ADDENDUM TO THE RFP DOCUMENTS	Page Number 1	No. of Pages 38 including attachments
Addendum No. One	**Date Addendum Issued:** January 18, 2018	
Issuing Office Dept. of Natural Resources/Support Services Division 550 West 7th Ave., Suite 1330, Anchorage, Alaska 99501 Phone: 269-8666 Fax: 269-8909	**Previous Addenda Issued** None	
Project: 1000 Skies Subdivision Roads MP 136.5 Glenn Highway, Nelchina, AK	**Date and Hour of Offers Due** January 30, 2018 4:00 P.M..	

NOTICE TO OFFERORS

Offeror must acknowledge receipt of this addendum prior to the hour and date set for the proposals being due by one of the following methods:

(a) By acknowledging receipt of this addendum on the proposal submitted.
(b) By telegram or telefacsimile which includes a reference to the project and addendum number.

The bid documents require acknowledgment individually of all addenda to the drawings and/or specifications. This is a mandatory requirement and any bid received without acknowledgment of receipt of addenda may be classified as not being a responsive bid. If, by virtue of this addendum it is desired to modify a proposal already submitted, such modification may be made by telegram or telefacsimile provided such a telegram or telefacsimile makes reference to this addendum and is received prior to the opening hour and date specified above.

****

Bid Documents:

1. Add the Procurement Officer's email address marlys.hagen@alaska.gov to the Design Build RFP Form 00020.
2. Replace the Approach/Driveway Requirements (Page 8 of the Project Manual) with the attached Approach/Driveway Requirements.
3. Replace the bid schedule with the attached bid schedule 00312 consisting of 2 pages.
4. Replace sheets 1 of 3 and 2 of 3 of the Plan Sheets dated 12/12/17 (Page 78 and 79 of the Project Manual) with sheet 1 of 3 and 2 of 3 of the plan sheets attached to the Land Use Permit Application Supplemental Questionnaire (Pages 118 and 119 of the Project Manual).
5. Add the attached Mat-Su Borough road cross-section drawing to the RFP documents.
6. Add the attached geotechnical report prepared by Shannon & Wilson to the RFP documents.

All other terms, conditions, plans, and specifications remain unchanged.

Offerors are required to acknowledge this addendum on the proposal form or by FAX prior to the proposals being due.

****

Addendum Number One (1) received.

_____

Name/Title Date

_____

Firm

END OF ADDENDUM

Approach/Driveway Requirements **ADDENDUM 1**

The approach/driveway that will be constructed for the One Thousand Skies Loop will be constructed under the Alaska Department of Transportation and Public Facility (AKDOT&PF) standards outlined in the AKDOT&PF, "Alaska Highway Preconstruction Manual" and "Alaska Department of Transportation and Public Facilities: Standard Specification for Highway Construction (2017 Edition)".

The approach/driveway will require a sign and culvert to be installed per AKDOT&PF standards.

All the required standard and specifications for approach/driveway, signs and culverts will be provided. Plan drawings outlining the general requirements will be provided as supplemental information that can be used when designing and constructing the approach/driveway.

The Contractor must obtain written acceptance as follows: (1) from Alaska Dept. of Transportation and Public Facilities for the constructed approach, and (2) from the Mat-Su Borough Public Works Department for the constructed pioneer road.

Contractor will be required to provide 2 separate development plans and reclamation plans prior to clearing and material extraction as follows: (1) for the existing material site, and (2) for the staging area and road construction. The Contractor should meet with the Project Contact and the DNR/MLW permitting section of the Southcentral Region Office (SCRO) prior to performing any on-site work to ensure that all of these requirements are met.

DNR has added an additive alternate to the bid schedule for construction of additional linear feet of pioneer road for Phase II of this subdivision project. DNR may choose to award the additive alternate if it fits within our budget.

DESIGN BUILD (DB)
BID SCHEDULE

Competitive Sealed Proposals – Design/Build – AS 36.30.200(c)

Project: Pioneer road construction, MP 136.5 Glenn Highway Program No.:

Offerors, please read the following carefully before preparing this bid schedule:

The Offeror shall insert a fixed price in figures opposite each pay item which appears in the bid schedule. No price is to be entered or tendered for any item not appearing in the bid schedule.

Conditioned or qualified proposals will be considered non-responsive. The State wants to get the greatest amount of linear feet of road completed as possible within our budget of $320,000.

NOTICE: Price Proposals will be evaluated as described in the Evaluation Criteria under "Price."

Pay Items:

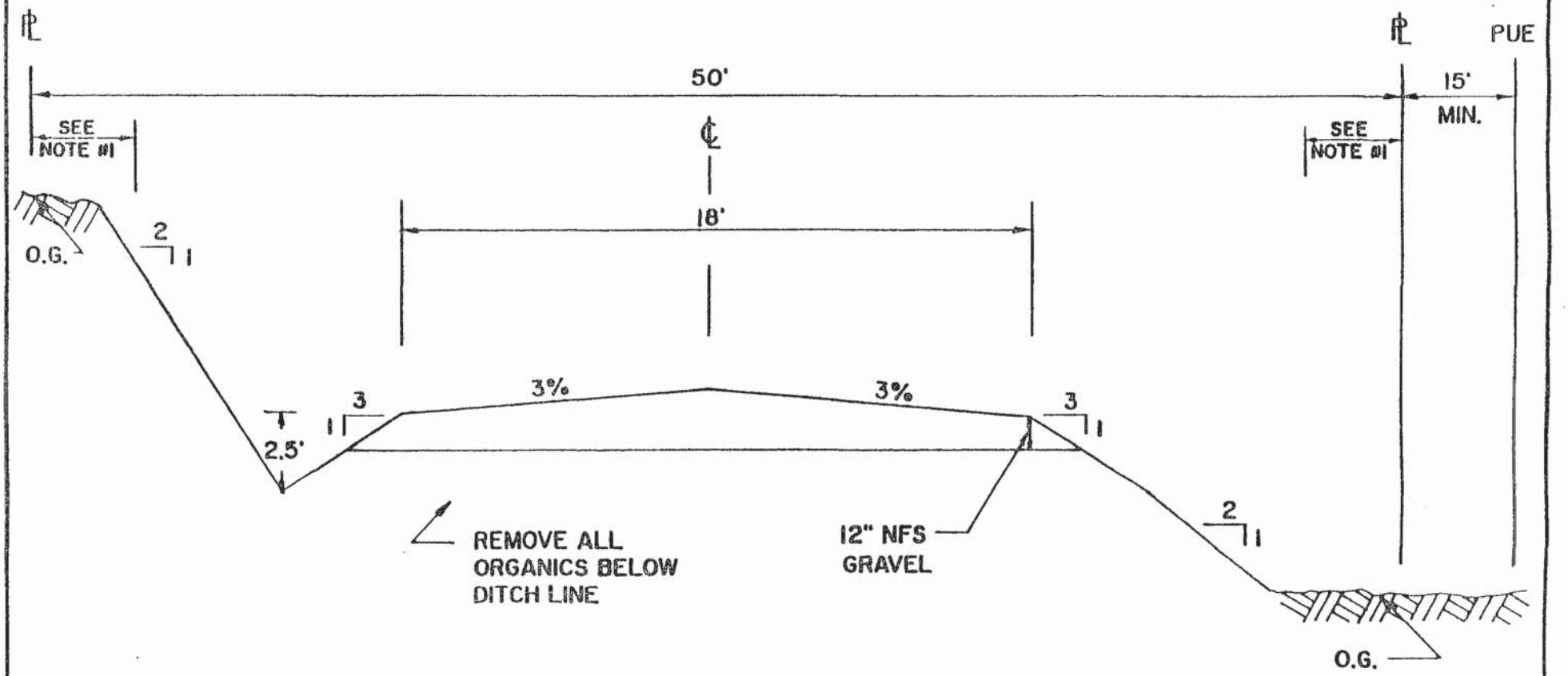
Item	Desc	Unit	Unit Price	Qty	Ext. Price
401(1)	Hot Mix Asphalt Type II, Grade B (only req'd if batch plant within 50 miles)	Ton	$_____	13.5	$_____
603(1)	24Inch CSP	LF	$_____	150	$_____
613(2)	Culvert Marker Post	Each	$_____	6	$_____
615(1)	Standard Sign (Stop Sign)	Sq ft	$_____	5	$_____
639(101)	Commercial Driveway (Approach)	LS		1	$_____
	Pioneer Road`	LF	$_____	_____	$_____
	Subtotal (add extended prices)				$_____
	Alaska Bidder's Preference (Subtract 5% of Subtotal				$_____
	Alaska Veteran-Owned Business Preference (Subtract 5% of Subtotal – not to exceed $5,000)				$_____
	Alaska Products Preference (attach worksheets)				$_____
	Adjusted Total Bid Amount				$_____
	Additive Alternate 1:				
	Additional LF of pioneer road for Phase II of the project.	LF	$_____	1	$_____

_____

Contractor's Name (Printed)

_____ _____
Business License Number, Expiration Date

_____ _____
Contractor's Registration Number, Expiration Date



PIONEER ACCESS
NTS

NOTES: #1. ROW OR SLOPE EASEMENT TO CONTAIN ALL CONSTRUCTION +5'.
#2. MORE THAN 12" NFS GRAVEL MAY BE NEEDED FOR STABLE ROAD, DEPENDING ON SUBBASE.

MATANUSKA-SUSITNA BOROUGH
PUBLIC WORKS DEPARTMENT
APRIL 15, 1991

Geotechnical Data Report
One Thousand Skies Subdivision
Nelchina, Alaska

May 2017

Submitted To:
Alaska Department of Natural Resources
550 West 7th Avenue, Suite 1230
Anchorage, Alaska 99501

By:

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32-1-02580

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GEOTECHNICAL DATA REPORT
ONE THOUSAND SKIES SUBDIVISION
NELCHINA, ALASKA

1.0 INTRODUCTION

This report presents the results of subsurface explorations and laboratory testing conducted by Shannon & Wilson, Inc. at the proposed site for the One Thousand Skies Subdivision near Nelchina, Alaska. The purpose of this geotechnical study was to observe and document subsurface conditions. To accomplish this, we advanced nine geotechnical borings within the project area. Selected soil samples recovered from the borings were tested in our Anchorage laboratory. Presented in this report are descriptions of the site and project, subsurface exploration and laboratory test results, and an interpretation of subsurface conditions.

Authorization to proceed with this work was received in the form of a small procurement document (Agreement Number CT 170007898) from Ms. Marlys Hagen, Procurement Officer of Department of Natural Resources (DNR) on April 14, 2017. Our work was conducted in general accordance with our April 3, 2017 proposal.

2.0 SITE AND PROJECT DESCRIPTION

The project area is located near approximate milepost (MP) 136 of the Glenn Highway, approximately 7 miles west of Nelchina, Alaska. The proposed development consists of a new roadway south from the Glenn Highway in portions of Sections 1 and 12 of Township 2 North, Range 10 West, Copper River Meridian. The proposed new road alignment generally follows a local topographic high and slopes gently down to the south. At the time of our explorations, the project area was undeveloped and vegetation consisted of numerous spruce and alder trees with moss covering the ground surface. A vicinity map indicating the general project location is presented as Figure 1. A site plan, included as Figure 2, shows the approximate boring locations.

3.0 SUBSURFACE EXPLORATIONS

Subsurface explorations for this study consisted of drilling and sampling nine borings, designated Borings B-1 through B-9, along the proposed project alignment on May 3 and 4, 2017. The general proposed alignment was located by Mr. Clifford Baker of DNR and the boring locations were selected to provide relatively even coverage as directed by Mr. Baker. The boring locations, shown on Figure 2, were recorded with a handheld GPS unit that is generally

considered accurate to within 20 feet horizontally. It should be noted that GPS accuracy may be affected by geographic features, and atmospheric anomalies. Elevations shown on the boring logs were based on topographic contours provided by the DNR. The boring locations shown on the site plan and elevations shown on the boring logs should be considered approximate.

Drilling services for this project were provided by Discovery Drilling, using a track mounted CME-75 drill rig. Traffic control, including signage, flaggers, and lane closure coordination, was provided by Northern Dame Construction. An experienced engineer from our firm was present during drilling to locate the borings, observe drill action, collect samples, log subsurface conditions, and observe groundwater conditions.

The borings were advanced with $3^1/_4$-inch inner diameter (ID), continuous flight, hollow-stem augers to depths ranging between 15.1 and 16.5 feet below ground surface (bgs). The final depth of the borings was dependent upon the penetration of the final sample. As the borings were advanced, samples were typically recovered using modified penetration test (MPT) methods at 2.5-foot intervals to 10 feet bgs with a final sample at 15 feet bgs. In the MPT method, samples are recovered by driving a 3-inch outer diameter (OD) split-spoon sampler into the bottom of the advancing hole with blows of a 340-pound hammer free falling 30 inches onto the drill rod. The number of blows required to advance the sampler the final 12 inches of an 18-inch penetration is termed the penetration resistance. Where the sampler did not penetrate the full 18 inches, our logs report the total blow count and corresponding penetration in inches. Blow counts are shown graphically on the boring logs as "penetration resistance" and are displayed adjacent to sample depth. The penetration resistance values give a measure of the relative density (compactness) or consistency (stiffness) of cohesionless or cohesive soils, respectively. In addition to the split-spoon samples, a grab sample of the near-surface soils was collected from the auger cuttings in the upper 2 feet of each boring.

The soils that were encountered in the borings were observed and described in the field in general accordance with the classification system described by ASTM International (ASTM) D2488. Selected samples recovered during drilling were tested in our laboratory to refine our soil descriptions in general accordance with the Unified Soil Classification System (USCS) described in Figure 3. Frost classifications were also estimated for samples based on laboratory testing (sieve analyses and percent passing the Number 200 sieve [P-200]) and are shown on the boring logs. The frost classification system is presented in Figure 4 and a legend to the frozen soil classification system is presented as Figure 5. Summary logs of the borings are presented in Figures 6 through 14.

