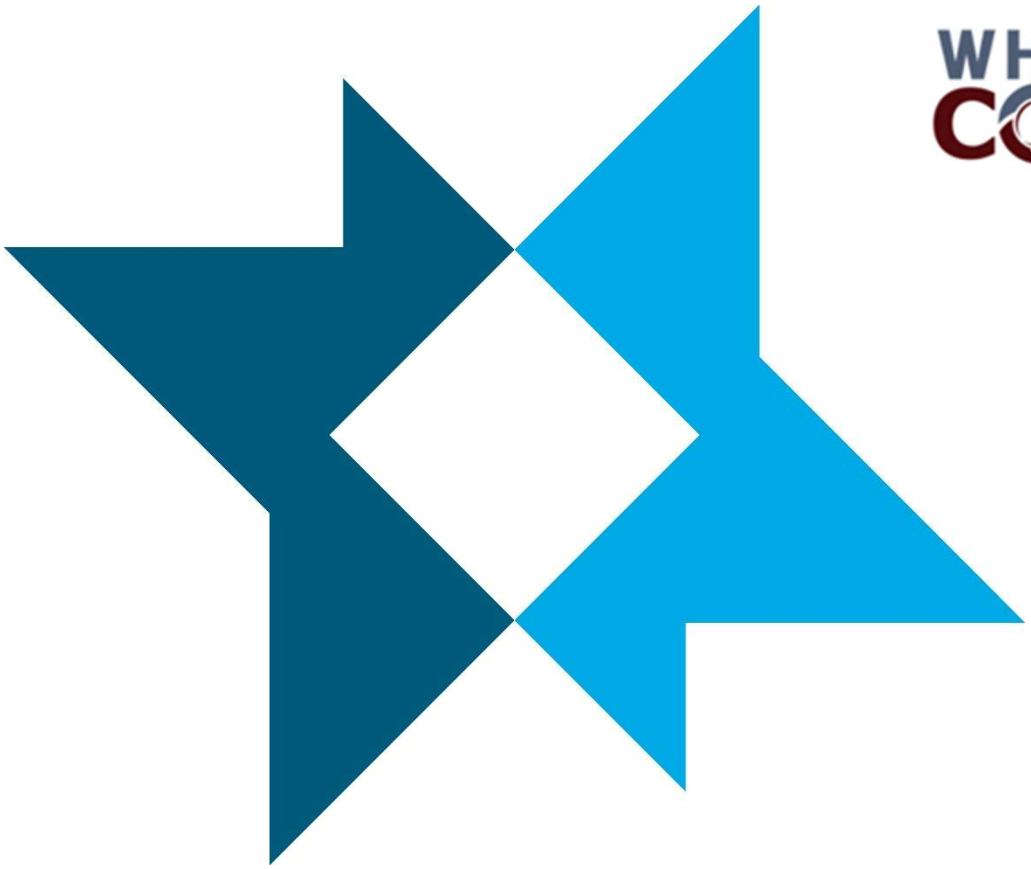
Mining Permit Application
White Pine North Project
Volume IB
Appendix E-3



White Pine Copper LLC
White Pine, Michigan

September 2026

Project I.D.: 23W200

Solving our clients' toughest science and engineering challenges.

E-3

Tailings Management Design Report

White Pine Copper, LCC | White Pine North Project

Tailings Management Design Report

Tetra Tech Project Number: 117-372636-25001

August 17, 2026

Final

PRESENTED TO

White Pine Copper, LLC

PRESENTED BY

Tetra Tech
4750 West 2100 South
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TETRA TECH

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Acronyms/Abbreviations

Acronym/Abbreviation	Definition
AMSL	above mean sea level
CAPEX	Capital Expenditure
ft	feet
gpm	gallons per minute
LOM	life of mine
m	meter
m^3	cubic meters
MGD	million gallons per day
Mt	million tonnes (metric)
MT	million short tones
NP1	North Pond 1
NP2	North Pond 2
NPDES	National Pollution Discharge Elimination System
NPV	Net Present Value
OPEX	Operational Expenditure
Pa	pascals
P&C	Paterson and Cooke
PFS	Pre-Feasibility Study
SP	South Pond
TDF	tailings disposal facility
t/m^3	tonnes per cubic meter
WPC	White Pine Copper LLC
WPM	White Pine Mine

EXECUTIVE SUMMARY

This report has been prepared on behalf of White Pine Copper, LLC (WPC) to document the design of the tailings management for the White Pine North Project (the Project). The project will generate an estimated 133.6 million dry tonnes (Mt) of tailings over a life of mine (LOM) of 26 years, which will be deposited as thickened tailings within the existing legacy tailings disposal facilities (TDFs), North Pond 1 (NP1), and North Pond 2 (NP2).

The following supporting studies, investigations, and testing were performed to support the pre-feasibility study:

- Tailings Management Trade-Off Study – Tetra Tech conducted to compare the efficacy and cost associated with disposing of unthickened, 45% solids content, and 55% percent solids content tailings within NP1 and NP2.
- Geotechnical Investigation – Tetra Tech completed to collect additional geotechnical data associated with the existing NP1 and NP2 embankments to support assessing their existing stability and stability to support the deposition design.
- Tailings Thickening Studies – Resourceful Paths and Paterson & Cooke conducted thickening studies, which included rheology test work and beach slope modeling, to evaluate the optimal degree of thickening to target a 2% beach slope and to develop the design for the tailings thickening process equipment and pumping and piping conveyance systems.
- Thickened Tailings Geotechnical Testing – Advanced Terra Testing completed geotechnical test work on the tailings to determine the consolidation, conductivity and strength properties of the thickened tailings.
- Site-Wide Water Balance – Foth developed a water balance to support the estimated magnitude of inputs and outputs for the TDFs.

Based on the results of the trade-off study, a high-density thickened tailings, with a targeted solids content range of between 58% to 62% solids capable of achieving a 2% beach slope, was selected to advance through detailed design.

The design criteria developed for the tailings management design based on the supporting studies listed above are summarized in Table E-1-1.

Table E-1-1 – Summary of Tailings Management Design Criteria

Design Criteria	Value	Source
Tailings Deposition Design Criteria		
LOM	26 years	Stantec Mine Plan received March 16, 2026.
Pre-Production Period	3 years	From Ausenco Common Values and Reference Sheet 108571-GX-00000-11100-001-02.
Total Ore Produced	137.8 million tonnes	Stantec Mine Plan dated March 17, 2026
LOM Dry Tailings Production	133.6 million tonnes	From Ausenco's mass balance.
Hourly Tailings to Thickening	653 dry tonnes per hour	Paterson and Cooke (2026) Mass Balance Rev_B.
Tailings Specific Gravity	2.768	Table V of Paterson and Cooke's (2025) Test Work Report Rev_B.
Thickener Underflow Solids Concentration (nominal)	62%	Based on Paterson and Cooke's (2025) Test Report Rev_B.
Whole Slurry Bingham Yield Stress	80 Pa	Based on Paterson and Cooke's (2025) Tailings System Hydraulic Report Rev_B.
Beach Slope	2%	Based on Water, Waste and Land's (2026) Report Rev_B.

Design Criteria	Value	Source
Zero Free Water Solids Mass Concentration	76.9%	Table VIII of Paterson and Cooke's (2025) Test Work Report Rev_B.
Final Consolidated Dry Density	1.46 tonnes/m^3	Assumed value based on pond tailings consolidation tests and literature review values.
Final Consolidated Solids Concentration	81%	Based on a specific gravity 2.768 and a final dry basis moisture content of 23%.
Influent Criteria		
Thickened Tailings Discharge Liquid Volumetric Flow Rate	436 m^3/hr	Paterson and Cooke (2026) Mass Balance Rev_B.
Bedell Pond Discharge Flows	17.4 m^3/hr	Based on Foth Water Balance dated 3/3/2026.
White Pine North Dewatering (Peak)	191.88 m^3/hr	Based on Foth Water Balance dated 3/3/2026.
Former Mine Workings Dewatering	124 m^3/hr	Based on Foth Water Balance dated 3/3/2026.
Precipitation Flow to NP1	214 m^3/hr	Based on Foth Water Balance dated 3/3/2026.
Precipitation Flow to NP2	220.25 m^3/hr	Based on Foth Water Balance dated 3/3/2026.
Reclaim Water Pump System		
NP1 Max Reclaim Flow Rate to Process Water Tank	411 m^3/hr	Based on Foth Water Balance dated 3/3/2026.
NP1 Max Reclaim Flow Rate to Water Treatment Plant	418 m^3/hr	Based on Foth Water Balance dated 3/3/2026.
NP2 Max Reclaim Flow Rate to Process Water Tank Range	411 m^3/hr	Based on Foth Water Balance dated 3/3/2026.
NP1 Max Reclaim Flow Rate to Water Treatment Plant Range	471.22 m^3/hr	Based on Foth Water Balance dated 3/3/2026.
Surface Water Management Infrastructure		
South Pond Diversion Storm Event	100-yr 24-hr	Per 12/8/2025 email from Amanda Zeidler.
NP1 Reclaim (Contact) Water Overflow Spillway Storm Event	1,000-yr 24-hr	Based on meeting GISTM standards for significant hazard.
NP2 Reclaim (Contact) Water Overflow Spillway Storm Event	0.5PMF	Meets Michigan Dam Safety standards (0.5 PMP) and GISTM standards (2,745 yr) for a high hazard dam.
NP2 Non-Contact Water Storm Event	0.5 PMP	Meets Michigan Dam Safety standards (0.5 PMP) and GISTM standards (2,745 yr) for a high hazard dam. The existing emergency pipe spillway has already been confirmed to be capable of passing the PMP.

The deposition design consists of tailings being deposited first in NP1 in three cones using central discharge points and will be confined to the south by a new berm constructed along its southern boundary. Following deposition in NP1, tailings will be deposited from three cones using central discharge points followed by deposition of tailings from 62 discharge points along the crest of NP1's north embankment into NP2. A summary of the deposition design, including total stored tonnes of tailings is summarized in Table E-1-2.

Table E-1-2 – Tailings Deposition Design Summary

Design Item	Value	Comment
NP1 Deposition Cones		
Number of Deposition Towers	3	Spaced 740 meters apart
Number of Deposition Points per Tower	12	4 deposition points will be operated at any one time.
Maximum Deposition Height	Approx. 20 m	Measured from elevation of existing tailings surface to top elevation of deposition towers.
Depositional Area	4,984,445 m^2	Corresponds to surface area of new tailings.
Tailings Volume	42,584,581 m^3	Consolidated volume.
Tailings Mass	62,173,488 dry tonnes	Converted from volume based on a final consolidated density of 1.46 t/m^3.
NP2		
Number of Deposition Towers	3	Spaced 1000 meters apart
Number of Deposition Point Per Tower	12	4 deposition points will be operated at any one time.
Maximum Deposition Height	Approx 18 m	Measured from elevation of existing tailings surface to top elevation of deposition towers.
Crest Deposition Points	62	Spaced 40 m apart.
Depositional Area	6,424,025 m^2	Corresponds to surface area of new tailings.
Cone Deposition Tailings Volume	38,223,221 m^3	Consolidated volume.
Crest Deposition Tailings Volume	10,818,384	Consolidated volume.
Cone Deposition Tailings Mass	55,805,903 tonnes	Converted from volume based on a final consolidated density of 1.46 t/m^3.
Crest Deposition Tailings Mass	15,791,922 tonnes	Converted from volume based on a final consolidated density of 1.46 t/m^3.
Total Tailings Mass	71,597,825 tonnes	Converted from volume based on a final consolidated density of 1.46 t/m^3.

The tailings will be pumped from the underflow thickening tank into the tailings pipeline using positive displacement pumps. Due to the initial high pressure, 10-inch schedule standard steel high density polyethylene (HDPE) lined pipes transitioning to 12-inch HDPE SDR 9 pipe will convey the tailings to the TDF. The HDPE liner was specified to increase their longevity due to concerns with wear and the high flow velocities.

Although no raises to the existing embankments of the TDFs are required to support the future deposition of tailings, earthworks will be required to construct new berms to contain the extent of tailings deposition, separate contact and non-contact water compartment within NP2, and to provide sufficient access for maintenance vehicles to the reclaim pumping systems, along pipeline alignments, and to the central tailings discharge points. A summary of the total estimated volumes of earthworks is presented in Table E-1-3.

Table E-1-3 – Summary of Earthworks to Support Deposition Design

Earthworks Components	Quantity (m^3)	Comments
NP1 South Berm	1,115,424	Placed in pre-production years using a combination of waste rock and South Pond Embankment soil.
NP1 West and North Embankment Widening	25,472	Placed in pre-production years using legacy tailings.
NP1 Northwest Existing Embankment Buttress	16,042	Placed in pre-production years using Waste Rock
Initial NP1 Deposition Point Access Causeways	278,220	Placed in pre-production years using legacy tailings.
NP1 Deposition Point Access Causeway Raises	184,100	Placed through production Years 1 through 10 using South Pond Embankment soil.
Backfill of Existing NP1 Spillway	1,513	Placed in pre-production years using South Pond Embankment soil.
NP2 West Embankment Widening	17,230	Placed in production Year 10 using legacy tailings.
NP2 Contact Non-Contact Water Separation Berm	90,000	Placed in production Year 10 using legacy tailings.
Initial NP2 Deposition Points Access Causeways	858,805	Placed in production Year 10 using legacy tailings.
NP2 Deposition Points Access Causeways	262,925	Placed through production Years 11 through 24 using South Pond Embankment soil.

With the exception of waste rock and legacy tailings, the existing South Pond embankment, estimated to contain 1.85 million m^3 of soil, will be the primary borrow source for the earthworks. Based on the earthworks mass balance there will be 771,000 m^3 of South Pond soil remaining at the end of LOM.

The following provisions were included in the deposition to maintain consistency with the future water management philosophy:

- Reroute run-off (non-contact water) from South Pond and former mine underground workings dewatering system to discharge directly to NP2.
- Shift the location of the deposition cones in NP1 to the south to preserve the area of historical ponded water for use as a reclaim water pond to store the various water inflows.
- A conveyance channel with a berm on its east side will be constructed in NP2 to convey contact water to the reclaim pond and deflect non-contact water into the stormwater compartment.
- A berm will be constructed in NP2 to divide the historically ponded water area into separate reclaim and stormwater compartments.
- Abandon the existing overflow pipes in NP1 to prevent contact water from entering NP2.
- Abandon existing spillway in NP 1 and replace with new spillway and construct new spillway for the NP2 reclaim compartment.
- Preserve existing pipe spillway in NP2 to convey non-contact to discharge non-contact water.

1.0 INTRODUCTION AND BACKGROUND

White Pine Copper, LLC (WPC) retained Tetra Tech to complete the design associated with the management of tailings to support the White Pine North Project (the Project). This report presents the design associated with the future surface disposal of tailings generated from the Project.

1.1 Scope of Study

The scope of the design was to evaluate various options for the future surface disposal of tailings to support future mine operations associated with the Project. Following selection of a preferred option, Tetra Tech advanced the design of the preferred option to a detailed level of design. Major components of the study included the development of the basis of design, tailings deposition design, surface water and reclaim water management, and required earthworks to support the options. This study relies on information and inputs from various components conducted by other consultants including mine planning (Stantec), mineral processing (Ausenco), tailings thickening (Paterson and Cooke), site-wide surface water (Foth) and groundwater management.

1.2 Site Background

Discharge of tailings from the White Pine Mine (WPM) occurred between 1955 and 1995 and were managed in three TDFs, including the South Pond (SP), North Pond 1 (NP1) and North Pond 2 (NP2). A total of approximately 150 million short tons (150 SMT) were disposed of in the three TDFs. The Legacy TDFs have undergone reclamation, and for the past decade have been operating in a post-closure status. The location of the Legacy TDFs is shown on **Figure 1-1** (below).

1.2.1 Mine Vertical Datum

Many of the historical drawings related to the TDFs (e.g. those presented as Figure 1-2, Figure 1-3, Figure 1-4, and Figure 1-5**)** include elevations in the historical mine elevation datum. To convert to feet above mean sea level or meters above mean sea level the elevations should be subtracted by 4396.44.



Figure 1-1 – Legacy Tailings Disposal Facilities

1.2.2 South Pond

The South Pond (SP) area consists of three dams, constructed between 1958 and 1962, that make up the western, northern, and eastern edges of the basin. The southern boundary of SP is generally marked by an existing railroad grade. At the time of dam construction, active mine workings existed beneath SP at depths ranging from 500 to 1,600 feet below ground surface (bgs). The area under SP had been previously mined and some subsidence had occurred. Due to a concern for subsurface mine safety, tailings were not initially deposited in SP after the dams were completed. In 1993, additional disposal capacity was required; the SP was then refurbished and reactivated during the fall of 1994. (subsurface mining under the area of SP had ceased by 1993.) Sewage treatment effluent, excess cooling water from the power plant, and mine discharge water from mine surface discharge location 3 (MSD-3) were discharged directly into SP. After 1994, the SP was the only basin to receive mill tailings. In October 1996, all discharges into SP were discontinued. Portions of the dams were removed and used as clay cover over the adjacent tailings as part of an approved Interim Response Activity Plan (IRAP) (MFG, 2005).

1.2.3 North Pond 1

NP1 tailings impoundment was constructed during the 1950s and 1960s; first put into service in 1954, and continued receiving tailing until 1971. A total of approximately 91.6 SMT of tailings were placed within the NP1 facility between 1954 and 1971.

The NP1 consists of an approximate 7.5-mile long embankment, in an irregular rectangular shape, with containment embankments on the west (1.4-mile), north (2.4-mile), and east sides (1-mile), constructed of native earth materials. The south side (2.7-mile) of the tailings impoundment is bounded by a road embankment. The embankment height is typically in the range of less than 10 feet along the southwest to 60 feet along the north embankment. The impoundment covers an area of approximately 1,870 acres. Mill tailings material was placed as a slurry and a permanent pool covering; approximately 82 acres is located along the northeastern portion of the impoundment. The dam is currently classified as a “low” hazard dam under the Michigan Dam Safety Program (i.e. Part 315 of the Natural Resources and Environmental Protection Act, 1994 PA451, as amended (NREPA)).

A plan view and typical cross-section of NP1, provided on Figure 1-2 and Figure 1-3 respectively, shows a typical cross-section of the dam. The embankment dam was constructed with locally borrowed earth fill, primarily silty clay, with a downstream construction method in four stages between 1954 and 1964. The crest width is typically 20 feet, and the overall downstream slope is 2(H):1(V), maximum, between the dam crest and the downstream toe, with most areas along the north, northwest, and northeast having side slopes of approximately 2.2(H):1(V) to 2.5(H):1(V). The dam crest elevation varies from approximately 5,250 ft along the northeast embankment to 5,260 ft (El. 853.56 to 863.56 ft [above mean sea level] AMSL) in the southeast.

1.2.4 North Pond 2

NP2 began receiving tailings in 1970 following construction of the upstream and downstream starter dams in 1968 and 1969. Cyclone sands and native clay materials were used to construct the remainder of the dam and tailings deposition within the impoundment ceased in 1993. A total of approximately 92 SMT of tailings were placed within the NP2 facility between 1970 and 1993. This is approximately 34 percent of the total original design volume of 270 SMT of tailings.

The tailings dam for the NP2 extends approximately 5.5 miles and includes embankment on the west (1.2 miles), north (2.84 miles), and east (1.36 miles) sides. The embankment dam along the north, east, and west tailings dam were constructed by the downstream method with two starter dams (upstream and downstream) constructed using low-permeability native silty clay. Cyclone sand from the tailings were placed between the two starter dams and subsequent raises were constructed with native clay materials compacted over the previous clay raises and consolidated sands. Operation of NP2 ceased before the dam was constructed to its full design height, leaving an exposed area of cyclone sands between the raised clay embankments in a configuration that has created a bench between two steeper sections of embankment. The embankment varies in height from less than 10 feet at the southeast and southwest abutments, adjacent to the NP1 embankment, to approximately 55 to 70 feet high in areas along the north embankment. The maximum structural height from the crest to the invert of the perimeter drainage channel is approximately 80 feet along the northwest portion of the dam. The crest width is typically 20 feet, and the downstream slopes are an average 2(H):1(V) for the upper and lower sections of embankment, and an overall average downstream side slope of approximately 3(H):1(V) from the main dam crest to the downstream dam toe. The embankment crest elevation varies from approximately 5,197.5 ft to 5,198.5 ft with an average elevation of approximately 5,198 (El. 801.6 ft AMSL). The dam is currently classified as a “significant” hazard dam under the Michigan Dam Safety Program (i.e. Part 315 of NREPA, 1994 PA 451).

A plan view and typical cross-section of the dam is shown in Figure 1-4 and Figure 1-5, respectively. NP2 covers an area of approximately 2,400 acres and the permanent pond covers approximately 105 acres in the northeast portion of the impoundment. The original NP2 starter dam was constructed 1968 through 1970 and the tailings dam was constructed to approximately 60 percent of the total design height by 1993, when tailings deposition ceased at the impoundment.

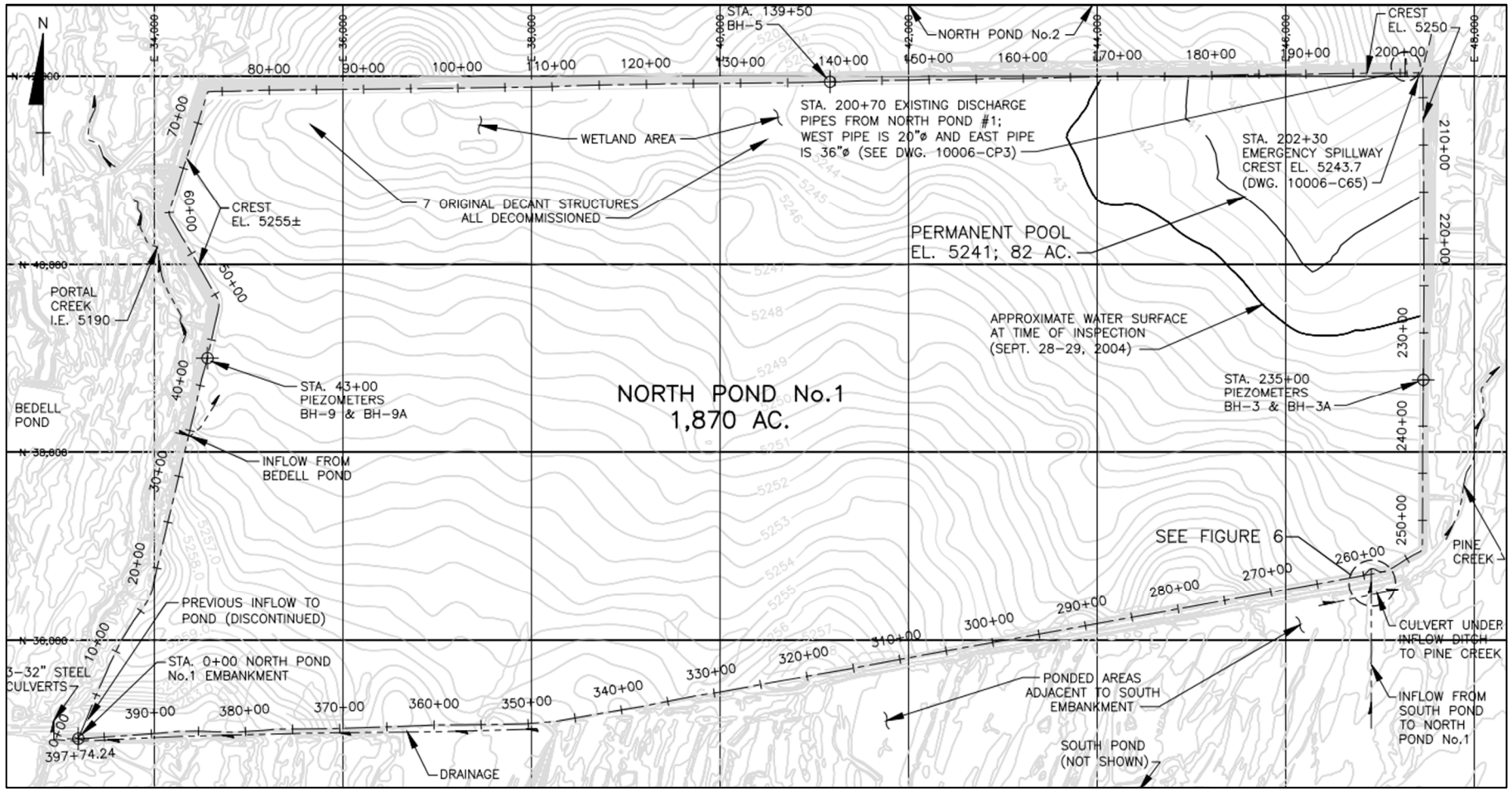


Figure 1-2 – North Pond 1 Plan View

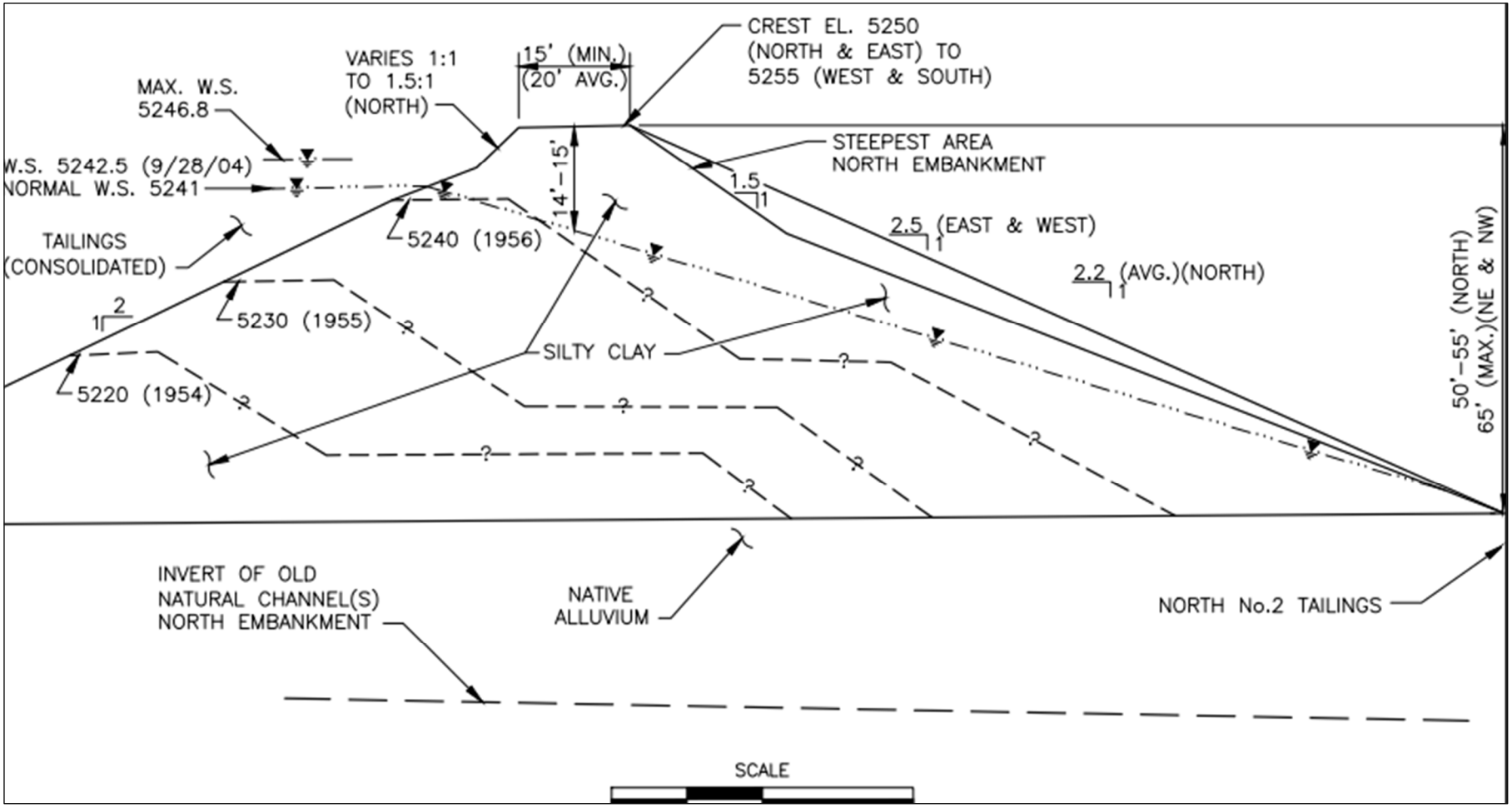


Figure 1-3 – North Pond 1 Typical Cross-Section

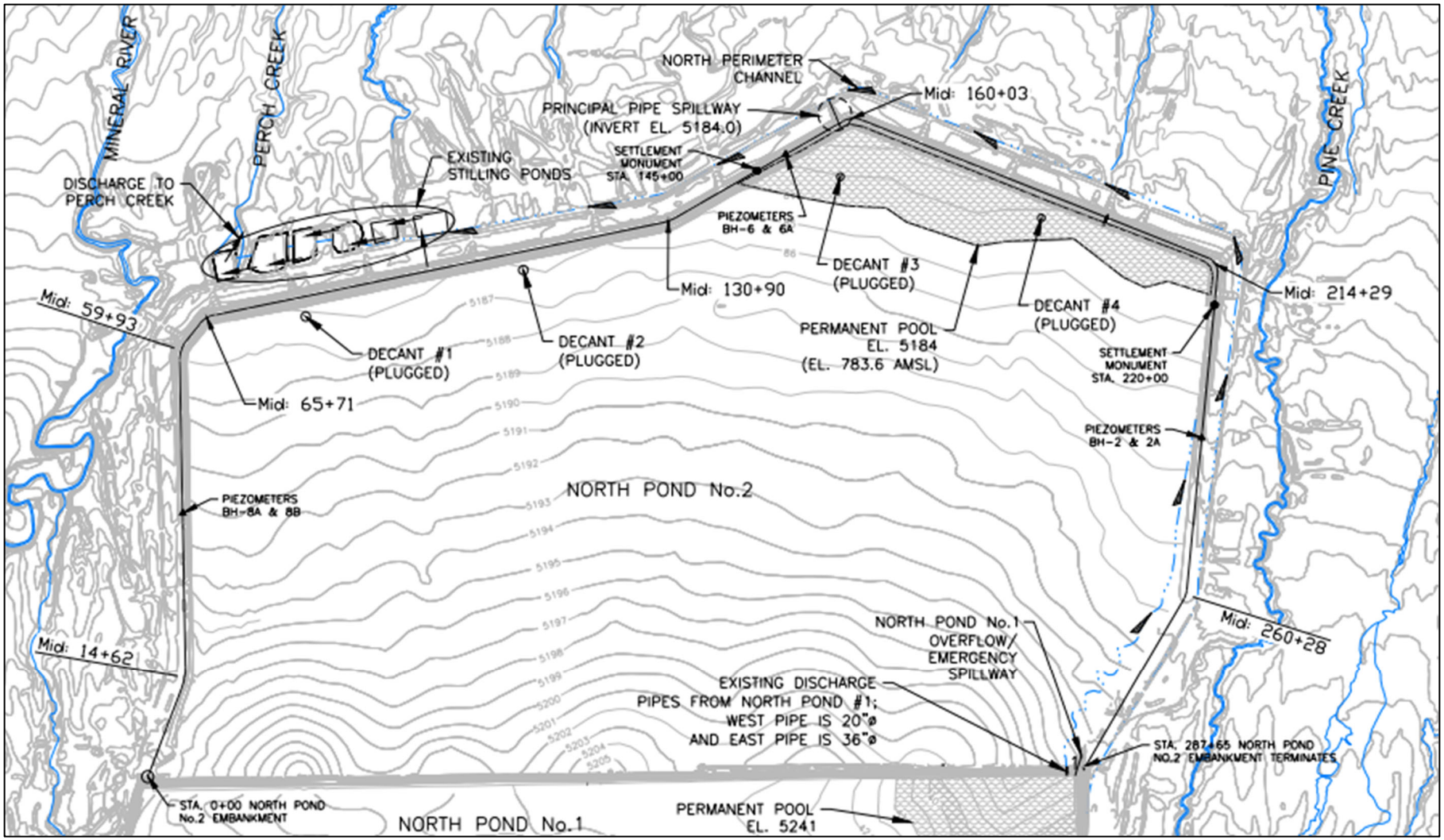


Figure 1-4 – North Pond 2 Plan View

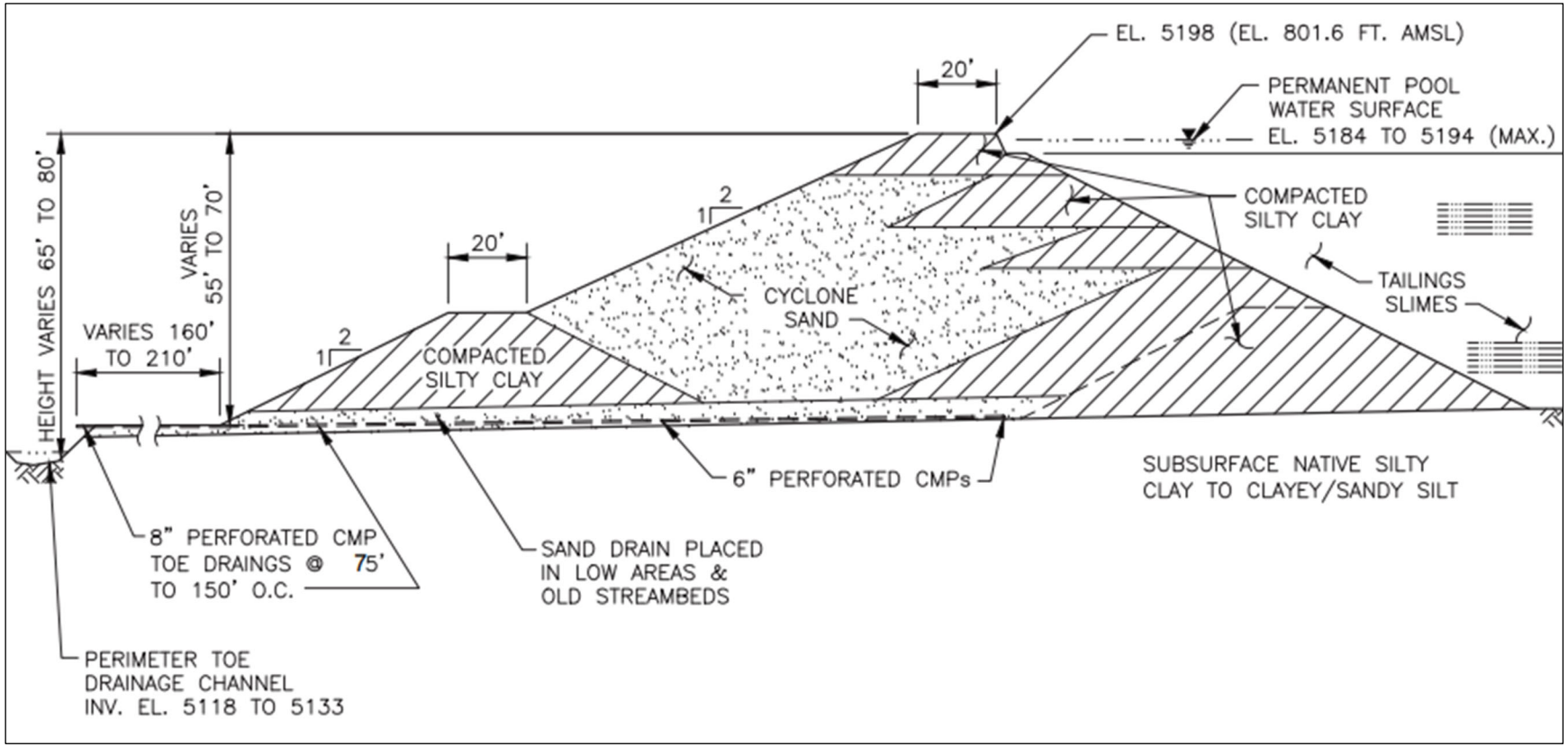


Figure 1-5 – North Pond 2 Typical Cross-Section

1.3 Proposed Project

The Project is estimated to have a 26-year mine life and is anticipated to produce approximately 15,000 dry metric tonnes (Mt) of ore per day and a total of 133.6 Mt of tailings. The Project will utilize the legacy tailings disposal facilities (Legacy TDFs), NP1, and NP2 for disposal of the tailings. Prior to discharge to the TDFs, the tailings will be sent to a thickener to increase the percent solids by weight of the tailings.

2.0 SITE CONDITIONS

2.1 Site Location

The mine site is located within the western portion of the Upper Peninsula of Michigan, approximately 5 miles south of Lake Superior. The mine site is adjacent to the town of White Pine in Ontonagon County in Township 50 North and Range 42 West. Nearby towns include White Pine to the west, Silver City to the North, Ontonagon to the northeast, and Bergland to the south.

2.2 Hydrogeological Setting

2.2.1 Topography

The site's surface topography slopes to the north towards Lake Superior. Surface elevations range from approximately 306 meters (1,004 ft) above sea level (m-asl) at the southern end of the site boundary to approximately 185 m-asl (607 ft-amsl) at the Lake Superior shoreline. Several streams and creeks flow through the site, generally from the south to the north towards Lake Superior.

2.2.2 Site Geology

The White Pine North site is located near the southern periphery of the Canadian Shield. The underlying bedrock are of the Precambrian age, which are overlain by unconsolidated and glacial-lacustrine sediments of the Pleistocene and recent ages.

Unconsolidated surficial deposits of mainly glacial and lacustrine origin are deposited on top of the Precambrian age bedrock and range in thickness from 0 to 330 feet within the site boundary. The majority of unconsolidated soil is Pleistocene clay till. Below the glacio-lacustrine surficial clay unit, the bulk of the glacial till is sandy clean clay with minor fractions of gravel.

The base of the till commonly contains bedrock boulders in a silty and sandy matrix, which transitions to a clay in the upper profile. The uppermost Pleistocene deposits are lacustrine clay.

Underlying the unconsolidated surficial deposits are the Freda Sandstone, Nonesuch Shale, and Copper Harbor Conglomerate bedrock formations of the Precambrian Keweenawan age. The bedrock formations are underlain by the older Porcupine Volcanics and Portage Lake Lava Series. The Precambrian bedrock formations are consolidated and highly cemented (Shephard Miller, Inc. 1995).

2.2.3 Groundwater

Groundwater underlying the site is present in an upper aquifer consisting of the basal sandy silt till and within the upper 10 to 20 feet of the three bedrock formations. Groundwater in the upper sandy till is low (<500 mg/L) in total dissolved solids (TDS). The sand till aquifer is hydraulically connected to the underlying bedrock via a fracture-based transmissive zone within the upper 3 to 6 meters (10 to 20 feet) of the bedrock.

The horizontal hydraulic gradient in the shallow till aquifer is predominantly north in the direction of Lake Superior. Based on groundwater monitoring well data, the shallow aquifer is under confining conditions. Meteoric recharge to the aquifer system has been estimated at 4.5 inches per year (Shepard Miller, 1995).

Groundwater in bedrock previously contacted by historical mine workings is considered a brine with TDS concentrations greater than 100,000 mg/L. The equivalent hydraulic gradient of the bedrock has been measured to be $<1x10^{-7}$ cm/sec.

Observations from historical mine operations indicate that the entry of water into the mine is limited by the low transmissivity and primarily via secondary features such as fractures and minor faults. Supply wells drilled near Lake Superior into bedrock have had salty water detected as shallow as 78 feet (Shephard Miller, 1995), indicating that the lake serves as a discharge boundary for what little groundwater migrates through the bedrock. By contrast, drill holes within the mine vicinity do not typically encounter brackish or saline water above 90 meters below ground surface (m bgs).

Currently, water level in the mine cavity is artificially maintained at a prescribed elevation equal to the Lake Superior level. The rate of yield from the bedrock is low enough, and the thickness of the non-saline surface layer thick enough, such that the mine water can be extracted and discharges to NP1, from which point it mixes with the surface runoff that leaves NP2 via the National Pollutant Discharge Elimination System (NPDES) outfall.

2.2.4 Surface Water

The site is located approximately five miles from Lake Superior. The surface water system in the vicinity of the project includes the Mineral River, Perch Creek, and a number of smaller perennial streams, all of which flow principally to the north into Lake Superior. Other surface water features of interest include the three currently reclaimed TDFs, which occupy roughly six square miles and numerous -wetland areas, created from beaver dams and development of borrow sources for the construction of the TDF embankment (Shephard Miller, Inc. 1995).

Major contributors to the Mineral River include the discharge from NP2 at outfall 001 on Perch Creek. The outfall is regulated under NPDES Permit (MI0006114). River base flow is contributed from influent from the shallow aquifer.

3.0 SUPPORTING STUDIES AND INVESTIGATIONS

A trade-off study, tailings thickening (dewatering) studies, and a geotechnical investigation of the legacy TDFs, NP1 and NP2, were conducted to support the design related to tailings management. The scope and results of these studies are presented below.

3.1 Tailings Thickening Studies

WPC retained Paterson and Cooke (P&C) to support the design associated with tailings thickening and conveyance design and beach slope rheology predictions. The study focused on completing settling tests, dynamic thickening studies, and rheology test work. The results of which were used by P&C to develop the detailed level design and equipment sizing for the tailings thickening process equipment and tailings conveyance pumping and piping system as well as used by Tetra Tech to further advance the tailings deposition designs. A complete description of the results of the test work (P&C, 2025a) and tailings thickening and conveyance design (P&C, 2025b) are presented in separate reports prepared by P&C provided in Appendices A and B of the report.

P&C subcontracted Water, Waste and Land Australia Pty Ltd (WWL) to perform beach slope rheology modeling to evaluate predicted beach slopes based on the rheology testing completed by P&C and the deposition designs developed by Tetra Tech. The modeling indicated that a minimum beach slope of 2% was achievable. Refer to Appendix C for beach slope modeling report (WWL, 2026).

3.2 Geotechnical Investigation

A geotechnical investigation was conducted in March 2025 focusing on collecting additional data to characterize the in-situ properties of the existing NP1 and NP2 embankments and foundation soils and collecting data to assess remolded properties of the legacy tailings and SP existing embankments. The data collected in 2025 was used to augment the geotechnical investigation completed by Golder and Associates (Golder) completed in 1998. The data from the 1998 and 2025 investigations were used to assess the structural integrity of the legacy TDFs under current conditions as well as to support the future tailings deposition design. Based on the findings of the report, the legacy TDFs were determined to generally have adequate factor of safety against failure based on current and future static and pseudo-static loading scenarios. The northwest embankment of NP1 showed modeled factor of safety under a steady state seepage static and pseudo-static loading conditions below the recommended minimum of 1.5 and 1.1, respectively. It was recommended to consider buttressing this portion of the NP1 embankment to bring the factor of safety to a minimum of 1.5. A report detailing the results of the 2025 geotechnical investigation and a summary of the 1998 geotechnical investigation is presented in Appendix D.

4.0 WATER MANAGEMENT

The legacy TDFs are currently used to manage various sources of water from the historical mine and will be used in the future to manage water sources generated from the WPN Mine. Therefore, water management of the TDFs was a major consideration in developing the tailings deposition design. The sources and quantity of legacy and new water sources that will be discharging to the TDF, as well as the preferred methodology for managing water on the TDF during operation are discussed below.

4.1 Legacy Water Management

Under its current legacy operation, the TDFs receive the following water inflows:

1. Precipitation falling directly on SP, NP1, and NP2.
2. Stormwater runoff from other areas of the former plant site, which are collected in Bedell Pond.
3. Historical Mine Workings Dewatering Water.

A block flow diagram showing the various inputs into the legacy TDF system is presented in Figure 4-1. As shown in Figure 4-1, the TDFs operate in series, with the SP discharging to NP1, and all water in NP1 discharging to NP2 via overflow pipes and seasonally through an overflow spillway. Water accumulating in NP2 is discharged through a 96-inch pipe spillway to the environment via the permitted Perch Creek Outfall 001. Flow readings for Outfall 001 from 2018 to 2024 are shown in Figure 4-2. As shown, the average peak annual discharges occur in April and May, giving strong argument to the fact that the current water balance of the TDF system is dominated by natural precipitation falling as both rain and snow, as well as snowmelt. Based on their respective areas, SP, NP1, and NP2 are expected to contribute 24%, 33.4% and 42.6% of the flow to Perch Creek Outfall 001 during peak flow, neglecting the Bedell Pond and Old Mine Dewatering System. This would result in an average peak flow of 6.7 million gallons per day (MGD) from SP, 9.32 MGD from NP1, and 11.88 MGD from NP2.

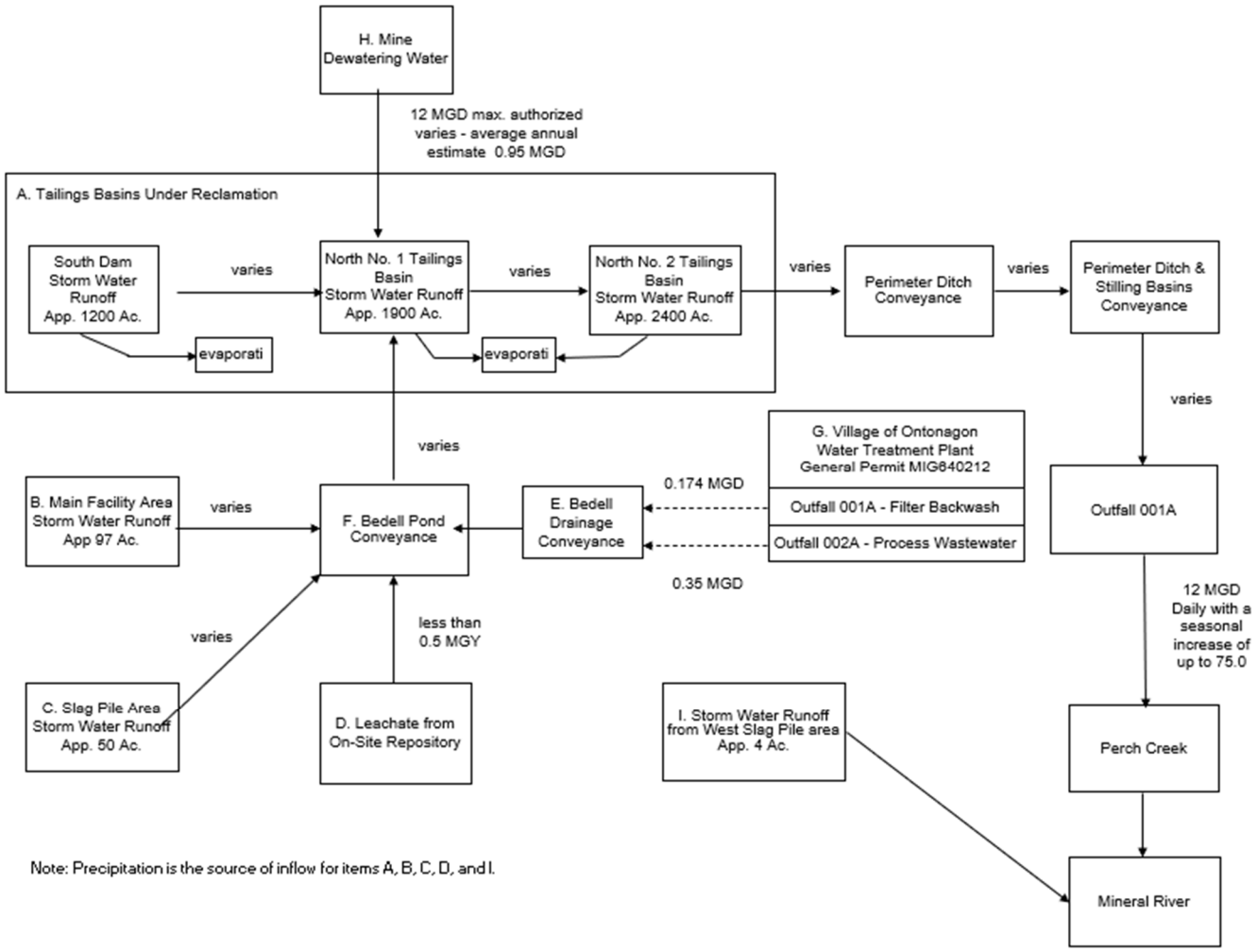


Figure 4-1 – Legacy Tailings Water Management Process Flow Diagram

2018-2024 Outfall 001 Daily Discharge Flow Rate Summary

Month	Minimum	Maximum	Mean	Median
January	1.41	13.50	4.08	3.17
February	1.07	17.24	3.49	2.63
March	1.19	91.44	9.25	4.33
April	1.54	87.46	27.89	17.18
May	0.75	65.08	14.62	5.75
June	0.08	23.72	4.00	2.21
July	0.02	19.43	2.91	1.65
August	0.02	11.52	1.30	0.33
September	0.00	12.83	1.13	0.28
October	0.00	55.48	4.92	0.67
November	0.00	47.65	6.84	5.84
December	0.60	19.73	5.58	4.50

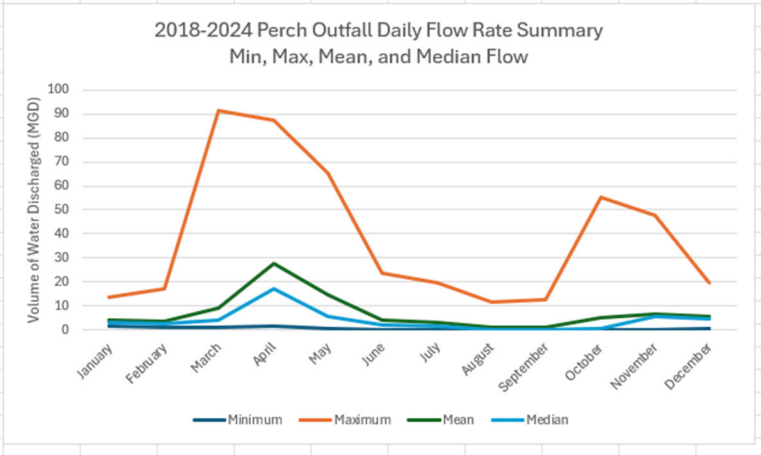


Figure 4-2 – Perch Creek Outfall 001 Discharge Data

4.2 Future Water Management Approach

Tetra Tech has coordinated with Foth and WPC to develop a preferred water management approach for the TDFs to support future operation. To facilitate obtaining future discharge permits for the mine, the water entering the TDFs will be characterized as non-contact or contact water. Non-contact water refers to all legacy water associated with historical/legacy operations, including precipitation/stormwater coming into contact with legacy tailings. Contact water refers to water anticipated to be generated from the new mining operations, including precipitation falling on the future tailing deposition areas and bleed water being released from the newly deposited tailings. A summary of the non-contact and contact water anticipated to be discharged to the TDFs during future operations is presented in Table 4-1.

Table 4-1 – Summary of Contact and Non-Contact Waters

Water Source	Water Type
Old Mine Dewatering	Non-Contact
South Pond Runoff	Non-Contact
Runoff from Legacy Tailings	Non-Contact
Bedell Pond Discharge	Contact
New Mine Dewatering	Contact
Future Tailings Discharge (Bleed Water)	Contact
Runoff from Future Tailings Deposition Area	Contact

Under future operations, non-contact water will be discharged to the existing permitted Perch Creek Outfall 001, while contact water will either be pumped back to the process plant as make-up water, pumped to a future water treatment plant for treatment prior to discharge, or under extreme weather events discharged through a spillway offsite.

The current site-wide water management philosophy considers the entire footprint of NP1 as a contact water basin and, as such, will not receive any non-contact water. All non-contact water will be directed to and discharged from NP2, through the existing Perch Creek NPDES Outfall.

Prior to deposition of tailings in NP2, it will be divided into separate non-contact and contact water areas to allow these waters to be managed separately. Excavation of trenches and construction of berms to separate contact and non-contact water and establishment of separate stormwater (non-contact) and reclaim (contact) basins within NP2 will prevent comingling of non-contact and contact waters.

In addition to managing process related streams and “typical” annual precipitation, it was an objective of the design to develop a management strategy for NP1 and NP2 to minimize discharge of contact related stormwater, even under low probability storm events. These low probability events were considered to prevent failure of the embankment due to overtopping. This requires surplus water to be pumped to a water treatment plant to maintain NP1 and NP2 at established water elevations to provide buffer storage capacity in each pond to contain the runoff volume from low probability design storm events. Maintaining these buffer storage water elevations will rely on pumping that can be prone to failure, either due to pump failure or loss of electrical power. As such, spillways were included in the design to ensure that the ponds will be able to pass the low probability storm events in the event of a pumping system failure to prevent overtopping of NP1 and NP2. Additional discussions regarding the design of surface water infrastructure to support the future water management strategy are presented in Section 6.5.

5.0 DESIGN CRITERIA AND PROCESS FLOW

5.1 Project Sequencing

The proposed approach to managing future tailings will be to first deposit tailings on NP1 and once NP1 has reached its design capacity transfer deposition to NP2 for the remaining life of mine (LOM). The duration of tailings deposition and corresponding quantity of deposited tailings are based on the tailings deposition designs.

5.2 Process Flow for TDFs

Process flow diagrams (PFDs) have been developed for NP1 and NP2 and submitted separately as 108571-ER-03100-31342-001-05 and 108571-ER-03100-31342-002-05, respectively. The tailings disposal facilities (TDFs) will receive the inputs listed in Table 5-1.

Table 5-1– List of Future Input Sources to Tailings Disposal Facilities

Input	Discharge Point	Input Description
Bedell Pond (includes process plant contact water)	NP1 and NP2	Pond receives contact water from Plant area and runoff water from legacy White Pine Mine areas.
Thickened Tailings	NP1 and NP2	Discharges thickened tailings to TDFs during normal plant operations.
South Pond Runoff	NP2	Surface water runoff from South Pond will be conveyed to directly discharge to NP2.
North Pond 1 Contact Water Overflow	NP2	Excess reclaim (contact water) in NP1 may be discharged via a spillway to NP2 during periods of high precipitation when reclaim system cannot pump sufficient reclaim water to the process plant or water treatment plant.
Historical Mine Working Dewatering	NP2	Historical mine working dewatering system will be conveyed to NP2 during the life of mine.
White Pine North Mine Dewatering System	NP1 and NP2	Dewatering flows will be conveyed directly to NP1 and NP2 and then conveyed to process plant or water treatment plant from reclaim basins.

The outputs from the TDFs, which include reclaim water and discharge of surface water to the permitted outfall, are listed in Table 5-2.

Table 5-2 – List of Future Outputs from Tailings Disposal Facilities

Input	Discharge Point	Output Description
NP1 Reclaim Water	Process Water Tank and Water Treatment Plant	During the period when tailings are being deposited to NP1, reclaim water will be sent to the plant process water tank (2813-TK-009) and surplus water sent to the water treatment plant.
NP1 Reclaim (Contact) Water Overflow	NP2	In the event that the process plant or water treatment plant capacity is reached due to high precipitation events, excess reclaim (contact) water will be conveyed to NP2 to prevent embankment overtopping.

Input	Discharge Point	Output Description
NP2 Reclaim Water	Process Water Tank and Water Treatment Plant	During the period when tailings are being deposited to NP2, reclaim water will be sent to the process water tank and surplus water sent to the water treatment plant. Reclaim water discharge to the process plant and water treatment plant will be conveyed in a common portion of pipeline with NP1.
North Pond 2 Non-Contact Water Overflow	Permitted Outfall (001 - Perch Creek)	Non-contact water including precipitation falling directly on NP2 legacy tailings, South Pond conveyed surface water, and historical mine workings dewatering flows will be conveyed through the existing emergency pipe spillway.
North Pond 2 Reclaim (Contact) Water Overflow	Permitted Outfall (001 - Perch Creek)	In the event that the process water tank or water treatment plant capacity is reached, excess reclaim (contact) water will be discharged via a new spillway to the permitted outfall to prevent embankment overtopping.

In addition to the inputs and outputs listed in Table 5-1 and Table 5-2, the reclaim water pumping system for NP1 and NP2 will also be connected to the respective tailings deposition system to allow flushing of the tailings deposition tower piping system.

5.3 Design Criteria

The design criteria to be used for the development of the tailings deposition design, reclaim pump systems, and surface water management infrastructures associated with the TDFS are presented in Table 5-3.

Table 5-3 – Design Criteria for Tailings Management

Design Criteria	Value	Source
Tailings Deposition Design Criteria		
LOM	26 years	From Ausenco Common Values and Reference Sheet 108571-GX-00000-11100-001-02
LOM Dry Tailings Production	133.6 million tonnes	Based on Stantec mine plan received March 16, 2026.
Hourly Tailings to Thickening	653 dry tonnes per hour	Paterson and Cooke mass balance 31-1983-PR-PFD-0002.
Influent Criteria		
Thickened Tailings Discharge Liquid Volumetric Flow Rate	436 m3/hr	Paterson and Cooke (2026) Mass Balance Rev_B.
Bedell Pond Discharge Flows	17.4 m3/hr	Based on Foth Water Balance dated 3/3/2026.
White Pine North Dewatering (Peak)	191.88 m3/hr	Based on Foth Water Balance dated 3/3/2026.
Former Mine Workings Dewatering	124 m3/hr	Based on Foth Water Balance dated 3/3/2026.
Precipitation Flow to NP1	214 m3/hr	Based on Foth Water Balance dated 3/3/2026.
Precipitation Flow to NP2	220.25 m3/hr	Based on Foth Water Balance dated 3/3/2026.
Reclaim Water Pump System		

Design Criteria	Value	Source
NP1 Max Reclaim Flow Rate to Process Water Tank	411 m3/hr	Based on Foth Water Balance dated 3/3/2026.
NP1 Max Reclaim Flow Rate to Water Treatment Plant	418 m3/hr	Based on Foth Water Balance dated 3/3/2026.
NP2 Max Reclaim Flow Rate to Process Water Tank Range	411 m3/hr	Based on Foth Water Balance dated 3/3/2026.
NP1 Max Reclaim Flow Rate to Water Treatment Plant Range	471.22 m3/hr	Based on Foth Water Balance dated 3/3/2026.
Surface Water Management Infrastructure		
South Pond Diversion Storm Event	100-yr 24-hr	Per 12/8/2025 email from Amanda Zeidler.
NP1 Reclaim (Contact) Water Overflow Spillway Storm Event	1,000-yr 24-hr	Based on meeting GISTM standards for significant hazard.
NP2 Reclaim (Contact) Water Overflow Spillway Storm Event	0.5PMF	Meets Michigan Dam Safety standards (0.5 PMP) and GISTM standards (2,745 yr) for a high hazard dam.
NP2 Non-Contact Water Storm Event	0.5 PMP	Meets Michigan Dam Safety standards (0.5 PMP) and GISTM standards (2,745 yr) for a high hazard dam. The existing emergency pipe spillway has already been confirmed to be capable of passing the PMP.

6.0 DESIGN FOR TAILINGS MANAGEMENT

This section presents the design associated with tailings management within the legacy TDFs including a description of the following:

- Tailings deposition design
- Earthworks
- Piping
- Water Management
- Reclaim water pumping and piping system

Refer to Appendix E for design drawings.

6.1 Tailings Characteristics and Deposition Design

6.1.1 Tailings Characteristics

Tailings characteristics critical to the development of the tailings deposition and conveyance designs include predicted beach slope rheology, yield stress, and final consolidated dry density of the tailings. As mentioned in Section 3.1, P&C completed extensive test work on the samples generated from the dynamic thickening tests. Additional geotechnical testing was performed by Advanced Terra Testing out of Lakewood Colorado on samples of the thickened tailings generated from P&C's test work to determine the hydraulic conductivity, strength, and consolidation properties. The design values for the thickened tailings used as the basis for the tailings deposition and conveyance designs are presented in Table 6-1.

Table 6-1 – Thickened Tailings Characteristics

Design Criteria	Value	Source
Tailings Specific Gravity	2.768	Table V of Paterson and Cooke's (2025) Test Work Report Rev_B.
Thickener Underflow Solids Concentration	62%	Based on Paterson and Cooke's (2025) Test Report Rev_B.
Fully Sheared Yield Stress	80 Pa	Based on Paterson and Cooke's (2025) Tailings System Hydraulic Report Rev_B.
Beach Slope	2%	Based on Water, Waste and Land's (2026) Report Rev_B.
Zero Free Water Solids Mass Concentration	76.9%	Table VIII of Paterson and Cooke's (2025) Test Work Report.
Final Consolidated Dry Density	1.46 tonnes/m^3	Based on consolidation testing and review of other thickened tailings performance data.
Final Consolidated Solids Concentration	81%	Based on a specific gravity 2.768 and a final dry basis moisture content of 23%.

The two key parameters in achieving the required capacity to store the 133.6 Mt of dry tailings within the footprint of NP1 and NP2 is the final beach slope and consolidated dry density of the thickened tailings. To support the tailings rheology and consolidation testing completed by P&C and ATT, respectively, Tetra Tech conducted a literature review of the performance of other mine sites utilizing similar thickened tailings deposition. A summary of this literature, including where available field verified beach slope and in-situ dry density of the tailings, is presented in Table 6-2.

The final consolidated dry density depends on several factors including the solids specific gravity, tailings slurry solids content, tailings minerology, deposition methodology, and depth of the tailings deposition. Case-studies summarized in **Table 6-2** indicate that for a thickened tailings slurry with a nominal solids content of 60% and a solids specific gravity of 2.768, a final consolidated dry density of the tailings of 1.46 to 1.70 tm^3 with an average beach slope of 2% is achievable. This is supported by the tailings consolidation testing (refer to Appendix F), which indicates that under optimal conditions the tailings could consolidate to a dry density of 1.8 t/m^3 under the predicted consolidation pressures. The deposition design discussed in Section 6.1.2, was based on achieving the required storage of 133.6 Mt of dry tailings based on a conservative dry density of 1.46 t/m^3 and a beach slope of 2%.

Table 6-2 – Summary of Literature Reviewed Reported Dry Densities ad Beach Slope of Thickened and Paste Thickened Tailings

Mine	Ore Type	Solids Specific Gravity	Particle Size of Tailings	Percent Solids of Tailings Underflow (%)	Dry Density (t/m3)	Average Beach Slope (%)	Reference
Not Specified	Copper	2.64	50% retained on 75 µm	57	1.6	2	The geomechanics of thickened and paste thickened tailings (Seddon KD, 2021)
Not Specified	Copper	3.5	80% passing 60 µm	70	1.6	Not Specified	Consolidation of Copper Tailings (N.P. Raposo, 2019)
Musselwhite	Gold	3.25	70% passing 75 µm	70	1.82	2	Thickened tailings disposal at Musselwhite Mine (S. Kam et. al, 2011)
Mine in Saudi Arabia	Phosphate	2.96	50% retained on 75 µm	35	NS	1	Tailings Central Thickened Discharge; Challenges Faced and Lessons Learned From Design to Operation. (SRK Consulting, 2016)
Sunrise Dam Gold Mine	Gold	NS	80% passing 75 µm	59 to 61	1.55	>2	Characterization of a thickened tailings beach (Seddon et.al., 2015)
Canadian Malartic Mine	Gold	2.74	73 to 95% passing 75 µm	60	1.4 to 1.72	Not Specified	Thickened Tailings Characterization Program for a Tailings Storage Facility Design Update – Case Study (Golder, 2015b)
CSA Mine	Copper/Silver	2.8	< 100 µm	50	1.2 to 1.4	3	Successful Transition of a Convention Slurry Tailings Storage Facility for Central Thickened Discharge (Golder, 2018b).

Mine	Ore Type	Solids Specific Gravity	Particle Size of Tailings	Percent Solids of Tailings Underflow (%)	Dry Density (t/m3)	Average Beach Slope (%)	Reference
Not Specified	Base metal	NS	62 to 74% passing 75 µm	65	1.65 to 1.7	Not Specified	Some Geotechnical Aspects of Closure – Case Study of a Thickened Tailings Valley Storage in Western Australia (Hogg C.S., 2010).
Kidd	Copper /Zinc	3.17	80% passing 100 µm	60 to 63	1.764	1.5	Canadian Experience in the Application of Paste and Thickened Tailings for Surface Disposal (Oxenford et al., 2006).

6.1.2 Deposition Design

The deposition design was developed based on the current approach to dispose of the tailings first on NP1 followed by NP2. The design was based on the disposal of 133.6 Mt of dry tailings with a final consolidated dry density of 1.46 t/m^3 and a beach slope of 2%. A summary of the dry tonnes of tailings disposed of in NP1 and NP2, throughout the LOM, based on the deposition design presented in Appendix E is provided in Table 6-3.

Table 6-3 – Tailings Deposition Design Summary

Design Item	Value	Comment
NP1 Deposition Cones		
Number of Deposition Towers	3	Spaced 740 meters apart
Number of Deposition Points per Tower	12	4 deposition point will be operated at any one time.
Maximum Deposition Height	Approx. 20 m	Measured from elevation of existing tailings surface to top elevation of deposition towers.
Depositional Area	4,984,445 m^2	Corresponds to surface area of new tailings.
Tailings Volume	42,584,581 m^3	Consolidated volume.
Tailings Mass	62,173,488 dry tonnes	Converted from volume based on a final consolidated density of 1.46 t/m^3.
NP2		
Number of Deposition Towers	3	Spaced 1000 meters apart
Number of Deposition Point Per Tower	12	4 deposition point will be operated at any one time.
Maximum Deposition Height	Approx 18 m	Measured from elevation of existing tailings surface to top elevation of deposition towers.

Design Item	Value	Comment
Crest Deposition Points	62	Spaced 40 m apart.
Depositional Area	6,424,025 m^2	Corresponds to surface area of new tailings.
Cone Deposition Tailings Volume	38,223,221 m3	Consolidated volume.
Crest Deposition Tailings Volume	10,818,384	Consolidated volume.
Cone Deposition Tailings Mass	55,805,903 tonnes	Converted from volume based on a final consolidated density of 1.46 t/m^3.
Crest Deposition Tailings Mass	15,791,922 tonnes	Converted from volume based on a final consolidated density of 1.46 t/m^3.
Total Tailings Mass	71,597,825 tonnes	Converted from volume based on a final consolidated density of 1.46 t/m^3.

As summary of the total tonnes of tailings storage achieved based on the 1.46 t/m3 and the 2% beach slope along with stored tonnes based on a range of final consolidated densities is presented in Table 6-4. As shown in Table 6-4, based on a conservative dry consolidated density of 1.46 t/m^3, the current deposition design is capable of storing 133,771,313 dry tonnes of tailings or slightly over 100% of the required tonnage. It should be noted that if additional volume/tonnes of tailings are required to be stored due to lower than anticipated consolidated density, additional deposition directly off of the access causeways could be performed to fill in the valleys formed by the current deposition design.

Table 6-4 –Achieved Total Stored Dry Tailings Tonnes Based on a Varying Consolidated Dry Density

LOM Dry Tailings	**133,566,170**	**Metric Tonnes**							
TDF	**Volume (m^3) from CAD Deposition Design**	**Fill (tons) Dry Density = 1.46 tons/m^3**	**% of Required Tonnes**	**Fill (tons) Dry Density = 1.50 tons/m^3**	**% of Required Tonnes**	**Fill (tons) Dry Density = 1.55 tons/m^3**	**% of Required Tonnes**	**Fill (tons) Dry Density = 1.60 tons/m^3**	**% of Required Tonnes**
NP1	42,584,581	62,173,488	47%	63,876,872	48%	66,006,101	49%	68,135,330	51%
NP2 Cones	38,223,221	55,805,903	42%	57,334,832	43%	59,245,993	44%	61,157,154	46%
NP2 Crest	10,816,385	15,791,922	12%	16,224,578	12%	16,765,397	13%	17,306,216	13%
	Total Tonnes	**133,771,313**	**100%**	**137,436,281**	**103%**	**142,017,490**	**106%**	**146,598,699**	**110%**

6.2 Deposition System Operation

6.2.1 NP1 Tailings Deposition

The tailings deposition on NP1 was based on the following:

4. NP1 tailings will be deposited initially in three cones within the deposition area to maximum heights approximately 20 m. The locations of the three towers were located to create a 2% beach slope to the reclaim water pond area while eliminating the need to raise any of the existing NP-1 embankments. The cones would be created by depositing the tailings from deposition towers that would be raised along with the access causeways and maintenance pads as the height of tailings deposition increases. Only one tower would be depositing tailings at a time and would operate for a period of approximately two months initially with longer operating periods as the height of the deposition increases. Alternating the location of tailings deposition will allow time (approximately 6 month) for the tailings at each deposition point to dry and consolidate. It is estimated that a total of 62,173,488 dry tonnes of tailings will be deposited from the three towers.
5. Approximately 10% of the capacity of NP1 will remain open to provide contingent storage in the event of system disruptions such as pipe blockages or leaks during deposition in NP2.
6. A dedicated emergency tailings upset pipeline has also been included in the design and will discharge to the southwest corner of NP1. This line will activate in the event that there is a system disruption in the main tailings conveyance pipeline going to the NP1 discharge towers.

6.2.2 NP2 Tailings Deposition

1. NP2 tailings will be deposited initially in three cones within the deposition area to maximum heights approximately 18 m. The locations of the three towers were located to create a 2% beach slope to the reclaim water pond area while eliminating the need to raise any of the existing NP-2 embankments as well as preserving space to maintain a non-contact water compartment within NP2 (refer to Section 6.5 for description of water management of contact and non-contact water in NP2). The towers will be operated in a similar alternating fashion as the towers in NP1. It is estimated that a total of 55,805,903 dry tonnes of tailings will be deposited from the three towers.
2. Following the towers reaching the design tailings deposition elevation, tailings will be deposited from the North Embankment of NP1 using 62 spigots located on the embankment spaced at approximately 40 m intervals. At any one time 4 to 5 spigots will be discharging tailings with each set of 4 to 5 spigots being controlled with gate valves. Tailings discharged from these spigots would infill the low spots created from the deposition cones to maximize storage volume. It is estimated that a total of 15,791,922 dry tonnes of tailings will be deposited from the embankment discharge points.

6.3 Earthworks

Although no raises to the existing embankments of NP1 are required to support the future deposition of tailings, earthworks will be required to construct new berms to contain the extent of tailings deposition, separate contact and non-contact water compartment within NP2, and to provide sufficient access for maintenance vehicles to the reclaim pumping systems, along pipeline alignments, and to the central tailings discharge points. A summary of the total estimated volumes of earthworks is presented in Table 6-5.

Table 6-5 – Summary of Earthworks to Support Deposition Design

Earthworks Components	Quantity (m^3)	Comments
NP1 South Berm	1,115,424	Placed in pre-production years using a combination of waste rock and South Pond Embankment soil.
NP1 West and North Embankment Widening	25,472	Placed in pre-production years using legacy tailings.
NP1 Northwest Existing Embankment Buttress	16,042	Placed in pre-production years using Waste Rock
Initial NP1 Deposition Point Access Causeways	278,220	Placed in pre-production years using legacy tailings.
NP1 Deposition Point Access Causeway Raises	184,100	Placed through production Years 1 through 10 using South Pond Embankment soil.
Backfill of Existing NP1 Spillway	1,513	Placed in pre-production years using South Pond Embankment soil.
NP2 West Embankment Widening	17,230	Placed in production Year 10 using legacy tailings.
NP2 Contact Non-Contact Water Separation Berm	90,000	Placed in production Year 10 using legacy tailings.
Initial NP2 Deposition Points Access Causeways	858,805	Placed in production Year 10 using legacy tailings.
NP2 Deposition Points Access Causeways	262,925	Placed through production Years 11 through 24 using South Pond Embankment soil.

With the exception of waste rock and legacy tailings, the existing South Pond embankment which is estimated to contain 1.85 million m^3 of soil, will be the primary borrow source for earthworks. Based on the earthworks mass balance, there will be approximately 771,000 m^3 of South Pond soil remaining at the end of LOM.

The NP2 contact/non-contact separation berm will be constructed over existing legacy tailings and within the existing seasonal standing pool area. To support construction, the berm will be installed in late summer or early fall when the tailings are in a drier state and the standing pool area is the smallest. Legacy tailings used to construct the berm will be excavated by dozers pushing the tailings from both side of the berm's alignment. If necessary, construction of the berm may utilize temporary diesel pumps to further dewater the area prior to material placement.

6.4 Piping

6.4.1 Tailings Delivery Piping

Paterson and Cooke conducted hydraulic modeling to evaluate the required pumping and piping system to convey thickened tailings to the discharge points in NP1 and NP2. The design presented in Appendix B consists of high-pressure positive displacement pumps operating in parallel discharging to high density polyethylene (HDPE) lined steel pipe transitioning to HDPE SDR 9 pipe. The tailings delivery line for NP1 and NP2 from the tailings' thickener underflow tank (00-TK-002) to the southwest corner of NP1 will utilize a common pipeline, where a junction T and two gate valves will be installed to control tailings delivery to NP1 or NP2. The summary of tailings pipeline lengths and specifications is presented in Table 6-6.

Table 6-6 – Summary of Tailings Pipeline Lengths and Specifications

Pipe Specification	NP1 Length (m)	NP2 Length(m)
10inch HDPE lined carbon steel, Sch. STD, ASTM A53 Grade B, ERW, 0.28 inch (7.1 mm) liner, Class 900	569	0

Pipe Specification	NP1 Length (m)	NP2 Length(m)
10-inch HDPE lined carbon steel, Sch. STD, ASTM A53 Grade B, ERW, 0.28 inch (7.1 mm) liner, Class 600	929	3,320
10-inch HDPE lined carbon steel, Sch. STD, ASTM A53 Grade B, ERW, 0.28 inch (7.1 mm) liner, Class 300	2,032	2,006
12-inch HDPE SDR 9, ASTM F714, PE4710	1,335	2,409

To provide access for visual inspection, maintenance, and repairs, the tailings pipelines will be installed on the surface, except for those areas where the pipelines cross roadways. Michigan Administrative Code R425.203 Section C(xix)(F) requires the following as it relates to tailings transport lines:

"Tailings transport systems, if not buried, should be designed to provide for emergency tailings conveyance or storage should a pipeline break, plug, freeze or require repairs and be made accessible for inspection, emergency repair, and maintenance. Location of emergency spill areas shall be designed to prevent contamination of surface water. If a power failure occurs, then tailing pipelines shall be self draining to the tailings area or to an emergency spill area or standby pumps and pipelines or standby power shall be provided. In some cases (such as a long pipeline over rough country), several spill areas may have to be provided."

The majority of the tailing pipelines' alignment will be installed on the upstream side of the crest of the TDFs. Therefore, any breaks in the tailing pipelines in these areas will be contained within the perimeter of the TDFs. For the portion of pipelines outside of the TDFs and installed on the surface, impacted surface water due to a break in the tailings pipeline would report to the Bedell Pond, which is the main receiving pond from contact water for the mine processing facility. If a break were to occur, the main tailings pipeline would be shut down, and tailings conveyance would be switched to the Tailings Emergency Upset Discharge Line Discussed in Section 6.4.2. Tailings released outside of the perimeter of the TDFs would be excavated and disposed of in the TDFs.

6.4.2 Tailings Emergency Upset Discharge Line

In the event of a leak, breakage, or blockage of the NP1 tailings conveyance piping, thickened tailings will be temporarily discharged to the southwest corner of NP1 using a dedicated tailings emergency upset discharge pipeline. The summary of the tailings emergency upset discharge pipeline lengths and specifications is presented in Table 6-8.

Table 6-7 – Summary of Reclaim Water Pipelines

Pipe Specification	Length (m)
10inch HDPE lined carbon steel, Sch. STD, ASTM A53 Grade B, ERW, 0.28 inch (7.1 mm) liner, Class 300	1,000
12-inch HDPE SDR 9, ASTM F714, PE4710	2,000

6.4.3 Reclaim Water Piping

Reclaim water piping will be installed to send water pumped from the reclaim water pond in NP1 and NP2 to the process water tank (2813-TK-009) and/or the water treatment plant. Additional reclaim piping will be installed and connected to the HDPE tailings piping connected to the tailings deposition towers to allow the tailings pipelines to be flushed when not in use to prevent tailings from solidifying or freezing in the pipelines. A summary of reclaim pipeline lengths and specifications is presented in Table 6-8.

Table 6-8 – Summary of Reclaim Water Pipelines

Pipe Specification	NP1 Length (m) To Process Water Tank	NP2 Length(m) To Process Water Tank	Dedicated Common Reclaim Piping to Water Treatment Plant
HDPE Class 130 DR17, Class ,E4710	5,968	7,315	1,203

6.4.4 Former Mine Dewatering Piping

The dewatering system, of the former WPM underground workings, located near the southwest corner of NP1, will continue to remain in operation and is considered non-contact water. The existing piping will be extended to discharge to the southeast corner of NP2. The pipeline will be constructed of 10-inch SDR 17 HDPE pipe and will be approximately 5,881 m in length.

6.4.5 Mine Dewatering Pipeline

Water from the mine dewatering system will be conveyed to NP1 during the period of deposition and then extended to NP2's reclaim compartment when deposition begins in NP2.

6.4.6 Bedell Pond

Contact runoff water collected in the Bedell Pond will be pumped up to NP1 and subsequently extended to NP2's reclaim compartment.

6.5 Water Management

The following provisions were included in the deposition design for the thickened tailings to maintain consistency with the future water management philosophy:

1. Reroute run-off (non-contact water) from South Pond and former mine underground workings dewatering system to discharge directly to NP2.
2. Shift the location of the deposition cones in NP1 to the south to preserve the area of historical ponded water for use as a reclaim water pond to store the various water inflows.
3. A conveyance channel with a berm on its east side will be constructed in NP2 to convey contact water to the reclaim pond and deflect non-contact water into the stormwater compartment.
4. A berm will be constructed in NP2 to divide the historically ponded water area into separate reclaim and stormwater compartments.
5. Abandon the existing overflow pipes in NP1 to prevent contact water from entering NP2.
6. Abandon existing spillway in NP 1 and replace with new spillway and construct new spillway for the NP2 reclaim compartment.
7. Preserve existing pipe spillway in NP2 to discharge non-contact water.

6.5.1 Spillway Modifications and Sizing

Designs for modifications to the existing NP1 spillway invert elevations and size, and a new spillway for the NP2 Reclaim Compartment were completed to increase reclaim storage capacities as described further in Appendix G. Based on the

proposed spillway modifications and final depositional surface area, the storage capacities at the new proposed spillway invert elevations for NP1 and NP2 Reclaim Compartment are summarized in Table 6-9. Note the available topography only allows for storage to be calculated based on the surface water elevation at the time of the survey. Therefore, there is likely more storage available than calculated but the amount of storage below the water surface would need to be confirmed by performing a bathymetric survey.

Table 6-9 – Storage Capacities of NP1 Reclaim Pond and NP2 Reclaim and Stormwater Compartments

Compartment	Proposed Spillway Invert Elevation		Storage Capacity at Spillway Invert Elevation	
	(ft amsl)	(m amsl)	(acre-ft)	m^3
NP1 Reclaim Compartment	851.96	258.4	2669.58	2,669,624
NP2 Reclaim Compartment	795.75	242.61	2,157.81	2,660,842
NP2 Stormwater Compartment	787.60	240.12	254.24	313,600

The existing pipe spillway that will be located within the NP2 Stormwater Basin has been previously confirmed to convey the PMP for the existing conditions, which includes all stormwater runoff from the SP, NP1 and NP2 eventually discharging through this spillway. Therefore, the existing pipe spillway will remain in place to convey stormwater runoff from the SP and non-contact water compartment of NP2. Spillways will have a bottom width of 10 feet with 10:1 side slopes and will be constructed of concrete. This spillway sizing is more than capable of accommodating the design storm events, while allowing trafficability across the spillways to facilitate future operations and maintenance.

A flood or low flow discharge requests for NP1 and NP2 was made to EGLE, Water Resource Division and are provided in Appendix H. The written responses state the following:

- For NP1

  "Tributary to Mineral River at White Pine Mine North Tailings Pond No. 1, Dam ID 702, Section 28, T51N, R41W, Carp Lake Township, Ontonagon County, has a drainage area of 5.1 square miles. The design discharge for this dam is the 0.5% annual chance (200-year) flood discharge. The 0.5% and 0.2% chance peak flood discharges are estimated to be 2100 cubic feet per second (cfs) and 2600 cfs, respectively. The 0.5% and 0.2% chance flood volumes are estimated to be 1300 acre-feet (ac-ft) and 1600 ac-ft, respectively. (Watershed No. 56L Presque Isle (Lake).

- For NP2

  "Tributary to Mineral River at White Pine Mine North Tailings Pond No. 2, Dam ID 269, Section 16, T51N, R41W, Carp Lake Township, Ontonagon County, has a drainage area of 8.8 square miles. The design discharge for this dam is the 0.5% annual chance (200-year) flood discharge. The 0.5% and 0.2% chance peak flood discharges are estimated to be 2600 cubic feet per second (cfs) and 3300 cfs, respectively. The 0.5% and 0.2% chance flood volumes are estimated to be 2000 acre-feet (ac-ft) and 2500 ac-ft, respectively. (Watershed No. 56L Presque Isle (Lake).

The future spillways for NP1 and NP2 were designed to a 1000-yr (0.1% chance peak flood) and half the PMP event, respectively. Spillway discharge flows from NP1 will discharge to NP2, which will be combined with NP2 and SP stormwater flows and will cumulatively discharge through NP2's two spillways. Hydrologic modeling (refer to Appendix G) was conducted to estimate the spillway discharge flows and volumes from NP1 and NP2 as summarized in Table 6-10.

Table 6-10 – Peak Spillway Flows and Volumes for NP1 and NP2

Storm Event	Peak Spillway Inflow (cfs)			Spillway Discharge Volumes (acre-ft)		
	NP1	NP2 Reclaim Compartment	NP2 Stormwater Compartment	NP1	NP2 Reclaim Compartment	NP2 Stormwater Compartment
100-yr	NA	6.5	129.5	0	40	596.6
1000-yr	11.0	17.9	160.1	19.6	157.9	701.9
Half PMF	30.8	24.2	173.2	65.4	251	745.7

The hydraulic modeling accounted for attenuation and flood routing through the TDF discharge system. Based on the values presented in Table 6-10, the TDFs discharge system will have a cumulative discharge flow and volume of 197.4 cfs and 996.7 acre-ft, which are both less than the discharge flows and volumes stipulated in the discharge requests.

6.5.2 South Pond Diversion

To reduce the amount of water requiring management in NP1 and to avoid comingling of contact and non-contact water, runoff from the SP will be diverted around NP1 to discharge directly to the Non-Contact/Stormwater Basin of NP2. A 100-yr 24-hr storm event was selected for sizing the diversion system resulting in a peak discharge of 520 cubic feet per second (cfs). It was chosen to design the diversion system using a set of culverts. In order to convey the design peak discharge, it was determined that three 60-inch corrugated Type S pipe culverts were required. Refer to Appendix G for SP diversion system sizing.

6.6 Reclaim Water Pumping Systems

A reclaim pumping system will be installed first in the northeast corner NP1 followed in later years in the northwest corner of the NP2 reclaim basin. The pumps have been sized based on a required combined flow rate of up to 4,000 gpm to convey water through the reclaim pipelines to the process water tank and water treatment plant. The pumps will be positive suction (self-priming pumps) and will be capable of 15 feet of lift. The suction line will be constructed of 10-inch SDR 9 and will be ballast using concrete blocks to keep the suction piping submerged. Two pumps will be installed at each location and will operate one duty and one standby to provide redundancy. The current pumps are sized at 200 hp and power will be supplied by an overhead 13.8 KV powerline, the power from which will be stepped down with transformers to supply the required 480 volt 3-phase power. The pumps will be installed within a climate-controlled shed to provide all season serviceability.

The reclaim pump system will discharge to a common reclaim water pipeline, which will convey reclaim water to the process water tank for use in the mineral process and the water treatment plant for treatment prior to reuse or surface discharge. The flow rates to the process water tank and water treatment plant will be controlled using flow control valves controlled by ultrasonic flow meters.

7.0 PROJECT EXECUTION PLAN AND OPERATIONAL UPSET CONDITONS MITIGATION

7.1 Project Execution Plan

The execution strategy for tailings deposition will be implemented in a phased approach with deposition in NP1 occurring first followed by deposition in NP2. An execution strategy, organized by task in the general order of anticipated execution, is provided below.

7.1.1 Activities Prior to Deposition on NP1 (Years -2 and -1)

The following activities will be implemented beginning two years prior to depositing tailings on NP1:

1. Widen the west and north embankment crest of NP1 to provide sufficient space for pipelines and maintenance traffic.
2. Construct safety berms on crest of the NP1 embankment to be compliant with MSHA regulations (CFR §56.9300).
3. Construct containment berm located on the south side of NP1 using waste rock and soil from SP existing embankment.
4. Re-route runoff from SP around NP1 to the southeast corner of NP2.
5. Extend piping from former mine workings dewatering system to southeast corner of NP2 reclaim basin.
6. Install piping from Bedell Pond to northwest corner of NP1 reclaim basin.
7. Install initial height of tailings deposition towers in NP1.
8. Construct new reclaim basin spillway in northeastern portion of NP1 embankment.
9. Install reclaim water pump system and associated piping to process water tank and wastewater treatment plant.

7.1.2 Deposition on NP1 (Years 1 through 11)

The following activities will occur during deposition in NP2:

1. Operation of the towers will be alternated with an approximate stacking height of five meters. Between periods of operation each tower will be raised in 5-meter intervals. The raising of the deposition towers and causeways will be completed as follows:
    a. Open valve for the next deposition tower and once tailings starts to flow, close valve to previous tower.
    b. Open valve on reclaim pipeline to flush previously used tower of tailings. Once flush water discharging from spigot points is clear, close valve.
    c. Disconnect main 12-inch HDPE tailings delivery pipe from flanged T on deposition tower.
    d. Disassemble flanged spigot manifold connected to main tailings deposition tower pipe.
    e. Raise deposition tower by connecting a 5-meter section of flanged piping to current tower pipe. A blind will be installed between the two flanges to prevent tailings from flowing down existing tower pipe.

f. Disconnect as necessary required flanged sections of main 12-inch HDPE tailings delivery piping to facilitate raising access causeway and causeway maintenance pad.

g. Raise causeway maintenance pad to base of flanged connection of vertical deposition tower pipe and as necessary portions of the access causeway.

h. Reconnect flanged spigot manifold to vertical section of deposition tower pipe and connect 12-inch SDR 9 HDPE pipe to inlet T on tower using flexible tailings hose.

2. The access causeways and working platforms for the deposition towers will be raised as necessary to maintain access based on extent of tailings deposition.

7.1.3 Activities Prior to Deposition on NP2 (Year 11)

A year prior to reaching 10-percent of full stacking capacity in NP1 the following activities will be completed in preparation for tailings deposition in NP2:

1. Extend tailings pipeline to north embankment of NP1 in preparation for deposition of tailings on NP2 and install manifolds for crest deposition system.
2. Construct access ramps from NP1 northern embankment to NP2 tailings deposition tower locations using existing tailings.
3. Construct initial height of discharge towers in NP2 (initial height will be 5 meters above existing tailings).
4. Install reclaim pump system in NP2 and extend reclaim water pipeline to NP2 reclaim compartment.
5. Construct divider berm and diversion channels for reclaim and stormwater compartments and contact and non-contact water separation trenches and berms in NP2.
6. Construct reclaim compartment spillway in NP2.
7. Construct safety berms on crest of the NP2 embankment to be compliant with MSHA regulations (CFR §56.9300)

7.1.4 Deposition in NP2 (Years 12 to 26)

Once capacity in NP1 is reached, begin stacking tailings in NP2 from discharge towers through LOM.

1. Operation of the towers will be alternated with an approximate stacking height of five meters. Between periods of operation each tower will be raised in 5-meter intervals.
2. The access ramp and working platform for the deposition towers will be raised annually to maintain access.
3. Once tailings deposition cones from the three deposition towers have been reached, transition to discharging from crest deposition system.
4. Following reaching capacity of tailings deposition in NP2, transfer deposition back to NP1, as necessary, to achieve LOM tailings deposition.

7.2 Operational Upset Conditions Mitigation

Operational upsets during tailings deposition would mainly be associated with blockage, leaks, or breakage of the tailing's delivery pipelines. Although there could be an upset in the tailings thickening system itself, routine maintenance during planned shutdowns and the incorporation of a robust design significantly reduces the probability of this condition occurring. The thickened tailings pumps have been designed to provide an n+1 redundancy in the event of a failure of one of the pumps.

With respect to the upsets to the delivery pipelines, upsets in the HDPE pipelines going towards the deposition towers can be mitigated by switching deposition to one of the other two towers located within NP1 and NP2. Th most critical upset condition in the tailing's delivery pipelines would be if the common tailings pipeline for NP1 and NP2 or the main tailings delivery pipelines upstream of the NP1 and NP2 depositional points were to occur. For these conditions, the following mitigation measures have been incorporated into the design:

- An emergency tailings upset pipeline has been included from the tailings pumping system to the southwest corner of NP1 to provide an alternative method for temporarily delivering tailings to NP1 in event of an upset condition in the NP1 and NP2 common pipeline or an upset condition in the main tailings pipeline to the NP1 deposition tower junctions.
- In the event of an upset condition in the NP2 tailing's delivery pipeline, NP1 will maintain a 10% residual capacity to allow tailings to be sent to NP1.

8.0 CLOSURE DESIGN

The current TDF closure concept will be facilitated through the proposed deposition scheme, which will create a tailings surface (beach) sloping generally from south to north, toward the spillways in NP1 and NP2. Near the end of operations, the reclaims ponds will be drawn down to the extent practicable to minimize the pond volume remaining at the end of deposition. After the cessation of deposition, the TDFs will continue to be drawn down until the tailings mass has been completely drained. The water removed from the reclaim ponds during the closure period will be sent to the water treatment plant prior to being discharged to the environment. Grading of the deposited tailings and excavation of trenches will be completed as necessary to facilitate directing stormwater falling on the tailings to the north towards the reclaim basins and spillways to prevent ponding of water on the deposited tailings surface. Drawings (108571-EB-03100-31345-015-05 and 108571-EB-03100-31345-014) show the closure topography and post closure drainage pattern based on the current deposition design are provided in Appendix E. Based on the closure grading design, approximately 40,000 m^3 and 15,370 m^3 of fill will be required for NP1 and NP2, respectively. This material will be obtained by cutting portions of the deposition area already graded to drain to the north.

After cessation of tailing deposition, the water treatment plant will continue to treat and discharge reclaim water until tailings bleed water ceases reporting to the reclaim ponds and/or until water quality sampling does not detect constituents above the WPN mine's NPDES discharge limits. Based on consolidation test results and an assumed consolidated dry density of tailings of 1.46 t/m^3, the consolidated tailings will have a residual moisture content of around 23% by mass. The proposed deposition design with alternating operation of the deposition towers and NP2 crest deposition points will allow time for each lift of tailings deposition to consolidate and dry in order to reduce the timeframe after deposition ceases for the tailings to fully drain. It is anticipated that following deposition, the tailings will reach a full drained condition within 5 years. Permeability testing conducted on remolded samples of tailings prepared to a density of 1.46 t/m^3 and a moisture content of 23% indicate that the consolidated tailings will have a maximum permeability of 5.59×10^{-7} cm/sec. The low permeability will prevent the tailings from re-saturating due to future precipitation.

As previously required on the legacy tailings deposited during previous mine activities, the deposited tailings placed as part of the WPN mine will be revegetated. The objectives of the tailings revegetation will be to:

- Provide sufficient vegetative cover to effectively control the generation of fugitive dust.
- Reduce the transport of suspended solids by surface water runoff from the surface of the tailings.

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APPENDIX A:
Paterson and Cooke Tailings Thickening and Rheology Test Work Report

White Pine Copper North – Pre-Feasibility Study

P&C Project No.: HCW-31-1983

Rev No.	Date	Description	Prepared	Reviewed	Reviewed
			Originator		Client
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Document Title

Test Work Report

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TERMS OF REFERENCE

This work has been conducted by Paterson & Cooke for White Pine Copper LLC. Under the current Master Services Agreement effective September 19, 2025. The proposal for this work was presented in P&C Proposal 31-1983-00-PM-PRP-0001 Rev C dated Sept. 18, 2025.

This report, and accompanying drawings, has been prepared by Paterson & Cooke for the exclusive use of White Pine Copper for the White Pine Copper Tailings Pre-Feasibility Study, and no other party is an intended beneficiary of this report or any of the information, opinions and conclusions contained herein. The use of this report shall be at the sole risk of the user regardless of any fault or negligence of White Pine Copper or Paterson & Cooke. Paterson & Cooke accepts no responsibility for damages, if any, suffered by any third party as a result of decisions or actions based on this report. Note that this report is a controlled document and any reproductions are uncontrolled and may not be the most recent version.

EXECUTIVE SUMMARY

Whole Tails

The Whole Tails was created by combining two samples generated through a bulk flotation test, C43, at Base Met Labs in Kamloops, BC. The combined whole tails sample was 45% solids by mass[1]. Materials characterization results of note include a p80 of 50.8µm (wet sieve) and 56.0µm (laser diffraction). Solids density is 2767.5 ± 1.7 kg/m^3 and liquid density is 999.5 ± 0.2 kg/m^3. Settled slurry density at the zero free water concentration (76.9%m) is ~1486 kg/m^3. Dissolved solids (salts) are negligibly present in the process water at 0.048%m. Combined whole tails slurry pH was 9.2.

Static cylinder settling tests demonstrated that SNF 913 SH, an anionic, medium molecular weight flocculant provided the optimal combination of solids settling flux and overflow clarity. Note that overflow was quite cloudy at pH 9.2; additional tests were completed using calcium hydroxide ($Ca(OH)_2$) to increase pH to 11.0. This resulted in significant improvement to overflow clarity with reduced flocculant dosages. Additional static cylinder tests were completed to determine optimal thickener feed dilution. A feed solids concentration of 8%m provided the optimal combination of solids settling flux and overflow clarity.

The volume of process water provided with the slurry was insufficient for thickening test work. Process water chemistry was tested by Colorado Analytical Lab. Synthetic process water was prepared by adding salts to deionized water based on the chemistry data to approximate actual process water. When compared to static cylinder tests using process water, the overflow clarity was similar and settling rates were slightly conservative to the process water, validating the use of synthetic water in test work.

Thickening test work resulted in solids concentration increasing from the 8%m thickener feed to underflow concentrations between 54.0%m to 59.6%m depending on test variables. The 24-hour consolidation test indicates that with extended thickener residence time, underflow material consolidates significantly. The 24-hour consolidation test produced an underflow of 71.9%m, an increase of 14.4% from the 57.5%m underflow observed in an identical test without consolidation. Note that this residency time is extremely long and resulting underflow has very high yield stress of ~530 Pa.

Rotational viscometry was used to generate rheological correlations for carrier fluid (-45 µm fraction). Tube viscometry was used to generate rheological characterizations for whole slurry. General beach slope results are included in this report. Full rheological characterization of the beach slope test work will be updated in RevC following analysis by Water, Waste & Land Consulting Engineers.

[1] All solids concentrations measured using process definition, see Section 1.4.7

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1. INTRODUCTION

Paterson & Cooke (P&C) have been retained by White Pine Copper LLC (WPC), a joint venture between Highland Copper and Kinterra Copper USA, to carry out tailings test work. The test work is to support the White Pine North Project which is a brownfields pre-feasibility study for a site located on the Michigan Upper Peninsula near Lake Superior. White Pine Copper is considering high density/paste thickened tailings to eliminate the need for an embankment raise on their North Ponds 1 & 2.

The scope of work includes settling tests, dynamic thickening, beach slope, and rheology test work.

1.1 Test Work Samples

1.1.1 Samples Received

The following samples were delivered to P&C's laboratory in Golden, Colorado on Sept. 30, 2025. These samples were produced from a bulk flotatation test, C43, at Base Met Labs in Kamloops on Feb 19, 2025. Additional sample was received but was not used in test work as the primary sample was sufficient for test work.

Table I: Sample Notation

Sample Description	**P&C Sample Number**
BL1667-43 CT1A-E	Whole Tails Portion 1
BL1667-43 CT1A-E	Whole Tails Portion 2

The sample receipt forms are available in Appendix A.1.

1.1.2 Sample Preparation and Usage

Received barrels of slimes overflow and scavenger tailings were combined into a single Whole Tails sample for test work. This combined sample was then split into representative sub-samples using the wet rotary splitting device shown in Figure 1. Table II shows the sub-samples created and the tests for which each sub-sample was used.



Figure 1: Rotary Splitter

Table II: Sample Allocation

Primary Sample	Sub-samples	Test
Whole Tails	Whole Tails	Material Characterization, Thickening, Slurry Characterization
	Whole Tails +45 µm	C_{bmax}
	Whole Tails -45 µm	Rotational viscometer

1.2 Test Work Scope

At the time of issue for Revision A, not all test work has been completed. Test work in progress is noted in Sections 1.2.1 through 1.2.8.

1.2.1 Material Characterization

The following tests were included:

- As received slurry mass concentration, pH, and conductivity
- Solids and liquid density
- Particle size analysis
- Mineralogy

- Qualitative micro-photographs
- Zero free water
- Zeta potential.

1.2.2 Process Water Characterization

Process water analysis for full ionic balance, total alkalinity, total suspended solids (TSS) and total dissolved solids (TDS) were completed by Colorado Analytical Laboratories in Lakewood, CO.

1.2.3 Slurry Characterization

The following tests were completed:

- Coarse particle settling tests
- Penetrometer tests
- Bleed water tests
- Sloping pipe tests.

1.2.4 Static Cylinder Setting

The tests listed below were completed. The results were used to determine the test parameters for the dynamic thickening test work.

- Static cylinder settling test for colloidal/non-colloidal behavior determination
- Static cylinder settling tests for comparative flocculant evaluation
- Static cylinder settling tests for optimum feed solids concentration determination.

1.2.5 Dynamic Thickening

The dynamic thickening tests included dynamic laboratory scale high-rate thickener tests to map out the thickener performance as a function of solids loading rate and flocculant dosage.

The thickener test target pH, feed solids concentration and flocculant type were optimized in the static cylinder settling test work.

1.2.6 Dynamic Batch Thickener Bed Consolidation

The dynamic batch thickener bed consolidation test is a bench scale 24-hour test at the optimized feed solids concentration, flocculant type and flocculant dosage determined through the dynamic thickening test work.

1.2.7 Rheology

The following rheology test work was performed:

- Carrier fluid rheology – measured using P&C's rotational (Couette flow) viscometer over a range of concentrations.
- Whole slurry rheology – measured using P&C's tube viscometer over a range of concentrations.

1.2.8 Beach Slope

The beach slope tests included determination of beach slope sedimentation angle over a range of flow rates at a single target concentration following the Fitton method.

1.3 Symbols and Abbreviations

The following symbols and abbreviations are used in this report:

C_v	solids concentration by volume, volume of solids / sample volume (%v)
C_{vf}	carrier fluid solids concentration by volume (%v)
M_w	mass of the liquid phase (kg)
M_s	mass of solids (kg)
M_t	total sample mass (kg)
m_c	moisture content by process definition (%m), see Section 1.4.6
NTU	Nephelometric Turbidity Units
K_{BP}	plastic viscosity (Pa·s)
K_{BPf}	carrier fluid plastic viscosity (Pa·s)
P_f	percentage of fine particles by mass, see Section 1.4.1
PSD	particle size distribution
rpm	revolutions per minute
TSS	Total Suspended Solids (ppm)
T	temperature (°C)
w	moisture content by geotechnical definition, (%m) see Section 1.4.6
$\dot{\gamma}$	shear rate (s^{-1})
ρ_m	slurry mixture density (kg/m^3)

ρ_{mf}	carrier fluid density (kg/m^3), see Section 1.4.1
ρ_s	solid phase density (kg/m^3)
ρ_w	liquid phase density (kg/m^3)
τ_y	yield stress (Pa)
τ_{yv}	vane yield stress (Pa)
τ_{yB}	Bingham yield stress (Pa)
τ_{yBf}	carrier fluid Bingham yield stress (Pa)
μ_w	liquid phase Newtonian viscosity (Pa·s)

1.4 Terms and Definitions

1.4.1 Carrier Fluid

The fine particles and liquid phase are considered to form the carrier fluid which has a density and rheology higher than the liquid phase alone. For the purposes of this work, all particles finer than 45 µm are considered rheologically active and form part of the carrier fluid.

The mass concentration of the carrier fluid is:

$$C_f = \frac{P_f\, C}{1\text{-}C\ (1\text{-}P_f)}\ , \qquad (1)$$

where P_f = fraction of particles finer than 45 µm by mass.

The density of the carrier fluid is:

$$\rho_{mf} = \rho_w + \frac{\rho_w\, C_f\ (\rho_s - \rho_w)}{\rho_s - C_f\ (\rho_s - \rho_w)}\ , \qquad (2)$$

where ρ_s = solid particle density (kg/m^3)

ρ_w = liquid phase density (kg/m^3).

1.4.2 Coarse Particles

For the purposes of this work, all particles larger than 45 µm are termed coarse particles.

1.4.3 Decant

The supernatant liquid recovered above the surface of a settled bed of slurry is termed decant.

1.4.4 Dosage

All dosages are expressed as grams of full strength reagent per ton of dry solids (g/t).

1.4.5 Fully Sheared Rheology

The fully sheared rheology refers to the equilibrium rheology achieved after the slurry sample has been subjected to shearing action until there is no further change in rheology.

1.4.6 Moisture Content

The process engineering definition of moisture content is as the percentage of water in relation to the total mass:

$$m_c = \frac{M_w}{M_s + M_w} \quad , \tag{3}$$

where M_w = mass of water in sample (kg)

M_s = mass of solids in sample (kg).

The geotechnical engineering definition for moisture content is percentage by dry mass:

$$w = \frac{M_w}{M_s} \quad . \tag{4}$$

The relationship between the geotechnical and process definitions is:

$$m_c = \frac{w}{1+w} \tag{5}$$

The process definition is used throughout the body of this report.

1.4.7 Solids Concentration

The solids mass concentration is the percentage of solids in relation to the total mass of the sample:

$$C = \frac{M_s}{M_t} \quad , \tag{6}$$

where M_s = mass of solids in sample (kg)

M_t = total mass of the sample, i.e. both the solid and liquid phases (kg).

Some process liquids contain soluble materials (e.g. salts). For these cases, the solids mass concentration values obtained from oven drying the sample are corrected to account for the mass of soluble material contained in the liquid at the process temperature. The correction for dissolved salts was negligible; 0.048%m. The solids concentration measurements presented in the appendices included the uncorrected and corrected values.

2. MATERIAL CHARACTERIZATION TEST RESULTS

2.1 As Received Slurry

The as received tailings solids mass concentration, pH, and conductivity are presented in Table III. Note that Overflow Slimes and Scavenger Tails were combined to form the Whole Tails sample which was used for all test work. All mass solids concentrations were determined by oven drying at 60°C / 140°F. The datasheet is presented in Appendix A.2.

Table III: pH and Conductivity

Property	Overflow Slimes	Scavenger Tails	Whole Tails
Slurry solids concentration	45.0%m	45.0%m	46.0%m
Slurry pH	9.2	9.2	9.2
Slurry conductivity	4.2 mS/cm	5.6 mS/cm	5.2 mS/cm

2.2 Liquid Density and Dissolved Solids

Liquid density is measured using a 1-liter volumetric flask. The dissolved solids concentration is determined by oven drying a filtered water sample. Test results for the received decant water are summarized in Table IV and details are provided in Appendix A.1.

Table IV: Liquid Density and Dissolved Solids

Property	Whole Tails Process Water
Measurement temperature	20.0 °C
Liquid density	999.5 ± 0.2 kg/m^3
Dissolved solids by mass	480 ppm (0.048 %m)

2.3 Solids Density

The solids density of the Whole Tails was determined using a 0.001-gram accuracy balance and a helium gas pycnometer which measures solids volume. The results are summarized in Table V and details are available in Appendix A.3.

Table V: Solids Density

Property	Whole Tails
Solids density	2767.5 ± 3.9 (kg/m³)

2.4 Particle Size Analysis

Particle size distributions were determined by wet sieving according to the method detailed in ASTM D 422-63 (2007) "Standard Test Method for Particle Size Analysis of Soils", and by laser diffraction using a Microtrac Model S3500 adhering to ISO 13320-2009. The p80 for the whole tails sample is 50.8µm as measured with wet sieve and 56.0µm as measured with wet sieve.

Appendices A.4 and A.5 presents the particle size distribution analyses and Figure 2 shows the particle size distribution.

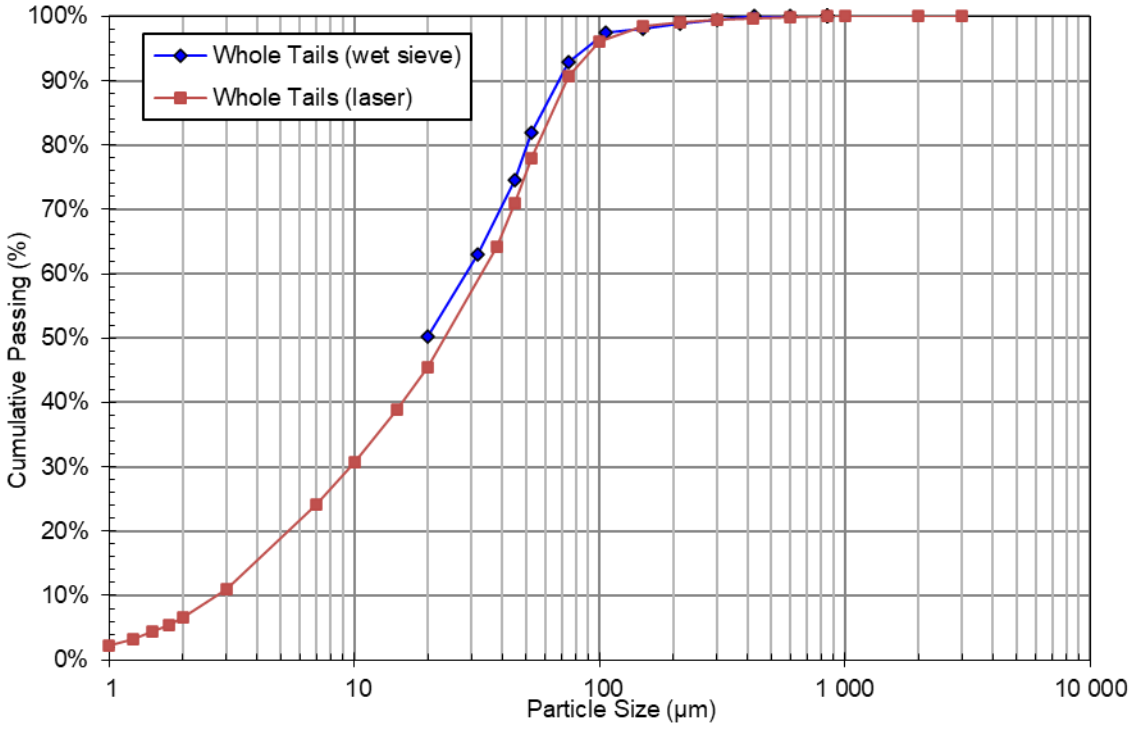


Figure 2: Whole Tails Particle Size Distributions

2.5 Mineralogy

A sub-sample of the Whole Tails was sent to DCM Science in Wheat Ridge, CO for mineral and clay analysis using X-ray diffraction (XRD) with reference intensity ratio (RIR). Table VI and Table VII summarize the results and the DCM Science report is available in Appendix A.6.

Table VI: XRD Results

Component	**% of Whole Tails**
Calcite	2.9 %
Chlorite	23.6 %
K-Feldspar	8.2 %
Mica	11.1 %
Plagioclase	22.2 %
Quartz	30.0 %
Unaccounted	<5 %
Total clay (% of total)	Not Detected

Table VII: XRD Analysis of Clay Fraction Within -2 µm Size Fraction

Component	**% of Whole Tails**
Clay Fraction (<2 µm)	Not Detected

2.6 Micro-Photographs

Micro-photographs were taken of the sieved particle size fractions of the Whole Tails solids using a Leica microscope to provide a qualitative view of particle shape. Micro-photographs are presented in Figure 3 to Figure 6.

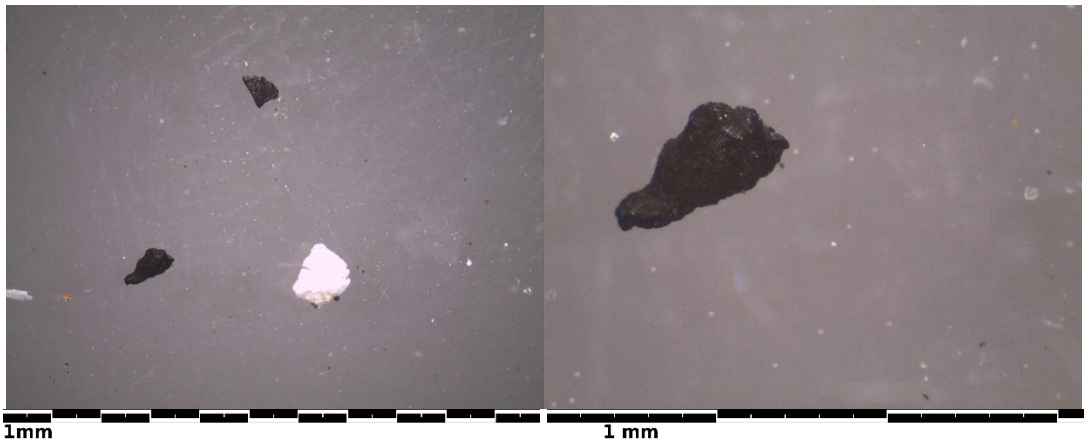


Figure 3: Whole Tails +600 µm size fraction (x10 magnification, x35 magnification)

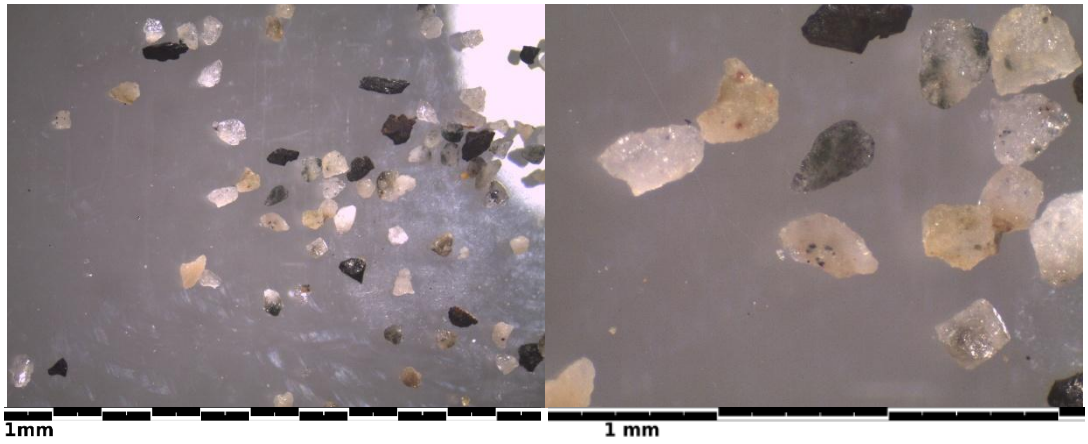


Figure 4: Whole Tails +300 µm size fraction (x10 magnification, x35 magnification)

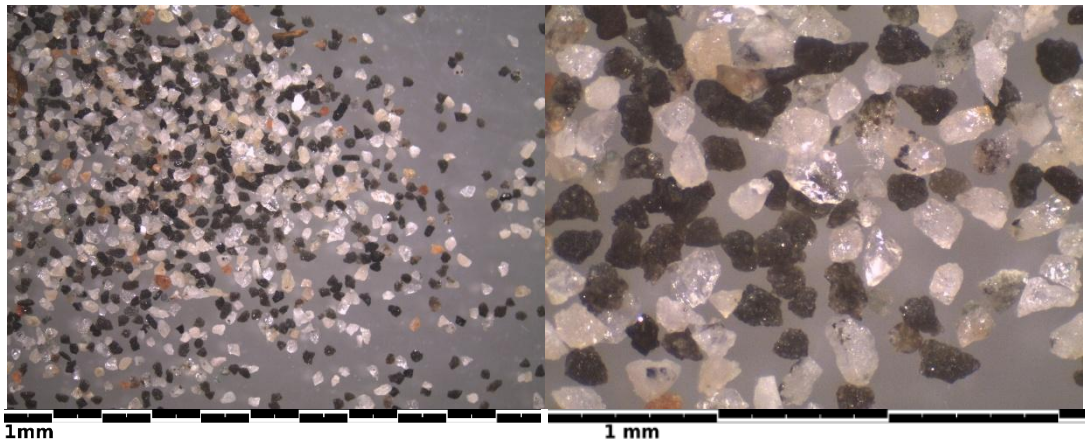


Figure 5: Whole Tails +150 µm size fraction (x10 magnification, x35 magnification)

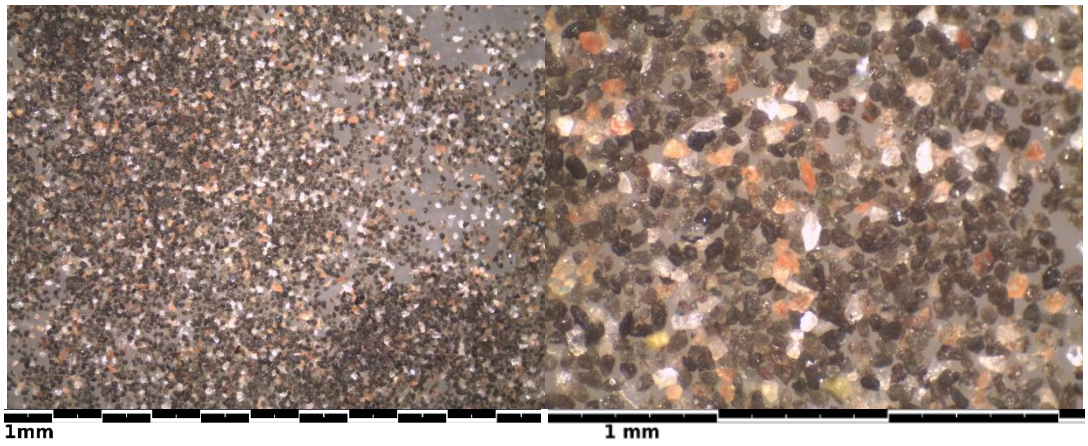


Figure 6: Whole Tails +75 µm size fraction (x10 magnification, x35 magnification)

2.7 Zero Free Water Solids Mass Concentration

The zero free water solids mass concentration is the highest solids mass concentration at which the packed particle bed (at 70 kPa / 10.2 psi vacuum) is still fully saturated, becoming partially saturated because of ingress of air at solids mass concentrations beyond this point. At the zero free water point only surface bound water and minimal pore space water remain in the fully saturated packed particle bed. The measurement is carried out on received samples to determine the dewatering characteristic of the material. The zero free water concentration can be considered as the theoretical maximum concentration achievable through dynamic thickening processes.

This test was performed in a Buchner-type vacuum filter, and the results are summarized in Table VIII. The detailed results are presented in Appendix A.7.

Table VIII: Zero Free Water Solids Mass Concentration

Property	**Whole Tails**
Test feed solids mass concentration	49.5%m
Test temperature	20.0 °C
Zero free water solids mass concentration	76.9 ± 0.5%m

2.8 Zeta Potential

Zeta potential is a measure of the charge between particle surface shear plane and the bulk solution. The measurement provides indication of solids / liquid separation efficiency. A high zeta potential (positive or negative) indicates greater electrostatic repulsion between the shear planes present in a mixture or slurry. A zeta potential close to zero indicates little repulsion between the

shear planes in a slurry. The lower the natural repulsion of the planes in a slurry, the easier the solids / liquid separation will be.

The slurry zeta potential was measured using the Microtrac Stabino® zeta potential measurement instrument shown in Figure 7.

The zeta potential of the slurry is summarized in Table IX and the detailed test results are presented in Appendix A.8.



Figure 7: Microtrac Stabino

Table IX: Zeta Potential

Property	**Whole Tails**
Solids mass concentration	10.0%m
Test temperature	20.1°C
Average zeta potential	-36.38 ± 1.05 mV

2.9 Specific Cake Resistance

Values from the zero free water test are used to estimate the specific cake resistance. The specific cake resistance is a number that uniquely describes the filterability of a material. Standard specific cake resistance values range from $1x10^9$ to $1x10^{14}$ m/kg. A sandy material that is easy to filter will have a lower specific cake resistance value than a material that is more difficult to filter due to the presence of more clays.

The specific cake resistance values are presented in Table X and detailed are available in Appendix A.7.

Table X: Specific Cake Resistance

Property	Whole Tails
Specific cake resistance	9.05×10^{11} m/kg

3. PROCESS WATER CHARACTERIZATION

3.1 Process Water Analysis

The process water samples were sent to Colorado Analytical Laboratories in Lakewood, Colorado for constituent analysis. The results were used to develop synthetic water recipes for test work where there was insufficient provided decant. Table XI summarizes the constituent analysis and Table XII provides a brief characterization summary. Detailed test results are available in Appendix B.1.

The results show a sodium to calcium ratio of around 2 (i.e. twice as much sodium as calcium in the process water system), which can be unfavorable to fines coagulation and settling.

Table XI: Process Water Constituent Analysis

Component	Whole Tails Process Water
Aluminum	0.078 mg/l
Boron	0.49 mg/l
Calcium	28.6 mg/l
Iron	0.027 mg/l

Component	Whole Tails Process Water
Magnesium	4.57 mg/l
Potassium	12.4 mg/l
Sodium	58.3 mg/l
Bicarbonate as $CaCO_3$	106.4 mg/l
Chloride	43.6 mg/l
Nitrogen, Ammonia	Not Detected
Nitrogen, Nitrate	Not Detected
Sulfate	52.5 mg/l
Silica, dissolved	3.80 mg/l

Table XII: Process Water Characterization Summary

Parameter	Whole Tails Process Water
Total dissolved solids	278 mg/l
Total suspended solids	Not Detected
Specific conductivity	0.474 mS/cm
pH	7.84
Sodium to calcium ratio	2.04

3.2 Synthetic Water Validation

Due to an insufficient volume of process water to complete the thickening test work, synthetic water was created by adding a variety of salts to de-ionized water to approximate results from chemical analysis of Whole Tails process water as outlined in Section 3.1.

Validation of synthetic water was completed following preliminary static cylinder test work outlined in Section 4 by comparing pH, electrical conductivity, and additional static cylinder tests. Initial static cylinder testing completed at pH around 8.9 indicated that while settling performance was good, overflow clarity remained poor. Additional trials were completed using $Ca(OH)_2$ to increase pH to 11.0. This change in pH resulted in significantly improved settling speed and overflow clarity. Additional static cylinder tests were used to ensure that settling performance

between Whole Tails process water and the synthetic process were approximately equivalent. Table XIII and Figure 8 outline these comparisons. Additional details can be seen in Appendix C.2

Table XIII: Synthetic Water pH and Conductivity

Parameter	Whole Tails Process Water	Whole Tails Synthetic Process Water	Whole Tails Process Water (pH 11.0)	Whole Tails Synthetic Process Water (pH 11.0)
pH (water alone)	7.8	8.8	11.0	11.0
Conductivity (water alone)	0.46 mS/cm	0.40 mS/cm	0.76 mS/cm	0.81 mS/cm
pH (slurry)	8.92	8.85	11.0	11.0
Conductivity (slurry)	0.52 mS/cm	0.36 mS/cm	0.73 mS/cm	0.73 mS/cm

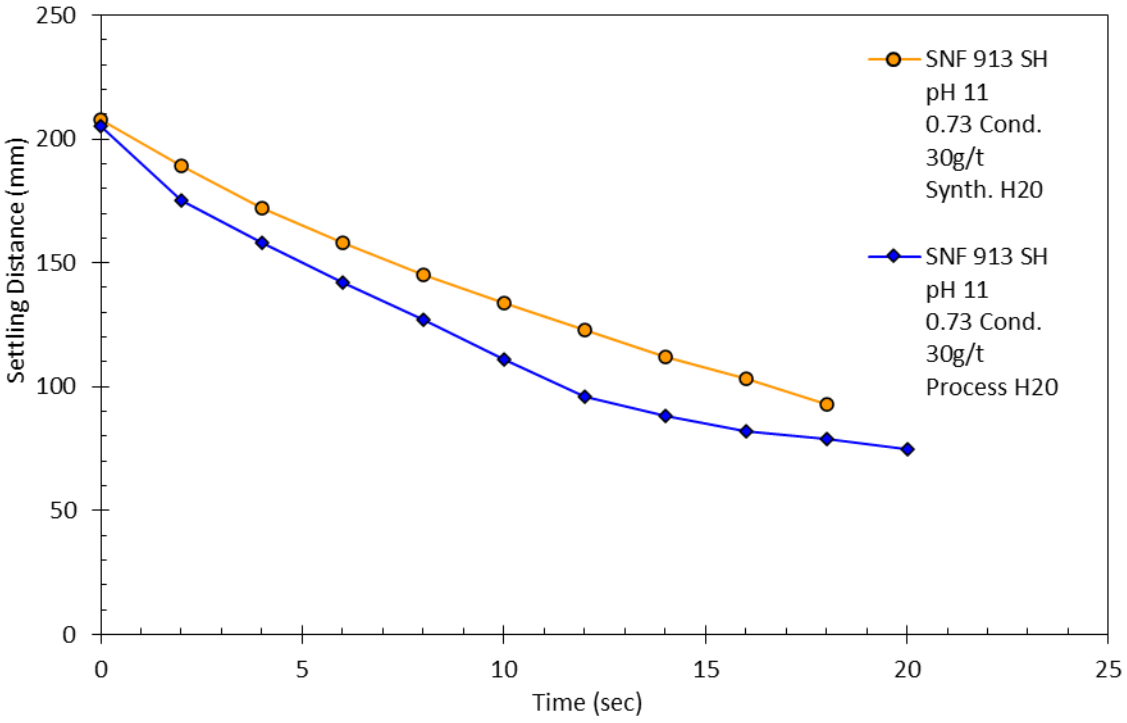


Figure 8: Whole Tails Synthetic versus Process Water Settling Tests

4. STATIC CYLINDER TEST WORK

Static cylinder tests investigate the necessity of a coagulant in addition to flocculant, flocculant type, and thickener feed solids concentration.

The colloidal behavior investigation is a qualitative test to provide a visual of the natural settling (un-flocculated) behavior of a slurry. Coagulant test work is typically then carried out if the sample is colloidally stable.

The flocculant selection and feed solids concentration optimization tests provide a measured settling rate. For each test, a sample is mixed in a graduated cylinder with a selected flocculant type, dosage, and feed solids concentration. Free settling rates are used to identify the optimum flocculant type and feed solids concentration. To measure the free settling rates, the height of the slurry/supernatant interface is recorded at various times as the solids settle to produce a settling curve as seen in Figure 9. The settling rate is calculated using equation (7).

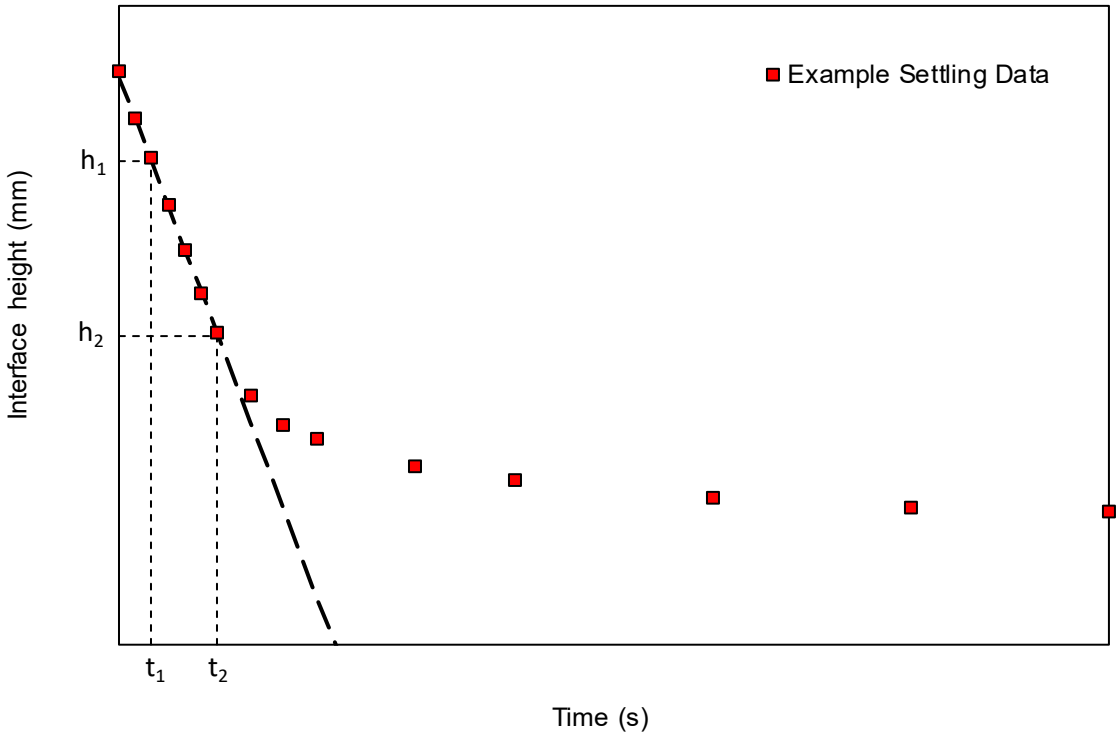


Figure 9: Example Settling Data of Settling Interface Height with Time

$$\text{Settling Rate} = \frac{(h_1\text{-}h_2)}{(t_2\text{-}t_1)} \quad (7)$$

where: h is expressed in mm

t is expressed in seconds.

The free settling rate is simply the speed at which the slurry/supernatant interface drops. It does not account for other factors that may impact settling such as feed solids concentration or settling area.

For the feed solids concentration optimization, the feed solids concentration is varied and therefore settling rate is not an appropriate analysis tool. The varying feed solids concentration is accounted for by presenting the data in terms of free settling solids flux. Free settling solids flux is the mass of solids that settle in an area per unit of time.

The free settling solids flux obtained from the cylinder tests should not be used to size a thickener because it does not consider factors present in the continuous thickening process (i.e. on-site flocculant dosing/mixing processes, rise rates, impact of rake etc.). It is presented in this report for comparison purposes only and is calculated as follows:

$$\text{Free Settling Solids Flux} = (M_s/t)/A \quad (8)$$

where M_s = mass of solids in the cylinder (kg)

t = time (h)

A = cylinder area (m²).

The time used in the free settling solids flux equation is calculated using the free settling rate and the distance the floccules settle:

$$t = \left(\frac{D}{V_s}\right)/3600 \quad (9)$$

where t = time (h)

V_s = free settling rate (m/s)

D = distance the floccules settle (m).

4.1 Colloidal Behavior

4.1.1 Method and Equipment

Whole tails were prepared at 10%m solids concentration using the decanted process water and allowed to settle in a 250 ml graduated cylinder.

4.1.2 Results

Figure 10 shows the settling behavior of the material over the course of 28.5 hours. At pH ~9, the material is colloidally stable, with the ultra-fine particulate remaining in suspension. Additional tests were completed at pH 11, as shown in Figure 11. This elevated pH resulted in the material behavior becoming colloidally unstable, with significantly faster free settling and overflow clarity.

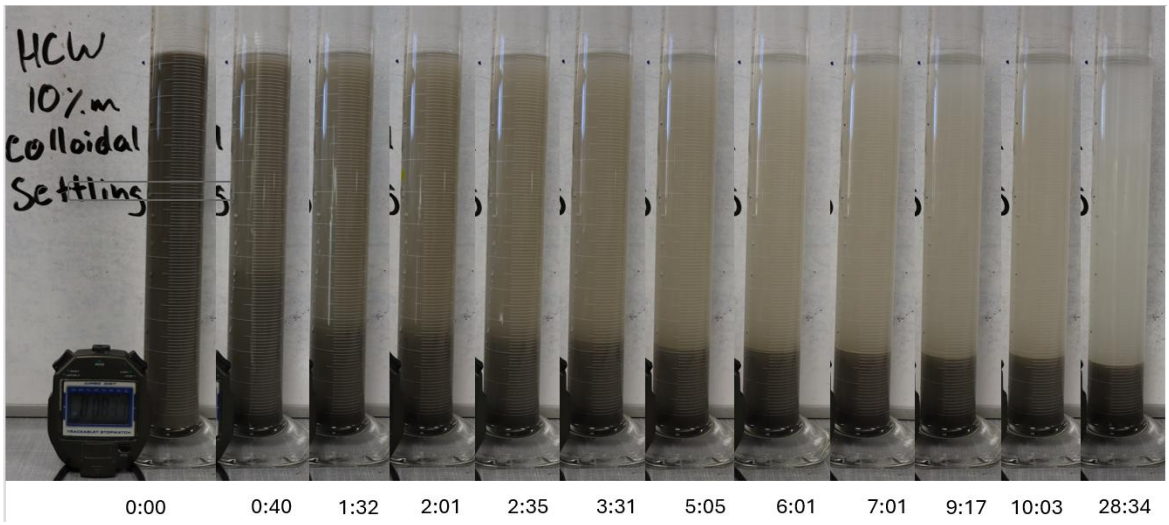


Figure 10: Whole Tails Colloidal Settling - pH 8.95 (time in hours : minutes)

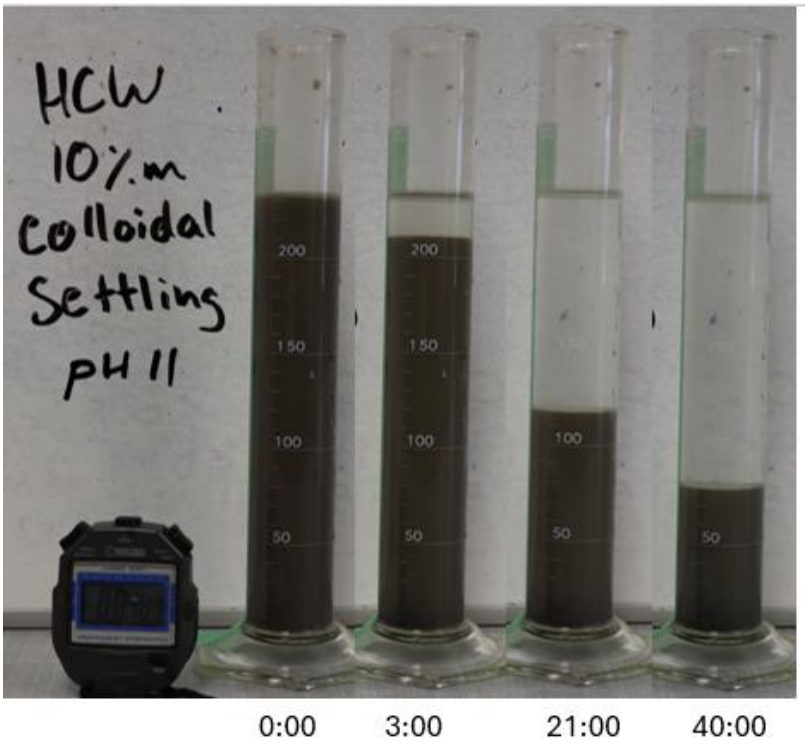


Figure 11: Whole Tails Colloidal Settling - pH 11.0 (time in minutes : seconds)

4.2 Flocculant Screening Tests

4.2.1 Method and Equipment

The flocculant screening tests are carried out in 250 ml graduated cylinders. Free settling rates and overflow clarity are considered in the flocculant selection.

4.2.2 Test Performed

The flocculant screening results are shown in Figure 12 and Figure 13. Results shown in Figure 12 are the initial flocculant scoping tests completed using process water at approximately pH 9. Flocculation at approximately pH 9 required relatively high dosages (80 g/t) to produce clearer overflow. The two best-performing flocculants, SNF 913 SH and SNF 923 SH, were later tested using process water at pH 11.0 for comparison. Results from these additional tests are shown in Figure 13. Note that a lower flocculant dosage (50 g/t) was used, resulting in slightly reduced free settling flux values but significantly clearer overflow. Additional details are available in Appendix C.1.

Flocculant SNF 913 SH, an anionic medium molecular weight flocculant, produced the least cloudy overflow and the fastest free settling rate for the Whole Tails sample at pH 11.

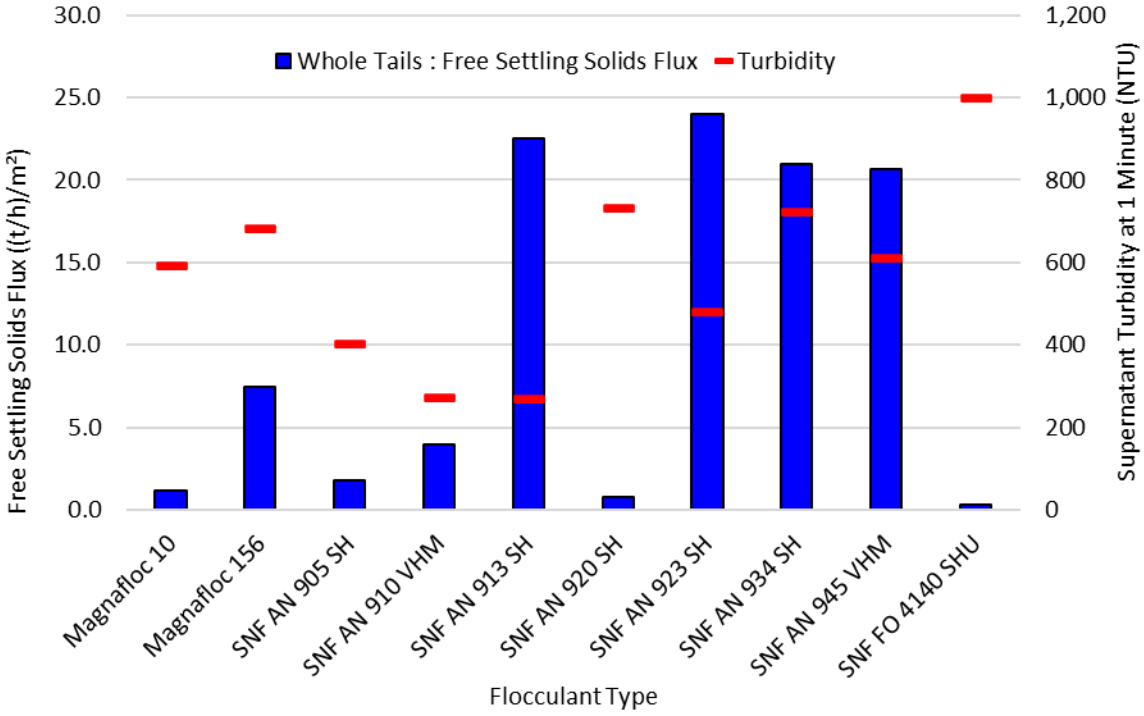


Figure 12: Free Settling Rate by Flocculant Type, pH 9

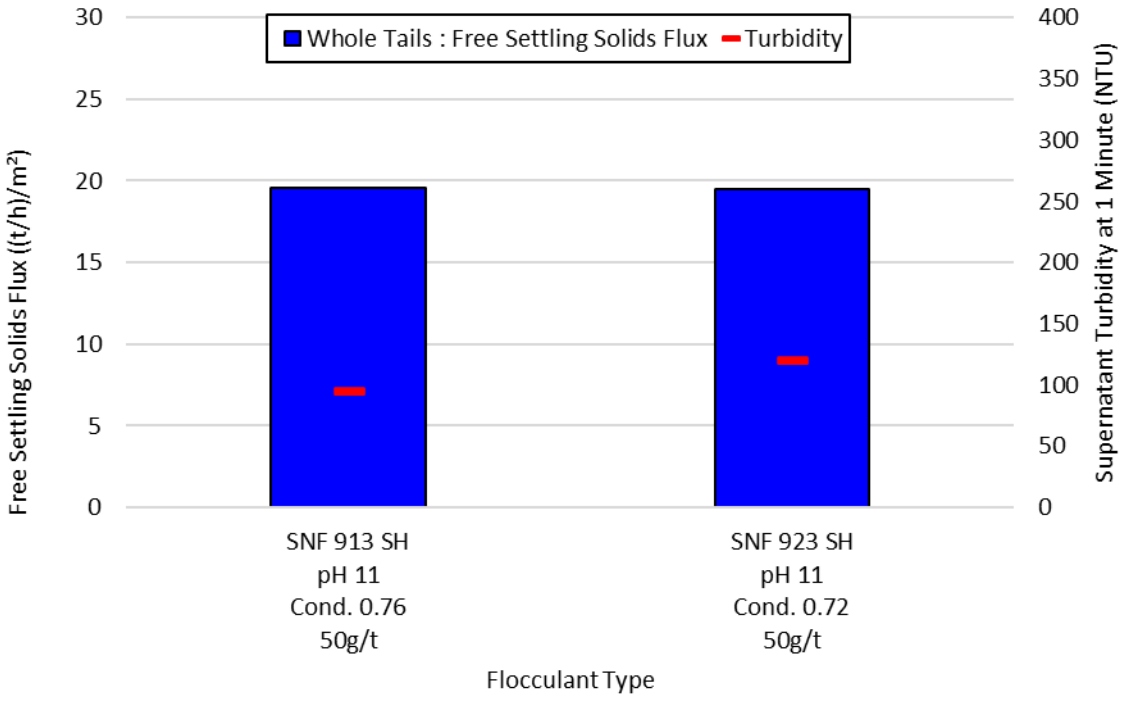


Figure 13: Flocculant Scoping Verification at pH 11

4.3 Synthetic Water Verification Screening Tests

4.3.1 Method and Equipment

Timed static cylinder tests are carried out in 250 ml graduated cylinders to ensure the synthetic water outlined in Section 3.2 performs approximately equally to the process water. The slurry pH was 11.0 with both the process water and synthetic water. The pH was adjusted using $Ca(OH)_2$. The slurry temperature was 20.1°C. The free settling solids flux was used as the primary analysis tool.

4.3.2 Results

The static cylinder test performed with synthetic water resulted in a slightly slower free settling solids flux and approximately equivalent turbidity measurement. These similarities indicate that using this synthetic water is valid, and results while using this synthetic water in additional test work will be slightly conservative to expectations of the full-scale operation. Results from the synthetic water validation are shown in Figure 15 below and details are available in Appendix C.2.

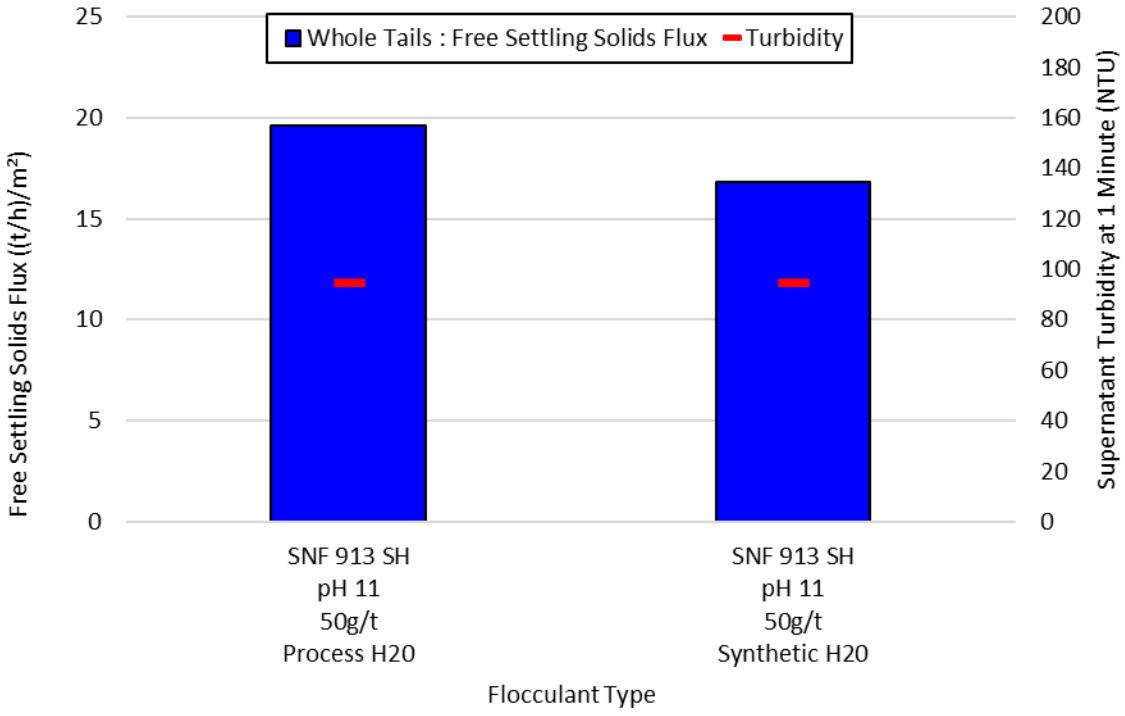


Figure 14: Free Settling Solids Flux & Turbidity: Process vs. Synthetic Water

4.4 Optimum Feed Solids Concentration Tests

4.4.1 Method and Equipment

Timed static cylinder tests are carried out in 250 ml graduated cylinders to determine the optimum thickener feed solids concentration for flocculation. The average slurry pH was 11.0 and synthetic water was used as outlined in Section 4.3. The pH was adjusted using $Ca(OH)_2$. The slurry temperature was 20.0 °C. The free settling solids flux was used as the primary analysis tool.

Detailed test results are available in Appendix C.3.

4.4.2 Results

Flocculant SNF 913 SH was selected from the results of the flocculant screening tests and used in static cylinder tests to determine the optimum feed solids concentration. The results are shown in Figure 15 below and details are available in Appendix C.

The optimum feed solids concentration selected for this material is 8.0%m.

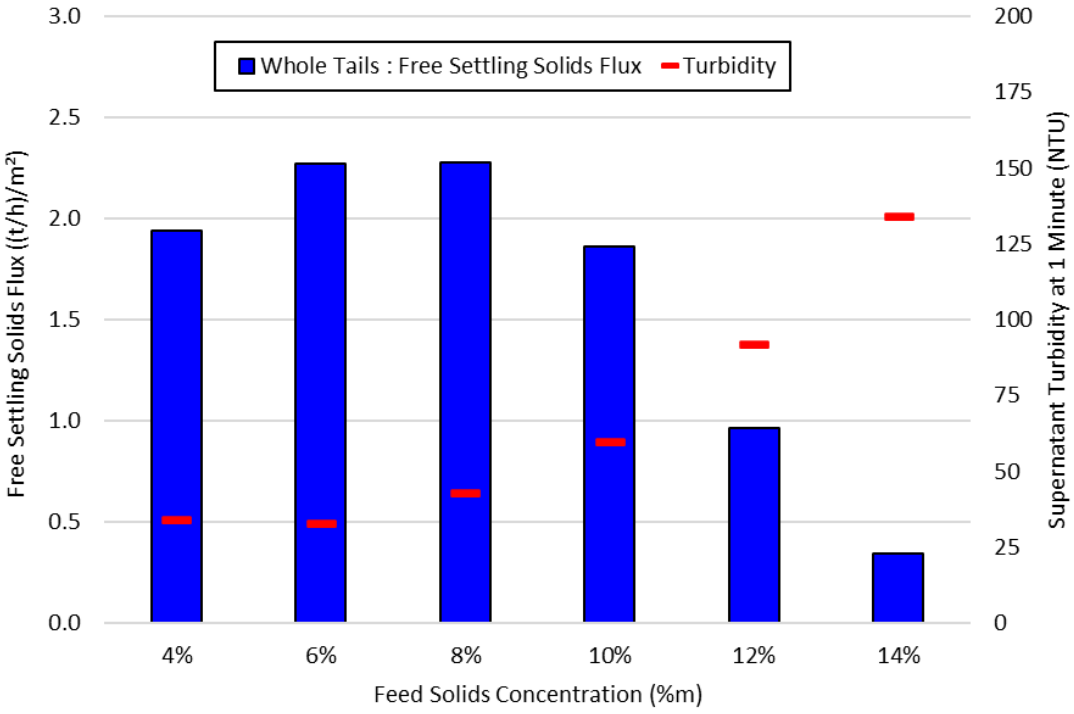


Figure 15: Free Settling Solids Flux by Feed Solids Concentration

4.5 Summary of Findings for Static Cylinder Test Work

The results of the static cylinder settling test work are as follows:

(1) Whole Tails slurry is colloidally stable at approximately pH 9.

(2) Whole Tails slurry is colloidally unstable at approximately pH 11.

(3) Flocculant SNF 913 SH had best performance in terms of free settling solids flux and overflow clarity.

(4) Synthetic water results indicate that synthetic water addition causes the slurry to behave similar to process water and settling speed is slightly conservative.

(5) Optimum thickener feed solids concentrations results indicate that 8%m is the optimal thickener feed dilution for design.

(6) Dynamic high-rate thickening tests will use flocculant SNF 913 SH, with thickener feed diluted to 8%m using synthetic water at a slurry pH target of 11.0.

5. DYNAMIC HIGH RATE THICKENER TEST WORK

The bench scale high-rate thickening test work is used to map out the impact of flocculant dosage and solids loading rate on thickener performance.

5.1 Test Method and Equipment

P&C's 100 mm diameter dynamic bench scale thickener (Figure 16) was used for the test work. Peristaltic pumps deliver feed and flocculant to the thickener. The underflow bed is built to 200 mm while raking at a speed of 3 rpm. Flocculant is added at two points in the feed line. The feed line diameter was 6.4 mm and total tubing was approximately 5 m long.

Overflow samples were collected and analyzed for solids concentration when the bed height reached 160 mm.



Figure 16: Bench Scale Thickener Equipment & Thickening Test in Progress

P&C's Anton Paar RheolabQC rotational viscometer shown in Figure 17 was used for vane yield stress measurements during the dynamic thickening tests. To measure the yield stress, the speed of the viscometer was held constant at 0.095 RPM, resulting in a constant shear strain rate of 0.02 s^{-1}. The torque was measured, and the maximum was used to calculate the yield stress. This data provides rake and underflow delivery design information for a full-scale thickener.



Figure 17: Anton Paar RheolabQC Rotational Viscometer

5.2 Test Conditions

The target feed solids mass concentration was 8%m and the flocculant used for all tests was SNF 913 SH, an anionic flocculant with medium molecular weight. All test work was completed using the synthetic process water at about pH 11.

The following high-rate thickening tests were conducted:

- 6 tests at fixed solids loading rate of 0.40 (t/h)/m^2 and floc dosage range of 10 to 40 g/t.
- 3 tests at fixed flocculant dosage of 25 g/t and solids loading rate range of 0.3 to 0.55 (t/h)/m^2.

5.3 Whole Tails High-Rate Thickening Results

The thickener tests investigating the impact of flocculant dosage are shown graphically in Figure 18 and Figure 19.

Results of the flocculant dosage series indicate that increasing dosage produces a corresponding increase of underflow concentration up to dosages of 30 g/t. Dosages above 30 g/t result in

approximately equivalent underflow concentrations and overflow TSS, adding cost without any significant benefit.

Dosages at and above 15 g/t resulted in consistently clean overflow, with turbidity ranging from 44 to 83 NTU and TSS between 52 and 74 ppm. At 10 g/t, particulate remained uncaptured by flocculant, leading to turbidity and overflow TSS values significantly higher than those observed at higher dosages, and the lowest underflow concentration observed. A flocculant dosage of 25 g/t was selected as an optimum for additional test work investigating the impact of solids loading rate on thickener performance.

Test details are available in Appendix D.1.

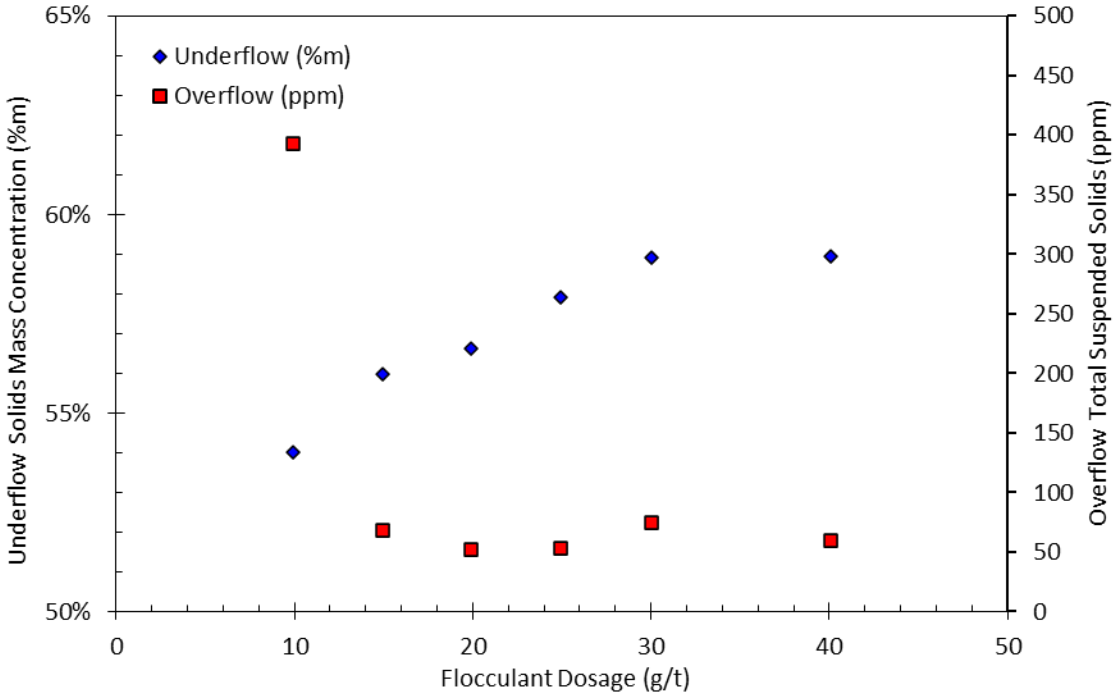


Figure 18: Underflow Solids Concentration and Overflow TSS versus Flocculant Dosage

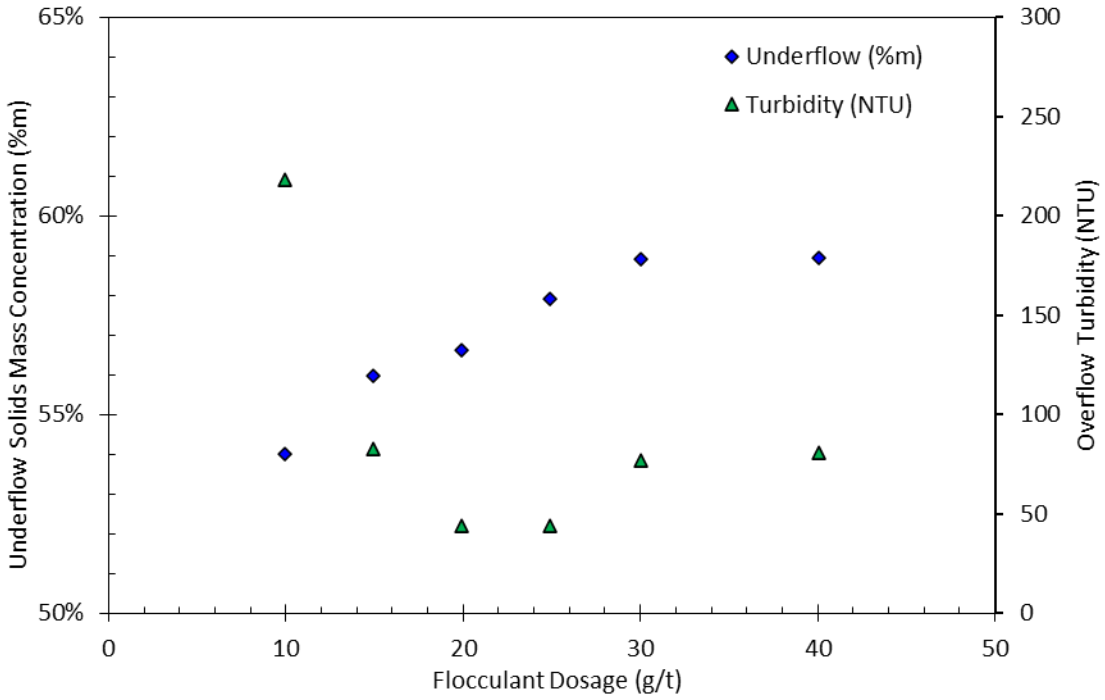


Figure 19: Overflow Solids Concentration and Turbidity versus Flocculant Dosage

The thickener tests for investigating the impact of solids loading rate are shown graphically in Figure 20 and Figure 21.

Results of the solids loading rate (SLR) series demonstrate a gradual 2%m decrease to underflow concentration as SLR increases from 0.30 to 0.55 (t/h)/m^2. As SLR increases, overflow TSS and turbidity also generally increase. The highest tested SLR of 0.55 (t/h)/m^2 results in a rise rate of 7.0 m/h, which is typically the high end of thickener operating parameters.

Operational parameters will likely dictate the solids loading rate of the full-scale thickener, but test work indicated that 0.50 (t/h)/m^2 was the optimum solids loading rate for increased throughput with good underflow solids concentration while maintaining acceptable overflow suspended solids and turbidity.

Parameters for the 24-hour consolidation test will be based on results from the high-rate thickening test, using a solids loading rate of 0.50 (t/h)/m^2 and a flocculant dosage of 25 g/t using SNF 913 SH.

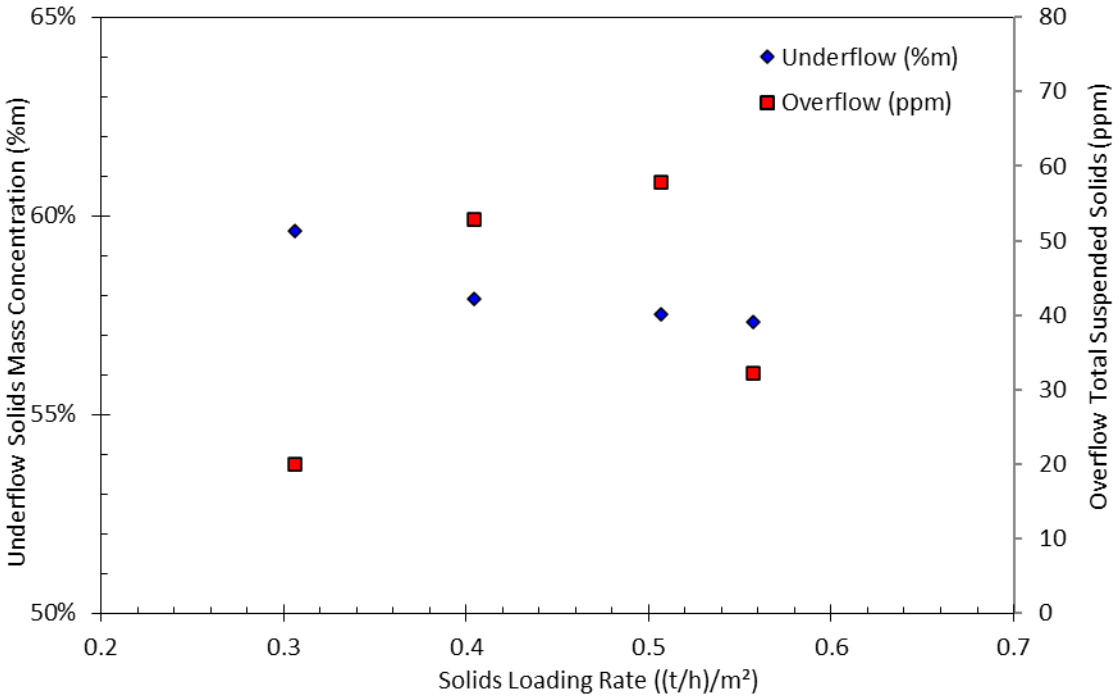


Figure 20: Underflow Solids Concentration and Overflow TSS versus Solids Loading Rate

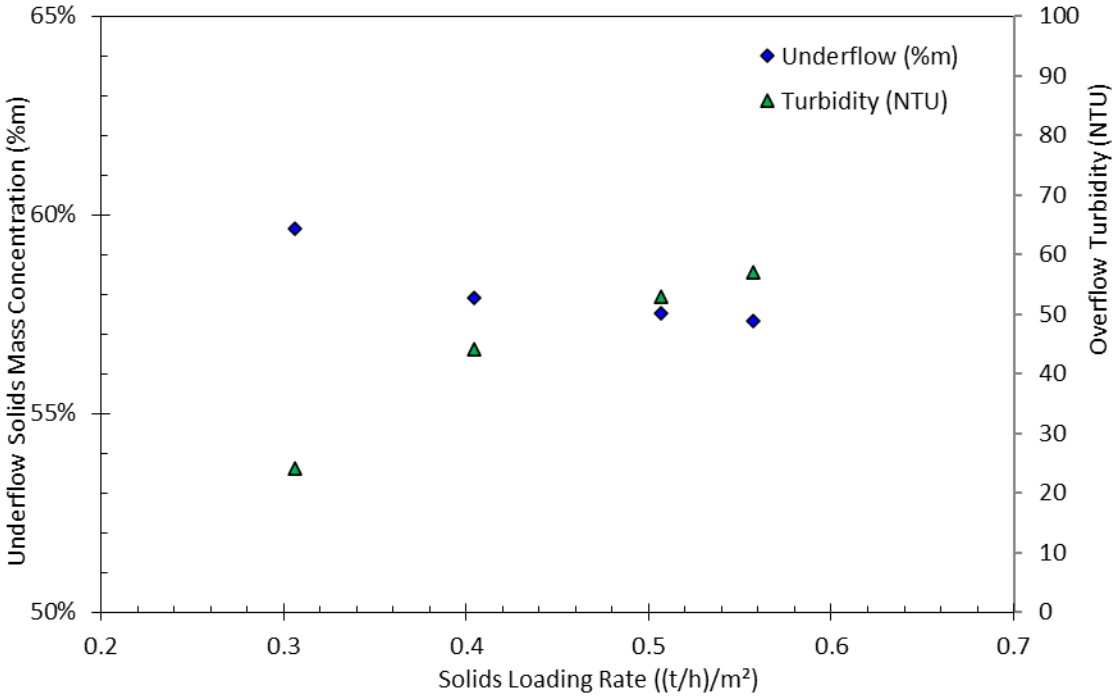


Figure 21: Overflow Solids Concentration and Turbidity versus Solids Loading Rate

5.4 Summary of Findings for High-Rate Thickener Test Work

The results of the thickener test work are as follows:

(1) Underflow concentrations ranged from 54%m to 60%m across high-rate thickening test work.

(2) Overflow quality was excellent for all tested solids loading rates and all flocculant dosages at or above 15 g/t. In those tests, turbidity ranged from 24 to 83 NTU and TSS ranged from 52 to 74 ppm. The 10 g/t test resulted in 218 NTU and 392 ppm.

(3) Flocculant dosage increases underflow solids concentration up to 30 g/t; beyond 30 g/t additional flocculant is not beneficial.

(4) Increasing solids loading rate decreases underflow concentrations by 2%m between 0.30 and 0.55 $(t/h)/m^2$.

(5) Feed slurry pH was 11.0; dropping below this could result in significant decrease to overflow quality.

(6) Parameters selected for 24-hour consolidation are a solids loading rate of 0.50 $(t/h)/m^2$ and 25 g/t flocculant using SNF 913 SH.

6. DYNAMIC BATCH THICKENER BED CONSOLIDATION TEST WORK

The thickener bed consolidation test work is used to investigate if material is suitable for high-density and/or paste thickening.

6.1 Method and Equipment

The bench scale dynamic batch thickener bed consolidation test work is carried out to determine the impact of thickener bed retention time on the thickener underflow concentration production. Operating conditions for the dynamic batch thickener bed consolidation test work are selected from the dynamic high-rate thickener test work. Both the higher rate thickener and thickener bed consolidation tests are completed using P&C's 100 mm diameter dynamic bench scale thickener shown in Figure 16.

Matching the chosen high-rate thickener test parameters, the thickener consolidation test builds a bed to 200 mm, then stops the solids loading, and records the bed height with time under either continuously raked or static conditions. At the end of 24 hours, the underflow solids concentration is measured and the total solids mass in the bed is accounted. From this direct measurement of underflow concentration and previous high-rate tests, the underflow solids concentration with

time is known. From the bed height, and therefore volume, with time and total solids accounting, an average bed concentration is calculated to provide indicative bed consolidation behavior.

These values of measured underflow concentration, average bed concentration, and bed height with time are presented in Figure 23.

As the direct underflow measurements are only collected at the end of the high rate and consolidation tests, the average bed concentration is used to infer the rate and completion of bed consolidation. This provides sight into considering if designing increased retention time is beneficial and if extended duration thickener shutdown events may lead to restarting issues.

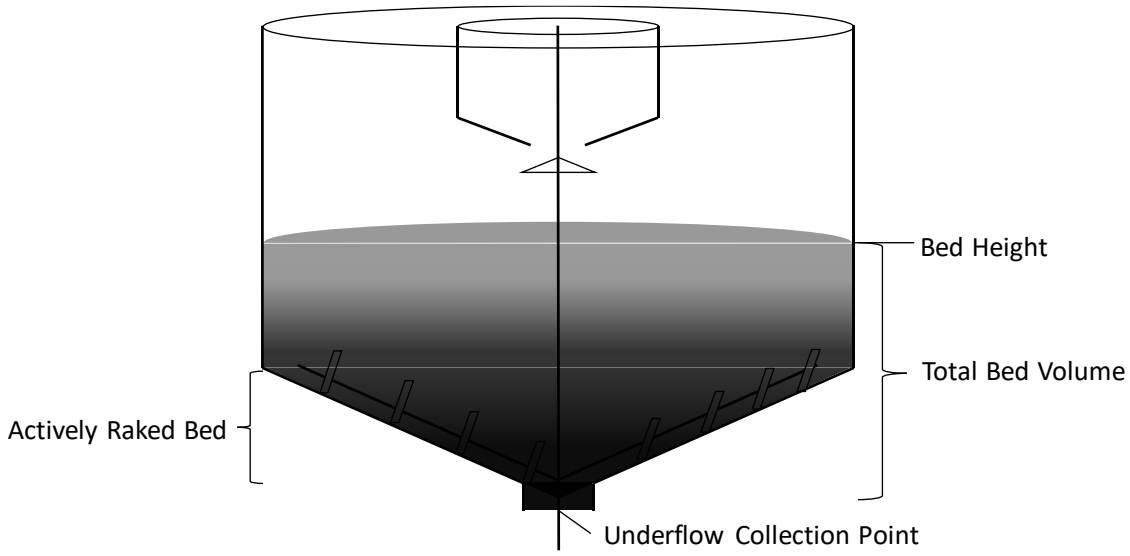


Figure 22: Thickener Bed Profile Sketch

As shown by color gradient in Figure 22, a thickener bed in operation will typically have a concentration profile from lowest concentration at the supernatant-bed interface to highest density at the thickener underflow discharge. This can be attributed to several factors including shear from the rake mechanism, bed retention time, and solids bed compression from bed height. The bed concentration profile is a material specific property and is revealed by and explains the difference between the average bed concentration and the measured underflow concentration. If the calculated average bed concentration is equal to the measured underflow concentration, then the bed is uniform. The further the average bed concentration is from the measured underflow concentration, the greater the bed concentration gradient. The larger the gradient, the less directly the average concentration can be used to infer the underflow concentration with time.

6.2 Test Performed

Based on the results of the high-rate thickening test work, the parameters for the thickener bed consolidation test were as follows:

- A feed solids concentration of 8%m
- Flocculant SNF 913 SH was dosed at 25 g/t
- A solids loading rate of 0.50 (t/h)/m².

The bed was raked throughout the bed build and 24 hour thickener bed consolidation to provide a maximum possible bed consolidation test.

6.3 Whole Tails Thickener Bed Consolidation

The raked thickener bed consolidation test work results are shown graphically Figure 23. Figure 24 shows the increase in underflow slurry yield stress from the high-rate thickening tests and the 24-hour consolidation test. Test result details are available in Appendix D.2.

Figure 23 displays the measured 24-hour consolidation underflow and previous high-rate thickener test underflows in green. The bed height with time is presented in blue, and is used together with bed solids volume to calculate the average bed concentration in red. This shows that there is a slight bed concentration profile, as shown by the difference between the measured underflow concentration and the calculated average bed concentration, particularly in the time range associated with operating conditions.

The consolidation test showed that the Whole Tails material consolidates from 57.5 to 71.9%m over the course of 24 hours. The increased thickener bed consolidation with increase in bed retention time indicates that the tailings are amenable to high-density or paste thickening.

While this test shows that an underflow concentration as high as 71.8%m is attainable, it is unlikely that the design parameters would allow a residence time long enough to achieve such a concentration. After 24 hours, this material increases in yield stress with raking to 539 Pa, which would likely affect removal from the thickener and subsequent pumping.

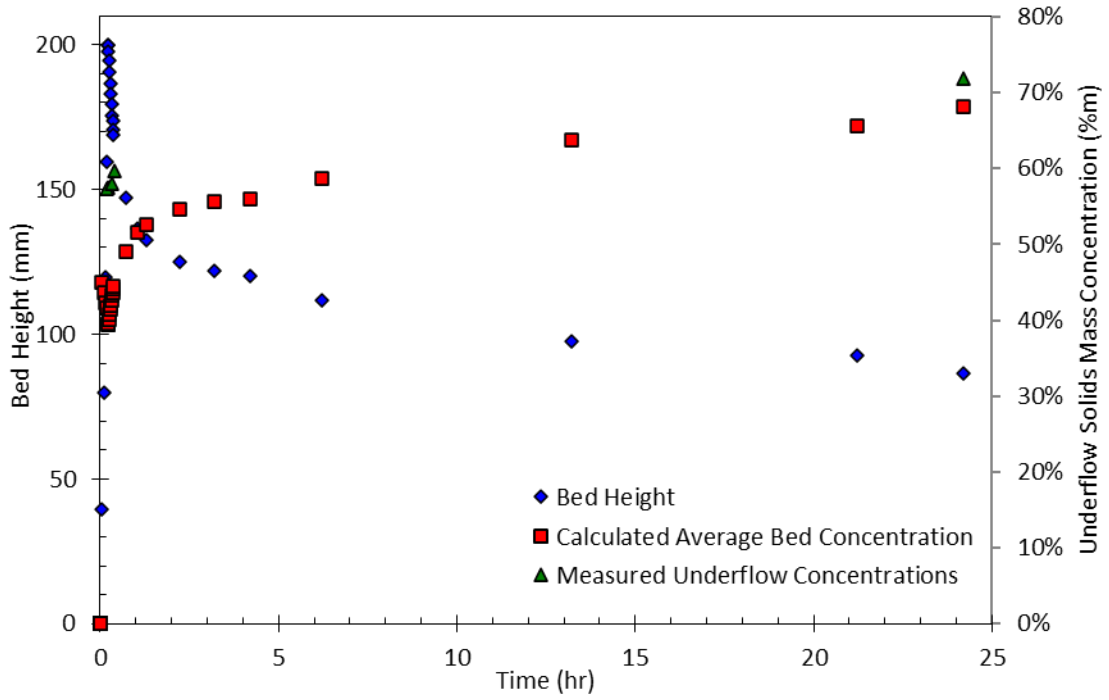


Figure 23: Thickener Bed Consolidation

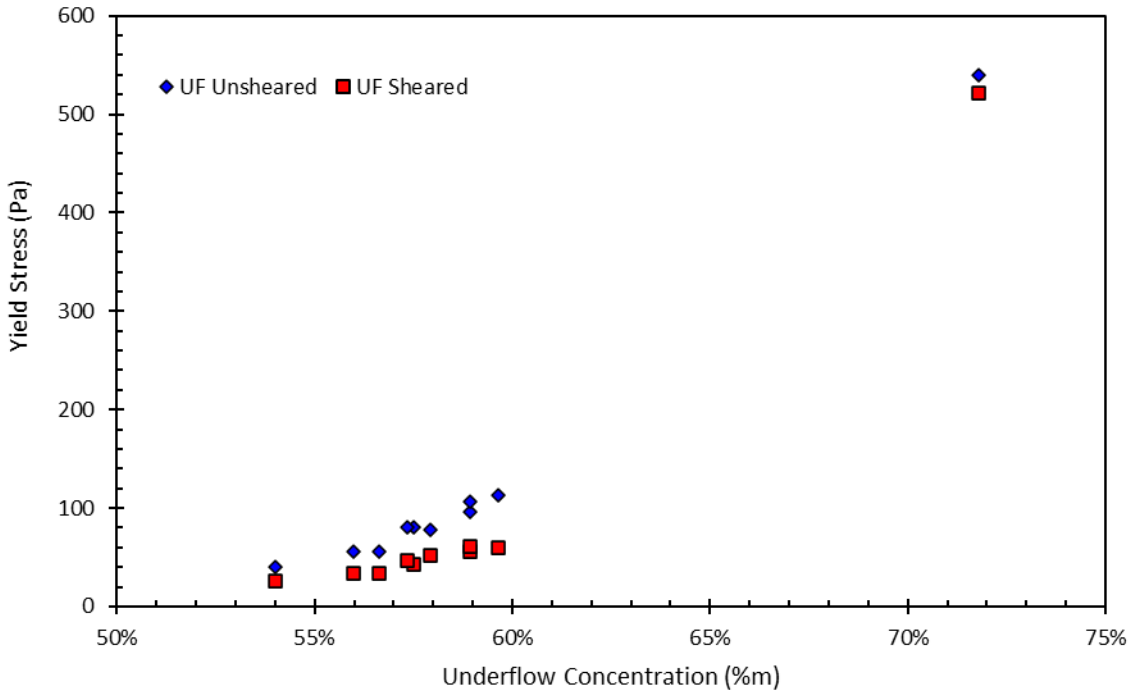


Figure 24: Un-sheared and Fully Sheared Vane Yield Stress for Underflow Consolidation

6.4 Summary of Findings for Dynamic Thickener Bed Consolidation Test Work

The thickener bed consolidation test work shows that the tailings are amenable to high-density or paste thickening. The measured thickener underflow results are summarized in Table XIV.

Table XIV: Thickener Underflow Bed Consolidation Summary

Test	High-Rate Thickener Underflow	Consolidated Underflow
Solids mass concentration	57.5%m	71.8%m
Un-sheared vane yield stress	79.9 Pa	539.4 Pa
Sheared vane yield stress	42.3 Pa	521.0 Pa

7. SLURRY CHARACTERIZATION TESTS

7.1 Coarse Particle Settling Behavior

The freely settled bed concentration, C_{bfree}, of the coarse fraction (+45 µm/+325 mesh) was measured by allowing the sample to settle in a graduated cylinder until the supernatant water was clear.

The maximum settled bed concentration, C_{bmax}, of the coarse fraction (+45 µm/+325 mesh) was measured by compacting the freely settled bed with a tamping rod until the maximum concentration was obtained.

Results are summarized in Table XV and detailed in Appendix E.1.

