biotic community, Sitka spruce with western hemlock, black cottonwood, or balsam poplar are commonly found on both moderate south-facing and north-facing slopes. The understory typically includes high and low shrubs generally consisting of Sitka alder, devil's club, and willow with a carpet of ferns, mosses, and lichens.

3.4 STATION TO STATION DESCRIPTIONS

Station to station descriptions provide specific detail along the project alignment. Directions such as "left" and "right" are referenced when facing up the alignment (e.g. from Station 2000+00 to 2001+00). Test boring logs are provided in **Appendix B.**

3.4.1 STATIONS 2000+00 TO 2032+00

This interval will serve as the transition from the future Juneau Creek portion of the wider Sterling Highway Reconstruction Project to the Phase 1B (eastern) portion of the project. The highway alignment in this portion is located on an undeveloped and forested hillside, descending from the beginning of project to the intersection with the existing highway near station 2034+00. The alignment crosses primarily coarse-grained soil deposits with occasional natural drainage channels generally oriented perpendicular to the alignment.

From BOP to approximately Station 2009+00, the alignment is interpreted to be underlain by granular colluvial soils over possible shallow bedrock. This interpretation is based on review of aerial

imagery and reconnaissance, as no subsurface investigations were performed in this interval. The thickness of soil is unknown.

From approximately Station 2009+00 to Station 2032+00, the alignment crosses a broad alluvial fan. The subsurface in the interval is interpreted to consist of primarily coarse-grained soils overlying relatively deep bedrock. The soil profile encountered at test borings typically consisted of a thin organic mat and primarily coarse-grained soil deposits, with some finer-grained deposits at depth. No bedrock was encountered at test borings in this interval within depths explored (20 to 21.5 feet below ground surface). Additionally, no groundwater was noted on test boring logs, however, groundwater should be expected near the drainage channels and in isolated areas at depth perched above fine-grained soils.

3.4.2 STATIONS 2032+00 TO 2046+00

The project alignment intersects the existing Sterling Highway embankment in this interval. Soil cuts and occasional rock cuts are exposed along the existing highway. The alignment crosses existing embankment fill and cuts, overlying coarse-grained soils and variable shallow bedrock.

The embankment section at the test boring located in the highway consisted of 0.3 feet asphalt and two feet of structural section fill material. Soils in undeveloped areas primarily consisted of a thin organic mat and coarse-grained soils over variable shallow bedrock, with bedrock exposure becoming more predominant to the east.

Bedrock was observed exposed in existing cut sections adjacent to the highway around Station 2037+50 and Station 2043+00, and bedrock was encountered in test borings at depths ranging from around 2 feet to greater than 21.5 feet below ground surface. Generally, the deeper soil deposits were primarily composed of roadway embankment fill materials. Bedrock exposed in cuts was interpreted to consist of fine-grained graywacke and shale, consistent with the rock of the Valdez Group (Figure 3-1).

FIGURE 3-1: ROCK OUTCROP NEAR STATION 2043+00

3.4.3 STATIONS 2046+00 TO 2055+00

The project alignment is routed over the existing Sterling Highway embankment in this interval. The alignment crosses existing embankment fill and predominantly coarse-grained soils near the surface with some fine-grained soils at depth and relatively deep bedrock.

The existing highway embankment at test boring locations consisted of 0.3 feet asphalt and three to four feet of structural section fill material. Soils in undeveloped areas primarily consisted of a thin organic mat, overlying two to 3 feet of silt, overlying primarily coarse-grained soils interpreted as colluvium and alluvial fan deposits. No bedrock was encountered at test borings in this interval within depths explored (20.5 to 22 feet below ground surface).

From approximately Station 2051+00 to 2055+00, the alignment crosses natural hillside clearings interpreted to be avalanche shoots. Some finer-grained clayey soils were encountered at depth in this interval, and wet soils were noted at a depth of 19 feet in one of the test borings.

The existing highway embankment at test boring locations consisted of 0.3 feet asphalt and two feet of structural section fill material. Soils in undeveloped areas primarily consisted of a thin organic mat and coarse-grained soils over variable shallow bedrock, with bedrock exposure becoming more predominant to the east.

3.4.4 STATIONS 2055+00 TO 2080+00

The project alignment is routed over or adjacent to the existing Sterling Highway embankment in this interval. Soil and rock cuts are exposed along much of the left side of the existing highway. The alignment crosses existing embankment fill and cuts, and fine to coarse-grained soil deposits with variable shallow bedrock.

The existing highway embankment at test boring locations consisted of 0.2 to 0.3 feet asphalt and one to more than five feet of structural section fill material, with both coarse and fine-grained soils underlying the embankment and bedrock encountered at depths ranging between 5.5 to more than 22 feet. Soils at test boring locations in undeveloped areas consisted of around one-foot of organic deposits, overlying silt and variable shallow bedrock or coarse-grained colluvial deposits.

Bedrock was observed exposed in existing cut sections around Stations 2055+50 to 2058+00, Stations 2059+50 to 2061+50, Stations 2067+50 to 2071+50, and Stations 2072+50 to 2074+00. Additionally, a natural bedrock outcrop was observed adjacent to the alignment left of Stations 2063+00 to 2063+50. Bedrock was encountered in test borings at depths ranging from around 3 feet to greater than 22 feet below ground surface. Bedrock exposed in cuts was interpreted to consist of siltstone, fine-grained graywacke, and shale, consistent with the rock of the Valdez Group (**Figure 3-2**).

FIGURE 3-2: ROCK OUTCROP NEAR STATION 2068+00

3.4.5 STATIONS 2080+00 TO 2092+00

This interval diverges from the existing Sterling Highway, crossing through a forested hillside with scattered bedrock outcrops exposed at the surface, and course-grained soil deposits over relatively shallow bedrock.

Coarse-grained colluvial soils with frequent cobbles and boulders were encountered at test borings drilled in this interval, and bedrock was encountered at depths ranging between 2 and 5 feet below the ground surface. Bedrock exposed in cuts was interpreted to consist of lightly metamorphosed siltstone and sandstone, and shale, consistent with the rock of the Valdez Group (**Figure 3-3**).

FIGURE 3-3: ROCK OUTCROP NEAR STATION 2083+50

3.4.6 STATIONS 2092+00 TO 2097+00

The project alignment is routed over the existing Sterling Highway embankment in this interval. The alignment crosses existing embankment fill and coarse grained-soil deposits, with some soil cuts left of the existing highway, and variable shallow bedrock.

The embankment at the one test boring location within the existing highway in this interval consisted of 0.2 feet asphalt and 2.5 feet of structural section fill material, overlying coarse-grained soil deposits containing cobbles and boulders, interpreted to be colluvium. Bedrock was encountered at a depth of around 20 feet at the test boring.

3.4.7 STATIONS 2097+00 TO 2115+00

This interval diverges from the existing Sterling Highway, crossing through an undeveloped and forested hillside with course-grained soil deposits over relatively shallow bedrock, and few bedrock outcrops exposed at the surface.

Coarse-grained colluvial deposits with frequent cobbles and boulders were encountered at test borings drilled in this interval, and bedrock was encountered at depths of zero to eight feet below the ground surface. Bedrock exposed in cuts near this alignment was interpreted to consist of primarily slate consistent with the rock of the Valdez Group (**Figure 3-4**).

FIGURE 3-4: ROCK OUTCROP RIGHT OF STATION 2086+00

3.4.8 STATIONS 2115+00 TO 2136+00

The project alignment descends from a forested hillside and converges with the existing Sterling Highway alignment in this interval, to the end of project. The alignment crosses primarily coarse-grained soil deposits and relatively deep bedrock in this interval.

This portion of the alignment enters the Quartz Creek valley, with the subsurface generally consisting of deep, coarse-grained alluvial deposits. Soils consist of sand and gravel with variable silt content. No bedrock was encountered within test borings advanced within this interval, nor is bedrock anticipated to exist near the ground surface in this area.

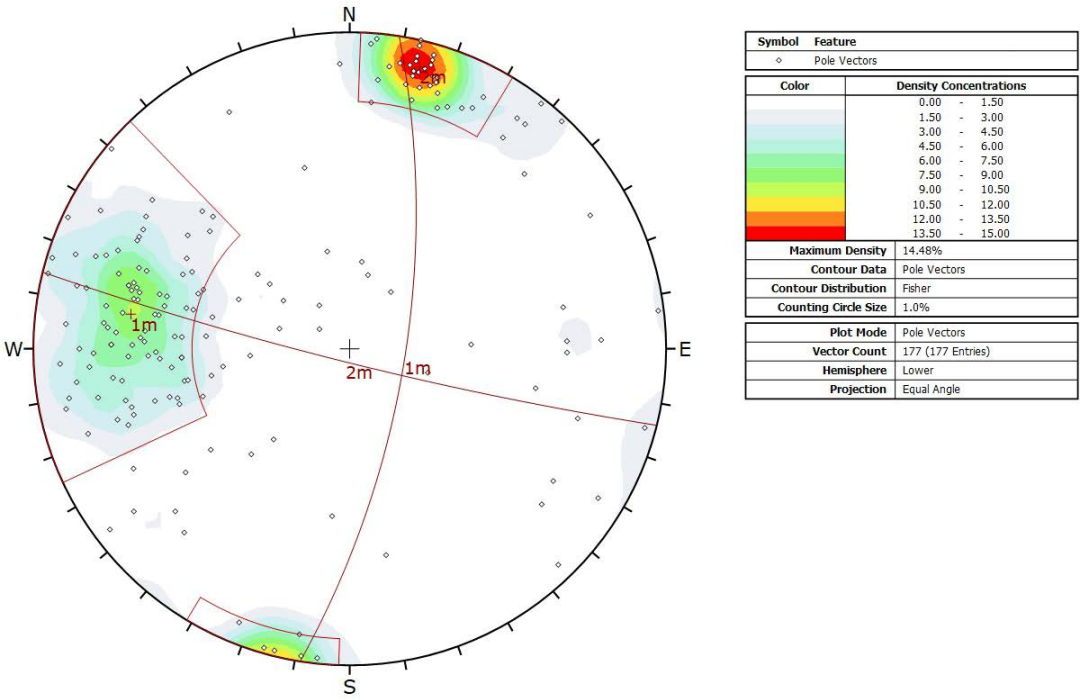
The embankment at the one test boring located within the existing highway in this interval consisted of 0.2 feet asphalt and 2 feet of structural section fill material, overlying coarse-grained soil deposits, interpreted to be alluvium. Groundwater was not noted on the log, but wet soils were interpreted at a depth of 16 feet below the pavement surface.

3.5 BEDROCK STRUCTURE

Discontinuities observed in the project area included foliation, and joints. The tectonic forces causing the accretion of the Valdez Group rocks resulted in regional foliation striking generally east-west with a near vertical dip. Tectonic forces resulted in plastic deformation of the argillite and phyllite as evidenced by closely spaced, wavy textures exhibiting flow structures around graywacke and chert inclusions. The graywacke appeared to break brittlely, and the foliation could often only be distinguished from other joints by their orientation. In addition to foliation, a near vertical joint set, orthogonal to the foliation was noted in the area. Several narrow shear zones or zones of weathered rock were observed during the mapping effort. These zones typically paralleled the foliation or joint sets.

Figure 3-5 presents a stereonet graphic representation (equal area, lower hemisphere pole plot) of rock discontinuity data collected in the project area. The shaded contours represent the probability of occurrence of a discontinuity in a particular orientation. The data shows five major joint sets and numerous randomly occurring joints. The random joints were variable, but were generally of low persistence.

FIGURE 3-5: STEREONET OF GEOLOGIC DISCONTINUITY DATA



The characteristics of the major joint sets and a summary of the major discontinuity groups is included in Table 3-1.

TABLE 3-1: SUMMARY OF MAJOR DISCONTINUITY SETS

Property	Valdez Group	
	Set 1	Set 2
Type	Foliation	Joint
Dip	70°±20°	85°±15°
Dip Direction	99°±30°	194°±10°
Persistence	Very Low to Medium	Low to Medium
Spacing	Extremely Close to wide	Very Close to Medium
Roughness (4 inches)	Smooth to Rough	Rough
Roughness (3 feet)	Undulating to Stepped	Stepped
Aperture	Closed	Closed
Filling	None	Some Calcite
Water	Dry to Damp	Dry

3.6 GROUNDWATER CONDITIONS

Groundwater was generally not encountered within the depths explored for the project test borings in the Phase 1B alignment, with a few exceptions:

- Groundwater was encountered at a depth of 17.5 feet at test boring TH19-2089 (near Station 2116+20).

- Various wet soil conditions were noted on several test borings across the project alignment. Wet soils were typically associated with either: lenses of fine-grained soil within primarily course-grained deposits, indicating potential perched groundwater conditions; or, near the base of test borings, indicating groundwater near the completion depth of select test borings.

- the project alignment crosses several existing intermittent to perennial drainage channels, and shallow groundwater may occur in vicinity to existing drainage channels.

The groundwater table is expected to fluctuate seasonally as it is affected by seasonal frost penetration, snow melt, and rain events.

4.0 FIELD INVESTIGATION METHODS

4.1 TEST BORINGS

Thirty-three test borings were completed for the Phase 1B subsurface investigation program. R&M prepared the exploration plan for drilling, including selection of proposed test boring locations and target completion depths for each location. DOT&PF personnel performed the drilling, including selection of final test boring locations and sampling and logging of the test borings.

Proposed test boring locations were staked by R&M using mapping grade global positioning system (GPS) units. Final test boring locations, where offset from proposed locations, were recorded by DOT&PF personnel using recreational grade GPS units. Surface elevation at each test boring location was interpolated by the civil design team using the final GPS coordinates and the project topographic map being prepared by R&M as part of civil design. **Tables 4-1 through 4-2** present a summary of the test borings performed for the Phase 1B subsurface investigation. Final, recorded test boring locations are illustrated relative the existing and proposed Sterling Highway alignments in **Appendix A** on **Drawings A-02 through A-05**.

Test boring and sampling operations were performed in Fall 2019 by DOT&PF drilling crews using DOT&PF drilling equipment. Central Region DOT&PF personnel completed test borings with a seven character identifier (e.g. TH19-20) as the Test Boring Number **(Tables 4-1 through 4-2).** Northern Region DOT&PF personnel completed test borings with a nine character identifier (e.g. TH19-2051) as the Test Boring Number **(Tables 4-1 through 4-2).** DOT&PF Central Region crews used a truck-mounted CME-75 drilling rig, and DOT&PF Northern Region crews completed test borings used a track-mounted CME-850 drilling rig.

Soil test borings were advanced using continuous flight, approximately 3.25-inch inside diameter (I.D.) hollow stem auger. Disturbed samples were collected using split-spoon samplers and a standard penetration test incorporating a standard diameter split-spoon. The standard penetration test was performed using a 1.4-inch inside diameter I.D., 2.0-inch outside diameter (O.D.) split-spoon sampler advanced with a 140-pound automatic drop-hammer falling 30 inches. The penetration resistance, defined as the number of blows (N-value) required to drive the sampler the final 12 inches of an 18-inch interval or middle 12 inches of a 24-inch interval, provides an indication of the in-place consistency of unfrozen soils. The blows for each 6-inch interval are recorded on the logs.

Rock test borings were advanced using triple-tube NQ (approx. 1 7/8 – inch core) wireline diamond bit coring methods following ASTM D 2113.

Test borings were either completed at their target depths or at refusal on presumed cobbles, boulders, or bedrock. Test boring meeting refusal on presumed cobbles or boulders or bedrock at shallow depth were often reattempted at offset locations with similar results. Some test borings were advanced into bedrock confirming bedrock depth, but the condition causing auger refusal in some instances was undetermined.

Recovered soil and rock samples were visually classified in the field following the Alaska Field Guide for Soil Classification (DOT&PF, 2003a) and the Alaska Field Rock Classification and Structural Mapping Guide (DOT&PF, 2003b). Soils recovered in the field were visually described following ASTM D 2488 and sealed in plastic bags. Samples were returned to the R&M laboratory in Anchorage

for further examination, testing and storage. Final soil descriptions are based on laboratory results and ASTM D 2487 classifications.

A key to the test boring log, general notes, an example of a typical log, and project logs of the test borings are provided in **Appendix B**.

Photographs of the recovered rock core for this project are provided in **Appendix E**.

4.2 BEDROCK STRUCTURE MAPPING

Bedrock structure mapping for the Phase 1B section of the project was conducted during the period of October 2 through October 3, 2019. Field mapping and data collection was performed by an experienced R&M geologist and geotechnical engineer utilizing a geologic stratum "Clar" compass. Rock mapping was performed to measure and record the following structure type, location, dip angle, dip direction, and discontinuity characteristics. Approximately 177 separate readings from 14 distinct exposures were obtained from bedrock surfaces within the project site. The following discontinuity data were recorded:

- Type
- Shape
- Spacing
- Persistence
- Infill
- Orientation
- Roughness
- Weathering
- Aperture
- Location

Rock Structure Mapping Data for each reading are presented in **Appendix D** on **Drawings D-01 through D-03.** The rock mapping effort was focused on the faces of rock cuts along the existing highway. Rock mapping used a recreational grade GPS unit to record the general locations of rock mapping observations.

4.3 BEDROCK LOCATION MAPPING

Bedrock outcrop and possible/shallow bedrock location mapping presented on Drawings A-02 through A-05 are the result of aerial photography interpretation. Test Borings available from the 2019 investigation performed by DOT&PF were used to assist aerial interpretation. An R&M field visit in 2019 (described in Section 4.2, above) included limited bedrock outcrop mapping, which were also used to assist aerial interpretation. This mapping has not been ground-truthed or investigated with test borings or other subsurface investigation methods. Given the uncertainty resulting from the sparse data available regarding actual bedrock depth and the mapping methods used, this bedrock mapping is likely to contain significant inaccuracy. Inaccuracy may include areas of bedrock outcrops and possible/shallow bedrock that have not been identified or that were identified incorrectly. Additional investigation would be necessary to improve the accuracy of this mapping product.

TABLE 4-1: TEST HOLE SUMMARY DRAWING A-02 AND A-03 (ARRANGED WEST TO EAST)

Drawing Number	Test Boring Number	DOT&PF Region	Elevation (Feet)	Total Depth (feet)	Bedrock Depth (feet)	Groundwater Depth (feet)	Fill Depth (feet)	Project Station	Coordinates (NAD 83)	
									Latitude	Longitude
A-02	TH19-2073	Northern	577.1	21.5	N.E.	N.E.	Off-road	2013+46 19RT	60.49617	-149.78231
	TH19-2074	Northern	523.7	20.0	N.E.	N.E.	Off-road	2014+35 360R	60.49521	-149.78212
A-03	TH19-2075	Northern	587.8	21.5	N.E.	N.E.	Off-road	2019+19 43RT	60.49586	-149.77919
	TH19-2076	Northern	544.1	21.5	21.5	N.E.	Off-road	2021+67 223RT	60.49528	-149.77794
	TH19-2072	Northern	570.9	21.0	N.E.	N.E.	Off-road	2023+61 21RT	60.49577	-149.77673
	TH19-2068	Northern	506.4	21.0	N.E.	N.E.	Off-road	2028+88 125RT	60.49537	-149.77386
	TH19-2069	Northern	521.1	20.0	N.E	N.E.	Off-road	2029+25 12RT	60.49567	-149.77361
	TH19-2070	Northern	505.8	21.0	N.E.	N.E.	Off-road	2030+74 49RT	60.49544	-149.77280
	TH19-2071	Northern	535.9	21.5	N.E.	N.E.	Off-road	2033+08 6RT	60.49561	-149.77149
	TH19-10	Central	544.1	20.2	20.2[a]	N.E.	2.5	2039+25 13RT	60.49546	-149.76808
	TH19-2078	Northern	577.9	5.9	5.5	N.E.	Off-road	2042+87 72LT	60.49562	-149.76604
	TH19-2079	Northern	586.6	10.7	10.5	N.E.	Off-road	2041+69 99LT	60.49572	-149.76668
	TH19-2077	Northern	578.5	4.0	3.5	N.E.	Off-road	2042+98 72LT	60.49562	-149.76598
	TH19-13	Central	574.1	22.0	N.E.	N.E.	4.5	2049+25 21RT	60.49516	-149.76258
	TH19-2080	Northern	619.8	20.5	N.E.	N.E.	Off-road	2051+76 94LT	60.49531	-149.76107
	TH19-15	Central	595.1	22.0	N.E.	N.E.	3.5	2054+30 29RT	60.49478	-149.75991

NOTES:
a Test boring log indicates refusal on possible bedrock or a possible boulder
N.E. = Not Encountered

TABLE 4-2: TEST HOLE SUMMARY DRAWINGS A-04 AND A-05 (ARRANGED WEST TO EAST)

Drawing Number	Test Boring Number	DOT&PF Region	Elevation (Feet)	Total Depth (feet)	Bedrock Depth (feet)	Groundwater Depth (feet)	Fill Depth (feet)	Project Station	Coordinates (NAD 83)	
									Latitude	Longitude
A-04	TH19-16	Central	601.4	22.0	N.E.	N.E.	2.5	2059+34 31RT	60.49423	-149.75738
	TH19-2081	Northern	636.0	4.7	4.7	N.E.	Off-road	2060+41 88LT	60.49438	-149.75654
	TH19-2082	Northern	634.8	3.8	3.8	N.E.	Off-road	2060+25 87LT	60.49440	-149.75662
	TH19-18	Central	590.6	20.5	N.E.	N.E.	3.0	2064+41 40RT	60.49350	-149.75502
	TH19-21	Central	553.2	7.1	5.5	N.E.	2.5	2074+42 39RT	60.49197	-149.75042
	TH19-22	Central	532.5	22.0	N.E.	N.E.	5.0	2079+36 37RT	60.49122	-149.74814
	TH19-2083	Northern	633.9	75.8	1.5	N.E.	Off-road	2080+94 72LT	60.49123	-149.74707
	TH19-2084	Northern	606.4	75.0	5.0	N.E.	Off-road	2086+31 31LT	60.49031	-149.74474
	TH19-2085	Northern	582.9	75.0	5.0	N.E.	Off-road	2089+76 27LT	60.48977	-149.74317
A-05	TH19-26	Central	487.1	22.0	N.E.	N.E.	5.0	2094+32 4RT	60.48900	-149.74117
	TH19-2086	Northern	529.9	75.0	5.0	N.E.	Off-road	2099+79 19LT	60.48821	-149.73859
	TH19-2087	Northern	476.5	22.0	8.0	N.E.	Off-road	2104+54 10LT	60.48747	-149.73643
	TH19-2091	Northern	549.0	40.0	0.0	N.E.	Off-road	2109+36 9RT	60.48676	-149.73417
	TH19-2090	Northern	505.2	50.0	8.0	N.E.	Off-road	2114+38 103RT	60.48673	-149.76141
	TH19-2088	Northern	470.8	25.0	N.E.	N.E.	Off-road	2116+18 27RT	60.48635	-149.73047
	TH19-2089	Northern	470.4	25.0	N.E.	17.5	Off-road	2116+21 31RT	60.48634	-149.73045
	TH19-33	Central	469.4	22.0	N.E.	N.E.	2.5	2121+05 22RT	60.48656	-149.72777

NOTES:
a Test boring log indicates refusal on possible bedrock or a possible boulder
N.E. = Not Encountered

5.0 LABORATORY TESTING PROGRAM

Select samples were submitted for analysis at the R&M material testing laboratory in Anchorage while other select samples were submitted for uniaxial compressive strength testing to Kleinfelder in Sacramento. The laboratory testing program was developed to provide data on important material characteristics necessary for engineering design and construction. Laboratory tests performed on soils consisted primarily of measuring key index properties for the purpose of classification. Laboratory testing was performed in accordance with the ASTM, AASHTO, and ATM standards tabulated in **Table 5-1** (DOT&PF, 2019; AASHTO, 2019; and ASTM, 2019).

TABLE 5-1: LABORATORY TESTING

Test Designation	Description
ASTM D 422 [a]	Particle size analysis of soils (sieve and hydrometer)
ASTM D 2216	Laboratory determination of water content of soil and rock by mass
ASTM D 2487	Classification of soils for engineering purposes
ASTM D 2488	Description and identification of soils (visual-manual procedure)
ASTM D 2974	Percent organic matter in soils by ignition
ASTM D 4318	Liquid limit, plastic limit, and plasticity index of soils
ASTM D 5731	Determination of the Point Load Strength Index of Rock
ASTM D 7012	Compressive Strength and Elastic Moduli on Intact Rock Core
AASHTO T96	Los Angeles Abrasion of Large-Size Coarse Aggregate
AASHTO T104	Sodium Sulfate Soundness
ATM 313	Degradation Value of Aggregates

NOTES
[a] ASTM 422 was not reapproved following the 2016 calendar year designation.

