

NOTES

1. THE HORIZONTAL DATUM FOR THIS PROJECT IS AN ARBITRARY LOCAL PLANE COORDINATE SYSTEM; DERIVED FROM AND MATCHING THE ORIGINAL SITE PLAN SURVEY CONTROL FOR THE SUBJECT PROPERTY COMPLETED BY DOWL OCTOBER 09, 2024.
2. THE BASIS OF COORDINATES FOR THIS PROJECT IS A FOUND 60D NAIL (#480) ON THE EDGE OF JONES POINT ROAD SET BY DOWL OCTOBER 09, 2024, HAVING LOCAL COORDINATES OF N: 2707789.375, E: 2348175.322.
3. THE BASIS OF VERTICAL CONTROL FOR THIS PROJECT IS A FOUND 60D NAIL (#480) ON THE EDGE OF JONES POINT ROAD SET BY DOWL OCTOBER 09, 2024, HAVING AN ELEVATION OF 31.22 U.S. FEET.
4. THE INFORMATION SHOWN HEREON IS BASED ON FIELD SURVEYS CONDUCTED BY PND ENGINEERS NOVEMBER 18-20, 2024 AND DOWL OCTOBER 09, 2024.
5. ALL DISTANCES ARE GROUND DISTANCES REDUCED TO HORIZONTAL IN U.S. SURVEY FEET; UNLESS OTHERWISE INDICATED.
6. THIS SURVEY WAS CONDUCTED USING TRIMBLE R12i GNSS RECEIVERS AND TRIMBLE ACCESS FIELD SOFTWARE.
7. UTILITY LOCATES WERE NOT MARKED FOR THIS PROJECT.
8. NO TITLE REPORT WAS PREPARED FOR THIS SURVEY. OTHER EASEMENTS AND ENCUMBRANCES MAY EXIST.
9. RECORD BEARINGS AND DISTANCES SHOWN HEREON OBTAINED FROM ALTA/NSPS LAND TITLE SURVEY COMPLETED AND SIGNED OCTOBER 09, 2024 BY DOWL WAS PROVIDED TO PND ENGINEERS BY SOUTHEAST ALASKA REGIONAL HEALTH CONSORTIUM (SEARCH).

PND SURVEY CONTROL

POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
* 201	2707723.865	2353637.880	22.25	FAC 2" DOWL HKM
* 202	2708441.885	2347805.563	23.31	FBC NGS B 141 B 141
* 203	2709112.534	2347743.994	29.22	FAC 3.25" ADOT PI ROW 78+95.55 43.5R 8904-S 1998
* 204	2707812.539	2348173.814	30.93	RBR SET 5/8" PND CONTROL
* 205	2706849.513	2348013.644	43.90	RBR SET 5/8" PND CONTROL

* NOT SHOWN HEREON

DOWL SURVEY CONTROL

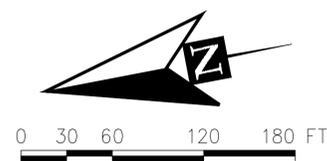
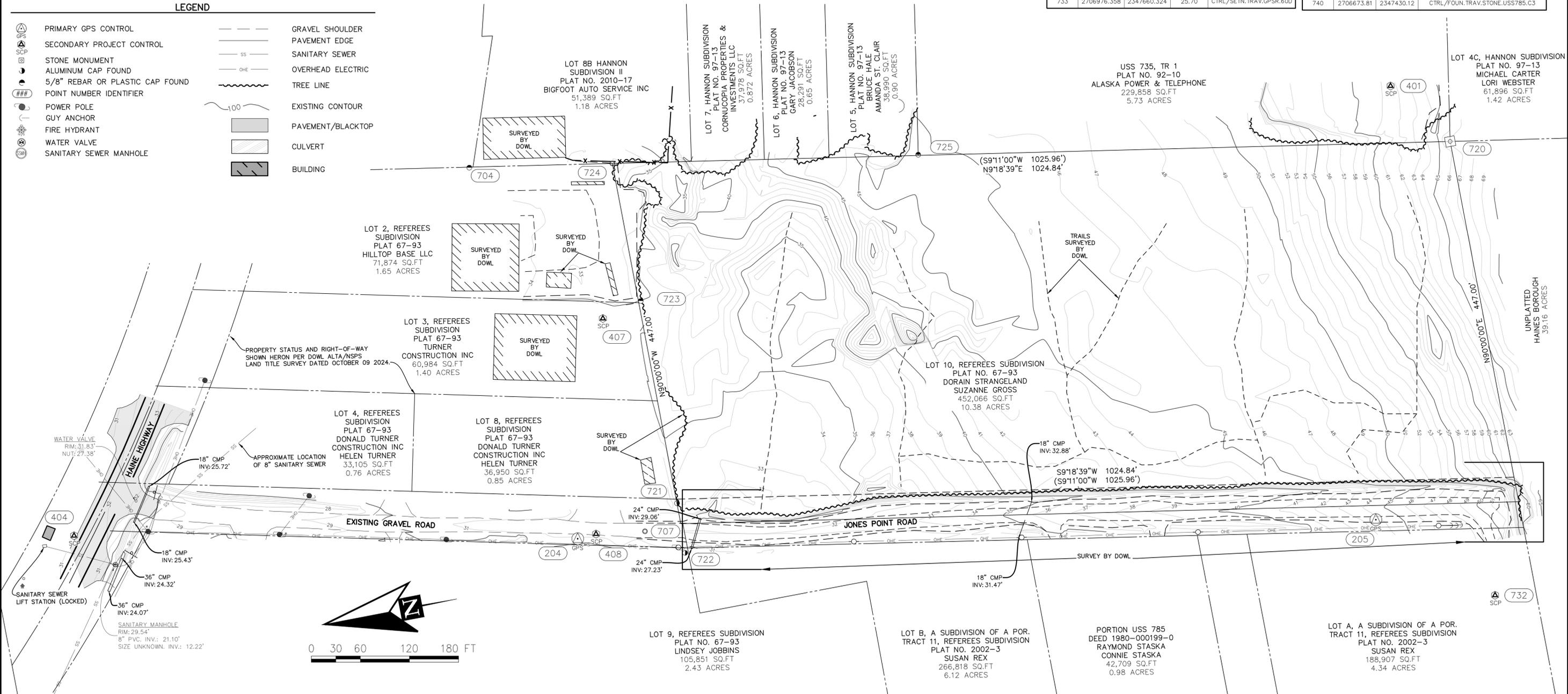
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
401	2706732.724	2348529.572	61.48	CTRL/SETN.GPSR.SPIKE
402	2706670.806	2348842.108	70.04	CTRL/SETN.GPSR.SPIKE
403	2708461.073	2348680.698	27.79	CTRL/SETN.GPSR.SPIKE
404	2708416.722	2348292.914	31.00	CTRL/SETN.GPSR.SPIKE
405	2708148.501	2348642.257	34.06	CTRL/SETN.GPSR.SPIKE
406	2708113.256	2348676.640	32.70	CTRL/SETN.GPSR.SPIKE
407	2707731.885	2348431.801	35.92	CTRL/SETN.GPSR.SPIKE
408	2707789.375	2348175.322	31.22	CTRL/SETN.GPSR.SPIKE
409	2707366.712	2348625.948	47.33	CTRL/SETN.GPSR.SPIKE
410	2707281.723	2348919.380	48.38	CTRL/SETN.GPSR.SPIKE
731	2706728.139	2347515.637	57.27	CTRL/SETN.GPSR.60D
732	2706723.579	2347895.776	47.98	CTRL/SETN.GPSR.60D
733	2706976.358	2347660.324	25.70	CTRL/SETN.TRAV.GPSR.60D

DOWL RECOVERED MONUMENTATION

POINT #	NORTHING	EASTING	DESCRIPTION
703	2708123.65	2348645.55	CTRL/FOUN.GPSR.ALPRM.DOT-PI
704	2707857.88	2348642.95	CTRL/FOUN.GPSR.5RBR
707	2707730.02	2348167.26	CTRL/FOUN.GPSR.IP.ZINCH
720	2706673.81	2348449.41	CTRL/FOUN.TRAV.STONE.USS785-C3
721	2707685.18	2348193.55	CTRL/FOUN.TRAV.JWBEAN.1.SINCH.ALCAP
722	2707686.81	2348132.31	CTRL/FOUN.TRAV.JWBEAN.2.SINCH.ALCAP
723	2707682.41	2348443.98	CTRL/FOUN.TRAV.TPC.JWBEAN
724	2707685.15	2348615.22	CTRL/FOUN.TRAV.IP
725	2707315.78	2348555.53	CTRL/FOUN.TRAV.YPC.WILD
726	2708213.48	2348703.32	CTRL/FOUN.TRAV.3.25.ALCAP.AK.SURV
727	2708520.80	2348752.80	CTRL/FOUN.TRAV.IP
728	2708520.54	2348753.12	CTRL/FOUN.TRAV.SPIN
740	2706673.81	2347430.12	CTRL/FOUN.TRAV.STONE.USS785.C3

LEGEND

- PRIMARY GPS CONTROL
- SECONDARY PROJECT CONTROL
- STONE MONUMENT
- ALUMINUM CAP FOUND
- 5/8" REBAR OR PLASTIC CAP FOUND
- POINT NUMBER IDENTIFIER
- POWER POLE
- GUY ANCHOR
- FIRE HYDRANT
- WATER VALVE
- SANITARY SEWER MANHOLE
- GRAVEL SHOULDER
- PAVEMENT EDGE
- SANITARY SEWER
- OVERHEAD ELECTRIC
- TREE LINE
- EXISTING CONTOUR
- PAVEMENT/BLACKTOP
- CULVERT
- BUILDING



REVISIONS

REV.	DATE	DESCRIPTION	DWN.	CKD.	APP.

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DESIGN: SCS CHECKED: IB SCALE: **1" = 60'**
 DRAWN: CRS APPROVED: IB

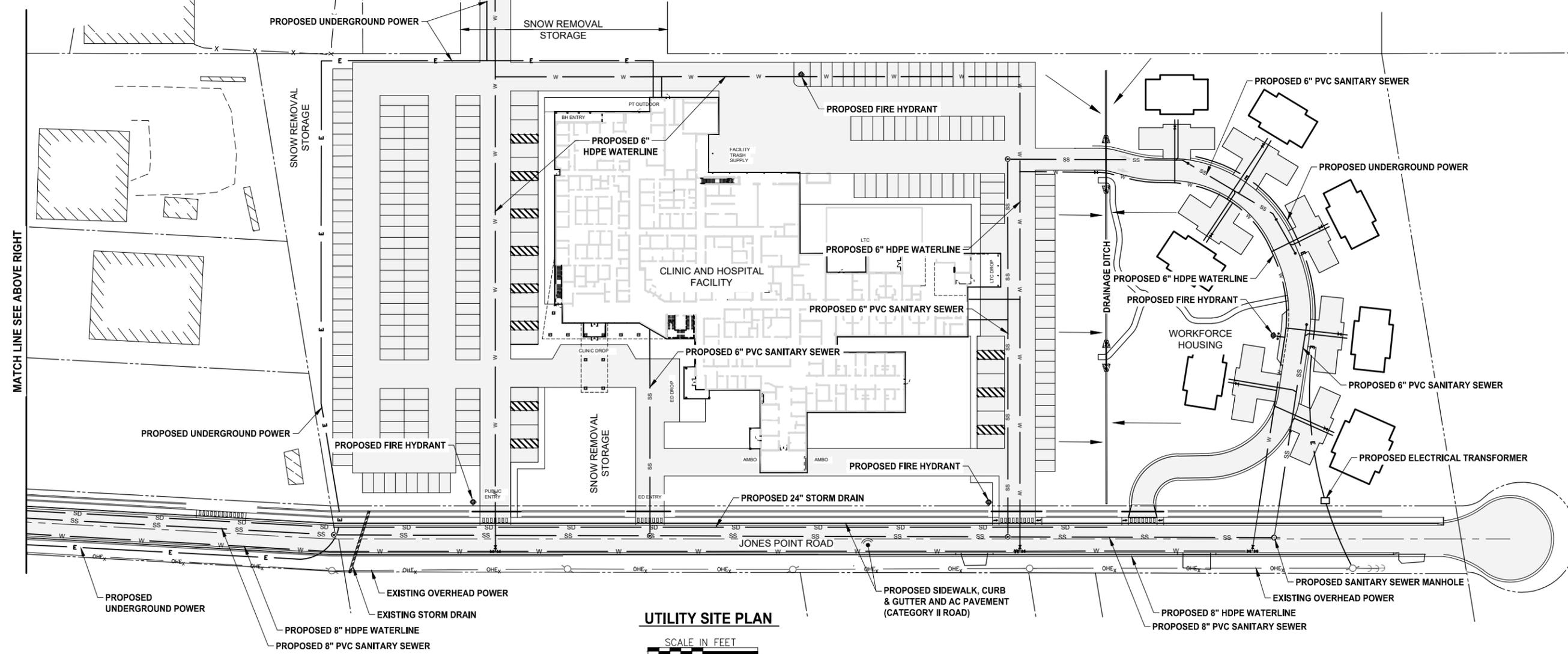
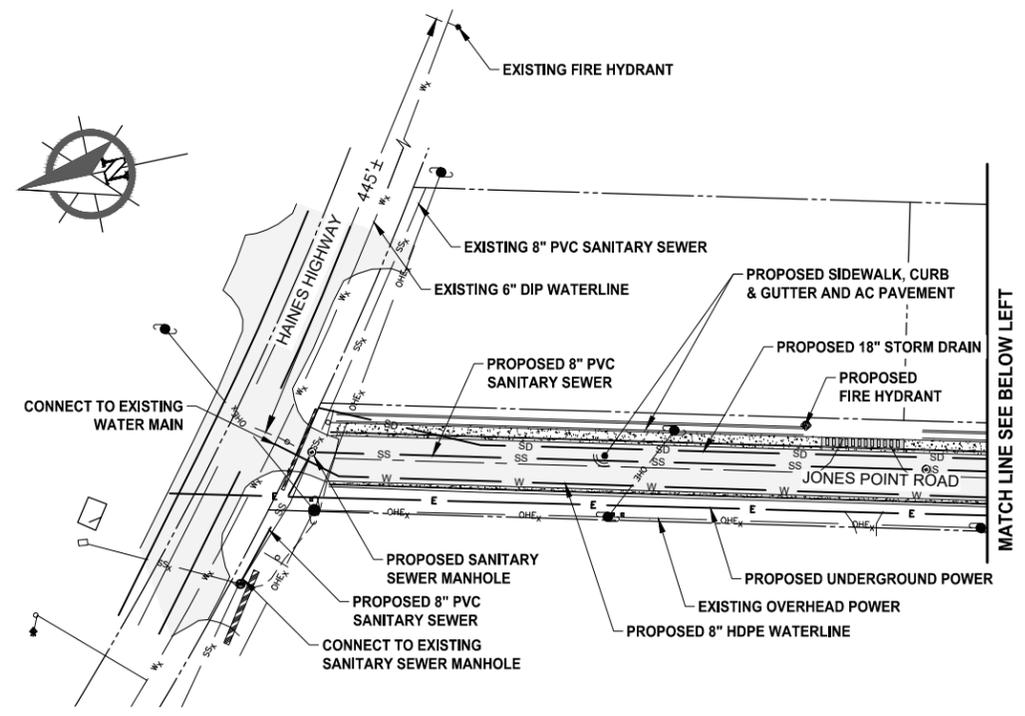
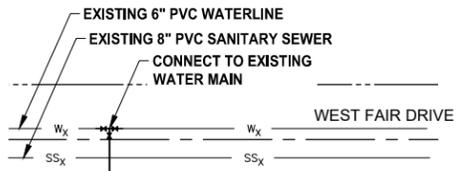
DATE: 12/12/2024

**SOUTHEAST ALASKA REGIONAL HEALTH CONSORTIUM
 LOT 10, REFEREE'S SUBDIVISION**

SHEET TITLE: **EXISTING CONDITIONS & SURVEY CONTROL**
 PND PROJECT NO.: 242078 C.A.N.:
C1.0

LEGEND

- OHE_x — EXISTING OVERHEAD ELECTRICAL
- E — PROPOSED UNDERGROUND POWER
- SD — PROPOSED STORM DRAIN (SIZE AS NOTED)
- W_x — EXISTING WATER (SIZE, TYPE AS NOTED)
- W — PROPOSED WATER (SIZE, TYPE AS NOTED)
- SS_x — EXISTING SANITARY SEWER (SIZE, TYPE AS NOTED)
- SS — PROPOSED SANITARY SEWER (SIZE, TYPE AS NOTED)
- ⊙ FIRE HYDRANT (PROPOSED OR EXISTING AS NOTED)



UTILITY SITE PLAN



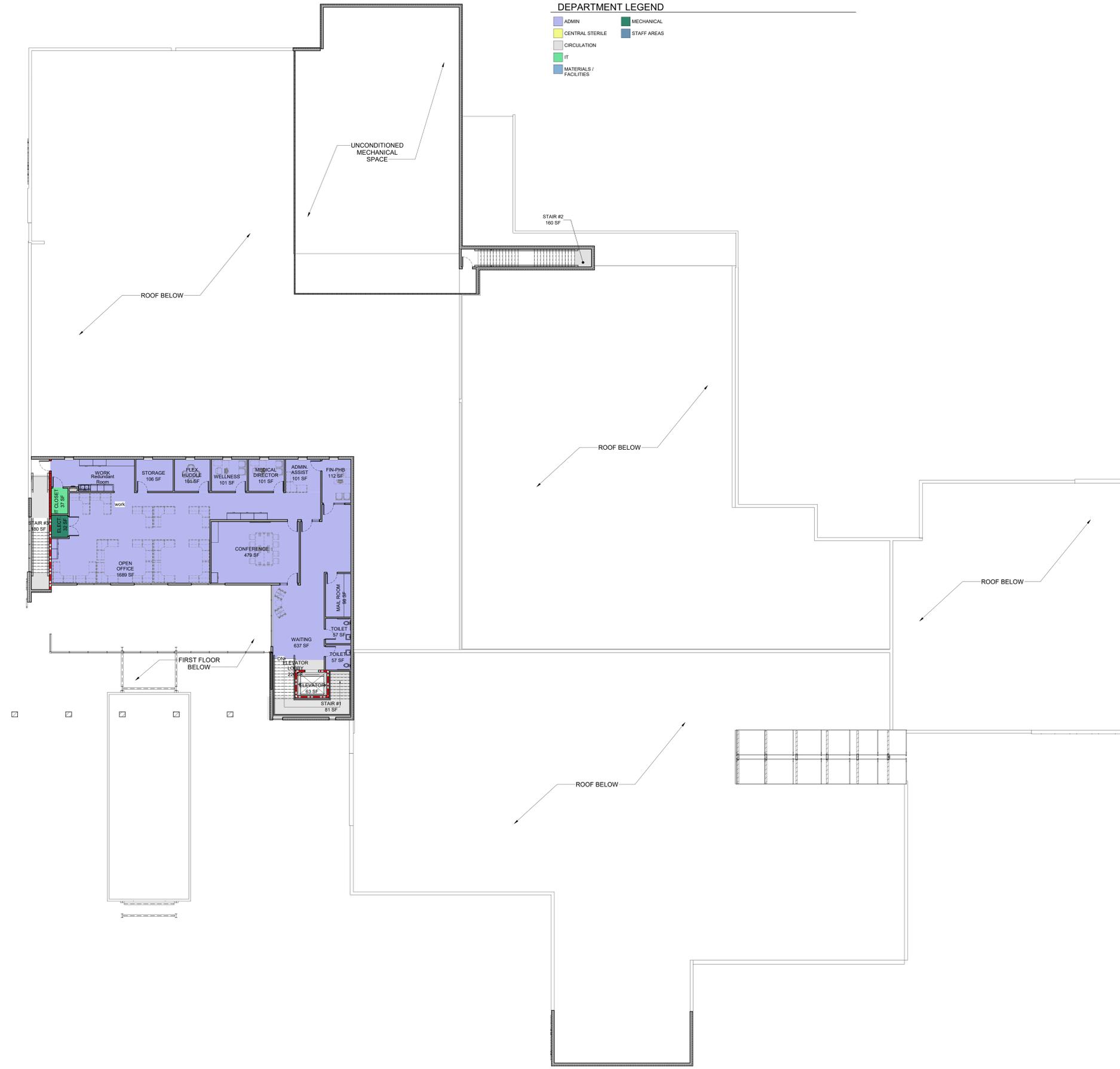
DEPARTMENT LEGEND

ACUTE	DENTAL	LAUNDRY	PHYSICAL REHABILITATION
BEHAVIORAL HEALTH	EMERGENCY DEPARTMENT	LONG TERM CARE	PUBLIC AREAS
CENTRAL STERILE	IMAGING	MATERIALS / FACILITIES	STAFF AREAS
CENTRAL SUPPLY	IT	MECHANICAL	
CIRCULATION	KITCHEN	OPTOMETRY	
CLINIC	LAB	PHARMACY	



DEPARTMENT LEGEND

- ADMIN
- CENTRAL STERILE
- CIRCULATION
- IT
- MATERIALS/FACILITIES
- MECHANICAL
- STAFF AREAS





WEST ELEVATION
SCALE: 1/32" = 1'-0"

TOP OF ROOF 40'-00" MAX
 TOP OF PARAPET 20'-06"
 TOP OF PARAPET 20'-06"
 TOP OF PARAPET 18'-00"



EAST ELEVATION
SCALE: 1/32" = 1'-0"

TOP OF PARAPET 20'-06"
 TOP OF PARAPET 18'-00"
 TOP OF ROOF 40'-00" MAX
 TOP OF PARAPET 20'-06"



SOUTH ELEVATION
SCALE: 1/32" = 1'-0"

TOP OF PARAPET 20'-06"
 TOP OF PARAPET 18'-00"
 TOP OF ROOF 40'-00" MAX
 TOP OF PARAPET 18'-00"



NORTH ELEVATION
SCALE: 1/32" = 1'-0"

TOP OF ROOF 40'-00" MAX
 TOP OF PARAPET 20'-06"
 TOP OF PARAPET 20'-06"

MATERIAL LEGEND	
	STONE VENEER
	METAL SIDING (BLACK)
	HORIZONTAL METAL SIDING (WOOD LOOK)
	GLASS

Project Overview

The project consists of a new, ground-up Clinic and Critical Access Hospital in Haines, Alaska, designed to provide comprehensive healthcare services to the region. Envisioned as a modern and resilient facility, the building will encompass 63,788 square feet and serve as a vital resource for community health, wellness, and emergency care.

The development is situated on a 10-acre site that supports the full scope of clinical and hospital operations. The site plan includes dedicated patient and staff parking, safe and intuitive campus circulation looping around the entire building, and multiple access points strategically connected to public roadways. Naturalized landscaping is planned throughout the property to blend the campus into its Alaskan surroundings while supporting low maintenance and long-term durability.

The structure itself is primarily a single-story building to maximize operational efficiency and patient accessibility, with a small second-story administrative department and a mechanical penthouse. This layout allows clinical services, hospital functions, and support operations to be closely integrated while maintaining clear circulation and departmental organization.

The clinic portion of the facility brings together a full spectrum of outpatient services, including Family Clinic, Dental Clinic, Physical Rehabilitation, Behavioral Health, and Optometry. Laboratory and Pharmacy services are centrally located to support efficient patient flow and coordinated care across all clinic departments and hospital functions. These services are planned to function cohesively, ensuring convenience for patients and optimized workflows for staff.

The Critical Access Hospital portion of the building houses essential inpatient and emergency services. Key components include an Emergency Department, Imaging Department, Acute Care unit, and Long-Term Care facilities. A full-service Kitchen supports both patient nutrition and long-term care dining needs. Together, these departments form a complete rural hospital designed to meet daily community needs and respond effectively to urgent medical situations.

Facility-wide support services are integrated throughout the building to sustain clinical and hospital operations. These include Facilities storage and services, mechanical and equipment spaces, Central Supply, Laundry services, and Housekeeping services. Each of these functions plays a crucial role in ensuring the building operates safely, efficiently, and reliably.

Throughout the planning process, the Cushing Terrell design team along with SEARHC leadership, department heads, and end users have collaborated for the flow and function of each department. Our teams have met virtually to review, refine, and develop the floor plan now represented in the project documentation. All stakeholders have had opportunities to provide input, and Cushing Terrell has incorporated this feedback to align the design with SEARHC expectations as laid out in the original Master Plan process. The design to date represents a full and complete build of all departments.

Architectural Design Narrative

Project Design Schedule

Schematic Design: 11-24-2025

Design Development: 2-20-2026

Construction Documents: 5-15-2025

Codes and Standards

The City of Haines, Alaska, does not have a building department, so review of the construction documents will be performed by the Alaska State Fire Marshall. Additionally, a health and life safety review will be conducted by the Alaska Department of Health and Social Services. The current adopted codes for the State of Alaska are as listed. It is unknown at this time if the State will adopt the new IBC 2024 suite of international codes. If that is announced, an updated review will need to be performed to ensure compliance with any added requirements in the new codes.

The design will incorporate the following codes and standards:

- 2022 FGI Guidelines for Design and Construction of Outpatient Facilities.
- 2022 FGI Guidelines for Design and Construction of Hospitals
- 2022 FGI Guidelines for Design and Construction of Residential Health, Care, and Support Facilities
- 2021 International Building Code
- 2021 International Fire Code
- 2021 International Mechanical Code
- 2021 International Energy Conservation Code
- 2021 International Fuel Gas Code
- USP 795 Non-Sterile Compounding
- USP 800 Compounding of Hazardous Drugs
- 2012 LSC: NFPA 101 Life Safety Code

Code Summary

Occupancy Classification:

- B – Outpatient Clinic
- I-2 Hospital and Long Term Care Facilities

Separated Occupancy: I-2 Institutional Hospital / B Business

Construction Type: IBC: Type IIB, NFPA: Type II (000)

Fully Sprinklered

Allowable Stories: I-2 Occupancy – 1 story, B Occupancy – can be >2 stories

Deferred Design: Fire Alarm, Fire Suppression

Exterior Envelope and Design

Envelope: Prescriptive Insulation Values Per IECC 2021, Climate Zone 7

Roof = R-35 CI

Walls (Metal Studs) = R-13 + 12.5 CI

Floors (Slab -on-grade, unheated) = R-20 CI for 48" below

Floors (Slab -on-grade, radiant heated) = R-20 CI for 48" below, R-5 CI under slab

Exterior Design Summary

The exterior of the hospital is designed to balance durability, energy performance, and a strong connection to the natural environment of Haines. A combination of metal stud walls with continuous insulation, high-performance glazing, and thermally broken doors ensures the building meets IECC CZ7 requirements while maintaining occupant comfort and minimizing energy use. The material palette — including wood-look aluminum planks, dark tone thin-set masonry, and a bold black metal panel — emphasizes a modern, durable aesthetic that harmonizes with the surrounding landscape. Large curtain walls and fully glazed entry doors maximize daylight and views, while carefully selected door and window systems mitigate condensation and thermal bridging. The roof combines a low-slope PVC membrane with a 1:12 standing seam metal roof to address snow, coastal exposure, and visual interest. Overall, the exterior strategy integrates high-performance systems, thoughtful material choices, and a cohesive architectural expression, providing both functional excellence and a welcoming environment for patients, staff, and visitors.

Exterior Envelope

1. Walls

- Type: Metal stud walls with continuous exterior insulation.
- Assemblies: R-13 metal studs + R-12.5 CI.
- Intent: Provide a durable, energy-efficient envelope that meets IECC CZ7 requirements.
- Rationale: Combines code-compliant insulation with continuous exterior layer to reduce thermal bridging; resilient against cold and wind-driven snow.
- Finish / Aesthetic: Wood-look aluminum planks, dark tone masonry, and large black metal panel for a modern, natural aesthetic.

2. Roof

- Type: Combination low-slope PVC membrane and 1:12 standing seam metal roof.
- Assemblies: R-35 continuous insulation above roof deck.

- Intent: Maintain high thermal performance and reduce energy loads; roof assemblies designed for both snow and coastal performance. The PVC membrane covers most low-slope areas, while the standing-seam metal roof provides durability and aesthetic interest on select slopes.

3. Foundation / Slab

- Type: Slab-on-grade.
- Insulation: R-20 continuous insulation along exterior edges to 48" below grade.
- Intent: Minimize heat loss through slab perimeter; heated slab areas are insulated per code, non-heated slab requires only perimeter insulation.

4. Glazing

- Window Types:
 - Curtain Wall: Floor-to-floor, two-story window walls; fully glazed entries.
 - Punched / Smaller Windows: Wood-clad aluminum-clad H3 Fusion Tech units.
- Performance Targets:
 - Triple-pane IGU, argon-filled, low-E #2/#5 coatings
 - U-factor ≤ 0.25
 - SHGC: 0.25–0.35
- Intent: Maximize natural daylight and visual connection to nature while maintaining high energy performance; reduce condensation risk; align aesthetics with modern, black aluminum exterior.

5. Doors

- Type:
 - Hollow-metal doors for back-of-house or fire-rated areas.
 - Thermally broken aluminum doors for curtain wall entries and vestibules.
- Glazing: Fully glazed doors in curtain walls and main entrances, triple-pane IGU matching curtain-wall performance.
- Performance Targets:
 - U-factor ≤ 0.30
 - Air infiltration ≤ 0.3 cfm/ft²
- Intent: Provide transparent, welcoming entries with high thermal performance; integrate seamlessly with curtain wall; ensure durability, safety, and ADA compliance.

6. Curtain Wall / Storefront Strategy

- Curtain Wall: Used for large window walls and fully glazed entries; supports high-performance triple-glass IGUs and visual continuity across facade.

- Storefront: Limited use for smaller horizontal openings where appropriate; must use thermally broken systems, triple-glass, high-performance.
- Intent: Optimize energy performance, minimize condensation risk, and maintain a cohesive, modern exterior aesthetic.

7. Materials / Aesthetic

- Exterior: Wood-look aluminum planks (longboard), Creative Mines Black Truffle masonry, and a large black metal panel (product TBD)
- Windows / Doors: Black aluminum curtain wall frames, thermally broken aluminum entry doors, wood-clad H3 windows internally
- Roof: Low-slope PVC membrane over main roof areas, complemented by 1:12 standing seam 238T McElroy Metal roof for coastal performance and visual interest
- Overall Intent: Modern, durable aesthetic that harmonizes with the natural environment of Haines, AK; emphasizes daylight, transparency, and human connection to outdoors.

Interior Finishes Design Narrative

Interior Walls

New interior walls will consist of 20 ga. metal studs at 16" o.c. with 5/8" type "X" gypsum wall board in all areas. Any walls required to be fire or smoke rated will be sealed to limit the passage of smoke. STC ratings per FGI design standards for clinical spaces will be observed. Water-resistant gypsum board will be used in wet locations. Wall blocking to be provided where necessary based on casework and equipment located on them. The design team will review these specific areas with SEARHC space by space for design input.

Architectural Security

New security features for staff safety and securing inventory of the building will be as follows. Over the will-call windows of the pharmacy, an electric retractable security shutter will be installed. At the various entry doors into the controlled staff-only areas, door hardware will be provided that will be compatible with badge reader functionality. At requested reception desks where staff safety is a concern, safety glazing will be installed. Cushing Terrell will meet with the SEARHC Life Safety and Security lead to discuss the strategies to deploy in this facility. Further development of that design will occur in the Design Development phase of the project.

Windows

New interior windows will be an aluminum frame fixed pane to allow for visibility and natural daylight throughout the space. Interior window placement will be specifically coordinated with each department and owner as Design Development progresses.

Doors

New interior doors will be flush panel, solid core, veneer wood doors with a clear stain finish. Interior door frames will be aluminum frame system to align with SEARHC standards. Door finishes will be consistent with the Standards Manual.

Finishes:

Flooring and Base

All floor and base finishes listed are placeholder suggestions that align with the SEARHC finish standards document. The design team will review with SEARHC space by space for design input.

Specific Department:

- Clinic
 - Exam Room: Sheet vinyl flooring with heat welded seams, Tarkett, IQ Optima, White Gray 872. Resilient Base, Roppe, traditional wall base, 4", Slate 175.

- Consult/Nutrition: Carpet tile, Mannington – Crafted, Frost and Resilient Base, Roppe, traditional wall base, 4", Slate 175.
- Behavioral Health
 - Waiting: Sheet vinyl flooring with heat welded seams, Tarkett, Tarkett, IQ Optima, White Gray 872. Resilient Base, Roppe, traditional wall base, 4", Slate 175.
 - Reception, Small Group Space: Carpet tile, Mannington – Crafted, Frost and Resilient Base, Roppe, traditional wall base, 4", Slate 175.
- Physical Rehabilitation
 - Rehab gym: Rubber flooring per standards. Resilient Base, Roppe, traditional wall base, 4", Slate 175.
 - Treatment: Sheet vinyl flooring with heat welded seams, Tarkett, IQ Optima, White Gray 872. 6" high integral cove base with stainless steel cap.
- Optometry
 - Resilient tile flooring, Mohawk Group- Hot and Heavy, Secoya C009/ Benmore 123. Resilient Base, Roppe, traditional wall base, 4", Slate 175.
- Dental
 - Sheet vinyl flooring with heat welded seams. Tarkett, IQ Optima, White Gray 872. Resilient Base, Roppe, traditional wall base, 4", Slate 175.
- Pharmacy
 - Tech Work, Waste Hold/ Breakdown, Receiving, Safe, Consult room: Sheet vinyl flooring with heat welded seams, Tarkett, IQ Optima, White Gray 872. Resilient Base, Roppe, traditional wall base, 4", Slate 175.
 - Ante and HZ Compounding Rooms: Sheet vinyl flooring with heat welded seams, Tarkett, IQ Optima, White Gray 872. 6" high integral cove base with stainless steel cap.
- Lab
 - Sheet vinyl flooring with heat welded seams, Tarkett, IQ Optima, Silver Bells CG0872. Resilient Base, Roppe, traditional wall base, 4", Slate 175.
- Imaging
 - Tech Work: Mohawk Group- Hot and Heavy, Secoya C009/ Benmore 123. Resilient Base, Roppe, traditional wall base, 4", Slate 175.
 - Mammo, Tech Work, Dress: Sheet vinyl flooring with heat welded seams, Tarkett, IQ Optima, White Gray 872. Resilient Base, Roppe, traditional wall base, 4", Slate 175.
 - X-Ray, CT, Ultra, Control Rooms: Static dissipative flooring will be used if required by machines specifications.
- Emergency Department
 - Decon: Epoxy flooring with epoxy coved base.
 - Trauma, Exam: Sheet vinyl flooring with heat welded seams, Tarkett, IQ Optima, White Gray 872. 6" high integral cove base with stainless steel cap.
 - Corridor, Charting, Meds & EMS Work: Sheet vinyl flooring with heat welded seams, Tarkett, IQ Optima, White Gray 872. Resilient Base, Roppe, traditional wall base, 4", Slate 175.
 - Dictation: Carpet tile, Mannington – Crafted, Frost and Resilient Base, Roppe, traditional wall base, 4", Slate 175.
- Kitchen
 - Tile floor with matching tile base installed with epoxy grout.

- Acute
 - Acute Rooms: Mohawk Group- Hot and Heavy, Secoya C009/ Benmore 123. Resilient Base, Roppe, traditional wall base, 4", Slate 175.
- Long Term Care
 - Nurse Station, Dining Room, Resident Kitchen, Activity/Day Room, Patient Rooms: Resilient tile flooring, Mohawk Group- Hot and Heavy, Secoya C009/ Benmore 123 on top of the Viconic Fall Defense underlayment. Resilient Base, Roppe, traditional wall base, 4" Slate.
 - Gym Exercise: Rubber flooring per standards. Resilient Base, Roppe, traditional wall base, 4", Slate 175.
 - Central Bathing/Spa, Patient Room Toilets: Safety flooring with coved base. Color and style based on SEARHC standards.

General Spaces:

- Vestibule: Shaw, Path Tile, in color sterling to be used as the walk off mat entry system.
- Main Registration Desk: Tile based on SEARHC standards and matching base.
- Registration, Public Corridors: Resilient tile flooring, Mohawk Group- Hot and Heavy, Secoya C009/ Benmore 123. Resilient Base, Roppe, traditional wall base, 4" Slate.
- Waiting, Lactation, Office/Administration, On-Call: Crafted, Frost and Resilient Base, Roppe, traditional wall base, 4", Slate 175.
- Laundry, Clean Supply, Soiled Hold, EVS, Back-of-House/Janitorial, Central Sterile: Sheet vinyl flooring with heat welded seams, Tarkett, IQ Optima, White Gray 872. 6" high integral cove base with stainless steel cap.
- Housekeeping, Staff Corridors, Materials/Facilities: Sheet vinyl flooring with heat welded seams, Tarkett, IQ Optima, White Gray 872 Resilient Base, Roppe, traditional wall base, 4", Slate 175.
- Restrooms: Tile flooring with epoxy grout, United Tile, Cottage by Piemme, Acacia, 6" x 36". Tile base, Daltile, color wheel collection, arctic white glossy, 6" x 18" w/ epoxy grout on wet walls. Resilient Base, Roppe, traditional wall base, 4", Slate 175 on remaining walls.
- Women's and Men's Locker Rooms: Tile flooring with epoxy grout, United Tile, Cottage by Piemme, Acacia, 6" x 36". Resilient Base, Roppe, traditional wall base, 4", Slate 175.
- Staff Break Room: Resilient tile flooring, Mohawk Group- Hot and Heavy, Secoya C009/ Benmore 123. Resilient Base, Roppe, traditional wall base, 4" Slate.
- IT: Static dissipative flooring. Resilient Base, Roppe, traditional wall base, 4" Slate.
- Mechanical: Sealed concrete. Resilient Base, Roppe, traditional wall base, 4" Slate.

Ceilings:

All ceiling finishes listed are placeholder suggestions that align with the SEARHC design standard document. The design team will review with SEARHC space by space for design input and an understanding if it meets the design goals of the space.

- Main Reception: Gypsum board soffit to align with the shape of the reception desk painted in a level 4 finish paint and egg-shell finish.
- Waiting areas: Wood look ceiling system, Armstrong Wood works, Redux Wood, Wheat.

- Restrooms, Compounding and Anti room: Gypsum board ceiling at underside of structure, painted in epoxy paint to match walls.
- General Ceilings: 15/16" beveled Armstrong Calla Health Zone 2'x 4' SLT Tile White standard Armstrong Prelude XL white 15/16" grid system.

Interior Walls:

All wall finishes listed are placeholder suggestions that align with the SEARHC finish standard document. The design team will review with SEARHC space by space for design input.

Specific Department:

- Clinic Spaces
 - Exam Room, Treatment: Level 4 finish and painted. Primed (1-coat), painted (2 coats), interior latex paint, egg-shell finish. Wall across from casework to have full height/width .040" thick rigid sheet wall protection panels w/ custom digital print.
- Behavioral Space
 - Level 4 finish and painted. Primed (1-coat), painted (2 coats), interior latex paint, egg-shell finish. Accent paint color on one wall.
- Physical Rehabilitation
 - Rehab Gym: Level 4 finish and painted. Primed (1-coat), painted (2 coats), interior latex paint, egg-shell finish. One wall will feature a large custom digital printed wall covering.
 - Treatment: Level 4 finish and painted. Primed (1-coat), painted (2 coats), interior latex paint, egg-shell finish. Accent paint color on one wall.
- Optometry
 - Reception, Frame Display: Level 4 finish and painted. Primed (1-coat), painted (2 coats), interior latex paint, egg-shell finish. Accent paint color on one wall. Frame displays will line the north and west wall.
 - Open Operator/Operator Rooms, Ceph Arm, Wet Lab: Level 4 finish and painted. Primed (1-coat), painted (2 coats), interior latex paint, egg-shell finish. Accent paint color on one wall.
- Dental
 - Open Operator: Level 4 finish and painted. Primed (1-coat), painted (2 coats), interior latex paint, egg-shell finish. One wall will feature a large custom digital printed wall covering.
 - Operator: Level 4 finish and painted. Primed (1-coat), painted (2 coats), interior latex paint, egg-shell finish. Accent paint color on one wall.
- Pharmacy
 - Consult: Level 4 finish and painted. Primed (1-coat), painted (2 coats), interior latex paint, egg-shell finish. One wall to have full height/width .040" thick rigid sheet wall protection panels w/ custom digital print.
 - Tech Work, Waste Hold/ Breakdown, Receiving, Safe: Level 4 finish and painted. Primed (1-coat), painted (2 coats), interior latex paint, egg-shell finish.
 - Ante and HZ Compounding Rooms: Painted with epoxy coating. Primed (1-coat), painted (2-coats), Water based (2-part) catalyzed epoxy paint.

- Lab
 - Painted with epoxy coating. Primed (1-coat), painted (2-coats), Water based (2-part) catalyzed epoxy paint.
- Imaging
 - X-Ray, CT, Mammo, Ultra: Level 4 finish and painted. Primed (1-coat), painted (2 coats), interior latex paint, egg-shell finish. One wall will feature a large custom digital printed wall covering.
 - Control Rooms, Tech Work, Dress: Primed (1-coat), painted (2 coats), interior latex paint, egg-shell finish. Accent paint color on one wall.
- Emergency Department
 - Decon: Painted with epoxy coating. Primed (1-coat), painted (2-coats), Water based (2-part) catalyzed epoxy paint.
 - Trauma, Exam: Painted with epoxy coating. Primed (1-coat), painted (2-coats), Water based (2-part) catalyzed epoxy paint with .040" thick rigid sheet wall protection panels to 4'0" high.
 - Charting & EMS Work: Primed (1-coat), painted (2 coats), interior latex paint, egg-shell finish.
- Acute
 - Primed (1-coat), painted (2 coats), interior latex paint, egg-shell finish. Accent paint color on one wall.
- Long Term Care
 - Dining Room, Resident Kitchen, Activity/Day Room: Primed (1-coat), painted (2 coats), interior latex paint, egg-shell finish. Accent paint color on one wall.
 - Gym Exercise: Primed (1-coat), painted (2 coats), interior latex paint, egg-shell finish. One wall to feature custom digital wall covering.
 - Patient Rooms: Primed (1-coat), painted (2 coats), interior latex paint, egg-shell finish. Accent paint color on one wall. Headwall to feature design elementals based on SEARHC standards.
 - Central Bathing/Spa: Walls to be full height tile. Daltile, color wheel collection, arctic white glossy, 6" x 18" w/ epoxy grout.
 - Patient Room Toilets: Walls to be full height tile w/ epoxy grout. Final tile will be inspired by SEARHC standards to give the patient room a more home like feel.

General Spaces:

- Registration: A bold, statement wall that displays the SEARHC logo being inspired by the design standards of SEARHC. Driving materials will be wood look long timbers, frosted glass on the second story illustrating the natural vegetation and stone features to anchor the reception desk.
- Public Hall: Wayfinding features will be incorporated through color and material to move the public through the space. Lightglass simulated windows will be incorporated to bring the illusion of day light into the interior space.
- Public Corridors: Primed (1-coat), painted (2 coats), interior latex paint, egg-shell finish with Inpro, Palladium wood grain 0.04" thick wall protection in color Beechwood panels installed as a wainscot above the floor base to height of 52" AFF.

- Waiting: Primed (1-coat), painted (2 coats), interior latex paint, egg-shell finish. One wall to include Garden on the Wall preserved moss, from 4' AFF to ceiling. One wall will have accent paint color.
- Lactation, Office, On-Call: Level 4 finish and painted. Primed (1-coat), painted (2 coats), interior latex paint, egg-shell finish. Accent paint color on one wall.
- Laundry, Clean Supply, Soiled Hold, EVS, Back-of-House/Janitorial, Central Sterile: Painted with epoxy coating. Primed (1-coat), painted (2-coats), Water based (2-part) catalyzed epoxy paint with .040" thick rigid sheet wall protection panels installed to a height appropriate for the space.
- Materials/Facilities, Central Supply, Housekeeping, Staff Corridors, IT, Mechanical: Level 4 finish and painted. Primed (1-coat), painted (2 coats), interior latex paint, egg-shell finish.
- Restrooms: Wet walls to be full height tile. Daltile, color wheel collection, arctic white glossy, 6" x 18" w/ epoxy grout. Remaining wall to be level 4 finish and painted. Primed (1-coat), painted (2 coats), interior latex paint, egg-shell finish.
- Women's and Men's Locker Rooms: Primed (1-coat), painted (2 coats), interior latex paint, egg-shell finish.
- Staff Break Room: Primed (1-coat), painted (2 coats), interior latex paint, egg-shell finish. Accent paint color on one wall.

Casework

All casework finishes listed are placeholder suggestions that align with the SEARHC finish standard document. The design team will review with SEARHC space by space for design input.

- Reception- Plastic Laminate casework and solid surface countertops built to AWI custom standards. Casework face to be Formica, Blond Cedar. Wood grain to run vertically. Solid surface countertops to be Formica, Designer Series, Bianco Mineral, 2cm thick, 1/4" rounded edges. Reception desk front to be plastic laminate with SEARHC standard graphic decal applied. Resin panel between the two stations will provide privacy. Resin to be 3-Form, Strand, White, 1/2" thick. Install with 3-Form hardware system. Panel to run from top of toe kick to ceiling and full depth of desk.
- General Casework: Plastic Laminate casework and solid surface countertops built to AWI custom standards. Casework face to be Formica, Blond Cedar. Wood grain to run vertically. Solid surface countertops to be Formica, Designer Series, Bianco Mineral, 2cm thick, 1/4" rounded edges with 4" applied backsplash.
- Specialty casework items each department will be specifically coordinated with owner in the use and function as Design Development progresses.

Signage

New signage will comply with ABA and NFPA requirements and design to match existing facility standard signage. The design team will coordinate with the owner's vendor for signage to align with SEARHC standards.

Accessibility

All new construction will meet the accessibility requirements of the Americans with disabilities Act and American Barriers Act (ADA/ABA).

Structural Design Narrative

General

The planned structure is to consist of steel framing with cold-formed steel studs acting as exterior and partition walls. The majority of the structure is to sit on a slab-on-grade while second floor areas will be framed using metal decking with concrete fill.

Codes and Standards

The Borough of Haines (BoH) is the Authority Having Jurisdiction (AHJ). BoH has deferred building codes the State of Alaska, which currently has adopted the 2021 IBC. However, the State of Alaska will have adopted the 2024 IBC by the time of final Construction Document Submittal in May 2026.

The design will incorporate the following codes and standards:

- 2024 INTERNATIONAL BUILDING CODE
- MINIMUM DESIGN LOADS AND ASSOCIATED CRITERIA FOR BUILDINGS AND OTHER STRUCTURES, ASCE/SEI 7-22.
- BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE, ACI 318-19.
- SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS, AISC 360-16.
- NATIONAL DESIGN SPECIFICATION FOR WOOD CONSTRUCTION, ANSI/AWC NDS-2024.

Design Loads

Gravity

- Roof Dead Load – 25 psf
- Roof Live Load – 20 psf
- Floor Dead Load – 48 psf
- Floor Live Load
 - Office Space – 50 psf
 - Corridors Above First Floor – 80 psf
 - Stairways and Exits – 100 psf
 - First Floor Corridors – 100 psf
 - Operating/Procedure Rooms – 60 psf
 - Patient Rooms – 50 psf
- Ground Snow Load – 370 psf
- Roof Thermal Factor C_t – 1.1 in heated spaces, 1.2 at exterior canopies
- Roof Snow Load – 342 psf
- Entry Canopy Snow Load – 373 psf

Wind

- Ultimate Wind Speed – 135 mph
- Exposure Category – C
- Risk Category – IV
- Importance Factor – 1.0

Seismic

- S_s – 1.210 S_1 – 0.520
- Risk Category – IV
- Site Class – D (Default)
- Importance Factor – 1.5
- SDS – 0.820 SD_1 – 0.617
- Analysis – Equivalent Lateral Force Procedure
- Resisting System – Steel Intermediate Moment Frames ($R=4.5$)

Seismic Design Values are to be refined to match values determined by final Geotechnical Report.

Structural Systems Schematic Design:

Foundation

- Design of foundation to be determined based on allowable soil bearing values and site conditions from the Final Geotechnical Report.
- Preliminary design assumption is that these foundations will consist of conventional concrete strip footings under walls and pad footings under columns over engineered fill. Based on preliminary discussions, the depth of this engineered fill may be required to extend to a depth of approximately 20 feet.

Gravity System

- The primary building system will consist of Structural Steel floor and roof beams and columns with column spacings ranging between 20 and 30 feet.
- Roofs are anticipated to utilize a 20 gauge steel roof decking attached to this structural steel.
- Elevated Floors are anticipated to consist of composite concrete slabs on metal deck.
- In an effort to minimize impacts to the overall floor plan, interior columns will be aligned with interior walls to the greatest extent practical.

Lateral Building System

- Based on the Seismic Design Criteria presented above it is anticipated that facility will be classified as Seismic Design Category D. As such, in addition to the lateral building system as discussed below seismic bracing will need to be incorporated into all building systems.

- In an effort to maintain flexibility within the facility the lateral building system is proposed to utilize Steel Intermediate Moment Frames. These moment frames will generally be located within the interior of the building and will generally align with interior walls. They will utilize bolted end plate moment connections and will generally be orientated in the strong axis of the column and beams.
- It should be noted that the use of steel intermediate moment frames is limited to buildings with a roof dead load of 20psf and to an. As a result this system will be further evaluated throughout the design development phase and if the proposed roof dead load is anticipated to exceed this 20psf limit, this lateral system will be changed to a Steel Special Moment Frame system which has additional seismic detailing requirements adding additional complexity to the fabrication and erection of the steel. If required this change is not anticipated however to impact the overall floorplan.

Mechanical Design Narrative

Mechanical Systems Schematic Design:

Ventilation Systems

AHU-1 Outpatient: AHU-1 sized for approximately 40,000 CFM will be equipped with multiple fan "fanwall" array of relief fans, 100% air economizer, MERV 8 & MERV 13 pre-filters, multiple fan "fanwall" array of supply fans, DX dehumidification and hot gas reheat coils, heating water coil, & chilled water coil. This unit will serve the outpatient B-occupancy areas of the building which includes the following departments:

- Behavioral Health
- Rehab
- Outpatient Clinic
- Administration (2nd floor)
- Dental Clinic
- Pharmacy
- Lab
- Warehouse & Laundry

This air system will run continuously. During nights and weekends, the temperature setpoints will be relaxed for rooms where this is acceptable, though the supply fans will run continuously due to departments requiring continuous ventilation. The return air path for this air system is fully return air ducted. The fans of this air system will be backed by the generator to maintain ventilation and heating capability on loss of normal power.

AHU-2 Inpatient: AHU-2 sized for 35,000 CFM will be equipped with multiple fan "fanwall" array of relief fans, 100% air economizer, MERV 8 pre-filters, multiple fan "fanwall" array of supply fans, DX dehumidification and hot gas reheat coils, heating water coil, chilled water, and MERV 14 final filters. This unit will serve the inpatient I-2 occupancy areas of the building which includes the following departments:

- Radiology
- Emergency Dept
- Sterile Processing
- Acute care
- Long Term Care (and future expansion / addition)

This air system will run continuously based on the inpatient care occurring in these areas. The return air path for this air system is fully return air ducted. Supply and return ducts will be sized for a future expansion to the long-term care. The fans of this air system will be backed by the generator to maintain ventilation and heating capability on loss of normal power.