Borings were backfilled with auger cuttings and in Borings B-3, B-5, and B-6, 1-inch PVC groundwater level monitoring casing was installed to the bottom of the borings to facilitate static water level measurements.

4.0 LABORATORY TESTING

Laboratory tests were performed on selected soil samples recovered from the borings. The laboratory testing was formulated with emphasis on determining gradation properties, natural water content, frost characteristics, and plasticity.

Water content tests were performed on the samples returned to our laboratory. Water content tests were performed in general accordance with ASTM D2216. The results of the water content measurements are presented graphically on the boring logs in Figures 6 through 14.

Grain size classification (gradation) testing was performed to estimate the particle size distribution of selected samples from the borings. The gradation testing generally followed the procedures described in ASTM C117/C136 and ASTM D421/422. The test results are presented in Figure 15 and summarized on the boring logs as percent gravel, percent sand, and percent fines. Percent fines on the boring logs are equal to the sum of the silt and clay fractions indicated by the percent passing the No. 200 sieve.

5.0 SUBSURFACE CONDITIONS

The subsurface conditions encountered in our explorations are presented graphically on the boring logs included in Figures 6 through 14. The borings generally encountered approximately 2 inches of moss and ground cover vegetation at the surface followed by granular material with varying amounts of silt and occasional fine grained layers. The seasonal frost zone generally extended from the surface to between 4 and 6.5 feet bgs in our borings, although the delineation of frozen material was difficult to discern due to the lack of excess ice, relatively weak ice bonding, the material type, and the compactness of the soils. Permafrost was noted in Borings B-5 and B-8 from approximately 10 feet bgs to the bottom of each boring, 15.3 and 15.5 feet bgs, respectively. Visible ice classified as Vr (random ice formations) to Vx (individual ice crystals) was observed in Boring B-4, Sample S2, Boring B-5, Sample S2, and Boring B-8, Sample S5b. Visible ice volume was estimated at 5 to 10 percent and ice crystal size was recorded from 1 to 3 millimeters. The remaining frozen soils were classified as Nf to Nbn (poorly bonded to well bonded).

Native material was dominated by silty sand with gravel but also contained silty gravel with sand and occasional cleaner (less than 12 percent fines) layers. Organic material was noted in the upper 2 feet of each boring. The material tested was generally moderately to highly frost susceptible (F3) and blow counts indicate that the non-frozen soils were very dense. Elevated blow counts were observed in the frozen soils and are considered unreliable in estimating soil density due to ice bonding. Moisture contents ranged from approximately 2 to 20 percent, with the higher values generally associated with fine grained material or surface soils.

Groundwater was not encountered during drilling except for Boring B-6, which found a significantly wetter zone at approximately 15 feet bgs. Note that water levels may fluctuate by several feet seasonally and may vary during periods of high precipitation or rapid snow melt.

6.0 CLOSURE AND LIMITATIONS

This report was prepared for the exclusive use of our client and their representatives for evaluating the site as it relates to the geotechnical aspects discussed herein. The conclusions contained in this report are based on site conditions as they presently exist. It is assumed that the exploratory borings are representative of the subsurface conditions throughout the site, i.e., the subsurface conditions everywhere are not significantly different from those disclosed by the explorations.

If there is a substantial lapse of time between the submittal of this report and the start of work at the site, or if conditions have changed due to natural causes or construction operations at or adjacent to the site, it is recommended that this report be reviewed to determine the applicability of the conclusions considering the changed conditions and time lapse. Unanticipated soil conditions are commonly encountered and cannot fully be determined by merely taking soil samples or advancing borings. Shannon & Wilson has prepared the attachments in Appendix A *Important Information About Your Geotechnical/Environmental Report* to assist you and others in understanding the use and limitations of the reports.

Copies of documents that may be relied upon by our client are limited to the printed copies (also known as hard copies) that are signed or sealed by Shannon & Wilson with a wet, blue ink signature. Files provided in electronic media format are furnished solely for the convenience of the client. Any conclusion or information obtained or derived from such electronic files shall be at the user's sole risk. If there is a discrepancy between the electronic files and the hard copies, or you question the authenticity of the report please contact the undersigned.

We appreciate this opportunity to be of service. Please contact the undersigned at (907) 561-2120 with questions or comments concerning the contents of this report.

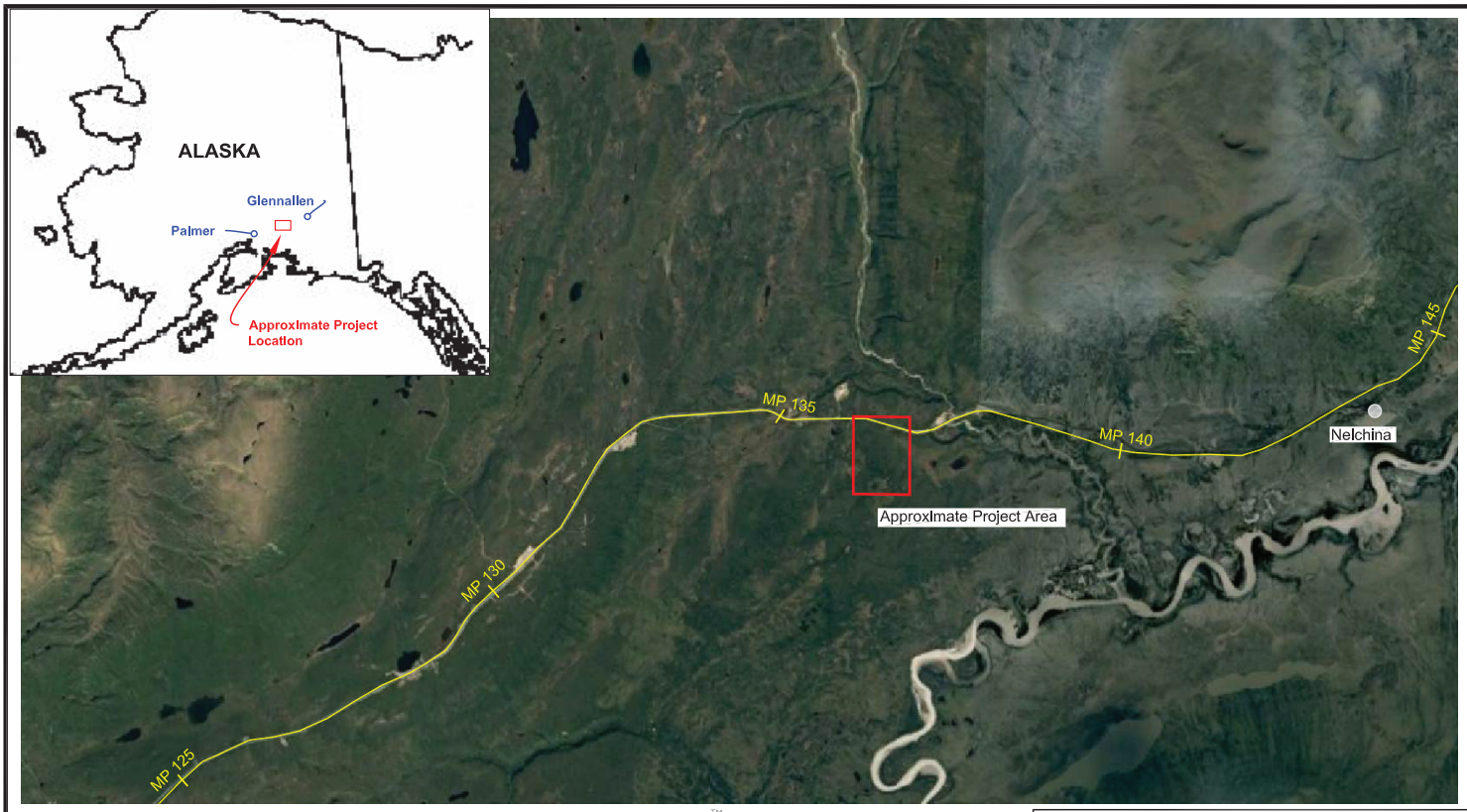
SHANNON & WILSON, INC.

Katra Wedeking

Digitally signed by Katra Wedeking
Date: 2017.05.23 11:45:20 -08'00'

Katra Wedeking, CPG
Senior Geologist

Kyle Brennan, PE
Vice President



Map adapted from aerial imagery provided by Google Earth Pro, reproduced by permission granted by Google Earth™ Mapping Service.

0 1 2 4

APPROXIMATE SCALE IN MILES

N

One Thousand Skies Subdivision
Nelchina, Alaska

VICINITY MAP

May 2017 32-1-02580

SHANNON & WILSON, INC.
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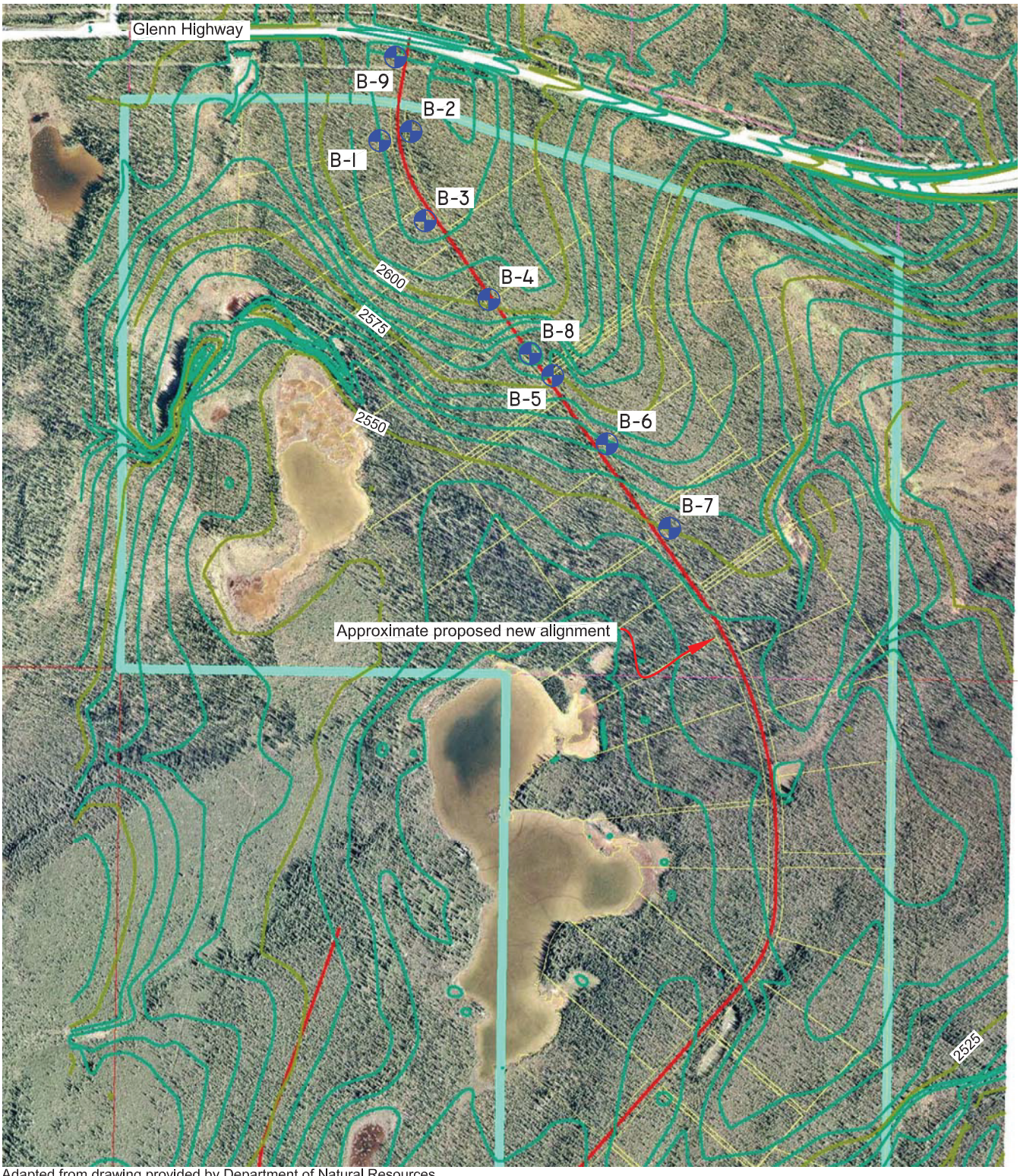
FIG. 1



Adapted from drawing provided by Department of Natural Resources.
Contour interval = 5 feet

LEGEND

B-1 Approximate Location of Boring B-1, Advanced by Shannon & Wilson, May 2017

0 500 1000 2000
APPROXIMATE SCALE IN FEET

N

One Thousand Skies Subdivision
Nelchina, Alaska

SITE PLAN

May 2017 32-1-02580

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FIG. 2

Shannon & Wilson, Inc. (S&W), uses a soil identification system modified from the Unified Soil Classification System (USCS). Elements of the USCS and other definitions are provided on this and the following pages. Soil descriptions are based on visual-manual procedures (ASTM D2488) and laboratory testing procedures (ASTM D2487), if performed.

S&W INORGANIC SOIL CONSTITUENT DEFINITIONS

CONSTITUENT[2]	FINE-GRAINED SOILS (50% or more fines)[1]	COARSE-GRAINED SOILS (less than 50% fines)[1]
Major	***Silt, Lean Clay, Elastic Silt,*** or ***Fat Clay***[3]	***Sand*** or ***Gravel***[4]
Modifying (Secondary) Precedes major constituent	30% or more coarse-grained: ***Sandy*** or ***Gravelly***[4]	More than 12% fine-grained: ***Silty*** or ***Clayey***[3]
Minor Follows major constituent	15% to 30% coarse-grained: ***with Sand*** or ***with Gravel***[4]	5% to 12% fine-grained: ***with Silt*** or ***with Clay***[3]
	30% or more total coarse-grained *and* lesser coarse-grained constituent is 15% or more: ***with Sand*** or ***with Gravel***[5]	15% or more of a second coarse-grained constituent: ***with Sand*** or ***with Gravel***[5]

[1]All percentages are by weight of total specimen passing a 3-inch sieve.
[2]The order of terms is: *Modifying Major with Minor*.
[3]Determined based on behavior.
[4]Determined based on which constituent comprises a larger percentage.
[5]Whichever is the lesser constituent.