In addition to the Unified Soil Classification System (USCS), samples that underwent particle size analysis and limited samples that were scheduled for a visual-manual classification were given a USCS classification based on the ASTM D 2487 and ASTM D 2488 USCS method, respectively. The classification method (USCS) is presented on the log of test boring and laboratory data summary for those respective samples tested. When the USCS classification was estimated, the estimated classification symbol is followed by an asterisk (*) on the laboratory data summary.

The Unified Soil Classification System is presented in **Appendix C** on **Drawing C-01**. Laboratory testing results summaries are provided on **Drawings C-02 through C-05**. Point load strength testing results summaries are provided on **Drawings C-06 though C-09**. Uniaxial compressive strength testing results are provided in **Appendix C** following the summaries.

It should be noted that the size of the gravel particles in the samples obtained with a 1.4-inch I.D. spilt-spoon sampler is limited by the size of the opening of the sampler, therefore the sample is thus not necessarily representative of the coarse gravel fraction.

6.0 CONCLUSIONS

The following conclusions are based on data collected from literature searches, report reviews, site reconnaissance by R&M and test boring logs by DOT&PF. Geotechnical data for the Sterling Highway MP 45-60, Sunrise to Skilak Lake Phase 1B (MP 45-46.5) reconstruction project reveal that:

1. The project alignment is located within the Kenai-Chugach Mountains physiographic province and generally situated in valley bottoms or on the lower flanks of the Kenai Mountains.

2. Identified geological hazards include earthquakes (i.e. strong ground shaking and liquefaction), potential shallow groundwater, flooding/erosion at existing drainage channels, avalanches, slope instability, and rockfall.

3. Aside from the existing roadway, the site is heavily vegetated with a combination of Sitka spruce with western hemlock, black cottonwood, or balsam poplar with an understory of Sitka alder, devil's club, and willow.

4. Depth to bedrock is highly variable across the project alignment, with portions of the alignment routed over variable shallow bedrock, existing rock cuts, and surface outcrops, and deep soil conditions underlying other portions of the alignment.

5. Groundwater was generally not encountered, or noted on logs, in test borings drilled as part of this project. However, relatively shallow perched groundwater may exist under portions of the alignment, and groundwater should be anticipated in vicinity to existing drainage channels. The groundwater table is expected to fluctuate seasonally and is affected by seasonal frost penetration, snow melt, rain events and changes to the level of associated creeks and sloughs.

6. Permafrost was not interpreted within any of the DOT&PF test borings to the total depth explored nor is it anticipated to underlie the project alignment.

7.0 CLOSURE

The interpretation of geotechnical conditions along with the conclusions and recommendations presented in this report are based on our understanding of the project requirements, geologic reconnaissance, test boring explorations, and other pertinent information listed herein. Significant alteration of any of these concepts or project scope could affect the foregoing interpretations. Additionally, because subsurface characteristics can change sharply within a given area, and with the passing of time, the possibility exists that important subsurface conditions not disclosed by this field investigation may be discovered during construction. Should this situation occur, the influence of the new information on the present interpretations should be evaluated without delay.

R&M Consultants, Inc. performed this work in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions. No warranty, express or implied, beyond exercise of reasonable care and professional diligence, is made. This report is intended for use only in accordance with the purposes of study described within.

We appreciate the opportunity to perform this geotechnical investigation. Should you require further information concerning the investigation or this report, please contact us at your convenience.

Sincerely,

R&M CONSULTANTS, INC.

Prepared by:

PRELIMINARY DRAFT

Aaron T. Banks, CPG
Senior Geologist

Reviewed by:

PRELIMINARY DRAFT

Brian M. Mullen PE
Geotechnical Engineer

PRELIMINARY DRAFT

Robert M. Pintner, PE
Senior Geotechnical Engineer

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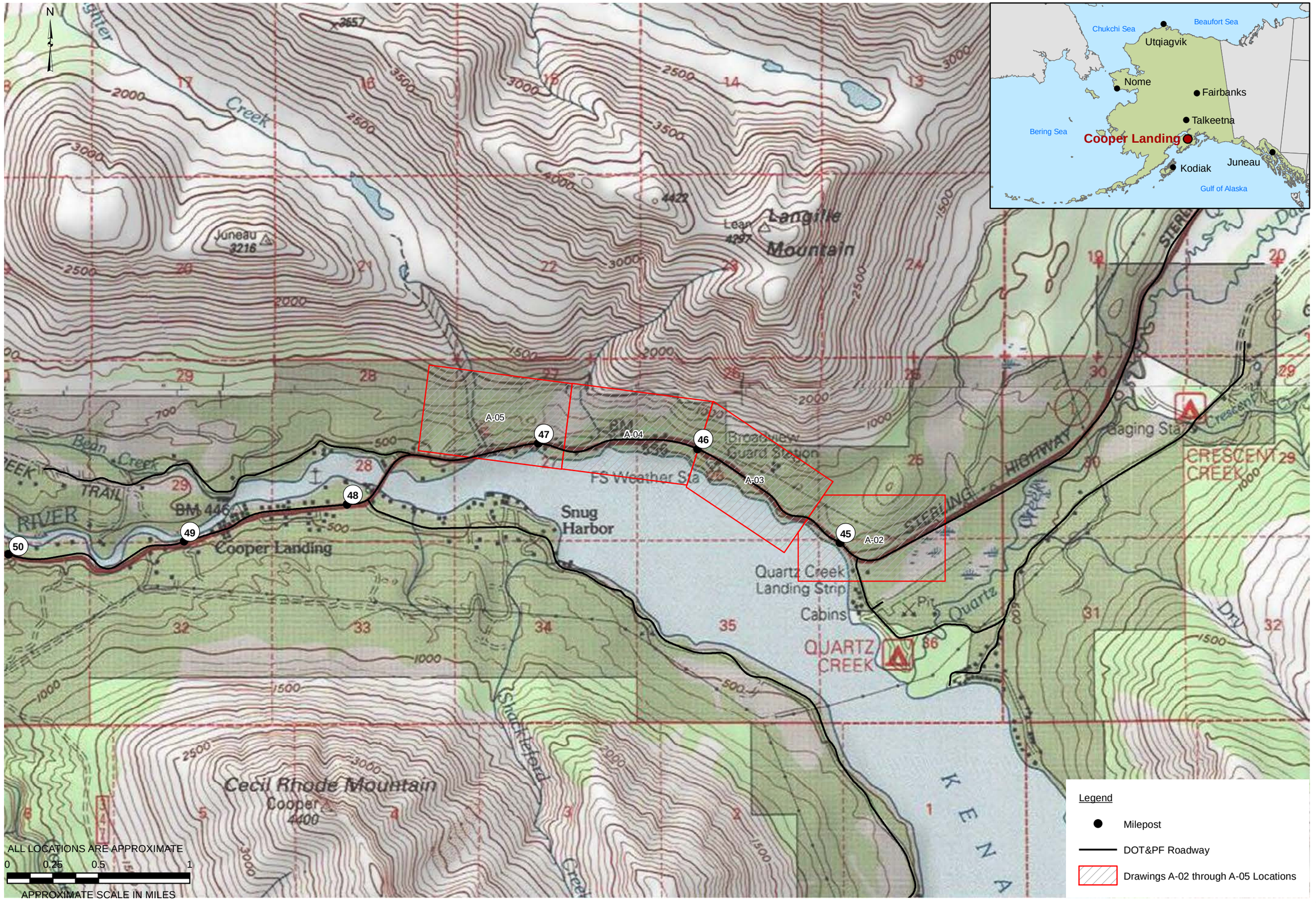
APPENDIX A
DRAWINGS



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DATE:	JAN 2020
REF:	N/A
DWG.:	A-01

STERLING HIGHWAY MP 45-60
SUNRISE TO SKILAK LAKE RD - PHASE 1B
PROJECT NO.: 0212015/Z530140000

LOCATION AND VICINITY MAP

PREPARED BY:
R&M CONSULTANTS, INC.

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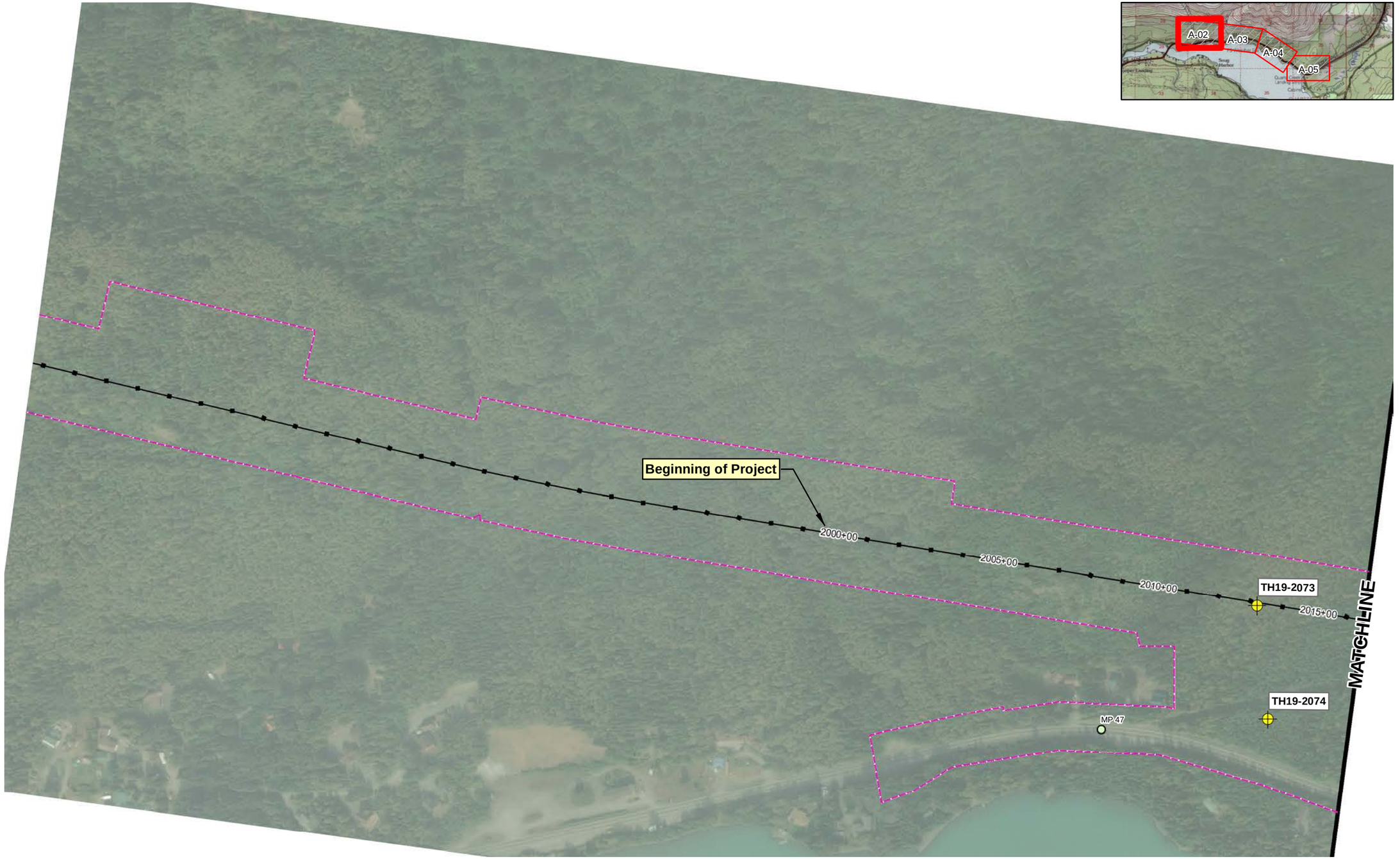

PROJ.NO:	2747.02
DATE:	APR 2020
REF:	N/A
DWG.:	A-02

STERLING HIGHWAY MP 45-60
SUNRISE TO SKILAK LAKE RD - PHASE 1B
PROJECT NO.: 0212015/Z530140000

GEOTECHNICAL INVESTIGATION BOREHOLE LOCATIONS

PREPARED BY:
R&M CONSULTANTS, INC.

N

APPROXIMATE SCALE IN FEET

0 150 300 600

ALL LOCATIONS ARE APPROXIMATE

NOTES:
- Proposed alignment and stationing are subject to change and are for general orientation purposes.
- Test boring locations are based on DOT&PF test boring logs and have not been land surveyed.
- Rock mapping locations are based on recreational grade GPS measurements and have not been surveyed.
- Mileposts and existing road layer are from publically available GIS data from the Alaska DOT&PF, accuracy has not been verified.
-Aerial photography from the ESRI Online World Imagery Layer, accessed January 2020.
- Bedrock Outcrop and Possible Bedrock/Shallow Bedrock locations are based on interpretation of the R&M aerial photography and have not been groundtruthed. Actual conditions may vary considerably.

- Central Region DOT&PF Test Boring
- Northern Region DOT&PF Test Boring
- Rock Mapping Location
- Possible Material Source
- Bedrock Outcrop
- Possible Bedrock/Shallow Bedrock
- Station Point (100 feet)
- Proposed Alignment
- Proposed Project Boundary
- Milepost

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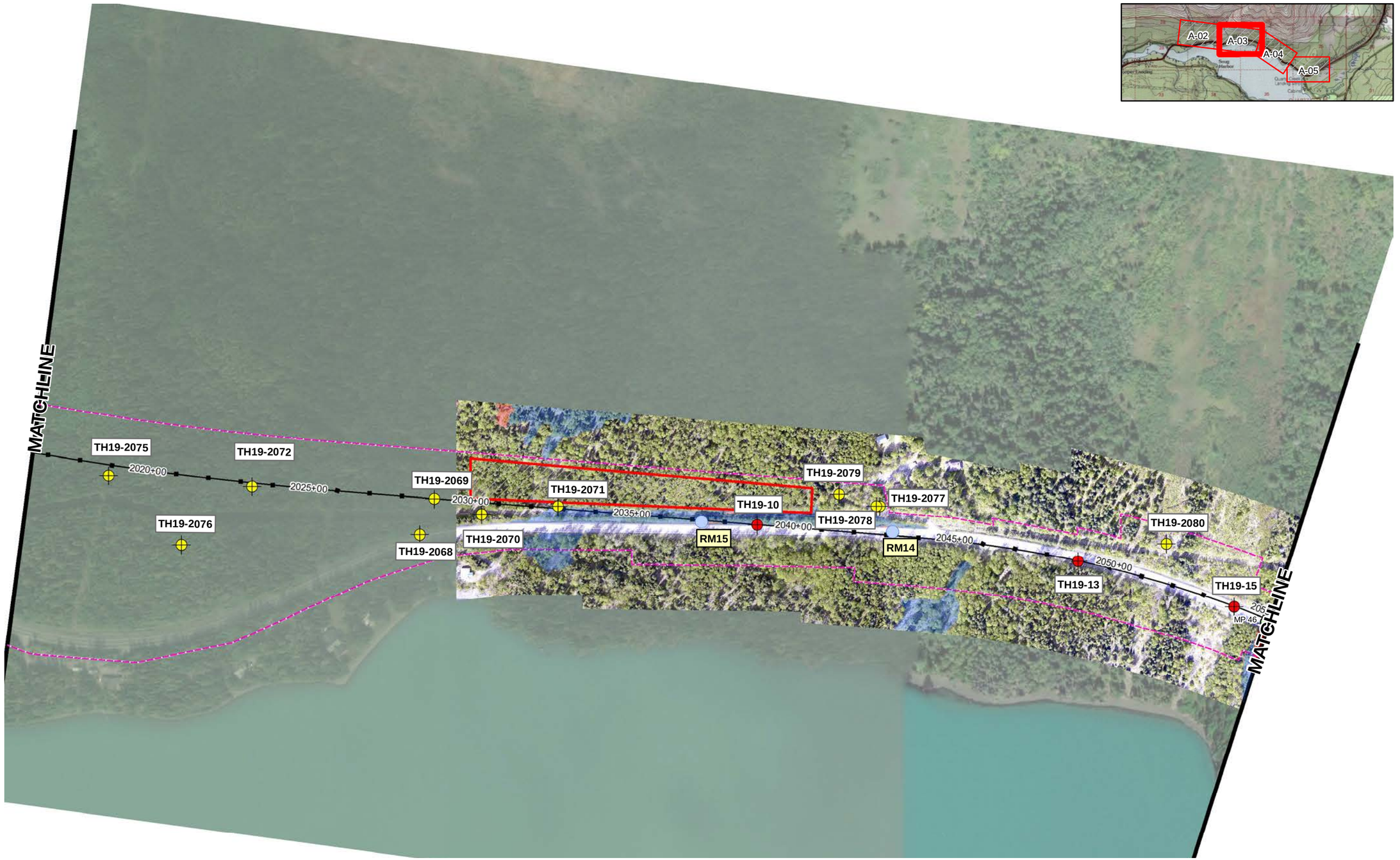

N

APPROXIMATE SCALE IN FEET

0 150 300 600

ALL LOCATIONS ARE APPROXIMATE

NOTES:
- Proposed alignment and stationing are subject to change and are for general orientation purposes.
- Test boring locations are based on DOT&PF test boring logs and have not been land surveyed.
- Rock mapping locations are based on recreational grade GPS measurements and have not been surveyed.
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- Central Region DOT&PF Test Boring
- Northern Region DOT&PF Test Boring
- Rock Mapping Location
- Possible Material Source
- Bedrock Outcrop
- Possible Bedrock/Shallow Bedrock
- Station Point (100 feet)
- Proposed Alignment
- Proposed Project Boundary
- Milepost

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DATE:	APR 2020
REF:	N/A
DWG.:	A-03

STERLING HIGHWAY MP 45-60
SUNRISE TO SKILAK LAKE RD - PHASE 1B
PROJECT NO.: 0212015/Z530140000

GEOTECHNICAL INVESTIGATION BOREHOLE LOCATIONS

PREPARED BY:
R&M CONSULTANTS, INC.

N

APPROXIMATE SCALE IN FEET

0 150 300 600

ALL LOCATIONS ARE APPROXIMATE

NOTES:
- Proposed alignment and stationing are subject to change and are for general orientation purposes.
- Test boring locations are based on DOT&PF test boring logs and have not been land surveyed.
- Rock mapping locations are based on recreational grade GPS measurements and have not been surveyed.
- Mileposts and existing road layer are from publically available GIS data from the Alaska DOT&PF, accuracy has not been verified.
-Aerial photography from the ESRI Online World Imagery Layer, accessed January 2020.
- Bedrock Outcrop and Possible Bedrock/Shallow Bedrock locations are based on interpretation of the R&M aerial photography and have not been groundtruthed. Actual conditions may vary considerably.

- Central Region DOT&PF Test Boring
- Northern Region DOT&PF Test Boring
- Rock Mapping Location
- Possible Material Source
- Bedrock Outcrop
- Possible Bedrock/Shallow Bedrock
- Station Point (100 feet)
- Proposed Alignment
- Proposed Project Boundary
- Milepost

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DATE:	APR 2020
REF:	N/A
DWG.:	A-04

STERLING HIGHWAY MP 45-60
SUNRISE TO SKILAK LAKE RD - PHASE 1B
PROJECT NO.: 0212015/Z530140000

GEOTECHNICAL INVESTIGATION BOREHOLE LOCATIONS

PREPARED BY:
R&M CONSULTANTS, INC.

NOTES:
- Proposed alignment and stationing are subject to change and are for general orientation purposes.
- Test boring locations are based on DOT&PF test boring logs and have not been land surveyed.
- Rock mapping locations are based on recreational grade GPS measurements and have not been surveyed.
- Mileposts and existing road layer are from publically available GIS data from the Alaska DOT&PF, accuracy has not been verified.
-Aerial photography from the ESRI Online World Imagery Layer, accessed January 2020.
- Bedrock Outcrop and Possible Bedrock/Shallow Bedrock locations are based on interpretation of the R&M aerial photography and have not been groundtruthed. Actual conditions may vary considerably.

- Central Region DOT&PF Test Boring
- Northern Region DOT&PF Test Boring
- Rock Mapping Location
- Possible Material Source
- Bedrock Outcrop
- Possible Bedrock/Shallow Bedrock
- Station Point (100 feet)
- Proposed Alignment
- Proposed Project Boundary
- Milepost

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PROJ.NO:	2747.02
DATE:	APR 2020
REF:	N/A
DWG.:	A-05

STERLING HIGHWAY MP 45-60
SUNRISE TO SKILAK LAKE RD - PHASE 1B
PROJECT NO.: 0212015/Z530140000

GEOTECHNICAL INVESTIGATION BOREHOLE LOCATIONS

PREPARED BY:
R&M CONSULTANTS, INC.

APPENDIX B
LOGS OF TEST BORINGS

LOG OF TEST HOLE

HOLE # LEGEND

STATE OF ALASKA DOT&PF
Statewide Geotechnical Services
Geology Section

PROJECT NUMBER :
PROJECT : *TEST HOLE EXPLANATION 2009*

Station / Location: *(Station, Lat./Long.)*
Offset: *Offset Location if applicable*
Elevation: *Elevation*

Equipment Type:
Hole Type:
Field Crew: *Driller, Helper*

Total Depth: *19.0 ft*
Date: *3/12/2009* -
Geologist:

Ground Water Data		
Depth in (ft.)	15.8	
Time	10:00	
Date	3/12/09	
Symbol	▼	

Weather: This section is for weather notes

Depth (Feet)	Sample Data: Drill Method	Blow Count	N Value	Number	Recovery	Sample Type	Sample	USCS Classification / Frozen Zone	Soil Graphic	SUBSURFACE MATERIAL
0										**SOIL GRAPHIC AND SOIL TYPE EXPLANATION** All graphics are generic representations of soil type and do not match soils as seen in-situ.
1								GP		**GRAVEL** (GP)
								GW		**GRAVEL** (GW)
2								SP		**SAND** (SP)
								SW		**SAND** (SW)
3								ML		**SILT** (ML)
								MH		**SILT** (MH)
4								CL		**CLAY** (CL)
								CH		**CLAY** (CH)
5								PT		**ORGANICS OR PEAT** (PT)
										Cobbles or Boulder Location with approximate strata contact
6										**ICE** or Frozen Soil Interval
										TRANSITIONAL SOIL CHANGE
7										**WEATHERED BEDROCK** (Strength Grade, Weathering Grade)
										BEDROCK (Strength Grade, Weathering Grade)
8		1	5	(09-3533) = Sample Number		SPT				**SAMPLE DATA EXPLANATION**
		2				SS				Standard Penetration Test Split Spoon Sample 1.4" ID x 2" OD with 140 lb. Hammer
9		3				MC				Split Spoon Sample 2.0" ID x 2.5" OD with 340 lb. Hammer
		4				GRAB				Split Spoon Sample 2.5" ID x 3" OD with 340 lb. Hammer
10						AUGER				Grab Sample
						EB				Auger Cuttings Grab Sample
11						CORE				Excavator Bucket Grab Sample
						ST				Rock Core
12						MS				Shelby Tube thin wall 3" OD
						NR				Modified Shelby Tube (size)
13						SNT				No Recovery
						FLD WT				Sample Not Tested or Retained
14						UNDIST				Field Weighted Sample
						VANE				Undisturbed Sample
15										Vane Shear Test: Vane Diameter =X", Vane Height = X", Vane Shear Undisturbed Torque=X ft.-lbs., Vane Shear Remolded Torque=X ft.-lbs.
▼ 16										Observed Groundwater, initial
17										**SAMPLE TEST RESULTS EXPLANATION**
18										Boulders = > 12" — Plasticity Index (PI) = % or Nonplastic (NP)
19										Cobbles = 3" to 12" — Liquid Limit (LL) = % or No Value (NV)
										Gravel = #4 to 3" — Degradation = Dimensionless Number
										Sand = #200 to #4 — LA Abrasion = % Loss
										Silt/Clay (P200) = <#200 — Sodium Sulfate (Cse or Fine) = % Loss
										Clay = <0.0075 Size — Max. Dry Density = Pounds Per Cubic Foot
										Natural Moisture Content = % — Optimum Moisture = %
										Organic Content = %
								BOH 19		Notes: This section is for drilling notes and additional equipment descriptions

SPT = BLOWCOUNT / ft. (TOTAL BLOWS FOR SECOND & THIRD 6" INCREMENT) WITH STANDARD PENETRATION TEST SAMPLER w/ 1.4" ID, 2" OD USING A CME AUTOHAMMER WITH 140 lb. HAMMER AND A 30" FREEFALL LATEST EDITION AASHTO T 206 (ASTM D1586).