Heating System:

The heating water plant will be water only (no glycol) and will be designed for 180 deg F supply water temperature. The piping configuration will be primary / secondary with each boiler equipped with its own primary pump. The secondary (building loop) pumping will be two variable speed pumps.

The boiler plant will consist of one electric boiler sized for the full building heating load, and two non-condensing oil fired boilers each sized for approximately 60% of the full building heating load. Electric boilers have a high turndown rating thus one boiler is expected to operate effectively even at times of low load. Fuel oil boilers traditionally have limited turndown, thus selecting two smaller oil-fired boilers will allow more effective operation and control of the boilers at times of low load.

Space for a second future electric heating boiler will be provided, allowing the owner to install another for additional redundancy. Freeze protection for the air handler heating water preheat coils will either be via coil pumps, or use of a separate glycol loop with plate heat exchanger.

The heating boilers and pumps will be designed in size and quantity for N+1 redundancy such that upon the loss of any one boiler or pump, reserve capacity will be available to makeup for the capacity of the lost equipment.

The electric boiler will not be backed up by the facility generator. Both fuel oil boilers will be backed by the generator thus on loss of normal power, the fuel oil boilers must be used for building heating.

Cooling System

One or two air-cooled chillers will be located on the roof over the back of house central support area. The chillers will be water only. Chilled water coil freeze protection will be via coil pumps during shoulder months, with the coils required to be drained through the winter months. The chiller will not be backed by the generator.

The piping configuration will be primary / secondary with the chiller(s) equipped with their own primary pump. The secondary (building loop) pumping will be two variable speed pumps for N+1 redundancy.

HVAC Outdoor Design Condition Assumptions

Winter heating condition is -8 degrees F DB.

Summer cooling design condition is 75 degrees F DB and 59 WB.

Dehumidification design condition is 70 grains/lb (coincident to 63 degree F DB)

Dehumidification

Both central air handling systems will be equipped with DX dehumidification coils with hot gas reheat. Each dehumidification coil will be paired with a roof mounted split-system DX condensing unit. The AHU-1 and AHU-2 dehumidification units will not be backed by the generator.

Specialized Room HVAC

- Procedure Room:** Non-invasive procedure room for minor surgical procedures will be designed with a minimum of 15 total air changes of supply air per hour. Type E non-aspirating diffusers will be provided, and low wall return will be provided. Room pressure will be positive. This room will be also used for Endoscopy procedures. Current 2022 FGI requirements for Endoscopy rooms are 6 air changes per hour, no specific room pressure requirement, and no requirement for exhausting the room, thus no special changes are required to use this room for Endoscopy. Electric fired steam humidifier will be provided in the zone duct for this room to maintain minimum 20% RH. Room pressure will be measured and trended via BMS, but a local room pressure indication will not be provided.
- ED Trauma Rooms:** Trauma rooms will be designed with a minimum of 15 total air changes of supply air per hour. Type E non-aspirating ceiling diffusers and low wall return will be provided. Room pressure will be positive. Room pressure will be measured and trended via BMS, but a local room pressure indication will not be provided.
- Infectious Isolation Rooms:** Isolation rooms will be designed with a minimum of 12 air changes per hour of exhaust. Exhaust grille will be located on the wall or in the ceiling near the head of the bed. Isolation room will be maintained at a negative room pressure relative to adjacent spaces. Minimum room pressure will be maintained at 0.10" w.c. and will be monitored both locally and in the BMS. Infectious exhaust duct systems will be separate from regular exhaust and will be powered by a utility set fan with a ducted discharge a minimum of ten feet above the roof.
- GI Endoscopy Room:** Gastrointestinal endoscopy procedures will be performed in the Procedure room. Refer to Procedure room for additional description.
- Ambulance Garage:** The garage will be designed assuming ambulance engines will be off when the doors are closed. A baseline continuous amount of air will be exhausted from the garage 24/7/365. Products of combustion sensors will be installed to alarm locally and in the building management system in case of buildup of dangerous exhaust. A garage exhaust purge fan and associated large makeup air unit will not be provided since this is not a service garage and

vehicles will not be running indoors. Heat will be provided by both radiant floor heat and heating water unit heater(s).

Compounding Pharmacy: The compounding pharmacy will be designed to current USP standards. The compounding taking place in this pharmacy is all non-sterile compounding, thus no cleanrooms are required. The non-sterile hazardous compounding room will be exhausted at minimum 12 air changes per hour. This room exhaust as well as the hazardous compounding hood exhaust will be served by a utility set exhaust fan located on the roof, with a discharge stack ten feet above the roof. The non-sterile hazardous compounding room will be equipped with room pressure monitoring both locally and in the BMS.

Kitchen: Type I exhaust fan(s) and hood(s) will be provided to capture and exhaust grease laden vapors above the cooking appliances. Type II exhaust fan and hood will be provided for heat and moisture laden air such as that from the dishwasher. A dedicated makeup air unit will be provided for the kitchen and will be interlocked to run when the kitchen exhaust fans run. A single glycol filled hydronic coil will switch between heating and cooling depending on outside air temperature. A plate heat exchanger will separate the heating and chilled water from the glycol.

Steam Systems / Humidification

No central steam boiler will be provided. Sterile processing department autoclaves will use onboard electric steam generators. The areas which require addition of humidity are as follows: Procedure room, two Trauma rooms, the Acute care wing of six patient rooms, and possibly the CT scan room (depending on mfr). A total of four electric to steam humidifiers (or five if the CT requires humidification) will be provided to maintain these spaces at a minimum of 20 % RH. Electric steam source units will be located on the wall in small closets or equipment rooms, with steam piping extending up to steam dispersion manifold in the zone ducts in the ceiling above.

Building Automation System

A DDC building controls system will be provided. Color graphics will be provided for each air system, for the heating plant, the cooling plant, and for each VAV zone. A floor plan graphic will display temperatures of each zone and will include links to allow users to jump to each individual VAV zone graphic. A summary table of the VAV zones will be included to allow users to quickly check VAV performance parameters. A graphic screen will be included for those rooms which require pressure control. DDC controls communication protocol will be Bacnet. A dedicated PC for the controls system will not be required. The system interface will be web-based such that users with the correct log in credentials will be able to access the system via a web browser such as internet explorer or google chrome from any computer.

Plumbing Design Narrative

Codes:

The following codes will be used to develop the design of the plumbing systems:

- 2018 Uniform Plumbing Code (UPC) with Alaska Amendments
- 2018 International Fire Code (IFC)
- 2018 International Energy Conservation Code (IECC)
- 2022 Facilities Guidelines Institute (FGI)
- 2019 National Fire Protection Association (NFPA) 110 – *Standard for Emergency and Standby Power Systems*
- 2021 NFPA 30 – *Flammable and Combustible Liquids Code*
- 2021 NFPA 99 – *Health Care Facilities Code*

Domestic Water

A new water service will be provided to serve the facility, entering along the exterior wall of the Fire room. The service entrance will be a combined service for fire and domestic water. A three-inch diameter domestic water will branch off the combined service and run to a 3" water meter with dual reduced pressure backflow preventers in parallel to allow testing or maintenance to occur without interrupting use of all domestic water. Current estimated maximum instantaneous water demand is 100 gpm.

During further design activities, the water quality will be ascertained; the current stance assumes the existing water supply to the building is suitable for use without water softening required. Water for the sterile processing department will be softened and further treated with a reverse osmosis (RO) system with storage tanks, filters, remineralization beds and circulation pumps to generate the quality of water required by the sterilization equipment. Based on the final facility arrangement, it is assumed that small, localized RO units will not be required at sinks and in the pharmacy to generate the required water quality for infusion drug compounding.

Domestic hot water will be generated using two electric storage water heaters. The system will generate, store, and circulate 140-degree F water to all remaining fixtures to positively control Legionella development. A localized electric storage booster heater will be provided to generate water at 160 deg F for the laundry, using the 140 deg F water as feed water. Separate domestic hot water recirculation loops will be developed for the facility, considering hours and days of occupancy. Each loop will include a dedicated recirculation pump controlled (started and stopped) in response to return water temperatures between 95- and 105 degrees F. For the clinic and office space loops, the circulation pumps will be controlled to prevent operation during nights and weekends. For all public and patient room fixtures, thermostatic mixing valves will be installed to reduce the hot water temperature to no more than 120 degrees F for sinks and lavatories, and 110 degrees F for all showers.

Materials for the domestic water system will be Type L copper tube with soldered joints and fittings, while allowing the contractor to utilize pressure-compressed fittings and joints. Where applicable, the use of crosslinked polyethylene tubing with cold expansion fittings and joints will be utilized. All domestic cold water, hot water, and recirculation piping will be insulated with glass fiber insulation with all service jacket in thicknesses mandated by the 2018 International Energy Conservation Code (IECC) and 2018 UPC. For all cold-water piping, the insulation thickness will be one inch. Insulation on the 140-degree F system will have one inch insulation on piping smaller than 1", with 1½" insulation thickness on all piping 1¼" to 1½" and 2" thick insulation on all hot water piping larger than 2". The laundry loop will have 1½" insulation on all piping 1½" and smaller and two inches on all piping 2" and larger.

Hot water supply to all public lavatories will be extended down to within 24 inches of the angle stop valve to comply with the IECC section C404.5.1.

Sanitary Waste & Vent

The building will be served by a 6" minimum sanitary sewer service. Location of service to the site civil system is pending. The building sewer service may require two separate connections if there are bury depth (invert elevation) concerns.

Sanitary waste and vent piping will be installed to serve all new fixtures. Underground piping will be a combination of Schedule 40 Polyvinyl Chloride (PVC) and Schedule 40 Chlorinated Polyvinyl Chloride (CPVC) piping, based on the entering drain water temperatures. The use of CPVC will be predominately in the sterile processing department and boiler room, although the use may be required for selected drains in the kitchen. All vent piping will be Schedule 40 PVC piping. Where ceiling cavities in any areas of the facility are used for return air plenums, then CPVC pipe and fittings or no-hub cast iron pipe and fittings with heavy duty elastomeric couplings will be used.

Several drains and sinks in the kitchen will generate greasy wastewater, dictating installation of a grease interceptor to comply with local requirements. The grease interceptor would be located exterior to the building and will be sized for a 60 day pump out cycle based on the number of meals prepared each day and an assumed grease production per meal. The outlet of the grease interceptor will be to the building sanitary waste.

The emergency department decontamination room will be equipped with a floor drain and an electrically actuated diverting valve to direct contaminated drain water to a retention tank installed below grade. The normal operation allows drain water to discharge through the sanitary waste system; the plumbing code requires any contaminated waste to be captured to prevent damaging the facility sewers or municipal sewage system.

Roof and Overflow Drainage

Roof drains will be discharged to below grade. Overflow drains will discharge to surface. Roof drains will be cast iron sumps with cast iron domes, and overflow drains will be standpipes extending two inches above the roof and protected with hardware cloth. Interior piping will be Schedule 40 PVC, and all horizontal pipe sections of both systems will be insulated with one inch glass fiber insulation with all service jacket, the insulation will extend down one foot vertically where the pipe transitions from horizontal to vertical. Downspout nozzles for roof and overflow will be brass. Where ceiling cavities in any areas of the facility are used for return air plenums, then CPVC pipe and fittings or no-hub cast iron pipe and fittings with heavy duty elastomeric couplings will be used.

Fuel Systems

Building heating boilers and standby generators will be served by an above ground fuel oil system, using localized day tanks to control fuel delivery. One day tank will be sized to serve both standby generators, and a second day tank will be selected to serve both fuel oil boilers.

The size and number of above ground tanks will be determined during full design development based on input with the Owner. NFPA 110 requires a minimum supply of 96 hours of fuel for critical facilities in seismic areas; the location and fuel delivery availability will form part of the decision on the size and number of storage tanks. Fuel supply for the boilers takes precedence over the fuel allocated for the generators to comply with NFPA 110. The location of the storage tanks will be coordinated with the Owner and site civil design, utilizing protected tanks complying with UL2048 to satisfy the IFC.

Medical Gas Systems

Medical gases will be provided following National Fire Protection Association (NFPA) 99 – Health Care Code and the Facilities Guidelines Institute (FGI) with user group input for the anticipated space usage. Standard gases to be provided are oxygen, medical air, and medical vacuum, with the potential to include support gases of carbon dioxide, nitrous oxide, nitrogen and instrument air. Medical air and medical oxygen will be delivered by NFPA 99 compliant high-pressure manifolds located in the medical gas room, and medical vacuum by a skid-mounted lubricated vane duplex pump with receiver tank. Any support gases of nitrogen, nitrous oxide, carbon dioxide, and instrument air will be delivered by automatic changeover manifolds located in the medical gas room. Use of cryogenic oxygen dewar tanks with high pressure reserve will be evaluated based on med gas room size and volume of oxidizers that are allowed to be stored within a medical gas room by NFPA 99.

Master medical gas alarm system panels will be provided, one located in the emergency department nurse station, the second in the facilities services area. Area alarm panels will be provided to comply with NFPA 99, specifically in critical care areas such as the emergency department.

Separate dental air and dental vacuum systems will be provided, with the generating equipment located in the mechanical penthouse above the dental clinic spaces. Nitrous oxide needs for the dental clinic will be determined based on meetings with the Owner and dentists; the location of the nitrous system will be determined once the need has been established. The category of the systems to comply with NFPA 99 Chapter 15 will be determined based on the type of sedation (deep versus moderate). Warning systems appropriate for the category of the system will be provided and located to comply with NFPA 99.

Clinic procedures include the use of liquid nitrogen in portable dewers that are filled from a stationary liquid nitrogen tank. The location of the stationary tank will be determined during the design development. The liquid nitrogen tank will be specified to include a vacuum-jacketed hose for transfilling the portable dewer.

The type of medical gas wall/ceiling inlets and outlets will be selected in concert with the SEARHC biomedical support group.

Facility Area Considerations

ACUTE

- Waste, vent and water
- Med Gas: O₂, VAC, MA
- Plan for future expansion of x patient rooms.

BEHAVIORAL HEALTH

- Waste, vent and water

CENTRAL STERILE

- Waste, vent and water
- Med Gas: Instrument Air
- RO water for steam sterilizer, steam autoclave, small autoclave and scope washer
- Pressure reducing valves as required for specific equipment
- Adjustable 3-comp sink
- Eye/face wash
- Backflow preventers

CENTRAL SUPPLY

- Services as required by staff

CIRCULATION

- Elevator Sump Pump with discharge to sanitary sewer

CLINIC

- Waste, vent and water
- Med Gas: As required by staff
- Plan for future expansion

DENTAL

- Waste, vent and water
- Med Gas: VAC, compressed air from systems dedicated to dental only

EMERGENCY DEPARTMENT

- Waste, vent and water
- Med Gas: O2, VAC, MA. Specialty gas if required by staff
- Holding tank for decontamination shower
- Trench drain in sally port. Connect to sand/oil interceptor
- Ligature resistant fixtures in Flex Hold room
- Scrub type sink in Trauma

IMAGING

- Waste, vent and water
- Med Gas: Oxygen and vacuum as required by staff

KITCHEN

- Waste, vent and water
- 140 deg. hot water to dishwasher, dish machine to be provided with booster heater for sanitization service
- Grease waste
- Assume 3-comp. 1-comp. and hand sink
- Floor sinks and drains as required

LAB

- Waste, vent and water
- Specimen restroom: flush valve type with flush valve and lavatory with manual operation faucet. Remote solenoid valves with wall switch to turn water supply off to the fixtures as required by the test protocol.

LAUNDRY

- Waste, vent and water
- 160 deg. hot water and cold water with water hammer arrestor
- Assume two 60 lb. washers, discharge to trench drain with lint trap
- Eye/face wash
- Backflow as required

LONG TERM CARE

- Waste, vent and water
- Med Gas: Oxygen at a minimum. VAC and MA as required by staff
- Plan for future expansion

MATERIALS/FACILITIES

- Compressed air (shop air) if required by staff for maintenance

MECHANICAL

- Waste, vent and water
- Water service in Fire room
- Water heaters
- Floor sinks and floor drains as required for equipment
- Make-up water to boiler system
- RO/DI water system for Central Supply
- Medical gas cylinders
- Medical vacuum and medical air systems
- Dental equipment pending
- Fuel oil day tanks for emergency generators and boilers

OPTOMETRY

- Waste, vent and water

PHARMACY

- Waste, vent and water
- Eye/face wash in compounding anteroom
- Hands free hand sink in anteroom

PHYSICAL REHABILITATION

- Waste, vent and water

PUBLIC AREAS

- Waste, vent and water
- 0.5 GPM faucets

STAFF AREAS

- Waste, vent and water

SECOND FLOOR

- Waste, vent and water
- Wall box for coffee

PLUMBING FIXTURES

- Water Closet: Public, Staff and general patient will be floor mounted with 1.28 gpf flush valve. ADA
- Water Closet: Acute and LTC consider the use of a bedpan washer. ADA
- Urinal: none planned at this time
- Lavatory: Public, Staff, general patient and Acute will be wall mounted with concealed arms support. ADA compliant. Faucet type pending
- Public lavatory faucets will be 0.5 gpm maximum to comply with the UPC.
- Patient of size rooms will utilize plumbing fixtures designated for use with bariatric patients.
- Fixtures in the behavioral health spaces will be ligature resistant.
- Lavatory: LTC type is pending. ADA compliant. Faucet type pending
- Sink: All sinks will be either drop in or undermount depending on countertop type. Faucet type pending
- Showers: ADA compliant
- Clinic Sink: Floor mounted set on a pedestal. Flush valve, faucet and bedpan washer
- Mop Sink: Floor mounted with drop front and stainless cap

Fire Protection Design Narrative

Fire Sprinkler Systems

General building scope: The construction scope shall be comprised of the following areas:

1. New 2-Story hospital built in phases.

Codes and Standards:

1. 2021 IBC with Amendments.
2. 2021 IFC with Amendments.
3. 2019 NFPA 13 "Standard for the Installation of Sprinkler Systems".
4. 2019 NFPA 20 "Standard for the Installation of Stationary Pumps for Fire Protection".
5. 2021 NFPA 30 "Flammable and Combustible Liquids Code".
6. 2021 NFPA 99 Healthcare Facilities
7. 2021 NFPA 101 "Life Safety Code".
8. FGI Guidelines for Design and Construction of Healthcare Facilities 2022.

Materials and Equipment:

1. The Masterplan Narrative may include references to materials and equipment by manufacturer's name and model number to help establish the level of quality.
2. Fire Riser Manifolds: Fire risers will be comprised of valves, pressure relief valves, and flow switches that will be monitored by the fire alarm system.
3. Piping and Fittings Interior: Interior piping 2" and smaller will be Schedule 40 or listed equivalent steel with cast iron threaded fittings. Piping 2½" and larger will be Schedule 10 or the listed equivalent steel with roll grooved fittings; cut grooved fittings will not be allowed. No mechanical tees or fittings will be allowed. Drain piping and fire department connection piping upstream of the check valve will be galvanized Schedule 40 for sizes 2" and smaller with cast iron threaded fittings or Schedule 40 for piping 2½" and larger with cut grooved pipe and painted ductile iron fittings.
4. Dry system will utilize a nitrogen generation system allowing black Schedule 10 piping 2½" and larger with roll grooved pipe.
5. Sprinklers: Sprinklers will be standard coverage quick response type selected for the thermal sensitivity of the appropriate application. Pendent sprinklers will be provided for all finished spaces and upright sprinklers will be provided for all unfinished or open structure areas. Concealed sprinklers will be used in Ct and X-ray rooms and as indicated on the plans. Extended coverage sprinklers will be considered for light hazard occupancy.

6. Hangers, Supports and Bracing: Hangers and supports will be spaced as required per NFPA 13. Due to the Seismic Design Category "D", based on the Site Class and Seismic Use Group of this region and facility, seismic bracing will be required per NFPA 13.
7. The fire department connection will be provided as per the local AHJ.
8. Electrical Devices: All valves on the fire sprinkler supply lines will be electrically supervised by tamper switches and monitored by the building fire alarm panel. Each fire sprinkler zone (riser manifold) will be electrically supervised by a flow switch and zone control isolation valve and tied into the fire alarm panel. The exterior horn and strobe assembly at the front of the building near the new fire department connection will also tie into the fire alarm panel.
9. Miscellaneous: Hydraulic placards will state the flow and pressure requirements of each zone and will be attached to the zone piping near the zone or riser manifolds. A spare stock of sprinklers will be provided for each type of sprinkler used in a zone.

System Design Conditions

Hydraulic design requirements:

1. The following areas will be classified as light hazard in accordance with NFPA 13 and designed to a uniform density of 0.1 gpm/square foot: patient rooms, waiting rooms, conference rooms, restrooms, operating rooms, work/office areas, common areas, hallways, and vestibule.
2. The mechanical and electrical rooms will be designed to a uniform density of 0.15 gpm/square foot as required by an Ordinary Hazard (Group 1) occupancy classification.
3. Storage rooms and janitor's closet will be designed to a uniform density of 0.2 gpm/square foot as required by an Ordinary Hazard (Group 2) occupancy classification.
4. The generator rooms will be designed to a uniform density of 0.3 gpm/square foot as required by an Extra Hazard (Group 1) occupancy classification.
5. The minimum allowed design area will be 1,500 square feet. The overall wet and dry systems will be based on the most hydraulically demanding remote areas of the sprinkler system. The sprinkler systems will be hydraulically calculated using the density/area method as outlined above.
6. Unconditioned spaces will require a dry system. A 30% increase in the hydraulic design area is required for the sloped ceilings, as well as an additional 30% increase for the dry system.
7. Overhangs, entry canopies, generator room, and sally port will require dry sprinkler sprinklers.

Seismic Category:

1. Contractor to install all piping and equipment for the entire project under seismic category 'D' importance factor 1.5 (Operating rooms category risk Factor IV).

Fire Pump Design Requirements:

1. A pump shall be designed to boost the site water supply pressure. The anticipate pump would be a centrifugal fire pump rated at 1000-gpm at 40 psi.

Electrical Design Narrative

Codes and Standards:

The building Electrical systems will be designed in accordance with the following current building codes:

- 2021 IBC International Building Code
- 2021 IMC International Mechanical Code
- 2021 IFC International Fire Code
- 2021 IECC International Energy Conservation Code

The electrical design will also follow the latest adopted edition of the following guidelines and standards.

- NFPA 70 – National Electrical Code
- NFPA 99 – Health Care Facilities
- NFPA 101 – Life Safety Code
- NFPA 110 – Emergency Systems

The healthcare specific Electrical design criteria used for the project will be based on the guidelines below:

- 2022 FGI Guidelines (containing ASHRAE 170-2021)

Power Distribution

Utility primary will be coordinated with Alaska Power and Telephone (AP&T) to bring a primary feeder to the new building and a site transformer with secondary metering. The utility transformer will provide service to the building at 277/480 volt. A main 277/480-volt switchboard will be located in the main electrical room. The 480-volt system will be used to serve larger mechanical loads such as air handlers and chillers, 277-volt lighting, Radiology machines, and for distribution at key points in the building. In the main electrical room, a transformer will also be installed to step down the 277/480 voltage to a 120/208-volt power system to power all the 120/208-volt power needs such as receptacles and smaller equipment. Main switchboards will be installed in the main electrical room and distribution and branch panelboards will be placed throughout the facility at key locations and sub-electrical rooms. Typically, the 120/208 panels will be placed to serve loads within a 100ft radius to avoid voltage drop on home-run circuits.

The hospital's emergency system will be provided from interior Level 1 Diesel generators or generators, with approximate size of (2) 1000KW, 277/480 volt and 96 hours of fuel supply. The generator(s) will provide emergency power to the facility within 10 seconds of a utility power outage per NFPA 110. The generator(s) will provide non-classified emergency power to an emergency distribution electrical room adjacent to the main electrical room. The generator power will be split into the three NEC code required emergency branches of life safety, critical and equipment as well as

a stand-by branch to cover the remainder of non-critical building loads to maintain complete electrical system utilization during a utility power outage utilizing closed transition automatic transfer switches with bypass capabilities. The transfer switches are used to transfer power to the generator system in the event of a utility or other normal power system outage. The emergency transfer switches will be a closed transition type to minimize interruption during transfers and to minimize interruption to equipment.

Emergency Power Main Distribution will be installed in the emergency electrical room adjacent to the main electrical room and distribution band branch panelboards will be placed throughout the facility at key locations and sub electrical rooms. Typically, the 120/208 panels will be placed to serve loads within a 100ft radius.

In operating rooms, power isolation panels will be utilized. The power isolation panels monitor ground currents as low as 1ma to ensure that the electrical circuits in the room are safe, which is a requirement in operating rooms with a wet procedure possibility.

Lighting

LED lighting technology will be provided for all interior lighting. Lighting for public areas and common areas will be coordinated with the interior design team and the owner for aesthetics utilizing downlights, accent fixtures, pendants and other fixtures that will help to highlight moments of interest. Light fixtures in clean room areas will be of a sealed type with maintenance access from below. Light fixtures in radiology rooms will utilize a combination of downlights and flat panel LED fixtures with optional lighting scenes. Back of house LED fixtures will be flat panel and strip type fixtures. Lighting color temperature will be designed at 3500 Kelvin. All other LED fixtures will be of 2'x2' or 2'x4' recessed troffers throughout the building.

Interior lighting controls will utilize occupancy sensors, smart wall switches and smart wall dimmers to comply with energy code requirements and allow for flexibility for users to adjust levels as necessary. Conference rooms and other special use areas will utilize wall stations with lighting zones and time functions. Corridor areas will be designed with occupancy sensing and dim down to a set level when no occupants are present.

Per the NEC and IBC codes, Emergency lighting will be provided from the emergency generator life safety branch powering exit signage, emergency egress lighting and exterior building entrance/exits with emergency egress lighting. Lighting fixtures with battery backup will be provided where required per IBC and NEC codes (i.e., trauma, resuscitation, mechanical rooms, etc.).

LED exterior lighting will be provided for building entrances, building accent, pathways and parking lot areas. All exterior lighting will be designed with cut-off type optics to prevent glare and to uphold dark sky standards. Light levels will be designed at a minimum for area security and for security cameras to capture images adequately. Flagpole lighting will also be provided to accent the United States, SEARHC and Alaska State flags.

Exterior lighting controls will be designed for flexibility in control. All lighting will be turned on via photocell with potential for override and with flexibility to turn off certain portions of lighting at set times. In addition, parking lot area lighting will be designed with the capability for group-controlled dimming when no cars or occupants are present to save energy. Exterior light poles will be mounted on a concrete base, and poles will be equipped with a provision for a potential security camera with 1" conduit stub from the pole to a ground box adjacent the pole.

Communications Systems

The communications system will require a main communications room centrally located within the building on the 1st floor. Coordination with AP&T will be provided to bring in a new fiber optic line to the IT server room. Conduit provisions will be made from the main communications room to outside the building for a CATV provider to bring in services that the hospital decides upon. Main server racks are anticipated in this room along with backbone copper and fiber distribution to other communication rooms in the hospital (if needed). The racks for the servers will be designed and coordinated with the hospital IT group. The actual servers will be by the owner.

In typical 1st floor communications rooms, there will be free standing racks with horizontal and vertical cable management for workstation cabling to be terminated on patch panels. The horizontal voice data cabling system is anticipated to be a Category 6 system which will support up to a 10G throughput. The CATV system will be designed with RG-6 cabling to data rooms from the room workstations and a backbone cable design will be tied back to the main communications room. The cabling, workstations, jacks, racks and patch panels will be designed and coordinated with the hospital IT group. The hub equipment, switches, services and rack UPS will be the responsibility of the owner.

Pathways will be provided from the IT server room to the roof for owner provided services such as Starlink, Snow Cloud, Dish Network, and emergency radio services.

Nurse Call System

A nurse call system will be designed for the facility based on Ascom nurse call systems for patient care areas in compliance with the 2022 FGI guidelines. The design will involve coordination with the hospital to ensure that all desired functionality and features are included. For typical patient rooms, a two-way audio communication-type system will be specified with typical patient stations, emergency call buttons and emergency pull cords. For the OR rooms, a more basic emergency call system and code blue is anticipated. For trauma rooms, patient stations a code blue system is anticipated. For clinic type spaces with basic outpatient functions, a basic tone and light system with emergency push buttons is anticipated.

Fire Alarm and Detection

A voice evacuation type Fire Alarm system will be designed for the building in accordance with the IFC and NFPA 72. This system will consist of a full coverage smoke detection system, speaker and

visible notification throughout and monitoring of the fire sprinkler system. Smoke duct detection will be installed in supply and return ducts of air handling equipment for shutdown or zone isolation during smoke conditions. Fire smoke dampers will be monitored and closed up upon detection of smoke. A main fire alarm panel is anticipated at the main entrance to the hospital.

Access Control System

A security card access system will be designed for the hospital with HID proximity readers, electric strikes, door position switches, mag locks where needed, fire alarm release and alarms. The design will be coordinated with the hospital as it is designed to ensure that it functions as needed to secure the hospital from the outside and secure critical areas within the hospital. In addition to security, the outside doors, corridors, med rooms, data rooms, surgery areas, labs, radiology, electrical rooms, mechanical rooms and staff break rooms are areas that typically will have controlled access. All access control devices will be provided by the hospital and installed by the access control contractor.

Video Surveillance

A closely related system to the controlled access is the security surveillance system. A security camera system will be designed around Milestone Systems which will monitor the building exterior, parking areas, interior corridors and other critical areas in the hospital with coordination and direction from the hospital as it is designed to ensure that it functions as needed to provide the desired video surveillance needs of the hospital. In some cases, this system might be used for allowing the card access system to release a door to let someone through as needed. All video surveillance devices will be provided by the hospital and installed by the video surveillance contractor.

Landscape Design Narrative

Landscape Narrative

The landscape design for the SEARHC Critical Access Hospital in Haines, Alaska establishes a restorative, culturally grounded, and environmentally responsive setting that supports patient wellness, staff needs, and community connection. The site is organized to balance the functional requirements of hospital operations—including long-term care, clinic use, parking, utilities, and snow storage, with welcoming exterior spaces that provide comfort, clear orientation, and opportunities for nature immersion.

Planting Design

Proposed vegetation consists primarily of native evergreen and deciduous trees (installed at (at a minimum) approximately 6 feet tall and/or 2-inch caliper), native ornamental trees (~1½-inch caliper), native shrubs (2–5 gallon container size), and native groundcovers and seed mixes. Plant size and density will increase in key pedestrian and high-impact areas. All plant material will conform to the current American Horticulture Industry Association Standard for Nursery Stock.

Landscape boulders will be incorporated throughout the site to enhance visual character and, in high-use areas, serve as informal seating. On-site boulders disturbed during construction are assumed to be salvaged and reused.

Irrigation

Plant material is expected to be supported through natural precipitation; a permanent irrigation system is not currently proposed.

Snow Storage

Amenity, site, and parking lot landscaping will be strategically located away from adjacent hardscape to ensure adequate space for snow push-off and seasonal storage.

Drainage

Stormwater will be conveyed through an open swale designed to resemble a natural stream corridor, integrating boulders and native vegetation. This swale will extend from between the CAH and the duplex housing south along Jones Point Road. Pedestrian bridges are proposed near the vehicular crossing.

Pedestrian Connections

A ~6-foot-wide concrete path will connect the duplex housing to the hospital, meandering through existing vegetation and following the natural topography. Due to grade constraints, this connection

may not meet ADA requirements. ADA/accessible pedestrian circulation will be provided adjacent to the hospital to connect entrances, parking areas, and key site amenities.

Perimeter Landscape & Buffering

Dense landscape screening will be installed along the north and west property boundaries to buffer adjacent uses and Jones Point Road. Screening will rely primarily on evergreen trees, complemented by native deciduous trees and shrubs, creating a naturalistic visual barrier. These perimeter plantings transition into a cohesive system of native groundcovers, ornamental accents, and grouped tree plantings that reinforce building architecture and guide visitors toward key entry points.

Impact Landscape Zones

Entry Drop-Off Landscape

The main entrance features an ornamental entry plaza with decorative paving, seating, lighting, planter pots, site furnishings, three flag poles, a steel-and-cedar trellis, and raised planting beds with integrated seat walls. Together, these elements establish a dignified and intuitive arrival experience. Adjacent pathways and small garden areas provide opportunities for stress relief and quiet reflection.

Long-Term Care Courtyard

The Long-Term Care Courtyard, designed as a therapeutic landscape with privacy screening, decorative fencing, accessible walkways and decorative paving, and social seating areas. Other amenities may also include a fire pit and/or gas built in grill station/kitchen and raised planter beds for gardening. Landscaping boulders, plant masses, and softscape treatments will help create a serene, protected environment for residents and their families.

Long-Term Care Entrance / Healing Loop

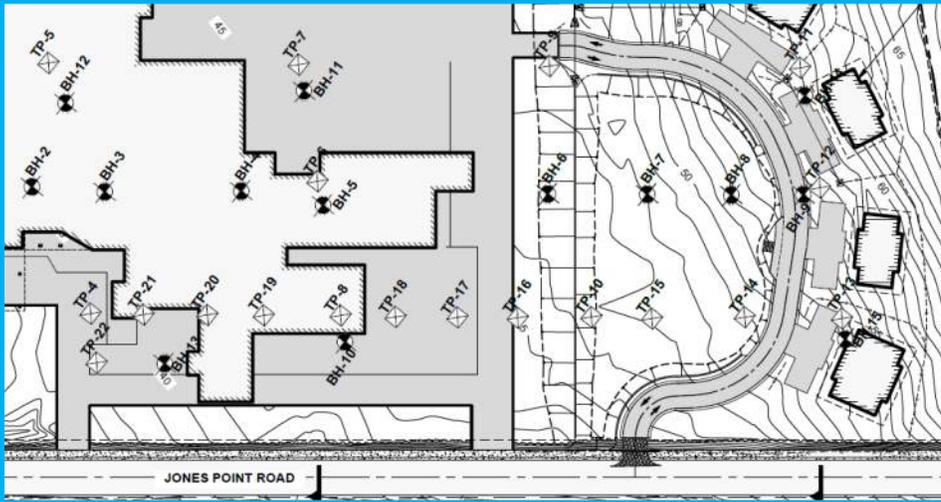
The Healing Loop is a small walking path enhanced with native berms, boulders, small gathering nodes, and ornamental plantings. This space encourages gentle outdoor movement, rehabilitation, and mental well-being.

Duplex Housing Landscape

Areas surrounding the duplex homes will emphasize native revegetation and woodland enhancement, supporting ecological performance while helping the development blend into the surrounding forested context.

Overall Vision

Through resilient planting strategies, intuitive circulation, and integrated therapeutic landscapes, the design supports SEARHC's mission by fostering cultural resonance, environmental stewardship, and human-centered care across the site.



Haines Medical Campus Site Investigation Geotechnical Report

December 19, 2025

Project No. 242078

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1. INTRODUCTION

This report presents the results of a geotechnical field investigation, performed by PND Engineers, Inc. (PND), in support of the proposed Southeast Alaska Regional Health Consortium (SEARHC) Haines Medical Campus in Haines, Alaska. The report has been prepared by PND and provides data gathered during the field investigation, laboratory results from testing performed on selected retained soil samples, geotechnical analyses and design recommendations, and construction considerations.

2. PROJECT BACKGROUND AND DESCRIPTION

2.1 DESCRIPTION

The proposed site (Figure 2-1) for the SEARHC Haines Medical Campus is a roughly 10-acre lot located adjacent to Jones Point Road, about 0.75 miles west of downtown Haines. The property legal description is Lot 10, Referees Subdivision. The property measures approximately 450 feet wide (east-west) and 1,025 feet long (north south). The elevation (datum unknown) ranges from a low point of 32 feet on the north end to 67 feet on the south end with areas of moderate undulation throughout and steeper grades on the southern quarter. The entire site is heavily vegetated, ranging from mature trees to thick underbrush.



The project may also include building, utilities and roads on nearby Lots 5 and 6, Hannon Subdivision. No investigation was performed on these lots and thus the findings and recommendations contained herein may not be applicable to improvements on those lots.

2.2 PROJECT DESCRIPTION

The project scope, at the time this report was prepared, consists of phased construction of a medical facility including a clinic, critical access hospital, and long-term care. The clinic will be two stories while the other wings will be one story. Multi-family housing in the form of numerous one-story duplexes will also be constructed to house medical providers and non-local patients. Much of the remainder of the site will be comprised of parking and drive aisles.

2.3 SITE GEOLOGY

The site lies between the deltaic outlet of the Chilkat River (at the head of Chilkat Inlet) and the waters of Lynn Canal. Overburden type and thickness in Haines is highly variable even within a small area. Sand/gravel mixtures typical of river outwash deposits are often found near the surface in layers feet to tens of feet thick. Very soft marine silt and clay often underlies the surficial sand and gravel; this layer can be 50 feet thick or more but tapers to nothing and is sometimes not present at all. This soft marine silt and clay can be underlain by a hard, dry matrix-supported silty sand (diamicton) or alluvial sand/gravel mixtures of varying density. Bedrock may be 100 feet or more below the ground surface based on previous geotechnical investigations in the area.

The lot roughly 50 feet west of the project site was reportedly used as a gravel source, with excavation depths stated to be roughly 30 feet. However, nearby drilling investigations revealed soft cohesive soils up to 70 feet thick. As such, local geology can be expected to be highly variable.

2.4 REGIONAL SEISMICITY AND SEISMIC HAZARDS

The regional seismicity of Southeast Alaska is primarily defined by four known major faults: the Queen Charlotte-Fairweather Fault, Chatham Strait Fault, Denali Fault, and the Transition Fault. These four known faults are the main contributors to the seismic hazard of the project site. Wesson et al., (2007) found that these four faults could yield maximum moment magnitude (M_w) earthquakes of 7.8 to 8.2 for return intervals of 2% in 50 years. These ranges are consistent with the larger historic earthquakes that have previously been documented or recorded in Southeast Alaska (Brockman et al., 1988). Earthquakes of M_w 5.0 or less are common to Southeast Alaska, although they present low hazard to the project site.

The primary seismic-induced hazards for Haines and the surrounding region include strong ground shaking, slope failure, liquefaction, and landslides. Both the seismic setting and glacially-scoured, over-steepened terrain of the region contributes to the potential for both land-based and submarine landslides caused by earthquake-induced ground shaking or other triggering events, and are most likely to occur in saturated sediments and in unstable rock debris on steep slopes. Figure 2-2 shows previously recorded seismic activity in the Southeast Alaska region.

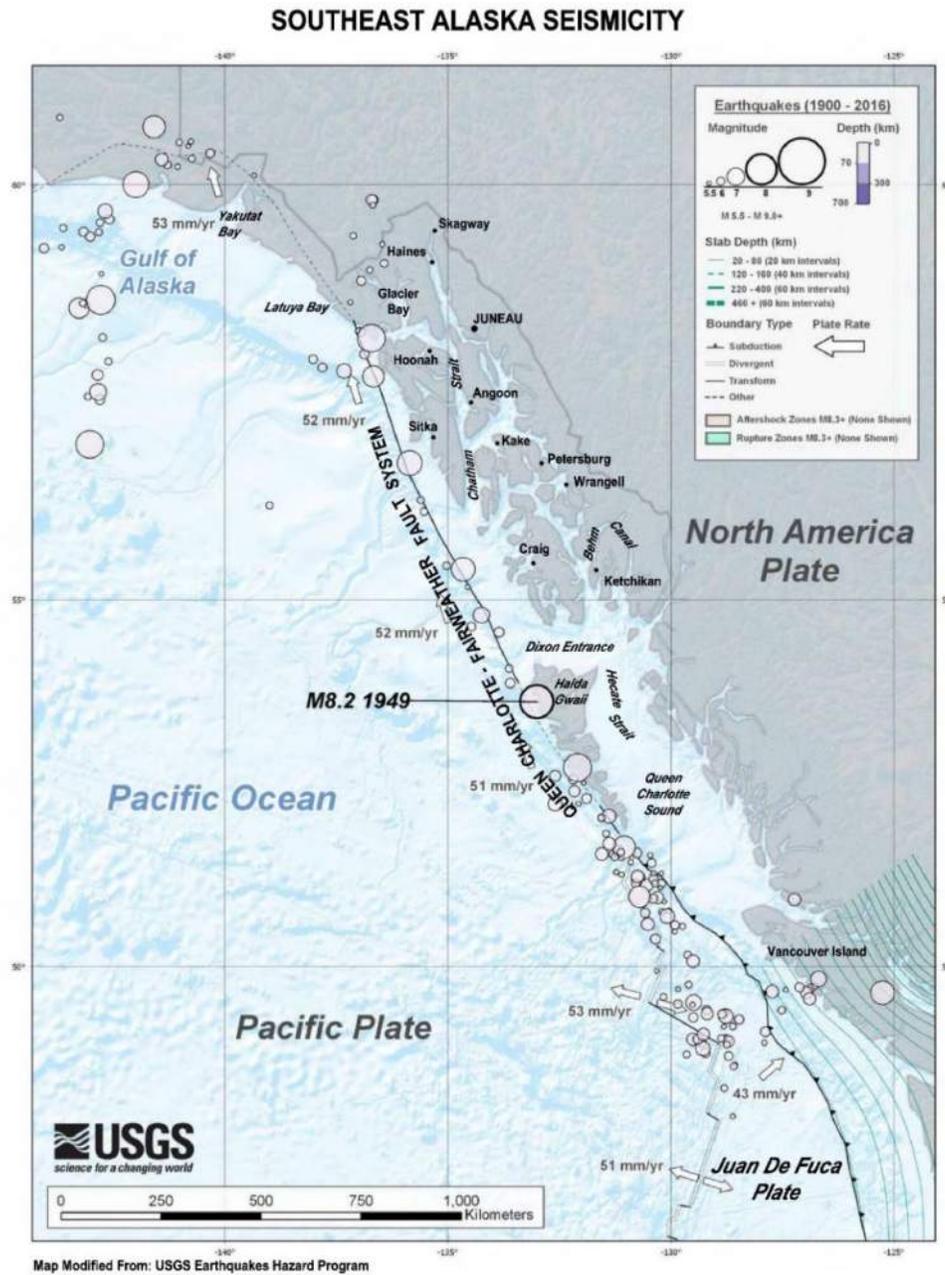


Figure 2-2: Previous Seismic Activity in Southeast Alaska

2.5 REGIONAL CLIMATE

Haines experiences humid continental climate conditions with dry summers and wet winters. The average monthly temperatures recorded in Haines typically range from 16°F in January to 58°F in July. Daily extreme temperatures range from (-)24°F to 92°F. Average annual precipitation typically ranges from 32 to 73 inches per year. This climate data was obtained from the Western Regional Climate Center Haines station (Station 503504) for the years 1989 to 2012.

3. FIELD INVESTIGATION

3.1 GEOTECHNICAL EXPLORATION

The geotechnical test pit investigation was performed in September 2024 with Diesel Dog Excavation providing excavation services. A total of 22 test pits were excavated across the site. The test pits were initially placed in a rough grid for broad coverage, and then supplemental test pits were added in the north area of the site to better define tapering shallow soil layers. Test pit depths ranged from 3 feet to 18 feet below ground surface (bgs). All test pits were excavated with a Hitachi 135 track-mounted backhoe.

The geotechnical drilling investigation was performed in May 2025 with Discovery Drilling, Inc. (DDI) providing drilling services. The drilling investigation consisted of boreholes with soil sampling and cone penetration tests (CPT). Three boreholes (BH-1, BH-5 and BH-9) and 12 CPTs (BH-2 through BH-4, BH-6 through BH-8, and BH-10 through BH-15) were advanced at various locations across the site. All boreholes and CPTs were advanced using a track-mounted Geoprobe 6712DT drill rig. Borehole depths ranged from 52 to 60 feet bgs. CPT depths ranged from 8.5 to 41.5 feet bgs.

PND field personnel provided oversight, directed the work, and documented findings during the investigation. Approximate borehole and test pit locations, as recorded by a handheld GPS and swing ties to existing features, are shown on the site plan presented in Appendix A.

3.2 EQUIPMENT AND METHODS

3.2.1 STANDARDS AND PROCEDURES

Sampling methods and classifications for soil were based on the Unified Soil Classification System (USCS) and the following American Society for Testing and Materials (ASTM) standards:

- ASTM D1586 *Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils*
- ASTM D2573-08 *Standard Test Method for Field Vane Shear Test in Cohesive Soil*
- ASTM D2488 *Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)*
- ASTM D5434 *Standard Guide for Field Logging of Subsurface Explorations of Soil and Rock*
- ASTM D5778 *Standard Test Method for Electronic Friction Cone and Piezocone Penetration Testing of Soils*

3.2.2 MODIFIED PENETRATION TESTS

Drilled boreholes were advanced using wash-rotary methods and HWT casing advancer system. Modified Penetration Tests (MPT) were performed at all drilled boreholes. Samples were typically conducted near the surface and at 2-foot intervals for the first 10 feet, then 5-foot intervals to a depth of 50 feet bgs, and 10-foot intervals thereafter to borehole termination. MPTs consist of driving a split-spoon sampler, having an outer diameter of 3 inches and inner diameter of 2.5 inches, with a 340-pound automatic drop-hammer

falling 30 inches per stroke. The number of blows required to drive the sampler for each 6-inch interval, for a maximum total distance of 24 inches, were recorded on the field borehole logs.

The blow counts shown on the borehole logs (presented in Appendix A) are field values that have not been corrected for overburden, rod length, or other factors.

3.2.3 VANE SHEAR TESTS

Where cohesive soils were encountered, a vane shear test was completed to determine the insitu undrained shear strength using a Geonor Vane Shear apparatus in accordance with ASTM D2573 *Standard Test Method for Field Vane Shear Test in Saturated Fine-Grained Soils*. The undrained shear strength is presented at depth on the borelogs in Appendix A

3.2.4 CONE PENETRATION TEST

CPTs were performed at various locations across the site to supplement the drilled boreholes and obtain additional soil data not readily collected with MPT samples. The test does not retain a physical sample of soil, but is capable of measuring tip resistance, sleeve friction, pore pressure, and other data in real time for the entire depth of the soil column. The tests were performed in accordance with ASTM D5778 *Standard Test Method for Electronic Friction Cone and Piezocone Penetration Testing of Soils* using a calibrated CPT probe with tip and sleeve areas of 10 square centimeters and 150 square centimeters, respectively. Processed data output files from each CPT location are attached in Appendix D using Geologimiki's CPET-iT software.

4. LABORATORY TESTING

Retained soil samples from the boreholes were transported to PND's soils-materials laboratory in Anchorage for additional testing upon completion of the field investigation. Laboratory results are presented in Appendix B. Tests performed consisted of the following:

- ASTM D2488 *Description and Identification of Soils – Visual Manual Procedure*
- ASTM D2216 *Moisture Content of Soils*
- ASTM D6913 *Gradation of Soils*
- ASTM D4318 *Atterberg Limits*

5. INVESTIGATION RESULTS

5.1 SOIL LITHOLOGY AND COMPOSITION

The results from the borehole drilling showed the subsurface conditions at the site were variable, mainly in regard to the presence and thickness of a very soft fine-grained soil deposit. A thin vegetative mat blankets essentially the entire site and overlays a roughly 2- to 5-foot-thick layer of poorly graded sand with gravel with boulders and cobbles throughout. This near-surface granular deposit overlays either gray wet clayey silt to lean clay up to about 30 feet thick, or poorly graded sand with gravel and subordinate amounts of silt of indefinite thickness that extended to borehole termination. The soft cohesive deposit

was completely absent at the north end of the project area, tapering to its greatest thickness at the southern end of the site.

The investigation included test pits excavations that further exposed and mapped the interbedded nature of the soils below the building site. Notable was an approximate 2 ft thick lens of cohesionless, coarse gravel and sand at a uniform depth of approximately 8 feet bgs. The coarse soils below this lens were observed to be intermittently interbedded with lenses of cohesive silt down to approximately 30 feet bgs. During the excavations, the cohesive material held up in the pit walls while the cohesionless material would slough.

The layer of very soft to soft clayey silt to lean clay is thickest on the southern portion of the lot at the proposed location of the housing units. The borehole and test pits advanced at the northern extent of the lot at the proposed parking lot indicated layers of medium dense to very dense sandy silty gravel to gravelly silty sand.

5.2 GROUNDWATER

Groundwater conditions were variable across the site and noticeably different across the two seasons that the investigations were performed. Subsurface groundwater was typically observed immediately above the silty clay/clayey silt at depths in the 3 to 5 feet bgs range. However, no groundwater was observed at several locations. Isolated locations of standing water may be present seasonally at different parts of the site.

6. DATA REDUCTION

6.1 CORRECTED BLOW COUNTS

The MPT blow counts were corrected to $(N_1)_{60}$ using standard correlations found in most geotechnical text and are presented for the medical facility and housing location in Figure 6-1 and Figure 6-2 respectively. Boreholes BH-1 and BH-5 were used to develop design recommendations for the medical components of the project and BH-9 was applied to housing elements. Additionally, CPT data correlations to determine $(N_1)_{60}$ blow counts are plotted representing the average CPT profiles at each respective site.

At the medical facility, design soil profile corrected blow counts highlight BH-5, which is located within the building footprint and reflects the recommended maximum excavated depth to remove the very soft clay and loose sandy clayey silt. Subsequent sections describe the range to which excavation shall occur within the building footprint to address the aforementioned clayey layers.

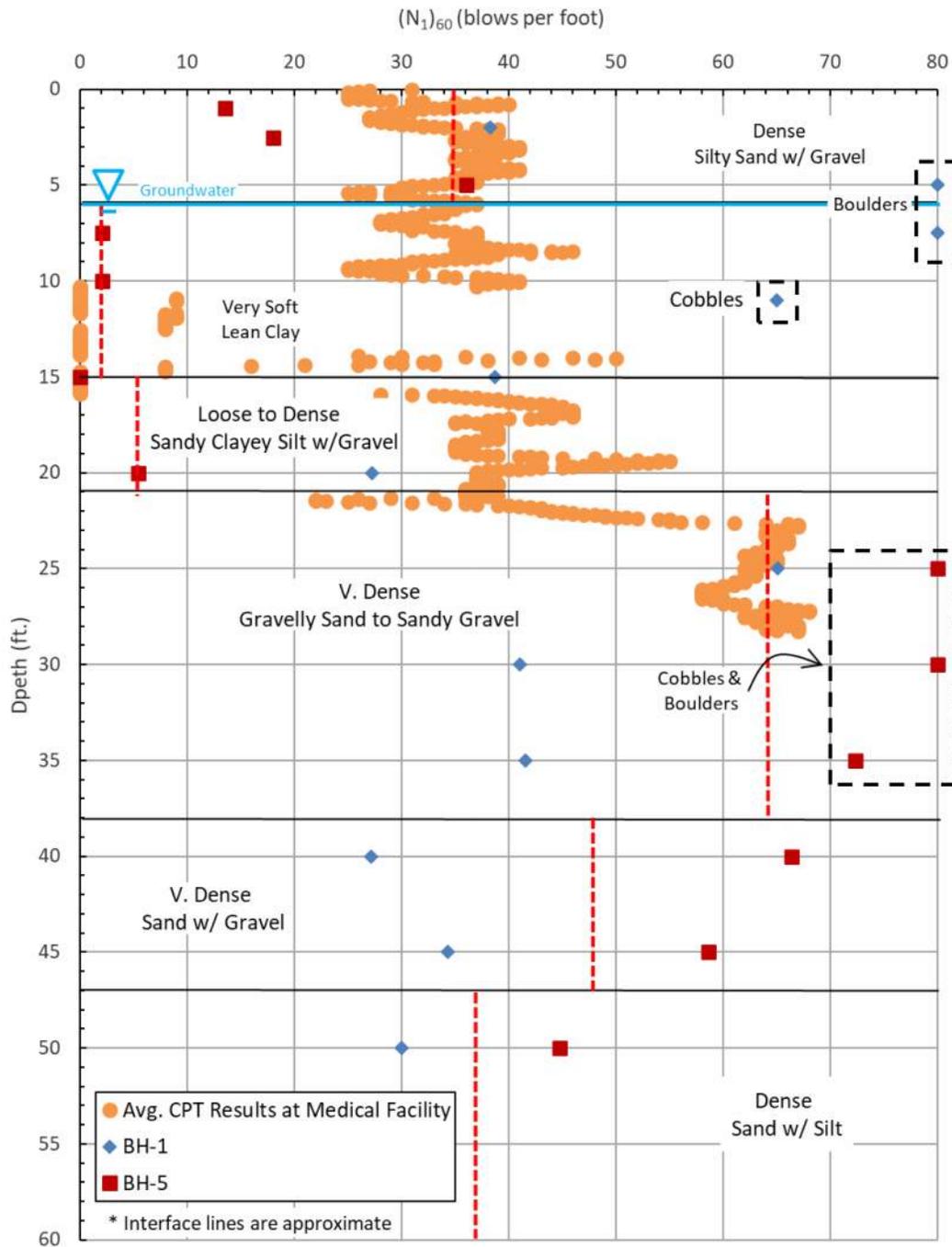


Figure 6-1. Corrected MPT Blow Counts $(N_1)_{60}$ vs Depth (feet bgs) at BH-1 and BH-5 with the average CPT $(N_1)_{60}$ estimated parameter across seven CPT boreholes (BH-2, -3, -4, -10, -11, -12, -13). Design corrected blow counts use BH-5 primarily to define the maximum extent of required excavation.