Table XV: Coarse Particle Settling Behavior Results

Property	Whole Tails
Freely settled bed, C_{bfree}	44.1%v
Maximum settled bed, C_{bmax}	54.2%v

7.2 Penetrometer Tests

The penetrometer test measures the mass required for a conical needle to fully penetrate a settled bed of the total mixture after 24 hours of settling in a beaker. The test provides an indication of

the ability to restart a settled pipeline after shutdown. In general, if the mass to fully penetrate the bed is below 50 g/0.11 lb, the pipeline will be relatively easy to restart[2].

Table XVI provides the results of the penetrometer test for the samples tested and details are available in Appendix E.2. The whole tails slurry samples required masses less than 50 g/0.11 lb at all concentrations to fully penetrate the bed.

Table XVI: Penetrometer Test Work Results

Property	**Whole Tails**		
Tested slurry concentration	55.0%m	60.0%m	65.0%m
Mass to fully penetrate bed	4 g	9 g	38 g

7.3 Bleed Water Tests

Bleed water tests were completed on sub-samples from the tube viscometer tests. Samples settled for 24 hours. Water bleed is defined as shown in Equation Table XVII

$$\text{Bleed Water} = \frac{M_i - M_f}{M_i(1-C)} \quad (10)$$

where: M_i = initial slurry mass (g)

M_f = final slurry mass once bleed water is removed (g)

C = the starting slurry concentration (%m).

The results are summarized in Table XVII and details are available in Appendix E.3.

Table XVII: Bleed Water Test Work Results

Property	**Whole Tails**		
Tested slurry concentration	55.0%m	60.0%m	65.0%m
Bleed water	7.3%	4.0%	3.3%

[2] Provided the pipeline slope is not steep enough to cause the bed to slide into low points following shutdown.

7.4 Sloping Pipe Tests

The sloping pipe test simulates the particle settling behavior in a slurry pipeline after shutdown. If the pipe slope is excessive, solids will migrate downslope and accumulate at low points along the pipeline. The resulting plug of settled solids increases the risk of a blockage during restart. The pipeline slope limitation is important to consider in selecting the pipeline route and determining the need for drain or flush procedures prior to a shutdown.

Table XVIII indicates the maximum recommended slope at which the pipeline should be installed for ease of restart and to avoid a potential pipeline blockage. Sketches of the sloping pipe test are included in Appendix E.4. The bed slide slope is the point at which bed slide is initiated.

Table XVIII: Sloping Pipe Test Results

Property	**Whole Tails**		
Settling time	24 hours		
Solids mass concentration	55.0%m	60.0%m	65.0%m
Maximum recommended pipeline slope (%)[3]	15%	< 10%	< 10%
Bed slide slope	12.4%	13.0%	14.8%

8. RHEOLOGY TEST WORK

8.1 Rotational Viscometer Tests – Carrier Fluid

8.1.1 Test Equipment

P&C's Anton-Paar RheolabQC rotational viscometer shown in Figure 25 has been used for the flow curve measurements. A DG42 double gap type rotor width is used to maximize surface area and minimize end effects. The sensor system geometry for the equipment used is provided in Table XIX

[3] The maximum recommended slope is to avoid the formation of a plug of slurry across the complete pipe cross section. Typically this recommendation only applies to relatively long pipeline lengths where plug formation could lead to pipeline blockage. Steeper slopes may be able to be used for short pipeline lengths as there is low probability of pipeline blockage. Engineering analysis and judgement are required to estimate acceptable slopes and corresponding pipeline length limitations.

and the definitions for each is shown in Figure 26. Data corresponding to incomplete shear and the onset of secondary laminar flow (Taylor vortices) were filtered during the analysis.



Figure 25: Anton Paar RheolabQC Rotational Viscometer

Table XIX: Sensor System Geometry (from DG42 Measuring System Data Sheet)

Parameter	DG42
R_1 (mm)	19.750
R_2 (mm)	20.250
R_3 (mm)	21.000
R_4 (mm)	21.500
Gap Length, L (mm)	78.700

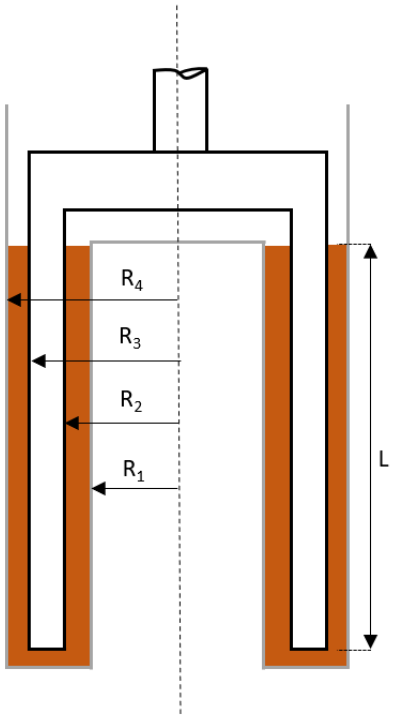


Figure 26: Geometric Definitions (Not to Scale)

8.1.2 Conditions

The sample was split into fine (-45 µm) and coarse (+45 µm) fractions by wet screening with synthetic water. The carrier fluid was diluted to 57.5%m and a 0.1%m flocculant stock solution was used at 33.4 g/t dosage. These flocculant dosages correspond to an equivalent 25 g/t dosage for the whole slurry. Slurry pH and temperature were monitored throughout the test work and are shown in Table XX and Table XXI. Slurry pH was adjusted as needed using $Ca(OH)_2$.

Table XX: pH During Rotational Viscometer Test Work

Parameter	Whole Tails
Maximum pH	11.1
Minimum pH	11.0
Average pH	11.0

Table XXI: Temperature During Rotational Viscometer Test Work

Parameter	Whole Tails
Maximum temperature	20.1 °C
Minimum temperature	20.1 °C
Average temperature	20.1 °C

8.1.3 Measured Test Data

Appendix E presents the detailed viscometer test data files. Each data file contains the following:

- Date, sample name and measuring system used for the tests
- Measured values of shear stress, shear rate and viscosity
- A rheogram (plot of wall shear stress versus shear rate).

The rheology is measured for the carrier fluid sample (-45 µm fraction). The results reported in this section and in the appendices are based on the carrier fluid solids concentration as calculated using Equation (1).

8.1.4 Flow Curve Tests

The rheogram for the Whole Tails is presented in Figure 27 and includes only laminar flow data where there is shear across the whole gap between the rotor and cup.

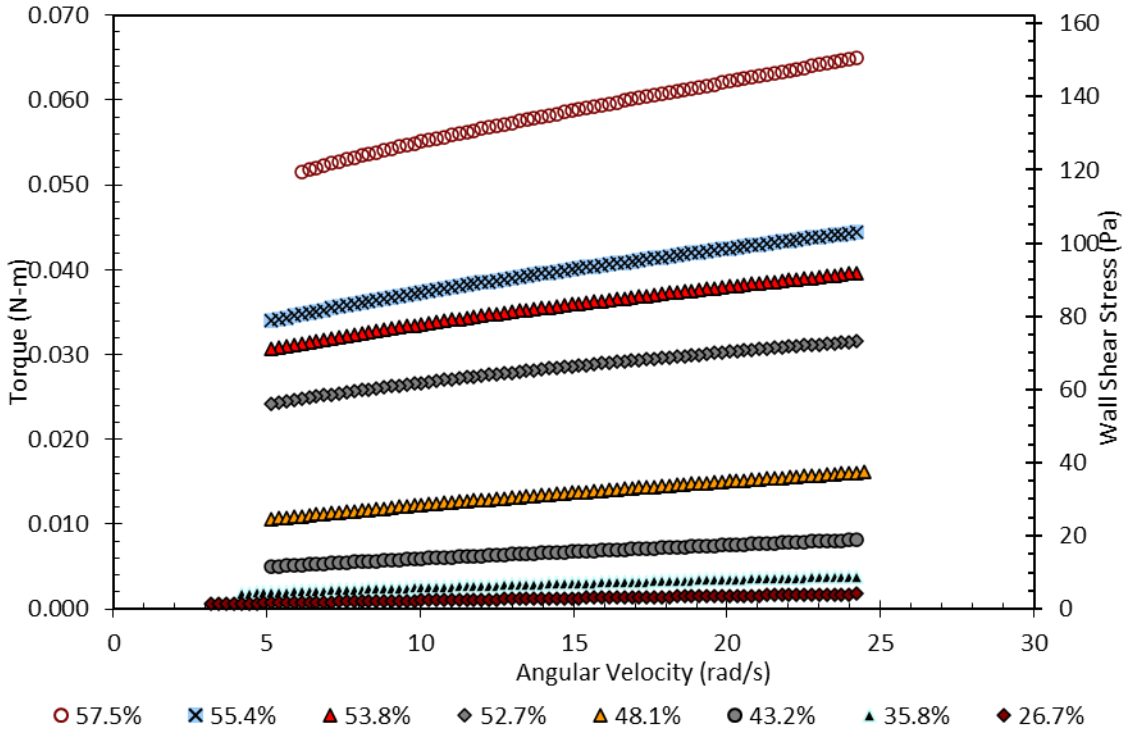


Figure 27: Rheogram – Whole Tails Carrier Fluid Sample with Anton-Paar DG-42

8.1.5 Rheological Characterization

The samples are characterized using the Bingham plastic model. The form of the Bingham plastic model is as follows:

$$\tau = \tau_{yB} + K_{BP}\dot{\gamma} \quad (11)$$

where: τ = shear stress (Pa)

τ_{yB} = Bingham yield stress (Pa)

K_{BP} = plastic viscosity (Pa·s)

$\dot{\gamma}$ = shear rate (s-1).

The Bingham yield stress and plastic viscosity values are calculated using the integrated equation for laminar flow in a double gap viscometer[4], which uses the torque (T) and angular velocity (ω) measurements from the viscometer and the following formulae for a Bingham fluid:

$$\tau = \mathrm{T} * \mathrm{K}_{\sigma} \tag{12}$$

$$\dot{\gamma} = \omega * K_{\dot{\gamma}} \tag{13}$$

$$K_{\sigma} = \frac{1}{2\pi L \frac{R_2}{R_1}(R_2^2 + R_3^2)} \tag{14}$$

$$K_{\dot{\gamma}} = \frac{1}{1 - \frac{R_3^2}{R_4^2}} + \frac{1}{\frac{R_2^2}{R_1^2} - 1} \tag{15}$$

where: ω = angular velocity of spindle (rad/s),

T = applied torque (N-m),

$\dot{\gamma}$ = shear rate (1/s),

and R_1, R_2, R_3, R_4, and L are defined in Figure 26 and Table XIX.

Then the equations above are applied to the Bingham plastic model, Equation (9) to arrive at the final correlation:

$$\omega = \frac{\mathrm{TK}_{\sigma} - \tau_{\mathrm{yB}}}{\mathrm{K}_{\mathrm{BP}}\mathrm{K}_{\dot{\gamma}}} \tag{16}$$

8.1.6 Carrier Fluid Rheology Correlations

Table XXII presents correlations for the Bingham yield stress and plastic viscosity as a function of carrier fluid mass concentration for the carrier fluid samples. These relationships are shown graphically in Figure 28 and Figure 29.

[4] Reference from thesis by Ghassan Izhar Khan, MEASUREMENT OF CARRIER FLUID VISCOSITIES OF OIL SAND SLURRIES, 2019

Table XXII: Carrier Fluid Rheological Parameters

Property	**Whole Tails**
Carrier fluid Bingham yield stress (Pa)	$\tau_{yBf}=a(C_f)^b$
Carrier fluid relative plastic viscosity	$K_{BPf}/\mu_{water}=(1-C_f/c)^{-d}$
a	10575.2
b	8.32
c	0.775
d	2.71
Measured carrier fluid concentration range	57.5%m to 26.7%m

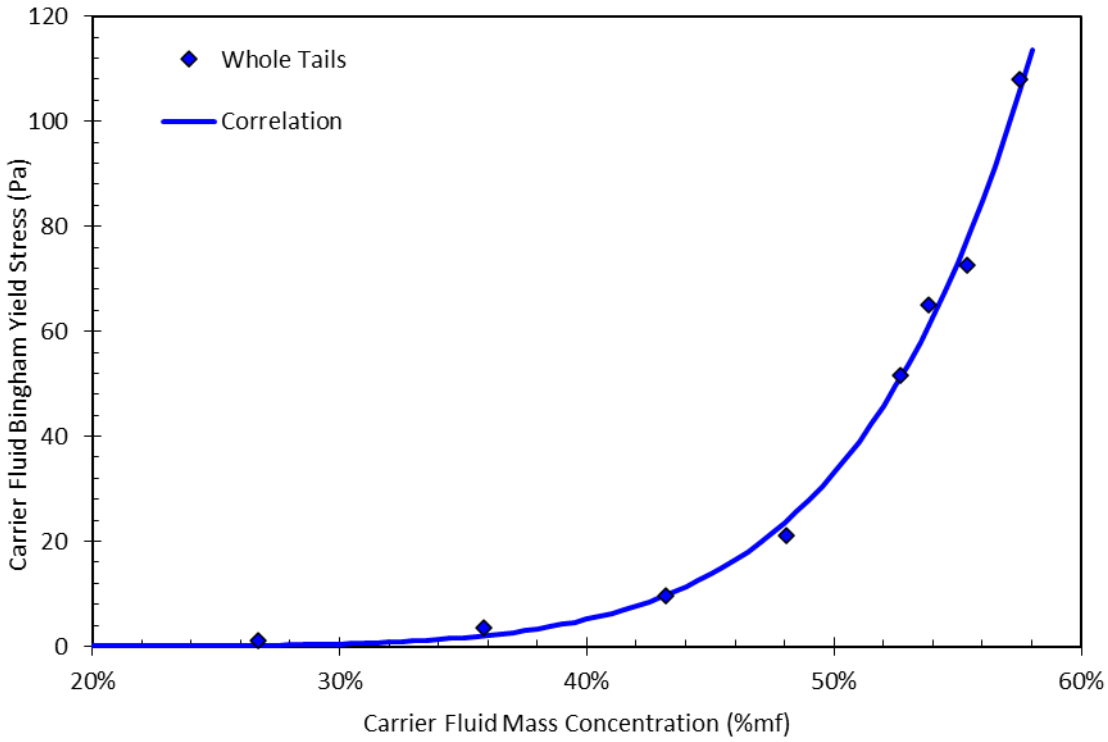


Figure 28: Bingham Yield Stress versus Carrier Fluid Mass Concentration, Test Concentration Range

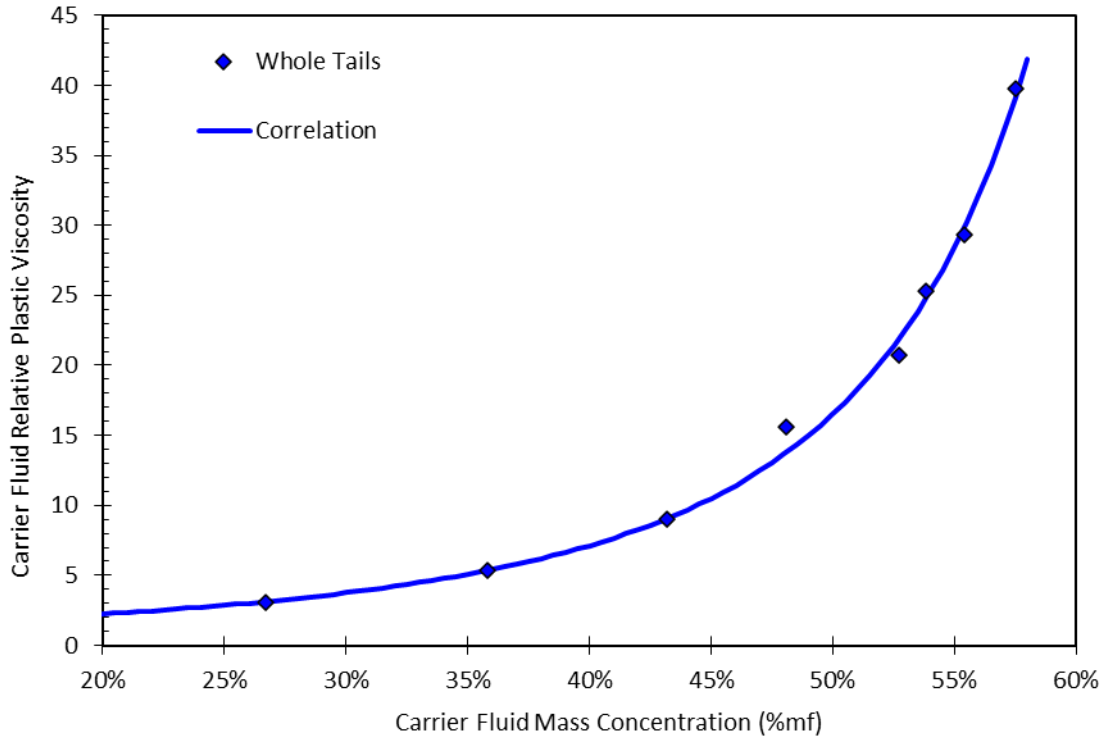


Figure 29: Plastic Viscosity versus Carrier Fluid Mass Concentration, Test Concentration Range

8.2 Tube Viscometer Rheology Measurements

8.2.1 Method and Equipment

P&C's ¾ inch (20 mm) tube viscometer has been used for the test work. An isometric sketch of the apparatus is shown in Figure 30. The viscometer comprises the following principal equipment:

- Progressive cavity pump with a variable frequency drive
- ¾ inch (20 mm) vertical up and down stainless steel measurement tubes
- Micromotion coriolis mass flow meter
- Rosemount differential pressure transmitters
- Heat exchanger to control the slurry temperature during a test.

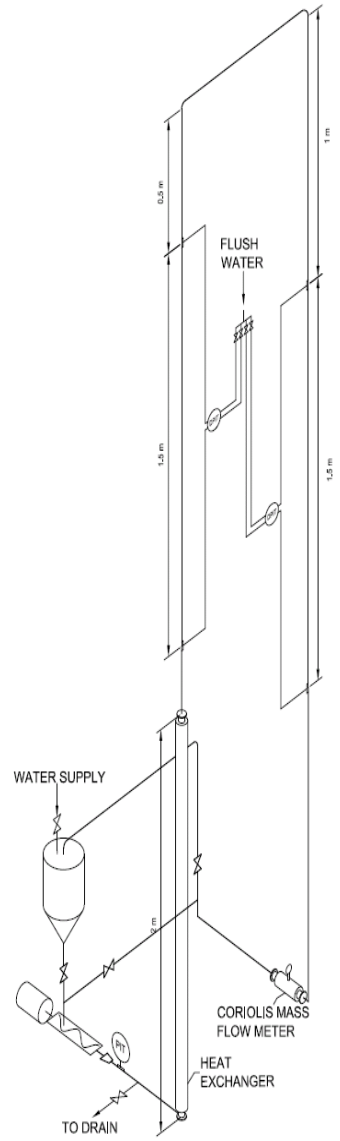


Figure 30: Isometric Sketch of P&C's ¾ inch (20 mm) Tube Viscometer

8.2.2 Conditions

Whole slurry samples of the whole tails were used for tube viscometer test work. The samples were flocculated with SNF 913 SH at a dosage of 25 g/t. Slurry pH and temperature was monitored throughout the test work and are shown in Table XXIII and Table XXIV.

Table XXIII: pH during Tube Viscometer test work

Parameter	Whole Tails
Maximum pH	11.1
Minimum pH	10.9
Average pH	11.0

Table XXIV: Temperature during Tube Viscometer test work

Parameter	Whole Tails
Maximum temperature (°C)	21.0 °C
Minimum temperature (°C)	20.1 °C
Average temperature (°C)	20.5 °C

8.2.3 Measured Data

Appendix F presents the tube viscometer test data files. Each data file contains the following:

- Date, sample name and measuring system used for the tests
- Measured values of pseudo-shear rate and wall shear stress
- A pseudo-shear diagram (plot of wall shear stress versus pseudo-shear rate).

The pseudo-shear diagrams in Figure 31 present the data for the Whole Tails sample. Only laminar flow data is presented on the pseudo-shear diagrams.

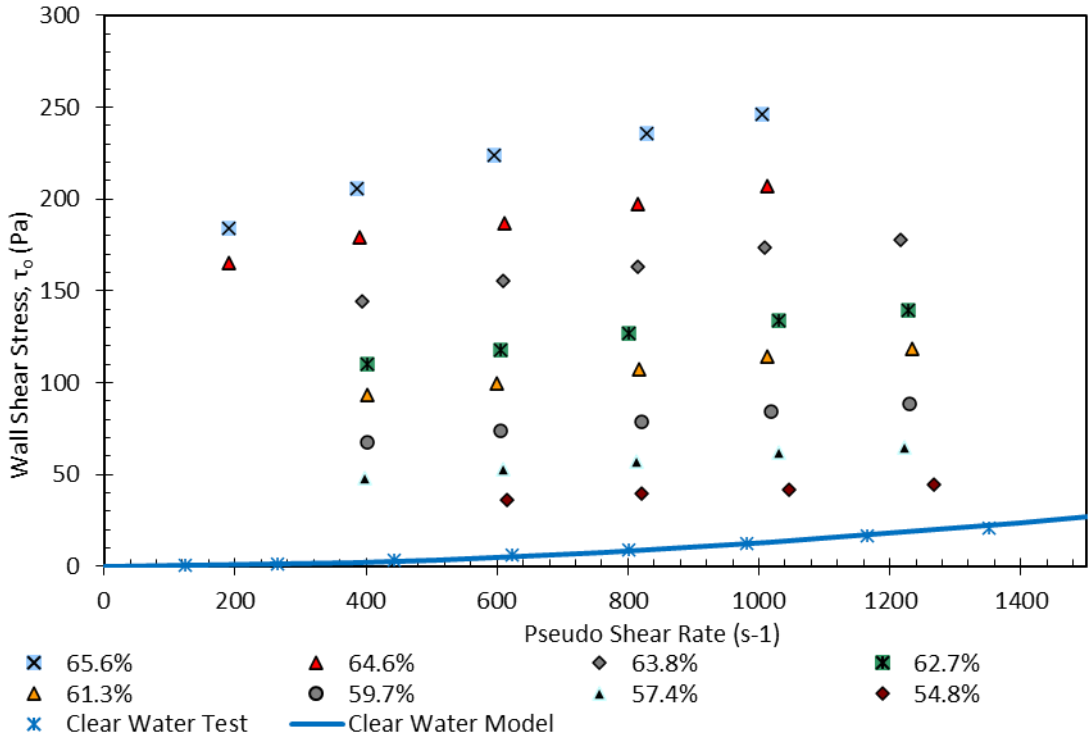


Figure 31: Whole Tails Pseudo-Shear Diagram

8.2.4 Rheological Characterization

The laminar flow behavior of the slurry is characterized using the Bingham plastic model:

$$\tau = \tau_{yB} + K_{BP}\dot{\gamma} \quad (17)$$

where: τ = shear stress (Pa)

τ_{yB} = Bingham yield stress (Pa)

K_{BP} = plastic viscosity (Pa·s)

$\dot{\gamma}$ = shear rate (s-1).

The Bingham yield stress and plastic viscosity values are determined using the Buckingham Equation for pipe flow, which relates the Bingham model parameters to the wall shear stress and pseudo shear rate:

$$\frac{8V}{D} = \frac{\tau_0}{K_{BP}}\left[1 - \frac{4}{3}\alpha + \frac{1}{3}\alpha^4\right] \quad (18)$$

where: $\alpha = \tau_{yB}/\tau_0$

K_{BP} = Plastic viscosity (Pa·s).

8.2.5 *Slurry Rheology Correlations*

Table XXV presents correlations for Bingham yield stress and plastic viscosity as a function of slurry mass concentration. These relationships are shown in Figure 32 and Figure 33, respectively.

Table XXV: Slurry Rheological Parameters

Property	**Whole Tails**
Bingham yield stress (Pa)	$\tau_{yB}=a(C)^b$
Relative plastic viscosity	$K_{BP}/\mu_{water}=(1- C/c)^{-d}$
a	24989
b	11.99
c	0.744
d	1.81
Measured slurry concentration range	65.6 to 54.8 %m

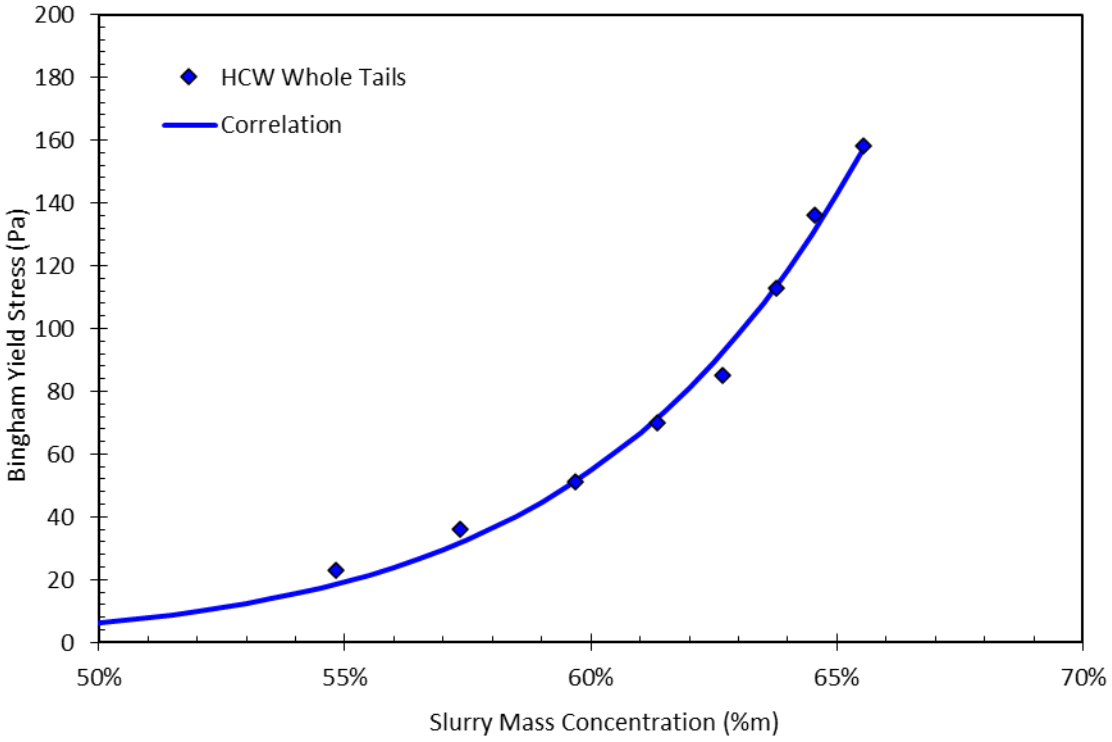


Figure 32: Bingham Yield Stress versus Slurry Mass Concentration

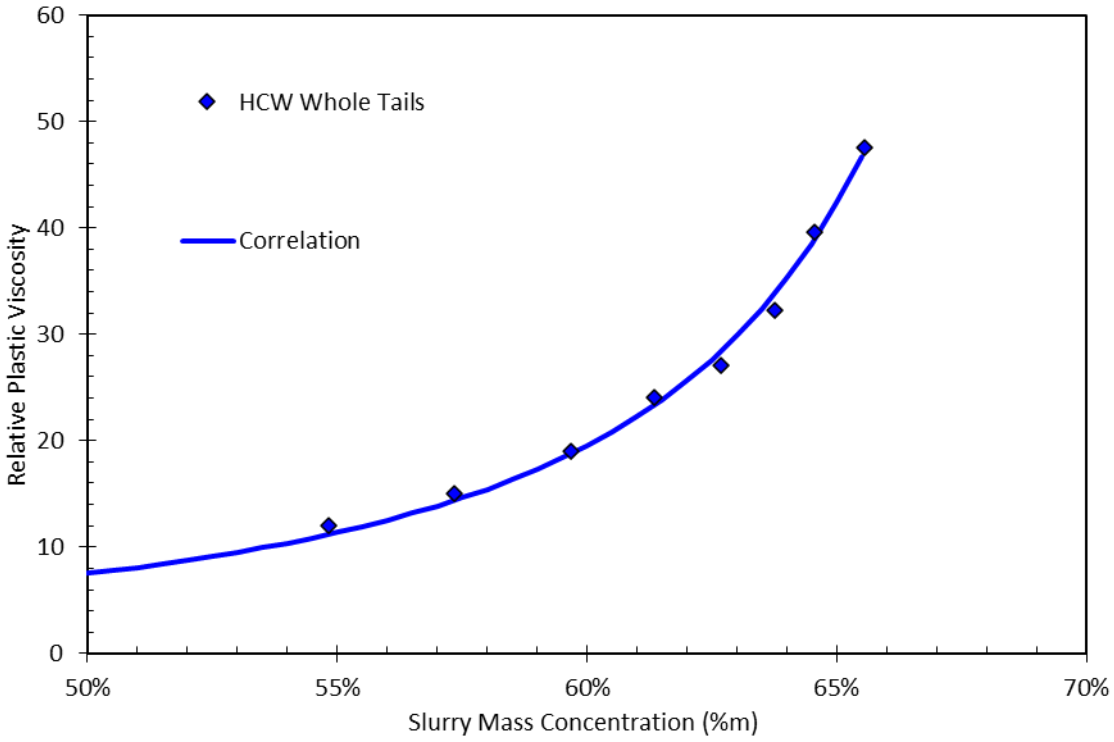


Figure 33: Relative Plastic Viscosity versus Slurry Mass Concentration

8.3 Boger Slump Tests

Boger slump tests have been conducted for the Whole Tails slurry. The samples were flocculated as detailed in Section 8.2.2, above.

8.3.1 Test Equipment and Analysis

P&C's standard 73 mm diameter by 73 mm height Boger slump cylinder was used to provide indicative yield stress estimations. A sub-sample at each tested concentration from the tube viscometer tests was taken to conduct the Boger slump tests.

The yield stress of non-Newtonian slurries is estimated from the slump obtained using a straight sided cylinder[5], as follows:

$$\frac{h}{H} = 1 - \frac{2\tau_y}{\rho_m g H}\left(1 - \ln\left(\frac{2\tau_y}{\rho_m g H}\right)\right) \qquad (19)$$

[5]Pashias, N, Boger, D.V., Summers, J., and Glenister, D.J.. "A Fifty Cent Rheometer for Yield Stress Measurement", *J Rheology*, Vol. 40, No. 6, p. 1179-1189.

where: h = measured slump height (m)

H = cylinder height (m)

ρ_m = slurry density (kg/m^3).

Photographs are shown in Figure 34 while results are presented in Table XXVI. Only tests with measurable slumps are reported.

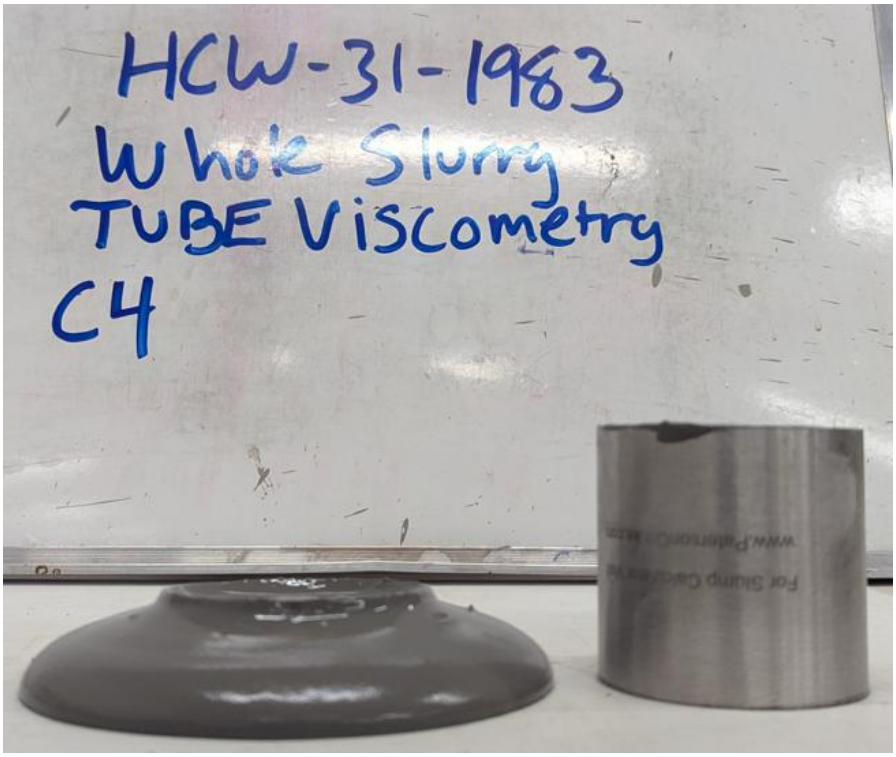


Figure 34: Whole Tails Boger Slump 64.6%m

Table XXVI: Whole Tails Boger Slump Results

Concentration (%m)	Boger Slump	Yield Stress
65.6%m	44.5 mm	78.6 Pa
64.6%m	51.0 mm	53.5 Pa
63.8%m	54.0 mm	43.3 Pa
62.7%m	58.0 mm	31.0 Pa
61.3%m	60.0 mm	25.3 Pa
59.7%m	62.0 mm	20.0 Pa

8.4 Beach Slope Rheology

Beach slope tests were completed for the Whole Tails sample at target concentrations of 64%m, 63%m, and 61%m using the TailPro McPhail MICRO Flume and procedure. The flume is pictured in Figure 35.

For each test run, a steady flow rate is pumped into the head tank, which then discharges into the flume. The beach is allowed to build up until either the height or length of the built beach approaches the top or end of the flume. Free water is allowed to drain off the end of the flume into a bucket. Video from both the side and overhead perspectives capture the beach deposition process.

The time to build the beach is recorded, and the beach is left undisturbed for 5 minutes following completion of deposition. The beach surface profile is recorded, and samples from the upstream and downstream ends of the profile are taken for solids mass concentration, vane yield stress, rotational viscometry, and particle size distribution. Vane yield stress and rotational viscometry data will be updated after approval from WWL in Revision C.

8.4.1 Beach Slope Flume

The TailPro McPhail MICRO Flume, 100 mm wide, was used for beach slope flume tests



Figure 35: TailPro McPhail MICRO Flume, 100mm wide

8.4.2 Observations

- Upstream and downstream concentrations were generally within 0.4%m of the feed concentrations. A small amount of bleed water (about 5 to 10 mL) was present at the downstream end of the beach slope. Bleed water generally increased as solids concentration decreased. At higher flow rates, this was slightly more noticeable and is somewhat reflected in the upstream vs downstream solids concentration measurements.

- Upstream and downstream particle size distributions for tested concentrations were essentially the same. Given the high proportion of fine-grained particles in the whole tails sample (74.5% passing 45µm), it is likely that the carrier fluid is supporting the coarse particles and not allowing for significant segregation within the length of the flume. Figure 36 shows particle size distribution graphically.

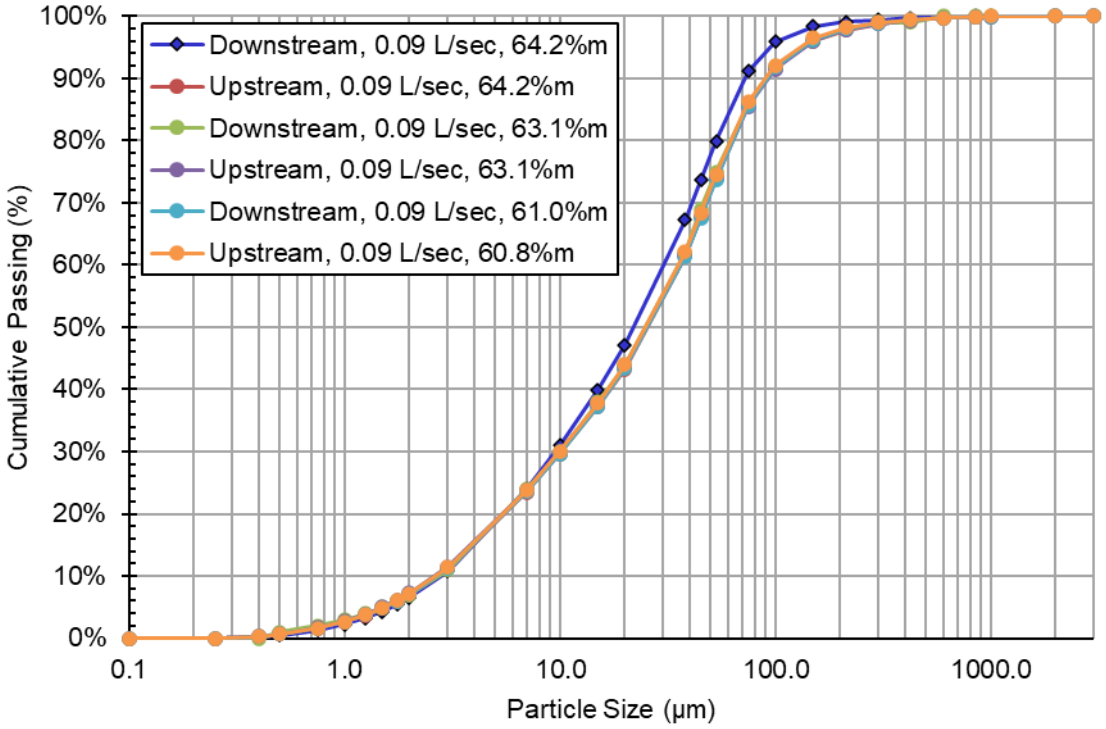


Figure 36: Particle Size Distribution for lowest flow rate Beach Slope tests

8.4.3 Data

A photo of the whole tails sample in the beach slope flume can be seen in Figure 37. This image is shown graphically as “Canal 1” in Figure 40, below. Additional beach slope profiles are presented in Figure 38, Figure 39 and Figure 40.

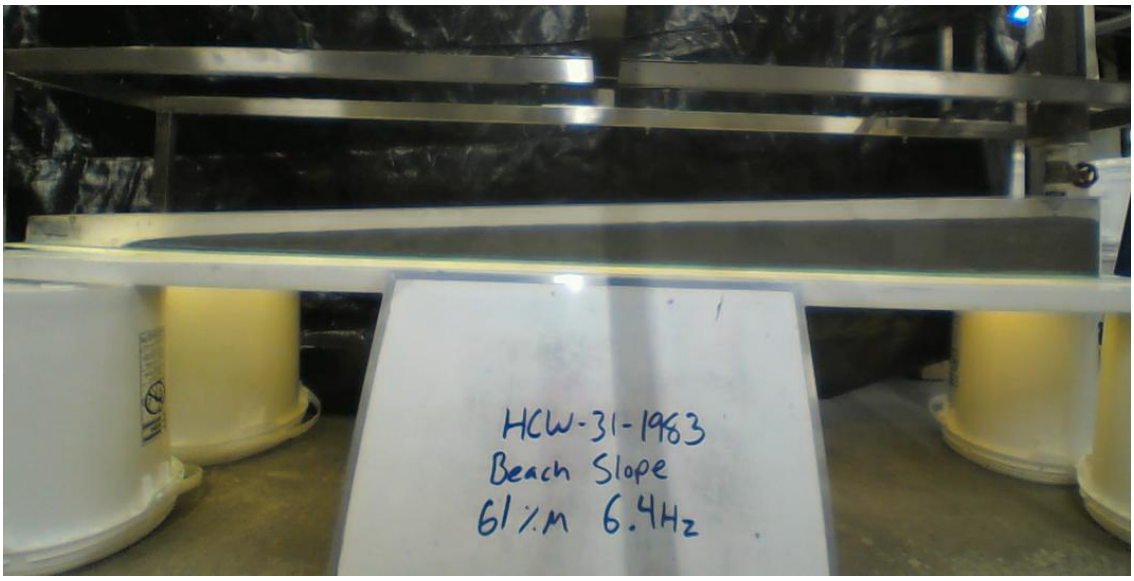


Figure 37: Beach at 61%m and 0.09 L/sec

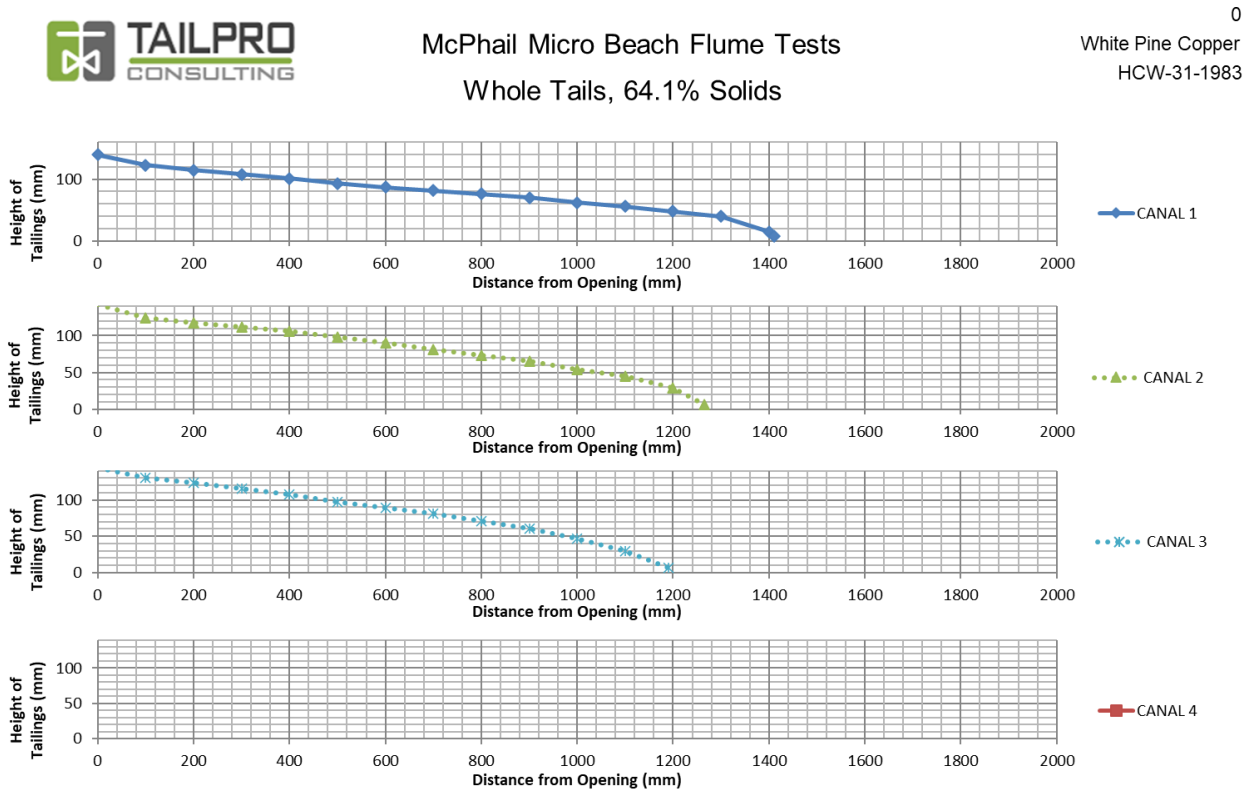


Figure 38: Beach Profiles, 64.1%m

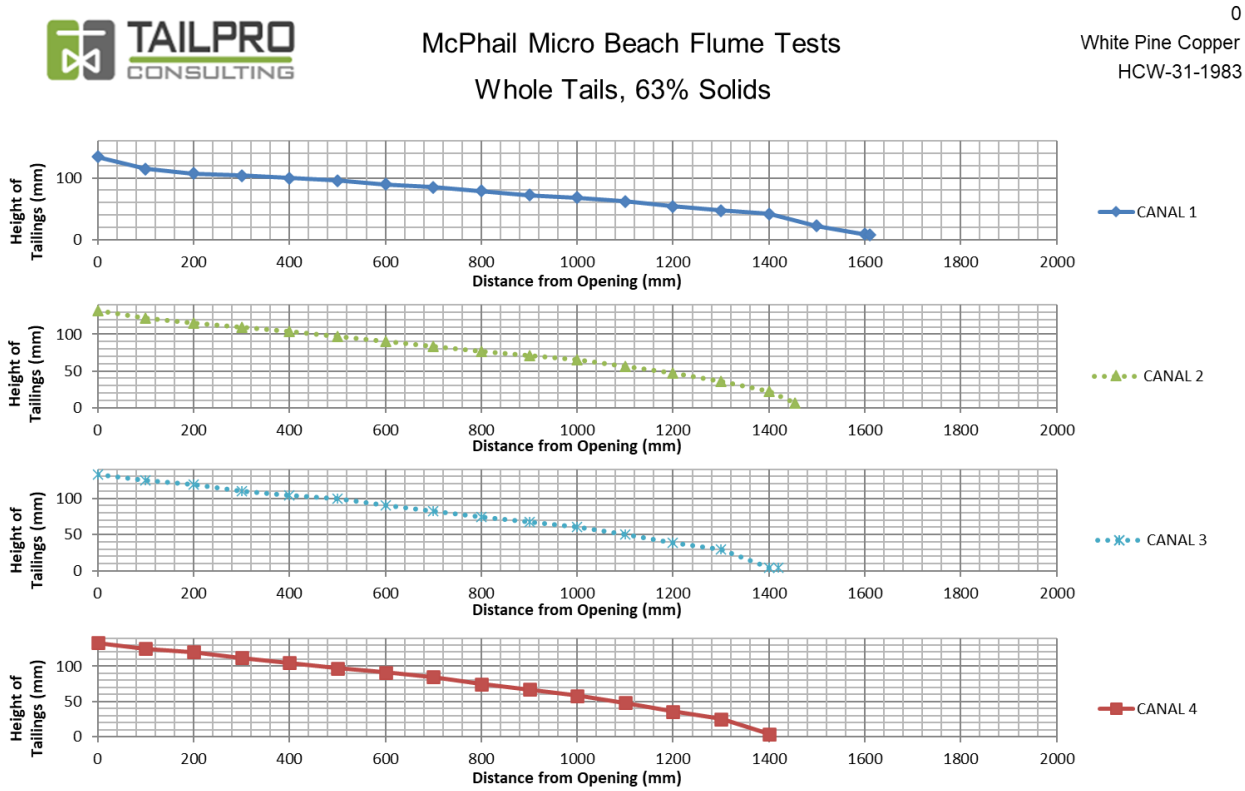


Figure 39: Beach Profiles, 63.0%m

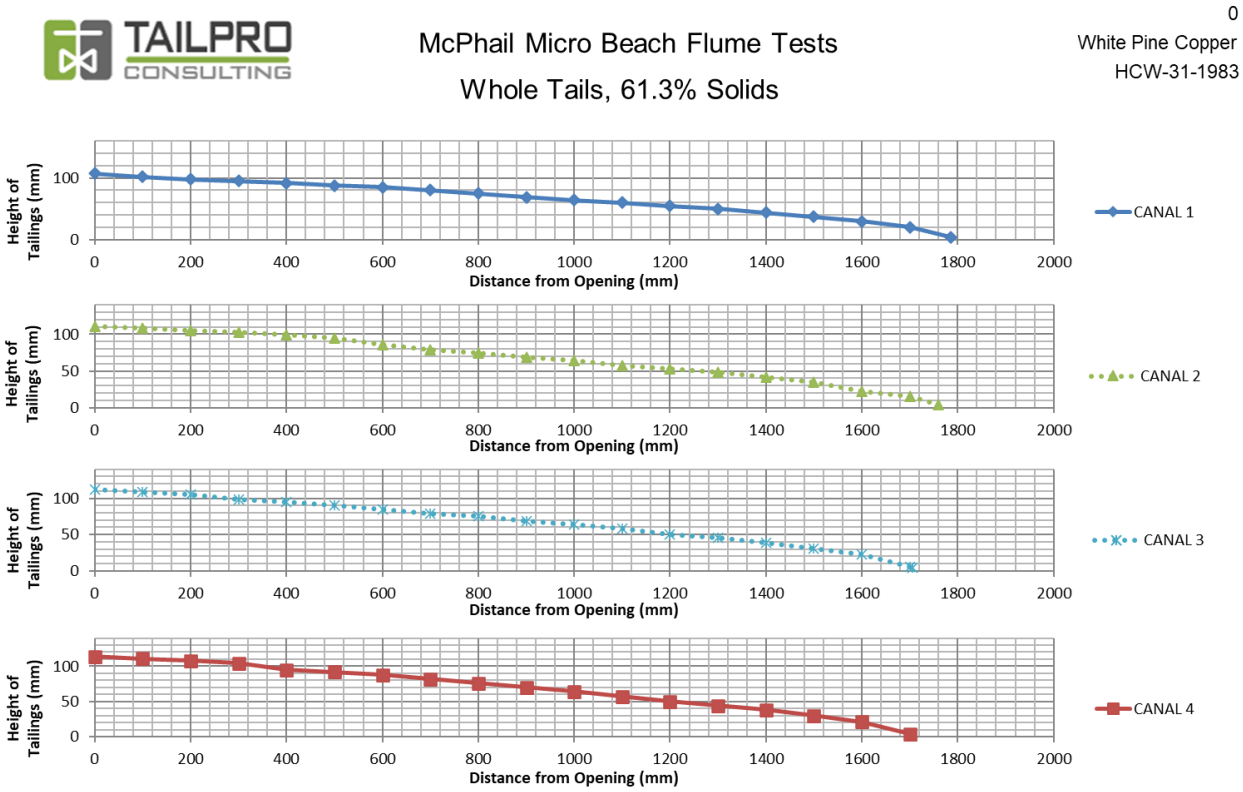


Figure 40: Beach Profiles, 61.3%m

A summary of concentration and flow rate for each run are presented in Table XXVII.

Table XXVII: Run Concentrations at Feed, Heel, and Toe

Target Concentration	Flow Rate (L/sec)	Measured Feed %m	Measured Heel %m	Measured Toe %m
64.0%m	0.22	64.0%m	64.2%m	64.2%m
	0.15	64.2%m	64.4%m	64.4%m
	0.09	64.3%m	64.4%m	64.3%m
63.0%m	0.28	63.1%m	63.1%m	63.1%m
	0.21	63.2%m	63.1%m	63.5%m
	0.15	63.4%	63.6%m	63.4%m
	0.09	63.5%m	63.6%m	63.4%m
61.0%m	0.28	61.3%m	61.1%m	61.4%m
	0.21	61.3%m	61.1%m	61.3%m
	0.15	61.1%m	61.2%m	61.2%m
	0.09	61.3%m	61.2%m	61.0%m

8.4.4 WWL Report Summary

A detailed report of the beach slope data analysis prepared by WWL will be provided in Revision C.

8.5 Summary of Findings for Rheology Test Work

The Whole Tails carrier fluid rheology has been measured using a rotational viscometer. The carrier fluid is characterized as a Bingham plastic slurry, and correlations presented relating Bingham yield stress and relative plastic viscosity to carrier fluid mass concentration.

The Whole Tails rheology has been measured using a tube viscometer. The slurry is characterized as a Bingham plastic slurry, and correlations presented relating Bingham yield stress and relative plastic viscosity to slurry mass concentrations.

Beach slope rheological characterization will be completed by Waste, Water & Land (WWL). Upon receipt of the results from WWL, P&C will incorporate them into this test work report and issue it as Revision C.

9. TEST WORK SUMMARY

This report outlines the results from materials characterization, slurry characterization, thickening, and rheology test work.

Jacob Bruihler
Technologist

Ian Farrell
Senior Engineer

Rachel Jansen
Tailings Manager

APPENDIX A : MATERIAL CHARACTERIZATION TEST RESULTS

Test
A.1 Sample Receipts and Transmittals
A.2 As-Received Slurry Concentration
A.3 Solids Density – Pycnometer
A.4 Particle Size Analysis - Wet Sieve
A.5 Particle Size Analysis – Microtrac Laser
A.6 Mineralogy – DCM Report
A.7 Zero Free Water
A.8 Zeta Potential

A.1 Sample Receipts and Transmittals

PATERSON & COOKE

1150 Catamount Drive
Golden, CO 80403
www.patersoncooke.com

SAMPLE RECEIPT FORM

PROJECT NAME	White Pine Copper Tailings Pre Feasibility Study	Date Received	September 30, 2025
PROJECT NUMBER	HCW-31-1983	Time Received	11:00 AM
PROJECT MANAGER	Rachel Jansen	Signature	MM

SAMPLE NAME	White Pine Copper Tailings	Container Damage Present	No
Supplied By	Base Met Labs	Sample Photo Taken	Yes
MSDS Received	Y	Effective Gamma Dose Rate (Γ) at face of material	0.02 µSv/h
P&C Sample Code	WPCT		

Container Label	Container Type	pH	Conductivity (mS/cm)	Mass Estimate	% Solids Estimate	Solids Mass Calculated	Water Mass Calculated
BL1667-13 CT1A-E	15 gal drum	9.2	4.2	29.50 kg	45.0%	13.28 kg	16.23 kg
BL1667-43 RTA-E	15 gal drum	9.2	5.6	47.00 kg	45.0%	21.15 kg	25.85 kg
					Total	34.43 kg	42.08 kg

Radiation Type	Distance from Sample	Time (min)	Total Count	Measured CPS	CPS Above Background	Dose Rate (µSv/h)
Background	2 m distance	10.0	542	0.90		
γ	At sample face	10.0	617	1.03	0.13	0.02

Water Density (g/L)	999.5	± 0.2
Trial 1	999.4	
Trial 2	999.7	
Trial 3	999.5	

Water TDS %m	0.048%	%m
Tin tare	7.088	g
Tin + Water	65.522	g
Tin + Salts	7.116	g

A.2 As-Received Slurry Concentration

PATERSON & COOKE

Concentration Determination

1150 Catamount Drive, Golden, Colorado 80403	Project Description: White Pine Copper	Project Number: HCW-31-1983 Sample: Whole Tails	Test Engineer: JCB Date Tested: 10/14/2025

Solids Density 2,767.5 | Liquid Density 1,000.0 | Dissolved Solids 0.0500% | Slump Height (mm) 73

	1										
Slurry + tare	39.954										
Solids + tare	19.099										
tare	1.304										
Slurry	38.650										
Solids	17.795										
Dissolved Solids Mass	0.0104										
% Solids with Dissolved	46.04%										
Corrected % Solids	**46.01%**										
Corrected % Moisture	53.99%										
Slurry Density	1,416.18										

A.3 Solids Density – Pycnometer

PATERSON & COOKE — **Solids Density**

1150 Catamount Drive, Golden, Colorado 80403	Project Description: White Pine Copper	Project Number: HCW-31-1983	Test Engineer: JCB
		Sample: Whole Tails	Date Tested: 10/21/2025

Reference Chamber Volume		cm³	192.5406	
Cell without Sample				
Average Vcell		cm³	196.5501	
Standard Deviation		cm³	0.047	

Cell with Sample A

Pp (kPa)	Pd (kPa)	Pa (kPa)	Vcell (cm³)
202.066	131.137	82.132	133.028
202.256	131.272	82.129	133.295
202.323	131.301	82.110	133.357
202.355	131.339	82.098	133.507
202.418	131.374	82.113	133.505

Average Vcell		cm³	133.3383	
Standard Deviation		cm³	0.1966	
Sample A Volume		cm³	63.2118	
Sample A Mass		g	174.238	
Sample A Density		kg/m³	**2756.4**	± 8.6

Cell with Sample B

Pp (kPa)	Pd (kPa)	Pa (kPa)	Vcell (cm³)
202.752	132.498	82.092	138.144
202.735	132.476	82.081	138.107
202.757	132.485	82.082	138.101
202.780	132.506	82.085	138.146
202.766	132.490	82.093	138.077

Average Vcell		cm³	138.1150	
Standard Deviation		cm³	0.0297	
Sample B Volume		cm³	58.4351	
Sample B Mass		g	161.944	
Sample B Density		kg/m³	**2771.3**	± 1.4

Cell with Sample C

Pp (kPa)	Pd (kPa)	Pa (kPa)	Vcell (cm³)
202.766	133.874	82.088	144.733
202.770	133.883	82.084	144.776
202.759	133.857	82.072	144.708
202.777	133.872	82.086	144.702
202.769	133.871	82.091	144.702

Average Vcell		cm³	144.7242	
Standard Deviation		cm³	0.0317	
Sample C Volume		cm³	51.8259	
Sample C Mass		g	143.805	
Sample C Density		kg/m³	**2774.8**	± 1.7
Average Density of Whole Tails		kg/m³	**2767.5**	± 3.9
Standard Deviation		kg/m³	9.8	

A.4 Particle Size Analysis - Wet Sieve

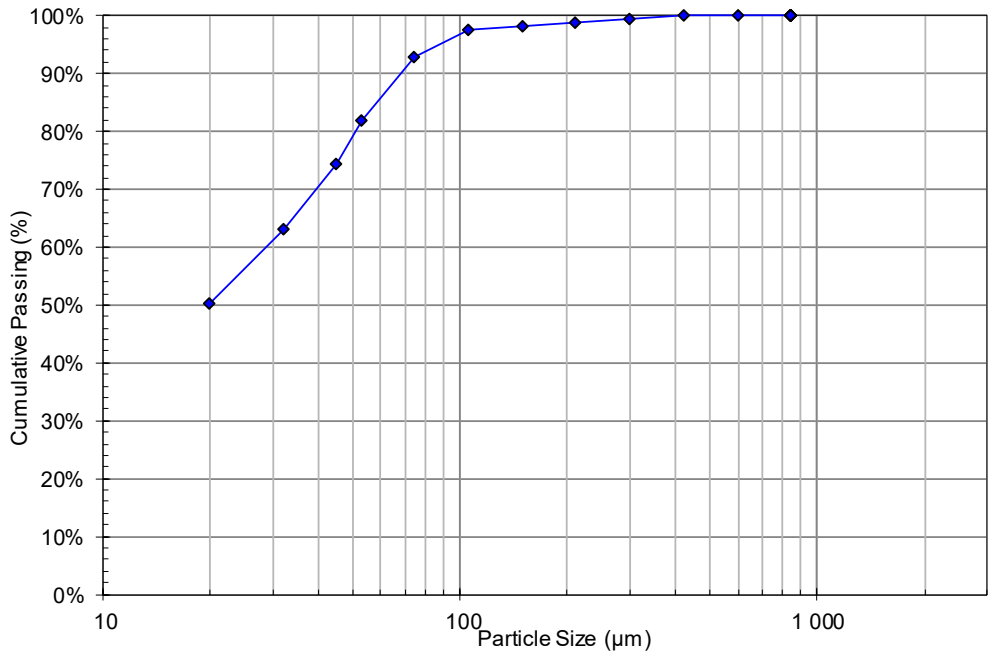
PATERSON & COOKE

Wet Sieve Particle Size Distribution

1150 Catamount Drive, Golden, Colorado 80403	Project Description: White Pine	Project Number: HCW-31-1983	Test Engineer: MTM
		Sample: Whole Tails	Date Tested: 10/20/2025

Standardized Sieve Set Sizes (µm)	Test Mass Retained (g)	Test Fraction Retained (%}	Standardized Cumulative Passing (%)
850	0	0.0%	100.0%
600	0	0.0%	100.0%
425	0.006	0.0%	100.0%
300	1.024	0.6%	99.4%
212	1.054	0.6%	98.8%
150	1.116	0.7%	98.1%
106	1.152	0.7%	97.5%
75	7.665	4.5%	93.0%
53	18.999	11.1%	81.9%
45	12.646	7.4%	74.5%
32	19.598	11.4%	63.1%
20	21.86	12.8%	50.3%
-20	86.104	50.3%	

Particle Size D50 (µm)	Particle Size D80 (µm)	Particle Size D90 (µm)
<20	50.8	68.3
% -75µm	% -45µm	% -20µm
93.0%	74.5%	50.3%



A.5 Particle Size Analysis – Microtrac Laser

PATERSON & COOKE

Laser Particle Size Distribution

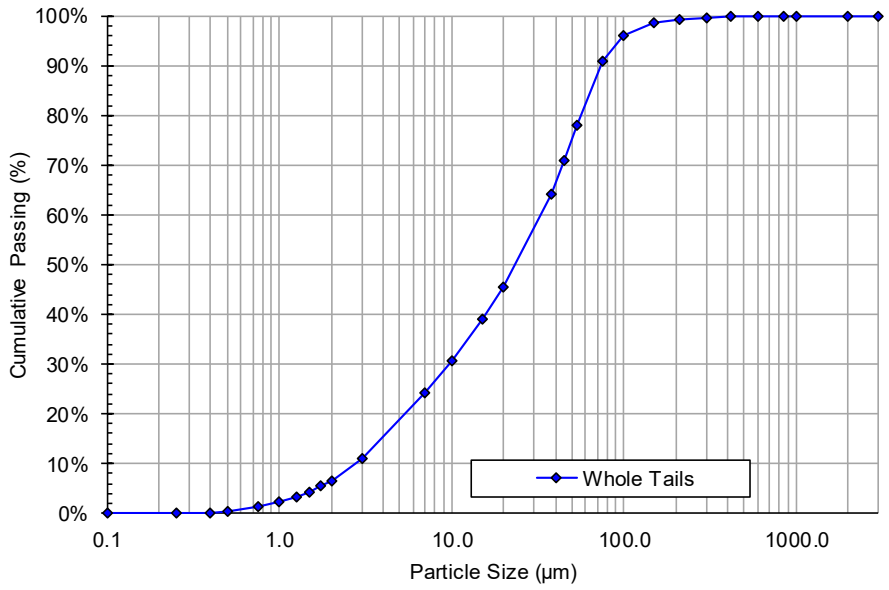
1150 Catamount Drive, Golden, Colorado 80403	Project Description: Whitepine Copper	Project Number: HCW-31-1983 Sample: Whole Tails	Test Engineer: MTM Date Tested: 10/21/2025

Standardized Sieve Set Sizes (µm)	Standardized Cumulative Passing (%)
3000	100%
2000	100%
1000	100%
850	100%
600	100%
420	100%
300	99%
212	99%
150	99%
100	96%
75	91%
53	78%
45	71%
38	64%
20	45%
15	39%
10	31%
7.0	24%
3.0	11%
2.0	7%
1.75	5%
1.50	4%
1.25	3%
1.00	2%
0.75	1%
0.50	0%
0.40	0%
0.25	0%
0.10	0%

Particle Size P50 (µm)	Particle Size P80 (µm)	Particle Size P90 (µm)
23.4	56.0	73.5

% -75µm	% -45µm	% -20µm
91%	71%	45%

% -3µm	% -1µm	% -0.25µm
11%	2%	0%



A.6 Mineralogy – DCM Report

12421 W. 49th Avenue, Unit #6
Wheat Ridge, CO 80033 (303) 463-8270

Semi-Quantitative X-Ray Diffraction Analysis
Page 1 of 2

Client:
Paterson & Cooke
1150 Catamount Dr
Golden, CO 80403

Analysis Date:	10-30-25
Reporting Date:	10-30-25
Receipt Date:	10-22-25
Client Job No.:	HCW-31-1983
Client Project:	None Given
PACE Project:	25041510

Client Sample No.:	WHOLE TAILS
Bulk Sample	
Calcite	2.9
Chlorite	23.6
K-Feldspar	8.2
Mica	11.1
Plagioclase	22.2
Quartz	30.0
Unaccounted	<5

Client Sample No.:	WHOLE TAILS
Total Clay	ND

ND - Not detected

The bulk sample was prepared for x-ray diffraction analysis and scanned over a range of 3° to 45° 2Θ Cu Kα radiation, 40kV, 35mA. Mineral phases were identified with the aid of computer-assisted programs accessing a powder diffraction database. Estimates of mineral concentrations are based on relative peak heights and reference intensity ratios (RIR) measured in-house.

12421 W. 49th Avenue, Unit #6
Wheat Ridge, CO 80033 (303) 463-8270

Semi-Quantitative Clay Analysis (XRD)
Page 2 of 2

Client:
Paterson & Cooke
1150 Catamount Dr
Golden, CO 80403

Analysis Date:	10-30-25
Reporting Date:	10-30-25
Receipt Date:	10-22-25
Client Job No.:	HCW-31-1983
Client Project:	None Given
PACE Project:	25041510

Client Sample No.:	**WHOLE TAILS**
Clay Fraction <2µm	ND

ND - Not detected

An oriented clay mount (<2µm) was prepared for each sample for x-ray diffration analysis and scanned over a range of 3° to 45° 2Θ Cu Kα radiation, 40kV, 25mA. The mount was analyzed air-dried RH ~25% and glycolated. Clay concentrations are based on peak areas and intensity factors measured in-house on known standards or computer calculated.

All information provided by client, including sample results, is considered proprietary and confidential. Client results and other information will not be released to anyone but the client except by client request. When the laboratory is required by law or authorized by contractual arrangement to release confidential information, the client or individual concerned shall, unless prohibited by law, be notified of the information provided.

Audrey Rager

Audrey Rager, Analyst

A.7 Zero Free Water & Specific Cake Resistance

PATERSON & COOKE

Zero Free Water

1150 Catamount Drive, Golden, Colorado 80403	Project Description: White Pine Copper	Project Number: HCW-31-1983	Sample: Whole Tails	Test Engineer: MTM	Date Tested: 10/15/2025

Vacuum Level (kPa)	kPa	70
Slurry Temperature	°C	20
Filter Diameter	mm	105
pH	-	9.09
Conductivity	mS/cm	3.09

Feed tare	g	1.283
Slurry + Feed tare	g	23.129
Solids + Feed tare	g	12.098

		Test 1	Test 2	Test 3	Test 4
Slurry Volume	mL	150	150	150	150
Syring + Slurry Mass	g	302.8	292.1	293.1	296.2
Syring Empty	g	71.7	73.2	73.8	73.8
Time to ZFW Point	min	12.23	12.61	12.85	12.35
Cake Thickness	mm	7	7	7	7
tare	g	1.278	1.283	1.302	1.299
Cake + tare	g	32.212	28.251	37.017	41.065
Solids + tare	g	25.118	21.831	28.944	31.906
Filtrate Volume	mL	75.0	78.0	78.0	78.0
Filtrate Mass	g	75.4	77.8	77.2	77.3

TDS	%	0.000%
Liquid Viscosity	Pa•S	0.001005
Filter Area	m²	0.0087
Feed Concentration	%m	49.51%

Slurry Mass	g	231.1	218.9	219.3	222.4
Slurry Density	kg/m³	1540.67	1459.33	1462.00	1482.67
Cake Mass	g	155.7	141.1	142.1	145.1
Zero Free Water Concentration	%m	77.1%	76.2%	77.4%	77.0%
Average ZFW Concentration	%m	76.9%			
Percentage Moisture	%m	23.1%			
Standard Deviation	%m	0.5%			
Specific Cake Resistance	m/kg	8.52E+11	9.42E+11	9.39E+11	8.88E+11
Average	m/kg	9.05E+11			
Standard Deviation	%	4.80%			

A.8 Zeta Potential

PATERSON & COOKE

Zeta Potential

1150 Catamount Drive, Golden, Colorado 80403	Project Description:	Project Number: HCW-31-1983	Test Engineer: JCB
	White Pine Copper	Sample: Whole Tails	Date Tested: 10/28/2025

Zeta Potential is here determined by streaming potential/streaming current method using Microtrac Stabino Particle Charge Mapper
Zeta potential is the potential difference between the dispersion medium and the stationary layer of fluid attached to the dispersed particle.

Calibration Standard		Alumina Mobility Standard
Calibration Zeta Potential		+50 mV
Piston Gap	µm	400
Maximum Particle Size	µm	75
Slurry Concentration	%m	10.0%

Trial 1		Trial 2		Trial 3		Trial 4	
Time (sec)	Zeta Potential	Time (sec)	Zeta Potential	Time (sec)	Zeta Potential	Time (sec)	Zeta Potential
0	-40.15	0	-40.35	0	-42.6	0	-41.74
6.36	-39.39	6.41	-39.61	6.38	-41.56	6.36	-40.87
13.3	-38.81	13.1	-38.96	13.04	-41.19	13.21	-40.09
19.97	-38.46	19.8	-38.61	19.71	-40.99	19.89	-39.92
26.64	-38.24	26.5	-38.15	26.39	-40.64	26.58	-39.63
33.3	-38.01	33.2	-37.97	33.08	-40.4	33.26	-39.42
39.98	-37.69	40.08	-37.76	39.75	-40.16	39.92	-39.21
46.66	-37.67	46.78	-37.45	46.68	-39.98	46.82	-39.08
53.5	-37.51	53.49	-37.34	53.38	-39.87	53.48	-38.65
60.18	-37.27	60.19	-37.18	60.04	-39.39	60.15	-38.58
66.86	-37.06	67.13	-36.99	66.7	-39.47	66.83	-38.42
73.53	-36.91	73.86	-36.77	73.37	-39.39	73.51	-38.19
80.2	-36.77	80.57	-36.69	80.31	-39.2	80.17	-38.13
87.13	-36.66	87.26	-36.61	86.97	-38.88	87	-38.11
93.81	-36.55	94.17	-36.51	93.65	-38.72	93.67	-37.82
100.48	-36.4	100.87	-36.34	100.33	-38.72	100.35	-37.72
107.16	-36.32	107.58	-36.32	107.01	-38.54	107.03	-37.7
113.84	-36.13	114.26	-36.16	113.67	-38.48	113.7	-37.55
120.51	-36.05	120.97	-36.01	120.53	-38.36	120.35	-37.47
127.18	-35.96	127.66	-36.05	127.2	-38.21	127.24	-37.37
134.07	-35.86	134.46	-35.91	133.87	-38.09	133.91	-37.32
140.74	-35.79	141.17	-35.84	140.54	-37.99	140.6	-37.18
147.41	-35.72	147.88	-35.77	147.64	-37.93	147.33	-37.17
154.09	-35.59	154.58	-35.66	154.32	-37.66	153.98	-37
160.78	-35.52	161.28	-35.55	161	-37.64	160.64	-36.95
167.45	-35.46	168.14	-35.53	167.67	-37.57	167.31	-36.9
174.33	-35.37	174.84	-35.42	174.32	-37.51	174.23	-36.88
181.01	-35.26	181.54	-35.31	181	-37.44	180.9	-36.71
187.68	-35.2	188.24	-35.38	187.66	-37.39	187.58	-36.64
194.36	-35.18	195.23	-35.28	194.53	-37.29	194.24	-36.64
201.04	-35.14	201.92	-35.21	201.2	-37.22	200.9	-36.41
207.92	-35.05	208.62	-35.05	207.87	-37.13	207.58	-36.41
214.59	-35.03	215.32	-35.07	214.53	-36.97	214.26	-36.39
221.26	-34.99	222.28	-35.06	221.2	-37.06	221.19	-36.33
227.93	-34.87	228.97	-34.86	227.86	-36.98	227.86	-36.24
234.6	-34.84	235.67	-34.82	234.53	-36.91	234.54	-36.21
241.26	-34.87	242.39	-34.81	241.52	-36.89	241.41	-36.17

Stable After Time	sec	100.00
Average Zeta-Potential	mV	-36.38
Standard Deviation	±mV	1.05

Stability behaviour of a colloid depending on zeta potential

Magnitude of Zeta potential (mV)	Stability behavior
0 to 5	Rapid coagulation or flocculation
10 to 30	Incipient instability
30 to 40	Moderate stability
40 to 60	Good stability
>61	Excellent stability

Kumar A, Dixit CK (2017). "Methods for characterization of nanoparticles". Advances in Nanomedicine for the Delivery of Therapeutic Nucleic Acids. pp. 43–58. doi:10.1016/B978-0-08-100557-6.00003-1. ISBN 978-0-08-100557-6.

APPENDIX B : PROCESS WATER CHARACTERIZATION TEST RESULTS

Test
B.1 Process Water Analysis – Colorado Analytical Laboratory Report

B.1 Process Water Analysis – Colorado Analytical Laboratory Report

Colorado Analytical LABORATORIES, INC.

Analytical Results

TASK NO: 251022084

Report To: Mitch May
Company: Paterson & Cooke USA, Ltd
1150 Catamount Drive
Golden CO 80403-7795

Bill To: Accounts Payable
Company: Paterson & Cooke USA, Ltd
1150 Catamount Drive
Golden CO 80403-7795

Task No.: 251022084
Client PO:
Client Project: HCW-31-1983

Date Received: 10/22/25
Date Reported: 10/29/25
Matrix: Water

Customer Sample ID HCW-31-1983
Sample Date/Time: 10/22/25 12:30 PM
Lab Number: 251022084-01

Test	Result / Units	Method	RL	MDL	Date Analyzed	QC Batch ID	Analyzed By
Total Alkalinity	106.4 mg/L as CaCO3	SM 2320-B	4.0	1	10/23/25	QC85822	JDM
Ammonia Nitrogen	ND mg/L	SM 4500-NH3-G	0.03	0.007	10/24/25	QC85858	KRB
Bicarbonate	106.4 mg/L as CaCO3	SM 2320-B	4.0	1	10/23/25	-	JDM
Carbonate	ND mg/L as CaCO3	SM 2320-B	4.0	1	10/23/25	-	JDM
Hydroxide	ND mg/L as CaCO3	SM 2320-B	4.0	1	10/23/25	-	JDM
Chloride	43.6 mg/L	EPA 300.0	1.00	0.007	10/23/25	QC85885	NRP
Fluoride	0.72 mg/L	EPA 300.0	0.10	0.024	10/23/25	QC85886	NRP
Nitrate Nitrogen	ND mg/L	EPA 300.0	0.05	0.02	10/23/25	QC85887	NRP
pH	7.84 units	SM 4500-H-B	0.01	0.01	10/23/25	-	ARH
Specific Conductance	474 umhos/cm @ 25c	EPA 120.1	5	5	10/23/25	-	ARH
Sulfate	52.5 mg/L	EPA 300.0	1.00	0.012	10/23/25	QC85889	NRP
Total Dissolved Solids	278 mg/L	SM 2540-C	5	2	10/24/25	QC85845	BP
Phosphorus - Total	ND mg/L	EPA 365.1	0.05	0.006	10/23/25	QC85824	TAB
Total Suspended Solids	ND mg/L	SM 2540-D	5	2	10/23/25	QC85821	ISG
Dissolved							
Silica (as SI)	3.80 mg/L	EPA 200.8	0.30	0.03	10/24/25	QC85873	AMJ
Total							
Aluminum	0.078 mg/L	EPA 200.8	0.001	0.00003	10/24/25	QC85873	AMJ
Boron	0.49 mg/L	EPA 200.7	0.05	0.01	10/24/25	QC85856	SMA
Calcium	28.6 mg/L	EPA 200.7	0.1	0.01	10/24/25	QC85856	SMA
Iron	0.027 mg/L	EPA 200.7	0.005	0.0005	10/24/25	QC85856	SMA
Magnesium	4.57 mg/L	EPA 200.7	0.02	0.002	10/24/25	QC85856	SMA
Potassium	12.4 mg/L	EPA 200.7	0.1	0.01	10/24/25	QC85856	SMA
Sodium	58.3 mg/L	EPA 200.7	0.1	0.01	10/24/25	QC85856	SMA

Abbreviations/ References:

RL = Reporting Limit = Minimum Level
MDL = Method Detection Limit
mg/L = Milligrams Per Liter or PPM
ug/L = Micrograms Per Liter or PPB
mpn/100 mls = Most Probable Number Index/ 100 mls
Date Analyzed = Date Test Completed

(a) RPD acceptable due to low duplicate and sample concentrations.
(s) The accuracy of the spike recovery value is reduced due to the analyte concentration in the sample being disproportionate to the spike level. The laboratory control sample recovery was acceptable

ND = Not Detected at Reporting Limit.

Colorado Analytical LABORATORIES, INC.

Analytical Results

TASK NO: 251022084

Report To: Mitch May
Company: Paterson & Cooke USA, Ltd
1150 Catamount Drive
Golden CO 80403-7795

Bill To: Accounts Payable
Company: Paterson & Cooke USA, Ltd
1150 Catamount Drive
Golden CO 80403-7795

Task No.: 251022084
Client PO:
Client Project: HCW-31-1983

Date Received: 10/22/25
Date Reported: 10/29/25
Matrix: Water

Customer Sample ID HCW-31-1983
Sample Date/Time: 10/22/25 12:30 PM
Lab Number: 251022084-01

Test	Result / Units	Method	RL	MDL	Date Analyzed	QC Batch ID	Analyzed By
Total							
Sodium Adsorption Ratio	2.7 units	Calculation	0.1	-	10/24/25	-	SMA

Abbreviations/ References:

RL = Reporting Limit = Minimum Level
MDL = Method Detection Limit
mg/L = Milligrams Per Liter or PPM
ug/L = Micrograms Per Liter or PPB
mpn/100 mls = Most Probable Number Index/ 100 mls
Date Analyzed = Date Test Completed

(a) RPD acceptable due to low duplicate and sample concentrations.
(s) The accuracy of the spike recovery value is reduced due to the analyte concentration in the sample being disproportionate to the spike level. The laboratory control sample recovery was acceptable

ND = Not Detected at Reporting Limit.

Colorado Analytical LABORATORIES, INC.

Analytical QC Summary

TASK NO: 251022084

Report To: Mitch May
Company: Paterson & Cooke USA, Ltd

Receive Date: 10/22/25
Project Name: HCW-31-1983

Test	QC Batch ID	QC Type	Result	Method	Prep Date
Total Alkalinity	QC85822	Blank	ND	SM 2320-B	10/23/25
Ammonia Nitrogen	QC85858	Method Blank	ND	SM 4500-NH3-G	10/23/25
Chloride	QC85885	Blank	ND	EPA 300.0	10/23/25
Fluoride	QC85886	Blank	ND	EPA 300.0	10/23/25
Aluminum	QC85873	Method Blank	ND	EPA 200.8	10/22/25
Silica (as Si)	QC85873	Method Blank	ND	EPA 200.8	10/22/25
Boron	QC85856	Method Blank	ND	EPA 200.7	10/22/25
Calcium	QC85856	Method Blank	ND	EPA 200.7	10/22/25
Iron	QC85856	Method Blank	ND	EPA 200.7	10/22/25
Magnesium	QC85856	Method Blank	ND	EPA 200.7	10/22/25
Potassium	QC85856	Method Blank	ND	EPA 200.7	10/22/25
Sodium	QC85856	Method Blank	ND	EPA 200.7	10/22/25
Nitrate Nitrogen	QC85887	Blank	ND	EPA 300.0	10/23/25
Sulfate	QC85889	Blank	ND	EPA 300.0	10/23/25
Total Dissolved Solids	QC85845	Blank	ND	SM 2540-C	10/23/25
Phosphorus - Total	QC85824	Blank	ND	EPA 365.1	10/22/25
Total Suspended Solids	QC85821	Blank	ND	SM 2540-D	10/23/25

Test	QC Batch ID	QC Type	Limits	% Rec	RPD	Method
Total Alkalinity	QC85822	Duplicate -251022024-01	0 - 20	-	0.6	SM 2320-B
		LCS	90 - 110	102.2	-	
		LCS-2	90 - 110	106.0	-	
Ammonia Nitrogen	QC85858	Duplicate -251020012-01	0 - 20	-	9.2	SM 4500-NH3-G
		LCS	90 - 110	109.8	-	
		MS -251020006-04	75 - 125	97.2	-	
Chloride	QC85885	Duplicate -251022140-01	0 - 20	-	0.8	EPA 300.0
		LCS	90 - 110	102.1	-	
		MS -251022140-01	80 - 120	102.8	-	
Fluoride	QC85886	Duplicate -251022140-01	0 - 20	-	1.2	EPA 300.0
		LCS	90 - 110	92.4	-	
		MS -251022140-01	80 - 120	90.0	-	
Aluminum	QC85873	LCS	90 - 110	107.6	-	EPA 200.8
		MS -251022002-01A	70 - 130	92.7	-	
		MSD -251022002-01A	0 - 10	-	1.8	
Silica (as Si)	QC85873	LCS	90 - 110	101.7	-	EPA 200.8
		MS -251022002-01A	70 - 130	92.6	-	
		MSD -251022002-01A	0 - 10	-	0.1	
Boron	QC85856	Duplicate -251022009-10	0 - 20	-	1.5	EPA 200.7
		LCS	90 - 110	96.6	-	
		MS -251022042-01	75 - 125	110.7	-	
Calcium	QC85856	Duplicate -251022009-10	0 - 20	-	2.4	EPA 200.7

Abbreviations/ References:

RL = Reporting Limit = Minimum Level
MDL = Method Detection Limit
mg/L = Milligrams Per Liter or PPM
ug/L = Micrograms Per Liter or PPB
mpn/100 mls = Most Probable Number Index/ 100 mls
Date Analyzed = Date Test Completed

(a) RPD acceptable due to low duplicate and sample concentrations.
(s) The accuracy of the spike recovery value is reduced due to the analyte concentration in the sample being disproportionate to the spike level. The laboratory control sample recovery was acceptable

ND = Not Detected at Reporting Limit.

Test	QC Batch ID	QC Type	Limits	% Rec	RPD	Method
		LCS	90 - 110	100.2	-	
		MS -251022042-01	75 - 125	94.3	-	
Iron	QC85856	Duplicate -251022009-10	0 - 20	-	1.4	EPA 200.7
		LCS	90 - 110	100.3	-	
		MS -251022042-01	75 - 125	104.1	-	
Magnesium	QC85856	Duplicate -251022009-10	0 - 20	-	2.3	EPA 200.7
		LCS	90 - 110	101.4	-	
		MS -251022042-01	75 - 125	92.4	-	
Potassium	QC85856	Duplicate -251022009-10	0 - 20	-	0.2	EPA 200.7
		LCS	90 - 110	93.6	-	
		MS -251022042-01	75 - 125	107.0	-	
Sodium	QC85856	Duplicate -251022009-10	0 - 20	-	3.8	EPA 200.7
		LCS	90 - 110	92.5	-	
		MS -251022042-01	75 - 125	96.8	-	
Nitrate Nitrogen	QC85887	Duplicate -251022140-01	0 - 20	-	0.0	EPA 300.0
		LCS	90 - 110	100.3	-	
		MS -251022140-01	80 - 120	90.9	-	
Sulfate	QC85889	Duplicate -251022140-01	0 - 20	-	0.7	EPA 300.0
		LCS	90 - 110	100.0	-	
		MS -251022140-01	80 - 120	100.7	-	
Total Dissolved Solids	QC85845	Duplicate -251022145-01	0 - 10	-	3.5	SM 2540-C
		LCS	85 - 115	100.7	-	
Phosphorus - Total	QC85824	Duplicate -251020012-01	0 - 20	-	7.0	EPA 365.1
		LCS	90 - 110	96.6	-	
		MS -251020018-04	90 - 110	91.0	-	
Total Suspended Solids	QC85821	Duplicate -251022115-01	0 - 10	-	0.1	SM 2540-D
		LCS	90 - 110	91.5	-	

All analyses were performed in accordance with approved methods under the latest revision to 40 CFR Part 136 unless otherwise identified. Based on my inquiry of the person or persons directly responsible for analyzing samples and generating the report (s), the analyses, report, and information submitted are, to the best of my knowledge and belief, true, accurate, and complete.

Lauren Hevert
Laboratory Director

Abbreviations/ References:

RL = Reporting Limit = Minimum Level
MDL = Method Detection Limit
mg/L = Milligrams Per Liter or PPM
ug/L = Micrograms Per Liter or PPB
mpn/100 mls = Most Probable Number Index/ 100 mls
Date Analyzed = Date Test Completed

(a) RPD acceptable due to low duplicate and sample concentrations.
(s) The accuracy of the spike recovery value is reduced due to the analyte concentration in the sample being disproportionate to the spike level. The laboratory control sample recovery was acceptable

ND = Not Detected at Reporting Limit.

Chain of Custody Form

Colorado Analytical Laboratories, Inc.

Brighton Lab
240 South Main Street
Brighton, CO 80601
Lakewood Lab
12860 W. Cedar Dr, Suite 100A
Lakewood CO 80228

Phone: 303-659-2313
Fax: 303-659-2315

www.coloradolab.com

Report To Information	Bill To Information (If different from report to)	Project Name
Company Name: Paterson & Cooke	Company Name: ____	HCW-31-1983
Contact Name: Mitch May	Contact Name: ____	____
Address: 221 Corporate Circle, Suite D	Address: ____	CAL Task 251022084
City Golden State CO Zip80401	City ____ State __ Zip ____	KFV
Phone:303 800 6280 Fax:	Phone: Fax:	Disposal Date(Lab Use Only)
Email: mitchell.may@patersoncooke	Email:	
Sample Collector: Mm	PO No.:	

Sample Matrix (Select One Only)

Waste Water ☒	Soil ☐	Plant Tissue ☐
Ground Water ☐	Sludge ☐	Other ☐ ____
Surface Water ☐	Compost ☐	

Date	Time	Sample ID	No. of Containers	Grab or Composite (Check One Only)	pH, Conductivity	TDS, TSS, SAR	CH, CAR, BiC	Ca, K, Mg, Na	Al, B, Fe	Cl, SO4, NO3	Si	PO4, F, NH4
10/22	12:30	HCW-31-1983	4	☒	☒	☒	☒	☒	☒	☒	☒	☒

Total metals per nist., can only run Si as diss. -KV

Instructions:

C/S Info: Deliver Via: Hand C/S Charge ☐

Seals Present Yes ☐ No ☐ Temp. 19.1 °C/Ice N Sample Pres. Yes ☑ No ☐

Relinquished By:	Date/Time:	Received By:	Date/Time:	Relinquished By:	Date/Time:	Received By:	Date/Time:
	10/22 1:13						10/22/25 1314

Page 5 of 5

APPENDIX C : STATIC CYLINDER SETTLING TEST WORK RESULTS

Test
C.1 Flocculant Screening Static Cylinder Tests
C.2 Synthetic Water Validation Static Cylinder Tests
C.3 Optimum Feed Solids Concentration Static Cylinder Tests

C.1 Flocculant Screening Static Cylinder Tests

PATERSON & COOKE

Flocculated Cylinders Settling

1150 Catamount Drive, Golden, Colorado 80403	Project Description: White Pine Copper	Project Number: HCW-31-1983	Test Engineer: JCB
		Sample: Whole Tails	Date Tested: 10/27/2025

Output

Solids Density	2,768 kg/m³										
Liquid Density	1,000 kg/m³										
Cylinder Area	10.75 cm²										
Feed Concentration	%m	9.9%	9.9%	9.9%	9.9%	9.9%	9.9%	9.9%	9.9%	9.9%	9.9%
Floc Type	-	Magnafloc 10	Magnafloc 156	SNF AN 905 SH	SNF AN 910 VHM	SNF AN 913 SH	SNF AN 920 SH	SNF AN 923 SH	SNF AN 934 SH	SNF AN 945 VHM	SNF FO 4140 SHU
Floc Dosage	g/t	80.6	80.6	80.6	80.6	80.6	80.6	80.6	80.6	80.6	80.6
Settling Distance		1	2	3	4	5	6	7	8	9	10
Time (Seconds)		mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
0		0	0	0	0	0	0	0	0	0	0
2		3	37	12	30	112	2	119	104	103	
4		9	71	26	53	142	4	147	151	149	
6		14	111	31	70	149	6	156	154	153	
8		20	129	40	87	153	11	158	156	155	
10		24	135	48	104		15	161		158	3
12		30	141	58	117		19				
14		34	145	66	125		24				
16		39	147	75	131		27				
18		43		82	135		30				
20		48		90	138		32				8
22		52		95			37				
24		57		103			40				
26		61		111			44				
28		66		118			48				
30		71		122			53				16
40		95									24
50		113									32
Free Settling Zone Selection											
Rate Height 1 Selected	mm	3		31	30		6				8
Rate Height 2 Selected	mm	20	111	75	87	112	37	119	104	103	32
Rate Time 1 Selected	sec	2		6	2		6				20
Rate Time 2 Selected	sec	8	6	16	8	2	22	2	2	2	50
Free Settling Rate	m/h	10.20	66.60	15.84	34.20	201.60	6.98	214.20	187.20	185.40	2.88
Free Settling Solids Flux	(t/h)/m²	1.15	7.46	1.78	3.93	22.48	0.79	24.00	20.98	20.68	0.33
Supernatant Suspended Solids	ppm										
Supernatant Turbidity	NTU	593.00	684.00	405.00	273.00	271.00	733.00	481.00	725.00	612.00	1000.00

PATERSON & COOKE

Flocculated Cylinders Settling

1150 Catamount Drive, Golden, Colorado 80403	Project Description:	Project Number:	HCW-31-1983	Test Engineer:	JCB
	White Pine Copper	Sample:	Whole Tails	Date Tested:	10/27/2025

Output

Solids Density	2,768 kg/m³											
Liquid Density	1,000 kg/m³											
Cylinder Area	10.75 cm²											
Feed Concentration	%m	9.9%	9.9%									
Floc Type	-	SNF 913 SH pH 11 Cond. 0.76 50g/t	SNF 923 SH pH 11 Cond. 0.72 50g/t									
Floc Dosage	g/t	50.4	50.4									
Settling Distance		1	2									
Time (Seconds)		mm	mm									
0		0	0									
2		99	96									
4		136	137									
6		146	145									
8		150	149									
10		153										
12												
14												
16												
18												
20												
22												
24												
26												
28												
30												
40												
50												
Free Settling Zone Selection												
Rate Height 1 Selected	mm											
Rate Height 2 Selected	mm	99	96									
Rate Time 1 Selected	sec											
Rate Time 2 Selected	sec	2	2									
Free Settling Rate	m/h	178.20	172.80									
Free Settling Solids Flux	(t/h)/m²	19.59	19.46									
Supernatant Suspended Solids	ppm											
Supernatant Turbidity	NTU	95.00	120.00									

C.2 Synthetic Water Validation Static Cylinder Tests

PATERSON & COOKE

Flocculated Cylinders Settling

1150 Catamount Drive, Golden, Colorado 80403	Project Description: White Pine Copper	Project Number: HCW-31-1983	Test Engineer: JCB
		Sample: Whole Tails	Date Tested: 10/27/2025

Output

Solids Density 2,768 kg/m³
Liquid Density 1,000 kg/m³
Cylinder Area 10.75 cm²

Feed Concentration	%m	9.9%	9.9%	9.9%	9.9%	9.9%	9.9%	9.9%	9.9%	9.9%	9.9%
Floc Type	-	SNF 913 SH pH 11 50g/t Process H20	SNF 913 SH pH 11 50g/t Synthetic H20 (1)	SNF 913 SH pH 11 50g/t Synthetic H20 (2)	SNF 913 SH pH 11 0.73 Cond. 30g/t Synth. H20	SNF 913 SH pH 11 0.73 Cond. 30g/t Process H20	SNF 913 SH pH 11 1.03 Cond. 30g/t 2nd Synth. H20	SNF 913 SH pH 11 0.24 Cond. 30g/t DI + Ca(OH)2	SNF 913 SH pH 11 0.36 Cond. 30g/t 3rd Synth. H20	SNF 913 SH pH 11 0.66 Cond. 30g/t 4th Synth. H20	SNF 913 SH pH 11 0.66 Cond. 30g/t 50/50 Blend 1 & 4 Synth. H20
Floc Dosage	g/t	50.4	50.4	50.4	30.2	30.2	30.2	30.2	30.2	30.2	30.2
Settling Distance		1	2	3	4	5	6	7	8	9	10
Time (Seconds)		mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
0		0	0	0	0	0	0	0	0	0	0
2		99	83	82	19	30	13	13	15	31	11
4		136	120	113	36	47	23	22	28	55	17
6		146	132	132	50	63	30	29	36	76	24
8		150	139	140	63	78	37	37	44	94	30
10		153	144	146	74	94	45	45	53	109	36
12				149	85	109	52	50	63	115	43
14					96	117	61	57	70	121	48
16					105	123	68	64	77	127	54
18					115	126	77	72	85	131	58
20						130		80	91	133	63
22									98		
24											
26											
28											
30											
40											
50											
Free Settling Zone Selection											
Rate Height 1 Selected	mm				36	30	23	13	15	31	11
Rate Height 2 Selected	mm	99	83	82	85	109	61	45	53	76	54
Rate Time 1 Selected	sec				4	2	4	2	2	2	2
Rate Time 2 Selected	sec	2	2	2	12	12	14	10	10	6	16
Free Settling Rate	m/h	178.20	149.40	147.60	22.05	28.44	13.68	14.40	17.10	40.50	11.06
Free Settling Solids Flux	(t/h)/m²	19.59	16.82	16.30	2.45	3.20	1.56	1.63	1.96	4.54	1.24
Supernatant Suspended Solids	ppm										
Supernatant Turbidity	NTU	95.00	95.00	87.00	45.00	37.00	25.00	721.00	1000.00	33.00	33.00

C.3 Optimum Feed Solids Concentration Static Cylinder Tests

PATERSON & COOKE

Flocculated Cylinders Settling

1150 Catamount Drive, Golden, Colorado 80403	Project Description: White Pine Copper	Project Number: HCW-31-1983	Test Engineer: JCB
		Sample: Whole Tails	Date Tested: 11/12/2025

Output

Solids Density	2,768 kg/m³											
Liquid Density	1,000 kg/m³											
Cylinder Area	10.75 cm²											
Feed Concentration	%m	4.0%	6.0%	8.0%	10.0%	12.0%	14.0%	10.0%				
Floc Type	-	SNF 913 SH	SNF 913 SH	SNF 913 SH	SNF 913 SH	SNF 913 SH	SNF 913 SH	SNF 913 SH				
Floc Dosage	g/t	30.0	30.0	30.0	30.0	30.0	30.0	30.0				
Settling Distance		1	2	3	4	5	6	7				
Time (Seconds)		mm	mm	mm	mm	mm	mm	mm				
0		0	0	0	0	0	0	0				
2		26	19	16	11	4		19				
4		51	38	28	19	8		36				
6		76	56	37	29	12		50				
8		102	75	48	38	15		63				
10		126	95	59	48	19	4	74				
12		151	119	66	56	23		85				
14		168	139	74	63	27		96				
16		174	146	84	72	31		105				
18		177	152	93	78	34		115				
20		179	155	103	86	38	8					
30				129	114	57	14					
40					123	77	20					
50						94	26					
60						102	32					
90						115	50					
120							67					
300							107					
Free Settling Zone Selection												
Rate Height 1 Selected	mm	26			11	15	14	50				
Rate Height 2 Selected	mm	126	75	28	56	77	67	96				
Rate Time 1 Selected	sec	2			2	8	30	6				
Rate Time 2 Selected	sec	10	8	4	12	40	120	14				
Free Settling Rate	m/h	45.00	33.75	25.20	16.20	6.98	2.12	20.70				
Free Settling Solids Flux	(t/h)/m²	1.94	2.27	2.27	1.86	0.96	0.34	2.31				
Supernatant Suspended Solids	ppm											
Supernatant Turbidity	NTU	34.00	33.00	43.00	60.00	92.00	134.00	45.00				

APPENDIX D : DYNAMIC THICKENER TEST WORK RESULTS

Test
D.1 Dynamic Bench Scale High Rate Thickening
D.2 24-Hour Consolidation Test

D.1 Dynamic Bench Scale High Rate Thickening

PATERSON & COOKE

HR Thickening

1150 Catamount Drive, Golden, Colorado 80403	Project Description:	Project Number: HCW-31-1983	Test Engineer:	JCB
	White Pine Copper	Sample: Whole Tails	Date Tested:	11/12/2025

Output Page

Solids Loading Rate Series

Feed							
Test Feed Solids Concentration	%m	8.15%	8.01%	7.93%	8.12%	8.02%	7.99%
Average Feed Concentration	%m	8.05%					
Feed Slurry Density	kg/m³	1,054	1,054	1,054	1,054	1,053	1,053
Feed Volume Concentration	%v	3.06%	3.06%	3.06%	3.06%	3.05%	3.05%
Conductivity	mS/cm	0.82	0.84	0.87	0.84	0.77	0.74
Target Temperature	°C	20					
Test Temperature	°C	19.3	19.5	19.4	19.6	19.2	20.1
Target pH	-	11.0					
Test pH	-	11.00	10.98	10.99	11.04	11.08	11.04
pH Adjustment Chemical	-	Ca(OH)2					
Test Feed Rate	mL/min	595	595	595	595	595	595
Test Solids Loading Rate	(t/h)/m²	0.40	0.40	0.40	0.40	0.40	0.40
Test Volume Loading Rate	(m³/h)/m²	4.73	4.73	4.73	4.73	4.73	4.73
Flocculant		SNF AN 913 SH					
Dosage by Solids	g/t	19.9	15.0	10.0	24.9	30.0	40.1
Dosage by Volume	g/m³	1.69	1.27	0.84	2.11	2.53	3.38
Thickener Unit							
Thickener Diameter	m	0.098	0.098	0.098	0.098	0.098	0.098
Thickener Area	m²	0.00754	0.00754	0.00754	0.00754	0.00754	0.00754
Effective Rise Area	m²	0.00704	0.00704	0.00704	0.00704	0.00704	0.00704
Bed Build							
Time to bed height of 40 mm	min	3.00	3.50	3.25	4.00	3.75	4.00
Time to bed height of 80 mm	min	6.75	7.00	6.25	8.00	8.50	8.00
Time to bed height of 120 mm	min	9.75	9.45	8.50	11.50	12.75	12.75
Time to bed height of 160 mm	min	12.75	12.25	10.50	15.00	16.25	16.75
Time to bed height of 200 mm	min	15.75	15.00	12.50	18.50	20.50	21.00
Bed build rate at 40 mm	m/h	0.80	0.69	0.74	0.60	0.64	0.60
Bed build rate at 80 mm	m/h	0.71	0.69	0.77	0.60	0.56	0.60
Bed build rate at 120 mm	m/h	0.74	0.76	0.85	0.63	0.56	0.56
Bed build rate at 160 mm	m/h	0.75	0.78	0.91	0.64	0.59	0.57
Bed build rate at 200 mm	m/h	0.76	0.80	0.96	0.65	0.59	0.57
Overflow							
Overflow Concentration	%m	0.0052%	0.0068%	0.0392%	0.0053%	0.0074%	0.0060%
Overflow TSS	ppm	52	68	392	53	74	60
TDS	%m	0.038%	0.042%	0.041%	0.041%	0.032%	0.042%
Average TDS	%m	0.040%					
Overflow Slurry Density	kg/m³	999.53					
Overflow Rise Rate	m/h	5.1	5.1	5.1	5.1	5.1	5.1
Feed Solids Loss to OvF Est.	%	0.055%	0.072%	0.417%	0.057%	0.080%	0.064%
Underflow							
Underflow Avg. Concentration	%m	56.6%	56.0%	54.0%	57.9%	58.9%	58.9%
Underflow Slurry Density	kg/m³	1,562	1,561	1,546	1,592	1,600	1,603
Vane Yield Stress Unsheared	Pa	56.5	55.4	39.7	78.3	95.9	106.3
Vane Yield Stress Sheared	Pa	33.4	33.9	26.4	52.5	55.8	61.2

PATERSON & COOKE

HR Thickening

1150 Catamount Drive, Golden, Colorado 80403	Project Description: White Pine Copper	Project Number: HCW-31-1983	Sample: Whole Tails	Test Engineer: JCB	Date Tested: 11/12/2025

Output Page

Solids Loading Rate Series

Feed					
Test Feed Solids Concentratio	%m	8.26%	8.00%	8.06%	8.12%
Average Feed Concentration	%m	8.11%			
Feed Slurry Density	kg/m³	1,054	1,054	1,054	1,054
Feed Volume Concentration	%v	3.09%	3.09%	3.09%	3.09%
Conductivity	mS/cm	0.79	0.82	0.84	0.84
Target Temperature	°C	20			
Test Temperature	°C	19.2	19.1	19.4	19.6
Target pH	-	11.0			
Test pH	-	11.01	11.06	10.97	11.04
pH Adjustment Chemical	-	Ca(OH)2			
Test Feed Rate	mL/min	745	450	820	595
Test Solids Loading Rate	(t/h)/m²	0.51	0.31	0.56	0.40
Test Volume Loading Rate	(m³/h)/m²	5.93	3.58	6.52	4.73
Flocculant		SNF AN 913 SH			
Dosage by Solids	g/t	24.7	24.5	24.6	24.7
Dosage by Volume	g/m³	2.11	2.09	2.11	2.11
Thickener Unit					
Thickener Diameter	m	0.098	0.098	0.098	0.098
Thickener Area	m²	0.00754	0.00754	0.00754	0.00754
Effective Rise Area	m²	0.00704	0.00704	0.00704	0.00704
Bed Build					
Time to bed height of 40 mm	min	3.00	5.25	2.30	4.00
Time to bed height of 80 mm	min	5.50	10.45	5.25	8.00
Time to bed height of 120 mm	min	8.25	15.50	7.30	11.50
Time to bed height of 160 mm	min	10.25	20.00	9.45	15.00
Time to bed height of 200 mm	min	12.25	24.75	11.50	18.50
Bed build rate at 40 mm	m/h	0.80	0.46	1.04	0.60
Bed build rate at 80 mm	m/h	0.87	0.46	0.91	0.60
Bed build rate at 120 mm	m/h	0.87	0.46	0.99	0.63
Bed build rate at 160 mm	m/h	0.94	0.48	1.02	0.64
Bed build rate at 200 mm	m/h	0.98	0.48	1.04	0.65
Overflow					
Overflow Concentration	%m	0.0058%	0.0020%	0.0046%	0.0053%
Overflow TSS	ppm	58	20	46	53
TDS	%m	0.039%	0.133%	0.088%	0.041%
Average TDS	%m	0.075%			
Overflow Slurry Density	kg/m³	999.54			
Overflow Rise Rate	m/h	6.4	3.8	7.0	5.1
Feed Solids Loss to OvF Est.	%	0.061%	0.021%	0.048%	0.056%
Underflow					
Underflow Avg. Concentration	%m	57.5%	59.6%	57.3%	57.9%
Underflow Slurry Density	kg/m³	1,576	1,621	1,571	1,592
Vane Yield Stress Unsheared	Pa	79.9	113.6	80.9	78.3
Vane Yield Stress Sheared	Pa	42.3	59.5	47.0	52.5

D.2 24-Hour Consolidation Test

PATERSON & COOKE

24 Hr Consolidation Thickening

1150 Catamount Drive, Golden, Colorado 80403	Project Description: White Pine Copper	Project Number: HCW-31-1983	Test Engineer: JCB
		Sample: Whole Tails	Date Tested: 11/18/2025

Output Page

Solids Loading Rate Series

Feed		
Test Feed Solids Concentratio	%m	8.14%
Average Feed Concentration	%m	8.14%
Feed Slurry Density	kg/m³	1,054
Feed Volume Concentration	%v	3.10%
Conductivity	mS/cm	0.75
Target Temperature	°C	20
Test Temperature	°C	20.4
Target pH	-	11.0
Test pH	-	11.08
pH Adjustment Chemical	-	Ca(OH)2
Test Feed Rate	mL/min	745
Test Solids Loading Rate	(t/h)/m²	0.48
Test Volume Loading Rate	(m³/h)/m²	5.58
Flocculant		SNF 913 SH
Dosage by Solids	g/t	24.6
Dosage by Volume	g/m³	2.11
Thickener Unit		
Thickener Diameter	m	0.101
Thickener Area	m²	0.00801
Bed Build		
Time to bed height of 40 mm	min	3.00
Time to bed height of 80 mm	min	5.75
Time to bed height of 120 mm	min	8.25
Time to bed height of 160 mm	min	10.75
Time to bed height of 200 mm	min	12.50
Bed build rate at 40 mm	m/h	0.80
Bed build rate at 80 mm	m/h	0.83
Bed build rate at 120 mm	m/h	0.87
Bed build rate at 160 mm	m/h	0.89
Bed build rate at 200 mm	m/h	0.96
Overflow During Bed Build		
Overflow Concentration	%m	0.0046%
Overflow TSS	ppm	46
TDS	%m	0.018%
Average TDS	%m	0.018%
Overflow Slurry Density	kg/m³	999.53
Overflow Rise Rate	m/h	5.2
Feed Solids Loss to OvF Est.	%	0.050%
Underflow after Consolidation		
Underflow Avg. Concentration	%m	71.9%
Underflow Slurry Density	kg/m³	1,848
Vane Yield Stress Unsheared	Pa	539.4
Vane Yield Stress Sheared	Pa	521.0
Total UF mass	g	842.7

APPENDIX E : SLURRY CHARACTERIZATION TEST RESULTS

Test
E.1 Coarse Particle Settling Behavior
E.2 Penetrometer Tests
E.3 Bleed Water Tests
E.4 Sloping Pipe Tests

E.1 Coarse Particle Settling Behavior

PATERSON & COOKE

Cbmax

1150 Catamount Drive, Golden, Colorado 80403	Project Number: HCW-31-1983	Sample: Whole Tails	Date: 11/17/2025	Page:

Solids Density	kg/m³	2767.5
Liquid Temperature	°C	20
Test Start Date	date	11/17/2025
Test Start Time	time	10:15am
Test End Date	date	11/17/2025
Test End Time	time	11:15am

			Test 1	Test 2	Test 3	Test 4
Mass of dry solids	m_s	g	75	75	75	75
Volume of freely settled bed	V_f	mL	61	62	62	61
Volume of max settled bed	V_{max}	mL	50	50	50	50
Volume of solids		mL	27.10	27.10	27.10	27.10
Freely settled concentration	C_{bfree}	%v	44.4%	43.7%	43.7%	44.4%
Max settled concentration	C_{bmax}	%v	54.2%	54.2%	54.2%	54.2%

Average Cbfree	%v	44.1%
Average Cbmax	%v	54.2%

Comments:

E.2 Penetrometer Tests

PATERSON & COOKE — **Penetrometer**

1150 Catamount Drive, Golden, Colorado 80403	Project Description: White Pine Copper	Project Number: HCW-31-1983 Sample: Whole Tails	Test Engineer: JCB Date Tested: 11/19/2025

Start Date 11/18/2025 End Date 11/19/2025
Start Time 1pm End Time 1pm

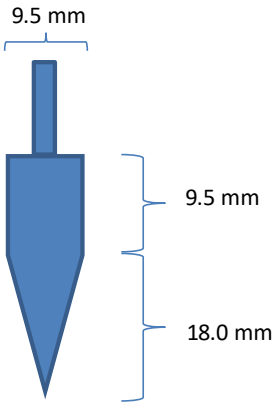
Beaker Size 500 mL

Mass to Overcome Fricton 15 g

Target %m	55%		60%		65%	
Trial	Mass (g)	(Y/N)	Mass (g)	(Y/N)	Mass (g)	(Y/N)
1	50	Y	20	N	30	N
2	25	Y	25	Y	40	N
3	20	Y	22	N	50	N
4	17	N	23	N	55	Y
5	18	N	24	Y	52	N
6	19	Y			53	Y
7						
8						
9						
10						
		(Y/N)		(Y/N)		(Y/N)
Visibly Segregated Bed?		N		N		N
Bed Depth	mm	80		81		82
Mass to overcome fricton and penetrate bed		19		24		53
Mass to Penetrate Bed		4		9		38

*If mass to penetrate bed is less than 50 g, pipelines are usually easy to restart.

Penetrometer Geometry:



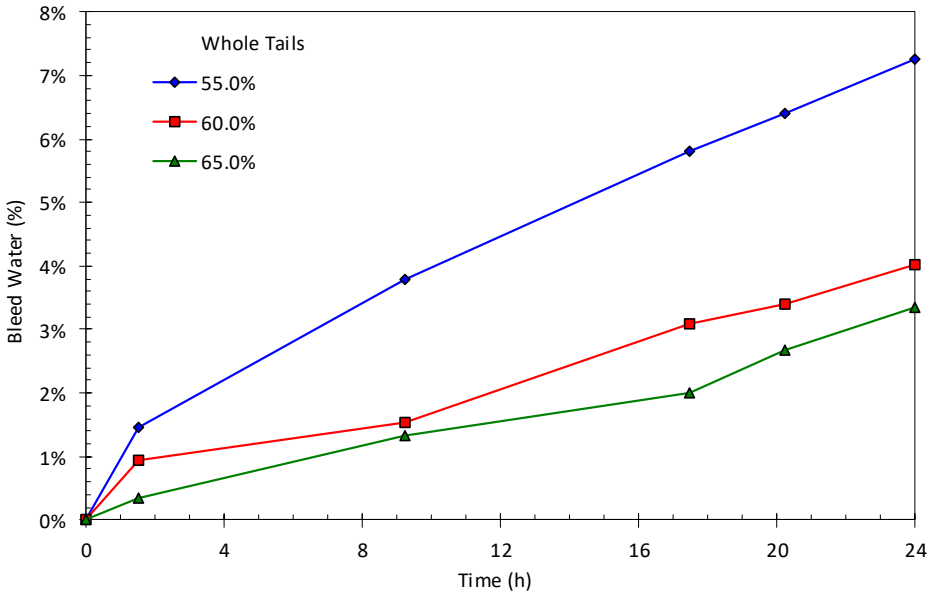
E.3 Bleed Water Tests

PATERSON & COOKE

Bleed Water

1150 Catamount Drive, Golden, Colorado 80403	Project Description: White Pine Copper	Project Number: HCW-31-1983	Test Engineer: JCB
		Sample: Whole Tails	Date Tested: 11/19/2025

Initial Slury Concentration	55.0%		60.0%		65.0%	
Cylinder Tare	353.8		347.0		349.1	
Cylinder Tare + Slurry	1118.4		1153.8		1202.8	
Slurry Mass	764.6		806.8		853.7	
Slurry Density	2768		2768		2768	
Liquid Density	1000		1000		1000	
Initial Volume	500		500		500	
Bleed Water with Time	Time (hr)	BW%	Time (hr)	BW%	Time (hr)	BW%
	0.0	0.0%	0.0	0.0%	0.0	0.0%
	1.5	1.5%	1.5	0.9%	1.5	0.3%
	9.3	3.8%	9.3	1.5%	9.3	1.3%
	17.5	5.8%	17.5	3.1%	17.5	2.0%
	20.3	6.4%	20.3	3.4%	20.3	2.7%
	24.0	7.3%	24.0	4.0%	24.0	3.3%



E.4 Sloping Pipe Tests

PATERSON & COOKE

Sloping Pipe

1150 Catamount Drive, Golden, Colorado 80403	Project Number: HCW-31-1983	Sample: Whole Tails	Date: 11/19/2025	Page:



Slurry Concentration (%m)	55%m		Flocculated (Y/N)		Y	Fully Sheared (Y/N)		Y	
Test	Start Date	Start Time	End Date	End Time	Plug (Y/N)	"A" (mm)	"B" (mm)	"C" (mm)	Slide Slope (%)
10%									-
15%	18-Nov	1pm	19-Nov	1pm	No	44	0	8	-
20%	19-Nov	1pm	20-Nov	1pm	Yes	47	130	0	-
1	20-Nov	1pm	21-Nov	1pm	-	-	-	-	12.40%

Slurry Concentration (%m)	60%m		Flocculated (Y/N)		Y	Fully Sheared (Y/N)		Y	
Test	Start Date	Start Time	End Date	End Time	Plug (Y/N)	"A" (mm)	"B" (mm)	"C" (mm)	Slide Slope (%)
10%	20-Nov	1pm	21-Nov	1pm	Yes	33	440	0	-
15%	19-Nov	1pm	20-Nov	1pm	Yes	40	730	0	-
20%									-
1	18-Nov	1pm	19-Nov	1pm	-	-	-	-	13.00%

Slurry Concentration (%m)	65%		Flocculated (Y/N)		Y	Fully Sheared (Y/N)		Y	
Test	Start Date	Start Time	End Date	End Time	Plug (Y/N)	"A" (mm)	"B" (mm)	"C" (mm)	Slide Slope (%)
10%	18-Nov	1pm	19-Nov	1pm	Yes	53	920	0	-
15%									-
20%									-
1	19-Nov	1pm	20-Nov	1pm	-	-	-	-	14.80%

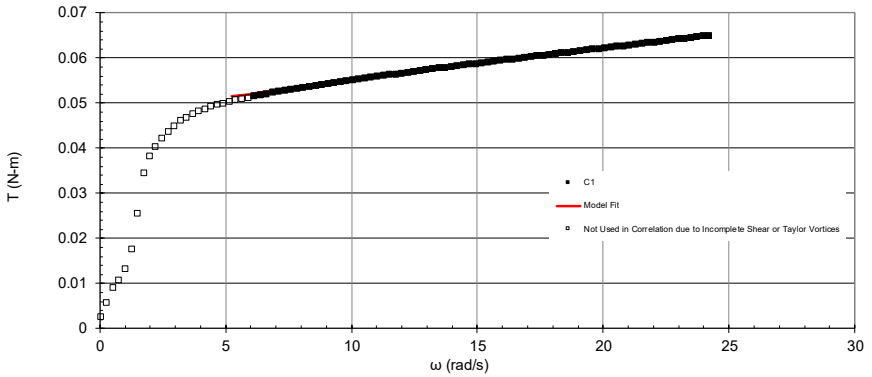
APPENDIX F : RHEOLOGY TEST RESULTS

Test	
Whole Tails Carrier Fluid Rotational Viscometer Test Conditions	
Whole Tails carrier fluid C1	Flow curve
Whole Tails carrier fluid C3	Flow curve
Whole Tails carrier fluid C4	Flow curve
Whole Tails carrier fluid C5	Flow curve
Whole Tails carrier fluid C7	Flow curve
Whole Tails carrier fluid C8	Flow curve
Whole Tails carrier fluid C9	Flow curve
Whole Tails carrier fluid C10	Flow curve
Whole Tails Rotational Viscometer concentrations	

Test	
Whole Tails Tube Viscometer Test Conditions	
Whole Tails carrier fluid C3	Tube viscometer test
Whole Tails carrier fluid C4	Tube viscometer test
Whole Tails carrier fluid C5	Tube viscometer test
Whole Tails carrier fluid C6	Tube viscometer test
Whole Tails carrier fluid C7	Tube viscometer test
Whole Tails carrier fluid C8	Tube viscometer test
Whole Tails carrier fluid C9	Tube viscometer test
Whole Tails carrier fluid C10	Tube viscometer test
Whole Tails Tube Viscometer concentrations	

Whole Tails Rotational Viscometer Data

Project Manager:	**RJ**			**Project No:**	**HCW-31-1983**
Sample ID:	**Whole Tails**				
Test Date/Time				Measure device	Anton-Paar RheolabQC
				Sensor: Anton-Paar DG	DG42/SS?QC-LTD
				R1, Cup Inner (mm)	19.750
Test Name	C1			R2, Bob Inner (mm)	20.250
Operator	JCB			R3, Bob Outer (mm)	21.000
				R4, Cup Outer (mm)	21.500
% mass	57.5%	Plastic Viscosity (Pa-s)	0.040	Length (mm)	78.700
pH	11.0	Bingham Yield Stress(Pa)	108.1	K(σ) (Calibrated) (Pa/Nm)	2,266.000
Avg. temperature (ºC)	20.1	Mixture Density, Carrier Flui	1,580	K(γ-dot) (Calibrated)	41.218



Rotational speed, w rad/s	Torque, T µN-m
24.2	64973
24.0	64818
23.7	64654
23.5	64491
23.2	64316
23.0	64166
22.8	64001
22.5	63822
22.3	63673
22.0	63493
21.8	63355
21.5	63170
21.3	63022
21.0	62868
20.8	62678
20.6	62533
20.3	62382
20.1	62208
19.8	62035
19.6	61866
19.3	61704
19.1	61545
18.8	61381
18.6	61214
18.4	61049
18.1	60886
17.9	60730
17.6	60580
17.4	60415
17.1	60229
16.9	60071
16.6	59922
16.4	59729
16.2	59577
15.9	59408
15.7	59236
15.4	59064
15.2	58903
14.9	58721
14.7	58566
14.4	58387
14.2	58215
14.0	58039
13.7	57874
13.5	57694
13.2	57517
13.0	57340
12.7	57161
12.5	56983
12.2	56803
12.0	56622
11.8	56434
11.5	56245
11.3	56069
11.0	55881
10.8	55684
10.5	55489
10.3	55307
10.0	55097
9.8	54914
9.6	54697
9.3	54502
9.1	54283
8.8	54105
8.6	53855
8.3	53664
8.1	53452
7.8	53205
7.6	52966
7.4	52753
7.1	52532
6.9	52289
6.6	52042
6.4	51768
6.1	51508
5.9	51229
5.6	50933
5.4	50612
5.2	50268
4.9	49903
4.7	49568
4.4	49168
4.2	48663
3.9	48177
3.7	47596
3.4	46854
3.2	46046
3.0	44966
2.7	43712
2.5	42200
2.2	40380
2.0	38184

Rotational speed, w rad/s	Torque, T µN-m
(continued)	(continued)
1.7	34362.0
1.5	25510.5
1.3	17561.5
1.0	13292.5
0.8	10806.5
0.5	8949.3
0.3	5738.3
0.0	2601.8

Rotational speed, w rad/s	Torque, T µN-m
(continued)	(continued)

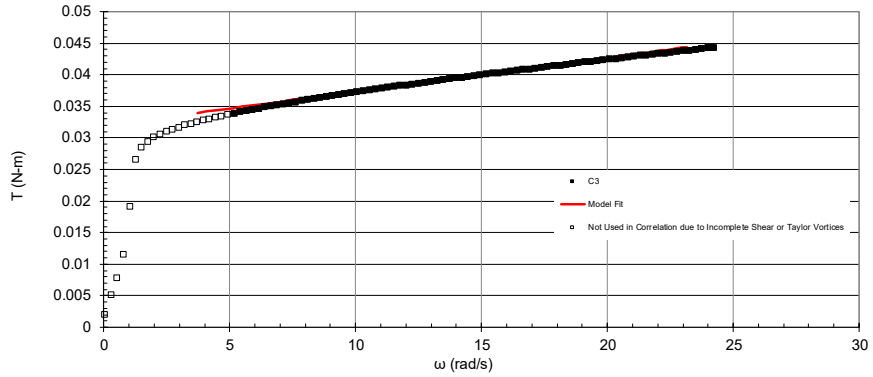
Rotational speed, w rad/s	Torque, T µN-m
(continued)	(continued)

Rotational speed, w rad/s	Torque, T µN-m
(continued)	(continued)

Whole Tails Rotational Viscometer Data

Project Manager:	**RJ**	**Project No:**	**HCW-31-1983**
Sample ID:	**Whole Tails**		

Test Date/Time				Measure device	Anton-Paar RheolabQC
				Sensor: Anton-Paar DG	DG42/SS?QC-LTD
				R1, Cup Inner (mm)	19.750
Test Name	C3			R2, Bob Inner (mm)	20.250
Operator	JCB			R3, Bob Outer (mm)	21.000
				R4, Cup Outer (mm)	21.500
% mass	55.4%	Plastic Viscosity (Pa·s)	0.029	Length (mm)	78.700
pH	11.0	Bingham Yield Stress(Pa)	72.5	K(σ) (Calibrated) (Pa/Nm)	2,266.000
Avg. temperature (ºC)	20.1 °C	Mixture Density, Carrier Flui	1,547	K(γ-dot) (Calibrated)	41.218



Rotational speed, w rad/s	Torque, T µN-m
24.2	44409
24.0	44294
23.7	44187
23.5	44088
23.2	43979
23.0	43862
22.8	43760
22.5	43643
22.3	43538
22.0	43422
21.8	43314
21.5	43202
21.3	43100
21.0	42963
20.8	42863
20.6	42764
20.3	42639
20.1	42510
19.8	42404
19.6	42299
19.3	42191
19.1	42079
18.8	41965
18.6	41844
18.4	41723
18.1	41599
17.9	41475
17.6	41358
17.4	41246
17.1	41134
16.9	40997
16.6	40882
16.4	40770
16.2	40635
15.9	40528
15.7	40391
15.4	40281
15.2	40150
14.9	40036
14.7	39908
14.4	39776
14.2	39659
14.0	39526
13.7	39396
13.5	39268
13.2	39138
13.0	39004
12.7	38873
12.5	38744
12.2	38613
12.0	38474
11.8	38338
11.5	38201
11.3	38058
11.0	37920
10.8	37784
10.5	37634
10.3	37490
10.0	37351
9.8	37197
9.6	37060
9.3	36896
9.1	36756
8.8	36593
8.6	36441
8.3	36288
8.1	36118
7.8	35957
7.6	35800
7.4	35635
7.1	35459
6.9	35282
6.6	35104
6.4	34928
6.1	34746
5.9	34562
5.6	34379
5.4	34185
5.2	33991
4.9	33770
4.7	33553
4.4	33341
4.2	33117
3.9	32862
3.7	32631
3.4	32354
3.2	32092
3.0	31774
2.7	31442
2.5	31060
2.2	30660
2.0	30149

Rotational speed, w rad/s	Torque, T µN-m
(continued)	(continued)
1.7	29504.0
1.5	28567.0
1.3	26664.5
1.0	19273.0
0.8	11617.5
0.5	7932.3
0.3	5208.2
0.0	2113.3

Rotational speed, w rad/s	Torque, T µN-m
(continued)	(continued)

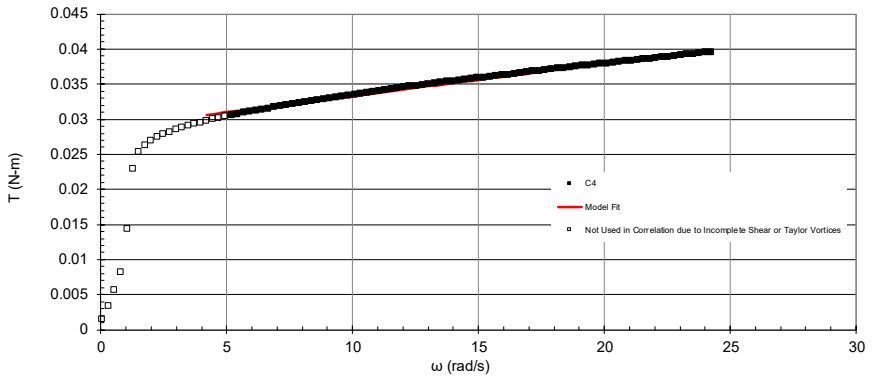
Rotational speed, w rad/s	Torque, T µN-m
(continued)	(continued)

Rotational speed, w rad/s	Torque, T µN-m
(continued)	(continued)

Whole Tails Rotational Viscometer Data

Project Manager:	**RJ**	**Project No:**	**HCW-31-1983**
Sample ID:	**Whole Tails**		

Test Date/Time				Measure device	Anton-Paar RheolabQC
				Sensor: Anton-Paar DG	DG42/SS?QC-LTD
				R1, Cup Inner (mm)	19.750
Test Name	C4			R2, Bob Inner (mm)	20.250
Operator	JCB			R3, Bob Outer (mm)	21.000
				R4, Cup Outer (mm)	21.500
% mass	53.8%	Plastic Viscosity (Pa·s)	0.025	Length (mm)	78.700
pH	11.1	Bingham Yield Stress(Pa)	65.0	K(σ) (Calibrated) (Pa/Nm)	2,266.000
Avg. temperature (ºC)	20.1 °C	Mixture Density, Carrier Flui	1,523	K(γ-dot) (Calibrated)	41.218



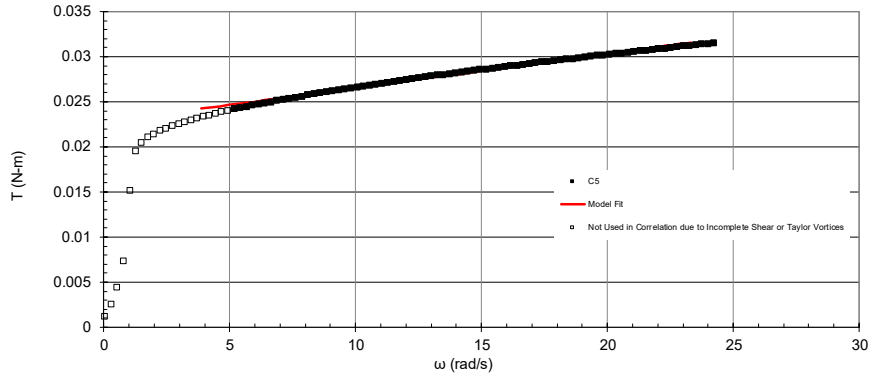
rad/s	µN-m
24.2	39626
24.0	39533
23.7	39437
23.5	39346
23.2	39263
23.0	39163
22.8	39068
22.5	38983
22.3	38878
22.0	38801
21.8	38688
21.5	38613
21.3	38508
21.0	38410
20.8	38330
20.6	38225
20.3	38118
20.1	38032
19.8	37943
19.6	37855
19.3	37756
19.1	37653
18.8	37554
18.6	37454
18.4	37358
18.1	37259
17.9	37155
17.6	37042
17.4	36945
17.1	36855
16.9	36754
16.6	36638
16.4	36543
16.2	36433
15.9	36329
15.7	36223
15.4	36118
15.2	36006
14.9	35909
14.7	35798
14.4	35692
14.2	35593
14.0	35481
13.7	35371
13.5	35261
13.2	35154
13.0	35047
12.7	34932
12.5	34818
12.2	34704
12.0	34590
11.8	34472
11.5	34350
11.3	34229
11.0	34103
10.8	33985
10.5	33860
10.3	33730
10.0	33611
9.8	33474
9.6	33343
9.3	33208
9.1	33081
8.8	32936
8.6	32811
8.3	32660
8.1	32513
7.8	32378
7.6	32241
7.4	32082
7.1	31929
6.9	31774
6.6	31614
6.4	31457
6.1	31293
5.9	31126
5.6	30959
5.4	30788
5.2	30620
4.9	30436
4.7	30223
4.4	30023
4.2	29837
3.9	29599
3.7	29364
3.4	29137
3.2	28853
3.0	28591
2.7	28261
2.5	27924
2.2	27518
2.0	27018

Rotational speed, w rad/s	Torque, T µN-m	Rotational speed, w rad/s	Torque, T µN-m	Rotational speed, w rad/s	Torque, T µN-m
(continued)	(continued)	(continued)	(continued)	(continued)	(continued)
1.7	26381.0				
1.5	25389.5				
1.3	22949.0				
1.0	14352.0				
0.8	8218.4				
0.5	5687.6				
0.3	3432.0				
0.0	1611.6				

Whole Tails Rotational Viscometer Data

Project Manager:	**RJ**	**Project No:**	**HCW-31-1983**
Sample ID:	**Whole Tails**		

Test Date/Time				Measure device	Anton-Paar RheolabQC
				Sensor: Anton-Paar DG	DG42/SS?QC-LTD
				R1, Cup Inner (mm)	19.750
Test Name	C5			R2, Bob Inner (mm)	20.250
Operator	JCB			R3, Bob Outer (mm)	21.000
				R4, Cup Outer (mm)	21.500
% mass	52.7%	Plastic Viscosity (Pa·s)	0.021	Length (mm)	78.700
pH	11.0	Bingham Yield Stress(Pa)	51.6	K(σ) (Calibrated) (Pa/Nm)	2,266.000
Avg. temperature (ºC)	20.1 °C	Mixture Density, Carrier Flui	1,507	K(γ-dot) (Calibrated)	41.218



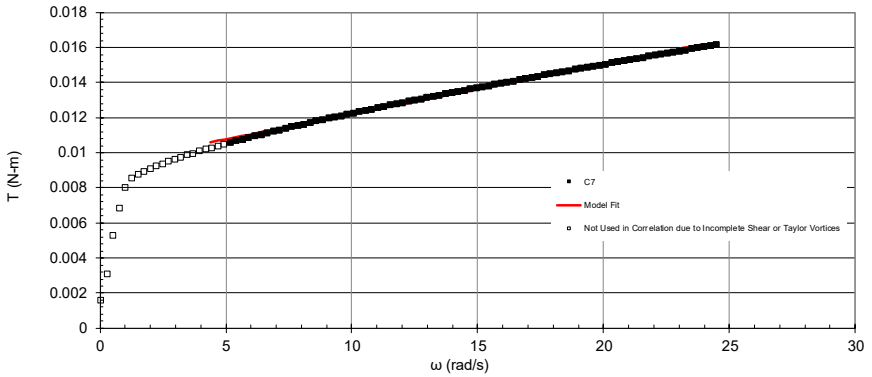
rad/s	µN-m
24.2	31574
24.0	31500
23.7	31427
23.5	31355
23.2	31289
23.0	31210
22.8	31139
22.5	31071
22.3	30992
22.0	30923
21.8	30840
21.5	30776
21.3	30694
21.0	30620
20.8	30549
20.6	30465
20.3	30387
20.1	30315
19.8	30242
19.6	30165
19.3	30086
19.1	30007
18.8	29928
18.6	29851
18.4	29771
18.1	29693
17.9	29612
17.6	29529
17.4	29443
17.1	29369
16.9	29286
16.6	29199
16.4	29121
16.2	29040
15.9	28955
15.7	28871
15.4	28784
15.2	28694
14.9	28610
14.7	28518
14.4	28435
14.2	28348
14.0	28260
13.7	28167
13.5	28076
13.2	27983
13.0	27892
12.7	27800
12.5	27703
12.2	27603
12.0	27507
11.8	27412
11.5	27310
11.3	27207
11.0	27104
10.8	26999
10.5	26898
10.3	26788
10.0	26683
9.8	26578
9.6	26470
9.3	26361
9.1	26247
8.8	26136
8.6	26028
8.3	25911
8.1	25792
7.8	25683
7.6	25564
7.4	25440
7.1	25314
6.9	25191
6.6	25058
6.4	24929
6.1	24799
5.9	24656
5.6	24518
5.4	24377
5.2	24233
4.9	24087
4.7	23919
4.4	23754
4.2	23596
3.9	23412
3.7	23232
3.4	23038
3.2	22828
3.0	22609
2.7	22383
2.5	22118
2.2	21844
2.0	21504

Rotational speed, w rad/s	Torque, T µN-m	Rotational speed, w rad/s	Torque, T µN-m	Rotational speed, w rad/s	Torque, T µN-m
(continued)	(continued)	(continued)	(continued)	(continued)	(continued)
1.7	21124.0				
1.5	20571.5				
1.2	19540.5				
1.0	15235.5				
0.8	7432.7				
0.5	4442.8				
0.3	2570.2				
0.0	1218.4				

Whole Tails Rotational Viscometer Data

Project Manager:	**RJ**	**Project No:**	**HCW-31-1983**
Sample ID:	**Whole Tails**		

Test Date/Time				Measure device	Anton-Paar RheolabQC
				Sensor: Anton-Paar DG	DG42/SS?QC-LTD
				R1, Cup Inner (mm)	19.750
Test Name	C7			R2, Bob Inner (mm)	20.250
Operator	JCB			R3, Bob Outer (mm)	21.000
				R4, Cup Outer (mm)	21.500
% mass	48.1%	Plastic Viscosity (Pa·s)	0.016	Length (mm)	78.700
pH	11.1	Bingham Yield Stress(Pa)	21.2	K(σ) (Calibrated) (Pa/Nm)	2,266.000
Avg. temperature (ºC)	20.1 °C	Mixture Density, Carrier Flui	1,442	K(γ-dot) (Calibrated)	41.218



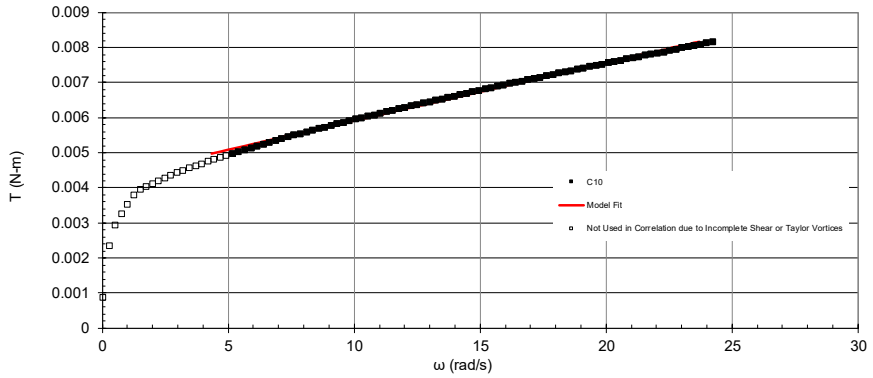
rad/s	µN-m
0.0	1590
0.3	3111
0.5	5320
0.8	6868
1.0	8000
1.2	8556
1.5	8754
1.7	8939
2.0	9090
2.2	9237
2.5	9386
2.7	9521
3.0	9650
3.2	9751
3.4	9886
3.7	9977
3.9	10099
4.2	10204
4.4	10299
4.7	10402
4.9	10509
5.2	10604
5.4	10693
5.6	10783
5.9	10874
6.1	10966
6.4	11049
6.6	11139
6.9	11225
7.1	11318
7.4	11403
7.6	11486
7.8	11563
8.1	11642
8.3	11728
8.6	11807
8.8	11884
9.1	11967
9.3	12039
9.6	12120
9.8	12196
10.0	12272
10.3	12349
10.5	12423
10.8	12496
11.0	12573
11.3	12646
11.5	12720
11.8	12794
12.0	12864
12.2	12936
12.5	13007
12.7	13079
13.0	13149
13.2	13219
13.5	13290
13.7	13360
14.0	13428
14.2	13500
14.4	13565
14.7	13634
14.9	13703
15.2	13772
15.4	13835
15.7	13905
15.9	13969
16.2	14042
16.4	14106
16.6	14172
16.9	14239
17.1	14306
17.4	14368
17.6	14437
17.9	14501
18.1	14565
18.4	14629
18.6	14693
18.8	14755
19.1	14820
19.3	14885
19.6	14953
19.8	15012
20.1	15069
20.3	15131
20.6	15196
20.8	15259
21.0	15316
21.3	15383
21.5	15442
21.8	15504
22.0	15563
22.3	15625

Rotational speed, w rad/s	Torque, T µN-m	Rotational speed, w rad/s	Torque, T µN-m	Rotational speed, w rad/s	Torque, T µN-m
(continued)	(continued)	(continued)	(continued)	(continued)	(continued)
22.5	15682.5				
22.8	15750.5				
23.0	15809.5				
23.2	15866.0				
23.5	15930.0				
23.7	15989.0				
24.0	16051.5				
24.2	16108.5				
24.5	16169.0				

Whole Tails Rotational Viscometer Data

Project Manager:	**RJ**	**Project No:**	**HCW-31-1983**
Sample ID:	**Whole Tails**		

Test Date/Time				Measure device	Anton-Paar RheolabQC
				Sensor: Anton-Paar DG	DG42/SS?QC-LTD
				R1, Cup Inner (mm)	19.750
Test Name	C8			R2, Bob Inner (mm)	20.250
Operator	JCB			R3, Bob Outer (mm)	21.000
				R4, Cup Outer (mm)	21.500
% mass	43.2%	Plastic Viscosity (Pa·s)	0.009	Length (mm)	78.700
pH	11.0	Bingham Yield Stress(Pa)	9.7	K(σ) (Calibrated) (Pa/Nm)	2,266.000
Avg. temperature (ºC)	20.1 °C	Mixture Density, Carrier Flui	1,380	K(γ-dot) (Calibrated)	41.218



rad/s	µN-m
0.0	884
0.3	2365
0.5	2938
0.8	3262
1.0	3539
1.2	3793
1.5	3949
1.7	4036
2.0	4120
2.2	4210
2.5	4283
2.7	4357
3.0	4430
3.2	4497
3.4	4571
3.7	4629
3.9	4695
4.2	4757
4.4	4814
4.7	4875
4.9	4933
5.2	4988
5.4	5044
5.6	5095
5.9	5150
6.1	5203
6.4	5254
6.6	5308
6.9	5357
7.1	5409
7.4	5456
7.6	5506
7.8	5550
8.1	5595
8.3	5646
8.6	5692
8.8	5735
9.1	5781
9.3	5822
9.6	5870
9.8	5911
10.0	5959
10.3	6003
10.5	6042
10.8	6088
11.0	6130
11.3	6172
11.5	6213
11.8	6256
12.0	6297
12.2	6339
12.5	6379
12.7	6419
13.0	6460
13.2	6501
13.5	6541
13.7	6582
14.0	6618
14.2	6661
14.4	6700
14.7	6741
14.9	6778
15.2	6820
15.4	6851
15.7	6895
15.9	6929
16.2	6975
16.4	7007
16.6	7049
16.9	7087
17.1	7119
17.4	7154
17.6	7199
17.9	7238
18.1	7272
18.4	7308
18.6	7345
18.8	7380
19.1	7420
19.3	7457
19.6	7495
19.8	7532
20.1	7565
20.3	7595
20.6	7633
20.8	7677
21.0	7708
21.3	7744
21.5	7785
21.8	7809
22.0	7854
22.3	7884

Rotational speed, w rad/s	Torque, T µN-m
(continued)	(continued)
22.5	7923.3
22.8	7959.8
23.0	7991.8
23.2	8028.7
23.5	8066.6
23.7	8095.0
24.0	8131.3
24.2	8169.6

Rotational speed, w rad/s	Torque, T µN-m
(continued)	(continued)

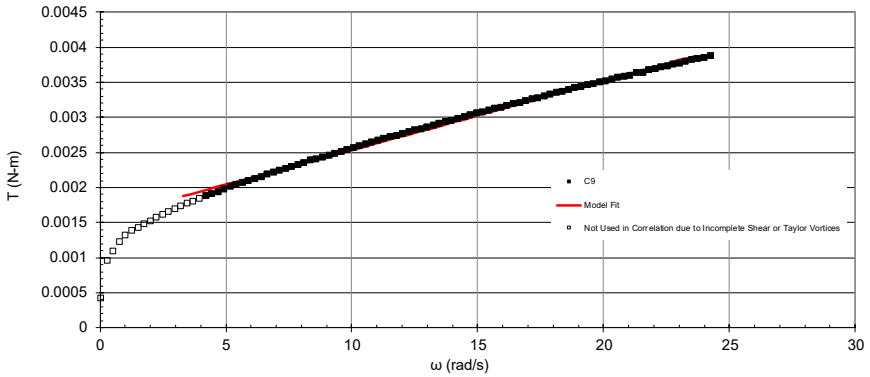
Rotational speed, w rad/s	Torque, T µN-m
(continued)	(continued)

Rotational speed, w rad/s	Torque, T µN-m
(continued)	(continued)

Whole Tails Rotational Viscometer Data

Project Manager:	**RJ**	**Project No:**	**HCW-31-1983**
Sample ID:	**Whole Tails**		

Test Date/Time				Measure device	Anton-Paar RheolabQC
				Sensor: Anton-Paar DG	DG42/SS?QC-LTD
				R1, Cup Inner (mm)	19.750
Test Name	C9			R2, Bob Inner (mm)	20.250
Operator	JCB			R3, Bob Outer (mm)	21.000
				R4, Cup Outer (mm)	21.500
% mass	35.8%	Plastic Viscosity (Pa·s)	0.005	Length (mm)	78.700
pH	11.0	Bingham Yield Stress(Pa)	3.5	K(σ) (Calibrated) (Pa/Nm)	2,266.000
Avg. temperature (ºC)	20.1 °C	Mixture Density, Carrier Flui	1,296	K(γ-dot) (Calibrated)	41.218



rad/s	µN-m
0.0	420
0.3	953
0.5	1091
0.8	1217
1.0	1317
1.2	1381
1.5	1429
1.7	1480
2.0	1522
2.2	1570
2.5	1611
2.7	1650
3.0	1694
3.2	1729
3.4	1770
3.7	1801
3.9	1837
4.2	1875
4.4	1905
4.7	1933
4.9	1973
5.2	2007
5.4	2034
5.6	2064
5.9	2093
6.1	2121
6.4	2151
6.6	2182
6.9	2211
7.1	2245
7.4	2273
7.6	2298
7.8	2321
8.1	2352
8.3	2383
8.6	2403
8.8	2434
9.1	2460
9.3	2485
9.6	2513
9.8	2538
10.0	2563
10.3	2593
10.5	2615
10.8	2641
11.0	2668
11.3	2693
11.5	2717
11.8	2740
12.0	2765
12.2	2788
12.5	2813
12.7	2837
13.0	2863
13.2	2888
13.5	2910
13.7	2932
14.0	2954
14.2	2982
14.4	3005
14.7	3026
14.9	3052
15.2	3074
15.4	3093
15.7	3122
15.9	3139
16.2	3165
16.4	3189
16.6	3204
16.9	3236
17.1	3257
17.4	3271
17.6	3296
17.9	3322
18.1	3348
18.4	3371
18.6	3393
18.8	3413
19.1	3435
19.3	3457
19.6	3477
19.8	3494
20.1	3509
20.3	3534
20.6	3564
20.8	3581
21.0	3595
21.3	3628
21.5	3640
21.8	3668
22.0	3686
22.3	3711

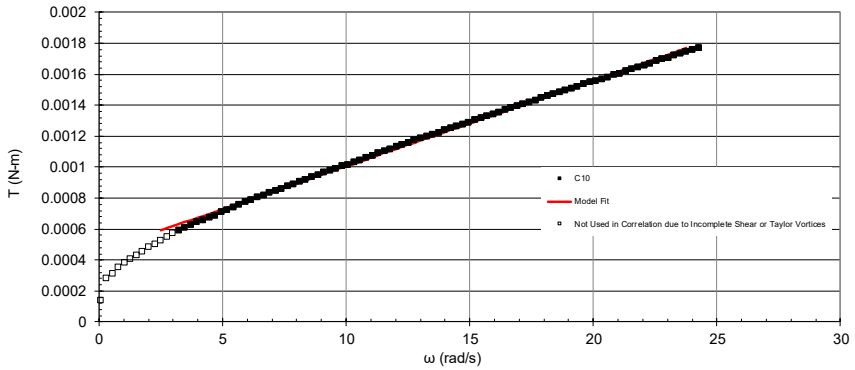
Rotational speed, w rad/s	Torque, T µN-m	Rotational speed, w rad/s	Torque, T µN-m	Rotational speed, w rad/s	Torque, T µN-m
(continued)	(continued)	(continued)	(continued)	(continued)	(continued)
22.5	3726.4				
22.8	3753.8				
23.0	3770.2				
23.2	3790.9				
23.5	3815.6				
23.7	3835.8				
24.0	3854.1				
24.2	3874.6				

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Whole Tails Rotational Viscometer Data

Project Manager:	**RJ**	**Project No:**	**HCW-31-1983**
Sample ID:	**Whole Tails**		

Test Date/Time				Measure device	Anton-Paar RheolabQC
				Sensor: Anton-Paar DG	DG42/SS?QC-LTD
				R1, Cup Inner (mm)	19.750
Test Name	C10			R2, Bob Inner (mm)	20.250
Operator	JCB			R3, Bob Outer (mm)	21.000
				R4, Cup Outer (mm)	21.500
% mass	26.7%	Plastic Viscosity (Pa-s)	0.003	Length (mm)	78.700
pH	11.0	Bingham Yield Stress(Pa)	1.0	K(σ) (Calibrated) (Pa/Nm)	2,266.000
Avg. temperature (ºC)	20.1 ℃	Mixture Density, Carrier Flui	1,205	K(γ-dot) (Calibrated)	41.218



rad/s	µN-m
0.0	140
0.3	285
0.5	315
0.8	354
1.0	385
1.2	407
1.5	430
1.7	458
2.0	482
2.2	505
2.5	528
2.7	551
3.0	572
3.2	592
3.4	607
3.7	625
3.9	643
4.2	659
4.4	676
4.7	690
4.9	712
5.2	725
5.4	742
5.6	758
5.9	774
6.1	788
6.4	804
6.6	819
6.9	834
7.1	849
7.4	863
7.6	876
7.8	892
8.1	908
8.3	922
8.6	936
8.8	950
9.1	965
9.3	978
9.6	990
9.8	1007
10.0	1018
10.3	1034
10.5	1047
10.8	1061
11.0	1076
11.3	1089
11.5	1103
11.8	1118
12.0	1132
12.2	1144
12.5	1160
12.7	1174
13.0	1186
13.2	1199
13.5	1212
13.7	1225
14.0	1239
14.2	1253
14.4	1266
14.7	1277
14.9	1291
15.2	1304
15.4	1316
15.7	1331
15.9	1341
16.2	1356
16.4	1370
16.6	1381
16.9	1398
17.1	1410
17.4	1421
17.6	1433
17.9	1449
18.1	1462
18.4	1473
18.6	1486
18.8	1498
19.1	1510
19.3	1524
19.6	1536
19.8	1548
20.1	1557
20.3	1568
20.6	1583
20.8	1599
21.0	1603
21.3	1621
21.5	1632
21.8	1646
22.0	1660
22.3	1670

Rotational speed, w rad/s	Torque, T µN-m
(continued)	(continued)
22.5	1684.9
22.8	1699.4
23.0	1704.7
23.2	1723.2
23.5	1734.1
23.7	1747.2
24.0	1757.4
24.2	1768.1

Rotational speed, w rad/s	Torque, T µN-m
(continued)	(continued)

Rotational speed, w rad/s	Torque, T µN-m
(continued)	(continued)

PATERSON & COOKE

Concentration Determination

1150 Catamount Drive, Golden, Colorado 80403

Project Description: White Pine Copper

Project Number: HCW-31-1983
Sample: Whole Tails

Test Engineer: JCB
Date Tested: 11/20/2025

Solids Density: 2.767.5 | Liquid Density: 999.5 | Dissolved Solids: 0.0500% | Slump Height (mm): 73

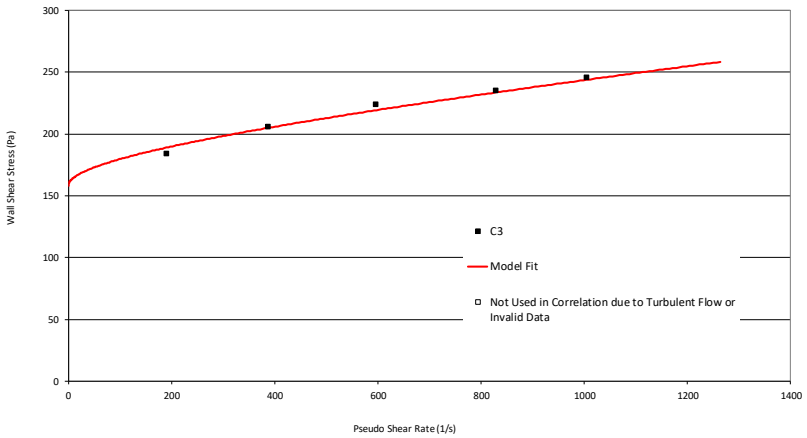
	1	2	3	4	5	6	7	8	9	10
Slurry + tare	24.985	31.099	29.795	28.351	23.828	22.691	31.962	29.846	20.741	28.547
Solids + tare	14.921	18.229	17.085	15.864	13.17	12.523	16.033	13.629	8.262	8.568
tare	1.283	1.287	1.285	1.291	1.285	1.287	1.281	1.287	1.287	1.284
Slurry	23.702	29.812	28.510	27.060	22.543	21.404	30.681	28.559	19.454	27.263
Solids	13.638	16.942	15.800	14.573	11.885	11.236	14.752	12.342	6.975	7.284
Dissolved Solids Mass	0.0050	0.0064	0.0064	0.0062	0.0053	0.0051	0.0080	0.0081	0.0062	0.0100
% Solids with Dissolved	57.54%	56.83%	55.42%	53.85%	52.72%	52.49%	48.08%	43.22%	35.85%	26.72%
Corrected % Solids	**57.52%**	**56.81%**	**55.40%**	**53.83%**	**52.70%**	**52.47%**	**48.06%**	**43.19%**	**35.82%**	**26.68%**
Corrected % Moisture	42.48%	43.19%	44.60%	46.17%	47.30%	47.53%	51.94%	56.81%	64.18%	73.32%
Slurry Density	1,580.12	1,568.86	1,546.97	1,523.39	1,506.76	1,503.48	1,442.28	1,380.33	1,296.11	1,204.87
pH	11.0	11.0	11.0	11.1	11.0	11.1	11.1	11.0	11.0	11.0

Pre-Feasibility Study Sample HCW Whole Tails Tube Viscometer Data

Project Manager:	**IF**	**Project No:**	**HCW-31-1983**
Sample ID:	**HCW Whole Tails**		

Date/Time				
Sample	C3	D	0.015748	m
Operator	JCB	Plastic Viscosity	0.047	Pa-s
		Bingham Yield Stress	158.3	Pa
% mass	65.6%	pm Slurry	1,720	kg/m^3
pH	11.0			
Temperature	20.8 °C			

Pseudo Shear Rate (1/s)	Wall Shear Stress (Pa)
1004.5	246.0
828.1	235.4
595.4	223.9
386.9	205.8
189.9	184.2

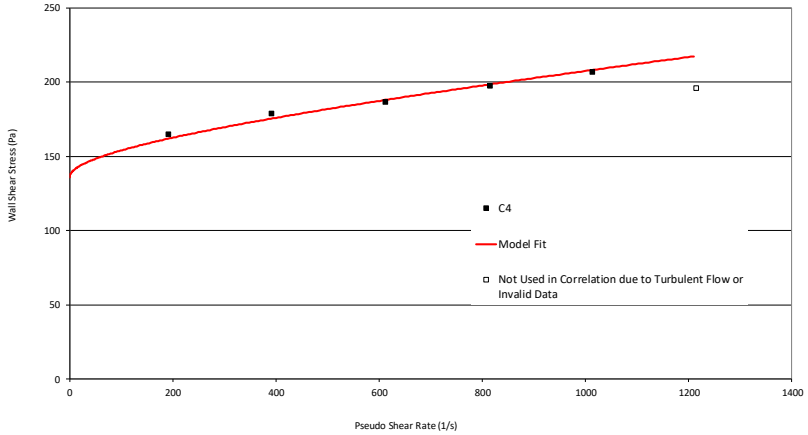


Pre-Feasibility Study Sample HCW Whole Tails Tube Viscometer Data

Project Manager:	IF	**Project No:**	HCW-31-1983
Sample ID:	HCW Whole Tails		

Date/Time				
Sample	C4			
Operator	JCB			
		D	0.015748	m
		Plastic Viscosity	0.039	Pa-s
		Bingham Yield Stress	136.0	Pa
% mass	64.6%	pm Slurry	1,701	kg/m^3
pH	11.0			
Temperature	21.0 °C			

Pseudo Shear Rate (1/s)	Wall Shear Stress (Pa)
1013.2	207.1
814.3	197.5
612.2	186.7
390.7	179.2
190.8	164.9

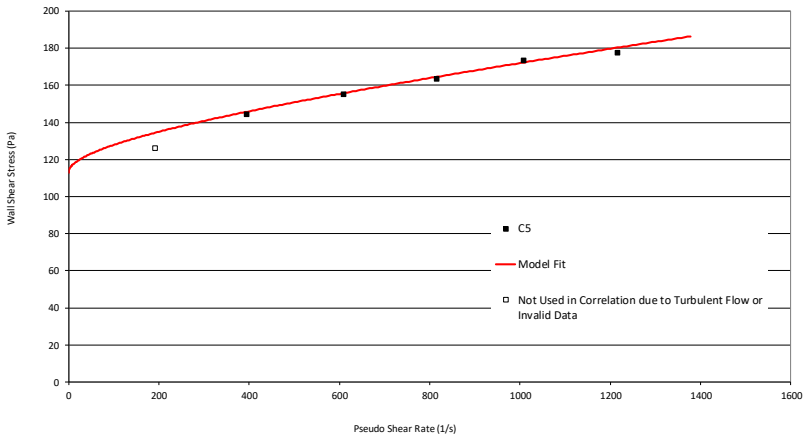


Pre-Feasibility Study Sample HCW Whole Tails Tube Viscometer Data

Project Manager:	**IF**	**Project No:**	**HCW-31-1983**
Sample ID:	**HCW Whole Tails**		

Date/Time		D	0.015748 m
Sample	C5	Plastic Viscosity	0.032 Pa-s
Operator	JCB	Bingham Yield Stress	113.0 Pa
% mass	63.8%	pm Slurry	1,686 kg/m^3
pH	11.0		
Temperature	20.6 °C		

Pseudo Shear Rate (1/s)	Wall Shear Stress (Pa)
1216.4	177.5
1008.1	173.4
814.8	163.3
609.4	155.2
394.9	144.2

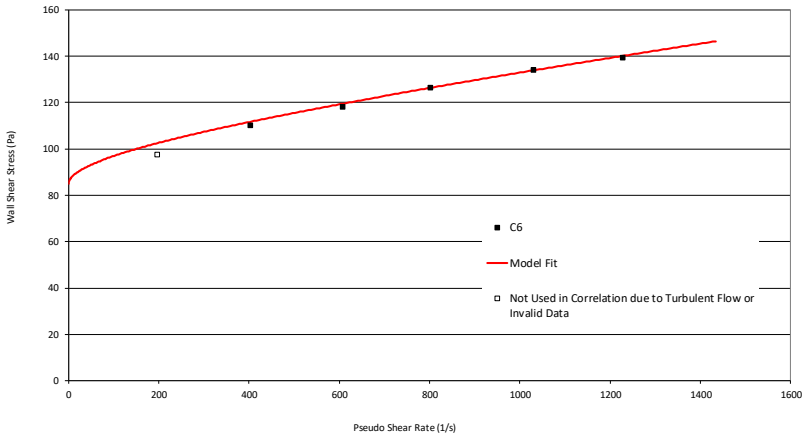


Pre-Feasibility Study Sample HCW Whole Tails Tube Viscometer Data

Project Manager:	**IF**	**Project No:**	**HCW-31-1983**
Sample ID:	**HCW Whole Tails**		

Date/Time				
Sample	C6	D	0.015748	m
Operator	JCB	Plastic Viscosity	0.027	Pa-s
		Bingham Yield Stress	85.0	Pa
% mass	62.7%	pm Slurry	1,667	kg/m^3
pH	11.0			
Temperature	20.4 °C			

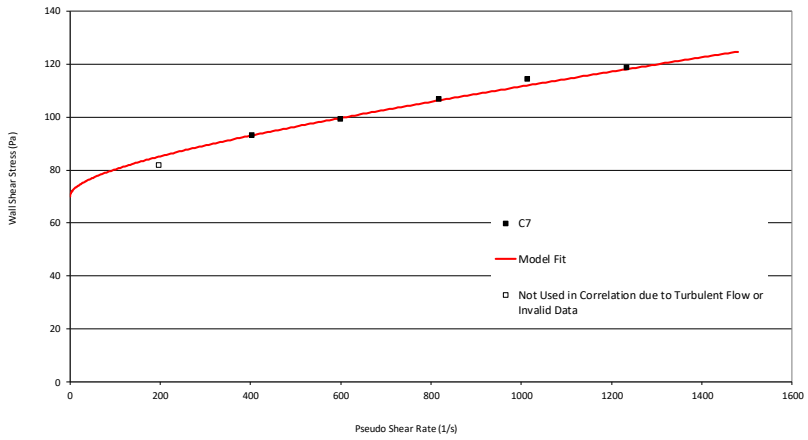
Pseudo Shear Rate (1/s)	Wall Shear Stress (Pa)
1227.3	139.5
1030.6	134.0
802.2	126.6
606.5	118.1
401.9	110.1



Pre-Feasibility Study Sample HCW Whole Tails Tube Viscometer Data	**Project Manager:**	IF	**Project No:**	HCW-31-1983
	Sample ID:	HCW Whole Tails		

Date/Time				
Sample	C7			
Operator	JCB			
% mass	61.3%			
pH	11.0			
Temperature	20.3 °C			
		D	0.015748	m
		Plastic Viscosity	0.024	Pa-s
		Bingham Yield Stress	70.0	Pa
		pm Slurry	1,644	kg/m^3

Pseudo Shear Rate (1/s)	Wall Shear Stress (Pa)
1233.2	118.8
1012.5	114.3
817.5	107.0
598.9	99.3
402.2	93.2



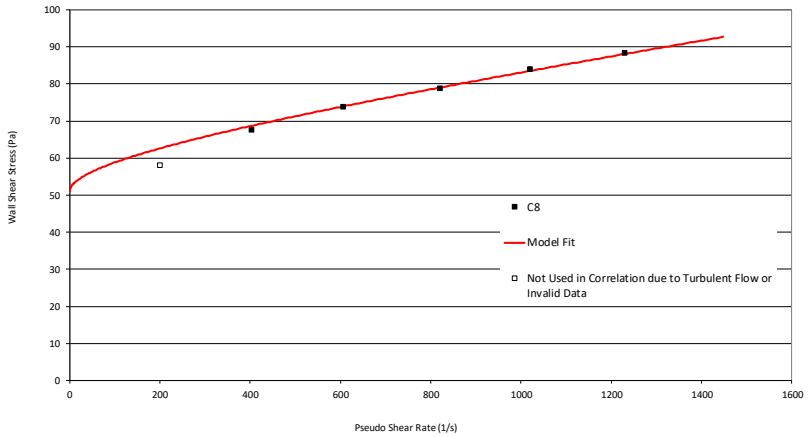
Pre-Feasibility Study Sample HCW Whole Tails Tube Viscometer Data

Project Manager:	**IF**	**Project No:**	**HCW-31-1983**
Sample ID:	**HCW Whole Tails**		

Date/Time	
Sample	C8
Operator	JCB
% mass	59.7%
pH	11.0
Temperature	20.3 °C

D	0.015748	m
Plastic Viscosity	0.019	Pa-s
Bingham Yield Stress	51.0	Pa
pm Slurry	1,616	kg/m^3

Pseudo Shear Rate (1/s)	Wall Shear Stress (Pa)
1230.0	88.3
1019.2	84.0
820.9	78.8
606.0	73.8
402.3	67.7



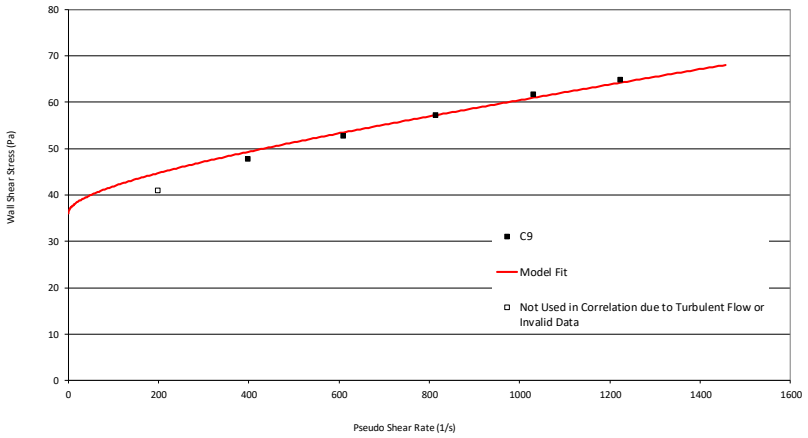
Pre-Feasibility Study Sample HCW Whole Tails Tube Viscometer Data

Project Manager:	**IF**	**Project No:**	**HCW-31-1983**
Sample ID:	**HCW Whole Tails**		

Date/Time	
Sample	C9
Operator	JCB
% mass	57.4%
pH	11.0
Temperature	20.2 °C

D	0.015748 m
Plastic Viscosity	0.015 Pa-s
Bingham Yield Stress	36.0 Pa
pm Slurry	1,577 kg/m^3

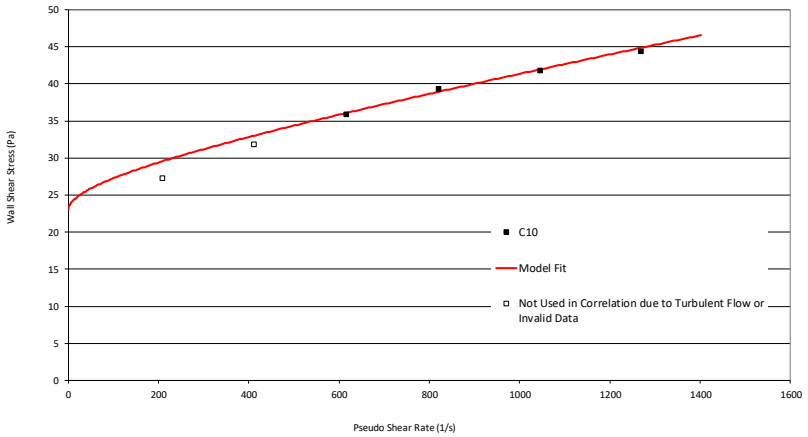
Pseudo Shear Rate (1/s)	Wall Shear Stress (Pa)
1222.0	64.8
1029.9	61.7
813.7	57.2
608.5	52.8
397.5	47.8



Pre-Feasibility Study Sample HCW Whole Tails Tube Viscometer Data		Project Manager:	IF	Project No:	HCW-31-1983
		Sample ID:	HCW Whole Tails		

Date/Time		D	0.015748	m
Sample	C10	Plastic Viscosity	0.012	Pa-s
Operator	JCB	Bingham Yield Stress	23.0	Pa
% mass	54.8%	pm Slurry	1,504	kg/m^3
pH	11.1			
Temperature	20.1 °C			

Pseudo Shear Rate (1/s)	Wall Shear Stress (Pa)
1268.2	44.3
1045.3	41.8
821.0	39.3
616.2	35.9



PATERSON & COOKE

Concentration Determination

1150 Catamount Drive, Golden, Colorado 80403	Project Description: White Pine Copper	Project Number: HCW-31-1983	Test Engineer: JCB
		Sample: Whole Tails	Date Tested: 12/11/2025

Solids Density	2,767.5	Liquid Density	999.5	Dissolved Solids	0.0500%	Slump Height (mm)	73

	1	2	3	4	5	6	7	8	9	10
Slurry + tare	37.079	50.855	31.207	33.257	43.75	27.331	31.009	29.705	25.997	25.087
Solids + tare	24.83	34.104	20.91	21.933	28.371	17.618	19.527	18.26	15.47	14.35
tare	1.301	1.303	1.3	1.299	1.298	1.298	1.297	1.298	1.302	1.304
Slurry	35.778	49.552	29.907	31.958	42.452	26.033	29.712	28.407	24.695	23.783
Solids	23.529	32.801	19.610	20.634	27.073	16.320	18.230	16.962	14.168	13.046
Dissolved Solids Mass	0.0061	0.0084	0.0052	0.0057	0.0077	0.0049	0.0057	0.0057	0.0053	0.0054
% Solids with Dissolved	65.76%	66.20%	65.57%	64.57%	63.77%	62.69%	61.36%	59.71%	57.37%	54.85%
Corrected % Solids	**65.75%**	**66.18%**	**65.55%**	**64.55%**	**63.76%**	**62.67%**	**61.34%**	**59.69%**	**57.35%**	**54.83%**
Corrected % Moisture	34.25%	33.82%	34.45%	35.45%	36.24%	37.33%	38.66%	40.31%	42.65%	45.17%
Slurry Density	1,723.34	1,731.56	1,719.66	1,700.88	1,686.34	1,666.86	1,643.49	1,615.56	1,577.45	1,538.38
pH	10.9	10.9	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.1
Slump (mm)	46	42	44.5	51	54	58	60	62		
Boger Yield Stress	72.75	89.8	78.6	53.5	43.25	31	25.3	20		

APPENDIX B
Paterson and Cooke Tailings Conveyance Hydraulic Design Report

White Pine Copper North – Pre-Feasibility Study

P&C Project No.: HCW-31-1983

Rev No.	Date	Description	Prepared	Reviewed	Reviewed
B	20 Feb 2026	Issued to Client	NJS	ICF	-
A	19 Jan 2026	Issued for Client Review	NJS	ICF	WPC
			Originator		Client

Document Title

Tailings System Hydraulic Design Report

Document Number						
Office Code	Project Code	Area Code	Disc. Code	Document Type	Seq. No.	Rev No.
31	1983	00	HY	REP	0001	B

Paterson & Cooke
KNOWLEDGE | EXPERIENCE | PASSION

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1150 Catamount Drive, Golden, Colorado 80403, USA
Denver@PatersonCooke.com www.PatersonCooke.com

TERMS OF REFERENCE

This work has been conducted by Paterson & Cooke for White Pine Copper LLC under the current Master Services Agreement effective September 19, 2025.

This report, and accompanying drawings, has been prepared by Paterson & Cooke for the exclusive use of White Pine Copper LLC for the White Pine Copper Tailings Pre-Feasibility Study, and no other party is an intended beneficiary of this report or any of the information, opinions and conclusions contained herein. The use of this report shall be at the sole risk of the user regardless of any fault or negligence of White Pine Copper or Paterson & Cooke. Paterson & Cooke accepts no responsibility for damages, if any, suffered by any third party as a result of decisions or actions based on this report. Note that this report is a controlled document and any reproductions are uncontrolled and may not be the most recent version.

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1. INTRODUCTION

1.1 Background

The White Pine Copper LLC. (WPC) White Pine North Project is a brownfields project for a site located on the Michigan Upper Peninsula near Lake Superior. WPC has requested that Paterson & Cooke (P&C) carry out the pre-feasibility study (PFS) level design for the tailings dewatering and transport system for the White Pine North Project.

A preliminary economic assessment was completed in 2023 and used a 22-year mine life at a processing rate of 15,000 t/d as the study basis. The flowsheet in this assessment combines slimes overflow (from primary flotation tailings desliming cyclones) and scavenger tailings in a tailings box, from which the combined tailings are pumped to the Tailings Disposal Facility (TDF) via an above ground high density polyethylene (HDPE) pipeline. The tailings box also receives any spillage/sump streams intermittently.

In 2024, WPC completed addition metallurgical testing, including tests with and without desliming. Desliming was subsequently removed from the flowsheet. The PFS flowsheet now includes two tailings streams, a copper rougher tailings and a copper 1st cleaner tailings, which are planned to be combined prior to thickening and transport to the TDF.

The existing TDF is divided into North Pond 1 (NP1) and North Pond 2 (NP2). The project is planning to deposit tailings into North Pond 1 intially, then into North Pond 2. Figure 1 shows the existing historic TDF. Based on a conventional tailings system, this area currently has approximately 18 million m^3 (23.5 million yd^3, approximately 22 million metric / 24.2 million short dry tons) of storage without considering any dam raises or freeboard. To store all the tailings and maintain 2 m (6.6 feet) of freeboard will require up to 8 m (26.2 feet) of lifts over the life of mine, and the site has limited borrow material available.

To maximize the storage potential of NP1 / NP2 and eliminate the need for embankment raising, high density/paste thickened tailings are being considered. The current plan is to deposit high density/paste thickened tailings using a series of central thickened discharge (CTD) points within the existing TDF.

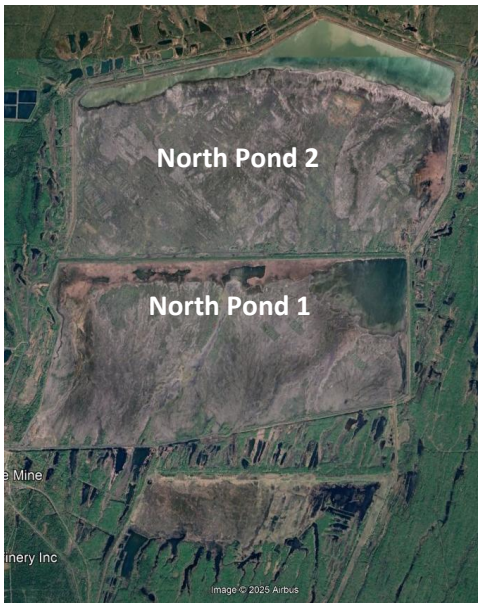


Figure 1: White Pine Copper existing TDF – North Ponds 1 and 2 (image from Google Earth)

1.2 Document Scope

This document summarizes the steady-state hydraulic design for the pumping systems associated with thickening and tailings distribution.

This document summarizes the design of these pipeline systems, including:

- The pipeline size selection
- The pressure loss modelling for the system
- The pressure rating requirements
- The required pumping components.

1.3 Reference Documents

The following documents are referenced in this report.

Table I: Reference Documents

Title	Document Number, Date	Abbreviation
Ausenco Process Mass & Water Balance	108571-ER-00000-22223-001-02 Rev C, December 12, 2025	AUS-02
Feluwa document: *"Feluwa P&C, Mi Tailings project, 1900358"*	Received January 9, 2026	FE-01
P&C document: *"White Pine Copper Tailings – Pre-Feasibility Study: Design Basis"*	31-1983-00-PR-REP-0001 Rev A Design Basis, November 11, 2025	P&C-01
P&C Report: "White Pine Copper North – Pre-Feasibility Study: Test Work Report"	31-1983-00-TW-REP-0001 Rev B, December 12, 2025	P&C-02
Tetra Tech preliminary drawing package	Deposition Design for P&C.pdf	TT-02

1.4 Units and Abbreviations

The inputs and outputs for the project are in metric units, but US customary units are also displayed due to the project location. Where metric units are the primary units per industry convention (e.g. rheology units) the US customary units are not displayed. The following units are used:

%m	percentage by mass (solids concentration)
°C	degrees Celsius
°F	degrees Fahrenheit
ANSI/HI	American National Standards Institute / Hydraulic Institute
ASTM	American Society for Testing and Materials (ASTM International)
cP	centipoise
CS	carbon steel
dyne/cm²	dynes per square centimeter
ERW	electric resistance welding (pipe construction)
ft	feet
ft/s	feet per second
gpm	gallons per minute

HDPE	high density polyethylene
HGL	hydraulic grade line
hp	horsepower
kg/m³	kilogram per cubic meter
kPa/m	kilopascal per meter
kW	kilowatt
lb/ft³	pounds per cubic feet
m	meter
m/s	meter per second
m³/h	cubic meters per hour
mm	millimeter
mwc	meters water column
NP1	North Pond 1
NP2	North Pond 2
P&C	Paterson & Cooke USA, Ltd.
pa	pascal
PD	positive displacement
PSD	particle size distribution
psi	pound per square inch
rpm	revolutions per minute
STD	standard (pipe schedule)
stph	short ton per hour
t/h	metric tons per hour
TDF	tailings disposal facility

2. PIPELINE DESIGN METHODOLOGY

The design of slurry pipeline systems requires consideration of several key parameters whose interactions affect the system requirements. These include:

- Slurry rheology correlation

- Slurry concentration
- Operating and minimum velocity.

The pipeline system design is an iterative process, as any change to one of the parameters impacts on the others and the final solution. For example, changing the slurry concentration affects the volumetric throughput and therefore the slurry velocity. The pressure gradient is altered by the velocity, so a different pipe size or wall thickness may be required.

The design process involves the following steps and objectives:

- Identify a suitable operating velocity and pipeline size based on the tonnage and slurry rheology.
- Determine the pipeline pressure gradients and required pressure rating for the system.
- Evaluate the pressure along the length of the pipeline to ensure pressurized flow (no slack flow) in the system.
- Evaluate other operating scenarios to check for additional requirements, such as low tonnage operation and static pressures during shut down.

3. DESIGN CRITERIA

The detailed design criteria used for this study are presented in P&C-01.

3.1 Slurry Properties

3.1.1 Rheology

The slurry rheology of the tailings and the carrier fluid have been measured during the test work which is presented in P&C-02. The whole slurry Bingham yield stress and plastic viscosity at each solids concentration is presented in Table II.

Table II: Whole Slurry Bingham Yield Stress & Plastic Viscosity

Solids concentration	Whole slurry Bingham yield stress	Whole slurry plastic viscosity
58%m	364 dyne/cm² 36.4 Pa	16 cP 0.016 Pa ·s
60%m	547 dyne/cm² 54.7 Pa	20 cP 0.020 Pa ·s
62%m	810 dyne/cm² 81 Pa	26 cP 0.026 Pa ·s

3.1.2 Particle Size Distribution (PSD)

The PSD of the tailings has been measured during the test work on received samples (P&C-02). The PSD of the tailings is presented in Figure 2.