SS = BLOW COUNT w/ 2" ID, 2.5" OD SAMPLER DRIVEN BY A 340 lb. CME AUTOHAMMER w/ A 30" FREEFALL.

MC = BLOW COUNT w/ 2.5" ID, 3" OD SAMPLER DRIVEN BY A 340 lb. CME AUTOHAMMER WITH A 30" FREEFALL

AN ASTERISK IN THE N-VALUE COLUMN INDICATES SAMPLER REFUSAL. REFUSAL DEFINED AS 50 OR MORE BLOWS PER 6" INCREMENT, 100 TOTAL BLOWS, OR NO MOVEMENT OBSERVED WITH 10 SUCCESSIVE BLOWS.

AN "X" IN THE N-VALUE COLUMN INDICATES NO VALID SPT.

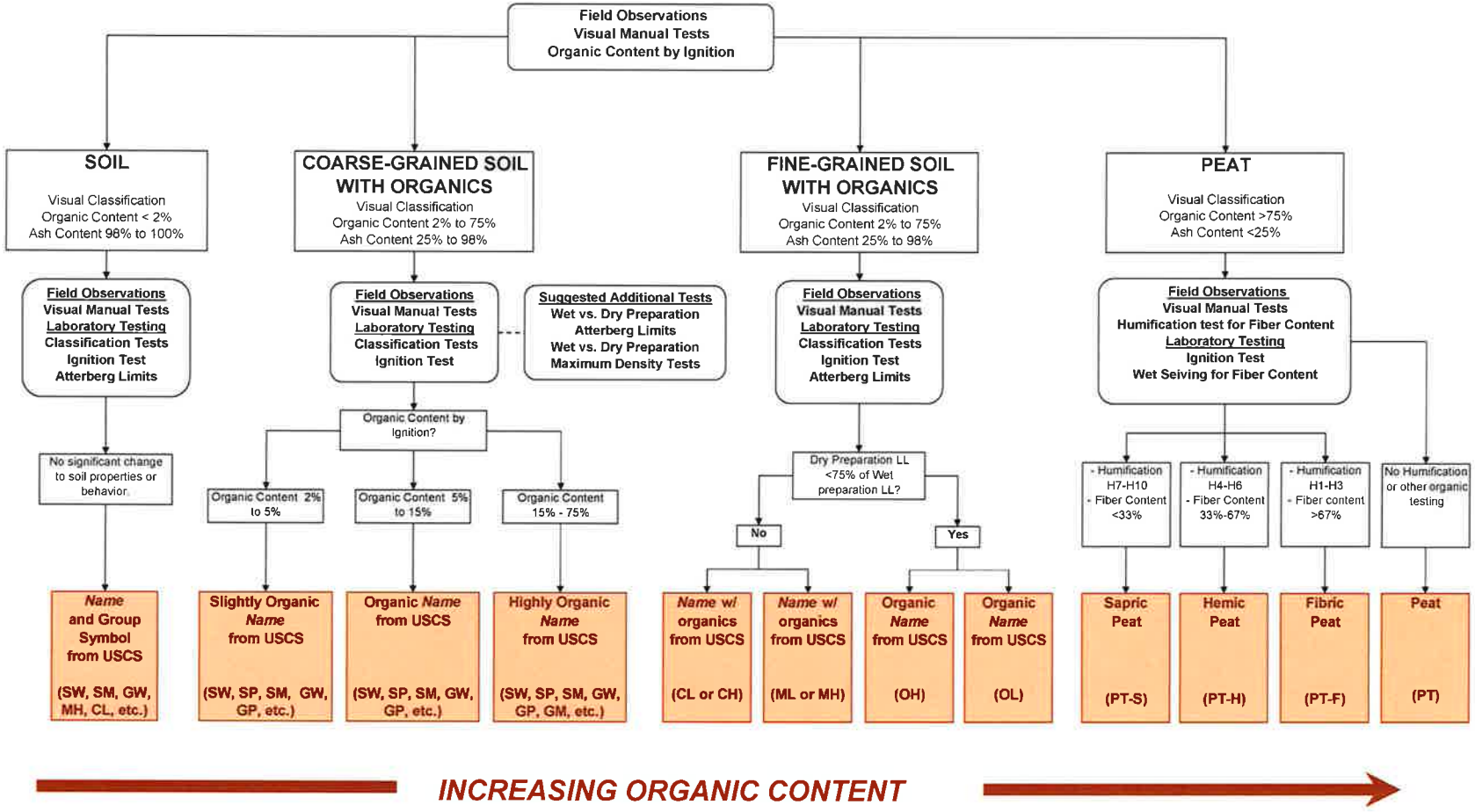
☐ CME Auto Hammer ☐ Cathead Rope Method

Sheet Number 1 of 1

LEGEND TEMPLATE 2009LOGLEGEND.GPJ DATA TEMPLATE 02-01-08.GDT 3/12/09

MARCH 2009

Peat and Organic Soil Classification System



LOG OF TEST HOLE

HOLE # TH19-10

STATE OF ALASKA DOT&PF
Statewide Materials
Geology Section

PROJECT NUMBER : *Z530140000*
PROJECT : *Sterling Highway MP 45 to 60 Reconstruction*
LATITUDE : *60.49546*, ***LONGITUDE :*** *149.76808*

Station / Location: *2039+25*
Offset: *13R*
Elevation: *544.1 ft*

Equipment Type: *CME 75 Truck*
Hole Type: *6.5 inch OD Hollow Stem Auger*
Field Crew: *B. Coke and T. Babin*

Total Depth: *20.2 ft*
Date: *9/23/19 - 9/23/19*
Geologist: *T. Weiss*

Ground Water Data		
Depth (ft.)	Not Observed	
Time		
Date		
Symbol		

Weather: Partly cloudy / 48 degrees

Surface: on road

Depth (Feet)	Drill Method	Blow Count	N Value	Sample Number	Recovery	Sample Type	Sample	USCS Classification Frozen Zone	Soil Graphic	SUBSURFACE MATERIAL
0										**Asphalt Concrete** 2.5 inches — 0.0
0.2										**Unbound Asphalt Blend (FILL)** black, dry to moist, Unbound asphalt blended with sand and gravel — 0.2
1.3								SP-SM		**SAND with Silt and Gravel (FILL)** (SP-SM) brown, moist Fabric — 1.3 / 1.4
2.5		8 7 6 11	13	SW-163		SPT		SM		**SILTY SAND with Gravel** (SM) brown, fine grained sand, moist SW-163 Moisture=10.7%, USCS from lab: SM — 2.5
5.0		10 9 10 16	19	SW-164		SPT		GM		**SILTY GRAVEL with Sand, Cobbles and Boulders** (GM) grayish brown, moist SW-164 sample combined with SW-165 for lab testing, Moisture=6.7%, USCS from lab: GM — 5.0
	Hollow-Stem Auger	12 19 27 36	46	SW-165		SPT				
		23 36 26 33	62	SW-166		SPT				SW-166 sample combined with SW-167 for lab testing, Moisture=5.5%, USCS from lab: GM
14.0										
15.5		27 56 50/4"	*	SW-167		SPT				moist to wet — 15.5
		50/2"	*			SPT			BOH 20.2	Refusal on boulder or bedrock — 20.2

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

A USCS TEST HOLE LOG STERLING HIGHWAY MP 45 TO 60 RECONSTRUCTION ON-ROAD TEST HOLES.GPJ DATA TEMPLATE 2018.GDT 11/19/19

LOG OF TEST HOLE

HOLE # TH19-13

STATE OF ALASKA DOT&PF
Statewide Materials
Geology Section

PROJECT NUMBER : *Z530140000*
PROJECT : *Sterling Highway MP 45 to 60 Reconstruction*
LATITUDE : *60.49516*, ***LONGITUDE :*** *149.76258*

Station / Location: *2049+25*
Offset: *21R*
Elevation: *574.1 ft*

Equipment Type: *CME 75 Truck*
Hole Type: *6.5 inch OD Hollow Stem Auger*
Field Crew: *B. Coke and T. Babin*

Total Depth: *22.0 ft*
Date: *9/23/19 - 9/23/19*
Geologist: *T. Weiss*

Ground Water Data		
Depth (ft.)	Not Observed	
Time		
Date		
Symbol		

Weather: Sunny / 53 degrees

Surface: on road

Depth (Feet)	Drill Method	Blow Count	N Value	Sample Number	Recovery	Sample Type	Sample	USCS Classification Frozen Zone	Soil Graphic	SUBSURFACE MATERIAL
0	Hollow-Stem Auger									**Asphalt Concrete** 3 inches 0.0
0.3										**Unbound Asphalt Blend (FILL)** black, dry to moist, Unbound asphalt blended with sand and gravel 1.2
1								SM		**SILTY SAND with Gravel, Cobbles (FILL)** (SM) grayish brown, moist 2.0
2		12 15 7 3	22	SW-168		SPT				SW-168 p200=13%, Sa=50%, Gr=37%
3										
4										
4.5								SM		**ORGANIC SILTY SAND with Gravel** (SM) grayish brown, moist
5		4 4 7 8	11	SW-169		SPT				SW-169 Moisture=10.3%, Org=6.8% 5.5
6								SM		**SILTY SAND with Gravel, Cobbles** (SM) grayish brown, moist
7										7.5
8		9 13 14 15	27	SW-170		SPT		GP-GM		**GRAVEL with Silt and Sand, Cobbles** (GP-GM) grayish brown, moist SW-170 p200=12%, Sa=43%, Gr=45%
9										
10		10 13 14 13	27	SW-171		SPT		SM		10.0 **SILTY SAND with Gravel** (SM) gray, dry to moist SW-171 p200=13%, Sa=51%, Gr=36%, Moisture=4.8%
11										
12										
13										
14										
15		7 12 10 12	22	SW-172		SPT		GM		15.0 **SILTY GRAVEL with Sand, Cobbles** (GM) gray, moist SW-172 sample combined with SW-173 for lab testing, Moisture=5.5%, USCS from lab: GM
16										
17										
18										
19										
20		8 12 12 10	24	SW-173		SPT				
21										21.5 moist to wet
22									BOH 22	22.0

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

LOG OF TEST HOLE

HOLE # TH19-15

STATE OF ALASKA DOT&PF
Statewide Materials
Geology Section

PROJECT NUMBER : *Z530140000*
PROJECT : *Sterling Highway MP 45 to 60 Reconstruction*
LATITUDE : *60.49478*, ***LONGITUDE :*** *149.75991*

Station / Location: *2054+30*
Offset: *29R*
Elevation: *595.1 ft*

Equipment Type: *CME 75 Truck*
Hole Type: *6.5 inch OD Hollow Stem Auger*
Field Crew: *B. Coke and T. Babin*

Total Depth: *22.0 ft*
Date: *9/23/19 - 9/23/19*
Geologist: *T. Weiss*

Ground Water Data		
Depth (ft.)	Not Observed	
Time		
Date		
Symbol		

Weather: Partly cloudy / 53 degrees

Surface: on road

Depth (Feet)	Drill Method	Blow Count	N Value	Sample Number	Recovery	Sample Type	Sample	USCS Classification Frozen Zone	Soil Graphic	SUBSURFACE MATERIAL
0										**Asphalt Concrete** 3 inches — 0.0
0.3										**Unbound Asphalt Blend (FILL)** black, dry to moist, Unbound asphalt blended with sand and gravel — 1.0
1								SM		**SILTY SAND with Gravel (FILL)** (SM) grayish brown, moist
2										brown SW-174 p200=15%, Sa=56%, Gr=29%, Moisture=7% — 2.5
3		4 5 4 6	9	SW-174		SPT				
3.5								SP-SM		**SAND with Silt and Gravel, Cobbles** (SP-SM) brown, moist
4										
5		4 7 16 50/1"	23	SW-175		SPT				SW-175 Refusal on cobble, Moisture=7.3%
6										
6.5										
7										
7.5								GM		**Slightly Organic SILTY GRAVEL with Sand, Cobbles** (GM) tan, dry to moist SW-176 sample combined with SW-177 for lab testing, Moisture=11.2%, Org=3.1%, USCS from lab: GM
8		2 2 5 6	7	SW-176		SPT				
9										
10		6 10 50/5"	*	SW-177		SPT				SW-177 Refusal on cobble
11										
11.5										
12										less gravel
12.5										
13										
13.5								ML		**SANDY SILT with Gravel** (ML) tan, moist
14										
15		9 16 30 33	46	SW-178		SPT				SW-178 Moisture=11.9%, USCS from lab: ML
16										
17										
18										
19										
19.5										
20								CL		**GRAVELLY CLAY with Sand** (CL) gray, moist
21		10 18 16 22	34	SW-179		SPT				SW-179 Moisture=11.7%, USCS from lab: CL
22										BOH 22 — 22.0

Hollow-Stem Auger

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

LOG OF TEST HOLE

HOLE # TH19-16

STATE OF ALASKA DOT&PF
Statewide Materials
Geology Section

PROJECT NUMBER : *Z530140000*
PROJECT : *Sterling Highway MP 45 to 60 Reconstruction*
LATITUDE : *60.49423*, ***LONGITUDE :*** *149.75738*

Station / Location: *2059+34*
Offset: *31R*
Elevation: *601.4 ft*

Equipment Type: *CME 75 Truck*
Hole Type: *6.5 inch OD Hollow Stem Auger*
Field Crew: *B. Coke and T. Babin*

Total Depth: *22.0 ft*
Date: *9/24/19 - 9/24/19*
Geologist: *T. Weiss*

Ground Water Data		
Depth (ft.)	Not Observed	
Time		
Date		
Symbol		

Weather: Partly cloudy / 45 degrees

Surface: on road

Depth (Feet)	Drill Method	Blow Count	N Value	Sample Number	Recovery	Sample Type	Sample	USCS Classification Frozen Zone	Soil Graphic	SUBSURFACE MATERIAL
0	Hollow-Stem Auger									**Asphalt Concrete** 2.5 inches 0.0
0.3										**Unbound Asphalt Blend (FILL)** black, dry to moist, Unbound asphalt blended with sand and gravel 1.0
1								SP-SM		**SAND with Silt and Gravel, Cobbles (FILL)** (SP-SM) grayish brown, moist
2										
2.5										
3		11 11 11 6	22	SW-180		SPT		SM		**Organic SILTY SAND with Gravel** (SM) gray, moist SW-180 Moisture=5.6%, Org=4.9%
4										
5		5 7 7 8	14	SW-181		SPT				SW-181 p200=13%, Sa=48%, Gr=39%, Org=5.3%
5.5										
6										
7										
7.5										
8		10 8 20 7	28	SW-182		SPT		GW-GM		**GRAVEL with Silt and Sand, Cobbles** (GW-GM) black to gray, moist to wet SW-182 p200=9.6%, Sa=40%, Gr=50%, Moisture=5.8%
9										
9.5										
10		3 1 2 2	3	SW-183		SPT		CL		**CLAY** (CL) gray, moist to wet, possible high plasticity SW-183 Moisture=49.3%, USCS from lab: CL
11										
12										
13								CL		**ORGANIC CLAY** (CL) gray, moist to wet, Drilled relatively loose 13.0
14										
15		11 27 24 19	51	SW-184		SPT		SM		**SILTY SAND with Gravel, Cobbles** (SM) gray to brown, moist SW-184 p200=18%, Sa=58%, Gr=24%, PI=NP, LL=N/A 15.0
16										
17										
18										with Cobbles 18.0
19										
20		6 17 16 37	33	SW-185		SPT				gray SW-185 Moisture=5.9%, USCS from lab: SM 20.0
21										
22									BOH 22	22.0

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

LOG OF TEST HOLE

HOLE # TH19-18

STATE OF ALASKA DOT&PF
Statewide Materials
Geology Section

PROJECT NUMBER : *Z530140000*
PROJECT : *Sterling Highway MP 45 to 60 Reconstruction*
LATITUDE : *60.4935*, ***LONGITUDE :*** *149.75502*

Station / Location: *2064+41*
Offset: *40R*
Elevation: *590.6 ft*

Equipment Type: *CME 75 Truck*
Hole Type: *6.5 inch OD Hollow Stem Auger*
Field Crew: *B. Coke and T. Babin*

Total Depth: *20.5 ft*
Date: *9/24/19 - 9/24/19*
Geologist: *T. Weiss*

Ground Water Data		
Depth (ft.)	Not Observed	
Time		
Date		
Symbol		

Weather: Partly cloudy / 49 degrees

Surface: on road

Depth (Feet)	Drill Method	Blow Count	N Value	Sample Number	Recovery	Sample Type	Sample	USCS Classification Frozen Zone	Soil Graphic	SUBSURFACE MATERIAL
0										**Asphalt Concrete** 2.5 inches 0.0
0.3										**Unbound Asphalt Blend (FILL)** black, dry to moist, Unbound asphalt blended with sand and gravel 0.8
1								SM		Fabric 1.0
2										**SILTY SAND with Gravel, Cobbles (FILL)** (SM) brown, moist
3		11 21 26 30	47	SW-186		SPT		SM		SW-186 sample combined with SW-187 for lab testing, p200=13%, Sa=53%, Gr=34%, Moisture=5.6% 3.0
4										**Slightly Organic SILTY SAND with Gravel** (SM) brown to black, moist
5		37 18 11 10	29	SW-187		SPT				
6										
7										
7.5										
8		1 2 5 4	7	SW-188		SPT		OL		**ORGANIC SILT** (OL) gray to black, moist to wet, with thin interbedded peat layers SW-188 Moisture=63.1%, Org=21.7%
9	Hollow-Stem Auger									
10		5 11 20 13	31	SW-189		SPT		GM		**SILTY GRAVEL with Sand, Cobbles and Boulders** (GM) gray, moist SW-189 p200=15%, Sa=37%, Gr=48%, Moisture=10.7% 10.0
11										
12										
13										
14										
15		11 17 22 23	39	SW-190		SPT				with Cobbles SW-190 Moisture=7.0%, USCS from lab: GM 15.0
16										
17										
18										
19								GP		**GRAVEL with Sand, Cobbles** (GP) gray, moist 19.0
20		65	*	SW-191		SPT			BOH 20.5	SW-191 Refusal on bedrock or dense gravels, Moisture=10.3% 20.5

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

A USCS TEST HOLE LOG STERLING HIGHWAY MP 45 TO 60 RECONSTRUCTION ON-ROAD TEST HOLES.GPJ DATA TEMPLATE 2018.GDT 11/19/19

LOG OF TEST HOLE

HOLE # TH19-21

STATE OF ALASKA DOT&PF
Statewide Materials
Geology Section

PROJECT NUMBER : *Z530140000*
PROJECT : *Sterling Highway MP 45 to 60 Reconstruction*
LATITUDE : *60.49197*, ***LONGITUDE :*** *149.75042*

Station / Location: *2074+42*
Offset: *39R*
Elevation: *553.2 ft*

Equipment Type: *CME 75 Truck*
Hole Type: *6.5 inch OD Hollow Stem Auger*
Field Crew: *B. Coke and T. Babin*

Total Depth: *7.1 ft*
Date: *9/24/19 - 9/24/19*
Geologist: *T. Weiss*

Ground Water Data		
Depth (ft.)	Not Observed	
Time		
Date		
Symbol		

Weather: Partly cloudy / 55 degrees

Surface: on road

Depth (Feet)	Drill Method	Blow Count	N Value	Sample Number	Recovery	Sample Type	Sample	USCS Classification Frozen Zone	Soil Graphic	SUBSURFACE MATERIAL	
0										**Asphalt Concrete** 3 inches	0.0
										Unbound Asphalt Blend (FILL) black, dry to moist, Unbound asphalt blended with sand and gravel	0.3
1								SP-SM		**SAND with Silt and Gravel, Cobbles (FILL)** (SP-SM) grayish brown, moist	1.0
2											
								GP-GM		**GRAVEL with Silt and Sand, Cobbles** (GP-GM) grayish brown, dry to moist SW-192 Moisture=4.1%, USCS from lab: GP-GM	2.5
3	Hollow-Stem Auger	18 24	55	SW-192		SPT					
4		31 26									
5		21	*	SW-193		SPT				SW-193 Refusal on bedrock, Moisture=6.6%, PI=NP, LL=16	
		50/3"								**BEDROCK** gray to black, Auger cuttings are very consistent indicating Bedrock	5.5
6										Relatively hard to drill	6.0
7		50/1"	*			SPT			BOH 7.1	Refusal on bedrock	7.1

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

LOG OF TEST HOLE

HOLE # TH19-22

STATE OF ALASKA DOT&PF
Statewide Materials
Geology Section

PROJECT NUMBER : *Z530140000*
PROJECT : *Sterling Highway MP 45 to 60 Reconstruction*
LATITUDE : *60.49122*, ***LONGITUDE :*** *149.74814*

Station / Location: *2079+36*
Offset: *37R*
Elevation: *532.5 ft*

Equipment Type: *CME 75 Truck*
Hole Type: *6.5 inch OD Hollow Stem Auger*
Field Crew: *B. Coke and T. Babin*

Total Depth: *22.0 ft*
Date: *9/25/19 - 9/25/19*
Geologist: *T. Weiss*

Ground Water Data		
Depth (ft.)	Not Observed	
Time		
Date		
Symbol		

Weather: Partly cloudy / 44 degrees

Surface: on road

Depth (Feet)	Drill Method	Blow Count	N Value	Sample Number	Recovery	Sample Type	Sample	USCS Classification Frozen Zone	Soil Graphic	SUBSURFACE MATERIAL
0	Hollow-Stem Auger									**Asphalt Concrete** 0.0
0.3										**Unbound Asphalt Blend (FILL)** black, dry to moist, Unbound asphalt blended with sand and gravel 1.0
1								SM		**SILTY SAND with Gravel, Cobbles (FILL)** (SM) brown, moist
2										
3		23 28 22 15	50	SW-194		SPT				SW-194 p200=20%, Sa=49%, Gr=31%
3.5										dry to moist 3.5
4										
5		11 11 14 12	25	SW-195		SPT		GM		**SILTY GRAVEL with Sand, Cobbles and Boulders** (GM) brown to gray, moist SW-195 sample combined with SW-196 for lab testing, Moisture=6.3%, USCS from lab: GM 5.0
6										
6.5										6.5
7										
8		6 37 16 14	53	SW-196		SPT				brown 8.5
8.5										
9										
10		15 14 15 18	29	SW-197		SPT		SM		**SILTY SAND with Gravel, Cobbles** (SM) brown, moist SW-197 p200=21%, Sa=47%, Gr=32% 10.0
11										
12										12.5
13										Drilled relatively loose 13.5
14										
15		3 3 6 9	9	SW-198		SPT		GP-GM		**GRAVEL with Silt and Sand, Cobbles and Boulders** (GP-GM) gray to brown, dry SW-198 Moisture=1.5% 15.0
16										
17										
18										cobbley 18.0
19										
20		12 7 18 8	25	SW-199		SPT				SW-199 p200=11%, Sa=41%, Gr=48%, Moisture=8.2%
21										moist to wet 21.0
22									BOH 22	22.0

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

LOG OF TEST HOLE

HOLE # TH19-26

STATE OF ALASKA DOT&PF
Statewide Materials
Geology Section

PROJECT NUMBER : *Z530140000*
PROJECT : *Sterling Highway MP 45 to 60 Reconstruction*
LATITUDE : *60.48900*, ***LONGITUDE :*** *149.74117*

Station / Location: *2094+31*
Offset: *4R*
Elevation: *487.2 ft*

Equipment Type: *CME 75 Truck*
Hole Type: *6.5 inch OD Hollow Stem Auger*
Field Crew: *B. Coke and T. Babin*