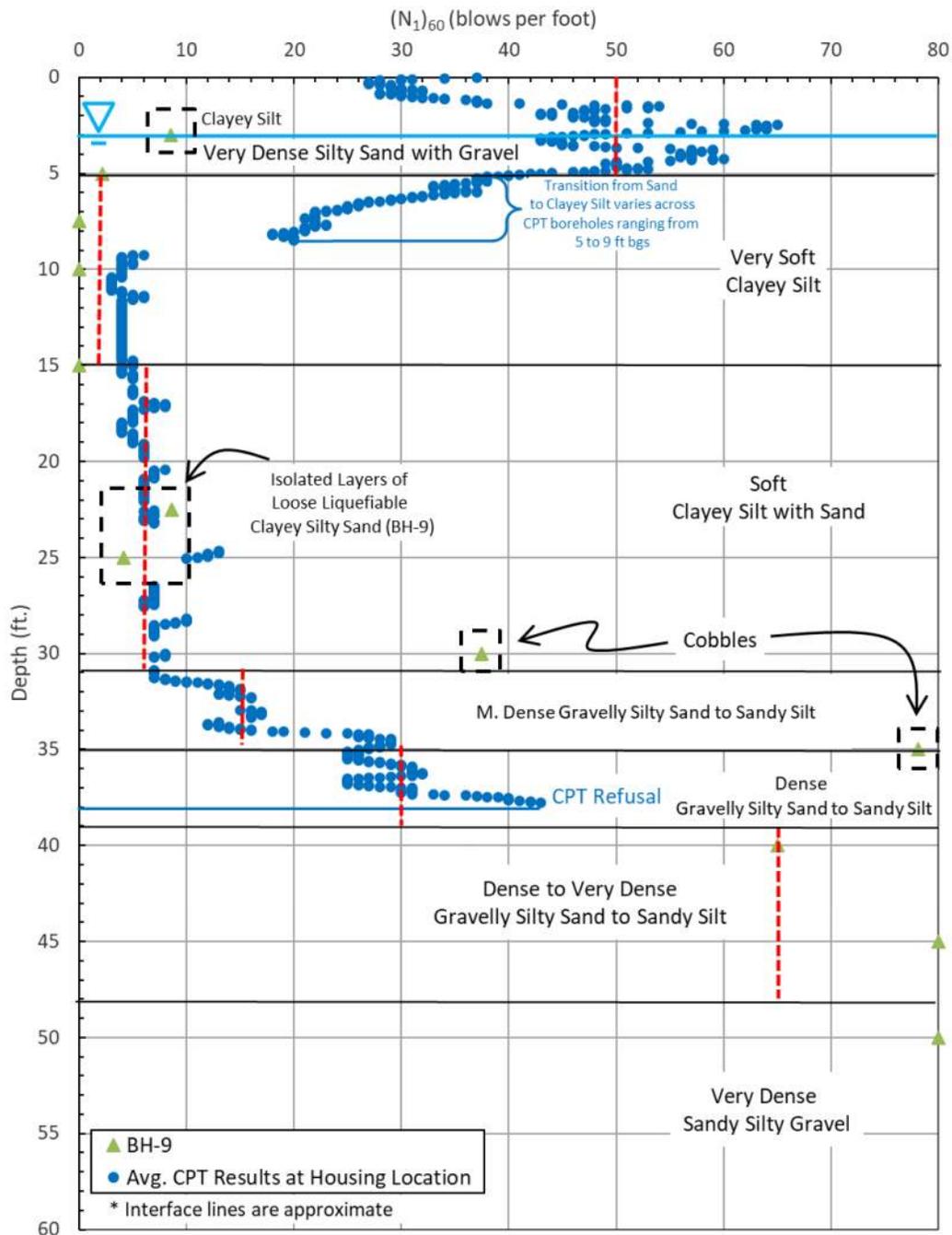


Figure 6-2. Corrected MPT Blow Counts $(N_1)_{60}$ vs Depth (feet bgs) at BH-9 with the average CPT $(N_1)_{60}$ estimate parameter across five CPT boreholes (BH-6, -7, -8, -14, -15).

6.2 CPT DATA

PND used software provided by Geologismiki’s CPeT-IT and CLiq processing databases to analyze the 13 CPT soundings. The data obtained from the CPT soundings were grouped by location to provide average estimated $(N_1)_{60}$ values and are presented against the MPT corrected data. CPT soundings BH-2, -3, -4, -10, -11, -12, and -13 provide data supporting the medical facility design while CPT soundings BH-6, -7, -8, -14 and -15 provide data to support the housing development design. Appendix D provides the output report for all estimated soil parameters based on the CPT investigation.

6.3 DESIGN SOIL PROFILES

The design soil profiles are presented with average estimated cut and fill depths based on the location.

6.3.1 MEDICAL FACILITY

The medical facility will require complete excavation of fine-grained compressible and potentially liquefiable soils, and replacement with structural fill. The maximum total excavation below the medical facility footprint will be approximately 22 feet bgs at the southern extents, tapering to approximately 5 feet bgs at the northern extents. The resulting design soil profile at the medical facility is presented in Table 6-1 reflecting the maximum recommended excavation and structural rock backfill.

Table 6-1. Design Soil Profile Properties at the Medical Facility showing depths following Cut, Excavation, and Maximum Backfill

Soil Layer	Depth (ft bgs)		Unit Weight (pcf)	Friction Angle (°)	Est. $(N_1)_{60}$
	Fr.	To			
Structural Rock Backfill	0	22	138	38	-
Gravelly Sand to Sandy Gravel	22	38	135	40	64
Sand with Gravel	38	47	135	38	48
Sand with Silt	34	38	130	36	37

6.3.2 HOUSING

The housing location will require a combination of cutting into the existing sloped ground on the uphill (south) side and filling over the sloped ground on the downhill (north) side to achieve desirable grades. An additional cut of at least 5 feet below structures is recommended to distribute structural loads and decrease long-term settlement. The resulting design soil profile at the housing location is presented in Table 6-2.

Table 6-2. Design Soil Profile Properties at the Housing Location showing depths following Cut, Excavation, and Backfill

Soil Layer	Depth (ft bgs)		Unit Weight (pcf)	Friction Angle (°)	Est. $(N_1)_{60}$	Undrained Shear Strength (psf)	Settlement			
	Fr.	To					Cc	Cr	e_0	OCR
Structural Rock Backfill	0	5	138	38	-	-	-	-	-	-
Clayey Silt	5	10	85	25*	1	400 [†]	0.11	0.017	0.545	4
Clayey Silt with Interbedded Sand	10	26	95	25*	5	400 [†]				
Gravelly Sand with Silt	26	30	115	32	15	-	-	-	-	-
Gravelly Sand with Silt	30	34	125	35	30	-	-	-	-	-
Gravelly Silty Sand to Sandy Silt	34	43	135	38	65	-	-	-	-	-
Sandy Silty Gravel	43	46.5	135	38	65	-	-	-	-	-
*Long term drained conditions only [†] Short term undrained conditions only										

7. SEISMIC RECOMMENDATIONS

7.1 SEISMIC DESIGN

Seismic design at the site shall follow all applicable federal, state, and local codes. The information presented in Table 7-1 is applicable for the project based on subsurface conditions encountered and our understanding of the facility program. Moment magnitude was taken as the mode of magnitude experienced at the site, incorporating uncertainty. The seismic criteria have been delineated into two categories (medical and housing) for two reasons. First, the medical components are assumed to be Risk Category IV which typically results in larger seismic design parameters than other risk categories. Secondly, the soil conditions below the medical facility and housing will be substantially different assuming that all fine-grained soil below the medical facility is removed and replaced in accordance with the recommendations contained in this report. This results in a different site class designation that the housing will receive if the fine-grained soil remains in place below the housing.

Moment magnitude was obtained from the online USGS Seismic Hazard Toolbox disaggregation utility. All other parameters were obtained from the online ASCE Seismic Hazard Tool, with ASCE 7-22 set as the reference document.

Table 7-1. Seismic Design Parameters

Project Area	Medical	Housing
Return Period	2475 years (2% in 50 years)	2475 years (2% in 50 years)
Site Class	D*	E
Risk Category	IV	II
Seismic Design Category	D	
Moment Magnitude (M_w)	6.1	5.1
Site Adjusted Peak Ground Acceleration (PGA_M)	0.62g	0.56
S_s (0.2 sec period acceleration)	1.21g	1.21g
S_1 (1.0 sec period acceleration)	0.52g	0.52g
S_{DS} (Spect. Res. Acceleration at 0.2 sec)	1.00g	1.06g
S_{D1} (Spect. Res. Acceleration at 1.0 sec)	0.91	1.62g
* Assuming excavation and replacement of compressible and liquefiable soils with structural rock fill		

7.2 LIQUEFACTION

A liquefaction analysis was completed to estimate the potential for in-situ soils to liquify during a maximum considered earthquake event. The program module CLiq was used to analyze all 13 CPT soundings with the results presented for each location based on the average outputs of the grouped CPT results. Earthquake-induced liquefaction generally occurs only under particular conditions, including a high groundwater table, strong earthquake ground shaking with long duration, and loose uniform sands. The analysis utilized the seismic design parameters presented in Table 7-1. The analysis at the medical facility location indicated a potential for liquefaction to occur from 5.5 feet bgs to approximately 22 feet bgs of the in-situ subsurface conditions. PND recommends excavation and back fill to between approximately 5 and 22 feet bgs to address the liquefaction concern.

At the housing location, based on in-situ subsurface conditions, potentially liquefiable soils range from a surficial sand layer overlying the clayey silt of approximately 2 feet thick followed by weak interbedded sand lenses from approximately 16 feet to 30 feet bgs. Substantial potentially liquefiable layers follow thereafter to 38 feet bgs. Figure 7-1 and Figure 7-2 present the calculated factor of safety against liquefaction vs. depth bgs for the average CPT results.

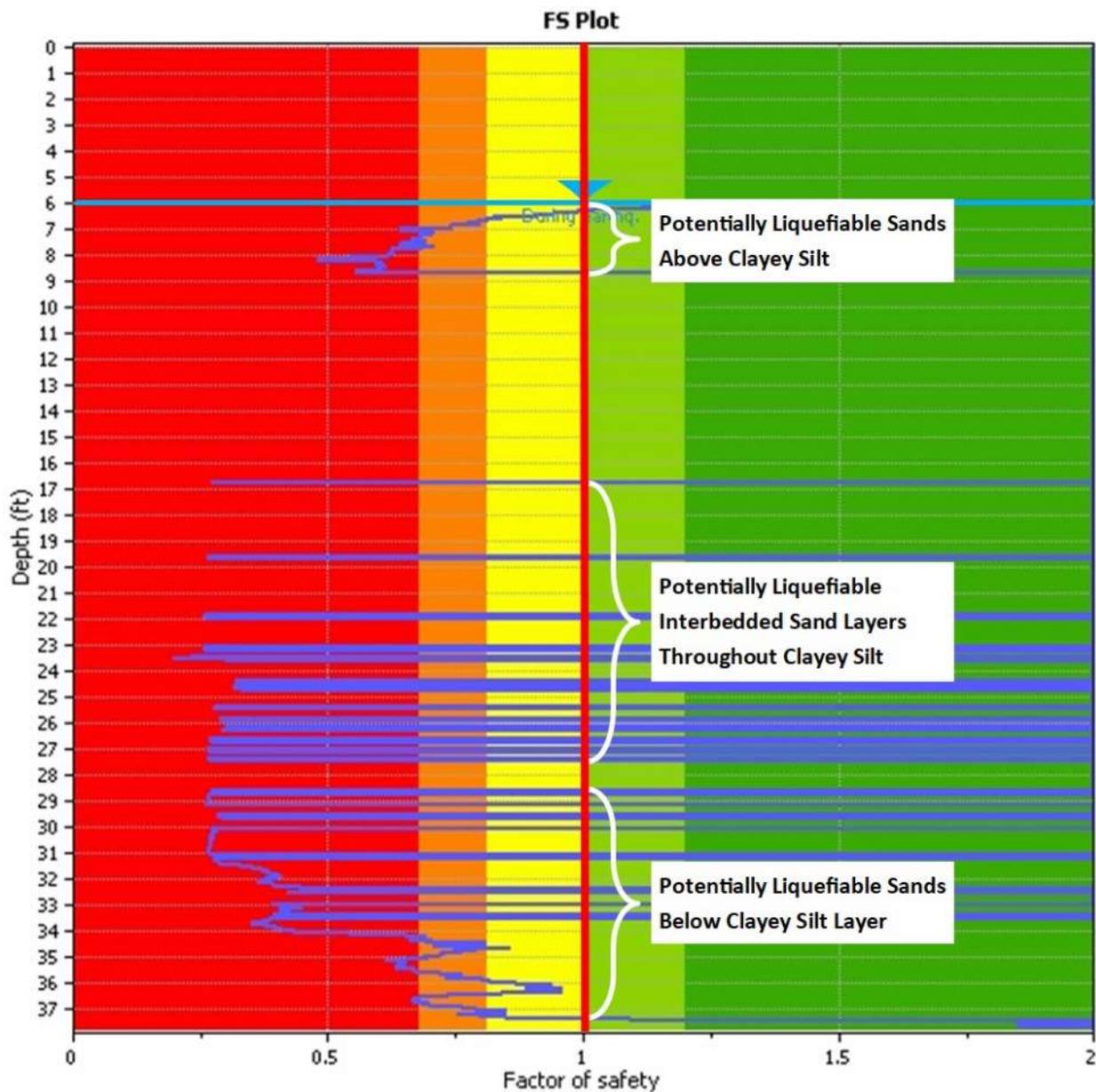


Figure 7-2. Factor of Safety Against Liquefaction vs. Depth at the Housing Location Based on the Average CPT Derived Soil Profile using CLiq.

7.3 SETTLEMENT DUE TO LIQUEFACTION

Table 7-2 provides an estimation of settlement due to liquefaction based on CPT results at the medical facility location and housing site. The cumulative settlement is dependent on the end depth of the sounding and will vary depending on if the data obtained was able to capture layers identified as potentially liquefiable. At the medical facility location, PND recommends approximately 22 feet excavation to bottom of potentially liquefiable soils to eliminate the potential for settlement during an earthquake event and replace with structural rock backfill.

At the housing location, total and differential settlement could be a concern over a large section of a slab-on-grade foundation. Liquefaction-induced settlement was estimated based on methods presented by Idriss and Boulanger using CLiq. To estimate possible differential settlement, Figure 7-3 provides the settlement gradient which may be multiplied by any length (i.e. building wall, distance between footings, etc.) to calculate differential settlement between two points.

Table 7-2. Cumulative Settlement Due to Liquefaction based on CPT Results

CPT Sounding Location	Cumulative Settlement due to Liquefaction (in)
Medical Facility	
BH-02	0.1
BH-03	0.6
BH-03b	1.3
BH-04	1.1
BH-06	1.0
BH-10	0.1
BH-11	4.4
BH-12	0.0
BH-13	2.9
Housing	
BH-06	1.0
BH-07	6.4
BH-08	2.5
BH-14	4.3
BH-15	3.6

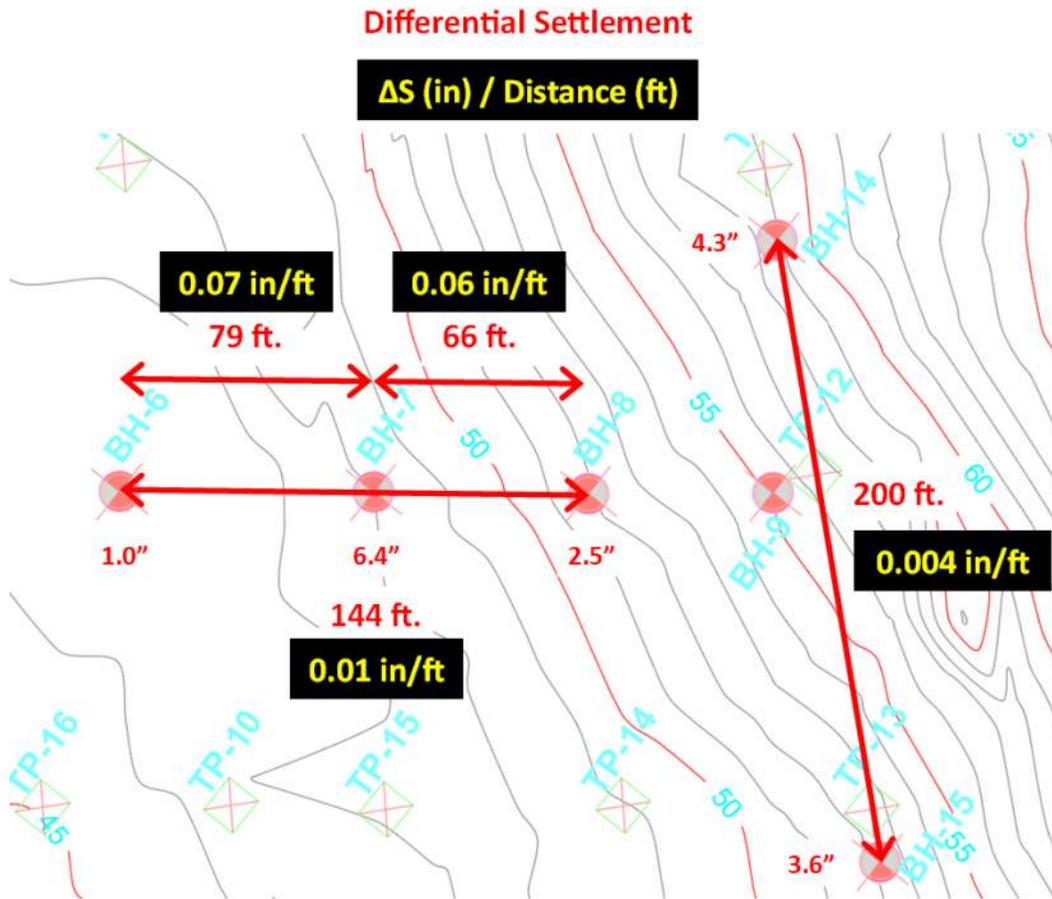


Figure 7-3. Liquefaction settlement estimations below the housing site with differential settlement gradient presented.

8. FROST DEPTH

PND estimated the frost depth at the site using the Modified Berggren Equation with 30-year climate normal (1991-2020) data obtained from NOAA’s National Centers for Environmental Information. The frost penetration analysis is applied to the design soil profiles following excavation and backfill and assumes that the gravel surface will be relatively clear of snow throughout the winter with an average gravel backfill moisture content of 3 percent. From the Modified Berggren analysis, the estimated frost depth is approximately 5.2 feet below finished ground surface. The extent of frost penetration can be limited with the addition of landscaping ground cover or insulation installed below grade near the building. PND recommends a design frost depth of 4 feet below grade in line with coastal locations similar to Haines, Alaska.

9. MEDICAL FACILITY FOUNDATION RECOMMENDATIONS

In general, foundation designs should be consistent with the current edition of the International Building Code (IBC) and with any local amendments or requirements for footing depths. Based on PND's assessment with cut and fill recommendations, the site conditions will be suitable to support the medical facility using conventional shallow foundations such as strip and column foots, mats, and structural or non-structural slabs. Cold perimeter footings shall be frost-protected or buried a minimum of 48 inches. The cover over warm or interior footings may be less. All foundations shall bear on non-frost susceptible structural fill.

The project site will be located on a maximum of 22 feet of structural rock fill. Excavation within the building footprint will range from approximately 5 feet bgs on the north end to 22 feet bgs on the south end. The building site shall be excavated to depths required to accommodate a 48-inch footing embedment and an 18-inch structural fill bearing layer beneath the footing, as well as any additional excavation required to mitigate liquefaction and long-term settlement. The in-situ groundwater depth is nominally 6 feet bgs but may increase in depth following excavation and replacement of cohesive soils.

9.1 MAXIMUM ALLOWABLE BEARING PRESSURE

If footing preparations follow PND recommendations, the allowable bearing pressure for medical facility foundations can be estimated from Figure 9-1 and Figure 9-2 for different footing widths pertaining to a square or continuous footing, respectively. The plots consider an elastic settlement limit of 0.5 inches. Foundation designers should consider the lower of the two intersecting curves when establishing allowable bearing pressure. Expected settlements will depend on footing dimensions and loads applied to the structure. The allowable bearing capacity includes a factor of safety of 3.0 with groundwater 2 feet below the bottom of footing (~6 feet bgs).

The allowable bearing capacity curve may be increased by 33% when considering short term loading, such as seismic loads. No such increase is permitted if the bearing pressure is controlled by elastic settlement. Further, the permissible increased bearing capacity may not exceed the equivalent bearing pressure controlled by elastic settlement for a given footing width.

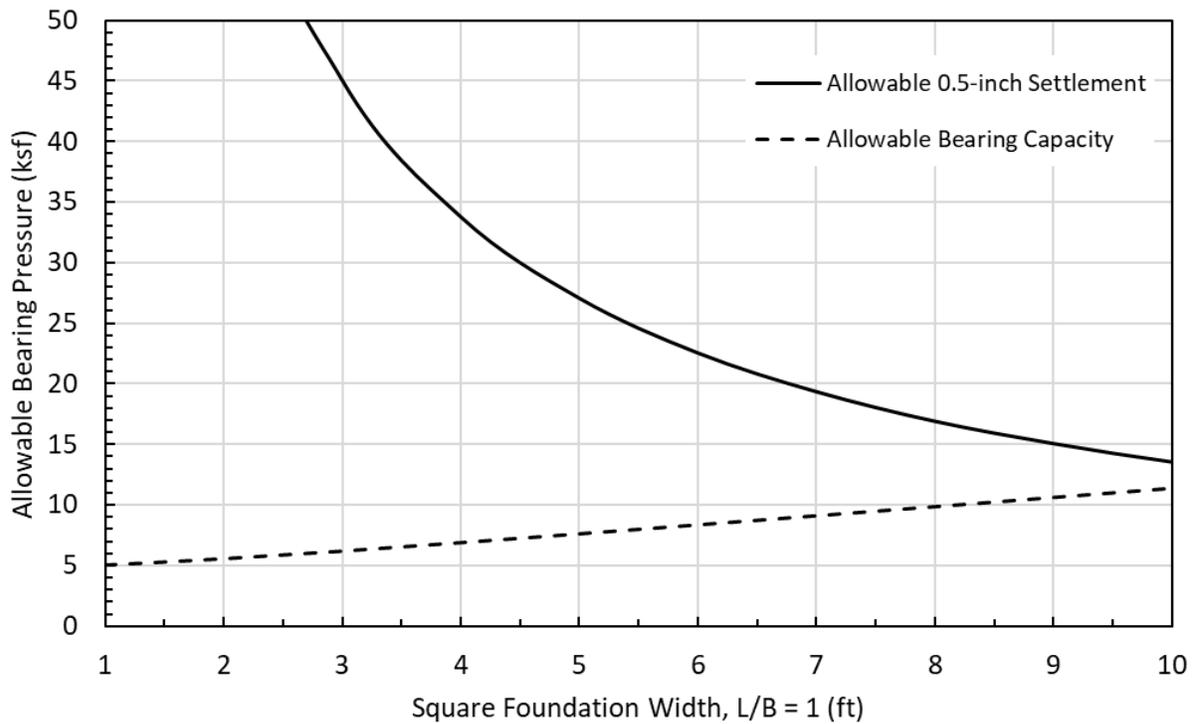


Figure 9-1. Allowable Bearing Pressure for Square Interior Spread Footings at the Medical Facility

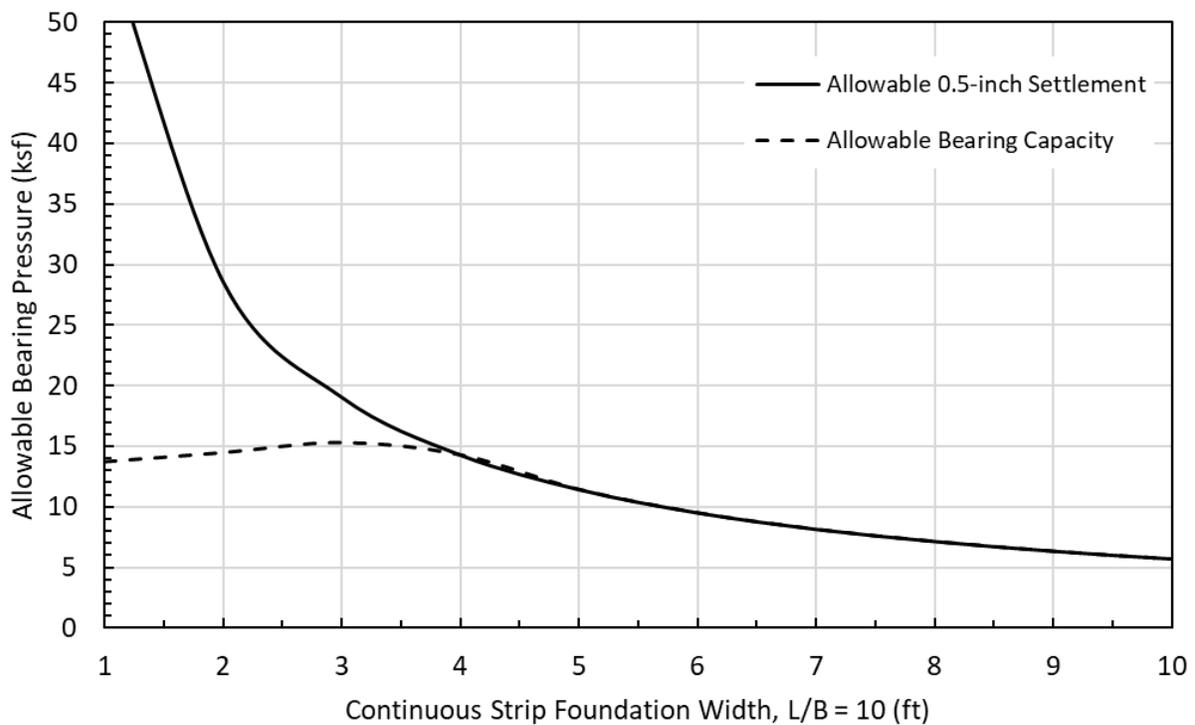


Figure 9-2. Allowable Bearing Pressure for Continuous Perimeter Strip Footings at the Medical Facility

9.2 DEPTH OF EMBEDMENT

- o Perimeter Footings: 48 inches, min.
- o Isolated, Interior Spread Footing: 12 inches

Perimeter footings are assumed to be warm footings. Depth is measured from the adjacent grade to the bottom of the footing.

9.3 ALLOWABLE ELASTIC SETTLEMENT

- o Total Settlement: 0.5 inch

Settlement from normally occurring static, live, and transient loads.

10. HOUSING FOUNDATION RECOMMENDATIONS

Ground improvement through removal and replacement of problematic soil is not expected to be economical for housing facilities due to the depth of required replacement. This section provides two foundation alternatives to help mitigation both long-term settlement due to primary consolidation, and liquefaction-induced settlement. The options consist of foundations supported by helical piers to bridge the problematic soils, and a mat/raft foundation to more evenly distribute load concentrations and reduce focused pressures.

Mat foundations are appropriate where a cut slope is located (generally south of the access road) and helical piles are recommended north of the access road in a fill condition where settlement and global stability is a concern. In fill condition PND expects displacements ranging between inches to a foot.

10.1 HELICAL PILES

Helical piles would be installed so that they bear on the dense gravelly sand with silt layer below potentially liquefiable and compressible soil layers. Helical piles primarily develop axial capacity from the helical flights bearing on soil, rather than from skin friction. Allowable capacities for helical piles with helices ranging from 8- to 12-inches in diameter are presented in Table 10-1. These capacities incorporate a factor of safety of 2 and assume that the piles will be installed to 35 feet bgs. The minimum spacing presented in Table 10-1 should be maintained to avoid pile group effects, which result in lower pile capacity. Note that these capacities are based on the bearing capacity of the soil and the area of the helix. The structural strength of the helical piles was not taken into consideration for this analysis.

Table 10-1. Maximum Helical Pile Axial Capacities

Helix Diameter (inches)	Maximum Allowable Axial Load (kips)	Minimum Spacing Between Piles (ft)
8	40.0	3
10	62.6	3.5
12	90.3	4

PND followed the “Individual Bearing Method” outlined in Chapter 4 of *Helical Piles – A Practical Guide to Design and Installation* by Perco, 2009, to provide preliminary helical pile design recommendations. A lateral load analysis should be completed once lateral loads have been provided using Ensoft’s LPile software to determine depth to fixity (minimum embed). The LPile analysis assumes that the lateral load acts on the pile head at the ground surface. To address lateral loading, PND recommends above-ground stabilization consisting of bracing if the pile head extends 2 feet or more above the finished ground surface. If the pile shaft only extends between 6 and 8 inches above grade, then wood posts and bracing/flush beam construction shall be followed to address lateral stability. Additionally, bracing battered helical piles could be utilized to capture lateral loading.

10.2 SLAB ON GRADE FOR HOUSING UNITS

10.2.1 ELASTIC SETTLEMENT AND PRIMARY CONSOLIDATION

PND completed a settlement analysis using Rocscience’s Settle3 software to determine initial elastic settlement and primary consolidation due to added overall stress from a slab-on-grade foundation to the clayey silt layer at the housing location. Soil properties were obtained from triaxial laboratory data obtained from a nearby location and compared with values provided by the CPT data analysis. The clayey silt soil properties are provided in Section 6.3.2. An evenly-distributed load of 500 psf was applied to the design soil profile to facilitate calculations.

Results indicated that settlement south of the access road are expected to be negligible, while settlement north of the access road could reach up to 0.59 inches. Elastic settlement is expected and ranges on the order of inches of settlement. Minor grade adjustments will be required after fill placement following initial elastic settlement of the clay material.

10.2.2 PREDICTED LIQUEFACTION-INDUCED SETTLEMENT

- o Differential Settlement: Gradient range (0.004 to 0.07 vertical in./LF)

10.2.3 FROST PROTECTED SHALLOW FOUNDATION

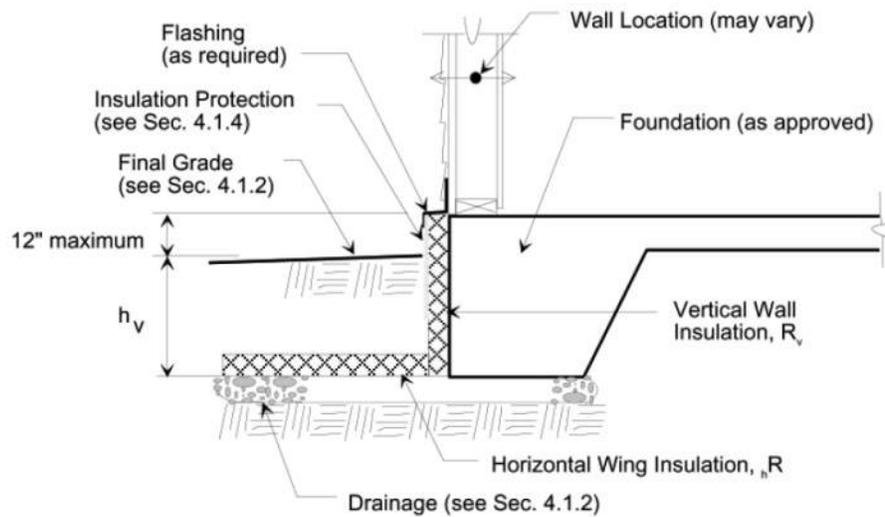
Per ASCE 32-01, the housing units could be supported by a slab-on-grade frost protected shallow foundation (FPSF) with insulation and a thickened edge to decrease footing depth. The thickened edge shall be embedded 16 inches below finished grade with insulation placed vertically and horizontally around the entire foundation. PND recommends Type IV XPS insulation as it exhibits moisture resistance over a longer period to maintain R-Value. The insulation above and below grade should be waterproofed to address surface water runoff due to storm events and landscaping. Horizontal wing insulation shall be sloped away from the foundation to aid in drainage. A shielding shall be installed where XPS is exposed above finished grade to protect from UV damage. The corner insulation is extended a distance D_{hc} at a length from the corner, L_c , in this case $D_{hc} = 30$ inches and $D_h = 12$ inches resulting in an additional 18-inch length at the corners. In accordance with ASCE 32-01 (2025), Table 10-2 provides the FPSF recommendations for insulation thickness and Table 10-3 provides the FPSF recommendations for lengths and widths where the insulation is placed. Reference Figure 10-1 for insulation placement detail and horizontal plan.

Table 10-2. FPSF recommendations for insulation thickness

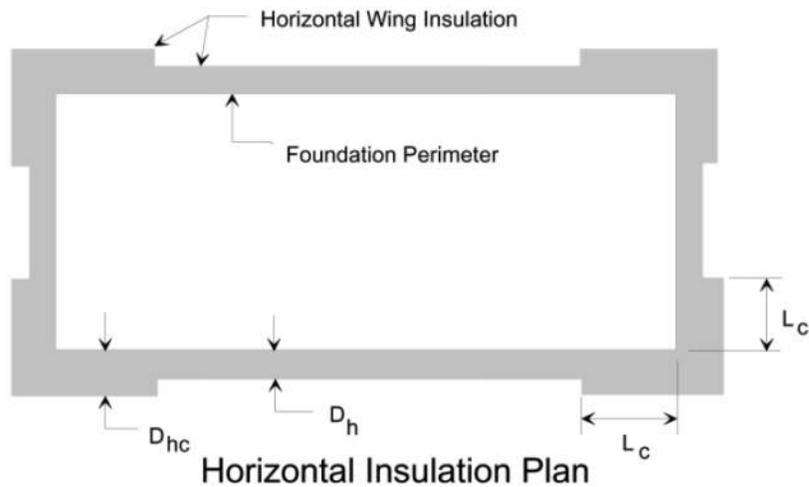
100 Year Return Freezing Index per Figure A1a of ASCE 32-01	3000 °F-Days
Vertical Insulation R-Value (hr-ft ² -°F/BTU)	9.7
Horizontal Insulation R-Value (hr-ft ² -°F/BTU)	6.5
Horizontal Insulation R-Value at Corners (hr-ft ² -°F/BTU)	8.0
Minimum Footing Depth Below Finished Grade (inch)	16
Recommended Insulation Type	XPS Type IV
Required Vertical Insulation Thickness (inch)	3
Required Horizontal Insulation Thickness (inch)	2
Required Horizontal Insulation Thickness at Corners (inch)	2

Table 10-3. FPSF recommendations for lengths and widths for insulation placement

Height above finished grade, h (inch)	12
Foundation depth along thickened edge, h _v (inch)	16
Vertical Insulation length, h+h _v (inch)	28
Width of horizontal wing insulation along walls, D _h (inch)	12
Width of horizontal wing insulation at corners, D _{hc} (inch)	30
Length along a wall of corner insulation, L _c (inch)	40



Insulation Detail



Horizontal Insulation Plan

Figure 10-1. Slab-on-grade foundation for heated buildings

10.3 GLOBAL STABILITY AT HOUSING LOCATION

The housing site is moderately sloped at present, but the slopes will be steepened to facilitate a bench cut for the proposed structures. The cut will extend south into the slope and backfilled with structural rock fill that will extend north over the toe of the existing slope. The analysis considered 40' x 40' slab on grade structures applying a 500 psf load on the backfill.

A slope stability analysis of the cut and fill slope was performed using Rocscience's Slide2 to assess global stability under static and seismic conditions. The horizontal seismic load was reduced by half for the analysis, assuming that some movement (on the order of inches) is permissible. The drained and

undrained clay properties were also analyzed to observe long term and short-term slope stability. The resulting cut into the slope will remove the surficial dense silty sand layer and extend a maximum of 2 feet into the clayey silt layer ranging from 5 to 7 feet thick fill layers. The results of the slope stability analysis are provided in Table 10-4 with targets for static and seismic Factors of Safety being 1.5 and 1.1, respectively. There is moderate concern for the short-term conditions where the FS targets are not met.

Due to the factors of safety under seismic conditions being less than 1.0, Newmark displacement calculations were performed according to the method described in Bray and Travasarou (2007). The analysis indicated potential high displacements in magnitude that would render the structure unusable, but will not cause collapse or life and safety concerns.

Slope stability figures are provided in Appendix C.

Table 10-4. Slope Stability Factors of Safety at the Housing Location

Clay Conditions	Static	Seismic
Undrained (short term)	1.2	0.6
Drained (long term)	2.4	1.1

11. GENERAL FOUNDATION RECOMMENDATIONS

11.1 LATERAL LOAD RESISTANCE

Lateral loads on footings and retaining walls will be resisted by passive earth pressures developed against the footing block and frictional resistance against the base of the footing. Recommended lateral earth pressure coefficients are summarized in Table 11-1 for the Medical Facility and Housing locations, assuming structural fill with a friction angle of 38° and an interface friction angle of 25°. The active and passive pressure values assume level backfill and vertical wall.

Table 11-1. Static and Seismic Lateral Earth Pressures

Lateral Earth Pressure	Medical Facility		Housing	
	Static	Seismic	Static	Seismic
At-rest, K_0	0.384	-	0.384	-
Active, $K_{a/AE}$	0.238	0.453	0.238	0.421
Passive, K_p	4.200	-	4.200	-

11.2 MODULUS OF SUBGRADE REACTION

Calculation of the modulus of subgrade reaction is a function of both the soil and the structural element. The recommended value for k_1 (subgrade reaction modulus for foundations measuring 1-foot by 1-foot) at the project site is 1000 pci. Das (2014) provides a series of equations utilizing k_1 that may then be used to calculate an appropriate subgrade reaction modulus for various foundation geometries.

11.3 FOUNDATION UPLIFT

Uplift loads may manifest in some foundation elements due to overturning moments that occur as a result of wind and seismic forces. Uplift loads may be resisted by the weight of the structure and soil above foundation footings, as well as shear resistance within the soil matrix.

The following equation may be utilized to determine the allowable uplift resistance of shallow rectangular footings in cases where subbase or base course make up the entirety of the soil above the footing. For square footings, the footing width, B is taken equal to the footing length, L .

$$Q_u = 105.8D^2(7.1B + L - B) + W$$

where:

- Q_u = ultimate footing uplift resistance
- B = footing width
- L = footing length
- D_f = footing burial depth
- W = Base weight (weight of concrete and soil uplifted)

A factor of safety of 3 should be applied to Q_u to obtain an allowable value, which may be increased by 33% when considering short-term transient loads such as wind and seismic forces.

12. DRIVEWAYS AND ACCESS ROADS

A significant area of the project contains highly frost-susceptible soil at fairly shallow depths. At these locations, the minimum road structural section should consist of:

- 3 inches of hot-mix asphalt concrete pavement
- 4 inches of base course
- 42 inches (minimum) of subbase

The subbase should be separated from the fine-grained subgrade by a robust geotextile suited for both separation and stabilization. This minimum section is necessary to avoid seasonal frost heave in the winter and thaw weakening in the spring. The north parking area appears to be capable of supporting a less-robust typical section due to the presence of clean sands and gravels within the frost penetration zone. The subbase layer thickness may be reduced to 12 inches in this case, and no geotextile is required.

13. CONSTRUCTION CONSIDERATIONS

13.1 SITE RECOMMENDATIONS

All earthworks should be performed according to the project specifications and in accordance with local, state, and federal laws and regulations and standards of practice.

13.2 SITE PREPARATION

Organic material at the surface should be removed and wasted offsite. The site climbs in elevation from north to south and will likely require a combination of cutting some areas and filling others to achieve a single finished grade desired for the medical facility.

13.3 EXCAVATIONS

Temporary excavations into soil should be performed with care and follow OSHA or other agency guidelines and recommendations for trenching and slope angles based on soil type encountered in the geotechnical investigations and as observed during construction. Permanent excavations into soil should either be retained or sloped to meet long term stability requirements. Care shall be taken with the deep excavations at the medical facility location to remove the clay and potentially liquefiable soils.

Any frozen soil must be removed from subgrades beneath the footings and slabs and replaced with material as recommended in this report and following all project specifications.

13.4 DRAINAGE AND CONTROL OF WATER

The average groundwater table is approximately 5 to 7 feet below ground surface at both the medical facility location and housing site. The level below ground surface is likely controlled by the cohesive lean clay or clayey silt layer. Excavations will likely experience significant infiltration from both shallow groundwater and runoff from elevation areas. A robust dewatering effort should be anticipated. The lean clay to clayey silt could be very difficult to work with when wet and disturbed. The weather should be monitored during excavation and construction when in-situ lean clay and clayey silt material is exposed. It is the contractor's responsibility to determine the appropriate dewatering technique(s) for the construction method chosen and for the soil and water conditions encountered in the geotechnical explorations and during construction.

Because the site is sloped in areas, grading will need to be designed to effectively move water away from construction activities. Site grading should be established to provide drainage of surface water away from the proposed building and toward suitable drainage structures. Ground adjacent to the building's foundation should be graded to slope away from the building at a minimum 1%, or steeper as code considerations permit.

13.5 FILL AND COMPACTION

This section provides general recommendations for the use of aggregate (structural) fill to be used during construction. Generally, imported structural fill should comply with AKDOT&PF Standard Specifications, with modifications as determined necessary. All structural fill should be angular, clean, sound, durable, and free of any frozen clumps, ice, or any deleterious material prior to placement. Structural fill should follow all project specifications and be a well-graded mixture of non-frost susceptible (NFS) sand and

gravel. For the purposes of this report, structural fill can be segregated into two material sub-types: subbase and base course.

Subbase should have a maximum particle size of 6 inches with less than 6 percent passing the No. 200 sieve size. Subbase shall be placed in lifts not exceeding 12 inches in loose thickness. Compaction of subbase shall be achieved by performing a minimum level of effort consisting of six complete passes with a 15-ton vibratory steel drum roller. In areas that are too small to accommodate a roller, compaction shall be accomplished by a minimum level of effort of six complete passes with a vibratory plate compactor with a minimum rated centrifugal force of 15,000 lbs. Compaction effort should be re-evaluated if alternate equipment is used.

Base course should have a maximum particle size of 1 to 1.5 inches and less than 6% passing the No. 200 sieve size. Base course shall be placed in lifts not exceeding 8 inches in loose thickness and shall be compacted to not less than 95 percent of the maximum density as determined by ASTM D1557 maximum density method. Base course compaction in the field should be verified by nuclear densometer per ASTM D6938.

In areas where deep excavations are anticipated, a more economical material (defined herein a Select Borrow) may be used from the bottom of the excavation up to 4 feet below finished ground surface or deeper if excavations for utilities are a consideration. Select Borrow should consist of predominantly gravel, such that it will not pump or hold moisture in a saturated condition, with a maximum particle size of 18 inches and not more than 10% passing the No. 200 sieve. Select Borrow shall be placed in lifts not exceeding 24 inches in loose thickness and compacted similarly to subbase.

All fill material should be protected from freezing during construction. No frozen soil should be used as fill, nor should any fill be placed over frozen soil. Any frozen soil should be removed, replaced, or thawed prior to fill placement.

Moisture control of materials should be implemented when stockpiling and placing fill material. Stockpiles should be covered to prevent saturation during wet weather conditions. Additional moistening or drying of fill material may be required in order to obtain the optimum moisture content for maximum compaction.

14. LIMITATIONS AND CLOSURE

The information submitted in this report is based on our interpretation of data from a field geotechnical investigation conducted for this project, laboratory test results, and other sources discussed in this report. Effort was made to obtain information that is representative of the actual conditions at the site. However, actual subsurface conditions will vary and additional information may be discovered that could impact our recommendations. If conditions significantly different from those indicated in this report are encountered by subsequent investigations or during construction, the recommendations of this report should be reviewed by PND.

This report was prepared by PND Engineers, Inc., for use on this project only, and may not be used in any manner that would constitute a detriment to PND. PND is not responsible for conclusions, opinions, or recommendations made by others based on data presented in this report.

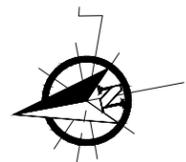
Included in Appendix E is a copy of the Geoprofessional Business Association (GBA) publication “Important Information about Your Geotechnical-Engineering Report.” The publication is included in this report to help the Owner, Contractor, and others who read this document understand the limitations described above and the additional limitations contained in the publication and made a part of this report. This document should be read carefully. If in the opinion of Contractors bidding this project, sufficient information has not been made available to satisfactorily bid the project then the Contractor should perform additional geotechnical investigations as necessary to satisfy themselves as to site conditions.

15. REFERENCES

- ASTM D1586. “Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils.”
- ASTM D2216 “Moisture Content of Soils”
- ASTM D2487. “Classification of Soils for Engineering Purposes (Unified Soil Classification System).”
- ASTM D2488. “Description and Identification of Soils (Visual Manual Method).”
- ASTM D2573 “Standard Test Method for Field Vane Shear Test in Cohesive Soil”
- ASTM D4318 “Atterberg Limits”
- ASTM D5434. “Standard Guide for Field Logging of Subsurface Explorations of Soil and Rock.”
- ASTM D5778 “Standard Test Method for Electronic Friction Cone and Piezocone Penetration Testing of Soils”
- ASTM D6913 “Gradation of Soils”
- Brockman, S.R., Espinosa, A.F., and Michael, J.A. (1988). Catalog of Intensities and Magnitudes for Earthquakes in Alaska and the Aleutian Islands – 1786 – 1981. United States Geological Survey, Survey Bulletin 1840.
- Combellick, R.A. and Long, W.E., (1983), “Geologic hazards in southeastern Alaska: an overview”, Alaska Division of Geological & Geophysical Surveys Report of Investigation 83-17, 17 p.
- Das, Braja M (2014). Principals of Foundation Engineering, 8th Edition. Cengage Learning. Boston, MA.
- Day, Robert W (2002). Geotechnical Earthquake Engineering Handbook. McGraw-Hill. New York, New York.
- Kramer, Steven Lawrence, (1996). Geotechnical Earthquake Engineering, Prentice-Hall Inc.
- Wesson, R.L., Boyd, O.S., Mueller, C.S., Bufe, C.G., Frankel, A.D., and Petersen, M.D. (2007). “Revision of time-independent probabilistic seismic hazard maps for Alaska.” *U.S. Geological Survey Open-File Report*, 2007-1043.

Youd, et al, (2001). Liquefaction Resistance of Soils: "Summary Report from the 1996 NCEER and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils", Journal of Geotechnical and Geoenvironmental Engineering.

Appendix A. Site Survey, Test Location Map, Geologic Section, and Test Logs



LOT 8B HANNON SUBDIVISION II
 PLAT NO. 2010-17
 BIGFOOT AUTO SERVICE INC
 51,389 SQ.FT
 1.18 ACRES

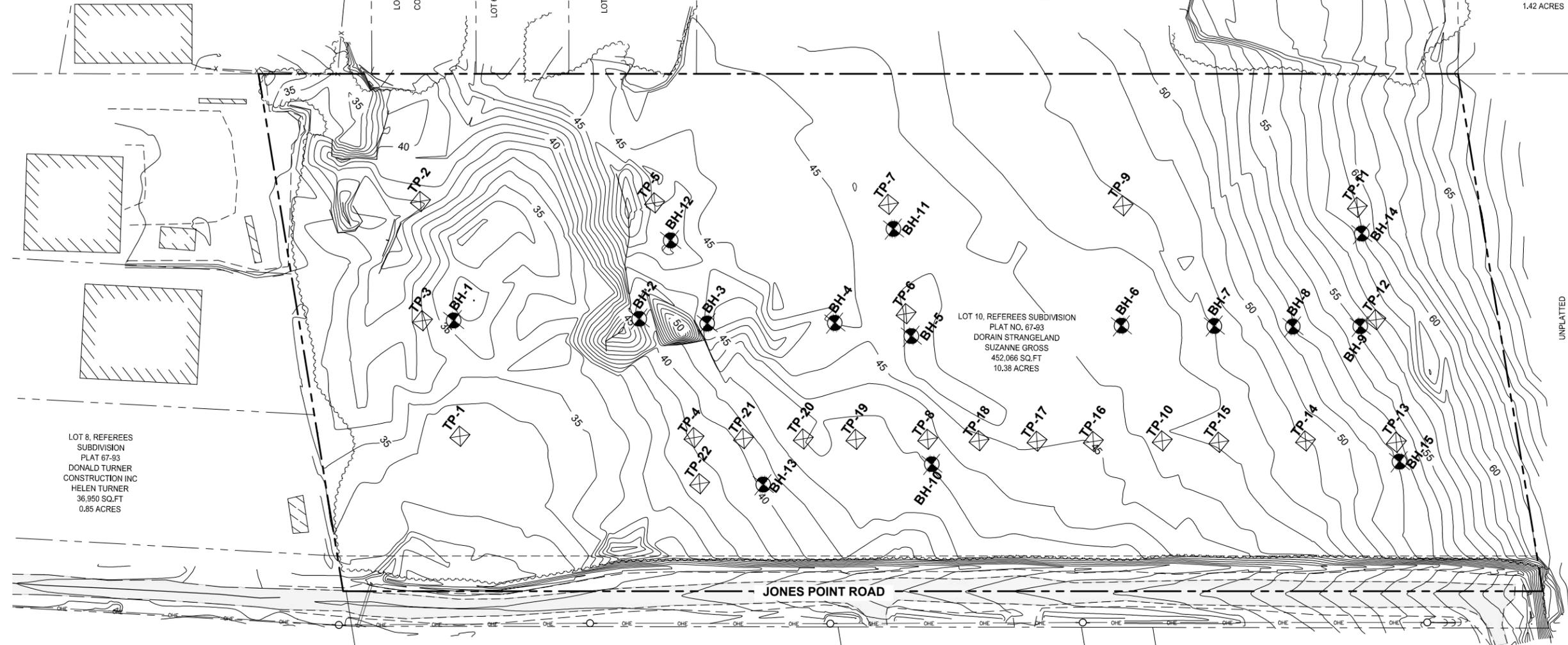
LOT 7, HANNON SUBDIVISION
 PLAT NO. 97-13
 CORNUCOPIA PROPERTIES &
 INVESTMENTS LLC
 37,978 SQ.FT
 0.872 ACRES

LOT 6, HANNON SUBDIVISION
 PLAT NO. 97-13
 GARY JACOBSON
 28,291 SQ.FT
 0.65 ACRES

LOT 5, HANNON SUBDIVISION
 PLAT NO. 97-13
 BRUCE HALE
 AMANDA ST. CLAIR
 38,989 SQ.FT
 0.90 ACRES

USS 735, TR 1
 PLAT NO. 92-10
 ALASKA POWER & TELEPHONE
 229,858 SQ.FT
 5.73 ACRES

LOT 4C, HANNON SUBDIVISION
 PLAT NO. 97-13
 MICHAEL CARTER
 LORI WEBSTER
 61,896 SQ.FT
 1.42 ACRES



LOT 8, REFEREES
 SUBDIVISION
 PLAT 67-93
 DONALD TURNER
 CONSTRUCTION INC
 HELEN TURNER
 36,950 SQ.FT
 0.85 ACRES

LOT 10, REFEREES SUBDIVISION
 PLAT NO. 67-93
 DORAIN STRANGELAND
 SUZANNE GROSS
 452,066 SQ.FT
 10.38 ACRES

UNPLATTED
 HAINES BOROUGH
 39,716 ACRES

LOT 9, REFEREES SUBDIVISION
 PLAT NO. 67-93
 LINDSEY JOBBINS
 105,851 SQ.FT
 2.43 ACRES

LOT B, A SUBDIVISION OF A POR,
 TRACT 11, REFEREES SUBDIVISION
 PLAT NO. 2002-3
 SUSAN REX
 266,818 SQ.FT
 6.12 ACRES

PORTION USS 785
 DEED 1980-000199-0
 RAYMOND STASKA
 CONNIE STASKA
 42,709 SQ.FT
 0.98 ACRES

LOT A, A SUBDIVISION OF A POR, TRACT 11,
 REFEREES SUBDIVISION
 PLAT NO. 2002-3
 SUSAN REX
 188,907 SQ.FT
 4.34 ACRES

TEST HOLE LEGEND

TEST PIT
 TP #

BOREHOLE/
 CPT
 BH #

PND ENGINEERS, INC.:
 09/24 INVESTIGATION

PND ENGINEERS, INC.:
 THIS INVESTIGATION

REVISIONS

REV.	DATE	DESCRIPTION	DWN.	CKD.	APP.