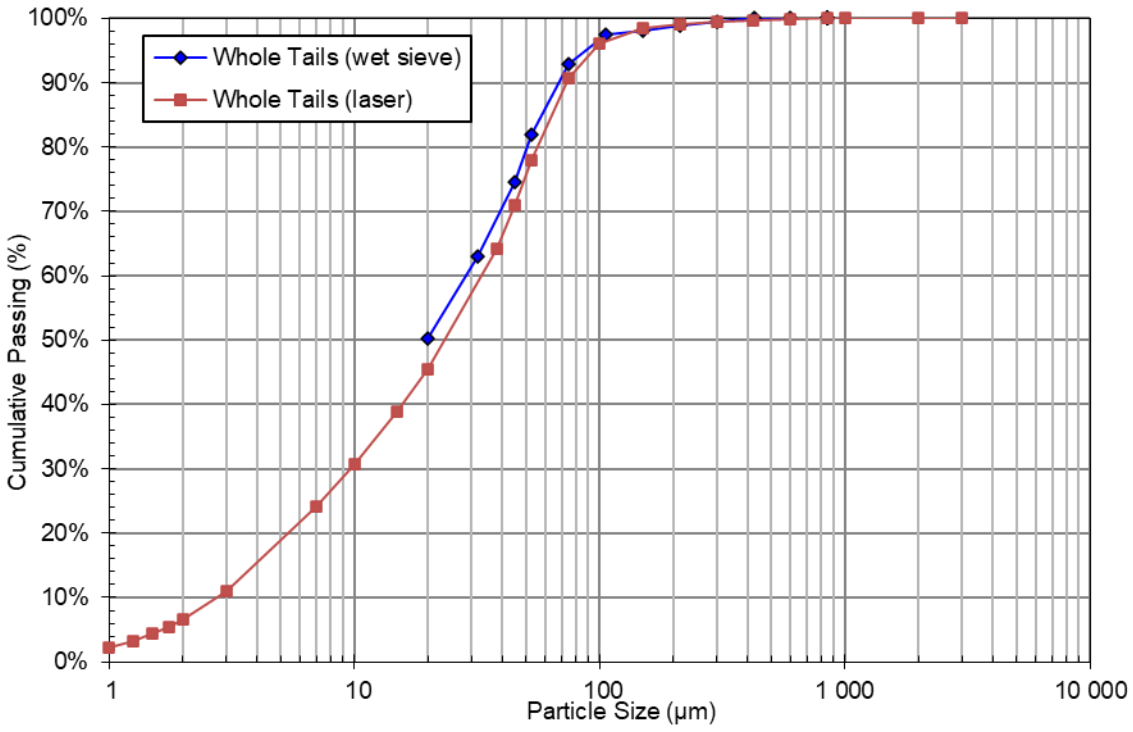


Figure 2: Tailings Particle Size Distributions (P&C-02)

3.2 Process Parameters

Item	Value / Description	Source / Comments
Stream	Tailings	-
Solids density	172.8 lb/ft^3 (2,768 kg/m^3)	P&C-02
Tonnage	Nominal: 721 stph (654 t/h) Maximum: 793 stph (719 t/h)	AUS-02 Calculated (10% design factor)
Plant availability	92%	AUS-02
Solids mass concentration	Minimum: 58%m Nominal: 60%m Maximum: 62%m	Calculated (see Section 4.1.2 for more information)
Flow rate	Minimum: 2,809 gpm (654 m³/h) Nominal: 2,964 gpm (673 m³/h) Maximum: 3,442 gpm (782 m³/h)	Calculated

4. PIPELINE HYDRAULIC DESIGN

4.1 Modelling Basis and Considerations

4.1.1 Steady State Hydraulic Modelling Basis

The turbulent deposition velocity for the tailings systems is estimated using software developed by the SRC for the turbulent flow of settling slurries in pipelines (SRC PipeFlow 10). P&C's standard is to apply a 1 foot/s (0.3 m/s) margin to the predicted deposition velocity to account for process variability and model accuracy.

The laminar to turbulent transition velocity is estimated using the intersection method. Laminar pipeline friction losses have been estimated using the Govier and Aziz equation for laminar flow of non-Newtonian slurries. Turbulent flow friction losses have been estimated using the Wilson and Thomas model for turbulent flow. An additional head loss allowance of 5% has been applied to the friction loss calculations to account for minor losses and variation in material properties and modelling predictions.

4.1.2 Solids Concentration

The solids concentration range of the thickened tailings has been selected to be 58%m to 62%m, with a nominal operating concentration of 60%m. This range was selected based on discussions with Gordon McPhail, who advised that achieving a 2% beach slope requires a whole slurry Bingham yield stress greater than 40 Pa (400 dyne /cm²). The process design range accounts for a slurry concentration ±2%m from nominal. At the lower bound, a solids concentration of 58%m corresponds to a yield stress of approximately 40 Pa. The upper bound of 62%m results in a yield stress range of 80 Pa (800 dyne /cm²).

4.1.3 Laminar Flow Operation

Based on the high yield stresses at the design concentrations, it is not reasonable to design the tailings pipeline to operate in turbulent flow as this will result in operating velocities in excess of 5 m/s. Operation at velocities this high will result in excessive energy consumption and high wear rates.

Laminar flow operation of coarse particle settling slurries is typically not recommended; however, it can be safely done. In P&C's experience, if the pipeline pressure loss is high enough, any coarse particles that migrate to the invert of the pipeline due to laminar flow operation, will be transported as a "sliding bed" and not form a plug. For this slurry P&C estimates that a pressure loss of 1 kPa/m will be sufficient.

Laminar flow is not commonly used in industry, and it is recommended that pipe loop tests are completed in future engineering phases to confirm the friction losses estimated in this design phase.

4.2 Tailings Delivery System

The tailings thickener has dedicated pumps to transfer underflow from the thickener to the Thickener Underflow Tank. It is recommended to have dedicated thickener underflow pumps instead of combining duty with the overland tailings delivery pumps. Operation of the thickener will be complex when it is hydraulically tied to an overland pipeline. In addition, the thickener is designed to achieve a solids concentration higher than the tailings pipeline is designed for so that trim water may be added to tailings slurry. This method of dilution control maintains a tighter range of tailings concentrations and, therefore, yield stresses. The agitated Thickener Underflow Tank serves as a pump station head tank to feed the overland Tailings Delivery Pumps. Due to the high rheology required for achieving the required beach slopes, the tailings pipeline will have high friction losses and positive displacement pumps are the best choice for this system (see Section 4.2.5 for additional details). As a result, each piston diaphragm (positive displacement) pump

requires a dedicated charge pump on the suction side. The charge pumps are centrifugal slurry pumps. Tailings slurry is then deposited to the various discharge points on the TDF.

The discharge points at the TDF will be a CTD, and the deposition design and towers will be designed by others. NP1 will be operated first and has Discharges 1, 2, and 3 which will be used until NP1 reaches the ultimate elevation. NP2 will be operated after NP1 has reached capacity and features Discharges 4, 5, and 6 which will be used until NP2 reaches the ultimate elevation at the end of mine life. Figure 3 shows the approximate pipeline routes, the tailings thickener location, and the discharge locations at each pond.

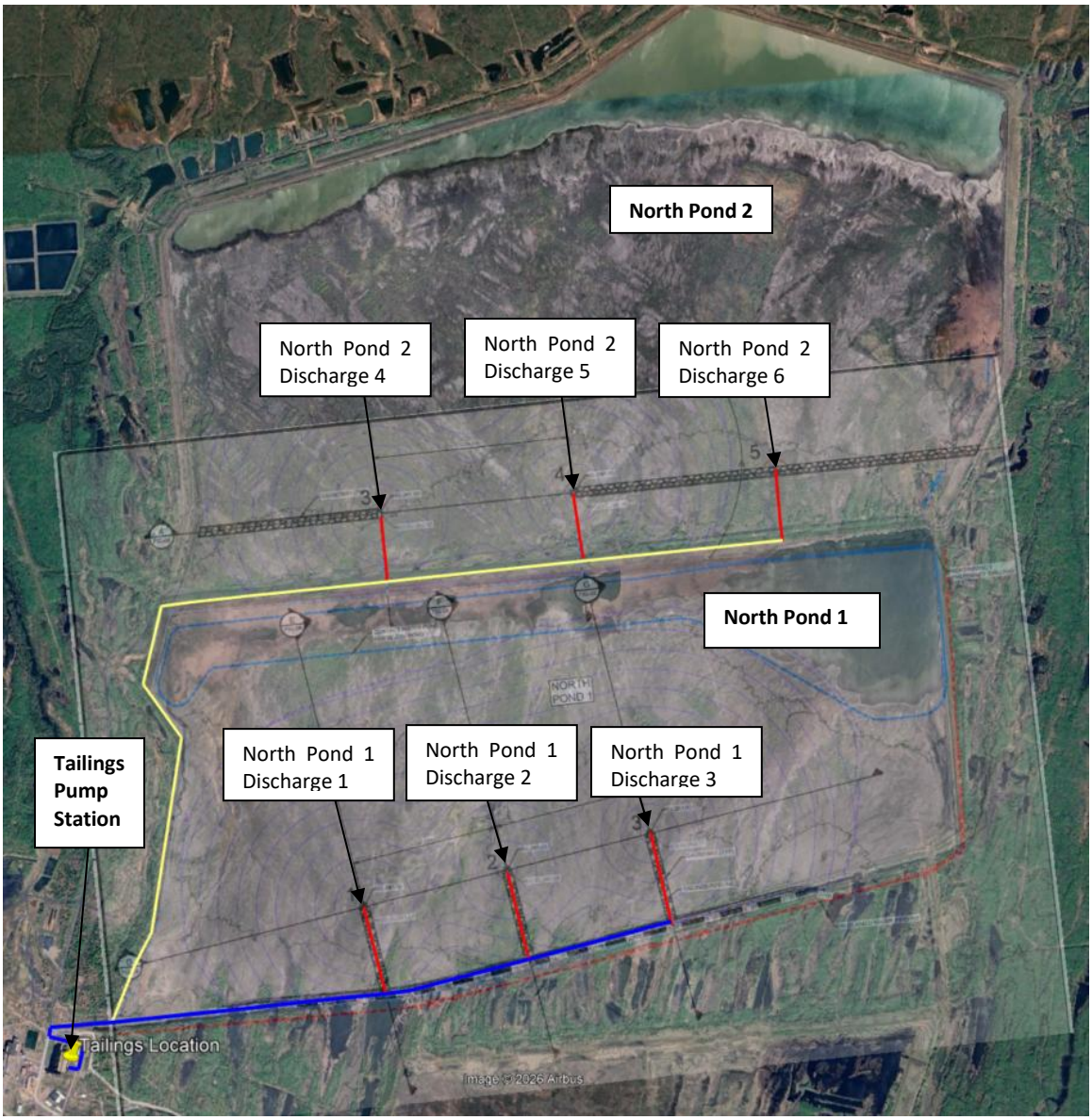


Figure 3: Approximate Pipeline Routes (Google Earth, TT-02)

4.2.1 Pipe Selection

The proposed pipe specification for the thickened tailings transportation system is provided in Table III. The proposed pipe size was determined considering key design criteria, which include:

- Operating with a target concentration range of 58%m to 62%m when discharging to the TDF.
- Operating at or above the recommended pressure gradient (1 kPa/m).

Due to laminar flow operation and high operating velocities, a lined carbon steel pipe is selected. See Section 4.2.2 for more information on the piping liner selection.

Table III: Pipe Specifications

Discharge location	**Pipe description**	**Pipe location**
North Pond 1 Discharge 1	10 inch HDPE lined carbon steel, Sch. STD, ASTM A53 Grade B, ERW, 0.28 inch (7.1 mm) liner, Class 900	Pump Station to North Pond 1 Crest
	10 inch HDPE lined carbon steel, Sch. STD, ASTM A53 Grade B, ERW, 0.28 inch (7.1 mm) liner, Class 600	
	10 inch HDPE lined carbon steel, Sch. STD, ASTM A53 Grade B, ERW, 0.28 inch (7.1 mm) liner, Class 300	
	12 inch HDPE SDR 9, ASTM F714, PE4710	North Pond 1 Crest to Discharge 1
North Pond 1 Discharge 2	10 inch HDPE lined carbon steel, Sch. STD, ASTM A53 Grade B, ERW, 0.28 inch (7.1 mm) liner, Class 900	Pump Station to North Pond 1 Crest
	10 inch HDPE lined carbon steel, Sch. STD, ASTM A53 Grade B, ERW, 0.28 inch (7.1 mm) liner, Class 600	
	10 inch HDPE lined carbon steel, Sch. STD, ASTM A53 Grade B, ERW, 0.28 inch (7.1 mm) liner, Class 300	
	12 inch HDPE SDR 9, ASTM F714, PE4710	North Pond 1 Crest to Discharge 2
North Pond 1 Discharge 3	10 inch HDPE lined carbon steel, Sch. STD, ASTM A53 Grade B, ERW, 0.28 inch (7.1 mm) liner, Class 900	Pump Station to North Pond 1 Crest
	10 inch HDPE lined carbon steel, Sch. STD, ASTM A53 Grade B, ERW, 0.28 inch (7.1 mm) liner, Class 600	
	10 inch HDPE lined carbon steel, Sch. STD, ASTM A53 Grade B, ERW, 0.28 inch (7.1 mm) liner, Class 300	
	12 inch HDPE SDR 9, ASTM F714, PE4710	North Pond 1 Crest to Discharge 3

Discharge location	Pipe description	Pipe location
North Pond 2 Discharge 4	10 inch HDPE lined carbon steel, Sch. STD, ASTM A53 Grade B, ERW, 0.28 inch (7.1 mm) liner, Class 900	Pump Station to North Pond 2 Crest
	10 inch HDPE lined carbon steel, Sch. STD, ASTM A53 Grade B, ERW, 0.28 inch (7.1 mm) liner, Class 600	
	10 inch HDPE lined carbon steel, Sch. STD, ASTM A53 Grade B, ERW, 0.28 inch (7.1 mm) liner, Class 300	
	12 inch HDPE SDR 9, ASTM F714, PE4710	North Pond 2 Crest to Discharge 4
North Pond 2 Discharge 5	10 inch HDPE lined carbon steel, Sch. STD, ASTM A53 Grade B, ERW, 0.28 inch (7.1 mm) liner, Class 900	Pump Station to North Pond 2 Crest
	10 inch HDPE lined carbon steel, Sch. STD, ASTM A53 Grade B, ERW, 0.28 inch (7.1 mm) liner, Class 600	
	10 inch HDPE lined carbon steel, Sch. STD, ASTM A53 Grade B, ERW, 0.28 inch (7.1 mm) liner, Class 300	
	12 inch HDPE SDR 9, ASTM F714, PE4710	North Pond 2 Crest to Discharge 5
North Pond 2 Discharge 6	10 inch HDPE lined carbon steel, Sch. STD, ASTM A53 Grade B, ERW, 0.28 inch (7.1 mm) liner, Class 900	Pump Station to North Pond 2 Crest
	10 inch HDPE lined carbon steel, Sch. STD, ASTM A53 Grade B, ERW, 0.28 inch (7.1 mm) liner, Class 600	
	10 inch HDPE lined carbon steel, Sch. STD, ASTM A53 Grade B, ERW, 0.28 inch (7.1 mm) liner, Class 300	
	12 inch HDPE SDR 9, ASTM F714, PE4710	North Pond 2 Crest to Discharge 6

4.2.2 Piping Material

Lined carbon steel piping is typically the selected material for slurry service when the pressure rating requirement exceeds the capabilities of standard HDPE pipe. The most common lining materials for slurry service are rubber and HDPE. Due to the high operating velocities of the tailings delivery system rubber would typically be the lining material of choice in this application. However, due to the high operating pressures of the system, HDPE lining was selected due to its known compatibility with high pressures. Rubber can present issues with flange sealing, porosity and debonding at high pressures and rubber lining should be investigated with a pipe lining vendor in the next phase of engineering. Polyurethane is another option for this system, but the pipe unit costs are typically higher than rubber or HDPE. HDPE typically has the lowest capital cost out of the three options as it can be pulled through relatively long spans of welded pipe and greatly reduce the number of flanges / couplings.

With the system operating mostly in laminar flow for the design duty points, the system is designed to operate at a specific pressure gradient to ensure coarse particles are transported and do not remain stationary on the pipe invert. Therefore, a specific pipe internal diameter was selected to achieve this velocity. The resulting operating velocities (3.9 to 4.8 m/s) are high and will result in higher-than-average pipe wear rates. Two nominal pipe sizes were compared for this system:

- In order to have a thicker HDPE liner (about 17 mm) with potentially more liner wear material, the first piping option was 12 inch with a relatively thick steel wall (Schedule 100).
- The other option, selected for this study, is a 10 inch standard schedule pipe with a thinner 7 mm HDPE liner. Although this pipe has less liner material, there is less unnecessary steel used in the piping and will reduce capital costs.

However, with the high operating velocities the pipe replacement intervals are not known. Wear tests can be completed in the next phase of design to highlight the relative wear rates of the different lining materials when operating with this specific tailings slurry. At this phase of design it is assumed that the carbon steel pipeline will be re-lined with a new HDPE liner if the existing liner wears out.

4.2.3 Operating Range

Figure 4 shows the operating window for the worst-case NP1 discharge scenario (Discharge 3, ultimate elevation). Figure 5 shows the operating window for worst-case NP2 discharge scenario (Discharge 6, ultimate elevation). The diagonal lines running across the plot show lines of constant slurry concentration. The horizontal dashed lines indicate the pipeline flow velocity. The minimum

and maximum pipeline limitations are stated in the plot legend. The red shaded area below the minimum recommended operating velocity represents an operating region that is not recommended due to the increased risk of pipeline blockage. The recommended operating range for the system is shown in the green shaded area. The yellow shaded area above the maximum recommended operating velocity represents an operating region that is not recommended due to the high velocities and increased wear rates.

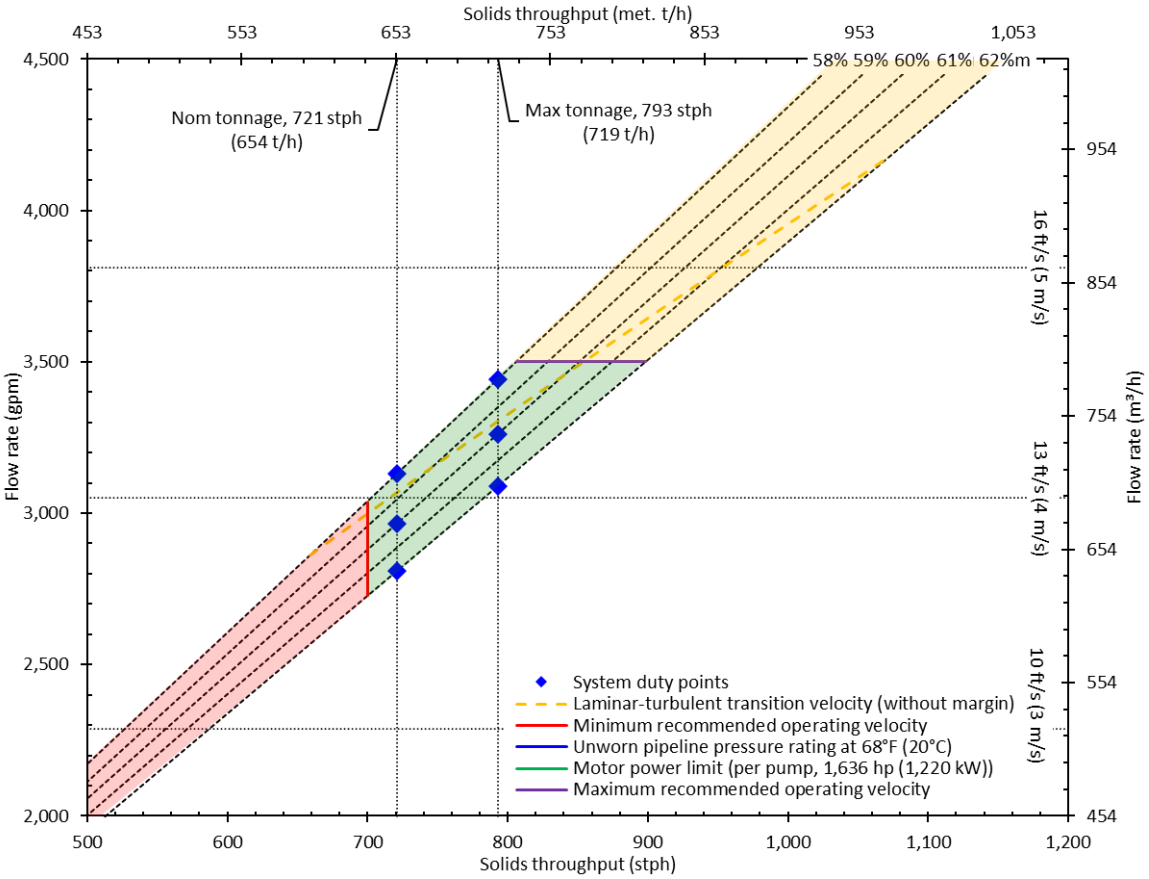


Figure 4: Operating Range Chart (NP1 Discharge 3, Ultimate Elevation)[1]

[1] For North Pond 1, the pipeline pressure rating and motor power limits are beyond the axes.

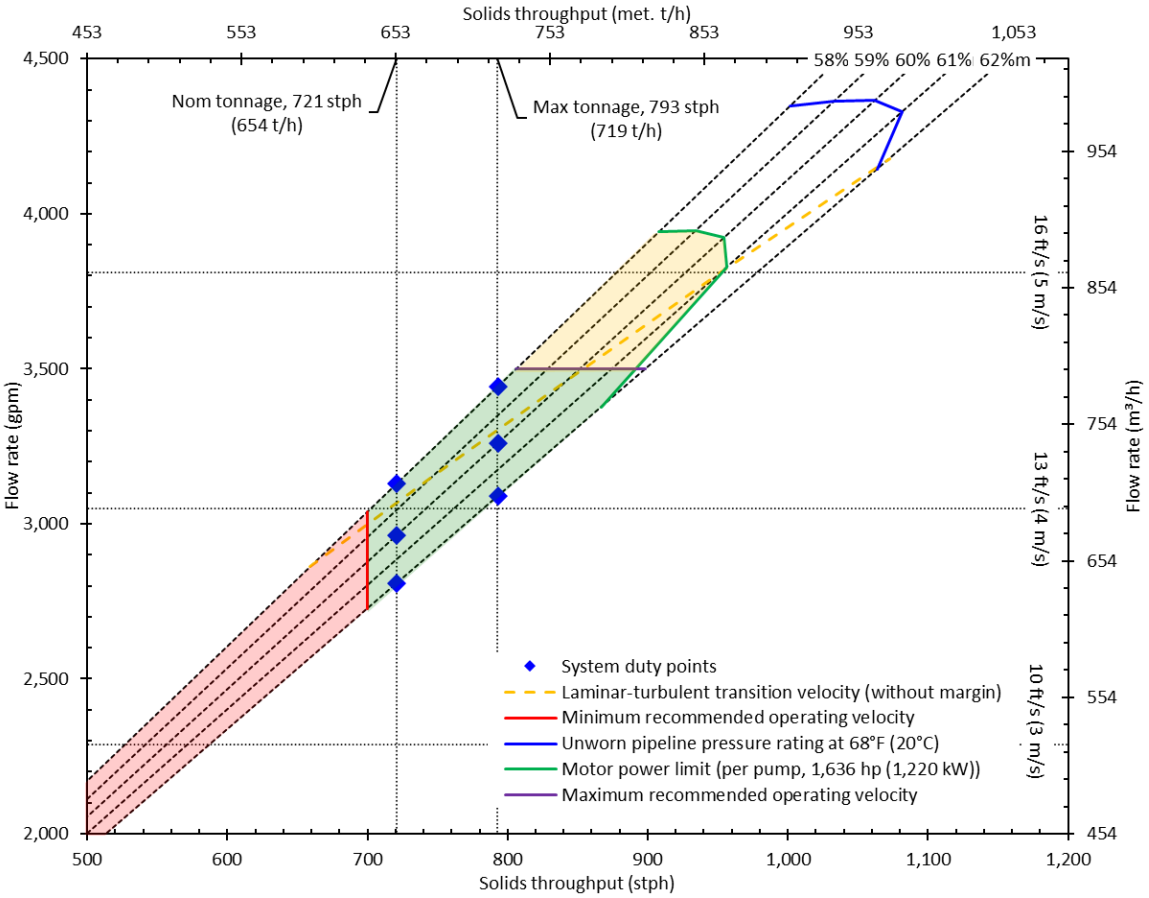


Figure 5: Operating Range Chart (NP2 Discharge 6, Ultimate Elevation)

4.2.4 Hydraulic Grade Lines

A hydraulic grade line (HGL) plot shows the variation of pressure (expressed in terms of head of slurry) along the pipeline. This allows for assessment of the following aspects of the design:

- The pumping pressure requirements at the start of the pipeline
- The pipeline pressure rating requirements
- Any risk or occurrence of slack flow in the pipeline.

The steady state HGLs for the systems spanning the range of estimated pump duty throughout the life of mine are shown below:

- NP1 minimum duty condition (Discharge 1, starting elevation) is shown in Figure 6
- NP1 maximum duty condition (Discharge 3, ultimate elevation) is shown in Figure 7
- NP2 minimum duty condition (Discharge 4 starting elevation) is shown in Figure 8
- NP2 maximum duty condition (Discharge 6 ultimate elevation) is shown in Figure 9.

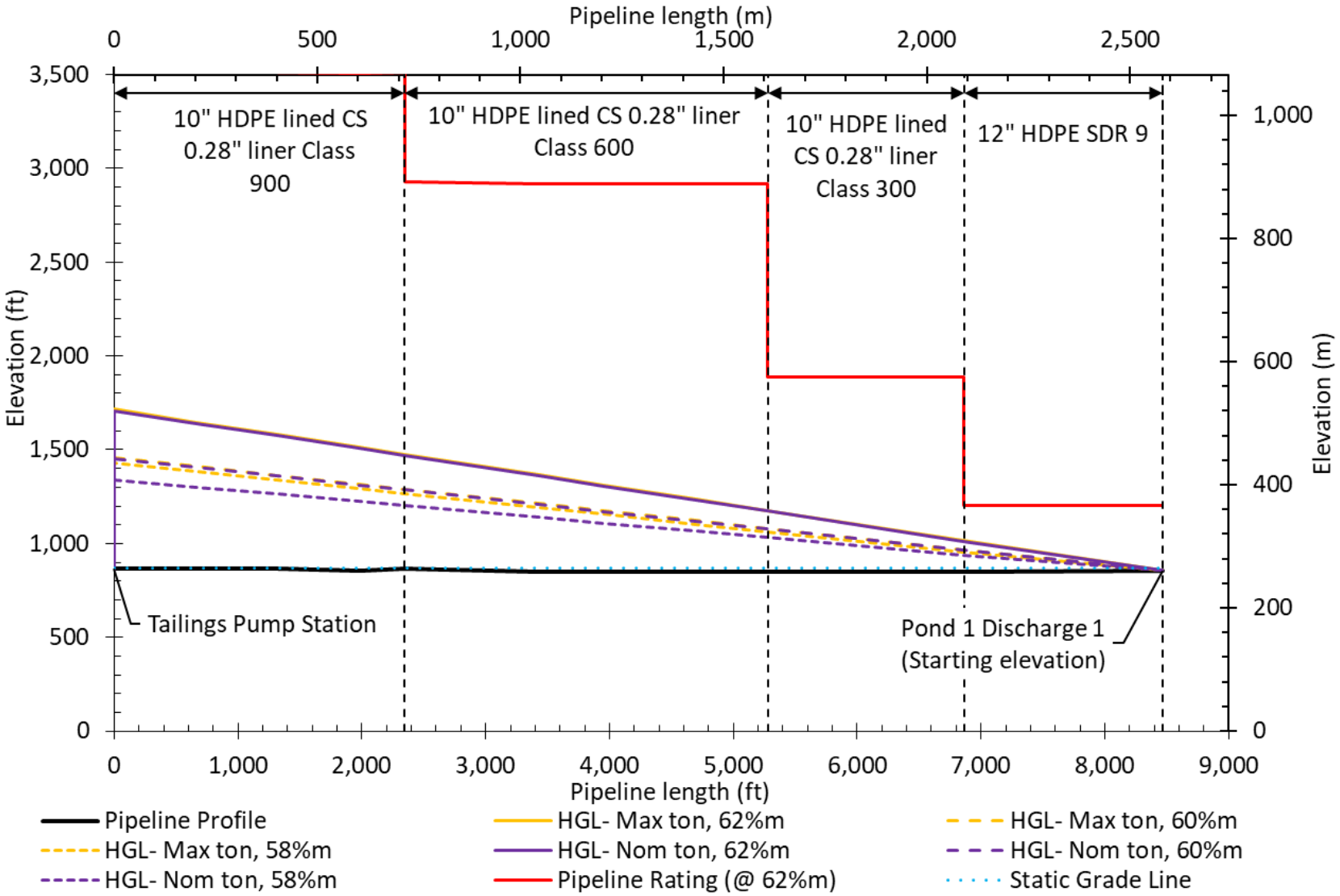


Figure 6: HGL (NP1 Discharge 1, Starting Elevation)

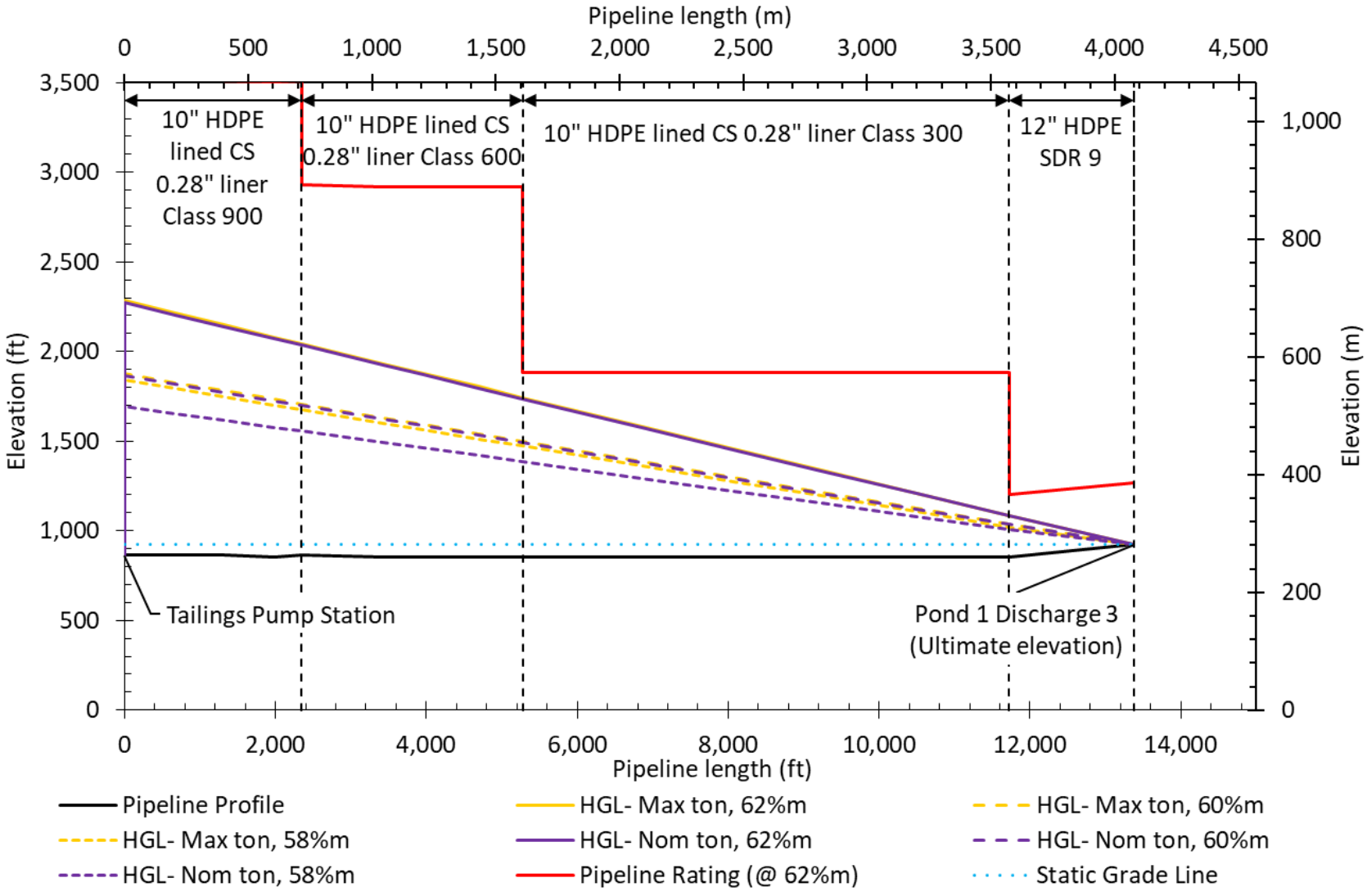


Figure 7: HGL (NP1 Discharge 3, Maximum elevation)

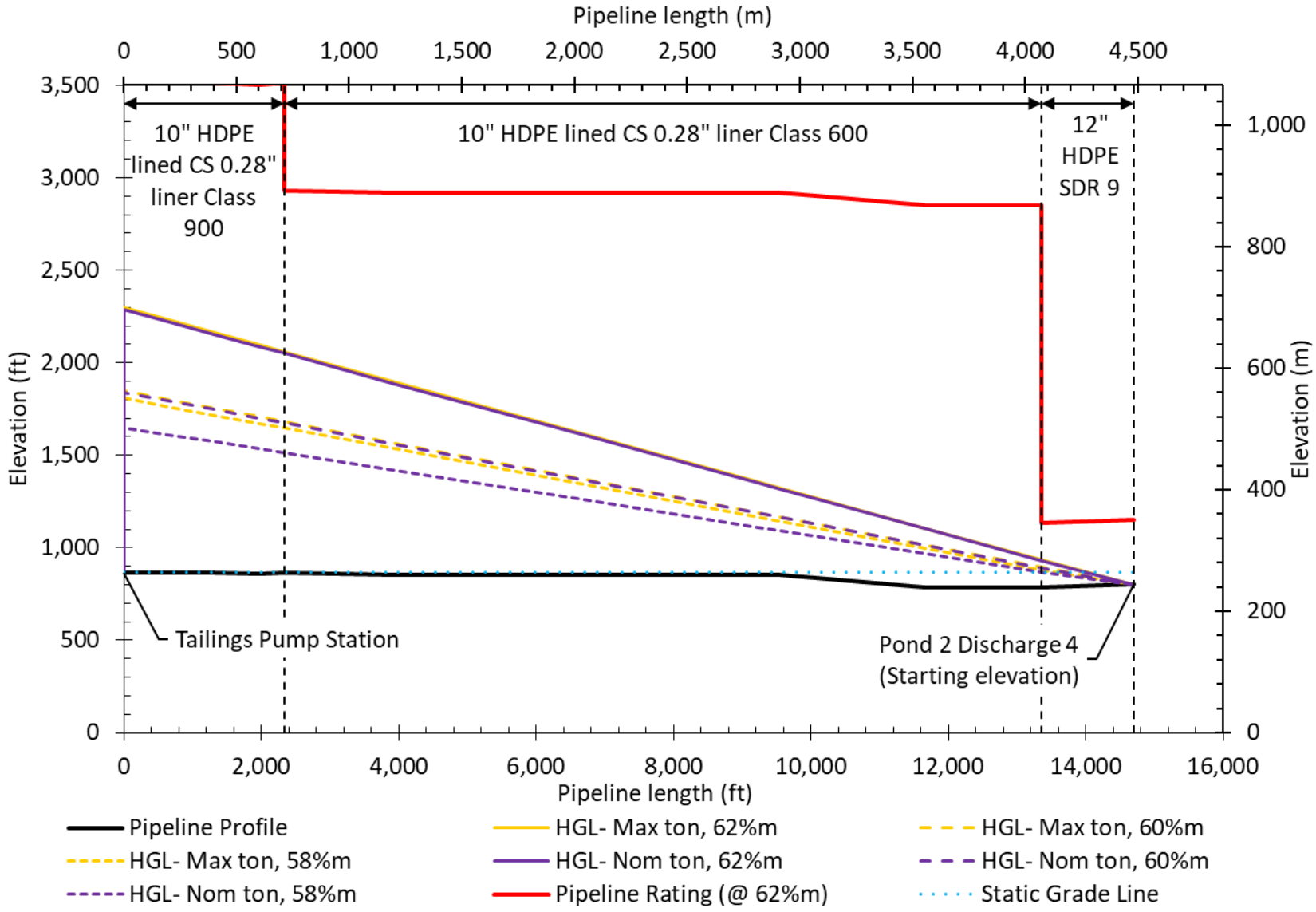


Figure 8: HGL (NP2 Discharge 4, Starting Elevation)

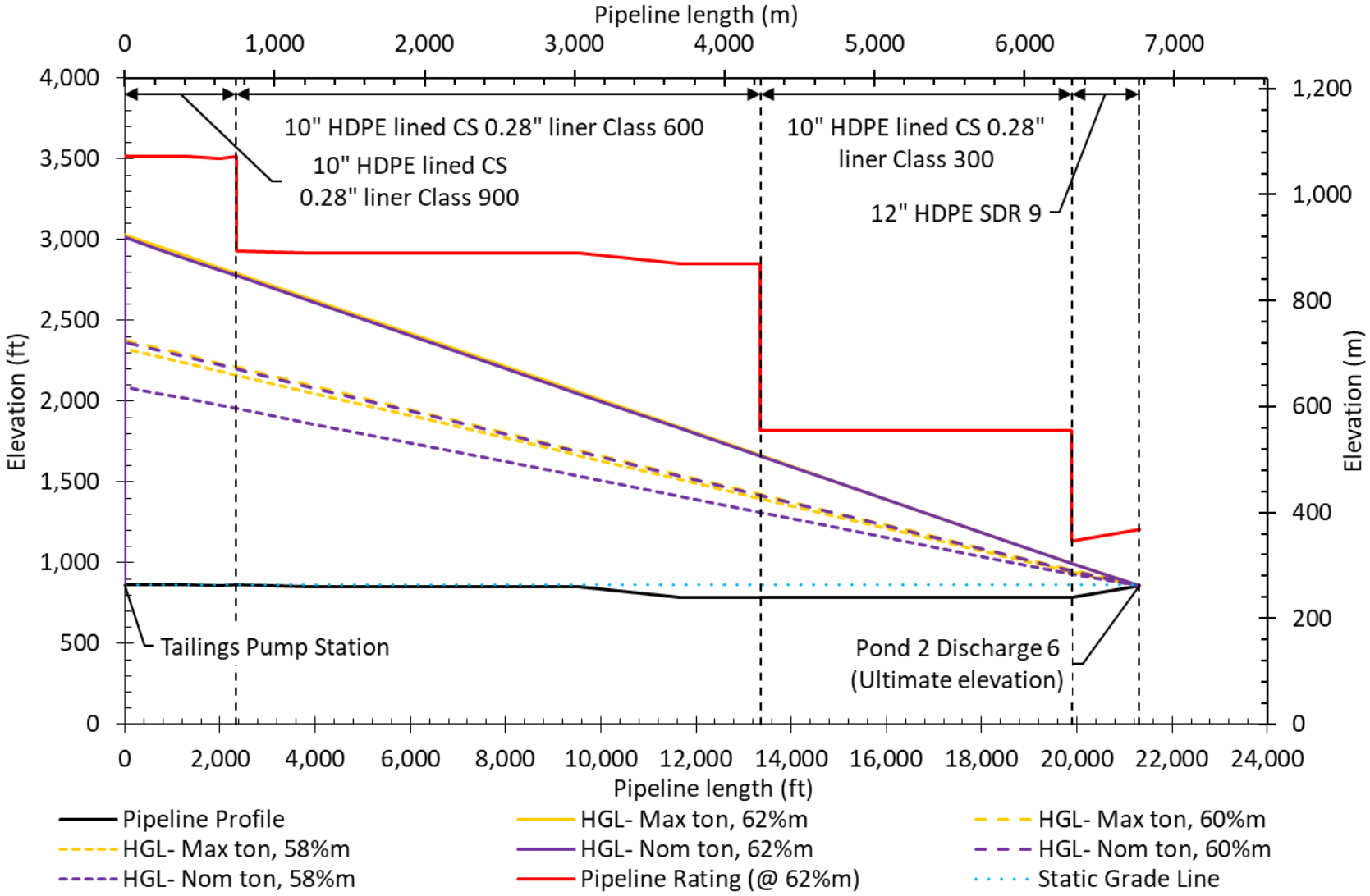


Figure 9: HGL (NP2 Discharge 6, Maximum elevation)

4.2.5 Pump Duty Points and Preliminary Pump Selection

The Tailings Pump Station consists of three positive displacement (PD) piston diaphragm pumps in parallel, two operating and one standby. Each PD pump will have a dedicated charge pump. The PD pumps for the Tailings Pump Station were selected by Feluwa[2] and the charge pump was preliminarily selected by P&C. The Tailings Pump Station duty points for the tailings system are summarized in Table IV. Table V shows the selected pump details.

[2] Equivalent pumps from other manufacturers are acceptable. P&C engaged Feluwa, GEHO/Weir and HMH Wirth for PD pump selection and quotation. Feluwa was chosen for this report due to their timely return of the requested information package.

Table IV: Tailings Pump Station Design Duty Points

Discharge location	Case description	Flow rate	Slurry density	Total discharge head	Maximum estimated discharge pressure
North Pond 1 Discharge 1 Starting Elevation	Minimum discharge pressure	3,130 gpm 711 m³/h	1,586 kg/m³	484 ft slurry 148 m slurry	614 psi 4,236 kPa
	Minimum flow rate	2,809 gpm 638 m³/h	1,654 kg/m³	850 ft slurry 259 m slurry	
	Maximum	3,090 gpm 702 m³/h	1,654 kg/m³	857 ft slurry 261 m slurry	
North Pond 1 Discharge 3 Ultimate Elevation	Minimum	3,130 gpm 711 m³/h	1,586 kg/m³	836 ft slurry 255 m slurry	1,022 psi 7,046 kPa
	Maximum	3,090 gpm 702 m³/h	1,654 kg/m³	1,425 ft slurry 434 m slurry	
North Pond 2 Discharge 4 Starting Elevation	Minimum	3,130 gpm 711 m³/h	1,586 kg/m³	792 ft slurry 242 m slurry	1,032 psi 7,114 kPa
	Maximum	3,090 gpm 702 m³/h	1,654 kg/m³	1,439 ft slurry 438 m slurry	
North Pond 2 Discharge 6 Ultimate Elevation	Minimum	3,130 gpm 711 m³/h	1,586 kg/m³	1,234 ft slurry 376 m slurry	1,556 psi 10,732 kPa
	Maximum discharge pressure	3,090 gpm 702 m³/h	1,654 kg/m³	2,170 ft slurry 662 m slurry	
	Maximum flow rate	3,442 gpm 782 m³/h	1,586 kg/m³	1,470 ft slurry 448 m slurry	

Table V: Tailings Pump Details

Item	Description
Tailings Delivery Pumps	
Pump type	Positive displacement piston diaphragm pumps

Item	Description
Manufacturer / model[3]	FELUWA DGK500
Number of pumps	3 pumps in parallel (2 operating, 1 standby)
Required pump suction pressure	10.2 mwc
Pump motor size	1,220 kW (approximately 1,635 hp)
Pump drive type	Variable speed
Charge Pumps	
Pump type	Centrifugal slurry pump
Manufacturer / model[3]	Warman 8/6 AH
Number of pumps	3 pumps (2 operating, 1 standby) One charge pump dedicated to each PD pump
Pump motor size	100 hp (75 kW)
Pump drive type	Variable speed

4.2.6 System Curve

The system curves for the tailings delivery system are as follows:

- Figure 10 shows the system curves for the life of NP1. NP1, Discharge 1 at starting elevation to NP1 Discharge 3 at ultimate elevation.
- Figure 11 shows the system curves for the life of NP2. NP2, Discharge 4 at starting elevation to NP2, Discharge 6 at ultimate elevation.

[3] Equivalent pumps from other manufacturers are acceptable.

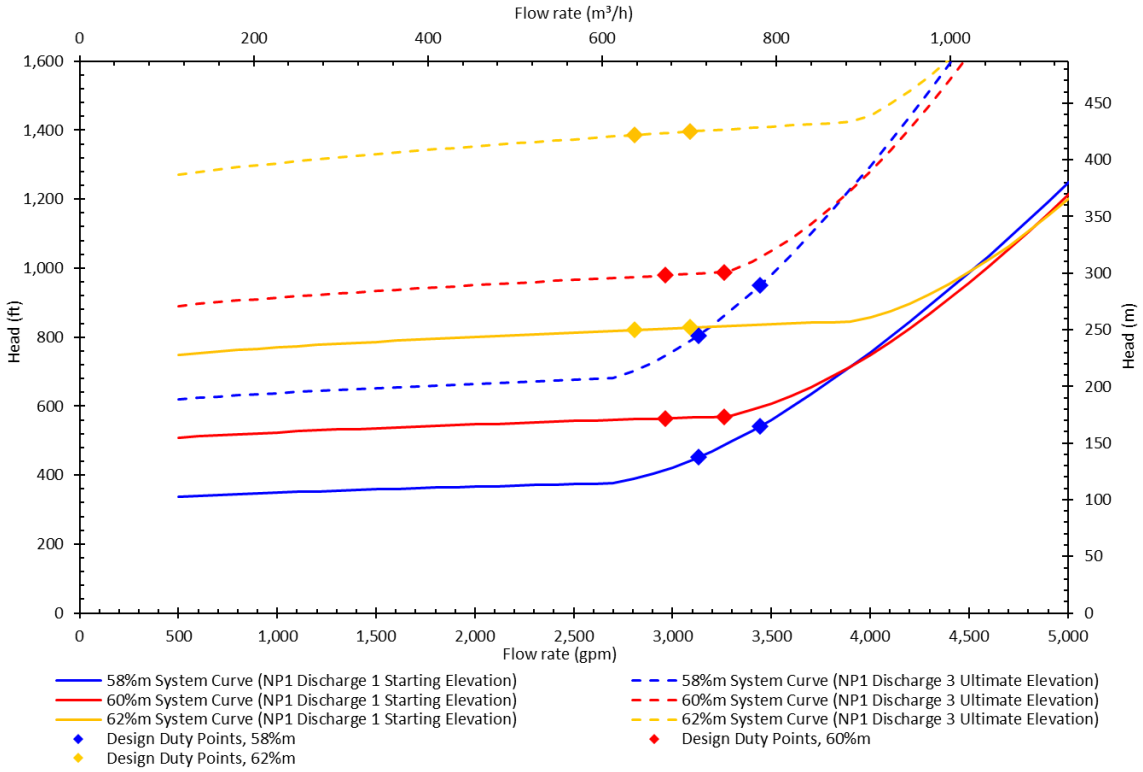


Figure 10: NP1 System Curve (Discharge 1, Starting Elevation & Discharge 3, Ultimate Elevation)

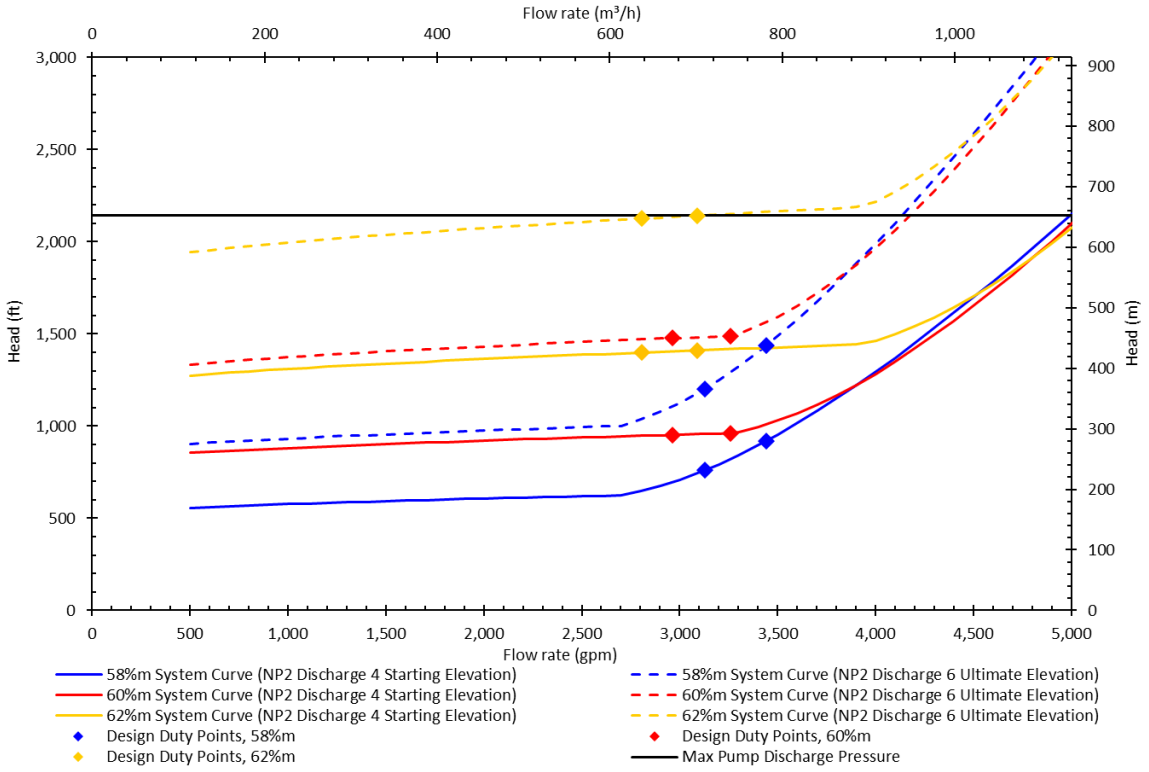


Figure 11: NP2 System Curve (Discharge 4, Starting Elevation & Discharge 6, Ultimate Elevation)

4.3 Thickener Underflow System

The Thickener Underflow system will have dedicated pumps that deliver underflow from the thickener to the Thickener Underflow Tank to simplify the operation of the thickener. The agitated Thickener Underflow Tank serves as a pump station head tank to feed the overland Tailings Delivery Pumps.

4.3.1 Pipe Selection

The proposed pipe specification for the thickener underflow transportation system from the Tailings Thickener to the Thickener Underflow Pumps is provided Table VI.

Table VI: Pipe Selection (Thickener Underflow)

Pipe description	**Pipe length**
10 inch HDPE lined carbon steel, Sch. STD, ASTM A53 Grade B, 0.28 inch (7.1 mm) liner, Class 150	75 ft (23 m) [4]

4.3.2 Hydraulic Grade Line

The steady state HGLs for the Thickener Underflow system spanning the range of estimated pump duty are shown in Figure 12. See Section 4.2.4 for a description of the HGL plot.

[4] The required piping length for the Thickener Underflow system was assumed since the layout is being developed by Ausenco in parallel to this report.

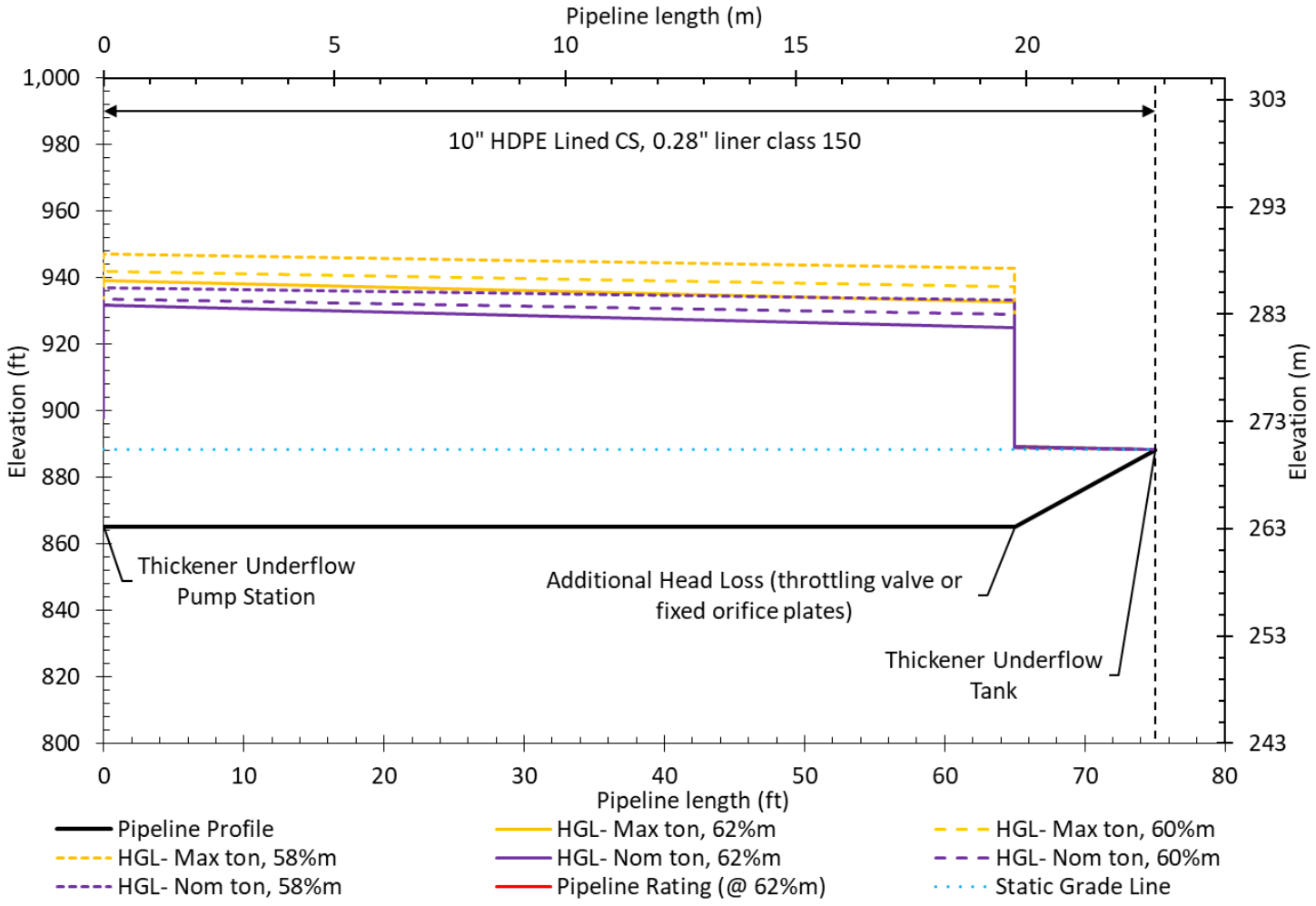


Figure 12: HGL (Thickener Underflow Pumps)

4.3.3 Additional Head Loss

Depending on the final pump selection and plant layout, the system may require additional head losses to ensure the system is operating in a reasonable location on the pump curve. These losses can be achieved using slurry throttling valves or fixed orifice plates. The hydraulic grade line for this system assumes that these head losses are included in the system but the method of achieving the head losses has not been developed further. When the plant layout, underflow tank height and pump selection are finalized, the best approach can be determined.

4.3.4 Preliminary Pump Selection and Duty Points

The Thickener Underflow Pump Station duty points are summarized in Table VII. Table VIII shows the pump details. Figure 13 shows the pump duty points on the pump curve.

Table VII: Thickener Underflow Design Duty Points

Case description	**Flow rate**	**Slurry density**	**Total differential head**	**Maximum estimated discharge pressure**
Minimum	2,809 gpm 638 m³/h	1,654 kg/m³	34 ft slurry 10 m slurry	56 psi 391 kPa
Nominal	2,964 gpm 673 m³/h	1,619 kg/m³	36 ft slurry 11 m slurry	
Maximum	3,442 gpm 782 m³/h	1,586 kg/m³	50 ft slurry 15 m slurry	

Table VIII: Thickener Underflow Pump Details

Item	**Description**
Pump manufacturer / model[5]	Warman 12/10 AH
Number of pumps	2 pumps (1 operating, 1 standby)
Pump motor size	150 hp (112 kW)
Required / maximum pump speed	400 rpm
Pump casing pressure rating	305 psi (2,100 kPa)

[5] Equivalent pumps from other manufacturers are acceptable.

Item	Description
Pump drive type	Variable

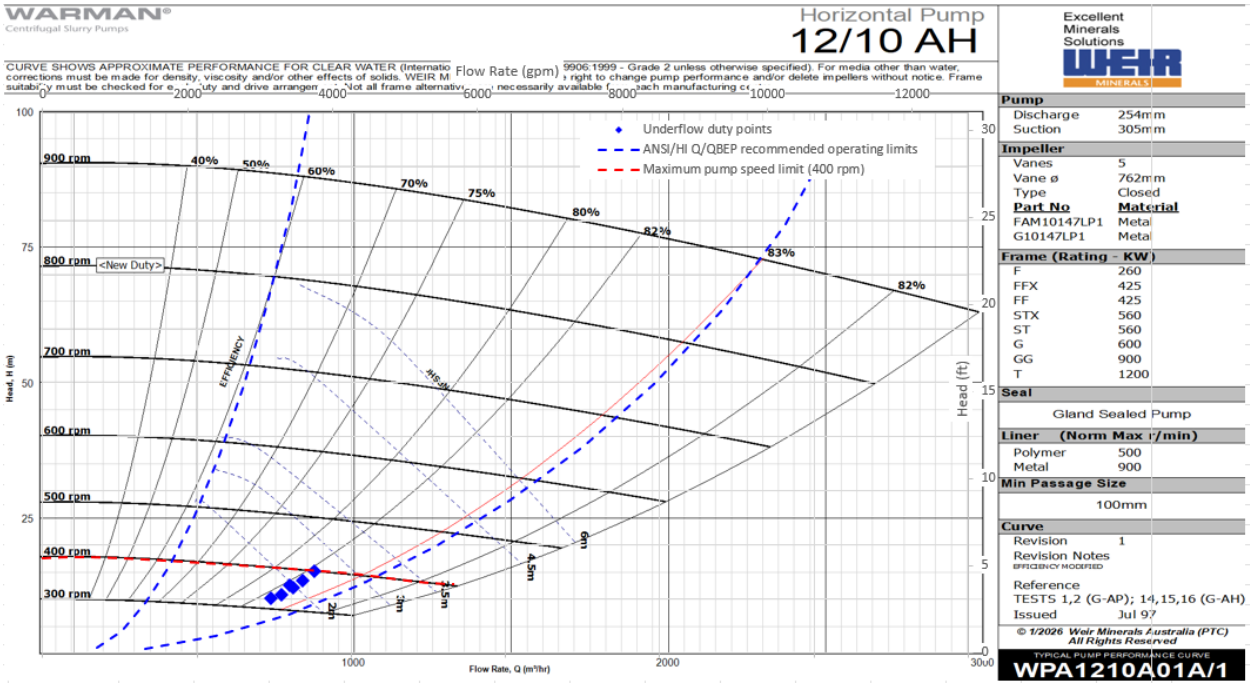


Figure 13: Duty Points (Thickener Underflow (image from Weir Minerals))

4.4 Upset Condition Tailings Pipeline

The upset condition tailings pipeline system will use the proposed Tailings Delivery Pump Station and deliver tailings to North Pond 1 outside the typical deposition area. The intention for this pipeline is to be able to continue operation when the main tailings pipeline must be shut down for maintenance. The upset condition tailings pipeline requires a minimum pump discharge pressure of 115 to 145 psi (800 to 1,000 kPa) to maintain stable pump operation. Figure 14 shows the approximate pipeline route for the upset condition tailings delivery system, the Tailings Delivery Pump Station location, and the discharge location in North Pond 1.

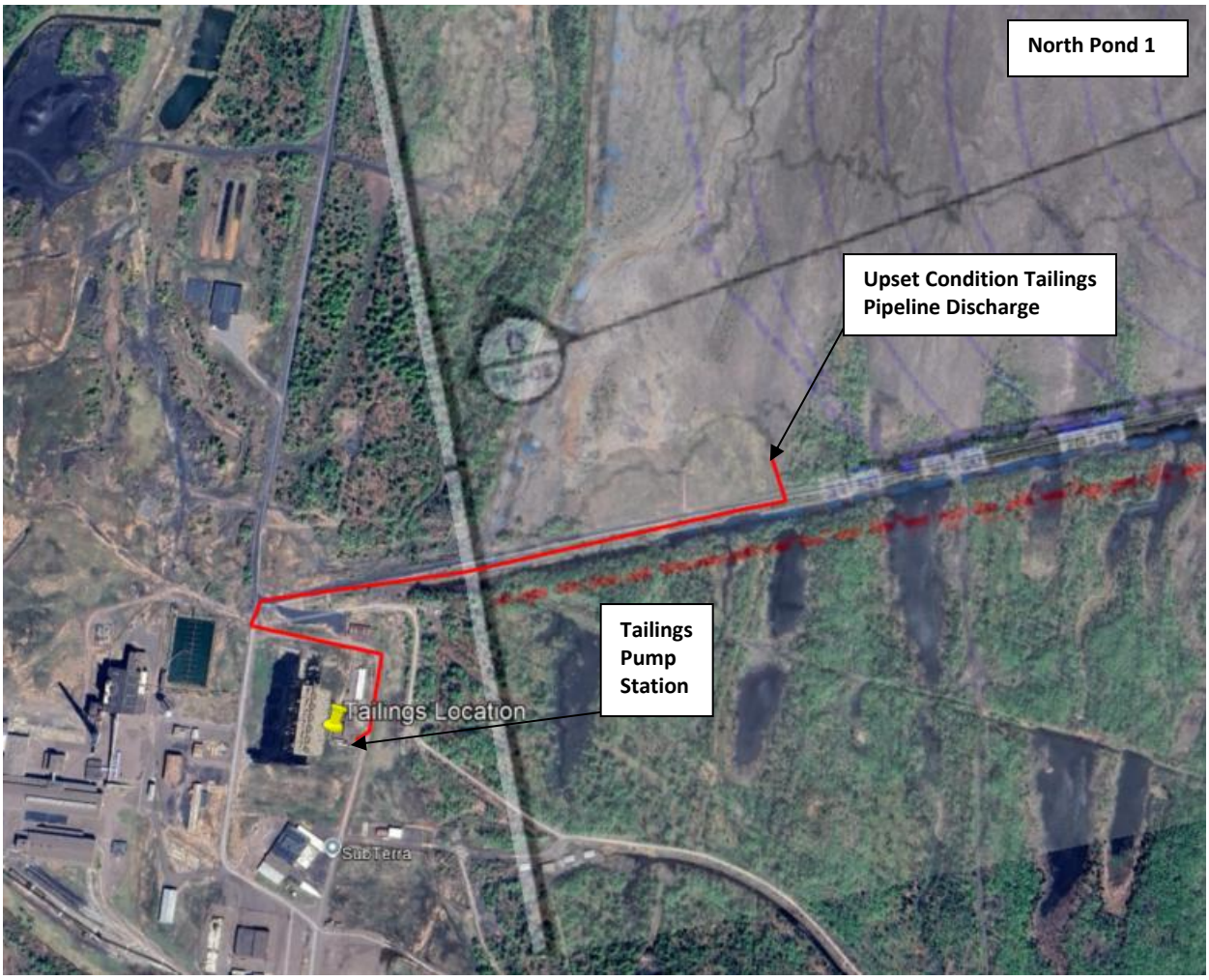


Figure 14: Approximate Upset Condition Tailings Pipeline Route (Google Earth, TT-02)

4.4.1 Pipe Selection

The proposed pipe size was determined considering key design criteria, which include:

- Operating with a target concentration range of 58%m to 62%m when discharging to the TDF.
- Operating at or above the recommended pressure gradient (1 kPa/m)
- Operating at a minimum discharge pump pressure of 115 to 145 psi (800 to 1,000 kPa).

Due to laminar flow operation and high operating velocities, a lined carbon steel pipe is selected. See Section 4.2.2 for more information on the piping liner selection.

Table IX: Pipe Selection (Upset Condition Tailings Pipeline System)

Pipe description	Pipe location
10 inch HDPE lined carbon steel, Sch. STD, ASTM A53 Grade B, 0.28 inch (7.1 mm) liner, Class 150	Upset Condition Tailings Pipeline System Discharge (see Figure 14)[6]
12 inch HDPE SDR 11, ASTM F714, PE4710	

4.4.2 Hydraulic Grade Line

The steady state HGL for the upset condition tailings delivery system is shown in Figure 15. See Section 4.2.4 for a description of the HGL plot.

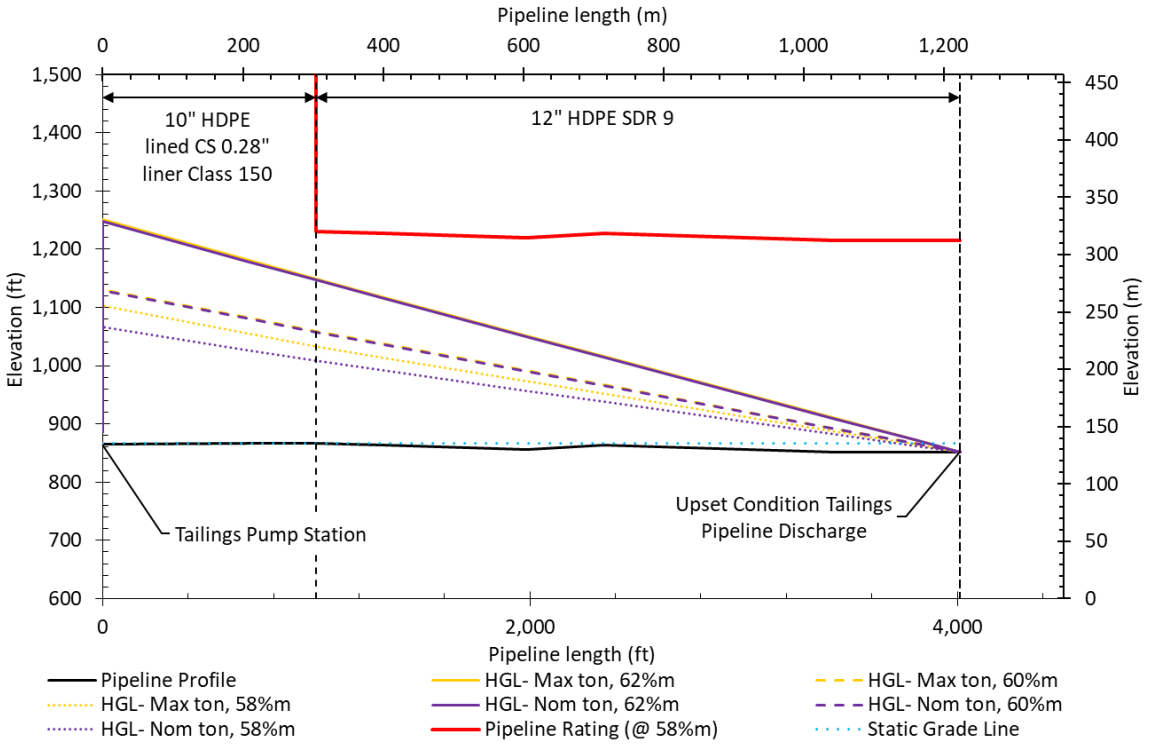


Figure 15: HGL (Upset Condition Tailings Pipeline Delivery System)

4.4.3 Pump Duty Points

The Tailings Pump Station duty points for the upset condition tailings pipeline are summarized in Table X. See Section 4.3.4 for more information on the Tailings Pump Station configuration.

[6] The discharge location for the upset condition tailings pipeline system is approximate.

Table X: Upset Condition Tailings Pipeline Design Duty Points

Case description	**Flow rate**	**Slurry density**	**Total differential head**	**Estimated discharge pressure**
Minimum discharge pressure	3,130 gpm 711 m^3/h	1,586 kg/m^3	179 ft slurry 55 m slurry	138 psi 954 kPa
Minimum flow rate	2,809 gpm 638 m^3/h	1,654 kg/m^3	362 ft slurry 110 m slurry	275 psi 1,894 kPa
Maximum discharge pressure	3,090 gpm 702 m^3/h	1,654 kg/m^3	365 ft slurry 111 m slurry	277 psi 1,909 kPa
Maximum flow rate	3,442 gpm 782 m^3/h	1,586 kg/m^3	216 ft slurry 66 m slurry	163 psi 1,126 kPa

4.5 Gland Seal Water

The centrifugal slurry pumps described in Sections 4.2 and 4.3 require gland service water. P&C's battery limit does not include the design of the gland seal water pumps and water will be drawn off the plant gland seal header. Table XI shows the gland seal water requirements for the charge pumps at the Tailings Pump Station. Table XII shows the gland seal water requirements for the thickener underflow pumps.

Table XI: GSW Details (Tailings Charge Pump, Per Pump, 2 Operating Pumps)

Case description	Flow rate	Required pressure
Minimum	11 to 22 gpm 2.5 to 5 m^3/h	39 psi 270 kPa
Nominal	11 to 22 gpm 2.5 to 5 m^3/h	40 psi 273 kPa
Maximum	11 to 22 gpm 2.5 to 5 m^3/h	43 psi 295 kPa

Table XII: GSW Details (Thickener Underflow, Per Pump, 1 Operating Pump)

Case description	Flow rate	Required pressure
Minimum	16 to 32 gpm 3.6 to 7 m^3/h	38 psi 265 kPa
Nominal	16 to 32 gpm 3.6 to 7 m^3/h	44 psi 303 kPa
Maximum	16 to 32 gpm 3.6 to 7 m^3/h	51 psi 349 kPa

4.6 Pumping Configuration

The main driver for the current hydraulic design approach is the requirement of a 2% beach slope for adequate tailings storage capacity. The slurry yield stress range of 40 to 80 Pa results in laminar flow operation and high pipeline pressure gradients. The pumping pressure requirements are as high as 107 bar (1,552 psi) and the most feasible alternative would be a PD pump station.

A centrifugal slurry pumping system for this amount of pressure would be unprecedented and borderline infeasible as sixteen pump stages in series would be required for the duty. This configuration would also require three pump stations along the route (a main pump station and two remote booster stations) to pump to the furthest extents of North Pond 2 at the ultimate elevation. This configuration would not be recommended for this system. Other than the benefit of phased capital expenses, a centrifugal slurry pumping system mainly has drawbacks:

- It is likely that the centrifugal pumps with remote booster station option is more expensive due to the remote infrastructure required.
- This system would be more difficult to operate than the PD pump system due to the number of stages in series and the remote pump station locations.
- The centrifugal pump system would likely be more maintenance intensive with a higher cost of maintenance consumables (pump casings, casing liners and impellers).
- The PD pump system would likely be more reliable.
- The PD pump system would be more energy efficient.

The price for three PD pumps for this system (two operating in parallel, one standby) is approximately $7 million USD as quoted by Feluwa at the time of the Revision A report. The price for thirty-two centrifugal slurry pumps (sixteen operating and sixteen standby pumps divided amongst three pump stations) would be approximately $6.9 million dollars based on quotes from the P&C database (Weir Warman 10/8 AH/AHP/AHPP). This excludes any costs associated with remote facilities: civil, structural, gland seal water, electrical power, drainage, etc.

4.7 CONCLUSIONS AND RECOMMENDATIONS

The following are conclusions and recommendations from the PFS-level design:

- The tailings delivery solids concentration range was selected based on discussions with Gordon McPhail, who advised that achieving a 2% beach slope requires a tailings slurry yield stress minimum of 40 Pa (400 dyne /cm^2).
- Due to the high rheology, the pipeline is designed to operate with a combination of laminar and turbulent flow. In P&C's experience, the pipeline pressure losses should be maintained high enough such that any coarse particles that migrate to the invert of the pipeline will be transported as a "sliding bed" and not form a plug. For this slurry P&C estimates that a pressure loss of 1 kPa/m will be sufficient. See the operating windows in Section 4.2.3 for minimum operating limitations.
- Due to the high rheology required for achieving the required beach slopes, the tailings pipeline will have high operating pressures. Piston diaphragm positive displacement pumps

are the best choice for this system when compared with centrifugal slurry pumps and booster stations. See Section 4.6 for additional details.

- 10 inch HDPE-lined steel piping was chosen for the overland tailings delivery piping specification. CTD discharge ramp piping is 12 inch HDPE SDR 9.
- The tailings delivery system was evaluated at each TDF and discharge point at both starting and ultimate elevations. The HGLs and system curves show details of NP1 (Discharge 1 at starting elevation and Discharge 3 at ultimate elevation) and NP2 (Discharge 4 at starting elevation and Discharge 6 at ultimate elevation) pumping configurations. This envelope shows the full range of pumping requirements over the life of mine.
- In future engineering phases, pipeline pressure gradients should be measured with pipe loop tests to compare with estimated pressure gradients in the hydraulic model. Laminar flow tailings slurry pipeline operation is not common and these tests will help confirm the slurry modeling approach.
- Piping liner alternatives should be investigated in future design phases. Vendors that specialize in lined carbon steel pipe should be engaged for input. The specific internal diameter requirement and high operating velocities and pressures mean that the piping liner material should be carefully selected for this application.
- Pipe wear testing should be completed in future phases with tailings samples on different pipe liner materials to determine relative wear rates between the pipe lining materials being considered.
- When the main tailings delivery pipelines require maintenance or need to be shut down, the upset condition tailings pipeline can be used to deliver tailings to North Pond 1. The upset condition tailings pipeline will use 10 inch HDPE-lined steel piping and 12 inch HDPE SDR 9 piping specifications. See Section 4.4 for more information.

Noah Sung **Ian Farrell**

Graduate Engineer Senior Engineer

Appendix C
Beach Slope Prediction Modeling Report

Report on:

ASSESSMENT OF RHEOLOGY, AND BEACH PREDICTION FOR A NEW COPPER PROJECT IN MICHIGAN

Prepared for

PATERSON AND COOKE USA LTD

PROJECT NO. 108-009

FEBRUARY 2026

Water, Waste & Land
Consulting Engineers and Scientists

* *Tailings dam engineering and management*
* *Landform engineering and erosion assessment*
* *Geotechnical engineering*
* *Flood assessment*
* *Dam break assessment*
* *Construction verification*

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Report on:

ASSESSMENT OF RHEOLOGY, AND BEACH PREDICTION FOR A NEW COPPER PROJECT IN MICHIGAN

Prepared for

PATERSON AND COOKE USA LTD

Revision	Date	Description	Issuer
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PROJECT NO. 108-009

FEBRUARY 2026

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Project No. 102-043 October 2025

ANALYSIS OF RHEOLOGICAL TESTING FOR DOMINGA MINE

1 INTRODUCTION

Paterson and Cooke USA Ltd (P&C) are assisting their client with the conceptual design of delivery and discharge systems on a tailings storage facility (TSF) One key issue to be addressed relates to the beaching characteristics of the tailings slurry once discharged into the TSF and have requested Water, Waste and Land Australia Pty (WWL) to analyse the test results and establish rheological parameters for use in beach slope assessments, based on a planned production rate of 14 440 tonnes per day. This report presents the rheological analyses performed and the corresponding beach slope projections derived from the test data.

2 TERMS OF REFERENCE

The scope of this report is defined by the following Terms of Reference:

- Review available process flow data and mass balances, particle size distribution data, rheological data etc.
- Develop a testing specification for one tailings slurry at three slurry percent solids. Testing is to include rotary viscometer and flume rheometer testing.
- Liaise with the P&C laboratory who are carrying out the laboratory testing.
- Analyse the rotary viscometer and flume rheometer data to develop flow curves for shear rates from 1 to 60s^{-1}.
- Develop beaching parameters from the flow curves.
- Carry out beaching simulations for 3 flow rates (spigot numbers), 3 beach lengths and 3 percentages of solids and estimate beach slopes for each combination.
- Document the above in a report.

Subsequent to production of Rev A of this report, P&C requested that concentrations of 58%, 60% and 62% be assessed to establish the number of spigots required to achieve a minimum beach slope of 2%. P&C also requested an analysis for a 1,000m beach length.

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3 INFORMATION PROVIDED

The following information was supplied for this analysis:

- Tailings production rate of 14.4 ktpd.
- Specified solids concentrations for testing of 61%, 63%, and 64% by weight.
- Test measurements obtained from flume rheometer testing at the stated solids concentrations.
- Solids concentrations and rotary viscometer measurements for samples collected at both the discharge end of the flume rheometer and the terminal point of the flume during each test.

4 DESCRIPTIONS OF THE RHEOLOGICAL TESTS

4.1 Flume Rheometer Test

Standard methods of measuring rheology such as the use of rotary viscometers and vane rheometers are inaccurate at the low shear rates representative of beaching slurries due to settling out of the slurry or slippage during the tests. It is therefore necessary to employ testing methods that work with the settling. Flume rheometer tests have been developed by Dr McPhail to address this problem.

Flume rheometer testing enables rheology to be determined at shear rates below 20 reciprocal seconds and down to 1 or 2 reciprocal seconds to a higher level of accuracy than rotary viscometer testing. In the course of a flume rheometer test, slurry is discharged into a 100mm wide 2m long flume at a specific discharge rate and the beach profile is measured. Four discharge rates between 0.05l/s and 0.7l/s are usually tested.

Analysis of the data from the flume rheometer tests entails fitment of an entropy-stream power curve to the beach profile based on discharge rates followed by solution at points down the measured beach of the force-momentum flux and continuity equations. Figure 1 shows a typical plot of the result of the stream power curve fit and shear stress vs bulk shear rate results.

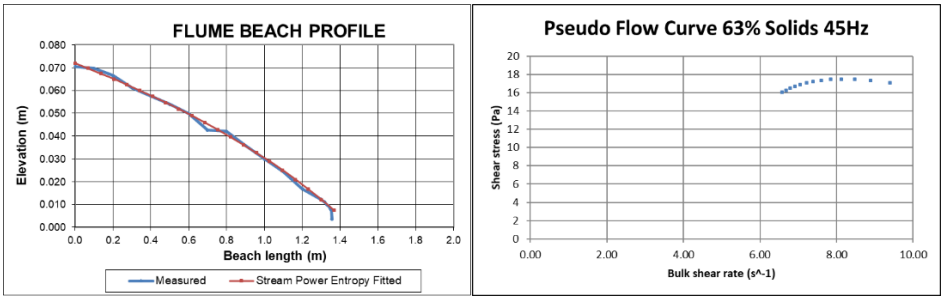


Figure 1: Typical plots of flume rheometer test result.

The bullnose at the advancing end of the beach is caused by friction of the slurry flowing over the base of the flume. Back from the bullnose the slurry is flowing over itself and only the side friction comes into play. This accounts for the drop off in the pseudo flow curve.

The absence of a yield stress at low shear rates is noteworthy and typical of dynamic flow curve measurements.

For each percent solids four flumes are run at different flow rates providing data over a range of shear rates. These are combined to generate the full pseudo flow curve. The final step is the conversion of bulk shear rates to true shear rates using the Mooney Rabinowitsch equation so as to yield the full flow curve.

4.2 Rotary viscometer testing

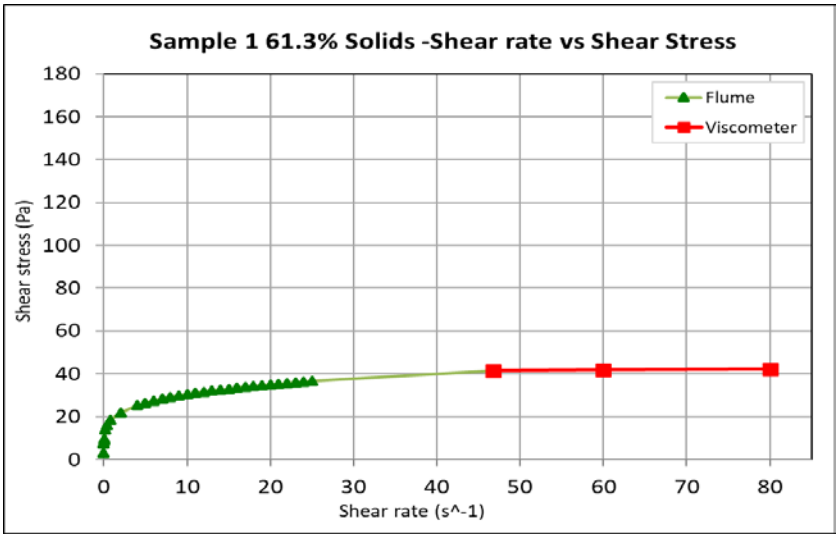
Rotary viscometer tests enable slurry rheology to be estimated above shear rates of 20 reciprocal seconds with reasonable reliability. These tests, as well as vane rheometer tests, are conducted using a Haake VT550 rheometer on samples recovered from the beach in the flume rheometer. Two samples are recovered at the end of each flume test, one at the discharge and one at the end of the beach.

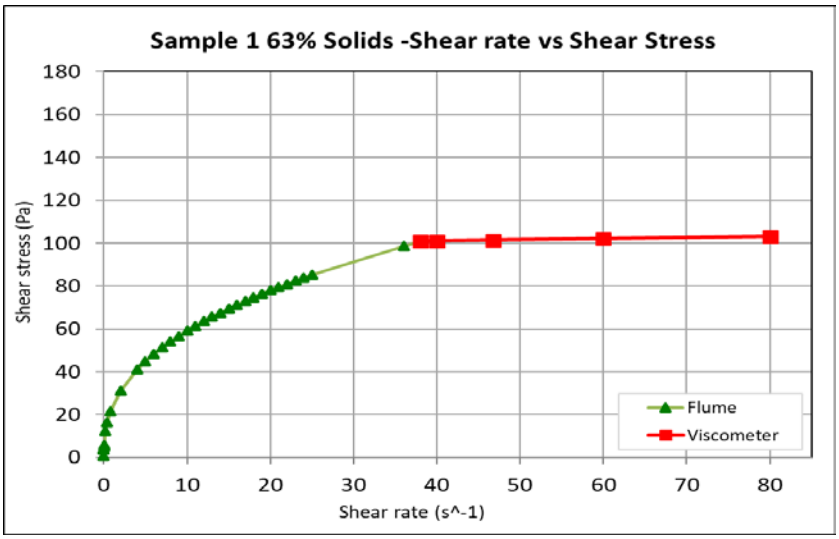
5 RHEOLOGY OF SLURRIES UNDER NON-SEGREGATED, NON-SETTLING CONDITIONS

5.1 Flow Curves

Although rotary viscometer testing exhibits limited accuracy at low shear rates, typically below 20 to 50 s^{-1}, it yields reliable data at higher shear rates. Consequently, the development of flow curves is best achieved through the integration of both testing methods. Figure 2 presents the flow curves, expressed in true shear terms, derived from the combined results of both methodologies across all tested solids concentrations for sample 1.

It is evident from Figure 2 that there are unusually large increases in rheology with relatively small increases in solids concentration. This will be related to the specific mineralogy of the tailings sample and is likely to impact not only the beaching behaviour of the slurry but also the thickening as well as pumping aspects unless careful control of the solids concentration is exercised.





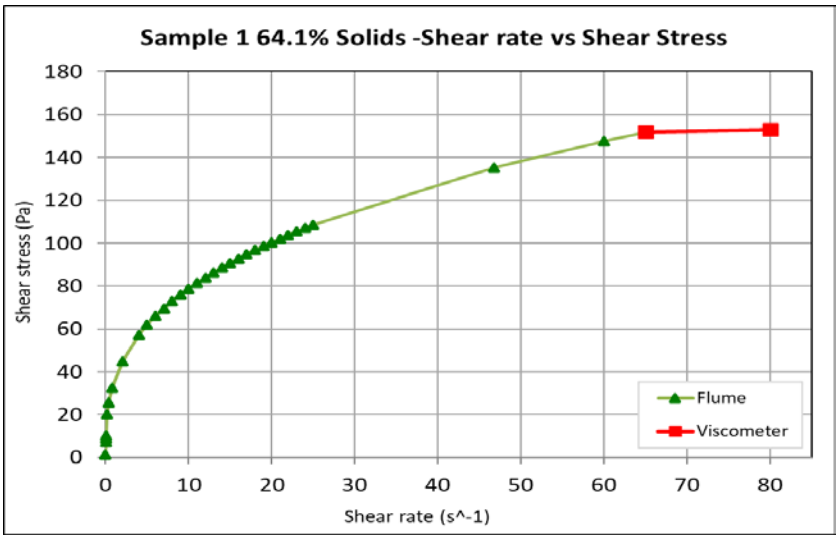


Figure 2: Flow curves for sample 1 from the flume rheometer and rotary viscometer testing of the slurry.

5.2 Combined Flow Curve Parameters

It is convenient to represent the flow curves using Herschel-Bulkley[1] parameters and to apply the parameters as a continuum over the range of percent solids tested. The resulting curves are presented in Figure 3 for sample M1. It should be noted that the rheology at low shear rates is represented by a Herschel-Bulkley equation with zero yield stress while the rheology at shear rates above 20 to 50s^{-1} is represented by Bingham Plastic parameters in which the Herschel-Bulkley parameter, n, is unity and the yield stress represents an extrapolation of the straight-line flow curve to the vertical axis.

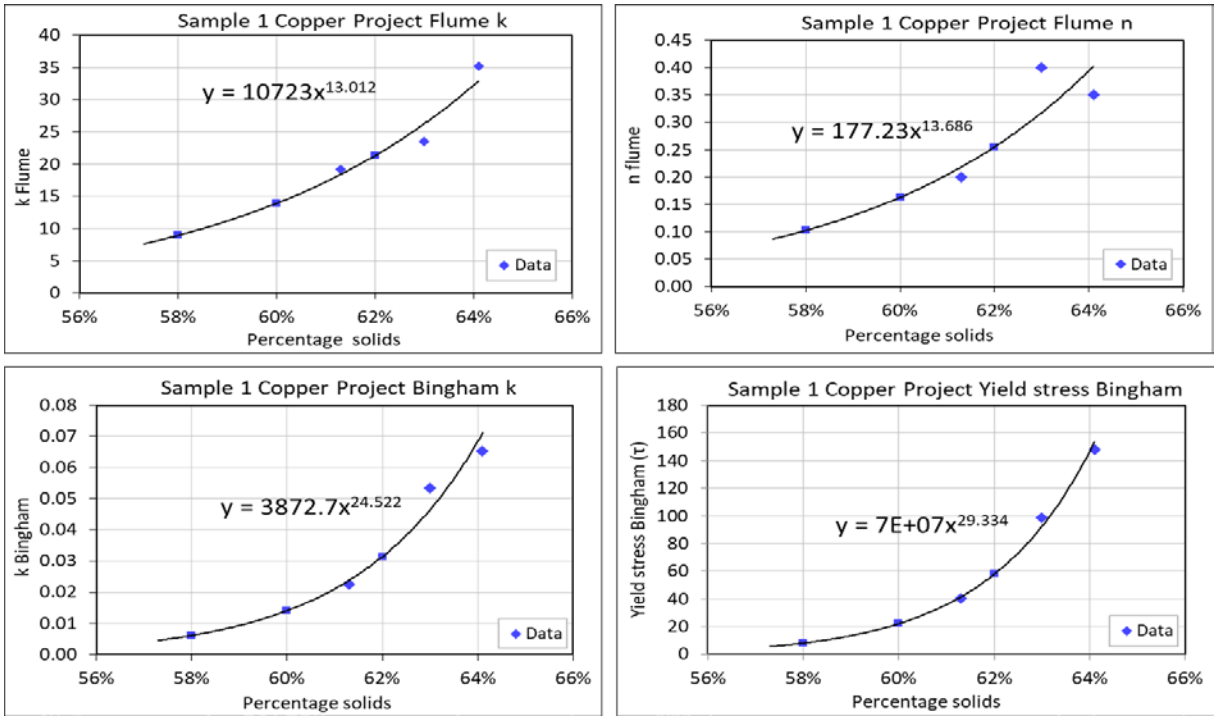


Figure 3: Curves for sample 1 showing the variation of Hershel-Bulkley parameters with percent solids of the slurry.

[1] The Herschel-Bulkley equation is a power law with a yield stress, $\tau = \tau_y + k\dot{\gamma}^n$ where τ is the shear stress at any shear rate $\dot{\gamma}$, τ_y is the yield stress, and k and n are constants.

6 BEACH SLOPE PREDICTIONS

Beach slope predictions have been undertaken using the stream power entropy approach for a single representative material sample (Sample 1). The assessment has been based on the following assumptions and input parameters:

- A production rate of 14.4 ktpd
- The number of discharge points was defined to achieve the target beach slope range of 2–3%. Accordingly, configurations with one, two, or three equally sized and independent discharge points were selected and evaluated as part of the analysis.
- Solids concentrations: 58%, 60%, 61%, 62%, 63% and 64%
- Assumed beach lengths: 300 m, 500 m, 800 m and 1000 m.

6.1 Beach length of 300m

Table 1 summarises the predicted average beach slope predictions by number of independent discharges. The concavity depths shown in the table represent the maximum deviation between a straight-line beach at the average slope and the concave beach profile. Figure 4, illustrates the variation in predicted beach slope with the number of equal-flow discharges for each slurry concentration.

Table 1: Predicted Average Beach Slopes for Sample 1 at 14.4ktpd and a Beach Length of 300 m

%solid	N independent discharges	Average beach slope (%)	Concavity (m)
58%	1	0.08	0.00
	5	0.49	0.01
	10	0.97	0.04
	15	1.42	0.11
	22	2.27	0.13
60%	1	0.13	0.01
	6	1.91	0.22
	8	3.00	0.14
	10	3.87	0.17
61%	1	0.16	0.02
	2	0.53	0.01
	3	1.03	0.12
	4	1.63	0.20
	6	3.07	0.46
	8	>5.00	0.71
62%	1	0.19	0.03

%solid	N independent discharges	Average beach slope (%)	Concavity (m)
	3	1.60	0.21
	4	2.62	0.42
	6	>5.00	0.86
63%	1	0.21	0.04
	2	1.01	0.19
	3	2.46	0.49
	4	4.80	0.92
64%	1	0.25	0.05
	2	1.56	0.36
	3	4.73	1.10

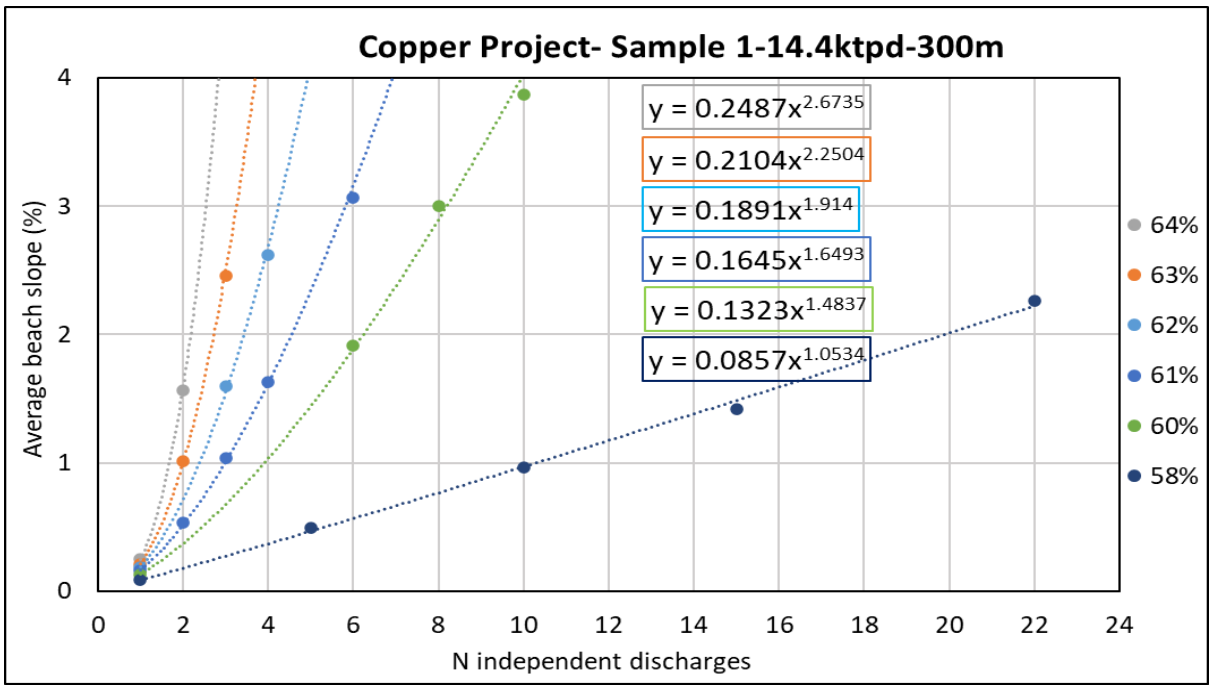


Figure 4: Beach slope vs. number of discharges for Sample 1 at 58%, 60%, 61%, 62%, 63% and 64% solids, beach length 300 m.

It is evident that to achieve a beach of greater than 2% for a slurry of 60% solids it will be necessary to operate with 6 to 8 simultaneously operating spigots over a beach length of 300m. Discharge at less than 60% solids is likely to cause significant trenching in the beach slope.

6.2 Beach length of 500m

Table 2 summarises the predicted average beach slope predictions by number of independent discharges. The concavity depths shown in the table represent the maximum deviation between a straight-line beach at the average slope and the concave beach profile. Figure 5,

illustrates the variation in predicted beach slope with the number of equal-flow discharges for each slurry concentration.

Table 2: Predicted Average Beach Slopes for Sample 1 at 14.4 ktpd and a Beach Length of 500 m

%solid	N independent discharges	Average beach slope (%)	Concavity (m)
58%	1	0.11	0.00
	5	0.58	0.02
	10	1.14	0.11
	17	2.27	0.06
60%	1	0.18	0.03
	5	2.23	0.13
	7	3.22	0.20
	9	4.80	0.00
61%	1	0.23	0.04
	2	0.74	0.13
	3	1.44	0.28
	4	2.26	0.51
	6	4.56	0.97
62%	1	0.29	0.07
	2	1.10	0.25
	3	2.30	0.60
	5	>5.00	1.29
63%	1	0.35	0.11
	2	1.68	0.53
	3	3.96	1.34
64%	1	0.44	0.17
	2	3.00	1.13
	3	>5.00	0.42

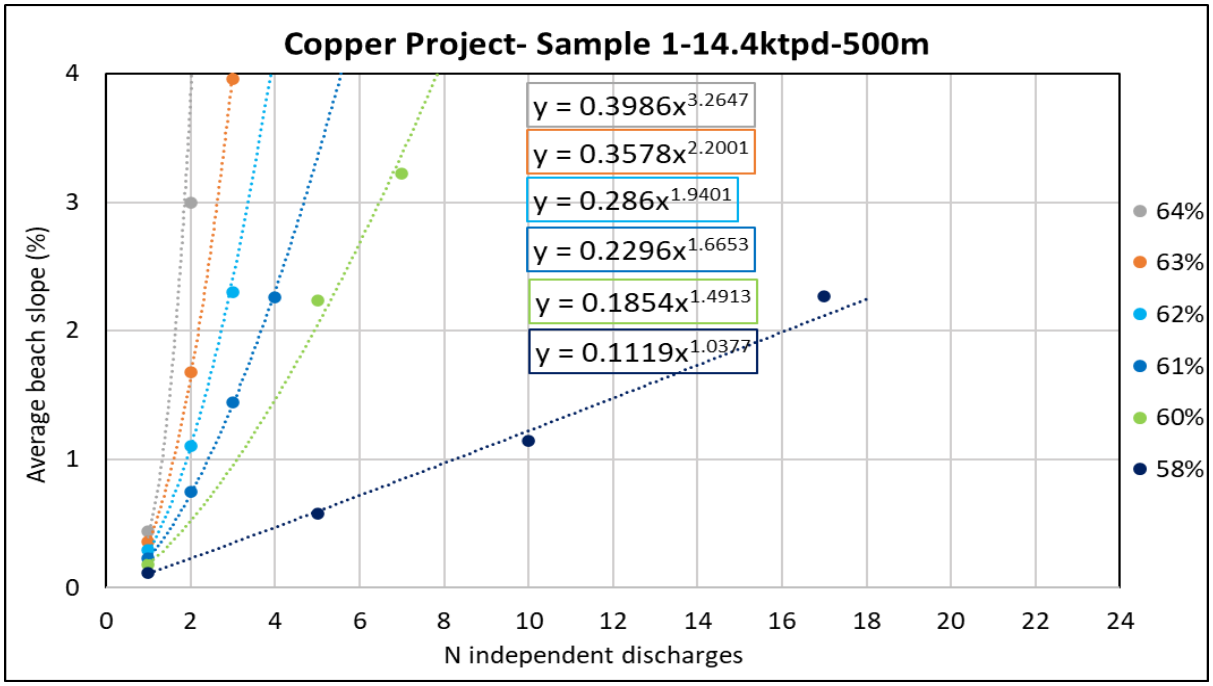


Figure 5: B Beach slope vs. number of discharges for Sample 1 at 58%, 60%, 61%, 62%, 63% and 64% solids, beach length 500 m.

It is evident that to achieve a beach of greater than 2% for a slurry of 60% solids it will be necessary to operate with 5 to 7 simultaneously operating spigots over a beach length of 500m. Discharge at less than 60% solids is likely to cause significant trenching in the beach slope.

6.3 Beach length of 800m

Table 3 summarises the predicted average beach slope predictions by number of independent discharges. The concavity depths shown in the table represent the maximum deviation between a straight-line beach at the average slope and the concave beach profile. Figure 6, illustrates the variation in predicted beach slope with the number of equal-flow discharges for each slurry concentration.

Table 3: Predicted Average Beach Slopes for Sample 1 at 14.4 ktpd and a Beach Length of 800 m

%solid	N independent discharges	Average beach slope (%)	Concavity (m)
58%	1	0.13	0.00
	5	0.68	0.06
	10	1.38	0.21
	13	2.13	0.00
60%	1	0.24	0.06
	3	1.24	0.33
	4	2.11	0.18
	7	4.55	0.00
61%	1	0.32	0.09
	2	1.01	0.30
	3	1.98	0.63
	4	3.16	1.08
	5	>5.00	0.00
62%	1	0.43	0.14
	2	1.59	0.60
	3	3.38	1.36
	4	7.13	1.29
63%	1	0.54	0.28
	2	2.58	0.13
	3	>5.00	2.74
64%	1	0.75	0.46
	2	>5.00	3.07

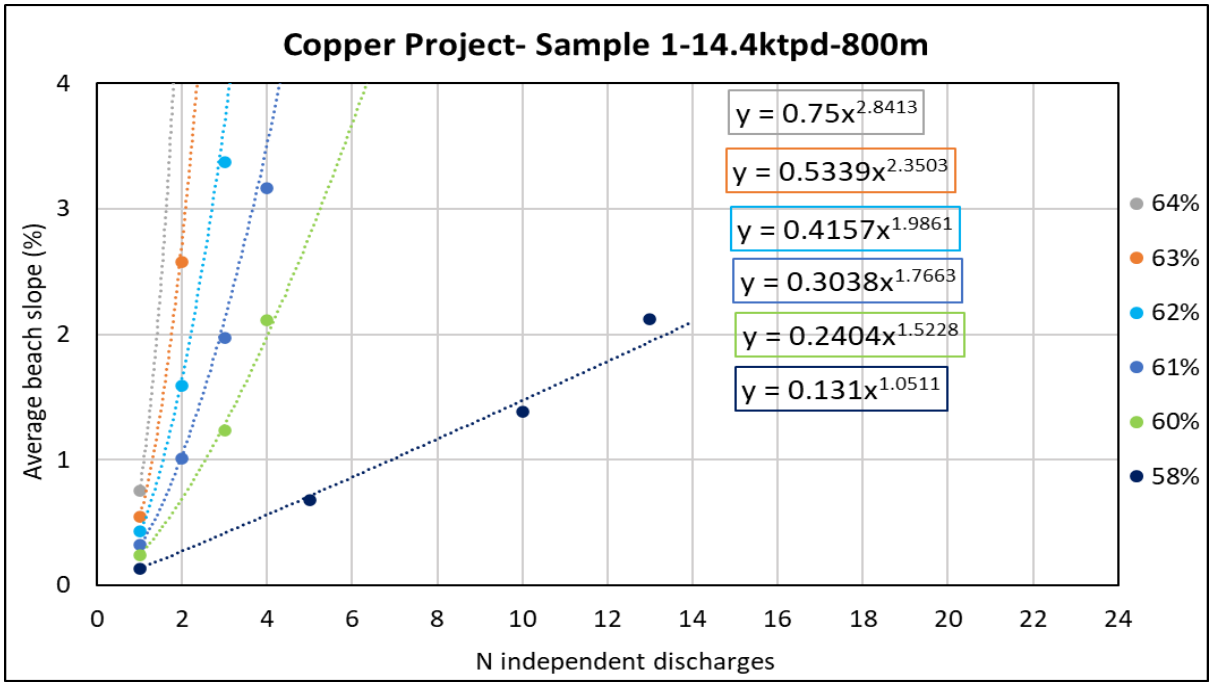


Figure 6: Beach slope vs. number of discharges for Sample 1 at 58%, 60%, 61%, 62%, 63% and 64% solids, beach length 800 m.

It is evident that to achieve a beach of greater than 2% for a slurry of 60% solids it will be necessary to operate with 4 to 5 simultaneously operating spigots over a beach length of 800m. Discharge at less than 60% solids is likely to cause significant trenching in the beach slope.

6.4 Beach length of 1000m

Table 3 summarises the predicted average beach slope predictions by number of independent discharges. The concavity depths shown in the table represent the maximum deviation between a straight-line beach at the average slope and the concave beach profile. Figure 6, illustrates the variation in predicted beach slope with the number of equal-flow discharges for each slurry concentration.

Table 4: Predicted Average Beach Slopes for Sample 1 at 14.4 ktpd and a Beach Length of 1000 m

%solid	N independent discharges	Average beach slope (%)	Concavity (m)
58%	1	0.15	0.00
	4	0.59	0.04
	8	1.19	0.19
	12	2.42	0.00
60%	1	0.28	0.08
	3	1.41	0.48

%solid	N independent discharges	Average beach slope (%)	Concavity (m)
	4	2.30	0.24
	6	4.09	0.00
61%	1	0.38	0.12
	2	1.16	0.46
	3	2.27	0.95
	4	3.83	1.37
62%	1	0.50	0.24
	2	1.84	0.94
	3	4.15	1.93
63%	1	0.656	0.440
	2	3.280	2.010

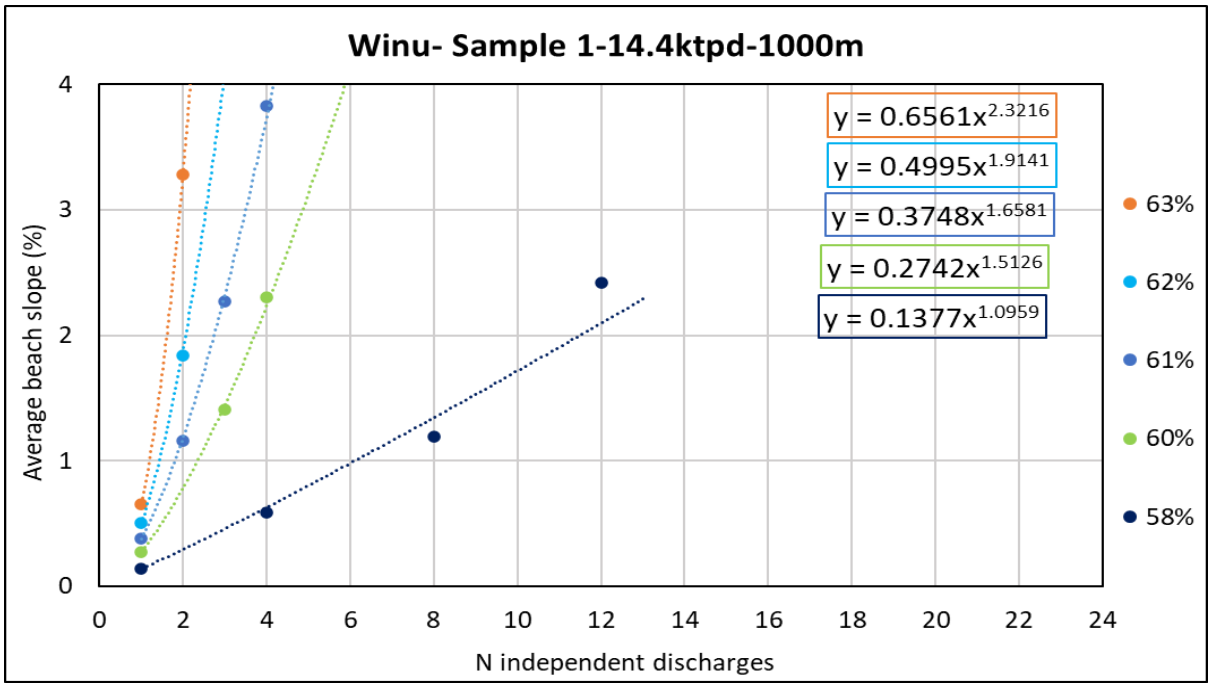


Figure 7: Beach slope vs. number of discharges for Sample 1 at 58%, 60%, and 62% solids, beach length 1000 m.

It is evident that to achieve a beach of greater than 2% for a slurry of 60% solids it will be necessary to operate with 4 simultaneously operating spigots over a beach length of 1,000m. Discharge at less than 60% solids is likely to cause significant trenching in the beach slope.

6.5 Beach length greater than 800m

The distance the slurry will flow down the beach is influenced by both rheology and flow rate. As flow rate increases so does the momentum in the flow stream enabling the slurry to flow further. However, there is a point at which, even with a single spigot, the momentum may be

insufficient to flow the full desired beach length. This is the situation for 65% solids and is potentially the situation for 63% solids.

Persistent operation at beach slopes in excess of 5% has the potential to introduce problems including:

- As the slurry builds up at the steep beach it may become geotechnically unable to sustain the beach slope and it may slump down the beach as an infinite slope failure. While possibly not critical it is an unstable method of operation.
- Even a small drop in the solids concentration will likely cause severe cutting down or trenching of the flow stream effectively transferring tailings to the end of the beach with an impact on the average beach slope should fluctuations in slurry concentration be persistent.

7 RELIABILITY OF BEACH PREDICTIONS

It is important to note that there are many sources of uncertainty and variability in the process of making the beach slope predictions. During the beach trials the following aspects impact on the reliability of the test results:

- Representativeness of the tailing's material tested.
- The influence of flocculation on the results and whether the flocculation action will be similar when compared to the full-scale situation.
- The extent to which the tailings are fully sheared at the time of discharge.
- Practicalities associated with ensuring that the discharges into the pilot scale flume and flume rheometers are constant, the tailings are consistent, and all measurements are accurate and correctly reported.

8 SPIGOT SPACING

The beach predictions are made on the basis that the spigot flow streams remain independent down the beach. If the flow streams combine as a result of meandering of the stream as the tailings settle out the combined flow will result in a reduction in the beach slope from the point of combination onwards.

Given the high rheology of the sample it is suggested that the spacing between spigots for beach lengths of 800m should not be less than 30m.

9 SUMMARY AND CONCLUSIONS

This report has documented the results of analyses of rheological testing by P&C on a single tailings samples labelled Sample 1 for Copper Project in Michigan. The testing programme

has included, flume rheometer tests, designed to provide flow curve data in the zero to $20s^{-1}$ shear rate range within which conventional rotary viscometer and vane rheometer testing is unreliable, as well as rotary viscometer tests to provide rheology at shear rates above $20s^{-1}$.

It is evident from the rheology test analyses that there is an unusually rapid increase in shear stress with relatively small increases in solids concentration. This impacts the beaching behaviour of the slurry but will also impact thickening and pumping of the slurry.

Beach predictions based on the rheological parameters derived from the rheological testing have been presented for a tailings production rate of 14.4 ktpd. The predictions consider a range of slurry solids concentrations, numbers of independent discharges and a range of beach lengths. The practically achievable beach length will depend on the slurry concentration.

While beach slopes greater than 5% are feasible for slurry concentrations greater than 63% solids this has implications for beach stability including:

- As the slurry builds up at the steep beach it may become geotechnically unable to sustain the beach slope and it may slump down the beach as an infinite slope failure. While possibly not critical it is an unstable method of operation.
- Even a small drop in the solids concentration will likely cause severe cutting down or trenching of the flow stream effectively transferring tailings to the end of the beach with an impact on the average beach slope should fluctuations in slurry concentration be persistent.

It is recommended that the spacing between spigots in a tailings dam should be no less than 30 meters.

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For and on behalf of

Water, Waste and Land Australia Pty Ltd

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Appendix D
Tailings Disposal Facility Geotechnical Evaluation Report

White Pine Copper, LCC | White Pine North Project

Tailing Disposal Facilities Geotechnical Evaluation Report

Tetra Tech Project Number: 117-372636-25001

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Acronyms/Abbreviations

Acronym/Abbreviation	Definition
AMSL	above mean sea level
ASTM	American Society of Testing and Materials
bgs	below ground surface
FOS	factor of safety
ft	feet
gpm	gallons per minute
LOM	life of mine
m	meter
m^3	cubic meters
MDD	Maximum dry density
MGD	million gallons per day
MT	million tons (metric)
NP1	North Pond 1
NP2	North Pond 2
NPDES	National Pollution Discharge Elimination System
Pa	pascals
PFS	Pre-Feasibility Study
pcf	pounds per cubic foot
psf	pounds per square inch
SP	South Pond
TDF	tailings disposal facility
t/m^3	metric tonnes per cubic meter
WPC	White Pine Copper LLC
WPM	White Pine Mine

1. INTRODUCTION AND BACKGROUND

This report has been prepared on behalf of White Pine Copper, LLC. (WPC) to present the geotechnical stability evaluation of the legacy Tailings Disposal Facilities (collectively referred to as the TDFs), North Pond 1 and 2 (NP1 and NP2), constructed to support the historical White Pine Mine as well as assess the stability of modifications to the TDF to support the White Pine North Project. The evaluation was conducted to assess the stability of the TDFs under their current condition as well as potential future configurations to support the surface disposal of tailings associated with the proposed White Pond North Project.

1.1 Site Background

Discharge of tailings from the White Pine Mine (WPM) occurred between 1955 and 1995 and were managed in three TDFs, including the South Pond (SP), North Pond 1 (NP1) and North Pond 2 (NP2). A total of approximately 150 million tons (150 MT) were disposed of in the three TDFs. The Legacy TDFs have undergone reclamation, and for the past decade have been operating in a post-closure status. The location of the Legacy TDFs is shown on Figure 1-1 (below). It is proposed that the Project will utilize areas associated with the former WPM, including the legacy TDFs, NP1 and NP2 for future disposal of tailings generated from the Project.



Figure 1-1 – Legacy Tailings Disposal Facilities

1.1.1 South Pond

The South Pond (SP) area consists of three dams, constructed between 1958 and 1962, that make up the western, northern, and eastern edges of the basin. The southern boundary of SP is generally marked by an existing railroad grade. At the time of dam construction, active mine workings existed beneath SP at depths ranging from 500 to 1,600 feet below ground surface (bgs). The area under SP had been previously mined and some subsidence had occurred. Due to a concern for subsurface mine safety, tailings were not initially deposited in SP after the dams were completed. In 1993, additional disposal capacity was required; the SP was then refurbished and reactivated during the fall of 1994. (subsurface mining under the area of SP had ceased by 1993.) Sewage treatment effluent, excess cooling water from the power plant, and mine discharge water from mine surface discharge location 3 (MSD-3) were discharged directly into SP. After 1994, the SP was the only basin to receive mill tailings. In October 1996, all discharges into SP were discontinued. Portions of the dams were removed and used as clay cover over the adjacent tailings as part of an approved Interim Response Activity Plan (IRAP) (MFG, 2005).

1.1.2 North Pond 1

NP1 tailings impoundment was constructed during the 1950s and 1960s; first put into service in 1954, and continued receiving tailing until 1971. A total of approximately 91.6 million tons of tailings were placed within the NP1 facility between 1954 and 1971.

The NP1 consists of an approximate 7.5-mile long embankment, in an irregular rectangular shape, with containment embankments on the west (1.4-mile), north (2.4-mile), and east sides (1-mile), constructed of native earth materials. The south side (2.7-mile) of the tailings impoundment is bounded by a road embankment. The embankment height is typically in the range of less than 10 feet along the southwest to 60 feet along the north embankment. The impoundment covers an area of approximately 1,870 acres. Mill tailings material was placed as a slurry and a permanent pool covering; approximately 82 acres is located along the northeastern portion of the impoundment. The dam is currently classified as a “low” hazard dam.

A plan view and typical cross-section of NP1, provided on Figure 1-2 and Figure 1-3 respectively, shows a typical cross-section of the dam. The embankment dam was constructed with locally borrowed earth fill, primarily silty clay, with a downstream construction method in four stages between 1954 and 1964. The crest width is typically 20 feet and the overall downstream slope is 2(H):1(V), maximum, between the dam crest and the downstream toe, with most areas along the north, northwest, and northeast having side slopes of approximately 2.2(H):1(V) to 2.5(H):1(V). The dam crest elevation varies from approximately 5,250 along the northeast embankment to 5,260 (El. 853.56 to 863.56 ft [above mean sea level] AMSL) in the southeast.

1.1.3 North Pond 2

NP2 began receiving tailings in 1970 following construction of the upstream and downstream starter dams in 1968 and 1969. Cyclone sands and native clay materials were used to construct the remainder of the dam and tailings deposition within the impoundment ceased in 1993. A total of approximately 92 million tons of tailings were placed within the NP2 facility between 1970 and 1993. This is approximately 34 percent of the total original design volume of 270 million tons of tailings.

The tailings dam for the NP2 extends approximately 5.5 miles and includes embankment on the west (1.2 miles), north (2.84 miles), and east (1.36 miles) sides. The embankment dam along the north, east, and west tailings dam were constructed by the downstream method with two starter dams (upstream and downstream) constructed using low-permeability native silty clay. Cyclone sand from the tailings were placed between the two starter dams and subsequent raises were constructed with native clay materials compacted over the previous clay raises and consolidated sands. Operation of NP2 ceased before the dam was constructed to its full design height, leaving an exposed area of cyclone sands between the raised clay embankments in a configuration that has created a bench between two steeper sections of embankment. The embankment varies in height from less than 10 feet at the southeast and southwest abutments, adjacent to the NP1 embankment, to approximately 55 to 70 feet high in areas along the north embankment. The

maximum structural height from the crest to the invert of the perimeter drainage channel is approximately 80 feet along the northwest portion of the dam. The crest width is typically 20 feet, and the downstream slopes are an average 2(H):1(V) for the upper and lower sections of embankment, and an overall average downstream side slope of approximately 3(H):1(V) from the main dam crest to the downstream dam toe. The embankment crest elevation varies from approximately 5,197.5 to 5,198.5 with an average elevation of approximately 5,198 (El. 801.6 ft AMSL). The dam is currently classified as a "significant" hazard dam.

A plan view and typical cross-section of the dam is shown in Figure 1-4 and Figure 1-5, respectively. NP2 covers an area of approximately 2,400 acres and the permanent pond covers approximately 105 acres in the northeast portion of the impoundment. The original NP2 starter dam was constructed 1968 through 1970 and the tailings dam was constructed to approximately 60 percent of the total design height by 1993, when tailings deposition ceased at the impoundment.

1.2 Proposed Project

Based on the current mine plan for the Project, it is anticipated to have a 26-year mine life and will produce approximately a total of 132.7 million metric tonnes (MT) of tailings. The future tailings will first be disposed of in NP1 followed by NP2. To facilitate the disposal of future tailings within the footprint of NP 1 and NP 2 and reduce the amount of water required to be managed within the two TDFs, WPC is planning to generate thickened or paste thickened tailings.

1.3 Previous Geotechnical Evaluation

A geotechnical site characterization, including stability analyses, was completed for NP1 and NP2 in 1998 (Golder, 1998). The site characterization consisted of performing cone penetrometer testing (CPT) within the tailings, drilling 9 borings within the embankments and foundations, and installing 11 piezometers. Soil samples were obtained from the borings and analyzed for a variety of geotechnical parameters. This data was used by Golder to evaluate the stability of NP1 and NP2. The 1998 Golder Report is provided in its entirety in Appendix A, which includes the hollow-stem auger boring, cone penetration testing (CPT) and well construction logs.

Tetra Tech completed an independent review and stability of NP1 and NP2 (Tetra Tech, 2024) to support a Semi-Quantitative Risk Assessment (SQRA) of NP1 and NP2 under their current post-closure condition. This updated stability model primarily relied on the data obtained from Golder during their 1998 geotechnical site characterization. Based on the results of the SQRA, Tetra Tech recommended that additional geotechnical data be collected pertaining to the embankment and foundation materials.

1.4 Historical Performance of NP1 and NP2

Inspections of the TDFs are completed every 4 or 5 years with the most recent inspection being completed in 2024 and 2023 for NP1 and NP2, respectively. Although the last inspections did identify areas and features to focus on for subsequent inspections, none of the areas or features were suggestive of obvious signs of structural weakness in the embankments.

A review of the historical operating records related to the performance of TDFs suggests that there have been no instances of significant instability that would suggest failure of the TDFs embankment is probable. Shallow surficial sluffing of the external embankments of NP1 have been observed and repaired.

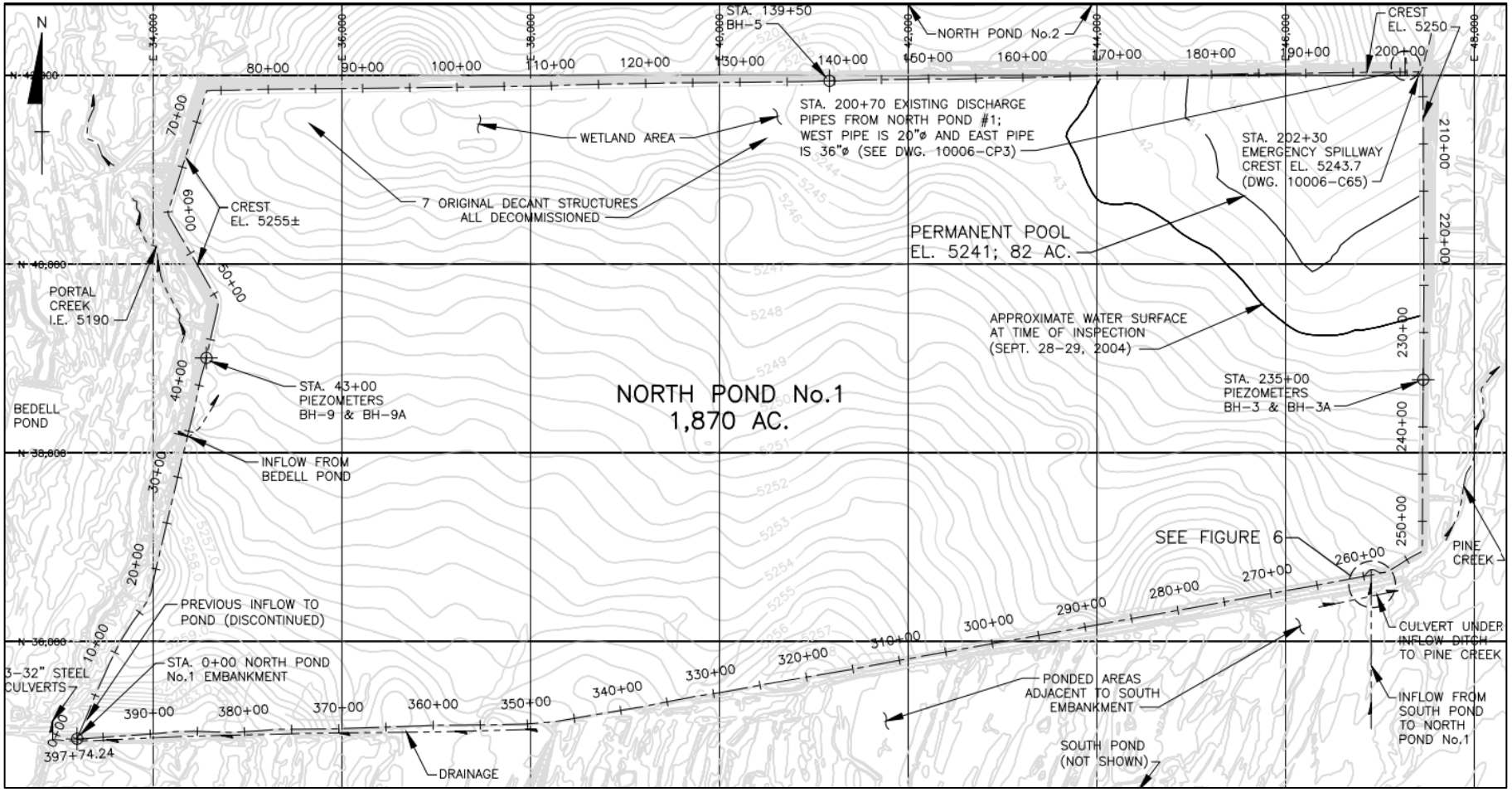


Figure 1-2 – North Pond 1 Plan View

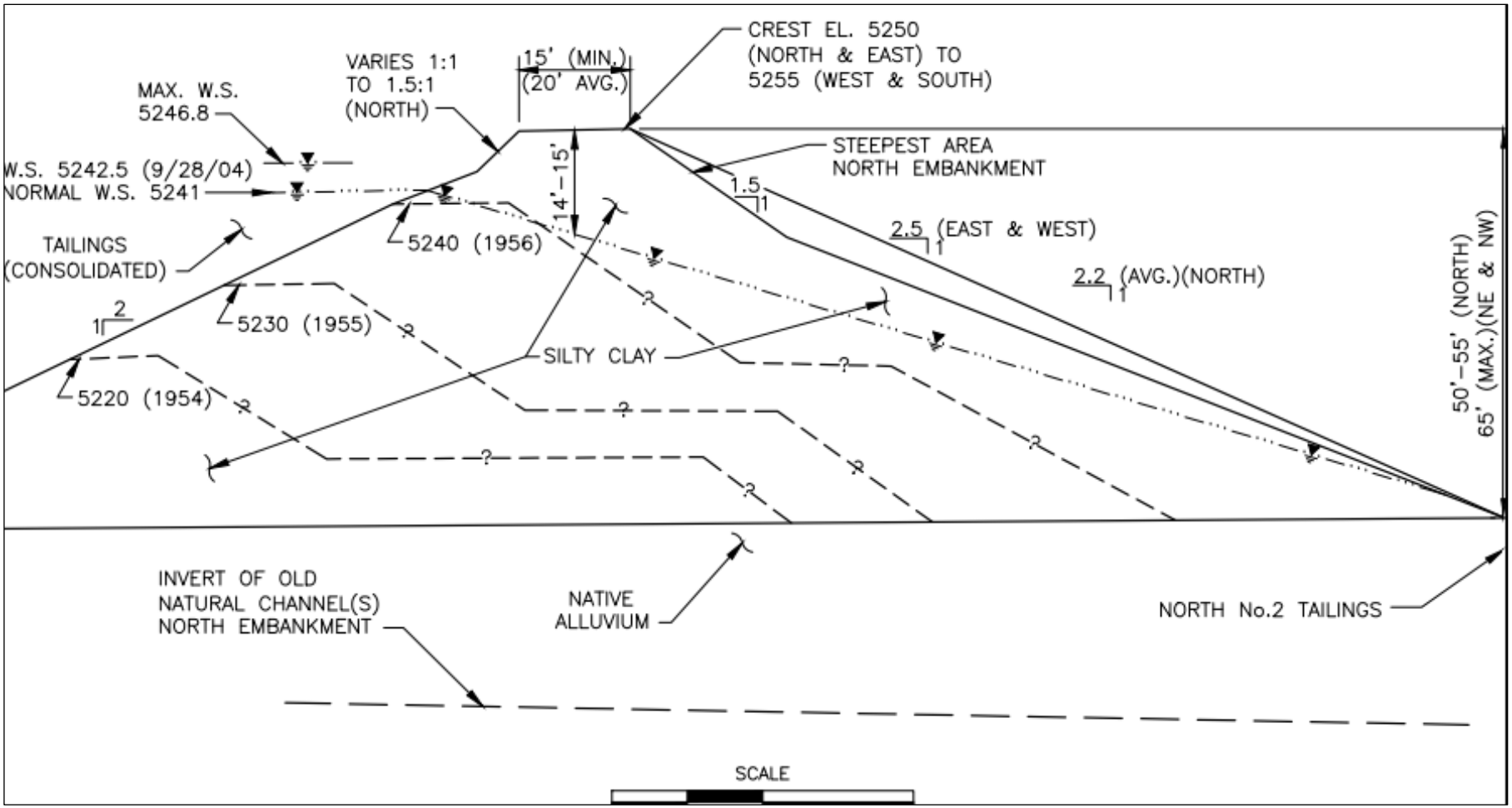


Figure 1-3 – North Pond 1 Typical Cross-Section

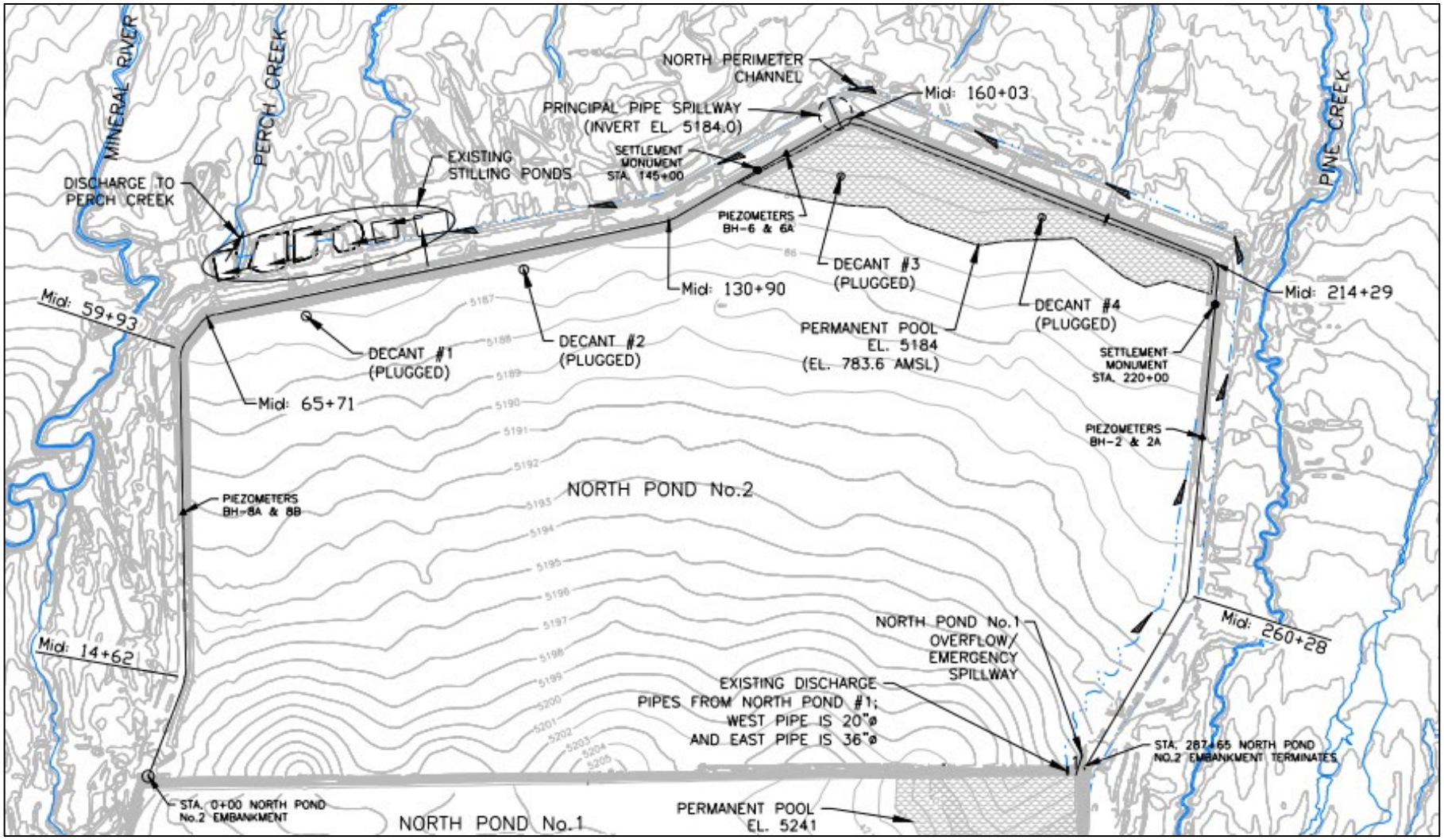


Figure 1-4 – North Pond 2 Plan View

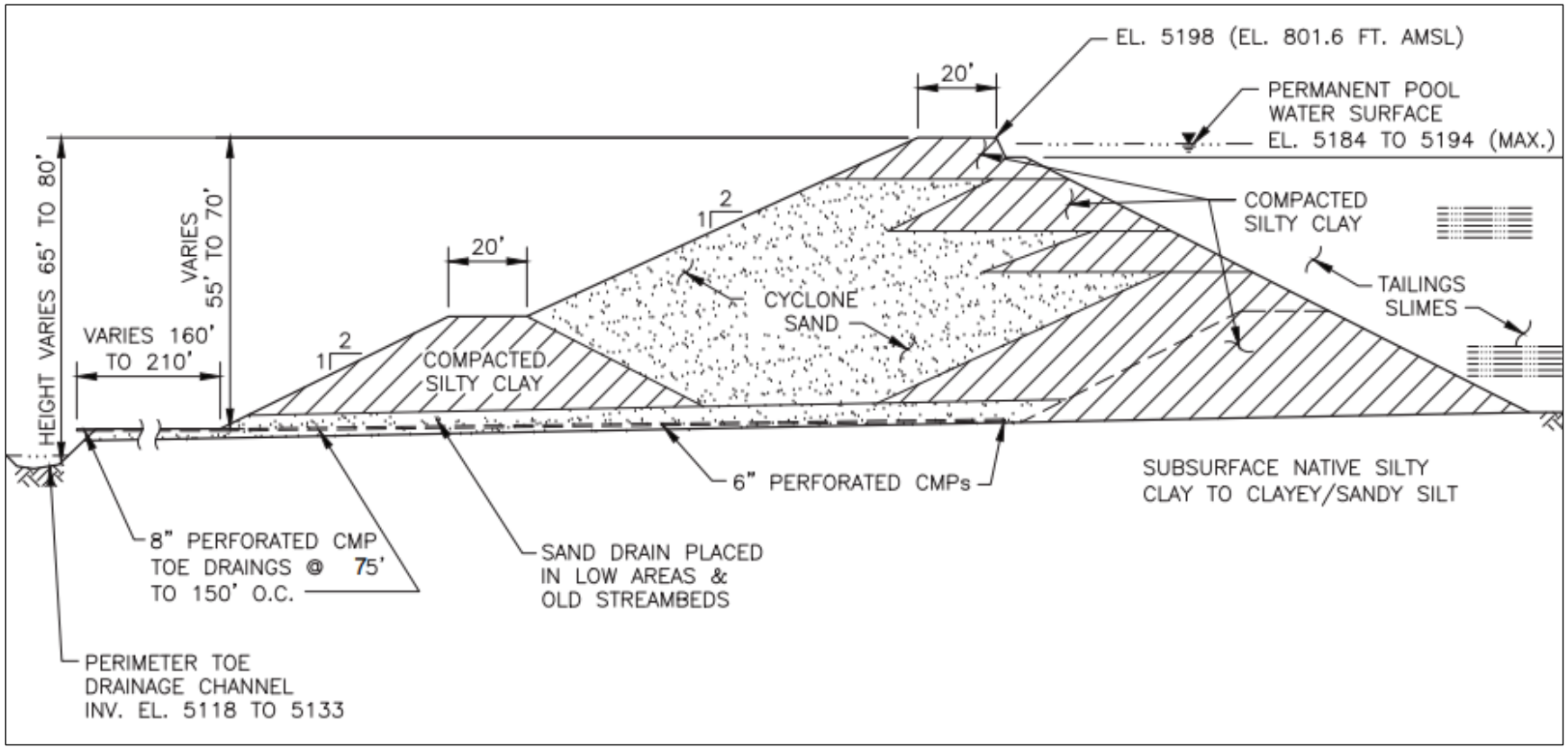


Figure 1-5 – North Pond 2 Typical Cross-Section

2. 2025 Geotechnical Investigation

To improve the confidence of the previous completed stability evaluation for the TDFs based on their current operating conditions and evaluating the stability of the TDFs based on future use scenarios, Tetra Tech completed an additional geotechnical investigation in March 2025 to augment the geotechnical investigation completed by Golder in 1998.

2.1 Geotechnical Borings, Soil Sampling, Laboratory Analysis

2.1.1 Geotechnical Borings

A total of 4 borings were drilled in NP1 and 6 borings were drilled in NP2 through the existing embankments as part of the 2025 geotechnical investigation. The coordinates, existing ground surface elevation, and maximum drill depths for the 2025 and 1998 borings are summarized in Table 2-1 and Table 2-2, respectively. The locations of the 2025 and 1998 borings are shown on Figure 2-1, and the boring logs are presented in Appendix B.

Table 2-1 – Summary of 2025 Geotechnical Borings

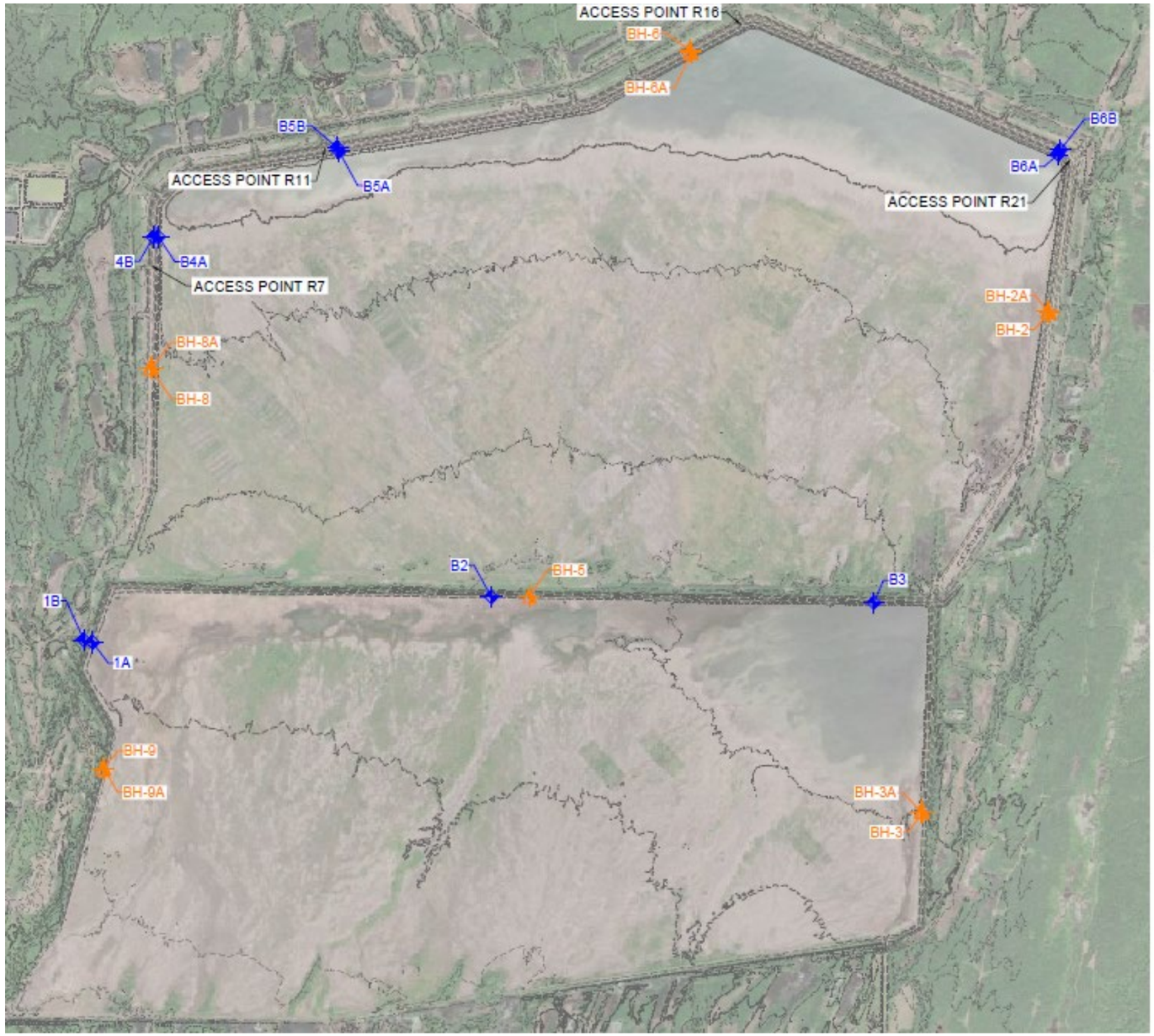
Borings	Coordinates		Ground Surface Elevation (ft)	Maximum Depth of Boring (ft)
	Latitude	Longitude		
NP 1 Borings				
PFS-BH-1A	46.78151	-89.5562	852	86.4
PFS-BH-1B	46.7816	-89.5567	836.8	51.5
PFS-BH-2	46.78403	-89.5313	856.8	59.7
PFS-BH-3	46.78431	-89.5073	854.9	55.0
NP 2 Borings				
PFS-BH-4A	46.79906	-89.5529	801.7	71.5
PFS-BH-4B	46.79903	-89.5532	773.2	46.5
PFS-BH-5A	46.80299	-89.5417	813	72.5
PFS-BH-5B	46.80314	-89.5418	779.8	51.5
PFS-BH-6A	46.80384	-89.4967	802.1	58.5
PFS-BH-6B	46.80405	-89.4965	776.3	42.7

Table 2-2 – Summary of 1998 Geotechnical Borings

Borings	Coordinates		Ground Surface Elevation (ft)	Maximum Depth of Boring (ft)
	Northing	Easting		
NP 1 Borings				
BH-4	35476	40468	865.06	50.0
BH-5	41923	41202	854.16	70.0
BH-9	38938	34542	861.16	60.0
BH-9A	38905	34538	859.76	6.5
NP 2 Borings				
BH-1	49633	47964	800.56	67.5
BH-2	46590	49148	801.36	55.0

Borings	Coordinates		Ground Surface Elevation (ft)	Maximum Depth of Boring (ft)
	Northing	Easting		
BH-3	38747	47454	801.36	53.0
BH-6	50531	43360	801.36	60.5
BH-7	48944	38533	801.06	85.0
BH-8	44845	35214	797.36	67.0

The 2025 drilling was conducted by American Engineering Testing (AET) using a hollow-stem auger, with logging and oversight from Tetra Tech geologist. Boreholes were advanced to depths ranging from 42.7 to 86.4 feet below ground surface (ft bgs). Material properties for selected intervals in each boring drilled in 2025 along with standard penetration test (SPT) blow counts are displayed on the boring logs presented in Appendix B.



Point Table			
Point #	Raw Description	Northing	Easting
35009	1A	5184057.929	304878.118
35010	1B	5184068.979	304835.929
35171	B5B	5186425.557	306050.448
35075	B3	5184247.936	308618.253
35084	B2	5184275.972	306786.947
35172	4B	5185997.204	305168.115
35135	B4A	5185999.157	305192.778
35320	B5A	5186408.226	306058.223
35213	B6A	5186393.075	309499.732
35177	B6B	5186416.196	309511.614

NOTES

1. PROJECT COORDINATES SHOWN ARE BASED ON THE UTM-WGS 1984 DATUM, ZONE 16 NORTH, METER; CENT. MERIDIAN 87D W COORDINATE SYSTEM.

LEGEND

- 2025 TETRA TECH BORING
- 1998 PIEZOMETER/BORING

Figure 2-1 – Location of 1998 and 2025 Geotechnical Borings

2.1.2 Sampling and Field Testing

Samples were collected at various intervals using split spoon samplers associated with SPT and larger diameter thin wall samplers to obtain undisturbed samples. SPT blow counts and disturbed samples were obtained by driving the split spoon sampler, with an external and internal diameter of 2 inches and 1.375 inches, respectively, using a 140-pound weight falling 30 inches in accordance with ASTM D1586. After "seating" the sampler into the soil interval, the number of blows required to drive the sampler in sequential six-inch intervals was recorded. The number of blows for each 12-inch interval (N-value) are recorded on the logs and used to categorize the consistency of the soil. AET indicated that, based on calibration teat completed in October 2025, the hammer efficiency was measured at 87.5%.

Undisturbed samples were collected using thin wall samples and were used as the primary samples for laboratory tests to evaluate the in-situ properties of the embankment and foundation soils. Consideration was given to the potential disturbance of these samples when interpreting the results of in-place density, unit weight, shear strength, and permeability tests.

Bulk samples of the existing tailings within NP 1 and the embankment materials of the former South Pond were collected to evaluate the material properties for these two sources for use as construction materials for future embankments and containment berms to support future deposition of the tailings.

The location and type of each sample collected are shown on the *Logs of Exploratory Borings*, included in Appendix B.

The uncorrected blow counts (N-value) were corrected based on the hammer efficiency of 87.5% using the equation presented in Figure 2-2.

$$N60 = (ETR/60) \times N$$

N60 = SPT blow count corrected for hammer efficiency

ETR = Hammer Energy Transfer Ratio

N = uncorrected (raw) SPT blow count

Figure 2-2 – Equation for Standard Blow Counts to N60 Based on Hammer Efficiency

A summary of minimum, maximum, and average N60 blow counts for each layer encountered in the borings are provided in Table 2-3.

Table 2-3 – Summary SPT N60 Blow Counts

Test	Minimum Value	Maximum Value	Average
NP 1 Borings			
Embankment Fill	7	77	22
Native Foundation	17	37	25
NP 2 Borings			
Embankment Fill	7	49	29
Native Foundation	17	94	49
Cyclone Sands	13	68	35

In-situ embankment soils for both NP 1 and NP 2 were characterized as having variable degrees of density with average SPT blow counts of 22 and 29 blows per foot (bpf), respectively, indicating in general stiff to very stiff soils. SPT blow counts for the native foundation soils underlying the embankments of NP 1 and NP2 showed that they were at similar

densities to the NP 1 embankment soils and generally denser than the NP2 soils. For the cyclone sands incorporated into the embankment of NP 2, the average SPT blow counts of 35 indicated that the cyclone sands were in a compact density.

2.1.3 Sample Handling and Transportation

Samples were collected and transported in accordance with ASTM D4220. Following removal from the sampling device, logging a physical description of the sample, and recording blow counts, all samples were sealed in appropriate containers and marked using an indelible *Sharpie*-style marker with the project identification number, borehole identification number, sampling date, and depth interval represented. Samples obtained from split spoon samplers were sealed in heavy-duty moisture-proof plastic storage bags. Samples were sealed in the thin-walled samplers using plastic and tape to preserve moisture content of the undisturbed samples.

2.1.4 Water Level Measurements

Observable water during drilling was only encountered in borings PFS-BH-4A and PFS-BH-4B at depths of 70.9 and 35.5 ft bgs.

2.1.5 Borehole Abandonment

Following completion of drilling and checking for water, each borehole was grouted using a cement-bentonite grout. Grout was mixed in a drum at the ground surface and poured into the open boreholes at a rate slow enough so that the grout could be tracked to the bottom of the open boreholes. The next day the grouting was finished to the ground surface after minor settling had occurred in the previous day's grout.

2.2 Piezometer Well Completion

Borings PFS-BH-1A, 5A, 4B, and 6A were completed as piezometers to allow for future monitoring of the phreatic surface in the embankment and to augment the existing piezometers installed during the 1998 Golder geotechnical investigation. Well logs are presented in Appendix C.

3. Subsurface Conditions

Subsurface conditions encountered during the 1998 and 2025 geotechnical programs included the following materials:

- Embankment soil (material from historical borrow sources placed and compacted to create the existing embankments).
- Native foundation
- Bedrock
- Cyclone Sand
- South Pond Embankment Borrow Material
- Existing NP 1 Tailings

The following sections provide a description of each material as well as results of representative laboratory testing results. A summary table of the 2025 laboratory testing results and associated laboratory test reports are presented in Appendix D.

3.1 Embankment Soils

Embankment fill soil was encountered in all borings drilled in 1998 and 2025. Based on the historical construction documentation for NP1 and NP2, fill used for the construction of the embankments was obtained from nearby borrow areas, which consisted of the same soil type that serves as the current foundation soils for the embankments. Representative undisturbed and disturbed samples of the existing embankment material were obtained from the borings drilled in 2025 (refer to Table 2-1) and those drilled in 1998 (refer to Table 2-2).

Embankment fill soils were predominantly characterized as sandy clay (unified soil classification system designation CL). Results of the laboratory analyses, from the 1998 and 2025 drilling program, conducted on the embankment soils are summarized in Table 3-1. Note the strength testing on embankment soils collected during the 1998 drilling program were only conducted on remolded samples.

Table 3-1 – Summary of Embankment Fill Geotechnical Testing Results

Test	Minimum Value	Maximum Value	Average
NP 1 Borings			
In-situ Moisture Content (%)	8.0	18.13	13.8
In-Situ Dry Density (pounds per cubic foot [pcf])	110.58	123.00	116.99
Fines Content (%)	66.90	74.10	71.31
Plasticity Index	9	16	11
Direct Shear Undrained Cohesion (pounds per square foot [psf])	--	--	518
Direct Shear Undrained Friction Angle (degrees)	--	--	25.50
Consolidated Undrained Triaxial Drained Cohesion (psf)	140	878	509
Consolidated Undrained Triaxial Drained Friction Angle (degrees)	23.50	34.40	28.95

Test	Minimum Value	Maximum Value	Average
Hydraulic Conductivity (centimeters per second [cm/sec])	2.2E-8	9.84E-7	5.03E-7
NP 2 Borings			
In-situ Moisture Content (%)	8	16	10.33
In-Situ Dry Density (pcf)	115.10	127.20	123.00
Fines Content (%)	78.50	53.50	67.75
Plasticity Index	6	18	10.33
Direct Shear Undrained Cohesion (psf)	--	--	788.00
Direct Shear Undrained Friction Angle (degrees)	--	--	31.8
Consolidated Undrained Triaxial Drained Cohesion (psf)	140	878	509
Consolidated Undrained Triaxial Drained Friction Angle (degrees)	23.50	34.40	28.95
Hydraulic Conductivity (cm/sec)	2.2E-8	6.24E-7	3.21E-7

3.2 Native Foundation

Native foundation soil was encountered in all borings drilled in 1998 and 2025. Representative undisturbed and disturbed samples of the existing embankment material were obtained from the borings drilled in 2025 (refer to Table 2-1) and those drilled in 1998 (refer to Table 2-2).

Foundation soils were predominantly characterized as sandy clay (unified soil classification system designation CL) exhibited very similar index properties as the embankment fill soil. Results of the laboratory analyses, from the 1998 and 2025 drilling programs, conducted on the native foundation soils are summarized in Table 3-2. Note there was no strength and permeability testing conducted on samples from the native foundation soil.

Table 3-2 – Summary of Native Foundation Soil Geotechnical Testing Results

Test	Minimum Value	Maximum Value	Average
NP 1 Borings			
Specific Gravity	--	--	2.70
In-situ Moisture Content (%)	10	16	12.80
Fines Content (%)	65.20	73.10	69.15
Plasticity Index	9	10	9.5
Consolidated Undrained Triaxial Drained Cohesion (psf)	--	--	14.40
Consolidated Undrained Triaxial Drained Friction Angle (degrees)	--	--	32.50
Hydraulic Conductivity (cm/sec)	1.99E-7	1.37E-5	6.95E-6
NP 2 Borings			
In-situ Moisture Content (%)	8	14	11.00
Fines Content (%)	59.30	64.70	62.0

Test	Minimum Value	Maximum Value	Average
Plasticity Index	4	13	8.50

3.3 Cyclone Sands

Cyclone sands were incorporated into the construction of the embankment of NP 2 and were encountered in all borings drilled in NP 2. Representative undisturbed and disturbed samples of the cyclone sands were obtained from the borings drilled in NP 2 in 2025 (refer to Table 2-1).

Cyclone sands were predominantly characterized as silty fine to coarse sand (unified soil classification system designation SC). Results of the laboratory analyses, from the 1998 and 2025 drilling programs, conducted on the cyclone sands are summarized in Table 3-3.

Table 3-3 – Summary of Cyclone Sands Geotechnical Testing Results

Test	Minimum Value	Maximum Value	Average
Specific Gravity	2.54	2.68	2.65
In-situ Moisture Content (%)	5.70	15	8.33
In-Situ Density (pcf)	101.53	102.80	102.16
Fines Content (%)	13.10	34.60	24.52
Plasticity Index	Non-Plastic		
Direct Shear Undrained Cohesion (psf)	--	--	302
Direct Shear Undrained Friction Angle (degrees)	--	--	36.10
Consolidated Undrained Triaxial Drained Cohesion (psf)	--	--	1540
Consolidated Undrained Triaxial Drained Friction Angle (degrees)	--	--	30
Hydraulic Conductivity (cm/sec)	--	--	1.2E-3

3.4 Bedrock

Bedrock was encountered in select 2025 and 1998 borings. Depth to bedrock encountered in the 2025 and 1998 borings is summarized in Table 3-4 and Table 3-5, respectively.

Table 3-4 – Summary Depth to Bedrock in 2025 Geotechnical Borings

Borings	Ground Surface Elevation (ft)	Maximum Depth of Boring (ft)	Elevation of Top of Bedrock
NP 1 Borings			
PFS-BH-2	856.8	59.7	797.1
NP 2 Borings			
PFS-BH-6B	776.3	42.7	733.6

Table 3-5 – Summary of Depth to Bedrock in 1998 Geotechnical Borings

Borings	Ground Surface Elevation (ft)	Maximum Depth of Boring (ft)	Elevation of Top of Bedrock
NP 1 Borings			
BH-4	865.06	50.0	815.06
BH-5	854.16	70.0	784.16
BH-9	861.16	60.0	Not Encountered
BH-9A	859.76	6.5	Not Encountered
NP 2 Borings			
BH-1	800.56	67.5	733.06
BH-2	801.36	55.0	746.36
BH-3	801.36	53.0	748.36
BH-6	801.36	60.5	740.86
BH-7	801.06	85.0	716.06
BH-8	797.36	67.0	730.36

4. Geotechnical Analysis Criteria

Engineering analyses and stability modeling were conducted to evaluate the current condition and stability of the dam. Finite element seepage analyses and limit equilibrium slope stability modeling were developed at critical cross-sections for both North No.1 and North No.2, which were identified based on the results of a topographical survey completed in August 2024 (refer to Appendix E). Methodology, calculation and model inputs, and results are discussed below.

4.1 Seismic Analysis

4.1.1 Seismic Design Criteria

The United States Geological Survey (USGS) Unified Hazard Tool (USGS 2021a) was used to calculate the peak ground acceleration (PGA) from a seismic event associated with a two percent probability of exceedance in 50 years (approximately 2,500-year return frequency). Using the same USGS resource a design PGA of 0.021g was calculated.

American Society of Civil Engineers (ASCE) 7-22 methodology requires that the properties of the soil at a proposed site be classified as one of several site classes for seismic design. Based on the subsurface investigation completed by Golder, the seismic design parameters for this site represent a seismic zone Site Class of (D) in accordance with the previous version of this guidance, ASCE 7-16. Under ASCE 7-22 Site Class D is defined as medium dense sand or stiff clay having a shear wave velocity of 700 to 1,000 ft/sec. When direct measurements of shear wave velocity are not available an estimation can be made using SPT blow counts. ASCE 7-22 recommends using the method for converting corrected blow counts to shear wave velocities outlined in the Pacific Earthquake Engineering Research Center Guidelines for Estimation of Shear Wave Velocity Profiles (PEER 2012-08). The conversion for silt and clay soils was used and is as follows:

$$\boldsymbol{Vs = 26\ (N_{60})^{0.17}(\delta' v)^{0.32}\ (Equation\ 4.40, PEER\ 2012)}$$

Where:

Vs = Shear wave velocity.
N60 = Energy loss corrected blow counts.
δ' v = the effective vertical stress after correcting for pore pressure

The shear wave velocity calculated was 942 ft/sec, which falls within the description for Class D in ASCE 7-22 given the soil type.

For determining the Peak Ground Acceleration (PGA) for use in stability analysis ASCE 7-22 requires the use of the PGA_m, which is the Peak Ground Acceleration from the maximum considered earthquake geometric mean. ASCE 7-16 required the determination of the F_{PGA}, which is the standard probabilistically determined PGA corrected using an amplification factor of 1.6. ASCE 7-22 recommends you use the ASCE Hazard Tool (ASCE 2026) because it was developed to determine the PGA_m. The PGA_m for the site determined by ASCE Hazard Tool is 0.024 g. Tetra Tech also determined the F_{PGA}, per ASCE 7-16 guidance which resulted in a larger ground acceleration of 0.034 g. To be conservative the larger value of 0.034 g was used in this analysis. The output from the USGS website used in determining the F_{PGA} and output from the ASCE website used in determining the PGA_m as well as the determination of the Site Class are included in Appendix F.

4.1.2 Liquefaction Screening

Soil liquefaction consists of shear strength reduction and associated deformation of saturated, cohesionless materials caused by excess pore pressures in response to seismic loading. The on-site silty clay soils used to construct the primary embankments are predominantly fine-grained, cohesive soils, and are not susceptible to liquefaction; therefore, liquefaction analysis was not applicable. For fine-grained material to be susceptible to liquefaction, it must meet all of the following criteria (Day et. Al, 2002):

- The soil must have less than 15 percent finer than 0.002 mm (clay fraction)

- The soil must have a liquid limit (LL) less than 35
- The water content of the soil must be greater than 90% of the LL
- The soils must be relatively loosely packed (low to medium relative density)

A review of field and laboratory tests indicate the following with respect to the liquefaction potential of the embankment and foundation soils:

- Based on a review on the particle size distributions curves for the embankment soil, the majority of samples had percent passing a #200 sieve greater than 50-percent and percent clay greater than 30%.
- Liquid limits are generally less than 35, in the low to mid 20s.
- SPT measurements collected during the borehole drilling indicate that the embankment, cyclone sands, and foundation soils at the depths where the phreatic surface (saturated conditions) are present are characterized as stiff to very stiff based on majority of blow counts exceeding 15 blows per foot.

Based on this initial screening, the embankment and foundation are characterized as having a low liquefaction potential. In addition to the soils susceptibility to liquefication, the ground shaking induced by an earthquake in the area of interest needs to be sufficient to cause liquefaction to occur. The TDFs are located in a Seismic Design Category A representing the lowest hazard with little to no anticipated damage due to earthquakes. Based on the results of this screening liquefaction analysis was not performed.

Tetra Tech also evaluated the liquefaction potential of the TDF embankments and existing and future tailings associated with underground blasting of the White Pine North Mine. Stantec prepared a Noise and Vibration Report (Stantec, 2026) in which they discussed the potential vibrations resulting from the underground blasting. The extent of underground mine workings underlying the TDFs is shown in **Figure 4-1** and the geotechnical domains for the underground workings are shown in Figure 4-2.

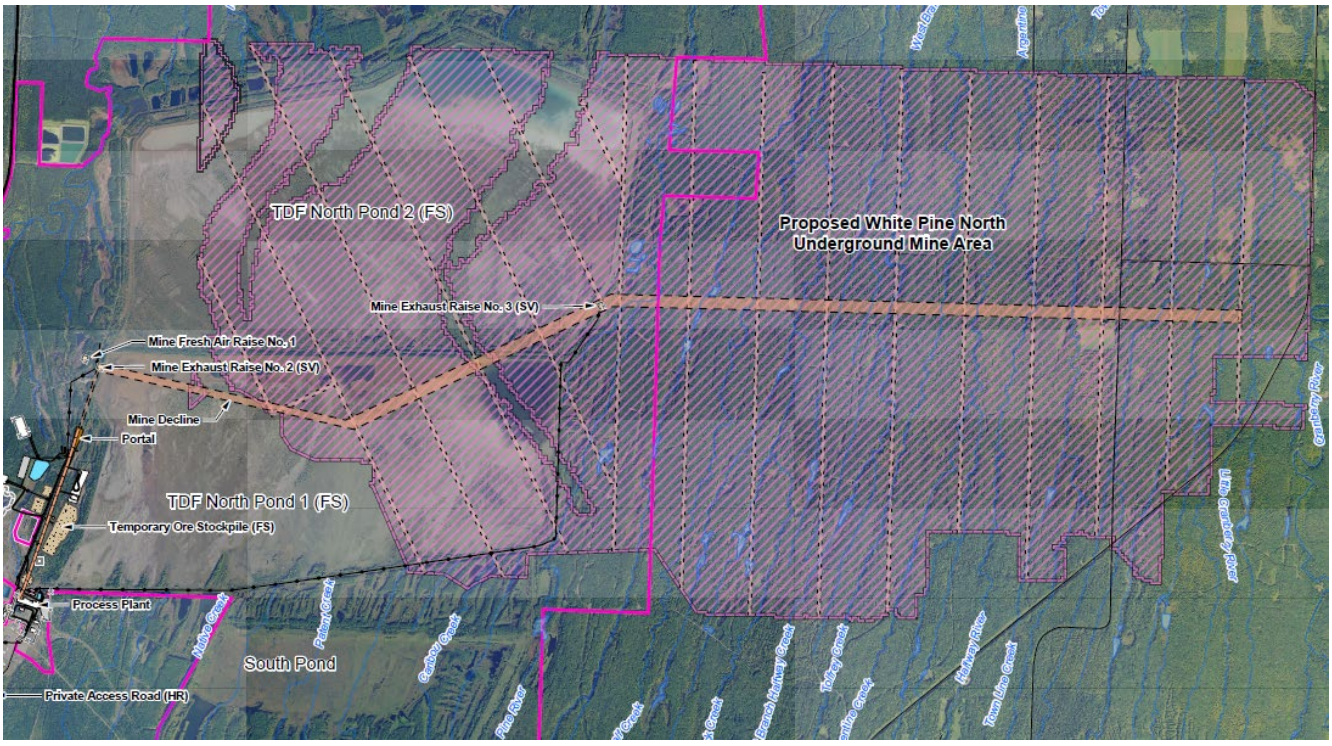


Figure 4-1 – Extent of Mine Workings Underlying TDFs (Stantec, 2026)

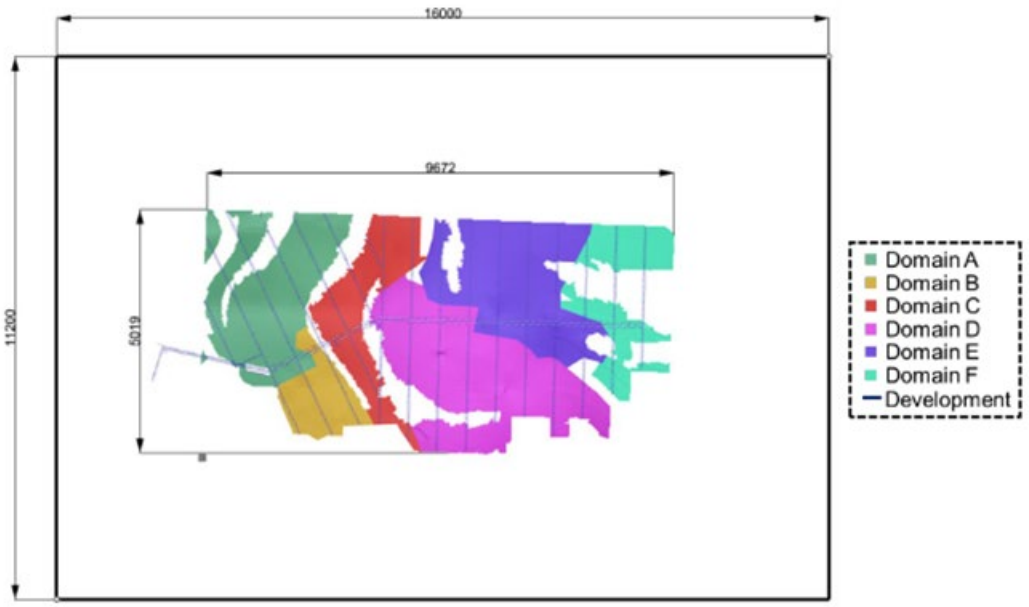


Figure 4-2 – Plan View of the Geotechnical Domain's of the White Pine North Mine (Stantec, 2026)

The TDFs are located under Domian Areas A, B, and C, which are located 400 to 900 meters (1,300 to 2952 feet) below ground surface. Based on Stantec's vibration impact assessment, they indicate that the detonation delays, LP delays, which vary from 200 ms up to nearly one second, there is little chance of a blast creating harmonic motion. The propensity for blasting to induce liquefaction is dependent on the peak particle velocity (ppv). A graph showing the PPV as a function of distance from the blast for the two diameters of charges is provided in Figure 4-3.

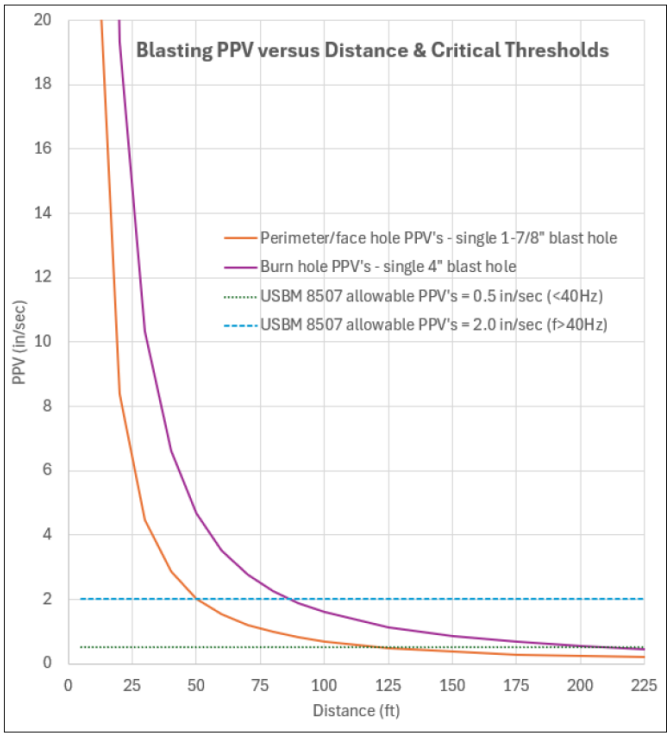


Figure 4-3 – Plan View of the Geotechnical Domains of the White Pine North Mine (Stantec, 2026)

Per Figure 4-3, PPV is predicted to reach a de minis value within 225 feet from the blast location. Given that the mine domains will be located a minimum 0f 1,300 feet deep, the potential for underground blasting to induce liquefaction is minimal.

4.2 Material Properties

Tetra Tech reviewed the results of the laboratory testing completed in 2025 as well as the limited laboratory testing presented in the 1998 Golder report to evaluate material strength and hydrological parameters to use in the stability and seepage modeling (refer to Section 5.0). Rational regarding the selection of the properties of the various materials are presented below. Soil unit weight and strength parameters for each soil unit used as model input values for stability modeling are presented in Table 4-1 and hydrological properties used in the seepage analyses are shown in Table 4-2. Refer to Appendix D for a summary table of the geotechnical testing results with minimum, maximum and average values.

Table 4-1 – Material Strength Properties

Material Name	Total Unit Weight (lb/ft^3)	Effective Cohesion (lb/ft^2)	Effective Φ (degrees)	Total Cohesion (lb/ft^2)	Total Φ (degrees)
Compacted Clay Embankment	135	513	27	482	23
Clay Foundation	141	14	32	1238	28
Cyclone Sands	102	302	36	Not Used	
Tailings Slimes	105	0	35	0	30
Future Deposited Tailings	110	29	34	Not Used	
SP Embankment Borrow (Remolded)	138	204	32	Not Used	
Existing Tailings (Remolded)	131	217	39	Not Used	
50:50 Existing Tailings and SP Embankment (Remolded)	138	310	34	Not Used	

Table 4-2 – Material Hydrological Properties

Material Name	Porosity	Saturated Hydraulic Conductivity (ft/s)	Ratio K_v/K_h
Compacted Clay Embankment	0.31	$1.65x10^{-8}$	1
Clay Foundation	0.31	$2.28x10^{-7}$	1
Cyclone Sands	0.42	$3.94x10^{-5}$	1
In-Situ Tailings Slimes	0.55	$4.92x10^{-4}$	0.2
Future Deposited Tailings	0.48	$2.0x10^{-8}$	0.2
SP Embankment Borrow (Remolded)	0.28	$8.86x10^{-7}$	1
Existing Tailings (Remolded)	0.29	$1.15x10^{-4}$	1
50:50 Remolded SP Embankment and Tailings (Remolded)	0.29	$8.17x10^{-7}$	1

4.2.1 Existing Embankment Properties

As shown in Table 2-1, the index properties (particle size and Atterberg Limits) for the embankment fill for NP 1 and NP 2 show that embankments were constructed of very similar material types, both being characterized as a sandy clay (CL) with moderate plasticity. Additionally, SPT blow counts (refer to Table 2-3) indicate that both embankments were

constructed at similar densities. Therefore, where results for specific direct testing of undisturbed samples were not available for NP 2, values based on test results from undisturbed samples collected from NP 1 were used.

Based on in-situ density, drained direct shear testing, and hydraulic conductivity results from NP 1 and NP 2 embankment soils, the NP 1 embankment soils were less dense and showed lower strength properties than NP 2 soils; therefore, to be conservative the average total unit weight, effective cohesion, effective friction angle, and hydraulic conductivity from NP 1 testing were assigned to the embankment fill.

4.2.2 Native Foundation Soils

The SPT blow counts (refer to Section 2.1.2 and Table 2-3) indicate that the embankment material is at a similar or higher density than the foundation soils. In addition, the embankment and foundation materials reported similar laboratory indexing properties. This would be consistent with the fact that, based on the historical construction documentation for NP1 and NP2, fill used for the construction of the embankments was obtained from nearby borrow areas, which consisted of the same soil type that serves as the current foundation soils for the embankments.

4.2.3 Cyclone Sands

Testing of the cyclone sands was completed on three samples collected from PFS-BH-4A at depths of 22 to 24 and 32 to 34 feet and PFS-BH-6B at a depth of 32 to 34 feet bgs. Given that the SPT blow counts in the cyclone sands indicate they have consolidated to a dense to very dense state, the samples were remolded to 90% of maximum dry density (MDD) and a moisture content of 6.2%, resulting in an average unit weight of 101.45 pcf. Results of direct shear testing resulted in a drained cohesion of 302 psf, a drained friction angle of 36 degrees, and a hydraulic conductivity of 1.2E-3 cm/sec.

4.2.4 Legacy (Existing) Tailings

The Golder 1998 geotechnical investigation included significant testing of the legacy impounded tailings in both NP 1 and NP 2 and therefore additional investigation of the legacy tailings was not conducted in 2025. The 1998 investigation consisted of advancing 21 cone penetration tests (CPTs) throughout the entire tailing's footprint of NP 1 and NP 2 to evaluate pore pressure/water levels and collect samples for remolded strength and hydraulic conductivity testing. It should be noted that the 1998 data associated with the existing tailings is conservative given they have had almost 30 years to consolidate and dewater. Therefore, the unit weight, strength, and hydraulic properties of the tailings reported in the 1998 Golder report were retained for the stability modeling.

4.2.5 Future Deposited Tailings

The tailings to be deposited in the existing TDFs will be thickened prior to being discharged to the TDFs. The tailings thickening process will generate thickened tailings with a percent solids content of 60%±2%. Rheology testing of samples of the thickened tailings generated from thickening test work and associated beach slope predictive modeling suggest that a beach slope of 2% is achievable. Based on the current deposition design, the maximum height of tailings will vary between 18 to 20 meters. Geotechnical testing of the thickened tailings was completed by Advanced Terra Testing out of Lakewood, Colorado and are presented in Appendix G. Consolidation testing suggests that the thickened tailings will achieve a minimum consolidated dry density of 90.52 pcf (1.45 tons/cubic meter [t/m^3]). As such, subsequent unconfined compressive strength, permeability, and direct shear testing was conducted on samples remolded to a density of 90.52 pcf. Based on the results of the geotechnical testing, a total unit weight of 110 pcf, and a drained cohesion and friction angle of 29 pcf and 34°, and a hydraulic conductivity of 5.59E-7 cm/sec were used in the stability modeling.

4.2.6 South Pond Existing Embankment

The SP embankment will serve as borrow material for use in the construction of containment berms/embankment and access causeways to support the future deposition of tailings. Geotechnical testing was completed on composite samples collected from the South Pond embankment. The composite samples were remolded to 95% of MDD. Results of the laboratory analyses conducted on the remolded SP embankment soils are summarized in Table 4-3.

Table 4-3 – Summary of South Pond Embankment Soil

Test	Minimum Value	Maximum Value	Average
Specific Gravity	--	--	2.75
Fines Content (%)	69.30	70.80	69.98
Maximum Dry Density (pcf)	--	--	123.90
Plasticity Index	10	12	11.50
Direct Shear Undrained Cohesion (psf)	--	--	204.0
Direct Shear Undrained Friction Angle (degrees)	--	--	32.50
Hydraulic Conductivity (cm/sec)	--	--	2.7E-5

4.2.7 Remolded Existing Tailings

The existing tailings will serve as borrow material for use in the construction of some of the internal containment berms/embankment, access causeways, and upstream crest widening of NP1 to support the future deposition of tailings and access to pumping and piping infrastructure. Geotechnical testing was completed on composite samples collected from the existing tailings. The composite samples were remolded to 95% of MDD. Results of the laboratory analyses conducted on the remolded existing tailings soils are summarized in Table 4-4.

Table 4-4 – Summary of Remolded Existing Tailings

Test	Minimum Value	Maximum Value	Average
Fines Content (%)	10.90	34.60	22.75
Maximum Dry Density (pcf)	107.50	126.20	116.85
Plasticity Index	10	12	11.50
Direct Shear Undrained Cohesion (psf)	210	224	217
Direct Shear Undrained Friction Angle (degrees)	37.50	40.70	39.10
Hydraulic Conductivity (cm/sec)	--	--	3.5E-3

4.2.1 Remolded 50:50 Remolded Mixture of Existing Tailings and SP Embankment

A 50:50 mixture SP borrow with existing tailings will serve as borrow material for use in the construction of some of the Southern Containment Berm in NP-1, access causeways to support the future deposition of tailings and access to pumping and piping infrastructure. Geotechnical testing was completed on composite samples collected from the existing tailings. The composite samples were remolded to 95% of MDD. Results of the laboratory analyses conducted on the remolded existing tailings soils are summarized in Table 4-5.