MOISTURE CONTENT TERMS

Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, from below water table

STANDARD PENETRATION TEST (SPT) SPECIFICATIONS

Hammer:	140 pounds with a 30-inch free fall. Rope on 6- to 10-inch-diam. cathead 2-1/4 rope turns, > 100 rpm NOTE: If automatic hammers are used, blow counts shown on boring logs should be adjusted to account for efficiency of hammer.
Sampler:	10 to 30 inches long Shoe I.D. = 1.375 inches Barrel I.D. = 1.5 inches Barrel O.D. = 2 inches
N-Value:	Sum blow counts for second and third 6-inch increments. Refusal: 50 blows for 6 inches or less; 10 blows for 0 inches.

NOTE: Penetration resistances (N-values) shown on boring logs are as recorded in the field and have not been corrected for hammer efficiency, overburden, or other factors.

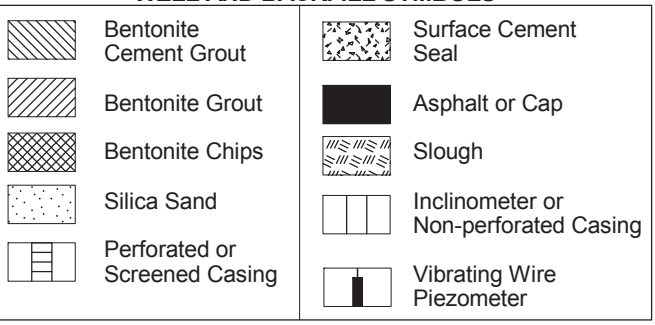
PARTICLE SIZE DEFINITIONS

DESCRIPTION	SIEVE NUMBER AND/OR APPROXIMATE SIZE
FINES	< #200 (0.075 mm = 0.003 in.)
SAND	
Fine	#200 to #40 (0.075 to 0.4 mm; 0.003 to 0.02 in.)
Medium	#40 to #10 (0.4 to 2 mm; 0.02 to 0.08 in.)
Coarse	#10 to #4 (2 to 4.75 mm; 0.08 to 0.187 in.)
GRAVEL	
Fine	#4 to 3/4 in. (4.75 to 19 mm; 0.187 to 0.75 in.)
Coarse	3/4 to 3 in. (19 to 76 mm)
COBBLES	3 to 12 in. (76 to 305 mm)
BOULDERS	> 12 in. (305 mm)

RELATIVE DENSITY / CONSISTENCY

COHESIONLESS SOILS		COHESIVE SOILS	
N, SPT, BLOWS/FT.	RELATIVE DENSITY	N, SPT, BLOWS/FT.	RELATIVE CONSISTENCY
< 4	Very loose	< 2	Very soft
4 - 10	Loose	2 - 4	Soft
10 - 30	Medium dense	4 - 8	Medium stiff
30 - 50	Dense	8 - 15	Stiff
> 50	Very dense	15 - 30	Very stiff
		> 30	Hard

WELL AND BACKFILL SYMBOLS



PERCENTAGES TERMS [1, 2]

Trace	< 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

[1]Gravel, sand, and fines estimated by mass. Other constituents, such as organics, cobbles, and boulders, estimated by volume.

[2]Reprinted, with permission, from ASTM D2488 - 09a Standard Practice for Description and Identification of Soils (Visual-Manual Procedure), copyright ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428. A copy of the complete standard may be obtained from ASTM International, www.astm.org.

One Thousand Skies Subdivision
Nelchina, Alaska

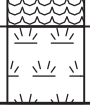
SOIL DESCRIPTION AND LOG KEY

May 2017 32-1-02580

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 3
Sheet 1 of 3

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)
(Modified From USACE Tech Memo 3-357, ASTM D2487, and ASTM D2488)

MAJOR DIVISIONS			GROUP/GRAPHIC SYMBOL		TYPICAL IDENTIFICATIONS
COARSE-GRAINED SOILS *(more than 50% retained on No. 200 sieve)*	Gravels *(more than 50% of coarse fraction retained on No. 4 sieve)*	Gravel *(less than 5% fines)*	GW		Well-Graded Gravel; Well-Graded Gravel with Sand
			GP		Poorly Graded Gravel; Poorly Graded Gravel with Sand
		Silty or Clayey Gravel *(more than 12% fines)*	GM		Silty Gravel; Silty Gravel with Sand
			GC		Clayey Gravel; Clayey Gravel with Sand
	Sands *(50% or more of coarse fraction passes the No. 4 sieve)*	Sand *(less than 5% fines)*	SW		Well-Graded Sand; Well-Graded Sand with Gravel
			SP		Poorly Graded Sand; Poorly Graded Sand with Gravel
		Silty or Clayey Sand *(more than 12% fines)*	SM		Silty Sand; Silty Sand with Gravel
			SC		Clayey Sand; Clayey Sand with Gravel
FINE-GRAINED SOILS *(50% or more passes the No. 200 sieve)*	Silts and Clays *(liquid limit less than 50)*	Inorganic	ML		Silt; Silt with Sand or Gravel; Sandy or Gravelly Silt
			CL		Lean Clay; Lean Clay with Sand or Gravel; Sandy or Gravelly Lean Clay
		Organic	OL		Organic Silt or Clay; Organic Silt or Clay with Sand or Gravel; Sandy or Gravelly Organic Silt or Clay
	Silts and Clays *(liquid limit 50 or more)*	Inorganic	MH		Elastic Silt; Elastic Silt with Sand or Gravel; Sandy or Gravelly Elastic Silt
			CH		Fat Clay; Fat Clay with Sand or Gravel; Sandy or Gravelly Fat Clay
		Organic	OH		Organic Silt or Clay; Organic Silt or Clay with Sand or Gravel; Sandy or Gravelly Organic Silt or Clay
HIGHLY-ORGANIC SOILS	Primarily organic matter, dark in color, and organic odor		PT		Peat or other highly organic soils (see ASTM D4427)

NOTE: No. 4 size = 4.75 mm = 0.187 in.; No. 200 size = 0.075 mm = 0.003 in.

NOTES

1. Dual symbols *(symbols separated by a hyphen, i.e., SP-SM, Sand with Silt)* are used for soils with between 5% and 12% fines or when the liquid limit and plasticity index values plot in the CL-ML area of the plasticity chart. Graphics shown on the logs for these soil types are a combination of the two graphic symbols (e.g., SP and SM).

2. Borderline symbols *(symbols separated by a slash, i.e., CL/ML, Lean Clay to Silt; SP-SM/SM, Sand with Silt to Silty Sand)* indicate that the soil properties are close to the defining boundary between two groups.

One Thousand Skies Subdivision
Nelchina, Alaska

SOIL DESCRIPTION AND LOG KEY

May 2017 32-1-02580

SHANNON & WILSON, INC.
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FIG. 3
Sheet 2 of 3

GRADATION TERMS

Poorly Graded	Narrow range of grain sizes present or, within the range of grain sizes present, one or more sizes are missing (Gap Graded). Meets criteria in ASTM D2487, if tested.
Well-Graded	Full range and even distribution of grain sizes present. Meets criteria in ASTM D2487, if tested.

CEMENTATION TERMS[1]

Weak	Crumbles or breaks with handling or slight finger pressure
Moderate	Crumbles or breaks with considerable finger pressure
Strong	Will not crumble or break with finger pressure

PLASTICITY[2]

DESCRIPTION	VISUAL-MANUAL CRITERIA	APPROX. PLASITICTY INDEX RANGE
Nonplastic	A 1/8-in. thread cannot be rolled at any water content.	< 4
Low	A thread can barely be rolled and a lump cannot be formed when drier than the plastic limit.	4 to 10
Medium	A thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. A lump crumbles when drier than the plastic limit.	10 to 20
High	It take considerable time rolling and kneading to reach the plastic limit. A thread can be rerolled several times after reaching the plastic limit. A lump can be formed without crumbling when drier than the plastic limit.	> 20

ADDITIONAL TERMS

Mottled	Irregular patches of different colors.
Bioturbated	Soil disturbance or mixing by plants or animals.
Diamict	Nonsorted sediment; sand and gravel in silt and/or clay matrix.
Cuttings	Material brought to surface by drilling.
Slough	Material that caved from sides of borehole.
Sheared	Disturbed texture, mix of strengths.

PARTICLE ANGULARITY AND SHAPE TERMS[1]

Angular	Sharp edges and unpolished planar surfaces.
Subangular	Similar to angular, but with rounded edges.
Subrounded	Nearly planar sides with well-rounded edges.
Rounded	Smoothly curved sides with no edges.
Flat	Width/thickness ratio > 3.
Elongated	Length/width ratio > 3.

ACRONYMS AND ABBREVIATIONS

ATD	At Time of Drilling
Diam.	Diameter
Elev.	Elevation
ft.	Feet
FeO	Iron Oxide
gal.	Gallons
Horiz.	Horizontal
HSA	Hollow Stem Auger
I.D.	Inside Diameter
in.	Inches
lbs.	Pounds
MgO	Magnesium Oxide
mm	Millimeter
MnO	Manganese Oxide
NA	Not Applicable or Not Available
NP	Nonplastic
O.D.	Outside Diameter
OW	Observation Well
pcf	Pounds per Cubic Foot
PID	Photo-Ionization Detector
PMT	Pressuremeter Test
ppm	Parts per Million
psi	Pounds per Square Inch
PVC	Polyvinyl Chloride
rpm	Rotations per Minute
SPT	Standard Penetration Test
USCS	Unified Soil Classification System
q_u	Unconfined Compressive Strength
VWP	Vibrating Wire Piezometer
Vert.	Vertical
WOH	Weight of Hammer
WOR	Weight of Rods
Wt.	Weight

STRUCTURE TERMS[1]

Interbedded	Alternating layers of varying material or color with layers at least 1/4-inch thick; singular: bed.
Laminated	Alternating layers of varying material or color with layers less than 1/4-inch thick; singular: lamination.
Fissured	Breaks along definite planes or fractures with little resistance.
Slickensided	Fracture planes appear polished or glossy; sometimes striated.
Blocky	Cohesive soil that can be broken down into small angular lumps that resist further breakdown.
Lensed	Inclusion of small pockets of different soils, such as small lenses of sand scattered through a mass of clay.
Homogeneous	Same color and appearance throughout.

[1]Reprinted, with permission, from ASTM D2488 - 09a Standard Practice for Description and Identification of Soils (Visual-Manual Procedure), copyright ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428. A copy of the complete standard may be obtained from ASTM International, www.astm.org.
[2]Adapted, with permission, from ASTM D2488 - 09a Standard Practice for Description and Identification of Soils (Visual-Manual Procedure), copyright ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428. A copy of the complete standard may be obtained from ASTM International, www.astm.org.

One Thousand Skies Subdivision
Nelchina, Alaska

SOIL DESCRIPTION AND LOG KEY

May 2017 32-1-02580

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FIG. 3
Sheet 3 of 3

2013_BORING_CLASS3_02580 GINT.GPJ SWNEW.GDT 5/18/17

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FROST CLASSIFICATION

(after Municipality of Anchorage, 2009 Rev. 3)

GROUP		0.02 Mil.	P-200*	USC SYSTEM (based on P-200 results)
NFS	Sandy Soils	0 to 3	0 to 6	SW, SP, SW-SM, SP-SM
	Gravelly Soils	0 to 3	0 to 6	GW, GP, GW-GM, GP-GM
F1	Gravelly Soils	3 to 10	6 to 13	GM, GW-GM, GP-GM
F2	Sandy Soils	3 to 15	6 to 19	SP-SM, SW-SM, SM
	Gravelly Soils	10 to 20	13 to 25	GM
F3	Sands, except very fine silty sands**	Over 15	Over 19	SM, SC
	Gravelly Soils	Over 20	Over 25	GM, GC
	Clays, PI>12			CL, CH
F4	All Silts			ML, MH
	Very fine silty sands**	Over 15	Over 19	SM, SC
	Clays, PI<12			CL, CL-ML
	Varved clays and other fined grained, banded sediments			CL and ML CL, ML, and SM; SL, SH, and ML; CL, CH, ML, and SM

PI = Plasticity Index
P-200 = Percent passing the number 200 sieve
0.02 Mil. = Percent material below 0.02 millimeter grain size

*Approximate P-200 value equivalent for frost classification. Value range based on typical, well-graded soil curves.