9360 Glacier Highway Ste 100
 Juneau, Alaska 99801
 Phone: 907-586-2093
 Fax: 907-586-2099
 www.pndengineers.com

DESIGN: SCS CHECKED: SCS
 DRAWN: PJD APPROVED: SCS



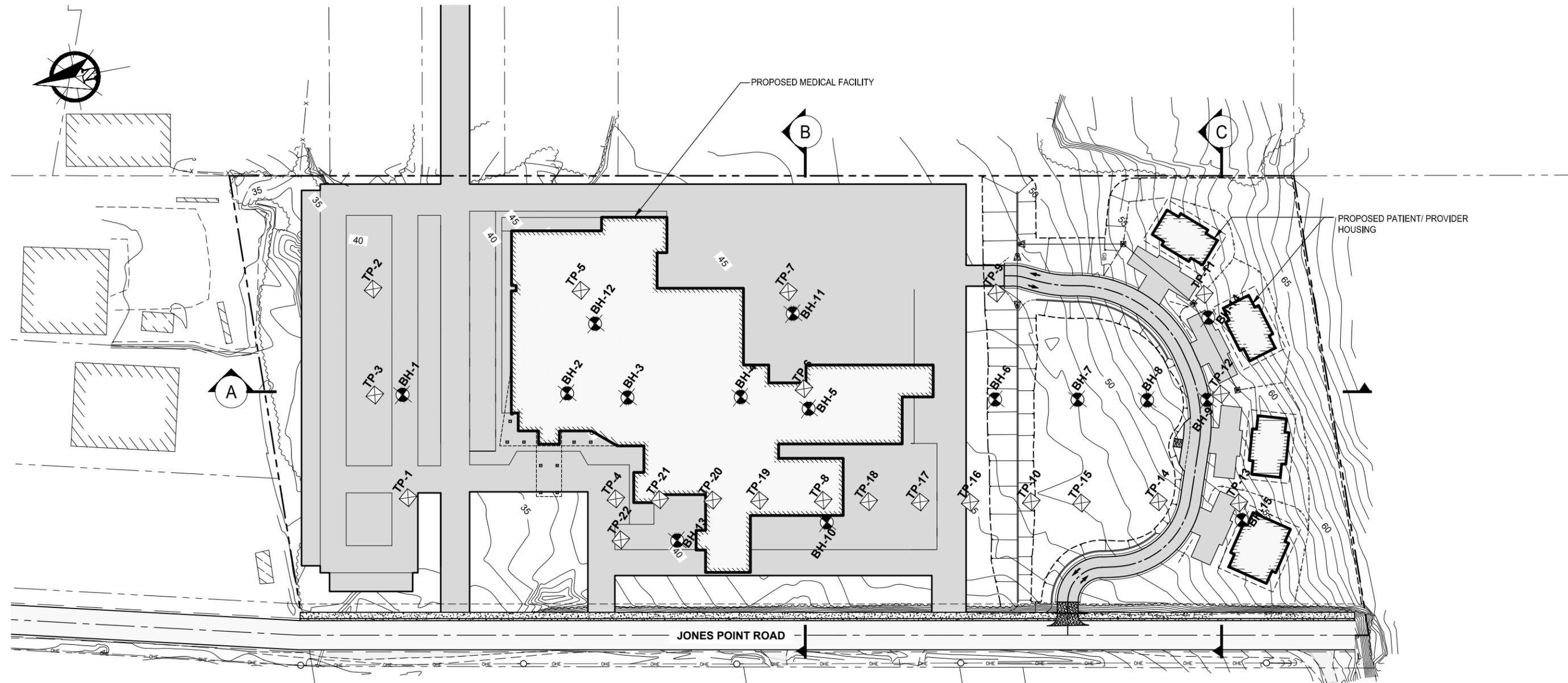
DATE: DEC. 2025

SEARCH
**HAINES MEDICAL CAMPUS
 GEOTECHNICAL SITE INVESTIGATION**

SHEET TITLE: **EXISTING CONDITIONS
 AND TEST HOLE LOCATIONS**

A1

PND PROJECT NO.: 242078.03 C.A.N. NO.: AECC250



TEST HOLE LEGEND

TEST PIT
 TP # PND ENGINEERS, INC.: 09/24 INVESTIGATION

BOREHOLE/ CPT
 BH # PND ENGINEERS, INC.: THIS INVESTIGATION

REVISIONS					
REV.	DATE	DESCRIPTION	DWN.	CKD.	APP.

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 ENGINEERS, INC.

9360 Glacier Highway Ste 100
 Juneau, Alaska 99801
 Phone: 907-586-2093
 Fax: 907-586-2099
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DESIGN: SCS CHECKED: SCS
 DRAWN: PJD APPROVED: SCS

SCALE: SCALE IN FEET
 0 50 100 FT.

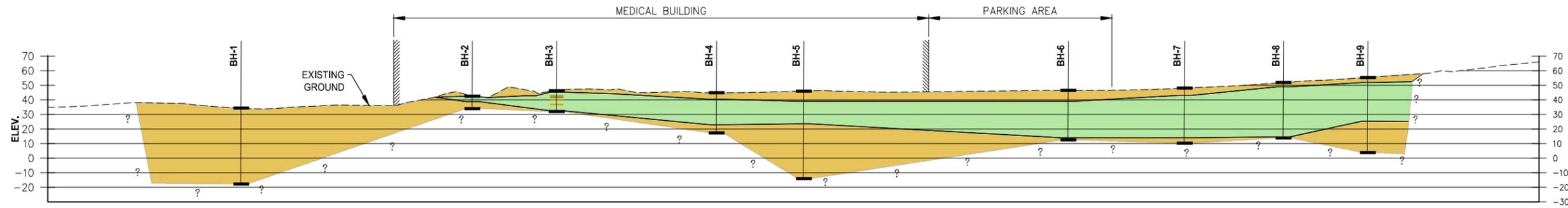
DATE: DEC. 2025

SEARCHC
**HAINES MEDICAL CAMPUS
 GEOTECHNICAL SITE INVESTIGATION**

SHEET TITLE: **SITE PLAN
 w/ TEST HOLE LOCATIONS**

PND PROJECT NO.: 242078.03 C.A.N. NO.: AECC250

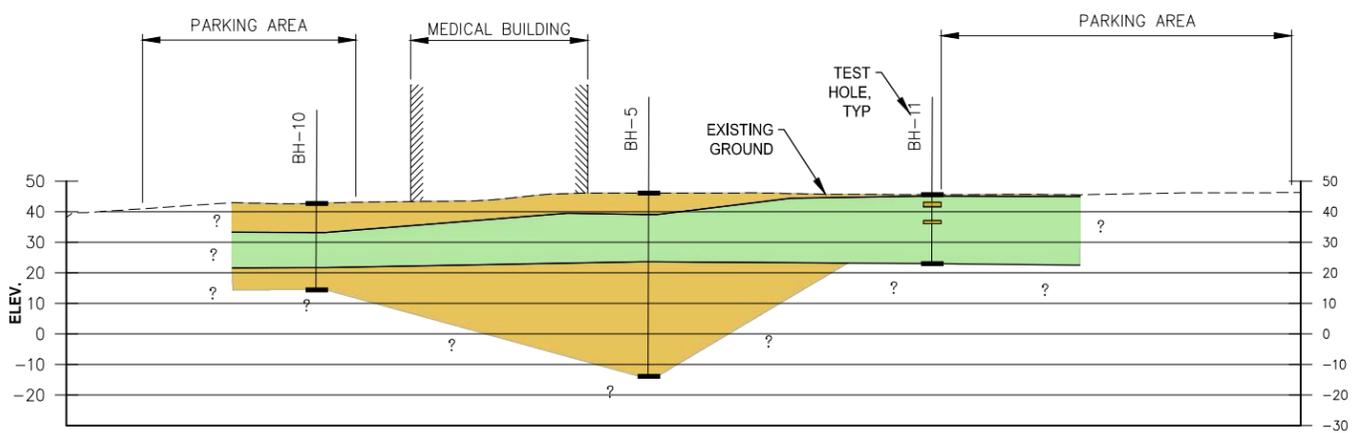
A2



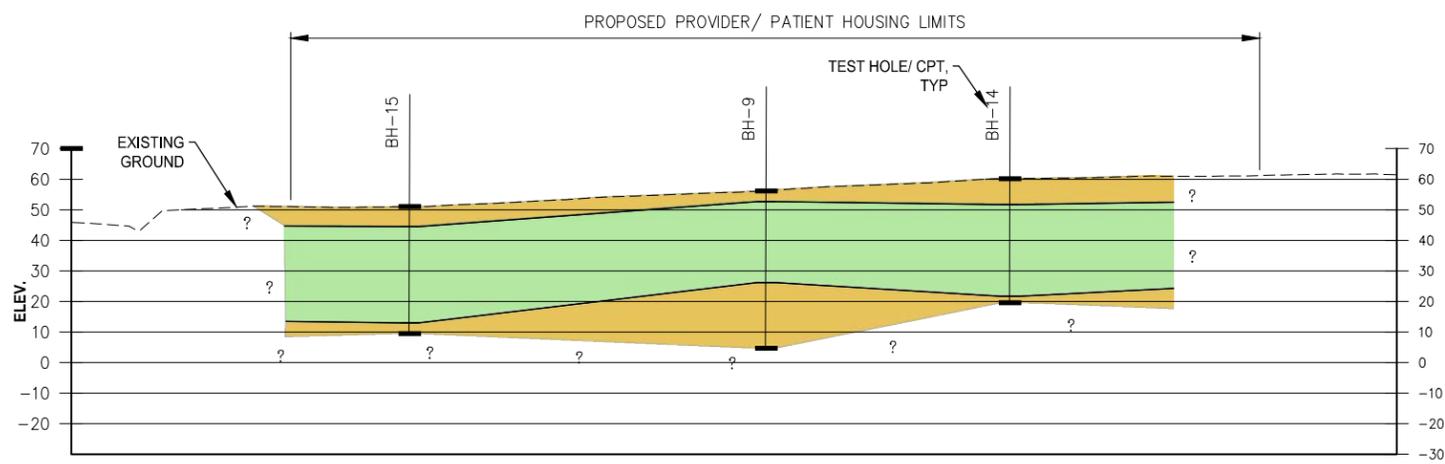
LEGEND

- SAND AND GRAVEL
- SILT AND CLAY

A SITE PROFILE
SCALE IN FEET
0 40 80 FT.



B SITE SECTION
SCALE IN FEET
0 30 60 FT.



C SITE SECTION
SCALE IN FEET
0 30 60 FT.

REVISIONS					
REV.	DATE	DESCRIPTION	DWN.	CKD.	APP.

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DRAWN: PJD APPROVED: SCS

DATE: DEC. 2025

**SEARCHC
HAINES MEDICAL CAMPUS
GEOTECHNICAL SITE INVESTIGATION**

SHEET TITLE:
SITE PROFILE AND SECTIONS

PND PROJECT NO.: 242078.03 C.A.N. NO.: AECC250

SOILS CLASSIFICATION, CONSISTENCY AND SYMBOLS

CLASSIFICATION

Identification and classification of soil samples is accomplished in general accordance with the ASTM version of the Unified Soil Classification System (USCS) as presented in ASTM Standard D2487. The standard is a qualitative method of classifying soil into the following major divisions (1) coarse grained soil, (2) fine grained soil, and (3) highly organic soils. Classification is performed on a soil sample which passes the 75 mm (3 inch) sieve, oversize material (> 75 mm particles) is noted on the soil logs as well. Classification of oversize material is not always possible because the oversize particles are typically too large to be captured in the sampling equipment. Oversize materials greater than 300 mm (12 inches) are termed boulders, while materials between 75 mm and 300 mm are termed cobbles. Coarse grained soils are described as having 50% or more of the sample retained on the No. 200 sieve (0.075 mm) while fine grained soils will have 50% or more of the sample passing the No. 200 sieve. Coarse samples containing >50% material retained on the No. 4 sieve is classified as gravel. If a majority of the sample is retained on the No. 200 sieve but passes the No. 4 sieve it is classified as a sand. Fine grained soils are those having more than 50% of the sample passing the No. 200 sieve; these may be classified as silt or clay depending their Atterberg limits or observations of field consistency. Refer to the most recent version of ASTM D2487 for a complete discussion of the classification method.

SOIL CONSISTENCY - CRITERIA

Soil consistency as defined below and determined by normal field and laboratory methods applies only to non-frozen material. For these materials, the influence of such factors as soil structure, i.e. Fissure systems, shrinkage cracks, slickensides, etc., must be taken into consideration in making any correlation with the consistency values listed below. In permafrost zones, the consistency and strength of frozen soils may vary significantly and unexplainably with ice content, thermal regime and soil type.

STANDARD PENETRATION TEST (BLOWS/FT) RELATIVE TO DENSITY/CONSISTENCY

N_{60}	Density	Relative Density	N_{60}	Consistency
0-4	Very Loose	0-15%	< 2	Very Soft
4-10	Loose	15-35%	2 - 4	Soft
10-30	Medium Dense	35-65%	4 - 8	Medium Stiff
30-50	Dense	65-85%	8 - 15	Stiff
> 50	Very Dense	>85%	15 - 30	Very Stiff
			> 30	Hard

UNDRAINED SHEAR STRENGTH

psf
< 250
250 - 500
500 - 1000
1000 - 2000
2000 - 4000
> 4000

(*correlations based upon standard 1.4" O.D. split spoon and 140 lb manual hammer dropped from a height of 30 inches)

(*Adjust as required for other sampler types)

Ref: Terzaghi and Peck, Soil Mechanics in Engineering Practice, 3rd Edition, pg 60-63
 ASTM D1586 Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils
 ASTM D2487 Standard Practice for Classification of Soils for Engineering Purposes (USCS)

LIST OF ABBREVIATIONS

Drill Methods:	Sample Methods:	Color:	Particle Angularity
AR Air Rotary	AR Air Rotary	G Gray	A Angular
CC60 Continuous Coring (RS-60)	Cc Continuous Core	GG Greenish Gray	R Rounded
CD Case and Drill	GR Grab Sample	LB Light Brown	SA Sub-Angular
CCm Continuous Coring (Macro Core)	Sh Oversize Split-Spoon	LG Light Gray	SR Sub-Rounded
CME Continuous Augering	Ss Standard Split-Spoon	OG Olive Gray	Particle Shape:
CWR Casing with Wash Rotary	ST Shelby Tube	P Pink	E Elongated
DH Down-hole hammer	Cs Core Sample	R Reddish	F Flat
HSA Hollow Stem Auger	Color:	RO Rusty Orange	
HWT Casing Advancer	BK Black	TN Tan	
MR Mud Rotary	BN Brown	YO Yellowish Orange	
NQ3 NQ3 Triple Tube	DG Dark Brown	BG Brownish Gray	
WR Wash Rotary	DG Dark Gray		
TP Test Pit			



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STANDARD BOREHOLE LOG DETAILS

BOREHOLE LOGS

FIGURE A-4

Depth (feet)	Water Table	GRAPHIC SYMBOL	SOIL/ROCK DESCRIPTION	SAMPLES					GRAPH				COMMENTS	Elevation (feet)
				Number	Type	Location	Recovery (%) (RQD)	Penetration Blows per 6/Inch (per Foot)* or {Rock Quality}	■ BLOW COUNT (BPF)* 20 40 60 80 ● POCKET PEN. (TSF) 1 2 3 4 ▲ VANE SHEAR (TSF) 2 4 6 8	20 40 60 80 1 2 3 4 2 4 6 8	20 40 60 80 1 2 3 4 2 4 6 8	20 40 60 80 1 2 3 4 2 4 6 8		
0.0			0' - 0.30' A.C. PAVEMENT											24.43
2			POORLY-GRADED GRAVEL W/ SILT AND SAND (GP-GM) Gray, Moist, Dense, Subangular	1	Ss		30	20-20-25 (45)				■		22.43
			SLATY ARGILLITE grayish black, fine grained, thin bedded, medium hard, BX-U, steeply dipping	2	Ct		56 (50)	{Poor}						

COLUMN DESCRIPTIONS

- 1** Depth Depth (in feet) below the ground surface (bgs).
- 2** Water Level Groundwater level recorded while drilling. Depths and times are recorded in comments column.
- 3** Graphic Log Graphic depiction of materials encountered.
- 4** Soil/ Rock Description Description of materials encountered, including USCS soil descriptions and rock descriptions defined in Fig. B-5 and B-6.
- 5** Sample Number Sample identification number.
- 6** Sample Type Type of soil or rock sample collected at depth interval depicted; symbols explained on Fig. B-1.
- 7** Sample Location Location of soil or rock sample taken.
- 8** Sample Recovery Soil: Percentage of sample recovered. Rock: Percentage of sample recovered and RQD value.
- 9** Sample Blows or Rock Quality Soil: Number of blows to advance driven sampler each 6-inch interval using sampler type specified with a 30-inch drop. Blows per foot given in parentheses. Rock: Rock quality as defined from RQD value.
- 10** Graphs Graphic log depicting blow counts per foot with a specified split spoon, Pocket Penetration and Vane Shear tests depicted where taken on fine grained soils.
- 11** Comments Comments or observations on drilling/sampling by driller or PND field personnel.
- 12** Elevation Elevation (in feet) with respect to Mean Lower Low Water (MLLW) or other datum where specified.

GENERAL NOTES

1. Field descriptions may have been modified to reflect laboratory test results.
2. Descriptions on these boring logs apply only at the specific locations at the time the borings were drilled. They are not warranted to be representative of subsurface conditions at other locations or times.
3. Split spoon blow counts shown are uncorrected raw data. Various hammer sizes and split spoon sizes were used and have not been corrected to a Standard Penetration Test (SPT). Blow counts may vary substantially between SPT and these methods.

<p>P N D ENGINEERS, INC.</p>	Designed: PND Drawn: PND Checked: PND Project No.: 242078.01 Date: SEPT. 2024	<h2 style="margin: 0;">STANDARD BOREHOLE LOG DETAILS</h2>	
		BOREHOLE LOGS	FIGURE A-5

Soil Legend

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS	
			GRAPH	LETTER		
COARSE GRAINED SOILS MORE THAN 50% RETAINED ON NO. 200 SIEVE (0.075mm)	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE (4.75mm)	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	Well-graded gravels, gravel sand mixtures, little or no fines	
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GP	Poorly graded gravels, gravel-sand mixtures, little or no fines	
		SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE (4.75mm)	CLEAN SANDS (LITTLE OR NO FINES)		SW	Well-graded sands, gravelly sands, little or no fines
			SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SP	Poorly graded sands, gravelly sands, little or no fines
	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50			ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity	
				CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts		
			CH	Inorganic clays of high plasticity, fat clays		
		OH	Organic clays of medium to high plasticity, organic silts			
HIGHLY ORGANIC SOILS				PT	Peat and other highly organic soils	

Stratigraphic Contact

- Distinct contact between soil strata or geologic units
- Gradual change between soil strata or geologic units
- Approximate location of soil strata change within a geologic soil unit

NOTES:

1. Coarse grain soils with fines content >5% or <15% require dual symbols: example GW-SM, SW-SM
2. Multiple symbols can be used to indicate borderline or dual soil classifications

Laboratory / Field Tests List of Abbreviations

%F	Percent Fines	HA	Hydrometer Analysis	PM	Permiability or Hydraulic Conductivity
AL	Atterberg Limits	LL	Liquid Limit	PP	Pocket Penetrometer
CP	Laboratory Compaction test	LMA	Limited Mechanical Analysis	SA	Sieve Analysis
CO	Consolidation test	MC	Moisture Content	TV	Torvane
DP	Depth "Peat" Probe	MD	Moisture content and Dry density	TX	Triaxial Shear
DS	Direct Shear	OC	Organic Content	UC	Unconfined Compression
		PL	Plastic Limit	VS	Vane Shear



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STANDARD BOREHOLE LOG DETAILS

BOREHOLE LOGS

FIGURE A-6

METRIC CONVERSIONS

Length	1 inch	= 25.4 mm	1 mm	= 0.0394 inch
	1 foot	= 0.3048 m	1 m	= 3.281 feet
	1 mile	= 1.6093 km	1 km	= 0.621 mile
Area	1 sq. inch	= 6.452 cm ²	1 cm ²	= 0.155 sq. inch
	1 sq. foot	= 0.0929 m ²	1 m ²	= 10.764 sq. foot
	1 acre	= 0.4047 hectare	1 hectare	= 2.47 acre
	1 sq. mile	= 2.59 km ²	1 km ²	= 0.386 sq. mile
Volume	1 cu. inch	= 16.387 cm ³ (cc)	1 cm ³	= 0.061 cu. inch
	1 cu. foot	= 0.0283 m ³	1 m ³	= 35.31 cu. foot
	1 cu. yard	= 0.7646 m ³	1 m ³	= 1.308 cu. yard
	1 U.S. gallon	= 3.785 liters	1 liter	= 0.264 U.S. gallon
Mass	1 lb.	= 0.4536 kg	1 kg	= 2.205 lb.
Force	1 lb.	= 4.448 N	1 N	= 0.225 lb.
	1 ton	= 8.896 kN	1 kN	= 0.1124 U.S. ton
Density	1 lb./cu. ft.	= 16.019 kg/m ³ = 0.1571 kN/m ³	1 kg/m ³	= 0.0624 lb./cu. foot
			1 kN/m ³	= 6.365 lb./cu. foot
Pressure/Stress	1 lb./sq. in.	= 0.0703 kg/cm ² (= 6.895 kPa)	1 kg/cm ²	= 14.22 lb./sq. inch
			1 kPa	= 0.145 lb./sq. inch
	1 lb./sq. ft.	= 4.882 kg/cm ² (= 0.04788 kPa)	1 kg/cm ²	= 0.2048 lb./sq. ft.
			1 kPa	= 20.886 lb./sq. foot
	1 U.S. ton/sq. ft.	= 95.76 kPa	1 kPa	= 0.01044 U.S. ton/sq. foot
[Note: 1 kPa	= 1 kN/m ²			
Flow Velocity	1 gal./min.	= 6.309 x 10 ⁻⁵ m ³ /sec	1 m ³ /sec	= 15,850 gallons per minute
	1 ft./sec.	= 0.3048 m/sec	1 m/sec	= 3.28 ft./sec
Coefficient of Compressibility M _v :	1 sq. ft./U.S. ton	= 0.0104 m ² /kN		
	1 sq. in./lb	= 14.22 cm ² /kg		
Coefficient of consolidation C _v :	1 sq. ft./year	= 0.0929 m ² /year (= 0.002946 mm ² /sec)	1 m ² /year	= 10.76 sq. ft. /year
			1 mm ² /sec	= 339.4 sq. ft./year
Moment	1 lb.-ft.	= 0.1383 kq-m (= 1.3558 Nm)	1 kq-m	= 7.23 lb.-foot
			1 N-m	= 0.7376 lb.-foot
Speed	1 mile/hour	= 1.609 km/hour (= 0.447 m/sec)	1 km/hour	= 0.622 mile/hour
			1 m/sec	= 2.237 mph
	1 foot/sec	= 0.3048 m/sec	1 m/sec	= 3.281 feet/sec



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Drawn: PND

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Date: SEPT. 2024

STANDARD BOREHOLE LOG DETAILS

BOREHOLE LOGS

FIGURE A-7

BOREHOLE LOG 242078.03 SEARHC HAINES CLINIC.GPJ PND ENGINEERS.GDT 12/15/25 ©2025

Depth (feet)	Water Table	Graphic Symbol	SOIL DESCRIPTION Soil Name, Color, Moisture Content, Relative Density, Soil Structure, Mineralogy, Other Information	SAMPLES			Penetration Blows per 6/Inch (per foot) or (Rock Quality)	GRAPH ■ BLOW COUNT (20, 40, 60, 80) ● POCKET PEN (tsf) (1, 2, 3, 4) ▲ VANE SHEAR (tsf) (0.2, 0.4, 0.6, 0.8)	COMMENTS Casing Depth, Drilling Rate, Fluid Loss, Drill Pressure, Tests, Instrumentation, Additional Information	Elevation (feet)
				Number	Type	Location Recovery % (RQD %)				
0.0			ORGANICS dark brown, moist						Geoprobe 6712DT w/ 340 lb Auto Hammer	55.5
2.5			POORLY-GRADED SAND WITH GRAVEL (SP) light brownish gray to bluish gray, dry, subrounded to subangular gravel Gravel=25% Sand=44% Fines=1%	1	Sh	84	2-7-10-17 (17)	■	MC=10%	53.0
5.0			Gravel=26% Sand=45% Fines=1%	2	Sh	75	5-19-29-36 (48)	■	MC=7%	50.5
7.5				3	Sh	50	17-32-39-25 (71)	■	Occasional BOULDERS beginning at 7.5'. Blowcount indicative of BOULDERS and COBBLES. MC=8%	48.0
10.0			SILTY SAND WITH GRAVEL (SM) light brownish gray to olive brown, moist, subrounded gravel	4	Sh	50	9-18-16-17 (34)	■	MC=12%	45.5
12.5				5	Sh	75	10-8-12-14 (20)	■	MC=18%	43.0
15.0			POORLY-GRADED SAND WITH SILT AND GRAVEL (SP-SM)							40.5
17.5			POORLY-GRADED SAND WITH SILT (SP-SM) brownish gray, moist, subrounded to subangular gravel							38.0
20.0										35.5



ENGINEERS, INC.

Logged By: MEE
 Data Entry: MEE
 Checked: SCS
 Project No.: 242078.03
 Date: May. 2025

SEARHC HAINES MEDICAL CAMPUS
 Haines, Alaska

BH-1

FIGURE A-8
 1 of 3

Depth (feet)	Water Table	Graphic Symbol	SOIL DESCRIPTION	SAMPLES				GRAPH	COMMENTS	Elevation (feet)	
			Soil Name, Color, Moisture Content, Relative Density, Soil Structure, Mineralogy, Other Information	Number	Type	Location	Recovery % (RQD %)	Penetration Blows per 6/Inch (per foot) or (Rock Quality)	■ BLOW COUNT ■ 20 40 60 80 ● POCKET PEN (tsf) ● 1 2 3 4 ▲ VANE SHEAR (tsf) ▲ 0.2 0.4 0.6 0.8		Casing Depth, Drilling Rate, Fluid Loss, Drill Pressure, Tests, Instrumentation, Additional Information
20.0			POORLY-GRADED SAND WITH SILT (SP-SM) brownish gray, moist, subrounded to subangular gravel(continued) Gravel=7% Sand=88% Fines=5%	6	Sh		67	4-5-9-14 (14)	■	3" heave MC=18%	35.5
22.5											33.0
25.0				7	Sh		100	6-15-22-23 (37)	■	1' heave MC=18%	30.5
27.5			Gradational color change POORLY-GRADED SAND WITH SILT (SP-SM) bluish gray, wet, subrounded to subangular gravel								28.0
30.0				8	Sh		0	6-9-15-16 (24)	■	BOULDERS present but able to advance past.	25.5
32.5											23.0
35.0				9	Sh		67	6-13-13 (26)	■	MC=17%	20.5
37.5											18.0
40.0											15.5

BOREHOLE LOG 242078.03 SEARHC HAINES CLINIC.GPJ PND ENGINEERS.GDT 12/15/25 ©2025



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SEARHC HAINES MEDICAL CAMPUS
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FIGURE A-8
2 of 3

Depth (feet)	Water Table	Graphic Symbol	SOIL DESCRIPTION	SAMPLES				GRAPH				COMMENTS	Elevation (feet)		
			Soil Name, Color, Moisture Content, Relative Density, Soil Structure, Mineralogy, Other Information	Number	Type	Location	Recovery % (RQD %)	Penetration Blows per 6/Inch (per foot) or (Rock Quality)	■ BLOW COUNT ■ 20 40 60 80 ● POCKET PEN (tsf) ● 1 2 3 4 ▲ VANE SHEAR (tsf) ▲ 0.2 0.4 0.6 0.8	Casing Depth, Drilling Rate, Fluid Loss, Drill Pressure, Tests, Instrumentation, Additional Information					
40.0			POORLY-GRADED SAND WITH SILT (SP-SM) bluish gray, wet, subrounded to subangular gravel(<i>continued</i>) Gravel=5% Sand=84% Fines=11%	10	Sh	42	5-8-10-13 (18)	■					MC=20%	15.5	
42.5														13.0	
45.0					11	Sh	25	6-10-14-17 (24)	■					MC=21%	10.5
47.5														COBBLES beginning at 47'.	8.0
50.0					12	Sh	0	8-10-12-7 (22)	■					2' heave	5.5
52.5													TOTAL DEPTH=52'	3.0	
55.0														0.5	
57.5														-2.0	
60.0														-4.5	

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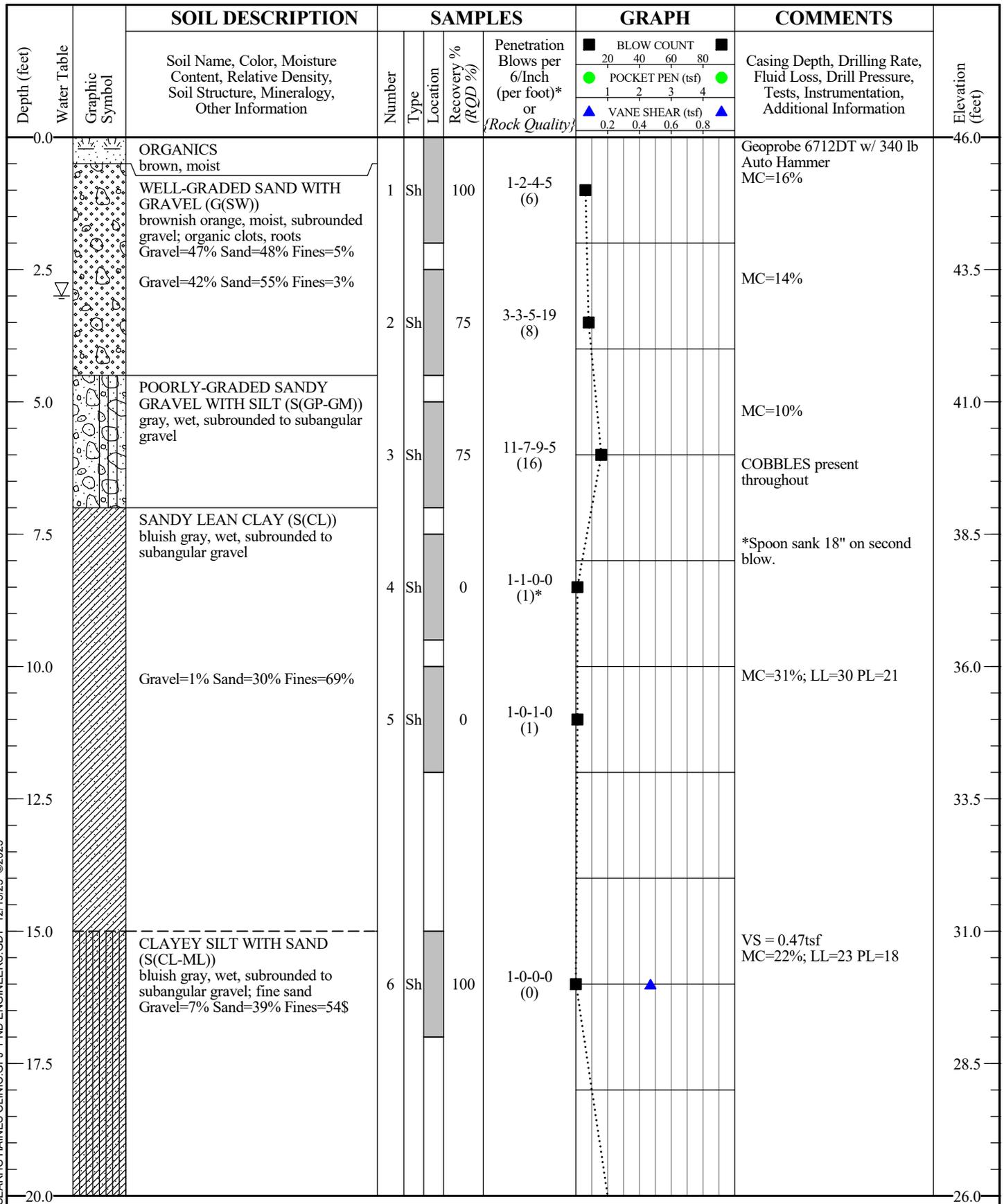


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FIGURE A-8
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FIGURE A-9
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BOREHOLE LOG 242078.03 SEARHC HAINES CLINIC.GPJ PND ENGINEERS.GDT 12/15/25 ©2025

Depth (feet)	Water Table	Graphic Symbol	SOIL DESCRIPTION	SAMPLES				GRAPH				COMMENTS	Elevation (feet)	
			Soil Name, Color, Moisture Content, Relative Density, Soil Structure, Mineralogy, Other Information	Number	Type	Location	Recovery % (RQD %)	Penetration Blows per 6/Inch (per foot)* or (Rock Quality)	■ BLOW COUNT 20 40 60 80	● POCKET PEN (tsf) 1 2 3 4	▲ VANE SHEAR (tsf) 0.2 0.4 0.6 0.8	Casing Depth, Drilling Rate, Fluid Loss, Drill Pressure, Tests, Instrumentation, Additional Information		
20.0			CLAYEY SILT WITH SAND (S(CL-ML)) bluish gray, wet, subrounded to subangular gravel; fine sand(continued)	7	Sh		50	2-50					MC=18%	26.0
22.5			POORLY-GRADED SAND WITH SILT AND GRAVEL ((SP-SM)G) bluish gray, moist, subrounded to subangular gravel											23.5
25.0			POORLY-GRADED SAND WITH SILT AND GRAVEL ((SP-SM)G) bluish gray, moist, subrounded to subangular gravel	8	Sh		75	6-18-32-25 (50)					MC=12% MC=13%	21.0
27.5			POORLY-GRADED GRAVELLY SAND WITH SILT (G(SP-SM)) bluish gray, moist, subrounded to subangular gravel											18.5
30.0			POORLY-GRADED SANDY GRAVEL WITH SILT (S(GP-GM)) bluish gray, moist, subrounded to subangular gravel	9	Sh		84	5-17-22-30 (39)					MC=14%	16.0
32.5			POORLY-GRADED SANDY GRAVEL WITH SILT (S(GP-GM)) bluish gray, moist, subrounded to subangular gravel											13.5
35.0			POORLY-GRADED SAND WITH SILT AND GRAVEL ((SP-SM)G) bluish gray, moist, subrounded gravel	10	Sh		67	8-15-24-23 (39)					MC=5%	11.0
37.5			POORLY-GRADED SAND WITH SILT AND GRAVEL ((SP-SM)G) bluish gray, moist, subrounded gravel											8.5
40.0														6.0



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FIGURE A-9
2 of 3

Depth (feet)	Water Table	Graphic Symbol	SOIL DESCRIPTION	SAMPLES				GRAPH				COMMENTS	Elevation (feet)	
			Soil Name, Color, Moisture Content, Relative Density, Soil Structure, Mineralogy, Other Information	Number	Type	Location	Recovery % (RQD %)	Penetration Blows per 6/Inch (per foot)* or (Rock Quality)	■ BLOW COUNT ■ 20 40 60 80	● POCKET PEN (tsf) ● 1 2 3 4	▲ VANE SHEAR (tsf) ▲ 0.2 0.4 0.6 0.8	Casing Depth, Drilling Rate, Fluid Loss, Drill Pressure, Tests, Instrumentation, Additional Information		
40.0			POORLY-GRADED SAND WITH SILT AND GRAVEL ((SP-SM)G) bluish gray, moist, subrounded gravel(continued)	11	Sh		50	11-19-20-17 (39)					MC=11%	6.0
42.5														3.5
45.0					12	Sh		50	7-17-20-27 (37)					MC=15%
47.5			POORLY-GRADED SAND WITH SILT (SP-SM) bluish gray, moist, rounded gravel											-1.5
50.0				13	Sh		67	3-11-19-20 (30)					MC=14%	-4.0
52.5														-6.5
55.0														-9.0
57.5													-11.5	
60.0													2' of heave at 60' bgs TOTAL DEPTH=60'	-14.0

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FIGURE A-9
3 of 3

Depth (feet)	Water Table	Graphic Symbol	SOIL DESCRIPTION Soil Name, Color, Moisture Content, Relative Density, Soil Structure, Mineralogy, Other Information	SAMPLES				GRAPH	COMMENTS Casing Depth, Drilling Rate, Fluid Loss, Drill Pressure, Tests, Instrumentation, Additional Information	Elevation (feet)
				Number	Type	Location	Recovery % (RQD %)			
0.0			ORGANICS (PT) brown						Geoprobe 6712DT w/ 340 lb Auto Hammer	34.5
2.5			WELL GRADED GRAVELLY SAND (G(SW)) bluish gray, subrounded gravel						MC=12%	32.0
5.0			CLAYEY SILT (CL-ML) bluish gray, subrounded gravel	1	Sh	50	5-3-1-0 (4)	■	MC=17%	29.5
7.5			SANDY CLAYEY SILT (S(CL-ML)) bluish gray, subrounded gravel Gravel=6% Sand=39% Fines=55%	2	Sh	100	1-0-1-1 (1)*	■ ▲	VS = 0.20tsf MC=20%; PL=21 LL=17 *Spoon sank 4" after being placed.	27.0
10.0			CLAYEY SAND WITH SILT (SC-SM) bluish gray, subrounded gravel; coarse sand	3	Ts	0				24.5
12.5			CLAYEY SAND WITH SILT (SC-SM) bluish gray, subrounded gravel; coarse sand	4	Ts	0				22.0
15.0			CLAYEY SAND WITH SILT (SC-SM) bluish gray, subrounded gravel; coarse sand	5	Sh	100	0-0-0-17 (0)	■ ▲	VS = 0.16tsf Spoon sank 18" under weight of the hammer. MC=27%	19.5
17.5			CLAYEY SAND WITH SILT (SC-SM) bluish gray, subrounded gravel; coarse sand							17.0
20.0			CLAYEY SAND WITH SILT (SC-SM) bluish gray, subrounded gravel; coarse sand							14.5

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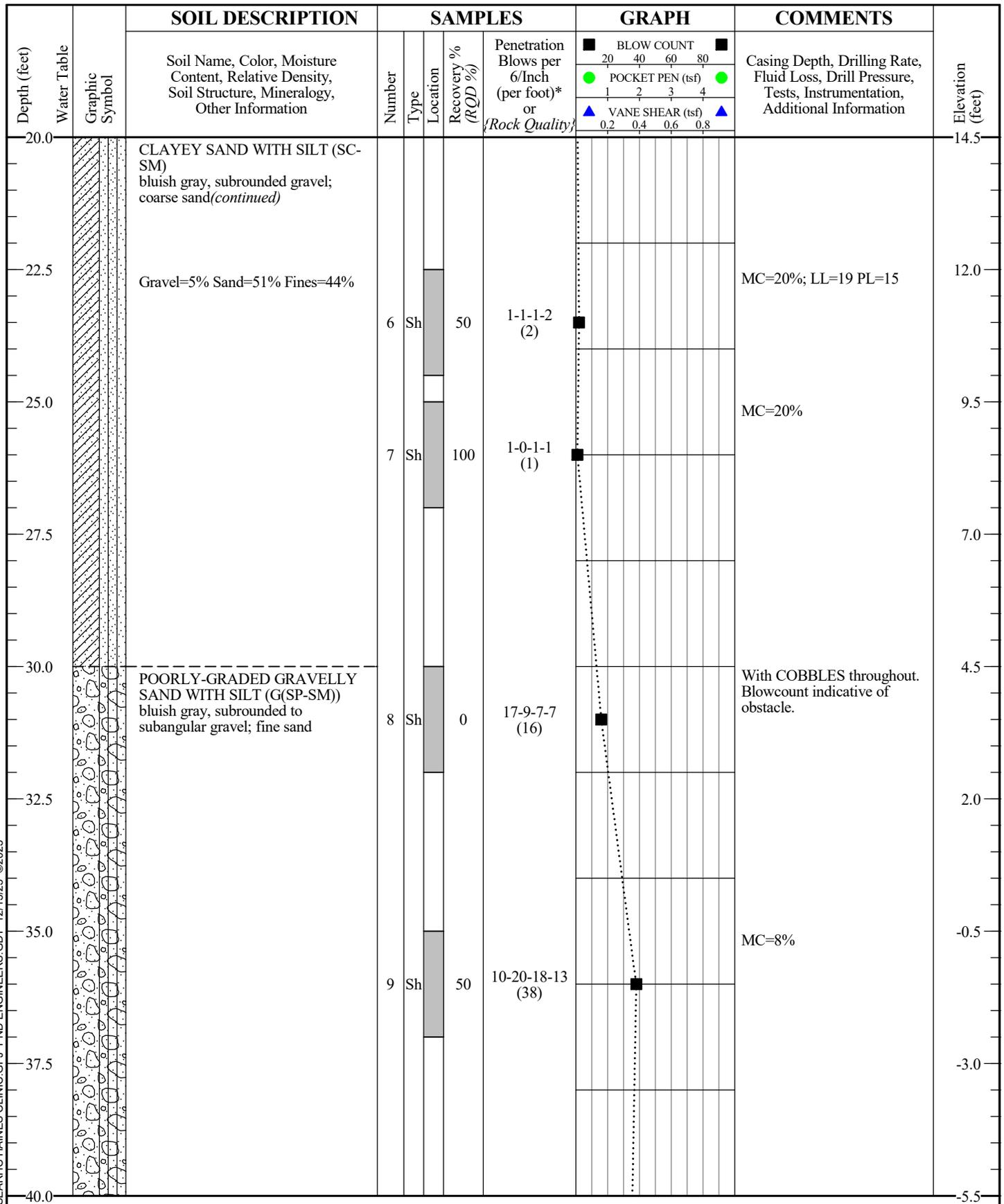


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FIGURE A-10
1 of 3



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FIGURE A-10
 2 of 3

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Depth (feet)	Water Table	Graphic Symbol	SOIL DESCRIPTION	SAMPLES				GRAPH	COMMENTS	Elevation (feet)
				Number	Type	Location	Recovery % (RQD %)			
40.0			POORLY-GRADED GRAVELLY SAND WITH SILT (G(SP-SM)) bluish gray, subrounded to subangular gravel; fine sand(continued)	10	Sh	50	13-22-13-20 (35)		MC=10%	-5.5
42.5										
45.0				11	Sh	50	12-25-38-35 (63)	MC=13%		
47.5			POORLY-GRADED SANDY GRAVEL WITH SILT (S(GP-GM)) bluish gray, subrounded gravel; fine sand	12	Sh	34	12-27-28-50 (55)		MC=8%	-15.5
50.0										
52.5									BOULDERS present. 50/2" REFUSAL. Blowcount indicative of obstacle. TOTAL DEPTH=51.5'	-18.0
55.0										
57.5										
60.0										



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FIGURE A-10
3 of 3

BOREHOLE LOG 242078.01 SEARHC HAINES CLINIC.GPJ PND ENGINEERS.GDT 12/15/25 ©2025

Depth (feet)	Water Table	Graphic Symbol	SOIL DESCRIPTION Soil Name, Color, Moisture Content, Relative Density, Soil Structure, Mineralogy, Other Information	SAMPLES				GRAPH				COMMENTS Casing Depth, Drilling Rate, Fluid Loss, Drill Pressure, Tests, Instrumentation, Additional Information	Elevation (feet)																		
				Number	Type	Location	Recovery % (RQD %)	Penetration Blows per 6/Inch (per foot) or (Rock Quality)	<table border="1"> <tr> <td colspan="4">BLOW COUNT</td> </tr> <tr> <td>20</td> <td>40</td> <td>60</td> <td>80</td> </tr> </table>	BLOW COUNT				20	40	60	80	<table border="1"> <tr> <td colspan="4">POCKET PEN (tsf)</td> </tr> <tr> <td>1</td> <td>2</td> <td>3</td> <td>4</td> </tr> </table>	POCKET PEN (tsf)				1	2	3	4	<table border="1"> <tr> <td colspan="4">VANE SHEAR (tsf)</td> </tr> <tr> <td>0.2</td> <td>0.4</td> <td>0.6</td> <td>0.8</td> </tr> </table>	VANE SHEAR (tsf)			
BLOW COUNT																															
20	40	60	80																												
POCKET PEN (tsf)																															
1	2	3	4																												
VANE SHEAR (tsf)																															
0.2	0.4	0.6	0.8																												
0.0			ORGANICS dark brown, moist										59.0																		
2.5			SANDY GRAVEL (GP) brownish gray, moist										56.5																		
4.5	▽		SILTY SAND (SM) light bluish gray, moist										54.0																		
5.0			POORLY-GRADED SAND (SP) olive brown, wet, very fine to fine grained										51.5																		
8.0			Total Depth = 8' bgs										49.0																		
10.0													46.5																		
12.5													44.0																		
15.0													41.5																		
17.5													39.0																		
20.0													39.0																		



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SEARHC HAINES MEDICAL CAMPUS
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TEST PIT TP-1

FIGURE B-11
1 of 1

Depth (feet)	Water Table	Graphic Symbol	SOIL DESCRIPTION Soil Name, Color, Moisture Content, Relative Density, Soil Structure, Mineralogy, Other Information	SAMPLES				GRAPH				COMMENTS Casing Depth, Drilling Rate, Fluid Loss, Drill Pressure, Tests, Instrumentation, Additional Information	Elevation (feet)	
				Number	Type	Location	Recovery % (RQD %)	Penetration Blows per 6/Inch (per foot) or (Rock Quality)	■ BLOW COUNT ■ 20 40 60 80 ● POCKET PEN (tsf) ● 1 2 3 4 ▲ VANE SHEAR (tsf) ▲ 0.2 0.4 0.6 0.8					
0.0			ORGANICS dark brown										Hitachi 135 Excavator	52.7
2.5			SANDY GRAVEL (GP) brownish gray, dry, subrounded gravel; upper depth orange stained											50.2
5.0														47.7
7.5			POORLY-GRADED SAND (SP) olive brown, wet, very fine to fine grained											45.2
10.0														42.7
12.5														40.2
15.0														37.7
17.5			SILTY GRAVEL WITH SAND (GW) light bluish gray, moist, matrix supported diamict, hard digging; walls sloughing Total Depth = 17' bgs											35.2
20.0														32.7

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SEARHC HAINES MEDICAL CAMPUS
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TEST PIT TP-2

FIGURE B-12
1 of 1

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Depth (feet)	Water Table	Graphic Symbol	SOIL DESCRIPTION Soil Name, Color, Moisture Content, Relative Density, Soil Structure, Mineralogy, Other Information	SAMPLES				GRAPH				COMMENTS Casing Depth, Drilling Rate, Fluid Loss, Drill Pressure, Tests, Instrumentation, Additional Information	Elevation (feet)
				Number	Type	Location	Recovery % (RQD %)	Penetration Blows per 6/Inch (per foot) or (Rock Quality)	■ BLOW COUNT ■ 20 40 60 80	● POCKET PEN (tsf) ● 1 2 3 4	▲ VANE SHEAR (tsf) ▲ 0.2 0.4 0.6 0.8		
0.0			ORGANICS dark brown									Hitachi 135 Excavator	57.5
2.5			SANDY GRAVEL (GP) coarse, subrounded gravel										55.0
5.0													52.5
7.5													50.0
10.0													47.5
12.5													45.0
15.0			POORLY-GRADED SAND (SP) fine grained sand; walls sloughing										42.5
17.5			Total Depth = 16' bgs										40.0
20.0													37.5



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SEARHC HAINES MEDICAL CAMPUS
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TEST PIT TP-3

FIGURE B-13
1 of 1

Depth (feet)	Water Table	Graphic Symbol	SOIL DESCRIPTION	SAMPLES				GRAPH	COMMENTS	Elevation (feet)
			Soil Name, Color, Moisture Content, Relative Density, Soil Structure, Mineralogy, Other Information	Number	Type	Location	Recovery % (RQD %)	Penetration Blows per 6/Inch (per foot) or (Rock Quality)	■ BLOW COUNT ■ 20 40 60 80 ● POCKET PEN (tsf) ● 1 2 3 4 ▲ VANE SHEAR (tsf) ▲ 0.2 0.4 0.6 0.8	
0.0			ORGANICS dark brown							47.6
2.5			SANDY SILT WITH GRAVEL (ML) light gray, dry, desiccated, coarse clumps; lacustrine deposits							45.1
5.0			POORLY-GRADED SAND WITH GRAVEL (SP) reddish brown mottled with orange, dry, coarse, subrounded gravel							42.6
7.5			POORLY-GRADED SAND (SP) light olive brown, dry to wet							40.1
10.0										37.6
12.5										35.1
15.0									walls sloughing	32.6
17.5			Total Depth = 16' bgs							30.1
20.0										27.6