Total Depth: *22.0 ft*
Date: *9/25/19 - 9/25/19*
Geologist: *T. Weiss*

Ground Water Data		
Depth (ft.)	Not Observed	
Time		
Date		
Symbol		

Weather: Rain / 48 degrees

Surface: on road

Depth (Feet)	Drill Method	Blow Count	N Value	Sample Number	Recovery	Sample Type	Sample	USCS Classification Frozen Zone	Soil Graphic	SUBSURFACE MATERIAL
0	Hollow-Stem Auger									**Asphalt Concrete** 3 inches 0.0
0.3										**Unbound Asphalt Blend (FILL)** black, dry to moist, Unbound asphalt blended with sand and gravel 1.0
1								SM		**SILTY SAND with Gravel, Cobbles (FILL)** (SM) brown, dry
2		13 14 18 22	32	SW-200		SPT				grayish brown, SW-200 p200=15%, Sa=43%, Gr=42%, Moisture=3.3% 2.5
5		29 12 14 7	26	SW-201		SPT		GW-GM		**GRAVEL with Silt and Sand, Cobbles and Boulders** (GW-GM) gray, dry SW-201 sample combined with SW-202 for lab testing, p200=7.6%, Sa=43%, Gr=50%, Moisture=1.4% 5.0
6.5										6.5
8		26 22 13 10	35	SW-202		SPT				
10		55	*	SW-203		SPT				SW-203 Refusal on cobble 10.5
13										Relatively hard to drill 13.0
15		8 11 22 8	33	SW-204		SPT		SM		**SILTY SAND with Gravel, Cobbles** (SM) brown, moist SW-204 p200=19%, Sa=48%, Gr=33%, Moisture=6.7% 15.0
20		7 12 14 13	26	SW-205		SPT				SW-205 USCS from Lab: SM
22									BOH 22	22.0

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

A USCS TEST HOLE LOG STERLING HIGHWAY MP 45 TO 60 RECONSTRUCTION ON-ROAD TEST HOLES.GPJ DATA TEMPLATE 2018.GDT 11/19/19

LOG OF TEST HOLE

HOLE # TH19-33

STATE OF ALASKA DOT&PF
Statewide Materials
Geology Section

PROJECT NUMBER : *Z530140000*
PROJECT : *Sterling Highway MP 45 to 60 Reconstruction*
LATITUDE: *60.48656* ***LONGITUDE:*** *149.72777*

Station / Location: *2121+05*
Offset: *22R*
Elevation: *469.4 ft*

Equipment Type: *CME 75 Truck*
Hole Type: *6.5 inch OD Hollow Stem Auger*
Field Crew: *B. Coke and T. Babin*

Total Depth: *22.0 ft*
Date: *9/25/19 - 9/25/19*
Geologist: *T. Weiss*

Ground Water Data		
Depth (ft.)	Not Observed	
Time		
Date		
Symbol		

Weather: Rain / 47 degrees

Surface: on road

Depth (Feet)	Drill Method	Blow Count	N Value	Sample Number	Recovery	Sample Type	Sample	USCS Classification Frozen Zone	Soil Graphic	SUBSURFACE MATERIAL
0										**Asphalt Concrete** 2.75 inches — 0.0
0.3										**Unbound Asphalt Blend (FILL)** black, dry to moist, Unbound asphalt blended with sand and gravel — 1.0
1								SP-SM		**SAND with Silt and Gravel (FILL)** (SP-SM) gray, moist
2										
2.5										
3		6 8 8 6	16	SW-206		SPT		SW-SM		**SAND with Silt and Gravel, Cobbles** (SW-SM) brown to gray, dry SW-206 Moisture=2.3%
4										subrounded gravel — 4.0
5		4 5 13 22	18	SW-207		SPT				SW-207 p200=11%, Sa=60%, Gr=29%, Moisture=3.6%
6										moist — 6.0
7										
7.5										
8		15 24 23 25	47	SW-208		SPT		SW-SM		**SAND with Silt and Gravel, Cobbles** (SW-SM) gray to black, dry SW-208 sample combined with SW-209 for lab testing, p200=8.5%, Sa=47%, Gr=44%, Moisture=2.6%
9										
10		21 30 35 35	65	SW-209		SPT				
11										
12										
13										
14										
15		16 19 12 11	31	SW-210		SPT				SW-210 Moisture=7.0%
16								SM		**SILTY SAND** (SM) gray to black, moist to wet — 16.0
17										
18										
18.5										
19								SW-SM		**SAND with Silt and Gravel, Cobbles** (SW-SM) brown to black, moist
20		12 22 23 20	45	SW-211		SPT				SW-211 p200=9.7%, Sa=53%, Gr=37%, Moisture=8.9%
21										
22									BOH 22	22.0

Hollow-Stem Auger

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

LOG OF TEST HOLE

HOLE # TH19-2068

STATE OF ALASKA DOT&PF
Central Region Materials

PROJECT NUMBER : *Z53014000*
PROJECT : *Sterling Hwy*
LATITUDE : *60.49537* ***LONGITUDE :*** *-149.77386*
Coordinate System: NAD83
Equipment_Type: *CME 850*
Drilling Method: *Hollow-Stem Auger*
Field Crew: *P. Lanigan, R. Sousa*

Station / Location: *2028+88*
Offset: *125 R*
Elevation: *506.4*

Total Depth: *21.0 feet*
Date: *10/24/2019 - 10/24/2019*
Geologist: *K. Maxwell*

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

Weather: 40s rain

Surface: ditch, 8' north of fogline

Depth (Feet)	Sample Data: Sample Type	Number	Blow Count	Sample	Recovery	N-Value	USCS Classification Frozen Zone	Soil Graphic	SUBSURFACE MATERIAL
0							SP		**SAND** (SP) Dark gray, moist to wet, sand: medium 0.0
1							SM		**SILTY SAND with Gravel** (SM) Greyish brown, moist, gravel: 3/4"-, rounded 1.0
2									19-8357 p200=16%, Sa=53%, Gr=31%, Moisture=7.1%
3	SPT	19-8357	5 12 11 12	X		23			
4									
5	SPT	19-8357	11	X		46			moist, gravel: 1 1/2"-, rounded to subangular bk schist, possible colluvuim 19-8358 5.0
6	SPT	19-8358	21 25 23	X					p200=15%, Sa=43%, Gr=42%, Moisture=4.8%, PI=3, LL=19
7									
8	SPT	19-8358	14 16 15 17	X		31			
9									
10	SPT	19-8358	12 20 17 19	X		37			
11									
12									
13									
14									
15	SPT	19-8358	11 15 13 >50	X		28			
16									16.0
17									
18									
19									
20	SPT	19-8358	13 >50	X					20.0
21								BOH 21	21.0

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

LOG OF TEST HOLE

HOLE # TH19-2069

STATE OF ALASKA DOT&PF
Central Region Materials

PROJECT NUMBER : *Z53014000*
PROJECT : *Sterling Hwy*
LATITUDE : *60.49567* ***LONGITUDE :*** *-149.77361*
Coordinate System: NAD83
Equipment_Type: *CME 850*
Drilling Method: *Hollow-Stem Auger*
Field Crew: *P. Lanigan, R. Sousa*

Station / Location: *2029+25*
Offset: *12 R*
Elevation: *521.1*

Total Depth: *20.0 feet*
Date: *10/24/2019 - 10/24/2019*
Geologist: *K. Maxwell*

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

Weather: 40s rain

Surface: woods

Depth (Feet)	Sample Data: Sample Type	Number	Blow Count	Sample	Recovery	N-Value	USCS Classification Frozen Zone	Soil Graphic	SUBSURFACE MATERIAL
0									**Vegetative Mat** moist — 0.0
1							ML		**ORGANIC SILT** (ML) Brown, moist — 0.5
2							SM		**SILTY SAND with Gravel** (SM) Greyish brown, dry to moist, gravel: 1 1/2"-, subangular — 1.0
3	SPT	19-8359	4 13 13 12			26			bk schist, possible colluvuim 19-8359 p200=14%, Sa=47%, Gr=39%, Moisture=4.8%, PI=2, LL=19
4									
5									
6									
7	SPT	19-8359	8 16 16 17			32			
8									
9									gravel: 3/4" — 9.0
10	SPT	19-8359	8 12 13 18			25			
11									
12									moist — 12.0
13									
14	SPT	19-8359	6 13 14 18			27			
15									
16									
17									
18									
19	SPT	19-8359	12 20 25 23			45			
20								BOH 20	20.0

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

Sheet Number 1 of 1

A USCS LOG OF TEST HOLE COPY_STERLING_HIGHWAY_MP_45_60_53014_2019_1.GPJ 2006DATATEMPLATE.GDT 1/29/20

LOG OF TEST HOLE

HOLE # TH19-2070

STATE OF ALASKA DOT&PF
Central Region Materials

PROJECT NUMBER : *Z53014000*
PROJECT : *Sterling Hwy*
LATITUDE : *60.49554* ***LONGITUDE :*** *-149.7728*
Coordinate System: NAD83
Equipment_Type: *CME 850*
Drilling Method: *Hollow-Stem Auger*
Field Crew: *P. Lanigan, R. Sousa*

Station / Location: *2030+74*
Offset: *49 R*
Elevation: *505.8*

Total Depth: *21.0 feet*
Date: *10/24/2019 - 10/24/2019*
Geologist: *K. Maxwell*

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

Weather: 40s rain

Surface: power line, 30' north of fogline

Depth (Feet)	Sample Type	Number	Blow Count	Sample	Recovery	N-Value	USCS Classification	Frozen Zone	Soil Graphic	SUBSURFACE MATERIAL
0										**Vegetative Mat** 0.0
1							SM			**SILTY SAND with Gravel** (SM) Greyish brown, moist to wet, sand: well-graded, high silt 0.2
2	AUGER	19-8360								19-8360 p200=34%, Sa=48%, Gr=18%, Moisture=18.6%, PI=2, LL=26
3										
4										dry to moist, gravel: 2"-, rounded 3.5
5	SPT	19-8361	4 9 14 16			23				19-8361 p200=14%, Sa=53%, Gr=33%, Moisture=3.6%
6										
7	SPT	19-8361	8 15 15 15			30				
8										gravel: 1" 8.0
9										
10	SPT	19-8361	8 17 16 20			33				dry to moist, gravel: 1/2" 10.0
11										
12										
13										
14										
15	SPT	19-8361	8 17 13			30				
16			12				SP			**SAND** (SP) Greyish brown, dry to moist, sand: very fine to fine 15.5
17							ML			**SILT with Sand** (ML) rapid dilatancy, moist to wet, sand: very fine 17.0
18										
19		19-8362	4 30							19-8362 p200=81%, Sa=12%, Gr=7%, Moisture=19.8%, PI=NP, LL=NV
20			34				SM			**SILTY SAND with Gravel** (SM) Greyish brown, dry to moist, gravel: 3/4"-, rounded to 20.0
21			>50							subangular, possible colluvuim 21.0
										BOH 21

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

LOG OF TEST HOLE

HOLE # TH19-2071

STATE OF ALASKA DOT&PF
Central Region Materials

PROJECT NUMBER : *Z53014000*
PROJECT : *Sterling Hwy*
LATITUDE : *60.49561* ***LONGITUDE :*** *-149.77149*
Coordinate System: NAD83
Equipment_Type: *CME 850*
Drilling Method: *Hollow-Stem Auger*
Field Crew: *P. Lanigan, R. Sousa*

Station / Location: *2033+08*
Offset: *6 R*
Elevation: *535.9*

Total Depth: *21.5 feet*
Date: *10/24/2019 - 10/24/2019*
Geologist: *K. Maxwell*

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

Weather: 40s rain

Surface: power line

Depth (Feet)	Sample Type	Number	Blow Count	Sample	Recovery	N-Value	USCS Classification Frozen Zone	Soil Graphic	SUBSURFACE MATERIAL
0							GW-GM		**GRAVEL with Silt and Sand** (GW-GM) Dark gray, moist, sand: medium, gravel: 3/4"-, rounded — 0.0
1									
2									
3	SPT	19-8363	7 11 15 16			26			19-8363 p200=6.6%, Sa=37%, Gr=56%, Moisture=2.6% gravel: 1 1/2"-, rounded — 3.0
4									
5									
6	SPT	19-8363	10 20 25 24			45			
7							GW-GM		**GRAVEL with Silt and Sand** (GW-GM) Greyish brown, dry to moist, gravel: 1"-, rounded — 6.9
8	SPT	19-8364	24 24 19 15			43			19-8364 p200=7.4%, Sa=36%, Gr=57%, Moisture=1.7%, PI=1, LL=16
9									
10									
11	SPT	19-8364	14 19 17 20			36			
12									
13									
14									
15									
16	SPT	19-8364	10 16 24 20			40			
17									
18									
19							SM		**SILTY SAND** (SM) Light brown, dry to moist, sand: coarse — 19.0
20			10						— 20.0
21	SPT	19-8365	15 25 30				SC-SM		**CLAYEY SAND with Gravel** (SC-SM) Light brown, dry to moist, sand: coarse 19-8365 p200=35%, Sa=50%, Gr=15%, Moisture=9.6%, PI=7, LL=23 — 21.5
								BOH 21.5	

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

LOG OF TEST HOLE

HOLE # TH19-2072

STATE OF ALASKA DOT&PF
Central Region Materials

PROJECT NUMBER : *Z53014000*
PROJECT : *Sterling Hwy*
LATITUDE : *60.49577* ***LONGITUDE :*** *-149.77673*
Coordinate System: NAD83
Equipment_Type: *CME 850*
Drilling Method: *Hollow-Stem Auger*
Field Crew: *P. Lanigan, R. Sousa*

Station / Location: *2023+61*
Offset: *21 R*
Elevation: *570.9*

Total Depth: *21.0 feet*
Date: *10/25/2019 - 10/25/2019*
Geologist: *K. Maxwell*

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

Weather: sunny!

Surface: woods

Depth (Feet)	Sample Type	Number	Blow Count	Sample	Recovery	N-Value	USCS Classification Frozen Zone	Soil Graphic	SUBSURFACE MATERIAL
0							GW-GM		**Vegetative Mat** 0.0
1									**GRAVEL with Silt and Sand** (GW-GM) Dark gray, moist, gravel: 2"- subangular bk schist, colluvuim 0.2
2			2				GM		**SILTY GRAVEL with Sand** (GM) Dark gray, moist, gravel: 2"- subangular bk schist, colluvuim 2.0
3	SPT		7 8 9			15			
4									dry to moist 4.5
5			5						
6	SPT		11 14 17			25			6.0
7									dry 7.0
8	SPT		12 12 13 >50			25			8.5
9									
10	SPT		20 33 18 20			51			10.3
11									
12									
13							SC-SM		**CLAYEY SAND with Gravel** (SC-SM) Light brown, moist, sand: coarse, gravel: 1"- 13.0
14									
15	SPT	19-8367	8 12 12 18			24			19-8367 p200=17%, Sa=49%, Gr=34%, Moisture=5.7%, PI=5, LL=22
16									
17									
18									
19									
20	SPT	19-8367	15 25 >50						gravel: 2"- 20.0
21								BOH 21	21.0

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

Sheet Number 1 of 1

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LOG OF TEST HOLE

HOLE # TH19-2073

STATE OF ALASKA DOT&PF
Central Region Materials

PROJECT NUMBER : *Z53014000*
PROJECT : *Sterling Hwy*
LATITUDE : *60.49617* ***LONGITUDE :*** *-149.78231*
Coordinate System: NAD83
Equipment_Type: *CME 850*
Drilling Method: *Hollow-Stem Auger*
Field Crew: *P. Lanigan, R. Sousa*

Station / Location: *2013+46*
Offset: *19 R*
Elevation: *577.1*

Total Depth: *21.5 feet*
Date: *10/25/2019 - 10/25/2019*
Geologist: *K. Maxwell*

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

Weather: sunny!

Surface: woods

Depth (Feet)	Sample Data: Sample Type	Number	Blow Count	Sample	Recovery	N-Value	USCS Classification Frozen Zone	Soil Graphic	SUBSURFACE MATERIAL
0							GP-GM		**Vegetative Mat** 0.0
1									**GRAVEL with Silt and Sand** (GP-GM) Greyish brown, moist, gravel: 1 1/2"- subangular bk schist, colluvuim 0.2
2									
3	SPT	19-8368	3 8 9 10			17			19-8368 p200=8.6%, Sa=36%, Gr=55%, Moisture=4%
4									
5			5						
6	SPT	19-8368	8 9 14			17			
7									
8	SPT	19-8368	5 8			19	SM		**SILTY SAND with Gravel** (SM) Light brown, moist to wet, gravel: 1"-, subangular bk schist, colluvuim 19-8369 p200=14%, Sa=59%, Gr=27%, Moisture=4.9% 8.0
9	SPT	19-8369	11 14						
10	SPT	19-8369	15				ML		**SANDY SILT with Gravel** (ML) Greyish brown, dry to moist 10.0 10.5
11			25 18 15			43			
12									
13							SM		**SILTY SAND with Gravel** (SM) Light brown, moist to wet 13.0
14									
15	SPT	19-8370	10 15 15 18			30			19-8370 p200=17%, Sa=53%, Gr=30%, Moisture=6%, PI=2, LL=18
16									
17									
18									
19									
20	SPT	19-8370	9 13 16 23			29			
21								BOH 21.5	21.5

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

LOG OF TEST HOLE

HOLE # TH19-2074

STATE OF ALASKA DOT&PF
Central Region Materials

PROJECT NUMBER : *Z53014000*
PROJECT : *Sterling Hwy*
LATITUDE : *60.49521* ***LONGITUDE :*** *-149.78212*
Coordinate System: NAD83
Equipment_Type: *CME 850*
Drilling Method: *Hollow-Stem Auger*
Field Crew: *P. Lanigan, R. Sousa*

Station / Location: *2014+35*
Offset: *360 R*
Elevation: *523.7*

Total Depth: *20.0 feet*
Date: *10/26/2019 - 10/26/2019*
Geologist: *K. Maxwell*

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

Weather: 50s P. Cloudy

Surface: woods

Depth (Feet)	Sample Type	Number	Blow Count	Sample	Recovery	N-Value	USCS Classification Frozen Zone	Soil Graphic	SUBSURFACE MATERIAL
0									**Vegetative Mat** 0.0
1							SW		**SAND with Silt and Gravel** (SW) Greyish brown, moist to wet, gravel: 1"- 0.4
2			4						moist 19-8371 p200=10%, Sa=50%, Gr=40%, Moisture=4.6% 2.0
3	SPT	19-8371	5 10 13			15			
4							GP-GM		**GRAVEL with Silt and Sand** (GP-GM) Greyish brown, moist, gravel: 2 1/2"- subangular, possible till 19-8372 p200=7.4%, Sa=25%, Gr=68%, Moisture=3.1% 4.0
5									
6	AUGER	19-8372	6 8 13 16						
7									7.2
8			8				OL GP-GM		**ORGANIC SILT** (OL) Brown, moist 7.3 **GRAVEL with Silt and Sand** (GP-GM) Greyish brown, moist, gravel: 2 1/2"- subangular, possible till
9			14 13 9						9.4
10							OL GP-GM		**ORGANIC SILT** (OL) Brown, moist 9.5 **GRAVEL with Silt and Sand** (GP-GM) Greyish brown, moist, gravel: 2 1/2"- subangular, possible till 10.5
11							ML		**SANDY SILT with Gravel** (ML) Greyish brown
12									
13			5				SP		**SAND with Silt and Gravel** (SP) Greyish brown, moist 12.5
14			12 15 18				GM		**SILTY GRAVEL with Sand** (GM) Greyish brown, moist, gravel: 3"- subangular, possible till 14.0
15									15.5
16									
17									17.0
18			3				SM		**SILTY SAND with Gravel** (SM) Greyish brown, moist to wet, gravel: 3/4"- 17.5 19-8373 p200=13%, Sa=45%, Gr=42%, Moisture=5.8%
19	SPT	19-8373	10 9 9			19			
20								BOH 20	20.0

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

LOG OF TEST HOLE

HOLE # TH19-2075

STATE OF ALASKA DOT&PF
Central Region Materials

PROJECT NUMBER : *Z53014000*
PROJECT : *Sterling Hwy*
LATITUDE : *60.49586* ***LONGITUDE :*** *-149.77919*
Coordinate System: NAD83
Equipment_Type: *CME 850*
Drilling Method: *Hollow-Stem Auger*
Field Crew: *P. Lanigan, R. Sousa*

Station / Location: *2019+19*
Offset: *43 R*
Elevation: *587.8*

Total Depth: *21.5 feet*
Date: *10/26/2019 - 10/26/2019*
Geologist: *K. Maxwell*

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

Weather: 50s P. Cloudy

Surface: woods

Depth (Feet)	Sample Type	Number	Blow Count	Sample	Recovery	N-Value	USCS Classification Frozen Zone	Soil Graphic	SUBSURFACE MATERIAL
0									**Vegetative Mat** 0.0
1							GP-GM		**GRAVEL with Silt and Sand** (GP-GM) Dark gray, moist, gravel: 3/4"- subangular, possible colluvium 0.5
2									
3	SPT	19-8374	2 2 5 4			7			19-8374 p200=7.9%, Sa=29%, Gr=63%, Moisture=2.8%
4									
5							GP-GM		**GRAVEL with Silt and Sand** (GP-GM) Greyish brown, dry to moist, gravel: 2"- subangular, possible colluvium 4.2
6	SPT	19-8374	3 7 8 10			15			
7									
8	SPT	19-8374	3 8 5 8			13			
9									
10	SPT	19-8374	5 8 6 6			14			
11									
12							SM		**SILTY SAND with Gravel** (SM) Greyish brown, moist, gravel: 3/4"-, rounded to subangular, possible colluvium 12.0
13									
14									
15	SPT	19-8375	3 6 6 7			12			19-8375 p200=13%, Sa=56%, Gr=31%, Moisture=5.2%, PI=1, LL=19
16									
17									
18									
19									
20	SPT	19-8375	4 14 14 22						
21							GM		**SILTY GRAVEL with Sand** (GM) Greyish brown, dry to moist, gravel: 1"- subangular, possible colluvium 20.5
								BOH 21.5	21.5

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

Sheet Number 1 of 1

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LOG OF TEST HOLE

HOLE # TH19-2076

STATE OF ALASKA DOT&PF
Central Region Materials

PROJECT NUMBER : *Z53014000*
PROJECT : *Sterling Hwy*
LATITUDE : *60.49528* ***LONGITUDE :*** *-149.77794*
Coordinate System: NAD83
Equipment_Type: *CME 850*
Drilling Method: *Hollow-Stem Auger*
Field Crew: *P. Lanigan, R. Sousa*

Station / Location: *2021+67*
Offset: *223 R*
Elevation: *544.1*

Total Depth: *21.5 feet*
Date: *10/26/2019 - 10/26/2019*
Geologist: *K. Maxwell*

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

Weather: 50s P. Cloudy

Surface: woods

Depth (Feet)	Sample Type	Number	Blow Count	Sample	Recovery	N-Value	USCS Classification Frozen Zone	Soil Graphic	SUBSURFACE MATERIAL
0									**Vegetative Mat** 0.0
1							ML		**SILT with Gravel** (ML) Dark gray, moist to wet, gravel: 3/4"- 0.5
2			2 6						
3			5 6			11	GP-GM		**GRAVEL with Silt and Sand** (GP-GM) Greyish brown, moist, sand: coarse, gravel: 1 1/2"- 2.5
4									subangular schist, colluvium
5			5 7						19-8377 p200=8.3%, Sa=25%, Gr=67%, Moisture=0.1%
6			8 10			15			dry to moist, gravel: 2"- 4.5
7			7						
8			16 12			28			with cobbles, gravel: 3"- 8.0
9	AUGER	19-8377	11						
10			7 11						
11			11 20			22			11.2
12									
13									13.0
14									14.0
15			13						
16			16 14			30			
17			17						16.5
18									17.5
19							SC-SM		**CLAYEY SAND with Gravel** (SC-SM) Greyish brown, moist to wet 18.0
20			13 10						19-8378 p200=16%, Sa=51%, Gr=33%, Moisture=5%, PI=5, LL=21
21	SPT	19-8378	22 28			32			21.5
									BOH 21.5

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

LOG OF TEST HOLE

HOLE # TH19-2077

STATE OF ALASKA DOT&PF
Central Region Materials

PROJECT NUMBER : *Z53014000*
PROJECT : *Sterling Hwy*
LATITUDE : *60.49562* ***LONGITUDE :*** *-149.76598*
Coordinate System: NAD83
Equipment_Type: *CME 850*
Drilling Method: *Hollow-Stem Auger*
Field Crew: *P. Lanigan, R. Sousa*

Station / Location: *2042+98*
Offset: *72 L*
Elevation: *578.5*

Total Depth: *4.0 feet*
Date: *10/28/2019 - 10/28/2019*
Geologist: *K. Maxwell*

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

Weather: 50s P. Cloudy

Surface: driveway

Depth (Feet)	Sample Data: Sample Type	Number	Blow Count	Sample	Recovery	N-Value	USCS Classification Frozen Zone	Soil Graphic	SUBSURFACE MATERIAL
0							GM		**Vegetative Mat** 0.0
1									**SILTY GRAVEL with Sand** (GM) Greyish brown, moist to wet, gravel: 2"- subangular schist, colluvium 0.2
2			>50						**Schist** Black, dry 2.3
3									**Schist** Black, dry, hard with gtz veins 3.5
4								BOH 4	4.0