Table 4-5 – Summary of Remolded 50:50 Mix of SP Embankment and Legacy Tailings

Test	Minimum Value	Maximum Value	Average
Specific Gravity	--	--	2.81
Fines Content (%)	38.90	52.10	28.90
Maximum Dry Density (pcf)	122.50	127.00	124.75
Plasticity Index	4	8	6

Test	Minimum Value	Maximum Value	Average
Direct Shear Undrained Cohesion (psf)	288.00	332.00	310.00
Direct Shear Undrained Friction Angle (degrees)	33.80	35.70	34.75
Hydraulic Conductivity (cm/sec)	5.8E-6	4.4E-5	2.49E-5

5. Seepage and Stability Modeling

This section presents the seepage and stability modeling conducted to assess the stability of the TDFs under their current condition as well as potential future configurations to support the surface disposal of tailings associated with the proposed White Pond North Project. The sections of the existing embankments deemed critical based on their downstream slope and height were identified based on the results of a topographic survey completed in August 2024 (refer to Appendix E)

Based upon the current PFS design, the White Pine North Project will deposit thickened tailings within the existing footprint of NP 1 and NP 2. There are no raises to the existing embankments anticipated but this will ultimately be determined by the final consolidated in-place density and beach slope the tailings are able to achieve. Although the future tailings will displace some of the current storage capacity in the existing TDFs, available to attenuate storm event run-on, modifications are planned to the existing spillways so that the flood pool elevations in NP 1 and NP 2 will not change. Current deposition designs are included in Appendix H.

Instability of earthen embankments used to retain fluids can occur by several mechanisms. Particular mechanisms of interest for the proposed dam include the following:

1) Water seeping through and/or under the embankments and exiting on the downstream side with a velocity sufficient to mobilize soil particles (piping), resulting in destabilization. This mechanism can ultimately lead to failure of the embankment or can contribute to slope instability if the condition is not corrected.

2) Decrease in shear strength of the embankment or slope failure as a result of over-steepening of slopes due to erosion, piping, overtopping of the crest, construction practices, or other factors.

3) Decrease in strength of the soil due to rapid drawdown or added horizontal forces caused by seismic activity.

To evaluate the potential for these mechanisms to contribute to instability of the legacy TDFs as well as their future stability to support disposal of tailings, Tetra Tech utilized the finite element computer modeling program SEEP/W to evaluate seepage conditions through and under the embankments, and SLOPE/W to evaluate the stability of the embankment slopes (GeoStudio 2021 by Geo-Slope International, Ltd, 2021). The most critical cross-section was identified based on a site topographic survey. The location of the cross-sections used to evaluate the seepage and stability characteristics of the dams are shown in Appendix E.

Analysis of the downstream embankment slopes under static and pseudo static loading conditions was in accordance with Technical Bulletin: Application of Dam Safety Guidelines to Mining Dams (CDA, 2014) for the steady state seepage static loading condition when the water level is at maximum operating water level and for steady state seepage under pseudo static loading. For static loading under flood pool elevations, the US Department of the Interior Bureau of Reclamation Dam Standards No. 13 (BOR, 2011) recommended minimum factor of safety (FOS) of 1.2 was adopted. The recommended minimum factors of safety and stress conditions under the select loading conditions are summarized in Table 5-1.

Table 5-1 – Minimum Safety Factors for Slope Stability Analyses

Design Condition	Minimum Factor of Safety
Steady state long-term stability, static loading (normal pool elevation)	1.5
Steady state long-term stability, static loading (flood pool elevation)	1.2
Steady state, pseudo-static loading	1.1

5.1 Seepage Modeling Methodology

Seepage analyses using Seep/W were conducted to predict pore pressure conditions within the embankment, assuming steady state seepage, for use in slope stability analyses. A steady state seepage analysis implies that the seepage occurred over a period of time sufficient to fully define the phreatic surface and provide continuous seepage magnitudes at all locations through and under the embankments. Given that both North No.1 and North No.2 have been functioning for several decades at fairly consistent operating pool elevations, it is appropriate to assume that steady state seepage conditions have developed. Furthermore, rapid drawdown of the TSFs is not anticipated and as such a transient seepage analysis is not required.

To evaluate impacts on the phreatic surface and associated stability, seepage models were run using the low and high conductivity values for the embankment and foundation soils. Separate analyses were also performed to account for the water surface elevation at the normal and flood pool elevations for the existing and future conditions as presented in Table 5-2 and Table 5-3. Normal pool elevations were selected at elevations slightly above the lowest outlet elevations and the flood pool water elevation represents the approximate water surface following a PMP event, as determined through the updated hydrologic evaluation.

Table 5-2 – NP 1 and 2 Existing Normal and Flood Pool Water Levels

TSF	Normal Pool Water Elevations		Flood Pool Water Elevations	
	Feet Above Mean Sea Level	Plant Vertical Datum (ft)	Feet Above Mean Sea Level	Plant Vertical Datum (ft)
North No.1	844	5,240.44	852.9	5,249.34
North No.2	788	5,184.44	795	5,191.44

Table 5-3 – NP 1 and 2 Future Normal and Flood Pool Water Levels

TSF	Normal Pool Water Elevations		Flood Pool Water Elevations	
	Feet Above Mean Sea Level	Plant Vertical Datum (ft)	Feet Above Mean Sea Level	Plant Vertical Datum (ft)
North No.1	853	5,249.44	856	5,252.44
North No.2	797	5,193.44	802	5,198.44

Boundary conditions used for the steady state analyses involved a total head representing the water level at the maximum water elevation and another boundary condition representing a potential seepage face applied to the downstream face of the embankment. A ratio of horizontal to vertical permeability (k_v:k_h) of 1 was used assuming that negligible anisotropy with depth occurs in the materials native foundation and embankment fill soils. A k_v:k_h of 0.2 was used for the existing tailings based on data presented in the 1998 Golder Report.

5.2 Stability Modeling Methodology

Embankment stability was analyzed using limit equilibrium principles. Potential failure surfaces were modeled using Spencer's method, which satisfies both force and moment equilibrium in and between slices. The model was set up to use entry and exit points to specify the failure planes instead of rotational center grids. Specifying entry and exit points allows the engineer to focus the analysis on critical areas that would result in significant failures and ignore superfluous, surficial slip surfaces. The SLOPE/W program incorporates a search routine to locate the failure surface with the lowest factor of safety within user defined search limits. Trial failure surfaces were defined with "entry and exit" parameters, resulting in a range of possible locations to search for the critical potential failure surface (lowest factor of safety). The "optimized" failure surface option was selected allowing for the search to not be confined to traditional circular or block models and instead find the critical hybrid surface that may be influenced by geometry, lithology, and groundwater conditions.

The slope stability analyses incorporated pore pressure conditions from the seepage analyses described in the previous section. Downstream slopes were evaluated under both static and pseudo-static loading conditions. The pseudo-static condition adds an additional horizontal loading condition occurring due to a seismic event. The maximum horizontal acceleration used for the pseudo-static analysis was 0.034g for the design earthquake using the methods described in Section 4.1.1.

Effective and total stress parameters were utilized depending on the scenario modeled (see Table 4-1). Effective stress parameters were used for the steady state long-term stability scenario and reduced effective stress parameters (representative of total strength envelope) were used for the pseudo-static loading for the clay foundation, tailings, and clay embankment in the event excess pore-water pressure is developed due to a seismic event. Static loading represents the long-term, steady-state condition where pore water pressure has reached a static state and therefore drained laboratory test results (effective stress parameters) are applicable to this scenario. The pseudo-static condition adds an additional horizontal loading condition occurring due to a seismic event. The maximum horizontal acceleration used for the pseudo-static analysis was 0.034g for the design earthquake using the methods described in Section 4.1. Additionally, for the pseudo-static loading conditions, total (undrained) strength parameters were utilized for soil layers which had the phreatic surface pass through them. Undrained strengths are recommended for cohesive soils under pseudo-static loading due to the excess pore water pressure that is likely to develop due the rate of loading being quicker than the material's ability to dissipate pore water pressures. Based on a review of grain size distribution and plasticity indexes from previous testing, the embankment, tailings, and native foundation materials have an appreciable percentage of fines and moderate plasticity, indicating that these materials are not free draining and excess pore-water pressure is likely to develop if seismic loading of sufficient magnitude is generated. Excess pore water pressure development generally results in a decrease in shear strength. As such, to be conservative, undrained strength for the pseudo-static loading condition were used. It should be noted that due to the low seismic zone of the site, the propensity for the materials to develop excess pore-water pressure and behave in an undrained condition is very low.

Profiles for the slope stability analyses of the critical cross-sections were developed based on the cross-sections developed based on the 2024 topographical survey and subsurface information from the exploratory borings. Cross sections incorporating subsurface information and material characteristics representing the model inputs are provided in Appendices I and J for the existing and future conditions, respectively.

5.3 Analysis and Results

The seepage and slope stability analyses were conducted at the critical cross-section of the dam (Sections K and M for NP 1 and Sections C and E for NP 2). Section locations and topographic cross sections are shown in Appendix E. Model outputs for NP 1 and NP 2 are presented in Appendices I and J for the existing and future conditions, respectively.

5.3.1 Seepage

The modeled phreatic surfaces were compared to water levels measured in piezometers as well as locations of seepage observed during previous inspections. It should be noted that locations of seepage observed during previous inspections were limited predominantly to the toe of the embankment and there were no signs of seepage emanating from the downstream slopes of either NP 1 and NP 2. Based on the comparison of measured water levels in the embankment and to the modeled phreatic surfaces, the modeled runs using the hydraulic conductivity obtained from the 2025 investigation for the embankment and foundation soils appeared to represent the actual phreatic surface conditions for both NP1 and NP2 as shown in Table 5-4.

Table 5-4 – Modeled vs. Measured Depths of Water below Embankment at Downstream Crest of North No.1 and North No.2 under Current Normal Operating Water Levels

TDF	Modeled Depth to Water (feet)	Measured Depth to Water (feet)[1/]
NP 1	18	14[2/]
NP 2	51	53[3/]

Notes:
[1/] Depth to Groundwater Based on October 7, 2023 measurements. Measurements were from Top of Casing.
[2/] Measurements from BH-9A located approximately 300 feet to the south of Cross-Section M.
[3/] Measurement from BH-6 located near Cross-Section E.

Maximum vertical and horizontal hydraulic gradients were calculated and compared to critical hydraulic gradients determined based on laboratory testing. If the critical hydraulic gradient occurs, soils approach values of vertical effective stress approximately equal to zero, which can result in boiling and piping ("quick conditions"), often near the downstream toe.

The critical hydraulic gradient for the NP1 and NP2 embankments was 1.18 calculated using a location-specific, average specific gravity of 2.71, and a maximum dry density of 117 pcf from in-situ soil density test results from undisturbed samples collected from the embankment. This resulted in a saturated unit weight of 136.2 pcf and an associated submerged unit weight of 73.8 pcf (assuming a unit weight for water of 62.4 pcf). A maximum exit hydraulic gradient of 0.52 and 0.9, based on future flood pool elevations, was computed by SEEP/W for NP 1 and NP 2, respectively, resulting in an associated FOS of 2.6 and 2.44 against piping. Refer to Appendix K for piping evaluation calculations. As recommended in U.S. Army Corps of Engineers EM 1110-2-1901 (USACE, 1993), a minimum FOS of 1.5 against internal erosion should be targeted. Therefore, boiling and piping due to hydraulic gradients are not anticipated to be encountered based on the calculated FOS and the conditions modeled. The presence of cyclone sands between the main embankment and downstream starter dam of NP 2 will serve as a quasi-blanket drain, which will prevent loss of fines of the main embankment if a piping feature were to develop further reducing the potential for a piping failure. Additionally, routine inspections of the downstream slopes and toes of the TDF embankments have observed that seepage rates are very low and the seepage is clear indicating that internal erosion has not been observed throughout the operation life of the TDFs.

5.3.2 Slope Stability

5.3.2.1 Existing Conditions

Modeling was completed to evaluate the current stability of the TDFs and the results are presented in Appendix I. The calculated FOS for the existing conditions is presented in Table 5-5.

Table 5-5 – Summary of Existing Conditions Slope Stability Factors of Safety

Cross-Section	SCENARIO				Calculated Minimum Factor of Safety[1/]	Recommended Factor of Safety
	Dam Face	Pore Water Conditions	Stress Conditions Evaluated	Horizontal Seismic Coefficient (%g)		
NP1 Normal Pool						
K	Downstream	Steady-State	Effective	-	1.5	1.5
	Downstream	Steady-State	Total	0.034	1.7	1.1
M	Downstream	Steady-State	Effective	-	***1.4***	1.5
	Downstream	Steady-State	Total	0.034	1.3	1.1
N	Downstream	Steady-State	Effective	-	1.8	1.5

Cross-Section	SCENARIO				Calculated Minimum Factor of Safety[1/]	Recommended Factor of Safety
	Dam Face	Pore Water Conditions	Stress Conditions Evaluated	Horizontal Seismic Coefficient (%g)		
	Downstream	Steady-State	Total	0.034	2.0	1.1
NP 1 Flood Pool						
K	Downstream	Steady-State	Effective	-	1.4	1.2
M	Downstream	Steady-State	Effective	-	1.4	1.2
N	Downstream	Steady-State	Effective	-	1.5	1.2
NP 2 Normal Pool						
C	Downstream	Steady-State	Effective	-	2.3	1.5
	Downstream	Steady-State	Total	0.034	2.4	1.1
E	Downstream	Steady-State	Effective	-	2.2	1.5
	Downstream	Steady-State	Total	0.034	2.2	1.1
NP 2 Flood Pool						
C	Downstream	Steady-State	Effective	-	2.3	1.2
E	Downstream	Steady-State	Effective	-	2.2	1.2

Notes:
[1/] **BOLD and ITALICIZED** indicates calculated factor of safety does not meet minimum recommended factor of safety.

The stability results presented in Table 5-5 indicate the following regarding the existing conditions of NP 1 and NP 2:

- North No.1
  - The minimum recommended FOS of 1.5 for the static loading condition under normal pool conditions was met for cross-section K and N but not achieved for cross-section M of NP1. However, additional modeling, discussed in Section 5.3.2.2, was performed to assess the extent of buttressing required at cross-section M to increase the FOS to a minimum of 1.5.
  - All cross-sections met the minimum recommended FOS of 1.1 for the pseudo static condition with a minimum modeled FOS of 1.3.
  - Cross-sections K, M, and N met the minimum recommended FOS of 1.2 for the flood pool condition.
- North No.2
  - The minimum recommended FOS of 1.5 was met for the static loading condition for both the normal and flood pool water elevations for cross-sections C and E.
  - The minimum recommended FOS of 1.1 for the pseudo static loading condition was achieved based on the normal pool water elevation for cross-sections C and E.
  - Failure surfaces similar in extent to those for the normal pool water elevation have comparable factor of safety indicating that there is not a significant difference in the stability of the dam based on a normal or flood pool water elevation.

5.3.2.2 Future Conditions

Modeling was completed to evaluate the stability of the TDFs required to support the deposition of new tailings and the results are presented in Appendix J. With respect to the future planned modifications of NP1 and NP2, the seepage and stability modeling were conducted to evaluate the future stability of:

- The new tailings containment berm along the south side of NP1 (refer to Appendix H).

- Stability of Section M with the addition of a downstream buttress and crops-section K with a higher reclaim pond level.
- Stability of NP2 based on a 5-foot embankment raise. Note this scenario was only modeled to provide a sensitivity of FOS to increased embankment height in NP2. The current deposition design indicates that the probability having to raise the NP2 embankment to contain life-of-mine tailings is very low.

The calculated FOS for the future conditions is presented in Table 5-6.

Table 5-6 – Summary of Future Conditions Slope Stability Factors of Safety

Cross-Section/Location	SCENARIO				Calculated Minimum Factor of Safety[1/]	Recommended Factor of Safety
	Dam Face	Pore Water Conditions	Stress Conditions Evaluated	Horizontal Seismic Coefficient (%g)		
NP 1 Normal Pool						
Southern Containment Embankment	Downstream	Steady-State	Effective	-	2.0	1.5
	Downstream	Steady-State	Total	0.034	1.9	1.1
K	Downstream	Steady-State	Effective	-	1.5	1.5
	Downstream	Steady-State	Total	0.034	1.5	1.1
M (buttressed)	Downstream	Steady-State	Effective	-	1.7	1.5
	Downstream	Steady-State	Total	0.034	1.5	1.1
NP 1 Flood Pool						
K	Downstream	Steady-State	Effective	-	1.4	1.2
M (buttressed)	Downstream	Steady-State	Effective	-	1.6	1.2
NP 2 Normal Pool						
C (with 5-meter embankment raise)	Downstream	Steady-State	Effective	-	2.0	1.5
	Downstream	Steady-State	Total	0.034	2.0	1.1
NP2 Flood Pool						
C (with 5-meter embankment raise)	Downstream	Steady-State	Effective	-	1.9	1.2

Notes:
[1/] BOLD and *ITALICIZED* indicates calculated factor of safety does not meet minimum recommended factor of safety.

The stability results presented in Table 5-6 indicate the following regarding the future conditions of NP 1 and NP 2:

- North No.1
  - The minimum recommended FOS of 1.5 for the static loading condition under normal pool conditions was achieved for cross-section M when a buttress is included at the toe of the existing embankment, which increased the FOS to 1.7.
  - The minimum recommended FOS of 1.5 for the static loading condition under normal pool conditions was achieved for cross-section K based on a higher reclaim pond water elevation.
  - All cross-sections met the minimum recommended FOS of 1.1 for the pseudo static condition.
  - Cross-sections K and M met the minimum FOS for the flood pool elevation during steady state static loading.
  - The proposed South Containment Embankment meets the minimum required factor of safety for both the steady state seepage static and pseudo static loading conditions.

- North No.2
  - The minimum recommended FOS of 1.5 was met for the static loading condition for the normal pool water elevations for cross-sections C.
  - The minimum recommended FOS of 1.1 for the pseudo static loading condition was achieved based on the normal pool water elevation for cross-section C.
  - The minimum recommended FOS of 1.2 was met for the static loading condition for the flood pool water elevation for cross-sections C.

5.4 Seepage and Stability Conclusions

The seepage and stability results showed that the NP1 and NP2 embankments are stable under the future loading conditions and the probability of seepage induced internal erosion resulting in a piping failure of the embankment is within acceptable FOS. Cross-section M of NP1 had a modeled FOS of 1.3 for the future condition below the recommended minimum (1.5) for both the normal and flood pool conditions. As such, buttressing of this area is recommended to bring the factor of safety up to the required minimum of 1.5.

5.5 Seismic Impact Analysis

Due to all modeled FOSs being greater than the recommended minimum FOS of 1.1 for the pseudo static loading condition as well as low probability of liquefaction, a seismic impact analysis is not warranted.

5.6 Subsidence Impact Evaluation

A subsidence impact evaluation was conducted to evaluate the potential impacts to surface infrastructure from bedrock subsidence due to the future White Pine North underground mine workings including:

- TDFs
- Neighboring offsite building foundations.
- Groundwater wells.

The evaluation presented in Appendix L concluded that the conservative maximum estimated bedrock subsidence of 2 cm (0.78 in) will not have a measurable impact on surface infrastructure.

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APPENDIX A:
1998 Golder Geotechnical Report

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GEOTECHNICAL SITE CHARACTERIZATION REPORT
COPPER RANGE COMPANY'S
WHITE PINE MINE TAILINGS IMPOUNDMENTS
WHITE PINE, MICHIGAN

Prepared for:

Copper Range Company
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1.0 INTRODUCTION

This report summarizes the information collected during the field and laboratory investigations and the subsequent data interpretations. Conclusions are made that define a model for the physical behavior of the impounded tailings and the embankment fill material in the dams. The results will be used in the subsequent analysis and design for the closure of the tailings impoundments.

Topographic elevations are reported in terms of the mine's local datum in this report. The local datum can be converted to "above mean sea level" values using the following relationship:

Local elevation - 4396.44 = USGS elevation (amsl)

Plan coordinates are reported using the mine's local grid system.

1.1 Background

The history of tailings deposition at the White Pine Mine begins with the construction of what is now referred to as North #1 Dam (see Figure 1), thereby forming the North #1 Tailings Impoundment (North Pond #1). The dam was constructed and raised in phases beginning before 1955. It is a compacted clay dam constructed using native soils excavated from various borrow areas in the footprint of what later became the North #2 Tailings Impoundment (North Pond #2) and adjoining areas. Tailings deposition in North Pond #1 took place from 1955 to 1970.

In 1967, construction began on North #2 Dam thereby forming the North #2 Tailings Impoundment (North Pond #2). This dam was designed to hold 270 million tons of tailings over a life of approximately 20 years. This dam was designed to have impervious outer

shells of compacted clay on both the upstream and downstream outslopes with a cycloned sand central core. The construction was to be done in phases with sequential downstream raises. The planned cross section is shown in Figure 2. Raises continued until 1977 when dam construction was halted at a crest elevation of 5196 feet. No further construction was conducted until 1991 when a 1030-ft. section of dam extension was built on the west leg at the south end to elevation 5195. In 1992 the dam elevation was raised to elevation 5198 in most areas and in 1994 a 500-ft. section was repaired due to erosion. The dam height varies from zero to approximately 60 feet and is approximately 30,000 feet long. Tailings deposition began in 1970 and continued until 1993 when deposition was initiated in the South Tailings Impoundment (South Pond). The total amount of tailings deposited in North #2 Pond is approximately 91.6 million tons.

The South Pond was formed behind the South Dam, constructed in a similar manner to North #1 Dam and constructed between 1958 and 1962. The South Pond is a four-sided structure in plan view with the west, north, and east legs consisting of compacted clay dams. The South leg is an abandoned railroad grade constructed of a material expected to be the native clay soils. The borrow source for the clay came from the sub-excavation of the South Impoundment footprint. Tailings deposition in the South Pond started in 1994 and ended in 1995 an totaled approximately 4.8 million tons.

1.2 Scope of Work

The scope of work for this part of the project involved the review of available information from previous geotechnical investigations, a new field and laboratory geotechnical program, and analysis of the combined database. The review of available information involved summarizing the geotechnical data previously collected and developing a conceptual model for the facility. The conceptual model was then used to find gaps in the existing data and allowed Golder to tailor the field and laboratory investigation program to fill in the gaps in the database. The field investigation employed a comprehensive

geotechnical investigation using cone penetrometer testing, geotechnical borings, and piezometer construction. This report includes a description of the investigation program, a summary of the data and interpretations, and conclusions.

1.3 Material Properties

Two previous reports provided information concerning material properties used in stability analysis for both North #2 Dam and the South Dam. The information concerning North #2 Dam was found in the report titled "Supplementary Design Analysis for Tailings Dam" by Bechtel Corporation, dated May 1968. In this report, Bechtel performed a stability analysis based on soil properties determined from laboratory testing of samples taken during a field investigation for the expansion. The strength parameters for the foundation soils were determined from triaxial tests run on the "better quality undisturbed" samples using a Pitcher sampler. The triaxial tests for the impervious fill were run slowly to model consolidated-drained conditions. The test results are shown below:

Description	Moist Unit Wt. (pcf)	Sat. Unit Wt. (pcf)	ϕ' (deg.)	c' (psf)
Foundation Soil	-	144	28	800
Impervious Borrow	133	137	25	400
Cycloned Sands	110	120	32	0
Slimes	-	70	0	0

An evaluation of the South Dam was performed in 1992 prior to the start of tailings deposition. This work is described in the October 1992 STS report titled "South Pond Evaluation." As described in this report, a field and laboratory investigation was performed to evaluate material properties and dam stability. The material properties used in this analysis as determined from laboratory testing are as follows:

Description	Moist Unit Wt. (pcf)	Sat. Unit Wt. (pcf)	c (psf)	ϕ (deg.)	c' (psf)	ϕ' (deg.)
Natural Clay	130	135	2880	10.5	0	35
Dike Fill	130	135	2880	10.5	0	35
Tailings	105	130	0	30	0	35
Toe Berm (Slag)	115	130	0	33	0	33

2.0 FIELD INVESTIGATION

The field investigation was conducted between the dates of September 25, and October 18, 1997 and included two phases. The first phase focused on the tailings while the second phase investigated the embankments. Phase one included cone penetration testing (CPT), standpipe piezometer construction and in situ sampling of the tailings in the North #1, North #2, and South Impoundments. The second phase included geotechnical drilling, standpipe piezometer construction and sampling of the embankment fill and foundation materials at the North #1 and North #2 Dams. Twenty CPT soundings were made of which spectral analysis of surface waves (SASW or seismic) data was collected from four soundings, and eight were completed as standpipe piezometers. A total of 47 tailings samples were taken at the tailings surface, or at various depths at the CPT testing locations. Nine geotechnical borings were drilled and 11 standpipe piezometers were installed to evaluate the groundwater conditions in the embankment fill materials and the foundation materials beneath the embankment. The CPT and geotechnical boring locations are shown on Figure 1. The plan coordinates of the sampling locations were established using a site specific coordinate system developed by Copper Range Company (CRC) and tied to the Universal Transverse Mercator (UTM) Coordinate System. The CPT and boring coordinates were established by Golder and located using a global positioning system (GPS). These coordinates were converted to the local grid system by direct surveying of several CPT locations after the completion of the investigation. This work was performed by a licensed land surveyor, Mr. Earl Applekamp of White Pine, Michigan.

2.1 Cone Penetrometer Operations

The CPT work was performed by ConeTec Inc. of Salt Lake City, Utah,, with field oversight provided by a Golder engineer. Testing in all but two locations was performed using a 25-ton, track-mounted vehicle (see Figure 8). The track-mounted vehicle is designed especially for applications where accessibility is limited due to very soft soils.

The rig is mounted on a Nodwell 100 tracked-carrier and exerts approximately three pounds per square inch (psi) of ground pressure. The rig has a fully enclosed work area that houses the computer controlled data collection equipment and pushing ram (see Figures 8 and 9). For sites CPT-20 and CPT-21, located over water within the tailings pool area, a small barge supplied by (CRC) was modified to accommodate a portable hydraulic pushing ram (see Figure 10).

2.1.1 Penetration Testing

Penetration testing is carried out using a 5-ton compression "seismic cone penetrometer." This device screws onto the end of high-carbon steel drilling rods and contains electronic equipment that can measure the tip resistance to penetration, side friction of the soil on the cone, and pore pressure within the surrounding soil strata. This information is transmitted to a computer in the drill rig via cable running through the center of the drill rods. The measured values of tip resistance, sleeve friction, and pore pressures are then used to make estimates of soil parameters based on correlation's produced from research. The soil parameters that were interpreted for this project were undrained strength, effective friction angle, in situ pore pressures, and material classification. A total of 688 feet of CPT testing was performed. Interpretation of this data is addressed in Section 4.1 and the complete report from ConeTec is provided in Appendix A.

2.1.2 Dissipation Testing

In an effort to establish the static pore pressure in situ, dissipation testing was performed at selected intervals throughout the cone penetration testing. During the advancement of the cone through the soil, a change in pore pressures is produced as the cone shears the soil. In order to determine the location of the static water table in the formation, the cone penetration is stopped and the pore pressures are allowed to return to their static values. Depending on the soil type, either positive or negative pore pressures will be induced

during penetration. As the pore pressure is allowed to equalize, an incremental time and pressure is recorded and is used in the analysis to estimate permeability and soil type. A total of 11.4 hours of dissipation testing was performed.

2.1.3 Spectral Analysis of Surface Waves

At four locations, (CPT-7, CPT-10, CPT-15, and CPT-21) measurements of the shear wave velocity were made at 3.28-ft. intervals for a total of 160 feet. The testing procedure involved inducing a shear wave at the surface and then measuring the time for the wave to reach a given depth where the cone was located. The cone was equipped with a "geo-phone" which senses a wave propagating through the soil material. The shear wave is produced by horizontally striking a steel bar placed under the CPT rig which is partially embedded in the ground (see Figure 9). A triggering mechanism on the hammer used to deliver the blow to the bar allows the computer to calculate the time it takes for the wave to travel from the point of generation to the receiver in the cone. From this, a calculation can be performed knowing the depth of penetration and the travel time of the wave, thus producing a shear wave velocity. Several correlation's are based on the shear wave velocity, including liquefaction potential and ground stiffness.

2.1.4 Standpipe Piezometer Installation

In order to monitor the static pore pressures in the future, eight standpipe piezometers were installed adjacent to the CPT holes (see Figure 1). The piezometers consist of a porous plastic filter threaded on PVC pipe. The tip is advanced with a pushing shoe and steel rods. Once the porous filter is at the desired depth, the pushing shoe and steel rods are retracted, leaving the filter and PVC pipe in place.

2.1.5 Sampling Methods

Two methods were used to recover samples for index and engineering properties testing. Twenty surface samples were collected adjacent to CPT locations by excavation through the crust of the tailings with a hand shovel. Approximately 1,000 grams of material were collected at each location and double-sealed in plastic bags.

Twenty-seven samples were taken at varying depths in the tailings. These samples were recovered from a hole pushed adjacent to the CPT hole using a push-in soil sampler. The sampler consists of a steel point with a retractable tip. The point is pushed to the desired sampling depth, and the tip is retracted by pulling up on the rods. Once the tip is retracted, it locks in place, and the rods are advanced, forcing soil into the sampler. Four samples were recovered in stainless steel liners located inside the sampler. The liners were capped and placed in sealed plastic bags. The remaining samples were extruded from the sampler and double-sealed in plastic bags.

A series of laboratory tests were prescribed for the samples. The details and results of the testing program are discussed in Section 3.0.

2.1.6 Water Table Elevations within the Tailings

Water table elevations were estimated by subtracting the measured depth of water table from the ground surface elevation. The depth to the water table was estimated using information from one of the following:

- Dissipation testing
- Piezometer well readings
- Dynamic pore pressure readings during cone penetration testing

The water table in the tailings was measured or calculated to be between 9 feet above to 5 feet below the ground surface. The water table elevations are presented in Table 1.

2.2 Drilling Operations

The drilling work for the investigation of the embankments was performed by Coleman Engineering Company of Iron Mountain, Michigan, with field oversight provided by a Golder engineer. The drill rig used was a rubber tired Diedrich D-120. (see Figure 3) The drill rig used 8-in. hollow-stem augers and samples were collected at 5-ft. intervals by driving a 2-in. outside diameter, split spoon sampler. All soil borings were either backfilled with grout and bentonite to the surface or completed as standpipe piezometers. A total of nine borings were completed for a total of 574.5 feet of drilling. The boring locations are shown on Figure 1.

2.2.1 Drilling Methods

The borings were drilled with 8-in. hollow-stem augers. The augers were in 5-ft. flights and were advanced by rotating the spindle and applying a downward force delivered by the drill rig. Samples of the embankment materials were retrieved at approximately 5-ft. increments. The sampling method consisted driving a 2-in. outside diameter by 1.5-ft. long split spoon by dropping a 140 pound hammer falling 30 inches. Typical samples are shown on Figure 4. The sampler was driven 18 inches noting the number of blows per 6 inches. This sampling method is referred to as the standard penetration testing. The blow count values are recorded on the boring logs. No undisturbed samples were taken.

Each sample was identified in the field according to Universal Soil Classification System (USCS) and then packaged for transportation and testing. The boring logs are shown in Appendix B. Rock coring was performed at only one location. This was performed using a rotary wash method with clean water as the drilling fluid. An example of the core samples are shown in Figure 5. A total of 3 feet of coring was performed.

2.2.2 Standpipe Piezometer Construction

A total of 11 standpipe piezometers at five boring locations were completed with the intent to define piezometric surfaces in both the embankment and the foundation materials (see Figure 6). The procedure for the completion of the piezometers used the auger flights as a tremie pipe, allowing backfilling from the bottom up to the surface. At the completion of drilling the bore hole, the center rods of the drill were removed and a 2-in. diameter PVC schedule 40 flush threaded casing with a variable length of 0.010-in. slotted screen PVC casing was inserted through the auger flights. Next, sand was poured down the auger flights to serve as the filter pack, while the level of the sand inside the auger flights was observed using a weighted tape measure. As the level of the sand rose in the augers, the augers were retracted out of the ground. This allowed the sand to fall out of augers and created a sand annulus around the casing. This procedure was continued until the level of the sand was above the top of the screened casing. Using this same tremie method, bentonite chips were placed on top of the sand pack to form a seal at the top of the sand. The bentonite chips were then hydrated with clean water and the remaining section of the annulus was then grouted to the surface. The well construction summaries for each of the piezometers can be found in Appendix C.

2.2.3 Sample Preservation

To minimize any changes in the physical properties of the samples, the samples from the split spoons were sealed in "Ziplock" plastic bags or 5 gallon plastic buckets for transport.

The samples were then shipped by air cargo to Golder's Denver Soils Laboratory for testing.

2.2.4 Water Table Elevations within the Embankment and Foundation Materials

Water table elevations were calculated by subtracting the measured depth to the water table from the ground surface elevation. Because water was used during the drilling process, the water was bailed from the hole and allowed to equilibrate before final water levels were measured. A summary of water table elevations is shown in Table 2.

3.0 LABORATORY TESTING

Laboratory testing was conducted to determine the index, strength, settling, and compression and strength properties of the tailings and embankment material. The specific tests that were performed are listed below:

- Natural Moisture Content (ASTM D 2216)
- Soil Classification (ASTM D 2488)
- Specific Gravity of Soils (ASTM D 854)
- Atterberg Limits (ASTM D 4318)
- Grain Size Distribution with Hydrometer (ASTM D 422)
- Laboratory Compaction Characteristics of Soil (ASTM D 698)
- Laboratory Miniature Vane Shear Test for Saturated Fine-Grained Soil (ASTM D 4748)
- Permeability of Fine-Grained Soils (ASTM D 5084)
- Consolidated-Undrained Triaxial Compression (ASTM D 4767)
- Slurry Consolidation Properties Using a Rigid Wall Consolidometer
- Sedimentation Testing of Reconstituted Fine-Grained Soils

The test results are presented in summary form in Appendix D and are discussed in the following sections.

3.1 Tailings Testing Results

The materials contained in the tailings can be roughly grouped into two categories, sands and slimes. The sands are basically medium-to-fine uniform sands with varying amounts of

silt-to-clay sized fines. The slimes are a low plasticity silty-clay to clayey-silt, and contain trace to little amounts of fine sands.

All of the raw laboratory data discussed in this section of the report can be found in Appendix D.1, Sections 1 through 5.

3.1.1 Index Properties

The plasticity index (PI) for the samples ranged from non-plastic (NP) to low plasticity material. The natural moisture content ranged from 154.2 percent to 8.0 percent water by weight, with the average moisture content at 32.2 percent. There were a total of 47 moisture content measurements made on the tailings samples.

Grain size analyses from the tailings samples showed that the tailings can be grouped into two general types of materials, sands and fine-grained silts and clays. A total of 43 grain size analyses were performed. Twelve tests were performed on only the material larger than the #200 sieve, and 31 were performed including use of the hydrometer to determine the relative proportions of silt and clay-sized particles. All of the of the tailings samples were found to consist solely of materials finer than the #4 sieve (the separation point between sand and gravels). The average percent passing the #200 sieve (the separation point between sand and silts) was 67.8 percent. The materials that had less than 50 percent passing the #200 sieve; i.e., relatively coarse grained material, were classified as poorly graded medium to fine sands to silty sand, with the fine sand portion predominating.

A total of 29 specific gravity tests were performed on the in situ tailings samples. The results ranged from 2.74 to 2.81 times the unit weight of water, with the average value equal to 2.74.

Unit weight measurements were performed to determine the in situ state of the tailings. Two methods were used to obtain bulk unit weight measurements from the tailings samples. The two methods were used because of possible disturbance to the samples during shipping. The first method assumed the material in the tube occupied the entire volume, while the second used a measured height of the sample as found after shipping. The first method calculated dry density ranging from 74.1 pounds per cubic foot (pcf) to 86.1 pcf with an average value of 77.2 pcf. The second method calculated dry density ranging from 93.8 pcf to 100.3 pcf with an average value of 90.7 pcf. Determinations of wet unit weight were also made and ranged for the first method from 97.2 pcf to 112.3 pcf with an average value of 104.2 pcf. The second method calculated wet density ranging from 113.8 pcf to 130.8 pcf with an average value of 122.4 pcf

Based on the results of the slurry consolidation testing, the measured density for this sample best corresponds with the average value from method 1. Therefore, further analysis will use a wet density of 104.2 pcf and a dry density of 77.2 pcf.

The raw laboratory data are presented in Appendix D.1.1.

3.1.2 Strength Properties

Strength testing was carried out on two remolded samples taken from the tailings samples. The two samples tested were from CPT-13 and CPT-17. The sample from CPT-13 was predominantly sand, and the sample from CPT-17 was predominantly slimes. Both of the samples were tested using a staged consolidated, undrained procedure with the measurement of excess pore pressures during shearing. The method produced effective and total stress results for subsequent interpretation.

Each of the samples was remolded to a specified density and placed into the triaxial testing apparatus. A seating pressure of three pounds per square inch (psi) was then applied. The

cell and back pressure were then incrementally increased to a level of 53 psi in the cell, and 50 psi backpressure. The sample was allowed to saturate for a period of time which varied for each specimen. Next, a "B" check was performed to determine the percent saturation of the specimen. A "B" check is a procedure where the drainage ports into and out of the sample are closed and the confining pressure is increased by 10 psi. The pore pressure response in the sample is measured and compared to the increase in cell pressure. If a sample is completely saturated, the pressure response in the sample should equal that of the increase cell pressure. The percent saturation is taken as the increase in the pore pressure divided by the increase in cell pressure. All samples tested were essentially fully saturated. The cell pressure was then increased to a predetermined consolidation value calculated to be the depth multiplied by the bulk unit weight of the soil. Each sample's consolidation pressure was different based on a different level of stress. A volume change versus time of the sample was made to determine when all of the excess pore pressures had dissipated and the primary consolidation process was complete. Based on the time rate of consolidation, a calculation was made to determine the appropriate strain rate. The samples were then sheared to failure and measurements of principle stress difference, strain, and excess pore water pressure obtained.

Analysis of the data involved the development of two failure envelopes. The effective friction angle determined from this testing showed a value 38 degrees for the sands and 35 degrees for the slimes. The raw laboratory data is presented in Appendix D.1.2. The test results and the interpretation method used to develop the failure envelope are discussed in Section 4.2.

Test results are presented in Appendix D.1.2.

3.1.3 Sedimentation Testing

Three tests were conducted to determine initial settled densities and the rate at which the tailings material would consolidate under its self-weight. These tests are referred to as sedimentation tests. From these tests, a void ratio or density-versus-time relationship can be determined. The height of solids is measured from the water/solids interface that develops that the top of the column. The water that collects at the top of the column is referred to as the supernatant. For these tests, the supernatant was found to be perfectly clear indicating very little colloidal material content in the tailings.

Three separate samples CPT-13, 0-1 feet, CPT-17, 0-1 feet, and CPT-21, 7-8 feet were reconstituted and tested. The index properties are shown in Appendix D.1.1, Table 1. The samples were mechanically mixed with water to varying solids contents. A portion of the material was then poured in sedimentation chambers that were made out of clear Lucite tubes with a drainage port in the bottom. Above the drainage port, filter paper/fabric was used to separate the solids from the liquids during draining.

Two sedimentation tests were performed on each material, one being undrained, and the second being drained. The definition of a undrained test was that the drainage port on the bottom of the chamber was kept closed and the solids settled out of solution under constant volume conditions. In the drained system, the water contained in the solution was allowed to drain out through the port on the bottom of the chamber. The water from the drained samples was collected and weighed to calculate the void ratio and density. The undrained method is meant to simulate subaqeous deposition in an impoundment that has no underdrain collection system, while the drained system simulates subaerial deposition in an impoundment with a working underdrain.

The sedimentation curves are shown in Appendix D.1.3. Samples CPT-17 and CPT-21 are both predominately slimes material, while CPT-13 is predominantly sands. It can be seen

from the figures of CPT-17 and CPT-21 (slimes) that if the samples are allowed to drain, not only does the densification occur in a shorter period of time, but the overall magnitude of densification is increased. The behavior is different for CPT-13 (sands) were we see even though the initial percent solids was different, the net gain in density is essentially the same for either drainage case. For the undrained case in the slimes, (CPT-17 and CPT-21) the increase in dry density from slurry to final steady state conditions ranged from 10.8 to 14.1 pcf. For the undrained case in the sand, (CPT-13) the increase in dry density from slurry to final steady state conditions was 12.0 pcf. For the drained case in the slimes, (CPT-17 and CPT-21) the increase in dry density from slurry to final steady state conditions ranged from 24.7 to 28.8 pcf. For the drained case in the sand, (CPT-13) the increase in dry density from slurry to final steady state conditions was 12.8 pcf.

3.1.4 Slurry Consolidation Testing

Three tests were completed on reconstituted samples collected during the field investigation to examine the consolidation properties and the dependency of permeability on void ratio. The procedure of consolidating a sample from a very high void ratio to much lower void ratio simulates "the life" of a unit of tailings as material is continued to be deposited over it. The compressibility and permeability is measured and can be used to predict how the tailings will behave. The test results are presented in Appendix D.1.4.

The equipment used to perform the consolidation is the Trautwein Slurry Consolidometer. This device is a stainless steel rigid wall cell that has a movable platen at the top of the sample. The load is applied to the top platen by means of water pressure. This allows for constant and accurate loads to be induced on the sample. The change in height of the sample is measured by a change in volume of the water in a burette that is supplying the sample load. The change in volume is directly proportional to the change in height by a the value of the area of the cell. Verification of the sample height is made upon completion of

the test and any adjustments are made when reducing the data. Drainage can occur out of either end of the sample through porous stones.

Permeability measurements were performed using the Trautwein Permometer. This device uses an mercury manometer to drive a closed circuit of water through the sample. The test conditions are a falling head permeability, rising tail situation. Because the Permometer uses a closed circuit of water, constant volume conditions exist, and therefore, testing times are on the order of minutes, rather than days as with the traditional methods where constant flow must be reached before the test is finished.

The testing procedures consist of assembling the cell base and bottom ring of the cell. The bottom porous stone is saturated along with the drain and fill lines. Next, a known mass of slurry is poured into the assembled bottom portion of the cell. The saturated top porous stone is placed on top of the slurry and an initial height is taken. The top portion of the cell is then assembled and the sliding piston/platen is pushed down until contact is made with the top porous stone and the remaining volume above the piston is then filled with water. The top cap of the cell is then placed on the cell and the tie down rods tightened into place. Drain and fill lines are now connected to the port valves at the head and tail of the sample and at the cell to the control panel. The lines are then bled of any air. Once it can be assured that the lines are clear of air, a seating backpressure is applied to the sample and the piston of ten pounds per square inch (psi). The system is now checked for leaks and is ready for the application of the first load increment.

A load increment ratio of one i.e., the doubling of the load at each application, was used as a standard. The loads were 2, 4, 8, 16, 32, and 64, and 90 psi. A full doubling of the last load was not possible due to the system limitations of the equipment and the supplied air pressure. The load increment duration varied due to the changing time to reach primary consolidation, but was approximately 24 hours.

The application of the load is done by adjusting the pressure on a burette to the desired value with the valves to the piston chamber closed. After noting the initial level of the burette, the valve is opened and the new stress is applied to the piston. Readings are made of both the volume of water in the piston chamber and the pore pressure at the tail of the sample at .1, .25, .5, .75, 1, 2, 4, ... minutes. This device allows us to quantify precisely when the end of primary consolidation occurs and is a single drainage system. As mentioned before, primary consolidation is over when the induced pore pressures caused by the application of the load increment have dissipated back to the original backpressure value. By using this information, values of secondary compression or creep are able to be obtained.

After the consolidation increment has been finished, the sample can then be permeated. By knowing the new sample height, the manometer in the Permometer is displaced by the appropriate amount based on a set gradient, and the sample is tested. Results are taken in increments of millimeters which are the smallest division on the Permometer. The test is stopped when steady state conditions are achieved.

This procedure is repeated for the desired number of load increments.

From the testing, results were obtained for classical consolidation parameters and void ratio versus permeability. The averaged results of the consolidation parameters are presented below. The graphical results for the consolidation properties are shown in Appendix D.1.4.

Sample Number	Depth (ft)	Compression Index, C_c	Coefficient of Consolidation, C_v cm^2/sec	Secondary Compression Index, C_α
CPT-13	0 to 1	0.14	2.8×10^{-1}	0.01
CPT-17	0 to 1	0.45	4.7×10^{-5}	0.03
CPT-21	7 to 8	0.25	1.2×10^{-4}	0.02

For CPT-17, the permeability varied from 7.7 x 10^{-7} cm/sec at a void ratio of 1.54 to 8.2 x 10^{-8} cm/sec at a void ratio of 0.85. For CPT-13, the permeability of the sample for all void ratios was greater than the measuring capability of the system which is 1.0 x 10^{-4} cm/sec. For CPT-21, the permeability varied from 6.2 x 10^{-7} cm/sec at a void ratio of 1.25 to 9.8 x 10^{-8} cm/sec at a void ratio of 0.83. The graphical results for the void ratio versus permeability are shown in Appendix D.1.4

3.1.5 Laboratory Shear Vane Testing

Laboratory shear vane testing was performed as a means to correlate a known shear strength to a specific soil type with the intent to validate the undrained shear strength values calculated from the CPT testing. The measured undrained shear strength determined from this testing will also be used as a comparison to the triaxial strength testing to be performed. The samples tested were both reconsolidated samples from CPT-17, 0-1 feet. The test results are presented in Appendix D.1.5

The samples tested were reconsolidated samples from CPT-17, 0-1 feet that had been used in the slurry consolidation testing. As discussed in Section 3.1.4, the samples were reconstituted bulk samples that were consolidated to known stresses using the slurry consolidometer. This method best reproduces the natural process of sedimentation and consolidation due to self weight and deposition of subsequent material over previously deposited tailings. Theory states that the undrained strength of a cohesive material will be in part dependent on the void ratio when sheared. By reconsolidating the material to known states of stress and then shearing the sample, we can relate this measured value of strength to similar materials at similar depths in the impoundment. The effective consolidation pressures used on the two samples were 8 psi and 90 psi. This corresponds to depths of approximately 27.5 and 310 feet below ground surface in the tailings. The second depth is far greater than any actual tailings depths at the site. However, it was the

last consolidation pressure used for the slurry consolidation testing and was therefore, a readily available data collection point.

The test consists consolidating a sample to a given stress and then disassembling the consolidation apparatus and exposing the sample. With the sample exposed but still in the consolidometer, a vane measuring 12.5 mm in diameter and is 12.5 mm in height is inserted into the sample. The vane is then rotated and the torque needed to cause displacement is then measured. Three points of rotation are measured; peak, residual and remolded. These points are the maximum strength, the immediate post failure strength, and the large displacement strength. The shearing is done rapidly enough to simulate undrained conditions. The procedure was repeated a total of three times per sample.

Calculations are then made to determine what the undrained shear strength of the material corresponding to the maximum, residual, and remolded strengths are. The averaged undrained shear strength of the tailings at the different effective consolidation pressures are shown below:

Consolidation Pressure (psi)	Peak Strength (psf)	Residual Strength (psf)	Strength (psf)
8	351.4	211.1	51.5
90	2005.5	1033.4	726.4

The raw laboratory data can be found in Appendix D.1.5. The specific results along with the analysis involved the development of the undrained strength versus depth are discussed in Section 4.2.1.

3.2 Embankment Testing Results

The materials found during exploration of the embankment can be grouped into three categories, cycloned sands, compacted clay, and natural materials. The cycloned sands are basically medium-to-fine uniform sands with low, but varying amounts of silt-to-clay sized fines. The compacted clay and native clays are a low plasticity silty-clay to silt, and contain varying amounts of coarse to fine sands. All of the raw laboratory data discussed in Section 3.2 can be found in Appendices D.2.1, D.2.2 and D.2.3.

3.2.1 Index Properties

The plasticity index (PI) for the samples ranged from non-plastic (NP) to low plasticity material. The natural moisture content ranged from 27.8 percent to 5.1 percent water by weight, with the average moisture content at 12.1 percent. There were a total of 29 moisture contents measurements made on the samples. The moisture contents for the cycloned sand material averaged 7.6 percent, the compacted clay averaged 13.2 percent, and the native clays average 14.8 percent.

A total of 11 grain size analyses were performed. Two tests on the cycloned sands, five on the compacted clay, and four on the native material. Out of the eleven samples tested, 6 were performed including use of the hydrometer to determine the relative proportions of silt and clay-sized particles. The cycloned sands were found to have 100 percent passing the #4 sieve (i.e., the separation point between sand and gravels), while the average percent passing the #200 sieve was 33.0 percent. The compacted clays were found to have between 91 and 98 percent passing the #4 sieve, while the average percent passing the #200 sieve was 67.0 percent. The clayey native material was found to have between 99 and 100 percent passing the #4 sieve, while the average percent passing the #200 sieve was 73.0 percent. The one sandy native material sample tested had 8 percent coarse to fine gravel and 38.0 percent passing the #200 sieve.

A total of seven specific gravity tests were performed on the embankment samples. The average for the cycloned sands was 2.81, for the compacted clay 2.68, and for the native material 2.70 times the weight of water.

Three standard Proctor (ASTM D-698) compaction tests were run on bulk samples of the embankment material. The cycloned sands had a maximum dry density of 92.5 pcf at an optimum moisture content of 12.0 percent, while the two compacted clay samples had maximum dry densities of 127.5 and 120.5 pcf at an optimum moisture contents of 9.5 and 12.0 percent.

The test results are presented in Appendix D.2.1.

3.2.2 Strength Properties

Strength testing was carried out on two remolded sets of samples taken from the embankment samples. One of the samples is of the compacted clay material while the second is from the cylconed sands. The clay sample was tested using a consolidated, undrained procedure with the measurement of excess pore pressures during shearing. The sample of the cycloned sands was tested using a staged consolidated, undrained procedure with the measurement of excess pore pressures during shearing. Both methods produce effective and total stress results for subsequent interpretation.

Each of the compacted clay samples was remolded to a specified density and placed into the triaxial testing apparatus. A seating pressure of three pounds per square inch (psi) was then applied. The cell and back pressure were then incrementally increased to a level of 53 psi in the cell, and 50 psi backpressure. The sample was allowed to saturate for a period of time which varied for each specimen. Next, a "B" check was performed to determine the percent saturation of the specimen. All samples tested as essentially fully saturated. The cell pressure was then increased to a predetermined consolidation value

calculated to be the depth multiplied by the bulk unit weight of the soil. Each sample's consolidation pressure was different based on a different level of stress. A volume change versus time of the sample was made to determine when all of the excess pore pressures had dissipated and the primary consolidation process was complete. Based on the time rate of consolidation, a calculation was made to determine the appropriate strain rate. The samples were then sheared to failure and measurements of principle stress difference, strain, and excess pore water pressure were obtained.

Analysis of the data involved the development of a failure envelope. The effective friction angle determined from this testing showed a value of 26.7 degrees and 490 psf cohesion. The raw laboratory data can be found in Appendix D.2.2 The test results and the interpretation method used to develop the failure envelope are discussed in Section 4.2.

The procedures for development of the cycloned sand failure envelope are the same as for the clay samples, differing only in the testing method. For this test, one sample was used for all three consolidation stresses. The sample is consolidated to the lowest stress and then sheared until the shear stress begins to peak. This is typically between 2 and 4 percent strain. At that point, the shearing process is stopped and the sample consolidated to the next stress level and the procedure repeated.

The analysis of the data involved the development of a single failure envelope. The effective friction angle determined from this testing produced a value of 36 degrees. The raw laboratory data is presented in Appendix D.2.2. The test results and the interpretation method used to develop the failure envelope are discussed in Section 4.2.

3.2.3 Permeability Testing

Three flexible wall permeability tests were performed on samples taken from the embankment material; two on the compacted clay and one on the cycloned sands. The procedure involved remolding the samples to 95 percent of the maximum dry density at the

optimum moisture content and then permeating the samples using a flexible wall permeameter. The samples were tested using an effective confining pressure of 30 psi. This corresponds to a depth below the ground surface of approximately 35 feet. Upon completion of the backpressure/saturation phase, the samples were permeated using a flow pump. The compacted clay samples had a permeability of 1.3×10^{-6} cm/sec while the permeability of the cycloned sand was greater than the measuring capability of the system which is 5.5×10^{-4} cm/sec. The second compacted clay sample was permeated between stages of the triaxial testing and produced a permeability value of 1.6×10^{-8} cm/sec. The laboratory data is summarized in Table 2 of Appendix D.2.3.

4.0 DATA INTERPRETATION

4.1 Cone Penetrometer Testing Interpretation

4.1.1 Revised Interpretation of Undrained Shear Strength

A Field Report was provided by ConeTec following completion of the cone penetration testing (CPT) program conducted at Copper Range Company's White Pine tailings facility. This report contained raw data consisting of tip resistance, sleeve friction and dynamic pore pressure collected at 5-cm depth increments. In addition to the raw data, estimates of several additional soil parameters were provided based on interpretation methods presented in the report. Of particular interest on this project is the interpretation of undrained shear strength, as this parameter will be used as input for stability models associated with the design phase of this project.

The undrained shear strengths presented in ConeTec's interpreted CPT logs are based on the following equations:

$$S_u = \frac{Qc - \sigma_v}{Nk};$$

where:

Qc = uncorrected tip resistance;
σ_v = total overburden stress (depth * soil unit weight); and
Nk = cone factor.

For ConeTec's interpretation of the data, the average unit weight of the tailings in the field was assumed based on typical values for the inferred soil type, which ranged from 79.6 to 130.5 pcf and the cone factor (Nk) was assumed to be 12.5. Golder's interpretation of the CPT data, using Golder's ConePlot computer program, used average values of unit weight and cone factor (Nk) as determined from results of laboratory testing, rather than assumed

values. The ConePlot program also uses a slightly different equation to estimate undrained shear strength as follows:

$$S_u = \frac{Qt - \sigma_v}{Nk},$$

where:

Qt = tip resistance corrected for pore pressure effects; rather than Qc (uncorrected).

Measurements taken in the laboratory indicate that the average unit weight of the tailings is approximately 104.2 pcf.

The goal of reexamining the shear strength data is to better quantify the value of Nk. This is done by measuring the actual shear strength of a sample of tailings and then using the measured Qt value from the CPT testing on similar tailings materials to derive Nk.

For the analysis Golder performed, the laboratory test results from shear vane tests on the tailings material were used to calculate site specific Nk values. Shear vane testing was performed on the same sample at effective consolidation stresses of 8 and 90 psi. Because one of the consolidation stresses models a depth far greater than what exists in any of the impoundments, two different methods were employed. The first method correlated shear vane test results on the sample consolidated to 8 psi to Qt values obtained from like materials consolidated under the similar pressure. The second method used both the low and high pressure shear vane results by assuming that a linear relationship exists between undrained shear strength and effective consolidation pressure. This assumes that the shear strength is void ratio dependent and knowing the slope of the line between these two points, a shear strength can be calculated for any consolidation stress. Both methods followed similar procedures:

1. CPT logs were reinterpreted with ConePlot using the average unit weight of tailings of 104.2 pcf measured in the laboratory in order to recalculate values of total overburden stress (σ_v).

2. The data from the reinterpreted ConePlot logs were sorted into either similar materials at an effective consolidation stress of 8 psi or sorted for only similar material types. (Method 1 or 2 respectively).

3. For Method 1, the corrected tip resistance (Qt) was calculated by averaging the Qt values for a depth range (approximately 6 inches surrounding that depth) associated with the 8 psi consolidation stress and the undrained shear strength, Su of 351.4 psf. For Method 2, the data was not averaged, so Qt values could be directly associated with a particular depth and then a value of Su was calculated.

4. Using either method, the ratio of Qt-σ_v divided by Su could then be found and Nk calculated using.

$$Nk = \frac{Qt - \sigma_v}{S_u}.$$

The values of Nk were calculated using the steps listed above and statistically analyzed. The average value for Nk was determined to be 8.0 by both methods.

The ConePlot program was then rerun using the site specific average Nk value of 8.0 to arrive at the Golder's revised interpretation of the undrained shear strength values shown on the ConePlot CPT logs. ConePlot CPT logs shown in Appendix E.

4.1.2 Pore Pressure Analysis

4.1.2.1 Field Procedure

Excess pore pressure generated during the advancement of the cone was measured along the vertical soil profile. At select intervals the advancement of the piezocone was stopped, pressure on the rods released, and the excess pore pressure was allowed to decay. The decay of the excess pore pressure was measured every five seconds and recorded in

magnetic format on the hard drive of the computer that ConeTec operated inside the cone rig. Most dissipation tests were allowed to continue until the pore pressure vs. time curve was determined by visual inspection, to be asymptotic along the x-axis (time). A pore pressure decay (PPD) computer output file was generated for each boring that records pore pressure and elapsed time.

4.1.2.2 Data Analyses

The excess pore pressure dissipation data collected with the cone penetrometer can be used to determine the static pore pressure and to compute an approximate value for c_h, the coefficient of consolidation in the horizontal direction.

Each PPD file was modified by parsing and sorting the pore pressure decay data into column format so the data could be analyzed. Each pore pressure decay data set was converted to excess pore pressure by subtracting the equilibrium pore pressure. If the pore pressure approached an asymptotic value, it can be assumed the minimum reading is the equilibrium pore pressure (P_{100}). If the pore pressure did not approach an asymptotic value, the equilibrium pore pressure was assumed based on an interpolation of the equilibrium pore pressures from dissipation tests performed in the same hole, but at different depths. Plots depicting the excess pore pressure vs. square root of time were developed for each set of pore pressure dissipation data, following recommended procedures outlined in Robertson and Campanella (1989). A value for P_{50}, the pore pressure at 50 percent dissipation, was calculated by dividing $(P_0-P_{100})/P_{100}$ by 2. The value of time associated with the P_{50} is referred to as t_{50}

Figure 11, Theoretical Curves for Cylindrical Pore Pressure Dissipation for Various Stiffness Ratios, taken from Robertson and Campanella (1989), was used to obtain a value for the theoretical time factor "T." "T" is constant at any given percent dissipation for soils exhibiting the same "A_f" and "I_R". A_f is Skempton's pore pressure parameter at

failure. The curve for A_f = 0.8 used on the figure is a typical value for normally consolidated soils and is consistent with values obtained during laboratory testing. The rigidity index "I_r" was assumed to be 100, again a typical value for soft soils. A value of 5.1 was obtained for 50 percent dissipation of excess pore pressure and the aforementioned values of A_f and I_R.

A value for c_h was computed for each pore pressure dissipation curve using the following formula:

$$c_h = \frac{R^2 T}{t},$$

where:

T = theoretical time factor for given tip geometry and porous element location.

t = time to reach given value of $\frac{\Delta u(t)}{\Delta u}$; and,

R = radius of cone.

The geometric mean of the coefficient of horizontal consolidation were calculated for both the sands and the slimes. For sands, the average c_h was determined to be 3.0×10^0 cm^2/sec. For slimes, the average c_h is 4.7×10^{-1} cm^2/sec. The values of coefficient of horizontal consolidation calculated from the pore pressure dissipation data were then used to compute values for coefficient of vertical consolidation (c_v). A correlation between c_h and c_v was developed for the silty materials by comparing the c_v values obtained during laboratory testing to the c_h values computed from the CPT data collected at the representative interval that the sample was taken. Due to physical differences, the c_h values were calculated using the Index Classification Number, Ic. The materials that had a Ic>2.6 were classified as silty to sandy-silt and materials that had an Ic<2.6 were classified as sand to silty-sand. The subsequent calculations were then correlated to the value of c_v obtained from the laboratory testing.

The correlation for $\frac{c_v}{c_h}$ for the silty soils was calculated as:

$$c_v = 1.0 \times 10^{-4} * c_h.$$

The correlation for $\frac{c_v}{c_h}$ for the sandy soils was calculated as:

$$c_v = 9.3 \times 10^{-2} * c_h.$$

To convert the coefficient of consolidation to a corresponding coefficient of permeability, procedures outlined by Robertson and Campanella (1989) were followed. The equation used to calculate the coefficient of horizontal permeability is:

$$k_h = c_h m_h \gamma_w.$$

The equation used to calculate the corresponding coefficient of vertical permeability is:

$$k_v = c_v m_v \gamma_w,$$

where k_h and k_v are the coefficient of permeability in the horizontal and vertical directions, respectively. Results of limited past experience suggest that soil compressibility (coefficient of volume change, m) can be regarded as approximately isotropic, $m_v = m_h$ (Mitchell et al., 1978; Ladd et al., 1977) for the purposes of estimating permeability.

The coefficient of volume change (m_v) and the compression index (C_c) are related by:

$$m_v = \frac{0.435C_c}{(1+e_0)\sigma_{va}},$$

where:

e_0 = initial void ratio
σ_{va} = average of initial and final stresses.

The average value calculated for m_v from the laboratory data for the slimes is 2.4 x 10^{-2} cm^2/g and 1.1 x 10^{-2} cm^2/g for the sands.

4.1.2.3 Results

The tabular output depicting the results of the calculations to determine values of c_h, and c_v for each pore pressure dissipation curve are and the dissipation curves are included as Appendix F.

Calculated values of c_h range from a maximum of 1.8 x 10^0 cm^2/sec to a minimum of 7.7 x 10^{-3} cm^2/sec with a geometric mean of 1.9 x 10^{-1} cm^2/sec for the silt materials (Ic>2.6). Calculated values of c_h range from a maximum of 1.6 x 10^1 cm^2/sec to a minimum of 1.2 x 10^{-1} cm^2/sec with a geometric mean of 1.3 x 10^0 cm^2/sec for the sand materials (Ic<2.6).

Calculated values of c_v range from a maximum of 1.8 x 10^{-4} cm^2/sec to a minimum of 7.7 x 10^{-7} cm^2/sec with a geometric mean of 1.9 x 10^{-5} cm^2/sec for the silt materials (Ic>2.6). Calculated values of c_v range from a maximum of 1.5 x 10^0 cm^2/sec to a minimum of 1.1 x 10^{-2} cm^2/sec with a geometric mean of 1.2 x 10^{-1} cm^2/sec for the sand materials (Ic<2.6).

Calculated values of k_h range from a maximum of 2.0 x 10^{-2} cm/sec to a minimum of 8.5 x 10^{-5} cm^2/sec with a geometric mean of 2.0 x 10^{-3} cm/sec for the silt materials (Ic > 2.6). Calculated values of k_h range from a maximum of 1.8 x 10^{-1} cm/sec to a minimum of 1.3 x 10^{-3} cm/sec with a geometric mean of 1.5 x 10^{-2} cm/sec for the sand materials (Ic < 2.6).

Calculated values of k_v range from a maximum of 4.3 x 10^{-6} cm/sec to a minimum of 1.9 x 10-^{8} cm/sec with a geometric mean of 4.5 x 10^{-7} cm/sec for the silt materials (Ic > 2.6). Calculated values of k_v range from a maximum of 3.6 x 10^{-2} cm/sec to a minimum of 2.7 x 10^{-4} cm^2/sec with a geometric mean of 3.0 x 10^{-3} cm/sec for the sand materials (Ic < 2.6).

It should be noted that the correlation between c_h and c_v was developed with limited laboratory data. Additionally, the conversion between the coefficients of consolidation and the coefficients of permeability were based on empirical equations presented in Robertson and Campanella (1989). If a particular analysis is extremely sensitive to these data, an appropriate level of conservatism should be considered.

4.1.2.4 Static Water Table

Calculations of the static water table level were made for each CPT location where dissipation testing was performed. The depth to the water table varied but ranged from 9 feet above to 5 feet below the surface of the tailings. The tabular results are shown in Table 1 and the graphical plots are shown in Appendix G.

4.2 Laboratory Testing Interpretation

4.2.1 Strength Data Interpretation

To compare the undrained strength data interpreted from the CPT analysis with the laboratory determined values, plots were made of undrained strength, S_u, versus depth. A plot showing all of the interpreted values of Su from the CPT investigation are plotted versus depth and is shown in Figure 12a. On this figure, the appearance of shear strength being depth or void ratio dependence is evident, but there are also several zones which show much lower shear strengths. In an attempt to quantify a numerical relationship of shear strength versus depth, Figure 12b shows Su plotted as determined by CPT testing, with the linear interpolation of the shear strength as determined by the laboratory shear vane testing, and a relationship that bounds the data to the approximate 95 percentile. The relationship for undrained shear strength is as follows:

$$\frac{S_u}{p'} = 0.1$$

where:

S_u = undrained strength;

p' = mean effective confining stress $(\frac{\sigma'_1 + \sigma'_3}{2})$.

Throughout most of the strata, the CPT interpreted values of S_u either plot between or above the linear model and that developed for S_u from the laboratory shear vane testing. The two correlations and interpreted CPT results for CPT-8 are shown in Figure 12C. The correlation developed for the tailings based on the mean effective stress almost always underpredicts what is measured from the actual CPT testing. This ratio of $S_u/p'=0.1$ translates to a total stress friction angle of 5.7 degrees. This total stress friction angle is very low, however, knowing that the shear strength of the tailings is void ratio or effective stress dependent. We can see from the exploratory program that the majority of the tailings thickness is less than 40 feet. Knowing that the thickness of tailings is not that

great and combining that with low bulk unit weight and a high water table, the net effective stress in the tailings is generally under 1600 psf. By either correlation, the shear strength predicted should therefore be approximately no more than 425 psf for the laboratory shear vane testing correlation and no more than 125 psf from the S_u/p' ratio. It should also be noted that with both models there are several zones which have lower CPT interpolated shear strength than what would be predicted from the models. Plots of S_u versus depth for each CPT hole are presented in Appendix H.

4.2.2 Slurry Consolidation Interpretation

Classical consolidation values were calculated using the results of the testing. As with every consolidation test, friction between the sample and the walls of the testing apparatus can affect the results. For the slurry consolidometer, side wall friction is more of a concern because a seal between the cell wall and the piston is maintained by using two U-rings. Proven means were employed to minimize the amount of side wall friction, but it is certain that it was not completely eliminated. The slope of the curve after primary consolidation in theory should be constant. This slope is termed the secondary compression index. If side wall friction is a factor in the testing, a stepwise decrease in sample height versus time would be observed. This would be due the fact the friction along the wall of the chamber and the sample would be able to take up some of the stresses being exerted on the top of the sample for a while before motion occurs. When we examine the test data of sample height versus time for each individual load increment, it can be seen that this is indeed what is occurring for some of the load increments. Without being able to actually quantify the amount of sidewall friction, we must assume some inaccuracy in our consolidation parameter values. The parameters most effected by the presence of sidewall friction would be the coefficient of consolidation, C_v and secondary compression index, C_α. The value for the compression index, C_c would not be effected by sidewall friction, although it would shift the curve to the right on the graph.

The permeability results are independent of any compliance problems that may exist with the testing apparatus. The values of void ratio are calculated based on sample height and known weight of solids, while the permeability is also measured independently. The relationships shown from the testing are constant with the theory governing permeability and void ratio. As a reduction in void ratio occurs, the permeability decreases. It can be seen from the plots that the reduction in permeability occurs at an increasing rate as void ratio decreases.

5.0 SLOPE STABILITY

A slope stability analysis was performed on North #1 Dam, North #2 Dam and the South Dam. The analysis started with reproducing the analyses performed previously by Bechtel and STS Consultants using the previous geometry and material parameters. The analyses were then run again using the updated material parameters and current geometry determined as part of this project.

5.1 Background

5.1.1 North #2 Dam

The original analysis of the proposed design is reported in the "Supplementary Design Analysis for Tailings Dam" dated May 1968 by the Bechtel Corporation. In this report Bechtel analyzed a generalized maximum cross-section of the dam using material properties determined from laboratory testing for the proposed expansion. Bechtel analyzed the section for five scenarios using four different seepage scenarios which were all based on the maximum pond level and tailings height.

5.1.2 South Dam

The stability analysis for the South Dam was performed as an evaluation of the existing dam prior to the start of tailings placement in 1993. The report titled "South Pond Evaluation" by STS Consultants Ltd. examined the stability of the embankment under several different filling scenarios.

5.1.3 North #1 Dam

Because no documentation of earlier stability could be found pertaining to North #1 Dam, no verification analysis was able to be performed. However, the stability of North #1 was verified in its existing condition.

5.2 Material Properties

The material properties used in these analyses are discussed in Section 1.2. These parameters were used to verify the previous analyses with the goal of modifying and refining them based on updated parameters obtained from the laboratory testing program.

Figures 13, 14 and 15 illustrate the dam cross-sections and material zonation used for the analyses.

5.3 Stability Analysis

Golder has performed global stability analyses for two sections to verify the earlier North #2 and South Dam analysis, as shown in Figures 13 and 14. The first section (North #2 Dam) was based on the proposed final topography as designed by Bechtel and consisted of a 2.5H:1V downstream face and a 2H:1V upstream face composite dam of cycloned sands and compacted clay. The second section (South Dam) was based on the described topography by STS and consisted of 2H:1V downstream and upstream faces constructed entirely of compacted clay. Several different seepage scenarios were analyzed along with the current dam and tailings heights.

Golder then performed stability analyses for existing conditions for North #2 Dam, South Dam, and North #1 Dam. A typical cross section for North #1 Dam is shown in Figure 15. Existing Conditions for North #2 are based on geotechnical and topographic

data obtained in 1997. Existing conditions for the South Dam use the same embankment cross section used by STS in the earlier analyses, but lower tailings and pool elevations based on 1997 survey data. For North #1 Dam, existing conditions are based on previously available survey data for the embankment and 1997 data for the tailings surface, upstream and downstream.

The stability analyses were performed using the computer program XSTABL version 5.20. Analyses were performed using Bishops method for circular failure surfaces.

The results for the static global stability analyses are presented below.

Section	Static FOS
North #2 Dam	
Case I	1.42
Case II	1.32
Case III	1.06
Case IV	0.91
Case V	1.19
Existing Topography	2.16

Section	Static FOS
South Dam	
Case I (Limiting Search)	1.08
Case I (Non-Limiting Search)	0.82
Existing Topography	1.41

Section	Static FOS
North #1 Dam	
Existing Topography	1.75

5.4 Results

It can be seen from the results of the analyses performed for North #2 Dam that good agreement with the original stability analysis has been obtained. Analyzing for the current case using the original material properties also shows that the current dam configuration is stable.

For North #2 Dam, the 5 cases previously analyzed by Bechtel examine the maximum section of the dam at the designed full height of tailings under different seepage scenarios. These analyses are not relevant for the verification of current stability because the existing height of tailings is less then the designed level.

The analysis of the South Dam shows both agreement with most aspects of the original analysis. If the search range is limited to a failure surface consistent with what is shown on Figure 14, STS's solution is verified. However, STS has shown a phreatic surface daylighting on the downstream face of the dam, which if analyzed using effective stress parameters produces a local, shallow slipsurface with a factor of safety much less than 1.0. However, piezometeric data from the South Dam indicates that the phreatic surface is below the dam in the foundation. Therefore, the phreatic surface used by STS is not a relevant model for further analysis. Analysis of the current dam configuration indicates that the structure is stable.

Analyzing for the current case of North #1 using the original material properties shows that the current dam configuration is stable.

6.0 CONCLUSIONS

From the investigation, the following conclusions concerning material properties can be made:

- The effective friction angle for the slimes was 35 degrees, and for the sands was 38 degrees.
- The strength envelope for the compacted clay was a friction angle of 26.7 degress and a cohesion of 490 psf, and for the cyclonned sands the friction angle was 36 degrees.
- There are basically two material types present in the tailings and can be roughly grouped into two categories, sands and slimes. The sands are medium to fine uniform sands with varying amounts of silt to clay sized fines. The slimes are a low plasticity silty clay to clayey silt, and contain trace to little amounts of fine sands.
- North #1 Dam and the impervious outer shells of North #2 Dam are constructed of low plasticity silty-clay to silt material containing varing amounts of coarse to fine sands. The cycloned sand inner core of North #2 is composed of medium to fine uniform sands with low, but varing amounts of silt to clay sized particles.
- The values of undrained strength can be bound generally by the ratio of Su over p' equal to 0.1 correlation at the lower end, and the CPT determined values at the high end. The laboratory values of undrained strength generally plot between these two bounding values. Even with these two models, several zones exist where lower then predicted shear strengths have been measured.

7.0 REFERENCES

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Ladd, C.C., R. Foot, K. Ishihara, F. Schlosser, and H.G. Poulos. 1977. "Stress-Deformation and Strength Characteristics" in Proceedings, *Ninth International Conference on Soil Mechanics and Foundation Engineering, Tokyo, Japan*, Vol. 11, pp. 421-494.

Mitchell, J.K., F. Guzikowski, and W.C.B. Villet. 1978. "The Measurement of Soil Properties In situ," Report prepared for U.S. Department of Energy Contract W-7405-ENG-48, Lawrence Berkeley Laboratory, University of California, Berkeley, CA. 94720, March 1978, 67 pgs.

Robertson, P.K., and R.G. Campanella. 1989. "Guidelines for Geotechnical Design Using CPT and CPTU", Soil Mechanics Series No. 120, Department of Civil Engineering, University of British Columbia, November, 1989, 179 pgs.

TABLES

TABLE 1

WATER TABLE ELEVATIONS IN TAILINGS

Site	Location		Elevation of Ground Surface (ft)	Depth to Water Table (ft)	Elevation of Water Table (ft)
	Northing (ft)	Easting (ft)			
CPT-1	33661	37998	5299.6	1.8[1]	5297.8
CPT-2	33683	40685	5289.2	1.0[2]	5288.2
CPT-3	35653	36548	5257.8	1.24[3]	5256.6
CPT-4	36345	42495	5253.8	1.0[2]	5252.8
CPT-5	37038	46669	5247.1	4.11[3]	5243
CPT-6	38178	35318	5252.9	3.10[1]	5249.8
CPT-7	38956	39909	5249.6	4.55[3]	5245.1
CPT-8	37710[4]	46407[4]	5246.8[5]	4.32[3]	5242.5
CPT-9	41355	34838	5247.1	0.5[2]	5246.6
CPT-10	41379	40406.8	5243.7	3.67[1]	5240
CPT-11	38710[4]	43719[4]	5247.3[5]	0.5[2]	5246.8
CPT-12	42815[4]	35845[4]	5199.0[5]	4.83[3]	5194.2
CPT-13	42966[4]	40655[4]	5201.3[5]	2.7[2]	5198.6
CPT-14	43379[4]	46725[4]	5196.0[5]	3.45[3]	5195.6
CPT-15	45541[4]	36213[4]	5191.5[5]	5.7[3]	5185.8
CPT-16	45085[4]	40862[4]	5195.0[5]	4.7[1]	5190.3
CPT-17	44957[4]	48099[4]	5189.8[5]	5.05[3]	5184.8
CPT-18	46555[4]	36246[4]	5189.8[5]	4.00[1]	5185.8
CPT-19	49189[4]	42525[4]	5183.0[6]	-2.0[7]	5185
CPT-20	50137[4]	44504[4]	5176.0[6]	-9.0[7]	5185
CPT-21	49479[4]	47794[4]	5176.0[6]	-9.0[7]	5185

Location and Elevation from survey data unless otherwise noted

(1) Depth to water table estimated from dissipation testing
(2) Depth to water table estimated from cone penetration dynamic pore pressures
(3) Depth to water table estimated from 10/97 piezometer well measurement
(4) Northing and Easting estimated from Global Positioning System (GPS)
(5) Elevation of ground surface inferred from 1997 topography of tailings
(6) Elevation of ground surface estimated from 1997 water level and estimated depth of water
(7) Depth to ground surface estimated from barge

TABLE 2

WATER TABLE ELEVATIONS WITHIN EMBANKMENT AND FOUNDATION MATERIAL

Site	Location		Elevation of Ground Surface (ft)	Depth to Water Table (ft)	Elevation of Water Table (ft)
	Northing (ft)	Easting (ft)			
BH-1	49633	47964	5197	nw	nw
BH-2	46590[1]	49148[1]	5197.8[2]	42.82	5155
BH-3	38747	47454	5255.2	33.65	5221.6
BH-3A	38722	47454	5255.2	31.5	5223.7
BH-4	35476[1]	40468[1]	5261.5[2]	nw	nw
BH-5	41923	41202	5250.6	49.7	5200.9
BH-6	50531[1]	43360[1]	5197.8[2]	57.68	5140.1
BH6A	50531[1]	43360[1]	5197.8[2]	nw	nw
BH-7	48944	38533	5197.5	68.1	5129.4
BH-8	44845[1]	35214[1]	5193.8[2]	33.3	5160.5
BH-8A	44845[1]	35214[1]	5193.8[2]	nw	nw
BH-8B	44845[1]	35214[1]	5193.8[2]	nw	nw
BH-9	38938	34542	5257.6	59.5[3]	5198.1
BH-9A	38905	34538	5258.2	31.3	5226.9

Location and Elevation from survey data unless otherwise noted

nw = no water present

(1) Northing and Easting estimated from pacing off distance from known location

(2) Elevation of ground surface estimated from survey data of dam crest

(3) Water level in BH-9 not stabilized as of 10/18/97

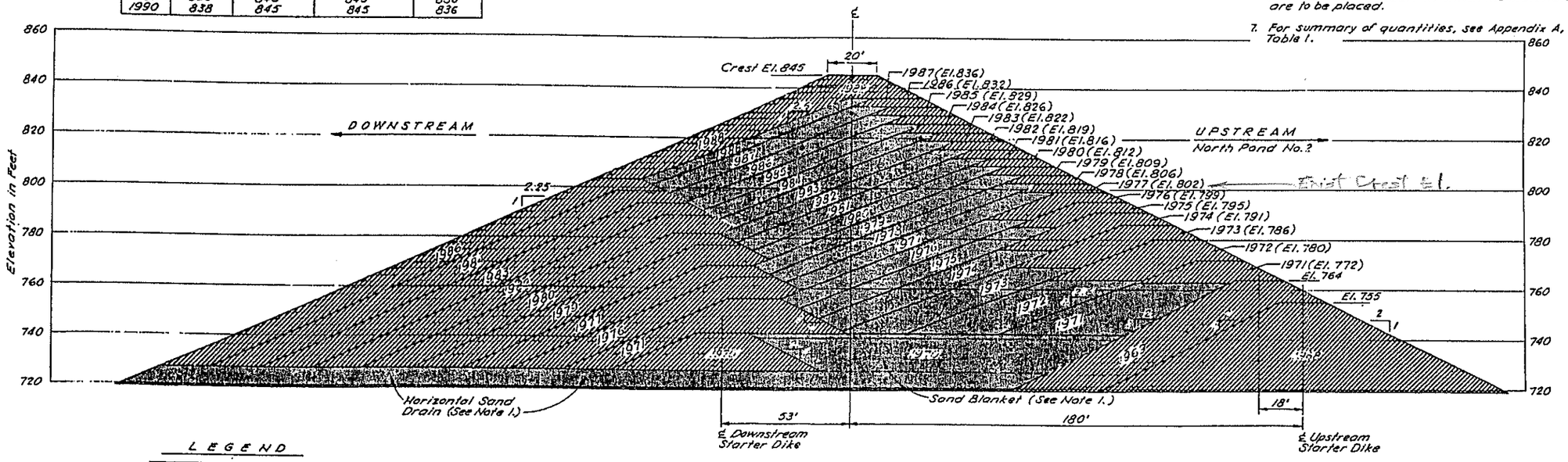
(4) BH-8 abandoned and grouted after initial reading

FIGURES

YEARLY SLIMES LEVEL AND ELEVATIONS FOR MATERIALS				
Year	Slimes Elev.	Upstream Crest El.	Downstream Crest El.	Top El. of Sand
1968		755		
1969		764		
1970	748	764	742	742
1971	762	772	757	763
1972	770	780	757	764
1973	777	786	757	769
1974	782	791	757	776
1975	787	795	757	785
1976	791	799	765	788
1977	795	802	770	799
1978	799	806	770	802
1979	802	809	778	806
1980	805	812	782	809
1981	809	816	782	812
1982	812	819	788	816
1983	815	822	793	819
1984	818	826	798	822
1985	822	829	798	826
1986	825	832	803	829
1987	828	836	803	832
1988	832	845	845	836
1989	835	845	845	836
1990	838	845	845	836

NOTES

1. Cycloned sand produced in 1970 to be placed in low areas as horizontal sand drains under the downstream slope, and as sand blanket between upstream and downstream starter dikes to elevation 742 as shown for the maximum section. For locations and extent of horizontal sand drains and sand blanket see Dwg. C-12-109-H.
2. Downstream rolled fill to be raised as needed to contain the cycloned sand.
3. All rolled fill incremental raises to have a crest width of 20 feet.
4. Dam to be underlain by a grid pattern of Armco perforated corrugated metal pipes for drainage. For details of drainage system see Dwgs. C-12-111d and C-12-115.
5. Elevations shown are from USGS topographic maps with datum referenced to mean sea level. To convert to plant datum add 4396.44.
6. Years shown on this section indicate the construction season in which the materials are to be placed.
7. For summary of quantities, see Appendix A, Table 1.



LEGEND

Cycloned Sand

Impervious Fill

MAXIMUM DAM SECTION
At Station 8+00

DRAWING TAKEN FROM

"WHITE PINE EXPANSION PROJECT"
SUPPLEMENTARY DESIGN ANALYSIS
FOR TAILINGS DAM
WHITE PINE COPPER COMPANY
BY BECHTEL CORPORATION
SAN FRANCISCO, CA
MAY, 1968

Golder Associates

CLIENT/PROJECT
COPPER RANGE COMPANY
WHITE PINE MINE CLOSURE

TITLE
TAILING DISPOSAL
TAILINGS DAM - NORTH POND #2
MAXIMUM DAM SECTION

DRAWN	DB	DATE	APRIL 1998	JOB NO.	973-2255
CHECKED	DRJ	SCALE	N.T.S.	DWG. NO. / REV. NO.	B061
REVIEWED	JMJ	FILE NO	2255B061	FIGURE	2

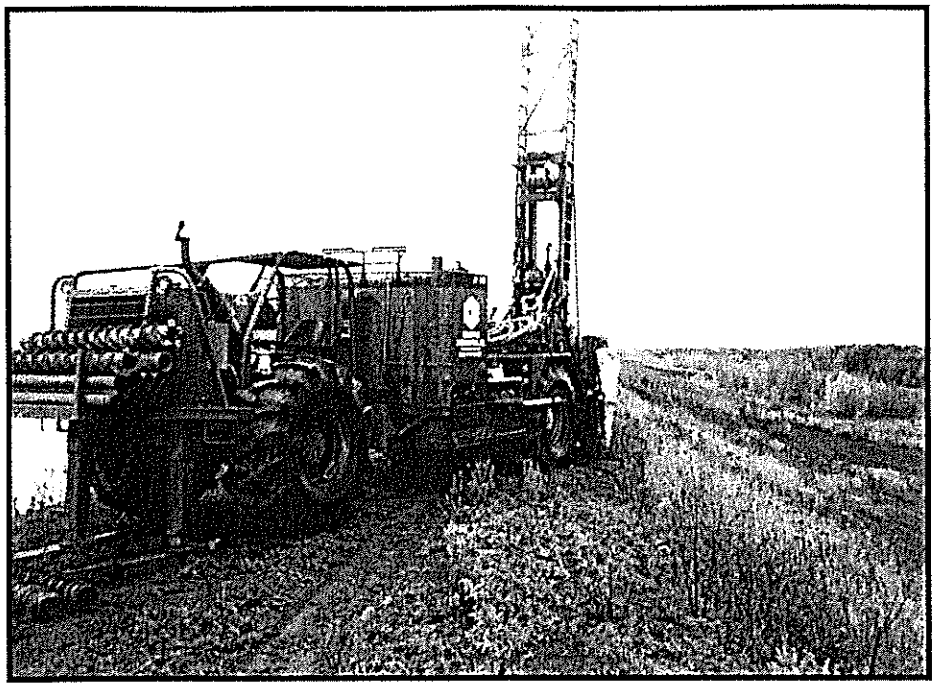


Plate 1 - Diedrich D120 Drill Rig

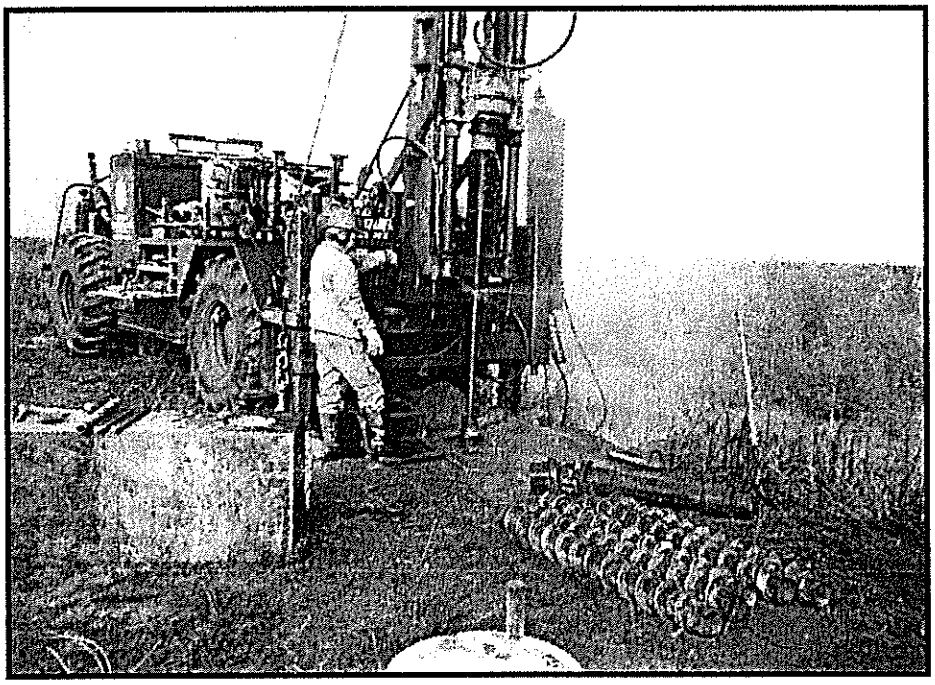


Plate 2 - Drill Rig while coring at BM-2

Golder Associates Denver, Colorado 200 Union Blvd. Ste. 500 50228	TITLE: EXAMPLE PHOTOGRAPHS			
CLIENT/PROJECT COPPER RANGE COMPANY WHITE PINE MINE CLOSURE	DRAWN DB	DATE APR. 1998	JOB NO. 973-2255	
	CHECKED DRJ	SCALE N/A	DWG. NO. / REV. NO. A062	
	REVIEWED JMJ	FILE NO. 2255A062	FIGURE 3	

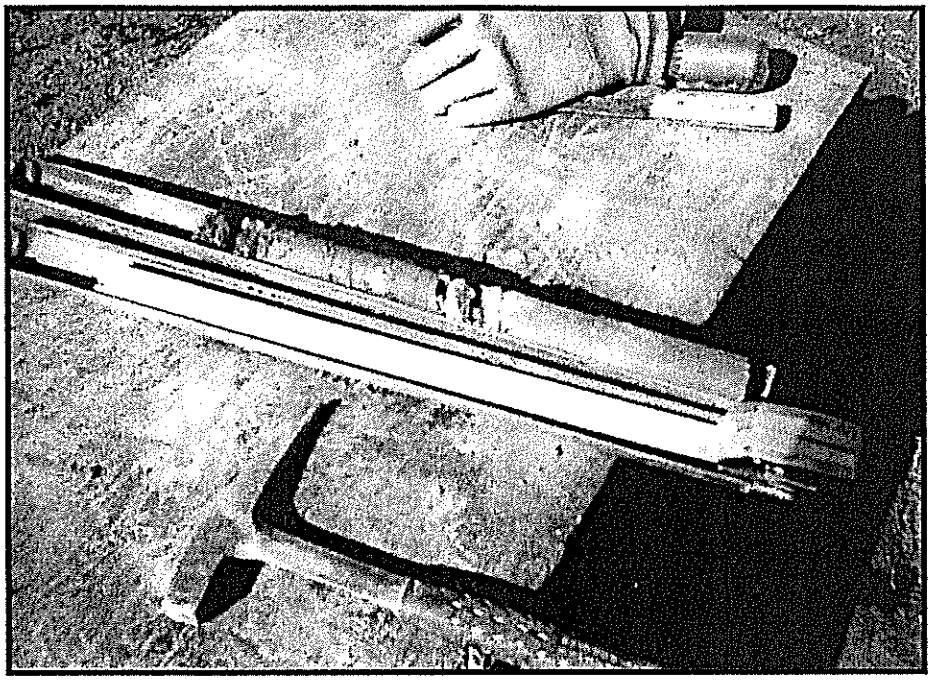


Plate 3 - Sample at BH-2, 10 to 11 ½ feet Showning contact between Clay and Cycloned Sand

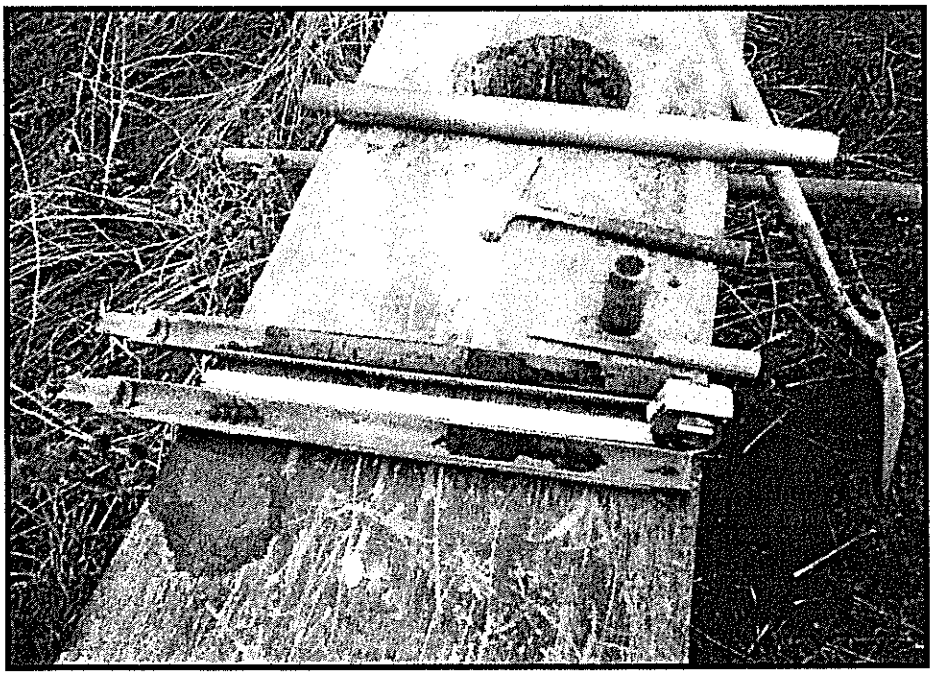


Plate 4 - Sample at BH-6, 10 to 11 ½ feet Showning contact between Clay and Cycloned Sand

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TITLE

EXAMPLE PHOTOGRAPHS

CLIENT/PROJECT

COPPER RANGE COMPANY
WHITE PINE MINE CLOSURE

DRAWN	DB	DATE	APR. 1998	JOB NO.	973-2255
CHECKED	DRJ	SCALE	N/A	DWG. NO. / REV. NO.	A063
REVIEWED	JMJ	FILE NO.	2255A063	FIGURE	4

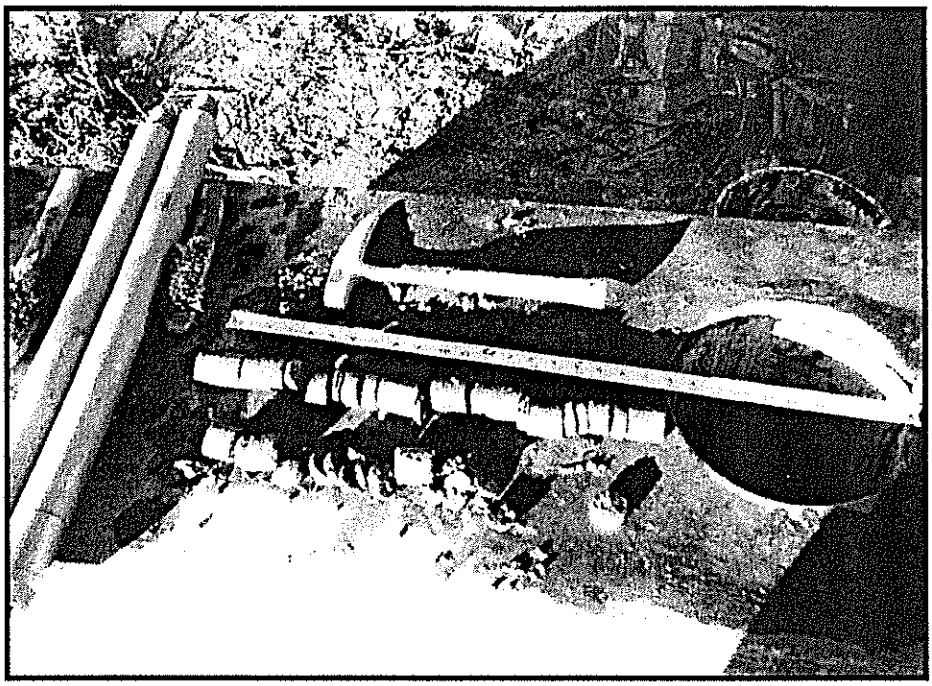


Plate 5 - BH-2 Core Recovery at 52 to 55 feet

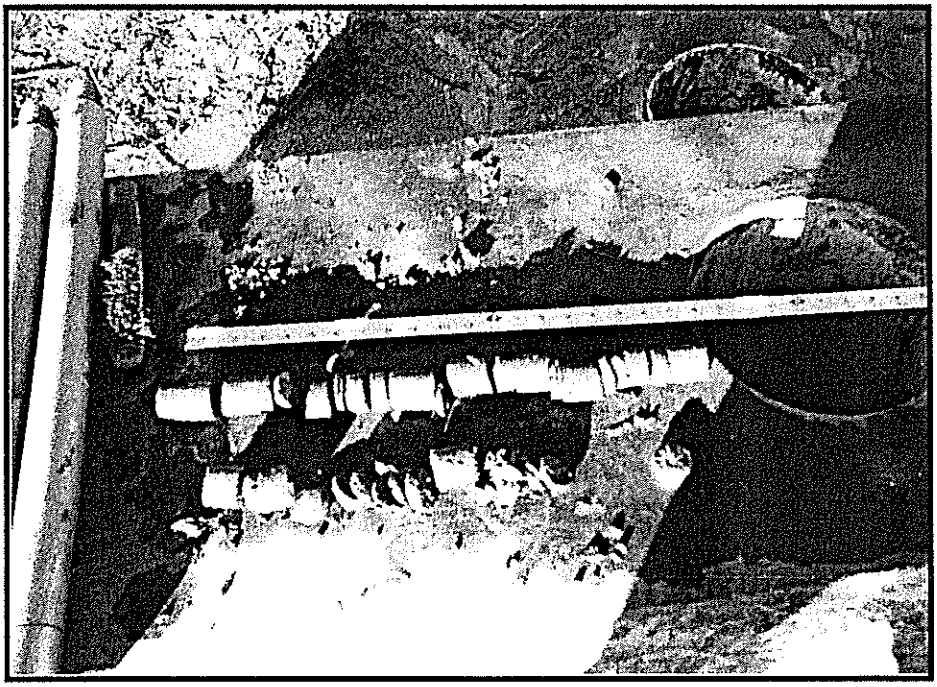


Plate 6 - BH-2 Core Recovery at 52 to 55 feet

Golder Associates Denver, Colorado 200 Union Blvd. Ste. 500 50228	TITLE **EXAMPLE PHOTOGRAPHS**		
CLIENT/PROJECT **COPPER RANGE COMPANY** **WHITE PINE MINE CLOSURE**	DRAWN DB	DATE APR. 1998	JOB NO. 973-2255
	CHECKED DRJ	SCALE N/A	DWG. NO. / REV. NO. A064
	REVIEWED JMJ	FILE NO. 2255A064	FIGURE 5



Plate 7 - Construction of Monitoring Well BH-3

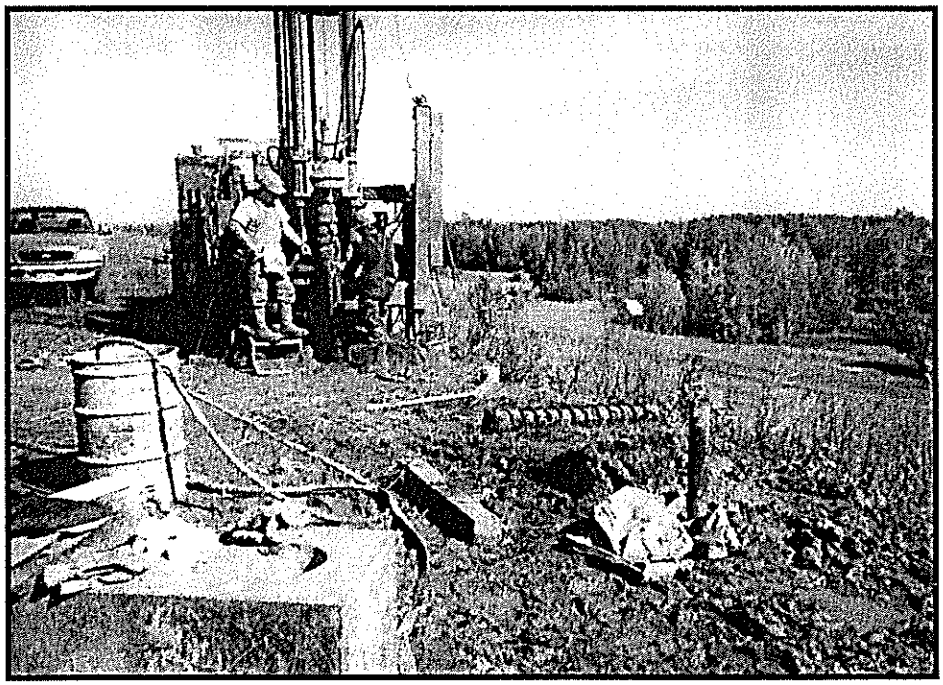


Plate 8 - Completed Monitoring Well BH-2A

Golder Associates Denver, Colorado 200 Union Blvd. Ste. 500 50228	TITLE: **EXAMPLE PHOTOGRAPHS**		
CLIENT/PROJECT **COPPER RANGE COMPANY** **WHITE PINE MINE CLOSURE**	DRAWN: DB	DATE: APR. 1998	JOB NO.: 973-2255
	CHECKED: DRJ	SCALE: N/A	DWG. NO. / REV. NO.: A065
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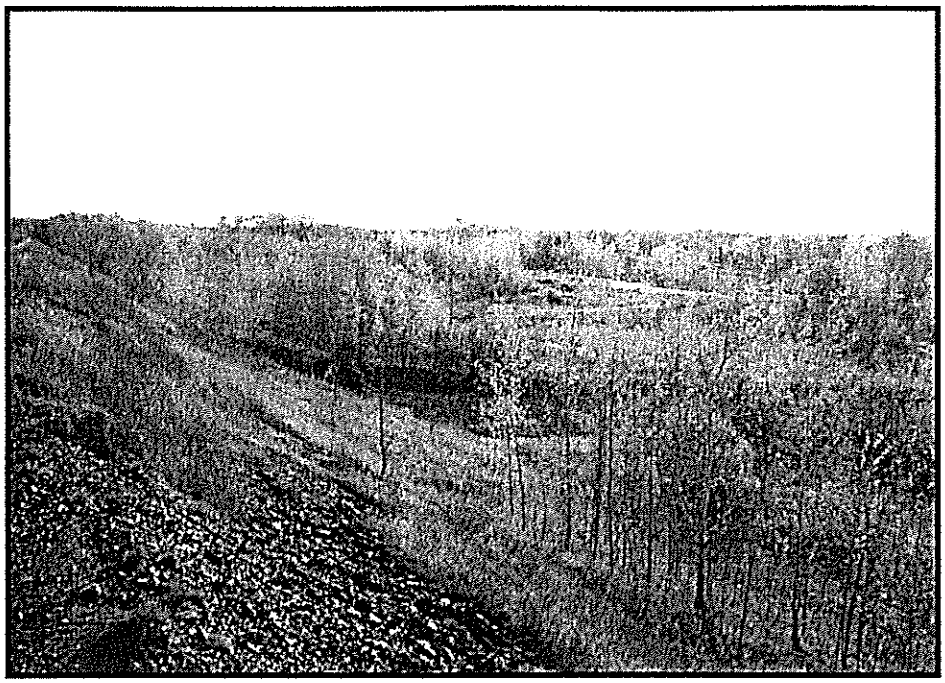


Plate 9 - View of Smelter and Mill from North #1 Dam



Plate 10 - View looking South from North #1 Dam across tailings

Golder Associates Denver, Colorado 200 Union Blvd. Ste. 500 50228	TITLE **EXAMPLE PHOTOGRAPHS**			
CLIENT/PROJECT **COPPER RANGE COMPANY** **WHITE PINE MINE CLOSURE**	DRAWN DB	DATE APR. 1998	JOB NO. 973-2255	
	CHECKED DRJ	SCALE N/A	DWG. NO. / REV. NO. A066	
	REVIEWED JMJ	FILE NO. 2255A066	FIGURE 7	



Plate 11 - Cone Penetration Testing (CPT) Rig

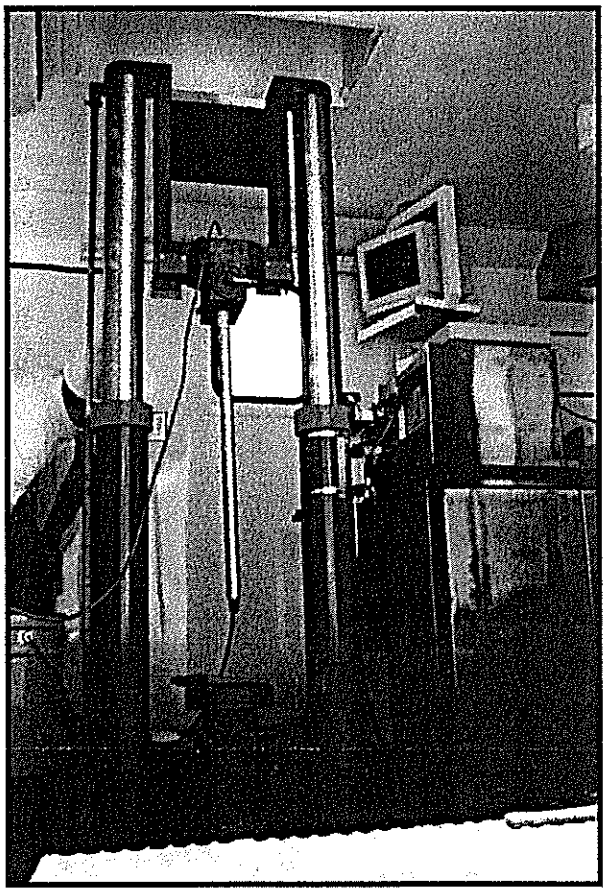


Plate 12 - Hydraulic Ram used in CPT Testing

Golder Associates Denver, Colorado 200 Union Blvd. Ste. 500 50228	TITLE: **EXAMPLE PHOTOGRAPHS**		
CLIENT/PROJECT **COPPER RANGE COMPANY** **WHITE PINE MINE CLOSURE**	DRAWN: DB	DATE: APR. 1998	JOB NO.: 973-2255
	CHECKED: DRJ	SCALE: N/A	DWG. NO. / REV. NO.: A067
	REVIEWED: JMJ	FILE NO.: 2255A067	FIGURE: 8

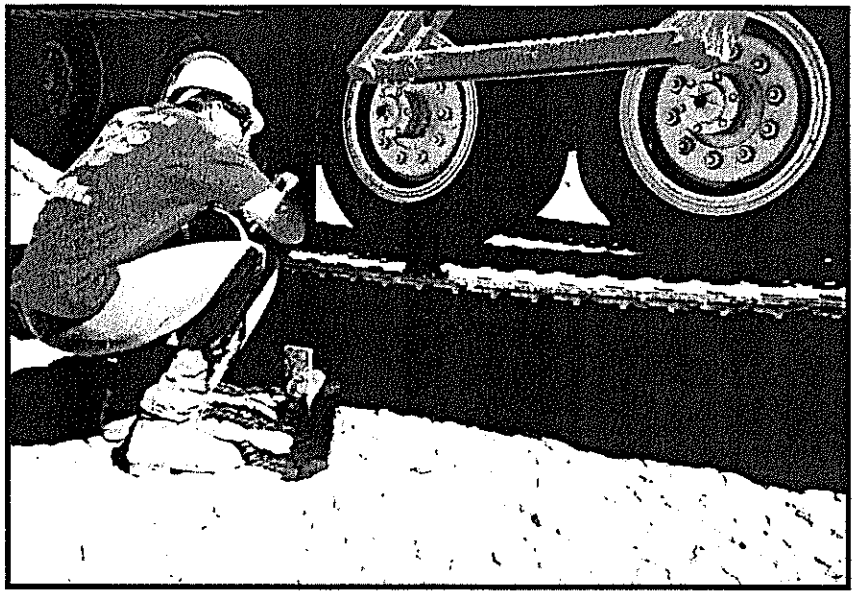


Plate 13 - Steel Bar used in Seismic Surface Wave Analysis Testing

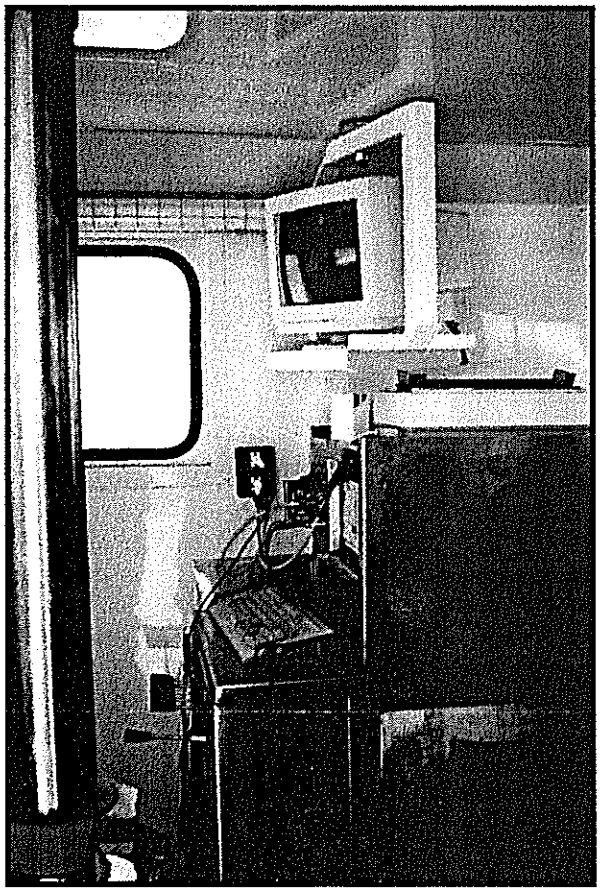


Plate 14 - CPT Data Acquisition Equipment

Golder Associates

Denver, Colorado
200 Union Blvd.
Ste. 500 50228

TITLE

EXAMPLE PHOTOGRAPHS

CLIENT/PROJECT

COPPER RANGE COMPANY
WHITE PINE MINE CLOSURE

DRAWN	DB	DATE	APR. 1998	JOB NO.	973-2255
CHECKED	DRJ	SCALE	N/A	DWG. NO. / REV. NO.	A068
REVIEWED	JMJ	FILE NO.	2255A068	FIGURE	9



Plate 15 - Sampling of Bulk Material for Testing

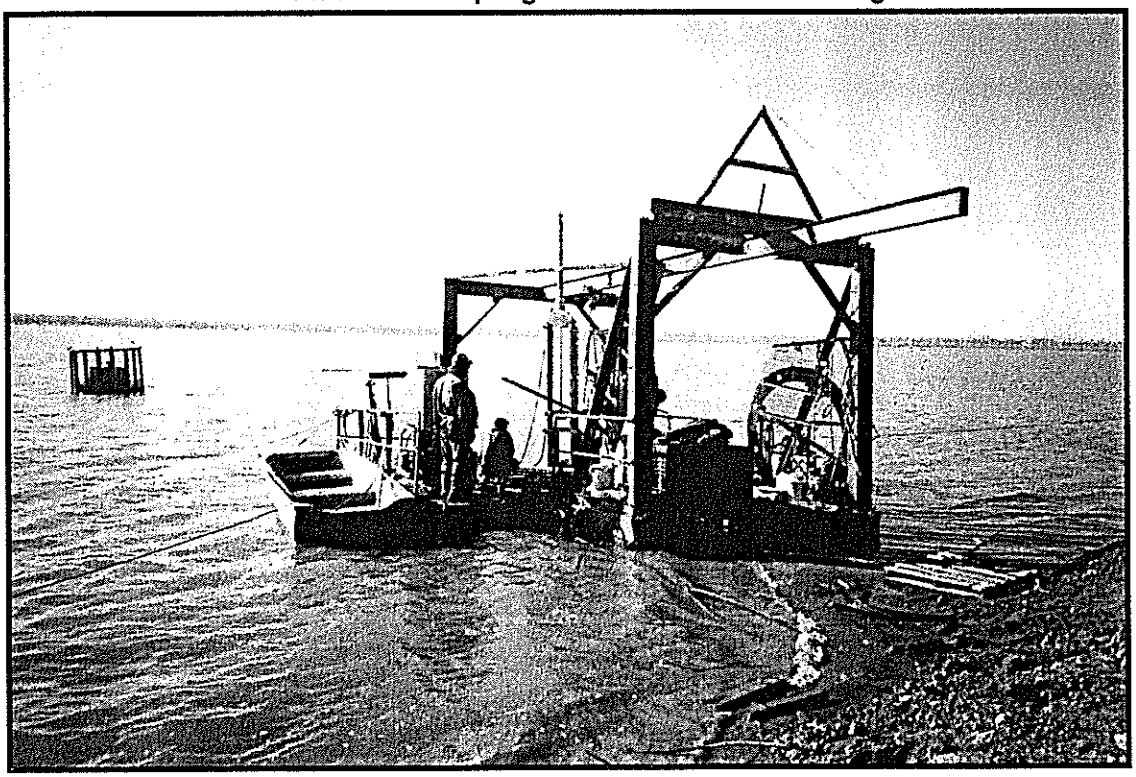


Plate 16 - Barge used to Perform CPT Testing in Pond Area

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Ste. 500 50228

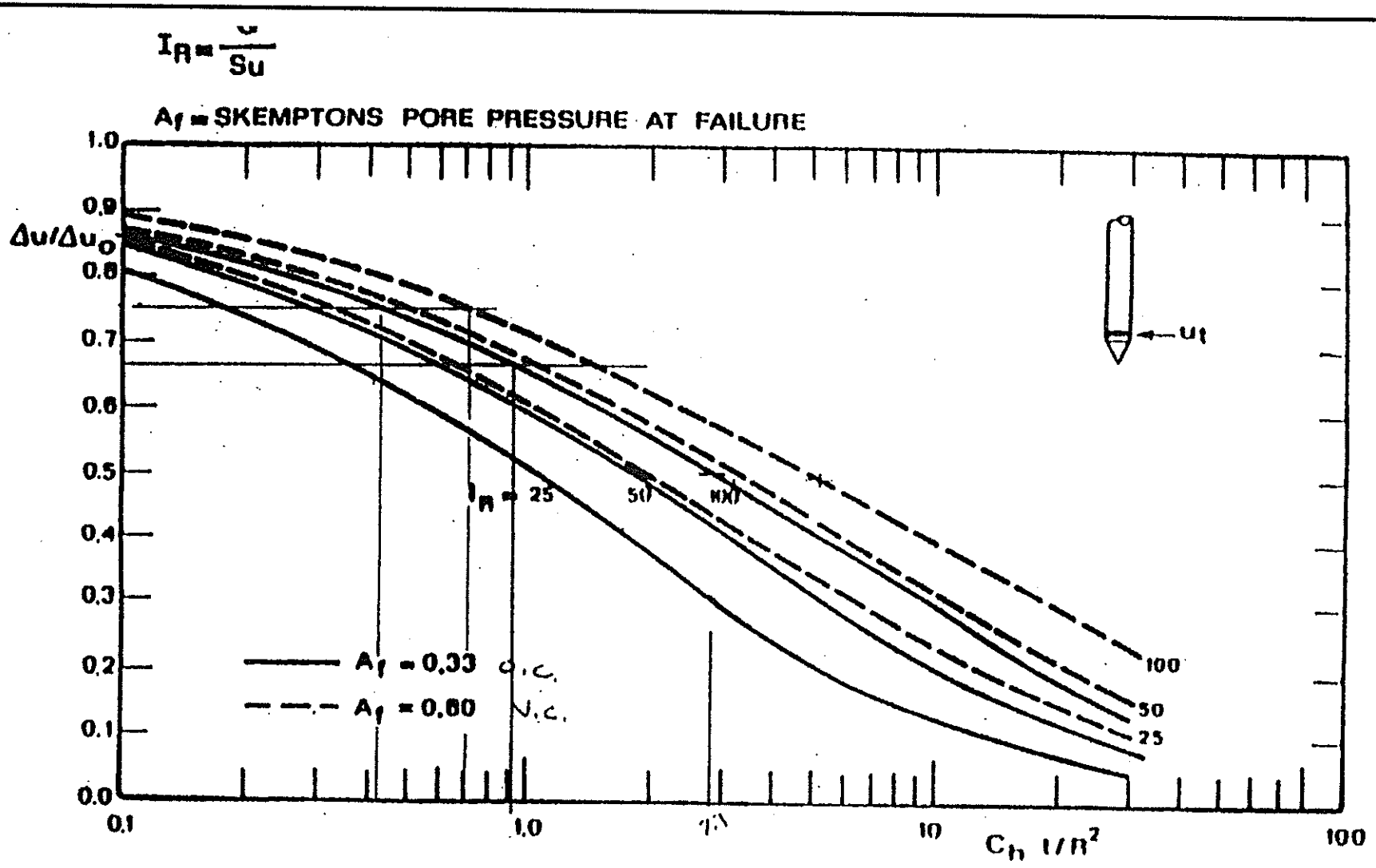
CLIENT/PROJECT

COPPER RANGE COMPANY
WHITE PINE MINE CLOSURE

TITLE

EXAMPLE PHOTOGRAPHS

DRAWN	DB	DATE	APR. 1998	JOB NO.	973-2255
CHECKED	DRJ	SCALE	N/A	DWG. NO. / REV. NO.	A069
REVIEWED	JMJ	FILE NO.	2255A069	FIGURE	10



REF: Theoretical Curves for Cylindrical Pore Pressure Dissipation for Various Stiffness Ratios (After Battaglio et al, 1981)

Golder Associates
200 UNION BLVD. SUITE 500
LAKEWOOD, COLORADO 80228
PHONE: (303) 980-0540
FAX.: (303) 985-2080

TITLE

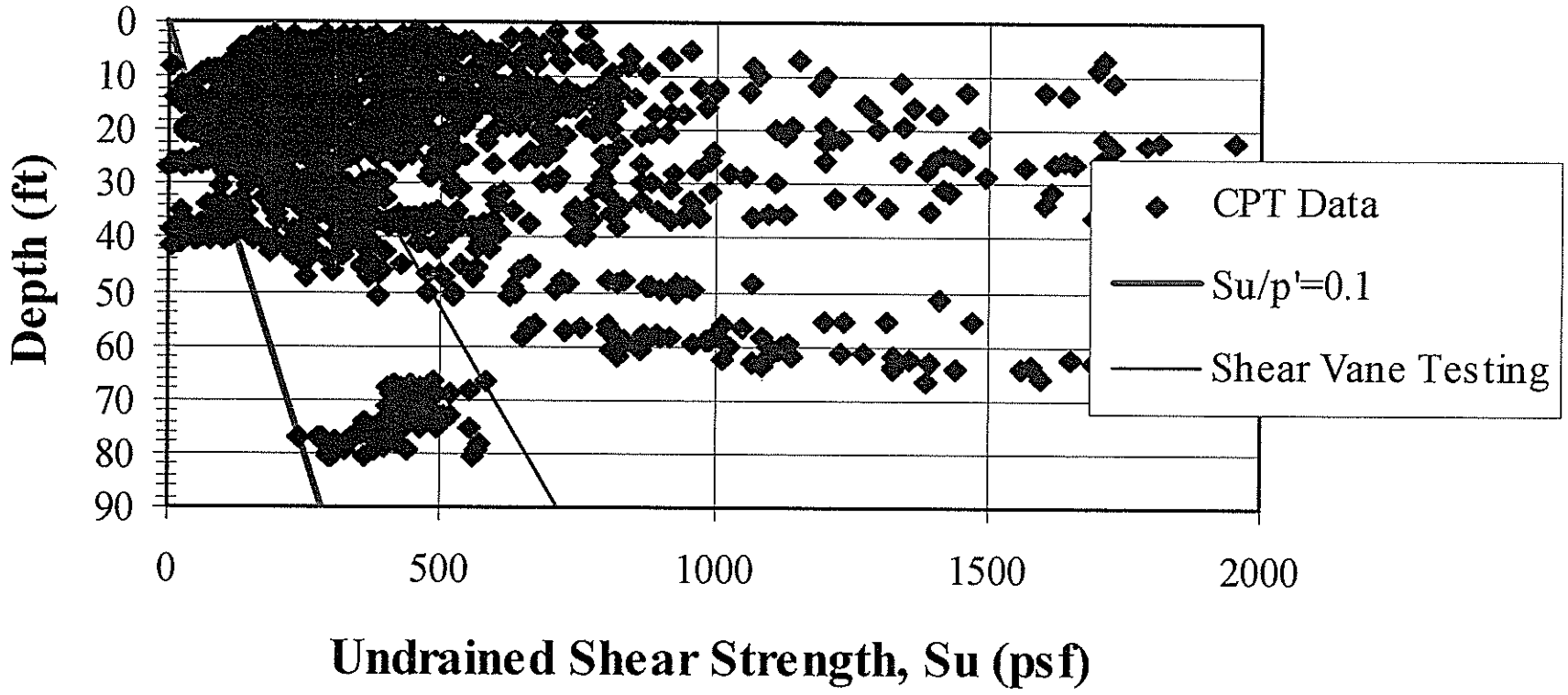
ROBERTSON AND CAMPANELLA CURVES

CLIENT/PROJECT

COPPER RANGE COMPANY
WHITE PINE MINE CLOSURE

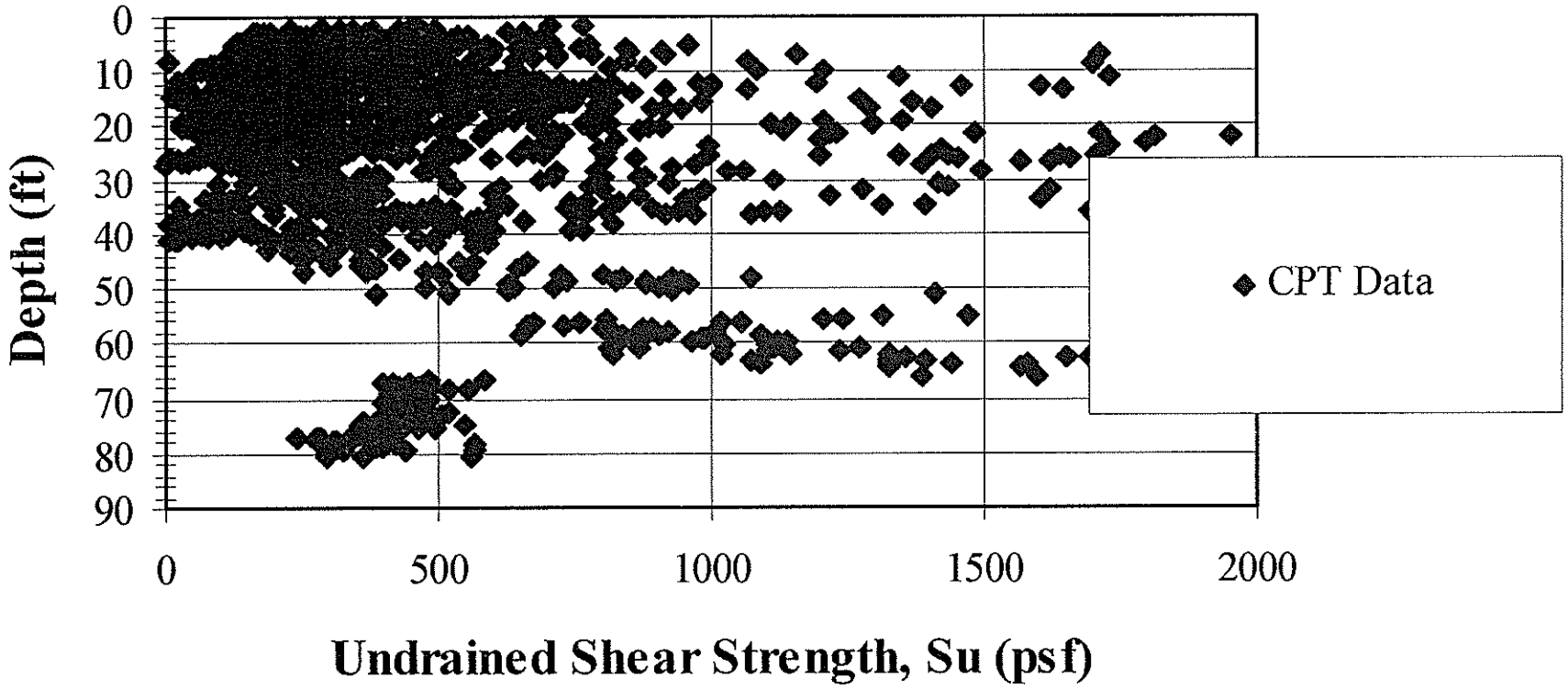
DRAWN	DB	DATE	APRIL 1998	JOB NO.	973-2255
CHECKED	DRJ	SCALE	NO SCALE	DWG. NO. / REV. NO.	A070
REVIEWED	JMJ	FILE NO.	2255A070	FIG. NO.	11

All CPT Data Points Measured and Modeled Undrained Shear Strength



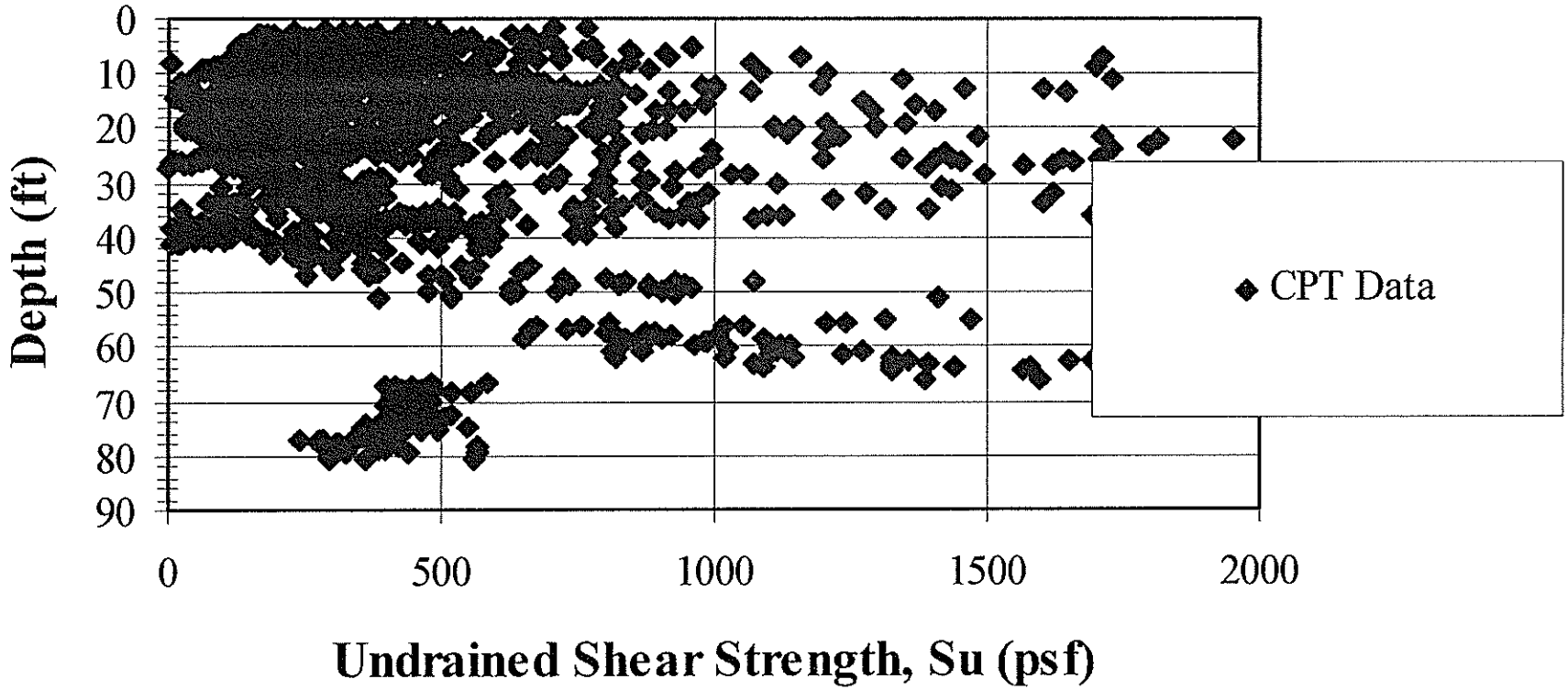
CLIENT/PROJECT: COPPER RANGE COMPANY WHITE PINE MINE CLOSURE			Golder Associates Denver, Colorado		TITLE: UNDRAINED STRENGTH VERSUS DEPTH
DRAWN: DB	CHECKED: DRJ	REVIEWED: JMJ	DATE: APRIL 1998	SCALE: N.T.S.	FILE NO.: 2255A071
JOB NO.: 973-2255	DWG NO./REV.NO.: A071	FIGURE: 12A			

All CPT Data Points
Measured Undrained Shear Strength

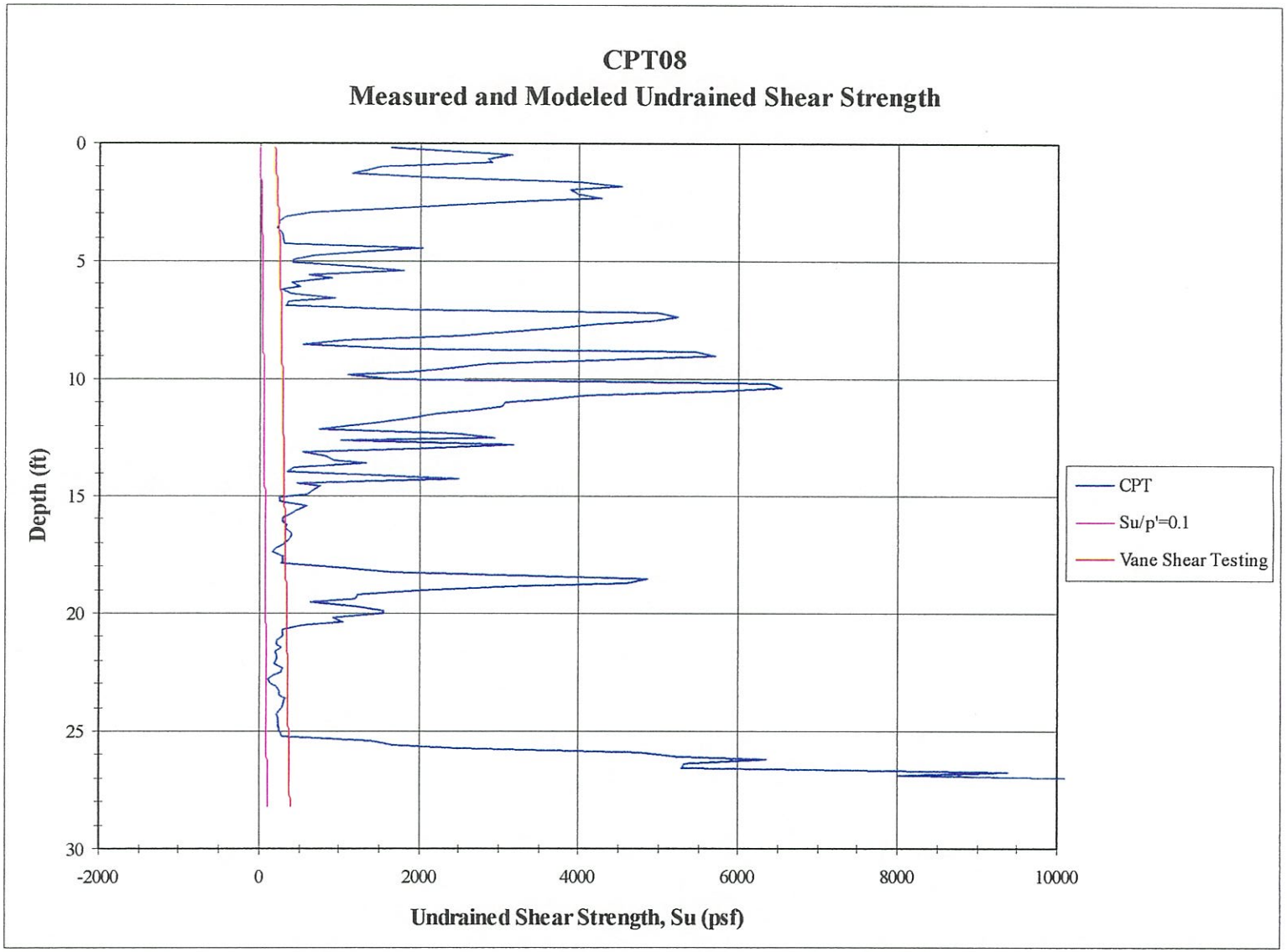


CLIENT/PROJECT COPPER RANGE COMPANY WHITE PINE MINE CLOSURE	Golder Associates Denver, Colorado		TITLE UNDRAINED STRENGTH VERSUS DEPTH
DRAWN DB / CHECKED DRJ / REVIEWED JMJ	DATE APRIL 1998 / SCALE N.T.S. / FILE NO. 2255A072		JOB NO. 973-2255 / DWG NO./REV.NO. A072 / FIGURE 12B

All CPT Data Points
Measured Undrained Shear Strength

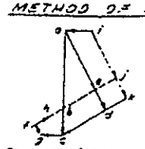


CLIENT/PROJECT COPPER RANGE COMPANY WHITE PINE MINE CLOSURE			Golder Associates Denver, Colorado			TITLE UNDRAINED STRENGTH VERSUS DEPTH	
DRAWN DB	CHECKED DRJ	REVIEWED JMJ	DATE APRIL 1998	SCALE N.T.S.	FILE NO. 2255A072	JOB NO. 973-2255	DWG NO./REV.NO. A072	FIGURE 12B

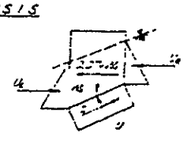


CLIENT/PROJECT COPPER RANGE COMPANY WHITE PINE MINE CLOSURE			Golder Associates Denver, Colorado			TITLE UNDRAINED STRENGTH VERSUS DEPTH		
DRAWN DB	CHECKED DRJ	REVIEWED JMJ	DATE APRIL 1998	SCALE N.T.S.	FILE NO. 2255A073	JOB NO. 973-2255	DWG NO./REV.NO. A073	FIGURE 12C

METHOD OF ANALYSIS



Polygon of Forces acting on a typical slice



Typical Slice with Boundary Forces

VECTOR KEY

ac Total Weight of Slice (Wt.)
cq Net Water forces acting on both sides of slice ($U_a - U_c$)
af Water forces acting on base of slice (U)
ad Component of ac normal to base of slice
ae Effective component of ac normal to base of slice
as Component of ac tangential to base of slice
is Seismic force (0.07 x Wt.)
ij Effective normal component of all forces considered
ck Tangential component of ac and is
fh Cohesion along base of slice (C)

CALCULATION OF SAFETY FACTOR

Without Earthquake

$$FS = \frac{\Sigma ae \times \tan \phi + \Sigma fh}{\Sigma dc}$$

With Earthquake

$$FS = \frac{\Sigma ij \times \tan \phi + \Sigma fh}{\Sigma kc}$$

ϕ Friction angle along base of slice.

ASSUMPTIONS

1. Interslice earth pressure is neglected.
2. Component of ($U_a - U_c$) in the tangential direction is neglected.
3. Seismic force is 0.07 of the total weight applied horizontally in direction of motion.

DESIGN PROPERTIES

Zone	Material	Unit Weight (PCF) Moist	Unit Weight (PCF) Saturated	Friction Angle	Cohesion PSF
①	*Foundation Soil	–	148	28°	500
②	Impervious Fill	133	137	25°	400
③	Cycloned Sand	110	126	32°	0
④	Slimes	–	77	0	0

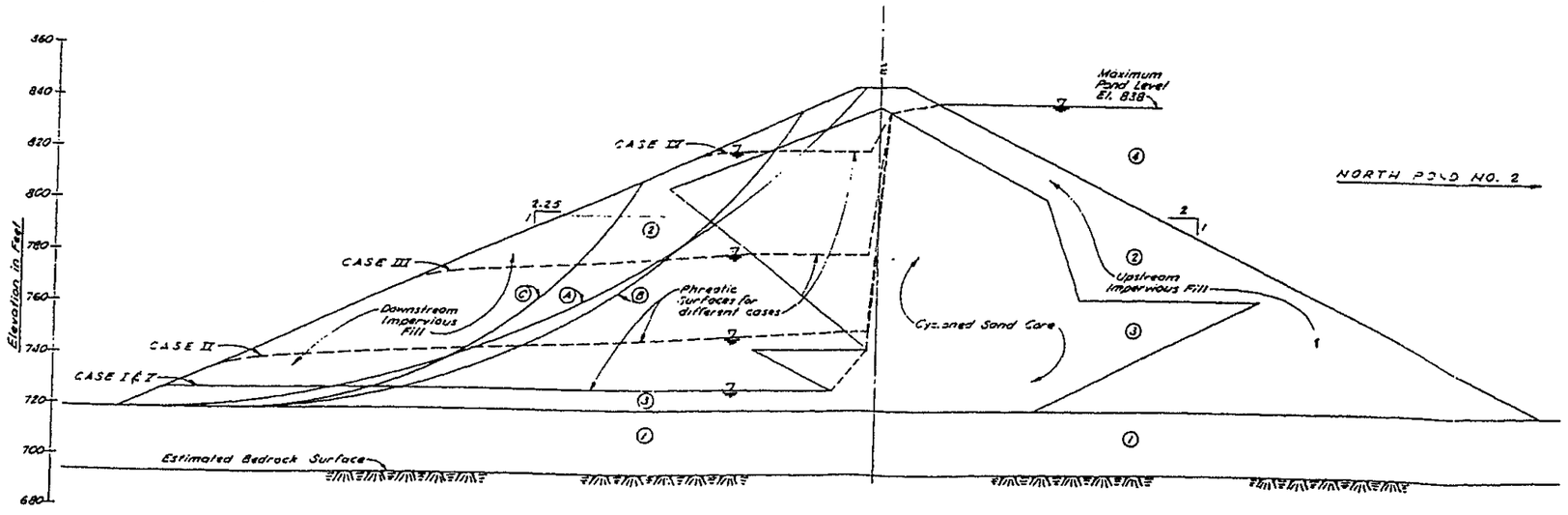
SUMMARY OF STABILITY RESULTS

Swedish Circular Arc Method (Computerized)

Case	Condition	Critical Arc	Min. Factor of Safety
I	Normal Steady-State Seepage	A	1.4
II	Phreatic Surface in Core @ El. 750'	B	1.3
III	Phreatic Surface in Core @ El. 780'	C	1.0
IV	Phreatic Surface in Core @ El. 820'	B	0.3
V	Case I plus Seismic Force (0.07g)	A	1.1

NOTES

1. Core section of the dam has been idealized for details of the actual dam section, see Appendix A, Plate 1.
2. Swedish Circular Arc Method calculations were performed by computer. Results were checked manually
3. Only minimum factor of safety obtained shown, other results available for reference.
4. Design properties based on laboratory tests presented by Soils Testing Services of Wisconsin, Inc., Green Bay, Wisconsin, and in Appendix B "Cycloned Sand Test Results" by Geo-Testing, Inc. of San Rafael, California. The slimes unit weight is based on the 25 cubic feet per ton bulk density of combined tailings used for computing pond storage capacity.
5. Elevations shown are from U.S.S. Topographic Maps with datum referenced to mean sea level. To convert to plant datum add 4356.44 feet.



IDEALIZED MAXIMUM DAM SECTION

DRAWING TAKEN FROM

"WHITE PINE EXPANSION PROJECT"
SUPPLEMENTARY DESIGN ANALYSIS
FOR TAILINGS DAM
WHITE PINE COPPER COMPANY
BY BECHTEL CORPORATION
SAN FRANCISCO, CA
MAY, 1968

Golder Associates

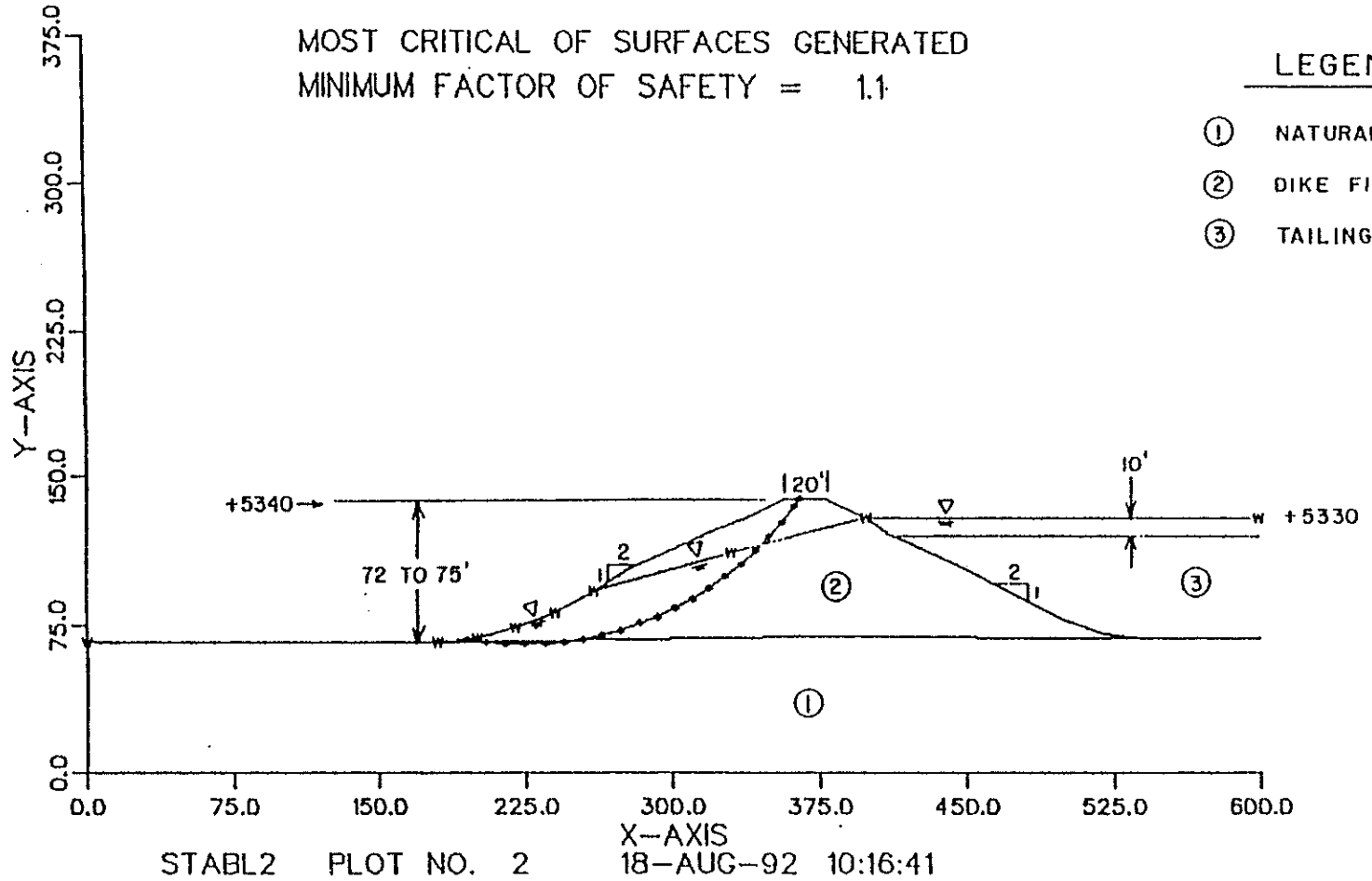
CLIENT/PROJECT
COPPER RANGE COMPANY
WHITE PINE MINE CLOSURE

TITLE
TAILING DISPOSAL
TAILINGS DAM - NORTH POND #2
STABLIITY ANALYSIS

DRAWN	DB	DATE	APRIL 1998	JOB NO.	973-2255
CHECKED	DRJ	SCALE	N.T.S.	DWG. NO. / REV. NO.	B074
REVIEWED	JMJ	FILE NO.	2255B074	FIGURE	13

COPPER RANGE CO–WHITE PINE:SOUTH POND

MOST CRITICAL OF SURFACES GENERATED
MINIMUM FACTOR OF SAFETY = 1.1



DRAWING TAKEN FROM

COPPER RANGE COMPANY
"SOUTH POND EVALUATION"
BY COPPER RANGE COMPANY
WHITE PINE, MICHIGAN
OCTOBER 1, 1992

Golder Associates

200 UNION BLVD. SUITE 500
LAKEWOOD, COLORADO 80228
PHONE: (303) 980-0540
FAX.: (303) 985-2080

CLIENT/PROJECT

COPPER RANGE COMPANY
WHITE PINE MINE CLOSURE

TITLE

STABILITY ANALYSIS "AS PLANNED" TAILINGS DISCHARGE LONG-TERM WITH TAILINGS POND TO FULL HEIGHT

DRAWN	DB	DATE	APRIL 1998	JOB NO.	973-2255
CHECKED	DRJ	SCALE	NO SCALE	DWG. NO. / REV. NO.	A075
REVIEWED	JMJ	FILE NO.	2255A075	FIG. NO.	14

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			GRAPHIC SYMBOL	GROUP SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS — MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS — MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LESS THAN 5% FINES)		GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (MORE THAN 12% FINES)		GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SAND AND SANDY SOILS — MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	CLEAN SAND (LESS THAN 5% FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINES (MORE THAN 12% FINES)		SM	SILTY SANDS, SAND-SILT MIXTURES
				SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS — MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	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
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50%		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS.

Golder Associates — Denver, Colorado

CLIENT/PROJECT
COPPER RANGE COMPANY
WHITE PINE MINE CLOSURE

TITLE
SOIL CLASSIFICATION CHART

DRAWN	RB	DATE	APRIL 1998	JOB NO.	973-2255
CHECKED	DRJ	SCALE	N.T.S.	DWG NO./REV. NO.	A077
REVIEWED	JMJ	FILE NO.	2255A077	FIGURE NO.	B-1

UNIFIED SOIL CLASSIFICATION SYSTEM

CRITERIA FOR ASSIGNING GROUP SYMBOLS AND NAMES			SOIL CLASSIFICATION GROUP	GENERALIZED GROUP DESCRIPTIONS
COARSE-GRAINED SOILS MORE THAN 50% RETAINED ON No. 200 SIEVE	GRAVELS MORE THAN 50% OF COARSE FRACTION RETAINED ON No. 4 SIEVE	CLEAN GRAVELS LESS THAN 5% FINES	GW	WELL-GRADED GRAVELS
			GP	POORLY-GRADED GRAVELS
		GRAVELS WITH FINES MORE THAN 12% FINES	GM	GRAVEL AND SILT MIXTURE
			GC	GRAVEL AND CLAY MIXTURE
	SANDS 50% OR MORE OF COARSE FRACTION PASSES No. 4 SIEVE	CLEAN SANDS LESS THAN 5% FINES	SW	WELL-GRADED SANDS
			SP	POORLY-GRADED SANDS
		SANDS WITH FINES MORE THAN 12% FINES	SM	SAND AND SILT MIXTURE
			SC	SAND AND CLAY MIXTURE
FINE-GRAINED SOILS 50% OR MORE PASSES THE No. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50	INORGANIC	CL	LOW-PLASTICITY CLAYS
			ML	NON-PLASTIC AND LOW-PLASTICITY SILTS
		ORGANIC	OL	NON-PLASTIC AND LOW-PLASTICITY ORGANIC CLAYS
				NON-PLASTIC AND LOW-PLASTICITY ORGANIC SILTS
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50	INORGANIC	CH	HIGH-PLASTICITY CLAYS
			MH	HIGH-PLASTICITY SILTS
		ORGANIC	OH	HIGH-PLASTICITY ORGANIC CLAYS
				HIGH-PLASTICITY ORGANIC SILTS
HIGHLY ORGANIC SOILS	PRIMARILY ORGANIC MATTER, DARK IN COLOR, AND ORGANIC ODOR		PT	PEAT

COMPONENT DEFINITIONS BY GRADATION

COMPONENT	SIZE RANGE
BOULDERS	ABOVE 12 IN.
COBBLES	3 IN. TO 12 IN.
GRAVEL	3 IN. TO NO. 4 (4.76mm)
COARSE GRAVEL	3 IN. TO 3/4 IN.
FINE GRAVEL	3/4 IN. TO NO. 4 (4.76mm)
SAND	NO. 4 (4.76mm) TO NO. 200 (0.074mm)
COARSE SAND	NO. 4 (4.76mm) TO NO. 10 (2.0mm)
MEDIUM SAND	NO. 10 (2.0mm) TO NO. 40 (0.42mm)
FINE SAND	NO. 40 (0.42mm) TO NO. 200 (0.074mm)
SILT AND CLAY	SMALLER THAN NO. 200 (0.074mm)

SAMPLES

SP	SPT SAMPLER (2.0" OD)
HD	HEAVY DUTY SPLIT SPOON
SH	SHELBY TUBE
P	PITCHER SAMPLER
B	BULK
C	CORED

UNLESS OTHERWISE NOTED, DRIVE SAMPLES ADVANCED WITH 140 lb. HAMMER WITH 30" DROP.

RELATIVE DENSITY OR CONSISTENCY UTILIZING STANDARD PENETRATION TEST VALUES

COHESIONLESS SOILS (A)			COHESIVE SOILS (B)		
DENSITY (C)	N, BLOWS/FT. (C)	RELATIVE DENSITY (%)	CONSISTENCY	N, BLOWS/FT. (C)	UNDRAINED SHEAR STRENGTH (D) (PSF)
VERY LOOSE	0 TO 4	0 TO 15	VERY SOFT	0 TO 2	<250
LOOSE	4 TO 10	15 TO 35	SOFT	2 TO 4	250-500
COMPACT	10 TO 30	35 TO 65	FIRM	4 TO 8	500-1000
DENSE	30 TO 50	65 TO 85	STIFF	8 TO 15	1000-2000
VERY DENSE	OVER 50	OVER 85	VERY STIFF	15 TO 30	2000-4000
			HARD	OVER 30	>4000

(A) SOILS CONSISTING OF GRAVEL, SAND, AND SILT, EITHER SEPARATELY OR IN COMBINATION, POSSESSING NO CHARACTERISTICS OF PLASTICITY, AND EXHIBITING DRAINED BEHAVIOR.

(B) SOILS POSSESSING THE CHARACTERISTICS OF PLASTICITY, AND EXHIBITING UNDRAINED BEHAVIOR.

(C) REFER TO TEXT OF ASTM D 1586-84 FOR A DEFINITION OF N; IN NORMALLY CONSOLIDATED COHESIONLESS SOILS RELATIVE DENSITY TERMS ARE BASED ON N VALUES CORRECTED FOR OVERBURDEN PRESSURES.

(D) UNDRAINED SHEAR STRENGTH = 1/2 UNCONFINED COMPRESSION STRENGTH.

LABORATORY TESTS

TEST	DESIGNATION
MOISTURE	(1)
DENSITY	D
GRAIN SIZE	G
HYDROMETER	H
ATTERBERG LIMITS	(1)
CONSOLIDATION	C
UNCONFINED	U
UU TRIAX	UU
CU TRIAX	CU
CD TRIAX	CD
PERMEABILITY	P

(1) MOISTURE AND ATTERBERG LIMITS PLOTTED ON LOG
Wa-% passing #200 sieve

DESCRIPTIVE TERMINOLOGY DENOTING COMPONENT PROPORTIONS

DESCRIPTIVE TERMS	RANGE OF PROPORTION
TRACE	0-5%
LITTLE	5-12%
SOME OR ADJECTIVE (A)	12-30%
AND	30-50%

(A) USE GRAVELLY, SANDY OR SILTY AS APPROPRIATE.

SILT AND CLAY DESCRIPTION

DESCRIPTION	TYPICAL UNIFIED DESIGNATION
SILT	ML (NON-PLASTIC)
CLAYEY SILT	CL-ML (LOW PLASTICITY)
SILTY CLAY	CL
CLAY	CH
PLASTIC SILT	MH
ORGANIC SOILS	OL, OH, PT

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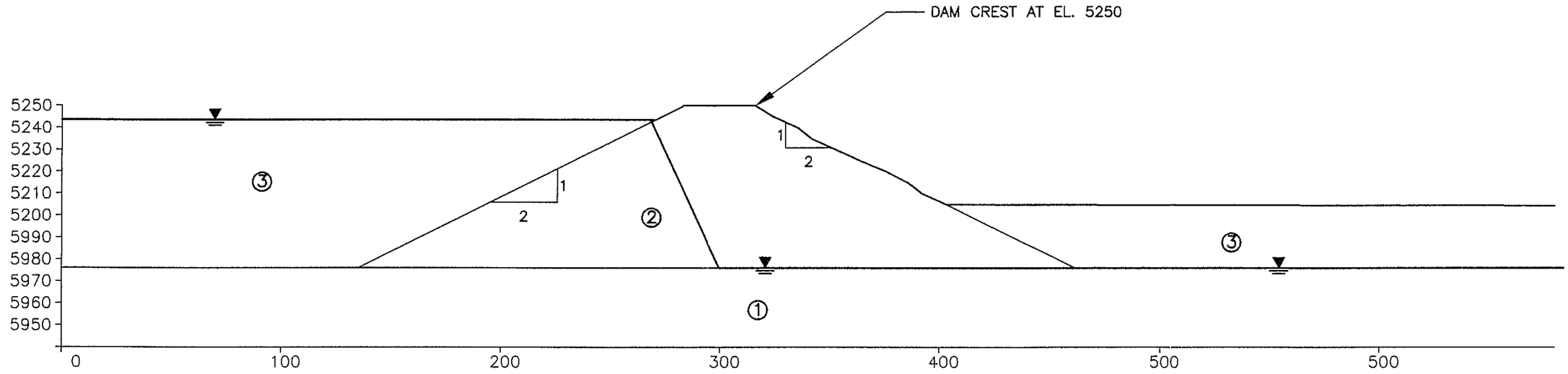
CLIENT/PROJECT
COPPER RANGE COMPANY
WHITE PINE MINE CLOSURE

TITLE
SOIL DESCRIPTION EXPLANATION

DRAWN	RB	DATE	APRIL 1998	JOB NO.	973-2255
CHECKED	DRJ	SCALE	N.T.S.	DWG NO./REV. NO.	A078
REVIEWED	JMJ	FILE NO.	2255A078	FIGURE NO.	B-2

LEGEND

① NATURAL SOILS
② COMPACTED CLAY/DAM FILL
③ TAILINGS



Scale in Feet
0 25 50 100
1" = 50 feet

Golder Associates Denver, Colorado

CLIENT/PROJECT
COPPER RANGE COMPANY
WHITE PINE MINE CLOSURE

TITLE
TAILINGS DAM - NORTH #1 DAM
STABILITY ANALYSIS

DRAWN	DRJ	DATE	APRIL 1998	JOB NO.	973-2255
CHECKED	DRJ	SCALE	1"=50'	DWG. NO./REV. NO.	B076
REVIEWED	JMJ	FILE NO.	2255B076	FIGURE NO.	15

APPENDIX A

CONETEC INVESTIGATION REPORT
(INCLUDED IN PREVIOUS DELIVERABLE)

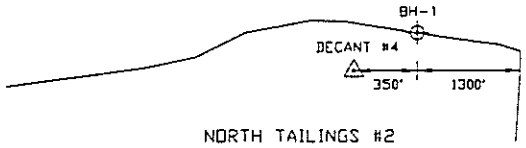
APPENDIX B

BORING LOGS

SOIL BOREHOLE LOG

Golder Associates

SITE NAME AND LOCATION



NORTHING: 49633
EASTING: 47964
ELEVATION 5197

DATUM

DRILLING METHOD: 4 1/4" I.D., 8" O.D. Hollow Stem Auger

SAMPLING METHOD: Split Spoon Sampler

BORING NO. BH-1

SHEET 1 OF 1

					DRILLING START	DRILLING FINISH
WATER LEVEL	DRY	TRACE			TIME	TIME
TIME	17:00	8:15			12:30	5:00
DATE	9/30/97	10/1/97			DATE	DATE
CASING DEPTH	66.33'	64.7'			9/30/97	9/30/97

DRILL RIG

ANGLE BEARING

SAMPLE HAMMER

SURFACE CONDITIONS NORTH SIDE OF AND ADJACENT TO PERIMETER ROAD, SOME GRASS AND LOW VEGETATION

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER (RECOVERY)	SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
5	9 6 11		(0.0-10.5 ft.) Stiff to very stiff, dark reddish brown (10R 3/4), Sandy CLAY, some Gravel lenses, some to little Silt, damp to moist, FILL	SS							
10	6 8 11			SS							
			(5186.5) 10.5								
15	3 10 13		(10.5-18.0 ft.) Compact, greenish black (5G 2/1), Silty SAND, fine to medium grained, damp, non-plastic, FILL	SS							
	6 8 9		(5179.0) 18.0	SS							
20	11 8 12		(18.0-25.5 ft.) Very stiff, dark reddish brown (10R 3/4), CLAY, little Sand, medium plastic, damp, FILL	SS							
25	3 11 13		(5171.5) 25.5								
			(25.5-62.0 ft.) Compact to dense, greenish black (5G 2/1), Silty SAND, fine to medium grained, non-plastic, damp, FILL	SS							
30	11 17 21			SS							
35	18 14 15			SS							
40	23 17 25			SS							
45	20 21 22			SS							
50	13 14 14			SS							
55				SS							
			@ 58.0 ft., hard drilling	SS							
60	7 8 9		(5135.0) 62.0	SS							
65			(62.0-66.0 ft.) Very stiff, dark reddish brown (10R 3/4), CLAY, little Sand, little Silt, medium plastic, damp								
			(5131.0) 66.0								
70			@ 66.0 ft., drive 40/6 in. and 50/1.5 in. No recovery, BEDROCK								
			Total Depth = 67.5 ft.								

DRILLING CONTR

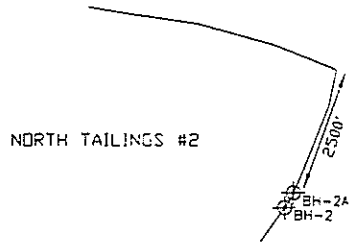
JOB NO.: 973-2255.210 LOGGED BY D. DIX

FILENAME: bh-1 DATE NOVEMBER 1997 CHK'D BY D. JENEVEIN

SOIL BOREHOLE LOG

Golder Associates

SITE NAME AND LOCATION



NORTHING: 46590
EASTING: 49148
DATUM ELEVATION 5197.8

DRILLING METHOD: 4 1/4" I.D., 8" O.D. Hollow Stem Auger

SAMPLING METHOD: Split Spoon Sampler

BORING NO. BH-2

SHEET 1 OF 1

					DRILLING START	DRILLING FINISH
WATER LEVEL	46.2'	43.1'	42.82'		TIME	TIME
TIME	15:00	16:15	10:15		11:30	6:30
DATE	10/2/97	10/3/97	10/11/97		DATE	DATE
CASING DEPTH	51.17'	51.17'	51.17'		10/1/97	10/1/97

DRILL RIG

ANGLE BEARING

SAMPLE HAMMER

SURFACE CONDITIONS EAST SIDE OF AND ADJACENT TO PERIMETER ROAD, GRASS, TALL WEEDS

DEPTH IN FEET (ELEVATION)	BLOW/6 IN. ON SAMPLER (RECOVERY)	SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL		SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
5	6 8 9		(0.0-10.5 ft.) Stiff to very stiff, dark reddish brown (10R 3/4), CLAY, little Gravel, little Sand, fine grained, medium plastic, little Silt, trace cobbles, damp, FILL		SS							
	24 20 ROCK IN TIP 15			(5187.3) 10.5	SS							
10			(10.5-13.0 ft.) Compact, greenish black (5G 2/1), Silty SAND, fine to medium grained, non-plastic, damp, FILL									
	14 15 13			(5184.8) 13.0	SS							
15			(13.0-21.0 ft.) Very stiff, dark reddish brown (10R 3/4), Clayey SILT, non to medium plastic, little fine grained Sand, trace Gravel, FILL									
	5 8 9				SS							
20				(5176.8) 21.0								
	12 13 TAILINGS IN TIP 18		(21.0-40.5 ft.) Compact to dense, greenish black (5G 2/1), Silty SAND, fine to medium grained, non-plastic, damp, 1 in. zone was wet at Clay contact (40.5 ft.), FILL		SS							
25	5 8 9				SS							
30	8 8 9				SS							
35	8 21 24				SS							
40				(5157.3) 40.5								
	9 8 16		(40.5-45.0 ft.) Stiff, moderate reddish brown (10R 4/6), CLAY, medium plastic, little fine grained Sand, trace Gravel, no HCL reaction	(5152.8) 45.0	SS							
45	19 67 92/3"		(45.0-51.0 ft.) Weathered bedrock, moderate reddish brown (10R 4/6), SANDSTONE, NR at 50.0 ft., auger refusal at 50.0 ft.	(5146.8) 51.0	SS							
50	38/3"		(51.0-55.0 ft.) BEDROCK, slightly to moderately weathered, (R1-R3) Cored from 51.0-52.0 ft. with about 3.0 in. recovery and from 52.0-55.0 ft. with about 27.0 in. recovery	(5142.8) 55.0								
55			Total Depth = 55.0 ft									
60												
65												
70												

DRILLING CONTR

JOB NO.: 973-2255.210 LOGGED BY D. DIX

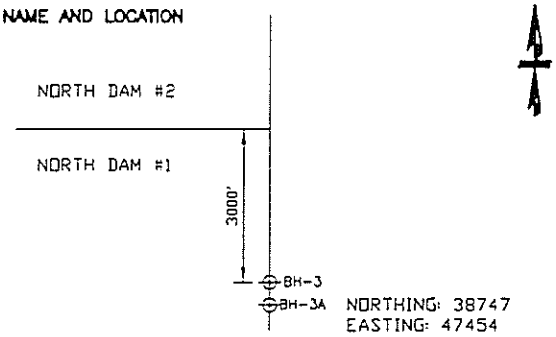
DATE NOVEMBER 1997 CHK'D BY B. JENEVEIN

FILENAME: BH-2

SOIL BOREHOLE LOG

Golder Associates

SITE NAME AND LOCATION



NORTHING: 38747
EASTING: 47454
ELEVATION 5255.2

DATUM

DRILLING METHOD: 4 1/4" I.D., 8" O.D. Hollow Stem Auger

SAMPLING METHOD: Split Spoon Sampler

BORING NO. BH-3

SHEET 1 OF 1

					DRILLING START	DRILLING FINISH
WATER LEVEL	37.8'	33.2'	33.6'	33.65'	TIME	TIME
TIME	9:00	9:30	11:15	18:00	17:00	9:45
DATE	10/3/97	10/6/97	10/11/97	10/16/97	DATE	DATE
CASING DEPTH	45.0'	52.9'	52.92'	52.92'	10/2/97	10/3/97

DRILL RIG

ANGLE BEARING

SAMPLE HAMMER

SURFACE CONDITIONS ADJACENT TO EAST SIDE OF ROAD, GROUND DROPS ~40'

TO THE EAST

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN ON SAMPLER (RECOVERY)	SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
5	5 7 7		(0.0-33.0 ft.) Stiff to very stiff, dark reddish brown (10R 3/4), CLAY, medium plastic, little Sand, fine to coarse, trace Gravel, little Silt, damp, 1 in. moist lenses at 11.0 ft. and 16.0 ft., FILL	SS							
10	6 8 12			SS							
15	4 4 6			SS							
20	3 3 7			SS							
25	3 5 7			SS							
30	5 7 10			SS							
35	6 7 10		(5222.2) 33.0	SS							
40	7 10 15		(33.0-42.0 ft.) Very stiff to hard, dark reddish brown (10R 3/4), CLAY, medium plastic, little Sand, fine to coarse, trace Gravel, silty lenses with depth, damp and drier with depth	SS							
45	28 26 32		Cobble at 40-40.5 ft. (5213.2) 42.0	SS							
50	7 11 21		(42.0-53.0 ft.) Compact to very dense, dark reddish brown, (10R 3/4), SAND, fine to coarse, little Silt, some Gravel lenses, some Clay lenses, wet, difficult drilling from 45.0 ft.	SS							
55	7 20 37 100/2"		@ 53.0 ft., BEDROCK, auger refusal, no recovery, sample obtained from end of auger (5202.2) 53.0 Total Depth = 53.0 ft.	SS							
60											
65											
70											

DRILLING CONTR

LOGGED BY D. DIX

CHK'D BY D. JENEVEIN

DATE NOVEMBER 1997

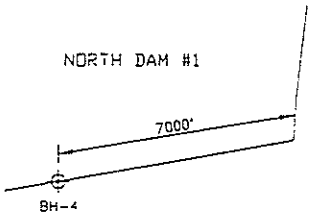
JOB NO.: 973-2255.210

FILENAME: BH-3

SOIL BOREHOLE LOG

Golder Associates

SITE NAME AND LOCATION



NORTHING: 35476
EASTING: 40468
ELEVATION 5261.5

DATUM

DRILLING METHOD: 4 1/4" I.D., 8" O.D. Hollow Stem Auger					BORING NO. BH-4
					SHEET 1 OF 1
SAMPLING METHOD: Split Spoon Sampler					DRILLING START / FINISH
WATER LEVEL	46.0'	TRACE			TIME 14:15 / TIME 17:00
TIME	17:00	8:30			
DATE	10/6/97	10/7/97			DATE 10/6/97 / DATE 10/6/97
CASING DEPTH	50.0'	33.5'			

DRILL RIG

ANGLE BEARING

SAMPLE HAMMER

SURFACE CONDITIONS WEEDS AND GRASSES, ASPEN TREES, BH-4 ON SOUTH SIDE OF ACCESS ROAD. GROUND DROPS ABOUT 15' TO THE SOUTH.

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER (RECOVERY)	SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
5	4 4 5		(0.0-14.0 ft.) Stiff, moderate reddish brown (10R 4/6), Silty CLAY, medium plastic, little Sand, fine to coarse grained, little fine to coarse Gravel, damp, trace carbonaceous, FILL 1/4-1/2 in. wet zones from 10.0-14.0 ft.	SS							
10	3 5 7			SS							
15	3 4 5			SS							
20	5 11 15		(14.0-38.0 ft.) Very stiff to hard, moderate reddish brown (10R 4/6), CLAY, medium plastic, trace Sand, fine to coarse grained, trace fine Gravel, little Silt, damp to moist	SS							
25	8 11 15			SS							
30	6 12 14			SS							
35	10 11 9		@ 30.0 ft., moist and highly plastic	SS							
40	20 24 24		@ 35.0 ft., cobble in tip (5223.5) 38.0 (38.0-49.5 ft.) Highly weathered BEDROCK, moderate reddish brown (10R 4/6), groundwater at 46.0 ft.	SS							
45	14 42/1"		@ 40.0 ft., cobble in tip	SS							
50	20 63 89		(5212.0) 49.5	SS							
55	50/1"		(49.5-50.0 ft.) BEDROCK, no recovery at 50.0 ft., auger refusal at 49.5 ft. (5211.5) 50.0 Total Depth = 50.0 ft.								
60											
65											
70											

DRILLING CONTR

LOGGED BY D. DIX

CHK'D BY D. JENEVEIN

DATE NOVEMBER 1997

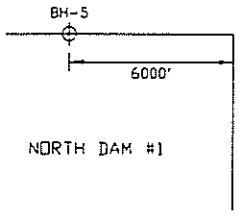
JOB NO.: 973-2255.210

FILENAME: BH-4

SOIL BOREHOLE LOG

Golder Associates

SITE NAME AND LOCATION



NORTHING: 41923
EASTING: 41202
ELEVATION 5250.6

DATUM

DRILLING METHOD: 4 1/4" I.D., 8" O.D. Hollow Stem Auger

SAMPLING METHOD: Split Spoon Sampler

BORING NO. BH-5

SHEET 1 OF 1

					DRILLING START	DRILLING FINISH
WATER LEVEL	49.7'				TIME 9:45	TIME 15:00
TIME	15:30				DATE 10/7/97	DATE 10/7/97
DATE	10/7/97					
CASING DEPTH	45.0'					

DRILL RIG

ANGLE BEARING

SAMPLE HAMMER

SURFACE CONDITIONS 1'-2' OF SLAG AS ROAD SURFACING, 40'-50' DROP TO NORTH AND 15' DROP TO SOUTH BORING IN MIDDLE OF ACCESS ROAD. WATER AND CATTAILS IN POND TO SOUTH.

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER (RECOVERY)	SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
5	5 8 7		(0.0-46.0 ft.) Stiff to very stiff, moderate reddish brown (10R 4/6), CLAY, medium plastic, trace fine to coarse Gravel, little fine to coarse Sand, trace Silt, damp with 1/4-1/2 in. damp to wet lenses, some greenish gray (5GY 6/1) mottling at 31.0-36.0 ft., FILL	SS							
10	3 6 7			SS							
15	3 4 9			SS							
20	6 8 9			SS							
25	3 4 6			SS							
30	3 5 7			SS							
35	6 9 12			SS							
40	4 8 11			SS							
45	5 6 7			SS							
50	3 7 11		(5204.6) 46.0 (46.0-65.0 ft.) Very stiff, to hard, mottled dark yellowish brown (10YR 4/2), CLAY, medium plastic, little fine to medium Sand, trace Gravel, changing to moderate brown (5YR 4/4) then moderate reddish brown (10R 4/6) with depth, moist at 46.0 ft. changing to damp by 55.0 ft., little Silt	SS							
55	6 7 8			SS							
60	7 17 26			SS							
65	12 45 30/3"		(5185.6) 65.0 (65.0-67.0 ft.) Highly weathered BEDROCK, reddish brown (10R 4/6), wet at 65.0 ft. (5183.6) 67.0 (67.0-70.0 ft.) BEDROCK, auger refusal at 70.0 ft. (5180.6) 70.0 Total Depth = 70.0 ft.	SS							
70											

DRILLING CONTR

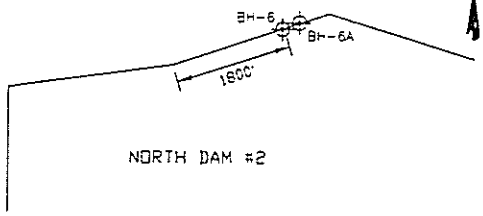
JOB NO.: 973-2255.210 LOGGED BY D. DIX DATE NOVEMBER 1997 CHK'D BY D. JENEVEIN

FILENAME: BH-5

SOIL BOREHOLE LOG

Golder Associates

SITE NAME AND LOCATION



NORTHING: 50531
EASTING: 43360
ELEVATION 5197.8

DATUM

DRILLING METHOD: 4 1/4" I.D., 8" O.D. Hollow Stem Auger

SAMPLING METHOD: Split Spoon Sampler

BORING NO. BH-6

SHEET 1 OF 1

					DRILLING START	DRILLING FINISH
WATER LEVEL	TRACE	57.68'			TIME	TIME
TIME	17:00	12:00			9:00	12:00
DATE	10/8/97	10/11/97			DATE	DATE
CASING DEPTH	62.48'	62.47'			10/8/97	10/8/97

DRILL RIG

ANGLE BEARING

SAMPLE HAMMER

SURFACE CONDITIONS NORTH SIDE OF EMBANKMENT, GRASS AND WEEDS, ~50' DROP TO NORTH AND 20' DROP TO SOUTH, SOUTH SIDE HAS PONDED WATER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER (RECOVERY)	SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
5	8 13 Rock in tip 11		(0.0-10.5 ft.) Very stiff, moderate reddish brown (10R 4/6), Sandy CLAY, medium plastic, fine to coarse grained, little Silt, little fine to coarse Gravel, damp, some 1 ft. Clay lenses with little Sand, FILL	SS							
10	5 10 14		(5187.3) 10.5	SS							
15	6 7 12		(10.5-20.5 ft.) Compact, greenish black (5G 2/1), Silty SAND, fine to medium grained, damp, FILL	SS							
20	8 10 12		from 15.0-16.0 ft., drive split spoon down middle - 1/2 Clay and 1/2 Sand	SS							
25	9 10 10		(5177.3) 20.5 (20.5-23.0 ft.) Very stiff, moderate reddish brown (10R 4/6), CLAY, medium plastic, little fine to coarse Sand, trace fine Gravel, damp, FILL	SS							
30	4 7 9		(5174.8) 23.0 (23.0-56.0 ft.) Compact to dense, greenish black (5G 2/1), Silty SAND, fine to medium grained, damp, FILL	SS							
35	12 17 24			SS							
40	8 10 10			SS							
45	10 12 20		from 40.0-40.5 ft., moderate reddish brown (10R 4/6), CLAY, little Silt, trace Sand	SS							
50	9 20 23			SS							
55	9 12 18			SS							
60			(5141.8) 56.0 (56.0-60.5 ft.) Very stiff to hard, moderate reddish brown (10R 4/6), Silty CLAY, some fine Sand, low plasticity, damp	SS							
65	17 34/1"		(5137.3) 60.5 @ 60.5 ft., BEDROCK, auger refusal Total Depth = 60.5 ft.								
70											

DRILLING CONTR

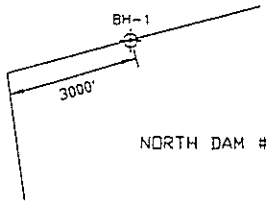
JOB NO.: 973-2255.210 LOGGED BY D. BIX

FILENAME: BH-6 DATE NOVEMBER 1997 CHK'D BY D. JENEVEIN

SOIL BOREHOLE LOG

Golder Associates

SITE NAME AND LOCATION



NORTHING: 48944
EASTING: 38533
ELEVATION 5197.5

DATUM

DRILLING METHOD: 4 1/4" I.D., 8" O.D. Hollow Stem Auger

SAMPLING METHOD: Split Spoon Sampler

BORING NO. BH-7

SHEET 1 OF 2

					DRILLING START TIME	DRILLING FINISH TIME
WATER LEVEL	81.5'	68.1'			12:15	9:00
TIME	17:45	8:30				
DATE	10/9/97	10/10/97			DATE 10/9/97	DATE 10/10/97
CASING DEPTH	80.0'	80.0'				

DRILL RIG

ANGLE BEARING

SAMPLE HAMMER

SURFACE CONDITIONS GRASS AND WEEDS. 70'-80' DROP TO NORTH, 15' DROP TO SOUTH WITH TAILINGS BEACH AND 100' SOUTH TO WATER. HOLE IN NORTH SIDE SIDE OF EMBANKMENT.