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SEARHC HAINES MEDICAL CAMPUS
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TEST PIT TP-4

FIGURE B-14
1 of 1

BOREHOLE LOG 242078.01 SEARHC HAINES CLINIC.GPJ PND ENGINEERS.GDT 12/15/25 ©2025

Depth (feet)	Water Table	Graphic Symbol	SOIL DESCRIPTION Soil Name, Color, Moisture Content, Relative Density, Soil Structure, Mineralogy, Other Information	SAMPLES				GRAPH				COMMENTS Casing Depth, Drilling Rate, Fluid Loss, Drill Pressure, Tests, Instrumentation, Additional Information	Elevation (feet)
				Number	Type	Location	Recovery % (RQD %)	Penetration Blows per 6/Inch (per foot) or (Rock Quality)	■ BLOW COUNT ■ 20 40 60 80	● POCKET PEN (tsf) ● 1 2 3 4	▲ VANE SHEAR (tsf) ▲ 0.2 0.4 0.6 0.8		
0.0			ORGANICS dark brown										46.5
			SILTY SAND (SM) dark brown										
2.5			UNKNOWN white, dry, pulverized - gritty; ash-like appearance										44.0
			POORLY-GRADED SAND (SP) tan, dry										
			SILT (ML) olive brown, moist, organics - plant roots; lacustrine deposits?										41.5
5.0													
7.5													39.0
			SILTY GRAVEL WITH SAND (GM) bluish gray, moist, matrix supported diamict; hard										
10.0			GRAVELLY SAND (SP) tan, wet										36.5
12.5													34.0
15.0													31.5
17.5			Total Depth = 16' bgs										29.0
20.0													26.5



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SEARHC HAINES MEDICAL CAMPUS
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TEST PIT TP-5

FIGURE B-15
1 of 1

BOREHOLE LOG 242078.01 SEARHC HAINES CLINIC.GPJ PND ENGINEERS.GDT 12/15/25 ©2025

Depth (feet)	Water Table	Graphic Symbol	SOIL DESCRIPTION Soil Name, Color, Moisture Content, Relative Density, Soil Structure, Mineralogy, Other Information	SAMPLES					GRAPH				COMMENTS Casing Depth, Drilling Rate, Fluid Loss, Drill Pressure, Tests, Instrumentation, Additional Information	Elevation (feet)
				Number	Type	Location	Recovery % (RQD %)	Penetration Blows per 6/Inch (per foot) or (Rock Quality)	■ BLOW COUNT ■ 20 40 60 80	● POCKET PEN (tsf) ● 1 2 3 4	▲ VANE SHEAR (tsf) ▲ 0.2 0.4 0.6 0.8			
0.0			ORGANICS										Hitachi 135 Excavator	46.2
			SANDY GRAVEL (GP) light gray, dry, fine to medium, flat gravel											
2.5			SANDY GRAVEL (GP) dark reddish brown mottled with orange, dry, coarse to medium, subrounded gravel; distinct FeO stained; ferricrete											43.7
5.0														41.2
7.5			SILTY CLAY (ML/CL) light bluish gray, soft - toothpaste consistency											38.7
			Total Depth = 8' bgs											
10.0														36.2
12.5														33.7
15.0														31.2
17.5														28.7
20.0														26.2

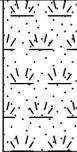


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SEARHC HAINES MEDICAL CAMPUS
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TEST PIT TP-6

FIGURE B-16
1 of 1

Depth (feet)	Water Table	Graphic Symbol	SOIL DESCRIPTION Soil Name, Color, Moisture Content, Relative Density, Soil Structure, Mineralogy, Other Information	SAMPLES				GRAPH				COMMENTS Casing Depth, Drilling Rate, Fluid Loss, Drill Pressure, Tests, Instrumentation, Additional Information	Elevation (feet)
				Number	Type	Location	Recovery % (RQD %)	Penetration Blows per 6/Inch (per foot) or (Rock Quality)	■ BLOW COUNT ■ 20 40 60 80	● POCKET PEN (tsf) ● 1 2 3 4	▲ VANE SHEAR (tsf) ▲ 0.2 0.4 0.6 0.8		
0.0			ORGANICS dark brown, wet, boggy surface; skunk cabbage									Hitachi 135 Excavator	43.5
2.5			SANDY GRAVEL (GM) light gray, moist, fine to medium, subangular, flat gravel										41.0
5.0			SILTY CLAY (ML/CL) light bluish gray, moist, soft, toothpaste consistency										38.5
7.5													36.0
10.0													33.5
12.5													31.0
15.0													28.5
17.5			Total Depth = 16' bgs										26.0
20.0													23.5

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**SEARHC HAINES MEDICAL CAMPUS
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TEST PIT TP-7

**FIGURE B-17
1 of 1**

Depth (feet)	Water Table	Graphic Symbol	SOIL DESCRIPTION Soil Name, Color, Moisture Content, Relative Density, Soil Structure, Mineralogy, Other Information	SAMPLES				GRAPH				COMMENTS Casing Depth, Drilling Rate, Fluid Loss, Drill Pressure, Tests, Instrumentation, Additional Information	Elevation (feet)
				Number	Type	Location	Recovery % (RQD %)	Penetration Blows per 6/Inch (per foot) or (Rock Quality)	■ BLOW COUNT ■ 20 40 60 80	● POCKET PEN (tsf) ● 1 2 3 4	▲ VANE SHEAR (tsf) ▲ 0.2 0.4 0.6 0.8		
0.0			ORGANICS dark brown, moist									Hitachi 135 Excavator	45.5
			POORLY-GRADED GRAVEL (GM) light gray, dry, fine, subangular gravel; pea gravel in appearance										
2.5			SANDY GRAVEL (GP) dark reddish brown mottled with orange, dry, coarse to medium, subrounded gravel; distinct FeO staining; ferricrete										43.0
5.0			POORLY-GRADED SAND (SP) grayish brown, moist, coarse grained sand										40.5
7.5			SILTY CLAY (ML/CL) light bluish gray, soft toothpaste consistency										38.0
10.0													35.5
12.5													33.0
15.0													30.5
17.5													28.0
			Total Depth = 18' bgs										
20.0													25.5

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SEARHC HAINES MEDICAL CAMPUS
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TEST PIT TP-8

FIGURE B-18
1 of 1

Depth (feet)	Water Table	Graphic Symbol	SOIL DESCRIPTION Soil Name, Color, Moisture Content, Relative Density, Soil Structure, Mineralogy, Other Information	SAMPLES				GRAPH				COMMENTS Casing Depth, Drilling Rate, Fluid Loss, Drill Pressure, Tests, Instrumentation, Additional Information	Elevation (feet)	
				Number	Type	Location	Recovery % (RQD %)	Penetration Blows per 6/Inch (per foot) or (Rock Quality)	■ BLOW COUNT ■ 20 40 60 80 ● POCKET PEN (tsf) ● 1 2 3 4 ▲ VANE SHEAR (tsf) ▲ 0.2 0.4 0.6 0.8					
0.0			ORGANICS dark brown, wet, boggy surface, abundant skunk cabbage										Hitachi 135 Excavator	39.0
2.5			POORLY-GRADED GRAVEL WITH SAND (GP) light gray, wet, fine, flat gravel											36.5
5.0			POORLY-GRADED GRAVEL WITH SAND (GP) dark reddish brown, wet, coarse, subrounded gravel; abundant cobbles and boulders to 3'; distinct FeO staining											34.0
7.5			SILTY CLAY (ML/CL) light bluish gray, soft toothpaste consistency											31.5
10.0														29.0
12.5														26.5
15.0														24.0
17.5														21.5
20.0			Total Depth = 18' bgs											19.0

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SEARHC HAINES MEDICAL CAMPUS
Haines, Alaska

TEST PIT TP-9

FIGURE B-19
1 of 1

BOREHOLE LOG 242078.01 SEARHC HAINES CLINIC.GPJ PND ENGINEERS.GDT 12/15/25 ©2025

Depth (feet)	Water Table	Graphic Symbol	SOIL DESCRIPTION Soil Name, Color, Moisture Content, Relative Density, Soil Structure, Mineralogy, Other Information	SAMPLES				GRAPH				COMMENTS Casing Depth, Drilling Rate, Fluid Loss, Drill Pressure, Tests, Instrumentation, Additional Information	Elevation (feet)	
				Number	Type	Location	Recovery % (RQD %)	Penetration Blows per 6/Inch (per foot) or (Rock Quality)	<div style="display: flex; justify-content: space-between;"> ■ BLOW COUNT ■ </div> <div style="display: flex; justify-content: space-between;"> 20 40 60 80 </div> <div style="display: flex; justify-content: space-between;"> ● POCKET PEN (tsf) ● </div> <div style="display: flex; justify-content: space-between;"> 1 2 3 4 </div> <div style="display: flex; justify-content: space-between;"> ▲ VANE SHEAR (tsf) ▲ </div> <div style="display: flex; justify-content: space-between;"> 0.2 0.4 0.6 0.8 </div>					
0.0			ORGANICS dark brown										Hitachi 135 Excavator	46.5
2.5			POORLY-GRADED GRAVEL (GP) light gray, dry, fine, subangular, flat gravel											44.0
5.0			POORLY-GRADED GRAVEL WITH SAND (GP) dark reddish brown, dry, distinct FeO staining; ferricrete											41.5
7.5			SILTY CLAY (ML/CL) light bluish gray											39.0
10.0			Total Depth = 7' bgs; Dry - no water observed											36.5
12.5														34.0
15.0														31.5
17.5														29.0
20.0														26.5



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SEARHC HAINES MEDICAL CAMPUS
Haines, Alaska

TEST PIT TP-10

FIGURE B-20
1 of 1

Depth (feet)	Water Table	Graphic Symbol	SOIL DESCRIPTION Soil Name, Color, Moisture Content, Relative Density, Soil Structure, Mineralogy, Other Information	SAMPLES				GRAPH				COMMENTS Casing Depth, Drilling Rate, Fluid Loss, Drill Pressure, Tests, Instrumentation, Additional Information	Elevation (feet)	
				Number	Type	Location	Recovery % (RQD %)	Penetration Blows per 6/Inch (per foot) or (Rock Quality)	■ BLOW COUNT ■ 20 40 60 80 ● POCKET PEN (tsf) ● 1 2 3 4 ▲ VANE SHEAR (tsf) ▲ 0.2 0.4 0.6 0.8					
0.0			ORGANICS dark brown										Hitachi 135 Excavator	33.6
2.5			POORLY-GRADED GRAVEL WITH SAND (GP) dark reddish brown mottled with orange, dry, coarse to medium, subrounded gravel; distinct FeO staining; ferricrete											31.1
5.0			SAND WITH SILT AND GRAVEL (SM) brownish gray, moist											28.6
7.5			SILTY CLAY (ML/CL) light bluish gray, soft toothpaste consistency											26.1
10.0														23.6
12.5														21.1
15.0														18.6
17.5														16.1
20.0			Total Depth = 18' bgs											13.6

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SEARHC HAINES MEDICAL CAMPUS
Haines, Alaska

TEST PIT TP-11

FIGURE B-21
1 of 1

BOREHOLE LOG 242078.01 SEARHC HAINES CLINIC.GPJ PND ENGINEERS.GDT 12/15/25 ©2025

Depth (feet)	Water Table	Graphic Symbol	SOIL DESCRIPTION Soil Name, Color, Moisture Content, Relative Density, Soil Structure, Mineralogy, Other Information	SAMPLES				GRAPH				COMMENTS Casing Depth, Drilling Rate, Fluid Loss, Drill Pressure, Tests, Instrumentation, Additional Information	Elevation (feet)
				Number	Type	Location	Recovery % (RQD %)	Penetration Blows per 6/Inch (per foot) or (Rock Quality)	■ BLOW COUNT ■ 20 40 60 80	● POCKET PEN (tsf) ● 1 2 3 4	▲ VANE SHEAR (tsf) ▲ 0.2 0.4 0.6 0.8		
0.0			ORGANICS dark brown									Hitachi 135 Excavator	34.6
			POORLY-GRADED GRAVEL WITH SAND (GP) dark reddish brown, dry										
2.5			SANDY GRAVEL (GP) orange, dry										32.1
			SANDY GRAVEL (GP) olive gray, dry										
5.0			SILTY CLAY (ML/CL) light bluish gray, soft toothpaste consistency										29.6
7.5			Total Depth = 6' bgs										27.1
10.0													24.6
12.5													22.1
15.0													19.6
17.5													17.1
20.0													14.6



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SEARHC HAINES MEDICAL CAMPUS
Haines, Alaska

TEST PIT TP-12

FIGURE B-22
1 of 1

BOREHOLE LOG 242078.01 SEARHC HAINES CLINIC.GPJ PND ENGINEERS.GDT 12/15/25 ©2025

Depth (feet)	Water Table	Graphic Symbol	SOIL DESCRIPTION Soil Name, Color, Moisture Content, Relative Density, Soil Structure, Mineralogy, Other Information	SAMPLES					GRAPH				COMMENTS Casing Depth, Drilling Rate, Fluid Loss, Drill Pressure, Tests, Instrumentation, Additional Information	Elevation (feet)																	
				Number	Type	Location	Recovery % (RQD %)	Penetration Blows per 6/Inch (per foot) or (Rock Quality)	<table border="1"> <tr> <td colspan="4">BLOW COUNT</td> </tr> <tr> <td>20</td> <td>40</td> <td>60</td> <td>80</td> </tr> </table>	BLOW COUNT					20	40	60	80	<table border="1"> <tr> <td colspan="4">POCKET PEN (tsf)</td> </tr> <tr> <td>1</td> <td>2</td> <td>3</td> <td>4</td> </tr> </table>	POCKET PEN (tsf)				1	2	3	4	<table border="1"> <tr> <td colspan="4">VANE SHEAR (tsf)</td> </tr> <tr> <td>0.2</td> <td>0.4</td> <td>0.6</td> <td>0.8</td> </tr> </table>	VANE SHEAR (tsf)		
BLOW COUNT																															
20	40	60	80																												
POCKET PEN (tsf)																															
1	2	3	4																												
VANE SHEAR (tsf)																															
0.2	0.4	0.6	0.8																												
0.0			ORGANICS dark brown												39.0																
			POORLY-GRADED GRAVEL (GP) light gray, fine, subangular, flat gravel																												
2.5			POORLY-GRADED GRAVEL WITH SAND (GP) dark reddish brown mottled with orange												36.5																
			SANDY GRAVEL (GP) olive brown																												
5.0			SILTY SAND WITH GRAVEL (SM) gray, lacustrine deposit?												34.0																
			SILTY CLAY (ML/CL) light bluish gray, soft toothpaste consistency																												
7.5			Total Depth = 7' bgs												31.5																
10.0															29.0																
12.5															26.5																
15.0															24.0																
17.5															21.5																
20.0															19.0																



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SEARHC HAINES MEDICAL CAMPUS
Haines, Alaska

TEST PIT TP-13

FIGURE B-23
1 of 1

BOREHOLE LOG 242078.01 SEARHC HAINES CLINIC.GPJ PND ENGINEERS.GDT 12/15/25 ©2025

Depth (feet)	Water Table	Graphic Symbol	SOIL DESCRIPTION Soil Name, Color, Moisture Content, Relative Density, Soil Structure, Mineralogy, Other Information	SAMPLES					GRAPH				COMMENTS Casing Depth, Drilling Rate, Fluid Loss, Drill Pressure, Tests, Instrumentation, Additional Information	Elevation (feet)
				Number	Type	Location	Recovery % (RQD %)	Penetration Blows per 6/Inch (per foot) or (Rock Quality)	■ BLOW COUNT ■ 20 40 60 80	● POCKET PEN (tsf) ● 1 2 3 4	▲ VANE SHEAR (tsf) ▲ 0.2 0.4 0.6 0.8			
0.0			ORGANICS										Hitachi 135 Excavator	36.2
2.5			POORLY-GRADED GRAVEL WITH SAND (GP) dark reddish brown											33.7
5.0			SILTY CLAY (ML/CL) light bluish gray											31.2
5.0			Total Depth = 5' bgs											28.7
7.5														26.2
10.0														23.7
12.5														21.2
15.0														18.7
17.5														16.2
20.0														



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SEARHC HAINES MEDICAL CAMPUS
Haines, Alaska

TEST PIT TP-14

FIGURE B-24
1 of 1

Depth (feet)	Water Table	Graphic Symbol	SOIL DESCRIPTION Soil Name, Color, Moisture Content, Relative Density, Soil Structure, Mineralogy, Other Information	SAMPLES				GRAPH				COMMENTS Casing Depth, Drilling Rate, Fluid Loss, Drill Pressure, Tests, Instrumentation, Additional Information	Elevation (feet)
				Number	Type	Location	Recovery % (RQD %)	Penetration Blows per 6/Inch (per foot) or (Rock Quality)	■ BLOW COUNT ■ 20 40 60 80 ● POCKET PEN (tsf) ● 1 2 3 4 ▲ VANE SHEAR (tsf) ▲ 0.2 0.4 0.6 0.8				
0.0			ORGANICS dark brown										43.0
			POORLY-GRADED GRAVEL (GP) light gray										
2.5			SANDY GRAVEL (GP) dark reddish brown										40.5
			SILTY SAND (SM)										
5.0			SILTY CLAY (ML/CL) light bluish gray										38.0
			Total Depth = 6' bgs										
7.5													35.5
10.0													33.0
12.5													30.5
15.0													28.0
17.5													25.5
20.0													23.0

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SEARHC HAINES MEDICAL CAMPUS
Haines, Alaska

TEST PIT TP-15

FIGURE B-25
1 of 1

Depth (feet)	Water Table	Graphic Symbol	SOIL DESCRIPTION Soil Name, Color, Moisture Content, Relative Density, Soil Structure, Mineralogy, Other Information	SAMPLES				GRAPH				COMMENTS Casing Depth, Drilling Rate, Fluid Loss, Drill Pressure, Tests, Instrumentation, Additional Information	Elevation (feet)
				Number	Type	Location	Recovery % (RQD %)	Penetration Blows per 6/Inch (per foot) or (Rock Quality)	■ BLOW COUNT ■ 20 40 60 80 ● POCKET PEN (tsf) ● 1 2 3 4 ▲ VANE SHEAR (tsf) ▲ 0.2 0.4 0.6 0.8				
0.0			ORGANICS										45.0
			POORLY-GRADED GRAVEL (GP) light gray										
2.5			POORLY-GRADED GRAVEL WITH SAND (GP) brown										42.5
5.0			SILTY CLAY (ML/CL) light bluish gray Total Depth = 5' bgs										40.0
7.5													37.5
10.0													35.0
12.5													32.5
15.0													30.0
17.5													27.5
20.0													25.0

BOREHOLE LOG 242078.01 SEARHC HAINES CLINIC.GPJ PND ENGINEERS.GDT 12/15/25 ©2025



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 Project No.: 242078.01
 Date: Sep. 2024

SEARHC HAINES MEDICAL CAMPUS
Haines, Alaska

TEST PIT TP-16

FIGURE B-26
1 of 1

BOREHOLE LOG 242078.01 SEARHC HAINES CLINIC.GPJ PND ENGINEERS.GDT 12/15/25 ©2025

Depth (feet)	Water Table	Graphic Symbol	SOIL DESCRIPTION Soil Name, Color, Moisture Content, Relative Density, Soil Structure, Mineralogy, Other Information	SAMPLES					GRAPH				COMMENTS Casing Depth, Drilling Rate, Fluid Loss, Drill Pressure, Tests, Instrumentation, Additional Information	Elevation (feet)
				Number	Type	Location	Recovery % (RQD %)	Penetration Blows per 6/Inch (per foot) or (Rock Quality)	■ BLOW COUNT ■ 20 40 60 80	● POCKET PEN (tsf) ● 1 2 3 4	▲ VANE SHEAR (tsf) ▲ 0.2 0.4 0.6 0.8			
0.0			ORGANICS										Hitachi 135 Excavator	45.0
			POORLY-GRADED GRAVEL (GP)											
			SANDY GRAVEL (GP) orange											
2.5			POORLY-GRADED GRAVEL WITH SAND (GP) dark reddish brown, crusty; distinct FeO; ferricrete											42.5
5.0			SILTY CLAY (ML/CL) light bluish gray Total Depth = 5' bgs											40.0
7.5														37.5
10.0														35.0
12.5														32.5
15.0														30.0
17.5														27.5
20.0														25.0



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SEARHC HAINES MEDICAL CAMPUS
Haines, Alaska

TEST PIT TP-17

FIGURE B-27
1 of 1

Depth (feet)	Water Table	Graphic Symbol	SOIL DESCRIPTION Soil Name, Color, Moisture Content, Relative Density, Soil Structure, Mineralogy, Other Information	SAMPLES				GRAPH				COMMENTS Casing Depth, Drilling Rate, Fluid Loss, Drill Pressure, Tests, Instrumentation, Additional Information	Elevation (feet)
				Number	Type	Location	Recovery % (ROD %)	Penetration Blows per 6/Inch (per foot) or (Rock Quality)	■ BLOW COUNT ■ 20 40 60 80 ● POCKET PEN (tsf) ● 1 2 3 4 ▲ VANE SHEAR (tsf) ▲ 0.2 0.4 0.6 0.8				
0.0			ORGANICS dark brown										45.0
			POORLY-GRADED GRAVEL WITH SAND (GP) orange										
2.5			POORLY-GRADED SAND (SP) tan										42.5
			POORLY-GRADED GRAVEL WITH SAND (GP) dark reddish brown										40.0
5.0			SILTY CLAY (ML/CL) light bluish gray Total Depth = 7' bgs										37.5
7.5													35.0
10.0													32.5
12.5													30.0
15.0													27.5
17.5													25.0
20.0													

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SEARHC HAINES MEDICAL CAMPUS
Haines, Alaska

TEST PIT TP-18

FIGURE B-28
1 of 1

Depth (feet)	Water Table	Graphic Symbol	SOIL DESCRIPTION Soil Name, Color, Moisture Content, Relative Density, Soil Structure, Mineralogy, Other Information	SAMPLES				GRAPH				COMMENTS Casing Depth, Drilling Rate, Fluid Loss, Drill Pressure, Tests, Instrumentation, Additional Information	Elevation (feet)
				Number	Type	Location	Recovery % (RQD %)	Penetration Blows per 6/Inch (per foot) or (Rock Quality)	■ BLOW COUNT ■ 20 40 60 80 ● POCKET PEN (tsf) ● 1 2 3 4 ▲ VANE SHEAR (tsf) ▲ 0.2 0.4 0.6 0.8				
0.0			ORGANICS dark brown										45.8
			POORLY-GRADED GRAVEL (GP) light gray										
2.5			POORLY-GRADED GRAVEL WITH SAND (GP) dark reddish brown, wet										43.3
5.0			POORLY-GRADED GRAVEL WITH SAND (GP) light gray and tan, wet										40.8
7.5			SILTY CLAY (ML/CL) light bluish gray Total Depth = 8' bgs										38.3
10.0													35.8
12.5													33.3
15.0													30.8
17.5													28.3
20.0													25.8

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SEARHC HAINES MEDICAL CAMPUS
Haines, Alaska

TEST PIT TP-19

FIGURE B-29
1 of 1

BOREHOLE LOG 242078.01 SEARHC HAINES CLINIC.GPJ PND ENGINEERS.GDT 12/15/25 ©2025

Depth (feet)	Water Table	Graphic Symbol	SOIL DESCRIPTION Soil Name, Color, Moisture Content, Relative Density, Soil Structure, Mineralogy, Other Information	SAMPLES					GRAPH				COMMENTS Casing Depth, Drilling Rate, Fluid Loss, Drill Pressure, Tests, Instrumentation, Additional Information	Elevation (feet)
				Number	Type	Location	Recovery % (RQD %)	Penetration Blows per 6/Inch (per foot) or (Rock Quality)	■ BLOW COUNT ■ 20 40 60 80	● POCKET PEN (tsf) ● 1 2 3 4	▲ VANE SHEAR (tsf) ▲ 0.2 0.4 0.6 0.8			
0.0			ORGANICS										Hitachi 135 Excavator	46.8
2.5			POORLY-GRADED GRAVEL (GP) light gray, fine to medium, subangular, flat gravel											44.3
5.0			POORLY-GRADED GRAVEL WITH SAND (GP) dark reddish brown, wet, distinct FeO; ferricrete											41.8
7.5			POORLY-GRADED SAND WITH GRAVEL (SP) tan											39.3
10.0			SILTY CLAY (ML/CL) light bluish gray, large boulder at pit bottom Total Depth = 6' bgs											36.8
12.5														34.3
15.0														31.8
17.5														29.3
20.0														26.8



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SEARHC HAINES MEDICAL CAMPUS
Haines, Alaska

TEST PIT TP-20

FIGURE B-30
1 of 1

BOREHOLE LOG 242078.01 SEARHC HAINES CLINIC.GPJ PND ENGINEERS.GDT 12/15/25 ©2025

Depth (feet)	Water Table	Graphic Symbol	SOIL DESCRIPTION Soil Name, Color, Moisture Content, Relative Density, Soil Structure, Mineralogy, Other Information	SAMPLES				GRAPH				COMMENTS Casing Depth, Drilling Rate, Fluid Loss, Drill Pressure, Tests, Instrumentation, Additional Information	Elevation (feet)
				Number	Type	Location	Recovery % (RQD %)	Penetration Blows per 6/Inch (per foot) or (Rock Quality)	■ BLOW COUNT ■ 20 40 60 80	● POCKET PEN (tsf) ● 1 2 3 4	▲ VANE SHEAR (tsf) ▲ 0.2 0.4 0.6 0.8		
0.0			ORGANICS dark brown										47.5
			POORLY-GRADED GRAVEL (GP) gray and brown, fine gravel										
2.5			POORLY-GRADED GRAVEL WITH SAND (GP) dark reddish brown										45.0
			SILTY CLAY (ML/CL) light bluish gray, cobbles and boulder to 3' at pit bottom Total Depth = 3' bgs										
5.0													42.5
7.5													40.0
10.0													37.5
12.5													35.0
15.0													32.5
17.5													30.0
20.0													27.5



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SEARHC HAINES MEDICAL CAMPUS
Haines, Alaska

TEST PIT TP-21

FIGURE B-31
1 of 1

Depth (feet)	Water Table	Graphic Symbol	SOIL DESCRIPTION Soil Name, Color, Moisture Content, Relative Density, Soil Structure, Mineralogy, Other Information	SAMPLES					GRAPH				COMMENTS Casing Depth, Drilling Rate, Fluid Loss, Drill Pressure, Tests, Instrumentation, Additional Information	Elevation (feet)
				Number	Type	Location	Recovery % (RQD %)	Penetration Blows per 6/Inch (per foot) or (Rock Quality)	■ BLOW COUNT ■ 20 40 60 80	● POCKET PEN (tsf) ● 1 2 3 4	▲ VANE SHEAR (tsf) ▲ 0.2 0.4 0.6 0.8			
0.0			ORGANICS dark brown										Hitachi 135 Excavator	48.4
			POORLY-GRADED GRAVEL WITH SAND (GP) orange											
2.5			SILT (ML) gray, lacustrine deposit?											45.9
			POORLY-GRADED SAND WITH GRAVEL (SP) orange, at bottom pit, south end - light bluish gray clay with large broken marine shells exposed											
5.0			Total Depth = 5' bgs											43.4
7.5														40.9
10.0														38.4
12.5														35.9
15.0														33.4
17.5														30.9
20.0														28.4

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**SEARHC HAINES MEDICAL CAMPUS
Haines, Alaska**

TEST PIT TP-22

**FIGURE B-32
1 of 1**

Appendix B. Laboratory Test Results

Summary of Sample Characteristics

Client: Southeast Alaska Regional Health Consortium
 Project: SEARHC Haines Medical Campus
 Project #: 242078



Borehole	Sample #	From	To	Sample Method	Liquid Limit (%)	Plastic Limit (%)	Gradation (%)			Max Particle Size (in)	Laboratory Classification*	Salinity (ppt)	Moisture (%)	Particle Shape	Angularity	Other Tests**
							Gravel	Sand	Fines*							
BH-1	1	2	4	Sh			25.0	43.9	0.7	2	SPg	10		SR		
BH-1	2	5	7	Sh			25.8	44.9	0.5	2	SPg	7		SR-SA		
BH-1	3	7.5	9.5	Sh						1.5	SPg	8		SR		
BH-1	4	11	13	Sh						1.5	SMg	12		SR		
BH-1	5	15	17	Sh						1/2	(SP-SM)g	18		SR		
BH-1	6	20	22	Sh			7.3	87.7	5.0	1.5	SP-SM	18		SR-SA		
BH-1	7	25	27	Sh							SP-SM	18				
BH-1	9	35	37	Sh						1	SP-SM	17		SR		
BH-1	10	40	42	Sh			4.5	84.2	11.3	1/2	SP-SM	20		SR		
BH-1	11	45	47	Sh						3/8	SP-SM	21		SR		
BH-5	1	0	2	Sh			47.0	48.3	4.7	1	gSW	16		SR		
BH-5	2	2.5	4.5	Sh			42.2	54.6	3.2	1	gSW	14		SR		
BH-5	3	5	7	Sh						1.5	s(GP-GM)	10		SR-SA		
BH-5	5	10	12	Sh	30	21	0.3	30.4	69.2		sCL	31				
BH-5	6	15	17	Sh	23	18	6.6	39.1	54.2	3/8	s(CL-ML)	22		SR		
BH-5	7	20	22	Sh						1.5	s(CL-ML)	18		SR-SA		
BH-5	8A	25	25.5	Sh						3/4	(SP-SM)g	12		SR-SA		
BH-5	8B	25.5	27	Sh						1	(SP-SM)g	13		SR-SA		
BH-5	9	30	32	Sh						1.5	g(SP-SM)	14		SR-SA		
BH-5	10	35	37	Sh						1.5	s(GP-GM)	5		SR-SA		
BH-5	11	40	42	Sh						3/4	(SP-SM)g	11		SR		
BH-5	12	45	47	Sh						1/2	(SP-SM)g	15		SR		
BH-5	13	50	52	Sh						3/8	SP-SM	14		R		
BH-9	1A	2.5	3.5	Sh						1	gSW	12		SR		
BH-9	1B	3.5	4.5	Sh							CL-ML	17				
BH-9	2	5	7	Sh	21	17	5.6	39.2	55.3	1	s(CL-ML)	20		SR		
BH-9	5	15	17	Sh						1	s(CL-ML)	27		SR		
BH-9	6	22.5	24.5	Sh	19	15	4.4	51.4	44.1	1/2	SC-SM	20		SR		
BH-9	7	25	27	Sh						1.5	SC-SM	20		SR		

*Fines type and content estimated with ASTM D2488 when ASTM D422 or D4318 were not performed

**Other tests: DEN = Bulk Density, SPG = Specific Gravity, HYD = Hydrometer, CONSL = Consolidation, UCS = Unconfined Compression Strength, TRIAX = Triaxial

Summary of Sample Characteristics

Client: Southeast Alaska Regional Health Consortium
Project: SEARHC Haines Medical Campus
Project #: 242078



Borehole	Sample #	From	To	Sample Method	Liquid Limit (%)	Plastic Limit (%)	Gradation (%)			Max Particle Size (in)	Laboratory Classification*	Salinity (ppt)	Moisture (%)	Particle Shape	Angularity	Other Tests**
							Gravel	Sand	Fines*							
BH-9	9	35	37	Sh						1.5	g(SP-SM)	8		SR-SA		
BH-9	10	40	42	Sh						1	g(SP-SM)	10		SR-SA		
BH-9	11	45	47	Sh						3/4	g(SP-SM)	13		SR		
BH-9	12	50	52	Sh						1	s(GP-GM)	8		SR		

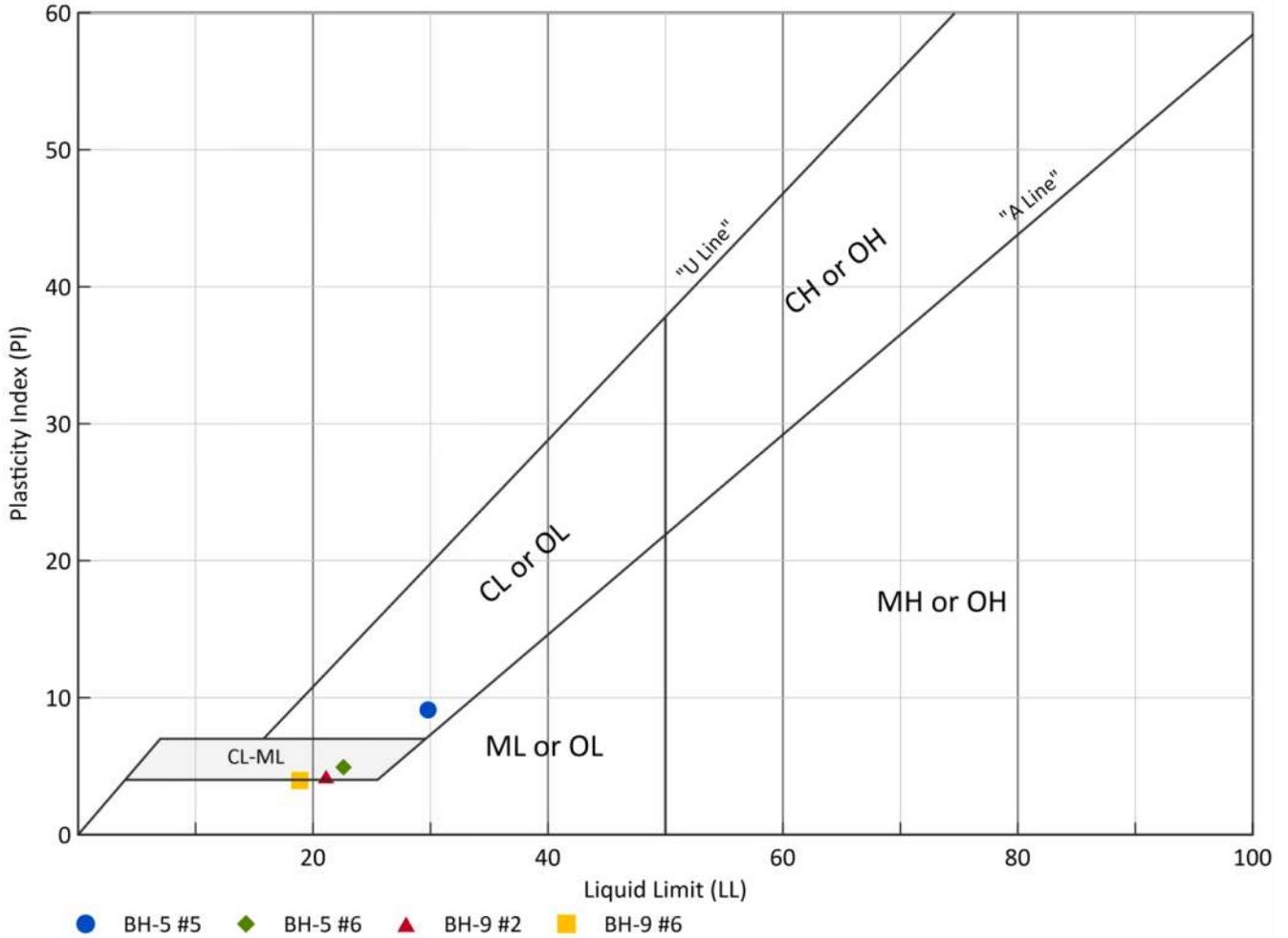
33 samples

*Fines type and content estimated with ASTM D2488 when ASTM D422 or D4318 were not performed

**Other tests: DEN = Bulk Density, SPG = Specific Gravity, HYD = Hydrometer, CONSL = Consolidation, UCS = Unconfined Compression Strength, TRIAX = Triaxial

Atterberg Test Results

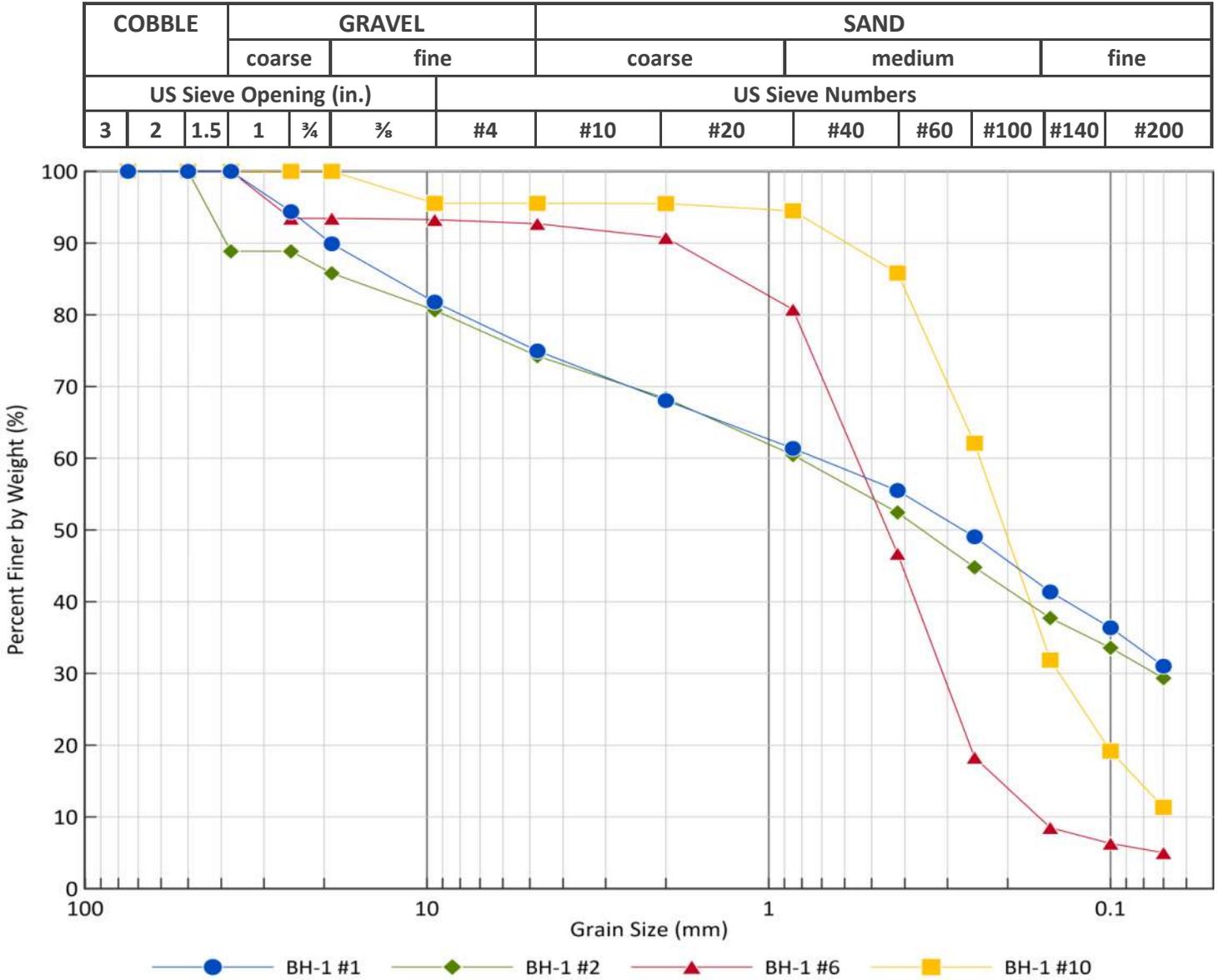
Client: Southeast Alaska Regional Health Consortium
Project: SEARHC Haines Medical Campus
Project #: 242078



Borehole	Sample #	From	To	Moisture %	LL	PL	PI	Fines Type
BH-5	5	10	12	30.86%	29.8	20.69	9.1	CL
BH-5	6	15	17	21.83%	22.6	17.66	4.9	CL-ML
BH-9	2	5	7	19.55%	21.1	16.84	4.3	CL-ML
BH-9	6	22.5	24.5	20.02%	18.9	14.92	4.0	ML

Grain Size Distribution

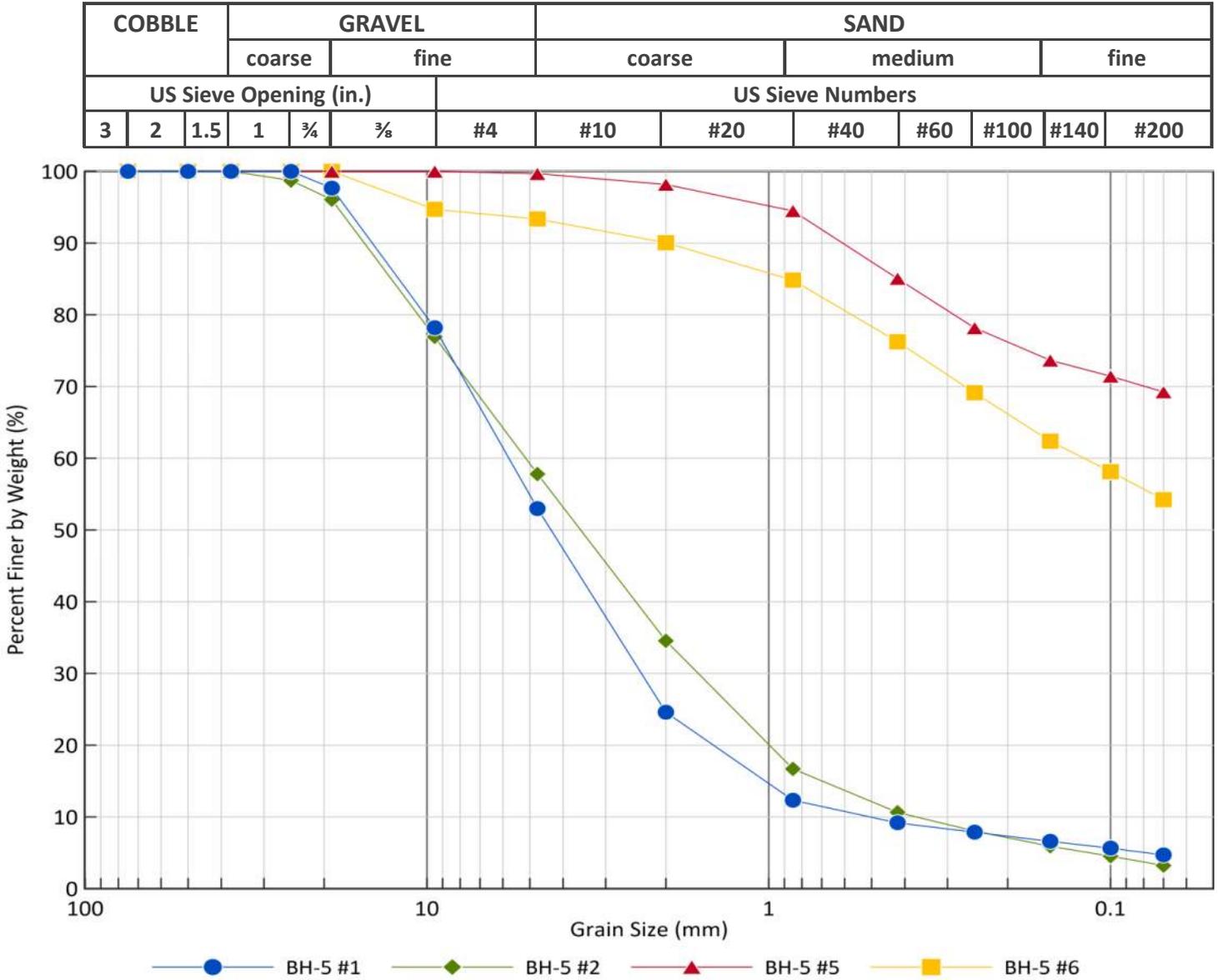
Client: Southeast Alaska Regional Health Consortium
 Project: SEARHC Haines Medical Campus
 Project #: 242078



*Fines type estimated with ASTM D2488 when ASTM D422 or D4318 were not performed

Grain Size Distribution

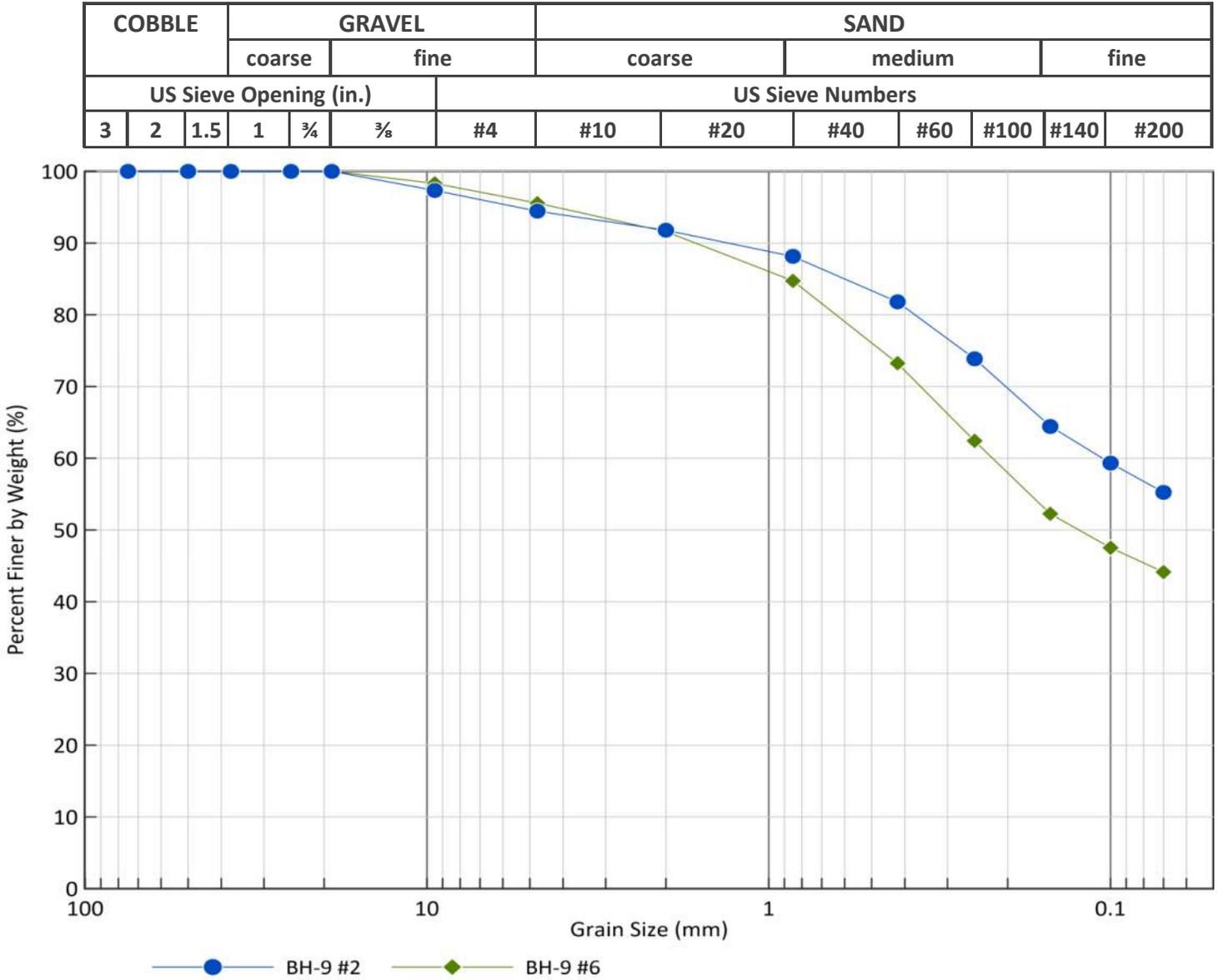
Client: Southeast Alaska Regional Health Consortium
 Project: SEARHC Haines Medical Campus
 Project #: 242078



*Fines type estimated with ASTM D2488 when ASTM D422 or D4318 were not performed

Grain Size Distribution

Client: Southeast Alaska Regional Health Consortium
 Project: SEARHC Haines Medical Campus
 Project #: 242078



*Fines type estimated with ASTM D2488 when ASTM D422 or D4318 were not performed

Appendix C. Slope Stability Results

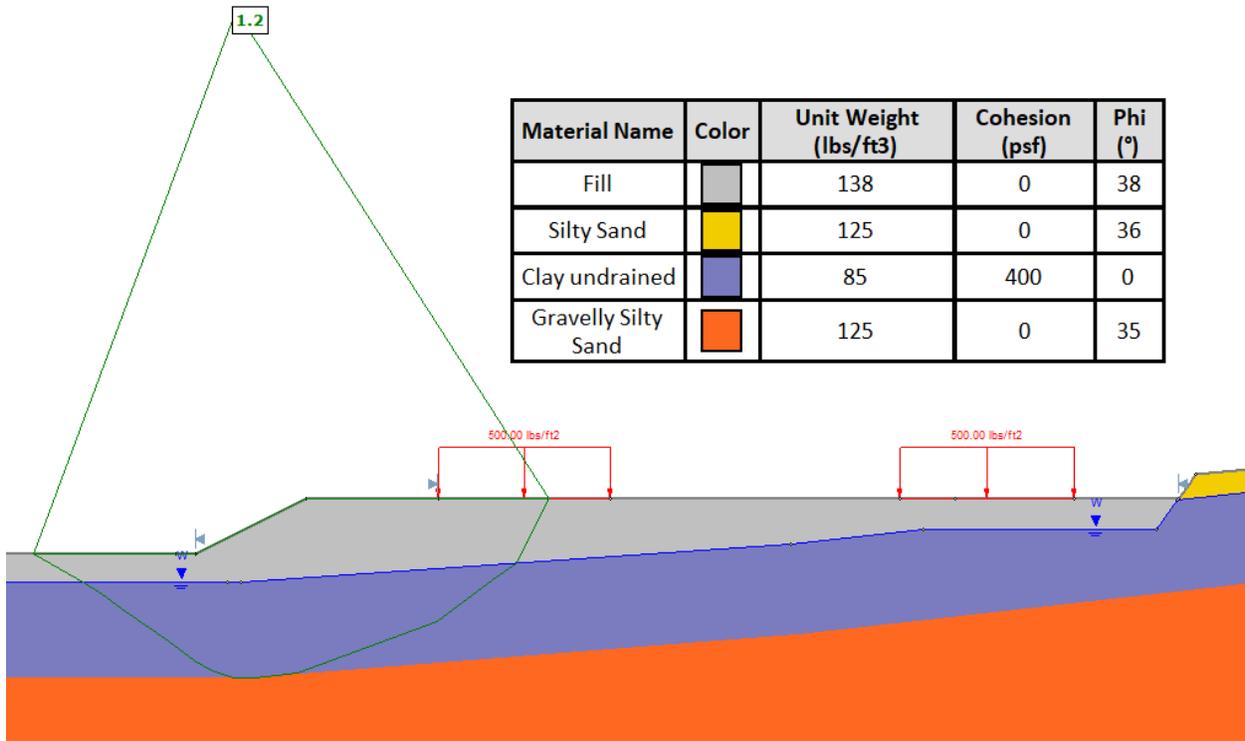


Figure C-1. Slope stability results using Rocscience’s Slide2 for the undrained static condition at the housing site