Notes:
refusal

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

LOG OF TEST HOLE

HOLE # TH19-2078

STATE OF ALASKA DOT&PF
Central Region Materials

PROJECT NUMBER : *Z53014000*
PROJECT : *Sterling Hwy*
LATITUDE : *60.49562* ***LONGITUDE :*** *-149.76604*
Coordinate System: NAD83
Equipment_Type: *CME 850*
Drilling Method: *Hollow-Stem Auger*
Field Crew: *P. Lanigan, R. Sousa*

Station / Location: *2042+87*
Offset: *72 L*
Elevation: *577.9*

Total Depth: *5.9 feet*
Date: *10/28/2019 - 10/28/2019*
Geologist: *K. Maxwell*

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

Weather: 50s P. Cloudy

Surface: driveway

Depth (Feet)	Sample Data: Sample Type	Number	Blow Count	Sample	Recovery	N-Value	USCS Classification Frozen Zone	Soil Graphic	SUBSURFACE MATERIAL
0									**Vegetative Mat** 0.0
1							GM		**SILTY GRAVEL with Sand** (GM) Greyish brown, moist to wet, gravel: 2"- subangular 0.3
2	AUGER	19-8379							schist, colluvium
3									19-8379 p200=18%, Sa=37%, Gr=45%, Moisture=4%
4									
5			>50						**Schist** Black, dry, angular bk schist cuttings 4.6
									Schist Black, dry, hard with gtz veins 5.5
								BOH 5.9	5.9

Notes:
refusal

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

LOG OF TEST HOLE

HOLE # TH19-2079

STATE OF ALASKA DOT&PF
Central Region Materials

PROJECT NUMBER : *Z53014000*
PROJECT : *Sterling Hwy*
LATITUDE : *60.49572* ***LONGITUDE :*** *-149.76668*
Coordinate System: NAD83
Equipment_Type: *CME 850*
Drilling Method: *Hollow-Stem Auger*
Field Crew: *P. Lanigan, R. Sousa*

Station / Location: *2041+69*
Offset: *99 L*
Elevation: *586.6*

Total Depth: *10.7 feet*
Date: *10/28/2019 - 10/28/2019*
Geologist: *K. Maxwell*

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

Weather: 50s P. Cloudy

Surface: driveway

Depth (Feet)	Sample Type	Number	Blow Count	Sample	Recovery	N-Value	USCS Classification Frozen Zone	Soil Graphic	SUBSURFACE MATERIAL
0							SM		**SILTY SAND with Gravel** (SM) Greyish brown, moist to wet, gravel: 3/4"-, rounded to angular, possible colluvium 0.0
1									
2									
3	SPT	19-8380	3 3 4 6			7			19-8380 p200=20%, Sa=47%, Gr=33%, Moisture=9.2%, PI=NP, LL=NV
4									
5	SPT	19-8380	4 17 11 15			28			gravel: 1 1/2"- 5.0
6									
7									gravel: 3/4"- 7.0
8	SPT	19-8380	5 9 9 10			18			
9									wet, gravel: 1"- 9.0
10	SPT	19-8380	15 40						10.5
								10.7	**BEDROCK** dry, hard 10.7

Notes:
refusal

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

LOG OF TEST HOLE

HOLE # TH19-2080

STATE OF ALASKA DOT&PF
Central Region Materials

PROJECT NUMBER : *Z53014000*
PROJECT : *Sterling Hwy*
LATITUDE : *60.49531* ***LONGITUDE :*** *-149.76107*
Coordinate System: NAD83
Equipment_Type: *CME 850*
Drilling Method: *Hollow-Stem Auger*
Field Crew: *P. Lanigan, R. Sousa*

Station / Location: *2051+76*
Offset: *94 L*
Elevation: *619.8*

Total Depth: *20.5 feet*
Date: *10/28/2019 - 10/28/2019*
Geologist: *K. Maxwell*

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

Weather: 50s P. Cloudy

Surface: woods

Depth (Feet)	Sample Type	Number	Blow Count	Sample	Recovery	N-Value	USCS Classification Frozen Zone	Soil Graphic	SUBSURFACE MATERIAL
0									**Vegetative Mat** 0.0
1							ML		**GRAVELLY SILT with Sand** (ML) Grey, moist to wet 0.5
2									
3									3.0
4	SPT	19-8381	4 6 7 5	X		13	GP-GM		**GRAVEL with Silt and Sand** (GP-GM) Dark gray, moist, gravel: 3/4"-, angular schist, colluvium 19-8381 p200=7.7%, Sa=39%, Gr=53%, Moisture=4.4%
5									
6			5						
7	SPT	19-8381	5 7 6	X		12			
8									
9			6						
10	SPT	19-8381	8 9 10	X		17			
11									
12									
13							SC-SM		13.0 **CLAYEY SAND with Gravel** (SC-SM) Dark gray, moist, gravel: 1"- 19-8382 p200=19%, Sa=44%, Gr=37%, Moisture=7.6%, PI=6, LL=21
14			6						
15	SPT	19-8382	10 12 11	X		22			
16									
17									
18									
19			10						wet 19.0
20	SPT	19-8382	14 11 15	X		25			
								BOH 20.5	20.5

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

LOG OF TEST HOLE

HOLE # TH19-2081

STATE OF ALASKA DOT&PF
Central Region Materials

PROJECT NUMBER : *Z53014000*
PROJECT : *Sterling Hwy*
LATITUDE : *60.49438* ***LONGITUDE :*** *-149.75654*
Coordinate System: NAD83
Equipment_Type: *CME 850*
Drilling Method: *Hollow-Stem Auger*
Field Crew: *P. Lanigan, R. Sousa*

Station / Location: *2060+41*
Offset: *88 L*
Elevation: *636.0*

Total Depth: *4.7 feet*
Date: *10/28/2019 - 10/28/2019*
Geologist: *K. Maxwell*

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

Weather: 50s P. Cloudy

Surface: woods

Depth (Feet)	Sample Type	Number	Blow Count	Sample	Recovery	N-Value	USCS Classification	Frozen Zone	Soil Graphic	SUBSURFACE MATERIAL
0										**Vegetative Mat** 0.0
1							OL			**ORGANIC SILT** (OL) Brown, moist to wet 0.5
2			2				ML			**SANDY SILT with Gravel** (ML) Light brown, moist to wet, gravel: 1"- 1.5
3			5				ML			**GRAVELLY SILT with Sand** (ML) Light brown, moist to wet 3.0
4			9 18							**Schist** Black, probable bedrock 3.9
									BOH 4.7	4.7

Notes:
refusal

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

Sheet Number 1 of 1

A USCS LOG OF TEST HOLE COPY_STERLING_HIGHWAY_MP_45_60_53014_2019_1.GPJ 2006DATATEMPLATE.GDT 1/29/20

LOG OF TEST HOLE

HOLE # TH19-2082

STATE OF ALASKA DOT&PF
Central Region Materials

PROJECT NUMBER : *Z53014000*
PROJECT : *Sterling Hwy*
LATITUDE : *60.4944* ***LONGITUDE :*** *-149.75662*
Coordinate System: NAD83
Equipment_Type: *CME 850*
Drilling Method: *Hollow-Stem Auger*
Field Crew: *P. Lanigan, R. Sousa*

Station / Location: *2060+25*
Offset: *87 L*
Elevation: *634.8*

Total Depth: *3.8 feet*
Date: *10/28/2019 - 10/28/2019*
Geologist: *K. Maxwell*

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

Weather: 50s P. Cloudy

Surface: woods

Depth (Feet)	Sample Data: Sample Type	Number	Blow Count	Sample	Recovery	N-Value	USCS Classification Frozen Zone	Soil Graphic	SUBSURFACE MATERIAL
0									**Vegetative Mat** 0.0
0.5							OL		**ORGANIC SILT** (OL) Brown, moist to wet 0.5
1							ML		**SANDY SILT with Gravel** (ML) Light brown 1.0
2									
3									**Schist** Black 3.0
								BOH 3.8	3.8

Notes:
refusal

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

Sheet Number 1 of 1

A USCS LOG OF TEST HOLE COPY_STERLING_HIGHWAY_MP_45_60_53014_2019_1.GPJ 2006DATATEMPLATE.GDT 1/29/20

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Sterling Highway	Test Hole Number	19-2083
Project Number	AKSAS	Total Depth	75.8 feet
Field Geologist	K. MAXWELL	Dates Drilled	10/30/2019
Field Crew	P. Lanigan, M. Sousa, T. Hartford, G. Nelson	Station, Offset	
Equipment Type	CME 850	Latitude, Longitude	N60.49123°, W14974707°
Weather		Elevation	
TH Finalized By	Seth Hooper	Vegetation	

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

GENERAL COMMENTS:
On gravel road

Drilling Method	Depth in (Feet)	Casing Size Blows / ft	Sample Data: Method	Number	Blow Count	Sample Interval	N-Value	Run Data: Run Number	Time (minutes)	RQD	Recovery	Longest Pc. (in.)	Structural Data	Frozen	Graphic Log
	0														
	1														
	2														
	3		CORE					1	6	0	89				
	4														
	5		CORE					2	10	84.6	92				
	6														
	7														
	8		CORE					3	7	86	100				
	9														
	10														
	11														
	12														
	13		CORE					4	5	88.9	100				
	14														
	15														
	16														
	17														
	18		CORE					5	5	100	100				
	19														
	20		CORE					6	13	94.1	98				
	21														
	22														
	23														
	24		CORE					7	5	100	98				
	25														
	26														
	27														
	28														
	29		CORE					8	6	100	94				
	30														

SUBSURFACE MATERIAL

Bn-Bk Silty GRAVEL
w/ Gravel (fill)
moist, gravel: angular bk rubble, 2"-

Gy-Bk BEDROCK, hard(Valdez Group Mudstone/Slate)
Dark gray mudstone/slate interlayered with cm-scale light gray quartz-/feldspathic-rich layers. Strong to very strong. Slightly weathered.

Fractures spaced 0.1-5' (~1' average), oriented ~60 (+/- degrees) degrees

Bedding oriented 80 degrees

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST CORE LOG - USCS_STERLING_HIGHWAY_MP_45_60_53014_2019_CORE DATA.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 3/2/20

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Test Hole Number 19-2083

Drilling Method	Depth in (Feet)	Casing Size Blows / ft	Method	Number	Blow Count	Sample Interval	N-Value	Run Number	Time (minutes)	RQD	Recovery	Longest Pc. (in.)	Structural Data	Frozen	Graphic Log	
	30															SUBSURFACE MATERIAL
	31															
	32															Bedding oriented 70 degrees
	33															
	34		CORE					9	8	96	100					
	35															
	36															
	37															
	38															
	39		CORE					10	5	100	98					
	40															
	41															
	42															
	43															
	44		CORE					11	8	93	98					
	45															
	46															
	47															
	48															
	49		CORE					12	9	98	100					
	50															
	51															
	52															
	53															
	54		CORE					13	7	96	100					
	55															Intensely fractured, fractures oriented at 60 degrees, core lengths <0.1'.
	56															
	57															
	58															
	59		CORE					14	9	100	100					
	60															
	61															
	62															
	63															
	64		CORE					15	9	90	100					

NR AKDOT TEST CORE LOG - USCS STERLING_HIGHWAY_MP_45_60_53014_2019_CORE DATA.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 3/2/20

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Test Hole Number 19-2083

Drilling Method	Depth in (Feet)	Casing Size Blows / ft	Method	Number	Blow Count	Sample Interval	N-Value	Run Number	Time (minutes)	RQD	Recovery	Longest Pc. (in.)	Structural Data	Frozen	Graphic Log	SUBSURFACE MATERIAL
	65															
	66															
	67															
	68															
	69		CORE					16	11	100	100					
	70															
	71															
	72															Bedding oriented 60 degrees
	73															
	74		CORE					17	9	44.4	98					Bedding oriented 55 degrees
	75															
																BOH

NR AKDOT TEST CORE LOG - USCS STERLING_HIGHWAY_MP_45_60_53014_2019_CORE DATA.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 3/2/20

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Sterling Highway	Test Hole Number	19-2084
Project Number	AKSAS	Total Depth	75 feet
Field Geologist	S. HOOPER	Dates Drilled	11/1/2019
Field Crew	P. Lanigan, M. Sousa, T. Hartford, G. Nelson	Station, Offset	
Equipment Type	CME 850	Latitude, Longitude	N60.490306°, W149.744747°
Weather	45 F, cloudy	Elevation	
TH Finalized By	Seth Hooper	Vegetation	Gravel access rd, spruce/willows

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

GENERAL COMMENTS:
On gravel road

Drilling Method	Depth in (Feet)	Casing Size Blows / ft	Sample Data: Method	Number	Blow Count	Sample Interval	N-Value	Run Data: Run Number	Time (minutes)	RQD	Recovery	Longest Pc. (in.)	Structural Data	Frozen	Graphic Log	SUBSURFACE MATERIAL
H-S Auger	0–5															COBBLES w/ Gravel Rubble (Cobbles + Gy GP-GM w/ sand) and highly weathered bedrock
Coring	5–30							1		54	92					Gy-Bk BEDROCK, hard(Valdez Group Mudstone/Slate) Dark gray mudstone/slate interlayered with cm-scale light gray quartz-/feldspathic-rich layers. Strong to very strong. Slightly weathered.
								2		29	62					Fractures spaced 0.5-6.6' (~2.4' average), oriented ~60 (+/- degrees) degrees
								3		46	90					Intensely fractured, core lengths <0.1'
								4		90	100					Fault oriented at 60 degrees, fractures spaced 1 cm apart, clay gouge + milled rock
								5		100	100					

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Test Hole Number 19-2084

Drilling Method	Depth in (Feet)	Casing Size Blows / ft	Method	Number	Blow Count	Sample Interval	N-Value	Run Number	Time (minutes)	RQD	Recovery	Longest Pc. (in.)	Structural Data	Frozen	Graphic Log	SUBSURFACE MATERIAL
Coring	30–64							6		100	100					
								7		100	100					
								8		100	100					
								9		82	100					
								10		100	100					
								11		100	100					
								12		100	100					

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Test Hole Number 19-2084

Drilling Method	Depth in (Feet)	Casing Size Blows / ft	Method	Number	Blow Count	Sample Interval	N-Value	Run Number	Time (minutes)	RQD	Recovery	Longest Pc. (in.)	Structural Data	Frozen	Graphic Log	SUBSURFACE MATERIAL
	65															65
	66															66
	67															67
	68							13		87	92					68
	69															69
	70															70
	71															71
	72							14		100	100					72
	73															73
	74															74
	75															BOH 75

NR AKDOT TEST CORE LOG - USCS STERLING_HIGHWAY_MP_45_60_53014_2019_CORE DATA.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 3/2/20

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Sterling Highway	Test Hole Number	19-2085
Project Number	AKSAS	Total Depth	75 feet
Field Geologist	S. HOOPER	Dates Drilled	11/2/2019
Field Crew	P. Lanigan, M. Sousa, T. Hartford, G. Nelson	Station, Offset	
Equipment Type	CME 850	Latitude, Longitude	N60.48977°, W149.74316°
Weather	45 F, rainy	Elevation	
TH Finalized By	Seth Hooper	Vegetation	Gravel access rd, spruce/willows

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

GENERAL COMMENTS:
On gravel road

Drilling Method	Depth in (Feet)	Casing Size Blows / ft	Sample Data: Method	Number	Blow Count	Sample Interval	N-Value	Run Data: Run Number	Time (minutes)	RQD	Recovery	Longest Pc. (in.)	Structural Data	Frozen	Graphic Log	SUBSURFACE MATERIAL
	0															
	1															COBBLES w/ Gravel Rubble (Cobbles + Gy GP-GM w/ sand) and highly weathered bedrock
	2															
	3															
	4															
	5															
	6															Gy-Bk BEDROCK, hard(Valdez Group Mudstone/Slate) Dark gray mudstone/slate interlayered with cm-scale light gray quartz-/feldspathic-rich layers. Strong to very strong. Slightly weathered.
	7							1		46	92					
	8															
	9															
	10															
	11															Fractures spaced 0-4.5' (~1.1' average), oriented ~60 (+/- degrees) degrees. Bedding oriented ~75-80 degrees throughout hole
	12							2		90	100					
	13															
	14															
	15															
	16															1 cm fault oriented at 60-70 degrees w/ fault gouge
	17							3		83	96					
	18															
	19															
	20															
	21															
	22							4		588	88					
	23															Intensely fractured, core lengths <0.1'
	24															
	25															
	26															
	27							5		56	100					
	28															
	29															
	30															

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST CORE LOG - USCS_STERLING_HIGHWAY_MP_45_60_53014_2019_CORE DATA.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 3/2/20

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Test Hole Number 19-2085

Drilling Method	Depth in (Feet)	Casing Size Blows / ft	Method	Number	Blow Count	Sample Interval	N-Value	Run Number	Time (minutes)	RQD	Recovery	Longest Pc. (in.)	Structural Data	Frozen	Graphic Log	
	30															SUBSURFACE MATERIAL
	31															
	32							6		76	100					
	33															
	34															
	35															
	36															
	37							7		50	90					
	38															
	39															
	40															
	41															
	42							8		70	100					Intensely fractured, core lengths <0.1'
	43															
	44															
	45															
	46															
	47							9		80	94					
	48															
	49															
	50															
	51															
	52							10		26	100					
	53															
	54															
	55															
	56															
	57							11		68	100					
	58															
	59															
	60															
	61															
	62							12		48	100					
	63															
	64															

NR AKDOT TEST CORE LOG - USCS STERLING_HIGHWAY_MP_45_60_53014_2019_CORE DATA.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 3/2/20

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Test Hole Number 19-2085

Drilling Method	Depth in (Feet)	Casing Size Blows / ft	Method	Number	Blow Count	Sample Interval	N-Value	Run Number	Time (minutes)	RQD	Recovery	Longest Pc. (in.)	Structural Data	Frozen	Graphic Log	SUBSURFACE MATERIAL
	65															65
	66															66
	67															67
	68							13		78	100					68
	69															69
	70															70
	71															71
	72															72
	73							14		100	100					73
	74															74
	75															BOH 75

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Sterling Highway	Test Hole Number	19-2086
Project Number	AKSAS	Total Depth	55 feet
Field Geologist	S. HOOPER	Dates Drilled	11/3/2019
Field Crew	P. Lanigan, M. Sousa, T. Hartford, G. Nelson	Station, Offset	
Equipment Type	CME 850	Latitude, Longitude	N60.488213°, W149.738585°
Weather	40 F, cloudy	Elevation	
TH Finalized By	Seth Hooper	Vegetation	Gravel access rd, spruce/willows

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

GENERAL COMMENTS:
On gravel road

Drilling Method	Depth in (Feet)	Casing Size Blows / ft	Sample Data: Method	Number	Blow Count	Sample Interval	N-Value	Run Data: Run Number	Time (minutes)	RQD	Recovery	Longest Pc. (in.)	Structural Data	Frozen	Graphic Log	SUBSURFACE MATERIAL
	0															COBBLES w/ Gravel Rubble (Cobbles + Gy GP-GM w/ sand) and highly weathered bedrock
	8															Gy-Bk BEDROCK, hard(Valdez Group Mudstone/Slate) Dark gray mudstone/slate interlayered with cm-scale light gray quartz-/feldspathic-rich layers. Strong to very strong. Slightly weathered. Fractures spaced 0-9.5' (~1.6' average), oriented ~60 (+/- degrees) degrees. throughout whole
	9							1		78	100					
	12							2		56	100					
	17							3		62	98					
	20							4		78	100					
	25							5		98	100					
	28															Bedding oriented 85 degrees
	30															

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST CORE LOG - USCS_STERLING_HIGHWAY_MP_45_60_53014_2019_CORE DATA.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 3/2/20

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Test Hole Number 19-2086

Drilling Method	Depth in (Feet)	Casing Size Blows / ft	Method	Number	Blow Count	Sample Interval	N-Value	Run Number	Time (minutes)	RQD	Recovery	Longest Pc. (in.)	Structural Data	Frozen	Graphic Log	SUBSURFACE MATERIAL
	30															
	31															Bedding oriented 70 degrees
	32															Bedding oriented 60 degrees
	33							6		88	98					Bedding oriented 50 degrees
	34															Bedding oriented 35 degrees
	35															Bedding oriented 50 degrees
	36															
	37															Bedding oriented 70 degrees
	38							7		86	100					
	39															
	40															
	41															Bedding oriented 60 degrees
	42															
	43							8		94	100					
	44															
	45															
	46							9		100	110					
	47															
	48															
	49															Bedding oriented 80 degrees
	50							10		100	92					
	51															
	52															
	53															Bedding oriented sub vertical at 90 degrees
	54							11		96	107					
	55															BOH

NR AKDOT TEST CORE LOG - USCS STERLING_HIGHWAY_MP_45_60_53014_2019_CORE DATA.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 3/2/20

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Sterling Highway	Test Hole Number	19-2087
Project Number	AKSAS	Total Depth	22 feet
Field Geologist	S. HOOPER	Dates Drilled	11/4/2019
Field Crew	P. Lanigan, M. Sousa, T. Hartford, G. Nelson	Station, Offset	
Equipment Type	CME 850	Latitude, Longitude	N60.487465°, W149.736437°
Weather	40 F, cloudy	Elevation	
TH Finalized By	Seth Hooper	Vegetation	Gravel access rd, spruce/willows

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

GENERAL COMMENTS:
On gravel road

Drilling Method	Depth in (Feet)	Casing Size Blows / ft	Sample Data: Method	Number	Blow Count	Sample Interval	N-Value	Run Data: Run Number	Time (minutes)	RQD	Recovery	Longest Pc. (in.)	Structural Data	Frozen	Graphic Log
	0														
	1														
	2														
	3														
	4														
	5														
	6														
	7														
	8														
	9							1		20	100				
	10							2		17	94				
	11														
	12														
	13														
	14							3		52	100				
	15														
	16														
	17														
	18														
	19							4		94	100				
	20														
	21														
	22														

SUBSURFACE MATERIAL

COBBLES
w/ Gravel
Rubble (Cobbles + Gy GP-GM w/ sand) and highly weathered bedrock

Gy-Bk BEDROCK, hard(Valdez Group Greywacke)
Gy greywacke w/ 1-2 mm quartz veins spaced <0.1'-1'+. Strong to very strong. Slightly weathered.
8-8.5: Intensely fractured, core lengths <0.1', redrill
Fractures spaced 0-2.3' (~0.5' average), oriented ~60 (+/- degrees) degrees.