** Very fine sand : greater than 50% of sand fraction passing the number 100 sieve

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Nelchina, Alaska

FROST CLASSIFICATION LEGEND

May 2017 32-1-02580

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FIG. 4

FROZEN SOIL CLASSIFICATION SYSTEM

Description			Designation
Segregated ice is not visible by eye	Friable, poorly-bonded Material is easily broken up		Nf
	Well bonded, soil particles strongly held together by ice	No excess ice	Nbn
		Excess ice	Nbe
Segregated ice is visible by eye (less than 1-inch thick)	Individual ice crystals or inclusions		Vx
	Ice coatings on soil particles		Vc
	Stratified or distinctly oriented ice formations		Vs
	Randomly or irregularly oriented ice formations		Vr
Ice greater than 1-inch thick	Ice with soil inclusions		ICE+ soil type
	Ice without soil inclusions		ICE

Based on Linell, K.A. and C.W. Kaplar 1966. Description and classification of frozen soils. *U.S. Army Cold Regions Research & Engineering Laboratory, Technical Report 150*. Hanover, NH

One Thousand Skies Subdivision
Nelchina, Alaska

FROZEN SOIL CLASSIFICATION LEGEND

May 2017 32-1-02580

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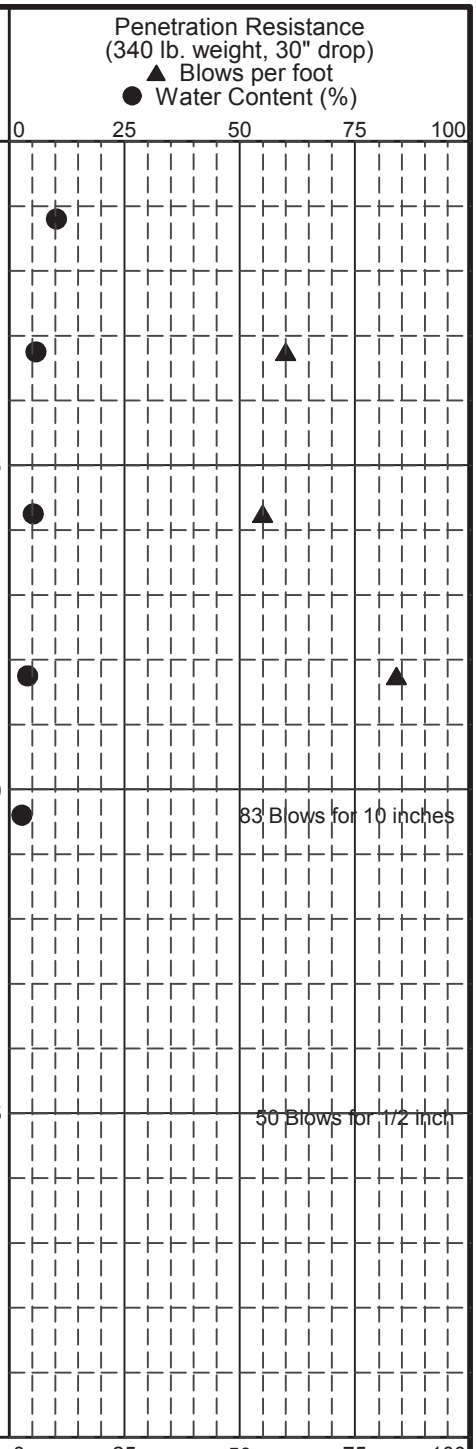
FIG. 5

MATERIAL DESCRIPTION Approx. Elevation: 2610 Ft.	Depth, Ft.	Symbol	Samples	Ground Water Depth, Ft.
2 inches moss/vegetation at surface Frozen to very dense. brown, *Silty Sand with Gravel (SM)*; moist; trace organics upper 2 feet Frozen soil Nf to Nbn	0.2		S1 B	
S2: 26% Gravel, 40% Sand, 34% Fines (F3)			S2	
			S3	
S4: 33% Gravel, 38% Sand, 29% Fines (F3)			S4	
			S5	
	15.1		S6 *	
Bottom of Boring Boring Completed 5.3.17				

Groundwater not encountered during drilling on 5.3.17



LEGEND

* Sample Not Recovered
B Auger Cuttings
3" O.D. Split Spoon Sample

Frozen

● Water Content (%)
Plastic Limit — Liquid Limit
Natural Water Content

NOTES

1. The stratification lines represent the approximate boundaries between soil types, and the transition may be gradual.
2. The discussion in the text of this report is necessary for a proper understanding of the nature of subsurface materials.
3. Water level, if indicated above, is for the date specified and may vary.

One Thousand Skies Subdivision
Nelchina, Alaska

LOG OF BORING B-1

May 2017 32-1-02580

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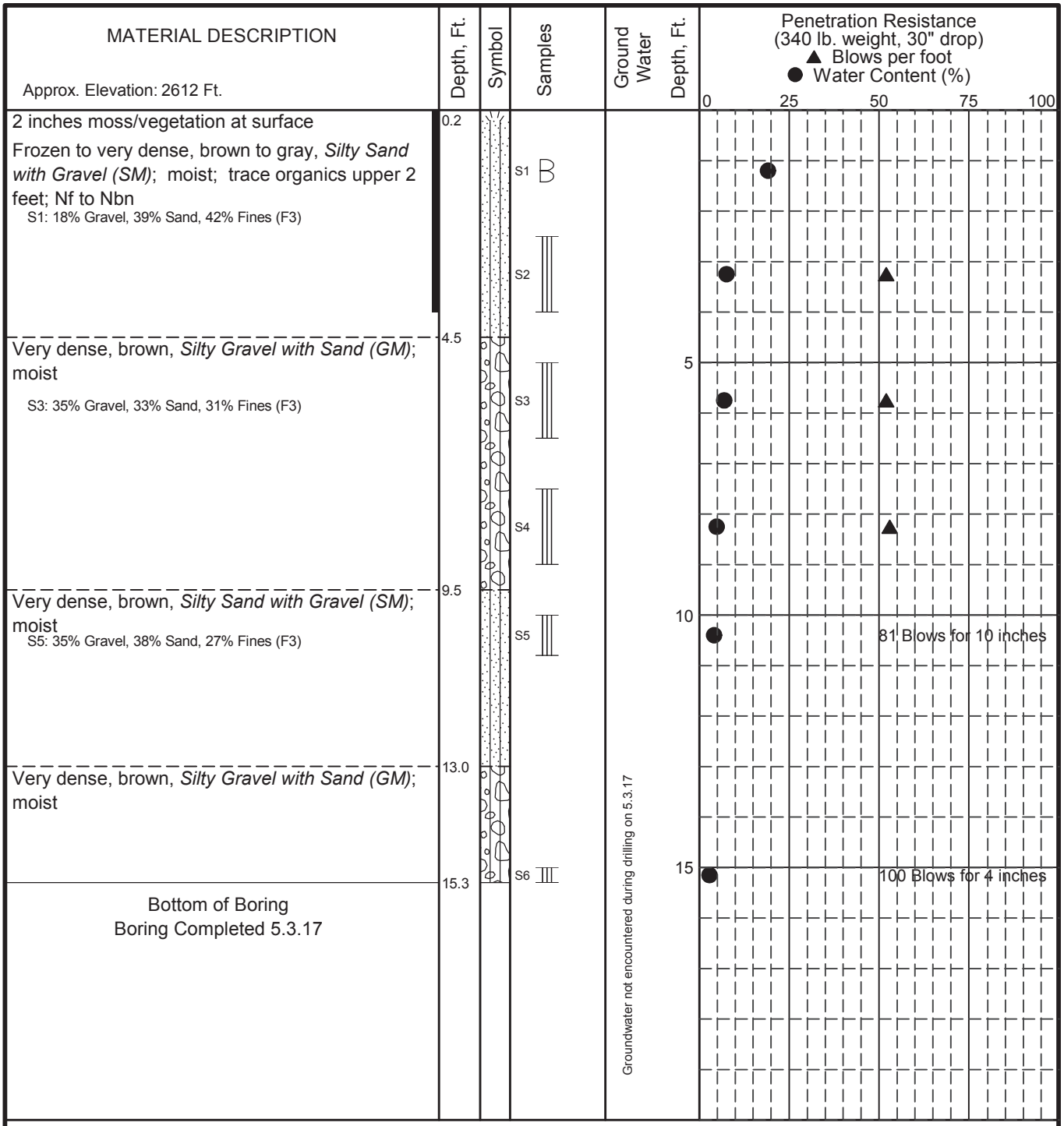
FIG. 6

GEOTECHNICAL LOG 02580 GINT.GPJ S&W_GEO1.GDT 5/18/17

REV 3 - Approved for Submittal



LEGEND

* Sample Not Recovered
B Auger Cuttings
3" O.D. Split Spoon Sample

Frozen

● Water Content (%)
Plastic Limit — Liquid Limit
Natural Water Content

NOTES

1. The stratification lines represent the approximate boundaries between soil types, and the transition may be gradual.
2. The discussion in the text of this report is necessary for a proper understanding of the nature of subsurface materials.
3. Water level, if indicated above, is for the date specified and may vary.

One Thousand Skies Subdivision
Nelchina, Alaska

LOG OF BORING B-2

May 2017 32-1-02580

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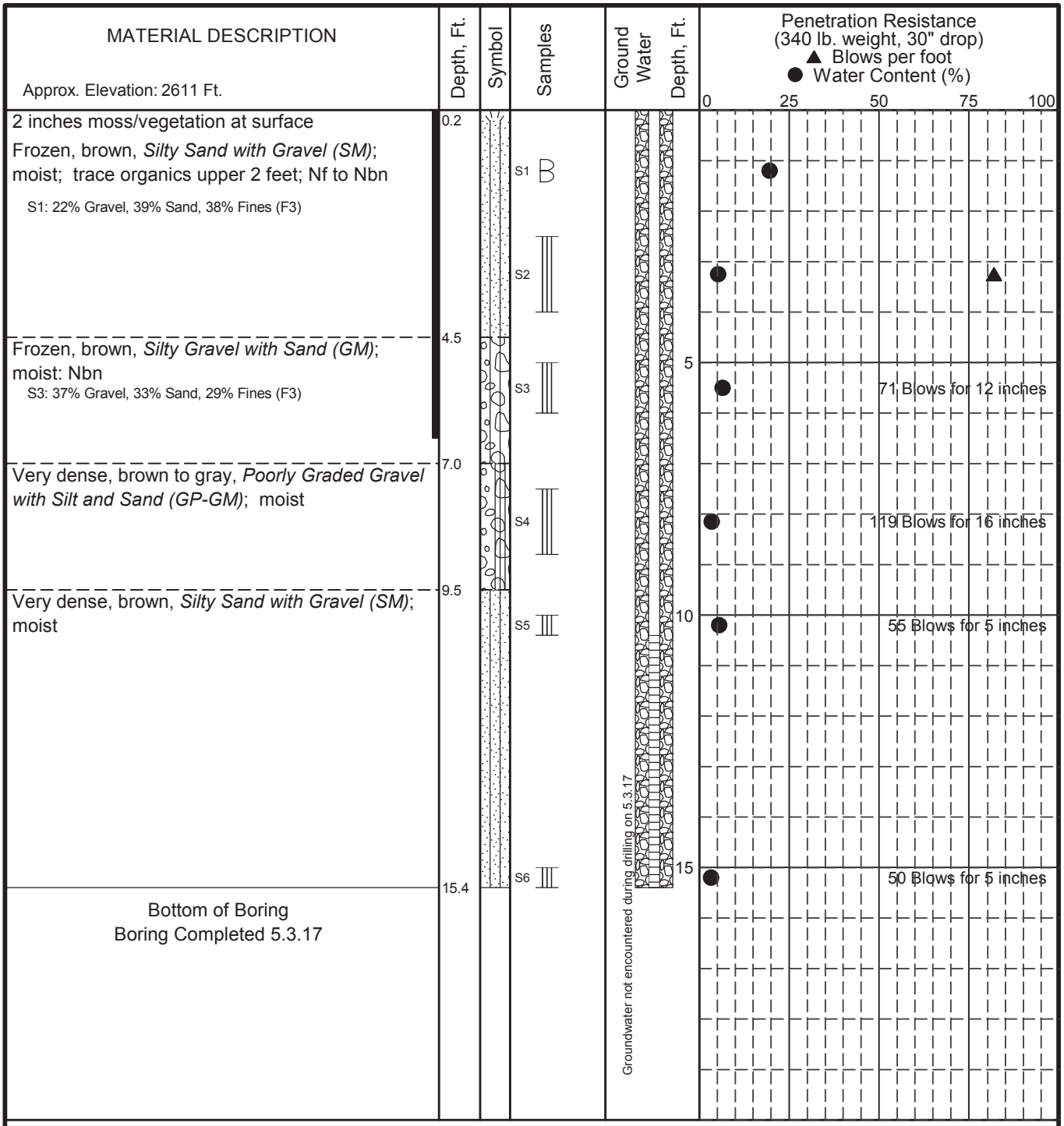
FIG. 7

GEOTECHNICAL LOG 02580 GINT.GPJ S&W_GEO1.GDT 5/18/17

REV 3 - Approved for Submittal



LEGEND

* Sample Not Recovered
B Auger Cuttings
3" O.D. Split Spoon Sample
Frozen
Blank Section, Cuttings Backfill
Slotted Section, Cuttings Backfill

● Water Content (%)
Plastic Limit — Liquid Limit
Natural Water Content

NOTES

1. The stratification lines represent the approximate boundaries between soil types, and the transition may be gradual.
2. The discussion in the text of this report is necessary for a proper understanding of the nature of subsurface materials.
3. Water level, if indicated above, is for the date specified and may vary.