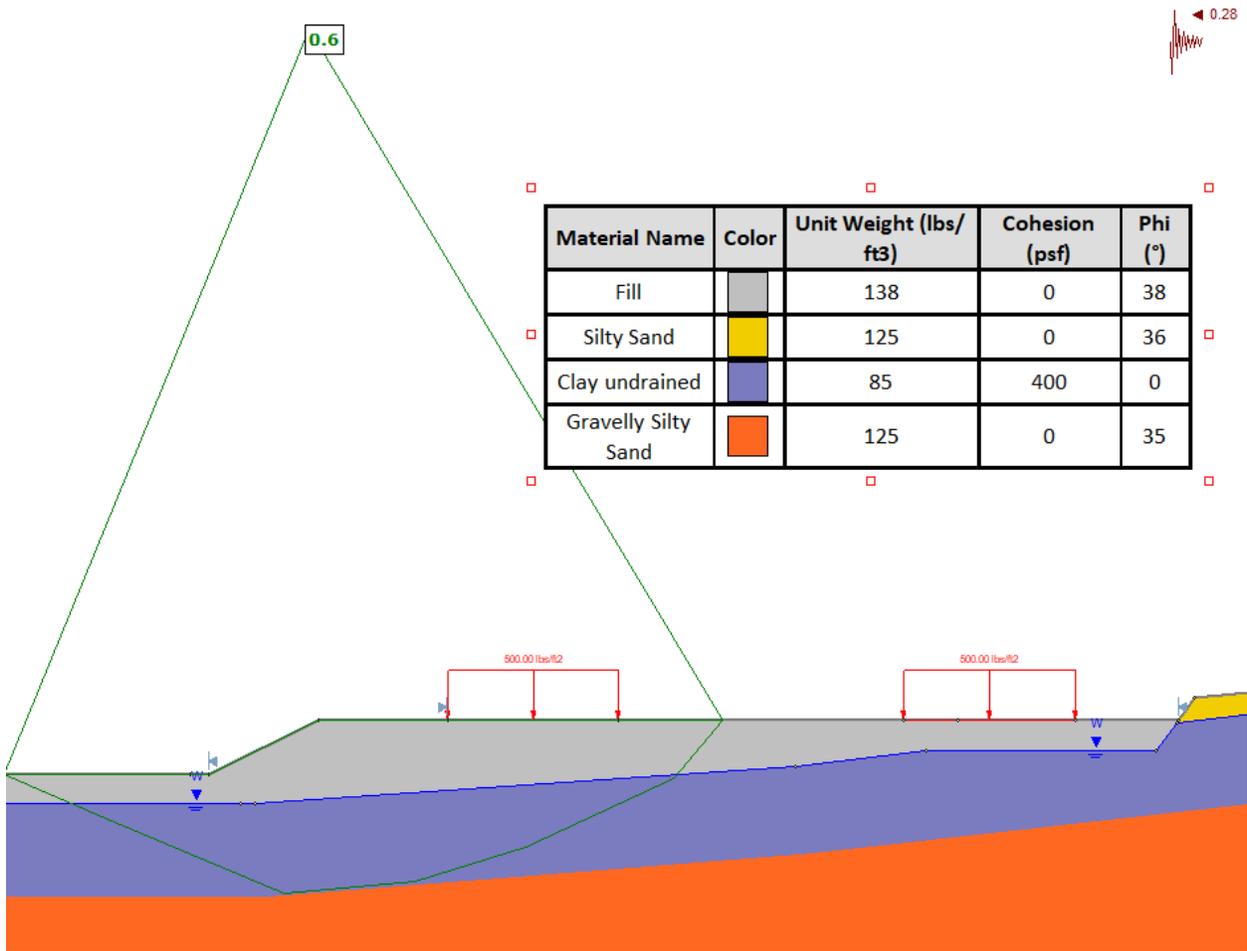


Figure C-2. Slope stability results using Rocscience’s Slide2 for the ***undrained*** seismic condition at the housing site

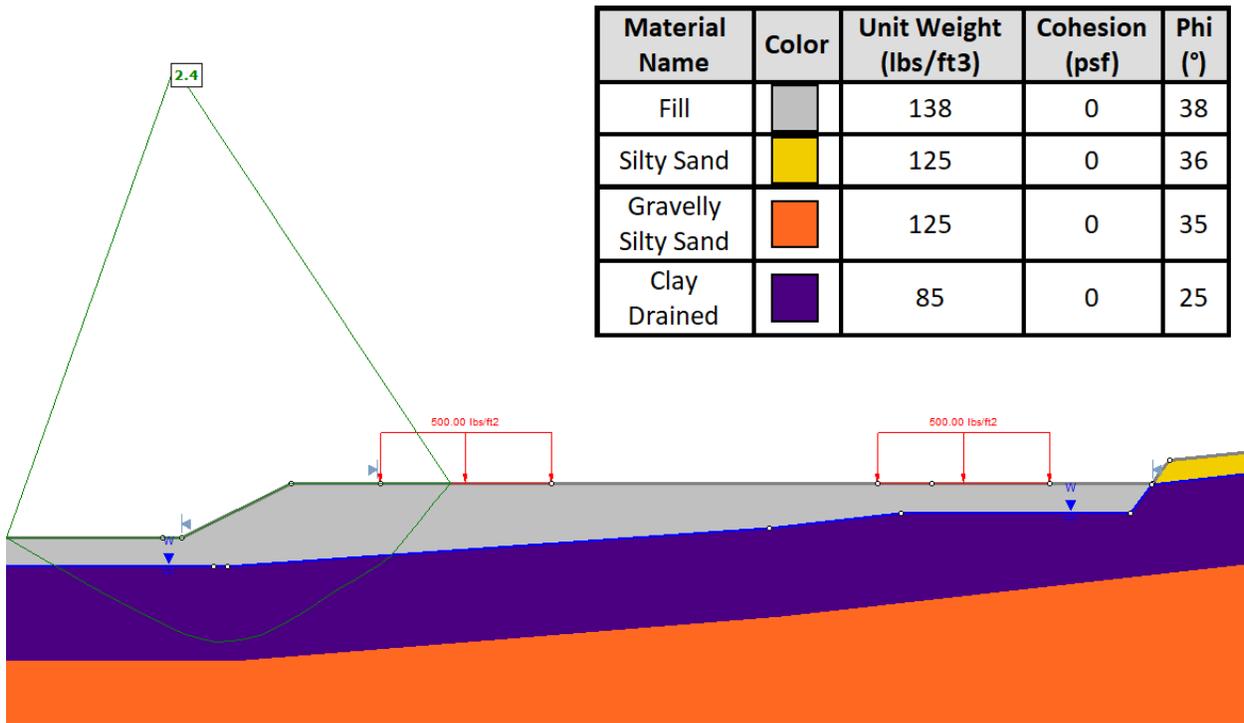


Figure C-3. Slope stability results using Rocscience’s Slide2 for the ***drained*** static condition at the housing site

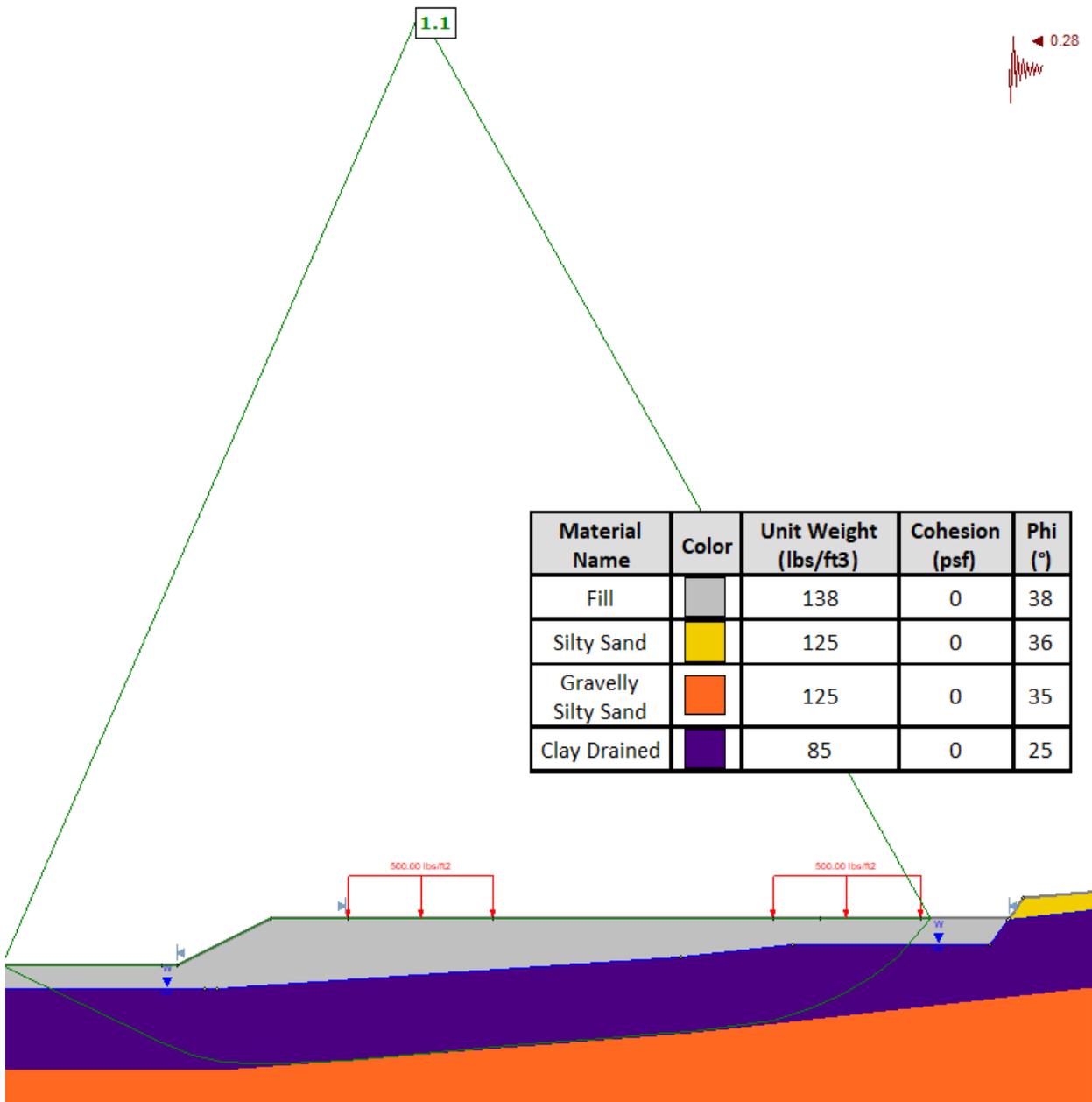
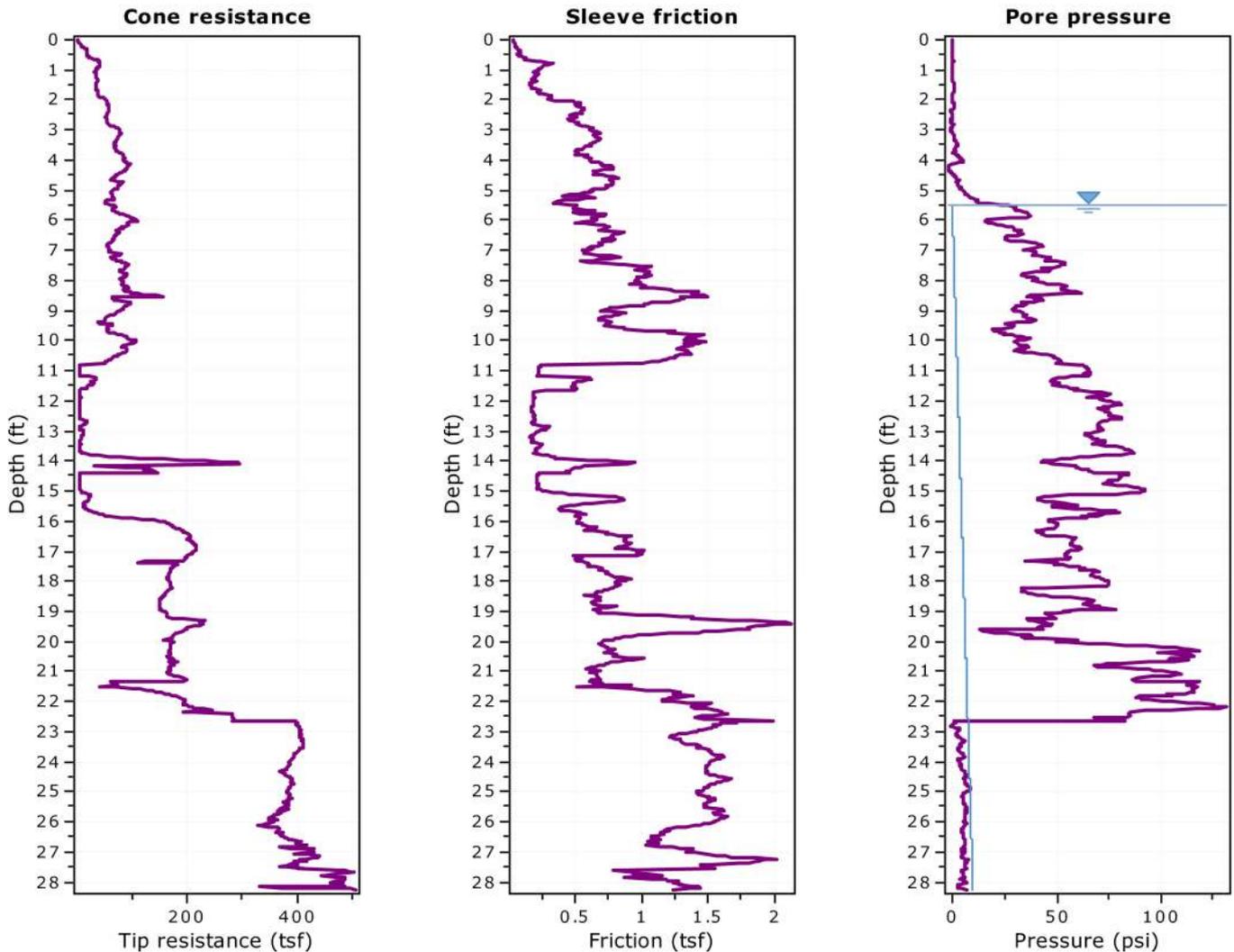
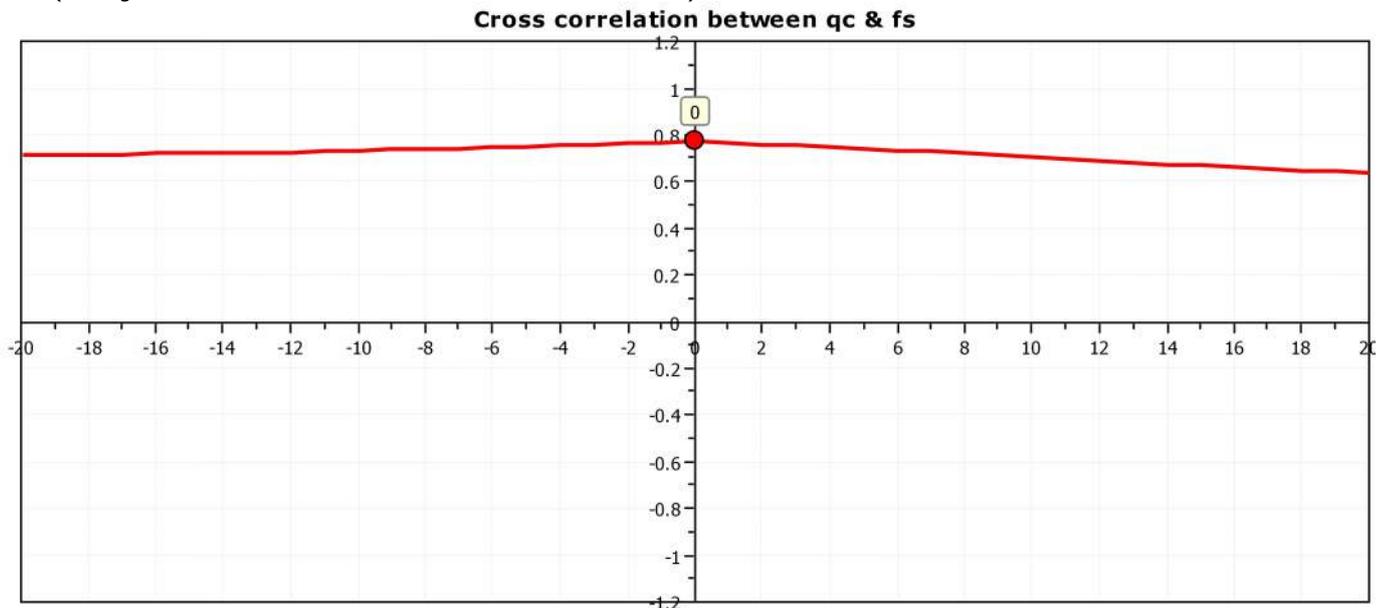


Figure C-4. Slope stability results using Rocscience’s Slide2 for the drained seismic condition at the housing site

Appendix D. CPT Output Results



The plot below presents the cross correlation coefficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two successive CPT measurements).





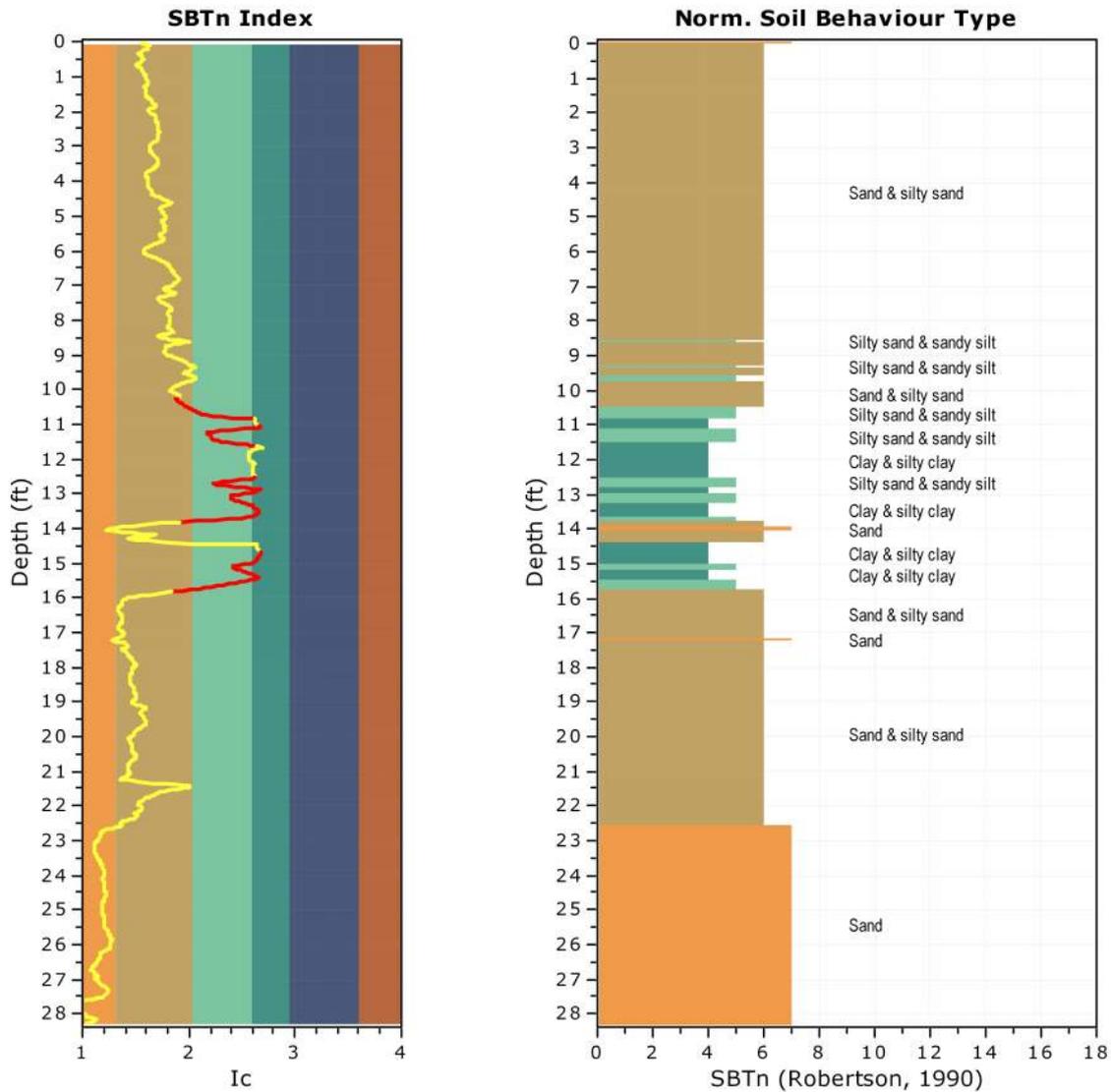
TRANSITION LAYER DETECTION ALGORITHM REPORT

Summary Details & Plots

Short description

The software will delete data when the cone is in transition from either clay to sand or vice-versa. To do this the software requires a range of I_c values over which the transition will be defined (typically somewhere between $1.80 < I_c < 3.0$) and a rate of change of I_c . Transitions typically occur when the rate of change of I_c is fast (i.e. ΔI_c is small).

The SBT_n plot below, displays in red the detected transition layers based on the parameters listed below the graphs.



Transition layer algorithm properties

I_c minimum check value: 1.70
 I_c maximum check value: 3.00
 I_c change ratio value: 0.0010
 Minimum number of points in layer: 4

General statistics

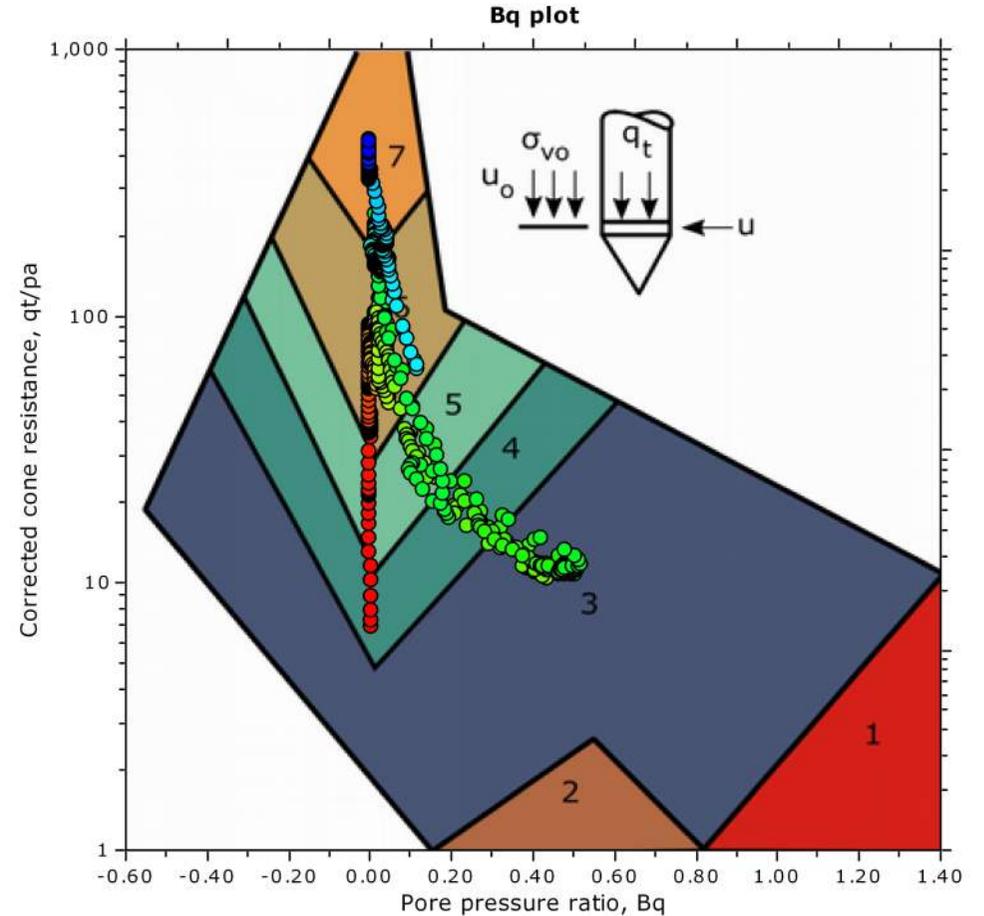
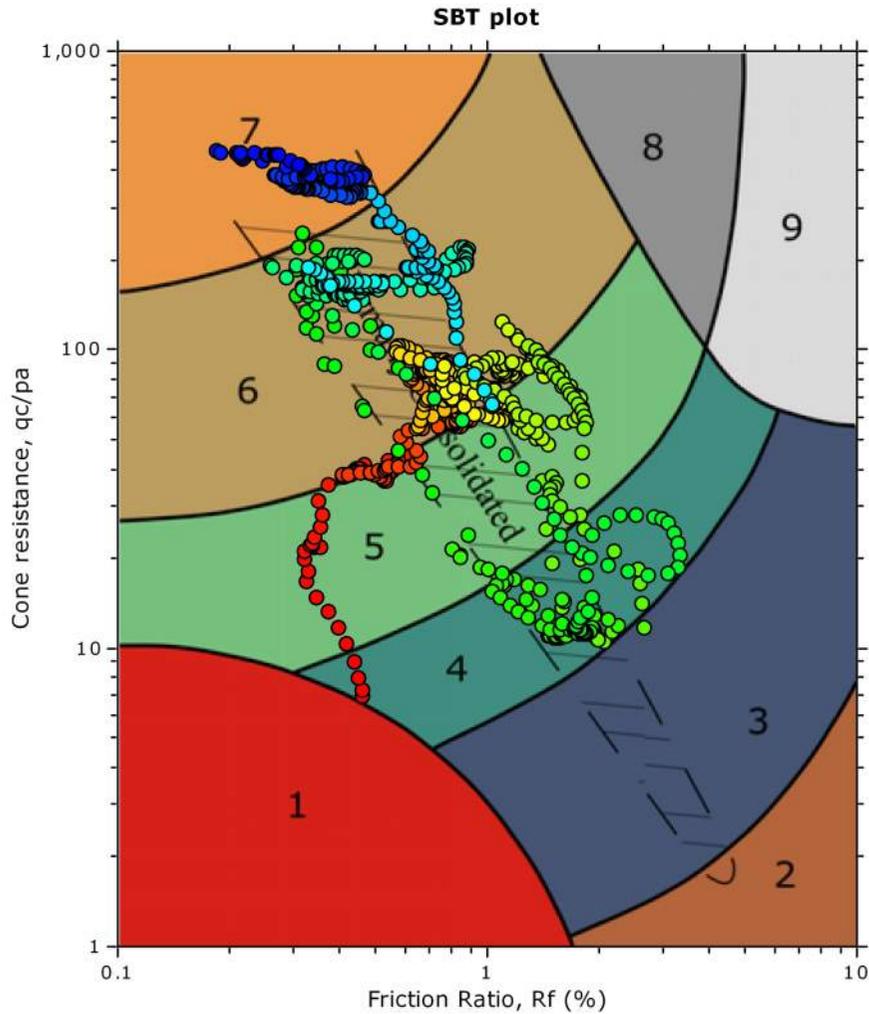
Total points in CPT file: 943
 Total points excluded: 132
 Exclusion percentage: 14.00%
 Number of layers detected: 11

Transition layer No	Number of points	Depth	SBT _n number	SBT _n description
Transition layer 1	21	Start depth: 10.29 (ft)	6	Sand & silty sand
		End depth: 10.89 (ft)	4	Clay & silty clay
Transition layer 2	7	Start depth: 11.07 (ft)	4	Clay & silty clay
		End depth: 11.25 (ft)	5	Silty sand & sandy silt
Transition layer 3	15	Start depth: 11.25 (ft)	5	Silty sand & sandy silt
		End depth: 11.67 (ft)	4	Clay & silty clay
Transition layer 4	7	Start depth: 12.54 (ft)	4	Clay & silty clay
		End depth: 12.72 (ft)	5	Silty sand & sandy silt
Transition layer 5	7	Start depth: 12.72 (ft)	5	Silty sand & sandy silt
		End depth: 12.90 (ft)	4	Clay & silty clay
Transition layer 6	7	Start depth: 12.90 (ft)	4	Clay & silty clay
		End depth: 13.08 (ft)	5	Silty sand & sandy silt
Transition layer 7	16	Start depth: 13.08 (ft)	5	Silty sand & sandy silt
		End depth: 13.53 (ft)	4	Clay & silty clay
Transition layer 8	12	Start depth: 13.53 (ft)	4	Clay & silty clay
		End depth: 13.86 (ft)	6	Sand & silty sand
Transition layer 9	14	Start depth: 14.73 (ft)	4	Clay & silty clay
		End depth: 15.12 (ft)	5	Silty sand & sandy silt
Transition layer 10	10	Start depth: 15.12 (ft)	5	Silty sand & sandy silt
		End depth: 15.39 (ft)	4	Clay & silty clay
Transition layer 11	16	Start depth: 15.42 (ft)	4	Clay & silty clay
		End depth: 15.87 (ft)	6	Sand & silty sand

Start depth: Depth where the transition layer begins

End depth: Depth where the transition layer ends

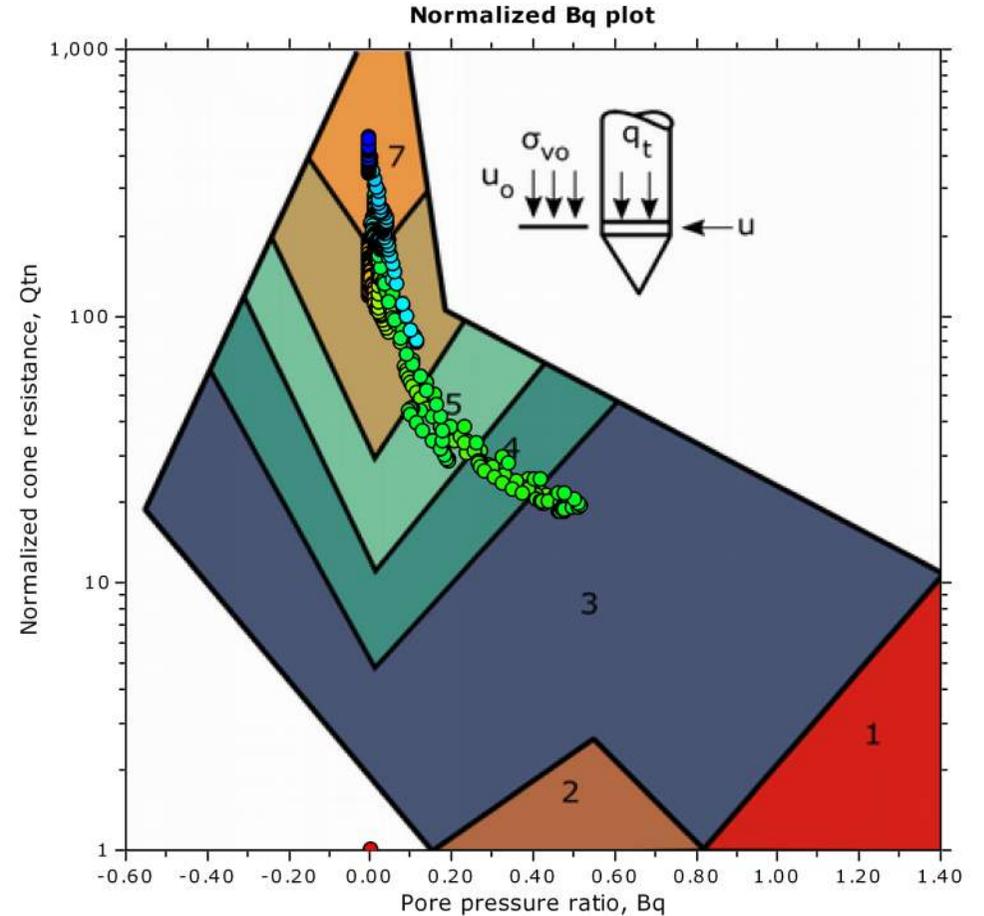
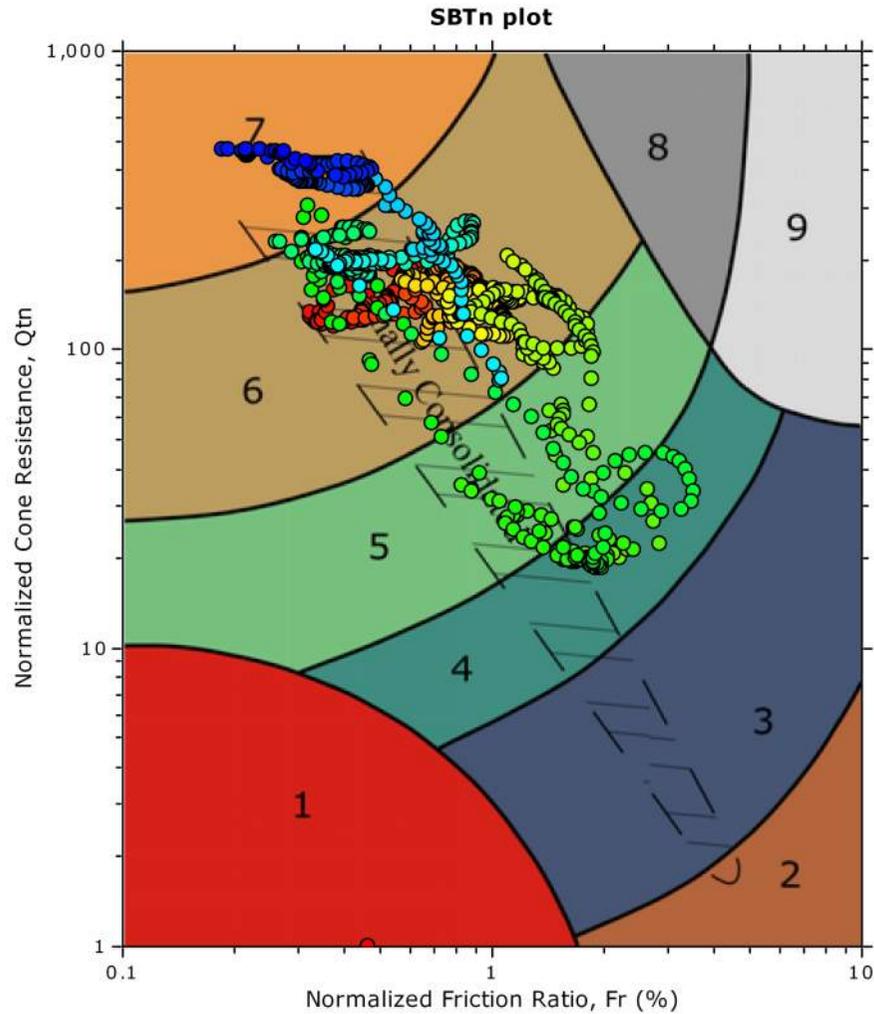
SBT - Bq plots



SBT legend

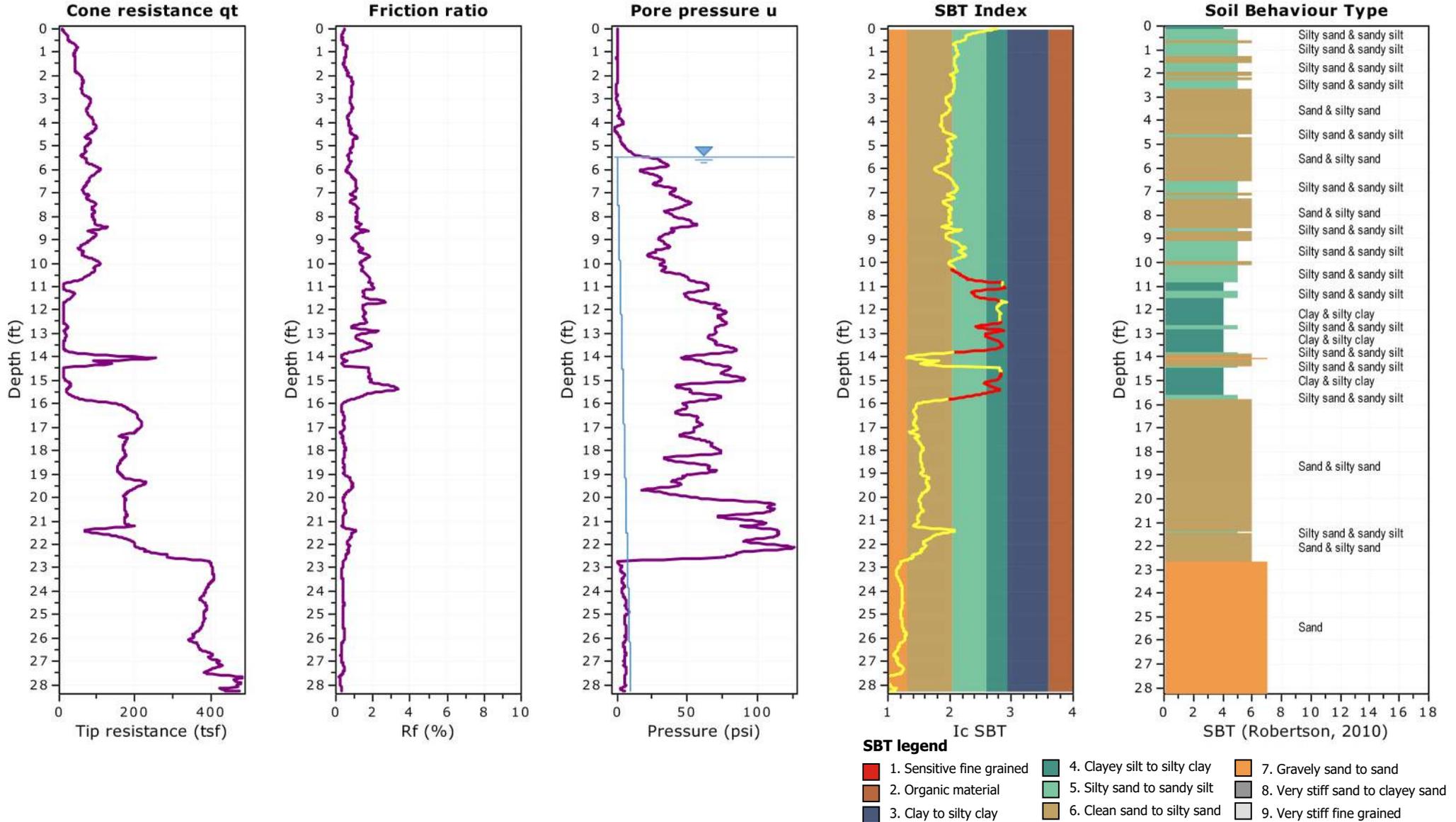
- | | | |
|--|---|---|
| ■ 1. Sensitive fine grained | ■ 4. Clayey silt to silty clay | ■ 7. Gravelly sand to sand |
| ■ 2. Organic material | ■ 5. Silty sand to sandy silt | ■ 8. Very stiff sand to clayey sand |
| ■ 3. Clay to silty clay | ■ 6. Clean sand to silty sand | ■ 9. Very stiff fine grained |

SBT - Bq plots (normalized)



SBTn legend

- | | | |
|--|---|---|
| ■ 1. Sensitive fine grained | ■ 4. Clayey silt to silty clay | ■ 7. Gravelly sand to sand |
| ■ 2. Organic material | ■ 5. Silty sand to sandy silt | ■ 8. Very stiff sand to clayey sand |
| ■ 3. Clay to silty clay | ■ 6. Clean sand to silty sand | ■ 9. Very stiff fine grained |

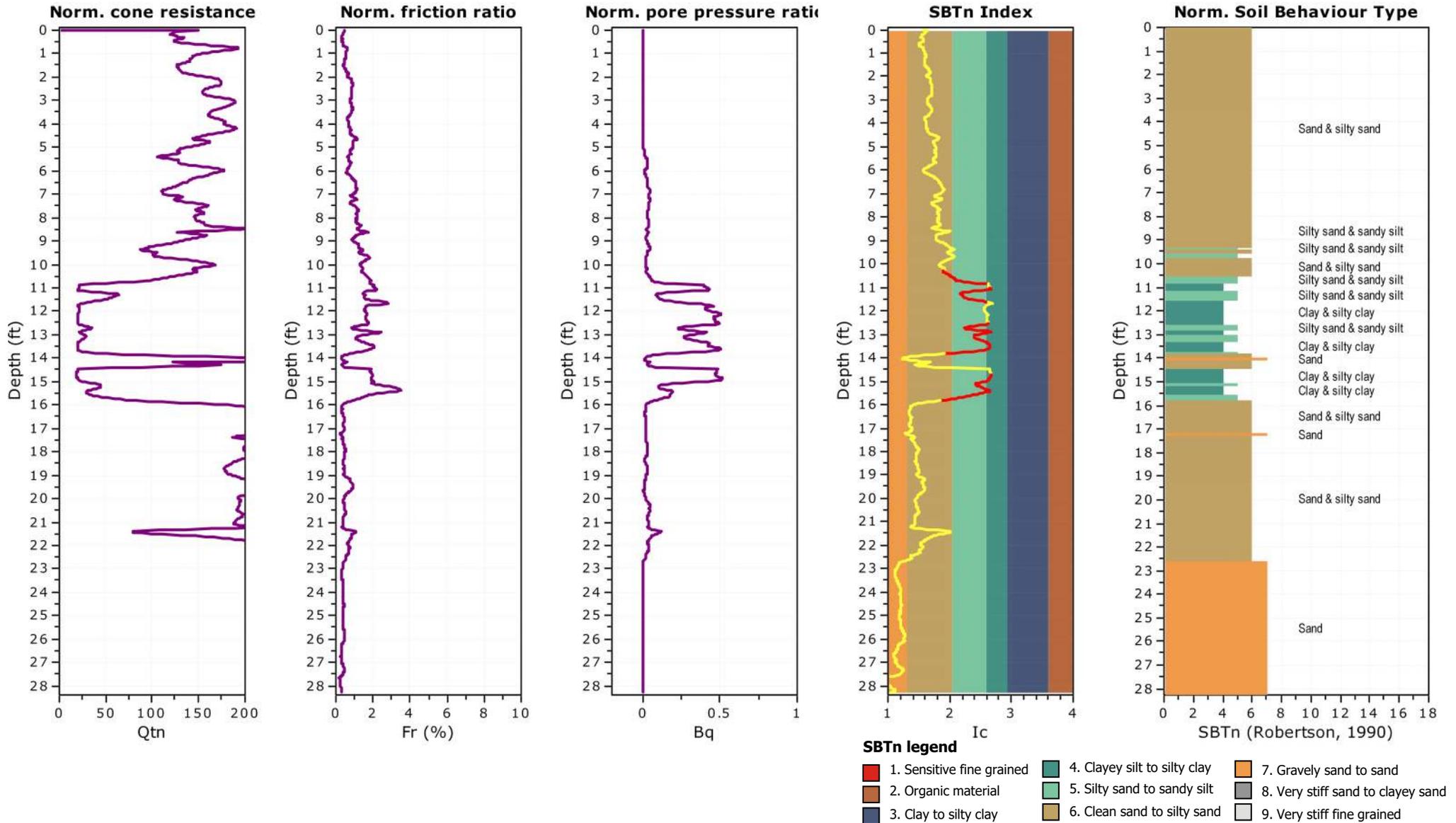




PND Engineers, Inc
 1506 W. 36th Ave.
 Anchorage, AK 99503

Project: SEARHC Haines Clinic Site Investigation
Location: Haines, Alaska

CPT: Average CPT - Clinic
 Total depth: 28.26 ft, Date: 9/25/2025
 Est. GWL: 5.50 ft
 Cone Operator: Discovery Drilling, LLC

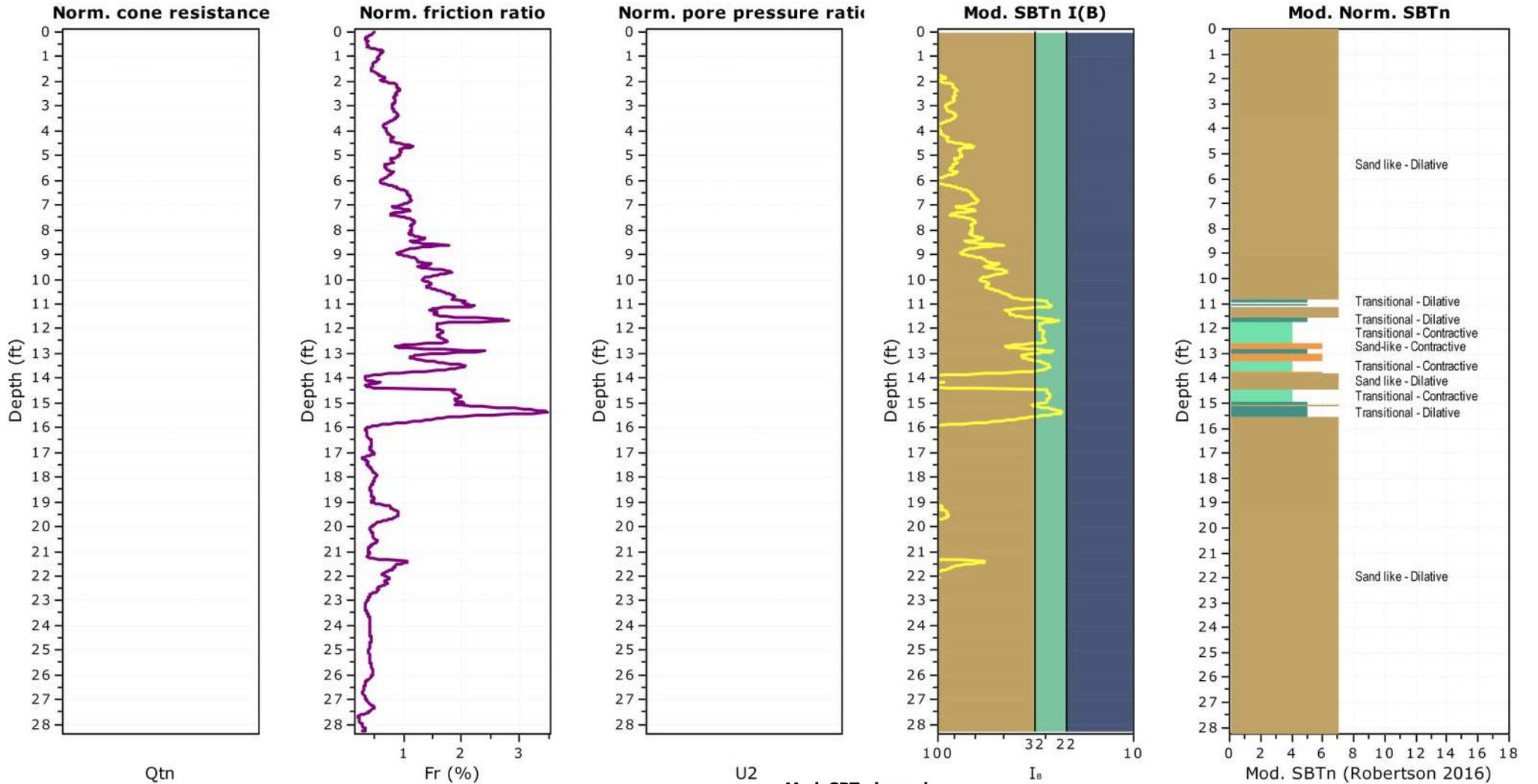




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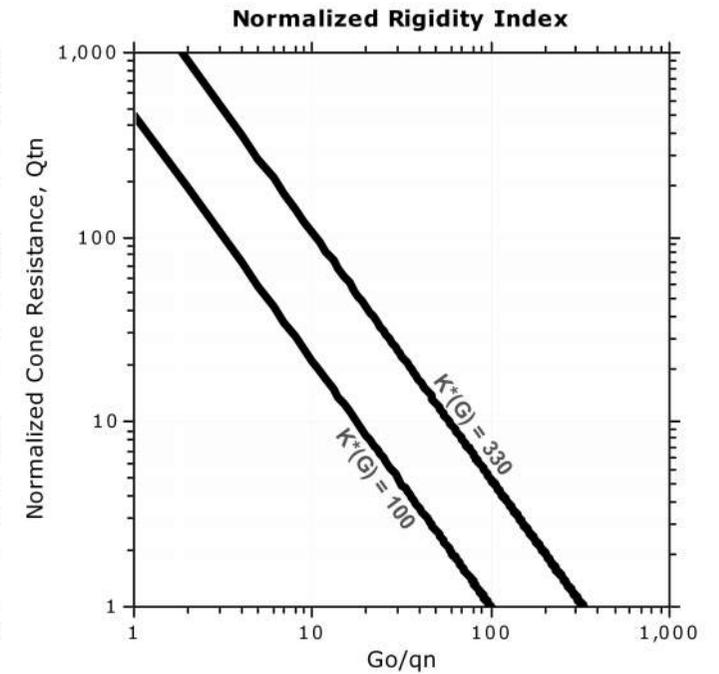
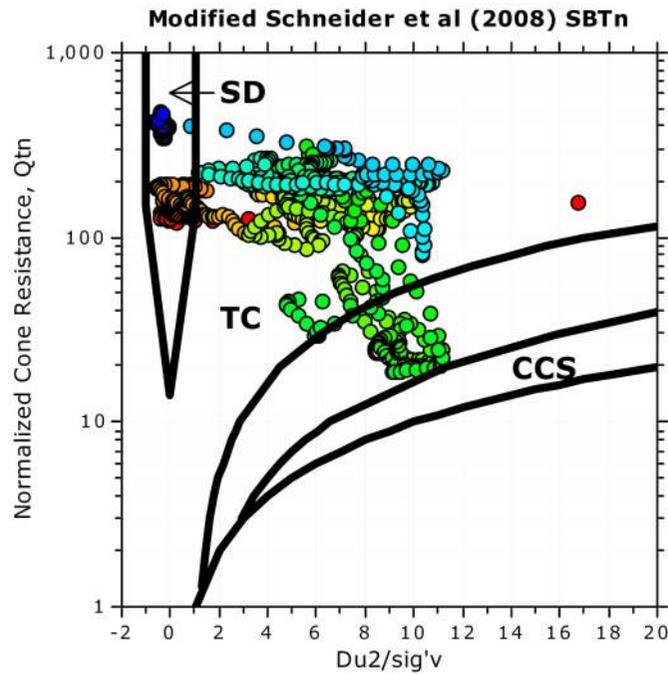
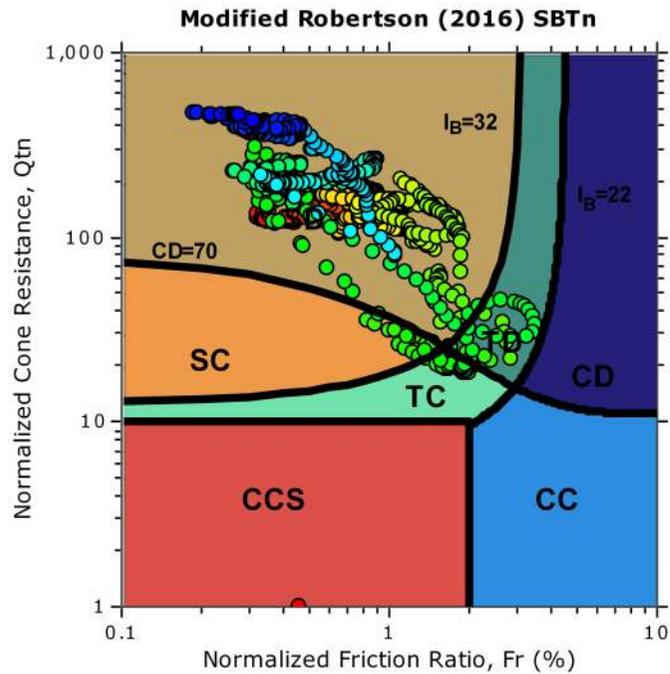
Project: SEARHC Haines Clinic Site Investigation
Location: Haines, Alaska