BOH

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST CORE LOG - USCS STERLING_HIGHWAY_MP_45_60_53014_2019_CORE DATA.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 3/2/20

LOG OF TEST HOLE

HOLE # TH19-2088

STATE OF ALASKA DOT&PF
Central Region Materials

PROJECT NUMBER : *Z53014000*
PROJECT : *Sterling Hwy*
LATITUDE : *60.48635* ***LONGITUDE :*** *-149.73047*
Coordinate System: NAD83
Equipment_Type: *CME 850*
Drilling Method: *6" OD Solid Auger*
Field Crew: *P. Lanigan, R. Sousa*

Station / Location: *2116+18*
Offset: *27 R*
Elevation: *470.8*

Total Depth: *25.0 feet*
Date: *11/4/2019 - 11/4/2019*
Geologist: *S. Hooper*

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

Weather: 40s P. Cloudy

Surface: woods

Depth (Feet)	Sample Data: Sample Type	Number	Blow Count	Sample	Recovery	N-Value	USCS Classification Frozen Zone	Soil Graphic	SUBSURFACE MATERIAL
0							GP-GM		**GRAVEL with Silt and Sand** (GP-GM) gray, fluvial greywacke gravel with cobbles 0.0
25								BOH 25	25.0

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

Sheet Number 1 of 1

A USCS LOG OF TEST HOLE COPY_STERLING_HIGHWAY_MP_45_60_53014_2019_1.GPJ 2006DATATEMPLATE.GDT 1/29/20

LOG OF TEST HOLE

HOLE # TH19-2089

STATE OF ALASKA DOT&PF
Central Region Materials

PROJECT NUMBER : *Z53014000*
PROJECT : *Sterling Hwy*
LATITUDE : *60.48634* ***LONGITUDE :*** *-149.73045*
Coordinate System: NAD83
Equipment_Type: *CME 850*
Drilling Method: *Hollow-Stem Auger*
Field Crew: *P. Lanigan, R. Sousa*

Station / Location: *2116+21*
Offset: *31 R*
Elevation: *470.4*

Total Depth: *25.0 feet*
Date: *11/4/2019 - 11/4/2019*
Geologist: *S. Hooper*

Ground Water Data		
Depth in (ft.)	17.5	
Time		
Date	11/4/19	
Symbol	▼	

Weather: 40s P. Cloudy

Surface: woods

Depth (Feet)	Sample Type	Number	Blow Count	Sample	Recovery	N-Value	USCS Classification	Frozen Zone	Soil Graphic	SUBSURFACE MATERIAL
0							OL			**ORGANIC SILT** (OL) brown — 0.0
1										
2							GP-GM			**GRAVEL with Silt and Sand** (GP-GM) gray, moist, with cobbles — 1.5
3										
4										
5			3				SM			**SILTY SAND with Gravel** (SM) gray, dry to moist, fluvial gravel 19-8383 p200=15%, — 5.0
6	SPT	19-8383	6			13				Sa=48%, Gr=37%, Moisture=7.7%
7			7							
8			14							
9										
10			12							19-8384 p200=28%, Sa=51%, Gr=21%, Moisture=8.0%, PI=NP, LL=NV
11	SPT	19-8384	18			40				
12			22							
13			18							
14										
15			16							19-8385 p200=33%, Sa=45%, Gr=22%, Moisture=6.0% — 15.5
16	SPT	19-8385	32			77				dry
17			45							
18			43							
19							SM			**SILTY SAND** (SM) gray, wet, sand: coarse, trace Fluvial gravel — 19.0
20			5							19-8386 p200=30%, Sa=58%, Gr=12%, Moisture=11.0%
21	SPT	19-8386	15			42				
22			27							
23			27							
24										
25									BOH 25	— 25.0

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

A USCS LOG OF TEST HOLE COPY_STERLING_HIGHWAY_MP_45_60_53014_2019_1.GPJ 2006DATATEMPLATE.GDT 1/29/20

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Sterling Highway	Test Hole Number	19-2090
Project Number	AKSAS	Total Depth	50 feet
Field Geologist	S. HOOPER	Dates Drilled	11/5/2019
Field Crew	P. Lanigan, M. Sousa, T. Hartford, G. Nelson	Station, Offset	
Equipment Type	CME 850	Latitude, Longitude	N60.486729°, W149.73141°
Weather	40 F, cloudy	Elevation	
TH Finalized By	Seth Hooper	Vegetation	Mixed spruce, birch, willow, and alders

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

GENERAL COMMENTS:
In forest/off road

Drilling Method	Depth in (Feet)	Casing Size Blows / ft	Sample Data: Method	Number	Blow Count	Sample Interval	N-Value	Run Data: Run Number	Time (minutes)	RQD	Recovery	Longest Pc. (in.)	Structural Data	Frozen	Graphic Log	SUBSURFACE MATERIAL
	0															COBBLES
	1															w/ Gravel
	2															Rubble (Cobbles + Gy GP-GM w/ sand) and highly weathered bedrock
	3															
	4															
	5															
	6															
	7															
	8															Gy-Bk BEDROCK, hard(Valdez Group Greywacke)
	9															Gy greywacke. Strong to very strong. Slightly weathered.
	10															
	11															
	12							1		0	3					
	13															
	14															
	15															
	16															
	17															
	18							2		0	0					
	19															
	20															
	21															
	22															
	23							3		0	30					
	24															
	25															
	26															
	27															Gy-Bk BEDROCK, soft(Valdez Group Mudstone/Slate)
	28							4		76	90					Dark gray mudstone/slate interlayered with cm-scale light gray quartz-/feldspathic-rich layers.
	29															Medium-weak to strong rock. Slightly weathered.
	30															

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST CORE LOG - USCS_STERLING_HIGHWAY_MP_45_60_53014_2019_CORE DATA.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 3/2/20

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Test Hole Number 19-2090

Drilling Method	Depth in (Feet)	Casing Size Blows / ft	Method	Number	Blow Count	Sample Interval	N-Value	Run Number	Time (minutes)	RQD	Recovery	Longest Pc. (in.)	Structural Data	Frozen	Graphic Log	SUBSURFACE MATERIAL
	30															
	31															Gy-Bk BEDROCK, hard(Valdez Group Greywacke) Gy greywacke. Strong to very strong rock. Slightly weathered.
	32							5		41	96					
	33															Gy-Bk BEDROCK, soft(Valdez Group Mudstone/Slate) Dark gray mudstone/slate interlayered with cm-scale light gray quartz-/feldspathic-rich layers. Abundant faults + fractures from 31.5'-50' w/ quartz veins and silica flooding, abundant sulfides (pyrite). Faults oriented 60 degrees to near vertical.
	34															(Faults w/ slicked spaced 0.1-6.2' (avg. 1') oriented at 40-80 degrees, planar to wavy, slicks smeared w/ sulfide or graphite)
	35							6		0	60					(Fault oriented at 50 degrees. Planar to wavy, slicks smeared w/ pyrite/graphite.)
	36															(Fault oriented at 50 degrees. Planar to wavy, slicks smeared w/ pyrite/graphite.)
	37							7		15	24					(Fault oriented at 40 degrees. Wavy, slicks smeared w/ pyrite/graphite.)
	38															(Shear zone w/ inc veins + sulfide)
	39															(Fault oriented at 20 degrees. Slicks smeared with pyrite/graphite.)
	40															(Fault oriented at 70 degrees with 0.5 cm clay gouge, irregular/wavy.)
	41															(Fault oriented at 60 degrees, irregular/wavy)
	42							8		50	94					(Fault oriented at 70 degrees. Wavy, slicks on fracture surface)
	43															(Fault oriented at 80 degrees. Slicks smeared with polished graphite/pyrite.)
	44															(1-3 cm quartz vein w/ feldspar along vein margins oriented 70-80 degrees. Sheared wall rock fragments in vein. Faults w/ slicks at upper/lower contact of vein.)
	45															(Fault oriented at 70 degrees, irregular, slicks on fracture surface.)
	46															(Fault oriented at 80 degrees, irregular, slicks on fracture surface.)
	47							9		26	60					(Fault oriented from 70 degrees to 90 degrees (near-vertical). Slicks smeared with graphite/pyrite on fracture surface.)
	48															(Fault oriented at 60 degrees. Slicks smeared with pyrite/graphite)
	49															(Fault oriented at 70 degrees, planar. Slicks on fracture surface.)
	50														BOH	(11+ fractures spaced ~1 cm apart oriented 60-70 degrees) (Pulverized mudstone)

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Sterling Highway	Test Hole Number	19-2091
Project Number	AKSAS	Total Depth	40 feet
Field Geologist	S. HOOPER	Dates Drilled	11/6/2019
Field Crew	P. Lanigan, M. Sousa, T. Hartford, G. Nelson	Station, Offset	
Equipment Type	CME 850	Latitude, Longitude	N60.486762°, W149.734173°
Weather	40 F, cloudy	Elevation	
TH Finalized By	Seth Hooper	Vegetation	Mixed spruce, birch, willow, and alders

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

GENERAL COMMENTS:
In forest/off road

Drilling Method	Depth in (Feet)	Casing Size Blows / ft	Sample Data: Method	Number	Blow Count	Sample Interval	N-Value	Run Data: Run Number	Time (minutes)	RQD	Recovery	Longest Pc. (in.)	Structural Data	Frozen	Graphic Log	SUBSURFACE MATERIAL
	0															Gy-Bk BEDROCK, hard(Valdez Group Mudstone/Slate) Dark gray mudstone/slate interlayered with cm-scale light gray quartz-/feldspathic-rich layers. Slightly weathered. Strong to very strong rock.
	1															
	2															
	3							6	8	80	80					
	4															
	5															
	6															
	7							1	10	20	100					
	8															
	9															
	10															
	11															(Fractures spaced 0.1-3.4' (~0.6' average), w/ FeOx filling, oriented ~60 (+/- 20 degrees) degrees. Bedding oriented ~70 degrees throughout hole)
	12															
	13							7	5	29	70					
	14															
	15															
	16															
	17															
	18							2	12	64	100					
	19															
	20															
	21															
	22															
	23							8	5	52	60					(Fault oriented 70 degrees, w/ slicks and crushed rock (<1 cm))
	24															
	25															
	26															
	27															
	28							3	12		100					
	29															
	30															

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST CORE LOG - USCS_STERLING_HIGHWAY_MP_45_60_53014_2019_CORE DATA.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 3/2/20

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Test Hole Number 19-2091

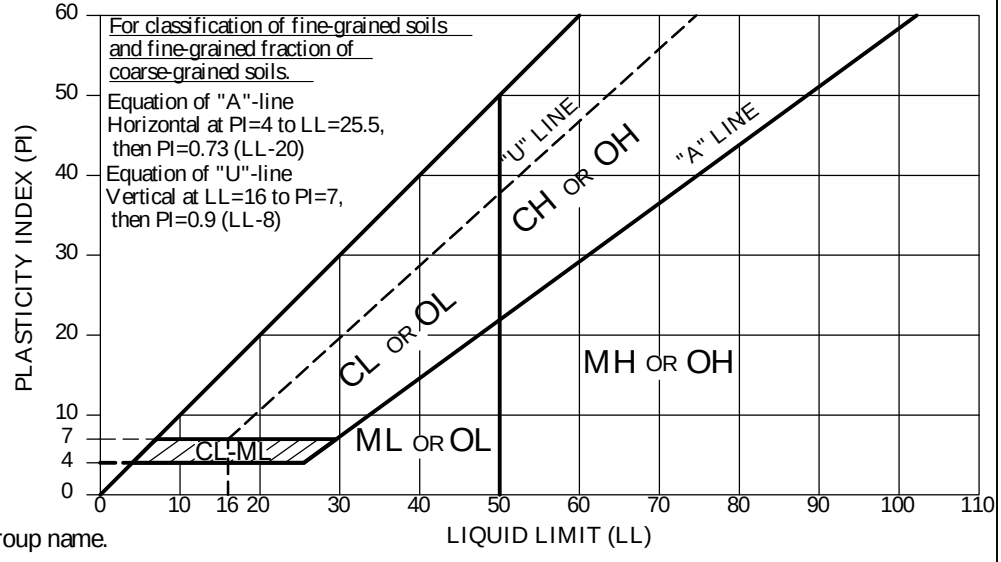
Drilling Method	Depth in (Feet)	Casing Size Blows / ft	Method	Number	Blow Count	Sample Interval	N-Value	Run Number	Time (minutes)	RQD	Recovery	Longest Pc. (in.)	Structural Data	Frozen	Graphic Log	SUBSURFACE MATERIAL
	30															30
	31															31
	32															32
	33							4	9	60	100					33
	34															34
	35															35
	36															36
	37							5	10	32	100					37
	38															38
	39															39
	40															BOH 40

NR AKDOT TEST CORE LOG - USCS STERLING_HIGHWAY_MP_45_60_53014_2019_CORE DATA.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 3/2/20

APPENDIX C
LABORATORY TEST DATA

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]			Soil Classification		
				Group Symbol	Group Name [B]
Coarse-grained Soils More than 50% retained on the No. 200 sieve	Gravels More than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels Less than 5% fines [C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$ [E]	GW	Well-graded gravel [F]
			$Cu < 4$ and/or $1 > Cc > 3$ [E]	GP	Poorly-graded gravel [F]
		Gravels with Fines More than 12% fines [C]	Fines classify as ML or MH	GM	Silty gravel [F,G,H]
			Fines classify as CL or CH	GC	Clayey gravel [F,G,H]
	Sands 50% or more of coarse fraction passes No. 4 sieve	Clean Sands Less than 5 % fines [D]	$Cu \geq 6$ and $1 \leq Cc \leq 3$ [E]	SW	Well-graded sand [I]
			$Cu < 6$ and/or $1 > Cc > 3$ [E]	SP	Poorly-graded sand [I]
		Sands with Fines More than 12 % fines [D]	Fines classify as ML or MH	SM	Silty sand [G,H,I]
			Fines classify as CL or CH	SC	Clayey sand [G,H,I]
Fine-grained Soils 50% or more passes the No. 200 sieve	Silts and Clays Liquid Limit less than 50	inorganic	PI > 7 and plots on or above "A" line [J]	CL	Lean clay [K, L, M]
			PI < 4 and plots below "A" line [J]	ML	Silt [K, L, M]
		organic	Liquid limit - oven dried / Liquid limit - not dried < 0.75	OL	Organic Clay [K, L, M,N] / Organic Silt [K, L, M,O]
	Silts and Clays Liquid Limit 50 or more	inorganic	PI plots on or above "A" line	CH	Fat clay [K, L, M]
			PI plots below "A" line	MH	Elastic silt [K, L, M]
		organic	Liquid limit - oven dried / Liquid limit - not dried < 0.75	OH	Organic Clay [K, L, M,P] / Organic Silt [K, L, M,Q]
Highly organic soils	Primarily organic matter, dark in color, and organic odor			PT	Peat

[A] Based on the material passing the 3-in. (75-mm) sieve.
[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.
[C] Gravel with 5 to 12 % fines require dual symbols:
GW-GM well-graded gravel with silt
GW-GC well-graded gravel with clay
GP-GM poorly-graded gravel with silt
GP-GC poorly-graded gravel with clay
[D] Sands with 5 to 12 % fines require dual symbols:
SW-SM well-graded sand with silt
SW-SC well-graded sand with clay
SP-SM poorly-graded sand with silt
SP-SC poorly-graded sand with clay
[E] $Cu = D_{60} / D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$
[F] If soil contains $\geq$ 15% sand, add "with sand " to group name.
[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.
[H] If fines are organic, add "with organic fines" to group name.
[I] If soil contains $\geq$ 15% gravel, add "with gravel" to group name.
[J] If Atterberg limits plot in hatched area, soil is a CL-ML, silty clay.
[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.
[L] If soil contains $\geq$ 30% plus No. 200, predominantly sand, add "sandy" to group name.
[M] If soil contains > 30% plus No. 200, predominantly gravel, add "gravelly" to group name.
[N] PI > 4 and plots on or above "A" line.
[O] PI < 4 and plots below "A" line.
[P] PI plots on or above "A" line.
[Q] PI plots below "A" line.



* (DRAWING 1 NEW ASTM CLASS ENG (DOT&PF)) 1/21/20 01:27 PM

DWN:	B.M.M.
CKD:	R.M.P.
DATE:	GENERAL
SCALE:	NONE

PREPARED BY: R&M CONSULTANTS, INC.

CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES ASTM D 2487

FB:	N/A
GRID:	N/A
PROJ.NO:	GENERAL
DWG.NO:	C-01

SUMMARY OF LABORATORY SOILS DATA
STERLING HIGHWAY MP 45-60 RECONSTRUCTION
SUNRISE TO SKILAK LAKE RD - PHASE 1B (MP 45-46.5)

SAMPLE IDENTIFICATION			PARTICLE SIZE ANALYSIS (% FINER)[1]														ATTERBERG LIMITS			MOIST. CONT. %	ORG. CONT. %	ASTM CLASS.[2]
			STANDARD SIEVE SIZE													(mm)						
TEST BORING	NO.	DEPTH (FT.)	3"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	#4	#10	#20	#40	#60	#140	#200	.02	LL	PL	PI			
TH19-10	SW-163	2.5 - 4.5																			10.7		SM**
	SW-164	5.0 - 7.0																			6.7		GM**
	SW-165	7.5 - 9.5																					
	SW-166	10.0 - 12.0																			5.5		GM**
	SW-167	15.0 - 16.3																					
TH19-13	SW-168	2.5 - 4.5				100	98	88	80	63	45	3	26	21	15	13							SM*
	SW-169	5.0 - 7.0																			10.3	6.8	
	SW-170	7.5 - 9.5			100	97	89	81	72	55	38	26	20	17	13	12							GP-GM*
	SW-171	10.0 - 12.0			100	97	93	85	79	64	43	29	23	19	15	13					4.8		SM*
	SW-172	15.0 - 17.0																			5.5		GM**
	SW-173	20.0 - 22.0																					
TH19-15	SW-174	2.5 - 4.5				100	94	90	84	71	56	43	34	27	18	15					7.0		SM*
	SW-175	5.0 - 7.0																			7.3		
	SW-176	7.5 - 9.5																			11.2	3.1	GM**
	SW-177	10.0 - 11.4																					
	SW-178	15.0 - 17.0																			11.9		ML**
	SW-179	20.0 - 22.0																			11.7		CL**
TH19-16	SW-180	2.5 - 4.5																			5.6	4.9	
	SW-181	5.0 - 7.0			100	97	93	85	77	61	41	30	24	19	15	13						5.3	SM*
	SW-182	7.5 - 9.5			100	96	87	70	64	50	35	24	18	15	11	9.6					5.8		GW-GM*
	SW-183	10.0 - 12.0																			49.3		CL**
	SW-184	15.0 - 17.0				100	96	90	86	76	64	52	41	32	21	18		NV	NV	NP			SM
	SW-185	20.0 - 22.0																			5.9		SM**
TH19-18	SW-186	2.5 - 4.5				100	97	88	83	66	46	34	26	21	15	13					5.6		SM*
	SW-187	5.0 - 7.0																					
	SW-188	7.5 - 9.5																			63.1	21.7	
	SW-189	10.0 - 12.0			100	88	79	70	64	52	38	31	25	22	17	15					10.7		GM*
	SW-190	15.0 - 17.0																			7.0		GM**
	SW-191	20.0 - 20.5																			10.3		
TH19-21	SW-192	2.5 - 4.5																			4.1		GP-GM**
	SW-193	5.0 - 7.0																16	NV	NP	6.6		

SUMMARY OF LABORATORY SOILS DATA
STERLING HIGHWAY MP 45-60 RECONSTRUCTION
SUNRISE TO SKILAK LAKE RD - PHASE 1B (MP 45-46.5)

SAMPLE IDENTIFICATION			PARTICLE SIZE ANALYSIS (% FINER)[1]															ATTERBERG LIMITS			MOIST. CONT. %	ORG. CONT. %	ASTM CLASS.[2]
			STANDARD SIEVE SIZE														(mm)						
TEST BORING	NO.	DEPTH (FT.)	3"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	#4	#10	#20	#40	#60	#140	#200	.02	LL	PL	PI			
TM19-22	SW-194	2.5 - 4.5				100	95	88	83	69	55	43	36	30	22	20							SM*
	SW-195	5.0 - 7.0																			6.3		GM**
	SW-196	7.5 - 9.5																					
	SW-197	10.0 - 12.0			100	97	90	84	80	68	54	43	35	30	24	21							SM*
	SW-198	15.0 - 17.0																			1.5		
	SW-199	20.0 - 22.0			100	97	90	77	68	52	37	26	20	17	12	11					8.2		GP-GM*
TH19-26	SW-200	2.5 - 4.5				100	92	82	73	58	43	32	25	21	17	15					3.3		SM*
	SW-201	5.0 - 7.0			100	94	85	73	67	50	33	22	16	12	9	7.6					1.4		GW-GM*
	SW-202	7.5 - 9.5																					
	SW-204	15.0 - 17.0			100	91	89	84	80	67	48	40	34	29	22	19					6.7		SM*
	SW-205	20.0 - 22.0																					SM**
TH19-33	SW-206	2.5 - 4.5																			2.3		
	SW-207	5.0 - 7.0				100	95	87	84	71	54	39	27	20	13	11					3.6		SW-SM*
	SW-208	7.5 - 9.5			100	96	92	82	76	56	39	27	20	15	10	8.5					2.6		SW-SM*
	SW-209	10.0 - 12.0																					
	SW-210	15.0 - 17.0																			7.0		
	SW-211	20.0 - 22.0				100	95	84	78	63	47	33	21	16	11	9.7					8.9		SW-SM*
TH19-2068	19-8357	2.0 - 5.0				100	99	90	85	69	50	37	28	23	17	16		NV	NV	NP	7.1		SM*
	19-8358	5.0 - 20.0			100	92	86	77	72	58	41	30	24	20	16	15		19	16	3	4.8		SM*
TH19-2069	19-8359	2.0 - 20.0			100	97	92	84	78	61	45	33	26	21	16	14		19	17	2	4.8		SM*
TH19-2070	19-8360	1.0 - 3.0				100	98	96	93	82	70	61	52	45	37	34		26	24	2	18.6		SM*
	19-8361	4.0 - 15.5			100	96	93	88	82	67	48	36	28	23	16	14					3.6		SM*
	19-8362	19.0 - 20.0					100	98	97	93	89	87	85	84	82	81		NV	NV	NP	19.8		ML*
TH19-2071	19-8363	2.0 - 6.5			100	92	78	61	55	44	29	21	17	13	8	6.6					2.6		GW-GM*
	19-8364	7.0 - 16.5			100	84	76	64	56	43	30	20	15	12	8	7.4		16	15	1	1.7		GW-GM*
	19-8365	20.0 - 21.5					100	98	95	85	74	63	53	44	37	35		23	16	7	9.6		SC-SM
TH19-2072	19-8367	14.5 - 21.0				100	97	90	82	66	45	32	25	21	18	17		22	17	5	5.7		SC-SM
TH19-2073	19-8368	2.0 - 8.0				100	88	73	62	45	31	22	17	14	10	8.6					4.0		GP-GM*
	19-8369	8.0 - 10.0					100	95	88	73	51	36	27	22	16	14		Low Samp Vol			4.9		SM*
	19-8370	14.5 - 21.5				100	99	93	86	70	50	36	29	24	18	17		18	16	2	6.0		SM*

SUMMARY OF LABORATORY SOILS DATA
STERLING HIGHWAY MP 45-60 RECONSTRUCTION
SUNRISE TO SKILAK LAKE RD - PHASE 1B (MP 45-46.5)

SAMPLE IDENTIFICATION			PARTICLE SIZE ANALYSIS (% FINER)[1]														ATTERBERG LIMITS			MOIST. CONT. %	ORG. CONT. %	ASTM CLASS.[2]
			STANDARD SIEVE SIZE													(mm)						
TEST BORING	NO.	DEPTH (FT.)	3"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	#4	#10	#20	#40	#60	#140	#200	.02	LL	PL	PI			
TH19-2074	19-8371	2.0 - 4.0				100	96	83	76	60	43	30	22	17	12	10					4.6		SW-SM*
	19-8372	4.0 - 9.4		100	94	86	69	51	42	32	24	18	14	12	9	7.4					3.1		GP-GM*
	19-8373	18.0 - 20.0				100	92	80	73	58	41	31	25	21	15	13		Low Samp Vol			5.8		SM*
TH19-2075	19-8374	2.0 - 11.5			100	95	81	66	56	37	26	19	15	13	9	7.9					2.8		GP-GM*
	19-8375	14.5 - 20.5				100	99	91	85	69	47	33	25	20	15	13		19	18	1	5.2		SM
TH19-2076	19-8377	2.0 - 15.0		100	96	87	81	64	55	33	17	14	12	11	9	8.3					0.1		GP-GM*
	19-8378	19.5 - 21.5					100	89	83	67	49	34	26	22	17	16		21	16	5	5.0		SC-SM
TH19-2078	19-8379	1.0 - 4.0		100	91	80	75	68	63	55	47	40	35	30	21	18					6.0		GM*
TH19-2079	19-8380	2.0 - 10.5				100	95	87	81	67	52	41	34	29	22	20		NV	NV	NP	9.2		SM
TH19-2080	19-8381	3.5 - 10.5			100	98	95	82	70	47	27	19	14	12	9	7.7					4.4		GP-GM*
	19-8382	13.5 - 20.5			100	96	92	85	78	63	45	34	28	24	20	19		21	15	6	7.6		SC-SM
TH19-2089	19-8383	5.0 - 7.0				100	94	83	78	63	46	33	27	22	17	15					7.7		SM*
	19-8384	10.0 - 12.0			100	97	92	90	87	79	67	58	50	44	32	28		NV	NV	NP	8.0		SM
	19-8385	15.0 - 17.0				100	98	91	89	78	66	58	52	47	37	33					6.0		SM*
	19-8386	20.0 - 22.0					100	96	95	88	78	68	61	53	37	30					11.0		SM*

1) The maximum particle size of samples is limited by the I.D. of the sampler opening or the width of the auger flights.