One Thousand Skies Subdivision
Nelchina, Alaska

LOG OF BORING B-3

May 2017 32-1-02580

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FIG. 8

GEOTECHNICAL LOG 02580 GINT.GPJ S&W_GEO1.GDT 5/18/17

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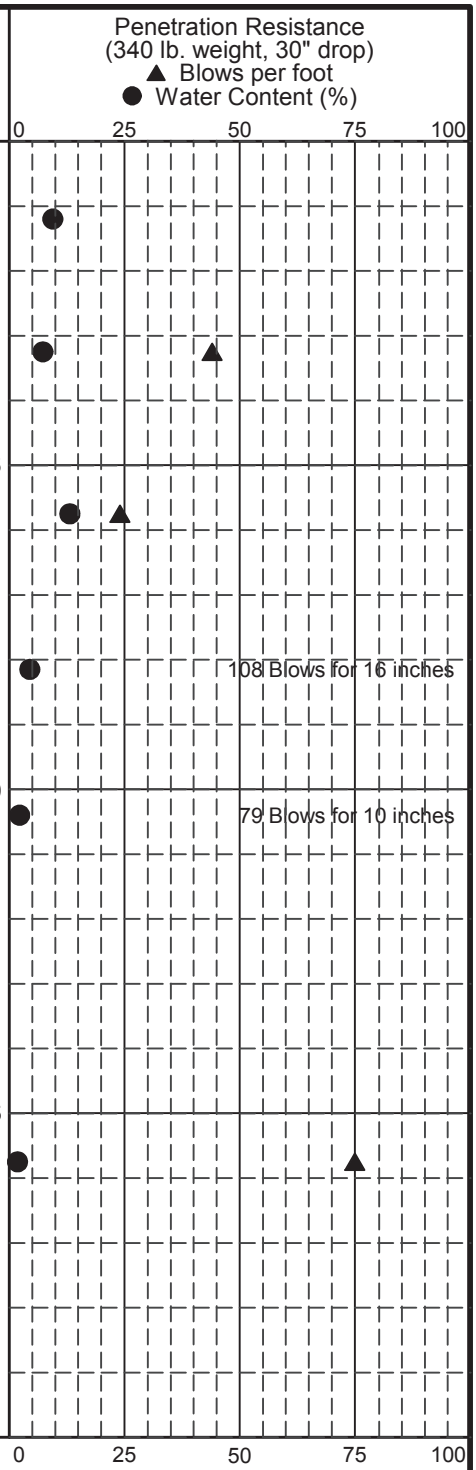
MATERIAL DESCRIPTION Approx. Elevation: 2601 Ft.	Depth, Ft.	Symbol	Samples	Ground Water Depth, Ft.
2 inches moss/vegetation at surface Frozen, brown, *Sandy Silt (ML)*; moist; trace organics; Nf	0.2		S1 B	
Frozen, brown, *Silty Sand with Gravel (SM)*; moist; Nf S2: 30% Gravel, 37% Sand, 33% Fines (F3)	2.0		S2	
Frozen, brown, *Silt with Sand (ML)*; moist; visible ice 5-10% by volume, Vr to Vx, 2-3mm	4.5		S3	
Very dense, brown to gray, *Silty Sand with Gravel (SM)*; moist	7.0		S4	
Very dense, brown, *Well-Graded Sand with Silt and Gravel (SW-SM)*; moist S6: 43% Gravel, 51% Sand, 6% Fines (NFS)	9.5		S5	
Bottom of Boring Boring Completed 5.3.17	16.5		S6	

Groundwater not encountered during drilling on 5.3.17



LEGEND

* Sample Not Recovered
B Auger Cuttings
3" O.D. Split Spoon Sample

Frozen

● Water Content (%)
Plastic Limit — Liquid Limit
Natural Water Content

NOTES

1. The stratification lines represent the approximate boundaries between soil types, and the transition may be gradual.
2. The discussion in the text of this report is necessary for a proper understanding of the nature of subsurface materials.
3. Water level, if indicated above, is for the date specified and may vary.

One Thousand Skies Subdivision
Nelchina, Alaska

LOG OF BORING B-4

May 2017 32-1-02580

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FIG. 9

GEOTECHNICAL LOG 02580 GINT.GPJ S&W_GEO1.GDT 5/18/17

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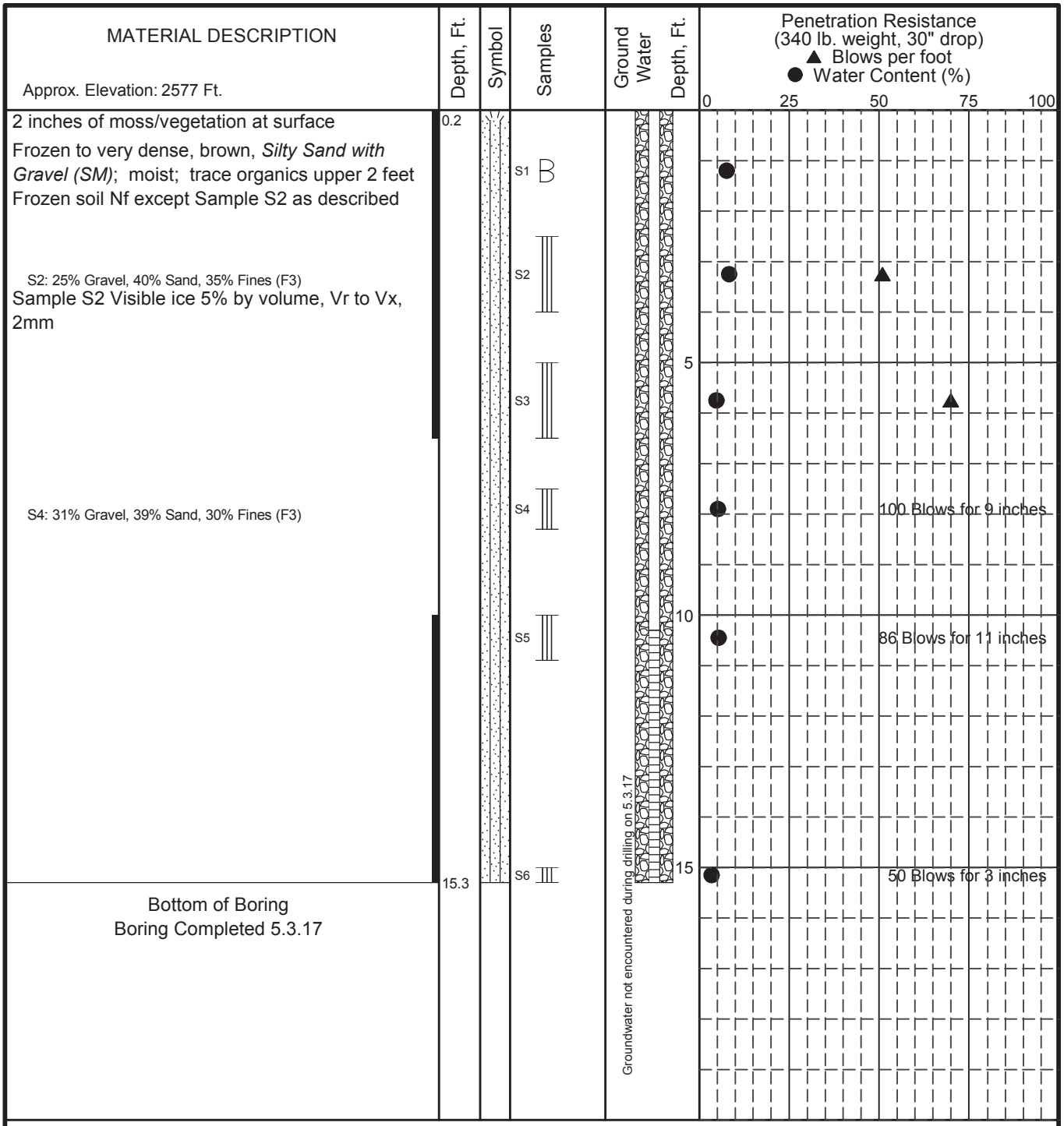

LEGEND

* Sample Not Recovered
B Auger Cuttings
3" O.D. Split Spoon Sample
Frozen
Blank Section, Cuttings Backfill
Slotted Section, Cuttings Backfill

● Water Content (%)
Plastic Limit — Liquid Limit
Natural Water Content

NOTES

1. The stratification lines represent the approximate boundaries between soil types, and the transition may be gradual.
2. The discussion in the text of this report is necessary for a proper understanding of the nature of subsurface materials.
3. Water level, if indicated above, is for the date specified and may vary.

One Thousand Skies Subdivision
Nelchina, Alaska

LOG OF BORING B-5

May 2017 32-1-02580

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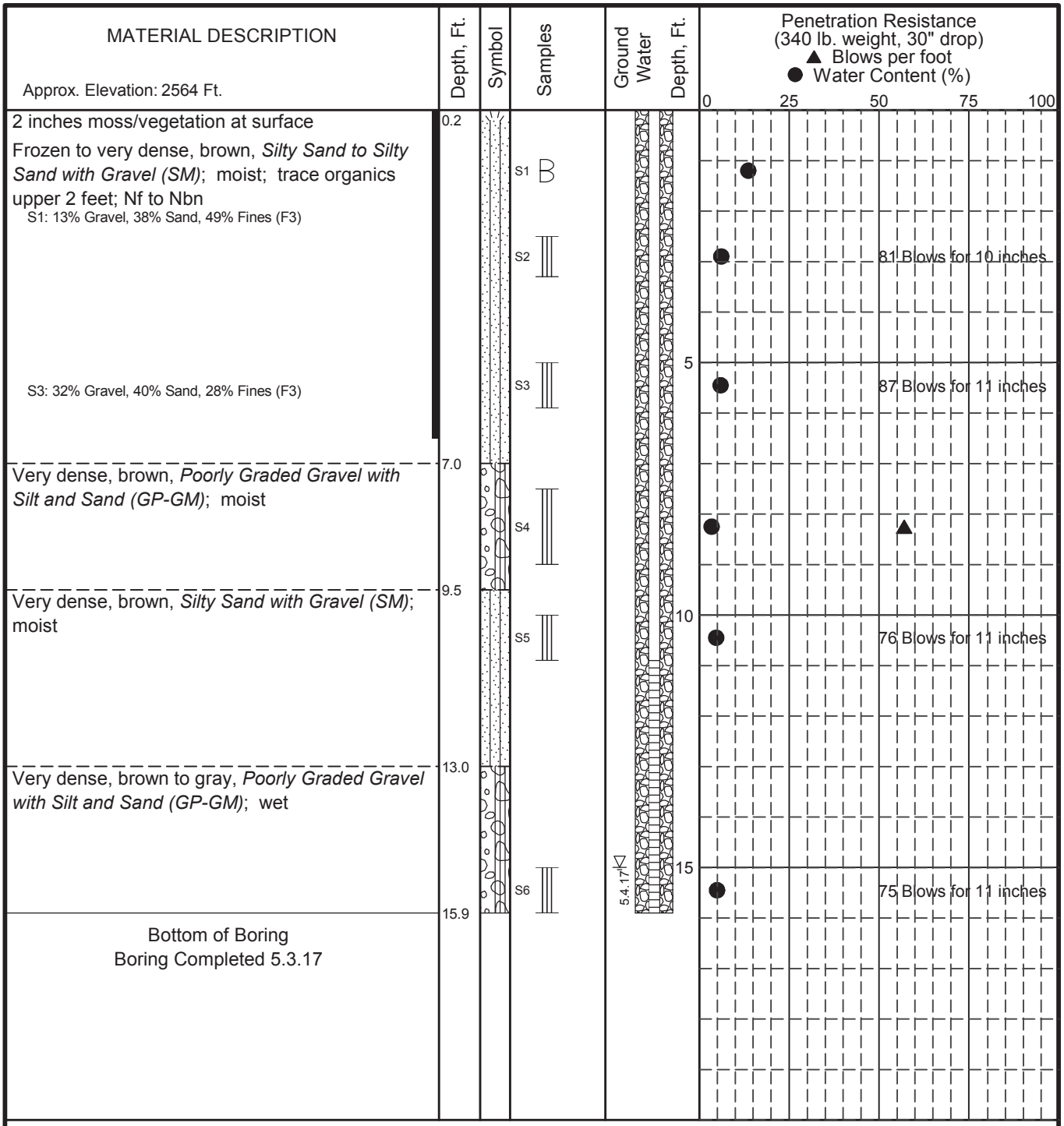
FIG. 10

GEOTECHNICAL LOG 02580 GINT.GPJ S&W_GEO1.GDT 5/18/17

REV 3 - Approved for Submittal



LEGEND

* Sample Not Recovered	Ground Water Level At Time Of Drilling
B Auger Cuttings	
3" O.D. Split Spoon Sample	Blank Section, Cuttings Backfill
	Slotted Section, Cuttings Backfill
Frozen	

● Water Content (%)
Plastic Limit — Liquid Limit
Natural Water Content

NOTES

1. The stratification lines represent the approximate boundaries between soil types, and the transition may be gradual.
2. The discussion in the text of this report is necessary for a proper understanding of the nature of subsurface materials.
3. Water level, if indicated above, is for the date specified and may vary.

One Thousand Skies Subdivision
Nelchina, Alaska

LOG OF BORING B-6

May 2017 32-1-02580

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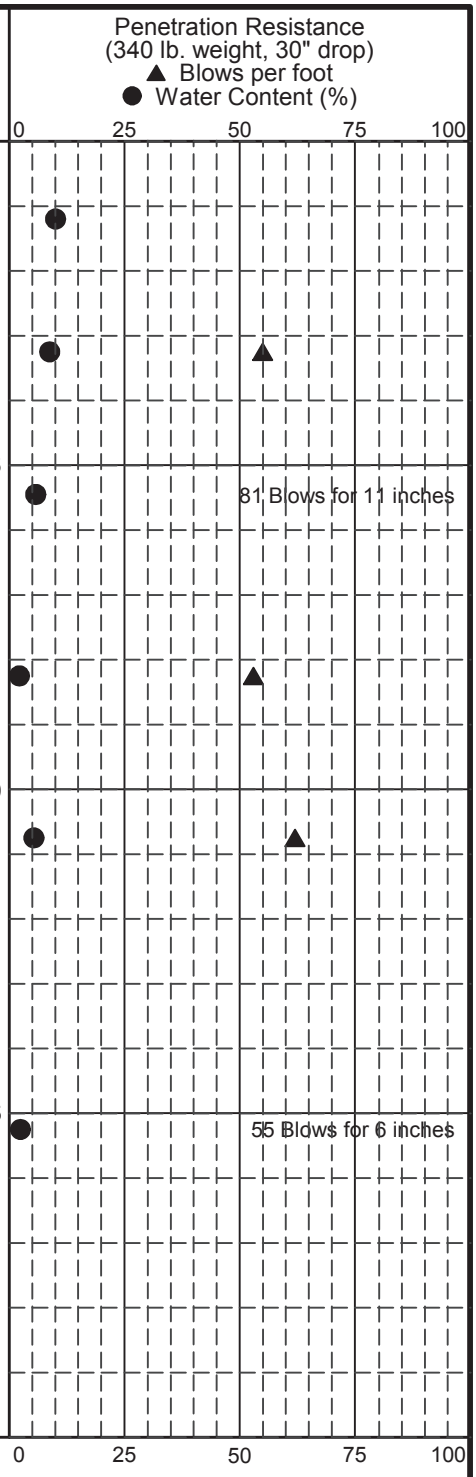
FIG. 11

GEOTECHNICAL LOG 02580 GINT.GPJ S&W_GEO1.GDT 5/18/17

REV 3 - Approved for Submittal

MATERIAL DESCRIPTION Approx. Elevation: 2550 Ft.	Depth, Ft.	Symbol	Samples	Ground Water Depth, Ft.
2 inches moss/vegetation at surface Frozen, brown, *Silty Sand with Gravel (SM)*; moist; trace organics upper 2 feet; Nf to Nbn S2: 16% Gravel, 46% Sand, 38% Fines (F3)	0.2		S1 B S2 S3	
Very dense, brown, *Silty Gravel with Sand (GM)*; moist S4: 58% Gravel, 26% Sand, 16% Fines (F2)	7.0		S4	
Very dense, brown, *Silty Sand with Gravel (SM)*; moist	9.5		S5	
Bottom of Boring Boring Completed 5.4.17	15.5		S6	

Groundwater not encountered during drilling on 5.4.17



LEGEND

* Sample Not Recovered
B Auger Cuttings
3" O.D. Split Spoon Sample

Frozen

● Water Content (%)
Plastic Limit — Liquid Limit
Natural Water Content

NOTES

1. The stratification lines represent the approximate boundaries between soil types, and the transition may be gradual.
2. The discussion in the text of this report is necessary for a proper understanding of the nature of subsurface materials.
3. Water level, if indicated above, is for the date specified and may vary.