DEPTH IN FEET (ELEVATION)	BLOW/6 IN. ON SAMPLER (RECOVERY)	SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
5	4 8 12		(0.0-10.5 ft.) Very stiff, moderate reddish brown (10R 4/6), Sandy CLAY, medium plastic, fine to coarse grained, little fine to coarse Gravel, trace cobbles, little Silt, damp, FILL	SS							
10	5 5 9 12			SS							
			(5187.0) 10.5								
15	12 13 14		(10.5-18.0 ft.) Compact, greenish black (5G 2/1), Silty SAND, fine to medium grained, damp, FILL	SS							
			(5179.5) 18.0								
20	14 12 14		(18.0-23.0 ft.) Stiff to very stiff, moderate reddish brown (10R 4/6), CLAY, medium plastic, trace to some fine to coarse Sand, trace cobbles, little Silt, damp, FILL	SS							
	18 8 7		(5174.5) 23.0								
25	7 11 9		(23.0-30.5 ft.) Compact, greenish black (5G 2/1), Silty SAND, fine to medium grained, damp, FILL	SS							
			(5167.0) 30.5								
30	12 7 7		(30.5-31.5 ft.) Stiff, moderate reddish brown (10R 4/6), CLAY, medium plastic, trace fine to coarse Sand, little Silt, damp, FILL	SS							
			(5166.0) 31.5								
35	14 12 11		(31.5-41.0 ft.) Compact, greenish black (5G 2/1), Silty SAND, fine to medium grained, damp, FILL	SS							
40	13 11 12			SS							
			(5156.5) 41.0								
45	22 24 24		(41.0-44.0 ft.) Very stiff, moderate reddish brown (10R 4/6), CLAY, medium plastic, trace fine Sand, little Silt, trace cobbles, damp, FILL	SS							
			(5153.5) 44.0								
50	2 12 17		(44.0-63.0 ft.) Compact to dense, greenish black (5G 2/1), Silty SAND, fine to medium grained, damp, FILL	SS							
55	5 7 8			SS							
60	14 22 26			SS							
			(5134.5) 63.0								
65			(63.0-80.0 ft.) Very stiff, moderate reddish brown (10R 4/6), CLAY, medium plastic, some fine to coarse Sand, little Silt								
70	22 16 24			SS							

DRILLING CONTR

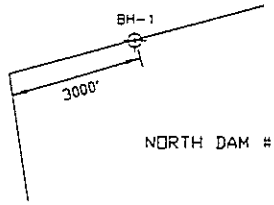
JOB NO.: 973-2255.210 LOGGED BY B. DIX

FILENAME: BH-7 DATE NOVEMBER 1997 CHK'D BY B. JENEVEIN

SOIL BOREHOLE LOG

Golder Associates

SITE NAME AND LOCATION



NORTHING 48944
EASTING 38533
ELEVATION 5197.5

DATUM

DRILLING METHOD: 4 1/4" I.D., 8" O.D. Hollow Stem Auger

SAMPLING METHOD: Split Spoon Sampler

BORING NO. BH-7

SHEET 2 OF 2

					DRILLING START TIME	DRILLING FINISH TIME
WATER LEVEL	81.5'	68.1'			12:15	9:00
TIME	17:45	8:30			DATE	DATE
DATE	10/9/97	10/10/97			10/9/97	10/10/97
CASING DEPTH	80.0'	80.0'				

DRILL RIG

ANGLE BEARING

SAMPLE HAMMER

SURFACE CONDITIONS GRASS AND WEEDS. 70'-80' DROP TO NORTH, 15' DROP TO SOUTH WITH TAILINGS BEACH AND 100' SOUTH TO WATER. HOLE IN NORTH SIDE OF EMBANKMENT.

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER (RECOVERY)	SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL		SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
80	16 25 50/5"		(63.0-80.0 ft.) Very stiff, moderate reddish brown (10R 4/6), CLAY, medium plastic, some fine to coarse Sand, little Silt	(5117.5) 80.0	SS			..				
85			(80.0-83.0 ft.) Reddish brown (10R 4/6), Silty SAND, moderate fine grained, little Silt, damp changing to wet at 81.5 ft., trace cobbles	(5114.5) 83.0								
90			(83.0-85.0 ft.) Weathered BEDROCK, difficult drilling	(5112.5) 85.0								
95			@ 85.0 ft., BEDROCK, auger refusal									
100			Total Depth = 85.0 ft.									
105												
110												
115												
120												
125												
130												
135												
140												
145												

DRILLING CONTR

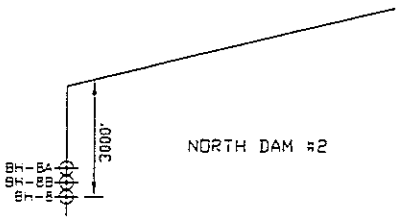
JOB NO.: 973-2255.210 LOGGED BY D. DIX

FILENAME: BH-7 DATE NOVEMBER 1997 CHK'D BY D. JENEVEIN

SOIL BOREHOLE LOG

Golder Associates

SITE NAME AND LOCATION



NORTHING: 44845
EASTING: 35214
ELEVATION 5193.8

DATUM

DRILLING METHOD: 4 1/4" I.D., 8" O.D. Hollow Stem Auger

BORING NO. BH-8

SHEET 1 OF 1

SAMPLING METHOD: Split Spoon Sampler

					DRILLING START	DRILLING FINISH
WATER LEVEL	51.0'	43.0'	38.5'	35.2'	TIME	TIME
TIME	12:00	14:00	15:30	17:30	12:30	12:00
DATE	10/14/97	10/14/97	10/14/97	10/14/97	DATE	DATE
CASING DEPTH	67.0'	40.0'	0.0'	0.0'	10/10/97	10/14/97

DRILL RIG

SURFACE CONDITIONS GRASS AND WEEDS, 40' DROP TO WEST, 5' DROP TO EAST

ANGLE BEARING

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER (RECOVERY)	SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
5	2 5 6		(0.0-10.5 ft.) Stiff to very stiff, moderate reddish brown (10R 4/6), CLAY, medium plastic, little fine to coarse Sand, little Silt, damp, trace organics, trace boulders, FILL	SS							
10	4 13 15		(5183.3) 10.5 (10.5-15.5 ft.) Compact, greenish black (5G 2/1), Silty SAND, fine to medium grained, damp, FILL	SS							
15	6 9 9		(5178.3) 15.5 (15.5-21.0 ft.) Stiff to very stiff, moderate reddish brown (10R 4/6), CLAY, medium plastic, little to some fine to coarse Sand, trace Gravel, damp, FILL	SS							
20	4 6 6		(5172.8) 21.0	SS							
25	4 9 16		(21.0-26.0 ft.) Compact, greenish black (5G 2/1), Silty SAND, fine to medium grained, damp, FILL	SS							
30	7 10 11		(5167.8) 26.0 (26.0-27.0 ft.) Stiff, moderate reddish brown (10R 4/6), CLAY, medium plastic, little fine to coarse Sand, damp, (Clay in tip of 25.0 ft. split spoon), FILL	SS							
35	7 8 16		(5166.8) 27.0 (27.0-43.0 ft.) Compact to dense, greenish black (5G 2/1), Silty SAND, fine to medium grained, damp, FILL	SS							
40	11 13 16			SS							
45	14 17 20		(5150.8) 43.0 (43.0-62.0 ft.) Very stiff, moderate reddish brown (10R 4/6), CLAY, medium plastic, little fine to coarse Sand, trace Gravel, damp	SS							
50	8 12 16			SS							
55	5 7 10			SS							
60	40/6"			SS							
65			(5131.8) 62.0 (62.0-67.0 ft.) Compact, moderate reddish brown (10R 4/6), SAND, fine to coarse grained, Silty to Clayey, some fine to coarse Gravel, wet								
70	3 7 16		(5126.8) 67.0 @ 67.0 ft., BEDROCK, auger refusal Total Depth = 67.0 ft.	SS							

DRILLING CONTR _____

JOB NO.: 973-2255.210 LOGGED BY _____ D. DIX

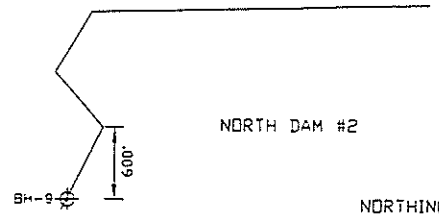
DATE NOVEMBER 1997 CHK'D BY D. JENEVEIN

FILENAME: BH-8

SOIL BOREHOLE LOG

Golder Associates

SITE NAME AND LOCATION



NORTHING: 38938
EASTING: 34542
ELEVATION 5257.6
DATUM

DRILLING METHOD: 4 1/4" I.D., 8" O.D. Hollow Stem Auger

SAMPLING METHOD: Split Spoon Sampler

BORING NO. BH-9

SHEET 1 OF 1

					DRILLING START	DRILLING FINISH
WATER LEVEL	DRY	19.1'	59.5'		TIME	TIME
TIME	16:00	9:30	12:00		13:45	16:15
DATE	10/17/97	10/18/97	10/18/97		DATE	DATE
CASING DEPTH	60.0'	62.07'	62.07'		10/17/97	10/17/97

DRILL RIG

ANGLE BEARING

SAMPLE HAMMER

SURFACE CONDITIONS WIDE SPOT IN PERIMETER ROAD WITH SLAG FILL TO WEST

APPROXIMATELY 40'-50' DROP TO WEST AND 5' DROP TO EAST

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN ON SAMPLER (RECOVERY)	SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
5	5 6 8		(0.0-13.0 ft.) Loose to compact, grayish black (N/2), Sandy GRAVEL, (slag and tailings) little Silt, some cobbles, damp, some boulders, FILL	SS							
10	5 3 2		(5244.6) 13.0	SS							
15	14 6 8		(13.0-34.0 ft.) Stiff to very stiff, moderate reddish brown (10R 4/6), CLAY, medium plastic, little fine to coarse Sand, trace Gravel, damp, trace organics, trace cobbles, FILL	SS							
20	6 6 8			SS							
25	2 2 8			SS							
30	6 9 14		(5223.6) 34.0	SS							
35			(34.0-60.0 ft.) Very stiff, moderate reddish brown (10R 4/6), CLAY, medium plastic, little fine to coarse Sand, damp with 1/4-1/2 in. wet zones at 41.0 ft. and changing to moist by 50.0 ft.								
40	5 8 13			SS							
45											
50	5 7 10			SS							
55											
60			(5197.6) 60.0								
65	4 6 10		Total Depth = 60.0 ft.	SS							
70											

DRILLING CONTR

JOB NO.: 973-2255.210 LOGGED BY D. DIX

FILENAME: BH-9 DATE NOVEMBER 1997 CHK'D BY B. JENEVEIN

SOIL BOREHOLE LOG

Golder Associates

SITE NAME AND LOCATION	DRILLING METHOD: 4 1/4" I.D., 8" O.D. Hollow Stem Auger	BORING NO. BH-9A
		SHEET 1 OF 1
	SAMPLING METHOD: Split Spoon Sampler	DRILLING
		START TIME 8:45 / FINISH TIME 9:45
	WATER LEVEL / TIME / DATE / CASING DEPTH	DATE 10/18/97 / DATE 10/18/97
DATUM	NORTHING: 38905 EASTING: 34538 ELEVATION 5258.2	
DRILL RIG	SURFACE CONDITIONS	
ANGLE BEARING		
SAMPLE HAMMER		

DRILLING CONTR

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER (RECOVERY)	SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
5	4 5 6		(0.0-3.0 ft.) Loose to compact, grayish black (N/2), Sandy GRAVEL, (slag and tailings) little Silt, some cobbles, damp, FILL (5255.2) 3.0	SS							
10			(3.0-6.5 ft.) Moderate reddish brown (10R 4/6), CLAY, medium plastic, little fine to coarse Sand, damp, FILL (5251.7) 6.5								
15			Total Depth = 6.5 ft.								
20											
25											
30											
35											
40											
45											
50											
55											
60											
65											
70											

JOB NO.: 973-2255.210 LOGGED BY D. DIX

DATE NOVEMBER 1997 CHK'D BY D. JENEVEIN

FILENAME: BH-9A

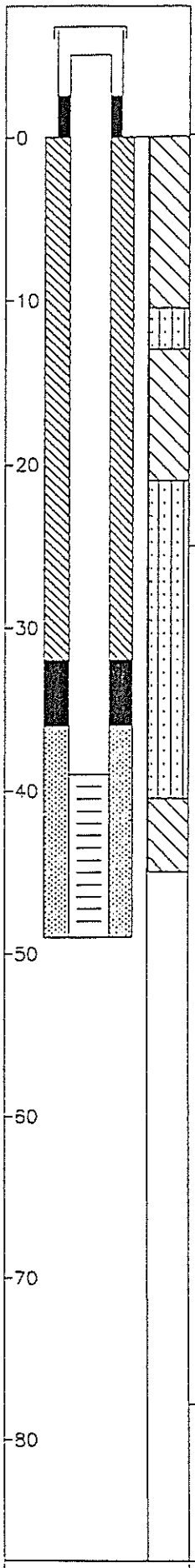
APPENDIX C

WELL CONSTRUCTION RECORDS

Well No. BH-2

Boring No. X-Ref: BH-2

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 46590 ft. Easting: 49148 ft.

Elevation Ground Level 5197.8 ft. NGVD

Top of PVC Casing 5199.8 ft. NGVD

Drilling Summary:

Total Depth 55.0 ft.

Borehole Diameter 8 in.

Casing Stickup Height 2.00 ft.

Driller Coleman

Rig

Bit(s) 4 1/4" I.D. 8" O.D. Hollow Stem Auger to 50'; 3 3/4" Roller Bit to 51'; Core 51-55'

Drilling Fluid Water

Protective Casing 4" O.D. Steel, 5' long with 3' embedment

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling	10/1/97	11:30	10/1/97	12:30
	10/1/97	2:30	10/1/97	3:30
	10/1/97	4:30	10/1/97	6:30
Geophys.Logging:				
Casing:	10/2/97	8:30	10/2/97	11:30
Filter Placement:	10/2/97	8:30	10/2/97	11:30
Cementing:	10/2/97	8:30	10/2/97	11:30
Development	10/2/97	8:30	10/2/97	11:30

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 2.00	-	41.17	C1	5199.80	-	5156.63
39.00	-	49.00	S1	5158.80	-	5148.80

Casing: C1 Solid 2" PVC

C2

Screen: S1 0.010" Slot

Sand Pack: None

Filter Pack: 23-40 Sand (36.0-49.0')

Grout Seal: See below (0.0-32.0')

Bentonite Seal: Bentonite Chips (32.0-36.0')

Concrete: None

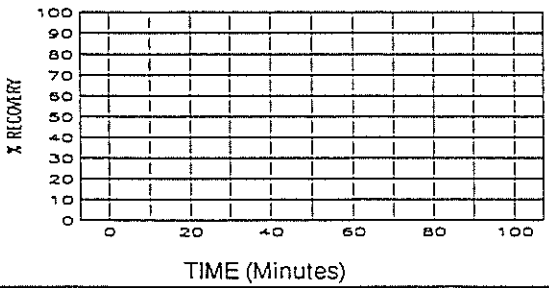
Well Development

Bailed to 7.5' from 43.1' on 10/3/97

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Grout=1 sack cement and 3-50lb. sacks powdered bentonite and 55 gal. water

1 sack bentonite chips and surface, water from coring bailed from well upon completion 10/3/97

Supervised by D. Dix

Job Number 973-2255

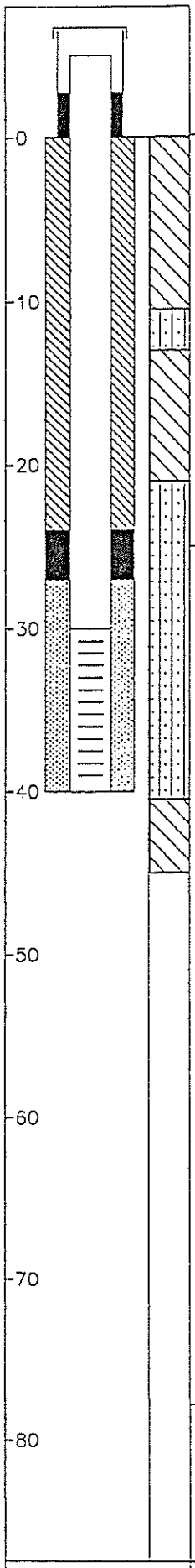
Site

File Name BH-2

Well No. BH-2A

Boring No. X-Ref: BH-2A

PIEZOMETER CONSTRUCTION SUMMARY



Survey Coords: Northing: 46590 ft.
Easting: 49148 ft.

Elevation Ground Level 5197.8 ft. NGVD
Top of PVC Casing 5198.0 ft. NGVD

Drilling Summary:

Total Depth 40.0 ft.
Borehole Diameter 8 in.
Casing Stickup Height 2.20 ft.
Driller Coleman

Rig
Bit(s) 4 1/4" I.D. 8" O.D. Hollow Stem Auger

Drilling Fluid None

Protective Casing 4" O.D. Steel, 5' long with 3' embedment

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling	10/2/97	12:30	10/2/97	1:30
Geophys.Logging:				
Casing:	10/2/97	1:30	10/2/97	3:00
Filter Placement:	10/2/97	1:30	10/2/97	3:00
Cementing:	10/2/97	1:30	10/2/97	3:00
Development	10/2/97	1:30	10/2/97	3:00

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 2.20	-	32.18	C1	5200.00	-	5165.62
30.00	-	40.00	S1	5167.80	-	5157.80

Casing: C1 Solid 2" PVC

C2

Screen: S1 0.010" Slot

Sand Pack: None

Filter Pack: 23-40 Sand (27.0-40.0')

Grout Seal: See below (0.0-24.0')

Bentonite Seal: Bentonite Chips (24.0-27.0')

Concrete: None

Well Development

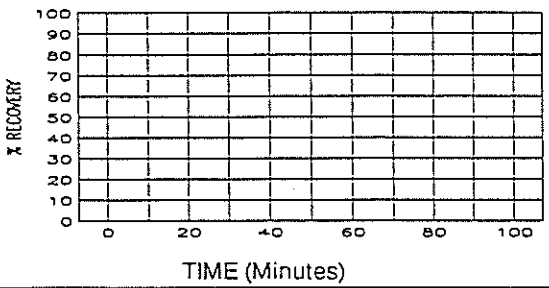
10/3/97 - 16:30 - Dry - 42.18'

10/11/97 - 10:15 - Dry - 42.18'

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments: Grout same as BH-2. BH-2A located approximately 25' north of BH-2.

Not to Scale

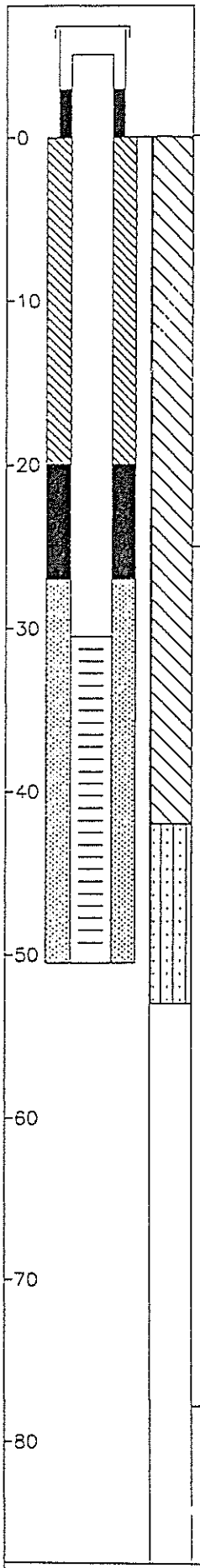
Supervised by D. Dix
Job Number 973-2255

Site
File Name BH-2A

Well No. BH-3

Boring No. X-Ref: BH-3

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 38747 ft.
Easting: 47454 ft.

Elevation Ground Level 5255.2 ft. NGVD
Top of PVC Casing 5257.6 ft. NGVD

Drilling Summary:

Total Depth 53.0 ft.
Borehole Diameter 8 in.
Casing Stickup Height 2.40 ft.
Driller Coleman

Rig
Bit(s) 4 1/4" I.D. 8" O.D. Hollow Stem Auger

Drilling Fluid None

Protective Casing 4" O.D. Steel, 5' long with 3' embedment

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling	10/2/97	17:00	10/3/97	9:45
Geophys.Logging:				
Casing:	10/3/97	9:45	10/3/97	1:00
Filter Placement:	10/3/97	9:45	10/3/97	1:00
Cementing:	10/3/97	9:45	10/3/97	1:00
Development	10/3/97	9:45	10/3/97	1:00

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 2.40	-	32.90	C1	5257.60	-	5222.30
30.50	-	50.50	S1	5224.70	-	5204.70

Casing: C1 Solid 2" PVC

C2

Screen: S1 0.010" Slot

Sand Pack: None

Filter Pack: 23-40 Sand (27.0-50.5')

Grout Seal: 55 gal. water, 3 sacks bentonite, 1 sack cement (0.0-20.0')

Bentonite Seal: Bentonite Chips (20.0-27.0')

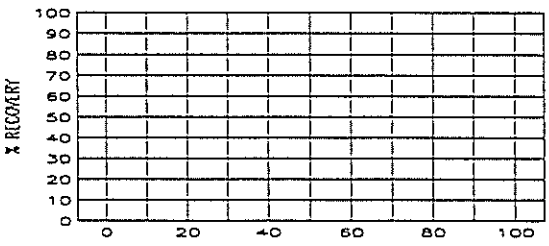
Concrete: None

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments: Unable to get measuring tape to bottom of casing. Piezometer bailed on 10/3/97, 10/6/97 to remove sediment.

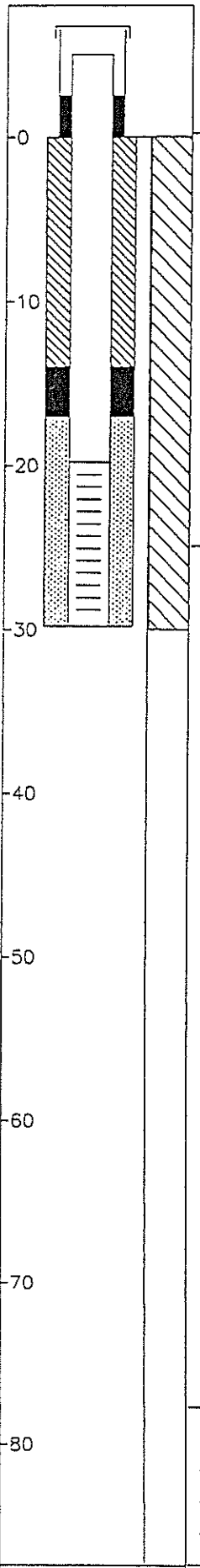
Supervised by D. Dix
Job Number 973-2255

Site
File Name BH-3

Well No. BH-3A

Boring No. X-Ref: BH-3A

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 38722 ft. Easting: 47454 ft.

Elevation Ground Level 5255.2 ft. NGVD

Top of PVC Casing 5257.2 ft. NGVD

Drilling Summary:

Total Depth 30.0 ft.

Borehole Diameter 8 in.

Casing Stickup Height 2.00 ft.

Driller Coleman

Rig

Bit(s) 4 1/4" I.D. 8" O.D. Hollow Stem Auger

Drilling Fluid None

Protective Casing 4" O.D. Steel, 5' long with 3' embedment

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling	10/6/97	10:00	10/6/97	11:00
Geophys.Logging:				
Casing:	10/5/97	11:00		
Filter Placement:	10/6/97	11:00	10/6/97	12:15
Cementing:				
Development			10/6/97	12:15

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 2.00	-	21.90	C1	5257.20	-	5233.30
19.80	-	29.80	S1	5235.40	-	5225.40

Casing: C1 Solid 2" PVC

C2

Screen: S1 0.010" Slot

Sand Pack: None

Filter Pack: 23-40 Sand (17.0-29.8')

Grout Seal: 1/2 sack cement, 1 sack bentonite powder, 25 gal. water (0.0-14.0')

Bentonite Seal: Bentonite Chips (14.0-17.0')

Concrete: None

Well Development

10/6/97 - 13:00 - Dry - 31.94'

10/11/97 - 11:00 - 30.95' - 31.94'

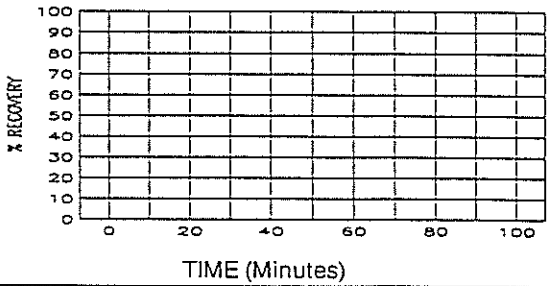
10/16/97 - 18:00 - 30.31' - 31.94'

Bailed after 10/11/97 measurement to 31.5'

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

25' south of BH-3

Supervised by D. Dix

Job Number 973-2255

Site

File Name BH-3A

Well No. BH-6

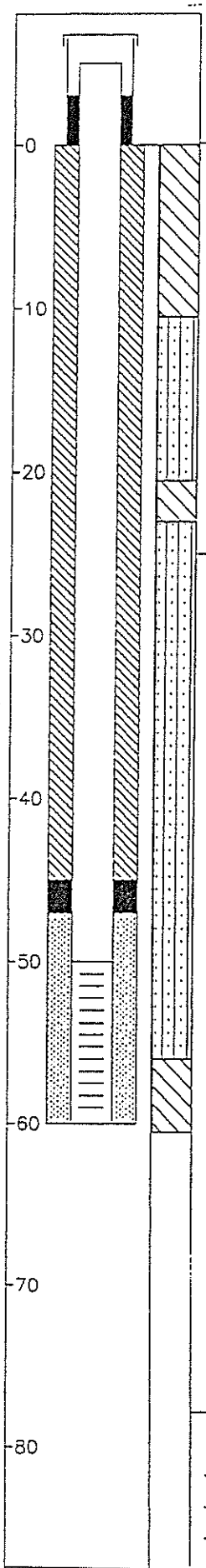
Boring No. X-Ref: BH-6

PIEZOMETER CONSTRUCTION SUMMARY

Survey Coords: Northing: 50531 ft. Easting: 43360 ft.

Elevation Ground Level 5197.8 ft. NGVD

Top of PVC Casing 5200.3 ft. NGVD



Not to Scale

Drilling Summary:

Total Depth 60.0 ft.
Borehole Diameter 8 in.
Casing Stickup Height 2.50 ft.
Driller Coleman

Rig
Bit(s) 4 1/4" I.D. 8" O.D. Hollow Stem Auger

Drilling Fluid None

Protective Casing 4" O.D. Steel, 5' long with 3' embedment

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 2.50	-	52.50	C1	5200.30	-	5145.30
50.00	-	60.00	S1	5147.80	-	5137.80
	-				-	
	-				-	
	-				-	
	-				-	

Casing: C1 Solid 2" PVC

C2

Screen: S1 0.010" Slot

Sand Pack: None

Filter Pack: 23-40 Sand (47.0-60.0')

Grout Seal: 55 gal. water, 3 sacks bentonite, 1 sack cement (0.0-45.0')

Bentonite Seal: Bentonite Chips (45.0-47.0')

Concrete: None

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling	10/8/97	9:00	10/8/97	12:00
Geophys.Logging:				
Casing:	10/8/97	12:00	10/8/97	
Filter Placement:	10/8/97	12:15	10/8/97	13:15
Cementing:				
Development				
	10/8/97	13:15	10/8/97	15:00

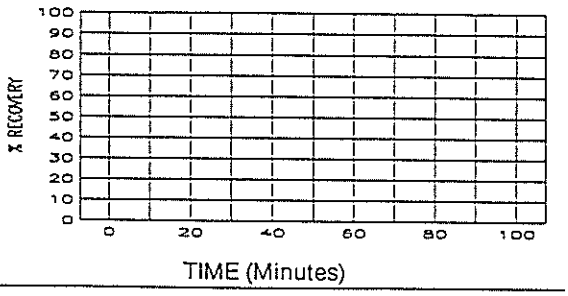
Well Development

Bailed to 60.0' on 10/11/97 after measurement. Water rising after bailing.

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Total grout, 6 sacks bentonite, 2 sacks cement, 1 sack @ surface seal

Supervised by D. Dix

Job Number 973-2255

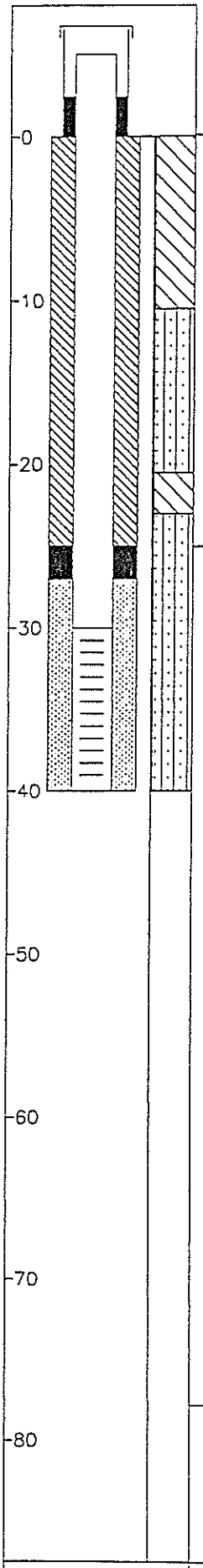
Site

File Name BH-6

Well No. BH-6A

Boring No. X-Ref: BH-6A

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 50531 ft. Easting: 43360 ft.

Elevation Ground Level 5197.8 ft. NGVD

Top of PVC Casing 5199.7 ft. NGVD

Drilling Summary:

Total Depth 40.0 ft.

Borehole Diameter 8 in.

Casing Stickup Height 1.90 ft.

Driller Coleman

Rig

Bit(s) 4 1/4" I.D. 8" O.D. Hollow Stem Auger

Drilling Fluid None

Protective Casing 4" O.D. Steel, 5' long with 3' embedment

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling	10/8/97	15:30	10/8/97	17:00
Geophys.Logging:				
Casing:				
Filter Placement:	10/8/97	17:30	10/8/97	18:00
Cementing:				
Development	10/9/97	9:45	10/9/97	10:15

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.90	-	39.90	C1	5199.70	-	5157.90
30.00	-	40.00	S1	5167.80	-	5157.80

Casing: C1 Solid 2" PVC

C2

Screen: S1 0.010" Slot

Sand Pack: None

Filter Pack: 23-40 Sand (27.0-40.0')

Grout Seal: 3 sacks bentonite, 3/4 sack cement, 50 gal. water (0.0-25.0')

Bentonite Seal: Bentonite Chips (25.0-27.0')

Concrete: None

Well Development

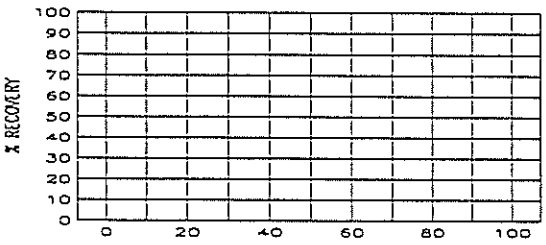
10/9/97 - 11:00 - Dry - 41.90'

10/11/97 - 12:00 - Dry - 41.90'

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

25.0' east of BH-6

Supervised by D. Dix

Job Number 973-2255

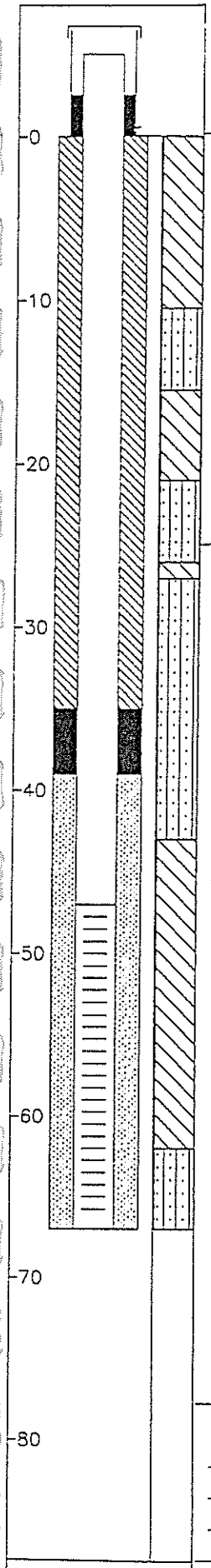
Site

File Name BH-6A

Well No. BH-8

Boring No. X-Ref: BH-8

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 44845 ft. Easting: 35214 ft.

Elevation Ground Level 5193.8 ft. NGVD

Top of PVC Casing 5195.8 ft. NGVD

Drilling Summary:

Total Depth 67.0 ft.

Borehole Diameter 8 in.

Casing Stickup Height: 2.00 ft.

Driller Coleman

Rig

Bit(s) 4 1/4" I.D. 8" O.D. Hollow Stem Auger

Drilling Fluid None

Protective Casing 4" O.D. Steel, 5' long with 3' embedment

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling	10/10/97	12:30	10/14/97	12:00
Geophys.Logging:				
Casing:				
Filter Placement:	10/14/97	12:00	10/14/97	15:00
Cementing:				
Development				

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 2.00	-	49.00	C1	5195.80	-	5144.80
47.00	-	67.00	S1	5146.80	-	5126.80
	-				-	
	-				-	
	-				-	
	-				-	

Casing: C1 Solid 2" PVC

C2

Screen: S1 0.010" Slot

Sand Pack: None

Filter Pack: 23-40 Sand (39.0-67.0')

Grout Seal: See below (0.0-35.0')

Bentonite Seal: Bentonite Chips (35.0-39.0')

Concrete: None

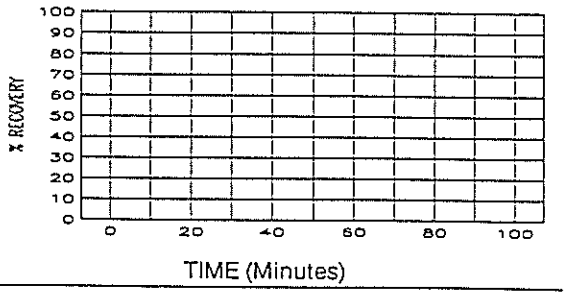
Well Development

10/15/97 - 8:00 - 33.3' - 0.0'

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Auger pulled during filter placement, had plug in lead auger preventing free flow of sand to screen. 2 1/2 sacks sand used to 44.0'. Additional inflow of water plus low sand take, resulted in filter placement to 39.0'. Piezometer abandoned on 10/15/97 thru 10/16/97. Backfilled with 5 sacks bentonite plus 100 gal. water and 1 sack chips.

Supervised by D. Dix

Job Number 973-2255

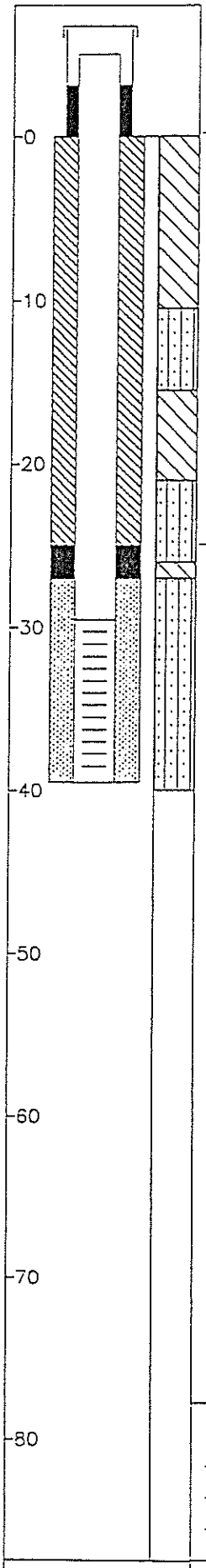
Site

File Name BH-8

Well No. BH-8A

Boring No. X-Ref: BH-8A

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 44845 ft. Easting: 35214 ft.

Elevation Ground Level 5193.8 ft. NGVD

Top of PVC Casing 5196.4 ft. NGVD

Drilling Summary:

Total Depth 40.0 ft.

Borehole Diameter 8 in.

Casing Stickup Height 2.60 ft.

Driller Coleman

Rig

Bit(s) 4 1/4" I.D. 8" O.D. Hollow Stem Auger

Drilling Fluid None

Protective Casing 4" O.D. Steel, 5' long with 3' embedment

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling	10/14/97	17:45	10/15/97	9:30
Geophys.Logging:				
Casing:				
Filter Placement:	10/15/97	10:00	10/15/97	10:30
Cementing:				
Development	10/15/97	13:15	10/15/97	14:00

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 2.60	-	32.10	C1	5196.40	-	5161.70
29.50	-	39.50	S1	5164.30	-	5154.30
	-				-	
	-				-	
	-				-	
	-				-	

Casing: C1 Solid 2" PVC

C2

Screen: S1 0.010" Slot

Sand Pack: None

Filter Pack: 23-40 Sand (27.0-39.5')

Grout Seal: 3 1/2 sacks bentonite, 1 sack cement, 55 gal. water (0.0-25.0')

Bentonite Seal: 1 1/2 sacks bentonite chips, 10 gal. water (25.0-27.0')

Concrete: None

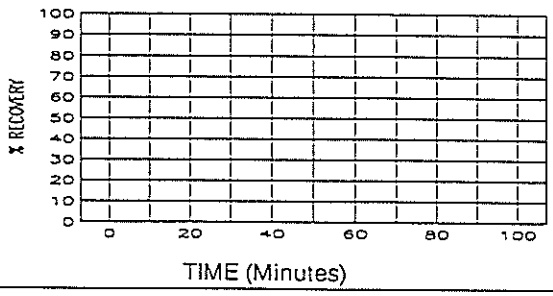
Well Development

10/15/97 - 14:00 - Trace - 42.1'

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments: While pulling auger from 20'-15' well casing comes up 2.5', able to push casing back to 39.5'. Piezometer located 45' north of BH-8.

Supervised by D. Dix

Job Number 973-2255

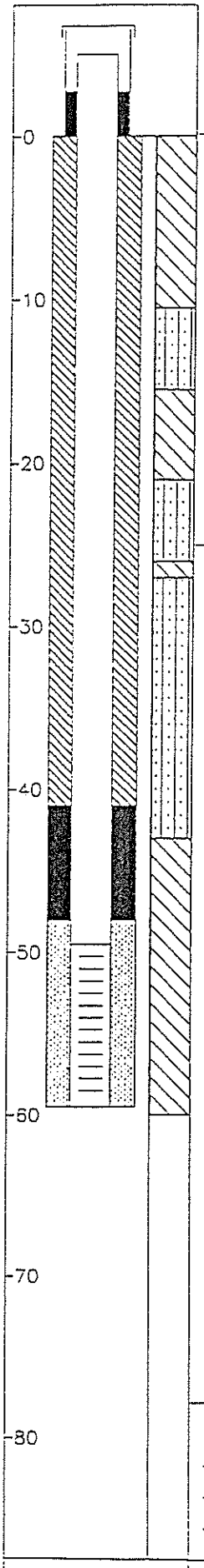
Site

File Name BH-8A

Well No. BH-8B

Boring No. X-Ref: BH-8B

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 44845 ft. Easting: 35214 ft.

Elevation Ground Level 5193.8 ft. NGVD

Top of PVC Casing 5196.0 ft. NGVD

Drilling Summary:

Total Depth 60.0 ft.

Borehole Diameter 8 in.

Casing Stickup Height 2.20 ft.

Driller Coleman

Rig

Bit(s) 4 1/4" I.D. 8" O.D. Hollow Stem Auger

Drilling Fluid None

Protective Casing 4" O.D. Steel, 5' long with 3' embedment

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling	10/16/97	14:00	10/17/97	9:30
Geophys.Logging:				
Casing:				
Filter Placement:	10/17/97	9:30	10/17/97	10:30
Cementing:				
Development				

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 2.20	-	51.72	C1	5196.00	-	5142.08
49.50	-	59.50	S1	5144.30	-	5134.30
	-				-	
	-				-	
	-				-	
	-				-	

Casing: C1 Solid 2" PVC

C2

Screen: S1 0.010" Slot

Sand Pack: None

Filter Pack: 23-40 Sand (48-59.5')

Grout Seal: 6 sacks bentonite, 120 gal. water (0.0-41.0')

Bentonite Seal: 2 sacks bentonite chips, 20 gal. water (41.0-43.0 & 46.5-48.0')

Concrete: None

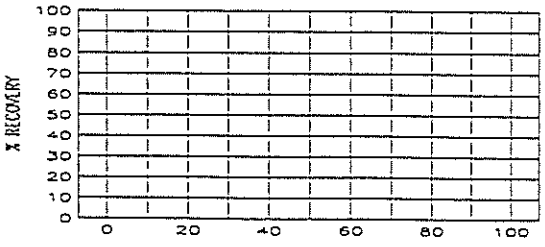
Well Development

10/17/97 - 11:15 - Dry - 61.72'

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments: 2 1/2' of chips placed before inside of auger is blocked 10' above bit. Auger cuttings fall in from 46.5'-43.0'. Additional chips placed to 41.0'. BH-8B located ~20' north of BH-8.

Supervised by D. Dix

Job Number 973-2255

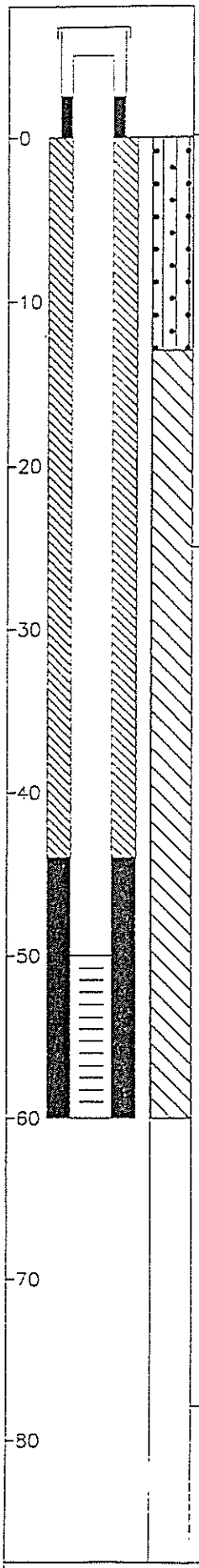
Site

File Name BH-8B

Well No. BH-9

Boring No. X-Ref: BH-9

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 38938 ft. Easting: 34542 ft.

Elevation Ground Level 5257.6 ft. NGVD

Top of PVC Casing 5259.6 ft. NGVD

Drilling Summary:

Total Depth 60.0 ft.

Borehole Diameter 8 in.

Casing Stickup Height 2.00 ft.

Driller Coleman

Rig

Bit(s) 4 1/4" I.D. 8" O.D. Hollow Stem Auger

Drilling Fluid None

Protective Casing 4" O.D. Steel, 5' long with 3' embedment

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling	10/17/97	13:45	10/17/97	16:15
Geophys.Logging:				
Casing:				
Filter Placement:	10/17/97	16:30	10/17/97	18:45
Cementing:				
Development	10/17/97	18:45	10/17/97	19:00

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 2.00	-	50.07	C1	5259.60	-	5207.53
50.00	-	60.00	S1	5207.60	-	5197.60

Casing: C1 Solid 2" PVC

C2

Screen: S1 0.010" Slot

Sand Pack: None

Filter Pack: 23-40 Sand (47.0-60.0')

Grout Seal: 1 sack quick gel, 1/2 sack cement, 40 gal. water (0.0-44.0')

Bentonite Seal: 1 1/2 sacks bentonite chips (44.0-47.0')

Concrete: None

Well Development

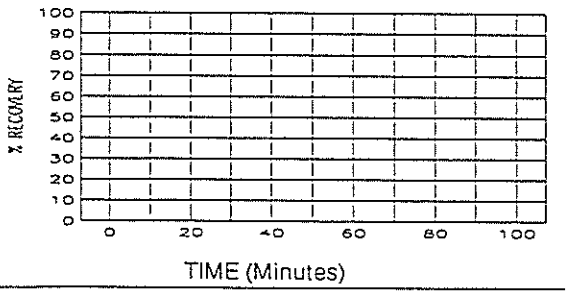
Construction water bailed 10/18/97

Water at 59.5' at 12:00 and rising.

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Supervised by D. Dix

Job Number 973-2255

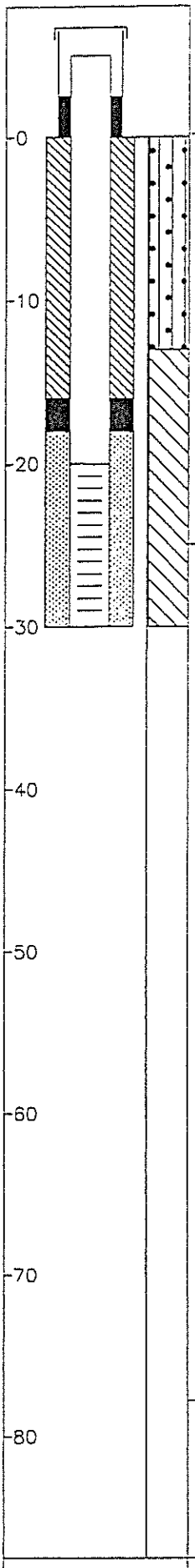
Site

File Name BH-9

Well No. BH-9A

Boring No. X-Ref: BH-9A

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 38905 ft. Easting: 34538 ft.

Elevation Ground Level 5258.2 ft. NGVD

Top of PVC Casing 5260.2 ft. NGVD

Drilling Summary:

Total Depth 30.0 ft.

Borehole Diameter 8 in.

Casing Stickup Height 2.00 ft.

Driller Coleman

Rig

Bit(s) 4 1/4" I.D. 8" O.D. Hollow Stem Auger

Drilling Fluid None

Protective Casing 4" O.D. Steel, 5' long with 3' embedment

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling	10/18/97	8:45	10/18/97	9:45
Geophys.Logging:				
Casing:				
Filter Placement:	10/18/97	10:30	10/18/97	11:15
Cementing:				
Development				

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 2.00	-	22.22	C1	5260.20	-	5235.98
20.00	-	30.00	S1	5238.20	-	5228.20
	-				-	
	-				-	
	-				-	
	-				-	

Casing: C1 Solid 2" PVC

C2

Screen: S1 0.010" Slot

Sand Pack: None

Filter Pack: 23-40 Sand (18.0-30.0')

Grout Seal: 1 sack quick gel, 1/2 sack cement, 40 gal. water (0.0-16.0')

Bentonite Seal: 1 1/2 sacks bentonite chips (16.0-18.0')

Concrete: None

Well Development

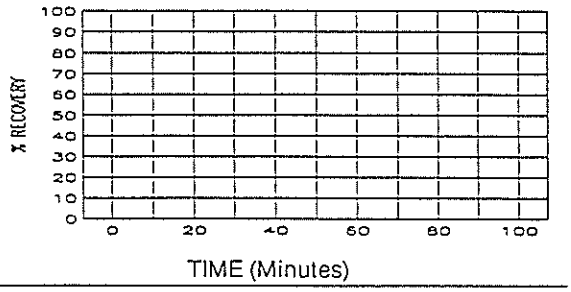
10/18/97 - 13:15 - 31.3' - 32.22'

Bailed to 32.0' after 13:15 measurement.

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments: Approximately 30.0' south of BH-9

Supervised by D. Dix

Job Number 973-2255

Site

File Name BH-9A

APPENDIX D

LABORATORY DATA

SECTION D.1.1

TAILINGS INDEX TESTING DATA

COPPER RANGE/MI-TAILINGS
973-2255.210
TABLE 1
SUMMARY OF SOIL DATA

SAMPLE TYPE	SAMPLE NO.	SAMPLE DEPTH (FT)	USCS SOIL CLASSI-FICATION	DELIVERED MOISTURE (%)	ATTERBERG LIMITS			GRAIN SIZE DISTRIBUTION			SPECIFIC GRAVITY	NATURAL DENSITY		ADDITIONAL TESTS COMMENTS (SEE NOTES)
					L.L	P.L.	P.I.	% FINER NO. 3/4"	% FINER NO. 4	% FINER NO. 200		PCF (DRY)	MOIST (%)	
BAG	CPT-1	0-1	-	-	-	-	-	100	100	26	2.78	-	-	-
BAG	CPT-1	10-11	-	27.8	-	-	-	100	100	18	-	-	-	-
BAG	CPT-1	20-21	-	24.3	-	-	-	100	100	19	-	-	-	-
BAG	CPT-2	0-1	-	8.0	-	-	-	100	100	11	2.75	-	-	-
BAG	CPT-2	12-13	SM	23.4	-	NP	-	100	100	32	2.83	-	-	-
BAG	CPT-2	25-26	-	41.3	-	-	-	100	100	98	2.78	-	-	-
BAG	CPT-3	0-6"	-	25.3	-	-	-	100	100	94	2.72	-	-	-
BAG	CPT-4	0-1	-	23.1	-	-	-	100	100	72	2.70	-	-	-
BAG	CPT-4	5-6	-	36.6	-	-	-	100	100	85	-	-	-	-
BAG	CPT-4	6-7	-	33.6	-	-	-	100	100	72	-	-	-	-
BAG	CPT-5	1-2	-	23.6	-	-	-	100	100	61	2.80	-	-	-
BAG	CPT-6	0-1	-	28.1	-	-	-	100	100	96	2.73	-	-	-
BAG	CPT-6	15-16	SM	35.3	-	NP	-	100	100	29	2.71	-	-	-
BAG	CPT-6	22-23	ML	34.4	-	NP	-	100	100	62	2.76	-	-	-
BAG	CPT-7	0-1	CL	34.5	34	23	11	100	100	99	2.84	-	-	-
BAG	CPT-7	7-12	-	25.2	-	-	-	100	100	81	2.90	-	-	-
BAG	CPT-7	15-20	-	20.3	-	-	-	100	100	45	2.85	-	-	-
BAG	CPT-8	0-1	ML	18.5	-	NP	-	100	100	80	2.73	-	-	-
BAG	CPT-8	13-16	ML	32.5	-	NP	-	100	100	64	-	-	-	-
BAG	CPT-8	20-25	-	27.7	-	-	-	100	100	73	-	-	-	-
BAG	CPT-9	0-1	SM	22.0	-	NP	-	100	100	49	2.74	-	-	-

COPPER RANGE/MI-TAILINGS
973-2255.210
TABLE 1
SUMMARY OF SOIL DATA

SAMPLE TYPE	SAMPLE NO.	SAMPLE DEPTH (FT)	USCS SOIL CLASSI-FICATION	DELIVERED MOISTURE (%)	ATTERBERG LIMITS			GRAIN SIZE DISTRIBUTION			SPECIFIC GRAVITY	NATURAL DENSITY		ADDITIONAL TESTS COMMENTS (SEE NOTES)
					L.L.	P.L.	P.I.	% FINER NO. 3/4"	% FINER NO. 4	% FINER NO. 200		PCF (DRY)	MOIST (%)	
BAG	CPT-10	0-1	CL	32.6	39	22	17	100	100	100	2.85	-	-	-
BAG	CPT-10	15-20	-	34.2	-	-	-	100	100	95	2.82	-	-	-
LINER	CPT-10	15-15.5	-	-	-	-	-	-	-	-	-	74.1[1]	33.9	-
LINER	CPT-10	15-15.5	-	-	-	-	-	-	-	-	-	93.8[2]	33.9	-
LINER	CPT-10	15.5-16	-	-	-	-	-	-	-	-	-	86.1[1]	30.4	-
LINER	CPT-10	15.5-16	-	-	-	-	-	-	-	-	-	100.3[2]	30.4	-
BAG	CPT-10	30-35	CL	44.6	36	22	14	100	100	100	2.79	-	-	-
LINER	CPT-10	30-30.5	-	-	-	-	-	-	-	-	-	69.6[1]	39.6	-
LINER	CPT-10	30-30.5	-	-	-	-	-	-	-	-	-	81.5[2]	39.6	-
LINER	CPT-10	30.5-31	-	-	-	-	-	-	-	-	-	78.8[1]	37.3	-
LINER	CPT-10	30.5-31	-	-	-	-	-	-	-	-	-	87.0[2]	37.3	-
BAG	CPT-12	0-1	-	25.6	-	-	-	100	100	88	2.90	-	-	-
BAG	CPT-13	0-1	-	14.0	-	-	-	100	100	48	-	-	-	-
BAG	CPT-13	5-6	-	35.3	-	-	-	100	100	13	-	-	-	-
BAG	CPT-13	10-11	ML	36.7	-	NP	-	100	100	58	-	-	-	-
BUCKET	CPT-13	0-1	-	16.5	-	-	-	100	100	50	2.83	-	-	T,CS,SL
BAG	CPT-14	0-1	-	11.8	-	-	-	100	100	23	2.68	-	-	-
BAG	CPT-15	0-1	ML	26.1	-	NP	-	100	100	97	2.61	-	-	-
BAG	CPT-15	19-20	-	27.1	-	-	-	100	100	91	2.73	-	-	-
BAG	CPT-15	39-40	ML	30.3	-	NP	-	100	100	99	2.77	-	-	-
BAG	CPT-16	0-1	-	19.7	-	-	-	100	100	86	2.88	-	-	-

COPPER RANGE/MI-TAILINGS
973-2255.210
TABLE 1
SUMMARY OF SOIL DATA

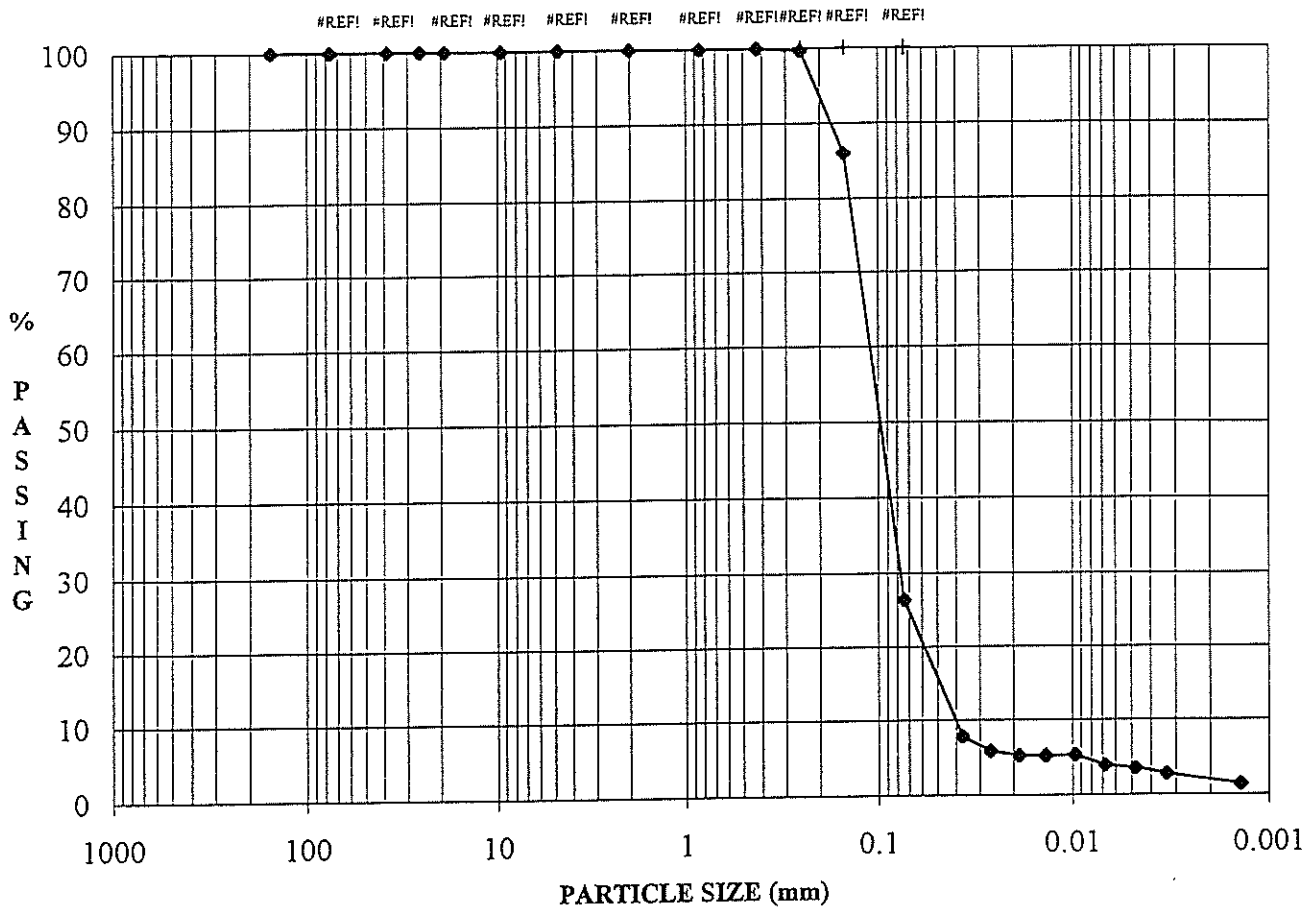
SAMPLE TYPE	SAMPLE NO.	SAMPLE DEPTH (FT)	USCS SOIL CLASSI-FICATION	DELIVERED MOISTURE (%)	ATTERBERG LIMITS			GRAIN SIZE DISTRIBUTION			SPECIFIC GRAVITY	NATURAL DENSITY		ADDITIONAL TESTS COMMENTS (SEE NOTES)
					L.L.	P.L.	P.I.	% FINER NO. 3/4"	% FINER NO. 4	% FINER NO. 200		PCF (DRY)	MOIST (%)	
BAG	CPT-16	5-6	-	27.7	-	-	-	100	100	38	2.84	-	-	-
BAG	CPT-16	11-12	-	35.6	-	-	-	100	100	16	-	-	-	-
BUCKET	CPT-17	0-1	CL	48.1	43	25	18	100	100	99	2.75	-	-	T,CS,SL
BAG	CPT-17	3-4	-	24.9	-	-	-	100	100	69	-	-	-	-
BAG	CPT-17	6.5-7.5	ML	36.3	-	NP	-	100	100	98	-	-	-	-
BAG	CPT-18	0-1	ML	29.2	-	NP	-	100	100	99	2.76	-	-	-
BAG	CPT-19	0-1	ML	154.2	44	30	14	100	100	98	2.81	-	-	-
BAG	CPT-21	0-1	ML	38.4	-	NP	-	100	100	71	2.74	-	-	-
BAG	CPT-21	7-8	ML	56.4	33	23	10	100	100	100	2.78	-	-	-

NOTES:

LL = LIQUID LIMIT
PL = PLASTIC LIMIT
PI = PLASTIC INDEX
SL = SHRINKAGE LIMIT
T = TRIAXIAL TEST
U = UNCONFINED COMPRESSION TEST
C = CONSOLIDATION TEST
DS = DIRECT SHEAR TEST
PERM = PERMEABILITY
CS = COLUMN SETTLING
SC = SLURRY CONSOLIDATION

(1) Natural Density by Method A.
(2) Natural Density by Method B.

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
COBBLES	GRAVEL		SAND			FINES

SAMPLE #:	CPT-1 0-1
WET COLOR:	Fine SAND with
DESCRIPTION:	some fines. -

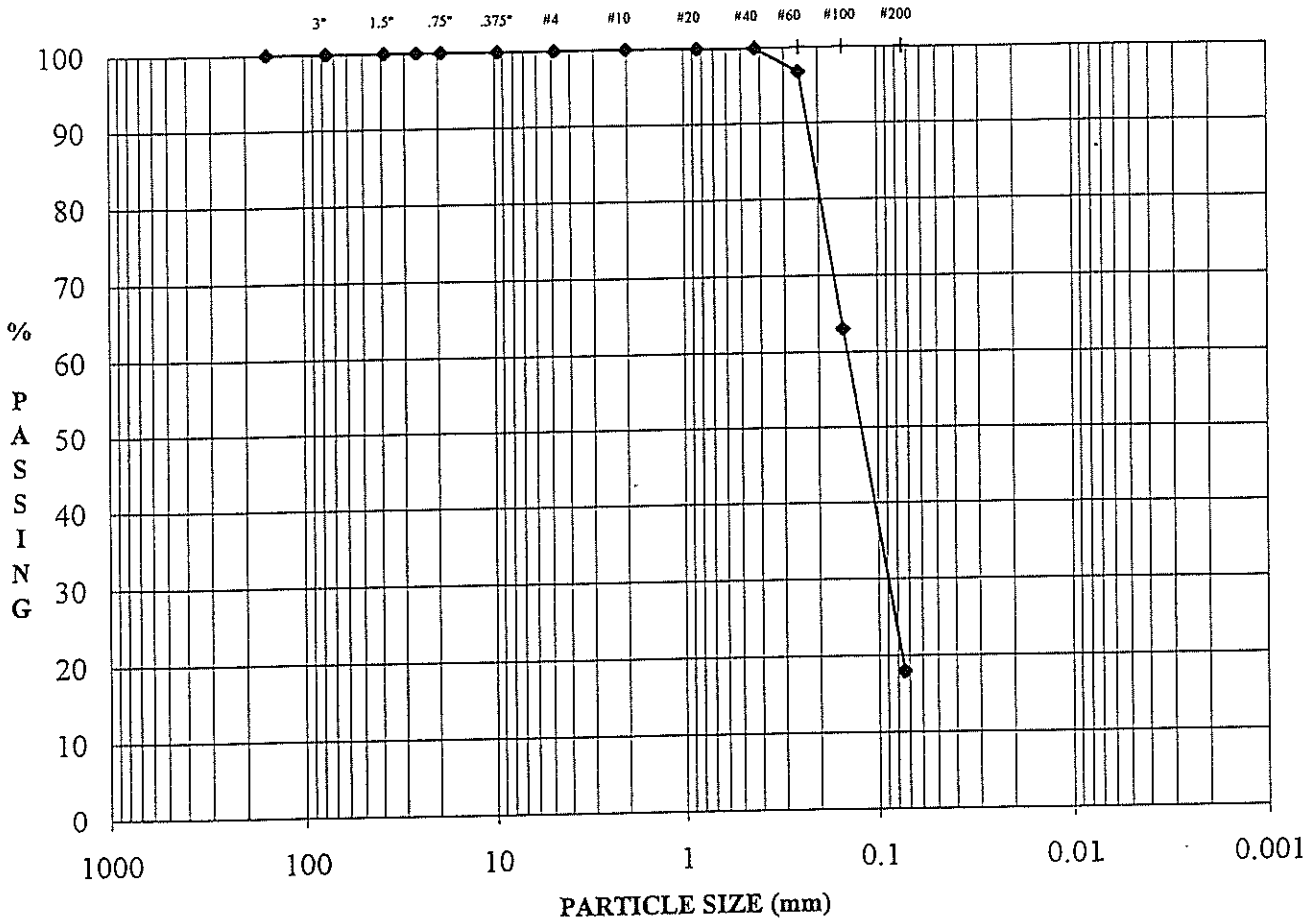
Mc:	-
LL:	-
PL:	-
PI :	-
Gs:	2.78

COPPER RANGE/MI
973-2255.210

DATE	11/7/97
TECH	BETH
REVIEW	KR

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
COBBLES	GRAVEL		SAND			FINES

SAMPLE #:	CPT-1 10-11'
DESCRIPTION:	Fine SAND with some fines. 0

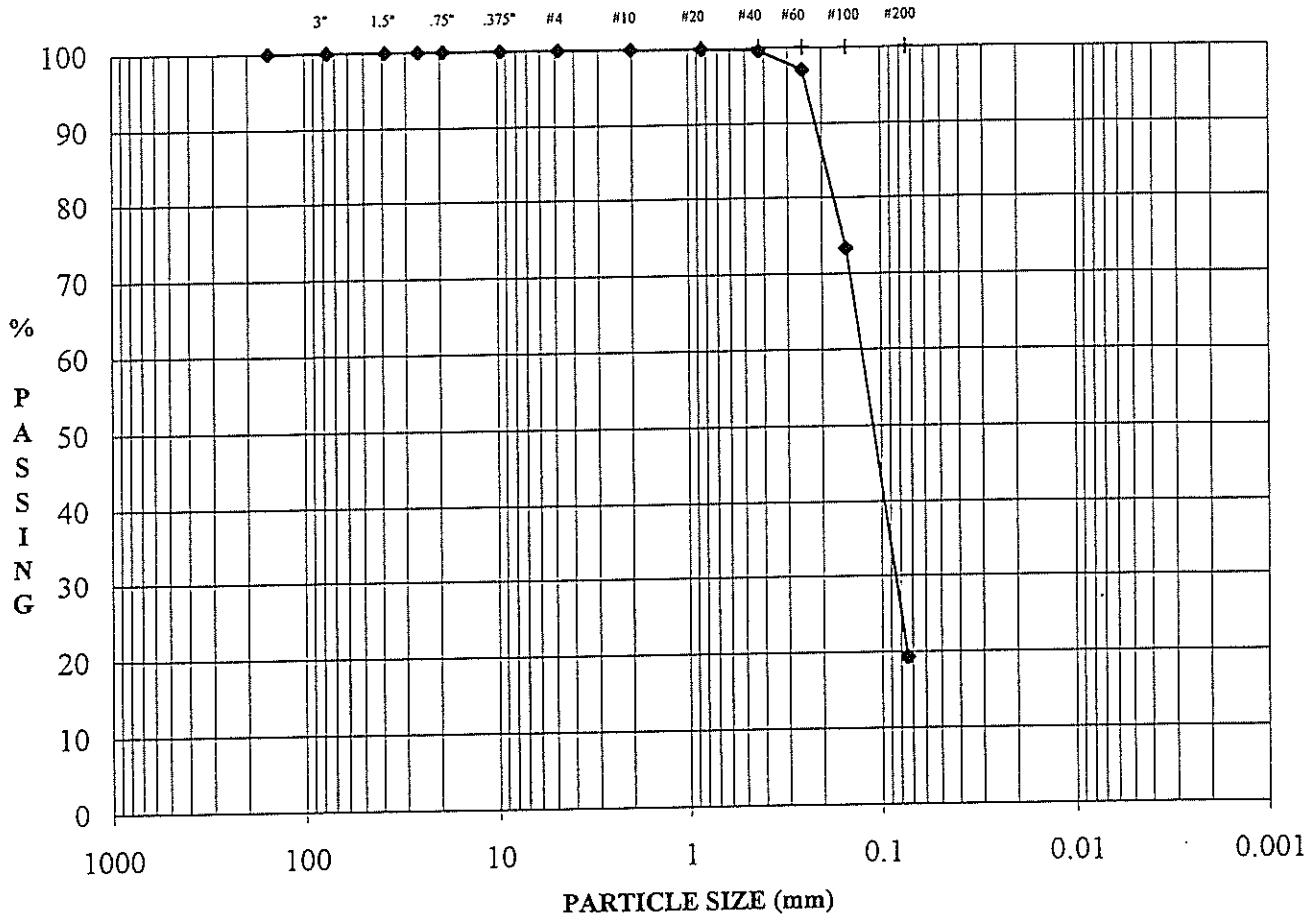
Mc:	27.8%
LL:	-
PL:	-
PI :	-
Gs:	-

COPPER RANGE/MI
973-2255.210

DATE	11/4/97
TECH	BETH
REVIEW	KR

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
COBBLES	GRAVEL		SAND			FINES

SAMPLE #:	CPT-1 20-21'
DESCRIPTION:	Fine SAND with some fines.

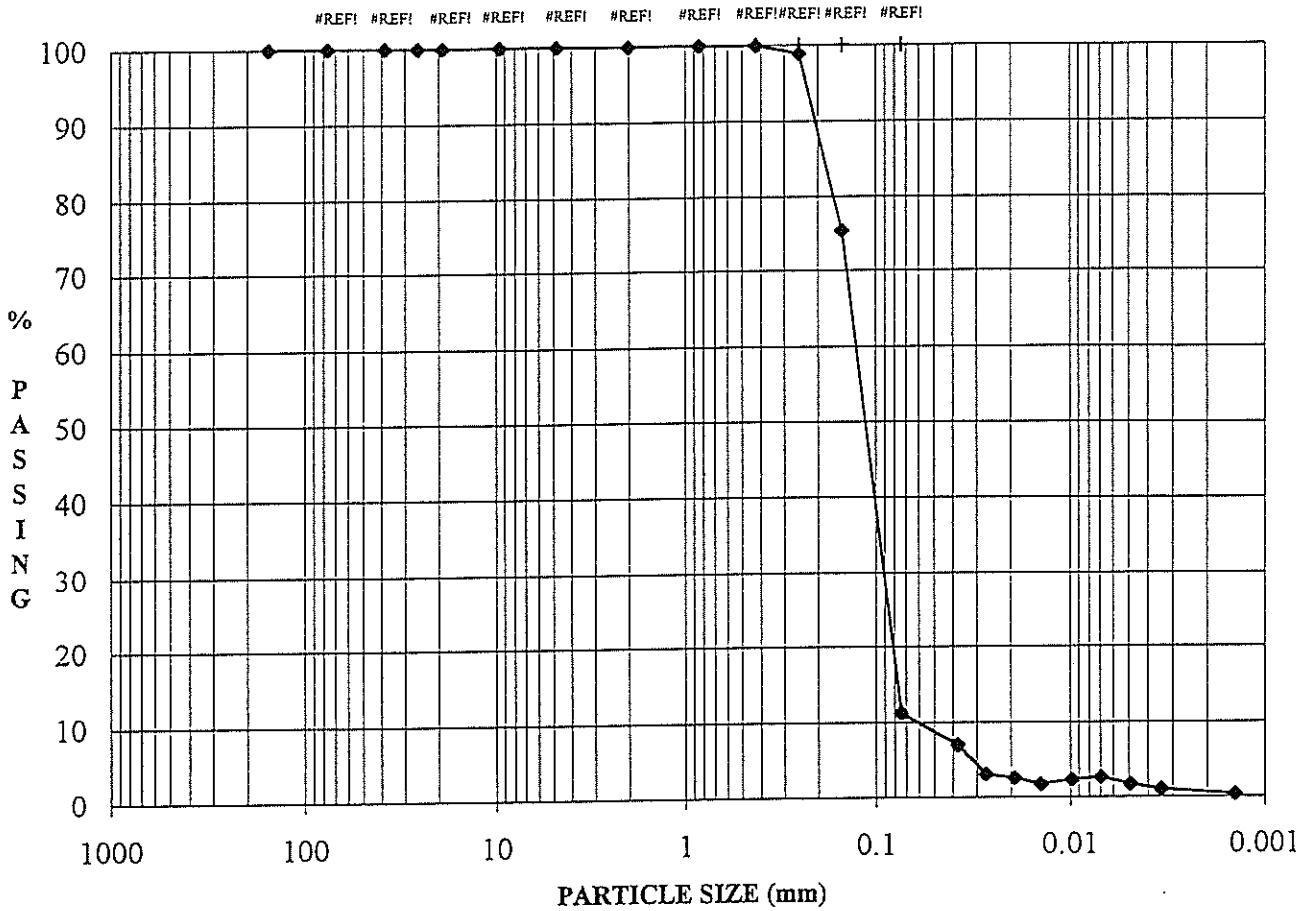
Mc:	24.3%
LL:	-
PL:	-
PI :	-
Gs:	-

COPPER RANGE/MI
973-2255.210

DATE	11/11/97
TECH	BETH
REVIEW	KR

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
COBBLES	GRAVEL		SAND			FINES

SAMPLE #:	CPT-2 0-1'
WET COLOR: DESCRIPTION:	Fine SAND with little fines. -

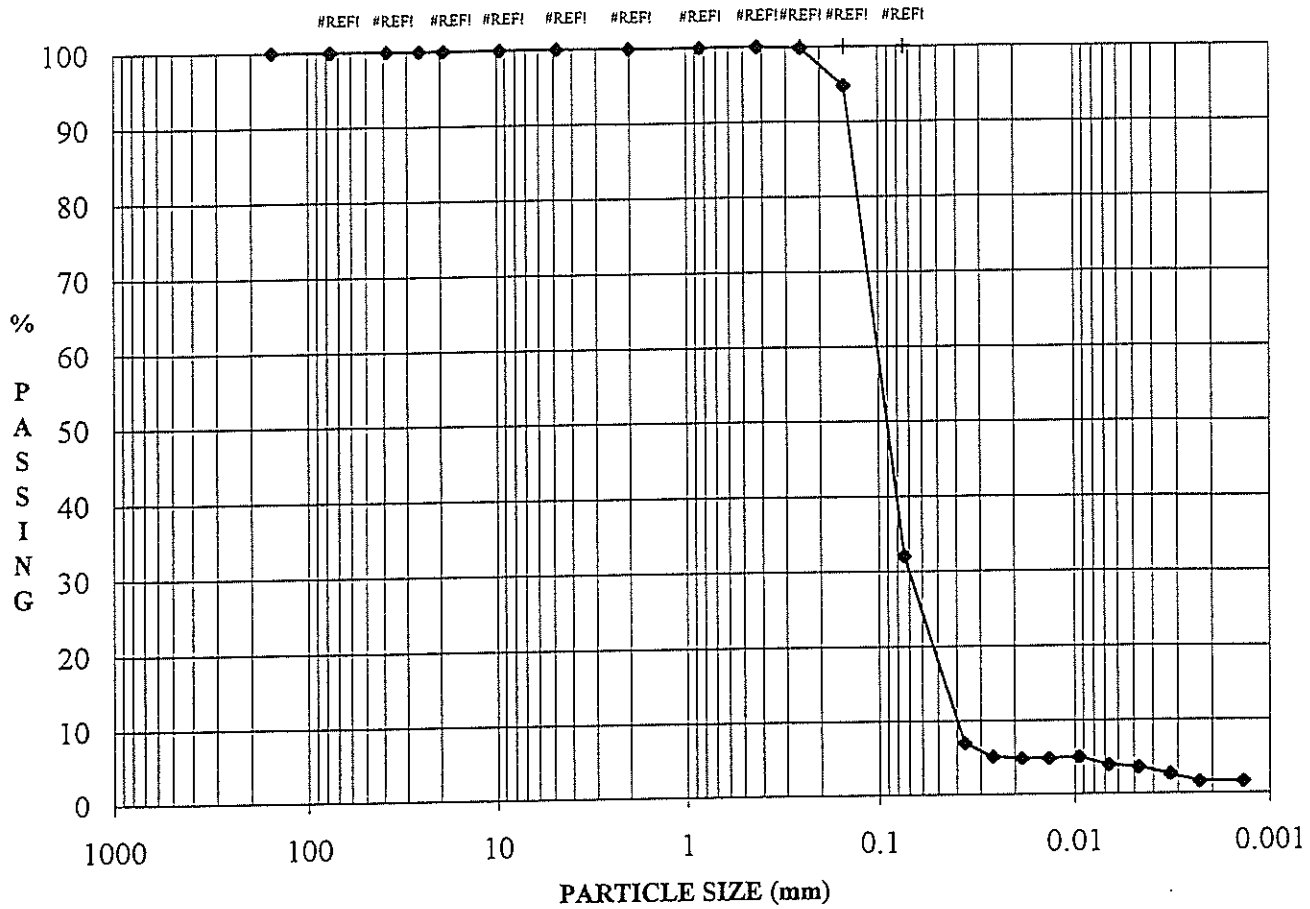
Mc:	8.0%
LL:	-
PL:	-
PI :	-
Gs:	2.75

COPPER RANGE/MI
973-2255.210

DATE	11/7/97
TECH	BETH
REVIEW	KR

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



COBBLES	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
	GRAVEL		SAND			FINES

SAMPLE #:	CPT-2 12-13'
WET COLOR: DESCRIPTION:	Fine SAND and SILT. (SM) -

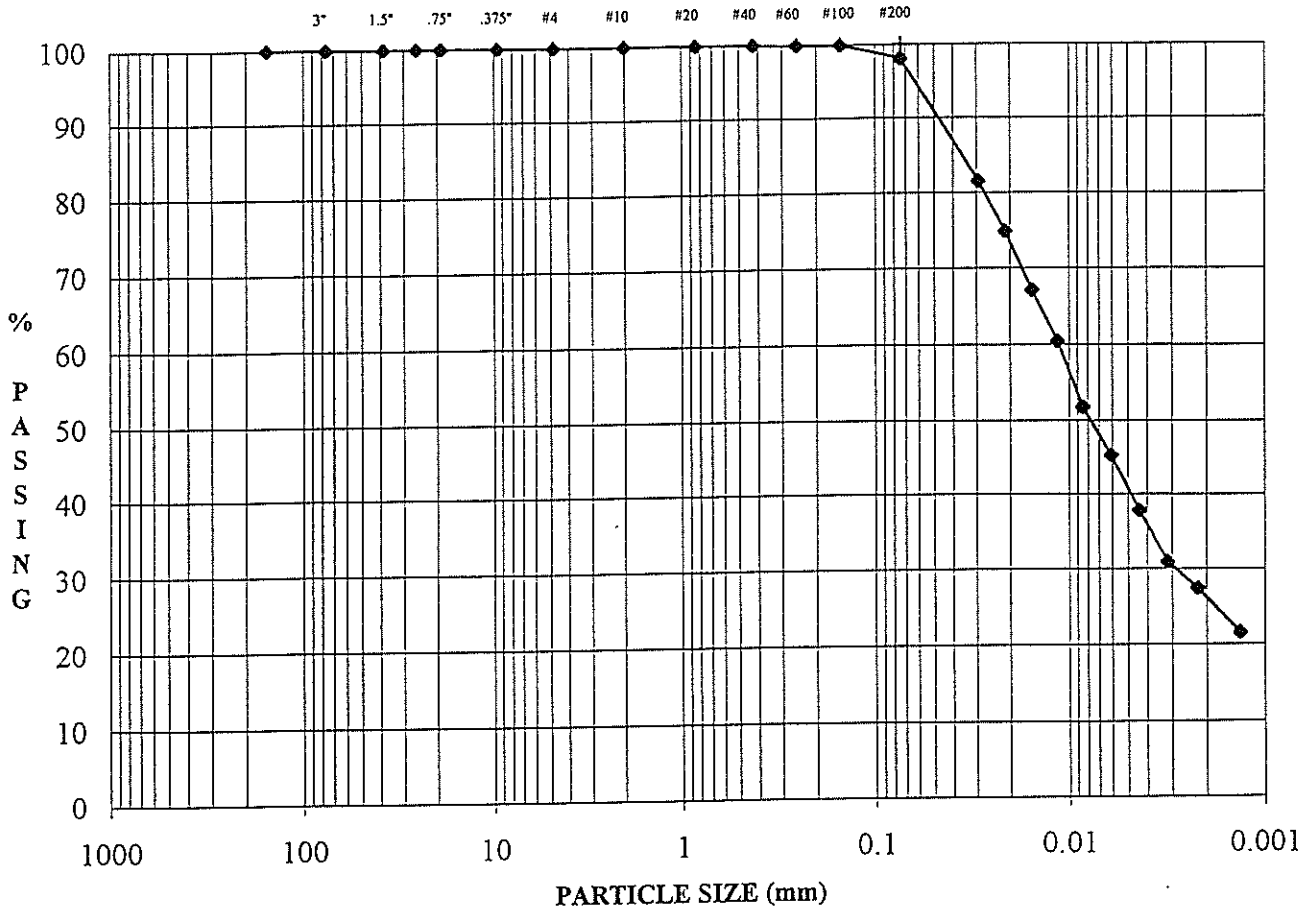
Mc:	23.4%
LL:	-
PL:	NP
PI :	-
Gs:	2.83

COPPER RANGE/MI
973-2255.210

DATE	11/7/97
TECH	BETH
REVIEW	KR

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



COBBLES	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
	GRAVEL		SAND			FINES

SAMPLE #:	CPT-2 25-26'
WET COLOR: DESCRIPTION:	FINES with trace fine sand. -

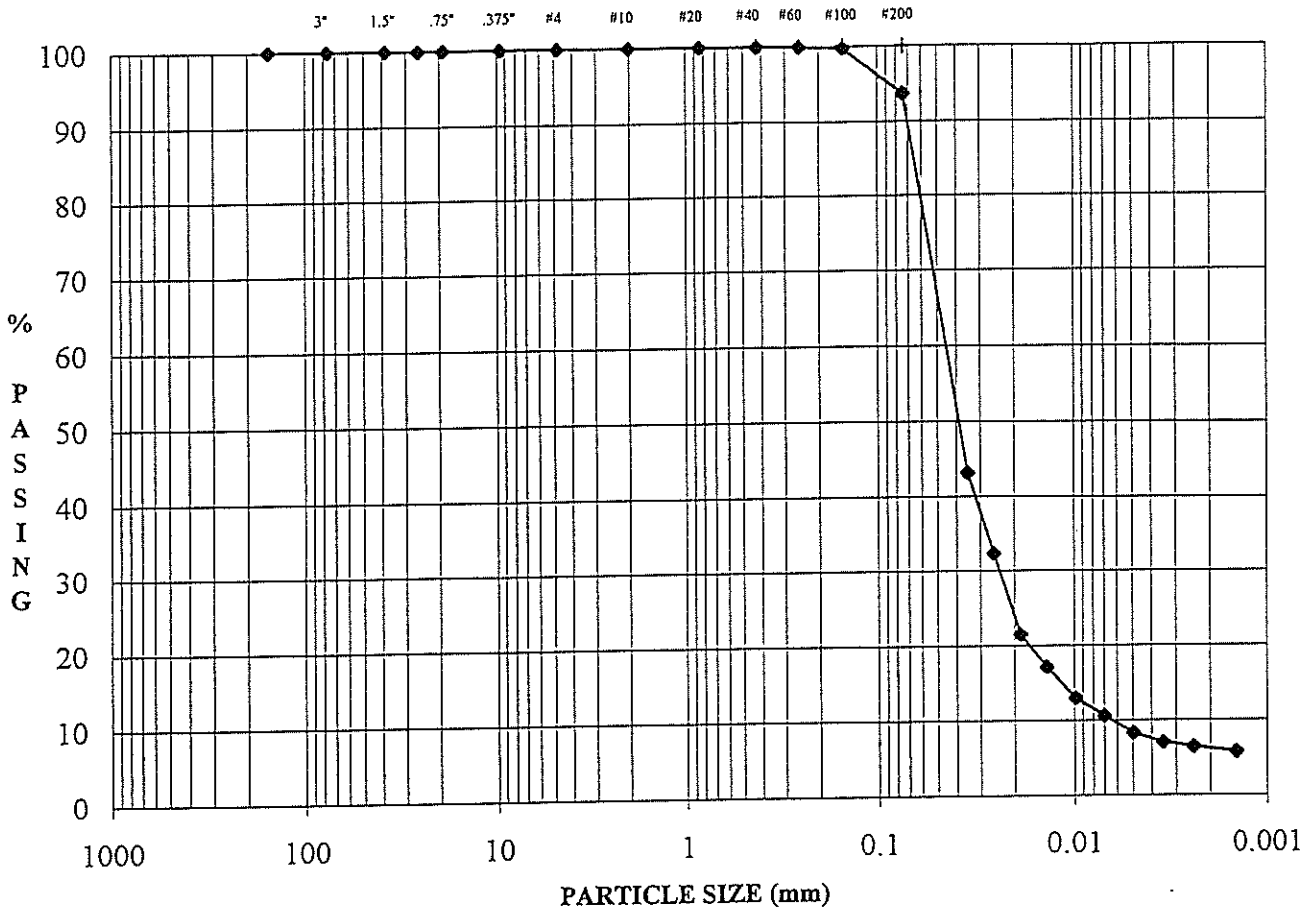
Mc:	41.3%
LL:	-
PL:	-
PI :	-
Gs:	2.78

COPPER RANGE/MI
973-2255.210

DATE	11/11/97
TECH	BETH
REVIEW	KR

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



COBBLES	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
	GRAVEL		SAND			FINES

SAMPLE #:	CPT-3 0-6"
WET COLOR: DESCRIPTION:	FINES with little fine sand. -

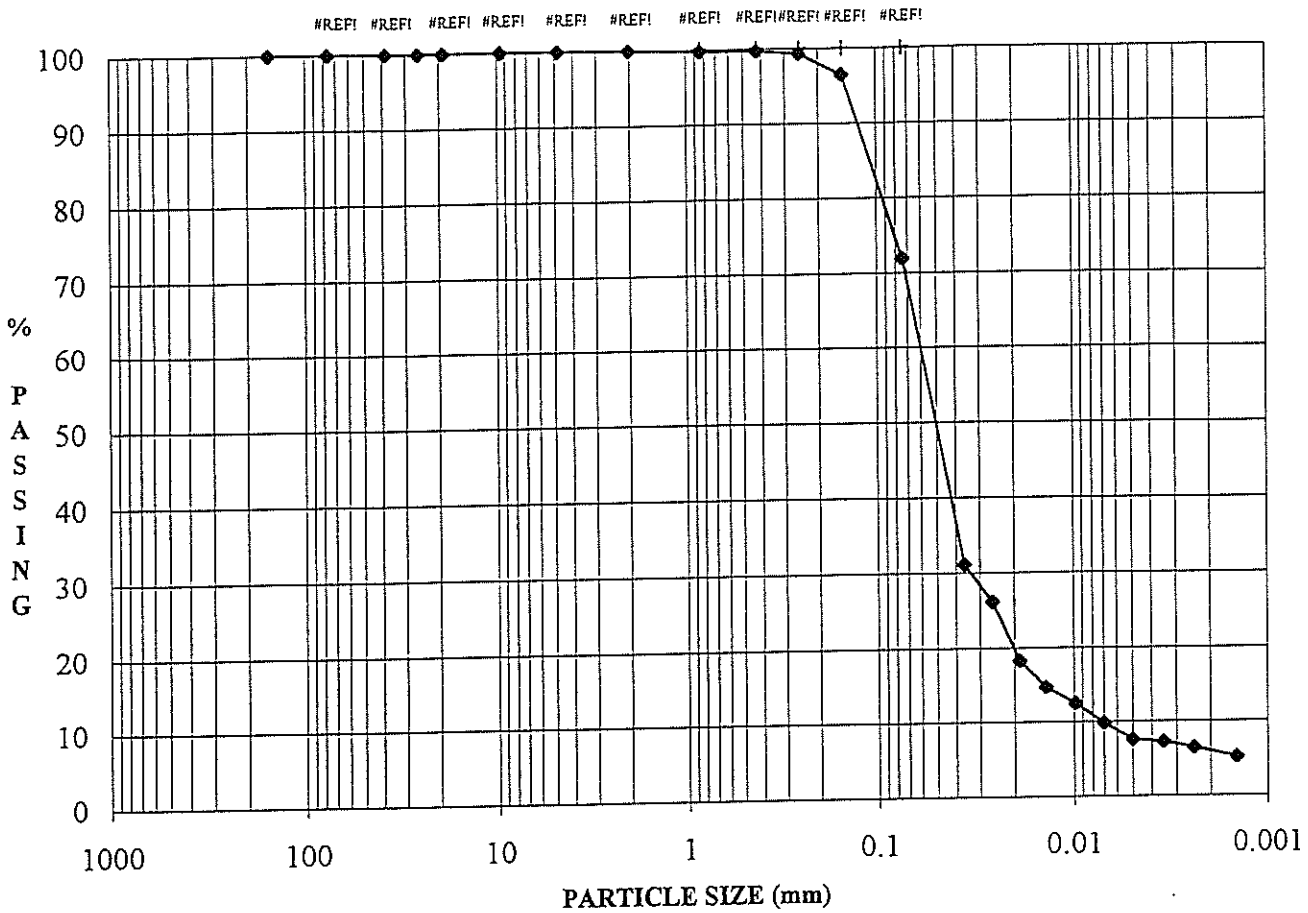
Mc:	25.3%
LL:	-
PL:	-
PI :	-
Gs:	2.72

COPPER RANGE/MI
973-2255.210

DATE	11/11/97
TECH	BETH
REVIEW	KR

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



COBBLES	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
	GRAVEL		SAND			FINES

SAMPLE #:	CPT-4 0-1'
WET COLOR: DESCRIPTION:	FINES with some fine sand. -

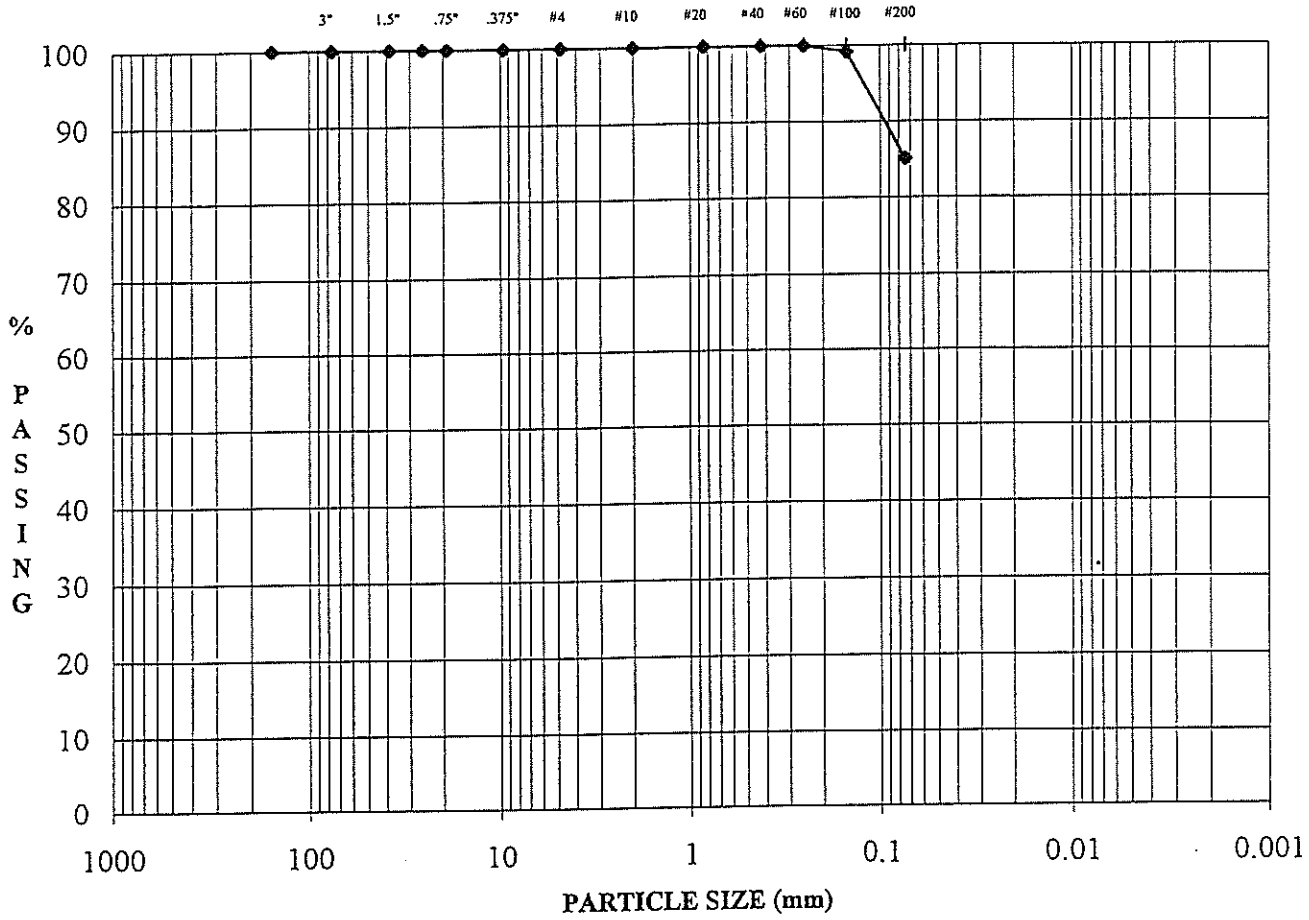
Mc:	23.1%
LL:	-
PL:	-
PI :	-
Gs:	2.70

COPPER RANGE/MI
973-2255.210

DATE	11/11/97
TECH	BETH
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GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



COBBLES	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
	GRAVEL		SAND			FINES

SAMPLE #:	CPT-4 5-6'
DESCRIPTION:	FINES with some fine sand.

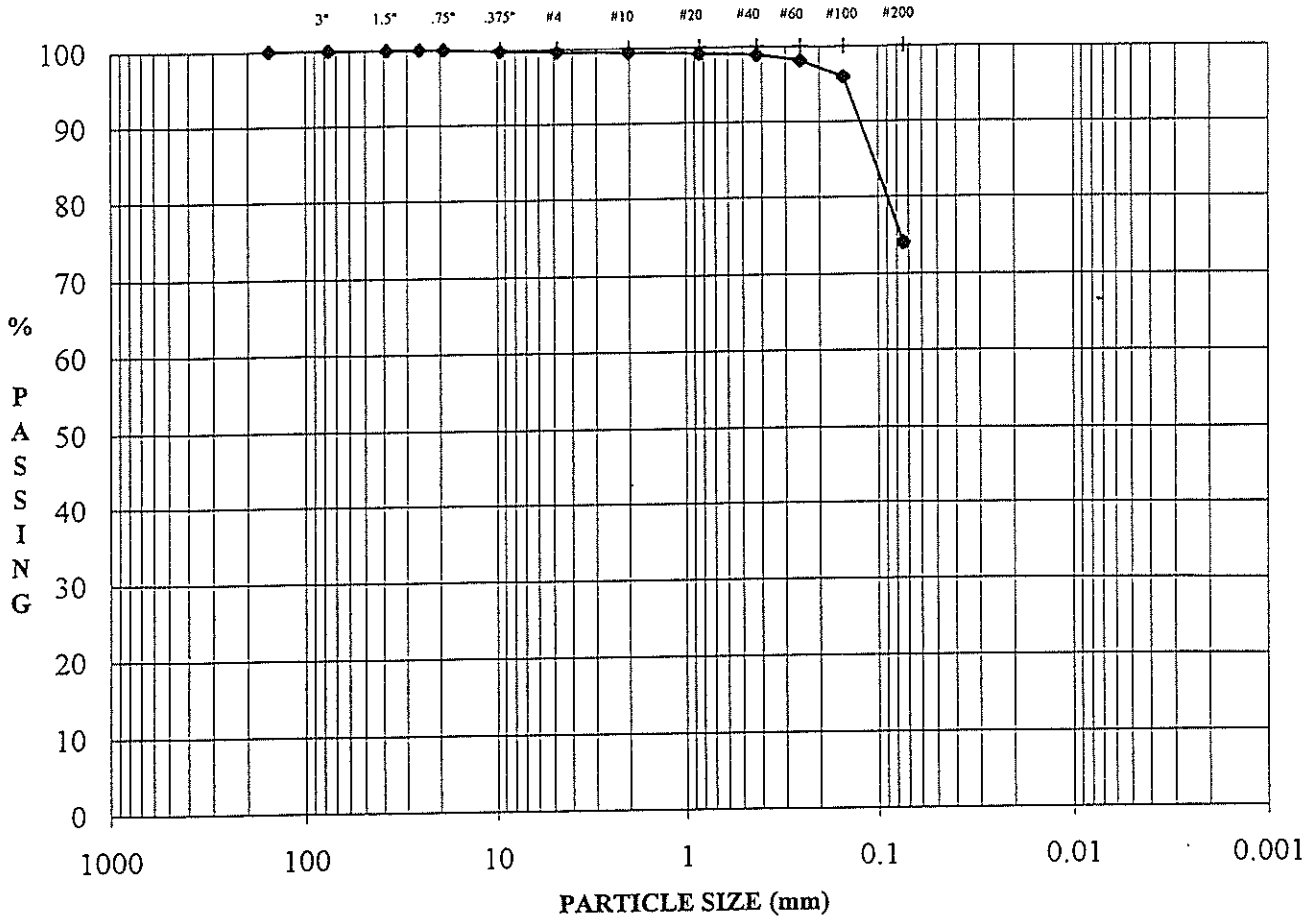
Mc:	36.58%
LL:	-
PL:	-
PI :	-
Gs:	-

COPPER RANGE/MI
973-2255.210

DATE	11/5/97
TECH	BETH
REVIEW	KR

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



COBBLES	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
	GRAVEL		SAND			FINES

SAMPLE #:	CPT-4 6-7'
DESCRIPTION:	FINES with some fine sand.

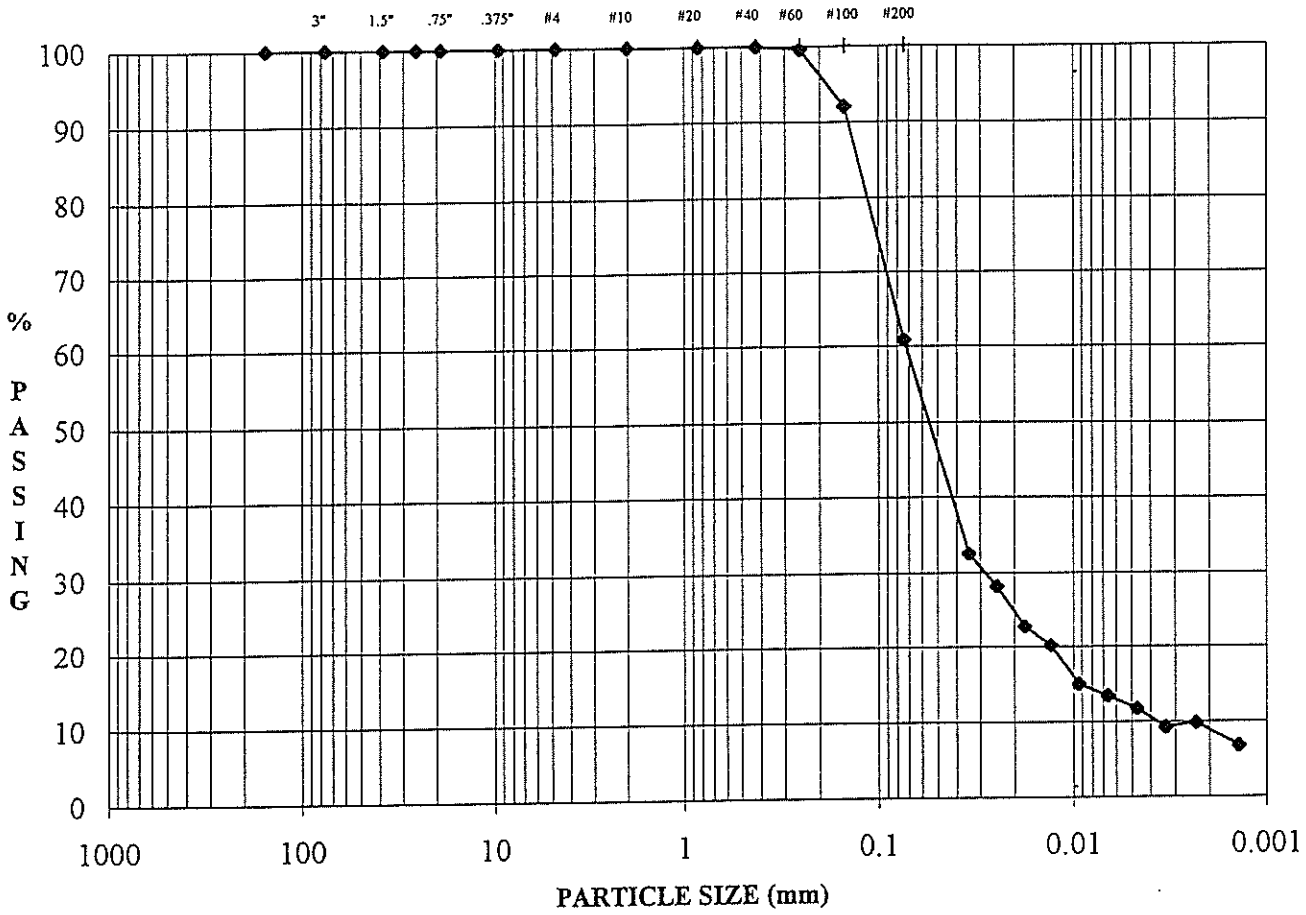
Mc:	33.6%
LL:	-
PL:	-
PI :	-
Gs:	-

COPPER RANGE/MI
973-2255.210

DATE	11/5/97
TECH	JE
REVIEW	KR

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
COBBLES	GRAVEL		SAND			FINES

SAMPLE #:	CPT-5 1-2'
WET COLOR: DESCRIPTION:	FINES and fine SAND. 0

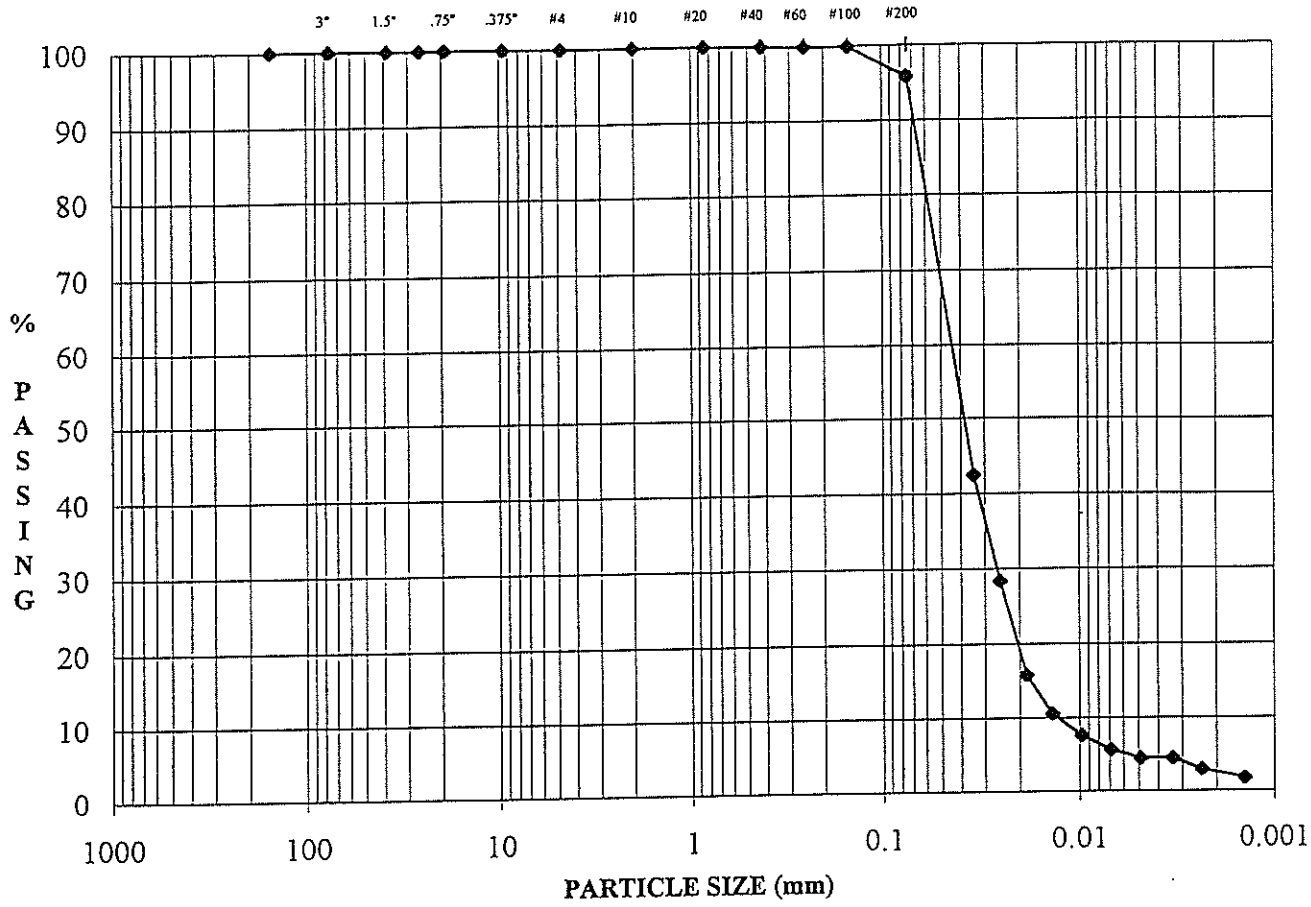
Mc:	23.6%
LL:	-
PL:	-
PI :	-
Gs:	2.80

COPPER RANGE/MI
973-2255.210

DATE	11/25/97
TECH	BETH
REVIEW	KR

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
COBBLES	GRAVEL		SAND			FINES

SAMPLE #:	CPT-6 0-1'
WET COLOR: DESCRIPTION:	FINES with trace fine sand. -

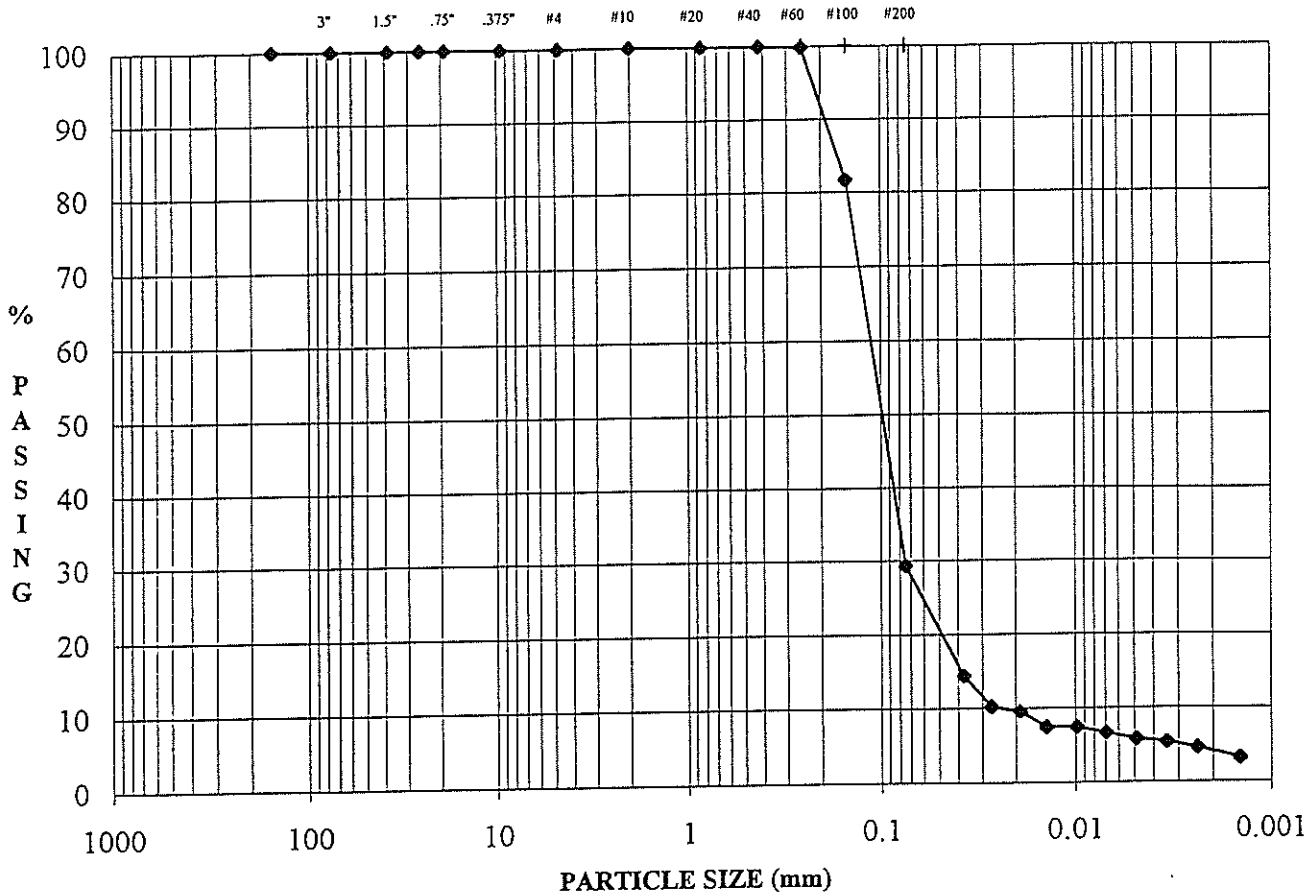
Mc:	28.1%
LL:	-
PL:	-
PI :	-
Gs:	2.73

COPPER RANGE/MI
973-2255.210

DATE	11/25/97
TECH	JE
REVIEW	KR

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
COBBLES	GRAVEL		SAND			FINES

SAMPLE #:	CPT-6 15-16'
WET COLOR: DESCRIPTION:	Fine SAND and SILT. (SM)

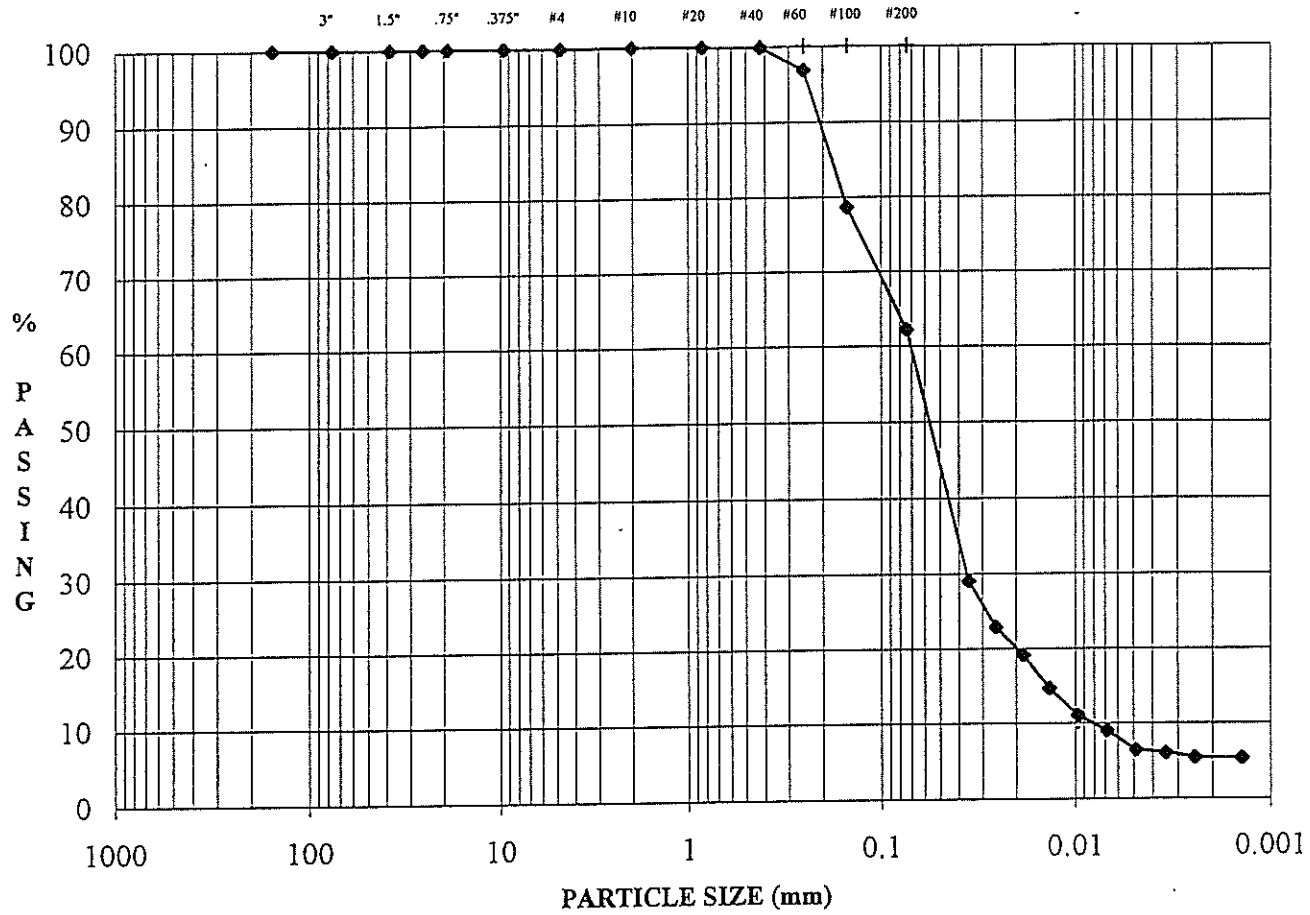
Mc:	35.3%
LL:	-
PL:	NP
PI :	-
Gs:	2.71

COPPER RANGE/MI
973-2255.210

DATE	11/25/97
TECH	JE
REVIEW	KR

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



COBBLES	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
	GRAVEL		SAND			FINES

SAMPLE #:	CPT-6 22-23'
WET COLOR:	SILT and fine
DESCRIPTION:	SAND. (ML)

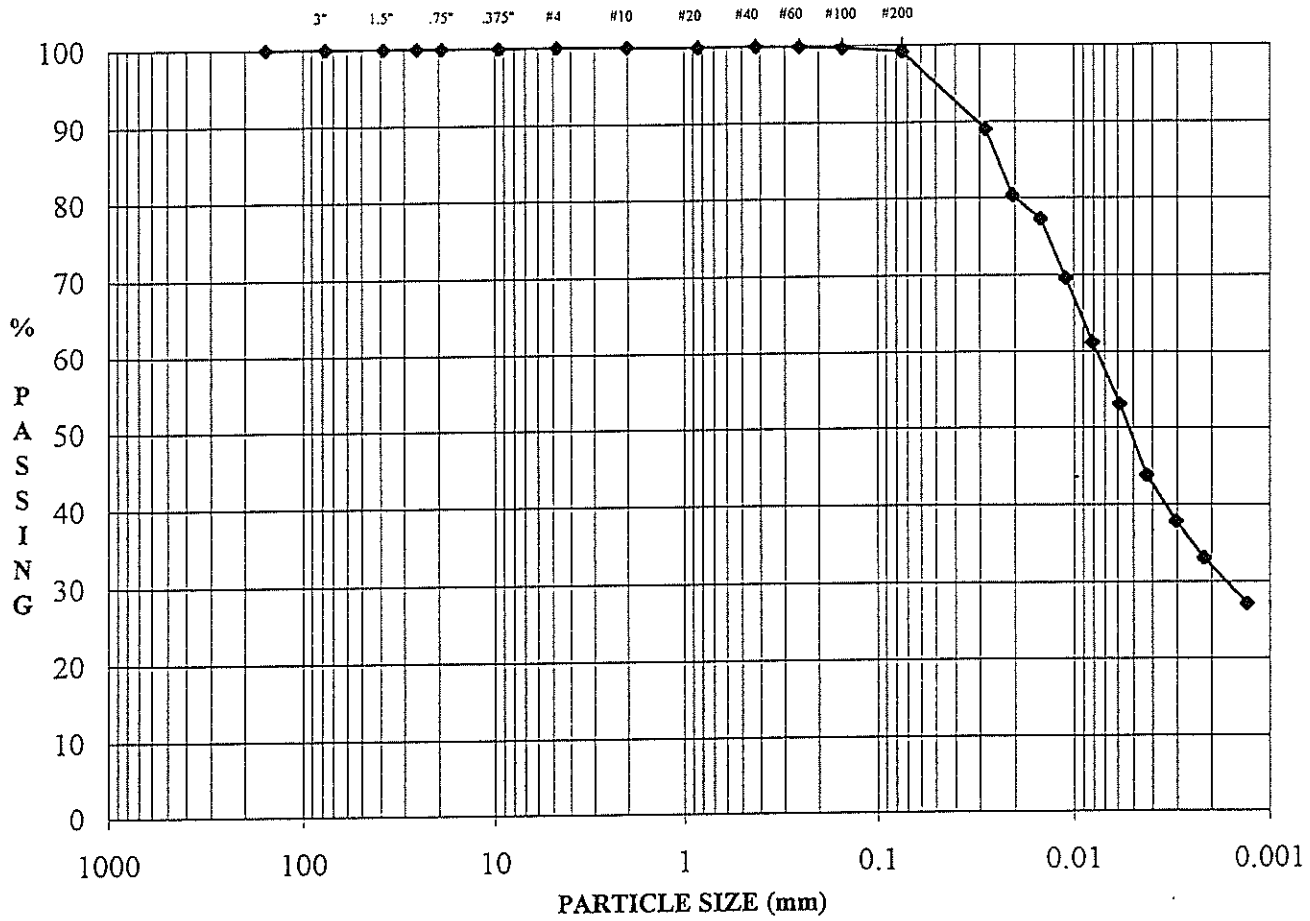
Mc:	34.4%
LL:	-
PL:	NP
PI :	-
Gs:	2.76

COPPER RANGE/MI
973-2255.210

DATE	11/22/97
TECH	BETH
REVIEW	KR

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



COBBLES	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
	GRAVEL		SAND			FINES

SAMPLE #:	CPT-7 0-1'
WET COLOR: DESCRIPTION:	Silty CLAY with trace fine sand. (CL)

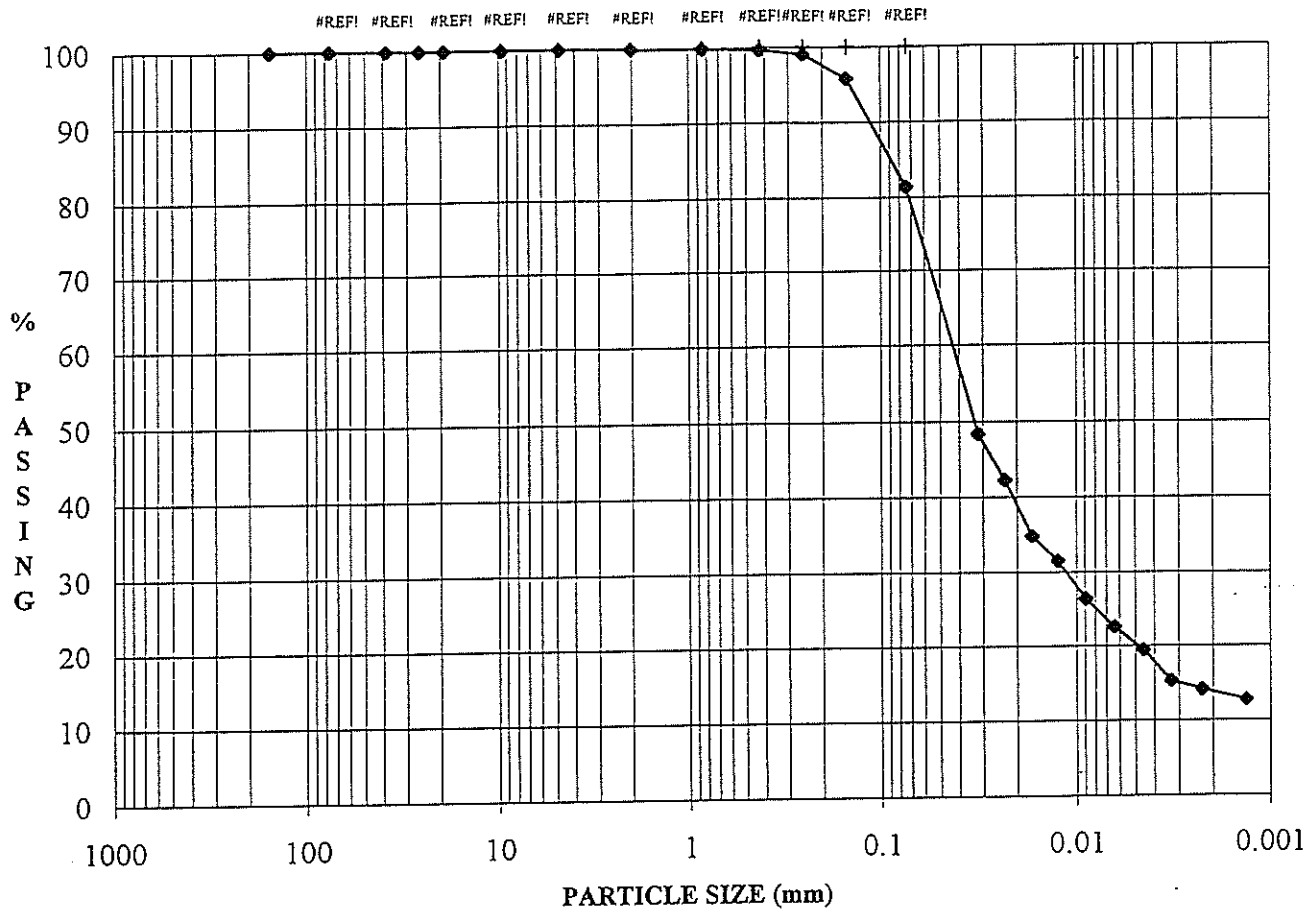
Mc:	34.5%
LL:	34
PL:	23
PI :	11
Gs:	2.84

COPPER RANGE/MI
973-2255.210

DATE	11/20/97
TECH	BETH
REVIEW	KR

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



COBBLES	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
	GRAVEL		SAND			FINES

SAMPLE #:	CPT-7 7-12'
WET COLOR:	FINES with some
DESCRIPTION:	fine sand. -

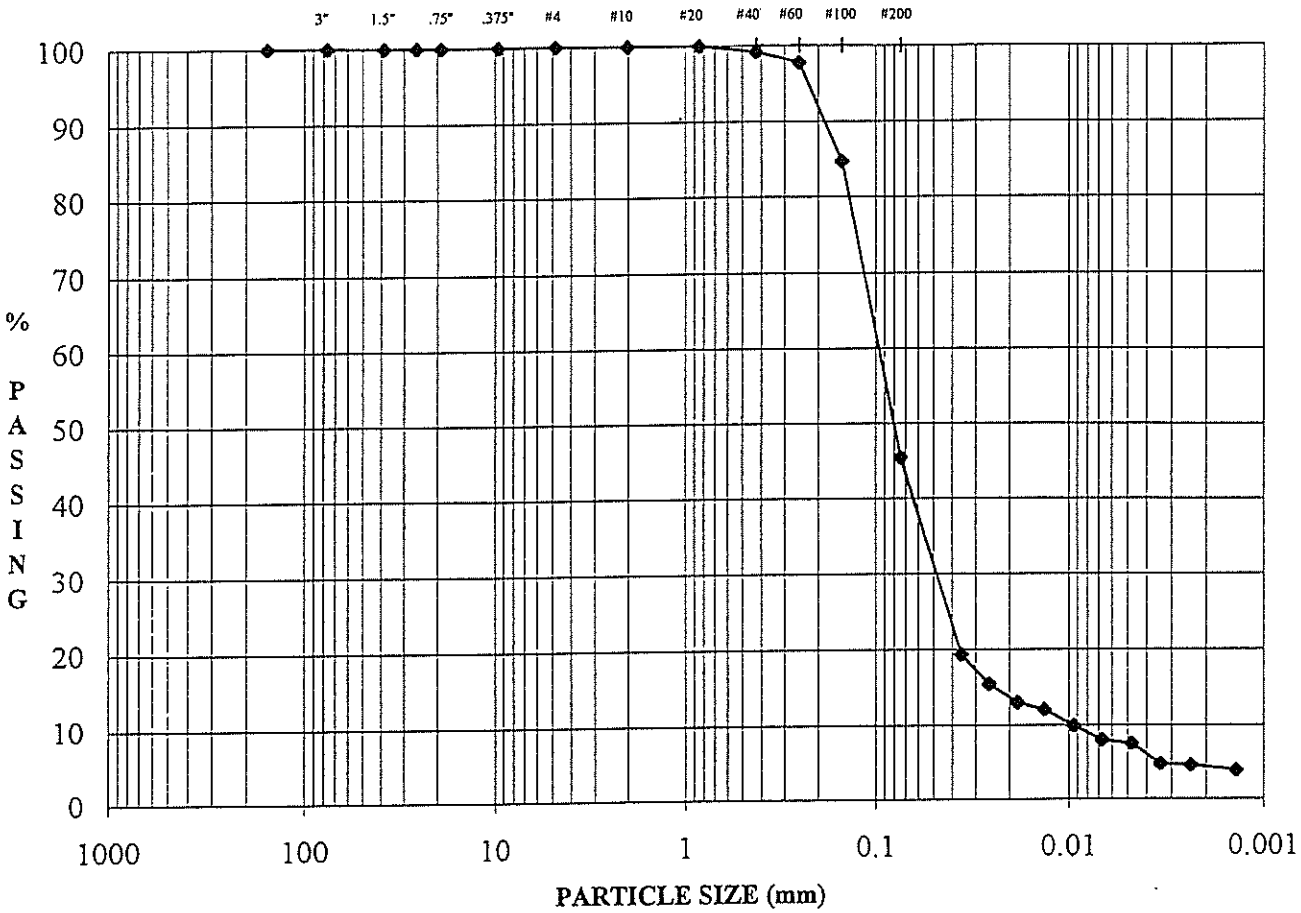
Mc:	25.2%
LL:	-
PL:	-
PI :	-
Gs:	2.90

COPPER RANGE/MI
973-2255.210

DATE	11/19/97
TECH	BETH
REVIEW	KR

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
COBBLES	GRAVEL		SAND			FINES

SAMPLE #:	CPT-7 15-20'
WET COLOR: DESCRIPTION:	Fine SAND and FINES. -

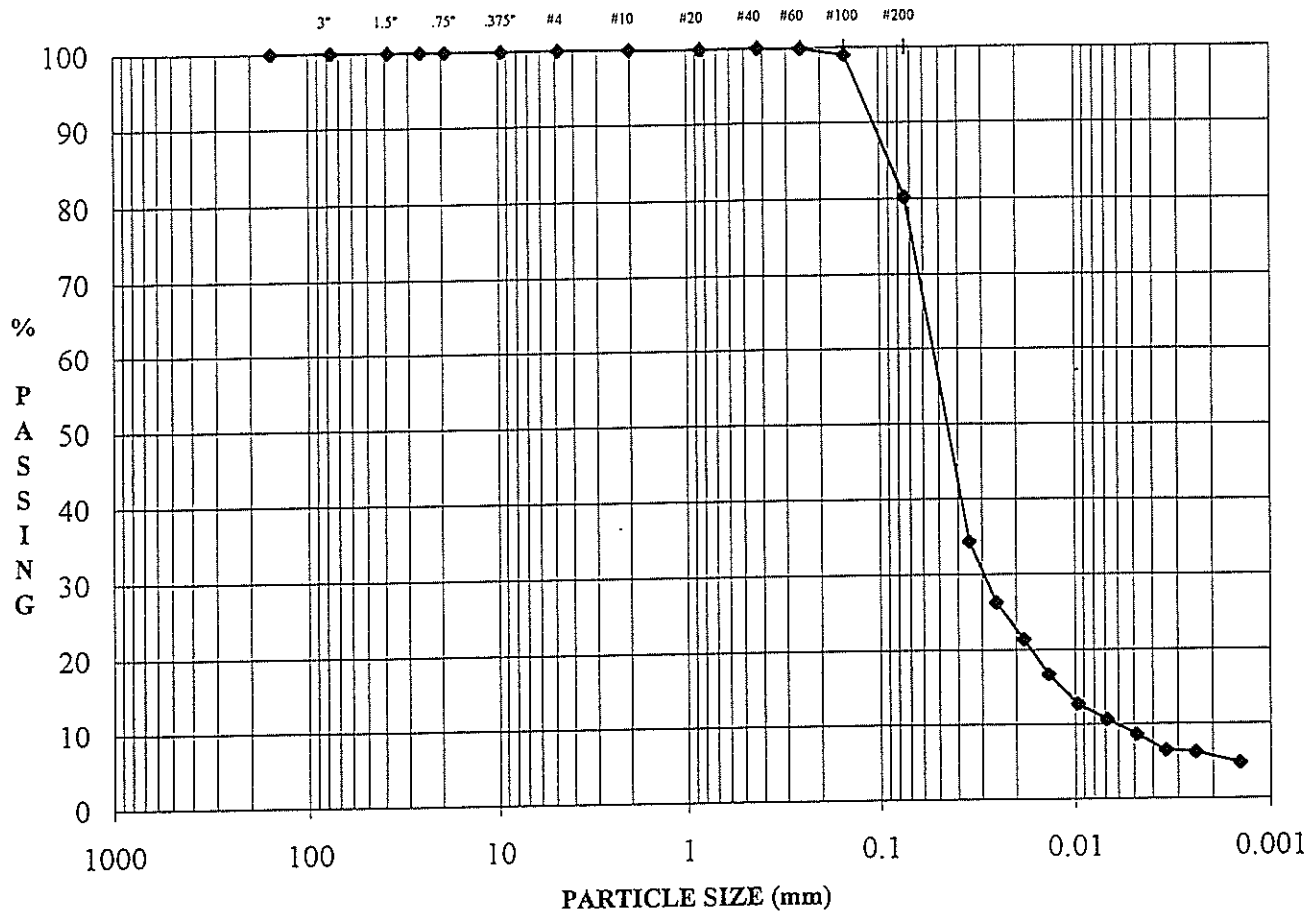
Mc:	20.3%
LL:	-
PL:	-
PI :	-
Gs:	2.85

COPPER RANGE/MI
973-2255.210

DATE	11/14/97
TECH	BETH
REVIEW	KR

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



COBBLES	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
	GRAVEL		SAND			FINES

SAMPLE #:	CPT-8 0-1'
WET COLOR: DESCRIPTION:	SILT with some fine sand. (ML)

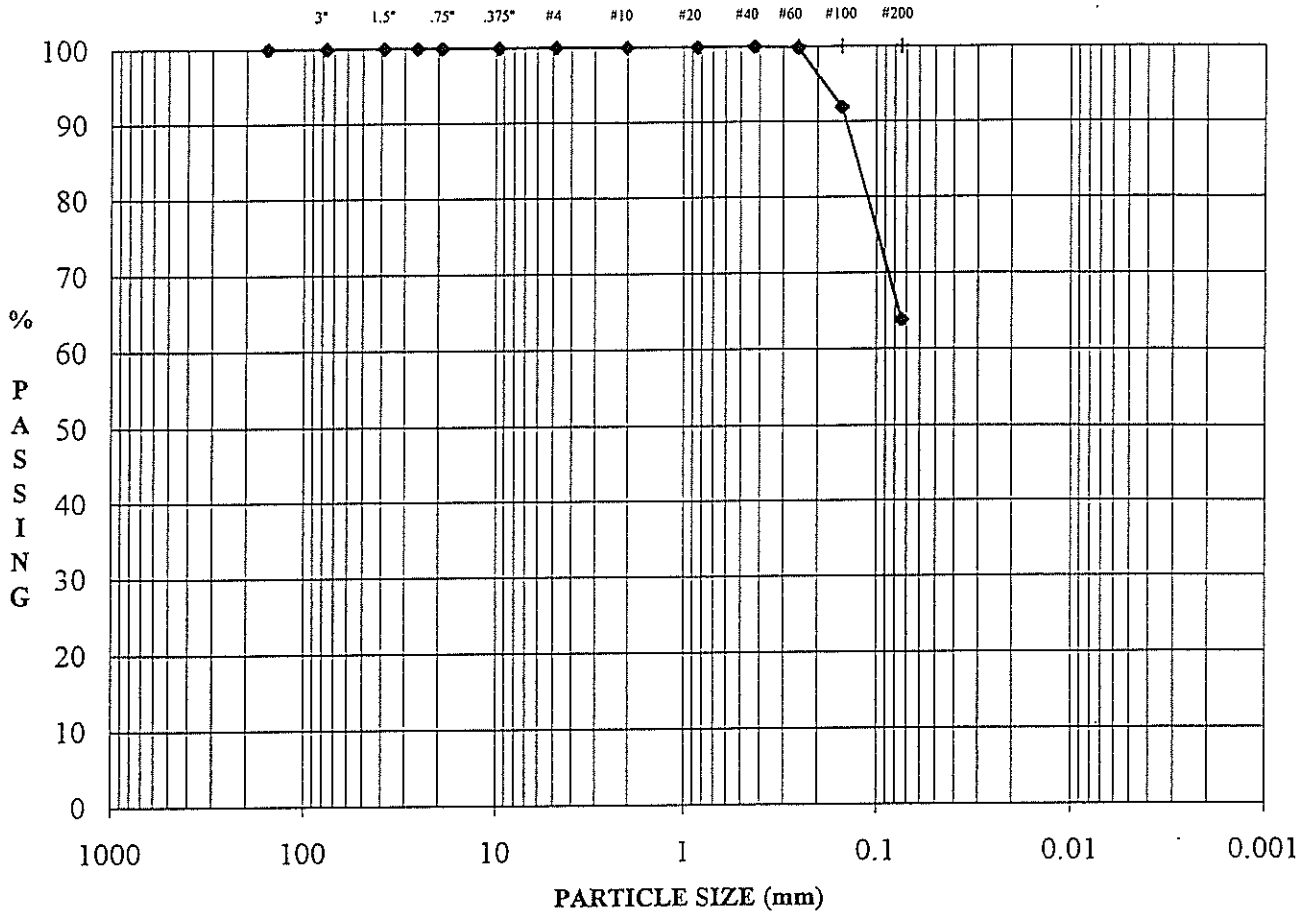
Mc:	18.5%
LL:	-
PL:	NP
PI :	-
Gs:	2.73

COPPER RANGE/MI
973-2255.210

DATE	11/20/97
TECH	BETH
REVIEW	KR

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



COBBLES	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
	GRAVEL		SAND			FINES

SAMPLE #:	CPT-8 13-16'
DESCRIPTION:	SILT and fine SAND. (ML) -

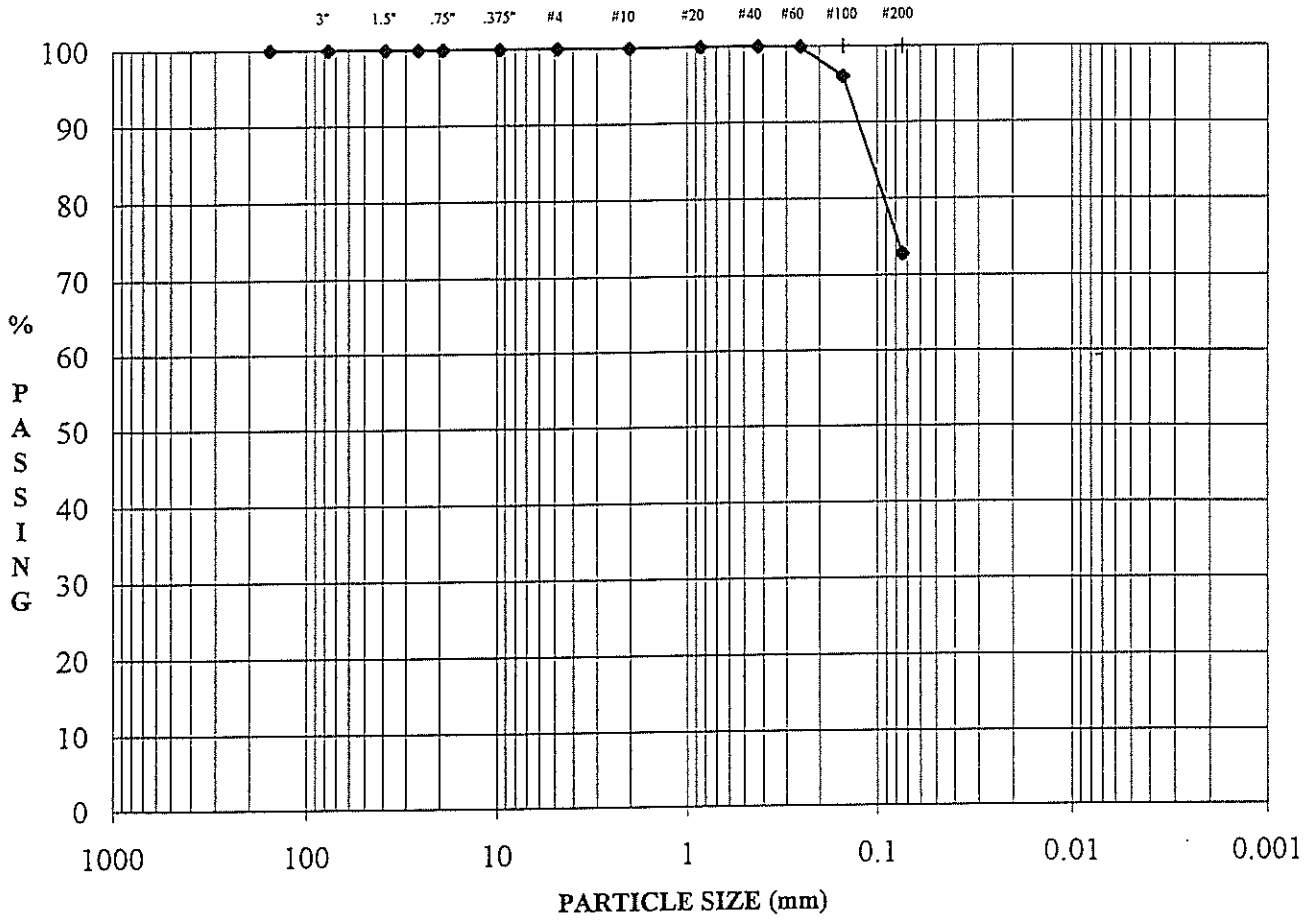
Mc:	32.5%
LL:	-
PL:	NP
PI :	-
Gs:	-

COPPER RANGE/MI
973-2255.210

DATE	11/12/97
TECH	TAS
REVIEW	KR

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
COBBLES	GRAVEL		SAND			FINES

SAMPLE #:	CPT-8 20-25'
DESCRIPTION:	FINES with some fine sand.

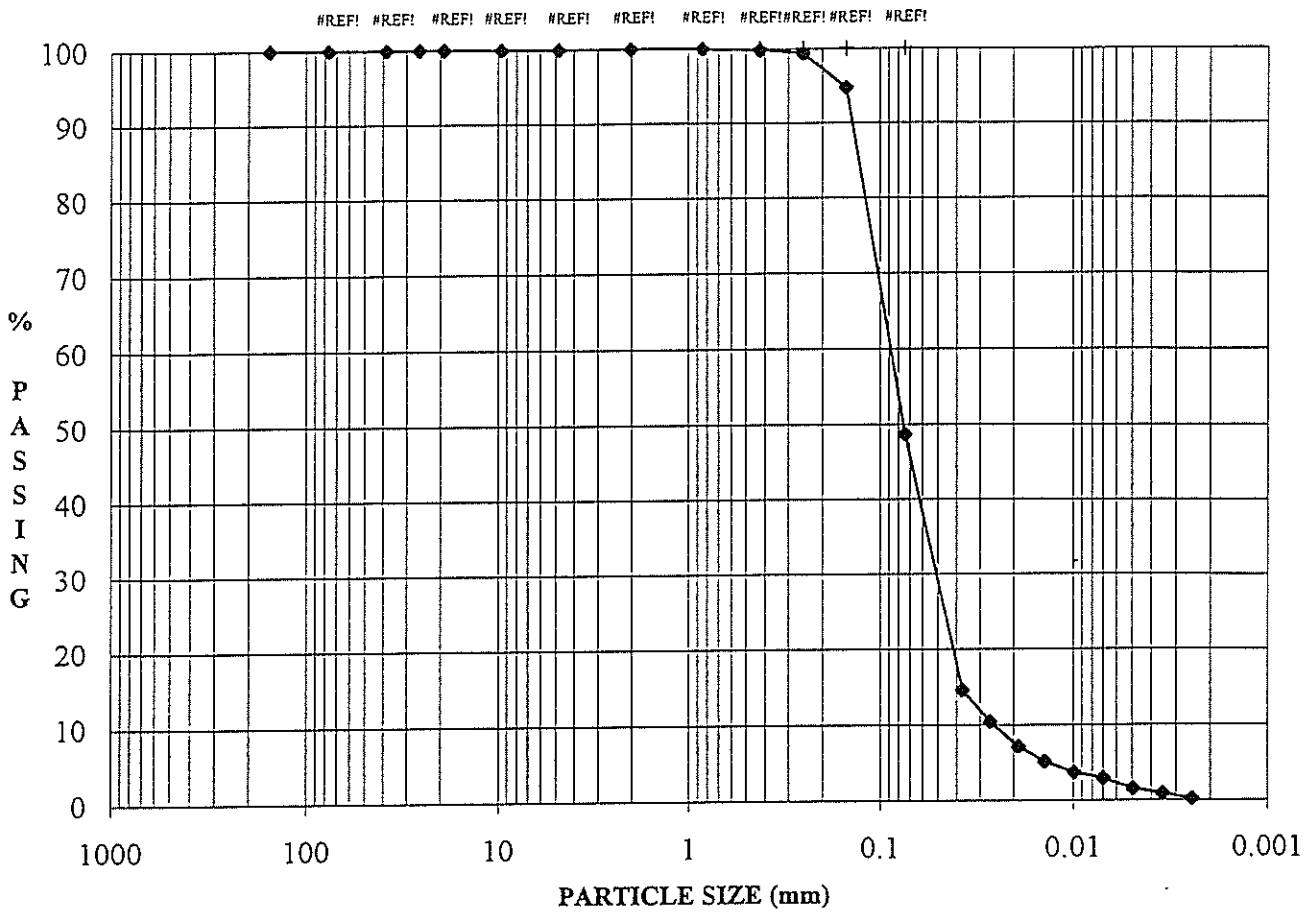
Mc:	27.7%
LL:	-
PL:	-
PI :	-
Gs:	-

COPPER RANGE/MI
973-2255.210

DATE	11/17/97
TECH	BETH
REVIEW	KR

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



COBBLES	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
	GRAVEL		SAND			FINES

SAMPLE #:	CPT-9 0-1'
WET COLOR: DESCRIPTION:	Fine SAND and SILT. (SM) -

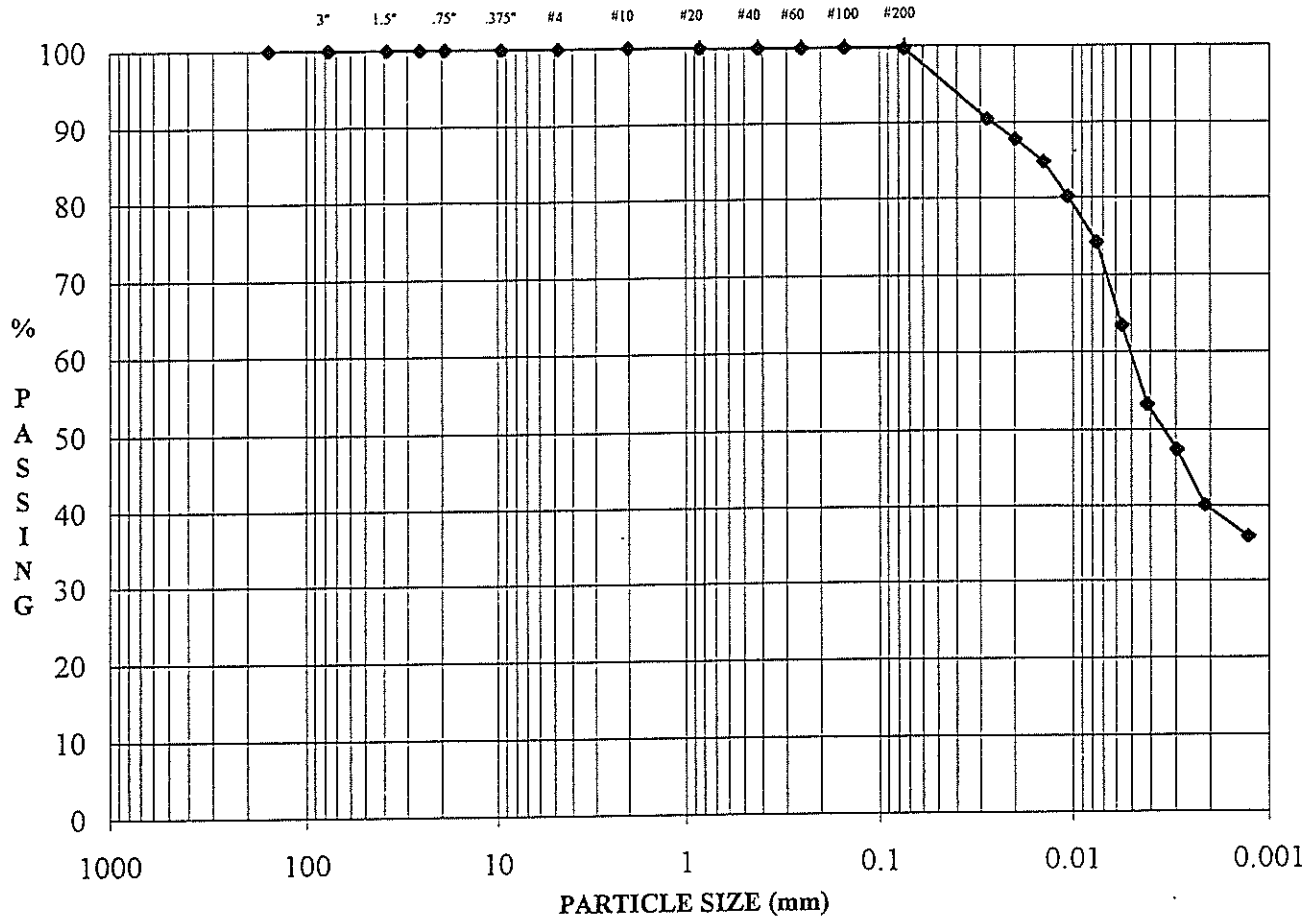
Mc:	22.0%
LL:	-
PL:	NP
PI :	-
Gs:	2.74

COPPER RANGE/MI
973-2255.210

DATE	11/14/97
TECH	BETH
REVIEW	KR

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
COBBLES	GRAVEL		SAND			FINES

SAMPLE #:	CPT-10 0-1'
WET COLOR: DESCRIPTION:	Silty CLAY. (CL) -

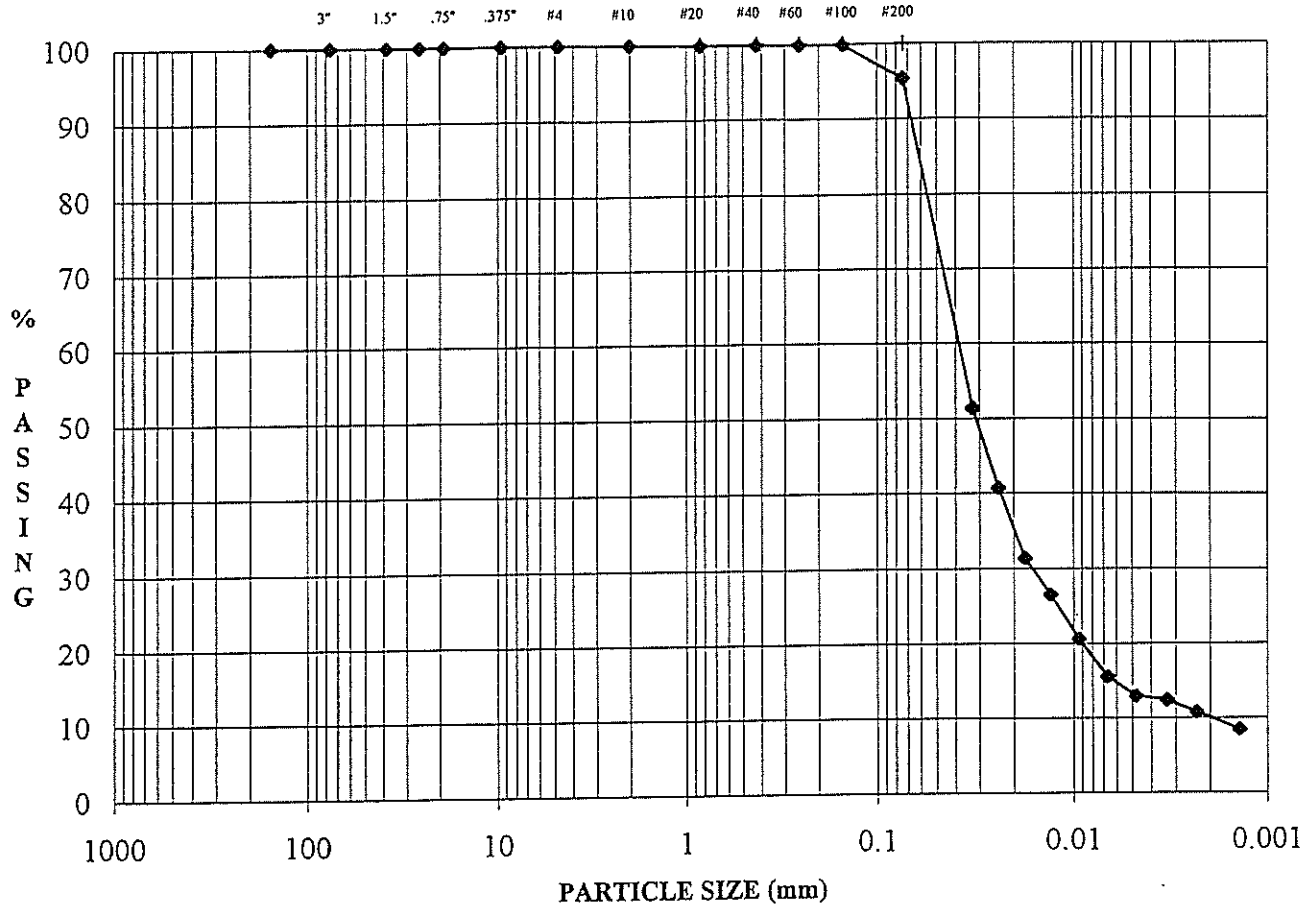
Mc:	32.6%
LL:	39
PL:	22
PI :	17
Gs:	2.85

COPPER RANGE/MI
973-2255.210

DATE	11/20/97
TECH	BETH
REVIEW	KR

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
COBBLES	GRAVEL		SAND			FINES

SAMPLE #:	CPT-10 15-20'
WET COLOR: DESCRIPTION:	FINES with trace fine sand. -

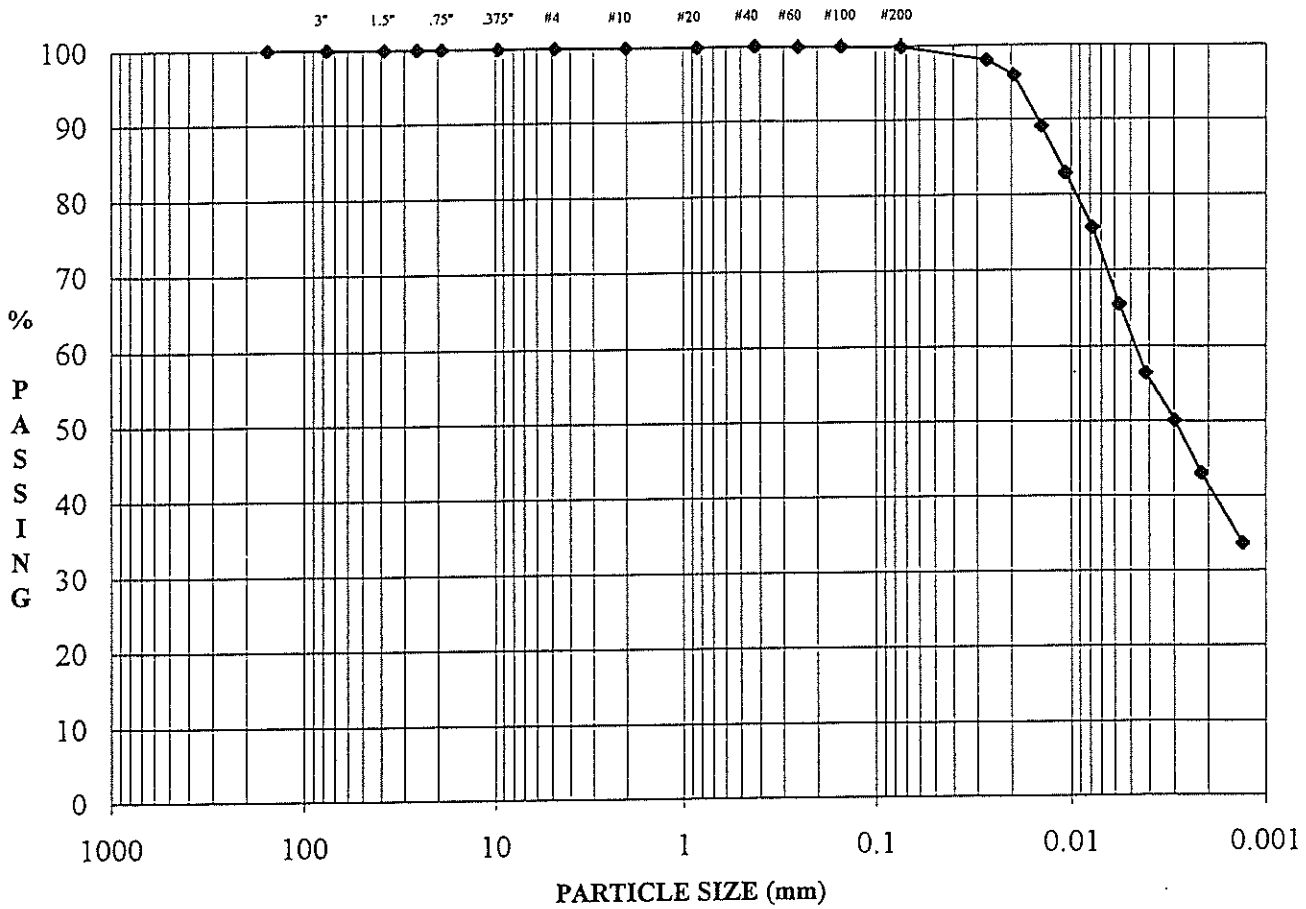
Mc:	34.2%
LL:	-
PL:	-
PI :	-
Gs:	2.82

COPPER RANGE/MI
973-2255.210

DATE	11/20/97
TECH	TAS
REVIEW	KR

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



COBBLES	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
	GRAVEL		SAND			FINES

SAMPLE #:	CPT-10 30-35'
WET COLOR:	Silty CLAY.
DESCRIPTION:	(CL)
	-

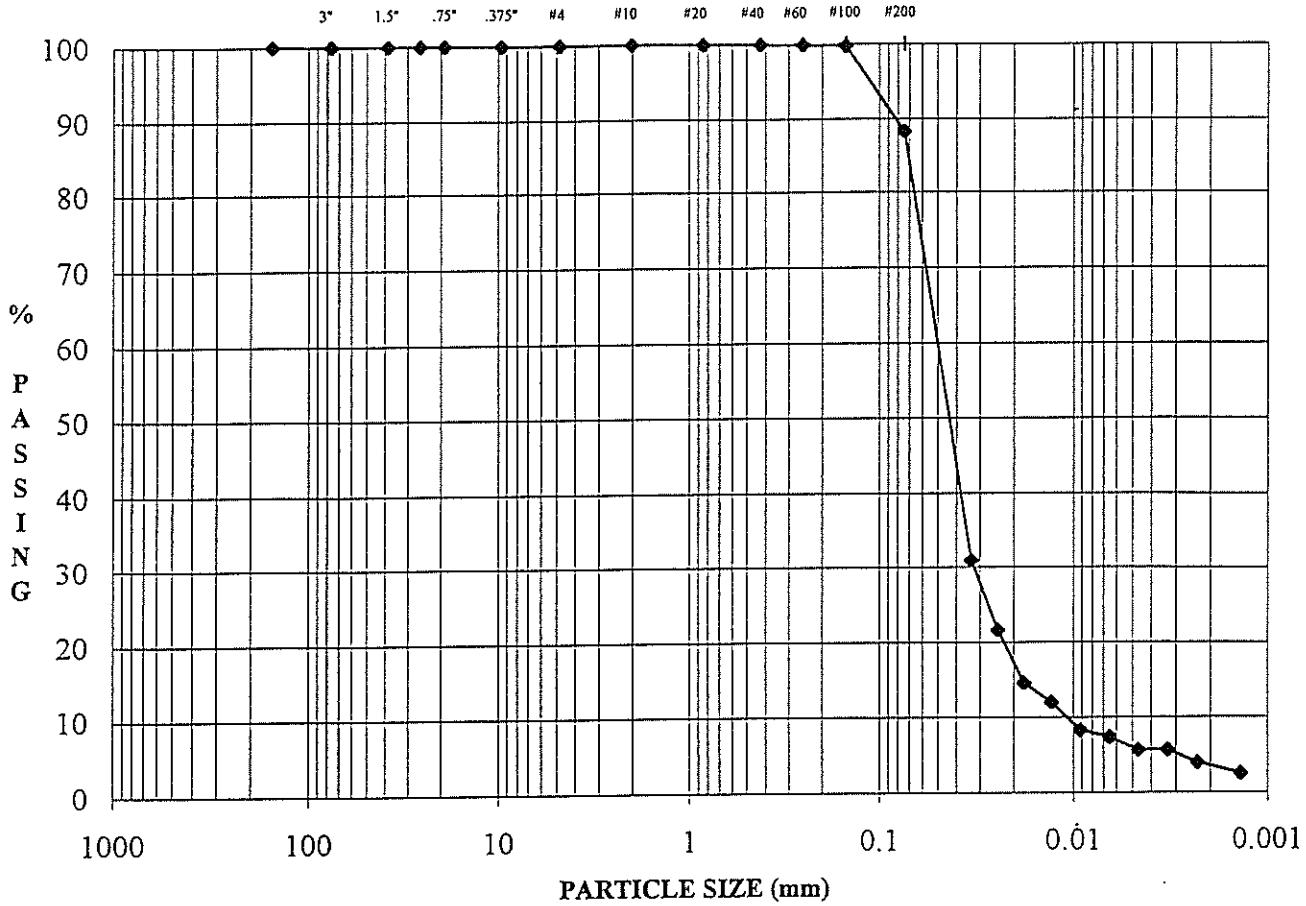
Mc:	44.6%
LL:	36
PL:	22
PI :	14
Gs:	2.79

COPPER RANGE/MI
973-2255.210

DATE	11/20/97
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REVIEW	KR

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
COBBLES	GRAVEL		SAND			FINES

SAMPLE #:	CPT-12 0-1'
WET COLOR: DESCRIPTION:	FINES with little fine sand. -

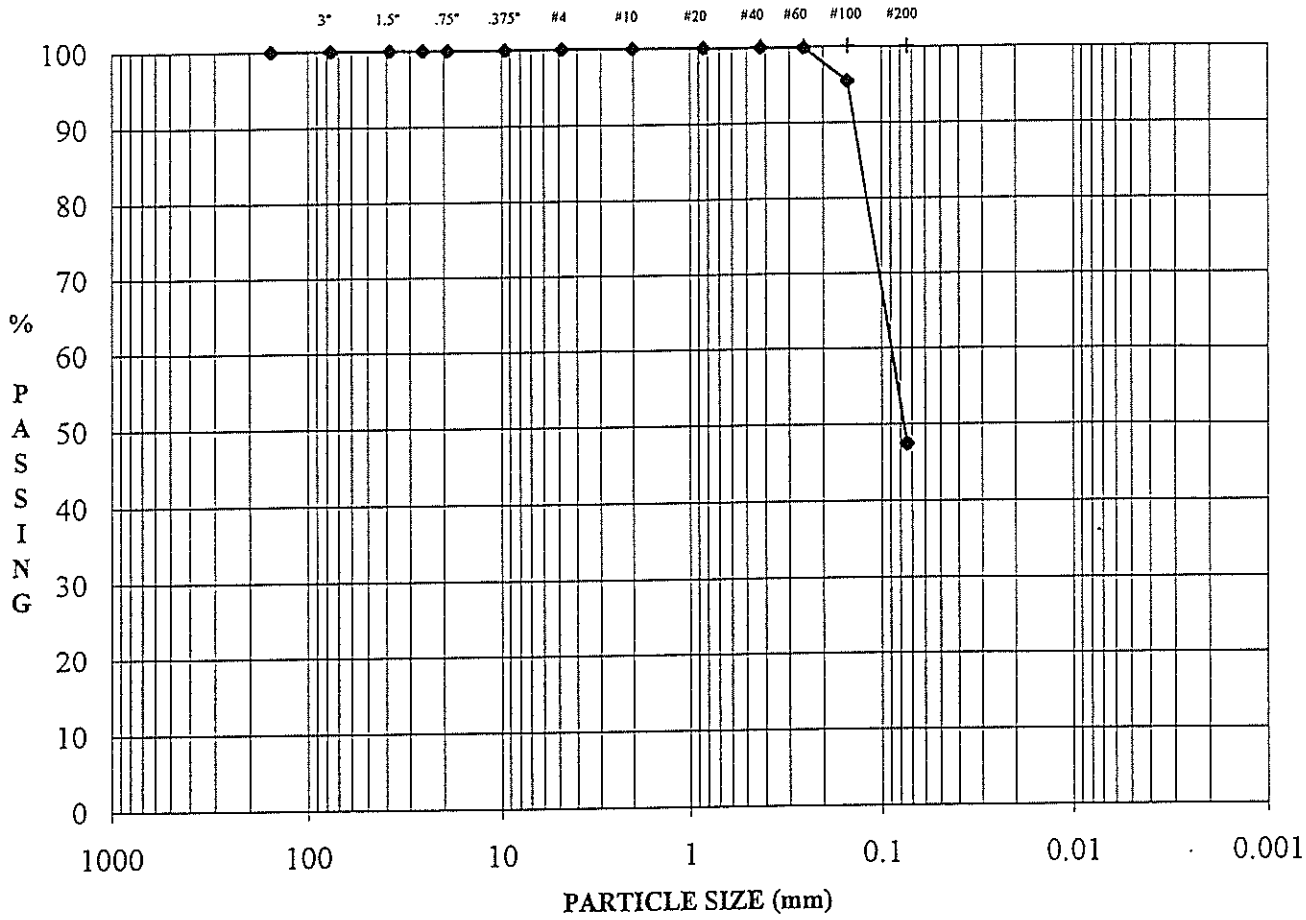
Mc:	25.6%
LL:	-
PL:	-
PI :	-
Gs:	2.90

COPPER RANGE/MI
973-2255.210

DATE	11/22/97
TECH	BETH
REVIEW	KR

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
COBBLES	GRAVEL		SAND			FINES

SAMPLE #:	CPT-13 0-1'
DESCRIPTION:	Fine SAND and FINES -

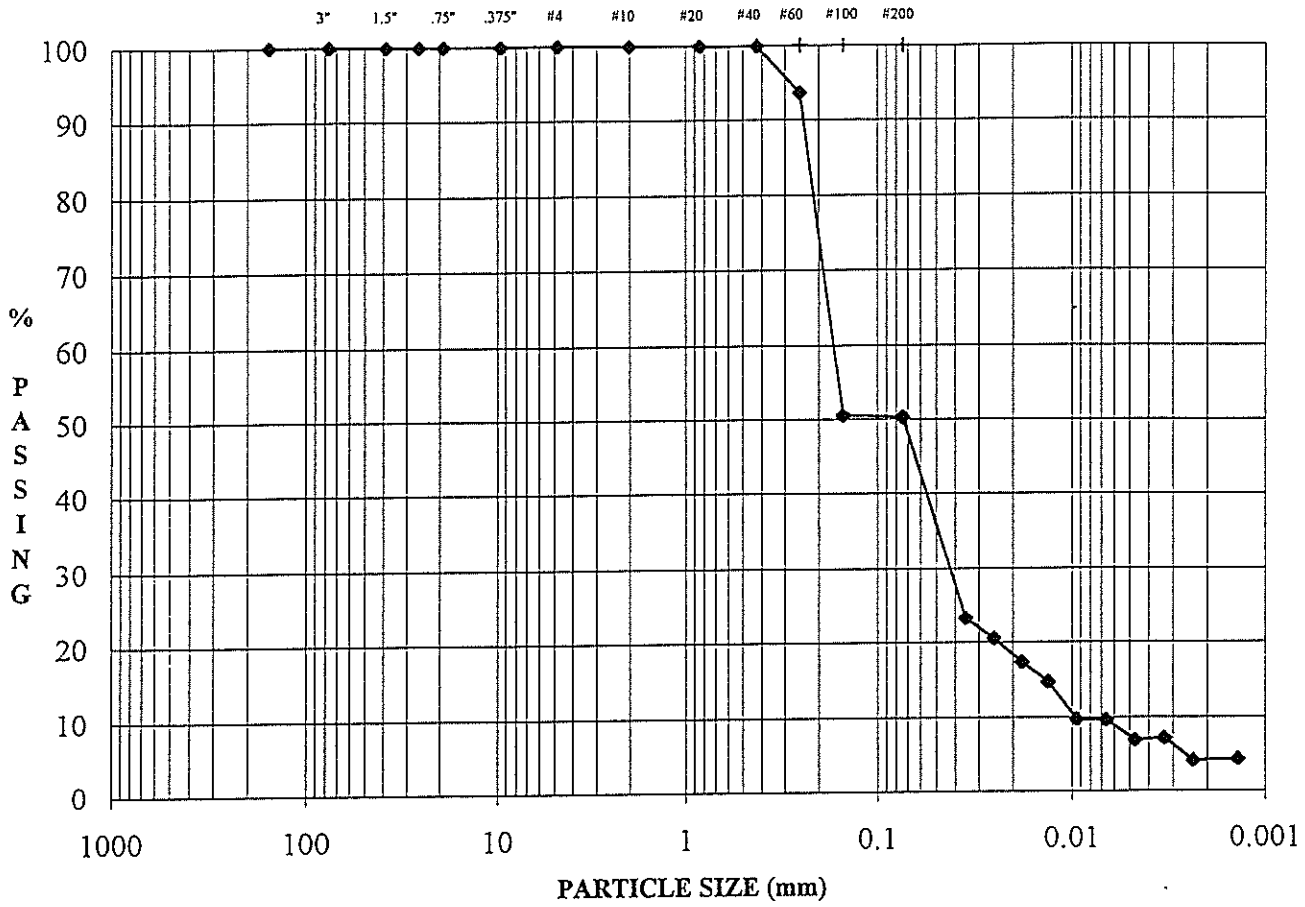
Mc:	14.0%
LL:	-
PL:	-
PI :	-
Gs:	-

COPPER RANGE/MI
973-2255.210

DATE	11/11/97
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REVIEW	KR

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



COBBLES	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
	GRAVEL		SAND			FINES

SAMPLE #:	CPT-13, Bucket 0-1'
WET COLOR:	FINES and fine
DESCRIPTION:	SAND. -

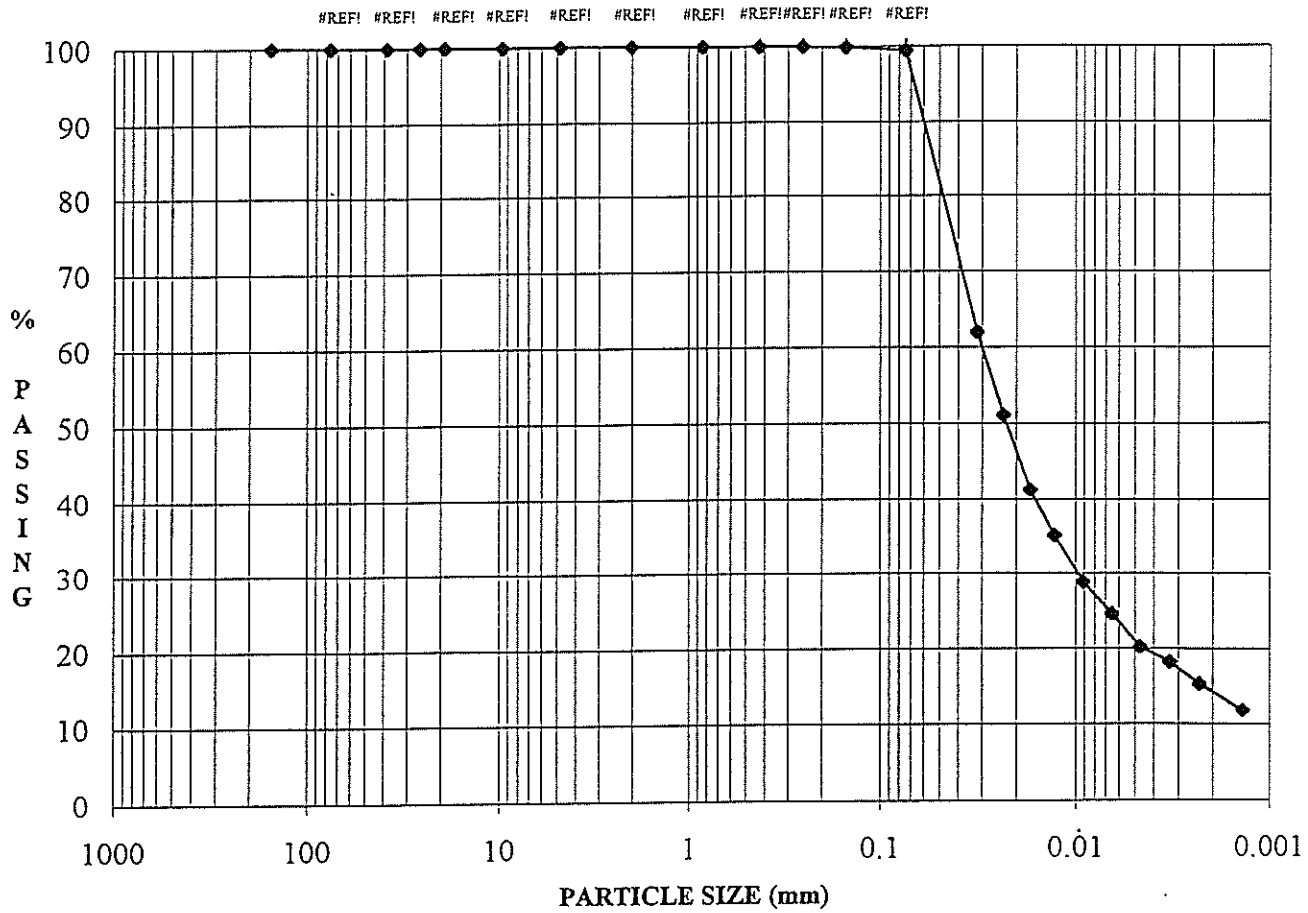
Mc:	16.5%
LL:	-
PL:	-
PI :	-
Gs:	2.83

COPPER RANGE/MI
973-2255.210

DATE	11/22/97
TECH	BETH
REVIEW	KR

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



COBBLES	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
	GRAVEL		SAND			FINES

SAMPLE #:	CPT-15 39-40'
WET COLOR: DESCRIPTION:	SILT with trace fine sand. (ML)