2) Soil plasticity was estimated following ASTM D 2488 when the Atterberg limits were not tested.

*Estimated classification

**Estimated classification by laboratory technician via ASTM D 2488

SUMMARY OF AGGREGATE QUALITY DATA
STERLING HIGHWAY MP 45-60 RECONSTRUCTION
SUNRISE TO SKILAK LAKE RD - PHASE 1B (MP 45-46.5)

SAMPLE IDENTIFICATION				LA ABRASION (AASHTO T96) (% LOSS)	SODIUM SULFATE SOUNDNESS (AASHTO T104) (%LOSS)	DEGRADATION (ATM 313)
TEST BORING	DEPTH (FT.)					
TH19-2083	27.7	-	45.2	18	1	22
TH19-2084	34.5	-	50.0	15	0	39
TH19-2085	32.0	-	48.5	15	0	35
TH19-2086	25.0	-	43.0	13	0	39
TH19-2091	19.0	-	36.0	18	1	33

R&M No.: 2747.02	Summary of Point Load Testing Results Sterling Hwy MP 45-60 Design, Phase 1B (MP 45-46.5)	April 2020

Test Boring No.	Sample Depth (ft)	Sample Diameter [1] (in)	Sample Length [2] (in)	Failure Load [3] (lb_f)	Uncorrected Load Index, I_s (psi)	Corrected Point Load Index [4], I_{s50} (psi)
TH19-2080	8.5	1.85	3.3	3000	876	852
	10.5	1.85	2.0	1260	368	358
	12.3	1.85	1.7	2400	701	682
	13.8	1.85	9.9	4450	1300	1264
	15.6	1.85	5.5	3400	993	966
	19.5	1.85	4.9	3000 *	876	852
	24.1	1.85	2.2	2150	628	611
	26.3	1.85	8.9	3750	1095	1065
	28.2	1.85	7.7	3250	949	923
	29.7	1.85	2.8	2000	584	568
	31.5	1.85	11.2	5000	1460	1420
	33.6	1.85	2.5	3750 *	1095	1065
	35.8	1.85	4.5	3400	993	966
	37.4	1.85	2.6	4400	1285	1250
	38.9	1.85	3.5	3150	920	895
	41.9	1.85	2.9	2950 *	862	838
	44.1	1.85	3.0	4900	1431	1392
	45.2	1.85	2.2	3100	905	880
	46.7	1.85	3.7	2200	643	625
	48.4	1.85	5.3	1750	511	497
	50.4	1.85	10.1	3850	1124	1094
	51.5	1.85	1.8	3600	1051	1023
	52.0	1.85	1.6	3000	876	852
	52.8	1.85	1.9	1850	540	525
	53.6	1.85	2.4	1250	365	355
	54.2	1.85	3.4	1700	497	483
	55.0	1.85	6.5	4700	1373	1335
TH19-2083	6.2	1.85	6.4	1100	321	312
	7.3	1.85	2.9	820	239	233
	9.6	1.85	9.4	980	286	278
	11.7	1.85	7.3	1750	511	497
	15.0	1.85	3.6	1800	526	511
	17.9	1.85	4.6	1200	350	341
	20.0	1.85	7.8	1700	497	483
	21.4	1.85	6.9	1600	467	454
	24.3	1.85	6.6	2600	759	738
	26.9	1.85	4.4	1600	467	454
	28.4	1.85	7.0	1600	467	454
	30.4	1.85	9.2	2000	584	568
	32.2	1.85	10.6	1800	526	511
	34.0	1.85	8.1	1550	453	440
	35.3	1.85	3.6	1400	409	398
	36.8	1.85	4.4	2200	643	625
	40.5	1.85	6.9	2600	759	738

R&M No.: 2747.02	Summary of Point Load Testing Results Sterling Hwy MP 45-60 Design, Phase 1B (MP 45-46.5)	April 2020

Test Boring No.	Sample Depth (ft)	Sample Diameter [1] (in)	Sample Length [2] (in)	Failure Load [3] (lb_f)	Uncorrected Load Index, I_s (psi)	Corrected Point Load Index [4], I_{s50} (psi)
TH19-2083	41.8	1.85	2.50	1600	467	454
	43.7	1.85	2.44	1950	570	554
	45.7	1.85	2.54	1950 *	570	554
	47.9	1.85	2.03	1300	380	369
	50.3	1.85	8.64	2100	613	596
	52.4	1.85	3.1	2500	730	710
	54.7	1.85	5.4	1800	526	511
	56.8	1.85	3.2	1700	497	483
	58.9	1.85	3.6	1160	339	329
	60.1	1.85	3.5	2200	643	625
	61.8	1.85	2.2	1600	467	454
	63.9	1.85	1.8	1400	409	398
	65.3	1.85	3.1	1600	467	454
	67.4	1.85	3.8	2200	643	625
	69.3	1.85	5.5	2600	759	738
	70.9	1.85	2.9	2600	759	738
	72.9	1.85	2.1	1600	467	454
	75.6	1.85	2.2	2200	643	625
TH19-2084	1.5	1.85	2.9	1160	339	329
	15.9	1.85	3.0	1500	438	426
	16.8	1.85	2.4	2600	759	738
	21.1	1.85	7.2	2400	701	682
	22.4	1.85	5.0	2600	759	738
	24.6	1.85	2.7	3600	1051	1023
	25.8	1.85	2.7	2900	847	824
	27.3	1.85	2.6	2100	613	596
	29.5	1.85	5.9	2200	643	625
	31.7	1.85	3.2	3400	993	966
	34.0	1.85	5.3	2500	730	710
	35.2	1.85	2.0	2400	701	682
	37.5	1.85	7.3	2600	759	738
	39.1	1.85	8.1	3000	876	852
	40.5	1.85	3.4	2750	803	781
	42.3	1.85	7.9	3100	905	880
	44.4	1.85	2.8	2250	657	639
	46.1	1.85	1.7	2900	847	824
	47.5	1.85	2.2	2400	701	682
	49.3	1.85	2.0	2400	701	682
	55.6	1.85	2.4	3400	993	966
	57.2	1.85	1.9	3900	1139	1108
	58.9	1.85	2.2	2000	584	568
	60.7	1.85	4.9	2250	657	639
	62.5	1.85	9.7	2500	730	710
	64.2	1.85	8.9	2400	701	682

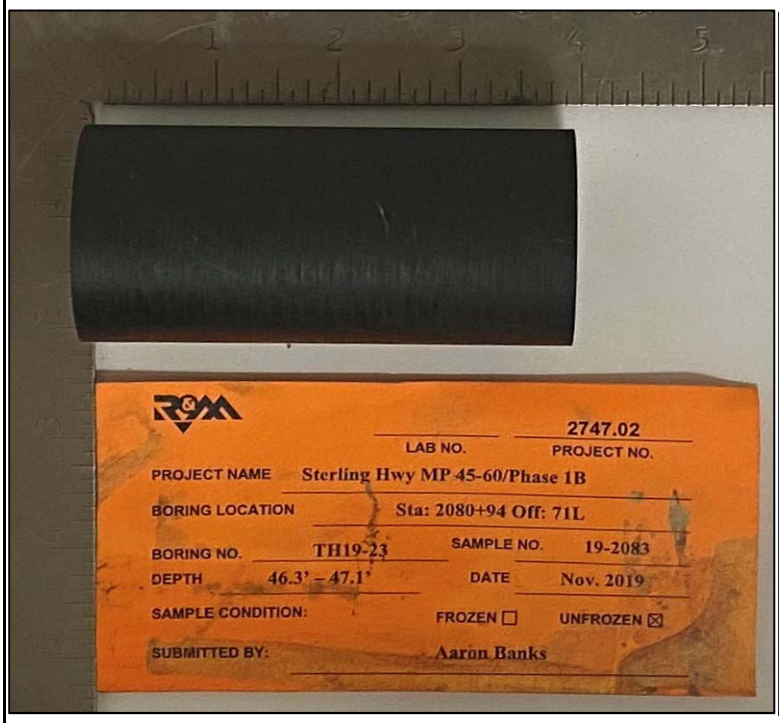
R&M No.: 2747.02	Summary of Point Load Testing Results Sterling Hwy MP 45-60 Design, Phase 1B (MP 45-46.5)	April 2020

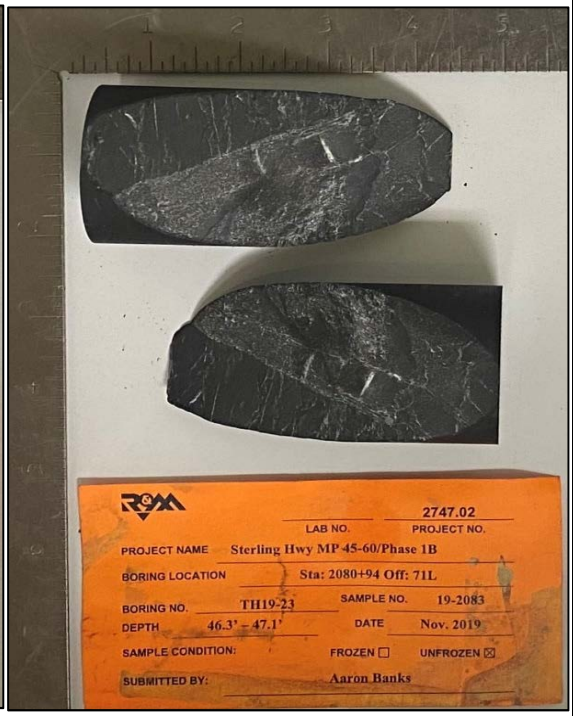
Test Boring No.	Sample Depth (ft)	Sample Diameter [1] (in)	Sample Length [2] (in)	Failure Load [3] (lb_f)	Uncorrected Load Index, I_s (psi)	Corrected Point Load Index [4], I_{s50} (psi)
TH19-2084	66.3	1.85	5.6	2700	789	767
	68.4	1.85	2.9	2100	613	596
	70.4	1.85	2.6	2500	730	710
	71.6	1.85	2.8	2700	789	767
	72.9	1.85	2.0	4050	1183	1150
TH19-2085	6.7	1.85	2.20	910	266	258
	7.7	1.85	2.20	2000	584	568
	9.5	1.85	1.44	2300	672	653
	11.5	1.85	6.0	1800	526	511
	12.7	1.85	6.1	3900	1139	1108
	14.8	1.85	1.3	1280	374	364
	16.8	1.85	2.7	1900	555	540
	19.1	1.85	6.8	1250	365	355
	21.9	1.85	1.8	1300	380	369
	24.6	1.85	2.6	1600	467	454
	26.8	1.85	3.4	4800	1402	1363
	29.8	1.85	2.3	2800	818	795
	31.3	1.85	5.6	2800	818	795
	33.0	1.85	4.9	1400	409	398
	36.4	1.85	1.1	2300	672	653
	40.6	1.85	4.6	2800	818	795
	42.4	1.85	4.6	4600	1343	1307
	45.6	1.85	4.6	2000	584	568
	47.8	1.85	2.6	1800	526	511
	50.3	1.85	3.6	3600	1051	1023
	52.2	1.85	1.3	1900	555	540
	55.5	1.85	2.5	1800	526	511
	57.4	1.85	3.9	2950	862	838
	59.1	1.85	3.0	2950	862	838
	60.5	1.85	1.5	2000	584	568
	63.8	1.85	1.9	2650	774	753
	65.9	1.85	9.2	2200	643	625
	67.9	1.85	2.9	3350	978	951
	69.7	1.85	1.9	3200	935	909
	71.5	1.85	5.9	1500	438	426
	74.6	1.85	2.8	1500	438	426
TH19-2087	9.1	1.85	1.2	1010 *	295	287
	13.4	1.85	2.1	2050	599	582
	15.6	1.85	2.2	2000	584	568
	17.6	1.85	2.1	1850	540	525
	20.3	1.85	5.6	3500	1022	994
	21.1	1.85	6.5	2550	745	724
TH19-2090	25.7	1.85	1.2	1750	511	497
	27.6	1.85	4.9	1900	555	540

R&M No.: 2747.02	Summary of Point Load Testing Results Sterling Hwy MP 45-60 Design, Phase 1B (MP 45-46.5)	April 2020

Test Boring No.	Sample Depth (ft)	Sample Diameter [1] (in)	Sample Length [2] (in)	Failure Load [3] (lb_f)	Uncorrected Load Index, I_s (psi)	Corrected Point Load Index [4], I_{s50} (psi)
TH19-2090	28.6	1.85	4.0	2600	759	738
	30.3	1.85	2.2	2000	584	568
	32.5	1.85	1.7	4350	1270	1236
	35.7	1.85	1.8	2500	730	710
	41.1	1.85	2.2	1500	438	426
	42.2	1.85	2.0	400	117	114
	43.0	1.85	2.8	1200	350	341
	46.6	1.85	1.9	4450	1300	1264
TH19-2091	6.2	1.73	4.6	1040	347	327
	7.4	1.73	3.0	680	227	214
	9.7	1.73	1.6	940	313	296
	11.2	1.73	4.0	1230	410	387
	14.2	1.73	4.9	700	233	220
	16.9	1.73	1.9	1800	600	566
	17.9	1.73	3.5	1160	387	365
	19.5	1.73	4.8	1600	533	503
	22.0	1.73	2.2	1165	388	366
	26.4	1.73	2.5	1400	467	440
	27.8	1.73	4.8	1200	400	377
	30.7	1.73	3.0	1400	467	440
	33.5	1.73	2.9	1200	400	377
	34.7	1.73	1.9	700	233	220
	39.1	1.73	1.2	1270	423	400
	39.8	1.73	1.4	1850	617	582

Notes:
1. All test were diametral and loaded parallel to apparent planes of weakness
2. Length was measured from load point to nearest edge of completely intact core
3. Failure loads marked with an asterisk indicate only partial failure was achieved
4. Conversion factors of 0.97 and 0.94 were applied for sample diameters of 1.85 and 1.73, respectively





Specimen Preparation in accordance with ASTM D4543	Diameter, in	D_O	1.87
Remarks:	Height, in	H_O	3.88
	Moisture Condition		As Received
	Unit Weight, pcf	ρ_d	174
	Uniaxial Compressive Strength (psi)	σ_u	7,000
	Time to Failure, mm:ss		2:22

Description of Specimen: Schist

Test Method: ASTM D7012, Method C

Boring:	TH19-23, 19-2083
Location	Sta. 2080+94, Off: 71L
Depth, ft:	46.3-47.1
Test Date:	12/10/2019

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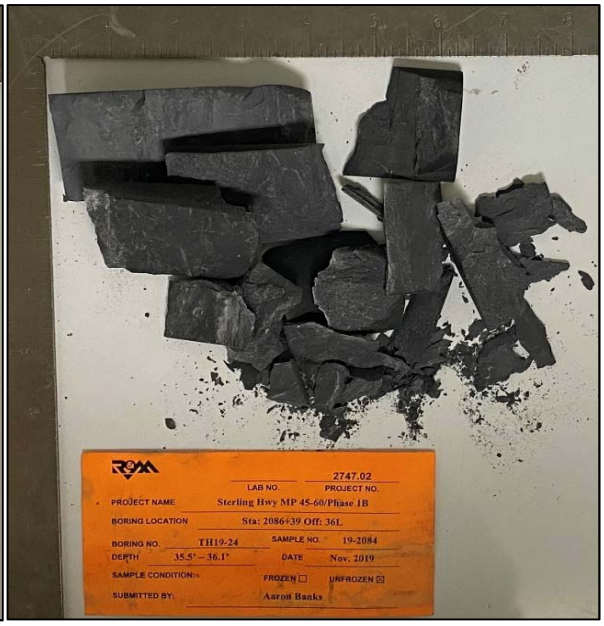
FIGURE



Specimen Preparation in accordance with ASTM D4543	Diameter, in	D_O	1.87
Remarks:	Height, in	H_O	3.86
	Moisture Condition		As Received
	Unit Weight, pcf	ρ_d	174
	Uniaxial Compressive Strength (psi)	σ_u	18,870
	Time to Failure, mm:ss		6:25

Description of Specimen: Schist	Test Method: ASTM D7012, Method C

Boring:	TH19-24, 19-2084
Location	Sta. 2086+39, Off: 36L
Depth, ft:	35.5-36.1
Test Date:	12/10/2019

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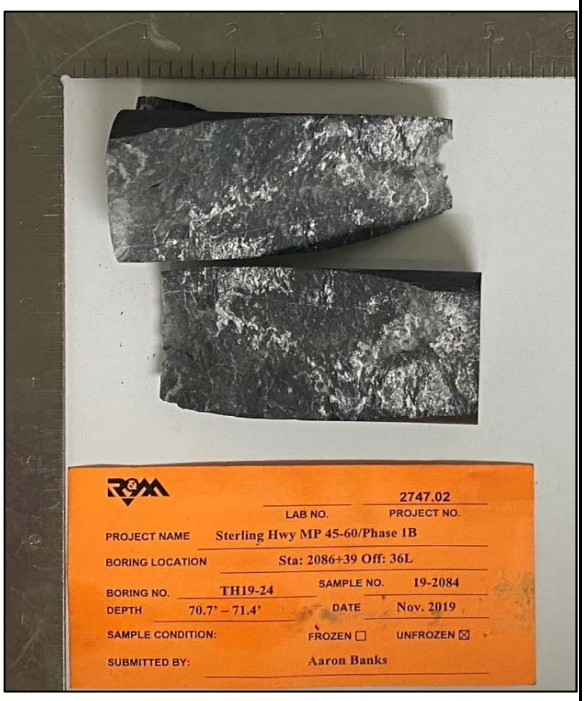
FIGURE



Specimen Preparation in accordance with ASTM D4543	Diameter, in	D_O	1.87
Remarks:	Height, in	H_O	3.84
	Moisture Condition		As Received
	Unit Weight, pcf	ρ_d	170
	Uniaxial Compressive Strength (psi)	σ_u	19,160
	Time to Failure, mm:ss		6:32

Description of Specimen: Schist

Test Method: ASTM D7012, Method C

Boring:	TH19-24, 19-2084
Location	Sta. 2086+39, Off: 36L
Depth, ft:	70.7-71.4
Test Date:	12/10/2019

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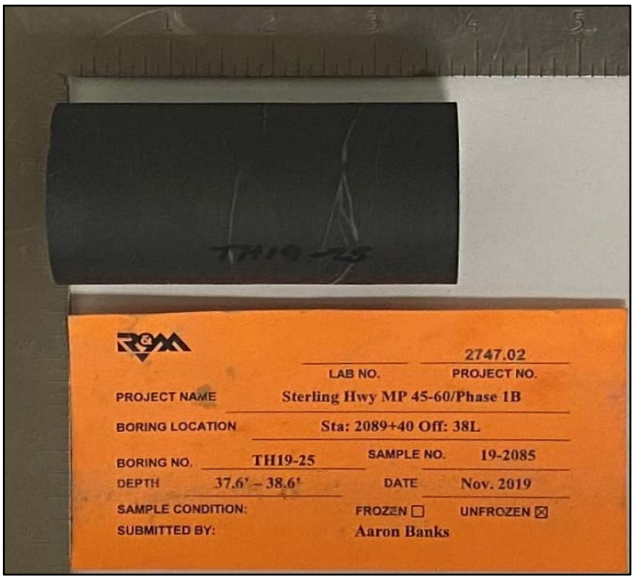
FIGURE



Specimen Preparation in accordance with ASTM D4543	Diameter, in	D_O	1.87
Remarks:	Height, in	H_O	3.78
	Moisture Condition		As Received
	Unit Weight, pcf	ρ_d	169
	Uniaxial Compressive Strength (psi)	σ_u	19,080
	Time to Failure, mm:ss		6:32

Description of Specimen: Schist

Test Method: ASTM D7012, Method C

Boring:	TH19-25, 19-2085
Location	Sta. 2089+40, Off: 38L
Depth, ft:	37.6-38.6
Test Date:	12/10/2019

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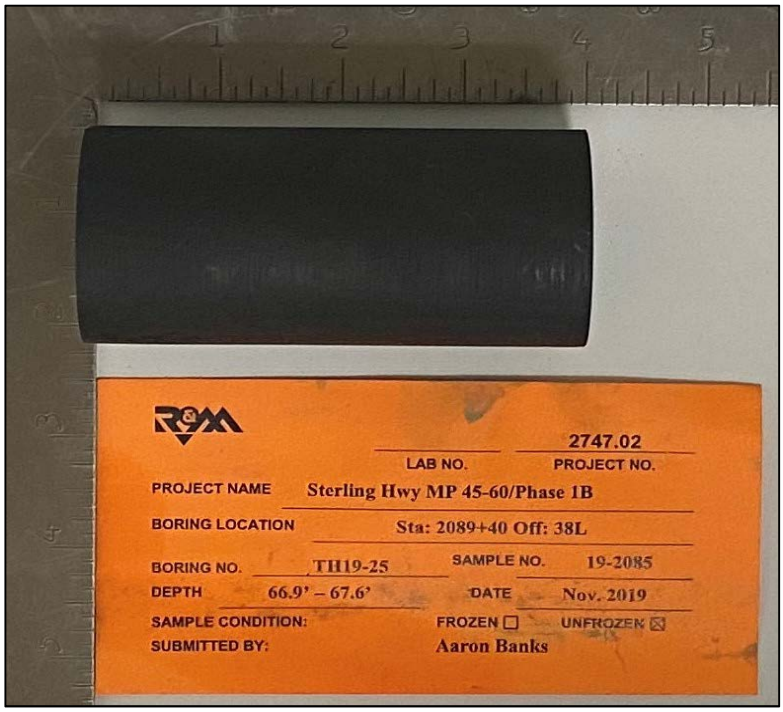
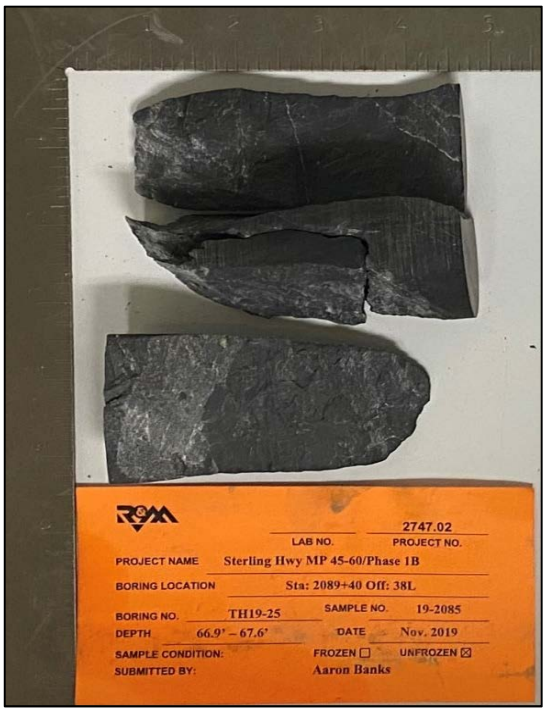
FIGURE





Specimen Preparation in accordance with ASTM D4543	Diameter, in	D_O	1.87
Remarks:	Height, in	H_O	3.96
	Moisture Condition		As Received
	Unit Weight, pcf	ρ_d	171
	Uniaxial Compressive Strength (psi)	σ_u	9,570
	Time to Failure, mm:ss		2:02

Description of Specimen: Schist

Test Method: ASTM D7012, Method C

Boring:	TH19-25, 19-2085
Location	Sta. 2089+40, Off: 38L
Depth, ft:	66.9-67.6
Test Date:	12/10/2019