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Nelchina, Alaska

LOG OF BORING B-7

May 2017 32-1-02580

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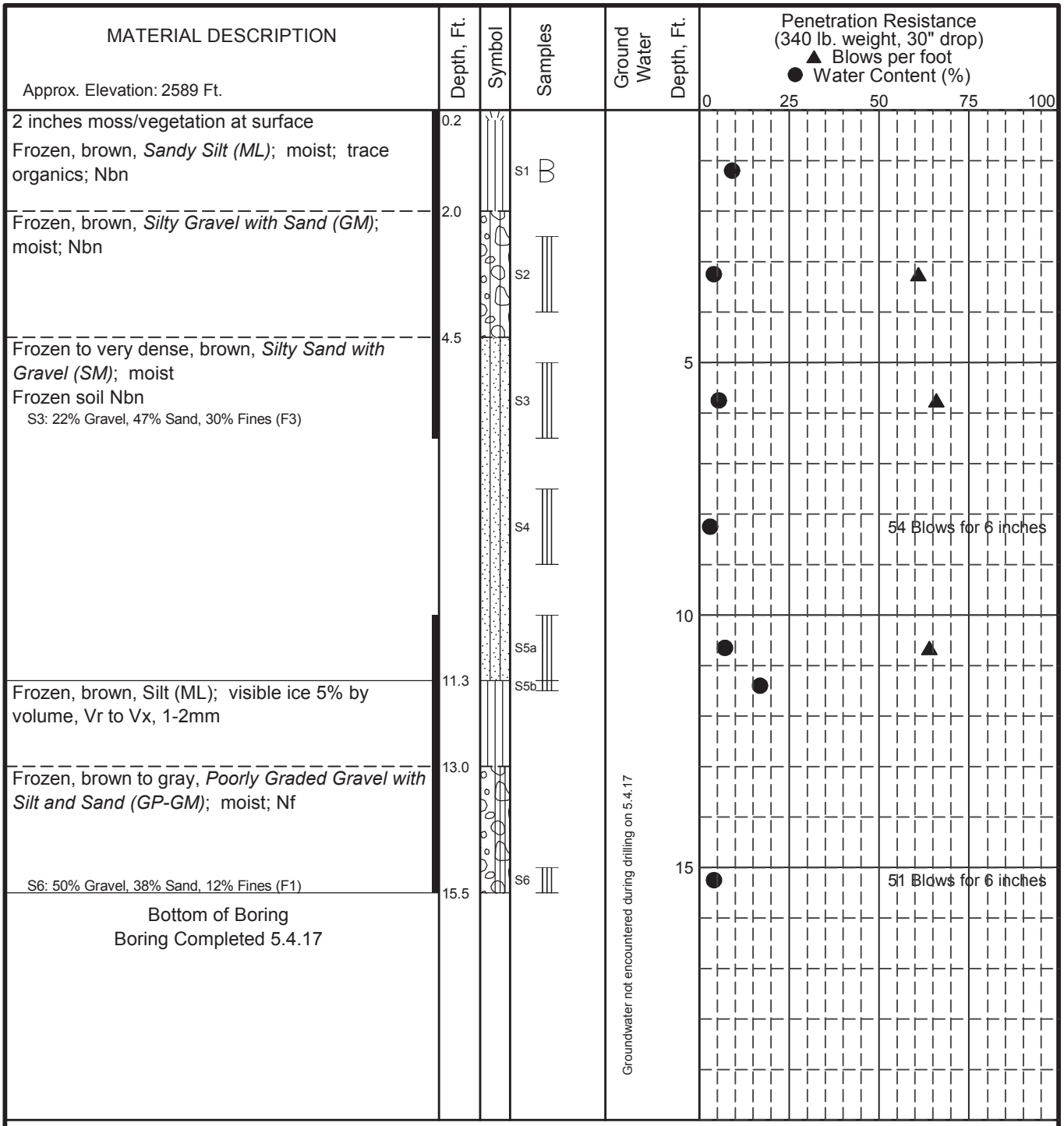
FIG. 12

GEOTECHNICAL LOG 02580 GINT.GPJ S&W_GEO1.GDT 5/18/17

REV 3 - Approved for Submittal



LEGEND

* Sample Not Recovered
B Auger Cuttings
3" O.D. Split Spoon Sample

Frozen

● Water Content (%)
Plastic Limit — Liquid Limit
Natural Water Content

NOTES

1. The stratification lines represent the approximate boundaries between soil types, and the transition may be gradual.
2. The discussion in the text of this report is necessary for a proper understanding of the nature of subsurface materials.
3. Water level, if indicated above, is for the date specified and may vary.

One Thousand Skies Subdivision
Nelchina, Alaska

LOG OF BORING B-8

May 2017 32-1-02580

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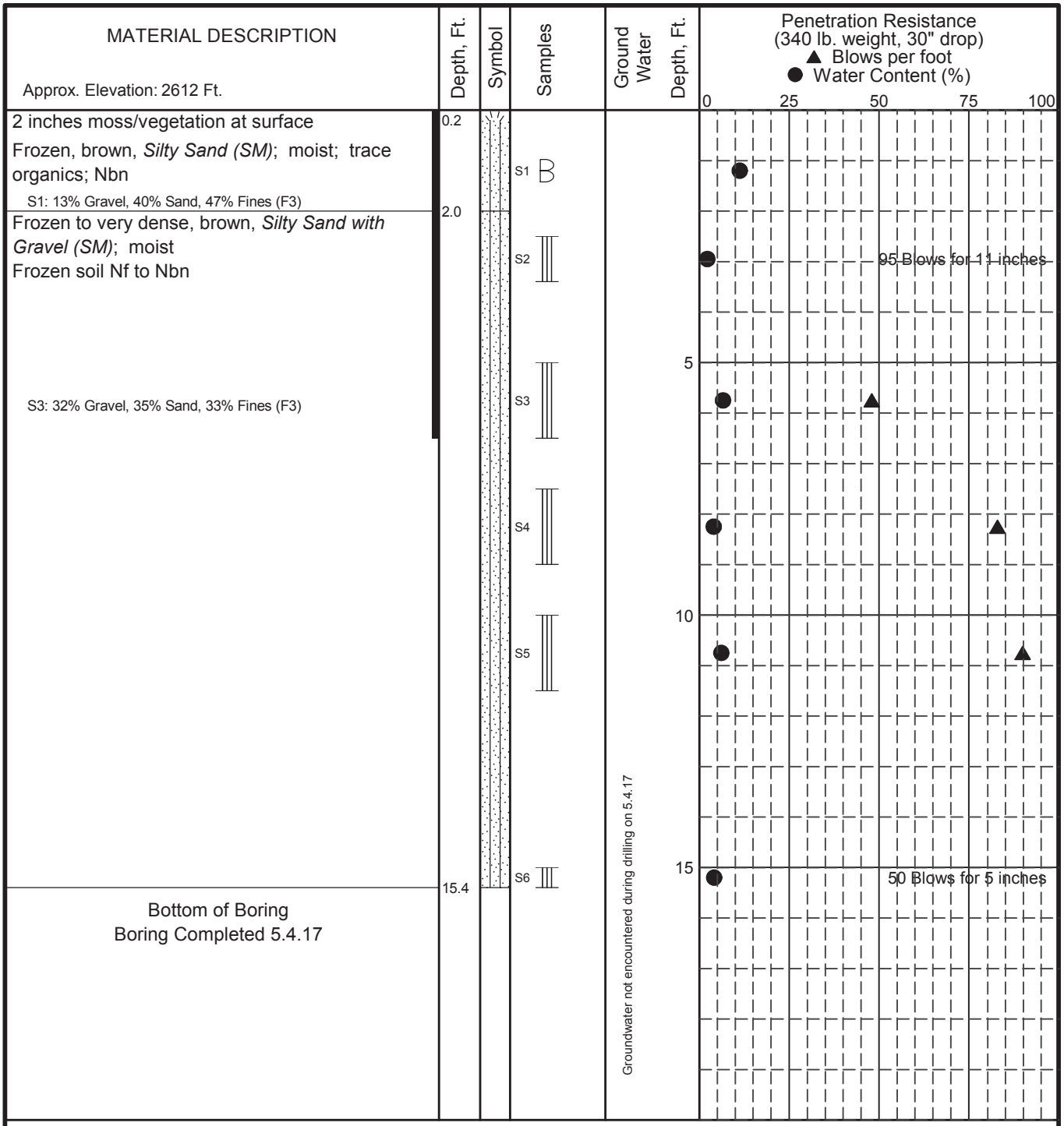
FIG. 13

GEOTECHNICAL LOG 02580 GINT.GPJ S&W_GEO1.GDT 5/18/17

REV 3 - Approved for Submittal



LEGEND

* Sample Not Recovered
B Auger Cuttings
3" O.D. Split Spoon Sample

Frozen

● Water Content (%)
Plastic Limit — Liquid Limit
Natural Water Content

NOTES

1. The stratification lines represent the approximate boundaries between soil types, and the transition may be gradual.
2. The discussion in the text of this report is necessary for a proper understanding of the nature of subsurface materials.
3. Water level, if indicated above, is for the date specified and may vary.

One Thousand Skies Subdivision
Nelchina, Alaska

LOG OF BORING B-9

May 2017 32-1-02580

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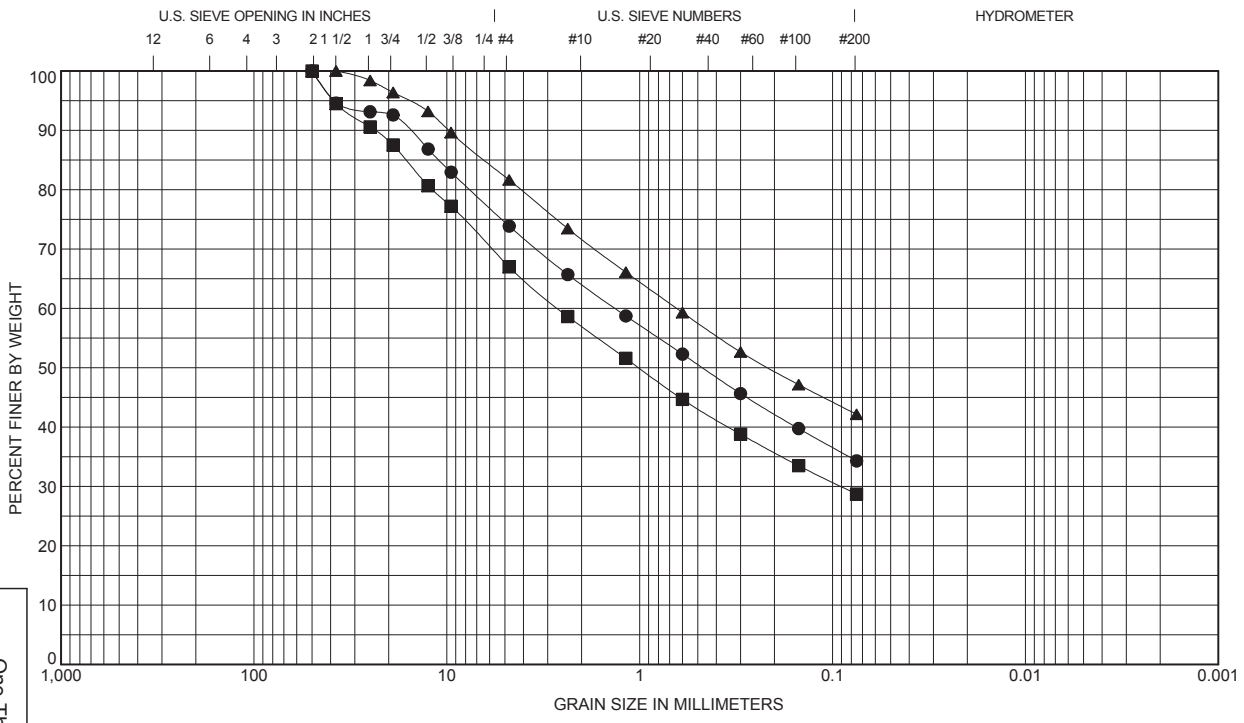
FIG. 14

GEOTECHNICAL LOG 02580 GINT.GPJ S&W_GEO1.GDT 5/18/17

REV 3 - Approved for Submittal



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Sample	Depth, Ft	Classification	LL	PL	PI	Cc	Cu
●	B-1 S2	2.5 - 4.0	**Silty Sand with Gravel (SM)**					
■	B-1 S4	7.5 - 9.0	**Silty Sand with Gravel (SM)**					
▲	B-2 S1	0.2 - 1.7	**Silty Sand with Gravel (SM)**					

	Sample	Depth, Ft	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-1 S2	2.5 - 4.0	**50**	**1.34**			**26**	**40**	**34**	
■	B-1 S4	7.5 - 9.0	**50**	**2.65**	**0.09**		**33**	**38**	**29**	
▲	B-2 S1	0.2 - 1.7	**37.5**	**0.64**			**18**	**39**	**42**	