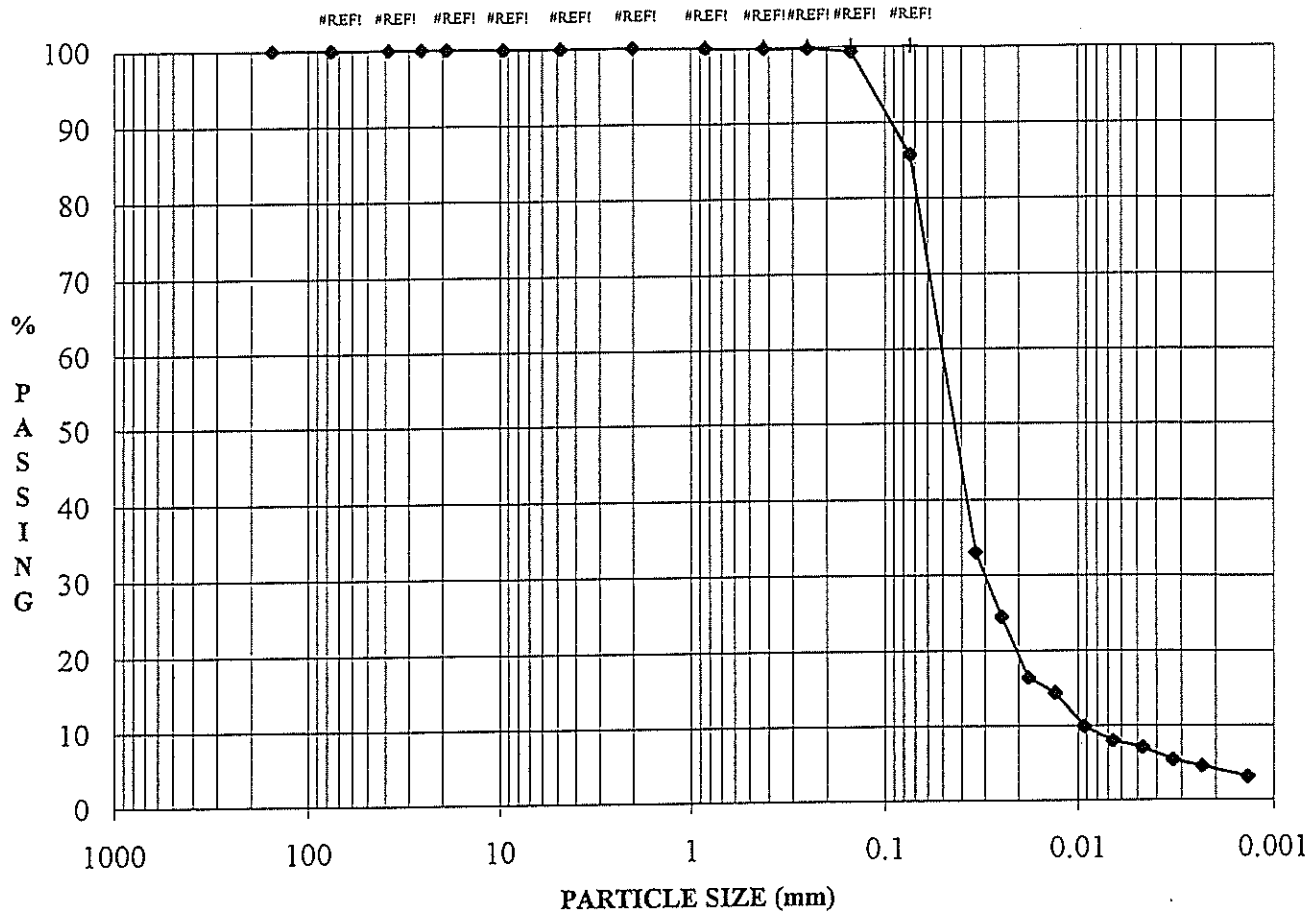
Mc:	30.3%
LL:	-
PL:	NP
PI :	-
Gs:	2.77

COPPER RANGE/MI
973-2255

DATE	11/25/97
TECH	BETH
REVIEW	KR

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



COBBLES	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
	GRAVEL		SAND			FINES

SAMPLE #:	CPT-16 0-1'
WET COLOR:	FINES with some
DESCRIPTION:	fine sand. -

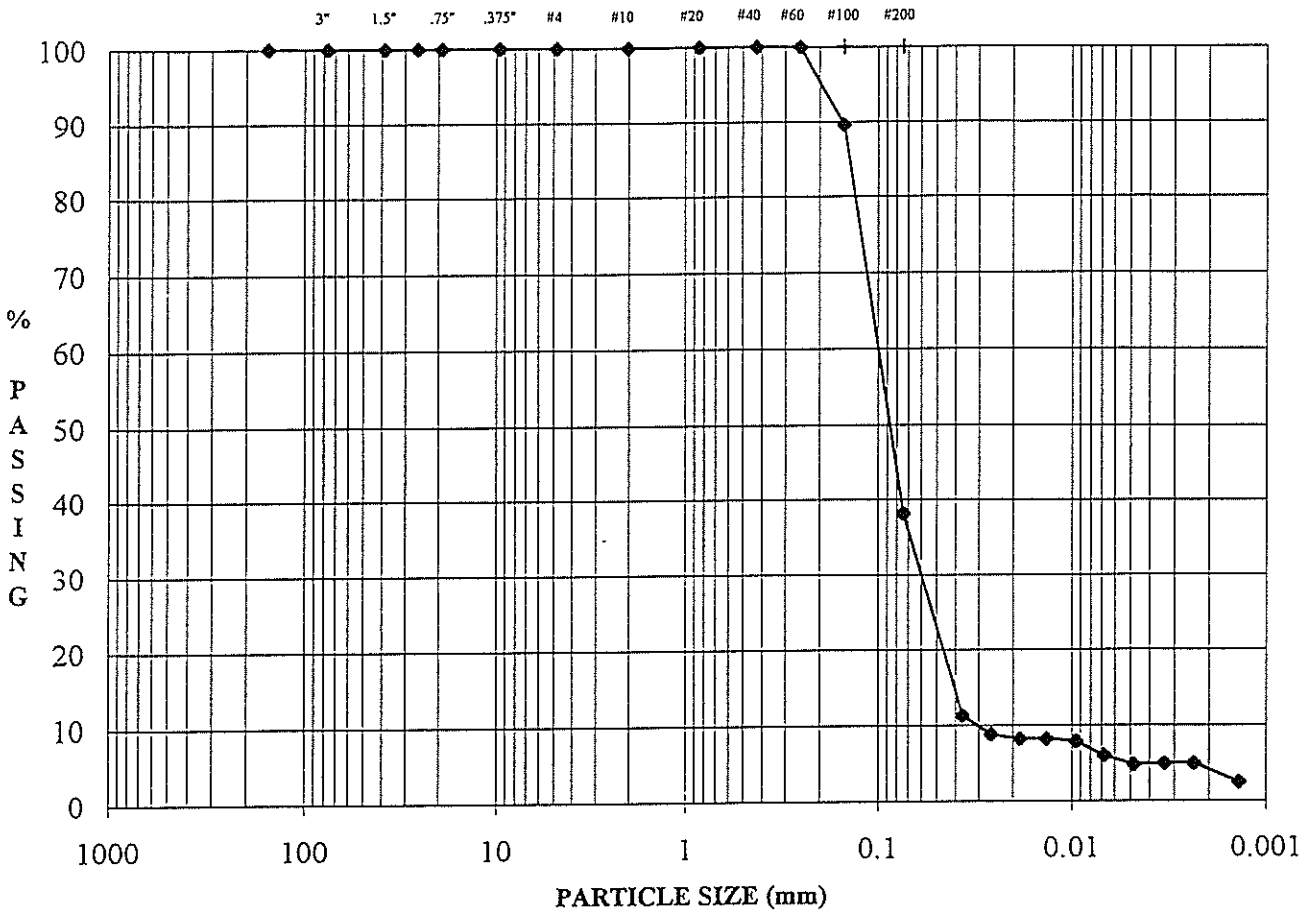
Mc:	19.70%
LL:	-
PL:	-
PI :	-
Gs:	2.88

COPPER RANGE/MI
973-2255.210

DATE	12/4/97
TECH	BETH
REVIEW	BB

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
COBBLES	GRAVEL		SAND			FINES

SAMPLE #:	CPT-16 5-6'
WET COLOR: DESCRIPTION:	Fine SAND and FINES. -

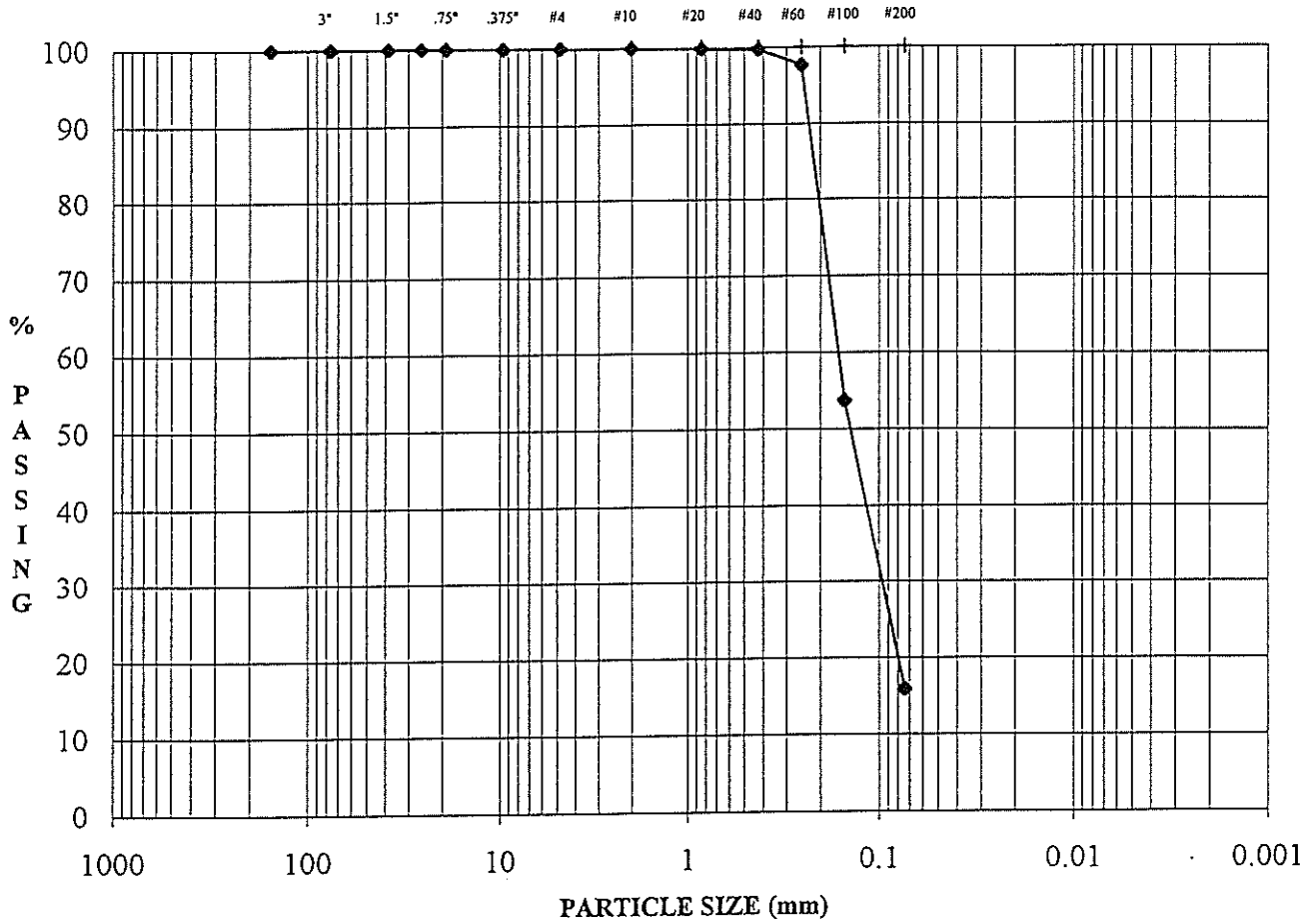
Mc:	27.70%
LL:	-
PL:	-
PI :	-
Gs:	2.84

COPPER RANGE/MI
973-2255.210

DATE	12/4/97
TECH	BETH
REVIEW	BB

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
COBBLES	GRAVEL		SAND			FINES

SAMPLE #:	CPT-16 11-12'
DESCRIPTION:	Fine SAND with some fines. -

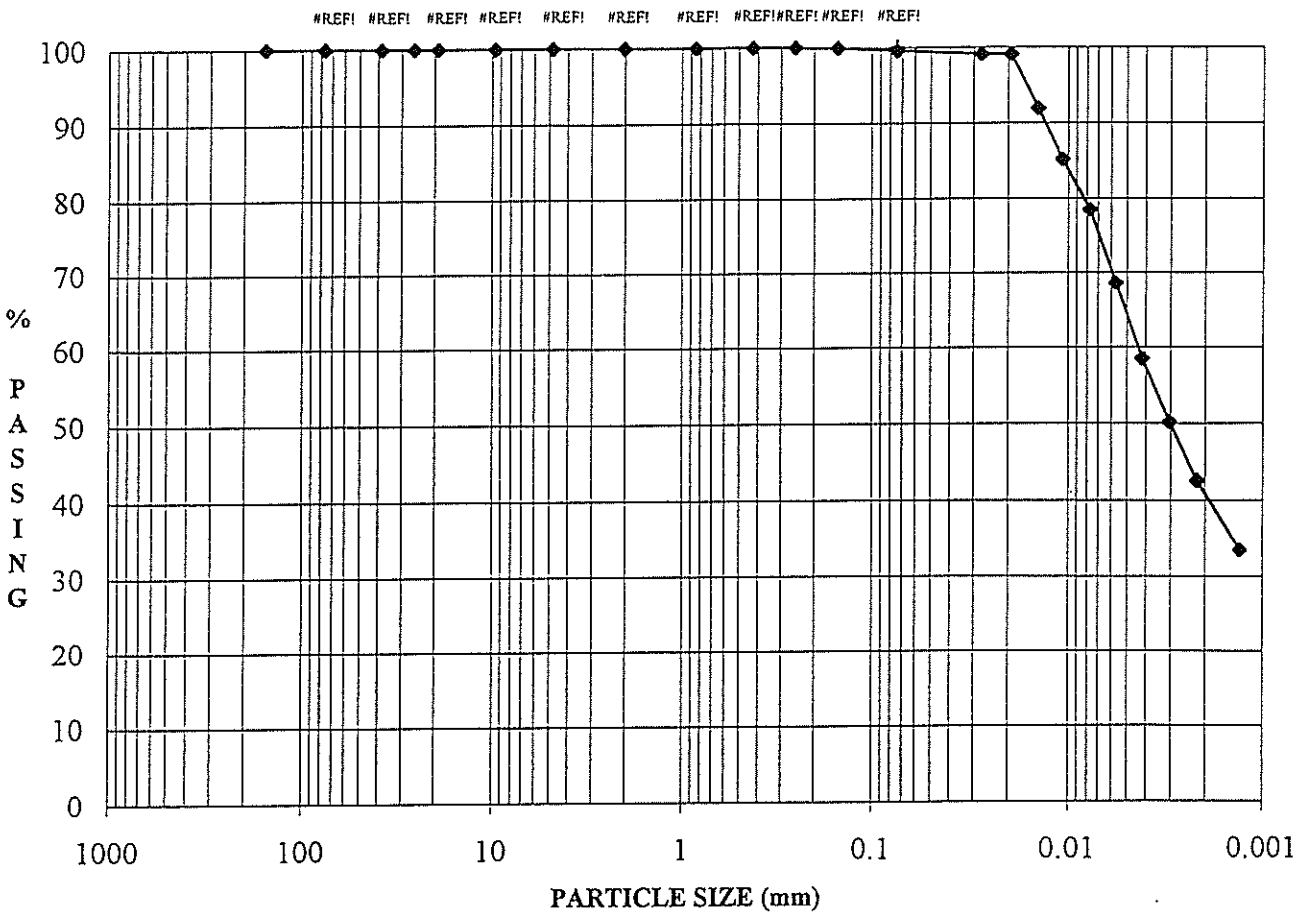
Mc:	35.6%
LL:	-
PL:	-
PI :	-
Gs:	-

COPPER RANGE/MI
973-2255.210

DATE	12/1/97
TECH	BETH
REVIEW	KR

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
COBBLES	GRAVEL		SAND			FINES

SAMPLE #:	CPT-17 0-1'
WET COLOR: DESCRIPTION:	Silty CLAY with trace fine sand. (CL)

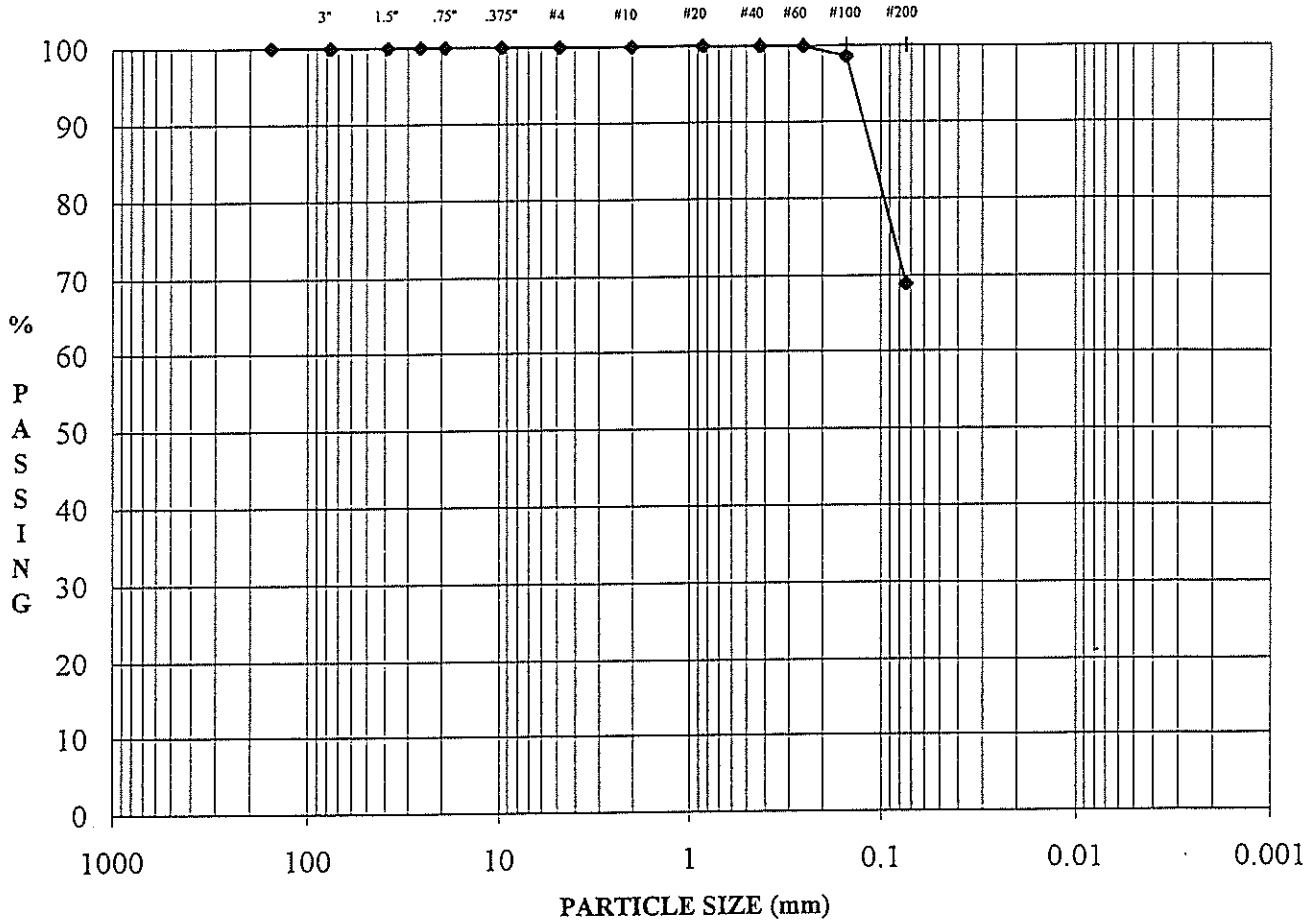
Mc:	48.0%
LL:	43
PL:	25
PI :	18
Gs:	2.75

COPPER RANGE/MI
973-2255.210

DATE	11/14/97
TECH	JE
REVIEW	KR

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
COBBLES	GRAVEL		SAND			FINES

SAMPLE #:	CPT-17 3-4'
DESCRIPTION:	FINES and fine SAND. -

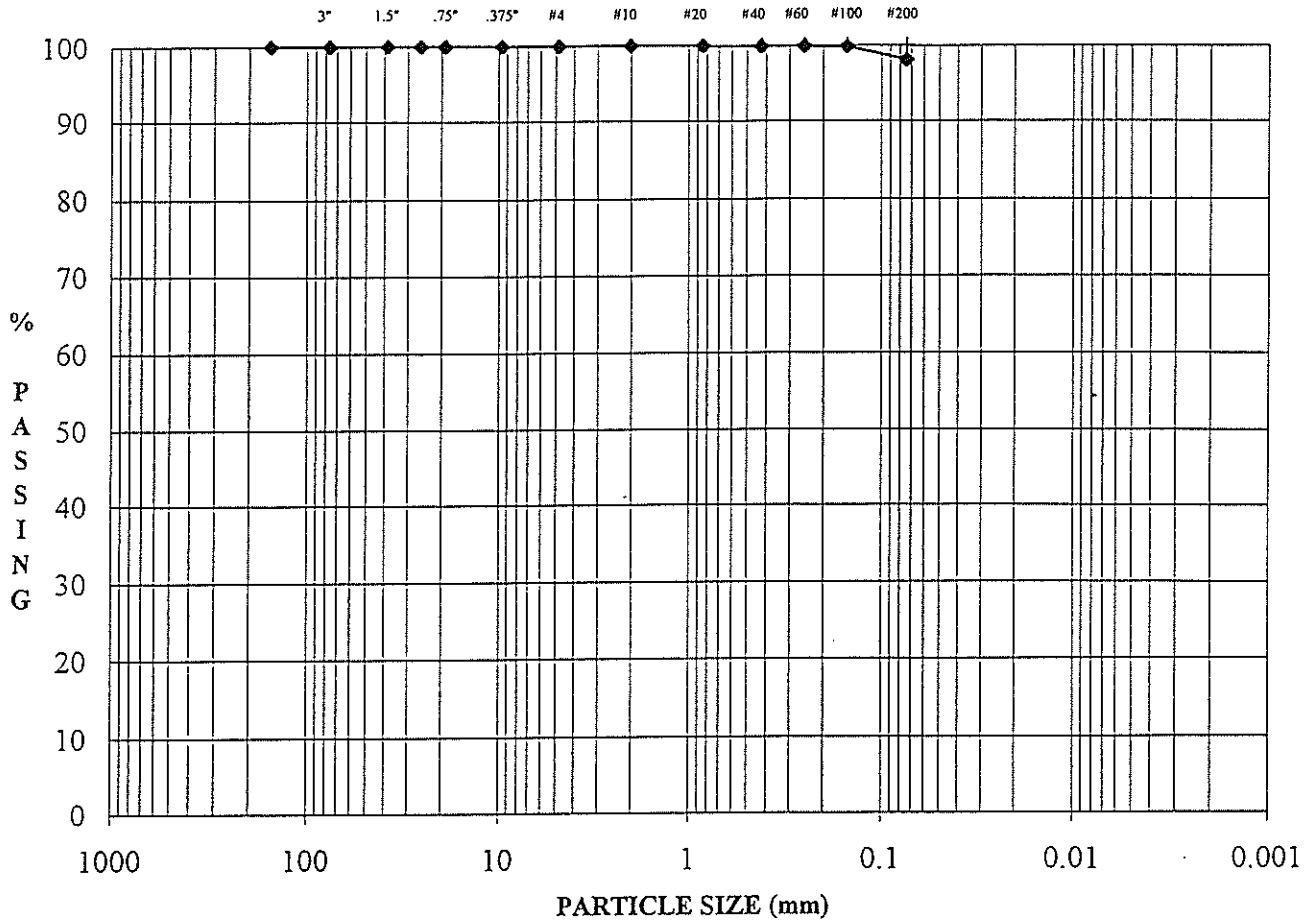
Mc:	24.9%
LL:	-
PL:	-
PI :	-
Gs:	-

COPPER RANGE/MI
973-2255.210

DATE	12/1/97
TECH	BETH
REVIEW	KR

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



COBBLES	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
	GRAVEL		SAND			FINES

SAMPLE #:	CPT-17 6.5-7.5'
DESCRIPTION:	SILT with trace fine sand. (ML)

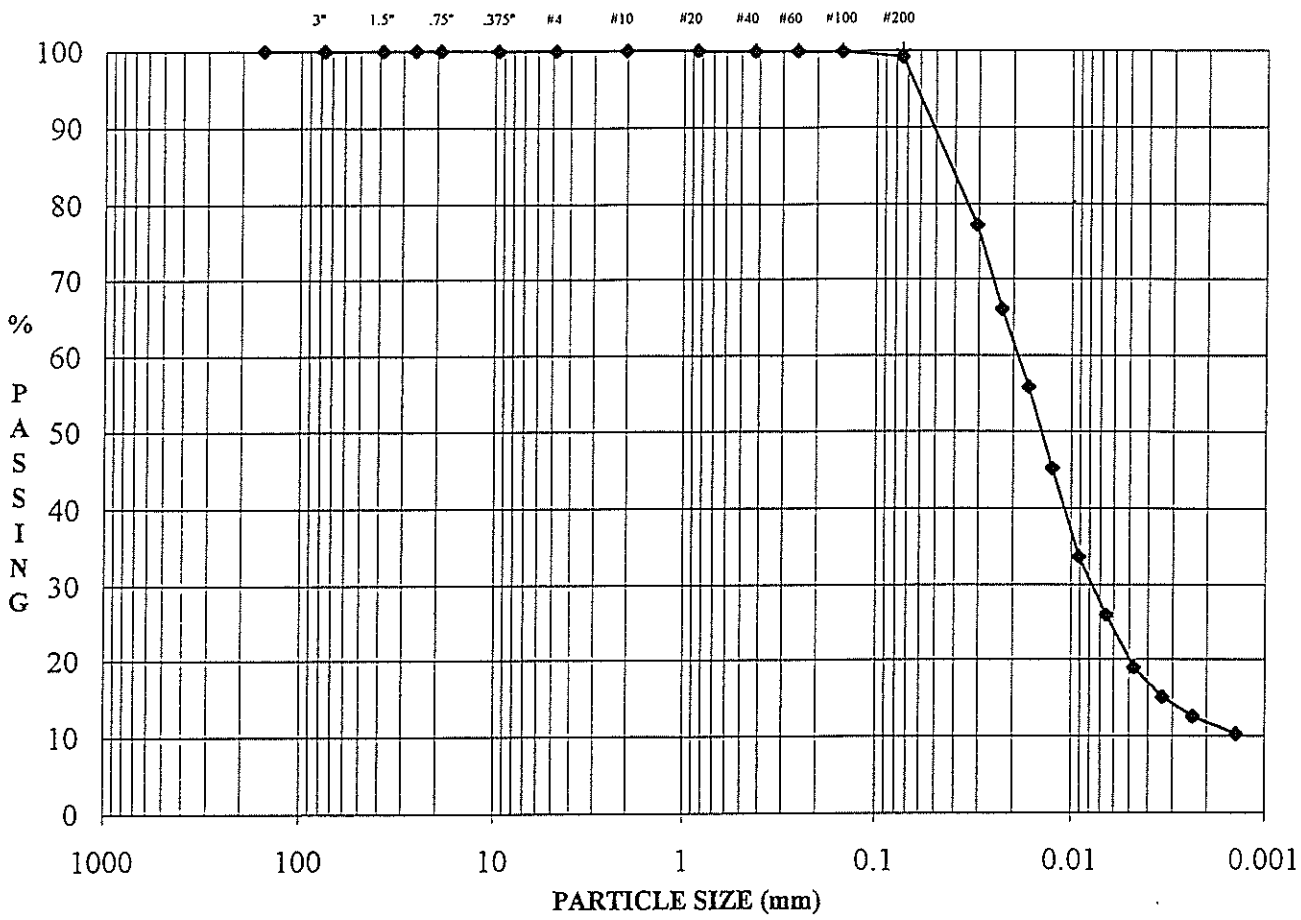
Mc:	36.3%
LL:	-
PL:	NP
PI :	-
Gs:	-

COPPER RANGE/MI
973-2255.210

DATE	12/1/97
TECH	BETH
REVIEW	KR

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



COBBLES	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
	GRAVEL		SAND			FINES

SAMPLE #:	CPT-18 0-1'
WET COLOR: DESCRIPTION:	SILT with trace fine sand. (ML)

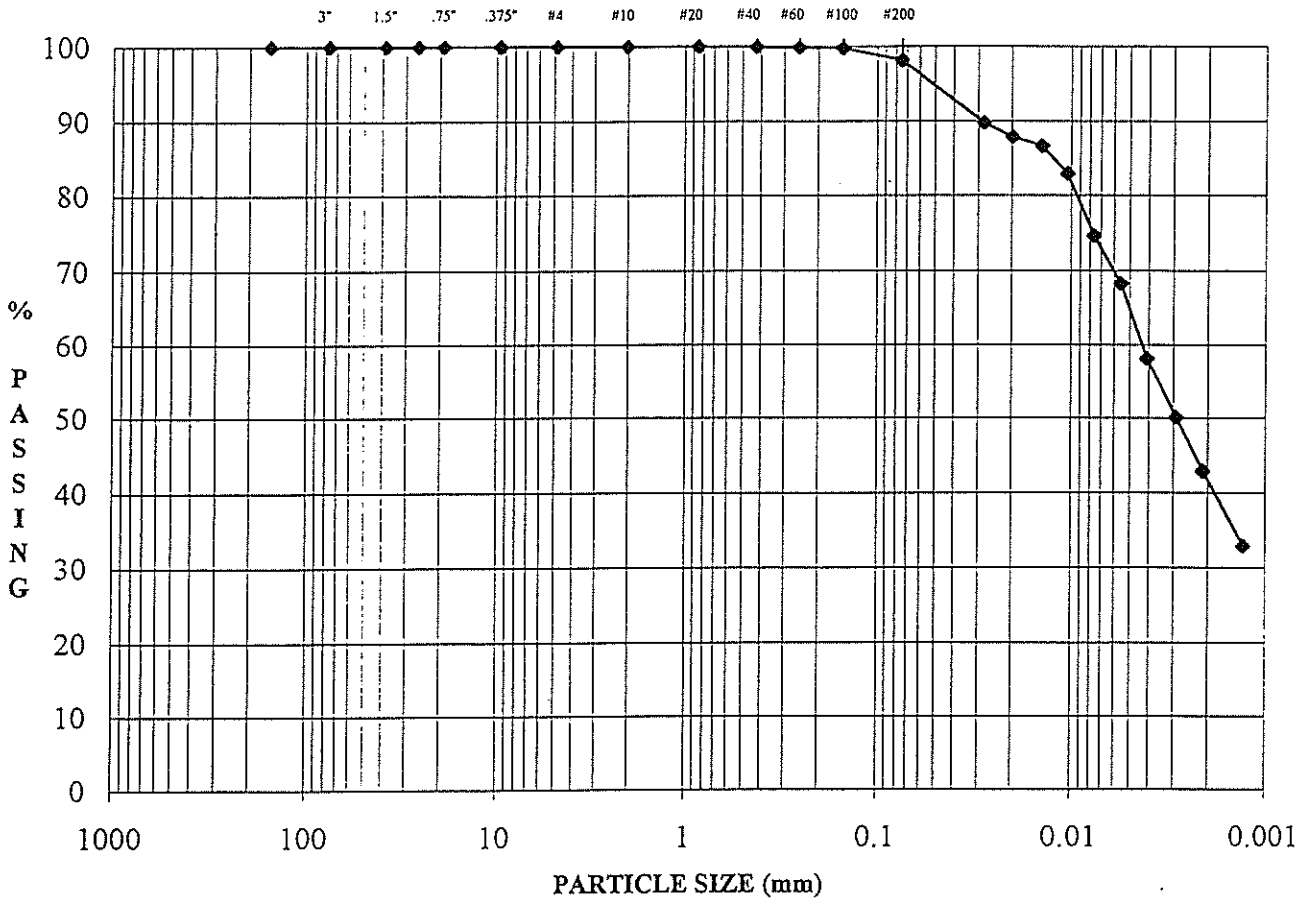
Mc:	29.2%
LL:	-
PL:	NP
PI :	-
Gs:	2.76

COPPER RANGE/MI
973-2255.210

DATE	11/22/97
TECH	BETH
REVIEW	KR

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
COBBLES	GRAVEL		SAND			FINES

SAMPLE #:	CPT-19 0-1'
WET COLOR: DESCRIPTION:	SILT with trace fine sand. (ML)

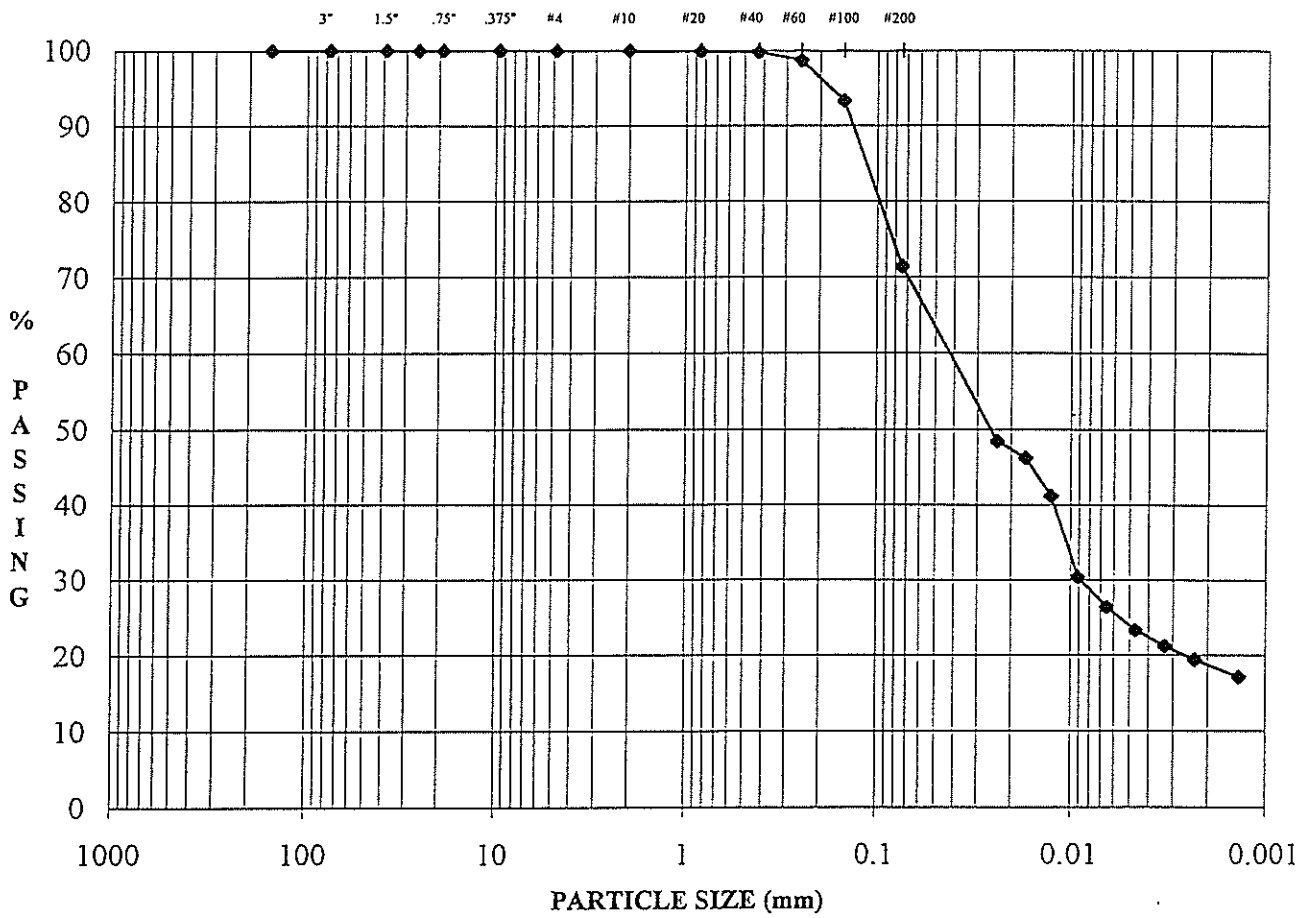
Mc:	154.20%
LL:	44
PL:	30
PI :	14
Gs:	2.81

COPPER RANGE/MI
973-2255.210

DATE	11/25/97
TECH	JE
REVIEW	KR

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



COBBLES	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
	GRAVEL		SAND			FINES

SAMPLE #:	CPT-21 0-1'
WET COLOR: DESCRIPTION:	SILT with some fine sand. (ML)

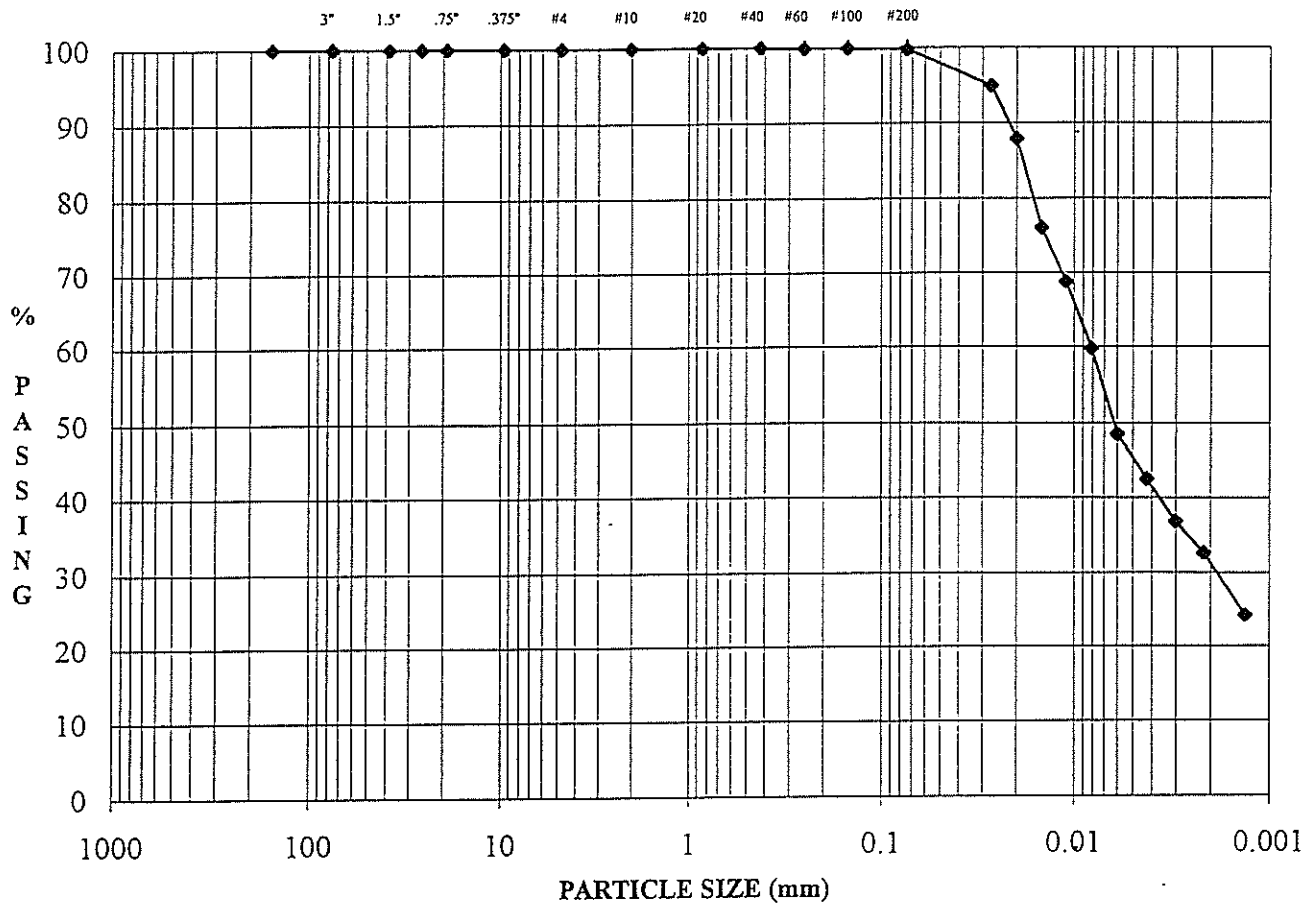
Mc:	38.4%
LL:	-
PL:	NP
PI :	-
Gs:	2.74

COPPER RANGE/MI
973-2255.210

DATE	11/25/97
TECH	BETH
REVIEW	KR

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



COBBLES	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
	GRAVEL		SAND			FINES

SAMPLE #:	CPT-21 7-8'
WET COLOR:	SILT. (ML)
DESCRIPTION:	- -

Mc:	56.40%
LL:	33
PL:	23
PI :	10
Gs:	2.78

COPPER RANGE/MI
973-2255.210

DATE	11/25/97
TECH	JE
REVIEW	KR

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

SECTION D.1.2

TAILINGS TRIAXIAL DATA

Triaxial Consolidated Undrained Lab Data

From: GOLDER ASSOCIATES INC.

Project: Copper Range/MI

Project Number: 973-2255

Sample Number	CPT-13
Depth	0-1 ft.
Effective Stress Analysis	

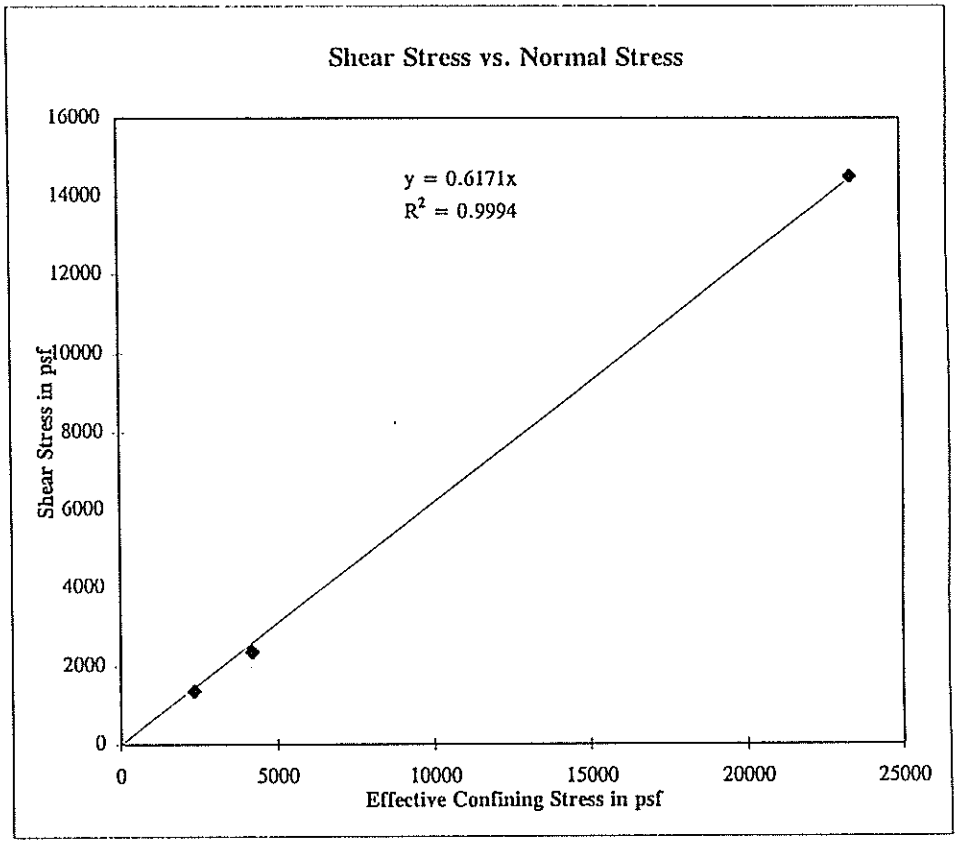
	Normal Load (psf)	Shear (psf)
C13A	2347	1354
C13B	4190	2347
C13C	23414	14501

Slope = 0.6171

Intercept= 0

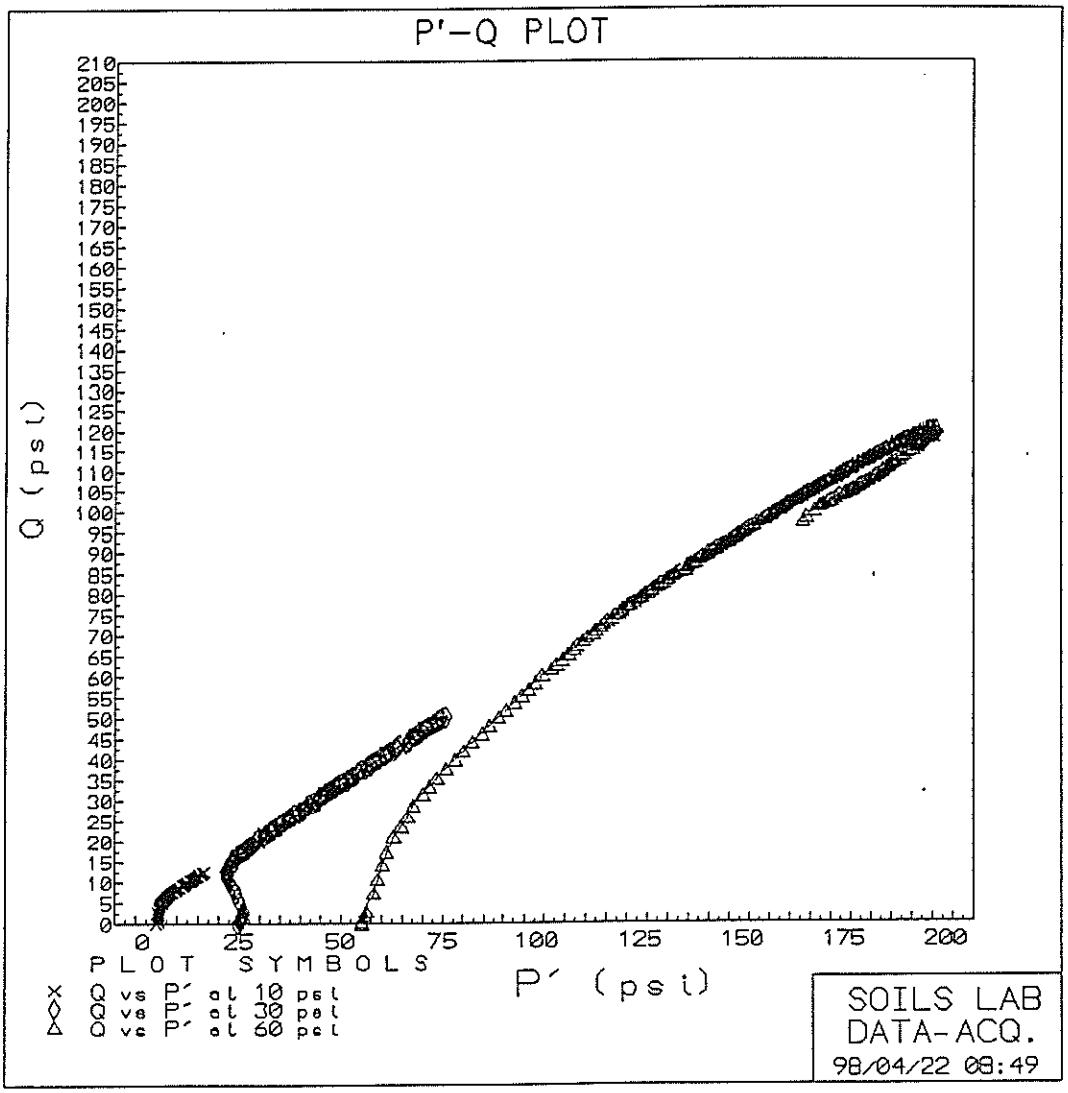
ϕ' = 38.1 degrees

c' = 0 psf



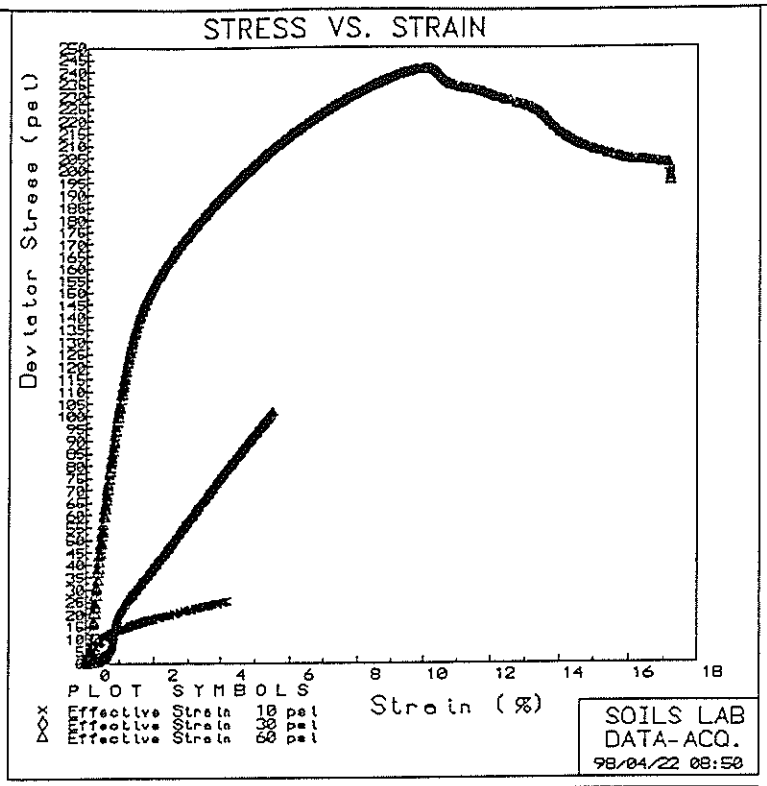
Boring Number	CTP13	CTP13	CTP13
Sample Number	C13	C13	C13
Sample Depth (ft.)	0 to 1	0 TO 1	0 to 1
Sample Diameter (in.)	2.89	2.89	2.89
Sample Length (in.)	6.54	5.90	5.90
Dry Density (pcf)	94.6	93.5	93.5
Initial Moisture Content (%)	18.4	19.8	19.8
Final Moisture Content (%)	29.7	27.3	27.3
Strain Rate (in./min)	0.0039	0.0039	0.0039
Effective Stress (psi)	10.0	30.0	60.0
Back Pressure (psi)	50.0	50.0	40.0

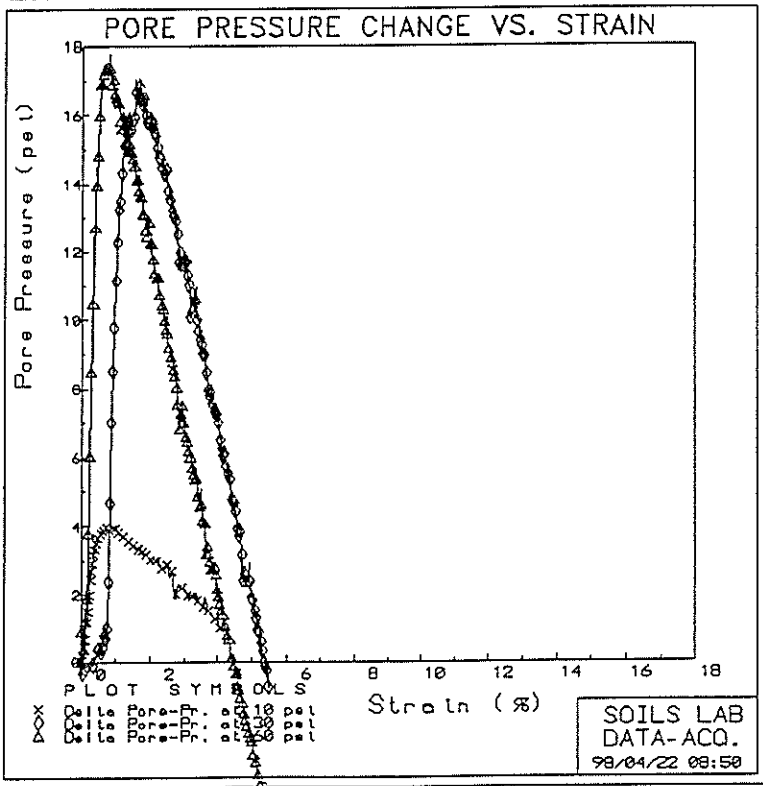
Alpha = Phi = A = C =



GOLDER ASSOCIATES INC		TITLE STAGED CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION	
Client/Project COPPER RANGE/MI		SAMPLE DESCR/ID CTP13	REPORT ID 2255-R4
DRAWN BDM	CHECKED DD	REVIEWED DJ	DATE JAN98	JOB NO. 973-2255	FIGURE --

2255C13A 2255C13B 2255C13C





GOLDER ASSOCIATES INC			TITLE STAGED CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION		
Client/Project COPPER RANGE/MI			SAMPLE DESCR/ID CTP13		REPORT ID 2255-R4
DRAWN BDM	CHECKED DD	REVIEWED DJ	DATE JAN98	JOB NO. 973-2255	FIGURE --

COPPER RANGE/MI
STAGED CONSOLIDATED UNDRAINED
TRIAXIAL COMPRESSION

SAMPLE NUMBER C13
SAMPLE DEPTH (FEET) 0 to 1
BORING NUMBER CTP13
EFFECTIVE STRESS (PSI) 10.0

Reading Nbr	Strain %	Area crrctd in^2	Force crrctd lbs	sigma1 psi	sigma3 psi	Deviator Stress sig1-sig3	Pore Press. psi	sig_1' psi	sig_3' psi	Q psi	P' psi
0	0.0	6.58	0.0	60.0	60.0	0.0	0.0	10.2	10.2	0.0	10.2
1	0.6	6.62	71.3	70.8	60.0	10.8	3.8	17.1	6.4	5.4	11.7
2	0.8	6.63	82.5	72.4	60.0	12.4	3.9	18.7	6.3	6.2	12.5
3	1.0	6.64	91.1	73.7	60.0	13.7	3.9	19.9	6.2	6.9	13.1
4	1.2	6.66	98.3	74.8	60.0	14.8	3.7	21.2	6.5	7.4	13.9
5	1.4	6.67	105.0	75.7	60.0	15.7	3.5	22.4	6.7	7.9	14.5
6	1.7	6.69	111.6	76.7	60.0	16.7	3.3	23.5	6.8	8.3	15.2
7	1.9	6.70	117.5	77.5	60.0	17.5	3.1	24.5	7.0	8.8	15.8
8	2.1	6.72	123.4	78.4	60.0	18.4	2.9	25.6	7.2	9.2	16.4
9	2.3	6.73	128.7	79.1	60.0	19.1	2.8	26.5	7.4	9.6	16.9
10	2.5	6.75	134.0	79.9	60.0	19.9	2.7	27.3	7.4	9.9	17.4
11	2.7	6.76	139.3	80.6	60.0	20.6	1.9	28.9	8.3	10.3	18.6
12	3.0	6.78	144.6	81.3	60.0	21.3	2.2	29.3	8.0	10.7	18.6
13	3.2	6.79	149.8	82.1	60.0	22.1	1.9	30.4	8.3	11.0	19.3
14	3.4	6.81	155.1	82.8	60.0	22.8	1.8	31.1	8.3	11.4	19.7
15	3.6	6.82	159.7	83.4	60.0	23.4	1.9	31.7	8.3	11.7	20.0
16	3.8	6.84	164.4	84.0	60.0	24.0	1.4	32.8	8.8	12.0	20.8
17	4.0	6.85	169.0	84.7	60.0	24.7	1.2	33.6	9.0	12.3	21.3

COPPER RANGE/MI
STAGED CONSOLIDATED UNDRAINED
TRIAXIAL COMPRESSION

SAMPLE NUMBER C13
SAMPLE DEPTH (FEET) 0 TO 1
BORING NUMBER CTP13
EFFECTIVE STRESS (PSI) 30.0

Reading Nbr	Strain %	Area crrctd in^2	Force crrctd lbs	sigma1 psi	sigma3 psi	Deviator Stress sig1-sig3 psi	Pore Press. psi	sig_1' psi	sig_3' psi	Q psi	P' psi
0	0.0	6.58	0.0	80.0	80.0	0.0	0.0	29.7	29.7	0.0	29.7
1	0.7	6.62	23.1	83.5	80.0	3.5	0.8	32.4	28.9	1.7	30.6
2	0.9	6.63	91.8	93.8	80.0	13.8	7.5	35.9	22.1	6.9	29.0
3	1.1	6.65	145.2	101.8	80.0	21.8	13.3	38.2	16.4	10.9	27.3
4	1.3	6.66	174.9	106.3	80.0	26.3	15.8	40.1	13.8	13.1	27.0
5	1.5	6.68	198.7	109.8	80.0	29.8	15.9	43.5	13.8	14.9	28.6
6	1.7	6.69	222.5	113.3	80.0	33.3	16.6	46.3	13.0	16.6	29.6
7	1.9	6.70	246.9	116.8	80.0	36.8	15.8	50.7	13.9	18.4	32.3
8	2.1	6.72	272.0	120.5	80.0	40.5	15.6	54.6	14.1	20.2	34.3
9	2.3	6.73	297.0	124.1	80.0	44.1	14.6	59.2	15.0	22.1	37.1
10	2.5	6.75	323.4	127.9	80.0	47.9	13.8	63.8	15.9	24.0	39.8
11	2.7	6.76	349.8	131.7	80.0	51.7	13.0	68.4	16.6	25.9	42.5
12	2.9	6.77	375.6	135.4	80.0	55.4	11.8	73.3	17.9	27.7	45.6
13	3.1	6.79	402.0	139.2	80.0	59.2	11.0	77.8	18.6	29.6	48.2
14	3.3	6.80	428.4	143.0	80.0	63.0	10.5	82.1	19.1	31.5	50.6
15	3.5	6.82	454.8	146.7	80.0	66.7	9.2	87.2	20.5	33.4	53.8
16	3.8	6.83	481.9	150.5	80.0	70.5	7.8	92.4	21.8	35.3	57.1
17	4.0	6.85	507.6	154.1	80.0	74.1	7.3	96.5	22.4	37.1	59.4
18	4.2	6.86	534.0	157.8	80.0	77.8	6.0	101.5	23.6	38.9	62.6
19	4.4	6.88	559.7	161.4	80.0	81.4	5.3	105.8	24.4	40.7	65.1
20	4.6	6.89	586.1	165.1	80.0	85.1	4.0	110.8	25.7	42.5	68.2
21	4.8	6.91	611.2	168.5	80.0	88.5	2.7	115.5	27.0	44.3	71.2
22	5.0	6.92	637.6	172.1	80.0	92.1	2.0	119.8	27.7	46.1	73.7
23	5.2	6.94	662.7	175.5	80.0	95.5	1.0	124.2	28.6	47.8	76.4
24	5.4	6.95	686.5	178.8	80.0	98.8	-0.2	128.6	29.9	49.4	79.2

COPPER RANGE/MI
STAGED CONSOLIDATED UNDRAINED
TRIAXIAL COMPRESSION

SAMPLE NUMBER C13
SAMPLE DEPTH (FEET) 0 to 1
BORING NUMBER CTP13
EFFECTIVE STRESS (PSI) 60.0

Reading Nbr	Strain %	Area crrctd in^2	Force crrctd lbs	sigma1 psi	sigma3 psi	Deviator Stress sig1-sig3	Pore Press. psi	sig_1' psi	sig_3' psi	Q psi	P' psi
0	0.0	6.58	0.0	100.0	100.0	0.0	0.0	60.3	60.3	0.0	60.3
1	0.7	6.62	493.7	174.6	100.0	74.6	17.3	117.5	43.0	37.3	80.3
2	1.1	6.65	745.9	212.2	100.0	112.2	16.3	156.1	44.0	56.1	100.0
3	1.5	6.68	917.5	237.4	100.0	137.4	14.6	183.1	45.7	68.7	114.4
4	1.9	6.70	1016.5	251.6	100.0	151.6	12.5	199.4	47.7	75.8	123.5
5	2.3	6.73	1086.5	261.4	100.0	161.4	10.5	211.2	49.8	80.7	130.5
6	2.7	6.76	1144.6	269.3	100.0	169.3	8.6	221.0	51.7	84.7	136.3
7	3.1	6.79	1198.0	276.5	100.0	176.5	6.4	230.4	53.9	88.3	142.1
8	3.5	6.82	1246.9	282.9	100.0	182.9	4.7	238.5	55.6	91.5	147.1
9	3.9	6.84	1293.7	289.0	100.0	189.0	2.7	246.6	57.6	94.5	152.1
10	4.3	6.87	1338.0	294.7	100.0	194.7	0.6	254.3	59.6	97.3	156.9
11	4.7	6.90	1380.2	300.0	100.0	200.0	-1.1	261.3	61.3	100.0	161.3
12	5.1	6.93	1421.1	305.0	100.0	205.0	-2.9	268.2	63.2	102.5	165.7
13	5.5	6.96	1460.1	309.7	100.0	209.7	-4.7	274.7	65.0	104.9	169.8
14	5.9	6.99	1496.4	314.0	100.0	214.0	-6.4	280.7	66.7	107.0	173.7
15	6.3	7.02	1529.4	317.8	100.0	217.8	-7.9	286.0	68.2	108.9	177.1
16	6.7	7.05	1562.4	321.5	100.0	221.5	-9.4	291.2	69.6	110.8	180.4
17	7.2	7.08	1594.7	325.1	100.0	225.1	-10.7	296.1	71.0	112.6	183.6
18	7.6	7.11	1624.4	328.3	100.0	228.3	-11.9	300.5	72.1	114.2	186.3
19	8.0	7.15	1653.5	331.4	100.0	231.4	-14.0	305.6	74.2	115.7	189.9
20	8.4	7.18	1680.5	334.2	100.0	234.2	-15.0	309.4	75.2	117.1	192.3
21	8.8	7.21	1705.0	336.5	100.0	236.5	-16.6	313.3	76.8	118.3	195.1
22	9.2	7.24	1728.7	338.7	100.0	238.7	-17.3	316.3	77.5	119.4	196.9
23	9.6	7.27	1748.5	340.4	100.0	240.4	-18.4	319.0	78.7	120.2	198.9
24	10.0	7.31	1762.4	341.2	100.0	241.2	-19.6	321.0	79.8	120.6	200.4
25	10.4	7.34	1759.1	339.7	100.0	239.7	-20.3	320.2	80.5	119.8	200.3
26	10.8	7.37	1732.0	334.9	100.0	234.9	-20.0	315.2	80.3	117.5	197.7
27	11.2	7.41	1728.1	333.3	100.0	233.3	-20.0	313.5	80.3	116.6	196.9
28	11.6	7.44	1729.4	332.4	100.0	232.4	-19.9	312.5	80.2	116.2	196.3
29	12.1	7.48	1722.1	330.3	100.0	230.3	-19.8	310.3	80.1	115.1	195.2
30	12.5	7.52	1716.2	328.4	100.0	228.4	-19.2	307.9	79.5	114.2	193.7
31	12.9	7.55	1712.9	326.8	100.0	226.8	-18.6	305.7	78.9	113.4	192.3
32	13.3	7.59	1703.6	324.6	100.0	224.6	-18.3	303.1	78.5	112.3	190.8
33	13.7	7.62	1676.6	320.0	100.0	220.0	-17.9	298.1	78.1	110.0	188.1
34	14.1	7.66	1642.9	314.5	100.0	214.5	-16.3	291.0	76.5	107.3	183.8
35	14.5	7.69	1624.4	311.1	100.0	211.1	-15.0	286.4	75.3	105.6	180.8
36	14.9	7.73	1613.2	308.7	100.0	208.7	-13.9	282.8	74.1	104.3	178.5
37	15.0					208.3					
37	15.0	7.74	1611.9	308.3	100.0	208.3	-13.9	282.4	74.1	104.2	178.3
38	15.4	7.78	1606.0	306.5	100.0	206.5	-12.6	279.4	72.9	103.2	176.1
39	15.9	7.82	1600.7	304.8	100.0	204.8	-12.4	277.4	72.6	102.4	175.0
40	16.3	7.86	1600.0	303.7	100.0	203.7	-11.5	275.4	71.8	101.8	173.6
41	16.7	7.89	1606.0	303.4	100.0	203.4	-10.9	274.6	71.2	101.7	172.9
42	17.1	7.93	1609.3	302.9	100.0	202.9	-10.6	273.7	70.8	101.4	172.3

Triaxial Consolidated Undrained Lab Data

From: GOLDER ASSOCIATES INC.

Project: Copper Range/MI

Project Number: 973-2255

Sample Number	CPT-17
Depth	0-1 ft.
Effective Stress Analysis	

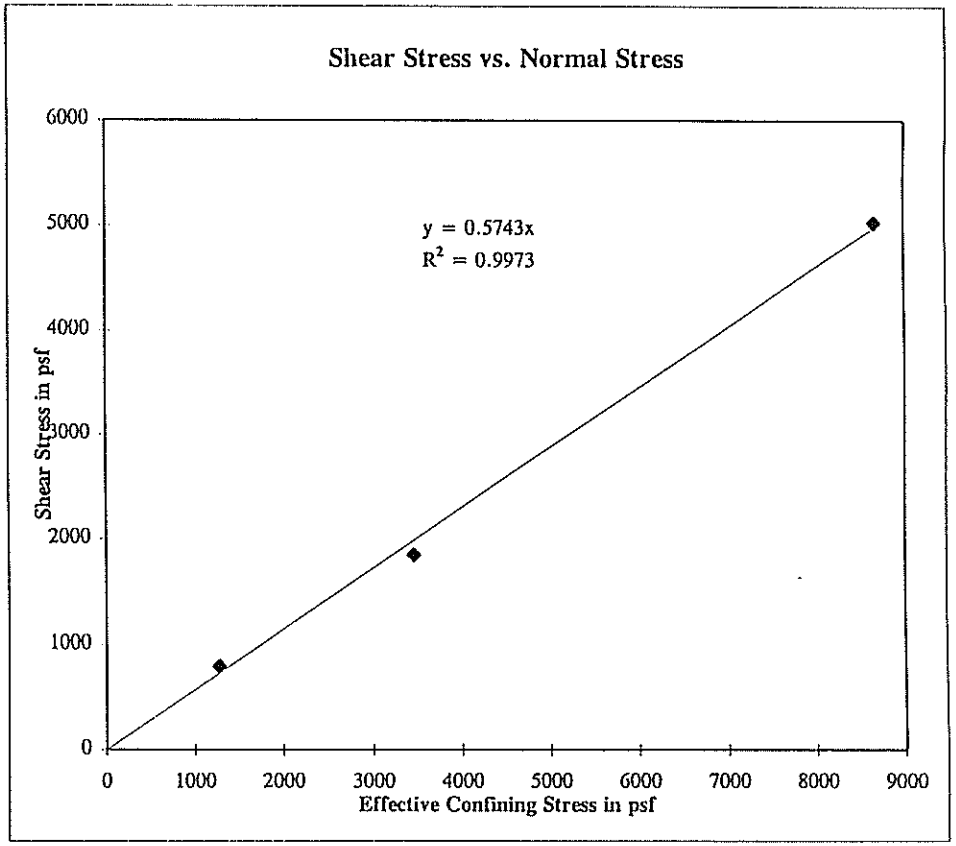
	Effective Confining Stress (psf)	Shear Stress (psf)
C17A	1267	792
C17B	3456	1843
C17C	8669	5026

Slope = 0.5743

Intercept= 0

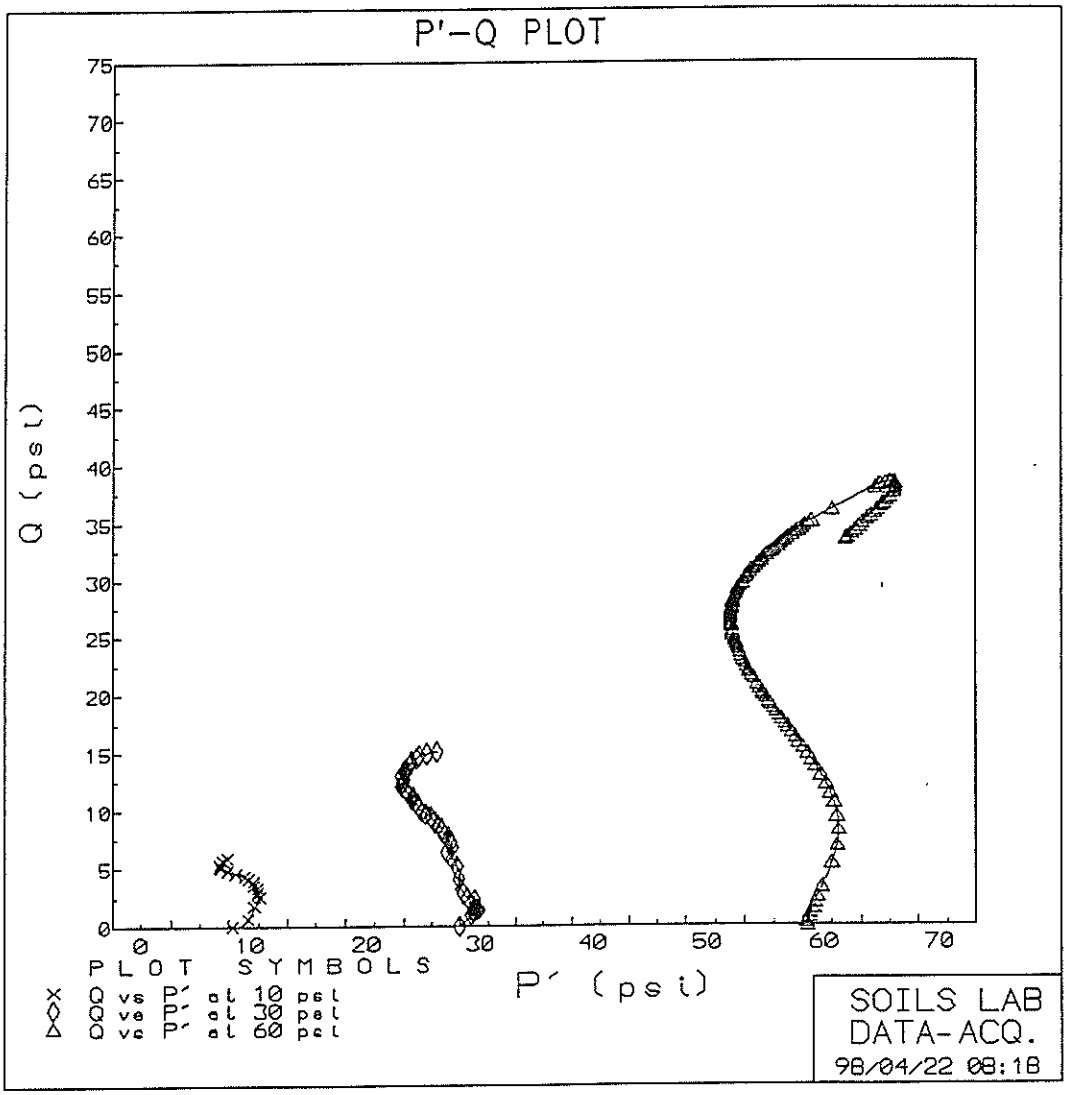
$\phi' =$ 35.1 degrees

$c' =$ 0 psf

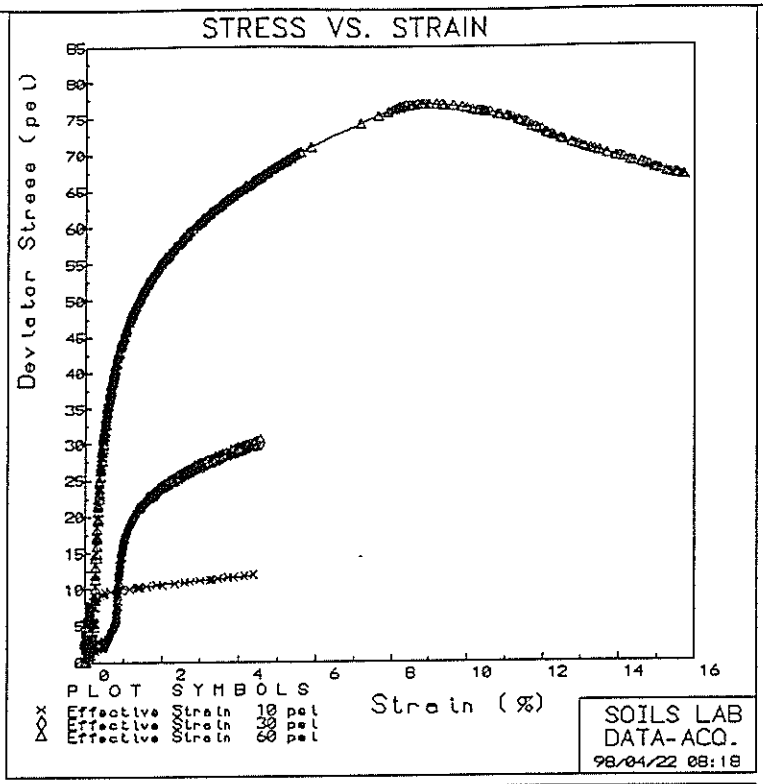


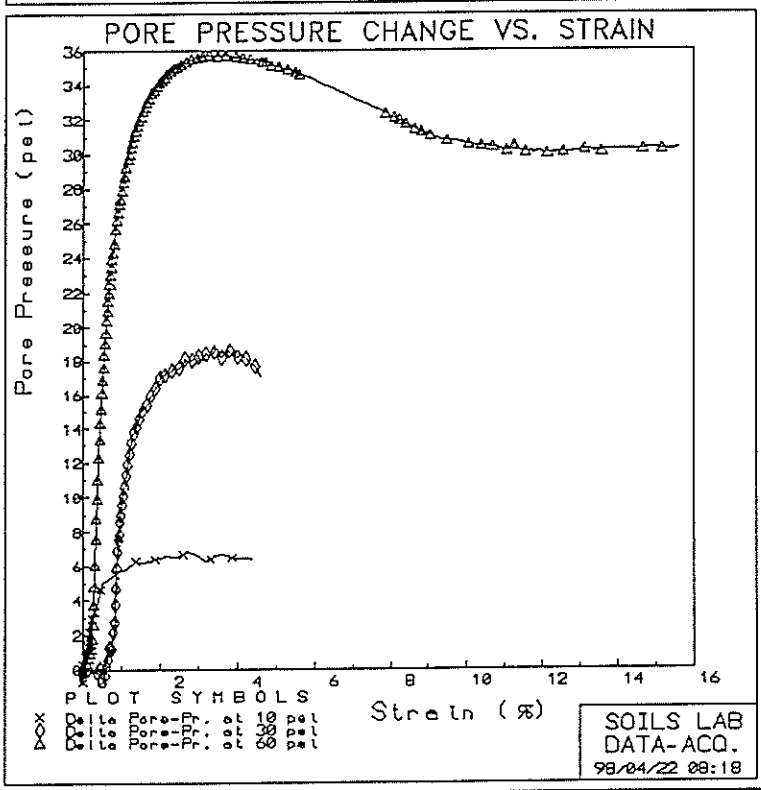
Boring Number	CTP17	CTP17	CTP17
Sample Number	C17	C17	C17
Sample Depth (ft.)	0 to 1	0 to 1	0 to 1
Sample Diameter (in.)	2.90	2.90	2.90
Sample Length (in.)	5.51	5.51	5.51
Dry Density (pcf)	83.5	83.5	83.5
Initial Moisture Content (%)	40.9	40.9	40.9
Final Moisture Content (%)	28.7	28.7	28.7
Strain Rate (in./min)	0.0020	0.0020	0.0020
Effective Stress (psi)	10.0	30.0	60.0
Back Pressure (psi)	50.0	50.0	40.0

Alpha = Phi = A = C =



GOLDER ASSOCIATES INC	TITLE STAGED CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION		
Client/Project COPPER RANGE/MI	SAMPLE DESCR/ID CTP17		REPORT ID 2255-R3
DRAWN BDM / CHECKED DD / REVIEWED DJ	DATE JAN98	JOB NO. 973-2255	FIGURE --
2255C17A	2255C17B		2255C17C





GOLDER ASSOCIATES INC		TITLE STAGED CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION	
Client/Project COPPER RANGE/MI		SAMPLE DESCR/ID CTP17	REPORT ID 2255-R3
DRAWN BDM	CHECKED DD / REVIEWED DJ	DATE JAN98	JOB NO. 973-2255 / FIGURE --

COPPER RANGE/MI
STAGED CONSOLIDATED UNDRAINED
TRIAXIAL COMPRESSION

SAMPLE NUMBER C17
SAMPLE DEPTH (FEET) 0 to 1
BORING NUMBER CTP17
EFFECTIVE STRESS (PSI) 10.0

Reading Nbr	Strain %	Area crrctd in^2	Force crrctd lbs	sigma1 psi	sigma3 psi	Deviator Stress sig1-sig3	Pore Press. psi	sig_1' psi	sig_3' psi	Q psi	P' psi
0	0.0	6.59	0.0	60.0	60.0	0.0	0.0	10.3	10.3	0.0	10.3
1	0.8	6.64	64.7	69.7	60.0	9.7	5.4	14.7	5.0	4.9	9.8
2	1.1	6.67	66.7	70.0	60.0	10.0	5.7	14.6	4.6	5.0	9.6
3	1.3	6.68	68.0	70.2	60.0	10.2	6.1	14.4	4.2	5.1	9.3
4	1.5	6.70	68.7	70.3	60.0	10.3	6.2	14.4	4.1	5.1	9.2
5	1.7	6.71	70.0	70.4	60.0	10.4	6.3	14.4	4.0	5.2	9.2
6	2.0	6.73	71.3	70.6	60.0	10.6	6.5	14.5	3.9	5.3	9.2
7	2.3	6.75	72.6	70.8	60.0	10.8	6.5	14.6	3.8	5.4	9.2
8	2.6	6.77	73.9	70.9	60.0	10.9	6.6	14.6	3.7	5.5	9.1
9	2.9	6.79	75.3	71.1	60.0	11.1	6.8	14.6	3.5	5.5	9.1
10	3.2	6.81	76.6	71.2	60.0	11.2	6.3	15.3	4.0	5.6	9.7
11	3.4	6.83	77.2	71.3	60.0	11.3	6.5	15.1	3.8	5.7	9.5
12	3.6	6.84	78.6	71.5	60.0	11.5	6.7	15.1	3.7	5.7	9.4
13	3.9	6.86	79.9	71.6	60.0	11.6	6.5	15.5	3.9	5.8	9.7
14	4.2	6.88	81.2	71.8	60.0	11.8	6.4	15.7	3.9	5.9	9.8
15	4.4	6.90	82.5	72.0	60.0	12.0	6.4	15.9	3.9	6.0	9.9

COPPER RANGE/MI
STAGED CONSOLIDATED UNDRAINED
TRIAXIAL COMPRESSION

SAMPLE NUMBER C17
SAMPLE DEPTH (FEET) 0 to 1
BORING NUMBER CTP17
EFFECTIVE STRESS (PSI) 30.0

Reading Nbr	Strain %	Area crrctd in^2	Force crrctd lbs	sigma1 psi	sigma3 psi	Deviator Stress sig1-sig3	Pore Press. psi	sig_1' psi	sig_3' psi	Q psi	P' psi
0	0.0	6.59	0.0	80.0	80.0	0.0	0.0	29.9	29.9	0.0	29.9
1	0.7	6.64	29.0	84.4	80.0	4.4	1.0	33.3	28.9	2.2	31.1
2	0.9	6.66	88.4	93.3	80.0	13.3	7.5	35.7	22.4	6.6	29.1
3	1.1	6.67	122.1	98.3	80.0	18.3	11.3	36.9	18.6	9.2	27.8
4	1.3	6.68	136.6	100.4	80.0	20.4	13.8	36.6	16.1	10.2	26.3
5	1.5	6.70	146.5	101.9	80.0	21.9	15.1	36.7	14.8	10.9	25.8
6	1.8	6.71	153.8	102.9	80.0	22.9	15.9	36.9	14.0	11.5	25.5
7	2.0	6.73	160.4	103.8	80.0	23.8	16.8	36.9	13.1	11.9	25.0
8	2.2	6.74	165.7	104.6	80.0	24.6	17.3	37.2	12.6	12.3	24.9
9	2.4	6.76	171.0	105.3	80.0	25.3	17.5	37.7	12.5	12.6	25.1
10	2.6	6.77	175.6	105.9	80.0	25.9	18.0	37.8	11.9	13.0	24.9
11	2.8	6.79	180.2	106.5	80.0	26.5	18.0	38.4	11.9	13.3	25.2
12	3.1	6.80	184.2	107.1	80.0	27.1	18.0	39.0	12.0	13.5	25.5
13	3.3	6.82	188.1	107.6	80.0	27.6	18.3	39.2	11.6	13.8	25.4
14	3.5	6.83	192.1	108.1	80.0	28.1	18.7	39.4	11.3	14.1	25.3
15	3.7	6.85	196.0	108.6	80.0	28.6	18.6	40.0	11.3	14.3	25.7
16	3.9	6.86	199.3	109.0	80.0	29.0	18.2	40.7	11.7	14.5	26.2
17	4.1	6.88	202.6	109.5	80.0	29.5	18.3	41.1	11.7	14.7	26.4
18	4.4	6.90	205.9	109.9	80.0	29.9	17.8	42.0	12.2	14.9	27.1
19	4.6	6.91	208.6	110.2	80.0	30.2	17.1	43.0	12.8	15.1	27.9

COPPER RANGE/MI
STAGED CONSOLIDATED UNDRAINED
TRIAXIAL COMPRESSION

SAMPLE NUMBER C17
SAMPLE DEPTH (FEET) 0 to 1
BORING NUMBER CTP17
EFFECTIVE STRESS (PSI) 60.0

Reading Nbr	Strain %	Area crrctd in^2	Force crrctd lbs	sigma1 psi	sigma3 psi	Deviator Stress sig1-sig3	Pore Press. psi	sig_1' psi	sig_3' psi	Q psi	P' psi
0	0.0	6.59	0.0	100.0	100.0	0.0	0.0	60.4	60.4	0.0	60.4
1	0.7	6.64	260.1	139.2	100.0	39.2	23.0	76.5	37.4	19.6	56.9
2	0.9	6.66	291.8	143.8	100.0	43.8	26.8	77.4	33.6	21.9	55.5
3	1.1	6.67	314.2	147.1	100.0	47.1	29.3	78.2	31.1	23.6	54.6
4	1.3	6.68	332.0	149.7	100.0	49.7	31.1	79.0	29.3	24.8	54.1
5	1.5	6.70	346.5	151.7	100.0	51.7	32.4	79.7	28.0	25.9	53.8
6	1.7	6.71	359.1	153.5	100.0	53.5	33.3	80.6	27.1	26.8	53.8
7	2.0	6.73	370.3	155.1	100.0	55.1	34.1	81.4	26.3	27.5	53.9
8	2.2	6.74	380.2	156.4	100.0	56.4	34.6	82.2	25.8	28.2	54.0
9	2.4	6.75	389.4	157.7	100.0	57.7	35.0	83.1	25.4	28.8	54.3
10	2.6	6.77	397.4	158.7	100.0	58.7	35.2	83.9	25.2	29.4	54.5
11	2.8	6.78	405.3	159.8	100.0	59.8	35.5	84.7	25.0	29.9	54.8
12	3.0	6.80	412.5	160.7	100.0	60.7	35.6	85.5	24.8	30.3	55.2
13	3.2	6.81	420.5	161.7	100.0	61.7	35.7	86.4	24.7	30.9	55.6
14	3.4	6.83	427.1	162.6	100.0	62.6	35.7	87.3	24.7	31.3	56.0
15	3.6	6.84	434.3	163.5	100.0	63.5	35.7	88.2	24.7	31.7	56.5
16	3.8	6.86	440.9	164.3	100.0	64.3	35.7	89.0	24.7	32.2	56.9
17	4.0	6.87	446.9	165.0	100.0	65.0	35.6	89.8	24.8	32.5	57.3
18	4.2	6.89	452.8	165.8	100.0	65.8	35.5	90.7	24.9	32.9	57.8
19	4.4	6.90	459.4	166.6	100.0	66.6	35.4	91.5	25.0	33.3	58.3
20	4.6	6.92	465.4	167.3	100.0	67.3	35.4	92.3	25.0	33.6	58.7
21	4.9	6.93	471.3	168.0	100.0	68.0	35.2	93.2	25.2	34.0	59.2
22	5.1	6.95	477.2	168.7	100.0	68.7	35.1	94.0	25.3	34.4	59.7
23	5.3	6.96	483.2	169.4	100.0	69.4	35.0	94.8	25.4	34.7	60.1
24	5.5	6.98	489.1	170.1	100.0	70.1	34.8	95.7	25.6	35.0	60.7
25	5.9	7.01	497.7	171.0	100.0	71.0	34.4	97.0	26.0	35.5	61.5
26	6.3	7.04	508.3	172.2	100.0	72.2	34.0	98.7	26.5	36.1	62.6
27	7.2	7.11	527.4	174.2	100.0	74.2	33.1	101.6	27.3	37.1	64.4
28	7.6	7.14	538.0	175.3	100.0	75.3	32.6	103.1	27.8	37.7	65.5
29	7.9	7.16	543.2	175.9	100.0	75.9	32.4	103.9	28.0	37.9	66.0
30	8.1	7.18	547.2	176.2	100.0	76.2	32.1	104.6	28.3	38.1	66.4
31	8.3	7.19	551.2	176.6	100.0	76.6	31.9	105.2	28.5	38.3	66.8
32	8.6	7.21	553.8	176.8	100.0	76.8	31.6	105.6	28.8	38.4	67.2
33	8.8	7.23	555.8	176.9	100.0	76.9	31.3	105.9	29.1	38.4	67.5
34	9.1	7.25	558.4	177.0	100.0	77.0	31.1	106.3	29.3	38.5	67.8
35	9.3	7.27	558.4	176.8	100.0	76.8	30.9	106.4	29.5	38.4	67.9
36	9.5	7.28	559.1	176.7	100.0	76.7	30.8	106.4	29.6	38.4	68.0
37	9.8	7.31	559.7	176.6	100.0	76.6	30.7	106.3	29.7	38.3	68.0
38	10.0	7.32	559.7	176.4	100.0	76.4	30.6	106.2	29.8	38.2	68.0
39	10.2	7.34	559.7	176.2	100.0	76.2	30.5	106.1	29.9	38.1	68.0
40	10.4	7.36	559.7	176.1	100.0	76.1	30.5	106.0	29.9	38.0	68.0
41	10.6	7.38	559.1	175.8	100.0	75.8	30.4	105.8	30.0	37.9	67.9
42	10.9	7.40	558.4	175.5	100.0	75.5	30.3	105.6	30.1	37.7	67.8
43	11.1	7.42	558.4	175.3	100.0	75.3	30.2	105.5	30.2	37.7	67.9
44	11.3	7.44	556.4	174.8	100.0	74.8	30.4	104.9	30.0	37.4	67.5
45	11.5	7.45	554.5	174.4	100.0	74.4	30.1	104.6	30.3	37.2	67.5
46	11.7	7.47	551.8	173.8	100.0	73.8	30.1	104.2	30.3	36.9	67.2
47	12.0	7.49	548.5	173.2	100.0	73.2	30.1	103.5	30.3	36.6	66.9
48	12.2	7.51	545.9	172.7	100.0	72.7	30.1	103.0	30.3	36.3	66.7
49	12.4	7.53	543.9	172.2	100.0	72.2	30.1	102.5	30.3	36.1	66.4
50	12.6	7.55	541.9	171.8	100.0	71.8	30.1	102.1	30.3	35.9	66.2
51	12.9	7.57	539.9	171.3	100.0	71.3	30.1	101.6	30.3	35.7	66.0
52	13.1	7.59	538.6	171.0	100.0	71.0	30.2	101.1	30.2	35.5	65.7
53	13.4	7.61	537.3	170.6	100.0	70.6	30.1	100.9	30.3	35.3	65.6
54	13.7	7.64	535.3	170.1	100.0	70.1	30.3	100.2	30.2	35.0	65.2
55	13.9	7.66	534.0	169.7	100.0	69.7	30.2	99.9	30.2	34.9	65.0
56	14.1	7.68	533.3	169.5	100.0	69.5	30.3	99.6	30.2	34.7	64.9
57	14.4	7.70	531.4	169.0	100.0	69.0	30.2	99.2	30.2	34.5	64.7
58	14.6	7.73	530.0	168.6	100.0	68.6	30.3	98.8	30.2	34.3	64.5
59	14.9	7.75	528.7	168.3	100.0	68.3	30.3	98.4	30.1	34.1	64.3
60	15.0					67.9					
60	15.0	7.76	527.4	167.9	100.0	67.9	30.3	98.1	30.1	34.0	64.1
61	15.3	7.78	526.1	167.6	100.0	67.6	30.2	97.8	30.2	33.8	64.0
62	15.5	7.80	525.4	167.3	100.0	67.3	30.2	97.5	30.2	33.7	63.8
63	15.7	7.82	524.8	167.1	100.0	67.1	30.3	97.2	30.1	33.5	63.7

SECTION D.1.3

TAILINGS SEDIMENTATION DATA

CPT-13, 0-1' - Undrained

Initial Moisture Content (%) =	48.1%
Tot. mass (g) =	1440.82
Mass of water Initial (g) =	467.95
Total Mass of Solids (g) =	972.87
Slurry % Solids =	67.5%

Date		Time		Elapsed Time	Height of Solids	Height of Water	Vol of Water	Volume of Solids	Moisture Content	Dry Density of Slurry	Wet Density of Slurry	Dry Density of Slurry
month	day	hour	min	(min)	(cm)	(cm)	cc	cc	%	g/cc	lbs/ft^3	lbs/ft^3
12	9	11	12	0.1	25.9	25.9	0.0	817.7	48.1%	1.19	110.0	74.3
12	9	11	13	1	25.8	25.9	3.2	814.5	47.8%	1.19	110.2	74.6
12	9	11	14	2	25.5	25.9	12.6	805.0	46.8%	1.21	110.8	75.5
12	9	11	15	3	25.2	25.9	22.1	795.6	45.8%	1.22	111.3	76.4
12	9	11	16	4	24.9	25.9	31.6	786.1	44.9%	1.24	111.9	77.3
12	9	11	19	7	24.6	25.9	41.0	776.6	43.9%	1.25	112.5	78.2
12	9	11	23	11	23.7	25.9	69.5	748.2	41.0%	1.30	114.4	81.2
12	9	11	32	20	22.5	25.9	107.3	710.3	37.1%	1.37	117.2	85.5
12	9	12	0	48	22.3	25.9	113.7	704.0	36.4%	1.38	117.7	86.3
12	9	12	40	88	22.3	25.9	113.7	704.0	36.4%	1.38	117.7	86.3
12	9	13	45	153	22.3	25.9	113.7	704.0	36.4%	1.38	117.7	86.3
12	9	15	50	278	22.3	25.9	113.7	704.0	36.4%	1.38	117.7	86.3
12	10	11	1	1429	22.3	25.4	97.9	704.0	38.0%	1.38	119.1	86.3

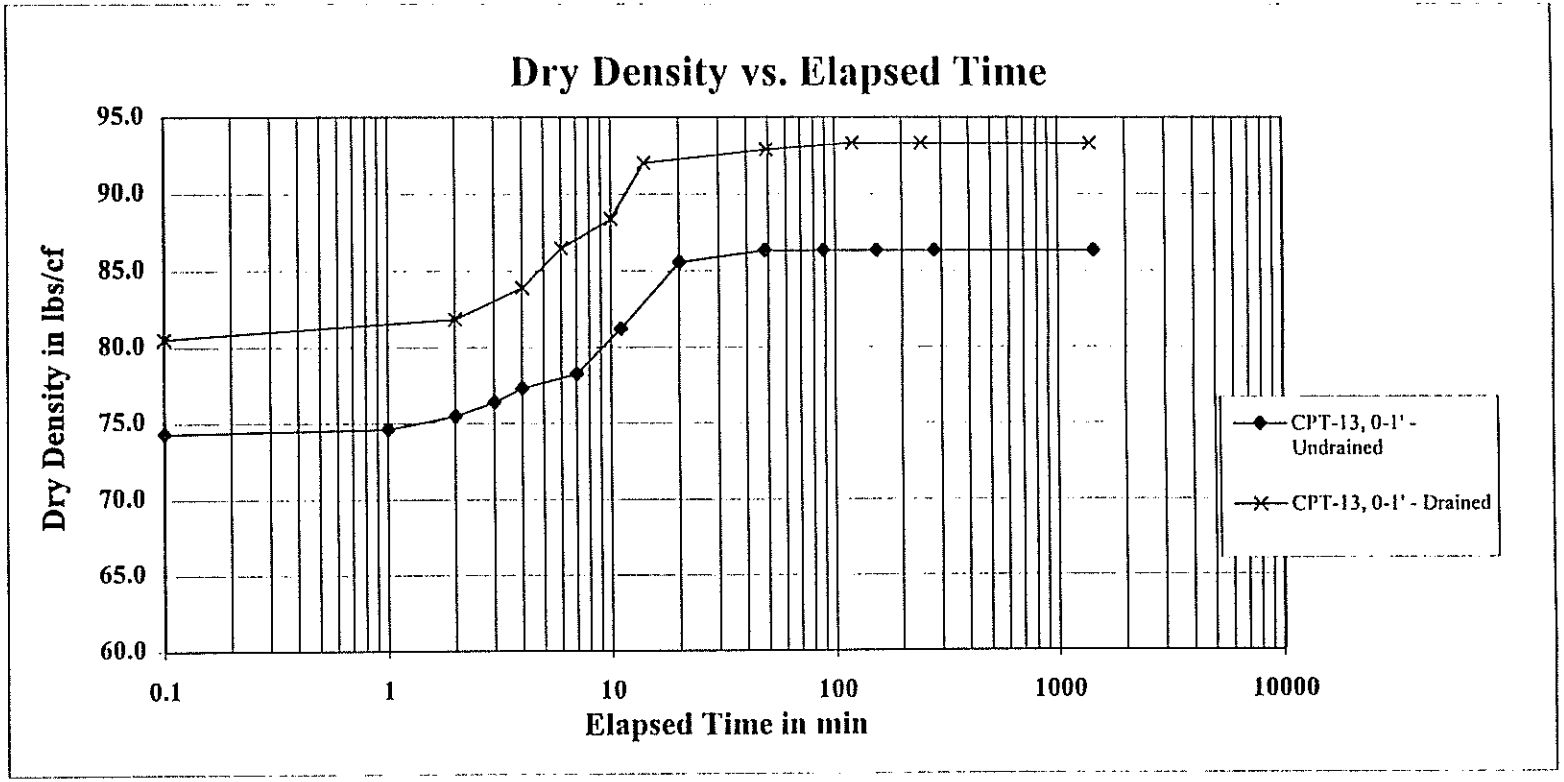
Golder Associates, Inc. **Denver, Colorado**			Title: **SEDIMENTATION TESTING** **SAMPLE DATA AND CALCULATIONS**		
Job Short Title: Copper Range/MI					
Sample No. **CPT-13**	Depth **0-1 feet**	Reviewed:	Date: December, 1997	Job Number: 973-2255	Figure: 1

CPT-13, 0-1' - Drained

Initial Moisture Content (%) = 42.9%
Tot. mass (g) = 1442.7
Mass of water initial (g) = 433.11
Total Mass of Solids (g) = 1009.59
Slurry % Solids = 70.0%

Date		Time		Elapsed Time	Height of Solids	Height of Water	Vol of Water As Supernatant	Vol of Water drained	Cuml. Vol. of Water	Moisture Content	Volume of solids	Dry Density of Slurry	Wet Density of Slurry	Dry Density of Slurry
month	day	hour	min	(min)	(cm)	(cm)	cc	cc	cc	%	cc	g/cc	lbs/ft^3	lbs/ft^3
12	9	11	46	0.1	24.8	24.8	0.0	0	0.0	42.9%	782.9	1.29	115.1	80.5
12	9	11	48	2	24.4	24.6	0.2	9.51	9.7	41.9%	770.3	1.31	116.2	81.8
12	9	11	50	4	23.8	24.2	0.4	11.17	21.3	40.8%	751.4	1.34	118.1	83.9
12	9	11	52	6	23.1	23.8	0.7	9.5	31.4	39.8%	729.3	1.38	120.8	86.4
12	9	11	56	10	22.6	23.5	0.9	12.0	44.3	38.5%	713.5	1.42	122.4	88.4
12	9	12	0	14	21.7	23.2	1.5	8.1	53.9	37.6%	685.1	1.47	126.6	92.0
12	9	12	35	49	21.5	22.9	1.4	36.9	92.2	33.8%	678.8	1.49	124.2	92.9
12	9	13	46	120	21.4	21.9	0.5	1.8	94.5	33.5%	675.6	1.49	124.6	93.3
12	9	15	50	244	21.4	21.9	0.5	0.0	95.0	33.5%	675.6	1.49	124.6	93.3
12	10	11	0	1394	21.4	21.4	0.0	0.0	95.0	33.5%	675.6	1.49	124.6	93.3

Golder Associates, Inc. Denver, Colorado			Title: SEDIMENTATION TESTING SAMPLE DATA AND CALCULATIONS	
Job Short Title: Copper Range/MI				
Sample No. CPT-13	Depth 0-1 feet	Reviewed:	Date: December, 1997	Job Number: 973-2255	Figure: 2



Golder Associates, Inc. **Denver, Colorado**			Title: **SEDIMENTATION TESTING** **GRAPHICAL DATA**		
Job Short Title: Copper Range/MI					
Sample No. **CPT-13**	Depth **0-1 feet**	Reviewed:	Date: December, 1997	Job Number: 973-2255	Figure: 3

CPT-17, 0-1' - Undrained

Initial Moisture Content (%) =	198.9%
Tot. mass (g) =	1168.8
Mass of water initial (g) =	777.77
Total Mass of Solids (g) =	391.03
Slurry % Solids =	33.5%

Date		Time		Elapsed Time	Height of Solids	Height of Water	Vol of Water	Volume of Solids	Moisture Content	Dry Density of Slurry	Wet Density of Slurry	Dry Density of Slurry
month	day	hour	min	(min)	(cm)	(cm)	cc	cc	%	g/cc	lbs/ft^3	lbs/ft^3
12	16	9	50	0.1	29.65	29.65	0.0	936.1	198.9%	0.42	78.0	26.1
12	16	9	51	1	29.65	29.65	0.0	936.1	198.9%	0.42	78.0	26.1
12	16	9	52	2	29.65	29.65	0.0	936.1	198.9%	0.42	78.0	26.1
12	16	10	0	10	29.65	29.65	0.0	936.1	198.9%	0.42	78.0	26.1
12	16	10	22	32	29.65	29.65	0.0	936.1	198.9%	0.42	78.0	26.1
12	16	11	6	76	29.5	29.65	4.7	931.3	197.7%	0.42	78.0	26.2
12	16	13	26	216	29.35	29.65	9.5	926.6	196.5%	0.42	78.1	26.4
12	16	16	30	400	29.1	29.65	17.4	918.7	194.5%	0.43	78.3	26.6
12	17	8	15	1345	28.15	29.65	47.4	888.7	186.8%	0.44	78.8	27.5
12	17	16	40	1850	27.55	29.65	66.3	869.8	181.9%	0.45	79.2	28.1
12	18	16	45	3295	26.3	29.65	105.8	830.3	171.9%	0.47	79.9	29.4
12	19	9	30	4300	25.35	29.65	135.8	800.3	164.2%	0.49	80.6	30.5
12	24	13	0	11710	21.15	29.65	268.3	667.7	130.3%	0.59	84.2	36.6
12	30	15	0	20470	20.95	29.65	274.7	661.4	128.7%	0.59	84.4	36.9

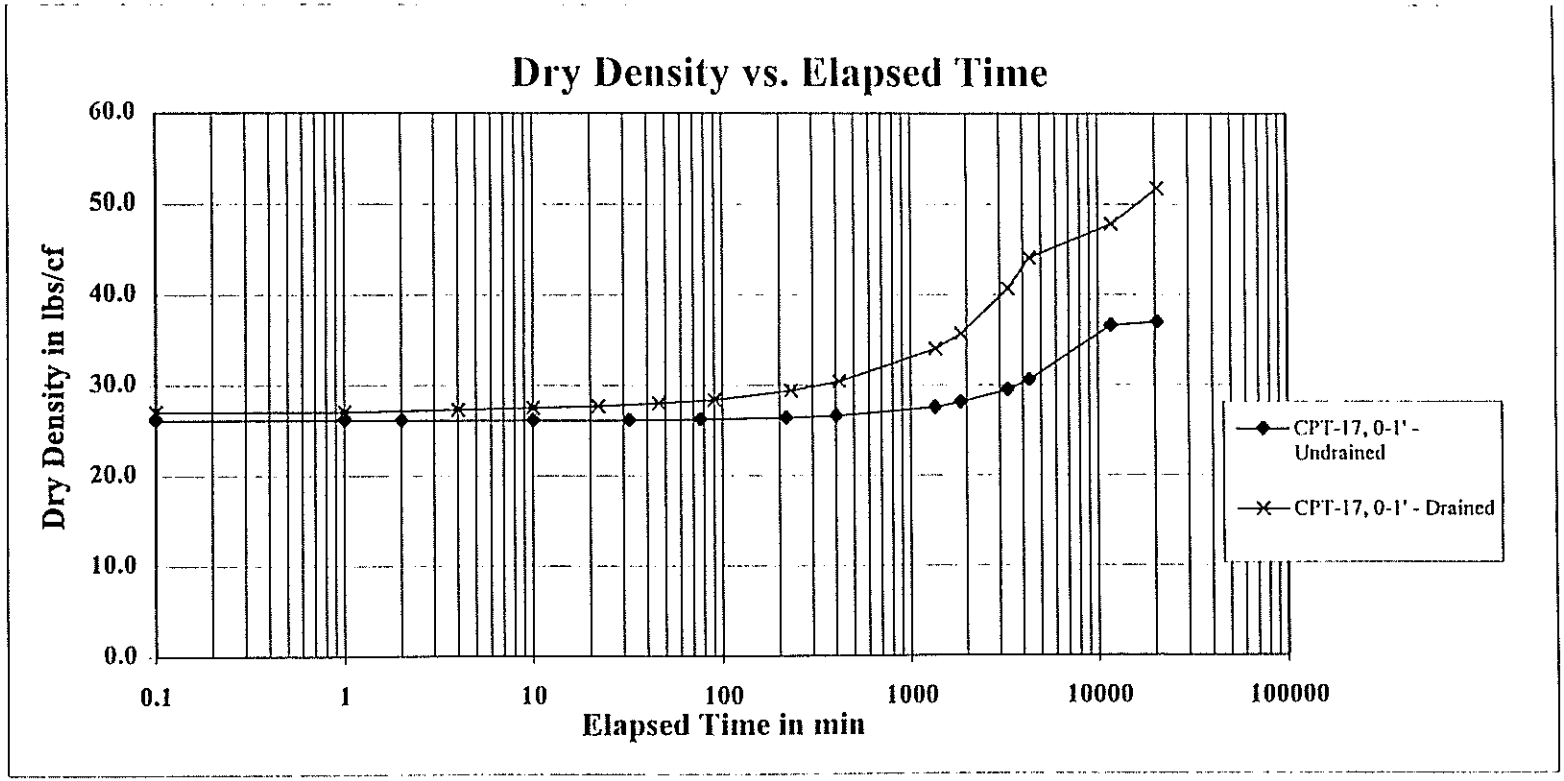
Golder Associates, Inc. **Denver, Colorado**			Title: **SEDIMENTATION TESTING** **SAMPLE DATA AND CALCULATIONS**	
Job Short Title: Copper Range/MI				
Sample No. **CPT-17**	Depth **0-1 feet**	Reviewed:	Date: January, 1998	Job Number: 973-2255	Figure: 1

CPT-17, 0-1' - Drained

Initial Moisture Content (%) = 199.1%
Tot. mass (g) = 1140.52
Mass of water initial (g) = 759.20
Total Mass of Solids (g) = 381.32
Slurry % Solids = 33.4%

Date		Time		Elapsed Time	Height of Solids	Height of Water	Vol of Water As Supernatant	Vol of Water drained	Cuml. Vol. of Water	Moisture Content	Volume of solids	Dry Density of Slurry	Wet Density of Slurry	Dry Density of Slurry
month	day	hour	min	(min)	(cm)	(cm)	cc	cc	cc	%	cc	g/cc	lbs/ft^3	lbs/ft^3,
12	16	9	35	0.1	27.9	27.9	0.0	0.00	0.0	199.1%	880.8	0.43	80.9	27.0
12	16	9	36	1	27.9	27.9	0.0	22.89	22.9	193.1%	880.8	0.43	79.2	27.0
12	16	9	39	4	27.65	27.65	0.0	3.98	26.9	192.1%	872.9	0.44	79.7	27.3
12	16	9	45	10	27.45	27.5	0.1	8.15	35.1	189.9%	866.6	0.44	79.7	27.5
12	16	9	57	22	27.25	27.5	0.3	5.57	40.9	188.4%	860.3	0.44	79.8	27.7
12	16	10	21	46	26.95	27.5	0.6	8.15	49.6	186.1%	850.8	0.45	80.1	28.0
12	16	11	5	90	26.6	26.85	0.3	9.61	59.5	183.5%	839.8	0.45	80.4	28.4
12	16	13	25	230	25.7	26.25	0.6	19.86	79.9	178.2%	811.3	0.47	81.6	29.3
12	16	16	30	415	24.85	25.5	0.6	18.66	99.2	173.1%	784.5	0.49	82.9	30.3
12	17	8	15	1360	22.2	23.75	1.6	45.35	146.1	160.8%	700.9	0.54	88.6	34.0
12	17	16	40	1865	21.15	23	1.9	16.83	164.8	155.9%	667.7	0.57	91.2	35.7
12	18	16	45	3310	18.55	21.65	3.1	31.33	199.2	146.9%	585.6	0.65	100.4	40.7
12	19	9	30	4315	17.15	20.95	3.8	15.92	218.9	141.7%	541.4	0.70	106.3	44.0
12	24	13	0	11725	15.8	17.75	2.0	55.17	276.0	126.7%	498.8	0.76	108.2	47.7
12	30	15	0	20485	14.6	14.6	0.0	0.00	276.0	126.7%	460.9	0.83	117.1	51.7

Golder Associates, Inc. Denver, Colorado			Title: SEDIMENTATION TESTING SAMPLE DATA AND CALCULATIONS	
Job Short Title: Copper Range/MI				
Sample No. CPT-17	Depth 0-1 feet	Reviewed:	Date: January, 1998	Job Number: 973-2255	Figure: 2



Golder Associates, Inc. **Denver, Colorado**			Title: **SEDIMENTATION TESTING** **GRAPHICAL DATA**		
Job Short Title: Copper Range/MI					
Sample No. **CPT-17**	Depth **0-1 feet**	Reviewed:	Date: January, 1998	Job Number: 973-2255	Figure: 3

CPT-21, 7-8" - Undrained

Initial Moisture Content (%) =	171.7%
Tot. mass (g) =	915.1
Mass of water initial (g) =	578.29
Total Mass of Solids (g) =	336.81
Slurry % Solids =	36.8%

Date		Time		Elapsed Time	Height of Solids	Height of Water	Vol of Water	Volume of Solids	Moisture Content	Dry Density of Slurry	Wet Density of Slurry	Dry Density of Slurry
month	day	hour	min	(min)	(cm)	(cm)	cc	cc	%	g/cc	lbs/ft^3	lbs/ft^3
1	13	12	38	0.1	22.65	22.65	0.0	715.1	171.7%	0.47	79.9	29.4
1	13	13	35	57	22.4	22.65	7.9	707.2	169.4%	0.48	80.1	29.7
1	13	16	55	257	22	22.65	20.5	694.5	165.6%	0.48	80.4	30.3
1	14	8	0	1162	20.65	22.65	63.1	651.9	153.0%	0.52	81.6	32.3
1	14	16	30	1672	20	22.65	83.7	631.4	146.9%	0.53	82.2	33.3
1	15	8	0	2602	18.9	22.65	118.4	596.7	136.5%	0.56	83.4	35.2
1	15	17	50	3192	18.2	22.65	140.5	574.6	130.0%	0.59	84.2	36.6
1	16	7	0	3982	17.4	22.65	165.7	549.3	122.5%	0.61	85.2	38.3
1	16	16	20	4542	16.94	22.65	180.3	534.8	118.2%	0.63	85.8	39.3
1	19	7	45	8347	15.5	22.65	225.7	489.3	104.7%	0.69	88.0	43.0
1	19	17	43	8945	15.3	22.65	232.0	483.0	102.8%	0.70	88.3	43.5
1	20	7	23	9765	15.3	22.65	232.0	483.0	102.8%	0.70	88.3	43.5

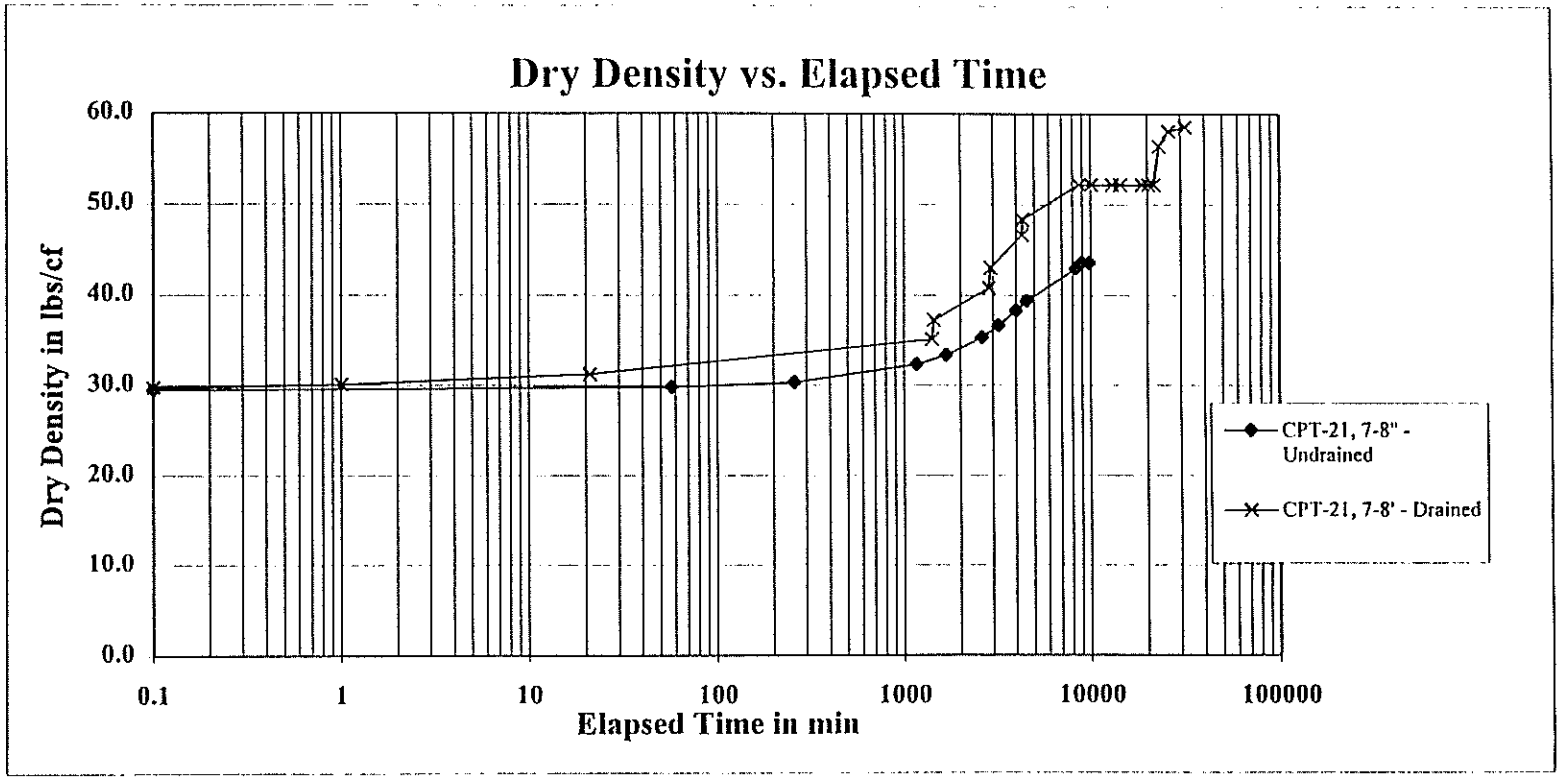
Golder Associates, Inc. **Denver, Colorado**			Title: **SEDIMENTATION TESTING** **SAMPLE DATA AND CALCULATIONS**	
Job Short Title: Copper Range/MI				
Sample No. **CPT-21**	Depth **7-8 feet**	Reviewed:	Date: January, 1998	Job Number: 973-2255	Figure: 1

CPT-21, 7-8' - Drained

Initial Moisture Content (%) = 172.1%
Tot. mass (g) = 1083
Mass of water initial (g) = 684.98
Total Mass of Solids (g) = 398.02
Slurry % Solids = 36.8%

Date: month	day	Time: hour	min	Elapsed Time (min)	Height of Solids (cm)	Height of Water (cm)	Vol of Water As Supernatant cc	Vol of Water drained cc	Cuml. Vol. of Water, cc	Moisture Content %	Volume of solids cc	Dry Density of Slurry g/cc	Wet Density of Slurry lbs/ft^3	Dry Density of Slurry lbs/ft^3
1	13	12	34	0.1	26.5	26.5	0.0	0.00	0.0	172.1%	836.6	0.48	80.8	29.7
1	13	13	35	1	26.2	26.5	0.3	7.79	8.1	170.1%	827.1	0.48	81.1	30.0
1	13	16	55	21	25.25	25.8	0.6	15.89	24.5	165.9%	797.1	0.50	82.9	31.2
1	14	8	0	1406	22.45	24.5	2.1	38.93	65.5	155.6%	708.7	0.56	89.6	35.1
1	14	16	30	1436	21.15	24	2.9	15.66	84.0	151.0%	667.7	0.60	93.4	37.2
1	15	8	0	2846	19.3	23.2	3.9	22.59	110.5	144.3%	609.3	0.65	99.7	40.8
1	15	17	50	2896	18.3	22.85	4.6	12.01	127.1	140.2%	577.7	0.69	103.3	43.0
1	16	7	0	4286	16.9	22.35	5.5	14.49	147.0	135.2%	533.5	0.75	109.5	46.6
1	16	16	20	4306	16.3	22	5.7	9.07	161.8	131.5%	514.6	0.77	111.8	48.3
1	19	7	45	8651	15.1	20.2	5.1	51.68	218.6	117.2%	476.7	0.83	113.2	52.1
1	19	16	43	8649	15.1	20	4.9	7.49	231.0	114.1%	476.7	0.83	111.6	52.1
1	20	7	23	10069	15.1	19.7	4.6	11.22	246.8	110.1%	476.7	0.83	109.5	52.1
1	22	12	40	12966	15.1	18.1	3.0	42.22	292.0	98.7%	476.7	0.83	103.6	52.1
1	23	14	35	14401	15.1	17.5	2.4	20.92	315.3	92.9%	476.7	0.83	100.6	52.1
1	26	12	0	18686	15.1	15.7	0.6	52.01	367.9	79.7%	476.7	0.83	93.7	52.1
1	27	13	0	20126	15.1	15.1	0.0	17.12	385.0	75.4%	476.7	0.83	91.4	52.1
1	28	16	5	21571	15.1	15.1	0.0	16.57	401.6	71.2%	476.7	0.83	89.3	52.1
1	29	12	35	23041	13.95	13.95	0.0	8.42	410.0	69.1%	440.4	0.90	95.4	56.4
1	31	10	0	25886	13.55	13.55	0.0	8.74	418.8	66.9%	427.8	0.93	97.0	58.1
2	4	8	40	31686	13.45	13.45	0.0	0.00	418.8	66.9%	424.6	0.94	97.7	58.5

Golder Associates, Inc. Denver, Colorado			Title: SEDIMENTATION TESTING SAMPLE DATA AND CALCULATIONS	
Job Short Title: Copper Range/MI				
Sample No. CPT-21	Depth 7-8 feet	Reviewed:	Date: January, 1998	Job Number: 973-2255	Figure: 2



Golder Associates, Inc. **Denver, Colorado**			**Title:** **SEDIMENTATION TESTING** **GRAPHICAL DATA**		
Job Short Title: Copper Range/M1					
Sample No. **CPT-21**	**Depth** **7-8 feet**	**Reviewed:**	**Date:** January, 1998	**Job Number:** 973-2255	**Figure:** 3

SECTION D.1.4

TAILINGS SLURRY CONSOLIDATION DATA

	Initial	Final	
Length =	4.96	4.66	cm
Diameter =	7.095	7.095	cm
Wet Weight =	400.73	386.04	g
Area =	39.5	39.5	sq.cm
Volume =	196.1	184.2	cc
Moisture Content =	30.9%	26.1%	
Specific Gravity =	2.75	2.75	
Dry Weight of Solids =	306.13	306.13	g
Wet Density =	2.04	2.10	g/cc
Dry Density =	1.56	1.66	g/cc
Wet Density =	127.5	130.8	pcf
Dry Density =	97.4	103.7	pcf

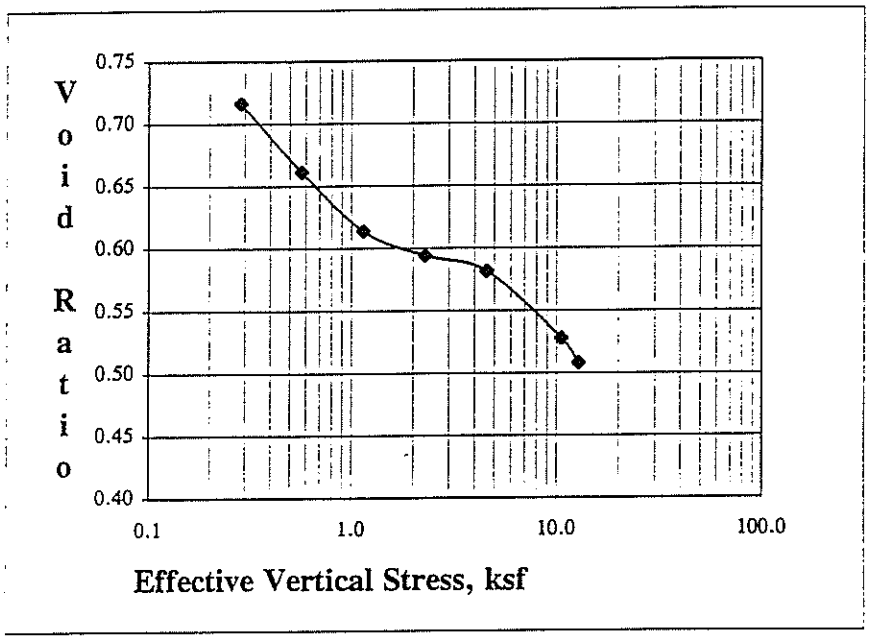
	Cc	Cv	Cα	Mv	kv
		cm^2/sec		cm^2/g	cm/sec
Max =	0.18	3.6E-01	0.04		
Min =	0.11	2.4E-04	0.00		
Average =	0.14	2.8E-01	0.01	1.1E-02	3.1E-03

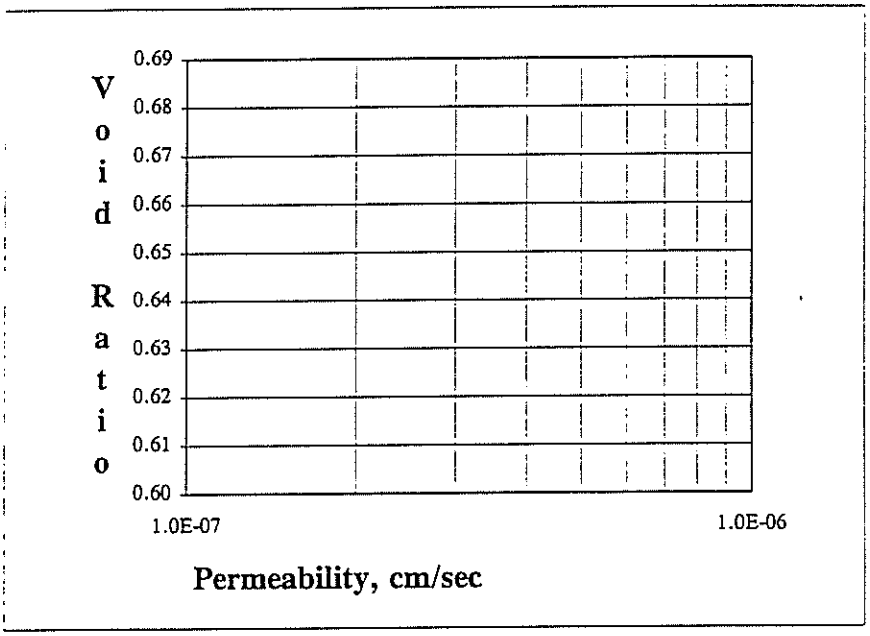
Load	Load	Void Ratio EOP	Void Ratio EOL	t100	tEOL	t50	H	Cc	Ch	Cα	Permeability	Dry Densitu
psi	ksf			min	min	min	cm		cm^2/sec		cm/sec	pcf
2	0.3	0.72	0.68	162.00	1332.00	81	4.83		2.4E-04	0.04	$>1x10^{-4}$	100.0
4	0.6	0.66	0.62	0.10	1080.00	0.05	4.68	0.18	3.6E-01	0.01	$>1x10^{-4}$	103.3
8	1.2	0.61	0.61	0.10	240.00	0.05	4.54	0.17	3.4E-01	0.00	$>1x10^{-4}$	106.3
16	2.3	0.59	0.59	0.10	60.00	0.05	4.49	0.14	3.3E-01	0.00	$>1x10^{-4}$	107.7
32	4.6	0.58	0.57	0.10	60.00	0.05	4.45	0.11	3.3E-01	0.01	$>1x10^{-4}$	108.5
74	10.7	0.53	0.52	0.10	150.00	0.05	4.30	0.12	3.0E-01	0.00	$>1x10^{-4}$	112.3
90	13.0	0.51	0.50	0.10	100.00	0.05	4.25	0.13	3.0E-01	0.00	$>1x10^{-4}$	113.8

Notes:

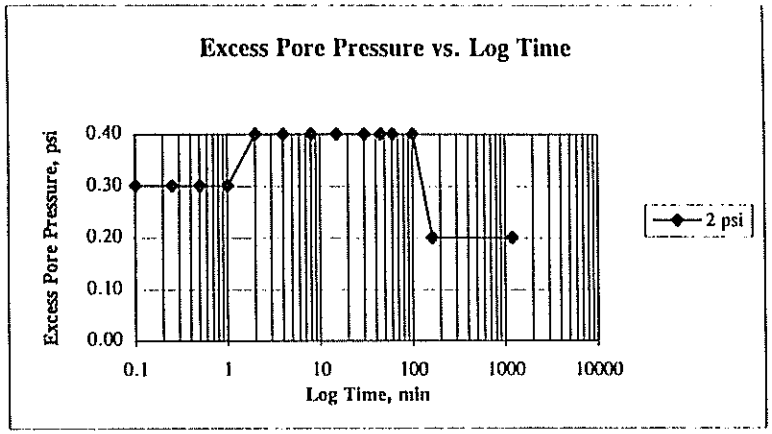
1) EOP = End of Primary Consolidation
2) EOL = End of Loading Sequence
3) t100 = Time at end of Primary consolidation
4) Hdr = Sample Height

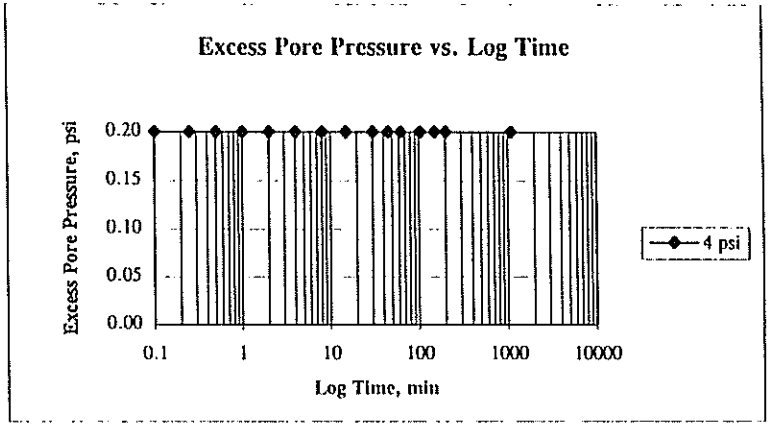
Golder Associates, Inc. **Denver, Colorado**			Title: SLURRY CONSOLIDATION TESTING SAMPLE DATA AND CALCULATIONS		
Job Short Title: Copper Range/MI					
Sample No. **CPT-13**	Depth **0-1 feet**	Reviewed:	Date: December, 1997	Job Number: 973-2255	Figure: 1

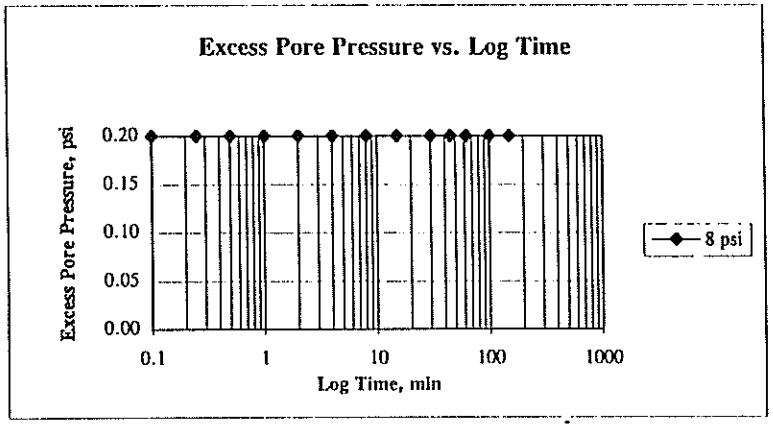


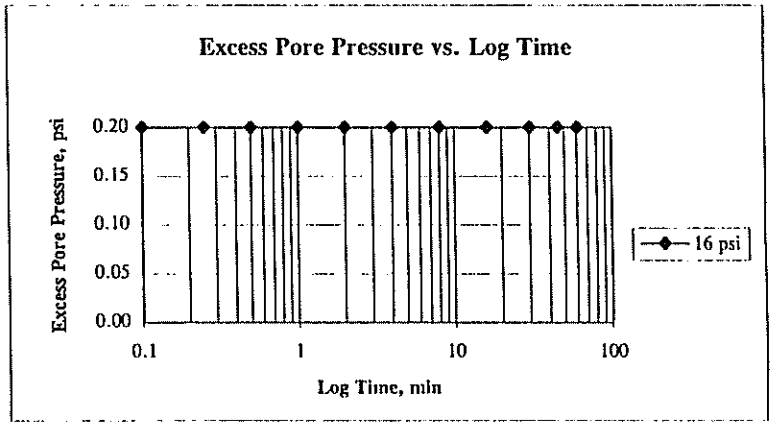


Golder Associates, Inc. Denver, Colorado			**Title:** SLURRY CONSOLIDATION TESTING COMPRESSION INDEX AND PERMEABILITY		
Job Short Title: Copper Range/MI					
Sample No. CPT-13	Depth 0-1 feet	Reviewed:	**Date:** December, 1997	**Job Number:** 973-2255	**Figure:** 2

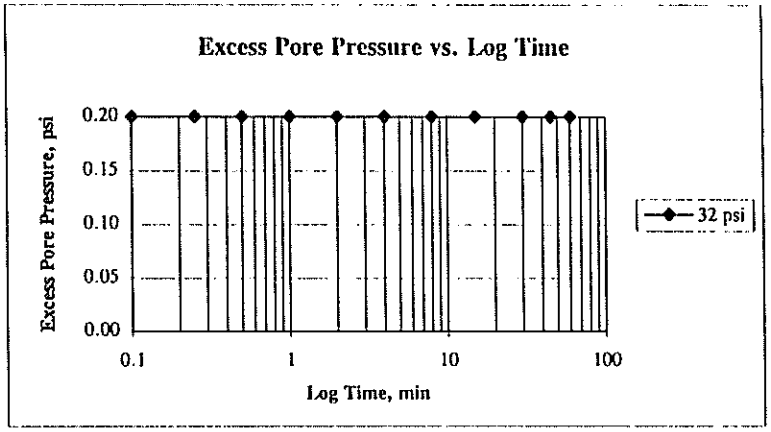


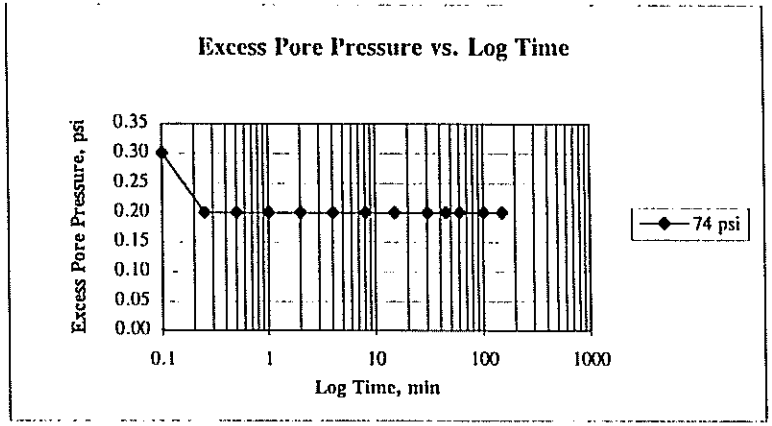


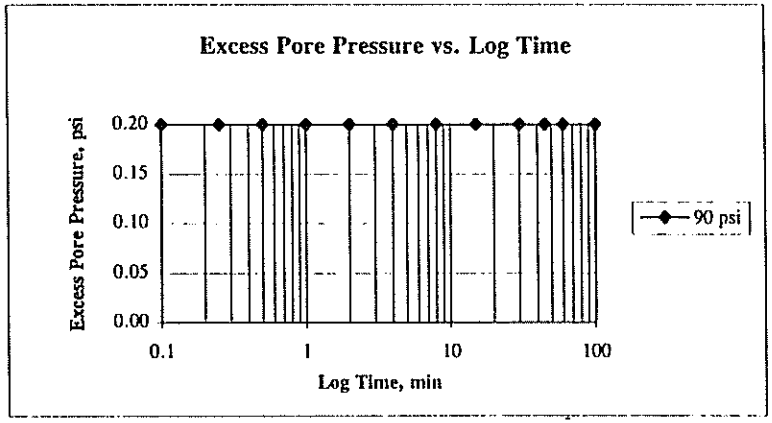




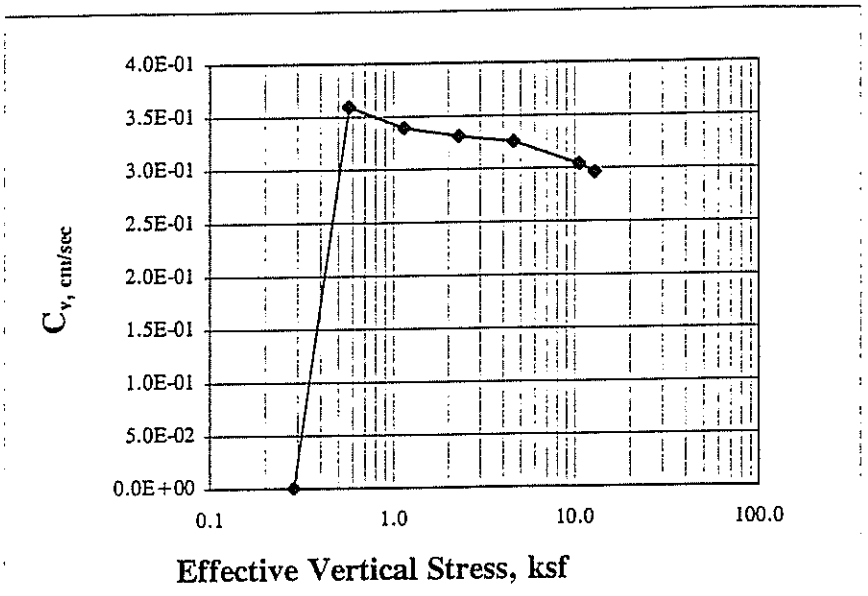
Golder Associates, Inc. **Denver, Colorado**			**Title:** SLURRY CONSOLIDATION TESTING TIME CONSOLIDATION READINGS		
Job Short Title: Copper Range/MI					
Sample No. CPT-13	Depth 0-1 feet	Reviewed:	**Date:** December, 1997	**Job Number:** 973-2255	**Figure:** 3

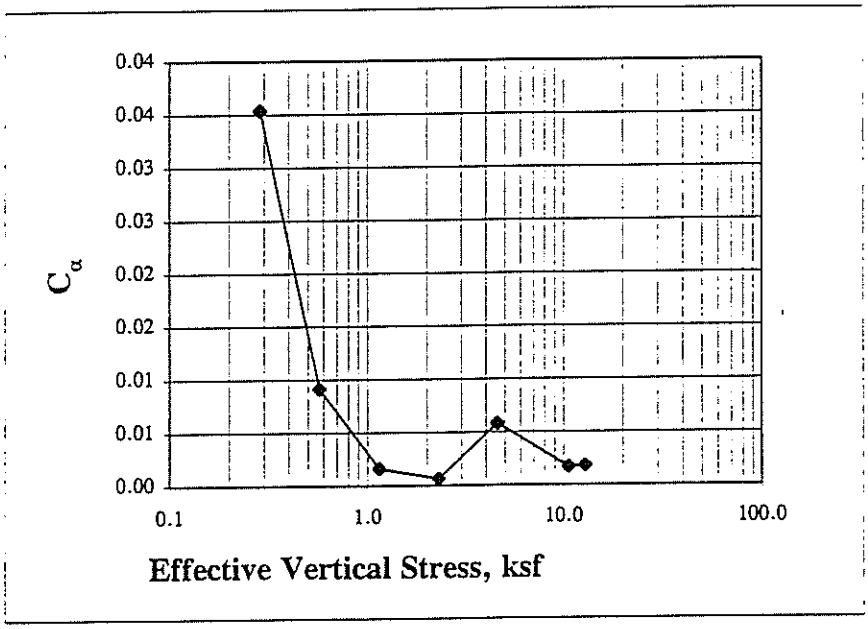






Golder Associates, Inc. **Denver, Colorado**			**Title:** SLURRY CONSOLIDATION TESTING TIME CONSOLIDATION READINGS		
Job Short Title: Copper Range/MI					
Sample No. CPT-13	Depth 0-1 feet	Reviewed:	**Date:** December, 1997	**Job Number:** 973-2255	**Figure:** 4





Golder Associates, Inc. **Denver, Colorado**			**Title:** SLURRY CONSOLIDATION TESTING COEFFICIENT OF CONSOLIDATION Secondary Compression Index		
Job Short Title: Copper Range/MI					
Sample No. CPT-13	**Depth** 0-1 feet	**Reviewed:**	**Date:** December, 1997	**Job Number:** 973-2255	**Figure:** 5

	Initial	Final	
Length =	5.49	2.90	cm
Diameter =	7.095	7.095	cm
Wet Weight =	327.07	222.48	g
Area =	39.5	39.5	sq.cm
Volume =	217.0	114.7	cc
Moisture Content =	95.8%	33.2%	
Specific Gravity =	2.75	2.75	
Dry Weight of Solids =	167.04	167.04	g
Wet Density =	1.51	1.94	g/cc
Dry Density =	0.77	1.46	g/cc
Wet Density =	94.0	121.1	pcf
Dry Density =	48.0	90.9	pcf

	Cc	Cv	Cα	Mv	kv
		cm^2/sec		cm^2/g	cm/sec
Max =	0.52	1.2E-04	0.11		
Min =	0.42	3.6E-06	0.00		
Average =	0.45	4.7E-05	0.03	2.4E-02	1.1E-06

Load	Load	Void Ratio EOP	Void Ratio EOL	t100	tEOL	t50	H	Cc	Ch	Cα	Permeability	Dry Densitu
psi	ksf			min	min	min	cm		cm^2/sec		cm/sec	pcf
2	0.3	1.54	1.54	1440	2880	720	3.91		1.7E-05	0.02	7.0E-07	67.5
4	0.6	1.39	1.39	300	1335	150	3.67	0.52	7.4E-05	0.00	5.0E-07	71.9
8	1.2	1.26	1.26	1230	1230	615	3.47	0.48	1.6E-05	-	3.3E-07	76.1
16	2.3	1.15	1.14	150	1500	75	3.30	0.44	1.2E-04	0.01	2.1E-07	79.9
32	4.6	1.01	1.01	4310	4630	2155	3.09	0.44	3.6E-06	0.11	1.1E-07	85.4
74	10.7	0.87	0.87	1200	1200	600	2.87	0.43	1.1E-05	-	8.6E-08	91.7
90	13.0	0.85	0.85	150	230	75	2.84	0.42	8.9E-05	0.00	8.2E-08	92.7

Notes:

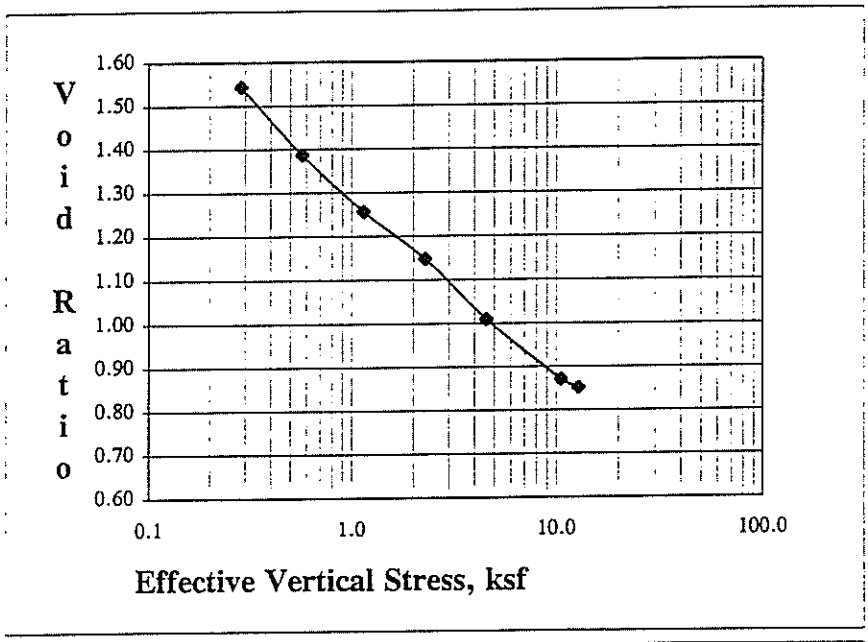
1) EOP = End of Primary Consolidation
2) EOL = End of Loading Sequence
3) t100 = Time at end of Primary consolidation
4) Hdr = Sample Height

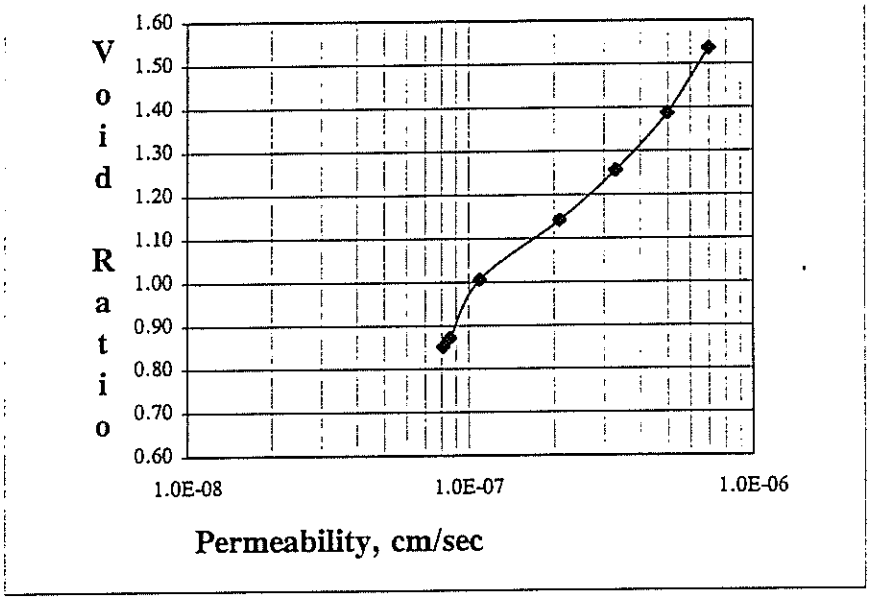
Golder Associates, Inc.
Denver, Colorado

Job Short Title: Copper Range/MI

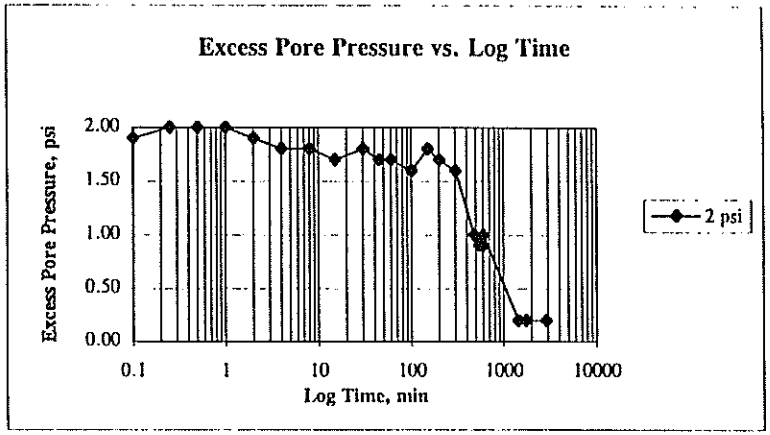
Title: SLURRY CONSOLIDATION TESTING
SAMPLE DATA AND CALCULATIONS

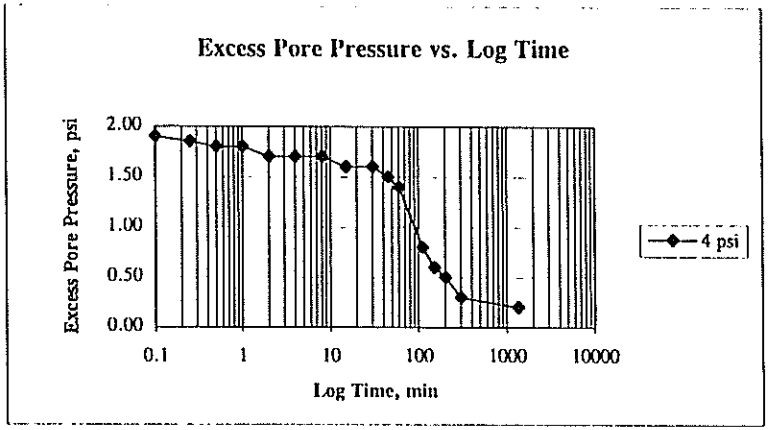
Sample No.	Depth	Reviewed:	Date:	Job Number:	Figure:
CPT-17	0-1 feet		December, 1997	973-2255	1

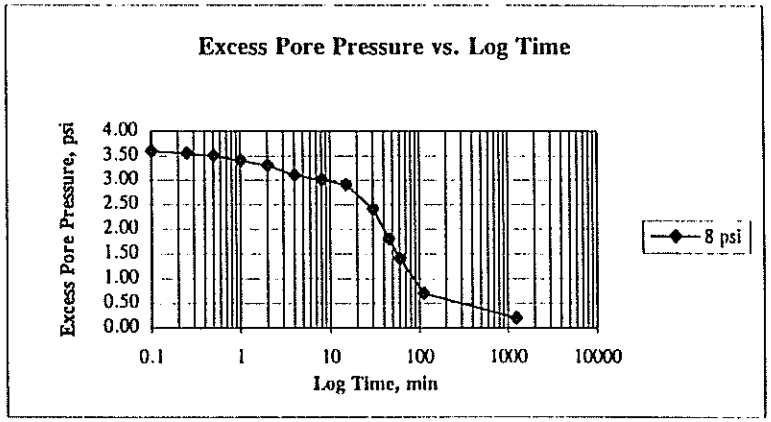


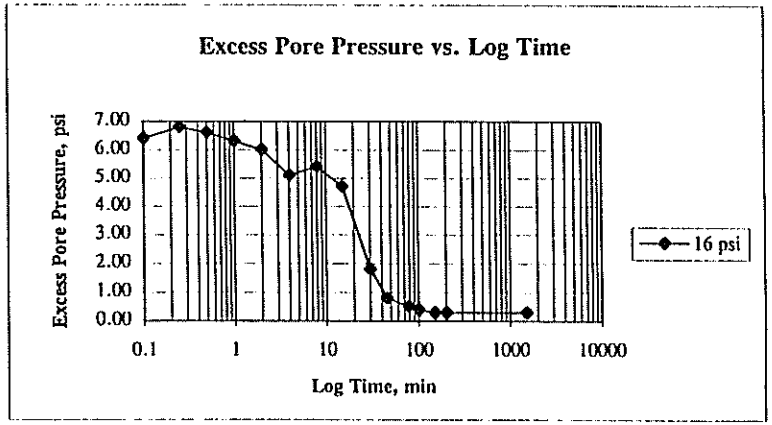


Golder Associates, Inc. Denver, Colorado			**Title:** SLURRY CONSOLIDATION TESTING COMPRESSION INDEX AND PERMEABILITY		
Job Short Title: Copper Range/MI					
Sample No. CPT-17	Depth 0-1 feet	Reviewed:	**Date:** December, 1997	**Job Number:** 973-2255	**Figure:** 2

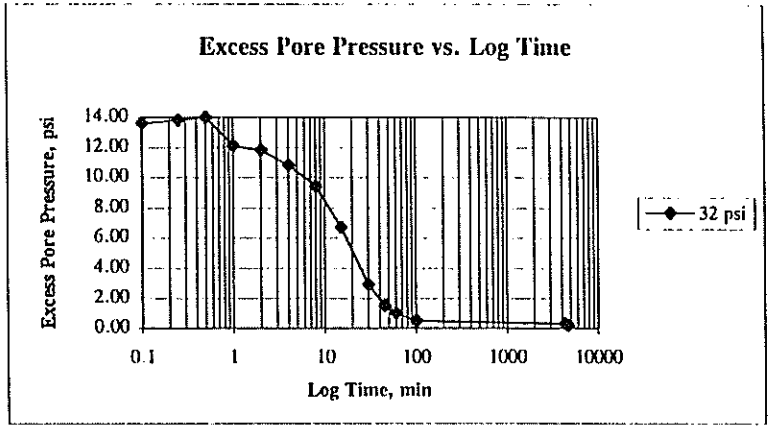


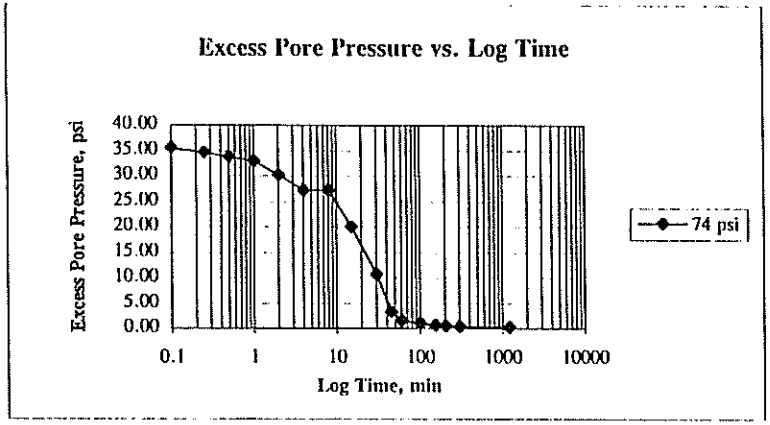


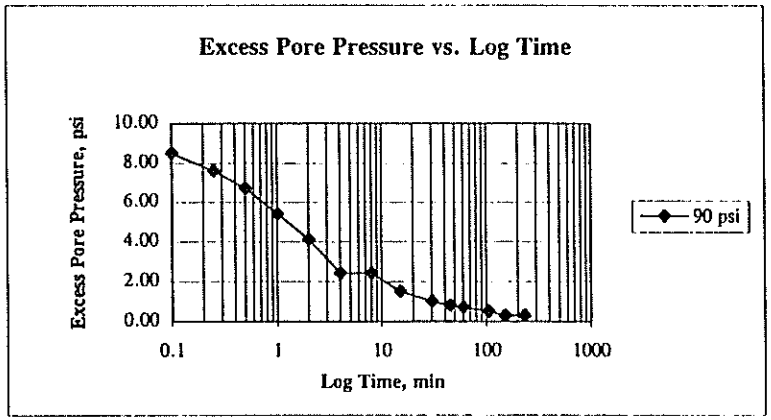




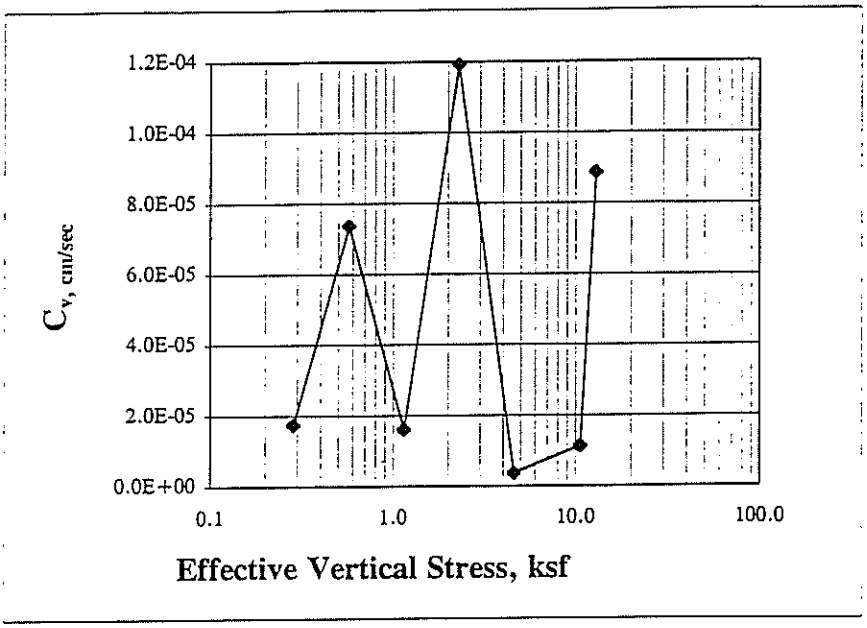
Golder Associates, Inc. **Denver, Colorado**			**Title:** SLURRY CONSOLIDATION TESTING TIME CONSOLIDATION READINGS		
Job Short Title: Copper Range/MI					
Sample No. CPT-17	Depth 0-1 feet	Reviewed:	**Date:** December, 1997	**Job Number:** 973-2255	**Figure:** 3

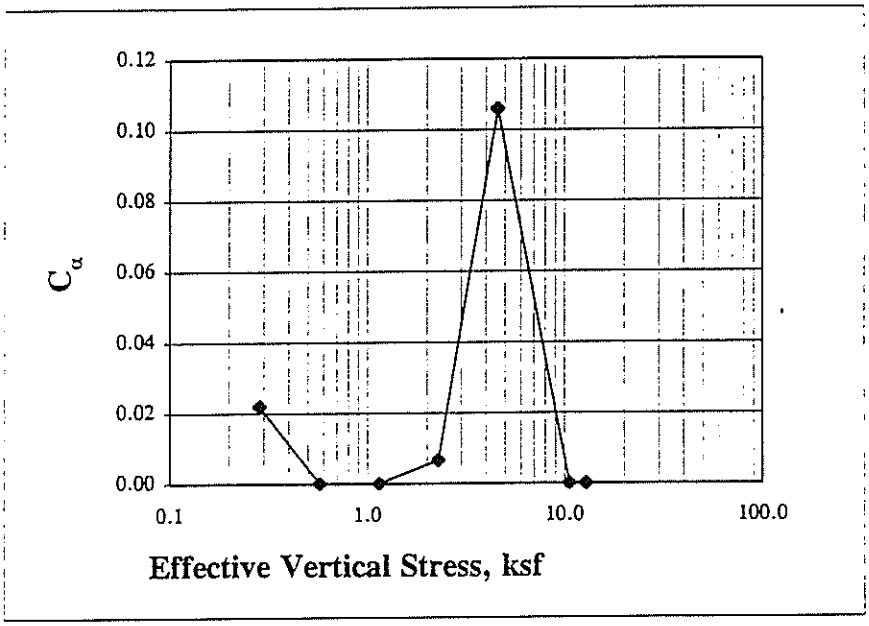






Golder Associates, Inc. **Denver, Colorado**			**Title:** SLURRY CONSOLIDATION TESTING TIME CONSOLIDATION READINGS		
Job Short Title: Copper Range/MI					
Sample No. CPT-17	Depth 0-1 feet	Reviewed:	**Date:** December, 1997	**Job Number:** 973-2255	**Figure:** 4





Golder Associates, Inc. **Denver, Colorado**			**Title:** **SLURRY CONSOLIDATION TESTING** **COEFFICIENT OF CONSOLIDATION** Secondary Compression Index		
Job Short Title: Copper Range/MI					
Sample No. CPT-17	**Depth** 0-1 feet	**Reviewed:**	**Date:** December, 1997	**Job Number:** 973-2255	**Figure:** 5

	Initial	Final	
Length =	5.22	3.30	cm
Diameter =	7.095	7.095	cm
Wet Weight =	342.70	270.32	g
Area =	39.5	39.5	sq.cm
Volume =	206.4	130.5	cc
Moisture Content =	60.5%	26.6%	
Specific Gravity =	2.78	2.78	
Dry Weight of Solids =	213.52	213.52	g
Wet Density =	1.66	2.07	g/cc
Dry Density =	1.03	1.64	g/cc
Wet Density =	103.6	129.3	pcf
Dry Density =	64.6	102.1	pcf

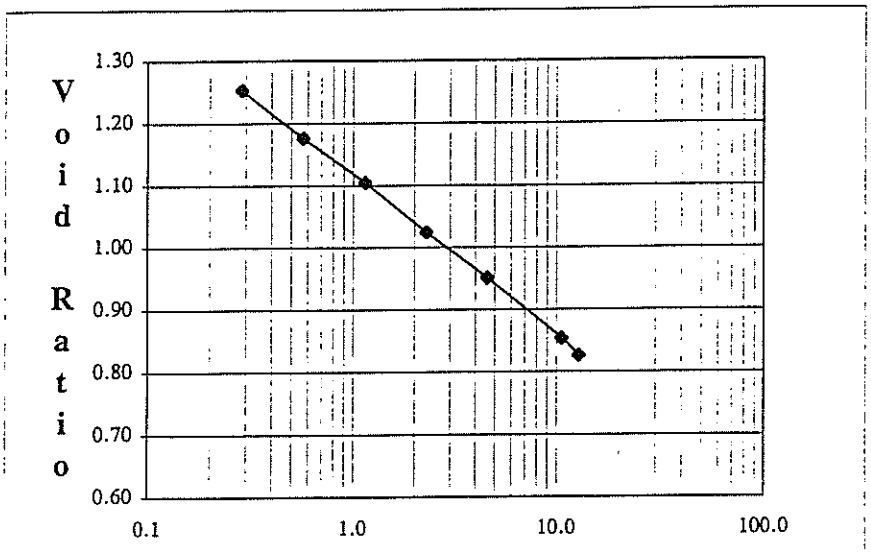
	Cc	Cv cm^2/sec	Cα	Mv cm^2/g	kv cm/sec
Max =	0.26	2.1E-04	0.05		
Min =	0.25	1.2E-05	0.01		
Average =	0.25	1.2E-04	0.02	1.5E-02	1.8E-06

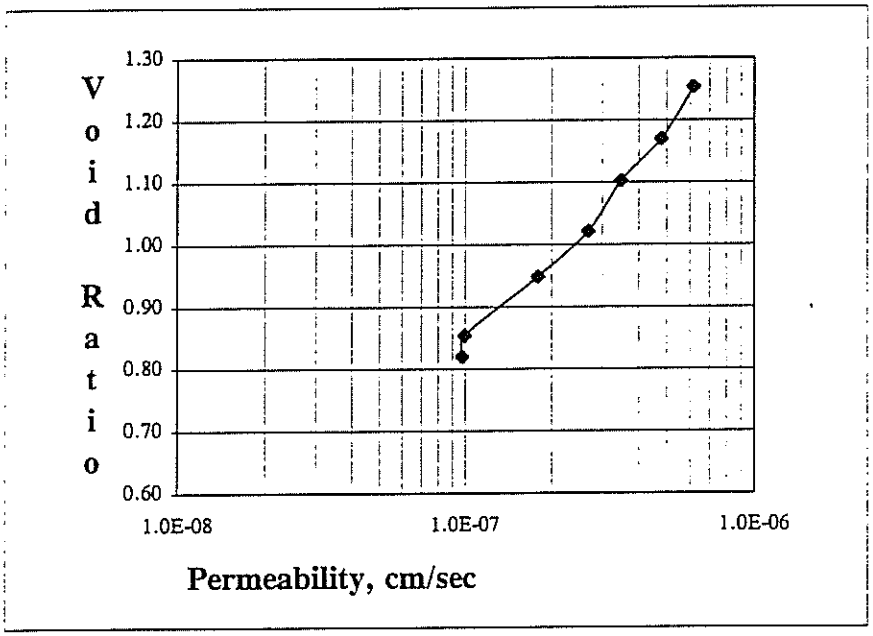
Load psi	Load ksf	Void Ratio EOP	Void Ratio EOL	t100 min	tEOL min	t50 min	H cm	Cc	Ch cm^2/sec	Cα	Permeability cm/sec	Dry Densitu pcf
2	0.3	1.25	1.25	2730	2730	1365	4.38		1.2E-05	-	6.2E-07	77.0
4	0.6	1.18	1.17	300	540	150	4.23	0.26	9.8E-05	0.03	4.8E-07	79.7
8	1.2	1.10	1.10	158	307	79	4.09	0.25	1.7E-04	0.01	3.5E-07	82.4
16	2.3	1.02	1.02	160	344	80	3.93	0.25	1.6E-04	0.01	2.7E-07	85.7
32	4.6	0.95	0.95	178	200	88.75	3.79	0.25	1.3E-04	0.05	1.8E-07	88.9
74	10.7	0.85	0.85	300	300	150	3.60	0.25	7.1E-05	-	1.0E-07	93.6
90	13.0	0.83	0.82	100	1470	50	3.55	0.26	2.1E-04	0.01	9.8E-08	95.0

Notes:

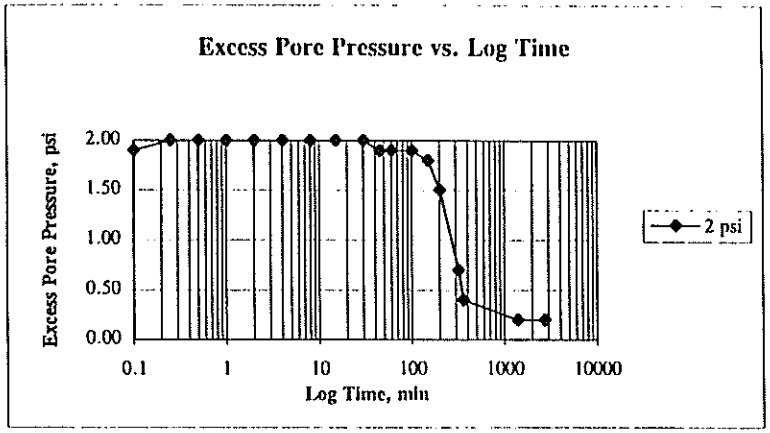
1) EOP = End of Primary Consolidation
2) EOL = End of Loading Sequence
3) t100 = Time at end of Primary consolidation
4) Hdr = Sample Height

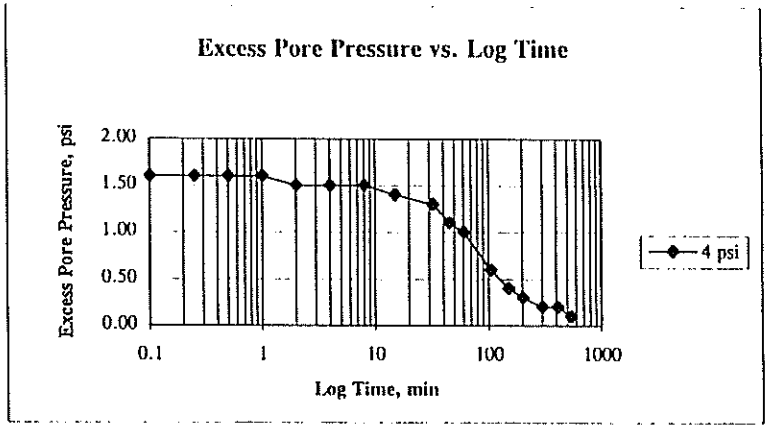
Golder Associates, Inc. Denver, Colorado			Title: SLURRY CONSOLIDATION TESTING SAMPLE DATA AND CALCULATIONS		
Job Short Title: Copper Range/MI					
Sample No. CPT-21	Depth 7-8 feet	Reviewed:	Date: January, 1998	Job Number: 973-2255	Figure: 1

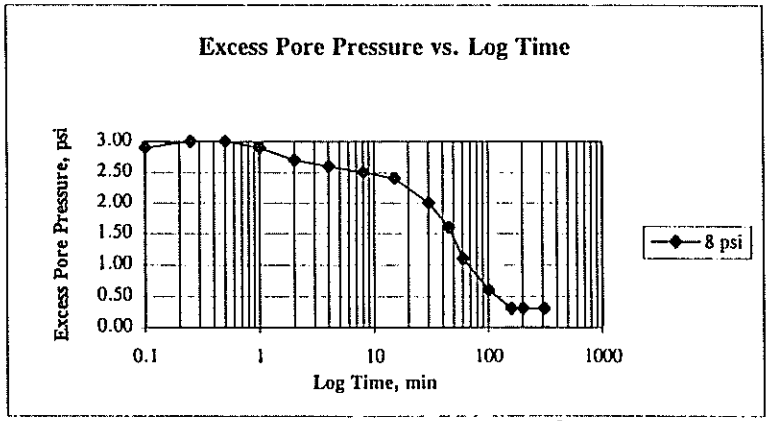


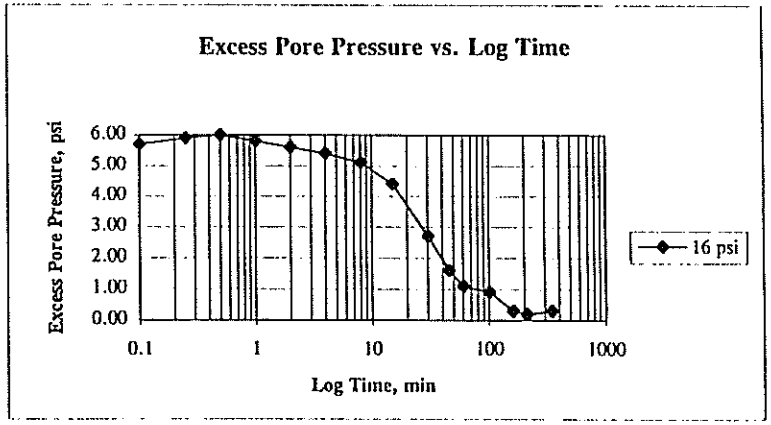


Golder Associates, Inc. **Denver, Colorado**			Title: SLURRY CONSOLIDATION TESTING COMPRESSION INDEX AND PERMEABILITY		
Job Short Title: Copper Range/MI					
Sample No. CPT-21	Depth 7-8 feet	Reviewed:	Date: January, 1998	Job Number: 973-2255	Figure: 2

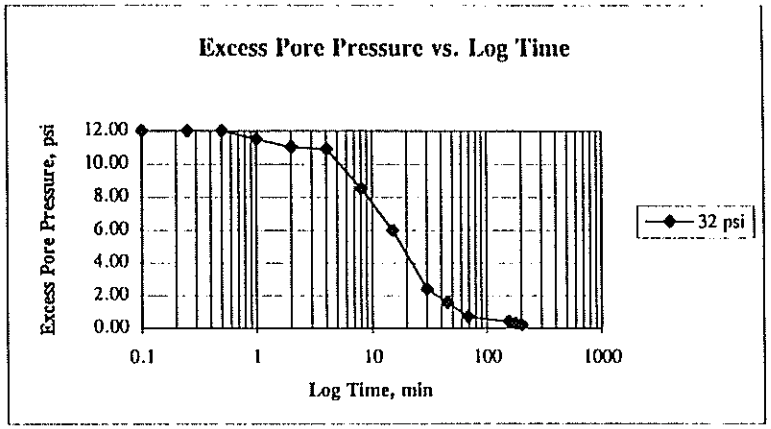


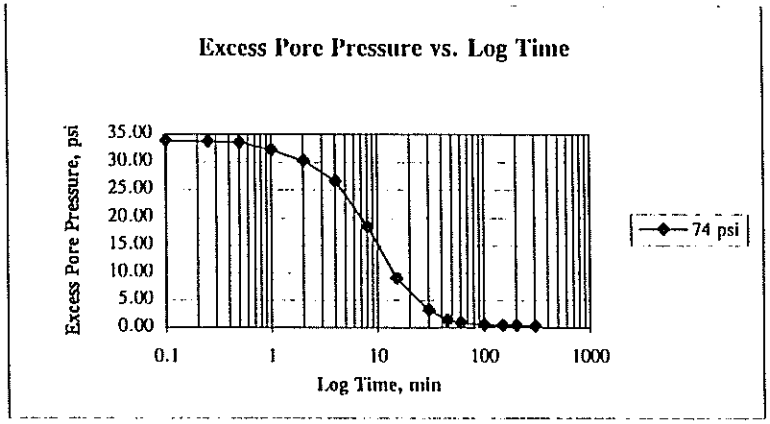


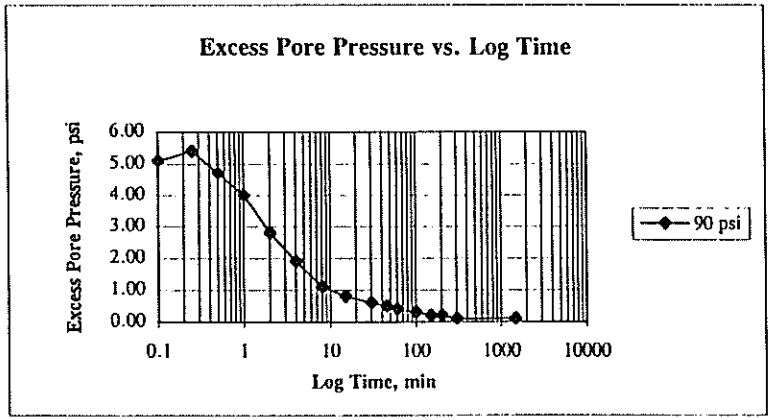




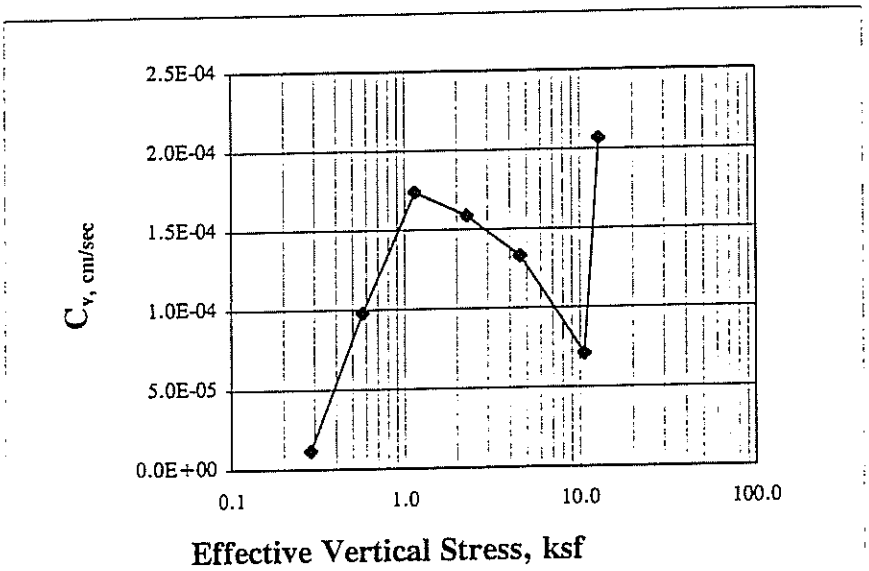
Golder Associates, Inc. **Denver, Colorado**			**Title:** SLURRY CONSOLIDATION TESTING TIME CONSOLIDATION READINGS		
Job Short Title: Copper Range/MI					
Sample No. CPT-21	Depth 7-8 feet	Reviewed:	**Date:** January, 1998	**Job Number:** 973-2255	**Figure:** 3

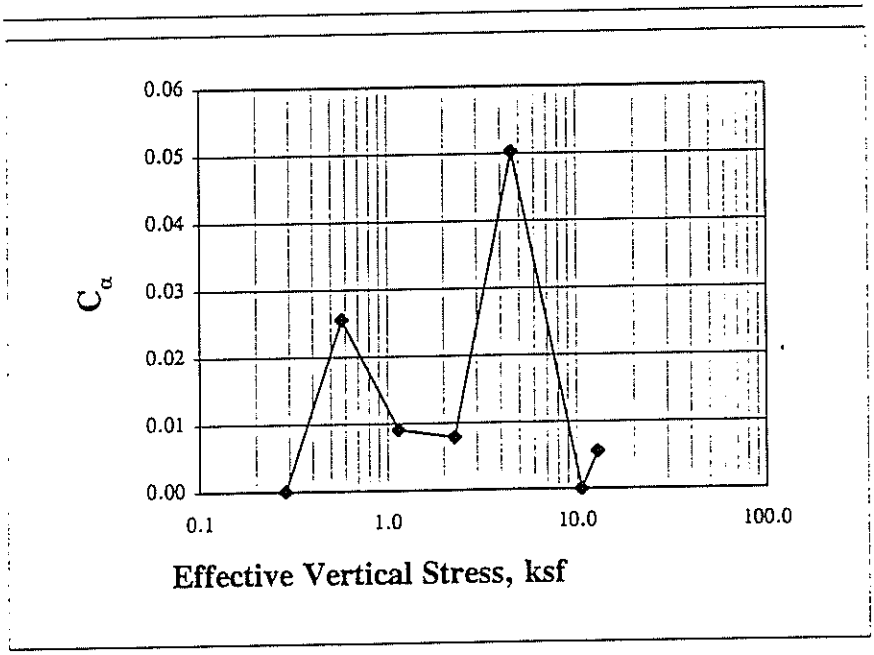






Golder Associates, Inc. **Denver, Colorado**			**Title:** SLURRY CONSOLIDATION TESTING TIME CONSOLIDATION READINGS		
Job Short Title: Copper Range/MI					
Sample No. CPT-21	Depth 7-8 feet	Reviewed:	**Date:** January, 1998	**Job Number:** 973-2255	**Figure:** 4





Golder Associates, Inc. **Denver, Colorado**			**Title:** SLURRY CONSOLIDATION TESTING COEFFICIENT OF CONSOLIDATION Secondary Compression Index		
Job Short Title: Copper Range/MI					
Sample No. CPT-21	**Depth** 7-8 feet	**Reviewed:**	**Date:** January, 1998	**Job Number:** 973-2255	**Figure:** 5

SECTION D.1.5

TAILINGS SHEAR VANE DATA

Laboratory Shear Vane Testing

Project: Copper Range/MI
Project Number: 973-2255
Date: 11-Dec-97
Sample: CPT-17, 0-1'
Consolidation Pressure = 8 psi

Input Variables and Constants:

Diameter of Vane =	12.5	mm
Height of Vane =	12.5	mm
Spring Number Used =	2	

Vane Constant:
K = 0.004090495

Testing Results:

Vane Rotation:

	Run #1		Run #2		Run #3	
Start =	179	degrees	179	degrees	180	degrees
Peak =	229	degrees	221.5	degrees	220	degrees
Residual =	204	degrees	209	degrees	206.5	degrees
Remolded =	186.5	degrees	187	degrees	188	degrees
Rotation at Peak =	50	degrees	42.5	degrees	40	degrees
Rotation at Residual =	25	degrees	30	degrees	26.5	degrees
Rotation at Remolded =	7.5	degrees	8	degrees	8	degrees

Calculations:

Peak Tourque =	0.7986	Kg*cm	0.6749	Kg*cm	0.6336	Kg*cm
Remolded Tourque =	0.3861	Kg*cm	0.4686	Kg*cm	0.4109	Kg*cm
Residual Tourque =	0.0974	Kg*cm	0.1056	Kg*cm	0.1056	Kg*cm
Peak Tourque =	0.0783	Nm	0.0661	Nm	0.0621	Nm
Residual Tourque =	0.0378	Nm	0.0459	Nm	0.0403	Nm
Remolded Tourque =	0.0095	Nm	0.0103	Nm	0.0103	Nm

Summary:

Peak Shear Strength =	19.13	kPa	16.17	kPa	15.18	kPa
Residual Shear Strength =	9.25	kPa	11.23	kPa	9.84	kPa
Remolded Shear Strength =	2.33	kPa	2.53	kPa	2.53	kPa
Peak Shear Strength =	**399.6**	**psf**	**337.7**	**psf**	**317.0**	**psf**
Remolded Shear Strength =	**193.2**	**psf**	**234.5**	**psf**	**205.6**	**psf**
Remolded Shear Strength =	**48.7**	**psf**	**52.8**	**psf**	**52.8**	**psf**

Average Peak Shear Strength = 351.4 psf
Average Remolded Shear Strength = 211.1 psf
Average Remolded Shear Strength = 51.5 psf

Laboratory Shear Vane Testing

Project: Copper Range/MI
Project Number: 973-2255
Date: 11-Dec-97
Sample: CPT-17, 0-1'
Consolidation Pressure = 90 psi

Input Variables and Constants:

Diameter of Vane =	12.5	mm
Height of Vane =	12.5	mm
Spring Number Used =	4	

Vane Constant:
K = 0.004090495

Testing Results:

Vane Rotation:

	Run #1		Run #2	
Start =	57.5	degrees	58.5	degrees
Peak =	156	degrees	157	degrees
Residual =	102	degrees	116	degrees
Remolded =	91	degrees	97	degrees
Rotation at Peak =	98.5	degrees	98.5	degrees
Rotation at Residual =	44.5	degrees	57.5	degrees
Rotation at Remolded =	33.5	degrees	38.5	degrees

Calculations:

Peak Tourque =	4.0081	Kg*cm	4.0081	Kg*cm
Remolded Tourque =	1.7995	Kg*cm	2.3312	Kg*cm
Residual Tourque =	1.3496	Kg*cm	1.5541	Kg*cm
Peak Tourque =	0.3928	Nm	0.3928	Nm
Residual Tourque =	0.1763	Nm	0.2285	Nm
Remolded Tourque =	0.1323	Nm	0.1523	Nm

Summary:

Peak Shear Strength =	96.02	kPa	96.02	kPa
Residual Shear Strength =	43.11	kPa	55.85	kPa
Remolded Shear Strength =	32.33	kPa	37.23	kPa

Peak Shear Strength =	**2005.5**	**psf**	**2005.5**	**psf**
Remolded Shear Strength =	**900.4**	**psf**	**1166.4**	**psf**
Remolded Shear Strength =	**675.3**	**psf**	**777.6**	**psf**

Average Peak Shear Strength =	**2005.5**	**psf**
Average Remolded Shear Strength =	**1033.4**	**psf**
Average Remolded Shear Strength =	**726.4**	**psf**

SECTION D.2.1

EMBANKMENT SOILS INDEX TESTING DATA

COPPER RANGE-EMBANKMENT/MI
973-2255.210
TABLE 1
SUMMARY OF SOIL DATA

SAMPLE TYPE	SAMPLE NO.	SAMPLE DEPTH (FT)	USCS SOIL CLASSI-FICATION	DELIVERED MOISTURE (%)	ATTERBERG LIMITS			GRAIN SIZE DISTRIBUTION			SPECIFIC GRAVITY	MOIST/DEN RELATIONSHIP STANDARD PROCTOR		ADDITIONAL TESTS COMMENTS (SEE NOTES)
					L.L	P.L.	P.I.	% FINER NO. 3/4"	% FINER NO. 4	% FINER NO. 200		PCF (DRY)	MOIST (%)	
-	BH-1	5-6.5'	-	10.0	-	-	-	-	-	-	-	-	-	-
-	BH-1	15-16.5'	-	7.5	-	-	-	-	-	-	-	-	-	-
-	BH-1	40-41.5'	-	10.5	-	-	-	100	100	40	2.81	-	-	-
-	BH-2	15-16.5'	ML	14.0	-	NP	-	100	91	60	-	-	-	-
-	BH-2	30-31.5'	-	7.1	-	-	-	-	-	-	-	-	-	-
-	BH-2	40-41.5'	-	15.3	-	-	-	-	-	-	-	-	-	-
-	BH-2	BANK	-	-	-	-	-	-	-	-	-	-	-	PERM, T.
-	BH-3	5-30'	-	-	-	-	-	-	-	-	-	-	-	PERM, T.
-	BH-3	10-11.5'	-	13.0	-	-	-	-	-	-	-	-	-	-
-	BH-3	25-26.5'	-	14.5	-	-	-	-	-	-	-	-	-	-
-	BH-3	35-36.5'	CL	13.3	27	14	13	100	100	75	2.72	-	-	-
-	BH-3	45-46.5'	-	17.4	-	-	-	96	92	38	-	-	-	-
-	BH-4	10-11.5'	CL-ML	12.9	25	18	7	100	98	67	-	-	-	-
-	BH-4	20-21.5'	-	12.5	-	-	-	-	-	-	-	-	-	-
-	BH-4	30-31.5'	-	27.8	-	-	-	-	-	-	-	-	-	-
-	BH-5	10-11.5'	-	16.2	-	-	-	-	-	-	-	-	-	-
-	BH-5	20-21.5'	-	14.8	-	-	-	100	95	77	2.72	-	-	-
-	BH-5	55-56.5'	CL	11.5	26	16	10	100	100	77	2.74	-	-	-
-	BH-6	5-6.5'	-	9.2	-	-	-	-	-	-	-	-	-	-
-	BH-6	15-16.5'	-	7.5	-	-	-	-	-	-	-	-	-	-
-	BH-6	45-46.5'	-	8.1	-	-	-	-	-	-	-	-	-	-

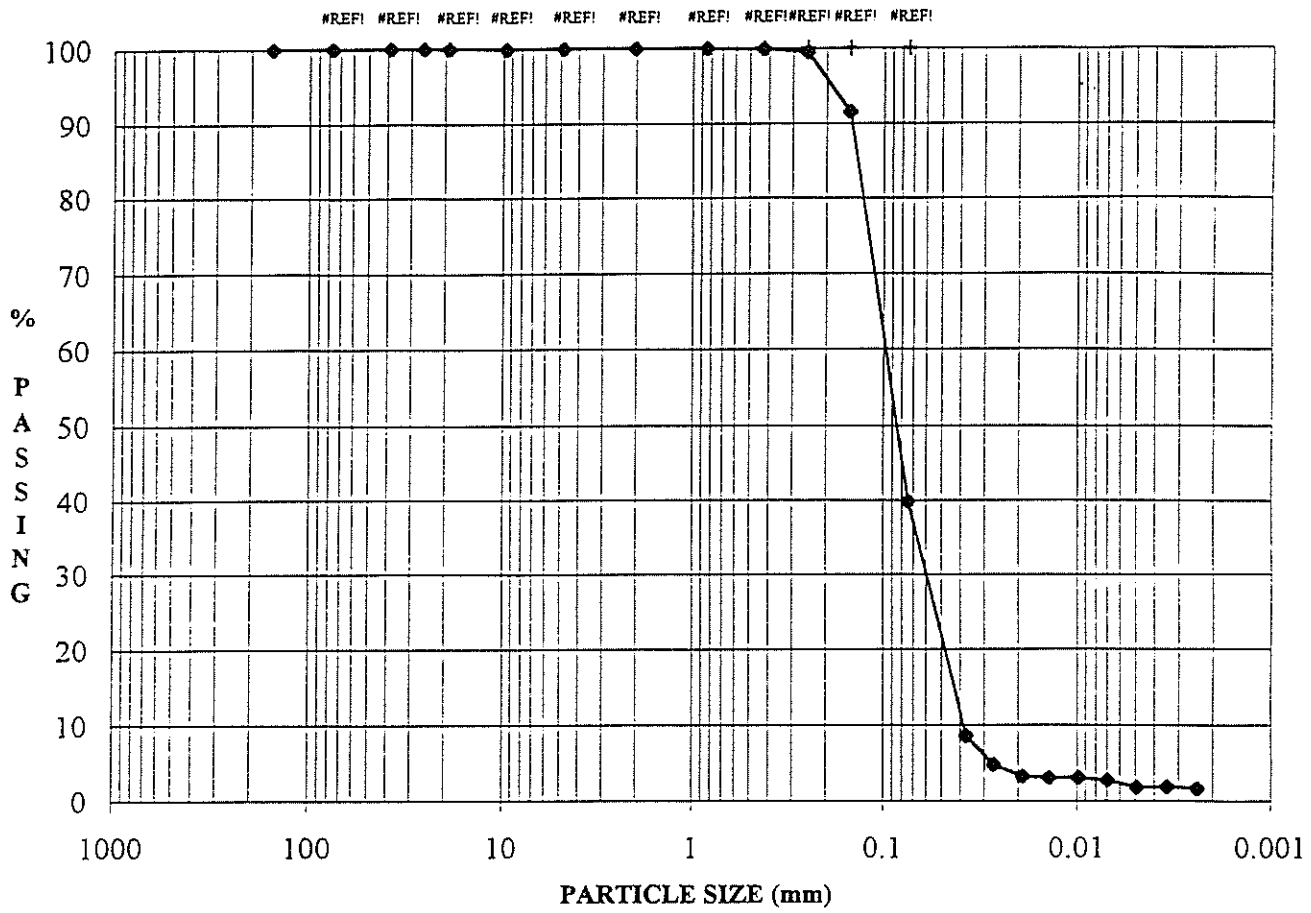
COPPER RANGE-EMBANKMENT/MI
973-2255.210
TABLE 1
SUMMARY OF SOIL DATA

SAMPLE TYPE	SAMPLE NO.	SAMPLE DEPTH (FT)	USCS SOIL CLASSI-FICATION	DELIVERED MOISTURE (%)	ATTERBERG LIMITS			GRAIN SIZE DISTRIBUTION			SPECIFIC GRAVITY	MOIST/DEN RELATIONSHIP STANDARD PROCTOR		ADDITIONAL TESTS COMMENTS (SEE NOTES)
					L.L	P.L.	P.I.	% FINER NO. 3/4"	% FINER NO. 4	% FINER NO. 200		PCF (DRY)	MOIST (%)	
-	BH-6	0-20'	CL	-	22	14	8	100	100	62	2.69	-	-	PERM
-	BH-7	15-16.5'	-	7.2	-	-	-	-	-	-	-	-	-	-
-	BH-7	35-36.5'	-	7.5	-	-	-	-	-	-	-	-	-	-
-	BH-7	50-51.5'	-	7.9	-	-	-	100	100	26	-	-	-	-
-	BH-7	70-71.5'	-	11.5	-	NP	-	-	-	-	-	-	-	-
-	BH-8	20-21'	-	11.9	-	-	-	-	-	-	-	-	-	-
-	BH-8	35-36.5'	-	5.1	-	-	-	-	-	-	-	-	-	-
-	BH-8	50-51.5'	CL	13.7	26	14	12	100	99	67	2.65	-	-	-
-	BH-9	5.5-16.	CL	13.9	27	14	13	100	98	64	2.64	-	-	-
-	BH-9	40-41.5'	-	13.3	-	-	-	-	-	-	-	-	-	-
-	BH-9	50-51.5'	-	14.8	-	-	-	-	-	-	-	-	-	-

NOTES:

LL = LIQUID LIMIT
PL = PLASTIC LIMIT
PI = PLASTIC INDEX
SL = SHRINKAGE LIMIT
T = TRIAXIAL TEST
U = UNCONFINED COMPRESSION TEST
C = CONSOLIDATION TEST
DS = DIRECT SHEAR TEST
PERM = PERMEABILITY

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
COBBLES	GRAVEL		SAND			FINES

SAMPLE #:	BH-1 40-41.5'
WET COLOR: DESCRIPTION:	Fine SAND and FINES. -

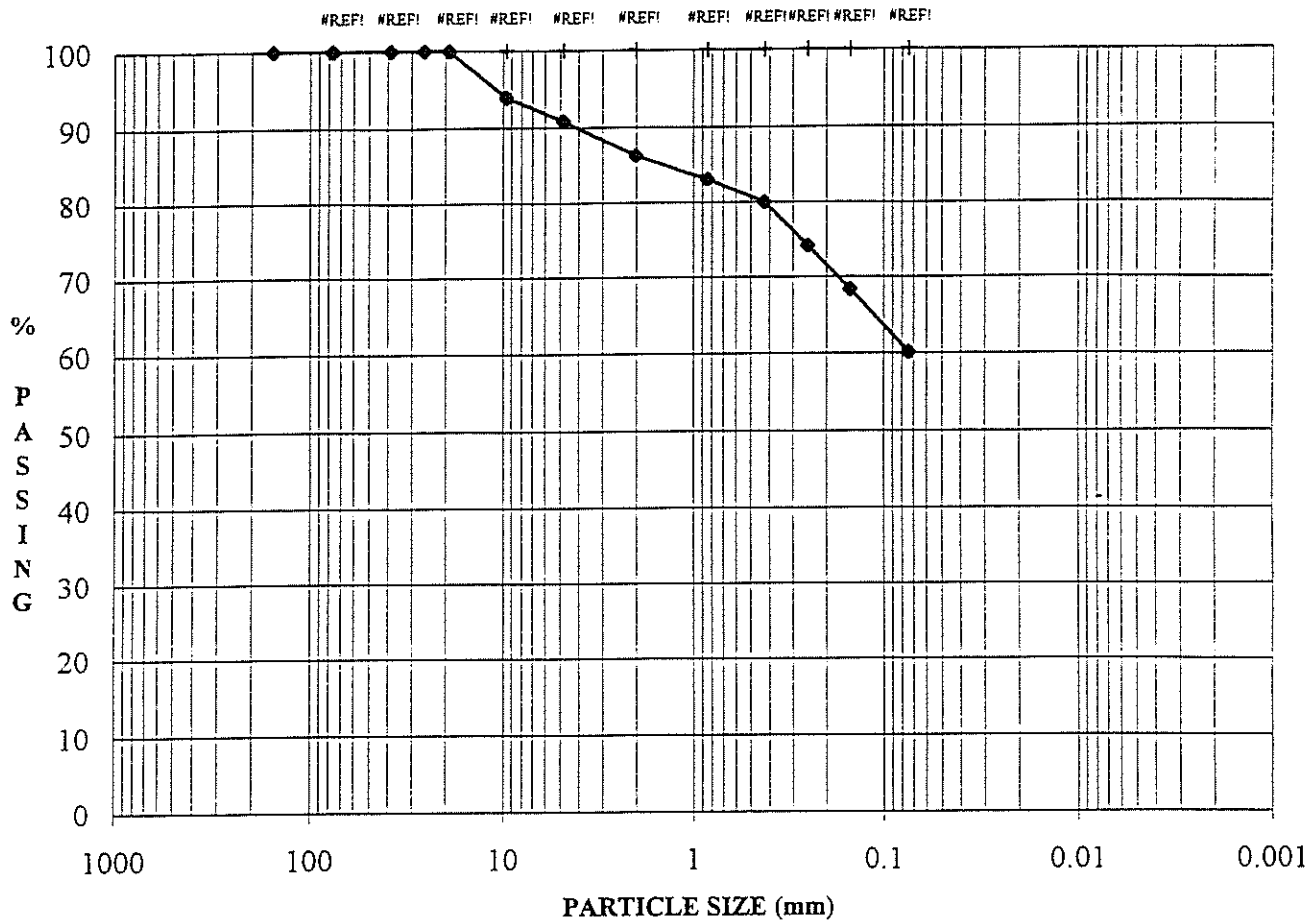
Mc:	8.0%
LL:	-
PL:	-
PI :	-
Gs:	2.81

COPPER RANGE/MI
973-2255.210

DATE	10/31/97
TECH	BETH
REVIEW	KR

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



COBBLES	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
	GRAVEL		SAND			FINES

SAMPLE #:	BH-2 15-16.5'
DESCRIPTION:	SILT and coarse to fine SAND, little gravel. (ML)

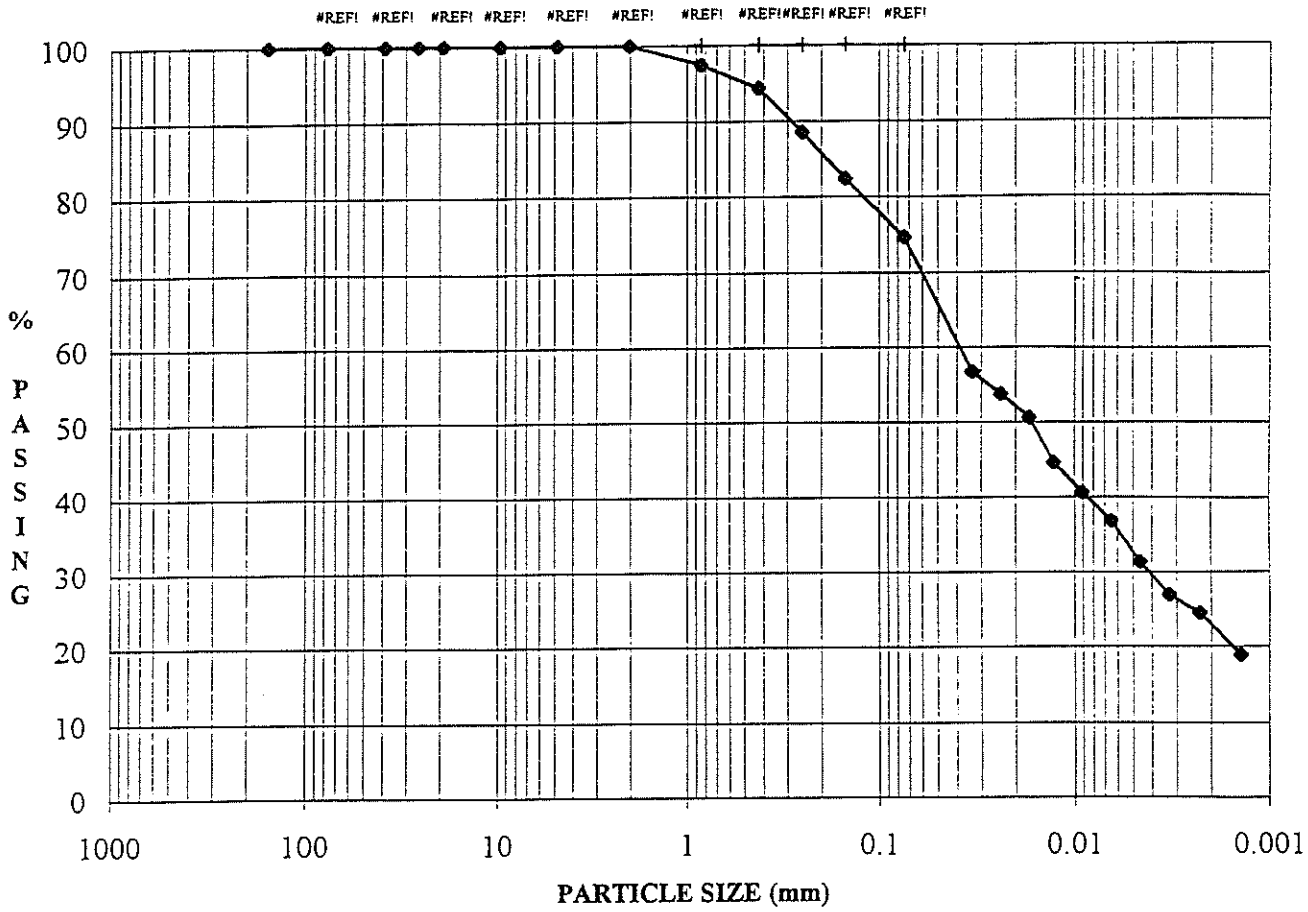
Mc:	14.0%
LL:	-
PL:	NP
PI :	-
Gs:	-

COPPER RANGE/MI
973-2255.210

DATE	10/27/97
TECH	BETH
REVIEW	KR

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



COBBLES	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
	GRAVEL		SAND			FINES

SAMPLE #:	BH-3 35-36.5'
WET COLOR: DESCRIPTION:	Silty CLAY with some medium to fine sand. (CL)

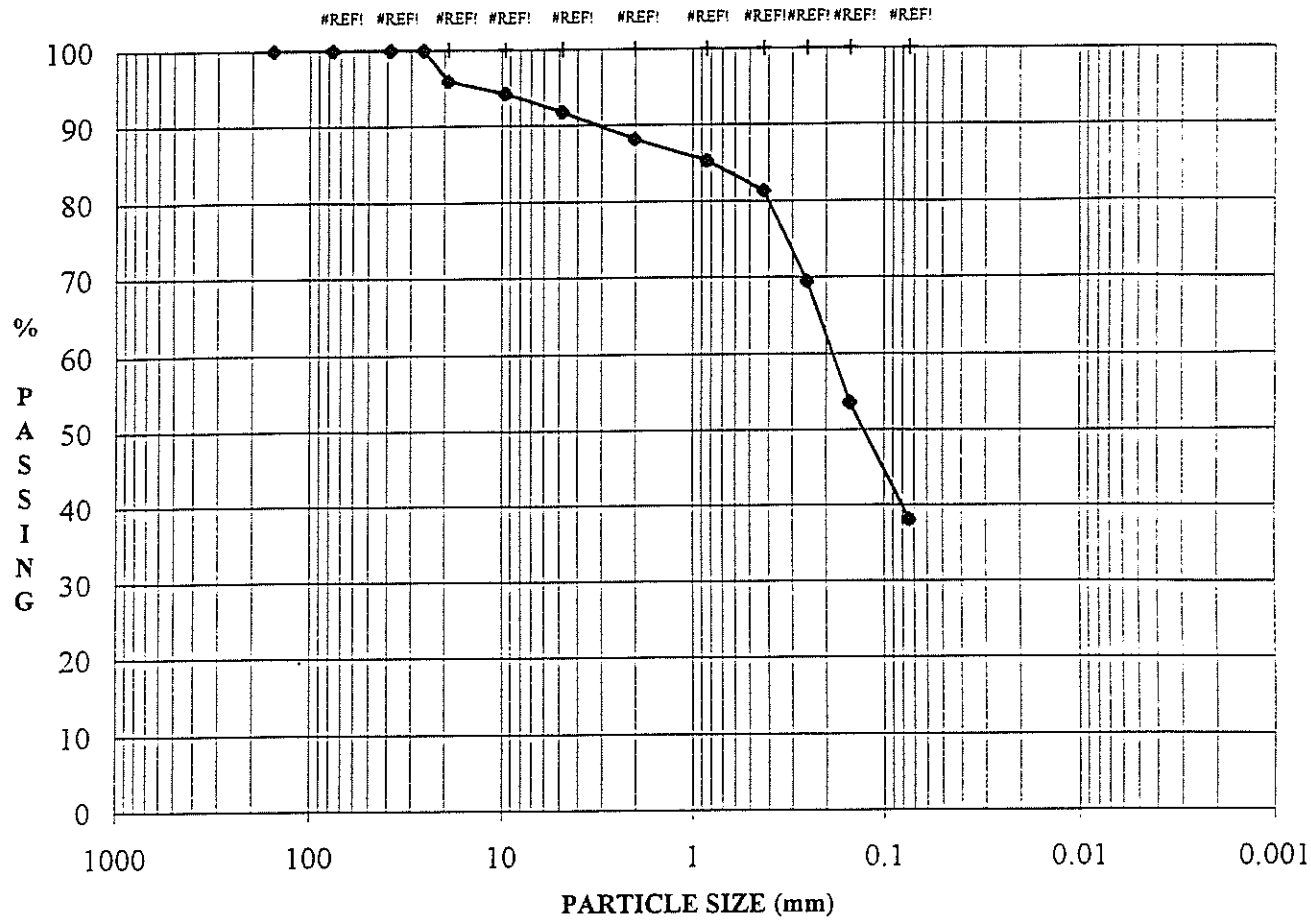
Mc:	13.3%
LL:	27
PL:	14
PI :	13
Gs:	2.72

COPPER RANGE/MI
973-2255.210

DATE	10/29/97
TECH	BETH
REVIEW	KR

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
COBBLES	GRAVEL		SAND			FINES

SAMPLE #:	BH-3 45-46.5'
DESCRIPTION:	Coarse to fine SAND and FINES, with little coarse to fine gravel.