CPT: Average CPT - Clinic
 Total depth: 28.26 ft, Date: 9/25/2025
 Est. GWL: 5.50 ft
 Cone Operator: Discovery Drilling, LLC



- Mod. SBTn legend**
- 1. CCS: ClayLike - Contractive, Sensitive
 - 4. TC: Transitional - Contractive
 - 2. CC: Clay-like - Contractive
 - 5. TD: Transitional - Dilative
 - 3. CD: Clay-Like: Dilative
 - 6. SC: Sand-like - Contractive
 - 7. SD: Sand-like - Dilative

Updated SBTn plots



- CCS: Clay-like - Contractive - Sensitive
- CC: Clay-like - Contractive
- CD: Clay-like - Dilative
- TC: Transitional - Contractive
- TD: Transitional - Dilative
- SC: Sand-like - Contractive
- SD: Sand-like - Dilative

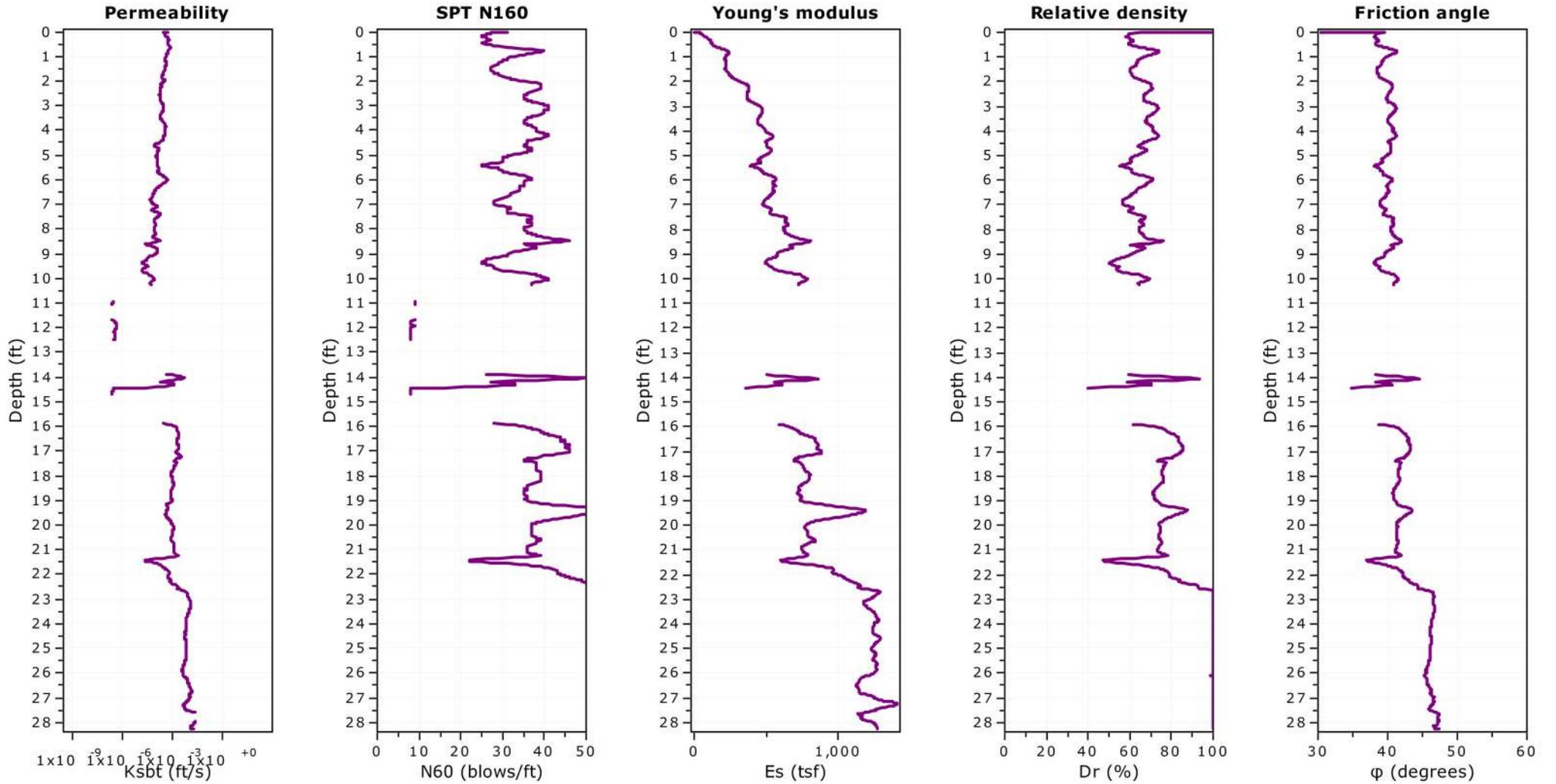
$K^*(G) > 330$: Soils with significant microstructure (e.g. age/cementation)



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 Est. GWL: 5.50 ft
 Cone Operator: Discovery Drilling, LLC



Calculation parameters

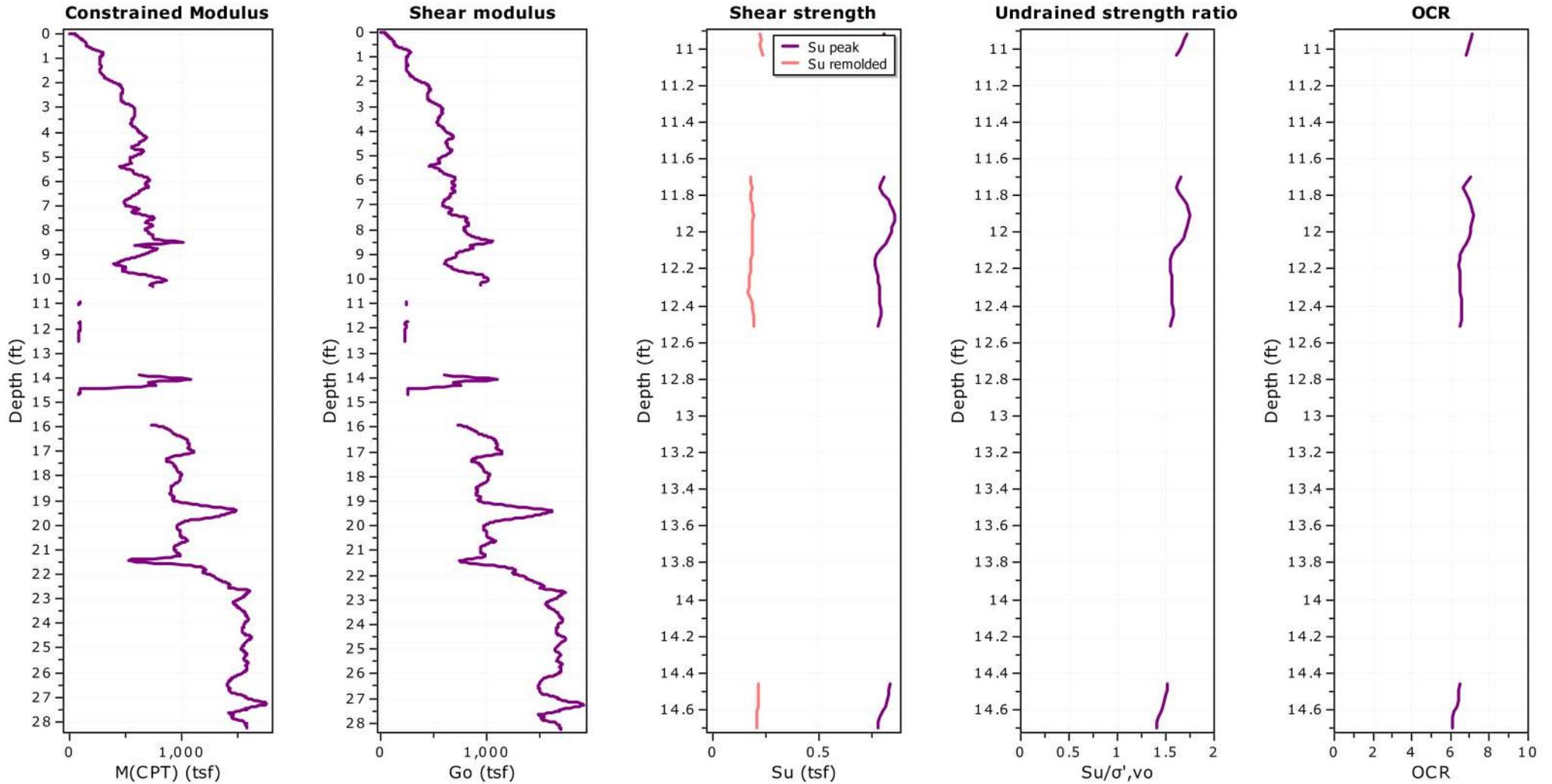
Permeability: Based on SBT_n

SPT N₆₀: Based on I_c and q_t

Young's modulus: Based on variable alpha using I_c (Robertson, 2009)

Relative density constant, C_{Dr}: 350.0

Phi: Based on Kulhawy & Mayne (1990)



Calculation parameters

Constrained modulus: Based on variable α using I_c and Q_{tn} (Robertson, 2009)

Go: Based on variable α using I_c (Robertson, 2009)

Undrained shear strength cone factor for clays, N_{kt} : 14

OCR factor for clays, N_{kr} : 0.33

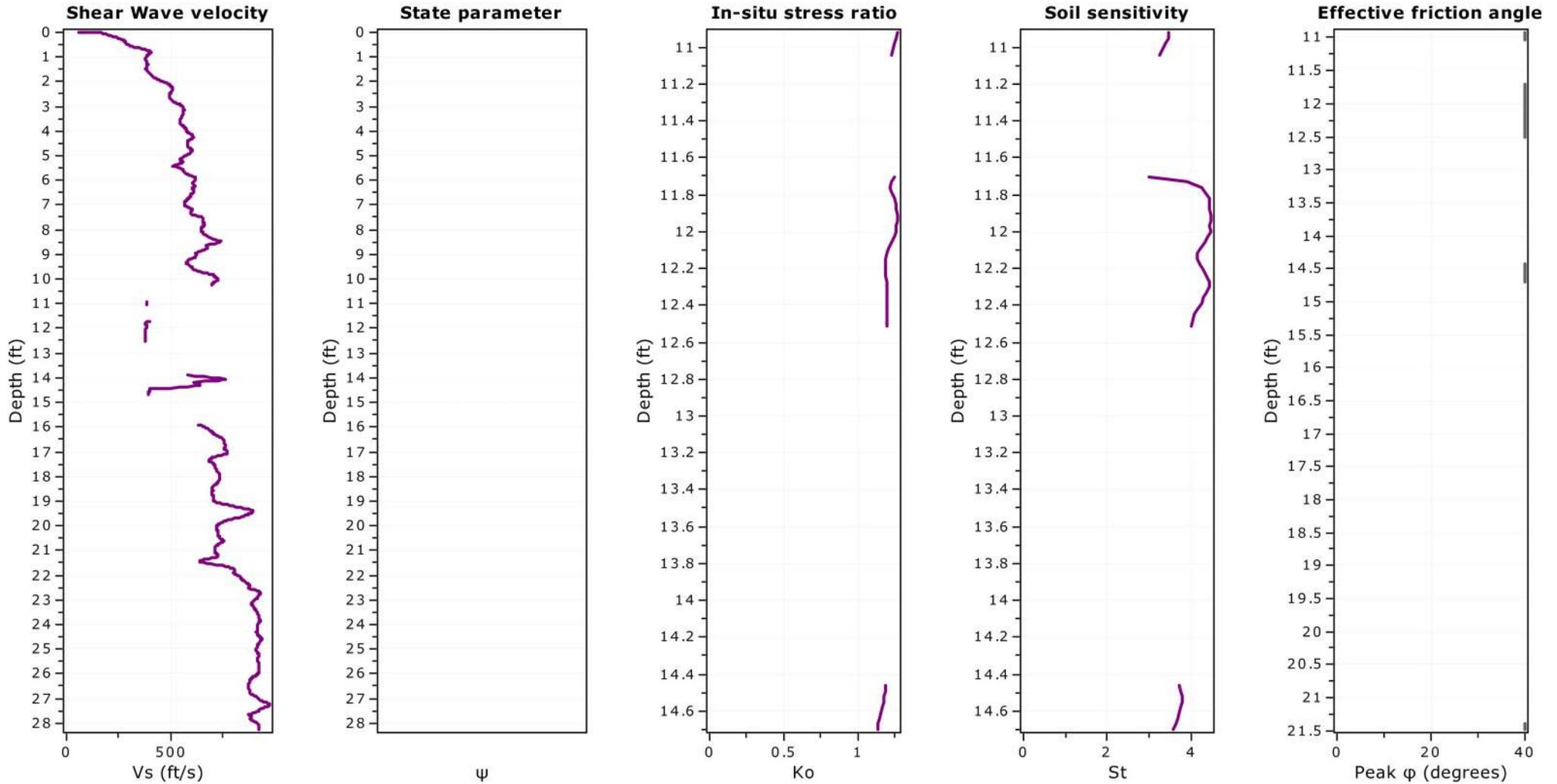
● Flat Dilatometer Test data



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Total depth: 28.26 ft, Date: 9/25/2025
Est. GWL: 5.50 ft
Cone Operator: Discovery Drilling, LLC



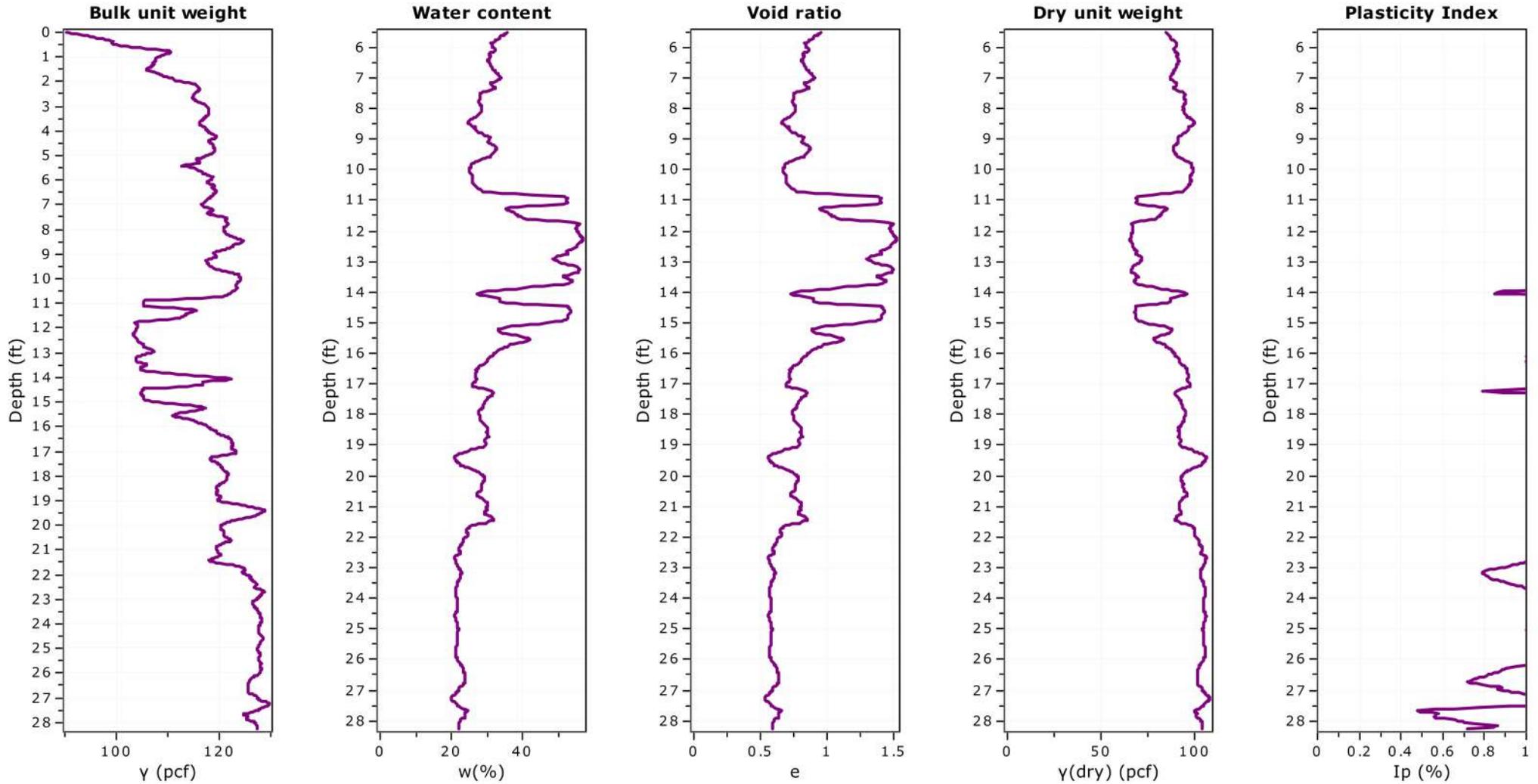
Calculation parameters
Soil Sensitivity factor, N_s : 7.00



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Total depth: 28.26 ft, Date: 9/25/2025
Est. GWL: 5.50 ft
Cone Operator: Discovery Drilling, LLC

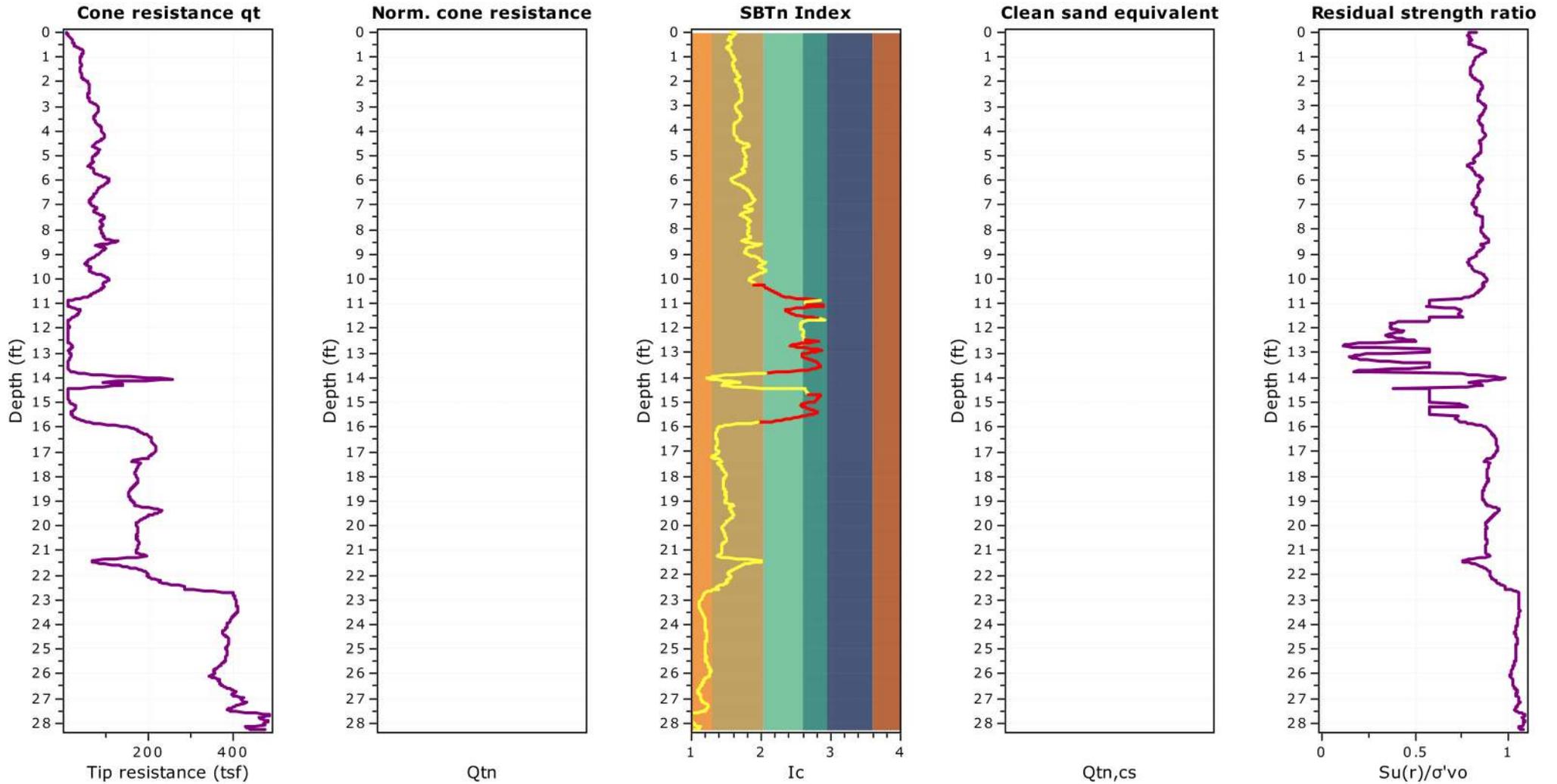




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Location: Haines, Alaska

CPT: Average CPT - Clinic
Total depth: 28.26 ft, Date: 9/25/2025
Est. GWL: 5.50 ft
Cone Operator: Discovery Drilling, LLC



Presented below is a list of formulas used for the estimation of various soil properties. The formulas are presented in SI unit system and assume that all components are expressed in the same units.

:: Unit Weight, g (kN/m³) ::

$$g = g_w \cdot \left(0.27 \cdot \log(R_f) + 0.36 \cdot \log\left(\frac{q_t}{p_a}\right) + 1.236 \right)$$

where g_w = water unit weight

:: Permeability, k (m/s) ::

$$I_c < 3.27 \text{ and } I_c > 1.00 \text{ then } k = 10^{0.952-3.04 \cdot I_c}$$

$$I_c \leq 4.00 \text{ and } I_c > 3.27 \text{ then } k = 10^{-4.52-1.37 \cdot I_c}$$

:: N_{SPT} (blows per 30 cm) ::

$$N_{60} = \left(\frac{q_c}{p_a} \right) \cdot \frac{1}{10^{1.1268-0.2817 \cdot I_c}}$$

$$N_{1(60)} = Q_{tn} \cdot \frac{1}{10^{1.1268-0.2817 \cdot I_c}}$$

:: Young's Modulus, E_s (MPa) ::

$$(q_t - \sigma_v) \cdot 0.015 \cdot 10^{0.55 \cdot I_c + 1.68}$$

(applicable only to $I_c < I_{c_cutoff}$)

:: Relative Density, Dr (%) ::

$$100 \cdot \sqrt{\frac{Q_{tn}}{k_{DR}}} \quad \text{(applicable only to SBT}_n\text{: 5, 6, 7 and 8 or } I_c < I_{c_cutoff}\text{)}$$

:: State Parameter, ψ ::

$$\psi = 0.56 - 0.33 \cdot \log(Q_{tn,cs})$$

:: Drained Friction Angle, ϕ (°) ::

$$\phi = 29.5^\circ \cdot B_q^{0.121} \cdot (0.256 + 0.336 \cdot B_q + \log Q_t)$$

(applicable only to SBT_n: 5, 6, 7 and 8 or $I_c < I_{c_cutoff}$)

:: 1-D constrained modulus, M (MPa) ::

If $I_c > 2.20$
 $\alpha = 14$ for $Q_{tn} > 14$
 $\alpha = Q_{tn}$ for $Q_{tn} \leq 14$
 $M_{CPT} = \alpha \cdot (q_t - \sigma_v)$

If $I_c \geq 2.20$

:: Small strain shear Modulus, G_0 (MPa) ::

$$G_0 = (q_t - \sigma_v) \cdot 0.0188 \cdot 10^{0.55 \cdot I_c + 1.68}$$

:: Shear Wave Velocity, V_s (m/s) ::

$$V_s = \left(\frac{G_0}{\rho} \right)^{0.50}$$

:: Undrained peak shear strength, S_u (kPa) ::

$$N_{kt} = 10.50 + 7 \cdot \log(F_r) \text{ or user defined}$$

$$S_u = \frac{(q_t - \sigma_v)}{N_{kt}}$$

(applicable only to SBT_n: 1, 2, 3, 4 and 9 or $I_c > I_{c_cutoff}$)

:: Remolded undrained shear strength, $S_u(\text{rem})$ (kPa) ::

$$S_{u(\text{rem})} = f_s \quad \text{(applicable only to SBT}_n\text{: 1, 2, 3, 4 and 9 or } I_c > I_{c_cutoff}\text{)}$$

:: Overconsolidation Ratio, OCR ::

$$k_{OCR} = \left[\frac{Q_{tn}^{0.20}}{0.25 \cdot (10.50 + 7 \cdot \log(F_r))} \right]^{1.25} \text{ or user defined}$$

$$OCR = k_{OCR} \cdot Q_{tn}$$

(applicable only to SBT_n: 1, 2, 3, 4 and 9 or $I_c > I_{c_cutoff}$)

:: In situ Stress Ratio, K_0 ::

$$K_0 = (1 - \sin \phi') \cdot OCR^{\sin \phi'}$$

(applicable only to SBT_n: 1, 2, 3, 4 and 9 or $I_c > I_{c_cutoff}$)

:: Soil Sensitivity, S_t ::

$$S_t = \frac{N_s}{F_r}$$

(applicable only to SBT_n: 1, 2, 3, 4 and 9 or $I_c > I_{c_cutoff}$)

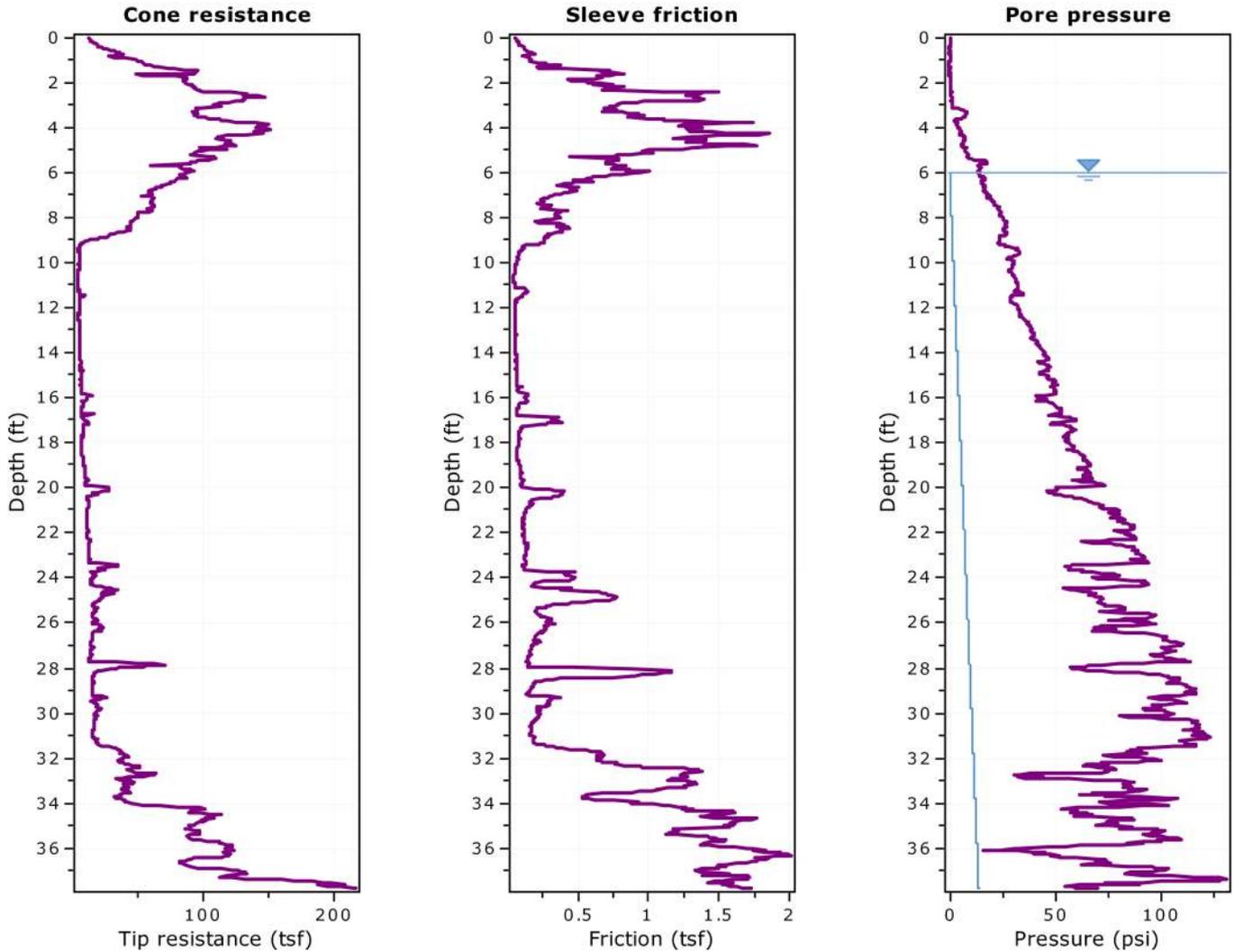
:: Peak Friction Angle, ϕ' (°) ::

$$\phi' = 29.5^\circ \cdot B_q^{0.121} \cdot (0.256 + 0.336 \cdot B_q + \log Q_t)$$

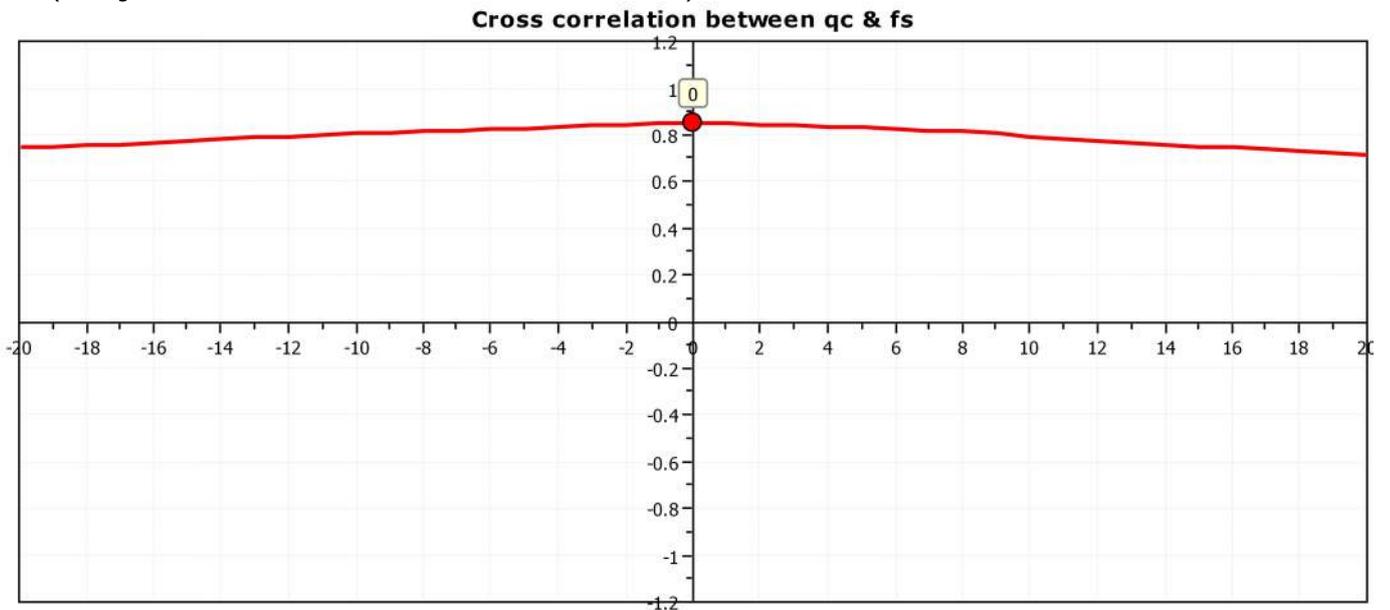
(applicable for $0.10 < B_q < 1.00$)

References

- Robertson, P.K., Cabal K.L., Guide to Cone Penetration Testing for Geotechnical Engineering, Gregg Drilling & Testing, Inc., 5th Edition, November 2012
- Robertson, P.K., Interpretation of Cone Penetration Tests - a unified approach., Can. Geotech. J. 46(11): 1337–1355 (2009)
- N Barounis, J Philpot, Estimation of in-situ water content, void ratio, dry unit weight and porosity using CPT for saturated sands, Proc. 20th NZGS Geotechnical Symposium



The plot below presents the cross correlation coefficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two successive CPT measurements).



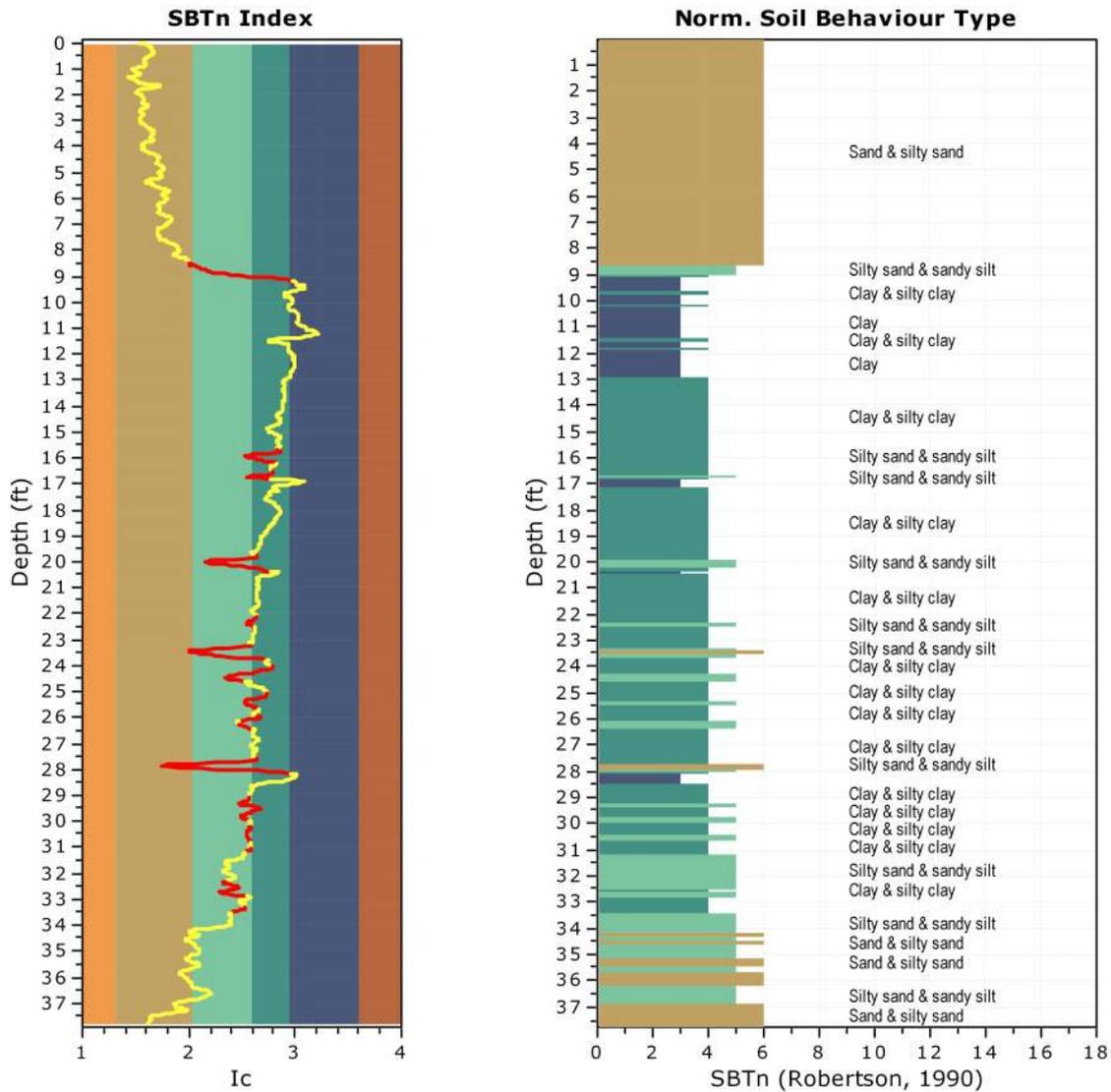


TRANSITION LAYER DETECTION ALGORITHM REPORT
Summary Details & Plots

Short description

The software will delete data when the cone is in transition from either clay to sand or vice-versa. To do this the software requires a range of I_c values over which the transition will be defined (typically somewhere between $1.80 < I_c < 3.0$) and a rate of change of I_c . Transitions typically occur when the rate of change of I_c is fast (i.e. ΔI_c is small).

The SBT_n plot below, displays in red the detected transition layers based on the parameters listed below the graphs.



Transition layer algorithm properties

I_c minimum check value: 1.70
 I_c maximum check value: 3.00
 I_c change ratio value: 0.0010
 Minimum number of points in layer: 4

General statistics

Total points in CPT file: 1259
 Total points excluded: 280
 Exclusion percentage: 22.24%
 Number of layers detected: 30

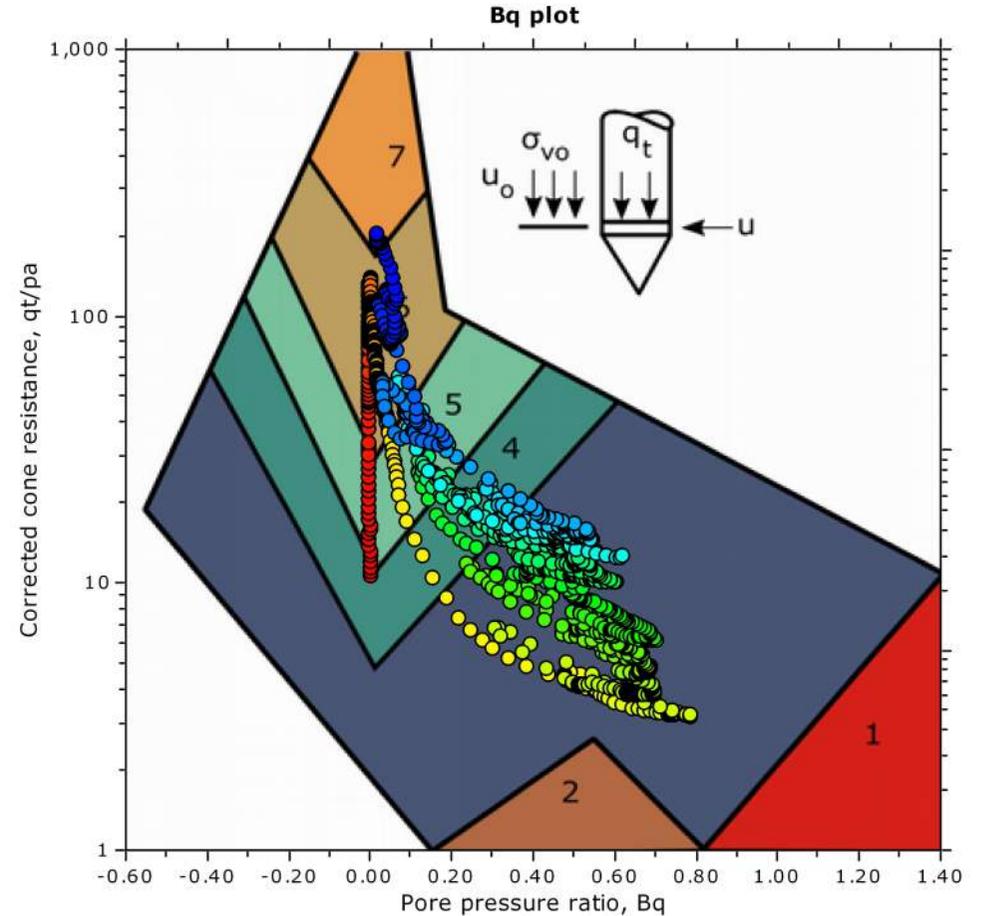
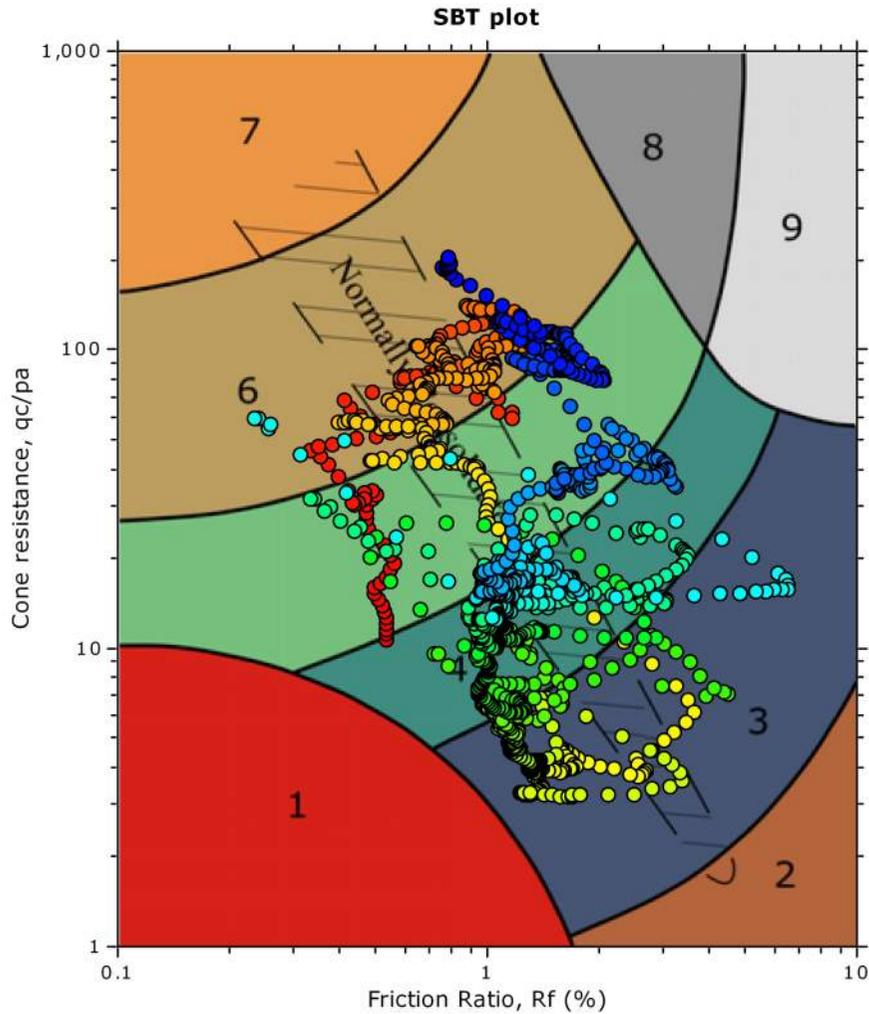
Transition layer No	Number of points	Depth	SBT _n number	SBT _n description
Transition layer 1	24	Start depth: 8.52 (ft)	6	Sand & silty sand
		End depth: 9.21 (ft)	3	Clay
Transition layer 2	7	Start depth: 15.75 (ft)	4	Clay & silty clay
		End depth: 15.93 (ft)	5	Silty sand & sandy silt
Transition layer 3	11	Start depth: 15.93 (ft)	5	Silty sand & sandy silt
		End depth: 16.23 (ft)	4	Clay & silty clay
Transition layer 4	6	Start depth: 16.56 (ft)	4	Clay & silty clay
		End depth: 16.71 (ft)	5	Silty sand & sandy silt
Transition layer 5	5	Start depth: 16.71 (ft)	5	Silty sand & sandy silt
		End depth: 16.83 (ft)	3	Clay
Transition layer 6	7	Start depth: 19.83 (ft)	4	Clay & silty clay
		End depth: 20.01 (ft)	5	Silty sand & sandy silt
Transition layer 7	14	Start depth: 20.01 (ft)	5	Silty sand & sandy silt
		End depth: 20.40 (ft)	3	Clay
Transition layer 8	9	Start depth: 22.11 (ft)	4	Clay & silty clay
		End depth: 22.35 (ft)	5	Silty sand & sandy silt
Transition layer 9	7	Start depth: 22.35 (ft)	5	Silty sand & sandy silt
		End depth: 22.53 (ft)	4	Clay & silty clay
Transition layer 10	8	Start depth: 23.25 (ft)	4	Clay & silty clay
		End depth: 23.46 (ft)	6	Sand & silty sand
Transition layer 11	12	Start depth: 23.46 (ft)	6	Sand & silty sand
		End depth: 23.79 (ft)	4	Clay & silty clay
Transition layer 12	15	Start depth: 24.06 (ft)	4	Clay & silty clay
		End depth: 24.48 (ft)	5	Silty sand & sandy silt
Transition layer 13	6	Start depth: 24.48 (ft)	5	Silty sand & sandy silt
		End depth: 24.63 (ft)	4	Clay & silty clay
Transition layer 14	10	Start depth: 25.11 (ft)	4	Clay & silty clay
		End depth: 25.38 (ft)	5	Silty sand & sandy silt
Transition layer 15	12	Start depth: 25.38 (ft)	5	Silty sand & sandy silt
		End depth: 25.71 (ft)	4	Clay & silty clay
Transition layer 16	7	Start depth: 25.98 (ft)	4	Clay & silty clay
		End depth: 26.16 (ft)	5	Silty sand & sandy silt
Transition layer 17	7	Start depth: 26.28 (ft)	5	Silty sand & sandy silt
		End depth: 26.46 (ft)	4	Clay & silty clay
Transition layer 18	10	Start depth: 27.60 (ft)	4	Clay & silty clay
		End depth: 27.87 (ft)	6	Sand & silty sand
Transition layer 19	11	Start depth: 27.87 (ft)	6	Sand & silty sand
		End depth: 28.17 (ft)	3	Clay
Transition layer 20	7	Start depth: 29.13 (ft)	4	Clay & silty clay
		End depth: 29.31 (ft)	5	Silty sand & sandy silt
Transition layer 21	7	Start depth: 29.31 (ft)	5	Silty sand & sandy silt
		End depth: 29.49 (ft)	4	Clay & silty clay
Transition layer 22	11	Start depth: 29.49 (ft)	4	Clay & silty clay
		End depth: 29.79 (ft)	5	Silty sand & sandy silt
Transition layer 23	8	Start depth: 29.79 (ft)	5	Silty sand & sandy silt
		End depth: 30.00 (ft)	4	Clay & silty clay

Transition layer No	Number of points	Depth	SBT _n number	SBT _n description
Transition layer 24	9	Start depth: 30.24 (ft)	4	Clay & silty clay
		End depth: 30.48 (ft)	5	Silty sand & sandy silt
Transition layer 25	13	Start depth: 30.48 (ft)	5	Silty sand & sandy silt
		End depth: 30.84 (ft)	4	Clay & silty clay
Transition layer 26	7	Start depth: 31.05 (ft)	4	Clay & silty clay
		End depth: 31.23 (ft)	5	Silty sand & sandy silt
Transition layer 27	8	Start depth: 32.34 (ft)	5	Silty sand & sandy silt
		End depth: 32.55 (ft)	4	Clay & silty clay
Transition layer 28	7	Start depth: 32.55 (ft)	4	Clay & silty clay
		End depth: 32.73 (ft)	5	Silty sand & sandy silt
Transition layer 29	7	Start depth: 32.73 (ft)	5	Silty sand & sandy silt
		End depth: 32.91 (ft)	4	Clay & silty clay
Transition layer 30	8	Start depth: 33.36 (ft)	4	Clay & silty clay
		End depth: 33.57 (ft)	5	Silty sand & sandy silt

Start depth: Depth where the transition layer begins

End depth: Depth where the transition layer ends

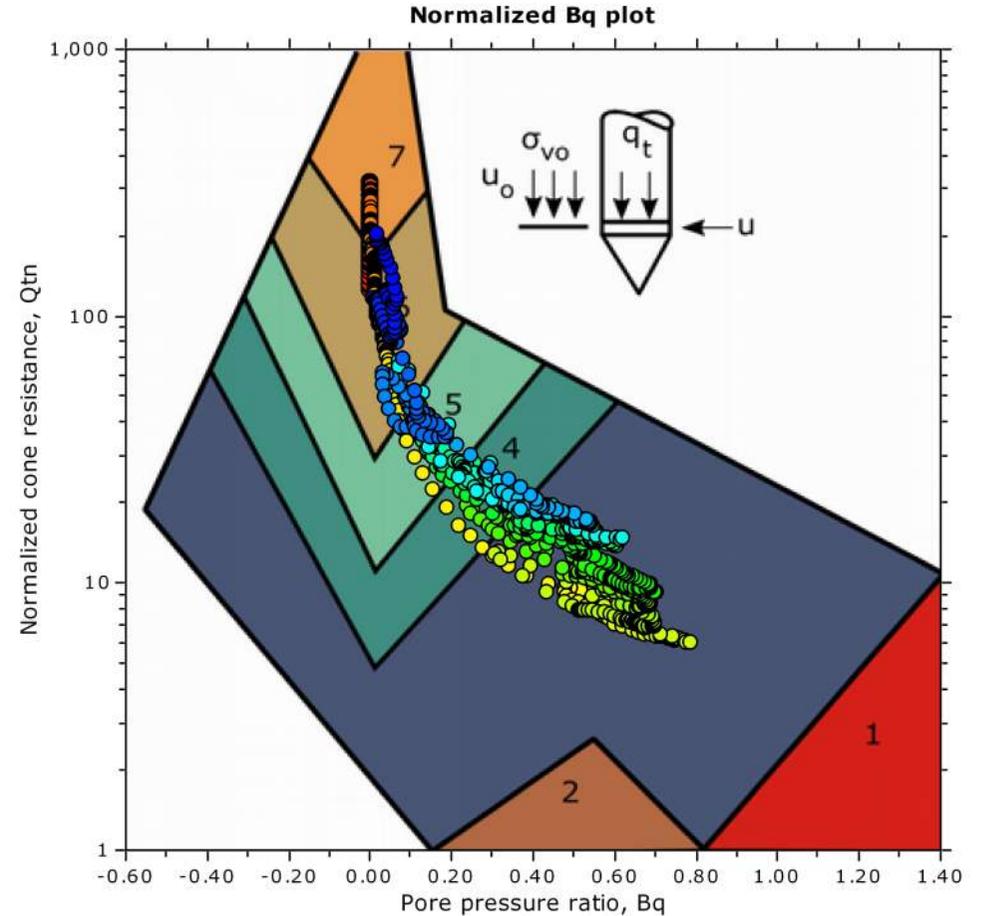
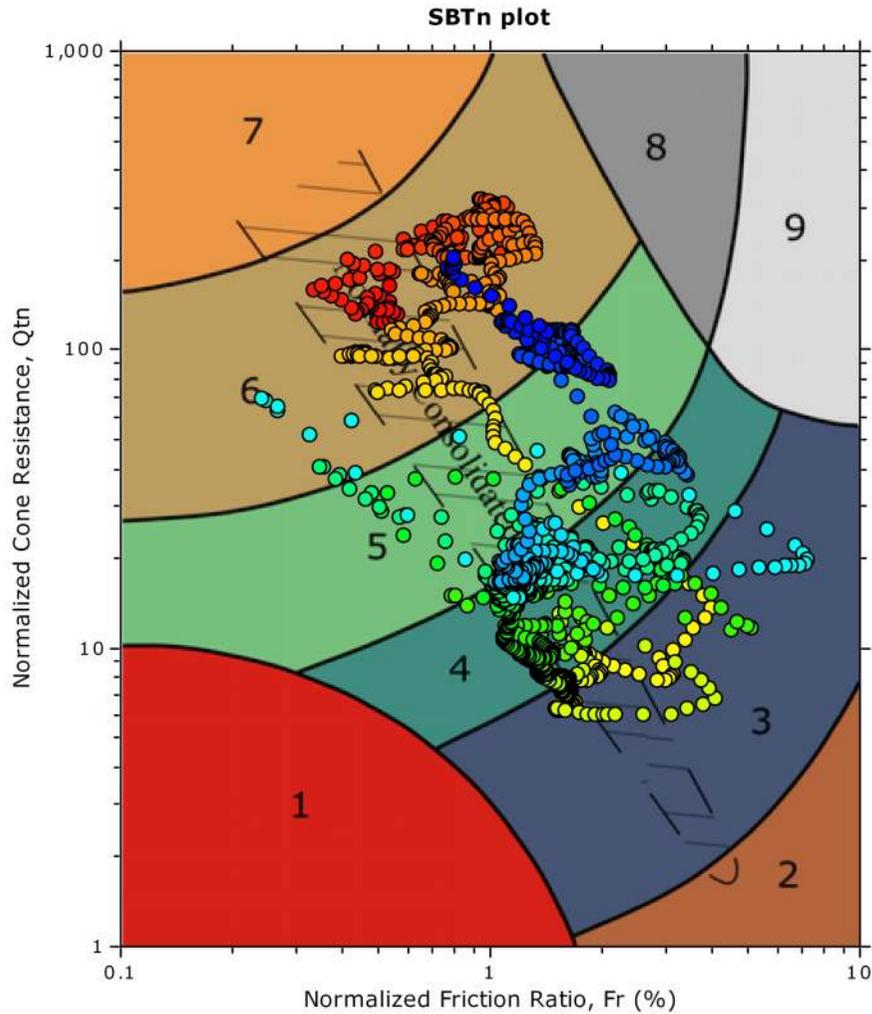
SBT - Bq plots