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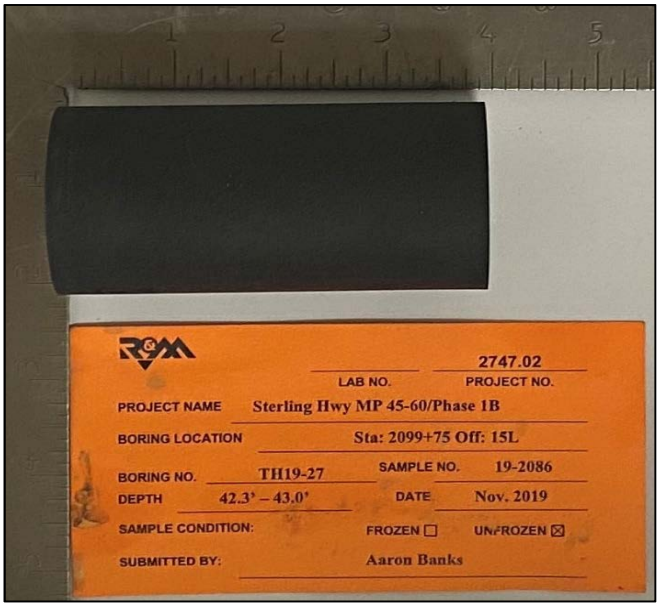
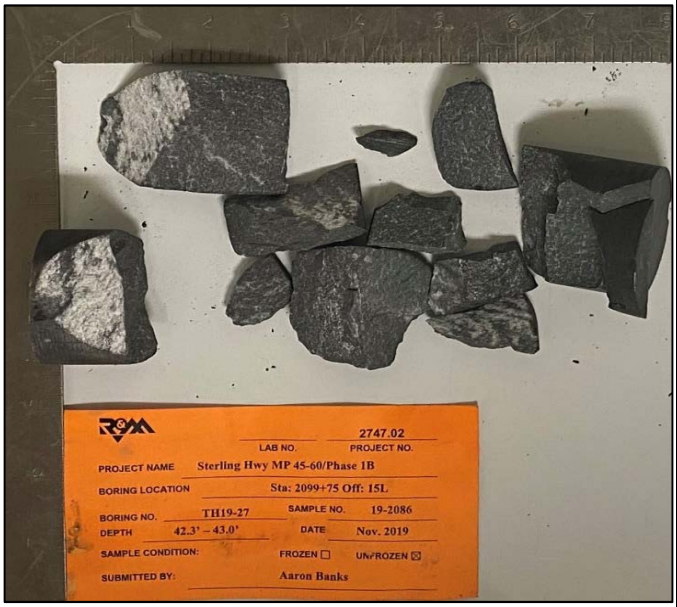
FIGURE





Specimen Preparation in accordance with ASTM D4543	Diameter, in	D_O	1.85
Remarks:	Height, in	H_O	3.90
	Moisture Condition		As Received
	Unit Weight, pcf	ρ_d	169
	Uniaxial Compressive Strength (psi)	σ_u	24,850
	Time to Failure, mm:ss		4:27

Description of Specimen: Schist

Test Method: ASTM D7012, Method C

Boring:	TH19-27, 19-2086
Location	Sta. 2099+75, Off: 15L
Depth, ft:	42.3-43.0
Test Date:	12/10/2019

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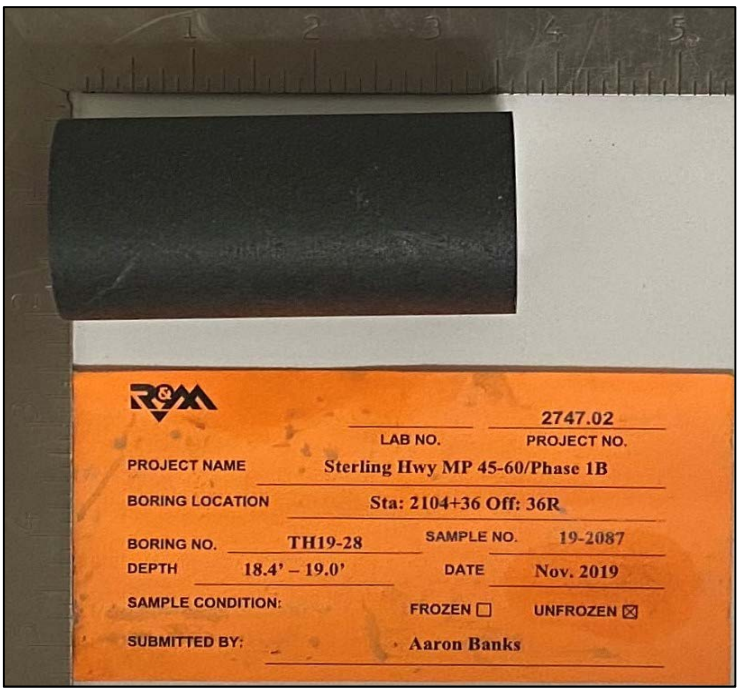
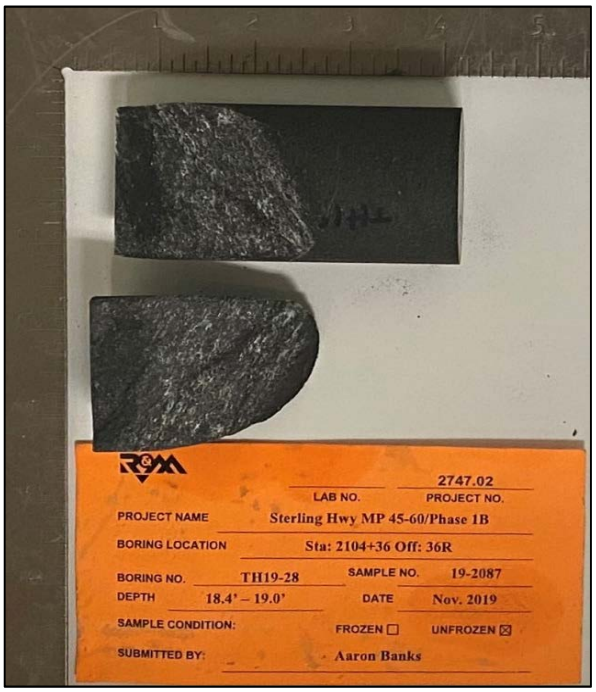
FIGURE





Specimen Preparation in accordance with ASTM D4543	Diameter, in	D_O	1.75
Remarks:	Height, in	H_O	3.60
	Moisture Condition		As Received
	Unit Weight, pcf	ρ_d	169
	Uniaxial Compressive Strength (psi)	σ_u	5,460
	Time to Failure, mm:ss		2:08

Description of Specimen: Schist

Test Method: ASTM D7012, Method C

Boring:	TH19-28, 19-2087
Location	Sta. 2104+36, Off: 36R
Depth, ft:	18.4-19.0
Test Date:	12/10/2019

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FIGURE

Specimen Preparation in accordance with ASTM D4543	Diameter, in	D_O	1.75
Remarks:	Height, in	H_O	3.83
	Moisture Condition		As Received
	Unit Weight, pcf	ρ_d	172
	Uniaxial Compressive Strength (psi)	σ_u	3,940
	Time to Failure, mm:ss		1:57

Description of Specimen: Schist

Test Method: ASTM D7012, Method C

Boring:	TH19-29, 19-2091
Location	Sta. 2109+37, Off: 26R
Depth, ft:	36.5-37.6
Test Date:	12/10/2019

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FIGURE

APPENDIX D

ROCK STRUCTURE MAPPING DATA

Sterling Highway 45-60, Stage 1B
Rock Structure Mapping Data

ID	Dip	Dip Direction	Set	Type	Persistance	Spacing	Roughness Micro	Roughness Macro	Aperature	Filling	Water	Location
1	89	263		BP	L	C	RO	ST	VT		1	RM-01
2	62	103	1	BP	L	C	RO	ST	VT		1	RM-01
3	90	193	2	JO	L	M	RO	ST	VT		1	RM-01
4	90	193	2	JO	L	M	RO	UN	VT		1	RM-01
5	65	88	1	BP	L	VC	RO	UN	VT		1	RM-01
6	85	190	2	JO	L	M	RO	ST	VT		1	RM-01
7	76	96	1	BP	L	XC	RO	ST	VT		1	RM-01
8	84	193	2	JO	L	M	RO	ST	VT		1	RM-01
9	74	91	1	BP	L	VC	RO	ST	VT		1	RM-01
10	74	83	1	BP	L	VC	RO	UN	VT		1	RM-01
11	85	87	1	BP	L	VC	RO	UN	VT		1	RM-01
12	84	188	2	JO	L	M	RO	UN	VT		1	RM-01
13	70	88	1	BP	L	XC	RO	UN	VT		1	RM-01
14	81	110	1	BP	L	VC	RO	UN	VT		1	RM-01
15	88	184	2	JO	L	M	RO	UN	VT		1	RM-01
16	74	91	1	BP	L	XC	RO	UN	VT		1	RM-02
17	69	91	1	BP	L	XC	RO	UN	VT		1	RM-02
18	66	92	1	BP	L	XC	RO	UN	VT		1	RM-02
19	86	196	2	JO	M	M	RO	ST	T		1	RM-03
20	95	190	2	JO	M	M	RO	ST	T		1	RM-03
21	81	192	2	JO	M	M	RO	ST	T		1	RM-03
22	86	193	2	JO	M	M	RO	ST	VT		1	RM-03
23	88	196	2	JO	M	M	RO	ST	VT		1	RM-03
24	71	107	1	BP	L	XC	RO	UN	VT		1	RM-03
25	78	89	1	BP	L	XC	RO	UN	VT		1	RM-03
26	85	301		FA	M	NA	RO	PL	W	SI	4	RM-03
27	85	192	2	JO	M	M	RO	ST	VT		1	RM-03
28	83	193	2	JO	M	M	RO	ST	VT		1	RM-03
29	70	106	1	BP	L	XC	SM	UN	VT		1	RM-03
30	27	194		JO	L	M	RO	UN	VT	FE	3	RM-04
31	84	197	2	JO	M	C	SM	ST	VT		1	RM-04
32	87	193	2	JO	L	C	RO	ST	VT		1	RM-04
33	75	108	1	BP	L	XC	SM	UN	VT		1	RM-04
34	25	216		JO	L	C	RO	ST	VT		1	RM-04
35	81	103	1	BP	L	XC	SM	UN	VT		1	RM-04
36	89	9	2	JO	L	C	RO	PL	T	CA	2	RM-04
37	84	193	2	JO	M	C	RO	ST	T	CA	2	RM-04
38	81	186	2	JO	M	C	RO	ST	T	CA	2	RM-04
39	31	188		JO	L	M	RO	PL	T		2	RM-04
40	79	86	1	BP	L	XC	SM	UN	VT		1	RM-04
41	63	89	1	JO	M	M	RO	PL	PO		3	RM-04
42	56	87	1	JO	L	M	SM	PL	T		5	RM-05
43	69	103	1	BP	L	XC	SM	UN	VT		1	RM-05
44	61	75	1	JO	L	C	SM	PL	VT		1	RM-05
45	59	74	1	JO	L	C	SM	PL	VT		1	RM-05
46	57	54		JO	L	M	RO	PL	VT		1	RM-05
47	76	185	2	JO	L	C	RO	ST	VT		4	RM-05
48	71	111	1	FL	VL	VC	RO	UN	VT		1	RM-06
49	77	113	1	FL	VL	VC	RO	UN	VT		1	RM-06
50	72	106	1	FL	VL	VC	RO	UN	VT		1	RM-06
51	44	82		JO	L	M	RO	PL	VT		1	RM-06
52	78	200	2	JO	M	W	RO	UN	VT		1	RM-06
53	81	207	2	JO	M	W	RO	UN	VT		1	RM-06
54	76	127	1	JO	L	VC	RO	PL	VT		1	RM-06
55	59	72	1	JO	L	VC	RO	ST	VT		1	RM-06
56	75	123	1	FL	VL	VC	RO	UN	VT		3	RM-06
57	76	61		JO	L	M	RO	ST	VT		3	RM-07
58	56	79	1	JO	L	C	RO	ST	T		3	RM-07
59	80	153		JO	L	C	RO	UN	VT		1	RM-07
60	84	80	1	JO	VL	C	RO	UN	VT		1	RM-07
61	60	130	1	FL	L	VC	RO	UN	VT		1	RM-07

Sterling Highway 45-60, Stage 1B
Rock Structure Mapping Data

ID	Dip	Dip Direction	Set	Type	Persistance	Spacing	Roughness Micro	Roughness Macro	Aperature	Filling	Water	Location
62	62	87	1	JO	VL	C	RO	UN	VT		1	RM-07
63	67	93	1	JO	VL	C	RO	UN	VT		1	RM-07
64	89	223		JO	L	C	RO	ST	VT		1	RM-07
65	76	225		JO	L	M	RO	ST	VT		1	RM-07
66	72	106	1	FL	L	VC	RO	UN	VT		1	RM-07
67	74	117	1	FL	L	VC	RO	UN	VT		1	RM-07
68	71	73	1	JO	L	C	RO	ST	T		3	RM-07
69	83	103	1	JO	L	VC	SM	UN	T		2	RM-07
70	81	90	1	JO	L	C	SM	UN	PO		4	RM-07
71	85	109	1	JO	L	C	RO	ST	T		3	RM-07
72	89	104	1	FL	VL	XC	SM	UN	VT		1	RM-07
73	74	47		JO	L	M	SM	ST	VT		3	RM-07
74	66	95	1	FL	VL	XC	SM	UN	VT		1	RM-07
75	76	42		JO	L	C	RO	ST	VT		2	RM-07
76	87	53		JO	L	C	RO	ST	VT		3	RM-07
77	74	120	1	FL	VL	XC	SM	UN	VT		1	RM-07
78	66	53		JO	L	M	RO	ST	VT		3	RM-07
79	59	84	1	JO	L	M	SM	UN	T		3	RM-08
80	71	105	1	BP	VL	XC	SM	UN	VT		1	RM-08
81	89	107	1	JO	VL	C	RO	UN	VT		3	RM-08
82	54	110	1	BP	VL	XC	SM	UN	VT		1	RM-08
83	82	83	1	JO	L	C	SM	ST	T		3	RM-08
84	64	125	1	BP	VL	XC	SM	UN	VT		1	RM-08
85	88	285		JO	L	C	RO	UN	T		4	RM-08
86	62	106	1	BP	VL	XC	SM	UN	VT		1	RM-08
87	89	115	1	BP	VL	XC	SM	UN	VT		1	RM-08
88	75	73	1	JO	L	C	RO	ST	T	CA	2	RM-08
89	81	53		JO	L	M	RO	ST	T	CA	2	RM-08
90	61	119	1	BP	VL	XC	SM	UN	VT		1	RM-08
91	75	303		JO	L	C	SM	UN	VT		3	RM-08
92	74	287		JO	L	C	RO	ST	T		3	RM-08
93	58	116	1	BP	VL	XC	SM	UN	VT		1	RM-08
94	72	82	1	JO	L	C	SM	UN	T		3	RM-08
95	53	112	1	BP	VL	XC	SM	UN	VT		1	RM-08
96	73	71	1	JO	M	M	RO	ST	T	CA	3	RM-08
97	71	75	1	JO	M	M	RO	ST	T	CA	3	RM-08
98	84	119	1	BP	L	VC	RO	UN	VT		1	RM-08
99	85	78	1	JO	L	M	SM	ST	T	CA	2	RM-08
100	74	118	1	BP	L	VC	SM	UN	VT		1	RM-08
101	58	94	1	JO	M	C	RO	ST	PO		3	RM-09
102	56	104	1	BP	L	XC	SM	UN	VT		1	RM-09
103	29	126		BP	L	XC	SM	UN	VT		1	RM-09
104	69	271		JO	L	C	SM	ST	VT		1	RM-09
105	42	114		BP	VL	XC	SM	UN	VT		1	RM-09
106	64	106	1	BP	L	XC	SM	UN	VT		1	RM-09
107	49	95		JO	L	M	SM	ST	T		3	RM-09
108	79	111	1	JO	L	W	RO	ST	VT		1	RM-09
109	56	87	1	JO	M	C	SM	PL	PO		4	RM-09
110	86	22	2	JO	M	W	SM	ST	PO		3	RM-09
111	81	199	2	JO	M	C	RO	ST	VT		1	RM-10
112	81	195	2	JO	M	C	RO	ST	VT		1	RM-10
113	69	268		JO	L	W	RO	ST	PO		4	RM-10
114	35	86		JO	L	C	SM	ST	W	SI	5	RM-10
115	48	79		JO	L	C	SM	UN	W	SI	4	RM-10
116	87	196	2	JO	M	C	RO	ST	VT		1	RM-10
117	60	114	1	BP	L	VC	RO	UN	VT		1	RM-10
118	56	94	1	BP	L	VC	RO	UN	VT		1	RM-10
119	65	75	1	JO	L	C	RO	ST	T		3	RM-11
120	89	16	2	JO	L	M	RO	UN	VT		1	RM-11
121	89	14	2	JO	M	C	RO	ST	PO		3	RM-11
122	19	145		JO	L	C	RO	UN	T		3	RM-11

Sterling Highway 45-60, Stage 1B
Rock Structure Mapping Data

ID	Dip	Dip Direction	Set	Type	Persistance	Spacing	Roughness Micro	Roughness Macro	Aperature	Filling	Water	Location
123	89	6	2	JO	L	M	RO	ST	VT		2	RM-11
124	13	123		JO	L	M	RO	ST	O	SI	4	RM-11
125	87	316		JO	L	C	RO	ST	T		4	RM-11
126	82	72	1	JO	M	C	RO	ST	O		4	RM-11
127	26	106		JO	VL	C	RO	UN	VT	CA	1	RM-11
128	48	103		JO	VL	M	RO	UN	T		3	RM-11
129	67	350		JO	M	W	RO	PL	PO		4	RM-11
130	82	241		JO	M	M	RO	ST	VT		2	RM-11
131	52	72		JO	L	M	RO	UN	T	CA	3	RM-11
132	56	6		JO	L	M	RO	ST	T	CA	3	RM-11
133	76	309		JO	M	M	RO	ST	T		4	RM-11
134	84	208	2	JO	H	M	RO	ST	T		2	RM-11
135	89	130	1	JO	L	M	RO	ST	PO		4	RM-11
136	84	216		JO	H	M	RO	ST	PO		4	RM-11
137	36	129		JO	M	M	RO	ST	T	CA	4	RM-11
138	62	282		JO	L	M	RO	ST	PO		4	RM-12
139	41	40		JO	L	M	RO	ST	T		3	RM-12
140	78	194	2	JO	M	M	RO	ST	VT		4	RM-12
141	79	202	2	JO	L	C	RO	ST	VT		2	RM-12
142	55	79	1	JO	L	C	RO	UN	VT		2	RM-12
143	82	197	2	JO	L	M	RO	ST	PO		4	RM-12
144	77	268		JO	L	C	RO	UN	PO		3	RM-12
145	49	43		JO	VL	C	RO	ST	T		3	RM-12
146	83	198	2	JO	L	W	RO	ST	W	SI	4	RM-12
147	69	259		JO	M	W	RO	UN	PO		3	RM-12
148	84	95	1	BP	VL	XC	SM	UN	VT		1	RM-13
149	89	185	2	JO	M	W	RO	ST	T		4	RM-13
150	73	94	1	BP	VL	XC	SM	UN	VT		1	RM-13
151	84	178		BP	VL	XC	SM	UN	VT		1	RM-13
152	72	77	1	BP	L	XC	SM	UN	VT		1	RM-13
153	85	195	2	JO	M	W	RO	ST	PO		4	RM-13
154	62	134	1	JO	M	W	RO	ST	MW	SI	4	RM-13
155	89	193	2	JO	L	M	RO	ST	PO		4	RM-13
156	69	105	1	BP	L	XC	SM	UN	VT		1	RM-13
157	29	287		JO	VL	W	RO	ST	T		4	RM-13
158	84	194	2	JO	M	C	RO	ST	T		4	RM-13
159	63	100	1	BP	VL	XC	SM	UN	VT		1	RM-13
160	42	268		JO	L	M	RO	ST	T		4	RM-13
161	69	111	1	BP	L	XC	SM	UN	VT		1	RM-15
162	79	216		JO	VL	C	RO	ST	VT		1	RM-15
163	70	103	1	BP	VL	XC	SM	UN	T		2	RM-15
164	65	133	1	JO	L	C	RO	ST	O	SI	4	RM-15
165	89	218		JO	L	C	RO	ST	T		3	RM-15
166	35	167		JO	L	W	SM	ST	PO		4	RM-15
167	41	129		BP	L	XC	SM	UN	VT		1	RM-15
168	84	198	2	JO	L	M	RO	ST	T		3	RM-15
169	54	104	1	BP	VL	XC	SM	UN	VT		1	RM-15
170	84	218		JO	L	XC	RO	UN	PO		2	RM-15
171	61	166		JO	L	M	RO	ST	PO		3	RM-14
172	76	100	1	BP	VL	XC	SM	UN	VT		1	RM-14
173	75	95	1	JO	L	M	RO	UN	O	SI	4	RM-14
174	72	99	1	BP	VL	XC	SM	UN	VT		1	RM-14
175	78	79	1	JO	L	C	RO	ST	PO	SI	4	RM-14
176	64	100	1	BP	L	XC	SM	UN	VT		1	RM-14
177	80	205	2	JO	L	VC	RO	ST	VT		2	RM-14

APPENDIX E

ROCK CORE PHOTOGRAPHS

Test Boring TH19-2083, Interval 1.5 to 10.6 ft, Box 1 of 9

Test Boring TH19-2083, Interval 10.6 to 19.3 ft, Box 2 of 9

Test Boring TH19-2083, Interval 19.3 to 27.7 ft, Box 3 of 9

Test Boring TH19-2083, Interval 27.7 to 36.3 ft, Box 4 of 9

Test Boring TH19-2083, Interval 36.3 to 45.2 ft, Box 5 of 9

Test Boring TH19-2083, Interval 45.2 to 53.2 ft, Box 6 of 9

Test Boring TH19-2083, Interval 53.2 to 61.3 ft, Box 7 of 9

Test Boring TH19-2083, Interval 61.3 to 70.5 ft, Box 8 of 9

Test Boring TH19-2083, Interval 70.5 to 75.8 ft, Box 9 of 9

Test Boring TH19-2084, Interval 0.5 to 16.5 ft, Box 1 of 8

Test Boring 19-2084, Interval 16.5 to 25.5 ft, Box 2 of 8

Test Boring TH19-2084, Interval 25.5 to 34.5 ft, Box 3 of 8

Test Boring TH19-2084, Interval 34.5 to 43.2 ft, Box 4 of 8

Test Boring TH19-2084, Interval 43.2 to 50.0 ft, Box 5 of 8

Test Boring TH19-2084, Interval 50.0 to 55.0 ft

Test Boring TH19-2084, Interval 55.0 to 60.0 ft, Box 6 of 8

Test Boring TH19-2084, Interval 60.0 to 68.5 ft, Box 7 of 8

Test Boring TH19-2084, Interval 68.5 to 73.5 ft, Box 8 of 8

TH19-2085

Test Boring TH19-2085, Interval 5.0 to 14.0 ft, Box 1 of 8

TH19-2085

Test Boring TH19-2085, Interval 14.0 to 23.0 ft, Box 2 of 8

Test Boring TH19-2085, Interval 23.0 to 32.0 ft, Box 3 of 8

Test Boring TH19-2085, Interval 32.0 to 42.0 ft, Box 4 of 8

Test Boring TH19-2085, Interval 40.0 to 48.5 ft, Box 5 of 8

Test Boring TH19-2085, Interval 48.5 to 56.8 ft, Box 6 of 8

Test Boring TH19-2085, Interval 56.8 to 65.0 ft, Box 7 of 8

Test Boring TH19-2085, Interval 65.0 to 75.0 ft, Box 8 of 8

Test Boring TH19-2086, 8.0 to 16.7 ft, Box 1 of 6

Test Boring TH19-2086, Interval 16.3 to 25.0 ft, Box 2 of 6

Test Boring TH19-2086, Interval 25.0 to 34.5 ft, Box 3 of 6

Test Boring TH19-2086, Interval 34.5 to 43.0 ft, Box 4 of 6

Test Boring TH19-2086, Interval 43.0 to 51.3 ft, Box 5 of 6

Test Boring TH19-2086, Interval 51.3 to 55.0 ft, Box 6 of 6

Test Boring TH19-2087, Interval 8.0 to 10.0 ft, Box 1 of 2

Test Boring TH19-2087, Interval 16.0 to 22.0 ft, Box 2 of 2

Test Boring TH19-2091, Interval 0.0 to 10.0 ft, Box 1 of 5

Test Boring TH19-2091, Interval 10.0 to 19.0 ft, Box 2 of 5

Test Boring TH19-2091, Interval 19.0 to 29.0 ft, Box 3 of 5

Test Boring TH19-2091, Interval 29.0 to 36.0 ft, Box 4 of 5

Test Boring TH19-2091, Interval 36.0 to 40.0 ft, Box 5 of 5

Test Boring TH19-2090, Interval 10.0 to 30.0 ft, Box 1 of 3

Test Boring TH19-2090, Interval 30.0 to 41.5 ft, Box 2 of 3

Test Boring TH19-2090, Interval 41.5 to 50.0 ft, Box 3 of 3

Test Boring TH19-2088, Interval 0.0 to 25.0 ft, Box 1 of 1