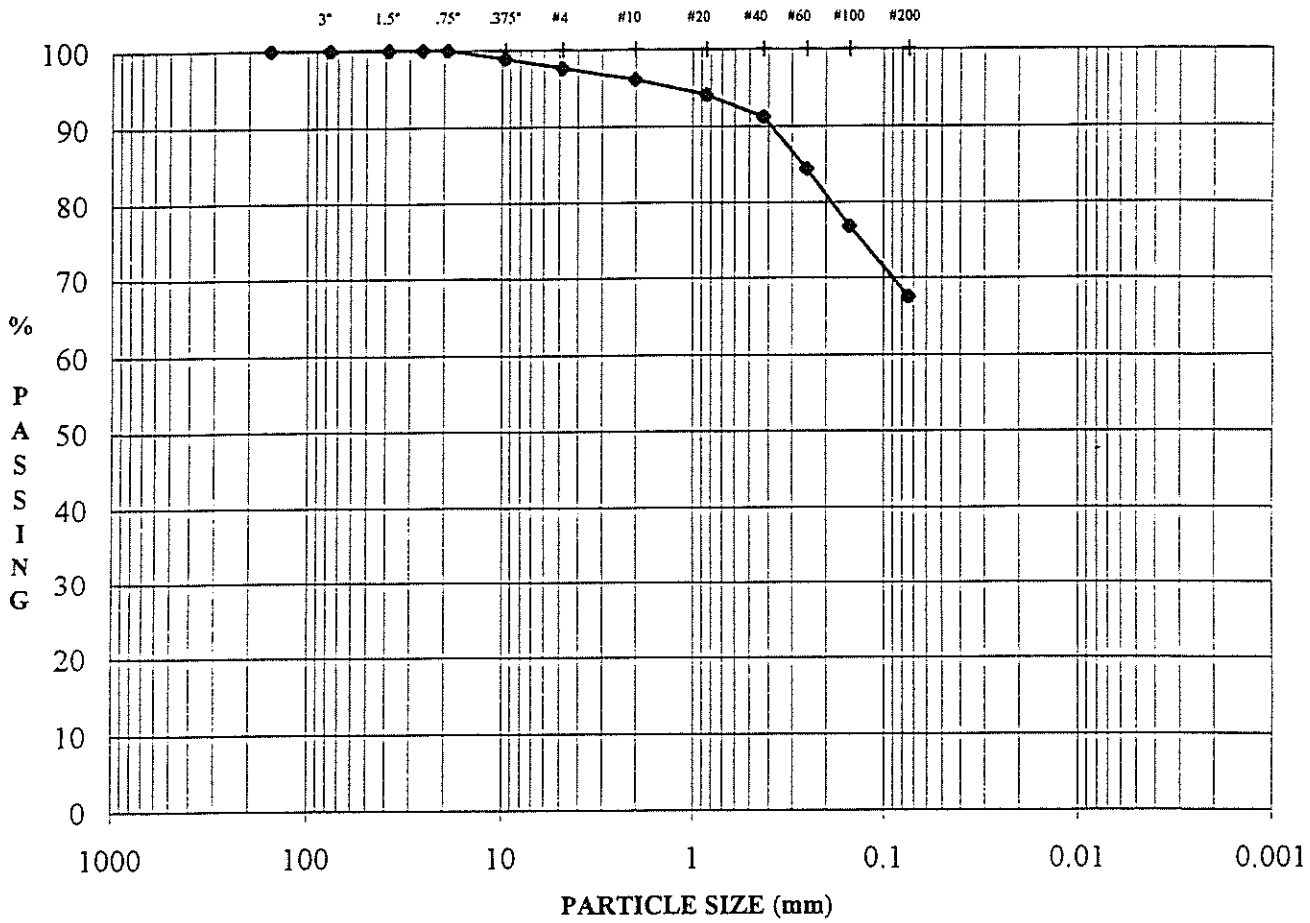
Mc:	17.4%
LL:	-
PL:	-
PI :	-
Gs:	-

COPPER RANGE/MI
973-2255.210

DATE	10/27/97
TECH	BETH
REVIEW	KR

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
COBBLES	GRAVEL		SAND			FINES

SAMPLE #:	BH-4 10-11.5'
DESCRIPTION:	Clayey SILT and coarse to fine SAND with trace fine gravel. (CL-ML)

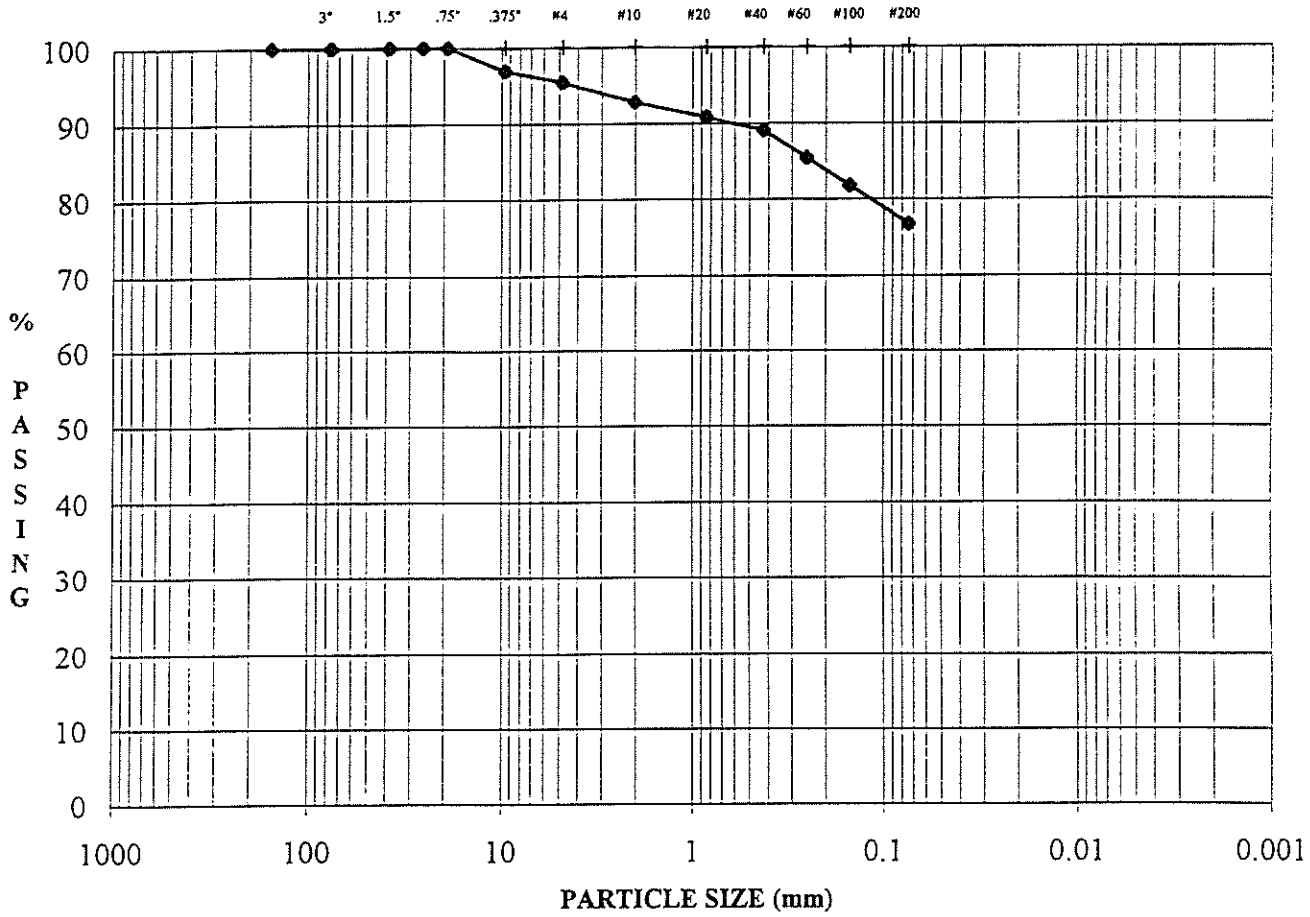
Mc:	12.9%
LL:	25
PL:	18
PI :	7
Gs:	-

COPPER RANGE/MI
973-2255.210

DATE	10/27/97
TECH	BETH
REVIEW	KR

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
COBBLES	GRAVEL		SAND			FINES

SAMPLE #:	BH-5 20-21.5
DESCRIPTION:	FINES with some coarse to fine sand, trace fine gravel.

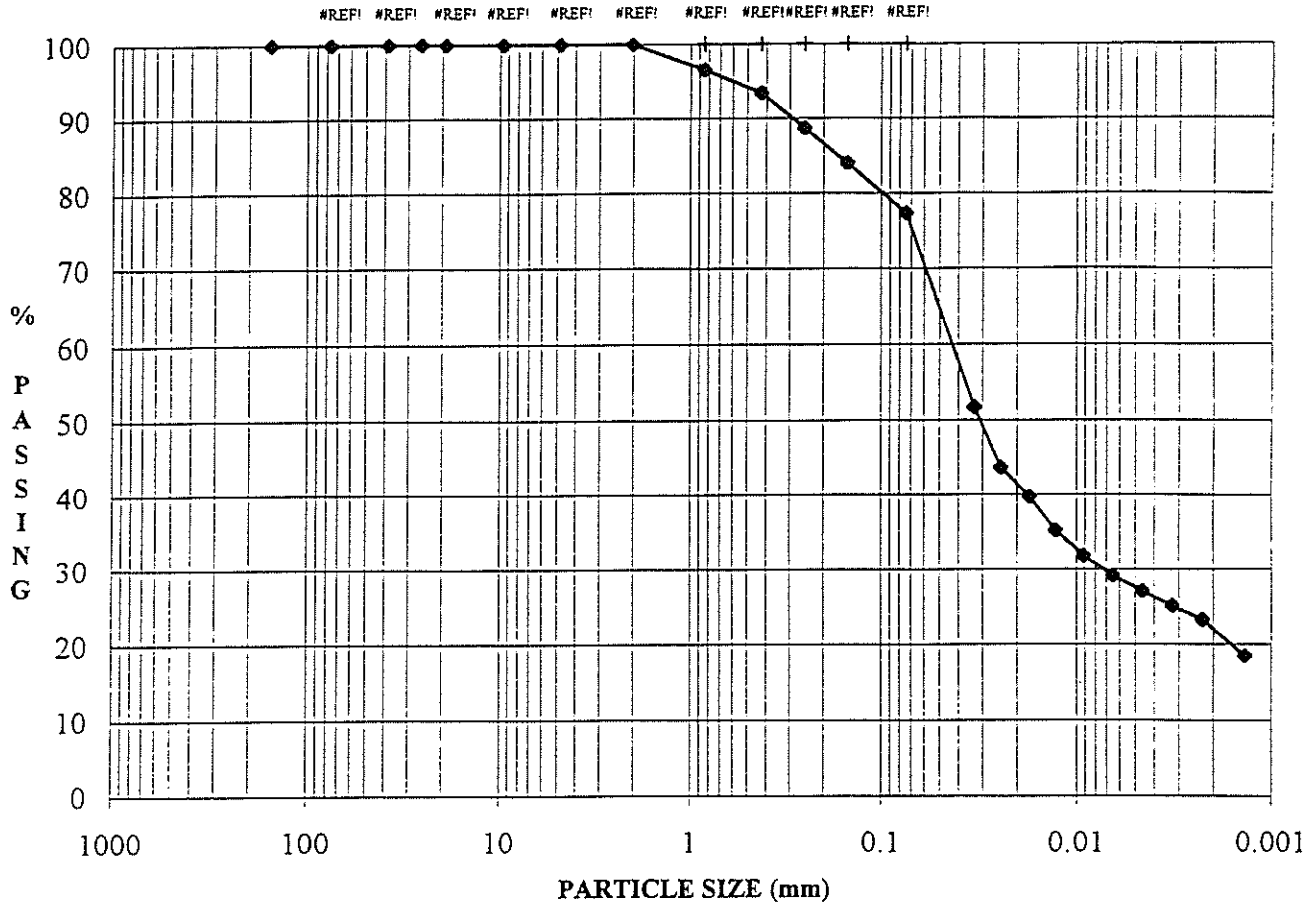
Mc:	14.8%
LL:	-
PL:	-
PI :	-
Gs:	2.72

COPPER RANGE/MI
973-2255.210

DATE	11/11/97
TECH	KR
REVIEW	KR

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



COBBLES	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
	GRAVEL		SAND			FINES

SAMPLE #:	BH-5 55-56.5'
WET COLOR: DESCRIPTION:	Silty CLAY with little medium to fine sand. (CL)

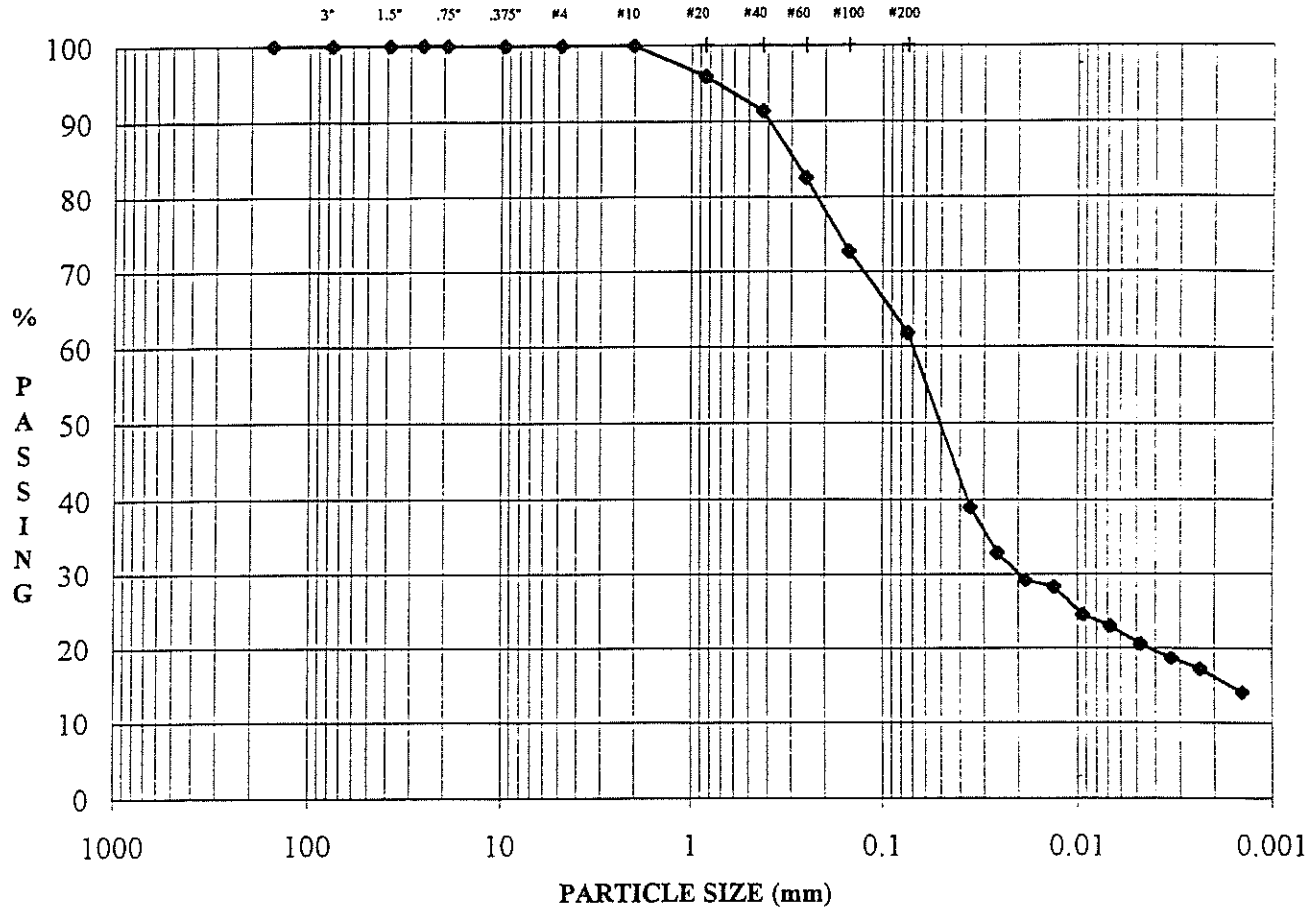
Mc:	11.5%
LL:	26
PL:	16
PI :	10
Gs:	2.74

COPPER RANGE/MI
973-2255.210

DATE	10/29/97
TECH	BETH
REVIEW	KR

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
COBBLES	GRAVEL		SAND			FINES

SAMPLE #:	BH-6 0-20'
WET COLOR: DESCRIPTION:	Silty CLAY and medium to fine sand. (CL)

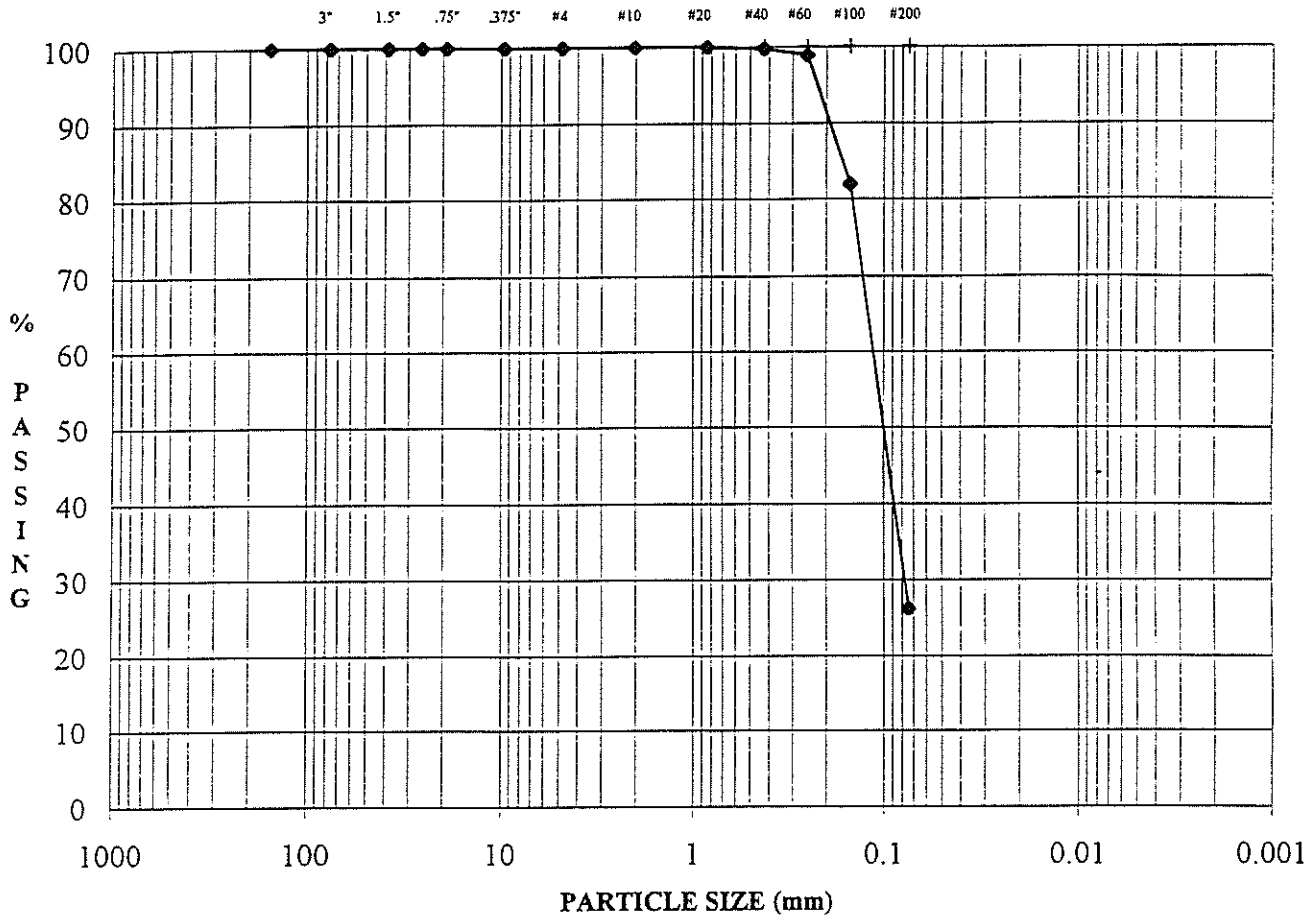
Mc:	-
LL:	22
PL:	14
PI :	8
Gs:	2.69

COPPER RANGE/MI
973-2255.210

DATE	10/29/97
TECH	BETH
REVIEW	KR

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



COBBLES	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
	GRAVEL		SAND			FINES

SAMPLE #:	BH-7 50-51.5'
DESCRIPTION:	Fine SAND with some fines. -

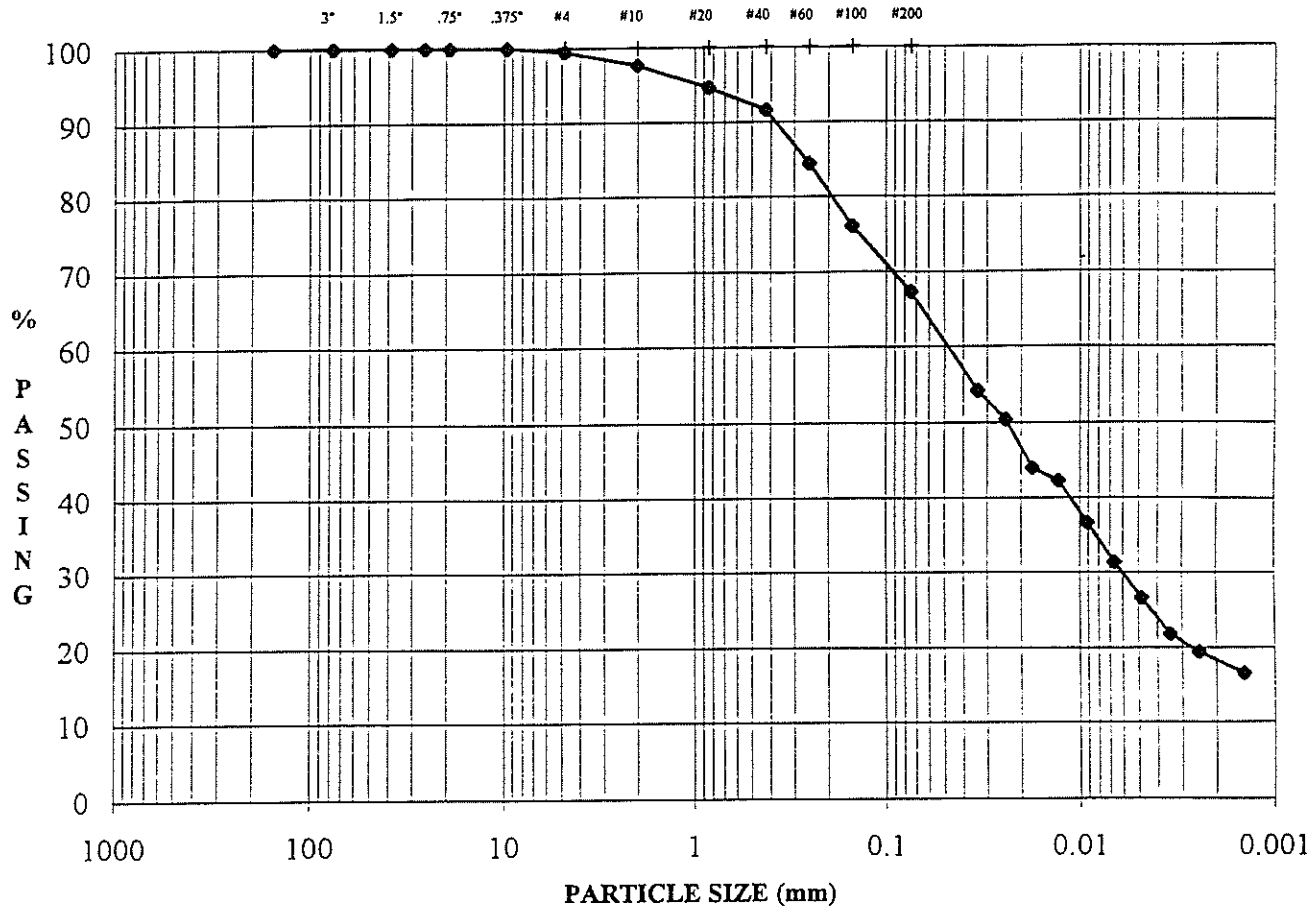
Mc:	7.9%
LL:	-
PL:	-
PI :	-
Gs:	-

COPPER RANGE/MI
973-2255.210

DATE	10/27/97
TECH	BETH
REVIEW	KR

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



COBBLES	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
	GRAVEL		SAND			FINES

SAMPLE #:	BH-8 50-51.5'
WET COLOR: DESCRIPTION:	Silty CLAY and coarse to fine SAND, trace fine gravel. (CL)

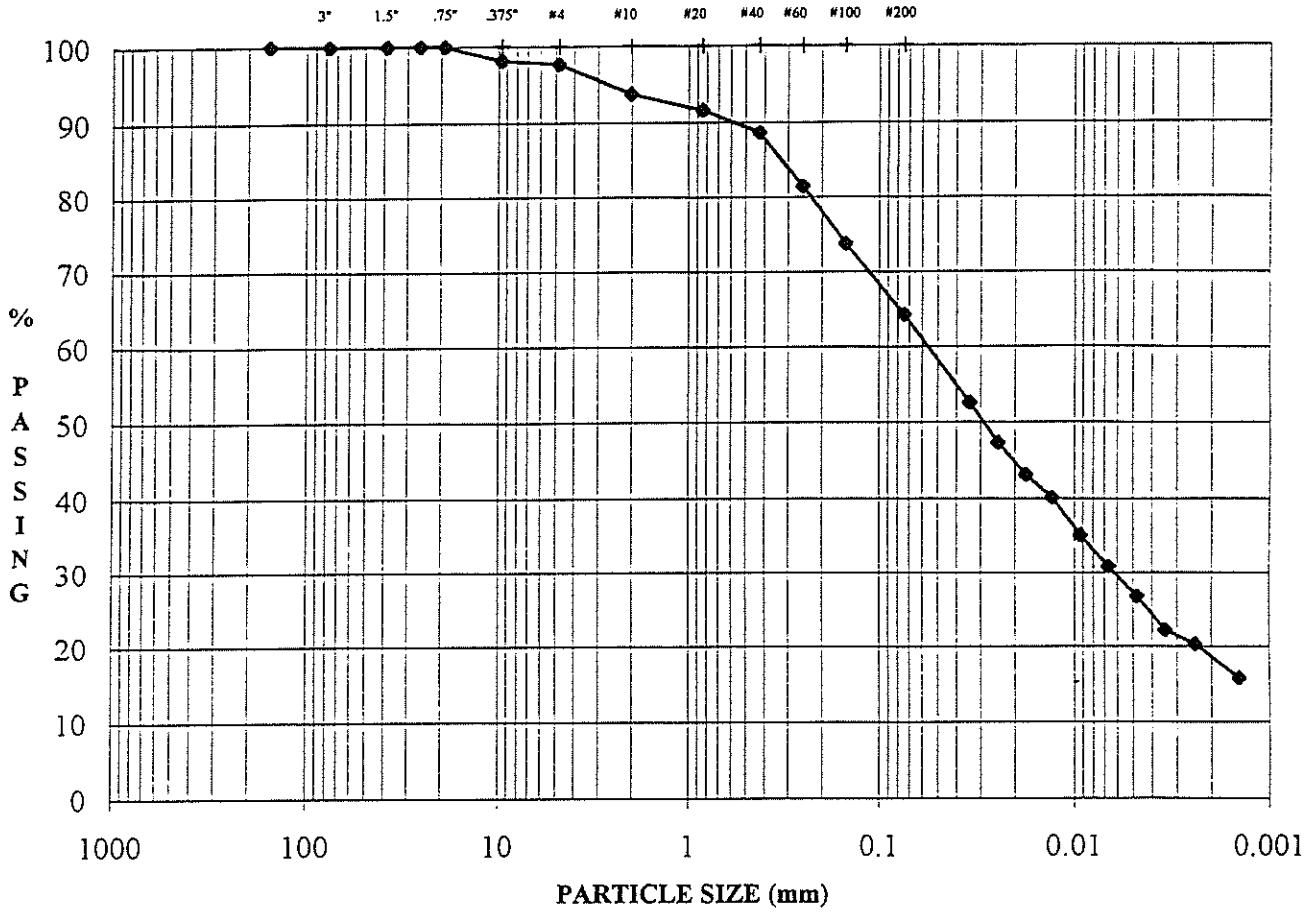
Mc:	13.7%
LL:	26
PL:	14
PI :	12
Gs:	2.65

COPPER RANGE/MI
973-2255.210

DATE	11/13/97
TECH	BETH
REVIEW	KR

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



COBBLES	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
	GRAVEL		SAND			FINES

SAMPLE #:	BH-9 15.5-16.5'
WET COLOR: DESCRIPTION:	Silty CLAY and coarse to fine SAND with trace fine gravel. (CL)

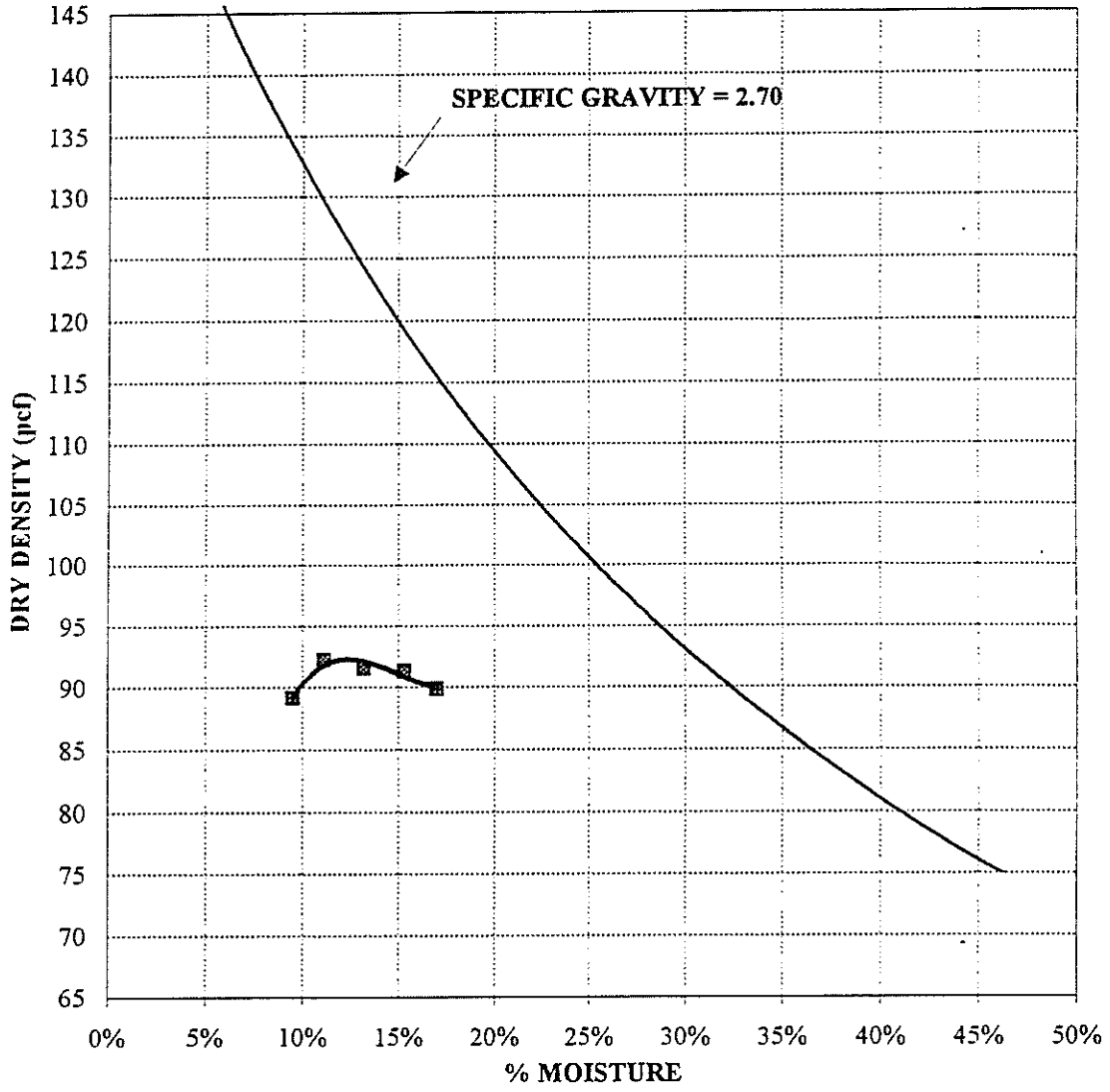
Mc:	13.9%
LL:	27
PL:	14
PI :	13
Gs:	2.64

COPPER RANGE/MI
973-2255.210

DATE	11/14/97
TECH	JE
REVIEW	KR

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

MOISTURE-DENSITY CURVE
ASTM D 698, METHOD A



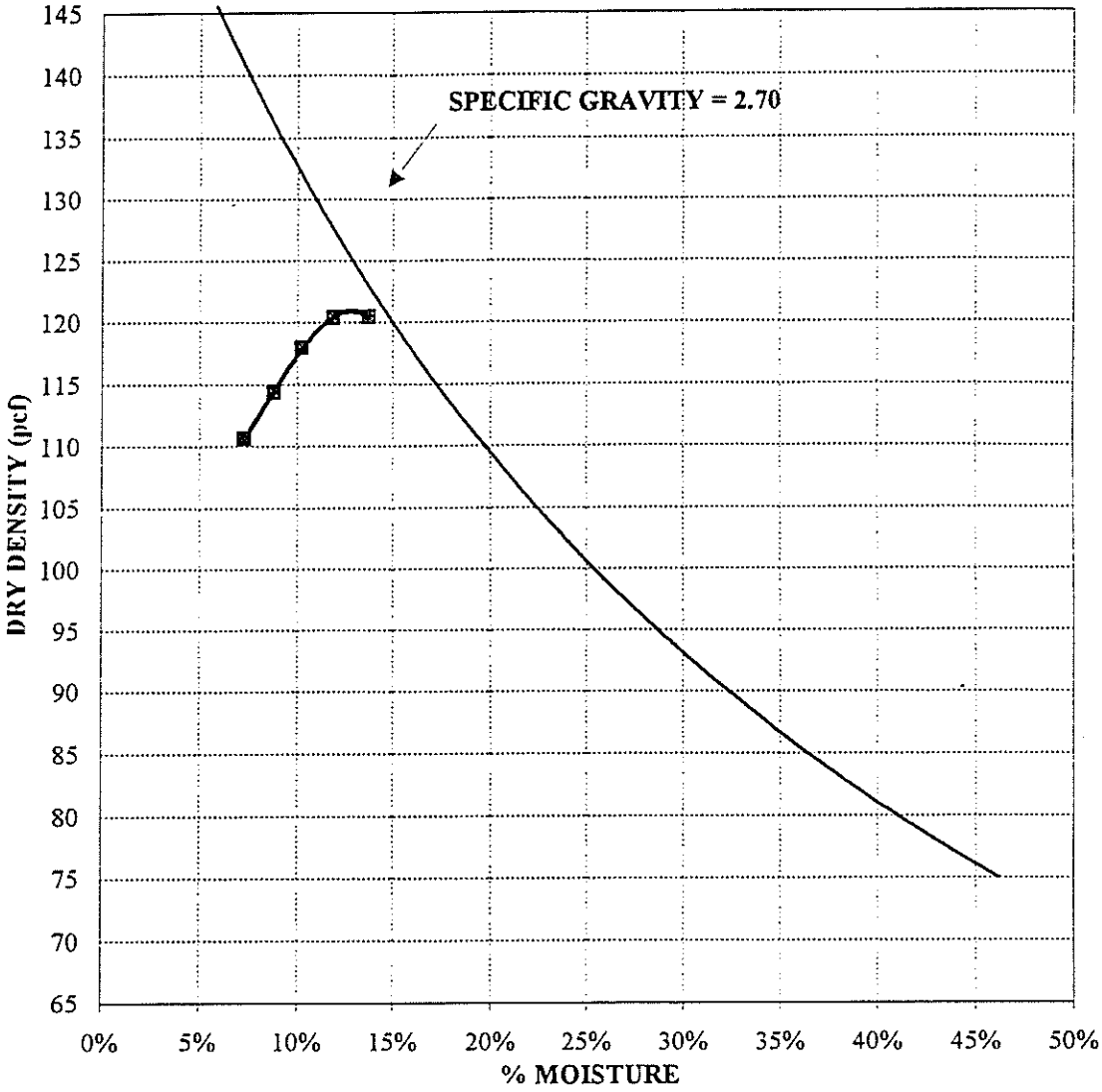
SAMPLE #:	BH-2 Bank	MAXIMUM DRY DENSITY (pcf)	92.5
	20-30'	OPTIMUM MOISTURE (%)	12.0
DESCRIPTION:	-	DELIVERED MOISTURE (%)	-
	-	LL:	-
	-	PL:	-
		PI:	-

DATE:	10/30/97
TECH:	JE
REVIEW:	BB

COPPER RANGE/MI
973-2255.210

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

MOISTURE-DENSITY CURVE
ASTM D 698, METHOD A

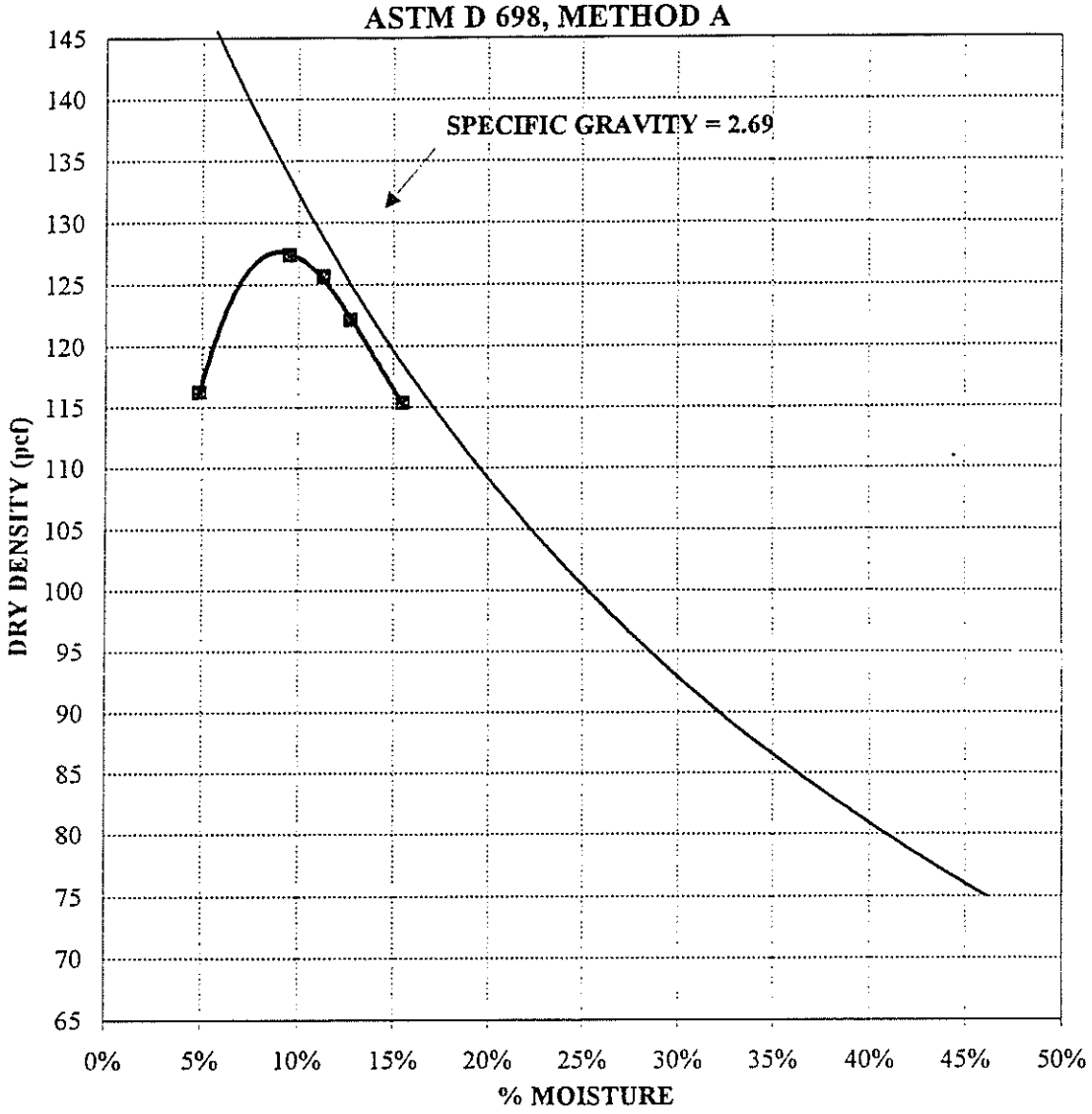


SAMPLE #:	BH-3	MAXIMUM DRY DENSITY (pcf)	120.5
	5'-30'	OPTIMUM MOISTURE (%)	12.0
DESCRIPTION:	-	DELIVERED MOISTURE (%)	-
	-	LL:	-
	-	PL:	-
		PI:	-
		DATE:	10/30/97
		TECH:	JE
		REVIEW:	BB

COPPER RANGE/MI
973-2255.210

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

MOISTURE-DENSITY CURVE
ASTM D 698, METHOD A



SAMPLE #:	BH-6 0-20'	MAXIMUM DRY DENSITY (pcf)	127.5
		OPTIMUM MOISTURE (%)	9.5
DESCRIPTION:	Silty CLAY and medium to fine sand. (CL)	DELIVERED MOISTURE (%)	-
		LL:	22
		PL:	14
		PI:	8
		DATE:	10/30/97
		TECH:	JE
		REVIEW:	BB

COPPER RANGE/MI
973-2255.210

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

SECTION D.2.2

EMBANKMENT SOILS TRIAXIAL DATA

Staged Triaxial Consolidated Undrained Lab Data

From: GOLDER ASSOCIATES INC.

Project: Copper Range/MI

Project Number: 973-2255

Sample Number	BH-2
Depth	20-30 ft.
Effective Stress Analysis	

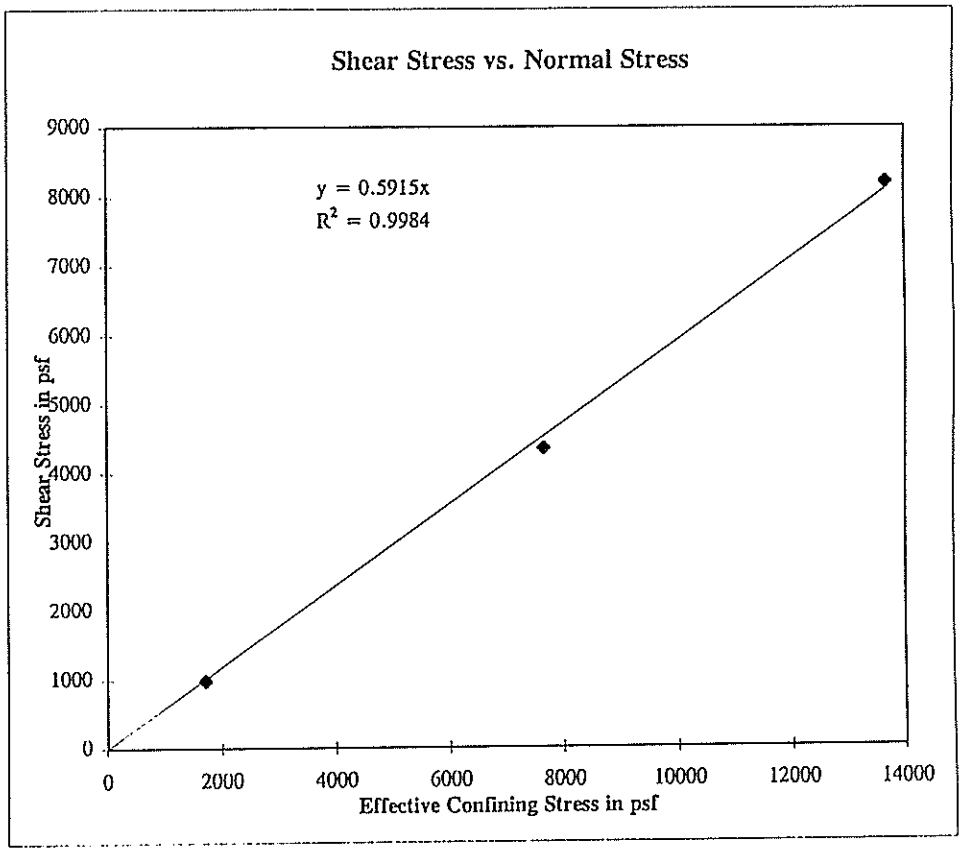
	P' (psf)	Q (psf)
BH-2A	1714	979
BH-2B	7646	4349
BH-2C	13680	8194

Slope = 0.5915

Intercept= 0

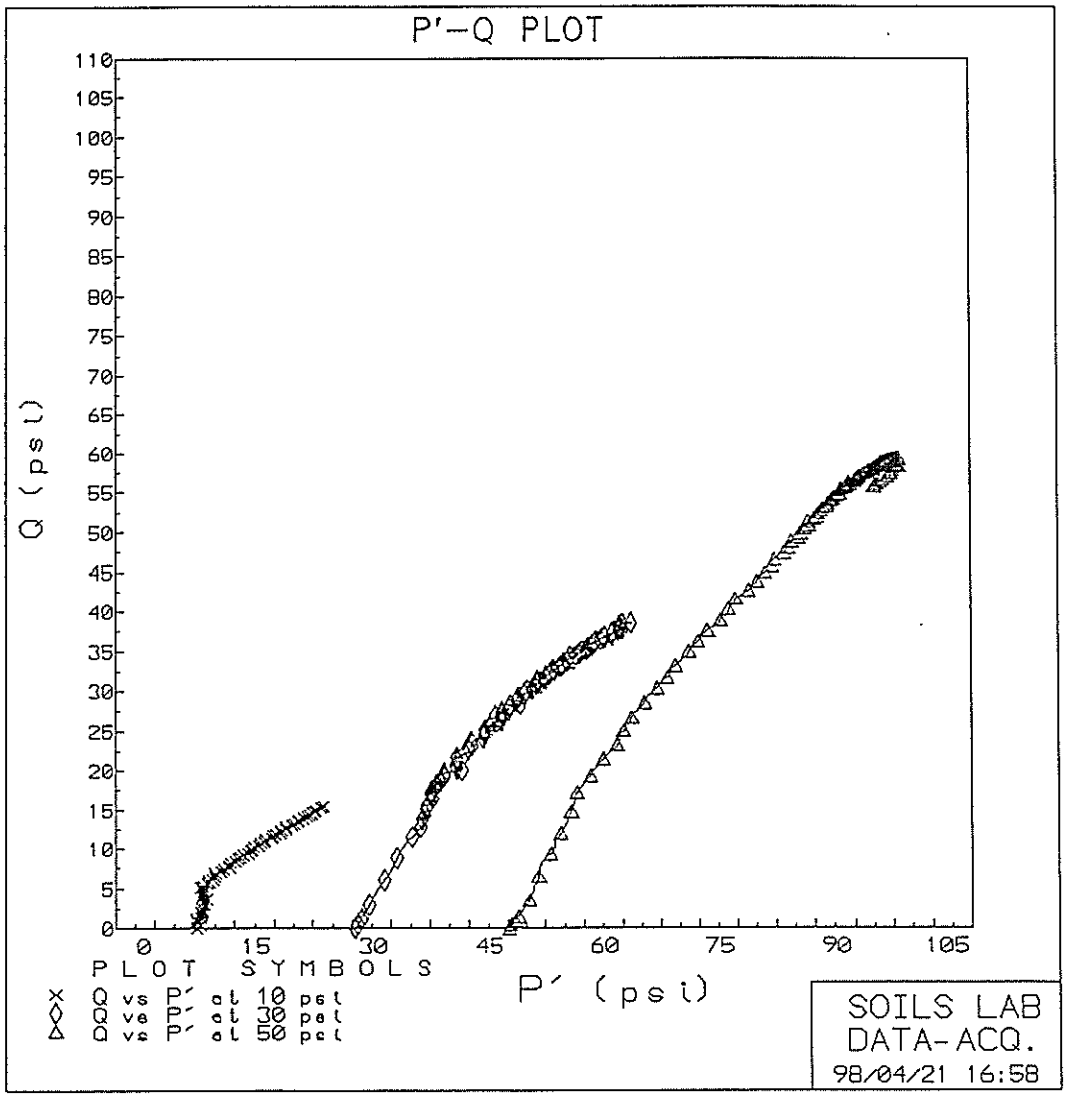
ϕ' = 36.3 degrees

c' = 0 psf



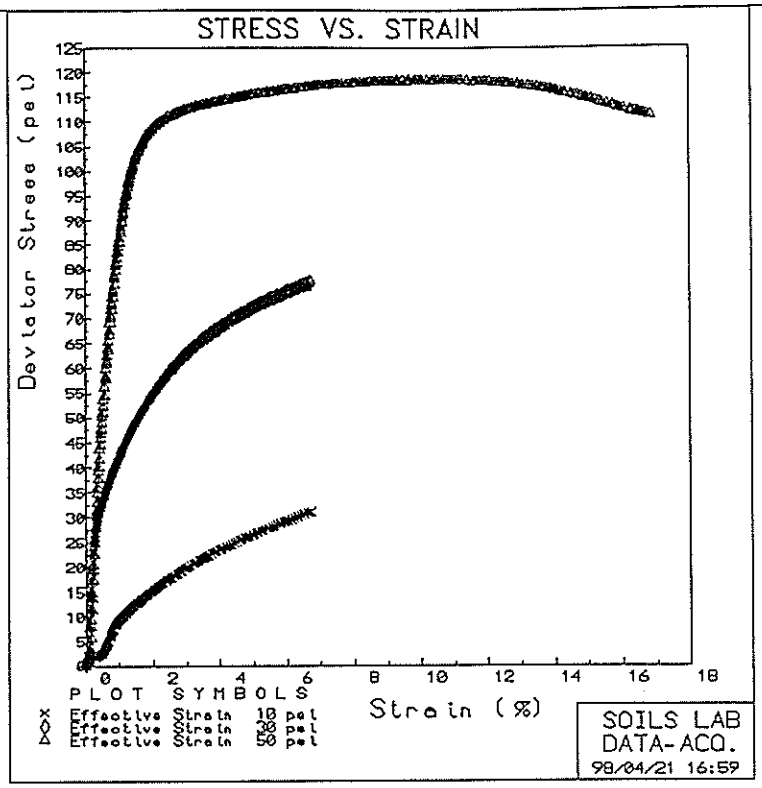
Boring Number	BH2	BH2	BH2
Sample Number	BH2	BH2	BH2
Sample Depth (ft.)	20-30ft	20-30ft	20-30ft
Sample Diameter (in.)	2.83	2.83	2.83
Sample Length (in.)	6.10	6.10	6.10
Dry Density (pcf)	84.7	84.7	84.7
Initial Moisture Content (%)	11.3	11.3	11.3
Final Moisture Content (%)	31.1	31.1	31.1
Strain Rate (in./min)	0.0039	0.0039	0.0039
Effective Stress (psi)	10.0	30.0	50.0
Back Pressure (psi)	50.0	50.0	50.0

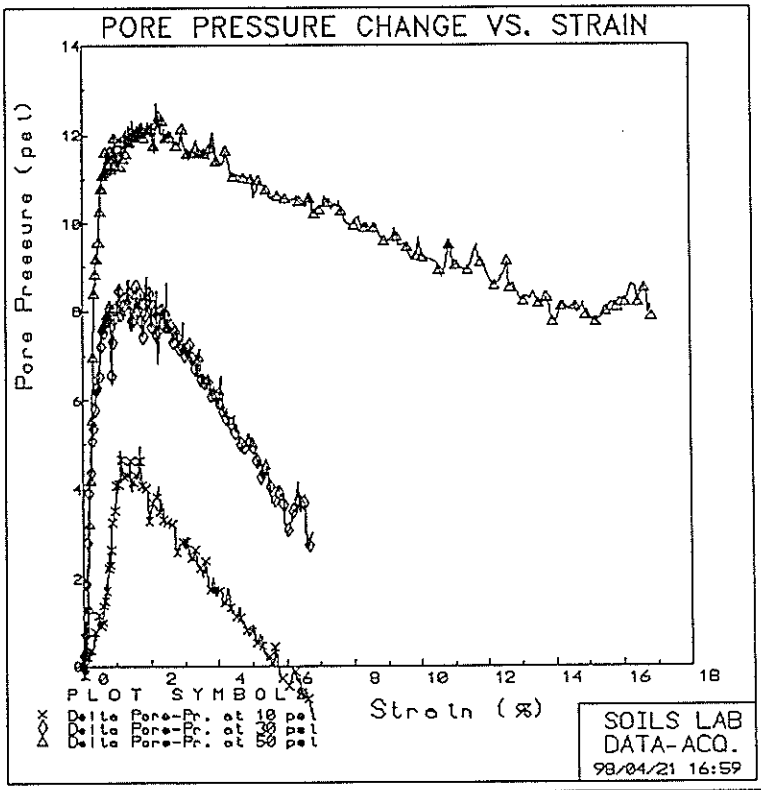
Alpha = Phi = A = C =



GOLDER ASSOCIATES INC			TITLE STAGED CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION	
Client/Project COPPER RANGE/MI			SAMPLE DESCR/ID BH2 BANK	REPORT ID 2255-R1
DRAWN BDM	CHECKED DD	REVIEWED DJ	DATE JAN98	JOB NO. 973-2255 FIGURE --

2255BH2A 2255BH2B 2255BH2C





GOLDER ASSOCIATES INC			TITLE STAGED CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION		
Client/Project COPPER RANGE/MI			SAMPLE DESCR/ID BH2 BANK		REPORT ID 2255-R1
DRAWN BDM	CHECKED DD	REVIEWED DJ	DATE JAN98	JOB NO. 973-2255	FIGURE --

COPPER RANGE/MI
STAGED CONSOLIDATED UNDRAINED
TRIAXIAL COMPRESSION

SAMPLE NUMBER BH2

SAMPLE DEPTH (FEET) 20-30ft

BORING NUMBER BH2

EFFECTIVE STRESS (PSI) 10.0

Reading Nbr	Strain %	Area crrctd in^2	Force crrctd lbs	sigma1 psi	sigma3 psi	Deviator Stress sig1-sig3	Pore Press. psi	sig_1' psi	sig_3' psi	Q psi	P' psi
0	0.0	6.28	0.0	60.0	60.0	0.0	0.0	10.2	10.2	0.0	10.2
1	0.6	6.32	27.7	64.4	60.0	4.4	1.5	13.1	8.7	2.2	10.9
2	0.8	6.33	49.5	67.8	60.0	7.8	3.2	14.8	7.0	3.9	10.9
3	1.1	6.34	62.7	69.9	60.0	9.9	4.1	15.9	6.0	4.9	11.0
4	1.3	6.36	72.0	71.3	60.0	11.3	4.3	17.2	5.9	5.7	11.5
5	1.5	6.37	79.9	72.5	60.0	12.5	4.2	18.5	6.0	6.3	12.3
6	1.7	6.38	87.8	73.8	60.0	13.8	4.5	19.4	5.7	6.9	12.6
7	1.9	6.40	95.1	74.9	60.0	14.9	3.8	21.3	6.4	7.4	13.8
8	2.1	6.41	103.0	76.1	60.0	16.1	3.8	22.5	6.4	8.0	14.4
9	2.3	6.42	109.6	77.1	60.0	17.1	3.7	23.5	6.5	8.5	15.0
10	2.5	6.44	116.2	78.0	60.0	18.0	3.3	24.9	6.8	9.0	15.9
11	2.7	6.45	122.1	78.9	60.0	18.9	2.6	26.5	7.5	9.5	17.0
12	3.0	6.47	128.1	79.8	60.0	19.8	2.8	27.2	7.4	9.9	17.3
13	3.2	6.48	133.3	80.6	60.0	20.6	2.5	28.3	7.7	10.3	18.0
14	3.4	6.49	138.6	81.3	60.0	21.3	2.4	29.1	7.8	10.7	18.5
15	3.6	6.51	143.9	82.1	60.0	22.1	2.2	30.1	8.0	11.1	19.0
16	3.8	6.52	149.2	82.9	60.0	22.9	1.8	31.3	8.4	11.4	19.8
17	4.0	6.54	154.5	83.6	60.0	23.6	1.8	32.0	8.4	11.8	20.2
18	4.2	6.55	159.1	84.3	60.0	24.3	1.6	32.9	8.6	12.1	20.7
19	4.4	6.57	163.7	84.9	60.0	24.9	1.2	33.9	9.0	12.5	21.4
20	4.6	6.58	168.3	85.6	60.0	25.6	1.1	34.6	9.0	12.8	21.8
21	4.9	6.60	172.9	86.2	60.0	26.2	0.7	35.6	9.4	13.1	22.5
22	5.1	6.61	177.6	86.9	60.0	26.9	0.5	36.5	9.7	13.4	23.1
23	5.3	6.63	182.2	87.5	60.0	27.5	0.4	37.3	9.8	13.7	23.5
24	5.5	6.64	186.1	88.0	60.0	28.0	0.0	38.2	10.1	14.0	24.2
25	5.8	6.66	190.8	88.6	60.0	28.6	-0.1	38.9	10.3	14.3	24.6
26	6.0	6.67	194.7	89.2	60.0	29.2	-0.3	39.7	10.5	14.6	25.1
27	6.2	6.69	198.7	89.7	60.0	29.7	-0.1	39.9	10.2	14.9	25.1
28	6.4	6.70	202.6	90.2	60.0	30.2	-0.5	40.9	10.6	15.1	25.8
29	6.6	6.72	206.6	90.8	60.0	30.8	-0.6	41.5	10.7	15.4	26.1

COPPER RANGE/MI
STAGED CONSOLIDATED UNDRAINED
TRIAXIAL COMPRESSION

SAMPLE NUMBER BH2
SAMPLE DEPTH (FEET) 20-30ft
BORING NUMBER BH2
EFFECTIVE STRESS (PSI) 30.0

Reading Nbr	Strain %	Area crrctd in^2	Force crrctd lbs	sigma1 psi	sigma3 psi	Deviator Stress sig1-sig3	Pore Press. psi	sig_1' psi	sig_3' psi	Q psi	P' psi
0	0.0	6.28	0.0	80.0	80.0	0.0	0.0	30.4	30.4	0.0	30.4
1	0.7	6.32	227.7	116.0	80.0	36.0	7.9	58.6	22.6	18.0	40.6
2	0.9	6.33	252.2	119.8	80.0	39.8	6.6	63.7	23.9	19.9	43.8
3	1.1	6.34	273.3	123.1	80.0	43.1	8.4	65.1	22.1	21.5	43.6
4	1.3	6.36	293.7	126.2	80.0	46.2	8.3	68.4	22.2	23.1	45.3
5	1.5	6.37	312.2	129.0	80.0	49.0	7.9	71.5	22.5	24.5	47.0
6	1.7	6.38	328.7	131.5	80.0	51.5	8.4	73.5	22.0	25.7	47.8
7	1.9	6.40	343.9	133.8	80.0	53.8	8.4	75.8	22.0	26.9	48.9
8	2.1	6.41	357.1	135.7	80.0	55.7	8.0	78.1	22.4	27.9	50.2
9	2.3	6.42	369.6	137.6	80.0	57.6	7.8	80.2	22.6	28.8	51.4
10	2.5	6.44	381.5	139.3	80.0	59.3	8.1	81.6	22.3	29.6	51.9
11	2.7	6.45	392.7	140.9	80.0	60.9	7.5	83.8	22.9	30.4	53.3
12	2.9	6.46	402.7	142.3	80.0	62.3	7.0	85.7	23.4	31.1	54.6
13	3.1	6.48	411.9	143.6	80.0	63.6	7.1	86.9	23.3	31.8	55.1
14	3.3	6.49	420.5	144.8	80.0	64.8	6.7	88.5	23.7	32.4	56.1
15	3.5	6.51	428.4	145.8	80.0	65.8	6.4	89.9	24.0	32.9	56.9
16	3.7	6.52	436.3	146.9	80.0	66.9	6.4	90.9	24.0	33.5	57.5
17	4.0	6.53	443.6	147.9	80.0	67.9	5.9	92.4	24.5	33.9	58.5
18	4.2	6.55	450.8	148.8	80.0	68.8	5.7	93.6	24.7	34.4	59.1
19	4.4	6.56	457.4	149.7	80.0	69.7	5.4	94.7	25.0	34.8	59.8
20	4.6	6.58	464.0	150.5	80.0	70.5	5.3	95.7	25.2	35.3	60.4
21	4.8	6.59	470.0	151.3	80.0	71.3	4.9	96.8	25.5	35.6	61.1
22	5.0	6.61	475.9	152.0	80.0	72.0	5.1	97.3	25.3	36.0	61.3
23	5.2	6.62	481.9	152.8	80.0	72.8	4.6	98.6	25.8	36.4	62.2
24	5.4	6.64	487.8	153.5	80.0	73.5	4.4	99.5	26.0	36.8	62.8
25	5.6	6.65	492.4	154.0	80.0	74.0	3.7	100.8	26.8	37.0	63.8
26	5.8	6.67	497.7	154.7	80.0	74.7	3.9	101.2	26.6	37.3	63.9
27	6.1	6.68	503.6	155.4	80.0	75.4	3.1	102.7	27.3	37.7	65.0
28	6.3	6.70	508.3	155.9	80.0	75.9	3.5	102.9	27.0	38.0	64.9
29	6.5	6.71	513.5	156.5	80.0	76.5	3.6	103.4	26.9	38.3	65.1
30	6.7	6.73	518.2	157.0	80.0	77.0	2.8	104.6	27.6	38.5	66.1

COPPER RANGE/MI
STAGED CONSOLIDATED UNDRAINED
TRIAXIAL COMPRESSION

SAMPLE NUMBER BH2

SAMPLE DEPTH (FEET) 20-30ft

BORING NUMBER BH2

EFFECTIVE STRESS (PSI) 50.0

Reading Nbr	Strain %	Area crrctd in^2	Force crrctd lbs	sigma1 psi	sigma3 psi	Deviator Stress sig1-sig3	Pore Press. psi	sig_1' psi	sig_3' psi	Q psi	P' psi
0	0.0	6.28	0.0	100.0	100.0	0.0	0.0	50.3	50.3	0.0	50.3
1	0.6	6.32	390.8	161.9	100.0	61.9	11.3	100.9	39.0	30.9	69.9
2	1.0	6.34	557.8	187.9	100.0	87.9	11.3	126.9	39.0	44.0	83.0
3	1.5	6.37	650.8	202.2	100.0	102.2	12.0	140.4	38.2	51.1	89.3
4	1.9	6.39	689.8	207.9	100.0	107.9	12.0	146.2	38.3	53.9	92.2
5	2.3	6.42	708.9	210.4	100.0	110.4	12.4	148.2	37.9	55.2	93.0
6	2.7	6.45	720.8	211.8	100.0	111.8	12.1	150.0	38.2	55.9	94.1
7	3.1	6.48	730.7	212.8	100.0	112.8	11.6	151.5	38.7	56.4	95.1
8	3.5	6.50	738.6	213.6	100.0	113.6	11.5	152.3	38.7	56.8	95.5
9	3.9	6.53	745.9	214.2	100.0	114.2	11.9	152.6	38.4	57.1	95.5
10	4.3	6.56	753.1	214.8	100.0	114.8	11.3	153.7	39.0	57.4	96.3
11	4.8	6.59	759.7	215.3	100.0	115.3	11.1	154.5	39.2	57.7	96.9
12	5.2	6.62	767.0	215.9	100.0	115.9	10.8	155.4	39.5	57.9	97.4
13	5.6	6.65	772.9	216.3	100.0	116.3	10.6	156.0	39.7	58.1	97.9
14	6.0	6.68	779.6	216.7	100.0	116.7	10.6	156.4	39.7	58.4	98.1
15	6.4	6.71	785.5	217.1	100.0	117.1	10.5	156.9	39.8	58.5	98.3
16	6.9	6.74	791.4	217.4	100.0	117.4	10.2	157.5	40.1	58.7	98.8
17	7.3	6.77	796.7	217.7	100.0	117.7	10.5	157.5	39.8	58.8	98.7
18	7.7	6.80	802.0	217.9	100.0	117.9	10.1	158.1	40.2	59.0	99.1
19	8.2	6.83	807.3	218.1	100.0	118.1	10.2	158.2	40.1	59.1	99.2
20	8.6	6.87	811.9	218.3	100.0	118.3	9.9	158.6	40.4	59.1	99.5
21	9.0	6.90	816.5	218.4	100.0	118.4	9.6	159.0	40.7	59.2	99.9
22	9.4	6.93	821.1	218.5	100.0	118.5	9.5	159.2	40.8	59.2	100.0
23	9.9	6.96	825.8	218.6	100.0	118.6	9.3	159.6	41.0	59.3	100.3
24	10.3	7.00	829.7	218.6	100.0	118.6	9.2	159.7	41.1	59.3	100.4
25	10.7	7.03	833.7	218.6	100.0	118.6	8.9	160.0	41.4	59.3	100.7
26	11.2	7.06	837.6	218.6	100.0	118.6	9.0	159.8	41.2	59.3	100.5
27	11.6	7.10	840.9	218.5	100.0	118.5	9.4	159.4	40.9	59.2	100.2
28	12.0	7.13	843.6	218.2	100.0	118.2	8.8	159.7	41.5	59.1	100.6
29	12.5	7.17	846.2	218.0	100.0	118.0	8.8	159.5	41.5	59.0	100.5
30	12.9	7.21	848.9	217.8	100.0	117.8	8.4	159.7	41.9	58.9	100.8
31	13.4	7.24	850.2	217.4	100.0	117.4	8.4	159.2	41.9	58.7	100.5
32	13.8	7.28	850.8	216.9	100.0	116.9	8.2	158.9	42.1	58.4	100.5
33	14.2	7.32	850.8	216.3	100.0	116.3	8.1	158.5	42.2	58.2	100.3
34	14.7	7.35	849.5	215.5	100.0	115.5	8.0	157.8	42.3	57.8	100.1
35	15.0					114.8					
36	15.0	7.39	848.2	214.8	100.0	114.8	7.9	157.2	42.4	57.4	99.8
36	15.4	7.42	845.6	213.9	100.0	113.9	7.9	156.3	42.4	57.0	99.3
37	15.9	7.46	843.6	213.1	100.0	113.1	8.1	155.3	42.2	56.5	98.7
38	16.3	7.50	841.6	212.2	100.0	112.2	8.6	153.9	41.7	56.1	97.8
39	16.8	7.54	840.3	211.4	100.0	111.4	8.0	153.8	42.3	55.7	98.0

Triaxial Consolidated Undrained Lab Data

From: GOLDER ASSOCIATES INC.

Project: Copper Range/MI

Project Number: 973-2255

Sample Number	BH-3
Depth	5-30 ft.
Effective Stress Analysis	

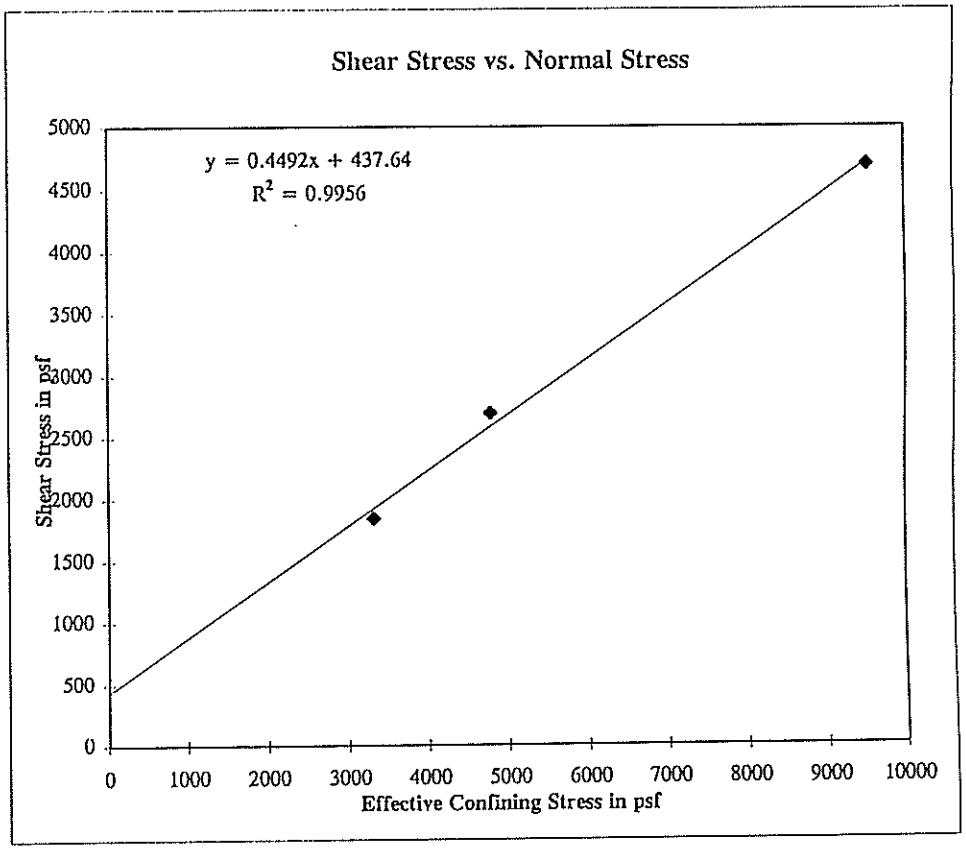
	P' (psf)	Q (psf)
BH-3A	4781	2693
BH-3B	3312	1843
BH-3C	9533	4694

Slope = 0.4492

Intercept= 437.64

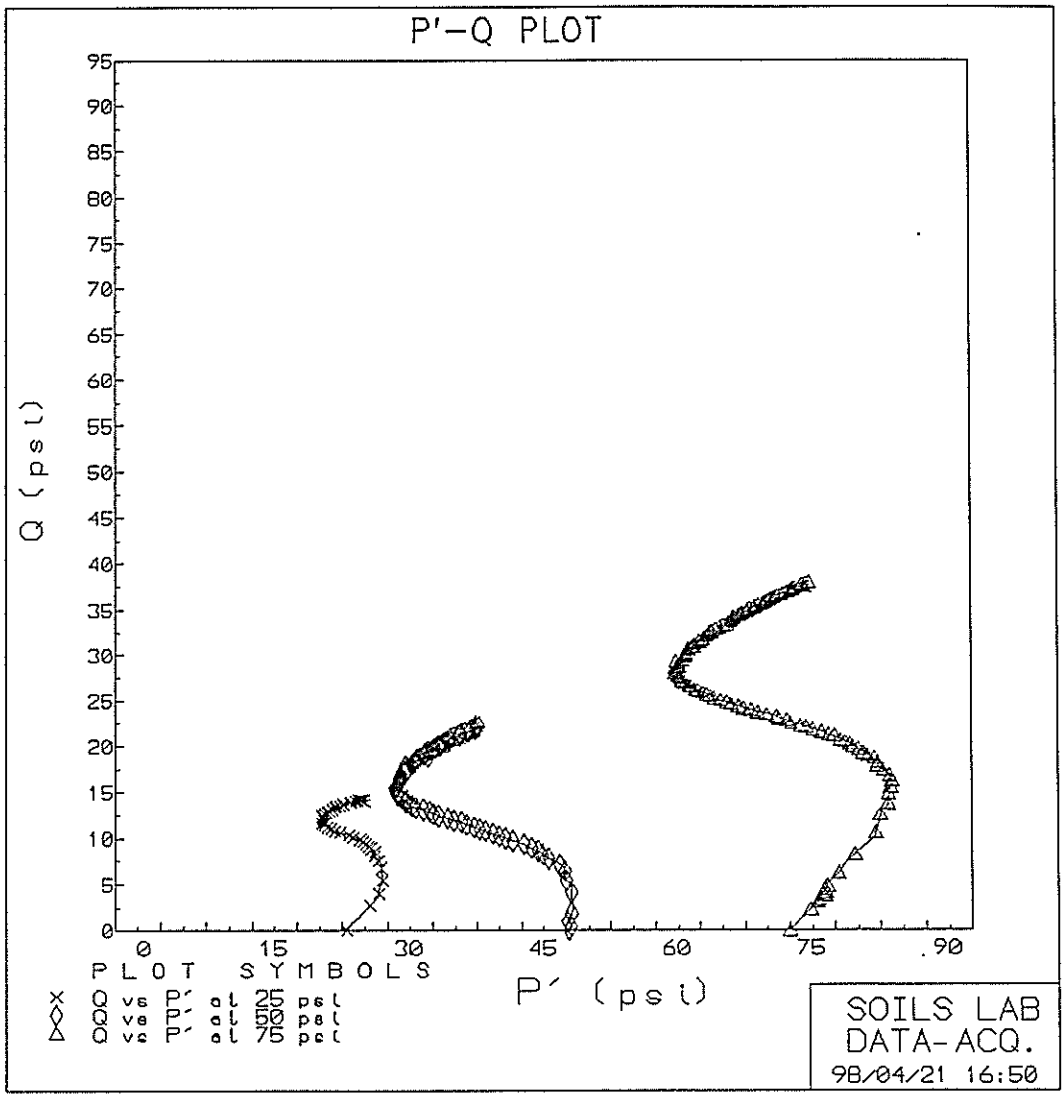
ϕ' = 26.7 degrees

c' = 490 psf



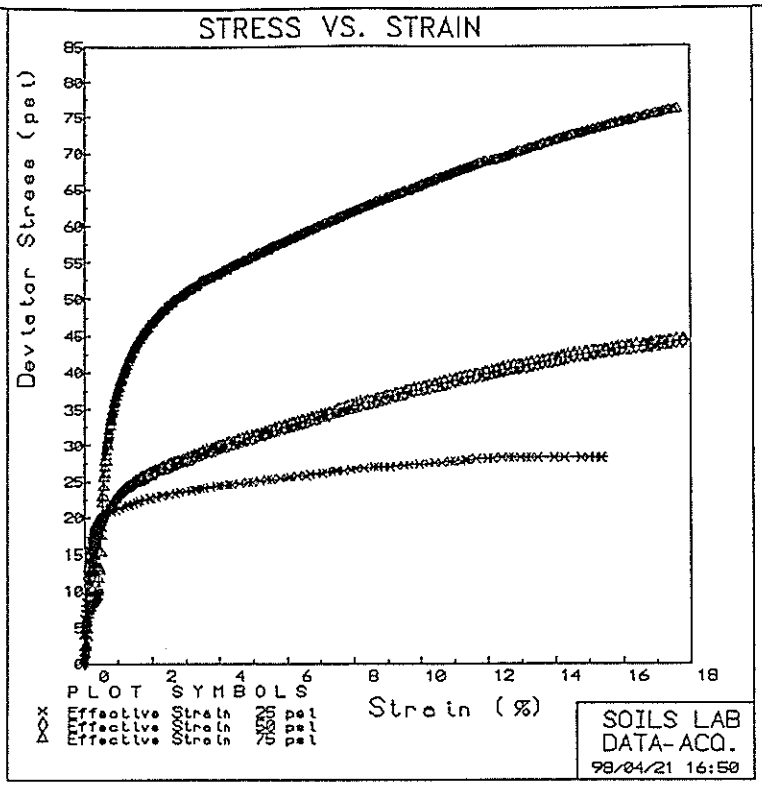
Boring Number	BH3	BH3	BH3
Sample Number	BH3	BH3	BH3
Sample Depth (ft.)	5-30	5-30	5-30
Sample Diameter (in.)	2.87	2.87	2.89
Sample Length (in.)	5.78	5.71	5.80
Dry Density (pcf)	115.4	117.0	113.7
Initial Moisture Content (%)	11.6	11.6	11.9
Final Moisture Content (%)	14.3	13.0	12.2
Strain Rate (in./min)	0.0039	0.0039	0.0039
Effective Stress (psi)	25.0	50.0	75.0
Back Pressure (psi)	75.0	50.0	25.0

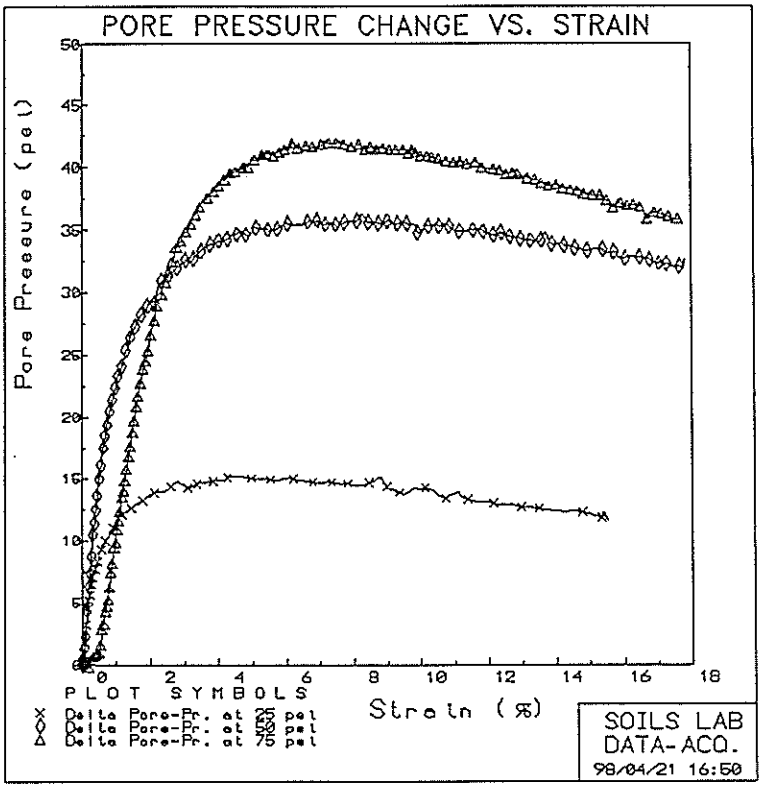
Alpha = Phi = A = C =



GOLDER ASSOCIATES INC		TITLE CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION	
Client/Project COPPER RANGE/MI		SAMPLE DESCR/ID BH3 5 to 30ft	REPORT ID 2255-R2
DRAWN BDM	CHECKED DD	REVIEWED DJ	DATE JAN98	JOB NO. 973-2255	FIGURE --

22558H3B 22558H3A 22558H3C





GOLDER ASSOCIATES INC			TITLE CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION		
Client/Project COPPER RANGE/MI			SAMPLE DESCR/ID BH3 5 to 30ft		REPORT ID 2255-R2
DRAWN BDM	CHECKED DD	REVIEWED DJ	DATE JAN98	JOB NO. 973-2255	FIGURE --

COPPER RANGE/MI
CONSOLIDATED UNDRAINED
TRIAXIAL COMPRESSION

SAMPLE NUMBER BH3

SAMPLE DEPTH (FEET) 5-30

BORING NUMBER BH3

EFFECTIVE STRESS (PSI) 25.0

Reading Nbr	Strain %	Area crrctd in^2	Force crrctd lbs	sigma1 psi	sigma3 psi	Deviator Stress sig1-sig3	Pore Press. psi	sig_1' psi	sig_3' psi	Q psi	P' psi
0	0.0	6.49	0.0	100.0	100.0	0.0	0.0	25.6	25.6	0.0	25.6
1	0.7	6.53	134.7	120.6	100.0	20.6	10.0	36.2	15.6	10.3	25.9
2	0.9	6.55	138.0	121.1	100.0	21.1	11.0	35.6	14.6	10.5	25.1
3	1.1	6.56	140.6	121.4	100.0	21.4	11.9	35.1	13.7	10.7	24.4
4	1.3	6.57	143.2	121.8	100.0	21.8	12.3	35.0	13.3	10.9	24.1
5	1.6	6.59	145.9	122.1	100.0	22.1	12.8	34.9	12.7	11.1	23.8
6	1.8	6.60	147.9	122.4	100.0	22.4	13.2	34.7	12.3	11.2	23.5
7	2.0	6.62	149.8	122.6	100.0	22.6	13.8	34.4	11.8	11.3	23.1
8	2.3	6.64	152.5	123.0	100.0	23.0	14.0	34.6	11.6	11.5	23.1
9	2.5	6.65	154.5	123.2	100.0	23.2	14.0	34.8	11.6	11.6	23.2
10	2.8	6.67	156.4	123.4	100.0	23.4	14.8	34.2	10.8	11.7	22.5
11	3.1	6.69	158.4	123.7	100.0	23.7	14.2	35.0	11.3	11.8	23.2
12	3.3	6.71	159.7	123.8	100.0	23.8	14.5	34.9	11.1	11.9	23.0
13	3.5	6.73	161.7	124.0	100.0	24.0	14.7	34.9	10.9	12.0	22.9
14	3.8	6.75	163.7	124.3	100.0	24.3	14.8	35.0	10.8	12.1	22.9
15	4.1	6.76	165.7	124.5	100.0	24.5	14.9	35.2	10.7	12.2	22.9
16	4.4	6.78	167.0	124.6	100.0	24.6	15.2	35.0	10.4	12.3	22.7
17	4.6	6.80	168.3	124.8	100.0	24.8	15.2	35.1	10.4	12.4	22.8
18	4.8	6.82	169.6	124.9	100.0	24.9	15.0	35.4	10.5	12.4	23.0
19	5.1	6.83	171.0	125.0	100.0	25.0	15.0	35.6	10.6	12.5	23.1
20	5.3	6.85	172.3	125.1	100.0	25.1	15.0	35.7	10.6	12.6	23.2
21	5.5	6.87	173.6	125.3	100.0	25.3	14.9	35.9	10.6	12.6	23.3
22	5.8	6.89	174.9	125.4	100.0	25.4	14.9	36.1	10.7	12.7	23.4
23	6.0	6.90	176.2	125.5	100.0	25.5	15.0	36.1	10.6	12.8	23.3
24	6.3	6.93	178.2	125.7	100.0	25.7	14.9	36.4	10.6	12.9	23.5
25	6.6	6.94	179.5	125.9	100.0	25.9	14.8	36.6	10.8	12.9	23.7
26	6.8	6.96	180.9	126.0	100.0	26.0	14.7	36.8	10.8	13.0	23.8
27	7.1	6.98	182.8	126.2	100.0	26.2	14.7	37.1	10.9	13.1	24.0
28	7.4	7.00	184.8	126.4	100.0	26.4	14.7	37.2	10.8	13.2	24.0
29	7.6	7.02	186.1	126.5	100.0	26.5	14.6	37.5	11.0	13.3	24.2
30	7.8	7.04	187.5	126.6	100.0	26.6	14.6	37.6	10.9	13.3	24.3
31	8.0	7.05	188.8	126.8	100.0	26.8	14.5	37.9	11.1	13.4	24.5
32	8.3	7.08	190.1	126.9	100.0	26.9	14.5	37.9	11.1	13.4	24.5
33	8.6	7.10	191.4	127.0	100.0	27.0	14.8	37.7	10.8	13.5	24.3
34	8.8	7.12	192.1	127.0	100.0	27.0	15.0	37.5	10.5	13.5	24.0
35	9.1	7.14	193.4	127.1	100.0	27.1	14.2	38.5	11.4	13.6	24.9
36	9.4	7.16	194.7	127.2	100.0	27.2	13.9	38.9	11.7	13.6	25.3
37	9.6	7.18	196.0	127.3	100.0	27.3	14.0	38.9	11.6	13.7	25.2
38	10.0	7.21	197.4	127.4	100.0	27.4	14.2	38.8	11.4	13.7	25.1
39	10.3	7.23	198.7	127.5	100.0	27.5	14.1	38.9	11.4	13.7	25.2
40	10.5	7.25	200.0	127.6	100.0	27.6	13.7	39.5	11.9	13.8	25.7
41	10.8	7.27	201.3	127.7	100.0	27.7	13.4	39.8	12.1	13.8	26.0
42	11.0	7.29	202.6	127.8	100.0	27.8	13.7	39.7	11.9	13.9	25.8
43	11.3	7.31	204.0	127.9	100.0	27.9	13.6	39.9	12.0	14.0	26.0
44	11.5	7.33	205.3	128.0	100.0	28.0	13.2	40.4	12.4	14.0	26.4
45	11.8	7.36	206.6	128.1	100.0	28.1	13.2	40.5	12.4	14.0	26.5
46	12.1	7.38	207.9	128.2	100.0	28.2	13.0	40.7	12.6	14.1	26.6
47	12.4	7.41	209.2	128.3	100.0	28.3	12.9	40.9	12.7	14.1	26.8
48	12.6	7.43	209.9	128.3	100.0	28.3	12.9	40.9	12.6	14.1	26.8
49	12.9	7.44	210.6	128.3	100.0	28.3	12.8	41.1	12.8	14.1	26.9
50	13.1	7.47	211.2	128.3	100.0	28.3	12.7	41.1	12.8	14.1	27.0
51	13.4	7.49	211.9	128.3	100.0	28.3	12.6	41.3	13.0	14.1	27.1
52	13.7	7.52	212.5	128.3	100.0	28.3	12.5	41.4	13.1	14.1	27.2
53	14.0	7.54	213.2	128.3	100.0	28.3	12.4	41.5	13.2	14.1	27.3
54	14.3	7.57	213.9	128.3	100.0	28.3	12.3	41.5	13.3	14.1	27.4
55	14.5	7.59	214.5	128.3	100.0	28.3	12.4	41.5	13.2	14.1	27.3
56	14.8	7.61	215.2	128.3	100.0	28.3	12.3	41.6	13.3	14.1	27.4
57	15.1					28.3					
57	15.1	7.64	215.8	128.3	100.0	28.3	12.0	41.8	13.6	14.1	27.7
58	15.3	7.66	216.5	128.3	100.0	28.3	11.9	41.9	13.7	14.1	27.8

COPPER RANGE/MI
CONSOLIDATED UNDRAINED
TRIAXIAL COMPRESSION

SAMPLE NUMBER BH3

SAMPLE DEPTH (FEET) 5-30

BORING NUMBER BH3

EFFECTIVE STRESS (PSI) 50.0

Reading Nbr	Strain %	Area crrctd in^2	Force crrctd lbs	sigma1 psi	sigma3 psi	Deviator Stress sig1-sig3	Pore Press. psi	sig_1' psi	sig_3' psi	Q psi	P' psi
0	0.0	6.49	0.0	100.0	100.0	0.0	0.0	50.3	50.3	0.0	50.3
1	0.7	6.53	136.0	120.8	100.0	20.8	18.7	52.5	31.7	10.4	42.1
2	1.1	6.56	153.1	123.3	100.0	23.3	23.6	50.0	26.7	11.7	38.4
3	1.5	6.59	163.7	124.9	100.0	24.9	27.0	48.1	23.3	12.4	35.7
4	1.9	6.61	171.6	125.9	100.0	25.9	29.0	47.3	21.3	13.0	34.3
5	2.3	6.64	178.2	126.8	100.0	26.8	30.9	46.2	19.4	13.4	32.8
6	2.7	6.67	184.2	127.6	100.0	27.6	31.8	46.1	18.5	13.8	32.3
7	3.1	6.70	189.4	128.3	100.0	28.3	32.4	46.2	17.9	14.1	32.1
8	3.6	6.73	195.4	129.0	100.0	29.0	33.4	46.0	16.9	14.5	31.5
9	4.0	6.76	201.3	129.8	100.0	29.8	34.1	46.0	16.2	14.9	31.1
10	4.5	6.79	206.6	130.4	100.0	30.4	34.6	46.1	15.7	15.2	30.9
11	4.9	6.82	211.9	131.1	100.0	31.1	34.5	46.9	15.8	15.5	31.4
12	5.3	6.85	217.2	131.7	100.0	31.7	35.1	47.0	15.3	15.8	31.1
13	5.8	6.88	222.5	132.3	100.0	32.3	35.1	47.5	15.2	16.2	31.4
14	6.2	6.92	227.7	132.9	100.0	32.9	35.4	47.8	14.9	16.5	31.4
15	6.7	6.95	233.0	133.5	100.0	33.5	35.7	48.2	14.7	16.8	31.4
16	7.1	6.98	238.3	134.1	100.0	34.1	35.4	49.1	15.0	17.1	32.0
17	7.5	7.01	243.6	134.7	100.0	34.7	35.5	49.6	14.9	17.4	32.2
18	7.9	7.05	248.9	135.3	100.0	35.3	35.7	50.0	14.6	17.7	32.3
19	8.3	7.08	253.5	135.8	100.0	35.8	36.1	50.1	14.3	17.9	32.2
20	8.8	7.11	258.1	136.3	100.0	36.3	35.5	51.1	14.8	18.1	32.9
21	9.2	7.15	263.4	136.9	100.0	36.9	35.6	51.6	14.8	18.4	33.2
22	9.7	7.18	268.7	137.4	100.0	37.4	35.4	52.3	14.9	18.7	33.6
23	10.1	7.21	273.3	137.9	100.0	37.9	34.9	53.3	15.4	18.9	34.4
24	10.5	7.25	277.9	138.3	100.0	38.3	35.4	53.2	14.9	19.2	34.1
25	10.9	7.28	282.5	138.8	100.0	38.8	35.1	54.0	15.2	19.4	34.6
26	11.4	7.32	287.8	139.3	100.0	39.3	34.9	54.7	15.4	19.7	35.1
27	11.8	7.36	291.8	139.7	100.0	39.7	35.0	55.0	15.3	19.8	35.1
28	12.2	7.39	296.4	140.1	100.0	40.1	34.5	55.9	15.8	20.1	35.9
29	12.7	7.43	301.0	140.5	100.0	40.5	34.4	56.4	15.9	20.3	36.2
30	13.1	7.46	305.0	140.9	100.0	40.9	34.2	57.0	16.1	20.4	36.6
31	13.5	7.50	309.6	141.3	100.0	41.3	34.0	57.6	16.3	20.6	37.0
32	14.0	7.54	314.2	141.7	100.0	41.7	33.8	58.2	16.6	20.8	37.4
33	14.4	7.58	318.8	142.1	100.0	42.1	33.7	58.7	16.6	21.0	37.6
34	14.8	7.61	322.8	142.4	100.0	42.4	33.4	59.3	17.0	21.2	38.1
35	15.0					42.5					
36	15.0	7.63	324.8	142.5	100.0	42.5	33.3	59.5	17.0	21.3	38.3
36	15.5	7.67	328.7	142.8	100.0	42.8	33.3	59.9	17.1	21.4	38.5
37	15.9	7.71	333.3	143.2	100.0	43.2	32.7	60.8	17.6	21.6	39.2
38	16.4	7.76	337.3	143.5	100.0	43.5	32.8	61.0	17.5	21.7	39.3
39	16.8	7.80	340.6	143.7	100.0	43.7	32.5	61.5	17.8	21.8	39.6
40	17.2	7.84	344.6	144.0	100.0	44.0	32.2	62.1	18.1	22.0	40.1
41	17.7	7.88	348.5	144.2	100.0	44.2	32.1	62.5	18.3	22.1	40.4

COPPER RANGE/MI
CONSOLIDATED UNDRAINED
TRIAXIAL COMPRESSION

SAMPLE NUMBER BH3

SAMPLE DEPTH (FEET) 5-30

BORING NUMBER BH3

EFFECTIVE STRESS (PSI) 75.0

Reading Nbr	Strain %	Area crrctd in^2	Force crrctd lbs	sigma1 psi	sigma3 psi	Deviator Stress sig1-sig3	Pore Press. psi	sig_1' psi	sig_3' psi	Q psi	P' psi
0	0.0	6.54	0.0	100.0	100.0	0.0	0.0	75.0	75.0	0.0	75.0
1	0.7	6.59	200.7	130.5	100.0	30.5	4.4	101.1	70.7	15.2	85.9
2	1.1	6.61	260.1	139.3	100.0	39.3	12.1	102.3	62.9	19.7	82.6
3	1.5	6.64	290.4	143.7	100.0	43.7	19.3	99.4	55.7	21.9	77.6
4	1.9	6.67	310.2	146.5	100.0	46.5	24.8	96.8	50.2	23.3	73.5
5	2.3	6.69	324.8	148.5	100.0	48.5	29.6	93.9	45.4	24.3	69.7
6	2.7	6.72	337.3	150.2	100.0	50.2	33.2	92.0	41.9	25.1	67.0
7	3.1	6.75	347.9	151.5	100.0	51.5	35.1	91.4	39.9	25.8	65.7
8	3.5	6.78	357.1	152.7	100.0	52.7	37.4	90.3	37.7	26.3	64.0
9	4.0	6.81	365.0	153.6	100.0	53.6	38.5	90.2	36.6	26.8	63.4
10	4.4	6.84	373.6	154.6	100.0	54.6	39.5	90.2	35.6	27.3	62.9
11	4.8	6.87	381.5	155.5	100.0	55.5	40.3	90.3	34.8	27.8	62.5
12	5.2	6.90	389.4	156.4	100.0	56.4	40.5	90.9	34.5	28.2	62.7
13	5.6	6.93	397.4	157.3	100.0	57.3	40.9	91.4	34.1	28.7	62.8
14	6.1	6.96	405.3	158.2	100.0	58.2	41.3	91.9	33.7	29.1	62.8
15	6.5	6.99	413.2	159.1	100.0	59.1	41.5	92.6	33.5	29.5	63.0
16	6.9	7.03	421.1	159.9	100.0	59.9	41.6	93.3	33.4	30.0	63.4
17	7.3	7.06	429.0	160.8	100.0	60.8	41.8	94.0	33.2	30.4	63.6
18	7.7	7.09	437.0	161.6	100.0	61.6	41.8	94.8	33.2	30.8	64.0
19	8.2	7.12	444.2	162.4	100.0	62.4	41.7	95.7	33.3	31.2	64.5
20	8.6	7.15	452.2	163.2	100.0	63.2	41.7	96.6	33.4	31.6	65.0
21	9.0	7.19	459.4	163.9	100.0	63.9	41.4	97.5	33.6	32.0	65.6
22	9.4	7.22	466.7	164.6	100.0	64.6	41.3	98.3	33.7	32.3	66.0
23	9.8	7.25	473.9	165.3	100.0	65.3	41.4	99.0	33.6	32.7	66.3
24	10.2	7.29	481.9	166.1	100.0	66.1	40.9	100.2	34.1	33.1	67.2
25	10.7	7.32	489.8	166.9	100.0	66.9	40.3	101.6	34.7	33.4	68.1
26	11.1	7.36	497.7	167.6	100.0	67.6	40.3	102.4	34.7	33.8	68.6
27	11.5	7.39	505.0	168.3	100.0	68.3	40.2	103.1	34.8	34.2	68.9
28	12.0	7.43	512.9	169.0	100.0	69.0	39.9	104.2	35.1	34.5	69.6
29	12.4	7.47	518.8	169.5	100.0	69.5	39.7	104.8	35.3	34.7	70.1
30	12.8	7.50	526.1	170.1	100.0	70.1	39.6	105.5	35.4	35.1	70.5
31	13.2	7.54	533.3	170.8	100.0	70.8	39.2	106.6	35.9	35.4	71.3
32	13.6	7.57	540.6	171.4	100.0	71.4	38.7	107.7	36.3	35.7	72.0
33	14.1	7.61	547.9	172.0	100.0	72.0	38.6	108.4	36.5	36.0	72.4
34	14.5	7.65	555.1	172.6	100.0	72.6	38.2	109.4	36.8	36.3	73.1
35	14.9	7.69	561.7	173.1	100.0	73.1	37.9	110.2	37.2	36.5	73.7
36	15.0					73.2					
36	15.0	7.70	563.7	173.2	100.0	73.2	38.0	110.3	37.1	36.6	73.7
37	15.4	7.74	570.3	173.7	100.0	73.7	37.4	111.3	37.6	36.9	74.5
38	15.9	7.78	577.6	174.3	100.0	74.3	37.3	112.0	37.7	37.1	74.9
39	16.3	7.82	584.2	174.7	100.0	74.7	37.0	112.8	38.0	37.4	75.4
40	16.7	7.85	590.8	175.2	100.0	75.2	35.8	114.4	39.2	37.6	76.8
41	17.1	7.89	597.4	175.7	100.0	75.7	36.3	114.5	38.8	37.8	76.6
42	17.6	7.94	604.0	176.1	100.0	76.1	35.8	115.3	39.2	38.1	77.3

SECTION D.2.3

EMBANKMENT SOILS PERMEABILITY DATA

TABLE 2

SUMMARY OF FLEXIBLE WALL PERMEABILITY TEST RESULTS

SAMPLE NUMBER	SAMPLE LENGTH (cm)	SAMPLE DIA. (cm)	SAMPLE DRY DEN. (pcf)	MAX. DRY DEN. (pcf)	COMPACTION (%)	INITIAL MOISTURE (%)	OPTIMUM MOISTURE (%)	EFFECT. STRESS (psi)	BACK PRESSURE (psi)	GRADIENT	AVERAGE PERM. (cm/sec)
BH-2 BANK	15.5	7.12	86.0	92.5	95	11.3	12.0	30	50	1	$>5.5 \times 10^{-4}$
BH-6	9.56	7.26	121.2	127.5	95	9.8	9.5	30	70	3	1.3×10^{-5}
BH-3 5'-30'	9.54	7.27	115.4	120.5	95	11.6	12.0	30	70	8	1.6×10^{-6}

APPENDIX E

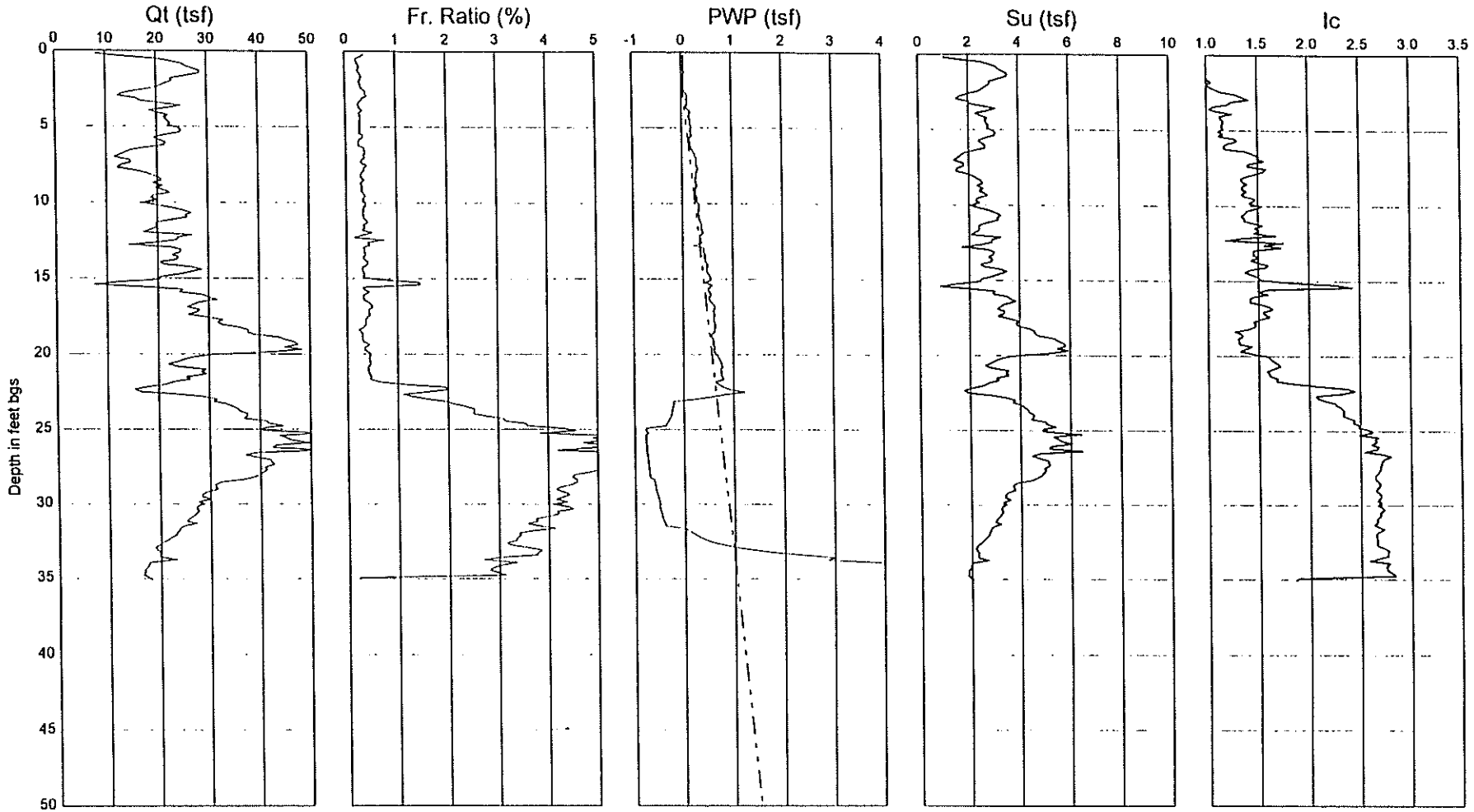
RE-INTERPRETED CPT LOGS

Cone Penetration Test - CPT-01

Test Date : 10.09.97
Location : N. 33661 ft, E.37998 ft

Operator : ConeTec

Ground Surf. Elev. : 0.00
Water Table Depth : 1.80



Qt normalized for unequal end area effects

Fr Ratio = 100*F/(Qt-Sigmav)
Gamma = 104 2 pcf

Su = (Qt - SigmaV) / Nk
Nk = 8
Gamma = 104 2 pcf

After Jefferies and Davies (1991)
Ic < 1 25 - Gravelly sands
1 25 <Ic < 1.90 - Clean to silty sand
1 90 <Ic < 2 54 - Silty sand to sandy silt
2 54 <Ic < 2 82 - Clayey silt to silty clay
2 82 <Ic < 3 22 - Clays

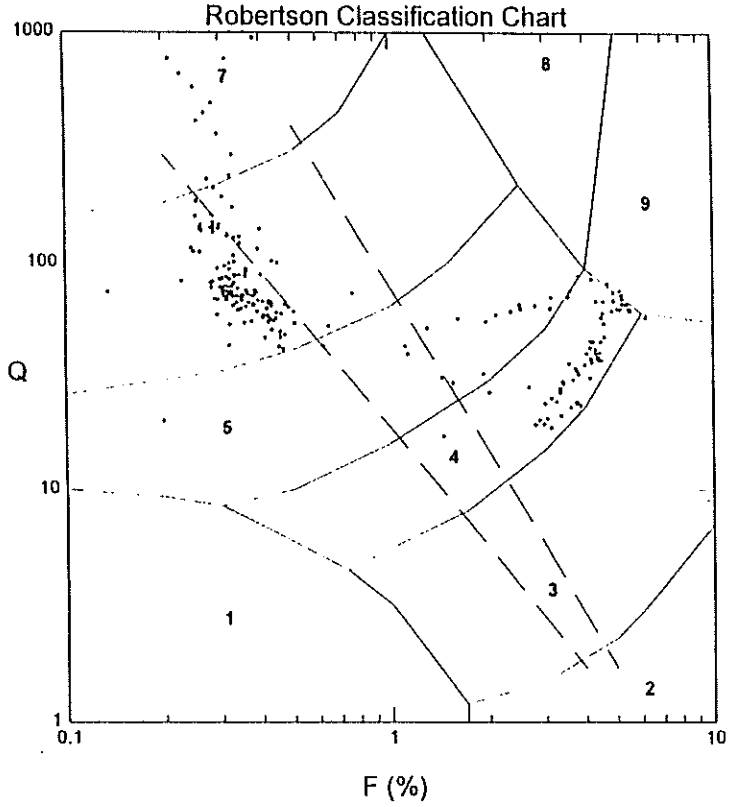
PROJECT NO. 973-2255 DATE: 2/9/98 DRAWN BY RTS

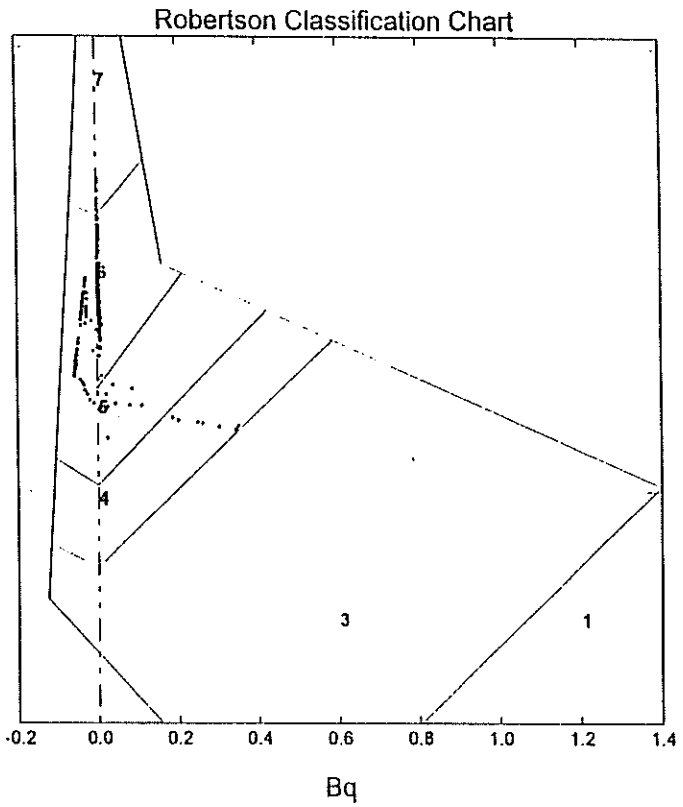
Cone Penetration Test - CPT-01

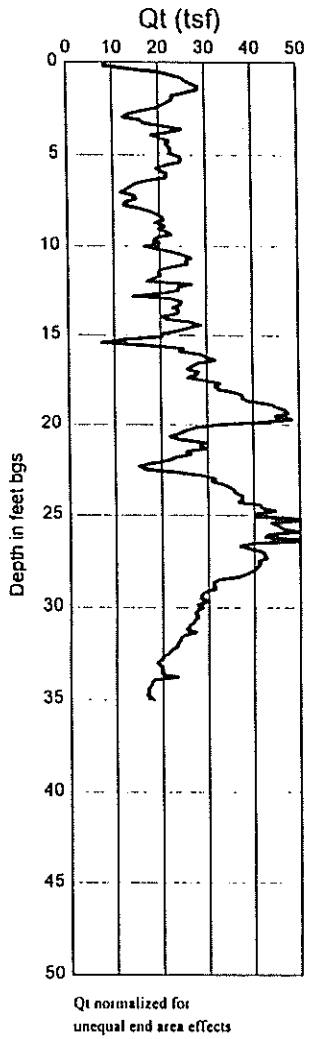
Test Date : 10:09:97
Location : N. 33661 ft, E.37998 ft

Operator : ConeTec

Ground Surf. Elev. : 0.00
Water Table Depth : 1.80







Qt normalized for unequal end area effects

Data points from 0.00 ft to 35.00 ft below ground surface

1 - Sensitive, Fine-Grained
2 - Organic Soils - Peats
3 - Clay to Silty Clay
4 - Clayey Silt to Silty Clay
5 - Silty Sand to Sandy Silt
6 - Clean to Silty Sand
7 - Gravelly Sand to Sand
8 - Very Stiff Sand to Clayey Sand
9 - Very Stiff Fine-Grained

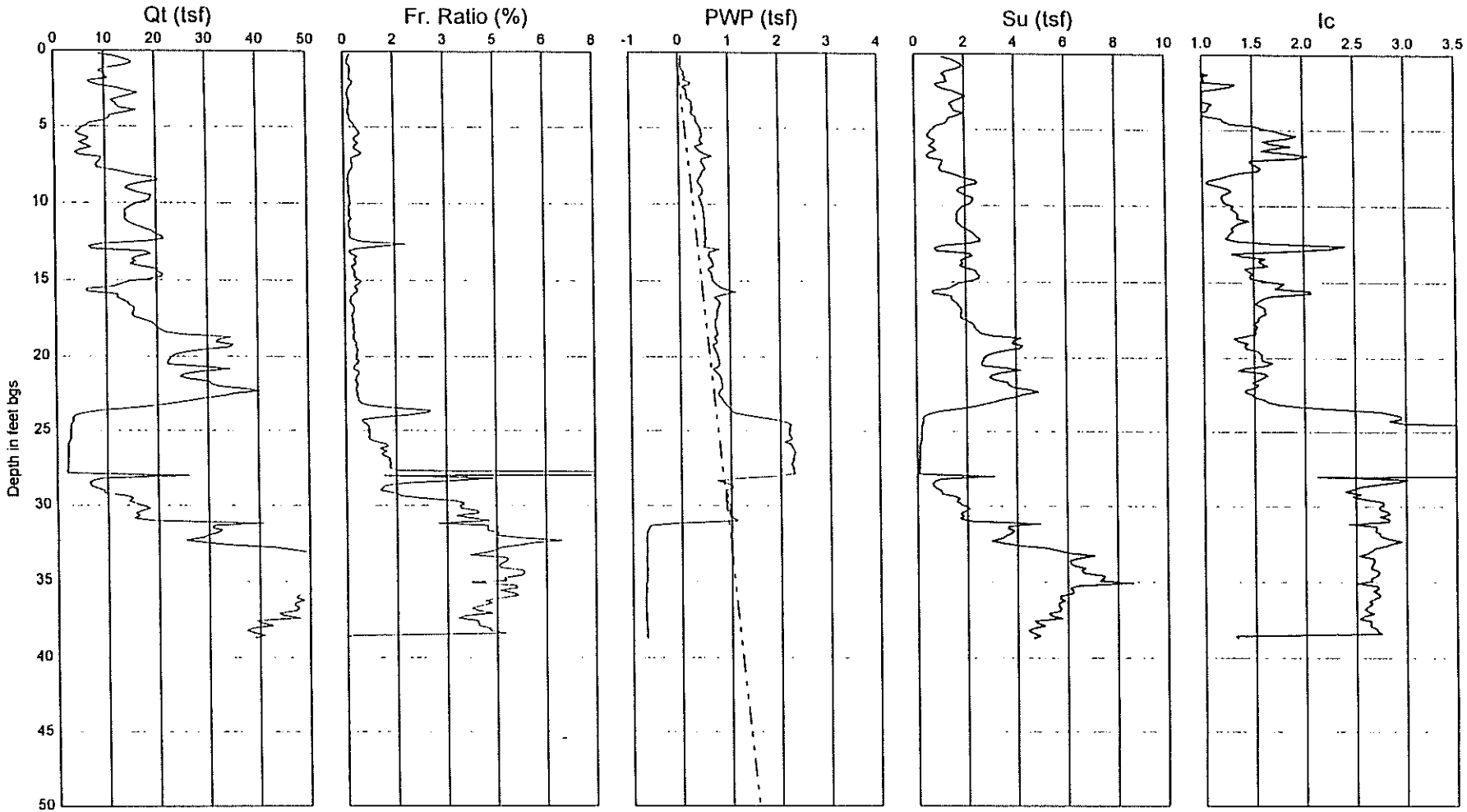
PROJECT NO. 973-2255 DATE: 2/9/98 DRAWN BY: RTS

Cone Penetration Test - CPT-02

Test Date : 10:09:97
Location : N. 33683 ft, E. 40685 ft

Operator : ConeTec

Ground Surf. Elev. : 0.00
Water Table Depth : 1.00



Qt normalized for
unequal end area effects

Fr Ratio = 100*F/(Qt-Sigmav)
Gamma = 104 2 pcf

Su = (Qt - SigmaV) / Nk
Nk = 8
Gamma = 104 2 pcf

After Jefferies and Davies (1991)
Ic < 1.25 - Gravelly sands
1 25 <Ic < 1.90 - Clean to silty sand
1.90 <Ic < 2 54 - Silty sand to sandy silt
2.54 <Ic < 2 82 - Clayey silt to silty clay
2 82 <Ic < 3 22 - Clays

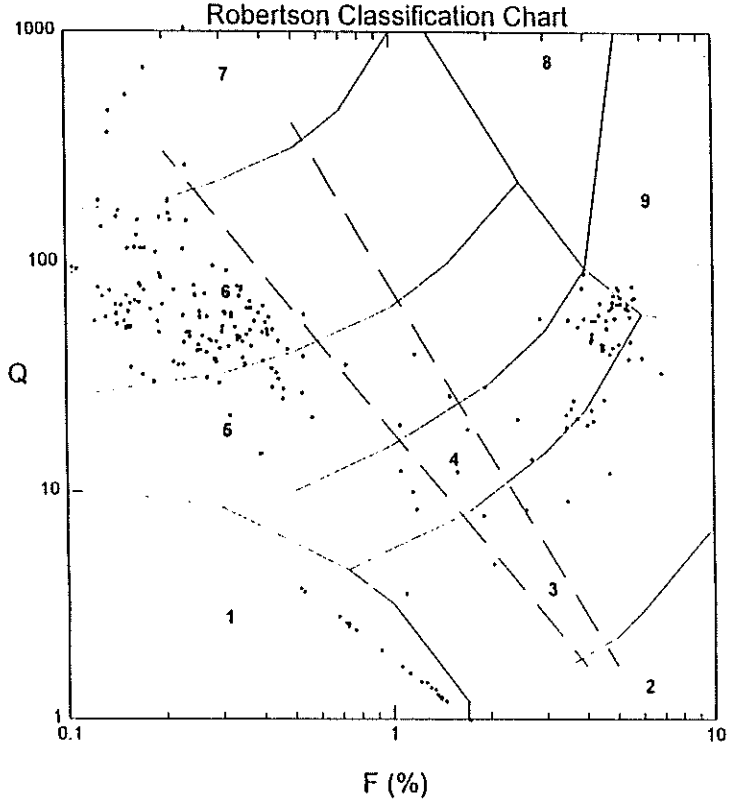
PROJECT NO 973-2255 DATE: 2/9/98 DRAWN BY: RTS

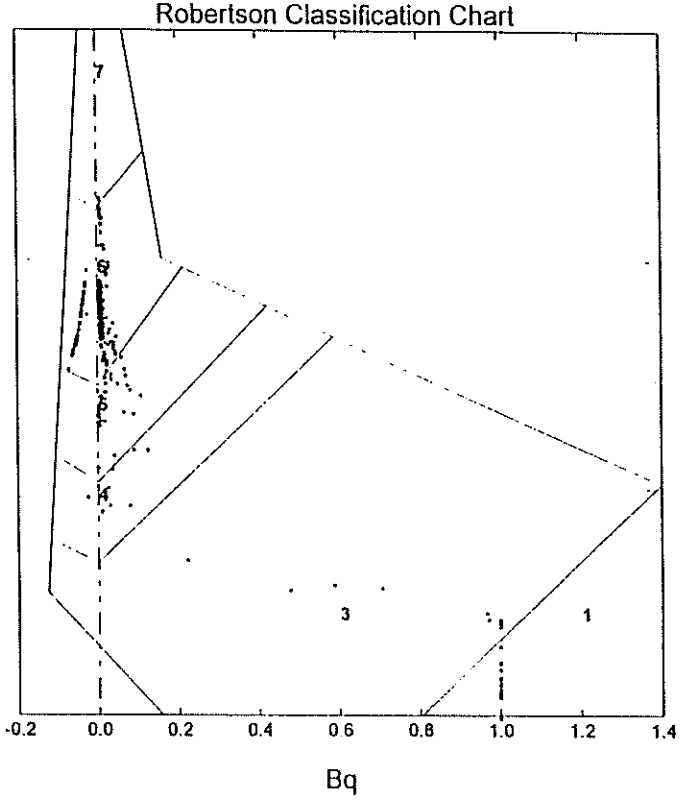
Cone Penetration Test - CPT-02

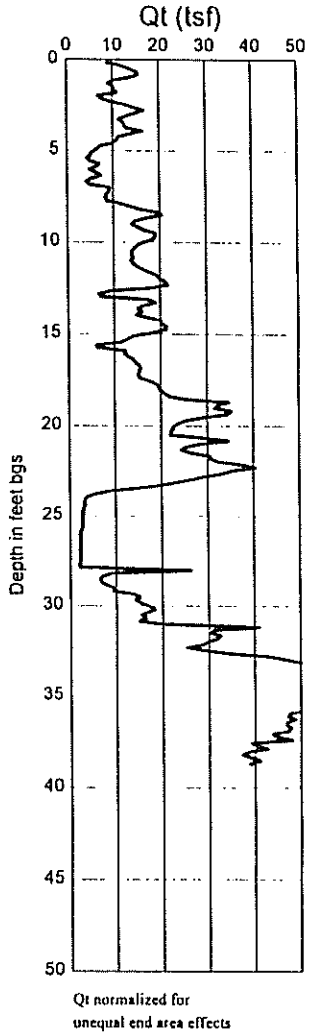
Test Date : 10:09:97
Location : N. 33683 ft, E. 40685 ft

Operator : ConeTec

Ground Surf. Elev. : 0.00
Water Table Depth : 1.00







Data points from 0.00 ft to 40.00 ft below ground surface

1 - Sensitive, Fine-Grained
2 - Organic Soils - Peats
3 - Clay to Silty Clay
4 - Clayey Silt to Silty Clay
5 - Silty Sand to Sandy Silt
6 - Clean to Silty Sand
7 - Gravelly Sand to Sand
8 - Very Stiff Sand to Clayey Sand
9 - Very Stiff Fine-Grained

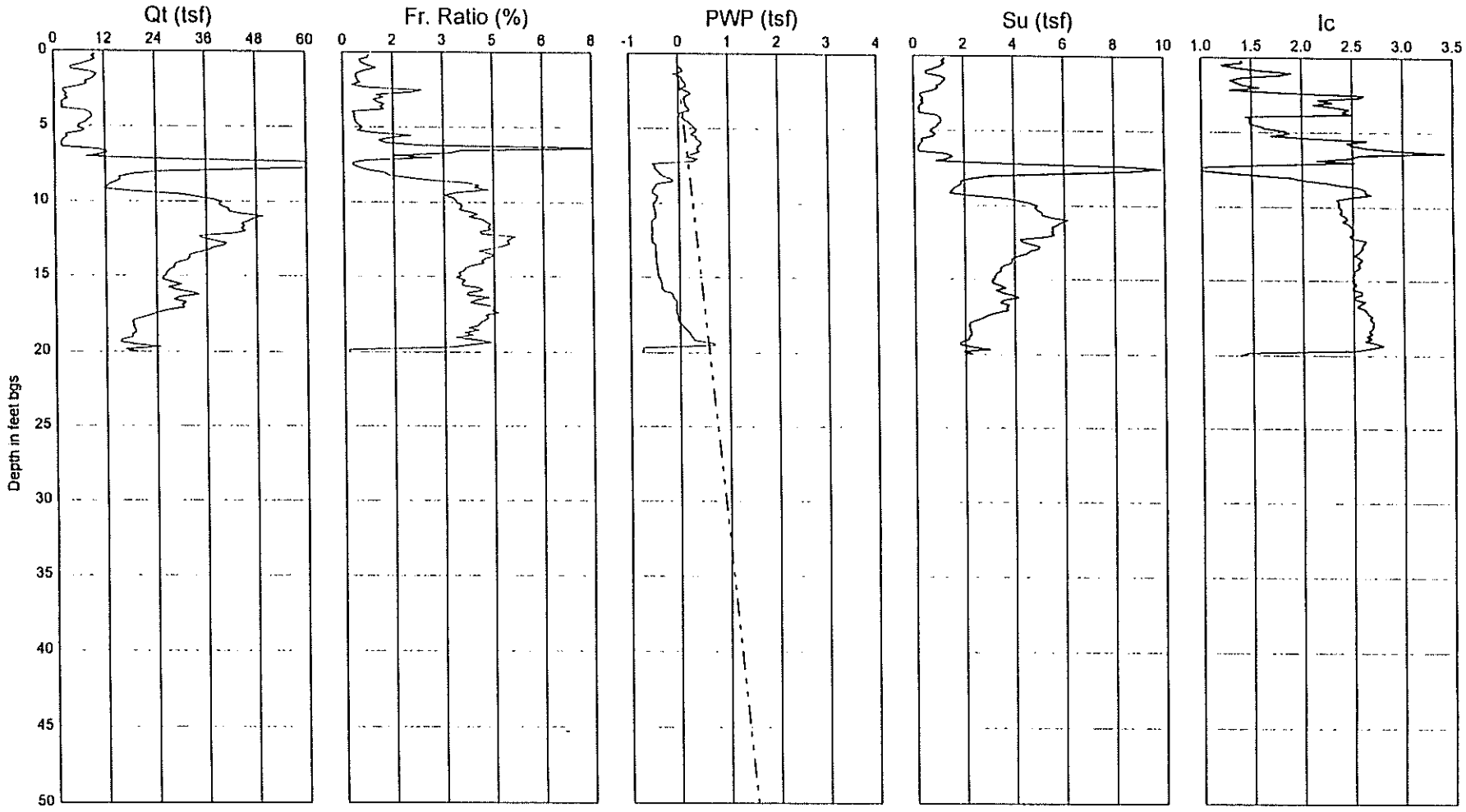
PROJECT NO 973-2255 DATE: 2/9/98 DRAWN BY: RTS

Cone Penetration Test - CPT-03

Test Date : 09:25:97
Location : N. 35653 ft, E. 36548 ft

Operator : ConeTec

Ground Surf. Elev. : 0.00
Water Table Depth : 1.24



Qt normalized for unequal end area effects

Fr Ratio = 100*F/(Qt-Sigmav)
Gamma = 104 2 pcf

Su = (Qt - SigmaV) / Nk
Nk = 8
Gamma = 104 2 pcf

After Jefferies and Davies (1991)
Ic < 1.25 - Gravelly sands
1 25 <Ic < 1.90 - Clean to silty sand
1.90 <Ic < 2 54 - Silty sand to sandy silt
2 54 <Ic < 2 82 - Clayey silt to silty clay
2 82 <Ic < 3 22 - Clays

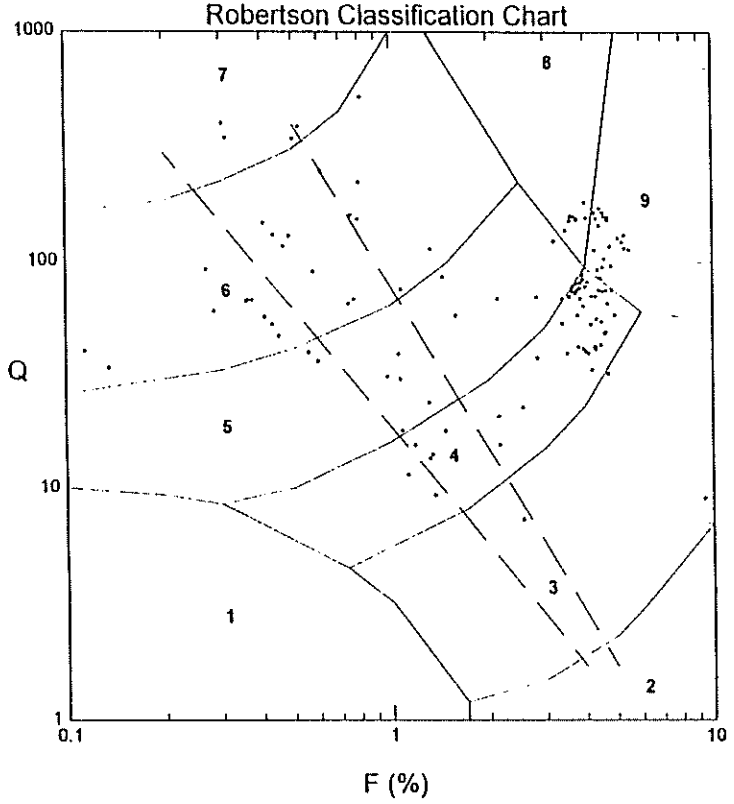
PROJECT NO. 973-2255 DATE: 2/9/98 DRAWN BY: RTS

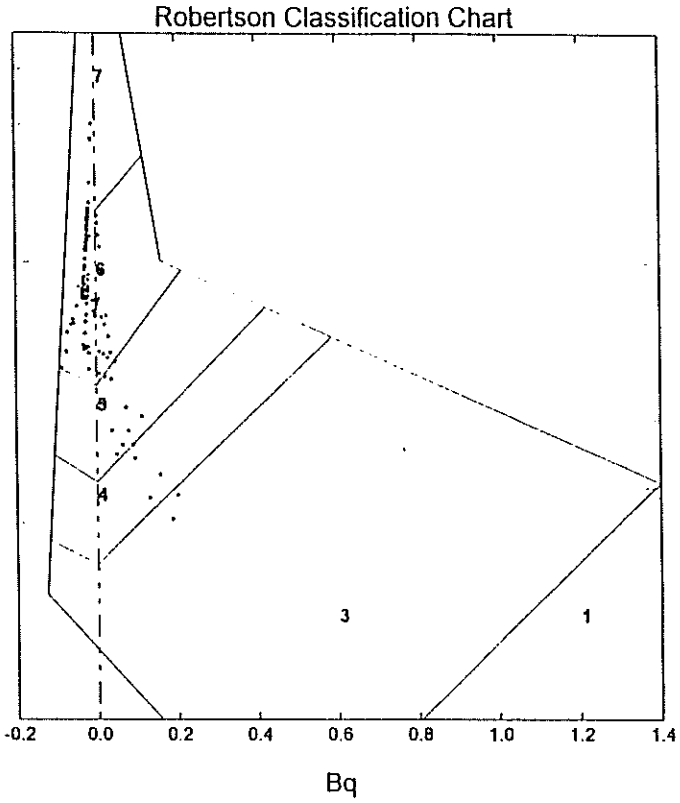
Cone Penetration Test - CPT-03

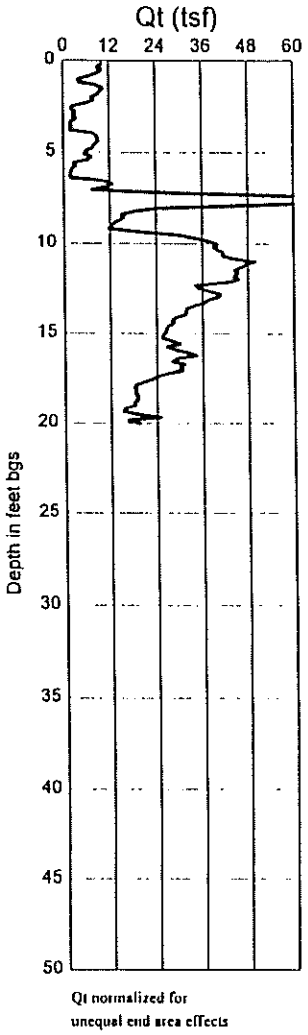
Test Date : 09:25:97
Location : N. 35653 ft, E. 36548 ft

Operator : ConeTec

Ground Surf. Elev. : 0.00
Water Table Depth : 1.24







Qt normalized for unequal end area effects

Data points from 0.00 ft to 25.00 ft below ground surface

1 - Sensitive, Fine-Grained
2 - Organic Soils - Peats
3 - Clay to Silty Clay
4 - Clayey Silt to Silty Clay
5 - Silty Sand to Sandy Silt
6 - Clean to Silty Sand
7 - Gravelly Sand to Sand
8 - Very Stiff Sand to Clayey Sand
9 - Very Stiff Fine-Grained

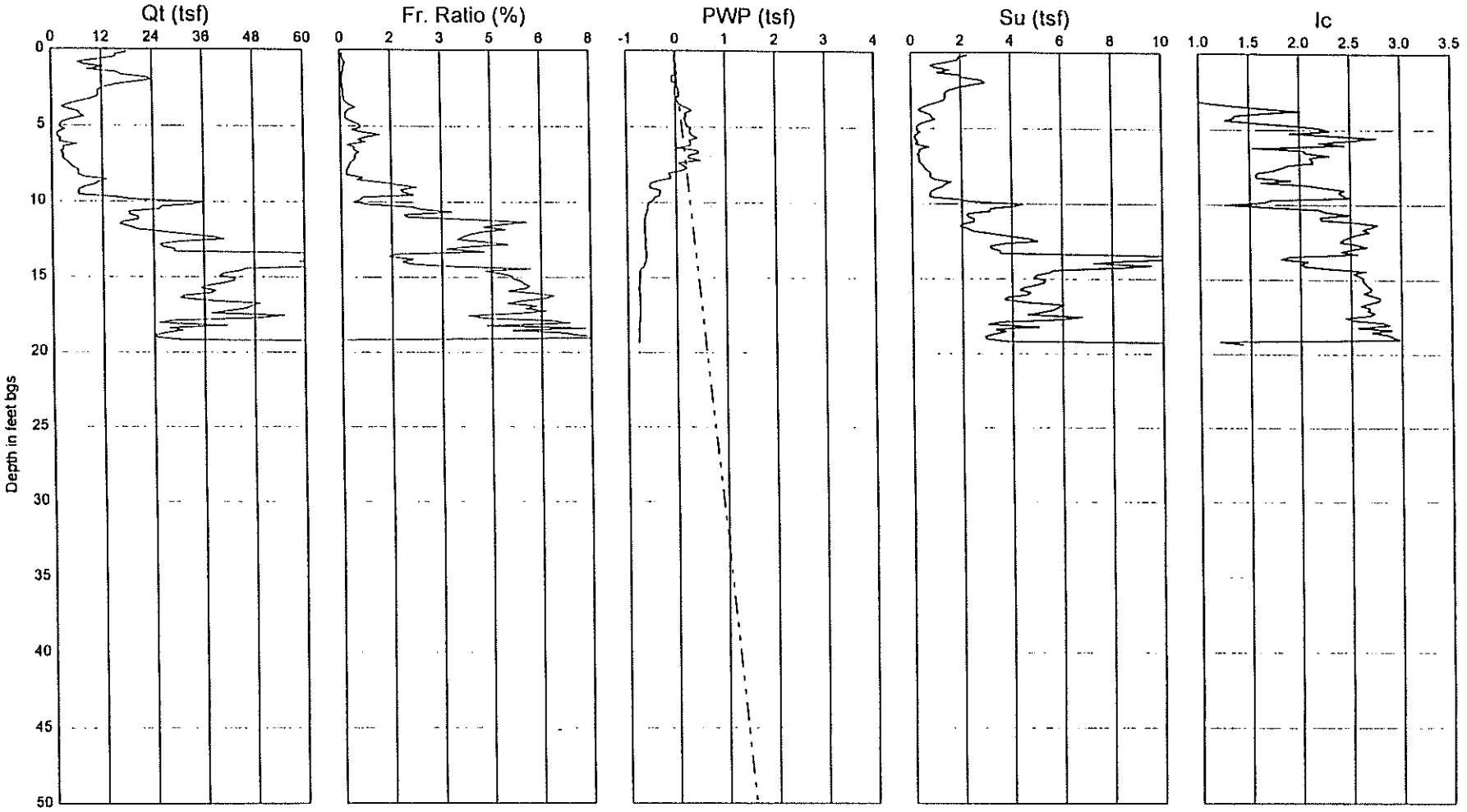
PROJECT NO. 973-2255 DATE 2/9/98 DRAWN BY. RTS

Cone Penetration Test - CPT-04

Test Date : 09:25:97
Location : N. 36345 ft, E. 42495 ft

Operator : ConeTec

Ground Surf. Elev. : 0.00
Water Table Depth : 1.00



Qt normalized for unequal end area effects

Fr Ratio = 100*F/(Qt-Sigmav)
Gamma = 104 2 pcf

Su = (Qt - SigmaV) / Nk
Nk = 8
Gamma = 104 2 pcf

After Jefferies and Davies (1991)
Ic < 1.25 - Gravelly sands
1.25 <Ic < 1.90 - Clean to silty sand
1.90 <Ic < 2.54 - Silty sand to sandy silt
2.54 <Ic < 2 82 - Clayey silt to silty clay
2 82 <Ic < 3 22 - Clays

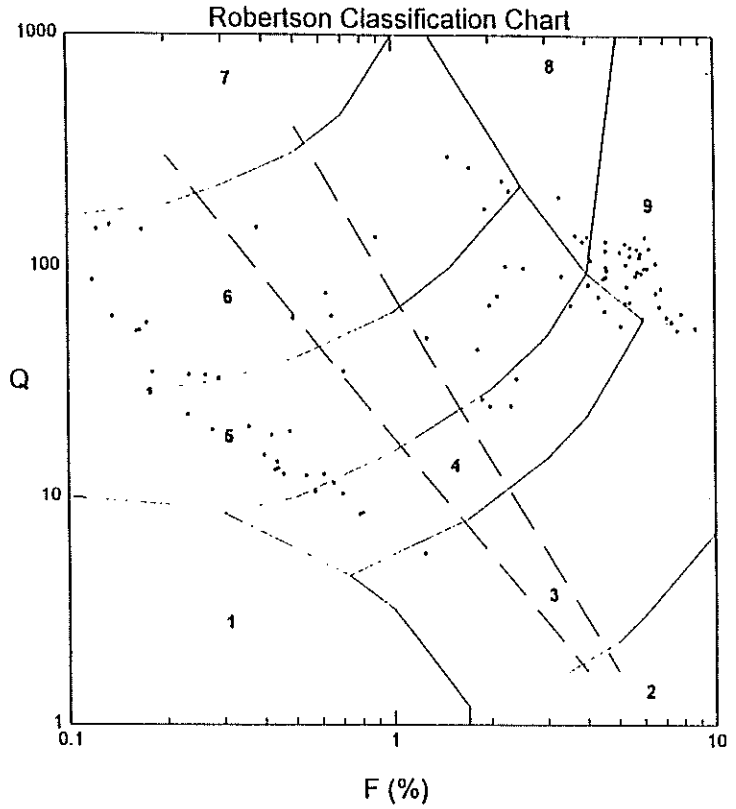
PROJECT NO. 973-2255 DATE. 2/9/98 DRAWN BY: RTS

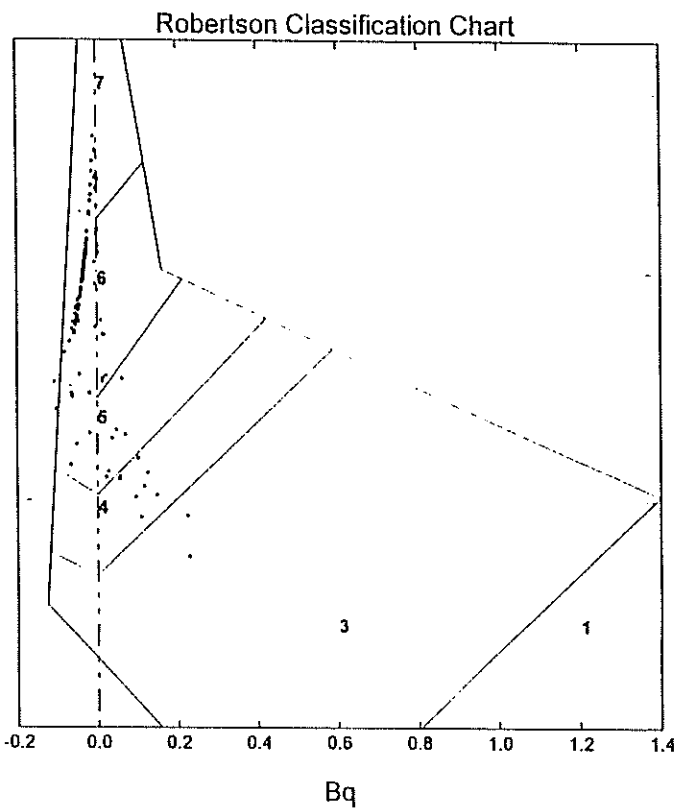
Cone Penetration Test - CPT-04

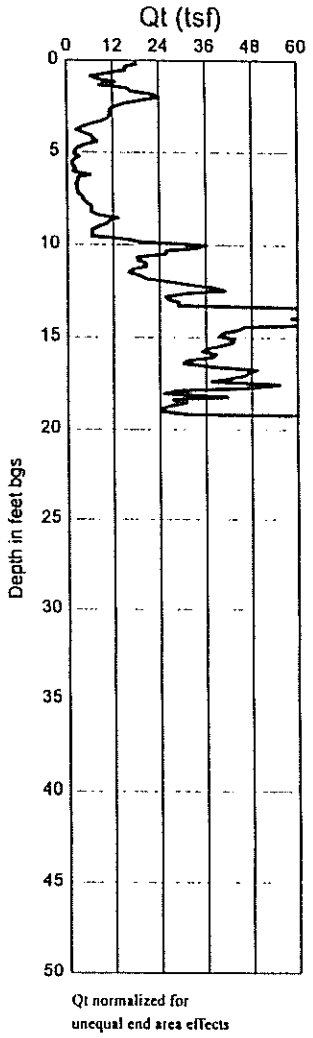
Test Date : 09:25:97
Location : N. 36345 ft, E. 42495 ft

Operator : ConeTec

Ground Surf. Elev. : 0.00
Water Table Depth : 1.00







Qt normalized for unequal end area effects

Data points from 0.00 ft to 40.00 ft below ground surface

1 - Sensitive, Fine-Grained
2 - Organic Soils - Peats
3 - Clay to Silty Clay
4 - Clayey Silt to Silty Clay
5 - Silty Sand to Sandy Silt
6 - Clean to Silty Sand
7 - Gravelly Sand to Sand
8 - Very Stiff Sand to Clayey Sand
9 - Very Stiff Fine-Grained

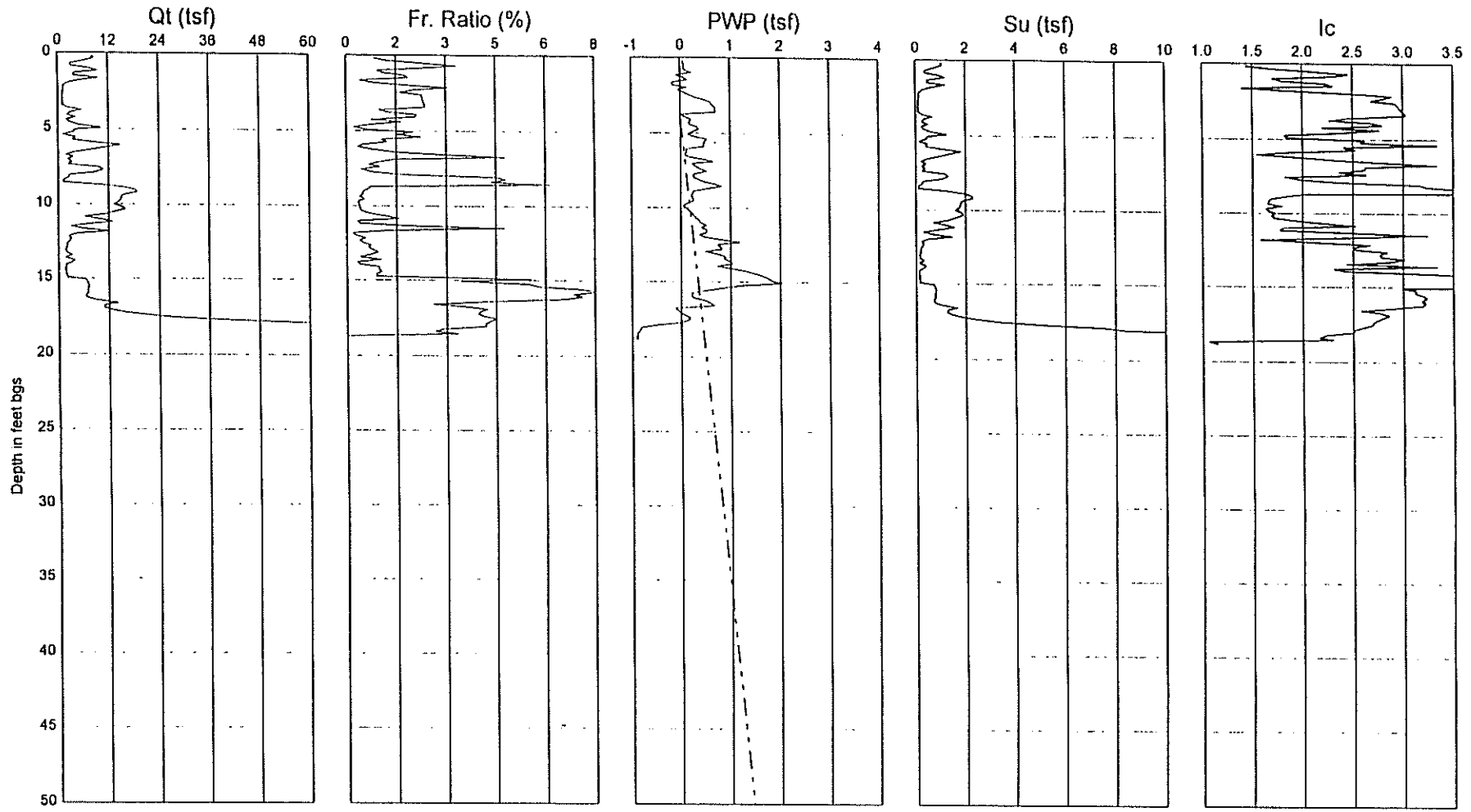
PROJECT NO. 973-2255 DATE: 2/9/98 DRAWN BY: RTS

Cone Penetration Test - CPT-05

Test Date : 09:26:97
Location : N. 37038 ft, E. 46669 ft

Operator : ConeTec

Ground Surf. Elev. : 0.00
Water Table Depth : 4.11



Qt normalized for
unequal end area effects

Fr Ratio = 100*F/(Qt-Sigmav)
Gamma = 104 2 pcf

Su = (Qt - SigmaV) / Nk
Nk = 8
Gamma = 104 2 pcf

After Jefferies and Davies (1991)
Ic < 1 25 - Gravelly sands
1 25 <Ic < 1.90 - Clean to silty sand
1 90 <Ic < 2 54 - Silty sand to sandy silt
2 54 <Ic < 2 82 - Clayey silt to silty clay
2 82 <Ic < 3 22 - Clays

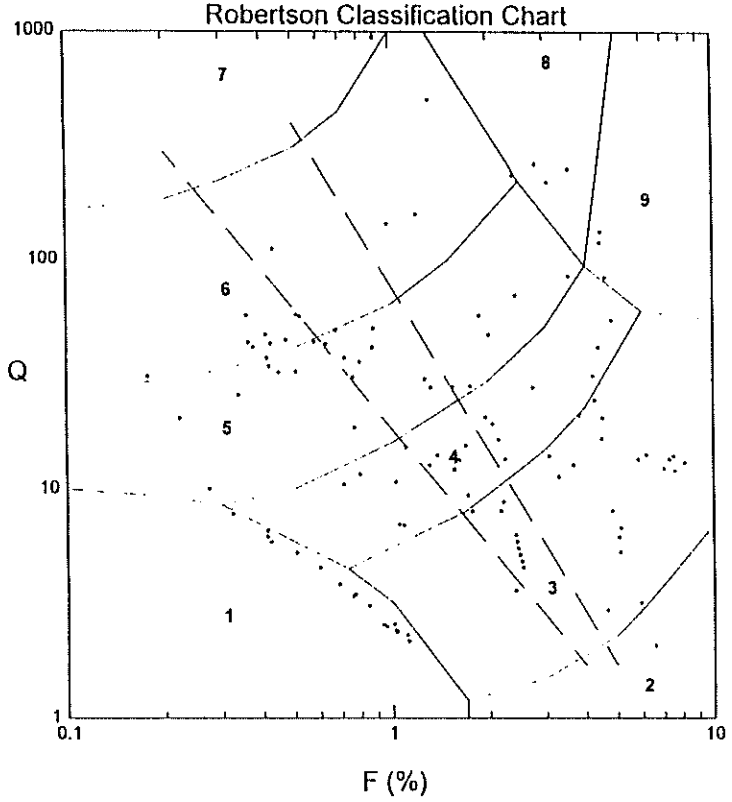
PROJECT NO 973-2255 DATE 2/9/98 DRAWN BY: RTS

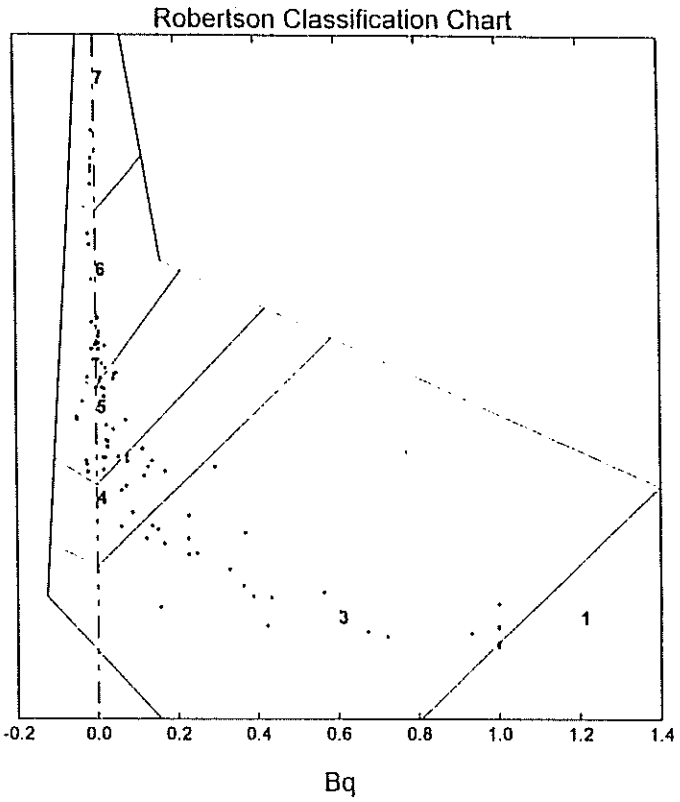
Cone Penetration Test - CPT-05

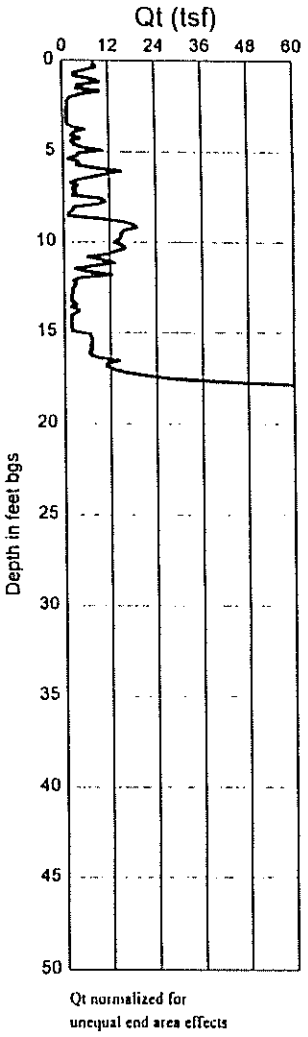
Test Date : 09:26:97
Location : N. 37038 ft, E. 46669 ft