GRAIN SIZE CLASSIFICATION

One Thousand Skies Subdivision
Nelchina, Alaska

May 2017

32-1-02580

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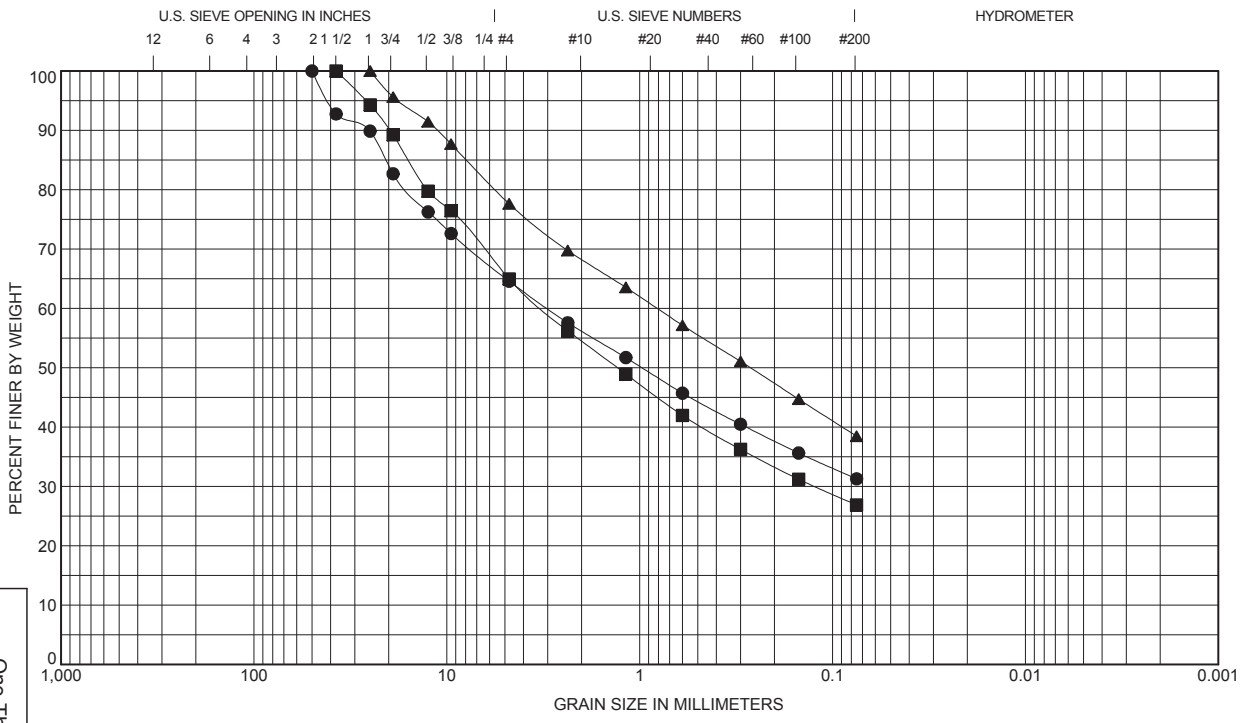
FIG. 15
Sheet 1 of 7



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Sample	Depth, Ft	Classification	LL	PL	PI	Cc	Cu
●	B-2 S3	5.0 - 6.5	**Silty Gravel with Sand (GM)**					
■	B-2 S5	10.0 - 11.5	**Silty Sand with Gravel (SM)**					
▲	B-3 S1	0.2 - 1.7	**Silty Sand with Gravel (SM)**					

	Sample	Depth, Ft	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-2 S3	5.0 - 6.5	**50**	**3.01**			**35**	**33**	**31**	
■	B-2 S5	10.0 - 11.5	**37.5**	**3.2**	**0.12**		**35**	**38**	**27**	
▲	B-3 S1	0.2 - 1.7	**25**	**0.81**			**22**	**39**	**38**	

GRAIN SIZE CLASSIFICATION

One Thousand Skies Subdivision
Nelchina, Alaska

May 2017

32-1-02580

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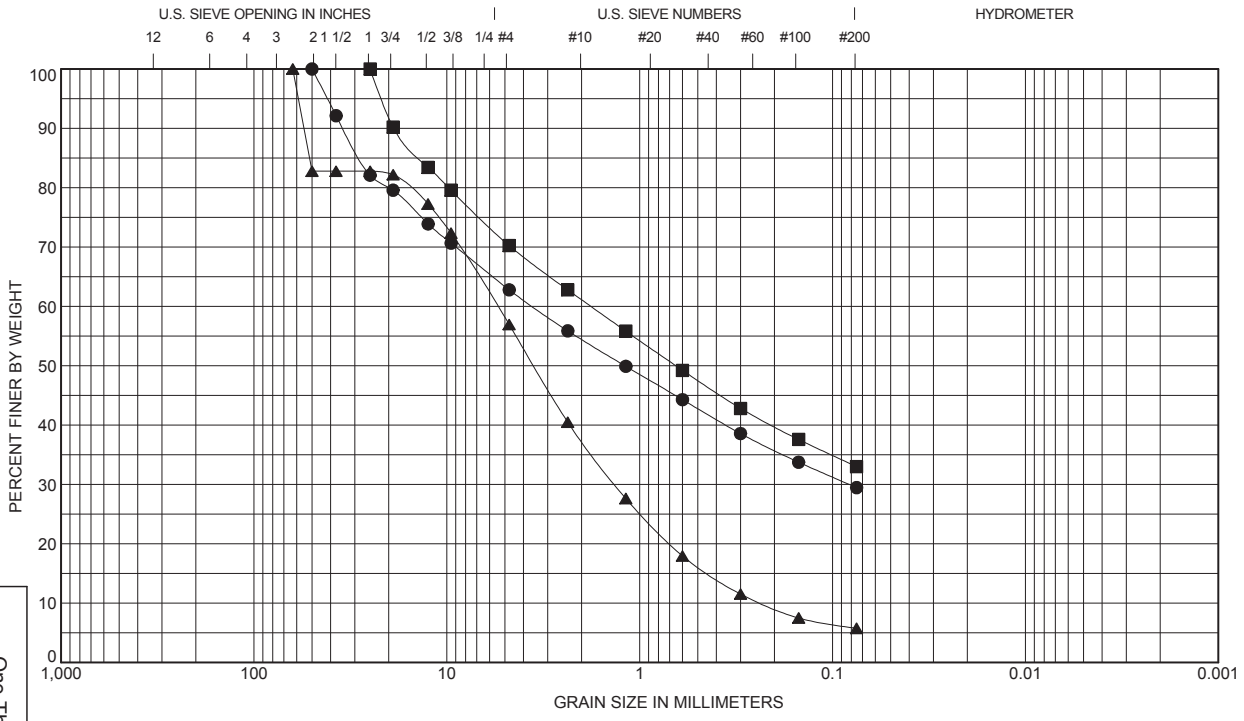
FIG. 15
Sheet 2 of 7



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Sample	Depth, Ft	Classification	LL	PL	PI	Cc	Cu
●	B-3 S3	5.0 - 6.5	**Silty Gravel with Sand (GM)**					
■	B-4 S2	2.5 - 4.0	**Silty Sand with Gravel (SM)**					
▲	B-4 S6	15.0 - 16.5	**Well-Graded Sand with Silt and Gravel (SW-SM)**				**1.4**	**23.6**

	Sample	Depth, Ft	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-3 S3	5.0 - 6.5	**50**	**3.58**	**0.08**		**37**	**33**	**29**	
■	B-4 S2	2.5 - 4.0	**25**	**1.79**			**30**	**37**	**33**	
▲	B-4 S6	15.0 - 16.5	**63**	**5.45**	**1.34**	**0.23**	**43**	**51**	**6**	

GRAIN SIZE CLASSIFICATION

One Thousand Skies Subdivision
Nelchina, Alaska

May 2017

32-1-02580

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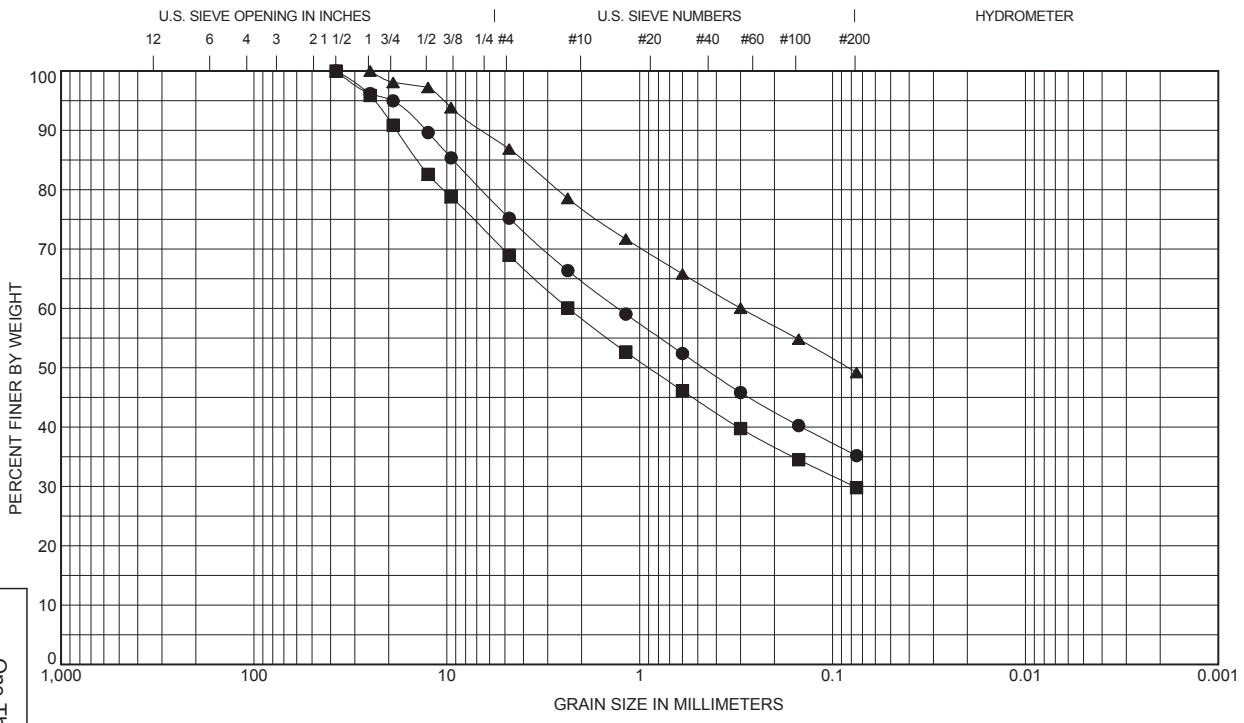
FIG. 15
Sheet 3 of 7



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Sample	Depth, Ft	Classification	LL	PL	PI	Cc	Cu
●	B-5 S2	2.5 - 4.0	**Silty Sand with Gravel (SM)**					
■	B-5 S4	7.5 - 9.0	**Silty Sand with Gravel (SM)**					
▲	B-6 S1	0.2 - 1.7	**Silty Sand (SM)**					

	Sample	Depth, Ft	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-5 S2	2.5 - 4.0	**37.5**	**1.29**			**25**	**40**	**35**	
■	B-5 S4	7.5 - 9.0	**37.5**	**2.34**	**0.08**		**31**	**39**	**30**	
▲	B-6 S1	0.2 - 1.7	**25**	**0.3**			**13**	**38**	**49**	

GRAIN SIZE CLASSIFICATION

One Thousand Skies Subdivision
Nelchina, Alaska

May 2017

32-1-02580

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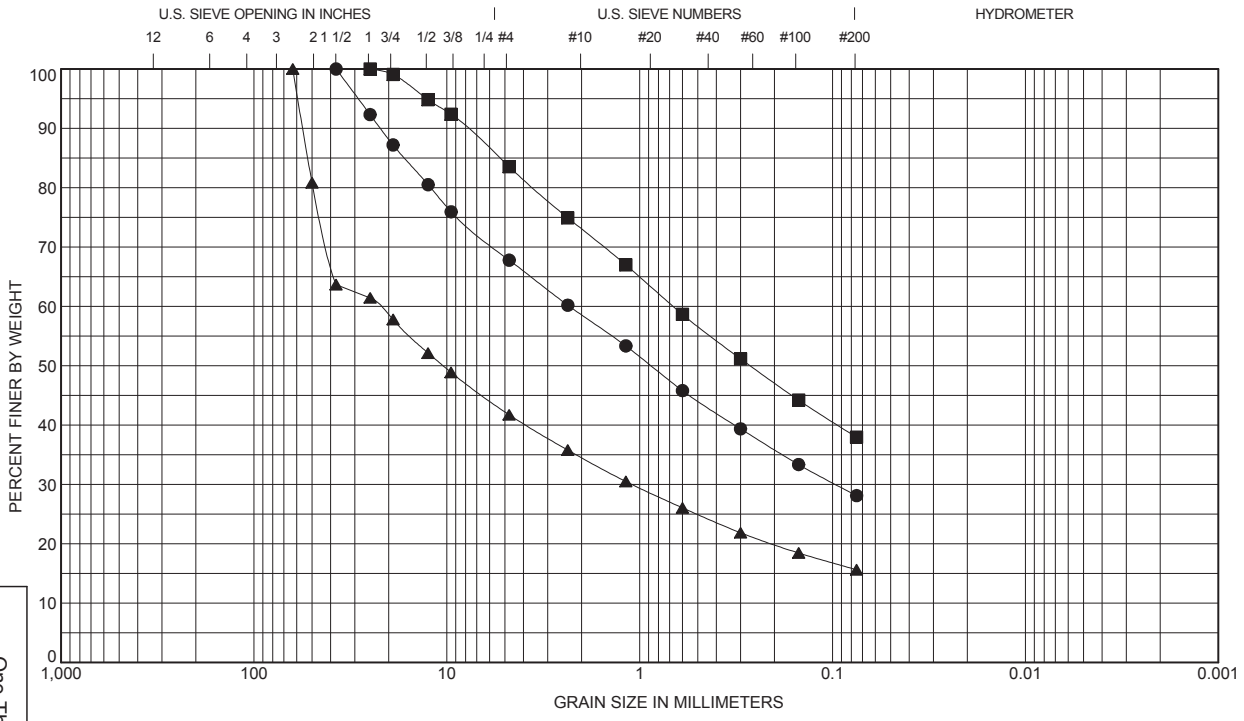
FIG. 15
Sheet 4 of 7