SBT legend

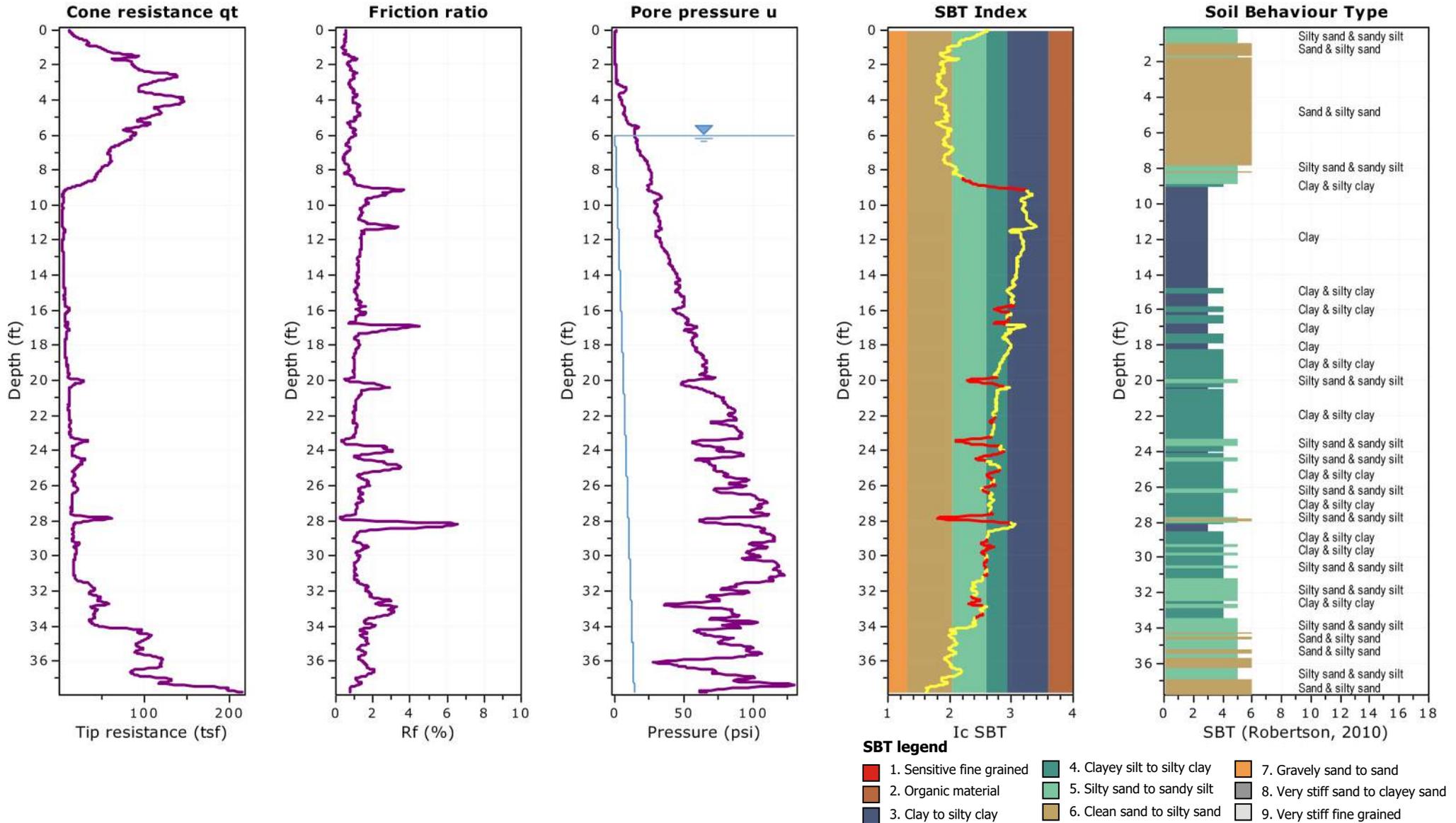
- | | | |
|--|---|---|
| ■ 1. Sensitive fine grained | ■ 4. Clayey silt to silty clay | ■ 7. Gravelly sand to sand |
| ■ 2. Organic material | ■ 5. Silty sand to sandy silt | ■ 8. Very stiff sand to clayey sand |
| ■ 3. Clay to silty clay | ■ 6. Clean sand to silty sand | ■ 9. Very stiff fine grained |

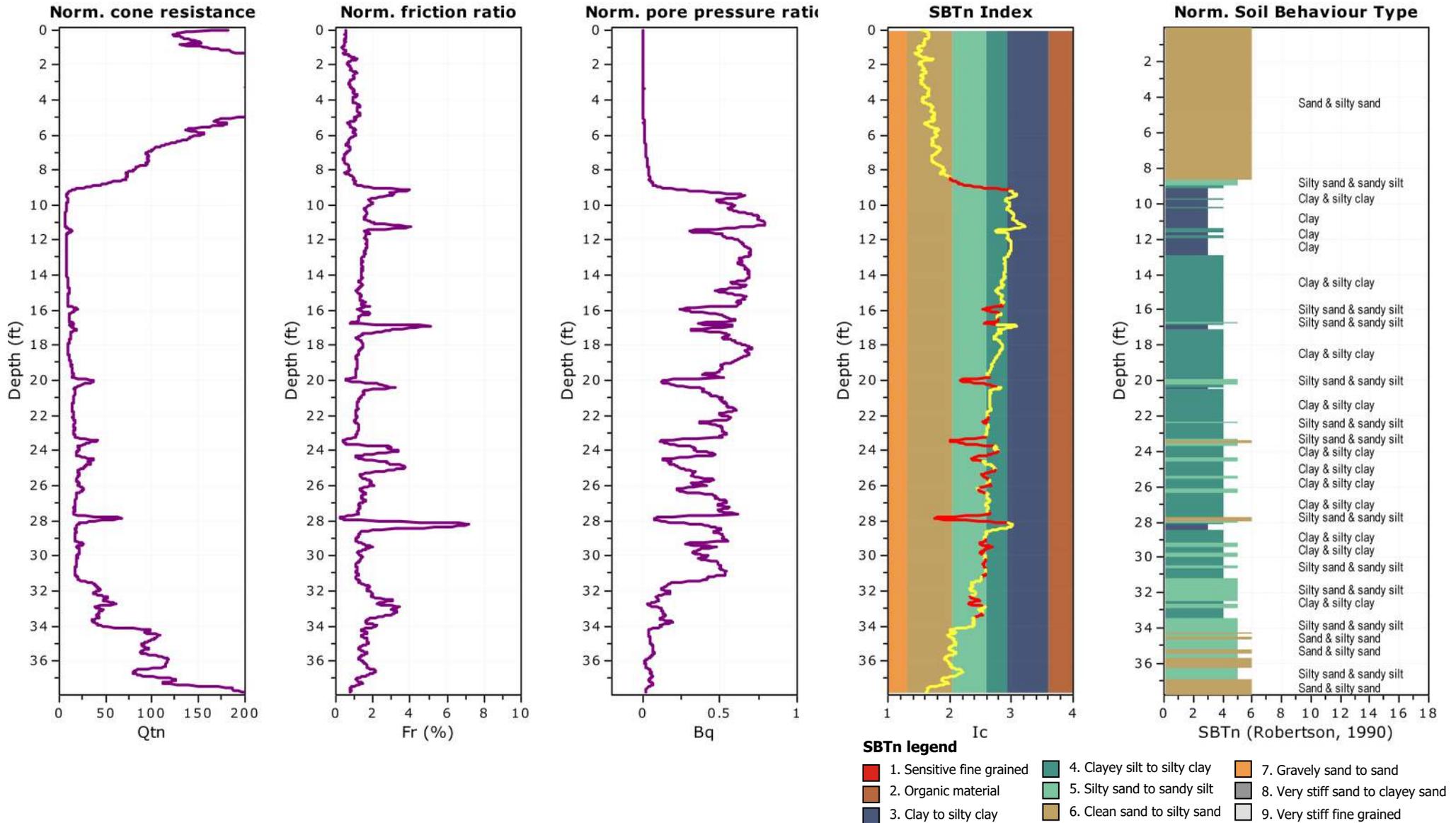
SBT - Bq plots (normalized)

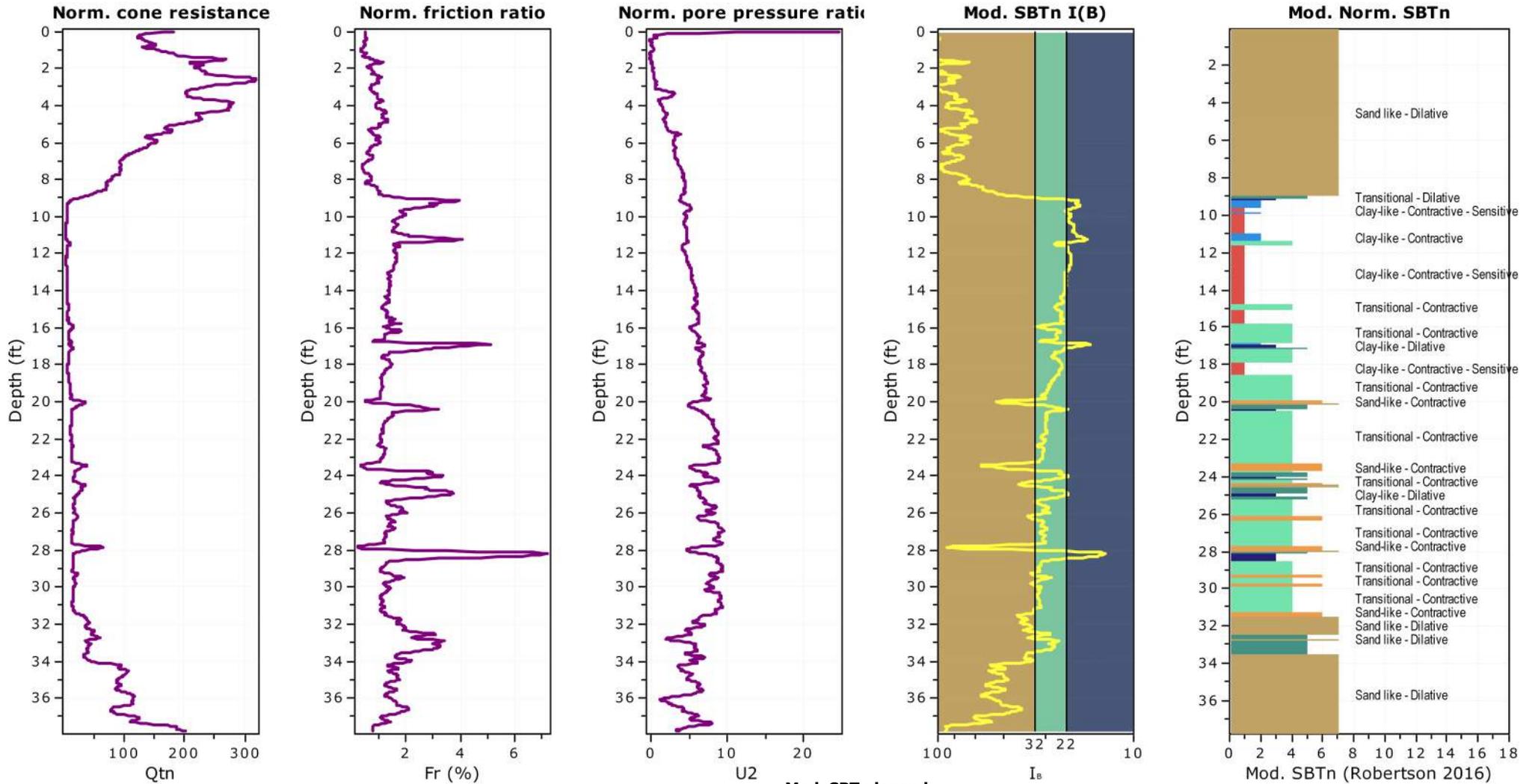


SBTn legend

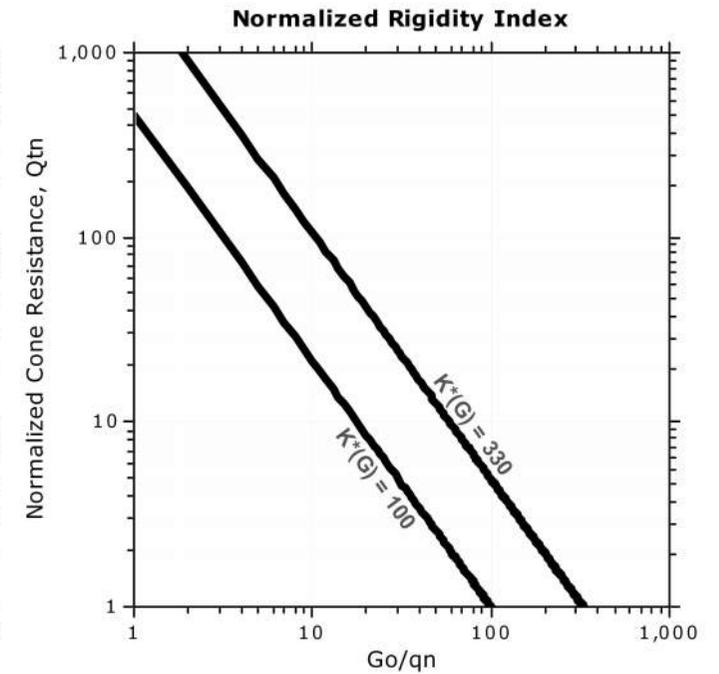
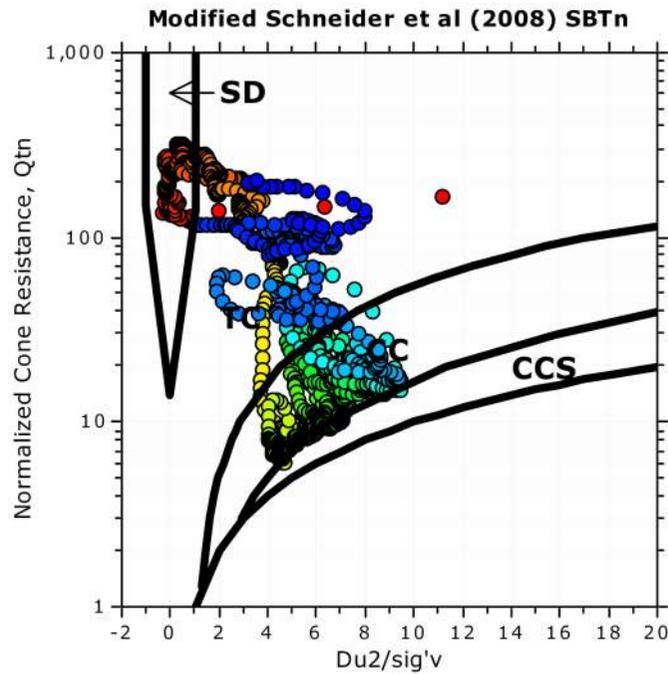
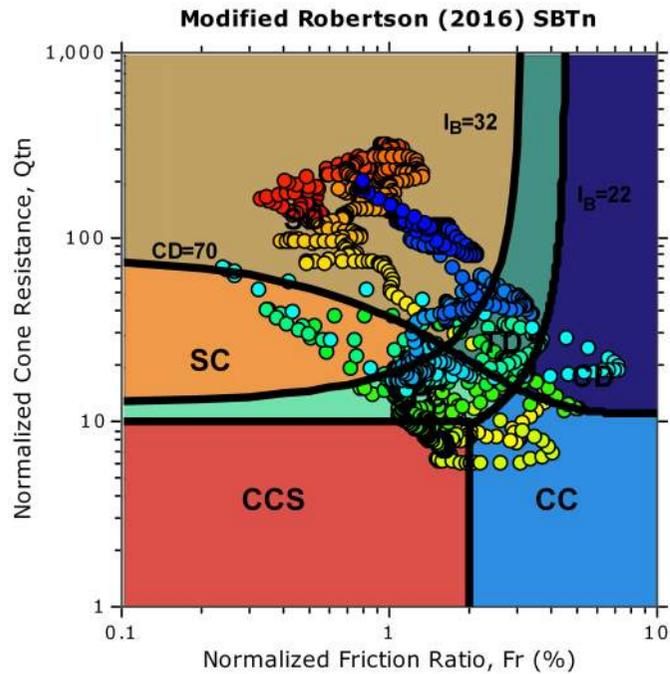
- | | | |
|--|---|---|
| ■ 1. Sensitive fine grained | ■ 4. Clayey silt to silty clay | ■ 7. Gravelly sand to sand |
| ■ 2. Organic material | ■ 5. Silty sand to sandy silt | ■ 8. Very stiff sand to clayey sand |
| ■ 3. Clay to silty clay | ■ 6. Clean sand to silty sand | ■ 9. Very stiff fine grained |







Updated SBTn plots



- CCS: Clay-like - Contractive - Sensitive
- CC: Clay-like - Contractive
- CD: Clay-like - Dilative
- TC: Transitional - Contractive
- TD: Transitional - Dilative
- SC: Sand-like - Contractive
- SD: Sand-like - Dilative

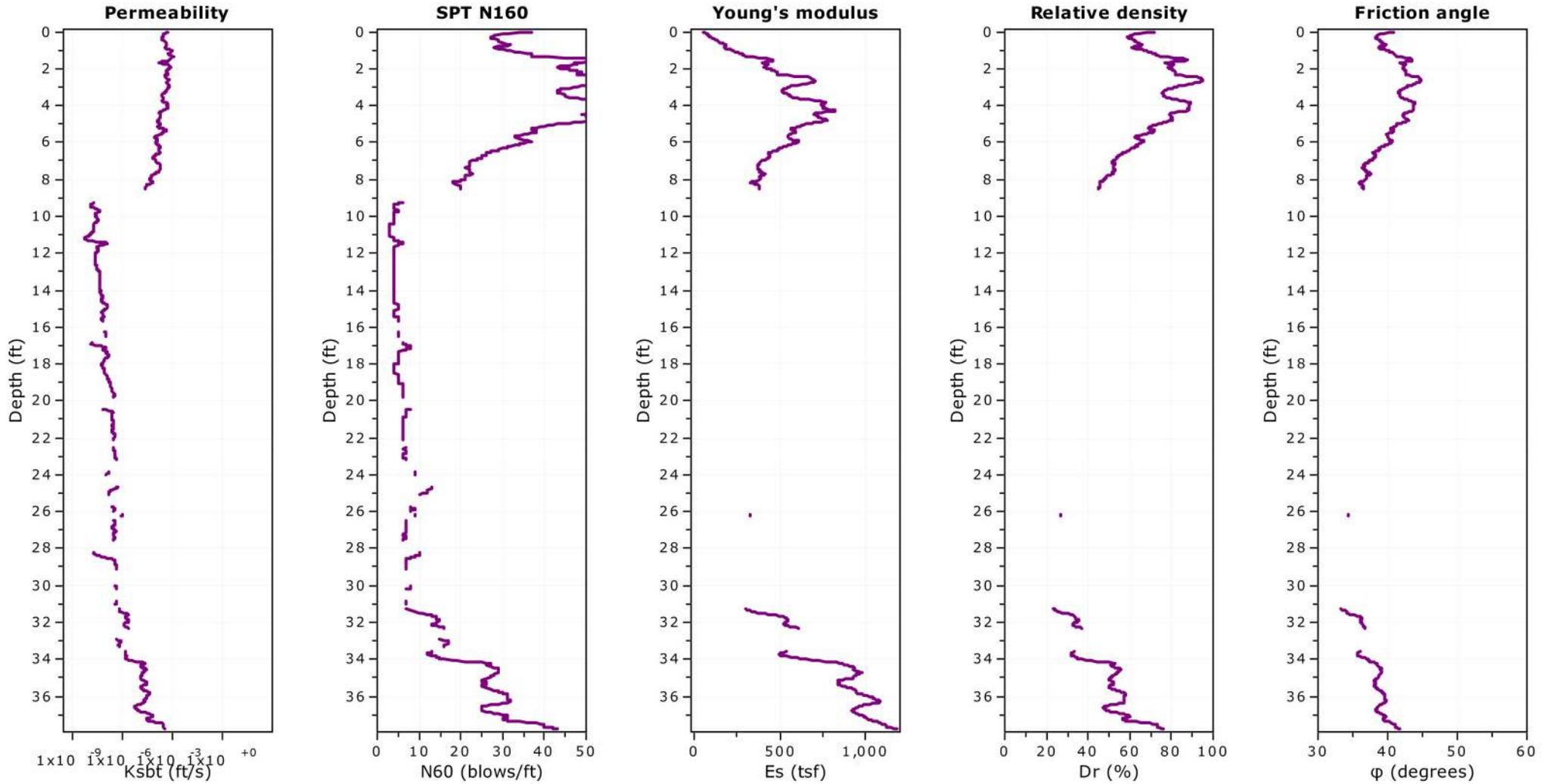
$K^*(G) > 330$: Soils with significant microstructure (e.g. age/cementation)



PND Engineers, Inc
 1506 W. 36th Ave.
 Anchorage, AK 99503

Project: SEARHC Haines Clinic Site Investigation
Location: Haines, Alaska

CPT: Average CPT - Housing
 Total depth: 37.77 ft, Date: 9/25/2025
 Est. GWL: 6.00 ft
 Cone Operator: Discovery Drilling, LLC



Calculation parameters

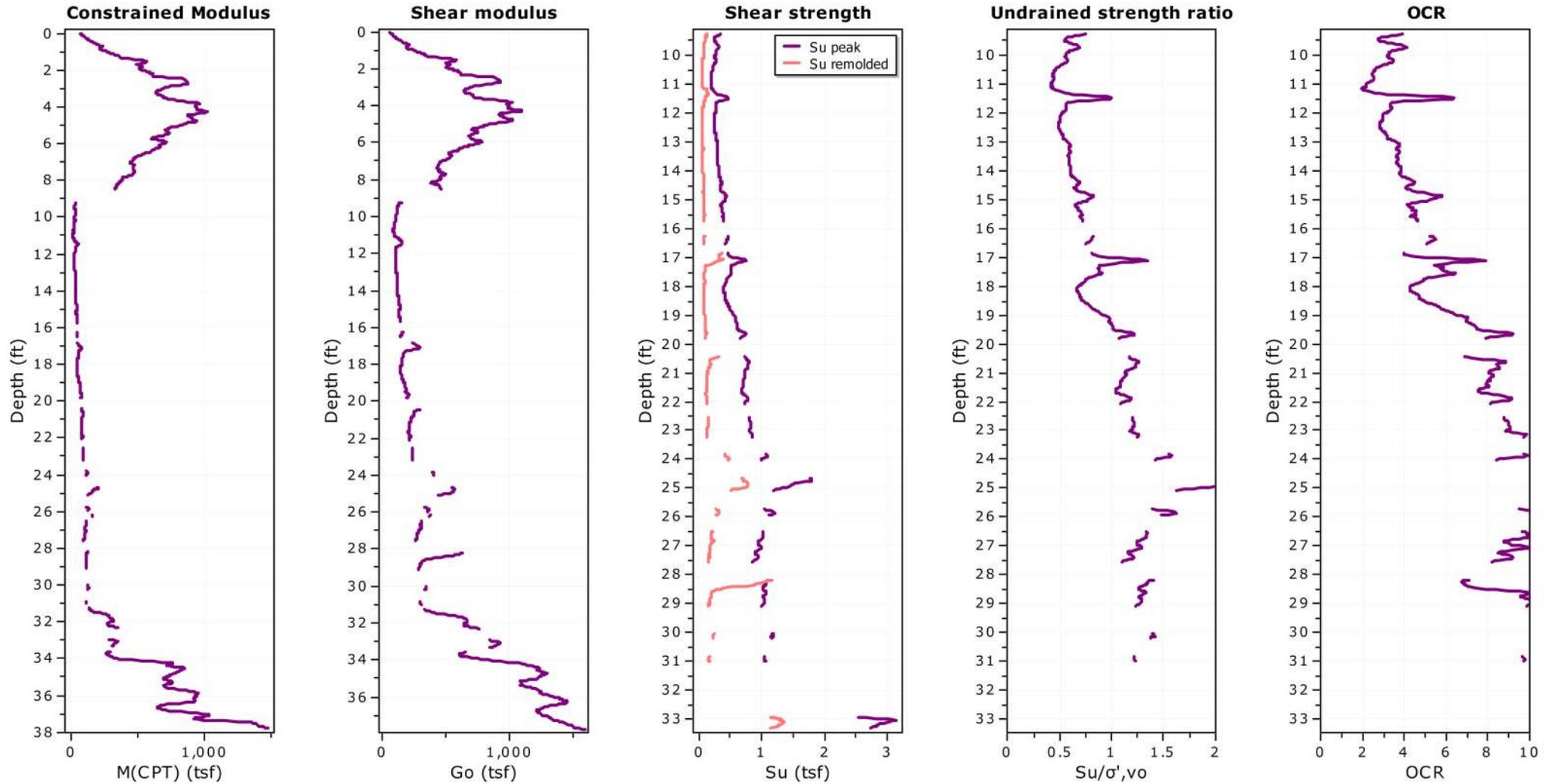
Permeability: Based on SBT_n

SPT N_{60} : Based on I_c and q_t

Young's modulus: Based on variable alpha using I_c (Robertson, 2009)

Relative density constant, C_{Dr} : 350.0

Phi: Based on Kulhawy & Mayne (1990)



Calculation parameters

Constrained modulus: Based on variable *alpha* using I_c and Q_{tn} (Robertson, 2009)

Go: Based on variable *alpha* using I_c (Robertson, 2009)

Undrained shear strength cone factor for clays, N_{kt} : 14

OCR factor for clays, N_{kt} : Auto

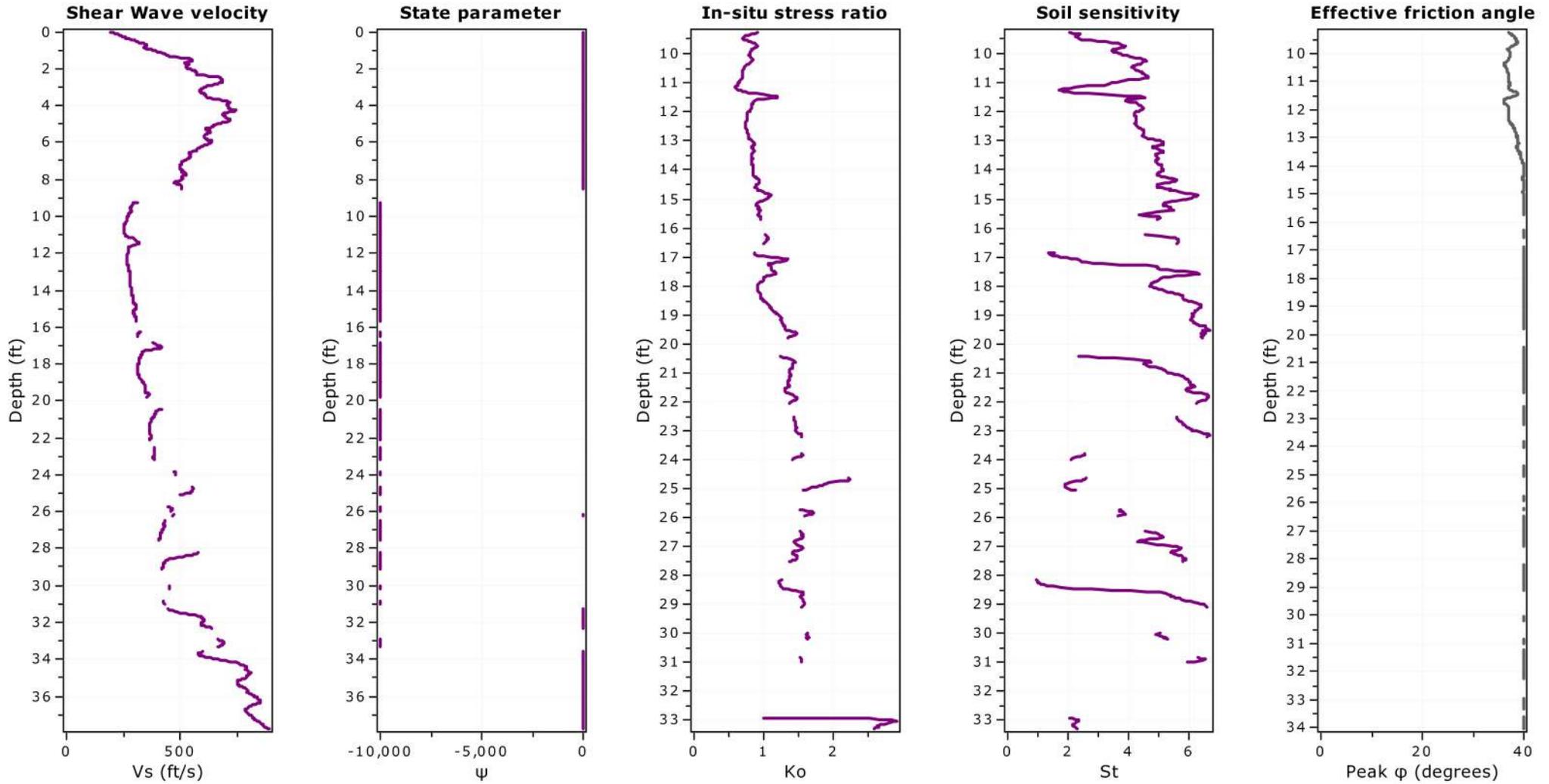
● Flat Dilatometer Test data



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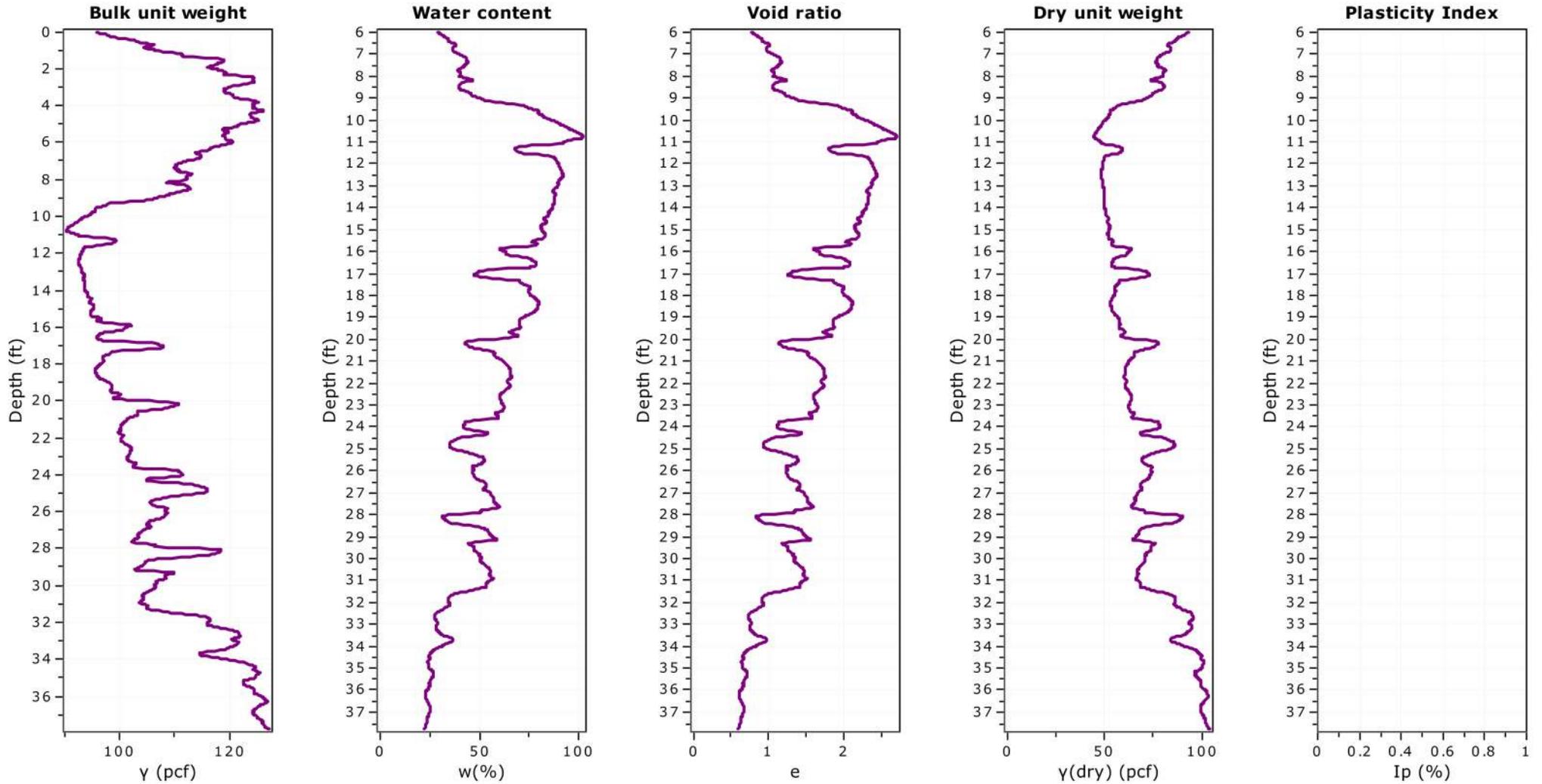
Calculation parameters
Soil Sensitivity factor, N_s : 7.00



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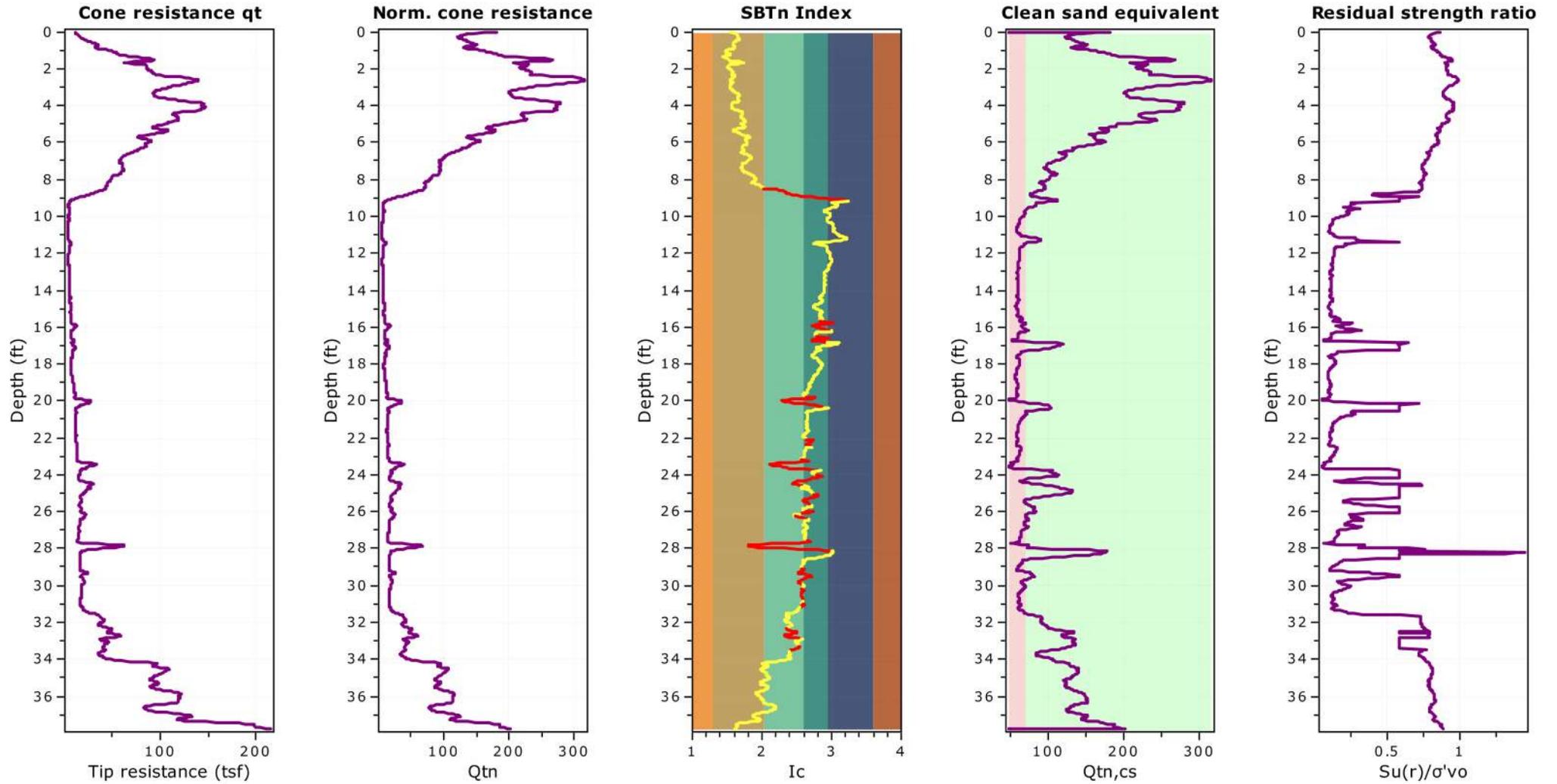




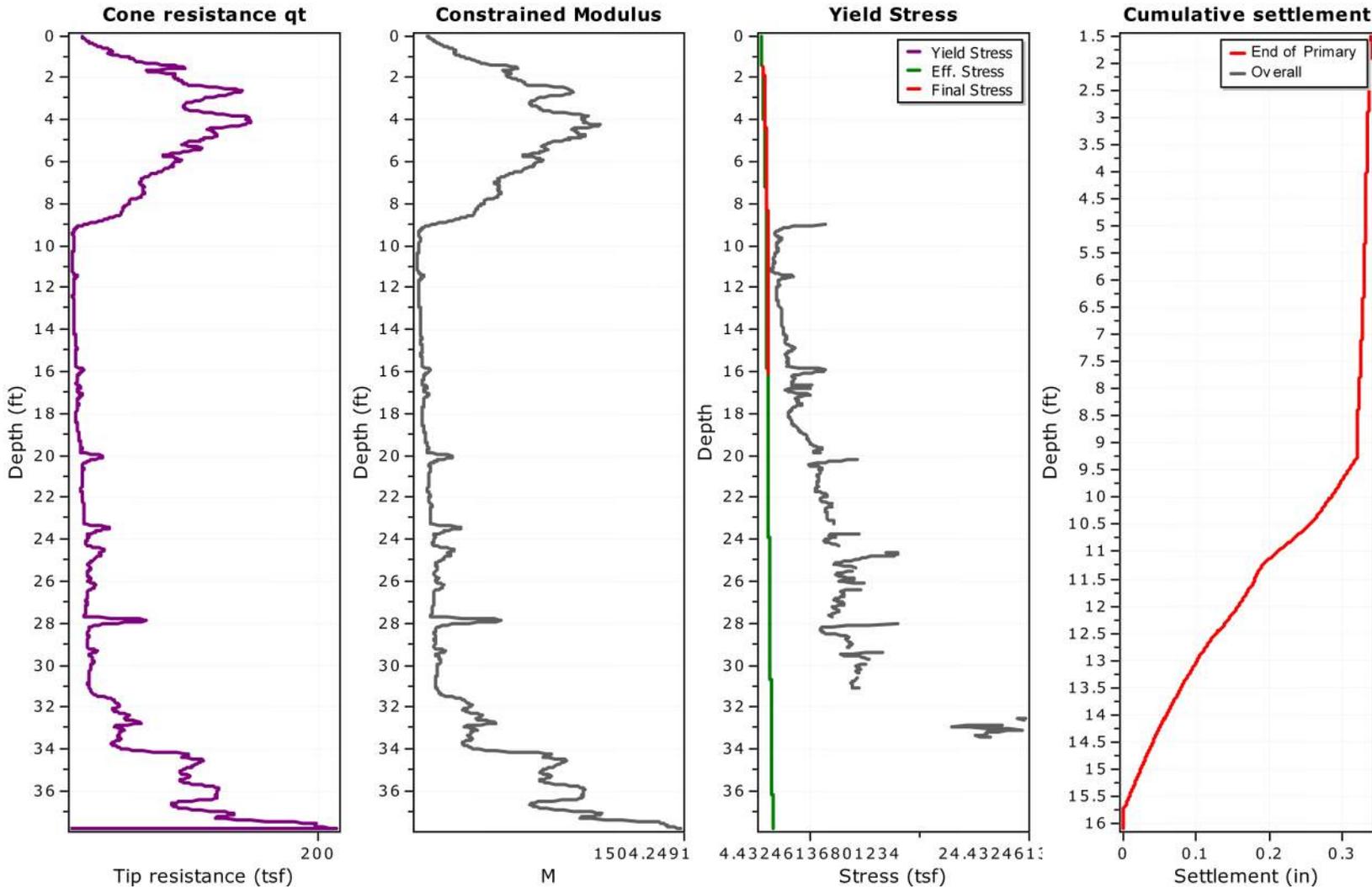
PND Engineers, Inc
1506 W. 36th Ave.
Anchorage, AK 99503

Project: SEARHC Haines Clinic Site Investigation
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Total depth: 37.77 ft, Date: 9/25/2025
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Cone Operator: Discovery Drilling, LLC



Settlements calculation according to theory of elasticity*



Calculation properties

- Footing type: Rectangular
- Footing width: 40.00 (ft)
- L/B: 1.0
- Footing pressure: 0.13 (tsf)
- Embedment depth: 1.50 (ft)
- Footing is rigid: No
- Remove excavation load: No
- Apply 20% rule: Yes
- Calculate secondary settlements: No
- Time period for primary consolidation: N/A
- Time period for second. settlements: N/A

* Primary settlement calculation is performed according to the following formula:

$$S = \sum \frac{\Delta\sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S_c = \dots$$

where t_p is the duration of primary consolidation

Presented below is a list of formulas used for the estimation of various soil properties. The formulas are presented in SI unit system and assume that all components are expressed in the same units.

:: Unit Weight, g (kN/m³) ::

$$g = g_w \cdot \left(0.27 \cdot \log(R_f) + 0.36 \cdot \log\left(\frac{q_t}{p_a}\right) + 1.236 \right)$$

where g_w = water unit weight

:: Permeability, k (m/s) ::

$$I_c < 3.27 \text{ and } I_c > 1.00 \text{ then } k = 10^{0.952-3.04 \cdot I_c}$$

$$I_c \leq 4.00 \text{ and } I_c > 3.27 \text{ then } k = 10^{-4.52-1.37 \cdot I_c}$$

:: N_{5PT} (blows per 30 cm) ::

$$N_{60} = \left(\frac{q_c}{p_a} \right) \cdot \frac{1}{10^{1.1268-0.2817 \cdot I_c}}$$

$$N_{1(60)} = Q_{tn} \cdot \frac{1}{10^{1.1268-0.2817 \cdot I_c}}$$

:: Young's Modulus, E_s (MPa) ::

$$(q_t - \sigma_v) \cdot 0.015 \cdot 10^{0.55 \cdot I_c + 1.68}$$

(applicable only to $I_c < I_{c_cutoff}$)

:: Relative Density, Dr (%) ::

$$100 \cdot \sqrt{\frac{Q_{tn}}{k_{DR}}} \quad \text{(applicable only to SBT}_n\text{: 5, 6, 7 and 8 or } I_c < I_{c_cutoff}\text{)}$$

:: State Parameter, ψ ::

$$\psi = 0.56 - 0.33 \cdot \log(Q_{tn,cs})$$

:: Drained Friction Angle, ϕ (°) ::

$$\phi = 29.5^\circ \cdot B_q^{0.121} \cdot (0.256 + 0.336 \cdot B_q + \log Q_t)$$

(applicable only to SBT_n: 5, 6, 7 and 8 or $I_c < I_{c_cutoff}$)

:: 1-D constrained modulus, M (MPa) ::

If $I_c > 2.20$
 $\alpha = 14$ for $Q_{tn} > 14$
 $\alpha = Q_{tn}$ for $Q_{tn} \leq 14$
 $M_{CPT} = \alpha \cdot (q_t - \sigma_v)$

If $I_c \geq 2.20$

:: Small strain shear Modulus, G_0 (MPa) ::

$$G_0 = (q_t - \sigma_v) \cdot 0.0188 \cdot 10^{0.55 \cdot I_c + 1.68}$$

:: Shear Wave Velocity, V_s (m/s) ::

$$V_s = \left(\frac{G_0}{\rho} \right)^{0.50}$$

:: Undrained peak shear strength, S_u (kPa) ::

$$N_{kt} = 10.50 + 7 \cdot \log(F_r) \text{ or user defined}$$

$$S_u = \frac{(q_t - \sigma_v)}{N_{kt}}$$

(applicable only to SBT_n: 1, 2, 3, 4 and 9 or $I_c > I_{c_cutoff}$)

:: Remolded undrained shear strength, $S_u(rem)$ (kPa) ::

$$S_{u(rem)} = f_s \quad \text{(applicable only to SBT}_n\text{: 1, 2, 3, 4 and 9 or } I_c > I_{c_cutoff}\text{)}$$

:: Overconsolidation Ratio, OCR ::

$$k_{OCR} = \left[\frac{Q_{tn}^{0.20}}{0.25 \cdot (10.50 + 7 \cdot \log(F_r))} \right]^{1.25} \text{ or user defined}$$

$$OCR = k_{OCR} \cdot Q_{tn}$$

(applicable only to SBT_n: 1, 2, 3, 4 and 9 or $I_c > I_{c_cutoff}$)

:: In situ Stress Ratio, K_0 ::

$$K_0 = (1 - \sin \phi') \cdot OCR^{\sin \phi'}$$

(applicable only to SBT_n: 1, 2, 3, 4 and 9 or $I_c > I_{c_cutoff}$)

:: Soil Sensitivity, S_t ::

$$S_t = \frac{N_s}{F_r}$$

(applicable only to SBT_n: 1, 2, 3, 4 and 9 or $I_c > I_{c_cutoff}$)

:: Peak Friction Angle, ϕ' (°) ::

$$\phi' = 29.5^\circ \cdot B_q^{0.121} \cdot (0.256 + 0.336 \cdot B_q + \log Q_t)$$

(applicable for $0.10 < B_q < 1.00$)

References

- Robertson, P.K., Cabal K.L., Guide to Cone Penetration Testing for Geotechnical Engineering, Gregg Drilling & Testing, Inc., 5th Edition, November 2012
- Robertson, P.K., Interpretation of Cone Penetration Tests - a unified approach., Can. Geotech. J. 46(11): 1337–1355 (2009)
- N Barounis, J Philpot, Estimation of in-situ water content, void ratio, dry unit weight and porosity using CPT for saturated sands, Proc. 20th NZGS Geotechnical Symposium

Appendix E. GBA Publication

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, clients can benefit from a lowered exposure to the subsurface problems that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed below, contact your GBA-member geotechnical engineer. Active involvement in the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Geotechnical-Engineering Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. *Those who rely on a geotechnical-engineering report prepared for a different client can be seriously misled.* No one except authorized client representatives should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one – not even you – should apply this report for any purpose or project except the one originally contemplated.*

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read it *in its entirety*. Do not rely on an executive summary. Do not read selected elements only. *Read this report in full.*

You Need to Inform Your Geotechnical Engineer about Change

Your geotechnical engineer considered unique, project-specific factors when designing the study behind this report and developing the confirmation-dependent recommendations the report conveys. A few typical factors include:

- the client's goals, objectives, budget, schedule, and risk-management preferences;
- the general nature of the structure involved, its size, configuration, and performance criteria;
- the structure's location and orientation on the site; and
- other planned or existing site improvements, such as retaining walls, access roads, parking lots, and underground utilities.

Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

This Report May Not Be Reliable

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, that it could be unwise to rely on a geotechnical-engineering report whose reliability may have been affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If your geotechnical engineer has not indicated an "apply-by" date on the report, ask what it should be, and, in general, if you are the least bit uncertain about the continued reliability of this report, contact your geotechnical engineer before applying it.* A minor amount of additional testing or analysis – if any is required at all – could prevent major problems.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface through various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing were performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgment to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team from project start to project finish, so the individual can provide informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, *they are not final*, because the geotechnical engineer who developed them relied heavily on judgment and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* revealed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a full-time member of the design team, to:

- confer with other design-team members,
- help develop specifications,
- review pertinent elements of other design professionals' plans and specifications, and
- be on hand quickly whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction observation.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for informational purposes only*. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report, but they may rely on the factual data relative to the specific times, locations, and depths/elevations referenced. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may

perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely*. Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures*. If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. As a general rule, *do not rely on an environmental report prepared for a different client, site, or project, or that is more than six months old*.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, none of the engineer's services were designed, conducted, or intended to prevent uncontrolled migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, *proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration*. Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. *Geotechnical engineers are not building-envelope or mold specialists*.



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