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Sample	Depth, Ft	Classification	LL	PL	PI	Cc	Cu
● B-6 S3	5.0 - 6.5	**Silty Sand with Gravel (SM)**					
■ B-7 S2	2.5 - 4.0	**Silty Sand with Gravel (SM)**					
▲ B-7 S4	7.5 - 9.0	**Silty Gravel with Sand (GM)**					

Sample	Depth, Ft	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● B-6 S3	5.0 - 6.5	**37.5**	**2.31**	**0.1**		**32**	**40**	**28**	
■ B-7 S2	2.5 - 4.0	**25**	**0.67**			**16**	**46**	**38**	
▲ B-7 S4	7.5 - 9.0	**63**	**22.45**	**1.1**		**58**	**26**	**16**	

GRAIN SIZE CLASSIFICATION

One Thousand Skies Subdivision
Nelchina, Alaska

May 2017

32-1-02580

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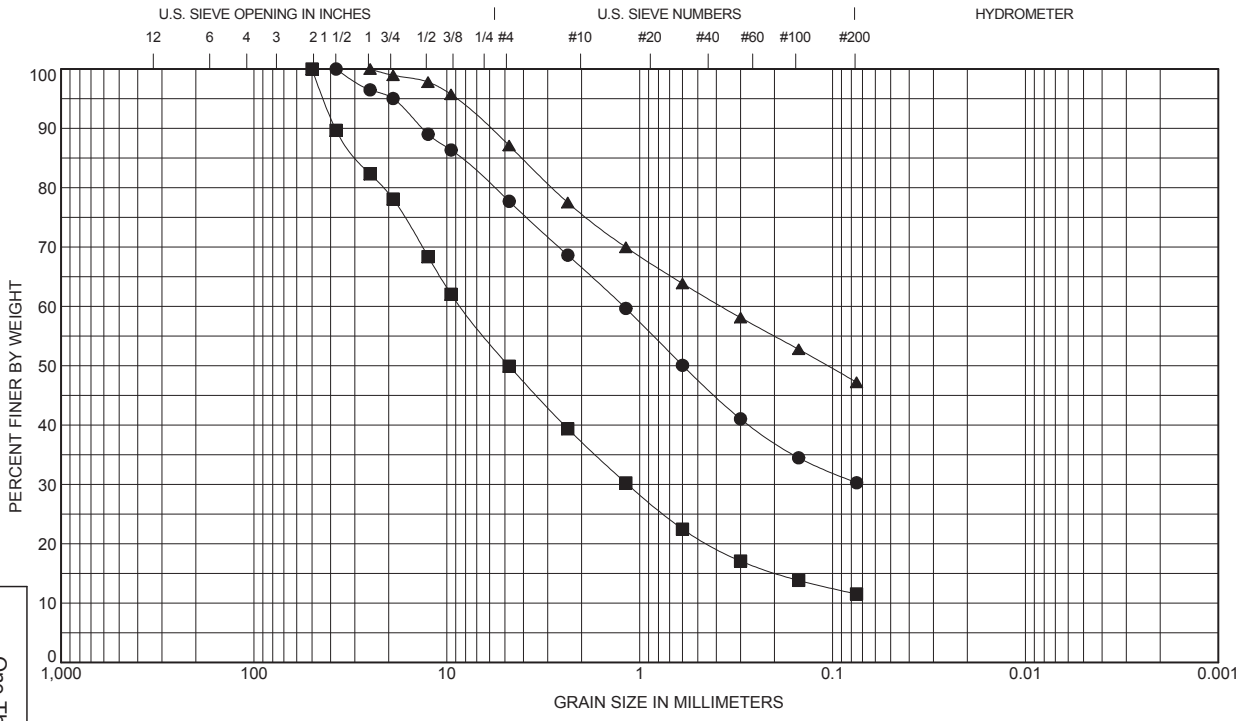
FIG. 15
Sheet 5 of 7



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Sample		Depth, Ft	Classification	LL	PL	PI	Cc	Cu
●	B-8 S3	5.0 - 6.5	**Silty Sand with Gravel (SM)**					
■	B-8 S6	15.0 - 16.5	**Poorly Graded Gravel with Silt and Sand (GP-GM)**				3.3	178.3
▲	B-9 S1	0.2 - 1.7	**Silty Sand (SM)**					

Sample		Depth, Ft	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-8 S3	5.0 - 6.5	37.5	1.21			22	47	30	
■	B-8 S6	15.0 - 16.5	50	8.45	1.15		50	38	12	
▲	B-9 S1	0.2 - 1.7	25	0.38			13	40	47	

GRAIN SIZE CLASSIFICATION

One Thousand Skies Subdivision
Nelchina, Alaska

May 2017

32-1-02580

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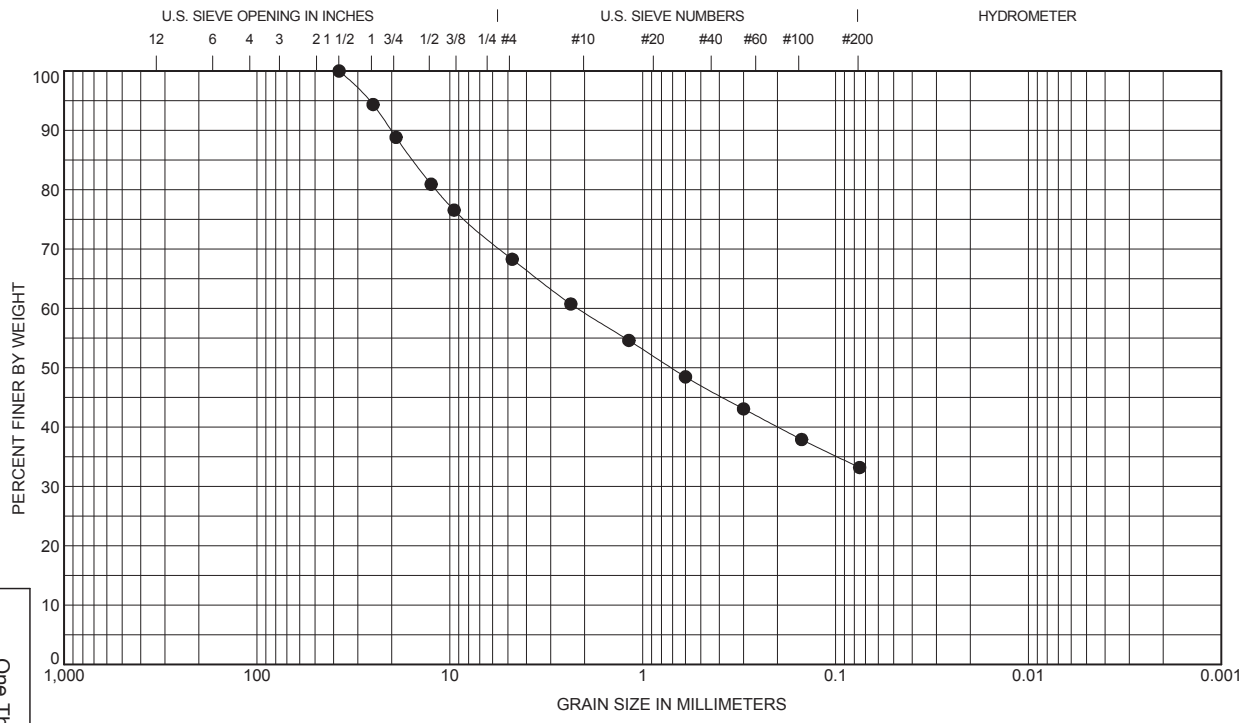
FIG. 15
Sheet 6 of 7



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Sample	Depth, Ft	Classification	LL	PL	PI	Cc	Cu
●	B-9 S3	5.0 - 6.5	**Silty Sand with Gravel (SM)**					

	Sample	Depth, Ft	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-9 S3	5.0 - 6.5	**37.5**	**2.17**			**32**	**35**	**33**	

GRAIN SIZE CLASSIFICATION

May 2017

32-1-02580

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FIG. 15
Sheet 7 of 7

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Nelchina, Alaska

APPENDIX A

IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL/ENVIRONMENTAL REPORT

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

Attachment to and part of Report 32-1-02580

Date: May 2017
To: Department of Natural Resources
One Thousand Skies Subdivision, Nelchina, Alaska

IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL/ENVIRONMENTAL REPORT

CONSULTING SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND FOR SPECIFIC CLIENTS.

Consultants prepare reports to meet the specific needs of specific individuals. A report prepared for a civil engineer may not be adequate for a construction contractor or even another civil engineer. Unless indicated otherwise, your consultant prepared your report expressly for you and expressly for the purposes you indicated. No one other than you should apply this report for its intended purpose without first conferring with the consultant. No party should apply this report for any purpose other than that originally contemplated without first conferring with the consultant.

THE CONSULTANT'S REPORT IS BASED ON PROJECT-SPECIFIC FACTORS.

A geotechnical/environmental report is based on a subsurface exploration plan designed to consider a unique set of project-specific factors. Depending on the project, these may include: the general nature of the structure and property involved; its size and configuration; its historical use and practice; the location of the structure on the site and its orientation; other improvements such as access roads, parking lots, and underground utilities; and the additional risk created by scope-of-service limitations imposed by the client. To help avoid costly problems, ask the consultant to evaluate how any factors that change subsequent to the date of the report may affect the recommendations. Unless your consultant indicates otherwise, your report should not be used: (1) when the nature of the proposed project is changed (for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one, or chemicals are discovered on or near the site); (2) when the size, elevation, or configuration of the proposed project is altered; (3) when the location or orientation of the proposed project is modified; (4) when there is a change of ownership; or (5) for application to an adjacent site. Consultants cannot accept responsibility for problems that may occur if they are not consulted after factors which were considered in the development of the report have changed.

SUBSURFACE CONDITIONS CAN CHANGE.

Subsurface conditions may be affected as a result of natural processes or human activity. Because a geotechnical/environmental report is based on conditions that existed at the time of subsurface exploration, construction decisions should not be based on a report whose adequacy may have been affected by time. Ask the consultant to advise if additional tests are desirable before construction starts; for example, groundwater conditions commonly vary seasonally.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes, or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical/environmental report. The consultant should be kept apprised of any such events, and should be consulted to determine if additional tests are necessary.

MOST RECOMMENDATIONS ARE PROFESSIONAL JUDGMENTS.

Site exploration and testing identifies actual surface and subsurface conditions only at those points where samples are taken. The data were extrapolated by your consultant, who then applied judgment to render an opinion about overall subsurface conditions. The actual interface between materials may be far more gradual or abrupt than your report indicates. Actual conditions in areas not sampled may differ from those predicted in your report. While nothing can be done to prevent such situations, you and your consultant can work together to help reduce their impacts. Retaining your consultant to observe subsurface construction operations can be particularly beneficial in this respect.

A REPORT'S CONCLUSIONS ARE PRELIMINARY.

The conclusions contained in your consultant's report are preliminary because they must be based on the assumption that conditions revealed through selective exploratory sampling are indicative of actual conditions throughout a site. Actual subsurface conditions can be discerned only during earthwork; therefore, you should retain your consultant to observe actual conditions and to provide conclusions. Only the consultant who prepared the report is fully familiar with the background information needed to determine whether or not the report's recommendations based on those conclusions are valid and whether or not the contractor is abiding by applicable recommendations. The consultant who developed your report cannot assume responsibility or liability for the adequacy of the report's recommendations if another party is retained to observe construction.

THE CONSULTANT'S REPORT IS SUBJECT TO MISINTERPRETATION.

Costly problems can occur when other design professionals develop their plans based on misinterpretation of a geotechnical/environmental report. To help avoid these problems, the consultant should be retained to work with other project design professionals to explain relevant geotechnical, geological, hydrogeological, and environmental findings, and to review the adequacy of their plans and specifications relative to these issues.

BORING LOGS AND/OR MONITORING WELL DATA SHOULD NOT BE SEPARATED FROM THE REPORT.

Final boring logs developed by the consultant are based upon interpretation of field logs (assembled by site personnel), field test results, and laboratory and/or office evaluation of field samples and data. Only final boring logs and data are customarily included in geotechnical/environmental reports. These final logs should not, under any circumstances, be redrawn for inclusion in architectural or other design drawings, because drafters may commit errors or omissions in the transfer process.

To reduce the likelihood of boring log or monitoring well misinterpretation, contractors should be given ready access to the complete geotechnical engineering/environmental report prepared or authorized for their use. If access is provided only to the report prepared for you, you should advise contractors of the report's limitations, assuming that a contractor was not one of the specific persons for whom the report was prepared, and that developing construction cost estimates was not one of the specific purposes for which it was prepared. While a contractor may gain important knowledge from a report prepared for another party, the contractor should discuss the report with your consultant and perform the additional or alternative work believed necessary to obtain the data specifically appropriate for construction cost estimating purposes. Some clients hold the mistaken impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems and the adversarial attitudes that aggravate them to a disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY.

Because geotechnical/environmental engineering is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, consultants have developed a number of clauses for use in their contracts, reports, and other documents. These responsibility clauses are not exculpatory clauses designed to transfer the consultant's liabilities to other parties; rather, they are definitive clauses that identify where the consultant's responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your report, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to your questions.

The preceding paragraphs are based on information provided by the
ASFE/Association of Engineering Firms Practicing in the Geosciences, Silver Spring, Maryland