Operator : ConeTec

Ground Surf. Elev. : 0.00
Water Table Depth : 4.11







Data points from 0.00 ft to 50.00 ft below ground surface

1 - Sensitive, Fine-Grained
2 - Organic Soils - Peats
3 - Clay to Silty Clay
4 - Clayey Silt to Silty Clay
5 - Silty Sand to Sandy Silt
6 - Clean to Silty Sand
7 - Gravelly Sand to Sand
8 - Very Stiff Sand to Clayey Sand
9 - Very Stiff Fine-Grained

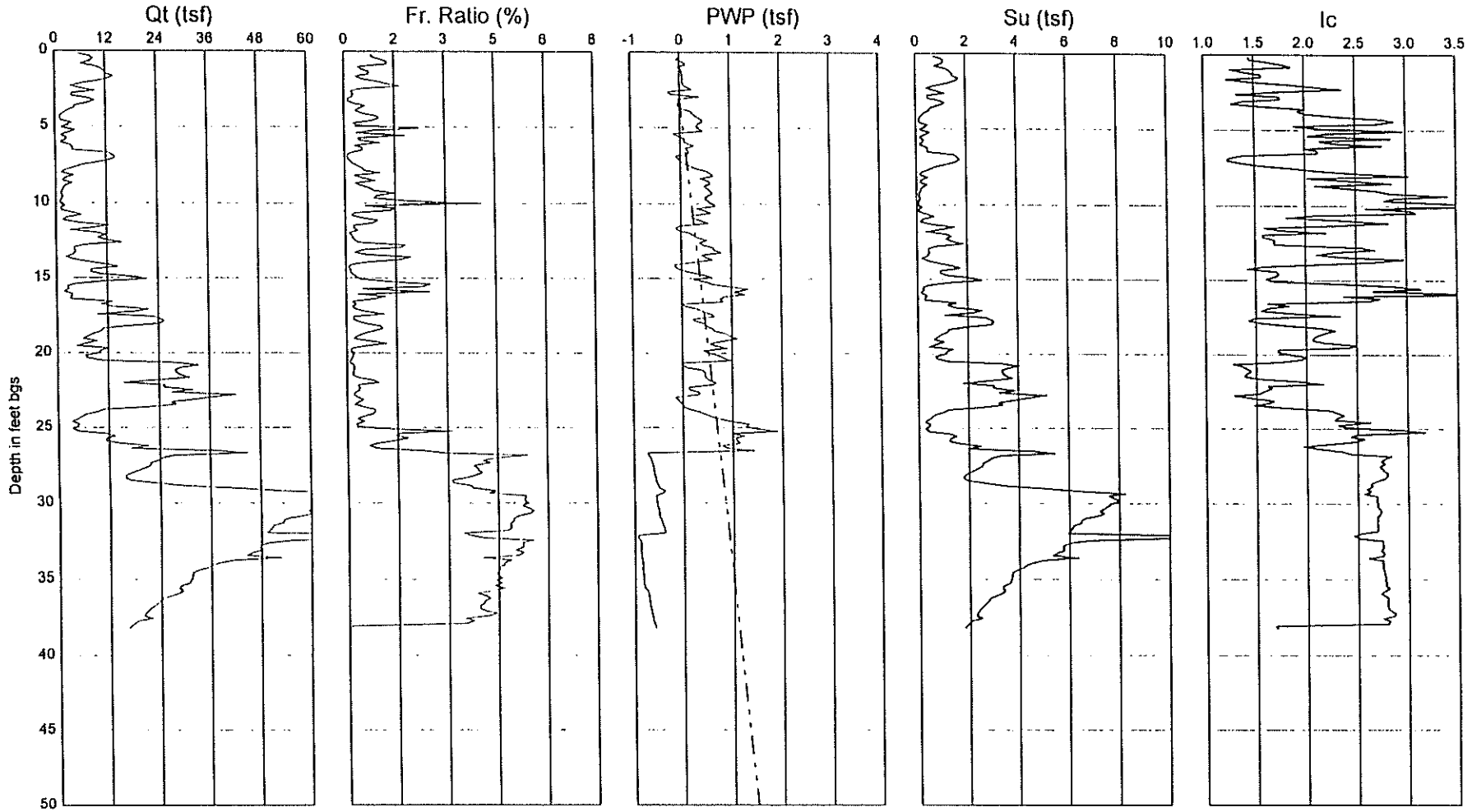
PROJECT NO. 973-2255 DATE: 2/9/98 DRAWN BY: RTS

Cone Penetration Test - CPT-06

Test Date : 09:29:97
Location : N. 38178 ft, E. 35318 ft

Operator : ConeTec

Ground Surf. Elev. : 0.00
Water Table Depth : 3.10



Qt normalized for
unequal end area effects

Fr Ratio = 100*F/(Qt-Sigmav)
Gamma = 104 2 pcf

Su = (Qt - SigmaV) / Nk
Nk = 8
Gamma = 104 2 pcf

After Jefferies and Davies (1991)
Ic < 1 25 - Gravelly sands
1 25 <Ic < 1 90 - Clean to silty sand
1 90 <Ic < 2 54 - Silty sand to sandy silt
2 54 <Ic < 2 82 - Clayey silt to silty clay
2 82 <Ic < 3 22 - Clays

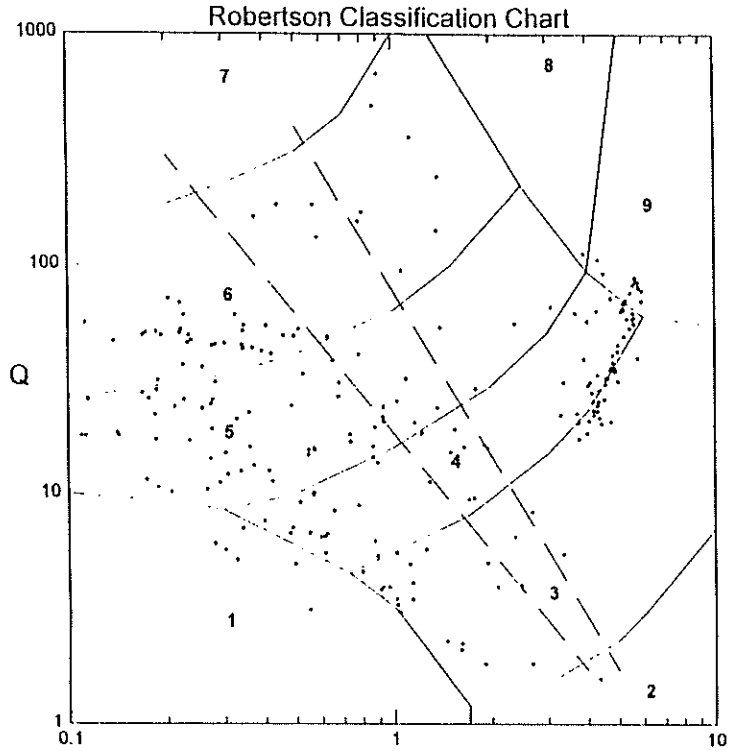
PROJECT NO. 973-2255 DATE: 2/9/98 DRAWN BY: RTS

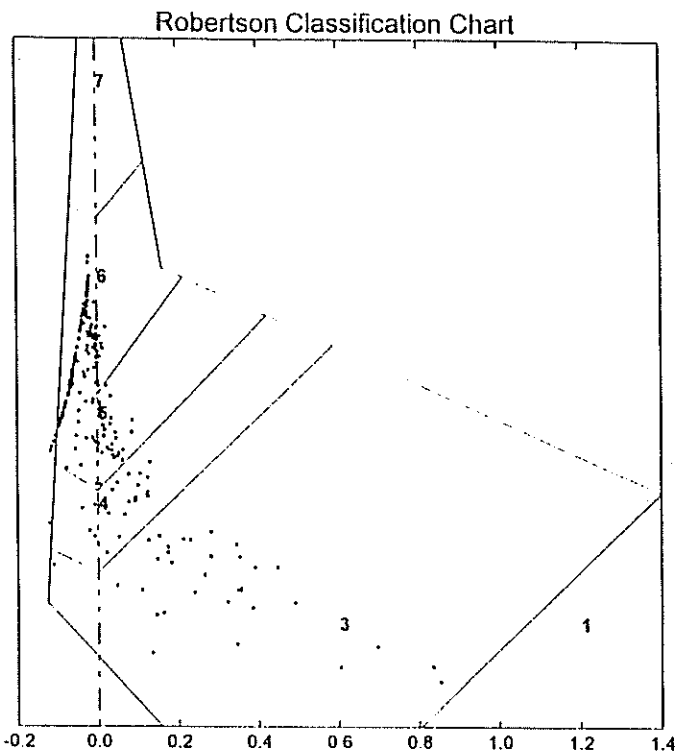
Cone Penetration Test - CPT-06

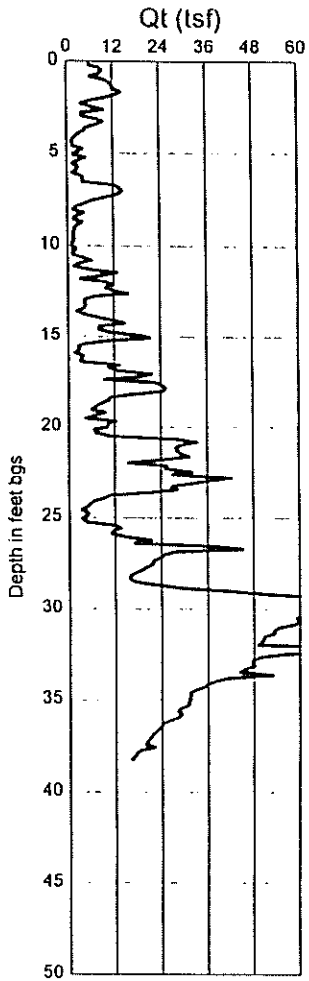
Test Date : 09:29:97
Location : N. 38178 ft, E. 35318 ft

Operator : ConeTec

Ground Surf. Elev. : 0.00
Water Table Depth : 3.10







Qt normalized for unequal end area effects

Data points from 0.00 ft to 50.00 ft below ground surface

1 - Sensitive, Fine-Grained
2 - Organic Soils - Peats
3 - Clay to Silty Clay
4 - Clayey Silt to Silty Clay
5 - Silty Sand to Sandy Silt
6 - Clean to Silty Sand
7 - Gravelly Sand to Sand
8 - Very Stiff Sand to Clayey Sand
9 - Very Stiff Fine-Grained

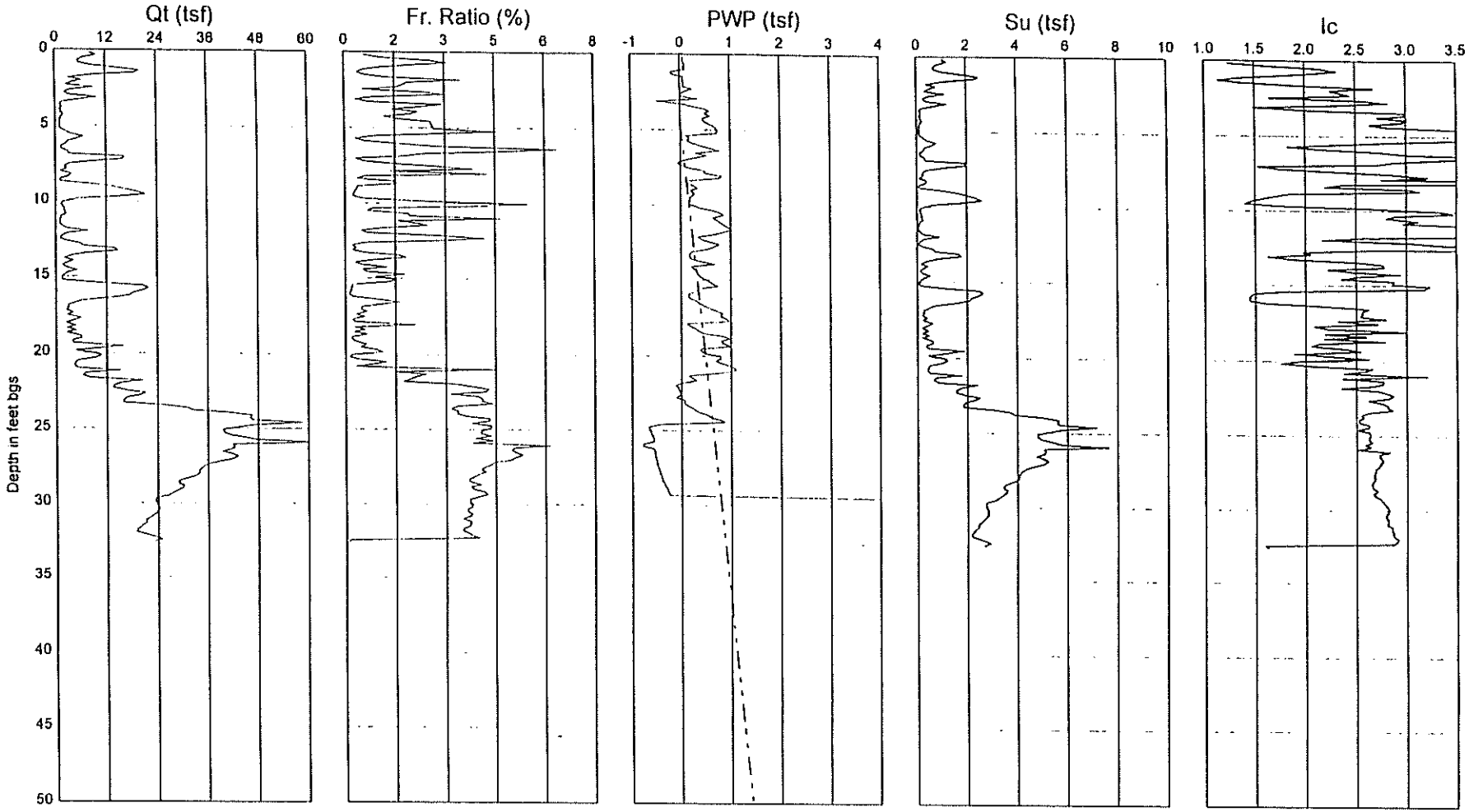
PROJECT NO. 973-2255 DATE: 2/9/98 DRAWN BY: RTS

Cone Penetration Test - CPT-07

Test Date : 09:27:97
Location : N. 38956 ft, E. 39909 ft

Operator : ConeTec

Ground Surf. Elev. : 0.00
Water Table Depth : 4.55



Qt normalized for
unequal end area effects

Fr Ratio = 100*F/(Qt-Sigmav)
Gamma = 104 2 pcf

Su = (Qt - SigmaV) / Nk
Nk = 8
Gamma = 104 2 pcf

After Jefferies and Davies (1991)
Ic < 1 25 - Gravelly sands
1 25 <Ic < 1 90 - Clean to silty sand
1 90 <Ic < 2 54 - Silty sand to sandy silt
2 54 <Ic < 2 82 - Clayey silt to silty clay
2 82 <Ic < 3 22 - Clays

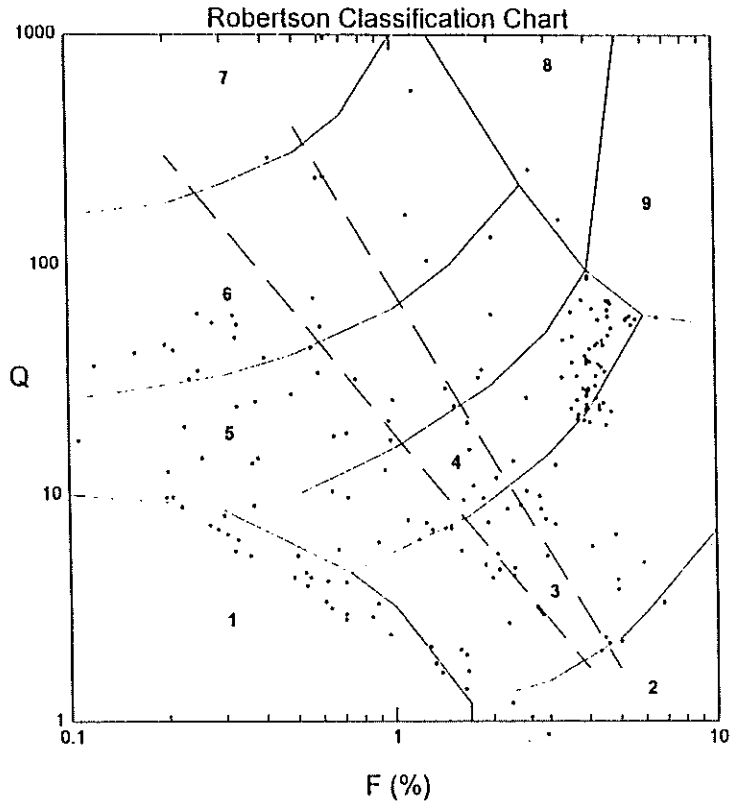
PROJECT NO 973-2255 DATE 2/9/98 DRAWN BY RIS

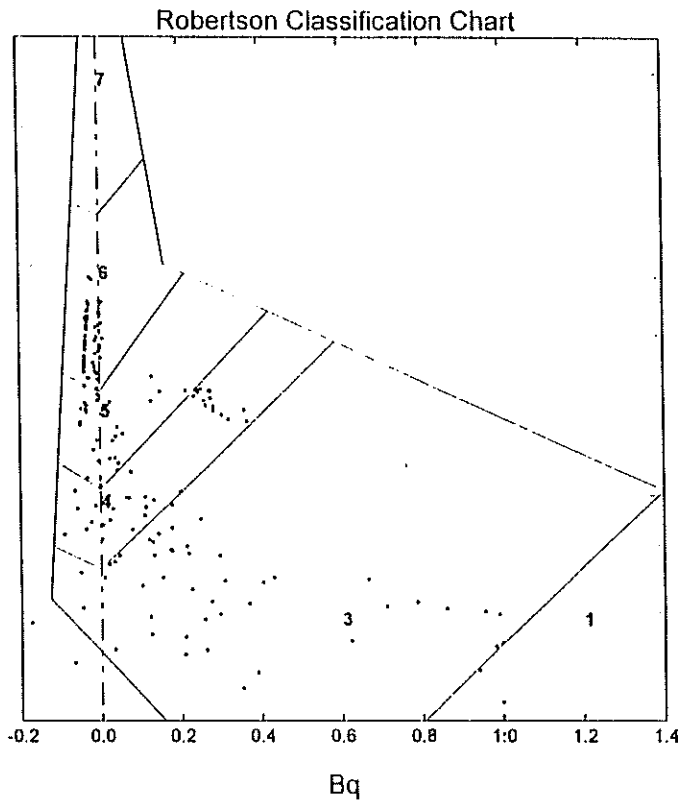
Cone Penetration Test - CPT-07

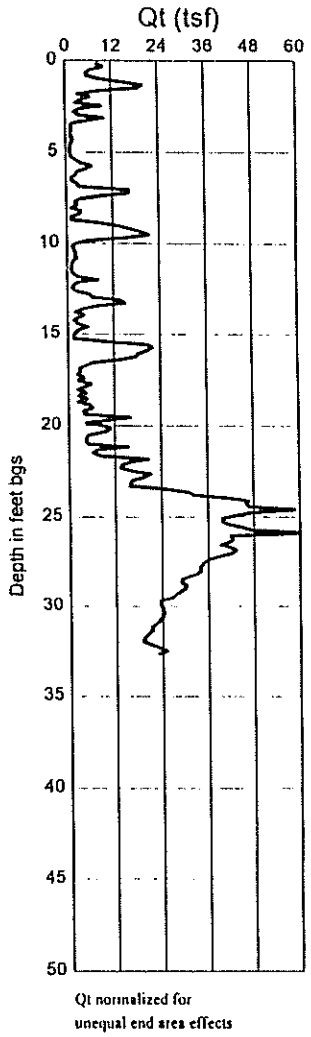
Test Date : 09:27:97
Location : N. 38956 ft, E. 39909 ft

Operator : ConeTec

Ground Surf. Elev. : 0.00
Water Table Depth : 4.55







Qt normalized for unequal end area effects

Data points from 0.00 ft to 50.00 ft below ground surface

1 - Sensitive, Fine-Grained
2 - Organic Soils - Peats
3 - Clay to Silty Clay
4 - Clayey Silt to Silty Clay
5 - Silty Sand to Sandy Silt
6 - Clean to Silty Sand
7 - Gravelly Sand to Sand
8 - Very Stiff Sand to Clayey Sand
9 - Very Stiff Fine-Grained

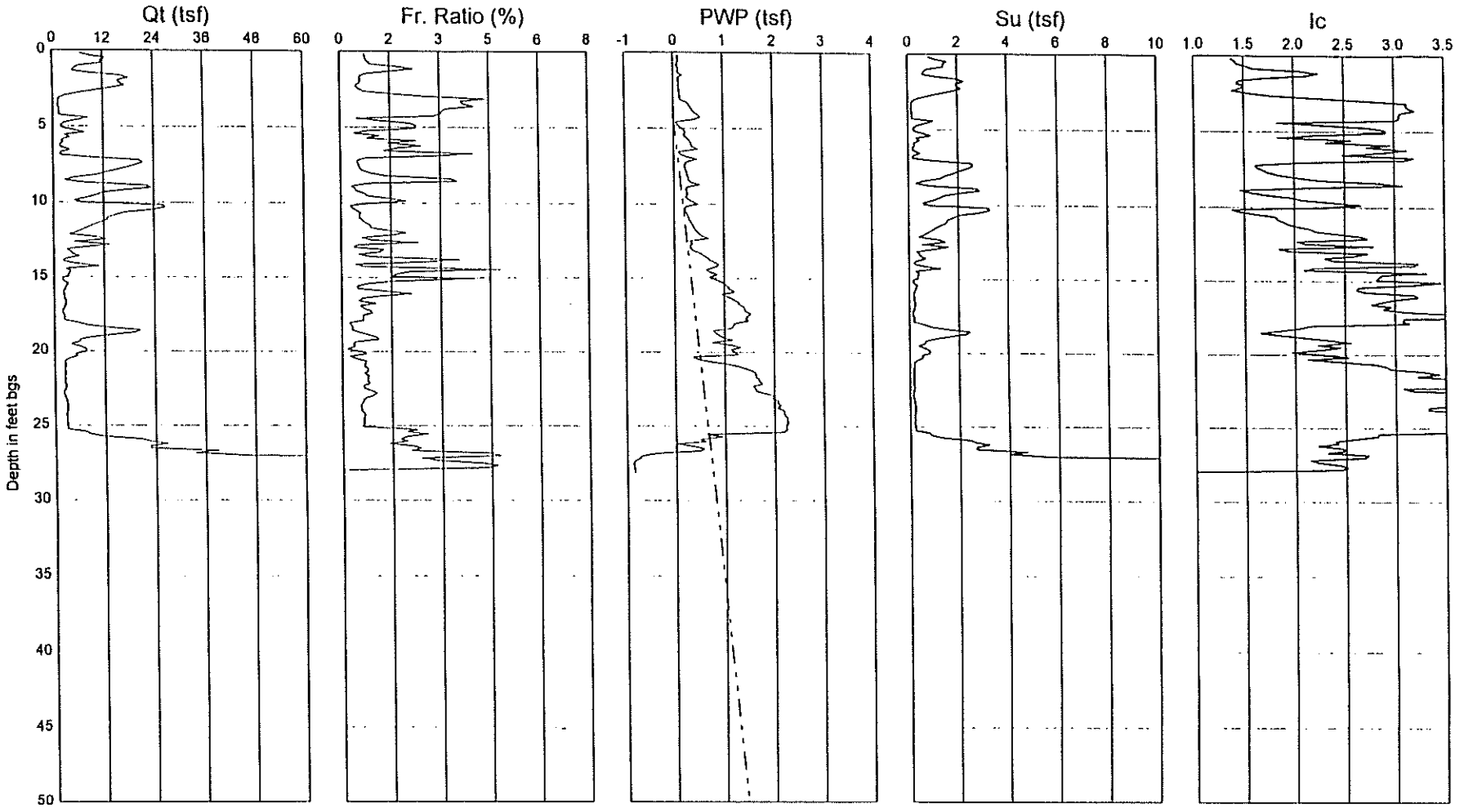
PROJECT NO 973-2255 DATE: 2/9/98 DRAWN BY RTS

Cone Penetration Test - CPT-08

Test Date : 09:26.97
Location : N. 37710 ft, E. 46407 ft

Operator : ConeTec

Ground Surf. Elev. : 0.00
Water Table Depth : 4.32



Qt normalized for unequal end area effects

Fr Ratio = 100*F/(Qt-Sigmav)
Gamma = 104 2 pcf

Su = (Qt - SigmaV) / Nk
Nk = 8
Gamma = 104 2 pcf

After Jefferies and Davies (1991)
Ic < 1 25 - Gravelly sands
1 25 <Ic < 1 90 - Clean to silty sand
1 90 <Ic < 2 54 - Silty sand to sandy silt
2 54 <Ic < 2 82 - Clayey silt to silty clay
2 82 <Ic < 3 22 - Clays

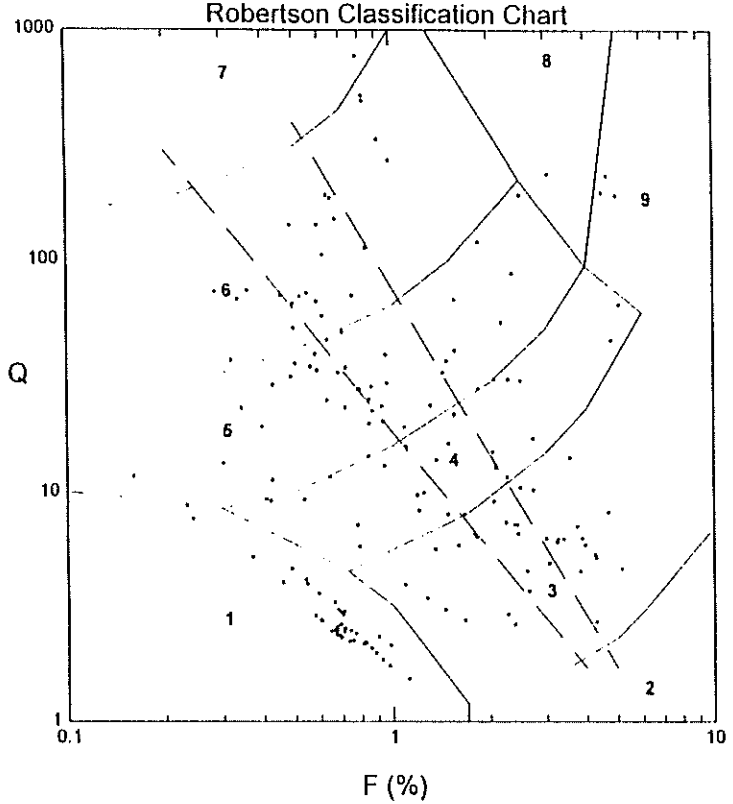
PROJECT NO 973-2255 DATE. 2/9/98 DRAWN BY. RTS

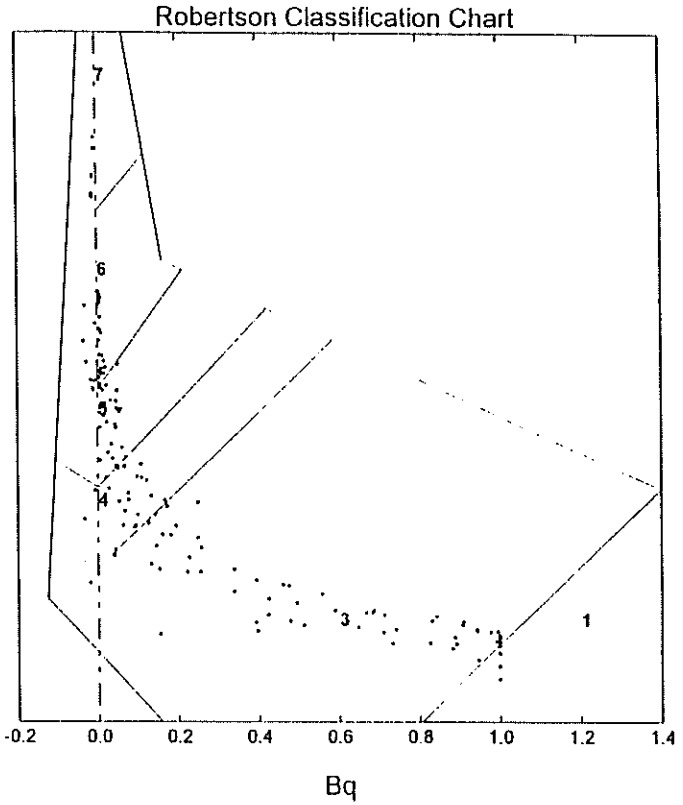
Cone Penetration Test - CPT-08

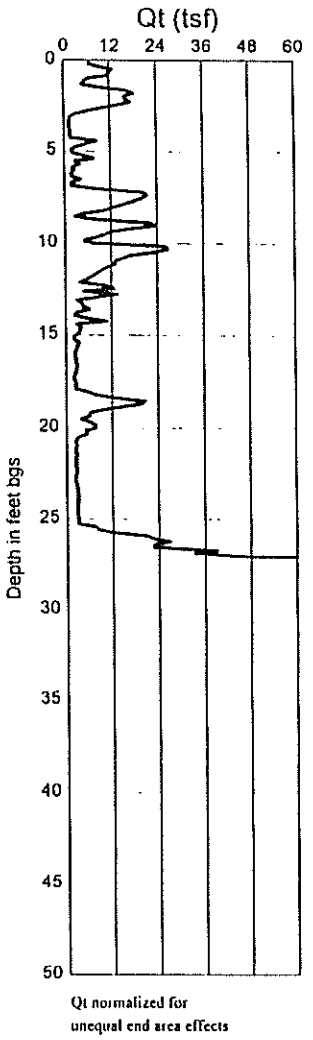
Test Date : 09:26:97
Location : N. 37710 ft, E. 46407 ft

Operator : ConeTec

Ground Surf. Elev. : 0.00
Water Table Depth : 4.32







Qt normalized for unequal end area effects

Data points from 0.00 ft to 50.00 ft below ground surface

1 - Sensitive, Fine-Grained
2 - Organic Soils - Peats
3 - Clay to Silty Clay
4 - Clayey Silt to Silty Clay
5 - Silty Sand to Sandy Silt
6 - Clean to Silty Sand
7 - Gravelly Sand to Sand
8 - Very Stiff Sand to Clayey Sand
9 - Very Stiff Fine-Grained

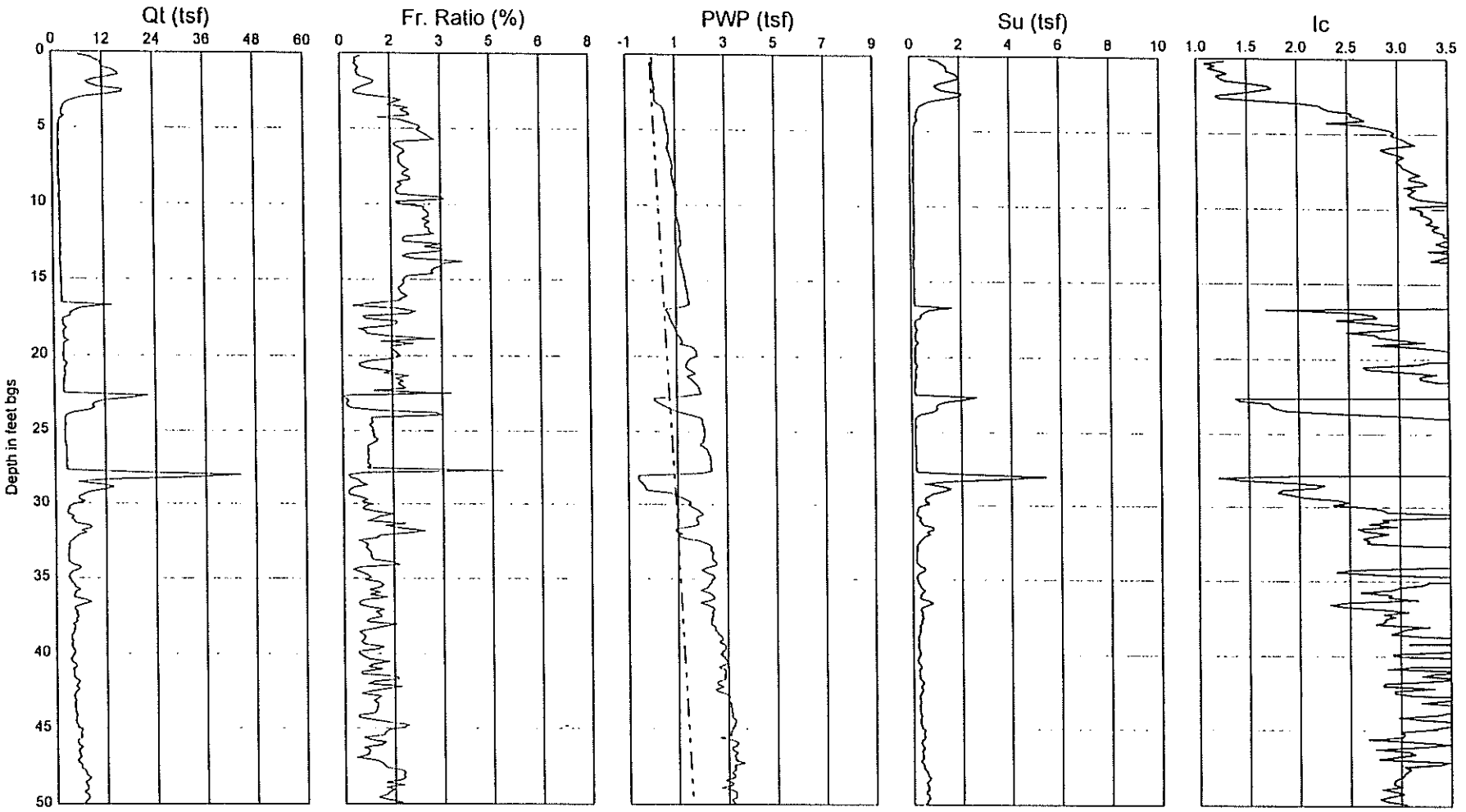
PROJECT NO 973-2255 DATE 2/9/98 DRAWN BY RTS

Cone Penetration Test - CPT-09

Test Date : 09:29:97
Location : N. 41355 ft, E. 34838 ft

Operator : ConeTec

Ground Surf. Elev. : 0.00
Water Table Depth : 0.50



Qt normalized for unequal end area effects

Fr Ratio = 100*F/(Qt-Sigmav)
Gamma = 104 2 pcf

Su = (Qt - SigmaV) / Nk
Nk = 8
Gamma = 104 2 pcf

After Jefferies and Davies (1991)
Ic < 1 25 - Gravelly sands
1 25 <Ic < 1 90 - Clean to silty sand
1 90 <Ic < 2 54 - Silty sand to sandy silt
2 54 <Ic < 2 82 - Clayey silt to silty clay
2 82 <Ic < 3 22 - Clays

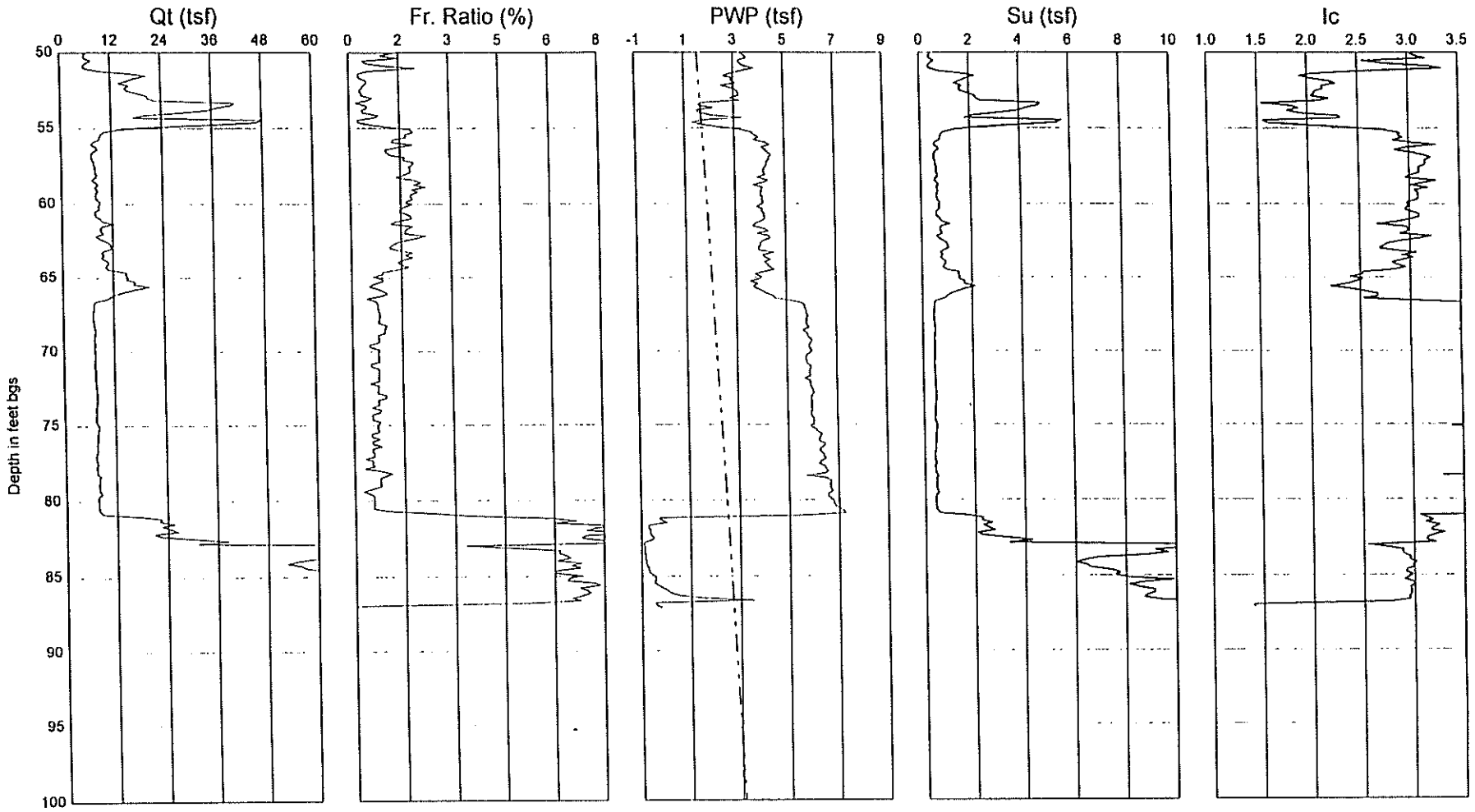
PROJECT NO. 973-2255 DATE 2/9/98 DRAWN BY. RTS

Cone Penetration Test - CPT-09

Test Date : 09:29:97
Location : N. 41355 ft, E. 34838 ft

Operator : ConeTec

Ground Surf. Elev. : 0.00
Water Table Depth : 0.50



Qt normalized for unequal end area effects

Fr Ratio = 100*F/(Qt-Sigmav)
Gamma = 104 2 pcf

Su = (Qt - SigmaV) / Nk
Nk = 8
Gamma = 104 2 pcf

After Jefferies and Davies (1991)
Ic < 1 25 - Gravelly sands
1 25 <Ic < 1 90 - Clean to silty sand
1.90 <Ic < 2.54 - Silty sand to sandy silt
2 54 <Ic < 2 82 - Clayey silt to silty clay
2 82 <Ic < 3.22 - Clays

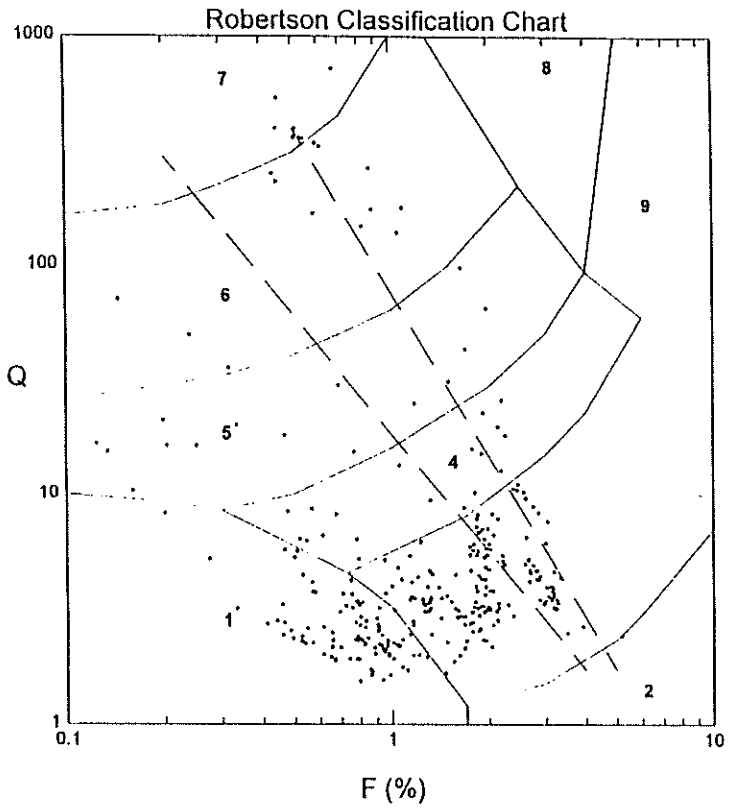
PROJECT NO 973-2255 DATE. 2/9/98 DRAWN BY. RTS

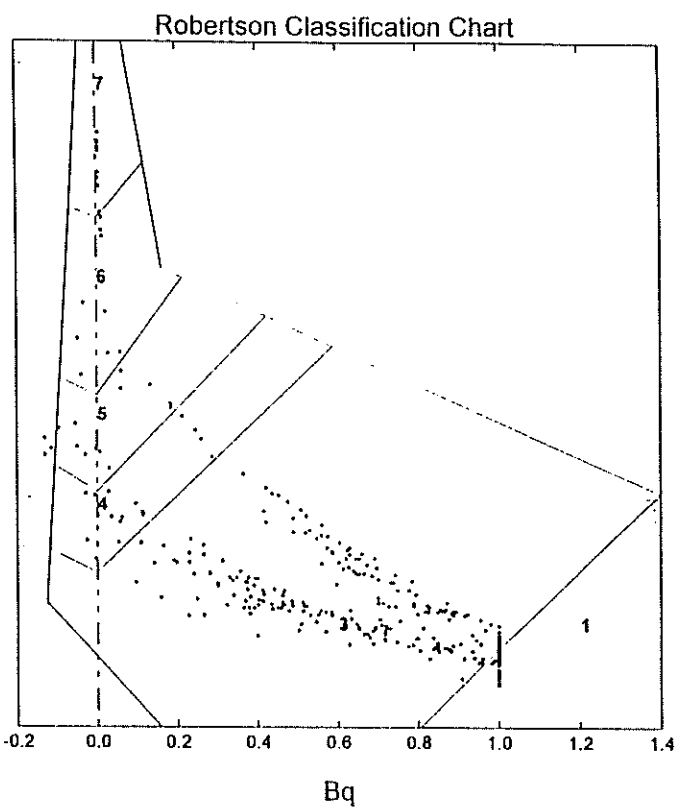
Cone Penetration Test - CPT-09

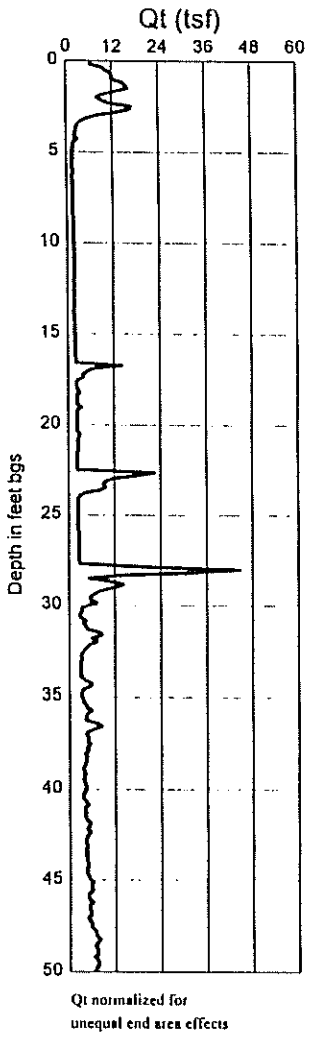
Test Date : 09:29:97
Location : N. 41355 ft, E. 34838 ft

Operator : ConeTec

Ground Surf. Elev. : 0.00
Water Table Depth : 0.50







Qt normalized for unequal end area effects

Data points from 0.00 ft to 50.00 ft below ground surface

1 - Sensitive, Fine-Grained
2 - Organic Soils - Peats
3 - Clay to Silty Clay
4 - Clayey Silt to Silty Clay
5 - Silty Sand to Sandy Silt
6 - Clean to Silty Sand
7 - Gravelly Sand to Sand
8 - Very Stiff Sand to Clayey Sand
9 - Very Stiff Fine-Grained

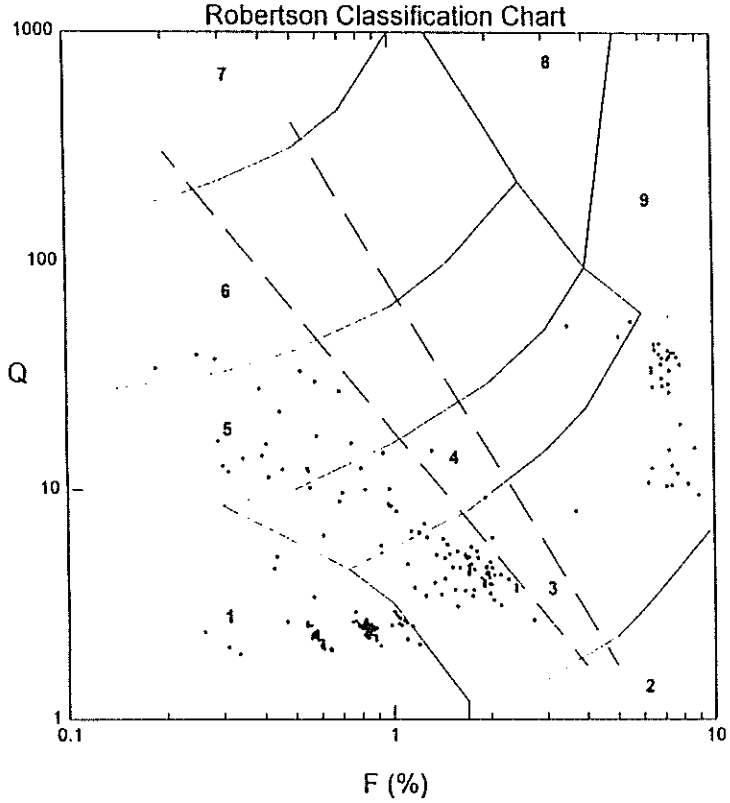
PROJECT NO 973-2255 DATE: 2/9/98 DRAWN BY: RTS

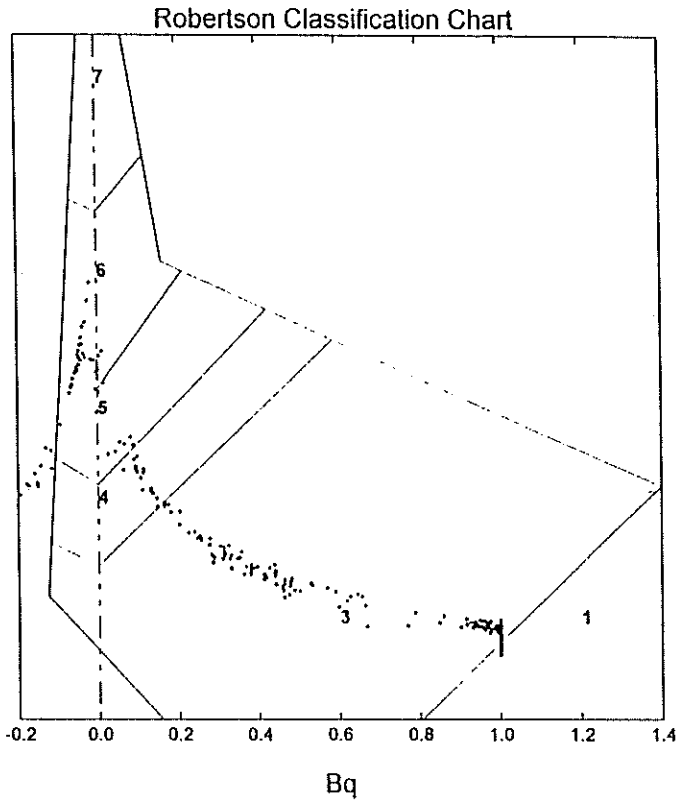
Cone Penetration Test - CPT-09

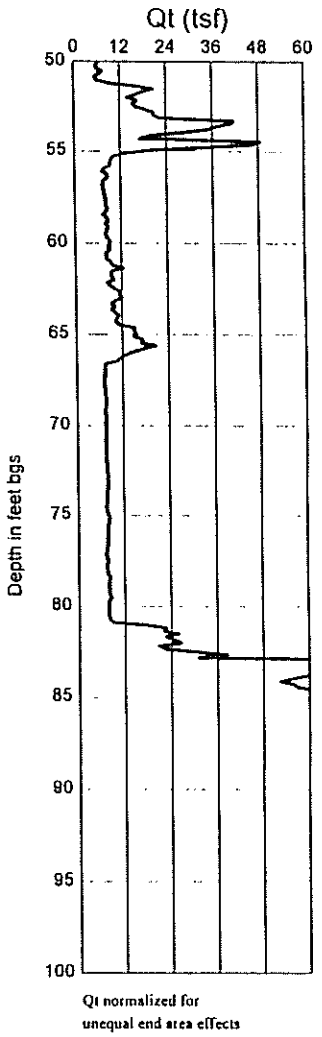
Test Date : 09:29:97
Location : N. 41355 ft, E. 34838 ft

Operator : ConeTec

Ground Surf. Elev. : 0.00
Water Table Depth : 0.50







Qt normalized for unequal end area effects

Data points from 50.00 ft to 100.00 ft below ground surface

1 - Sensitive, Fine-Grained
2 - Organic Soils - Peats
3 - Clay to Silty Clay
4 - Clayey Silt to Silty Clay
5 - Silty Sand to Sandy Silt
6 - Clean to Silty Sand
7 - Gravelly Sand to Sand
8 - Very Stiff Sand to Clayey Sand
9 - Very Stiff Fine-Grained

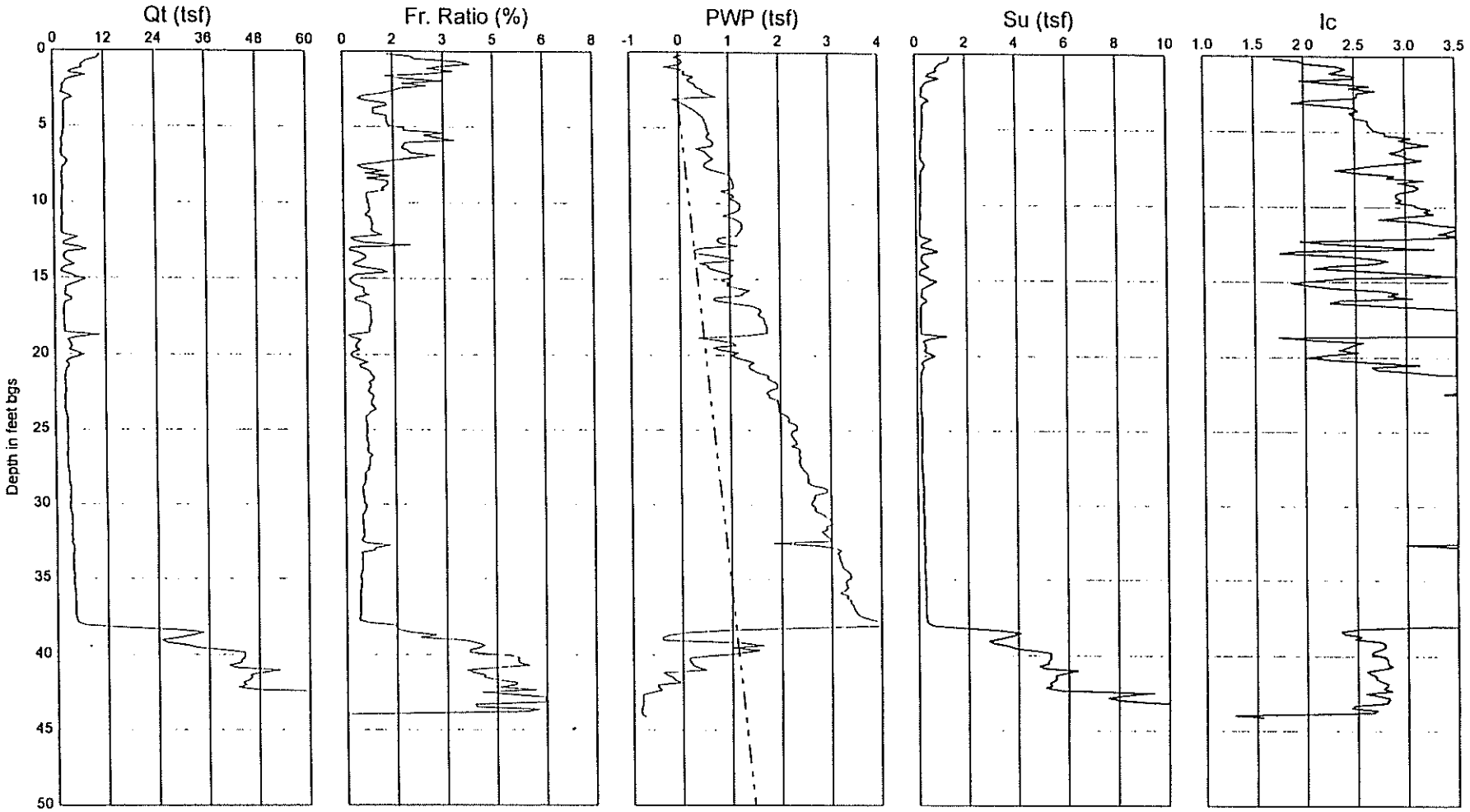
PROJECT NO. 973-2255 DATE: 2/9/98 DRAWN BY RTS

Cone Penetration Test - CPT-10

Test Date : 09:28:97
Location : N. 41379 ft, E. 40407 ft

Operator : ConeTec

Ground Surf. Elev. : 0.00
Water Table Depth : 3.67



Qt normalized for
unequal end area effects

Fr Ratio = 100*F/(Qt-Sigmav)
Gamma = 104.2 pcf

Su = (Qt - SigmaV) / Nk
Nk = 8
Gamma = 104.2 pcf

After Jefferies and Davies (1991)
Ic < 1.25 - Gravelly sands
1.25 <Ic < 1.90 - Clean to silty sand
1.90 <Ic < 2.54 - Silty sand to sandy silt
2.54 <Ic < 2.82 - Clayey silt to silty clay
2.82 <Ic < 3.22 - Clays

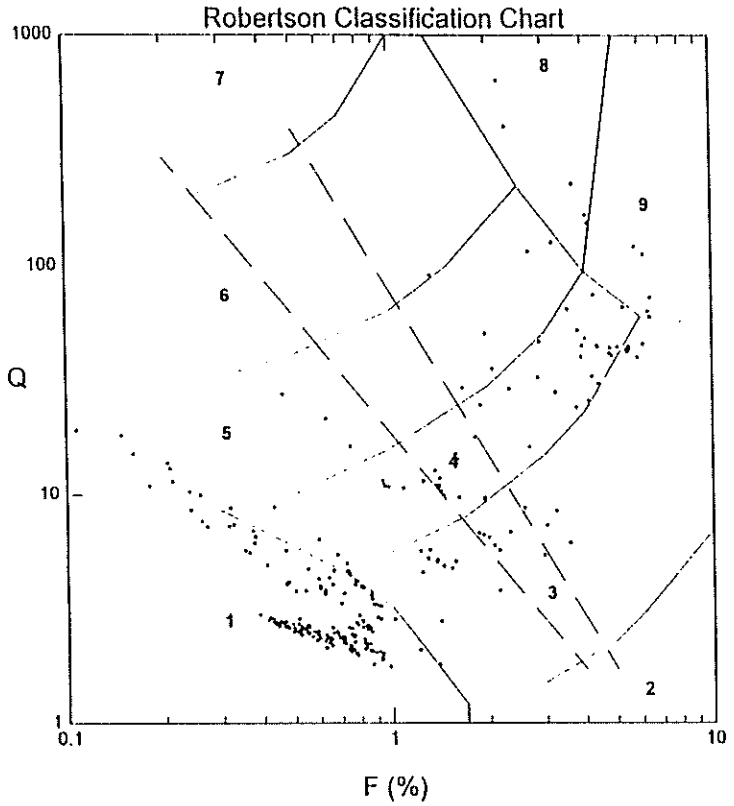
PROJECT NO 973-2255 DATE 2/9/98 DRAWN BY RTS

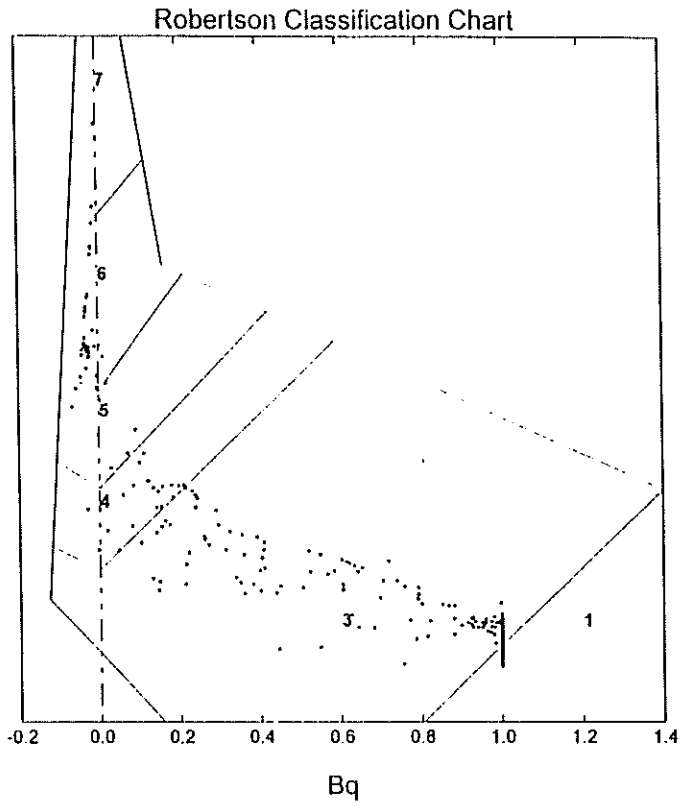
Cone Penetration Test - CPT-10

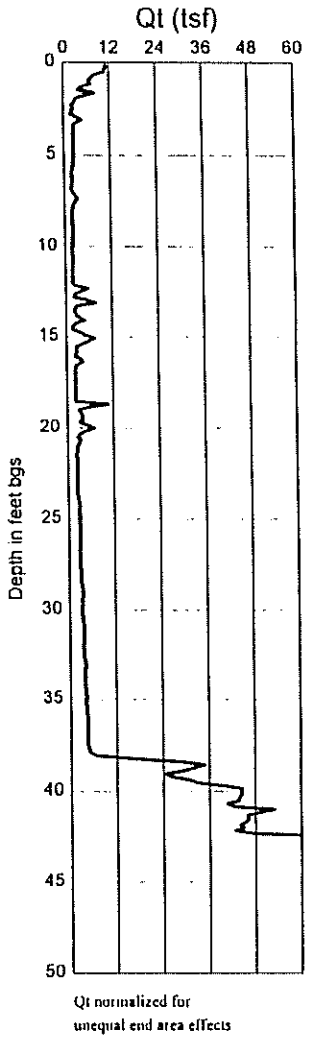
Test Date : 09:28:97
Location : N. 41379 ft, E. 40407 ft

Operator : ConeTec

Ground Surf. Elev. : 0.00
Water Table Depth : 3.67







Qt normalized for unequal end area effects

Data points from 0.00 ft to 50.00 ft below ground surface

1 - Sensitive, Fine-Grained
2 - Organic Soils - Peats
3 - Clay to Silty Clay
4 - Clayey Silt to Silty Clay
5 - Silty Sand to Sandy Silt
6 - Clean to Silty Sand
7 - Gravelly Sand to Sand
8 - Very Stiff Sand to Clayey Sand
9 - Very Stiff Fine-Grained

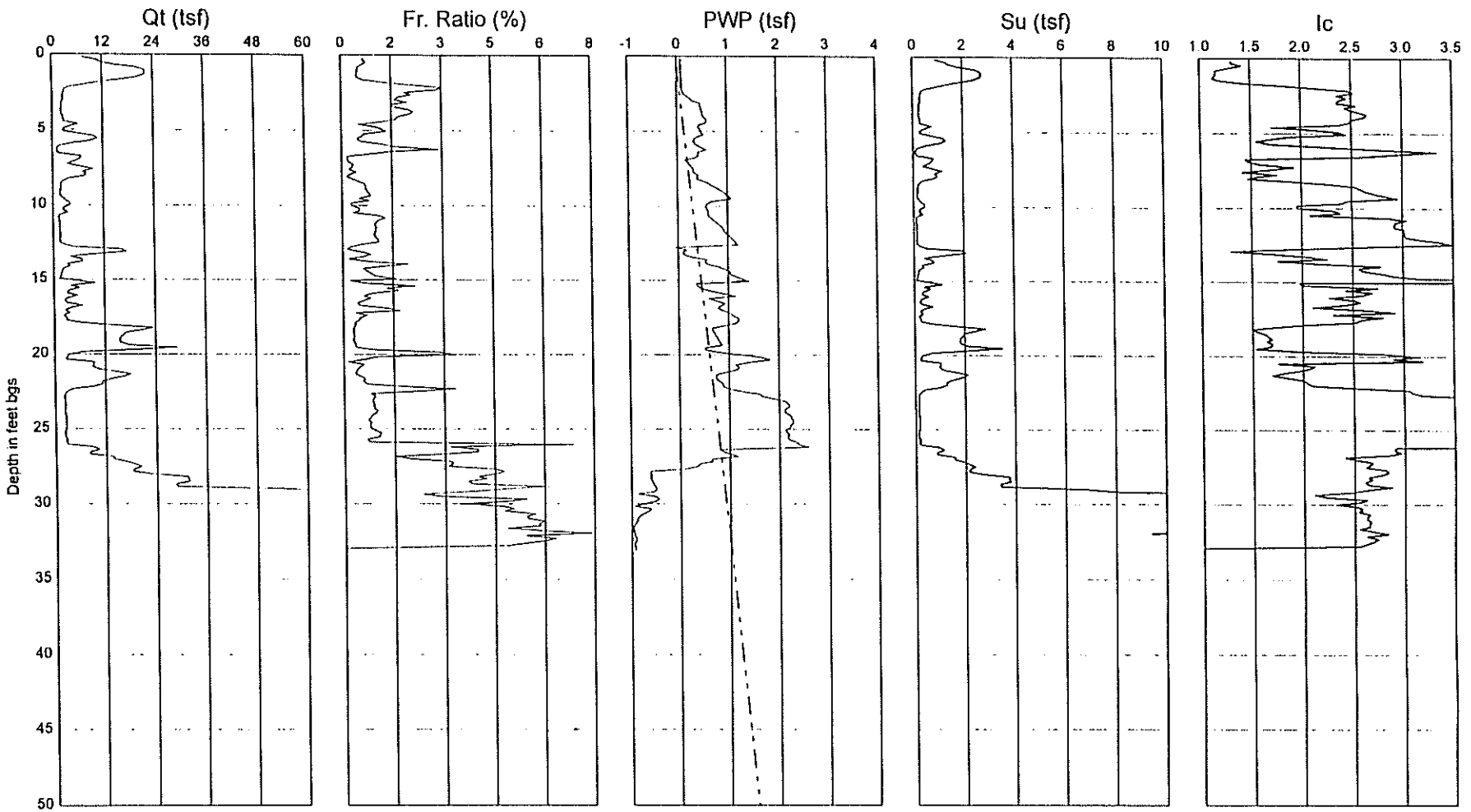
PROJECT NO 973-2255 DATE 2/9/98 DRAWN BY RTS

Cone Penetration Test - CPT-11

Test Date : 10:08:97
Location : N. 38710 ft, E. 43719 ft

Operator : ConeTec

Ground Surf. Elev. : 0.00
Water Table Depth : 0.50



Qt normalized for unequal end area effects

Fr Ratio = 100*F/(Qt-Sigmav)
Gamma = 104.2 pcf

Su = (Qt - SigmaV) / Nk
Nk = 8
Gamma = 104.2 pcf

After Jefferies and Davies (1991)
Ic < 1.25 - Gravelly sands
1.25 <Ic < 1.90 - Clean to silty sand
1.90 <Ic < 2.54 - Silty sand to sandy silt
2.54 <Ic < 2.82 - Clayey silt to silty clay
2.82 <Ic < 3.22 - Clays

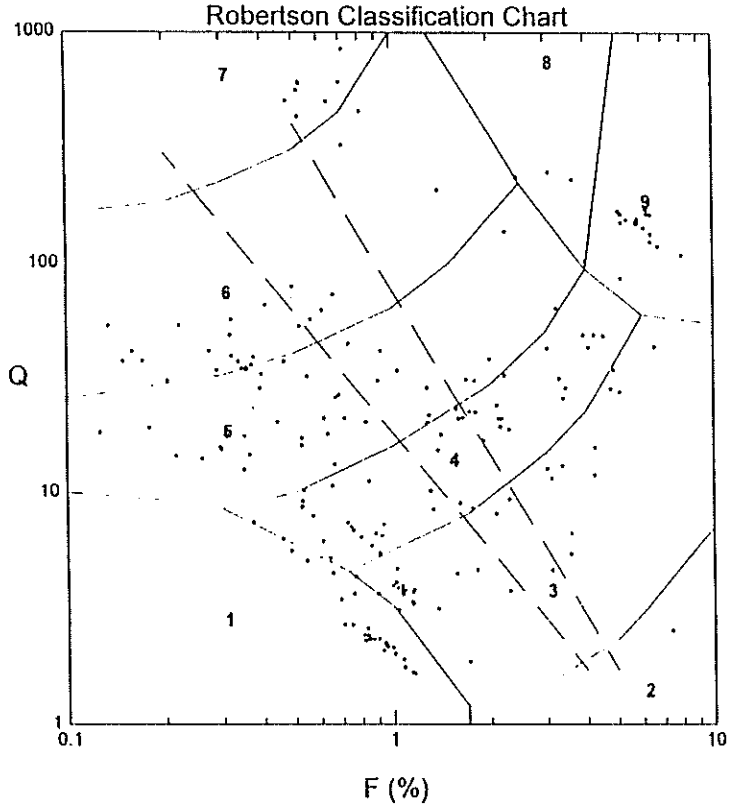
PROJECT NO 973-2255 DATE 2/9/98 DRAWN BY RTS

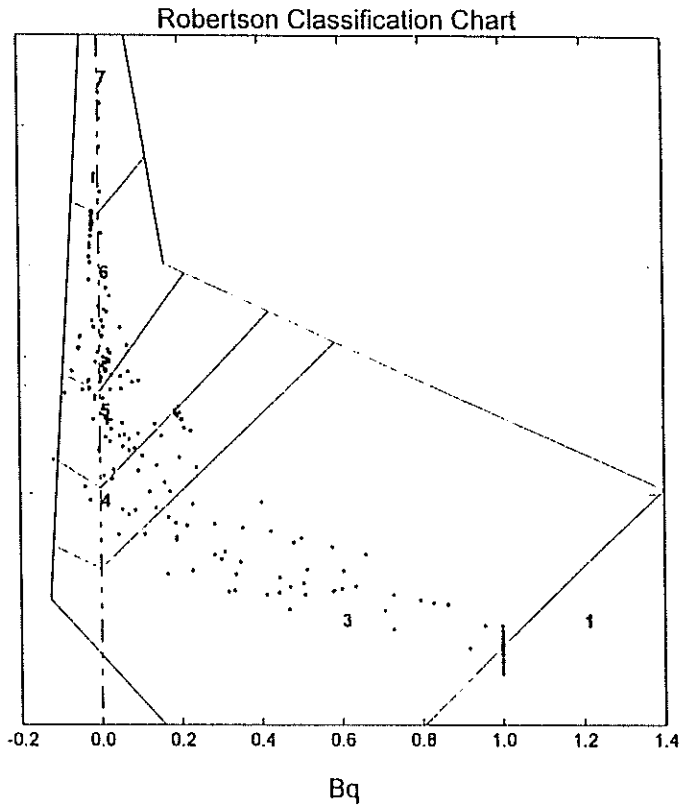
Cone Penetration Test - CPT-11

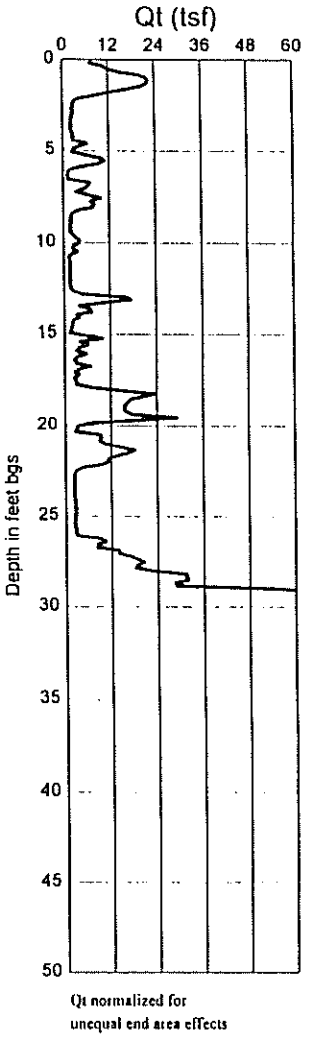
Test Date : 10.08.97
Location : N. 38710 ft, E. 43719 ft

Operator : ConeTec

Ground Surf. Elev. : 0.00
Water Table Depth : 0.50







Qt normalized for unequal end area effects

Data points from 0.00 ft to 50.00 ft below ground surface

1 - Sensitive, Fine-Grained
2 - Organic Soils - Peats
3 - Clay to Silty Clay
4 - Clayey Silt to Silty Clay
5 - Silty Sand to Sandy Silt
6 - Clean to Silty Sand
7 - Gravelly Sand to Sand
8 - Very Stiff Sand to Clayey Sand
9 - Very Stiff Fine-Grained

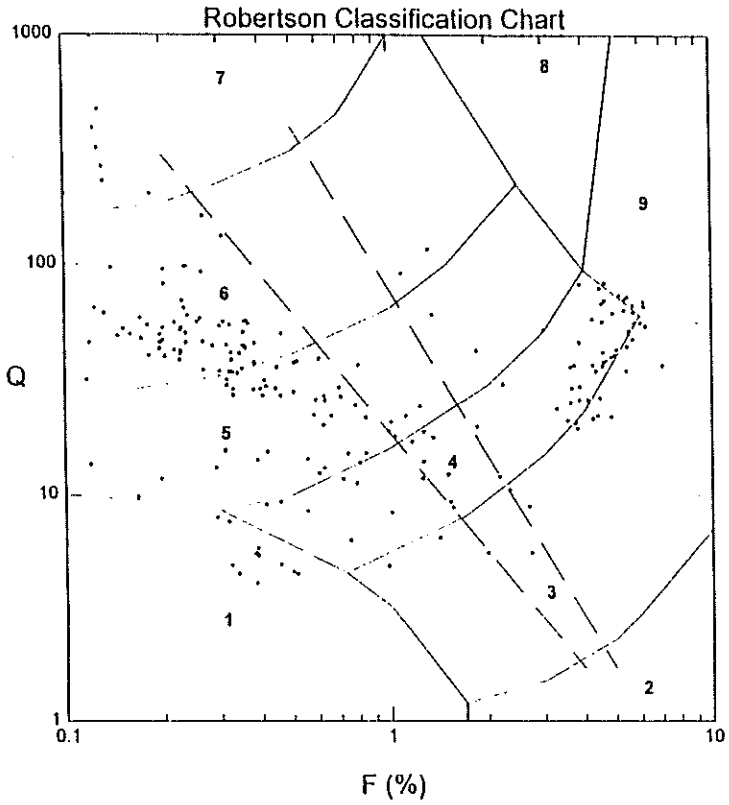
PROJECT NO 973-2255 DATE: 2/9/98 DRAWN BY RTS

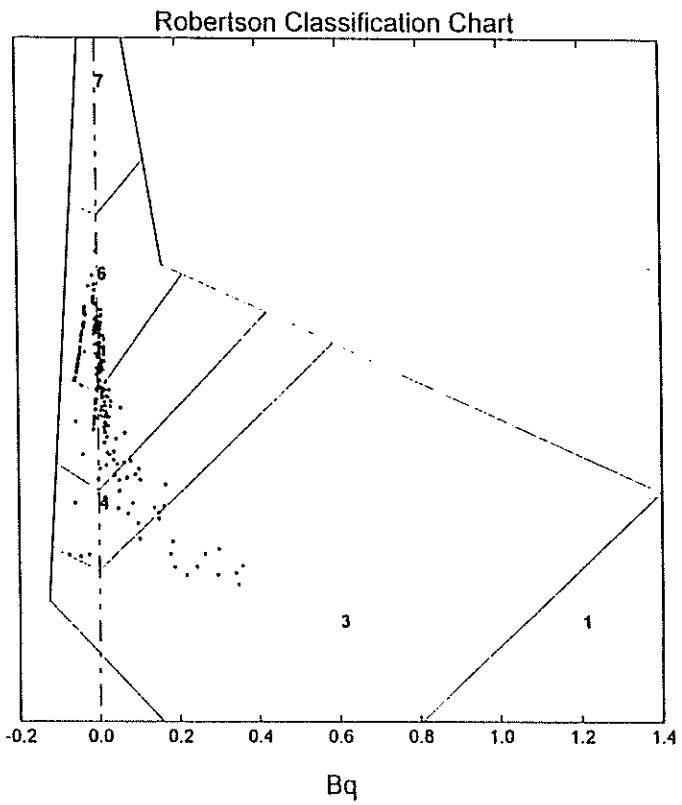
Cone Penetration Test - CPT-12

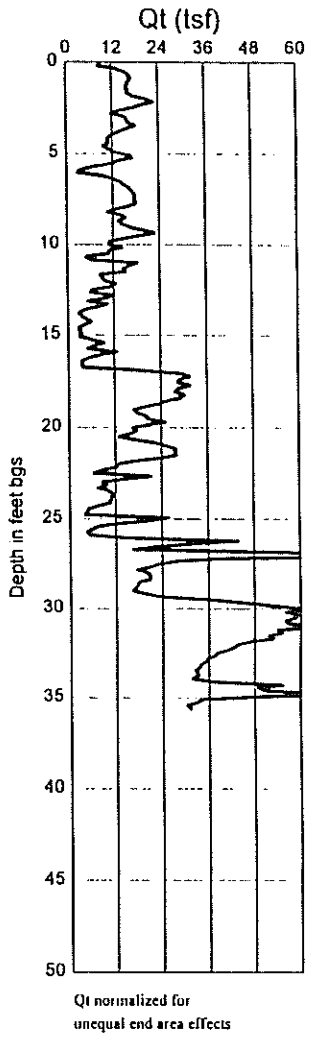
Test Date : 09:30:97
Location : N. 42815 ft, E. 35845 ft

Operator : ConeTec

Ground Surf. Elev. : 0.00
Water Table Depth : 4.83







Qt normalized for unequal end area effects

Data points from 0.00 ft to 50.00 ft below ground surface

1 - Sensitive, Fine-Grained
2 - Organic Soils - Peats
3 - Clay to Silty Clay
4 - Clayey Silt to Silty Clay
5 - Silty Sand to Sandy Silt
6 - Clean to Silty Sand
7 - Gravelly Sand to Sand
8 - Very Stiff Sand to Clayey Sand
9 - Very Stiff Fine-Grained

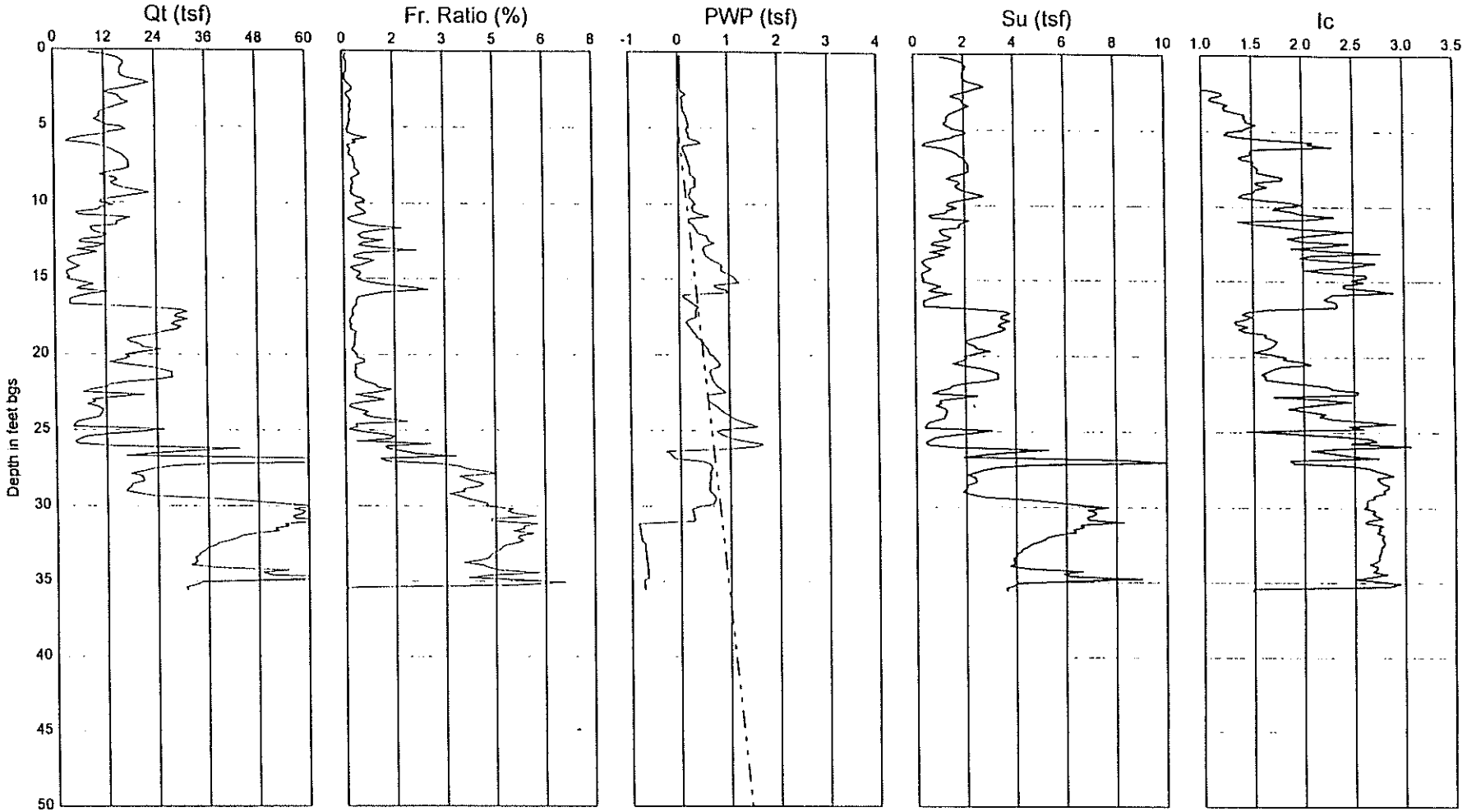
PROJECT NO. 973-2255 DATE. 2/9/98 DRAWN BY. RTS

Cone Penetration Test - CPT-12

Test Date : 09:30.97
Location : N. 42815 ft, E. 35845 ft

Operator : ConeTec

Ground Surf. Elev. : 0.00
Water Table Depth : 4.83



Qt normalized for unequal end area effects

Fr Ratio = 100*F/(Qt-Sigmav)
Gamma = 104 2 pcf

Su = (Qt - SigmaV) / Nk
Nk = 8
Gamma = 104 2 pcf

After Jefferies and Davies (1991)
Ic < 1 25 - Gravelly sands
1 25 <Ic < 1 90 - Clean to silty sand
1 90 <Ic < 2 54 - Silty sand to sandy silt
2 54 <Ic < 2 82 - Clayey silt to silty clay
2 82 <Ic < 3.22 - Clays

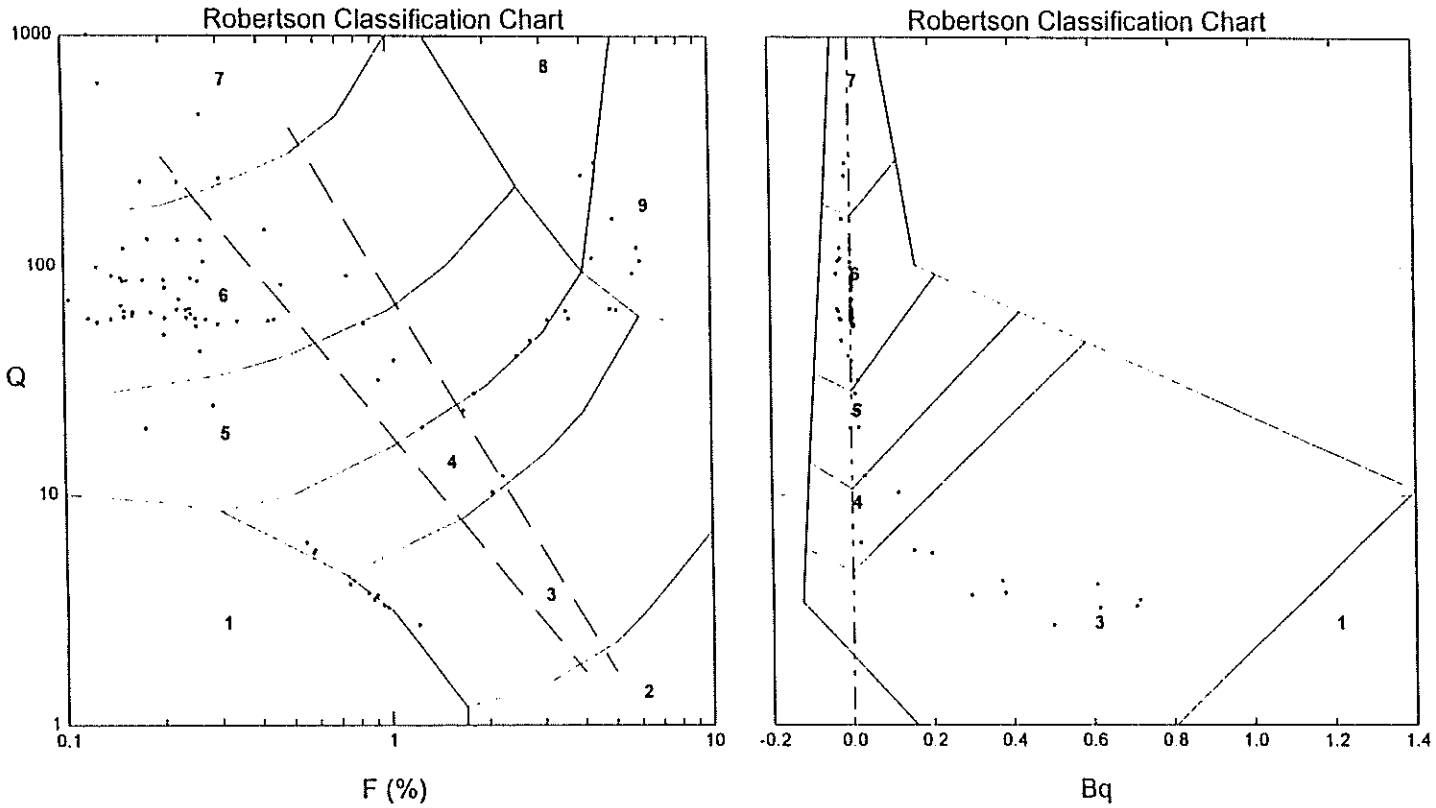
PROJECT NO. 973-2255 DATE. 2/9/98 DRAWN BY. RTS

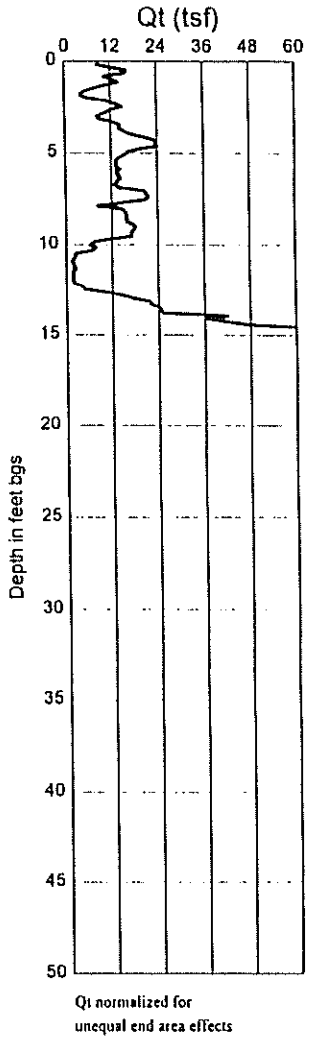
Cone Penetration Test - CPT-13

Test Date : 09:30:97
Location : N. 42966 ft, E. 40655 ft

Operator : ConeTec

Ground Surf. Elev. : 0.00
Water Table Depth : 2.70





Qt normalized for unequal end area effects

Data points from 0.00 ft to 15.00 ft below ground surface

1 - Sensitive, Fine-Grained
2 - Organic Soils - Peats
3 - Clay to Silty Clay
4 - Clayey Silt to Silty Clay
5 - Silty Sand to Sandy Silt
6 - Clean to Silty Sand
7 - Gravelly Sand to Sand
8 - Very Stiff Sand to Clayey Sand
9 - Very Stiff Fine-Grained

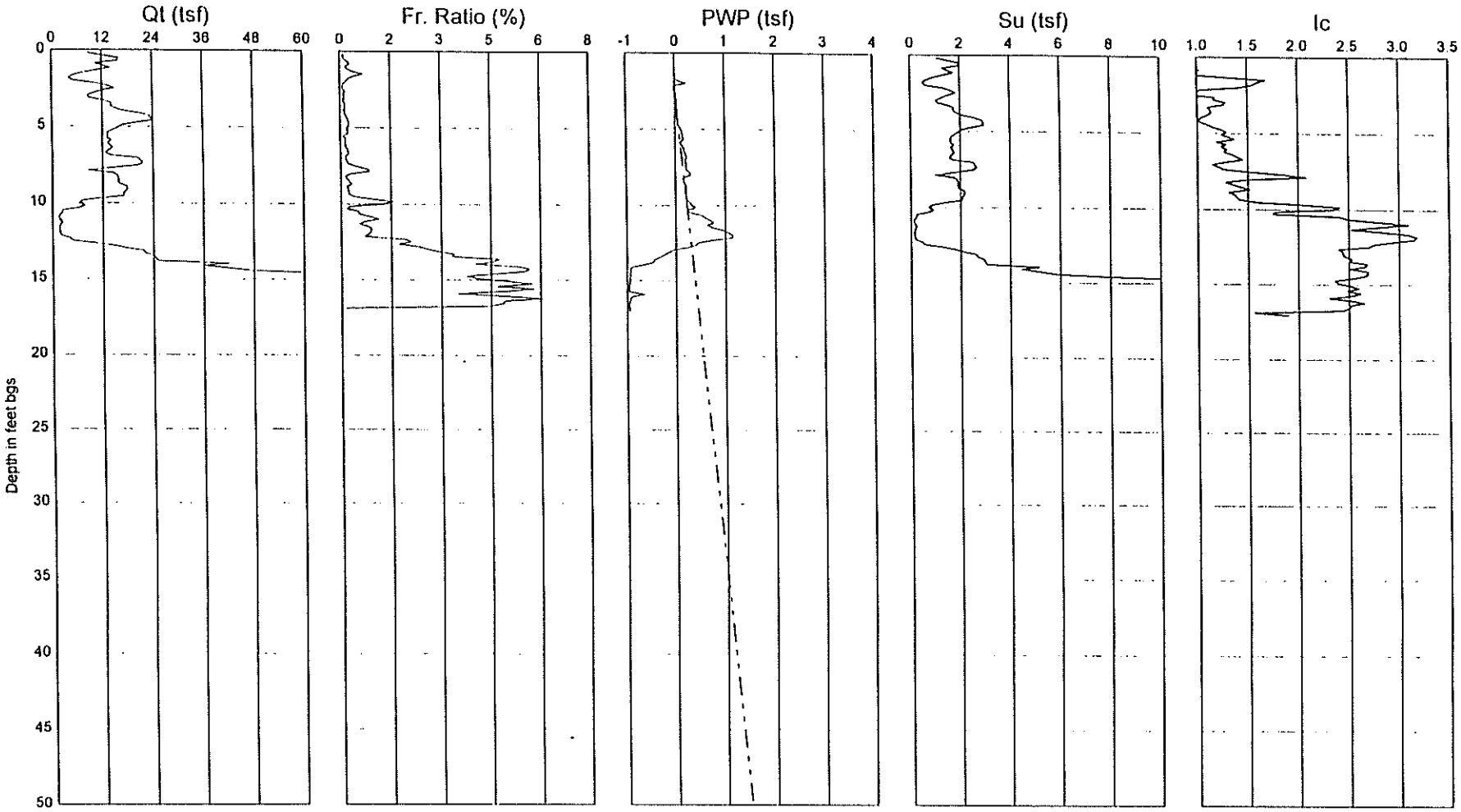
PROJECT NO 973-2255 DATE: 2/9/98 DRAWN BY: RTS

Cone Penetration Test - CPT-13

Test Date : 09:30.97
Location : N. 42966 ft, E. 40655 ft

Operator : ConeTec

Ground Surf. Elev. : 0.00
Water Table Depth : 2.70



Qt normalized for unequal end area effects

Fr Ratio = 100*F/(Qt-Sigmav)
Gamma = 104.2 pcf

Su = (Qt - SigmaV) / Nk
Nk = 8
Gamma = 104.2 pcf

After Jefferies and Davies (1991)
Ic < 1.25 - Gravelly sands
1.25 <Ic < 1.90 - Clean to silty sand
1.90 <Ic < 2.54 - Silty sand to sandy silt
2.54 <Ic < 2.82 - Clayey silt to silty clay
2.82 <Ic < 3.22 - Clays

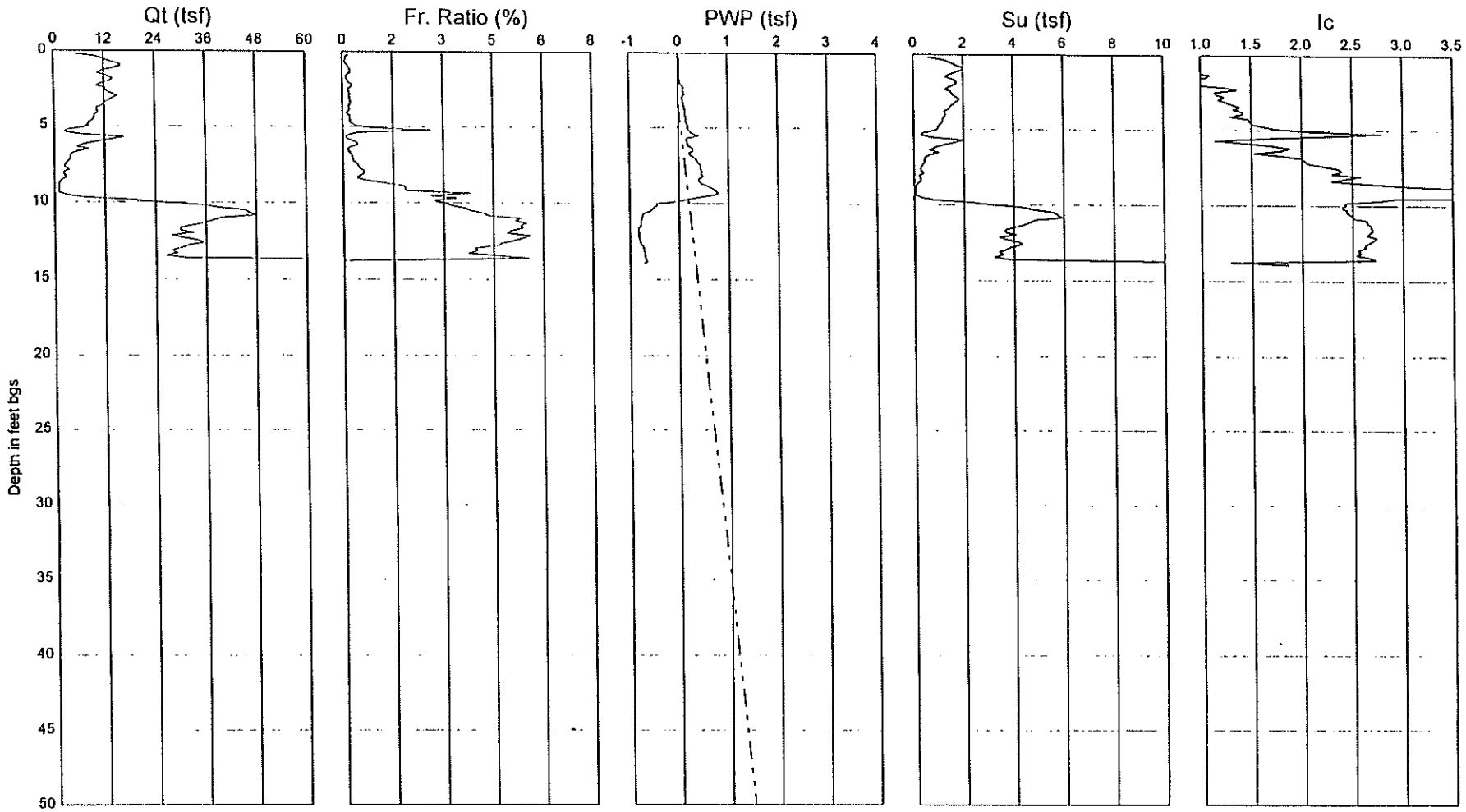
PROJECT NO. 973-2255 DATE: 2/9/98 DRAWN BY: RTS

Cone Penetration Test - CPT-14

Test Date : 10:01:97
Location : N. 43379 ft, E. 46725 ft

Operator : ConeTec

Ground Surf. Elev. : 0.00
Water Table Depth : 3.45



Qt normalized for unequal end area effects

Fr Ratio = 100*F/(Qt-Sigmav)
Gamma = 104.2 pcf

Su = (Qt - SigmaV) / Nk
Nk = 8
Gamma = 104.2 pcf

After Jefferies and Davies (1991)
Ic < 1.25 - Gravelly sands
1.25 <Ic < 1.90 - Clean to silty sand
1.90 <Ic < 2.54 - Silty sand to sandy silt
2.54 <Ic < 2.82 - Clayey silt to silty clay
2.82 <Ic < 3.22 - Clays

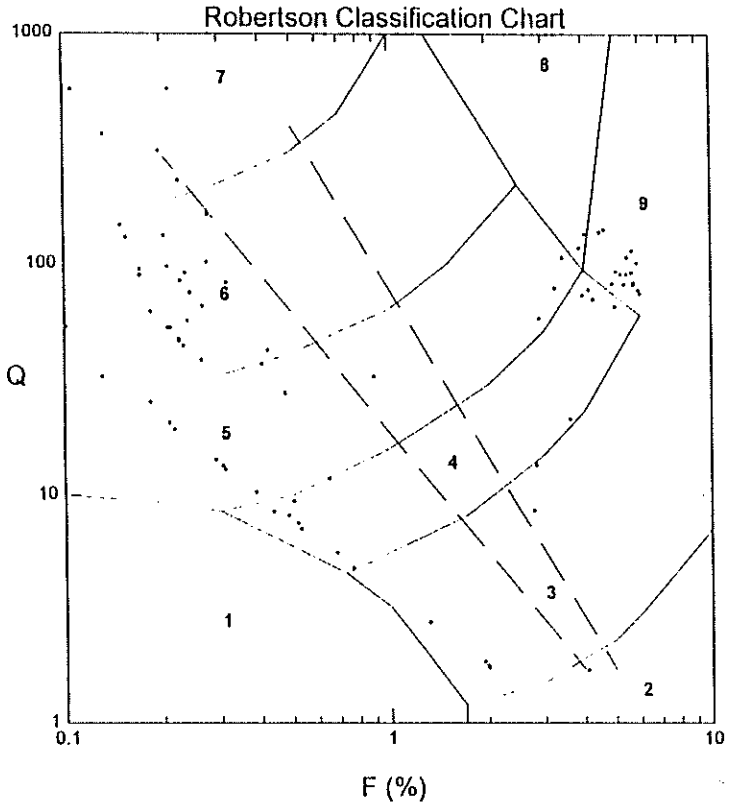
PROJECT NO 973-2255 DATE 2/9/98 DRAWN BY RTS

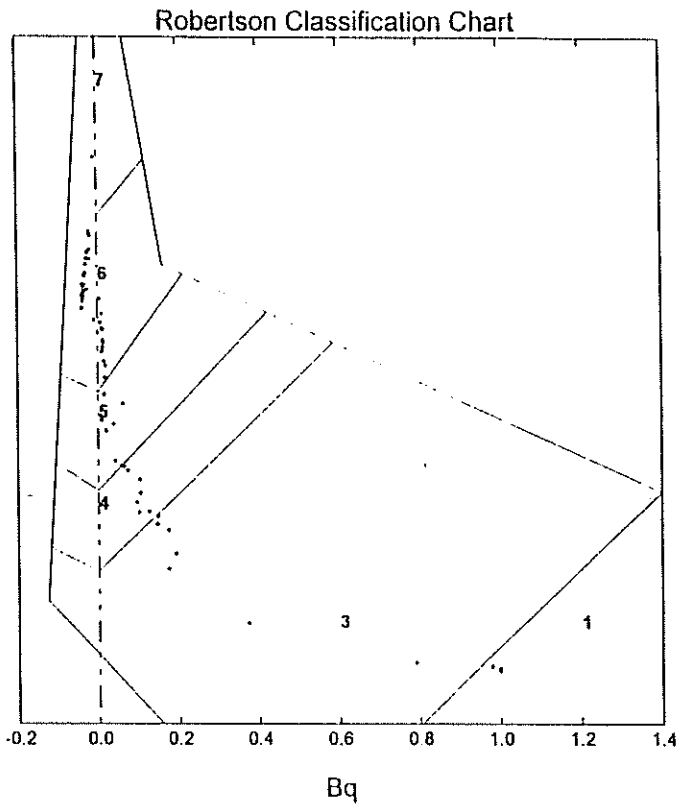
Cone Penetration Test - CPT-14

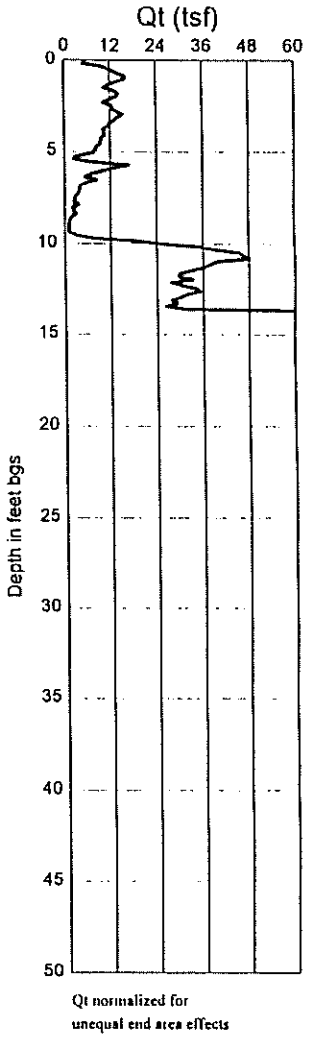
Test Date : 10:01:97
Location : N. 43379 ft, E. 46725 ft

Operator : ConeTec

Ground Surf. Elev. : 0.00
Water Table Depth : 3.45







Qt normalized for unequal end area effects

Data points from 0.00 ft to 15.00 ft below ground surface

1 - Sensitive, Fine-Grained
2 - Organic Soils - Peats
3 - Clay to Silty Clay
4 - Clayey Silt to Silty Clay
5 - Silty Sand to Sandy Silt
6 - Clean to Silty Sand
7 - Gravelly Sand to Sand
8 - Very Stiff Sand to Clayey Sand
9 - Very Stiff Fine-Grained

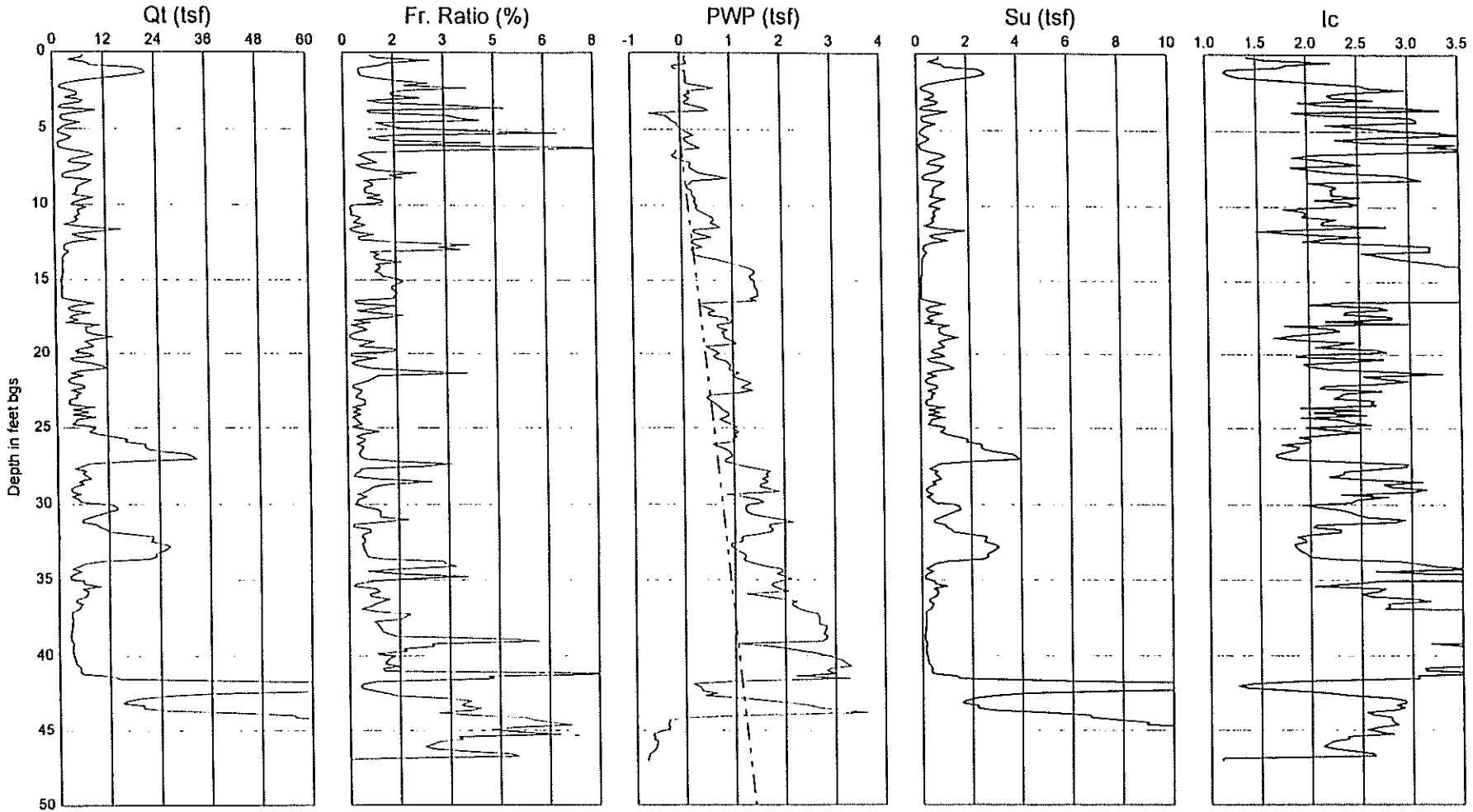
PROJECT NO 973-2255 DATE 2/9/98 DRAWN BY: RTS

Cone Penetration Test - CPT-15

Test Date : 10:04:97
Location : N. 45541 ft, E. 36213 ft

Operator : ConeTec

Ground Surf. Elev. : 0.00
Water Table Depth : 5.70



Qt normalized for unequal end area effects

Fr Ratio = 100*F/(Qt-Sigmav)
Gamma = 104 2 pcf

Su = (Qt - SigmaV) / Nk
Nk = 8
Gamma = 104 2 pcf

After Jefferies and Davies (1991)
Ic < 1.25 - Gravelly sands
1 25 <Ic < 1.90 - Clean to silty sand
1.90 <Ic < 2.54 - Silty sand to sandy silt
2 54 <Ic < 2 82 - Clayey silt to silty clay
2 82 <Ic < 3 22 - Clays

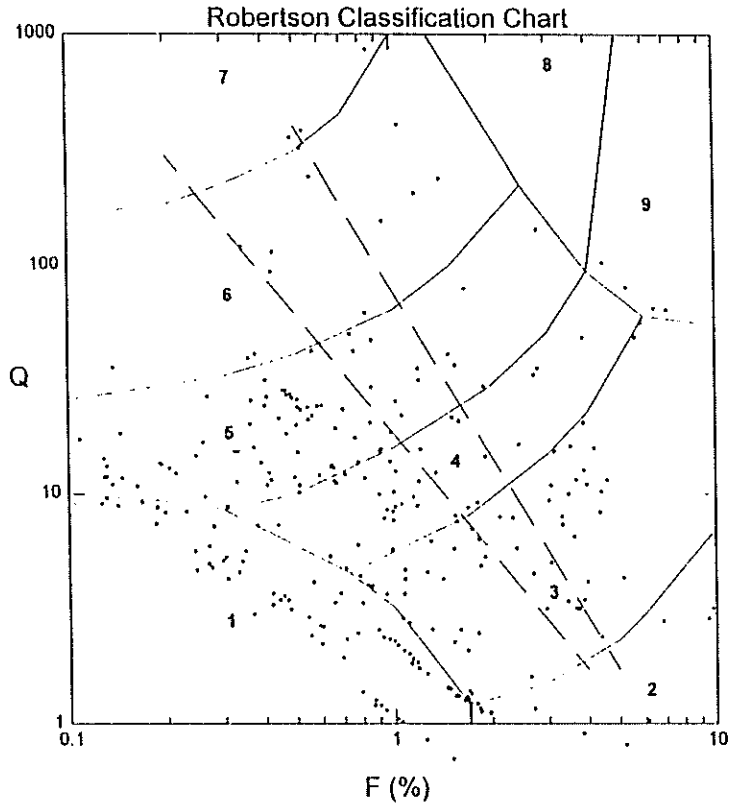
PROJECT NO 973-2255 DATE: 2/9/98 DRAWN BY: RTS

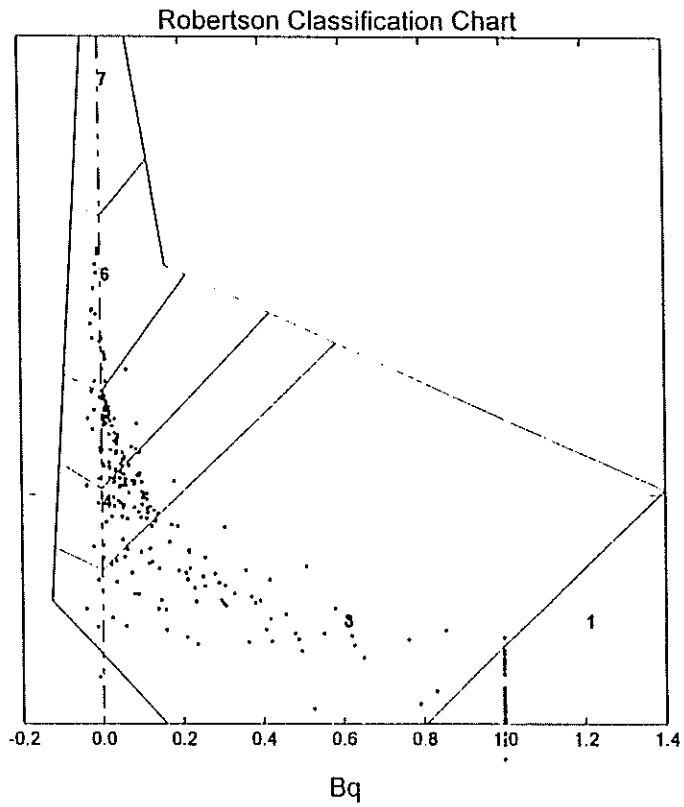
Cone Penetration Test - CPT-15

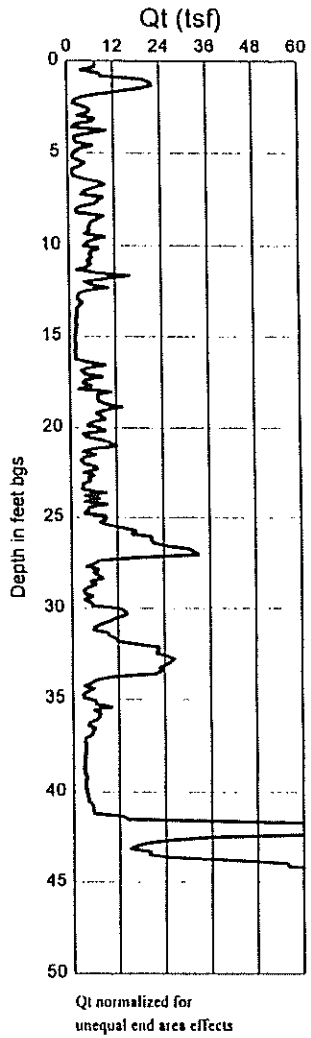
Test Date : 10:04.97
Location : N. 45541 ft, E. 36213 ft

Operator : ConeTec

Ground Surf. Elev. : 0.00
Water Table Depth : 5.70







Qt normalized for unequal end area effects

Data points from 0.00 ft to 45.00 ft below ground surface

1 - Sensitive, Fine-Grained
2 - Organic Soils - Peats
3 - Clay to Silty Clay
4 - Clayey Silt to Silty Clay
5 - Silty Sand to Sandy Silt
6 - Clean to Silty Sand
7 - Gravelly Sand to Sand
8 - Very Stiff Sand to Clayey Sand
9 - Very Stiff Fine-Grained

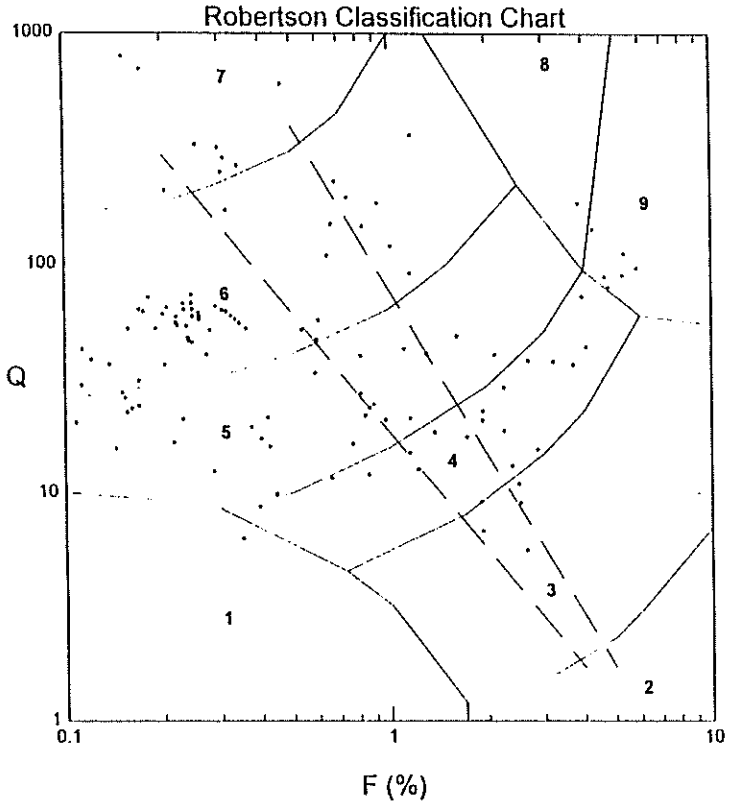
PROJECT NO 973-2255 DATE: 2/9/98 DRAWN BY: RTS

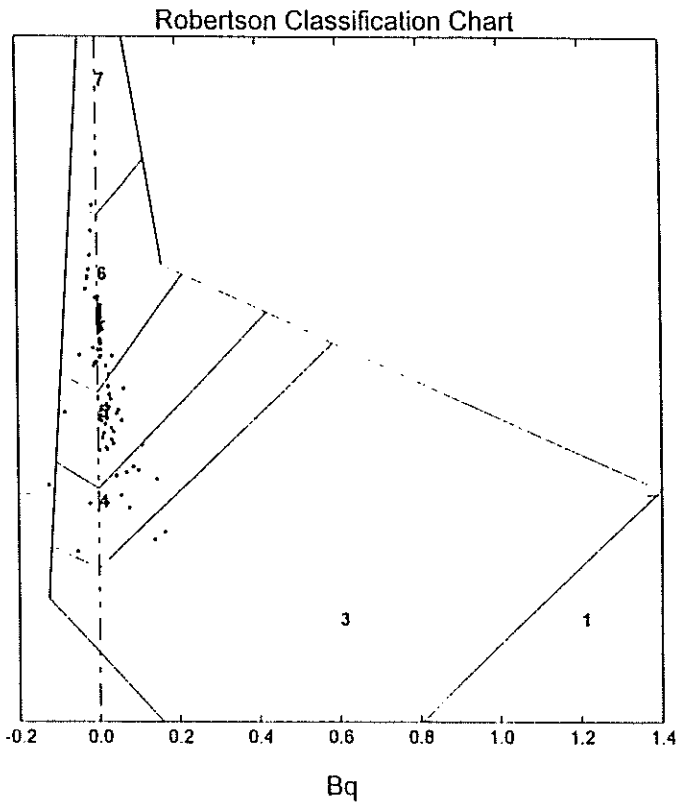
Cone Penetration Test - CPT-16

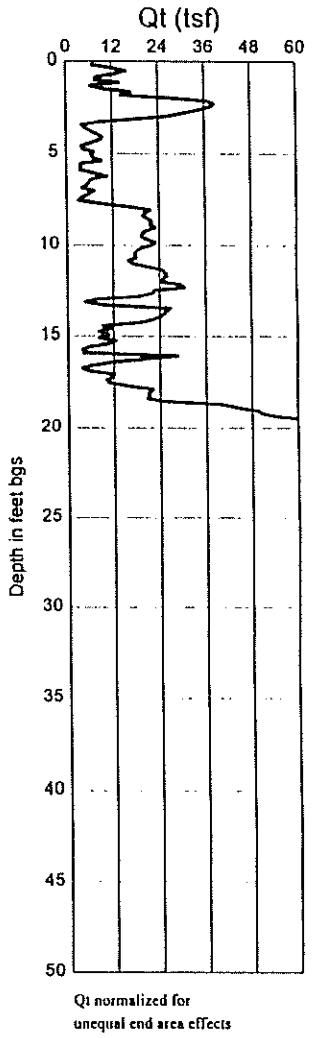
Test Date : 10:02:97
Location : N. 45085 ft, E. 40862 ft

Operator : ConeTec

Ground Surf. Elev. : 0.00
Water Table Depth : 4.70







Qt normalized for unequal end area effects

Data points from 0.00 ft to 20.00 ft below ground surface

1 - Sensitive, Fine-Grained
2 - Organic Soils - Peats
3 - Clay to Silty Clay
4 - Clayey Silt to Silty Clay
5 - Silty Sand to Sandy Silt
6 - Clean to Silty Sand
7 - Gravelly Sand to Sand
8 - Very Stiff Sand to Clayey Sand
9 - Very Stiff Fine-Grained

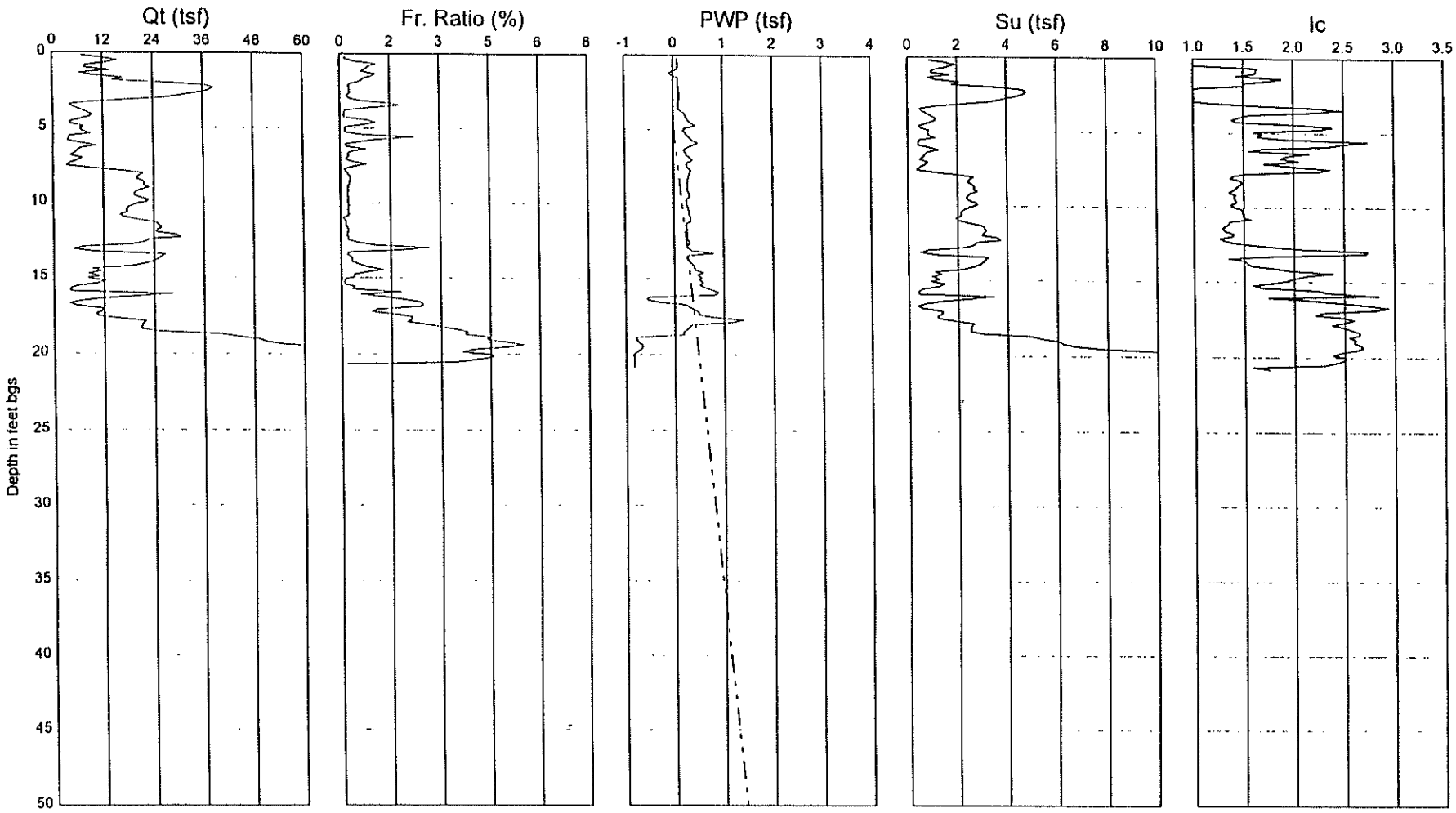
PROJECT NO 973-2255 DATE: 2/9/98 DRAWN BY: RTS

Cone Penetration Test - CPT-16

Test Date : 10:02:97
Location : N. 45085 ft, E. 40862 ft

Operator : ConeTec

Ground Surf. Elev. : 0.00
Water Table Depth : 4.70



Qt normalized for unequal end area effects

Fr Ratio = 100*F/(Qt-Sigmav)
Gamma = 104 2 pcf

Su = (Qt - SigmaV) / Nk
Nk = 8
Gamma = 104 2 pcf

After Jefferies and Davies (1991)
Ic < 1 25 - Gravelly sands
1 25 <Ic < 1.90 - Clean to silty sand
1.90 <Ic < 2.54 - Silty sand to sandy silt
2 54 <Ic < 2 82 - Claycy silt to silty clay
2 82 <Ic < 3 22 - Clays

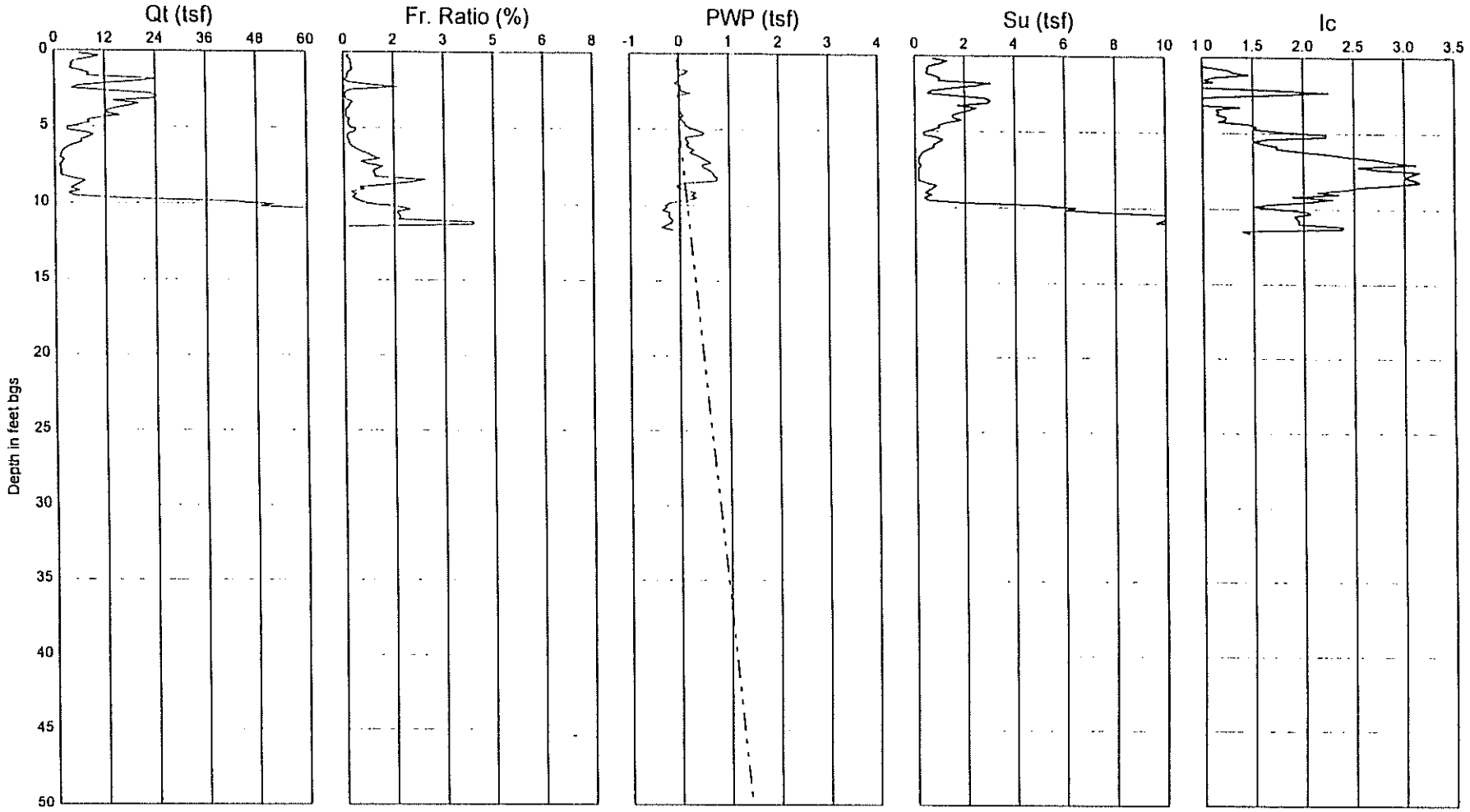
PROJECT NO 973-2255 DATE. 2/9/98 DRAWN BY. RTS

Cone Penetration Test - CPT-17

Test Date : 10:02:97
Location : N. 44957 ft, E. 48099 ft

Operator : ConeTec

Ground Surf. Elev. : 0.00
Water Table Depth : 5.05



Qt normalized for unequal end area effects

Fr Ratio = 100*F/(Qt-Sigmav)
Gamma = 104.2 pcf

Su = (Qt - SigmaV) / Nk
Nk = 8
Gamma = 104.2 pcf

After Jefferies and Davies (1991)
Ic < 1.25 - Gravelly sands
1.25 <Ic < 1.90 - Clean to silty sand
1.90 <Ic < 2.54 - Silty sand to sandy silt
2.54 <Ic < 2.82 - Claycy silt to silty clay
2.82 <Ic < 3.22 - Clays

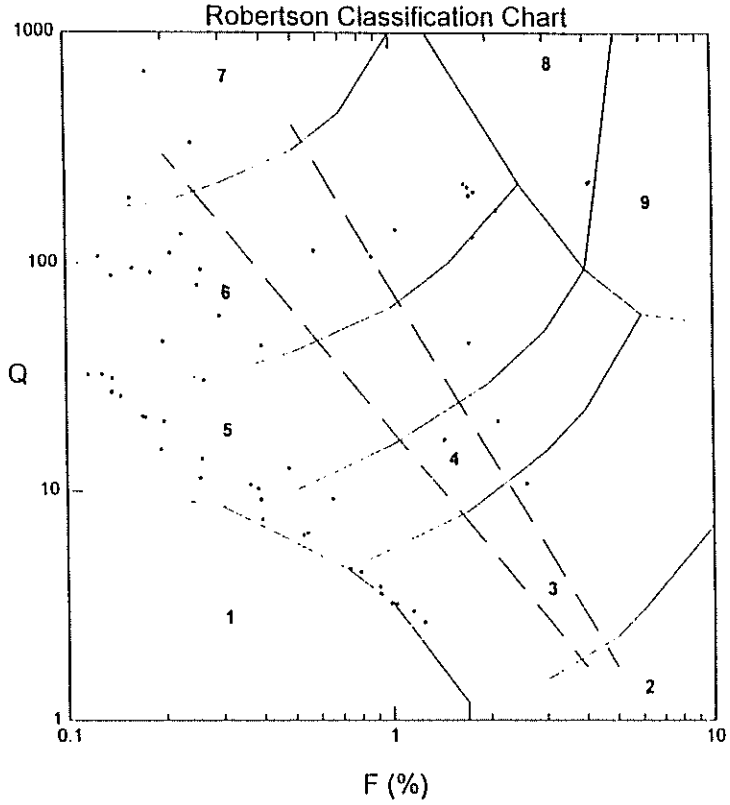
PROJECT NO 973-2255 DATE: 2/9/98 DRAWN BY RTS

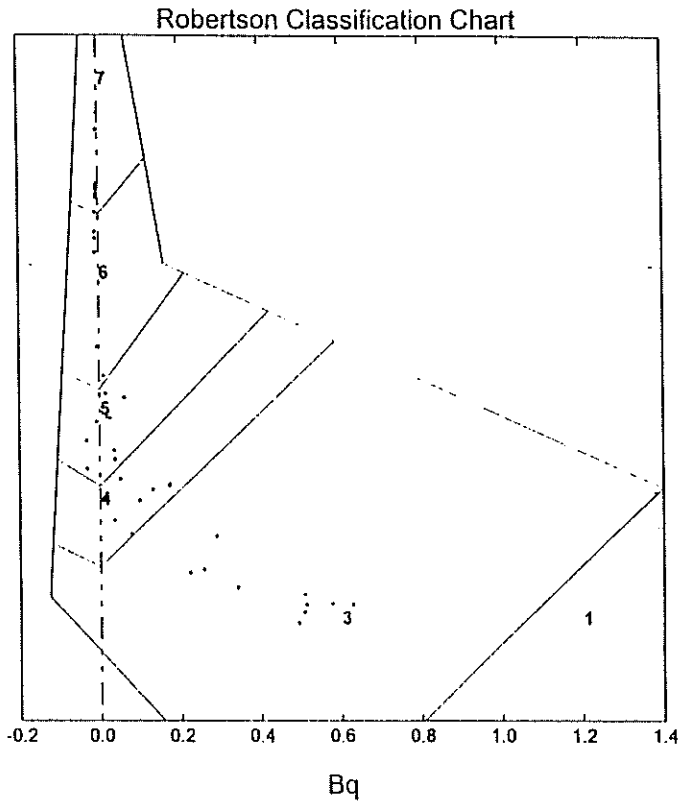
Cone Penetration Test - CPT-17

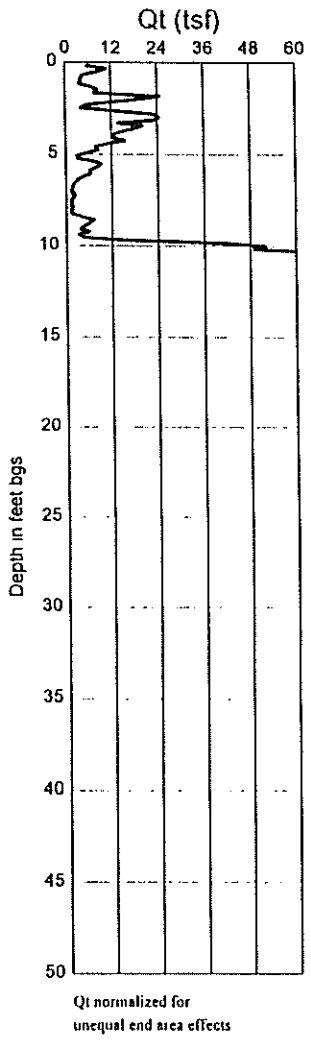
Test Date : 10.02.97
Location : N. 44957 ft, E. 48099 ft

Operator : ConeTec

Ground Surf. Elev. : 0.00
Water Table Depth : 5.05







Qt normalized for unequal end area effects

Data points from 0.00 ft to 15.00 ft below ground surface

1 - Sensitive, Fine-Grained
2 - Organic Soils - Peats
3 - Clay to Silty Clay
4 - Clayey Silt to Silty Clay
5 - Silty Sand to Sandy Silt
6 - Clean to Silty Sand
7 - Gravelly Sand to Sand
8 - Very Stiff Sand to Clayey Sand
9 - Very Stiff Fine-Grained

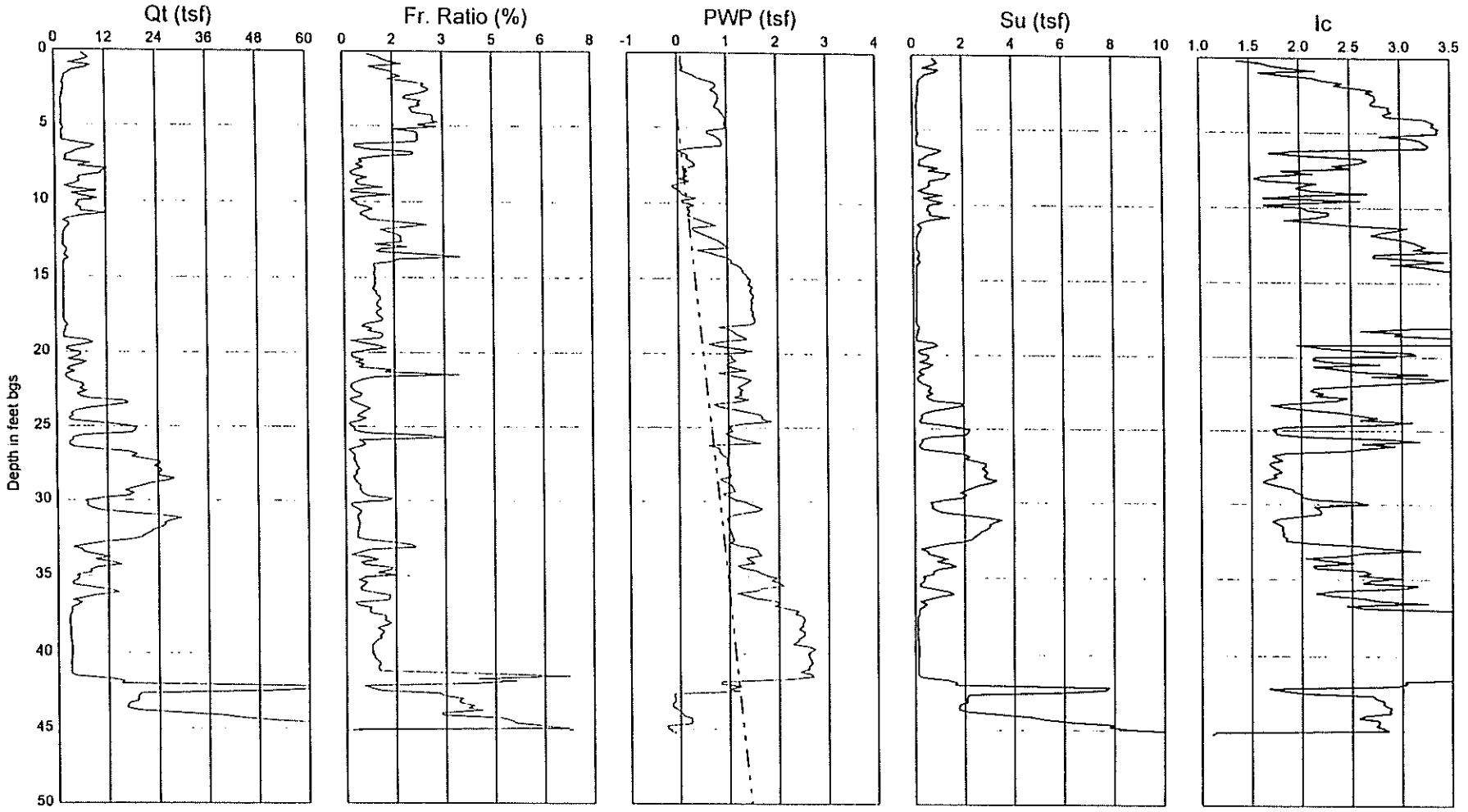
PROJECT NO. 973-2255 DATE: 2/9/98 DRAWN BY: RTS

Cone Penetration Test - CPT-18

Test Date : 10:05:97
Location : N. 46555 ft, E. 36246 ft

Operator : ConeTec

Ground Surf. Elev. : 0.00
Water Table Depth : 4.00



Qt normalized for unequal end area effects

Fr Ratio = 100*F/(Qt-Sigmav)
Gamma = 104 2 pcf

Su = (Qt - SigmaV) / Nk
Nk = 8
Gamma = 104 2 pcf

After Jefferies and Davies (1991)
Ic < 1 25 - Gravelly sands
1 25 <Ic < 1 90 - Clean to silty sand
1 90 <Ic < 2 54 - Silty sand to sandy silt
2 54 <Ic < 2 82 - Clayey silt to silty clay
2 82 <Ic < 3 22 - Clays

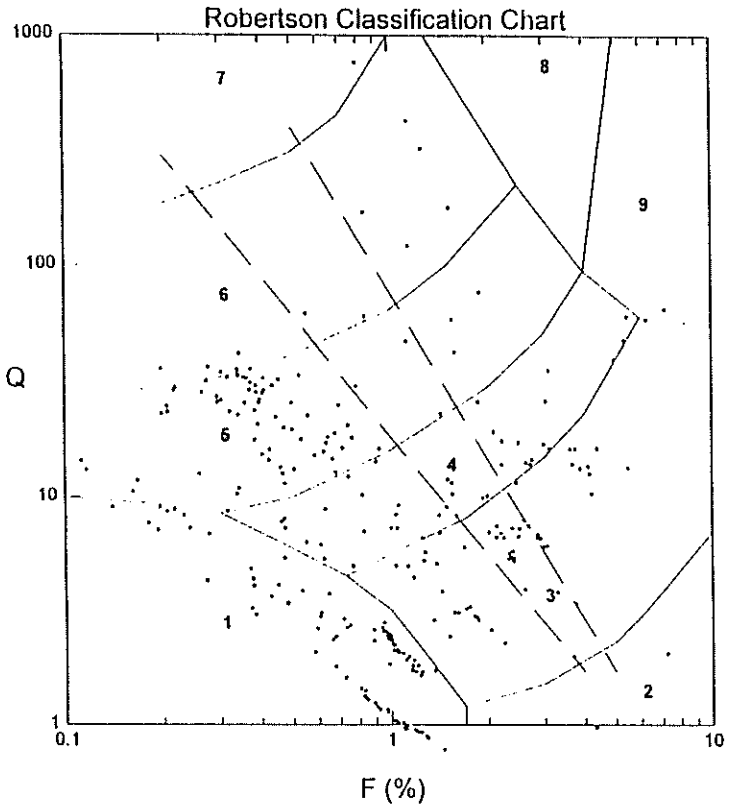
PROJECT NO 973-2255 DATE. 2/9/98 DRAWN BY. RTS

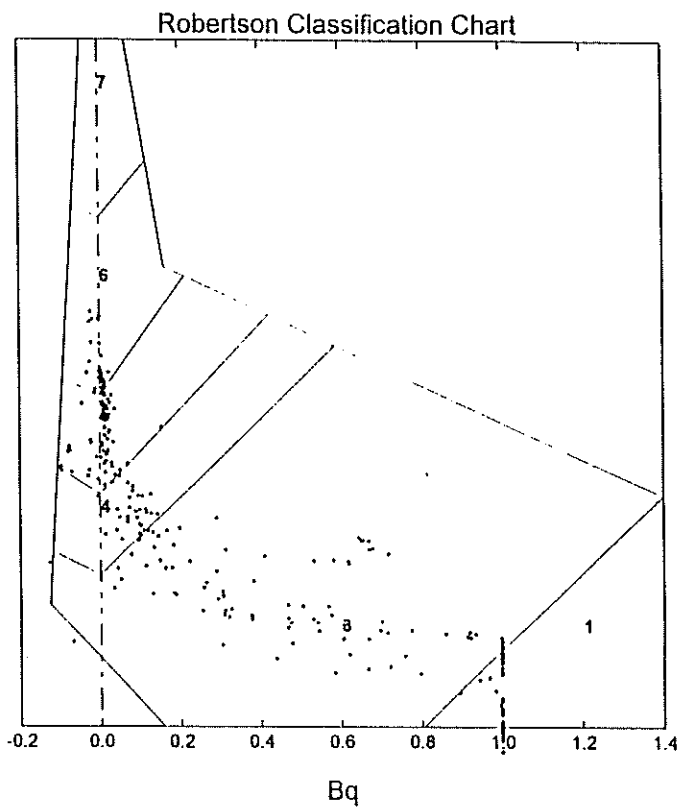
Cone Penetration Test - CPT-18

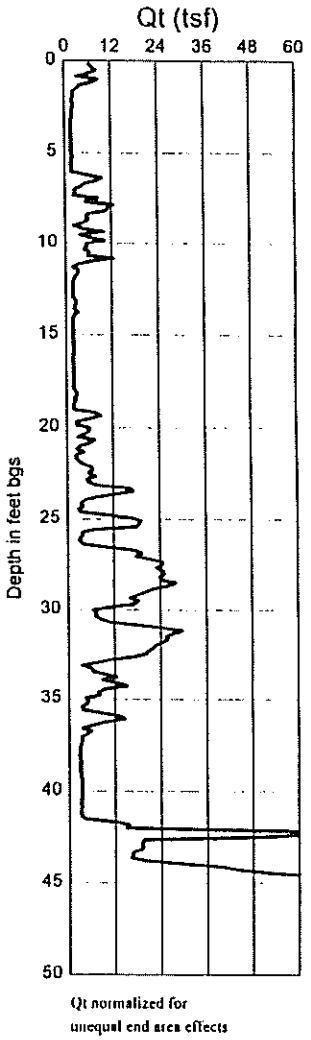
Test Date : 10.05.97
Location : N. 46555 ft, E. 36246 ft

Operator : ConeTec

Ground Surf. Elev. : 0.00
Water Table Depth : 4.00







Qt normalized for unequal end area effects

Data points from 0.00 ft to 45.00 ft below ground surface

1 - Sensitive, Fine-Grained
2 - Organic Soils - Peats
3 - Clay to Silty Clay
4 - Clayey Silt to Silty Clay
5 - Silty Sand to Sandy Silt
6 - Clean to Silty Sand
7 - Gravelly Sand to Sand
8 - Very Stiff Sand to Clayey Sand
9 - Very Stiff Fine-Grained

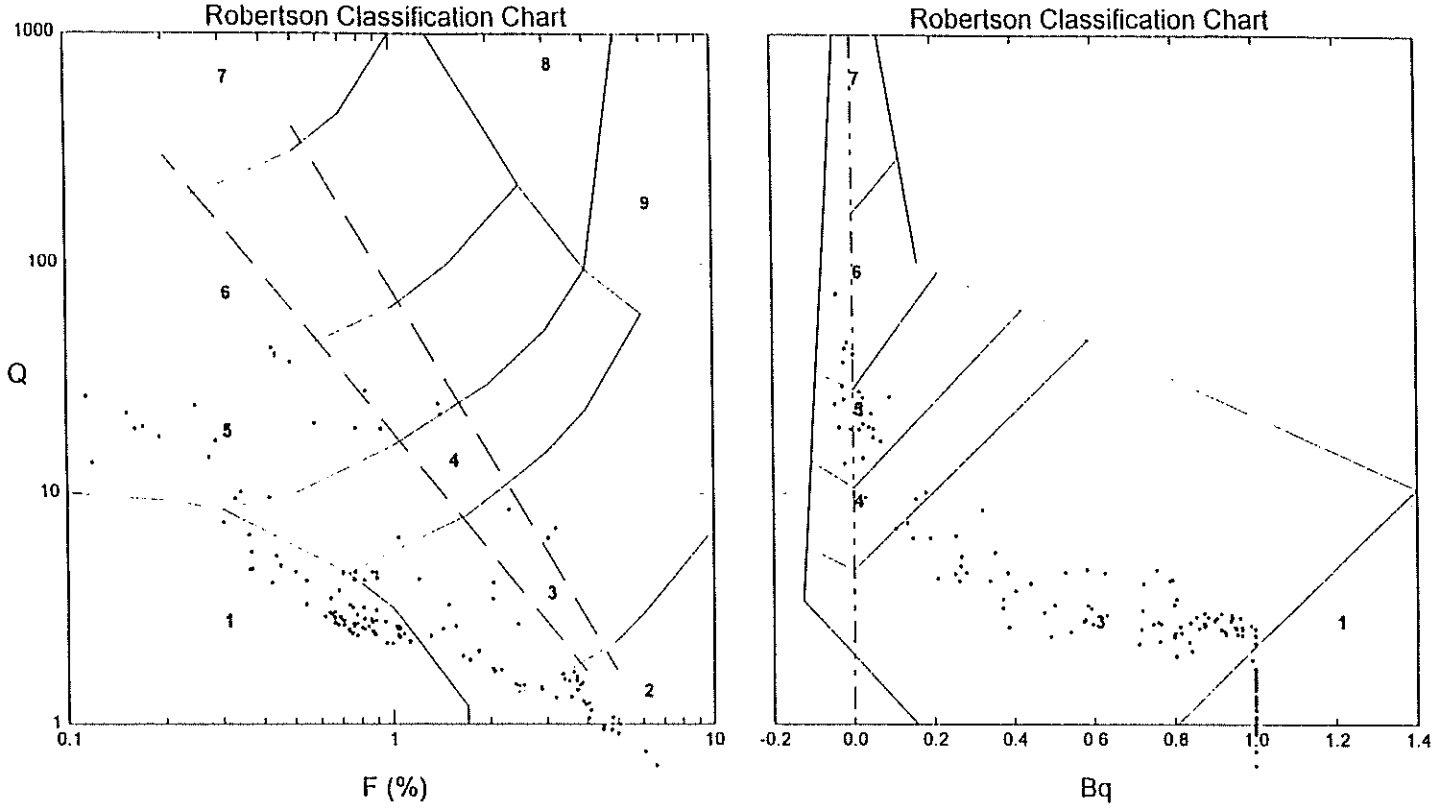
PROJECT NO 973-2255 DATE 2/9/98 DRAWN BY RTS

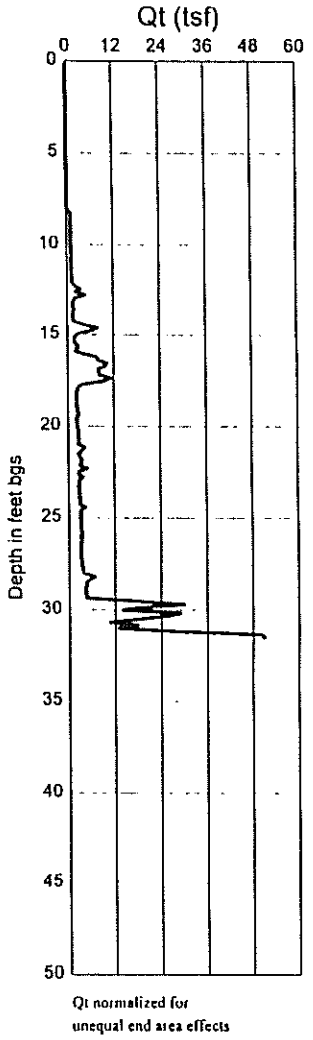
Cone Penetration Test - CPT-20B,,,

Test Date : 10.07.97
Location : N. 50137 ft, E. 44504 ft

Operator : ConeTec

Ground Surf. Elev. : 0.00
Water Table Depth : -9.00





Qt normalized for unequal end area effects

Data points from 0.00 ft to 35.00 ft below ground surface

1 - Sensitive, Fine-Grained
2 - Organic Soils - Peats
3 - Clay to Silty Clay
4 - Clayey Silt to Silty Clay
5 - Silty Sand to Sandy Silt
6 - Clean to Silty Sand
7 - Gravelly Sand to Sand
8 - Very Stiff Sand to Clayey Sand
9 - Very Stiff Fine-Grained

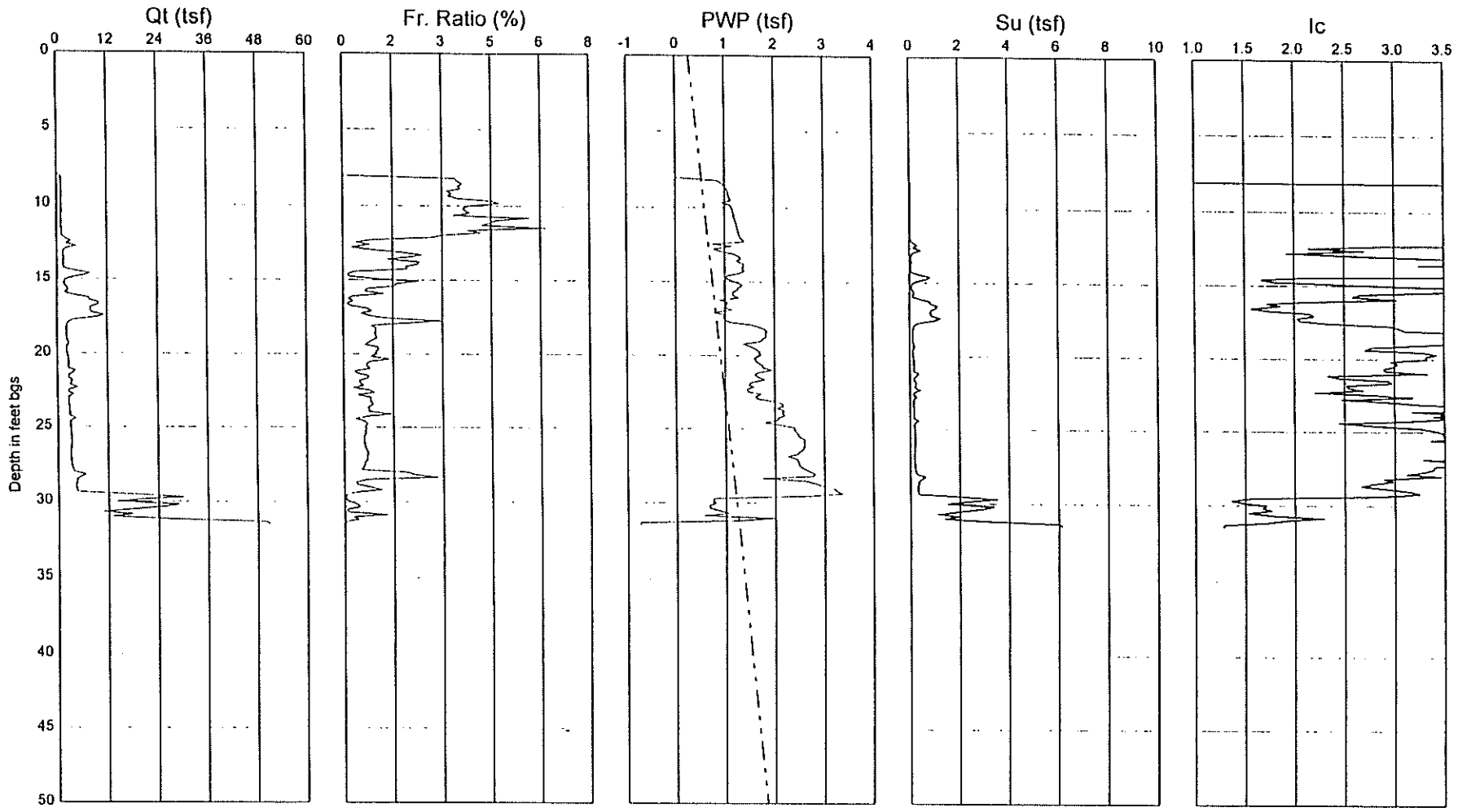
PROJECT NO 973-2255 DATE: 2/9/98 DRAWN BY: RTS

Cone Penetration Test - CPT-20B,,,

Test Date : 10:07:97
Location : N. 50137 ft, E. 44504 ft

Operator : ConeTec

Ground Surf. Elev. : 0.00
Water Table Depth : -9.00



Qt normalized for
unequal end area effects

Fr Ratio = 100*F/(Qt-Sigmav)
Gamma = 104 2 pcf

Su = (Qt - SigmaV) / Nk
Nk = 8
Gamma = 104 2 pcf

After Jefferies and Davies (1991)
Ic < 1 25 - Gravelly sands
1 25 <Ic < 1 90 - Clean to silty sand
1 90 <Ic < 2 54 - Silty sand to sandy silt
2 54 <Ic < 2 82 - Clayey silt to silty clay
2 82 <Ic < 3 22 - Clays

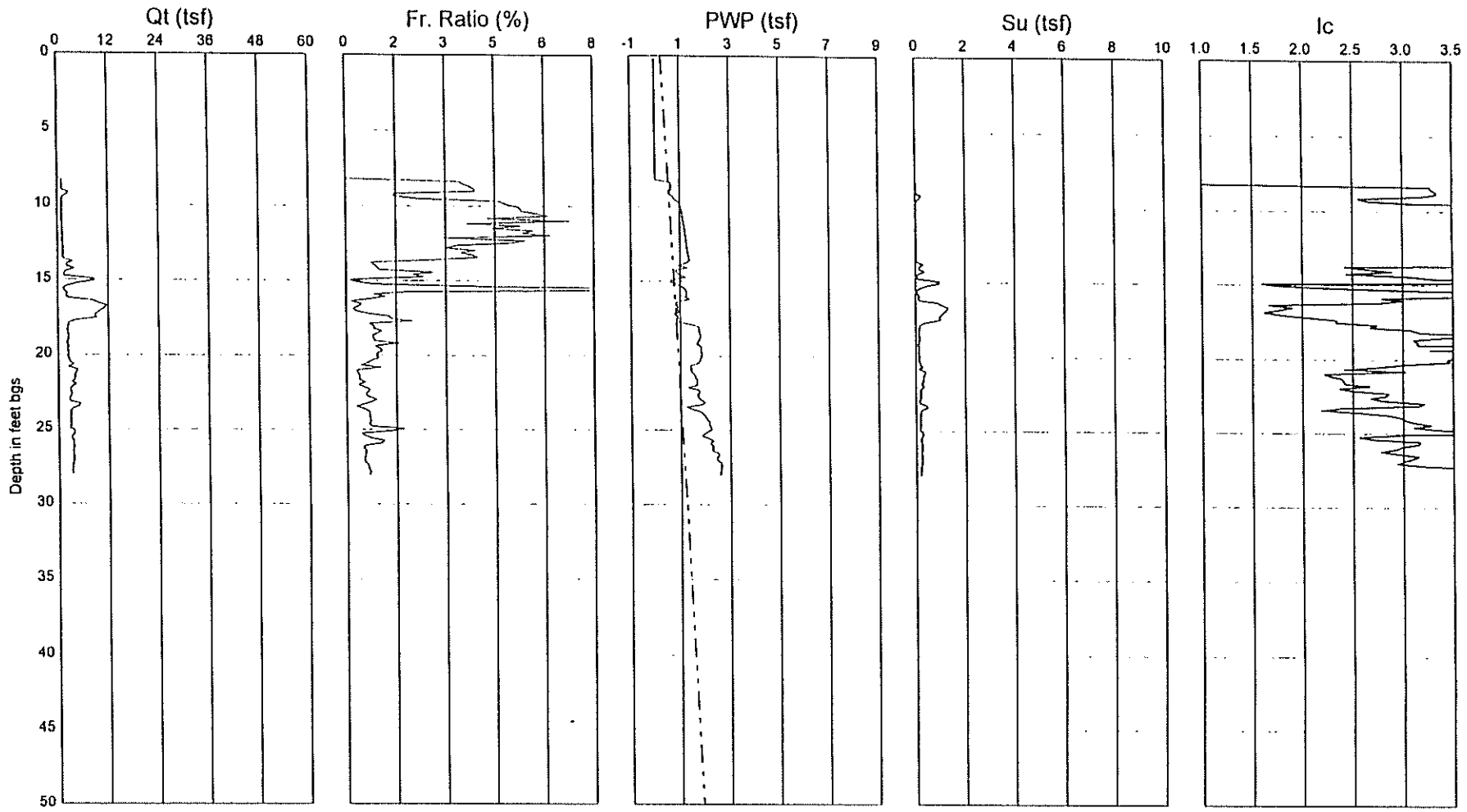
PROJECT NO. 973-2255 DATE: 2/9/98 DRAWN BY: RTS

Cone Penetration Test - CPT-20

Test Date : 10:03:97
Location : N. 50137 ft, E. 44504 ft

Operator : ConeTec

Ground Surf. Elev. : 0.00
Water Table Depth : -9.00



Qt normalized for unequal end area effects

Fr Ratio = 100*F/(Qt-Sigmav)
Gamma = 104 2 pcf

Su = (Qt - SigmaV) / Nk
Nk = 8
Gamma = 104 2 pcf

After Jefferies and Davies (1991)
Ic < 1.25 - Gravelly sands
1 25 <Ic < 1.90 - Clean to silty sand
1 90 <Ic < 2.54 - Silty sand to sandy silt
2 54 <Ic < 2 82 - Clayey silt to silty clay
2 82 <Ic < 3 22 - Clays

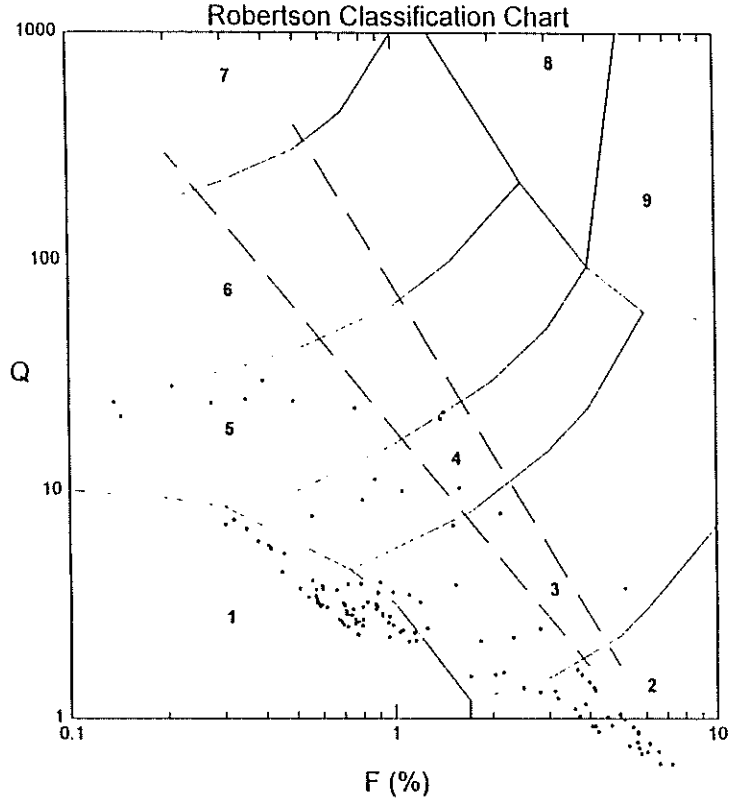
PROJECT NO 973-2255 DATE. 2/9/98 DRAWN BY. RTS

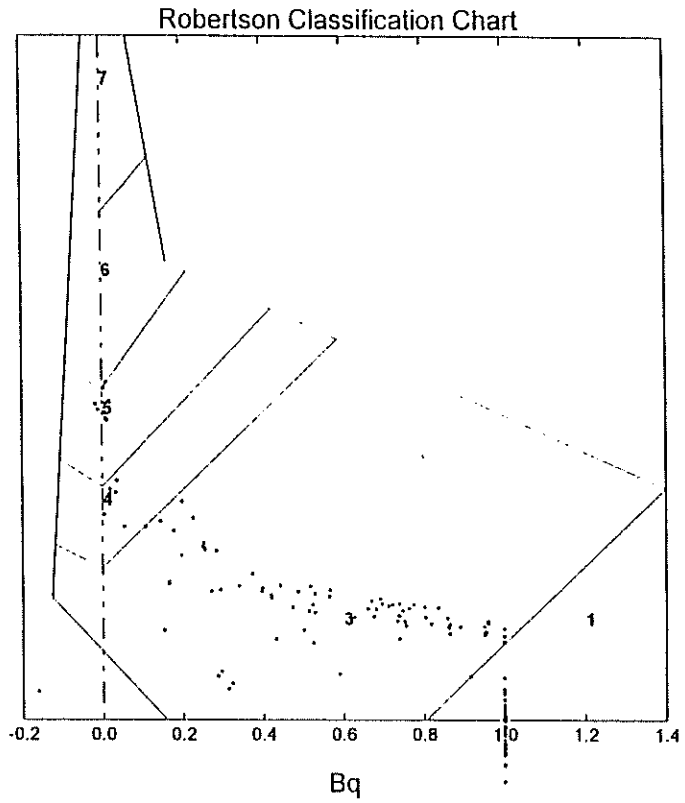
Cone Penetration Test - CPT-20

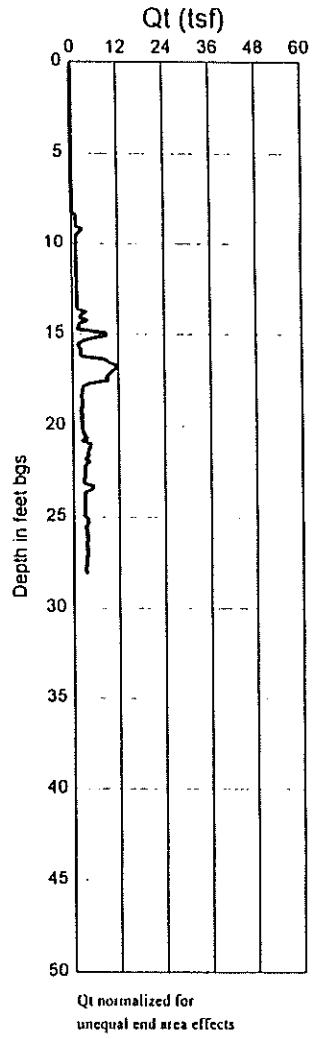
Test Date : 10:03:97
Location : N. 50137 ft, E. 44504 ft

Operator : ConeTec

Ground Surf. Elev. : 0.00
Water Table Depth : -9.00







Data points from 0.00 ft to 30.00 ft below ground surface

1 - Sensitive, Fine-Grained
2 - Organic Soils - Peats
3 - Clay to Silty Clay
4 - Clayey Silt to Silty Clay
5 - Silty Sand to Sandy Silt
6 - Clean to Silty Sand
7 - Gravelly Sand to Sand
8 - Very Stiff Sand to Clayey Sand
9 - Very Stiff Fine-Grained

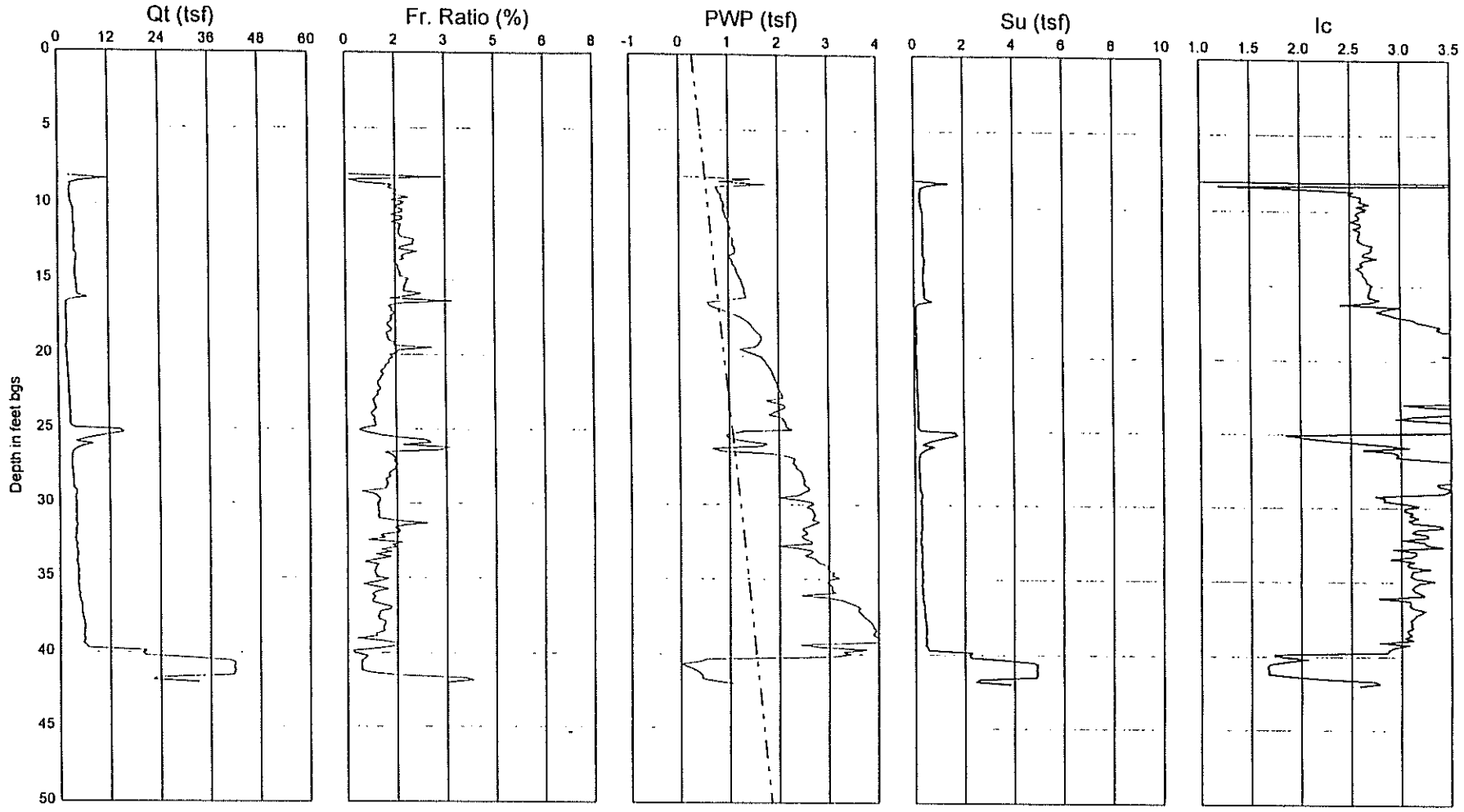
PROJECT NO. 973-2255 DATE: 2/9/98 DRAWN BY. RTS

Cone Penetration Test - CPT-21

Test Date : 10.06.97
Location : N. 49479 ft, E. 47794 ft

Operator : ConeTec

Ground Surf. Elev. : 0.00
Water Table Depth : -9.00



Qt normalized for unequal end area effects

Fr Ratio = 100*F/(Qt-Sigmav)
Gamma = 104.2 pcf

Su = (Qt - SigmaV) / Nk
Nk = 8
Gamma = 104.2 pcf

After Jefferies and Davies (1991)
Ic < 1.25 - Gravelly sands
1.25 <Ic < 1.90 - Clean to silty sand
1.90 <Ic < 2.54 - Silty sand to sandy silt
2.54 <Ic < 2.82 - Clayey silt to silty clay
2.82 <Ic < 3.22 - Clays

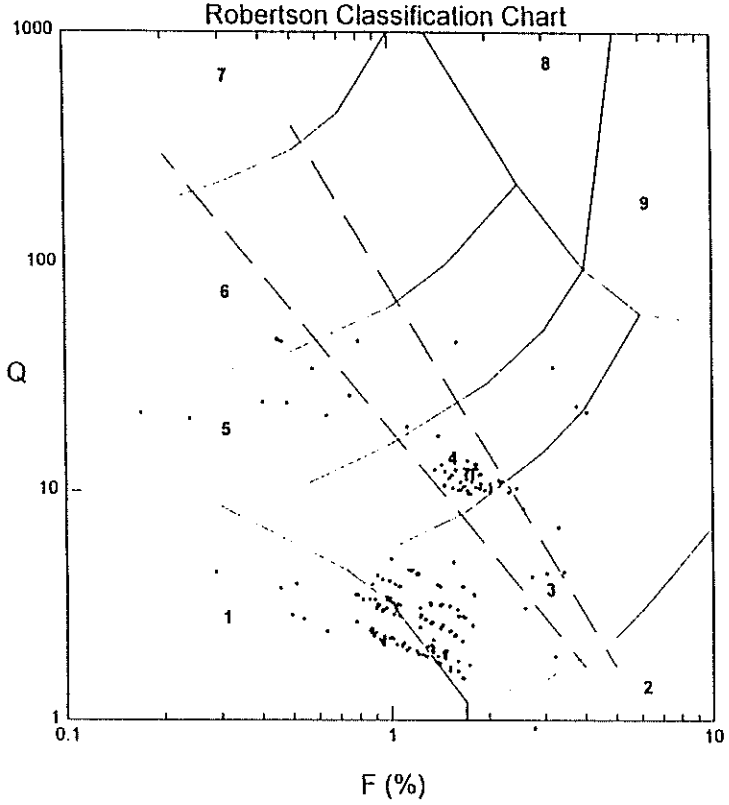
PROJECT NO 973-2255 DATE: 2/9/98 DRAWN BY: RTS

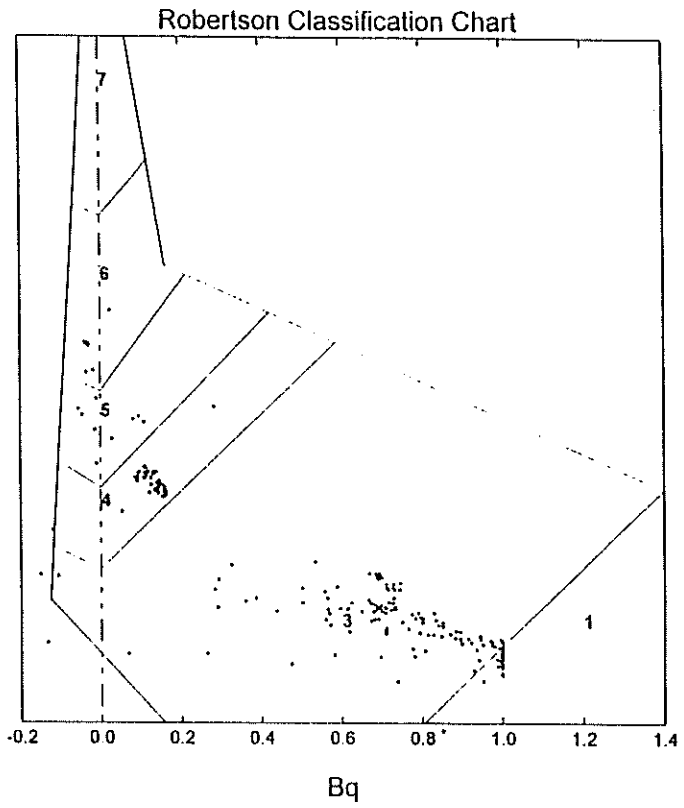
Cone Penetration Test - CPT-21

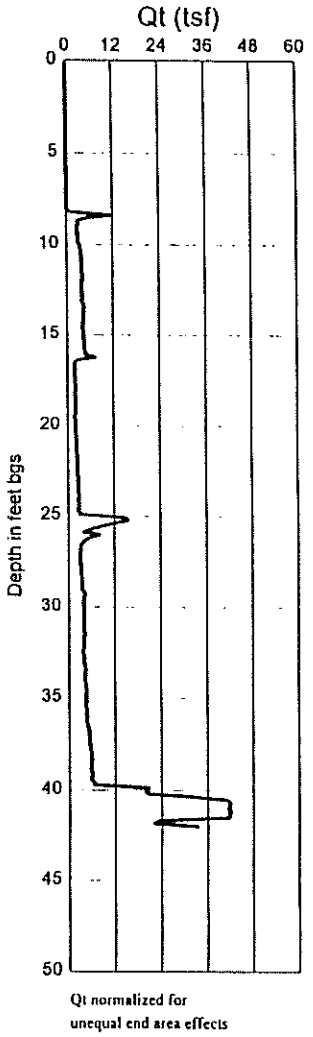
Test Date : 10.06.97
Location : N. 49479 ft, E. 47794 ft

Operator : ConeTec

Ground Surf. Elev. : 0.00
Water Table Depth : -9.00







Qt normalized for unequal end area effects

Data points from 0.00 ft to 45.00 ft below ground surface

1 - Sensitive, Fine-Grained
2 - Organic Soils - Peats
3 - Clay to Silty Clay
4 - Clayey Silt to Silty Clay
5 - Silty Sand to Sandy Silt
6 - Clean to Silty Sand
7 - Gravelly Sand to Sand
8 - Very Stiff Sand to Clayey Sand
9 - Very Stiff Fine-Grained

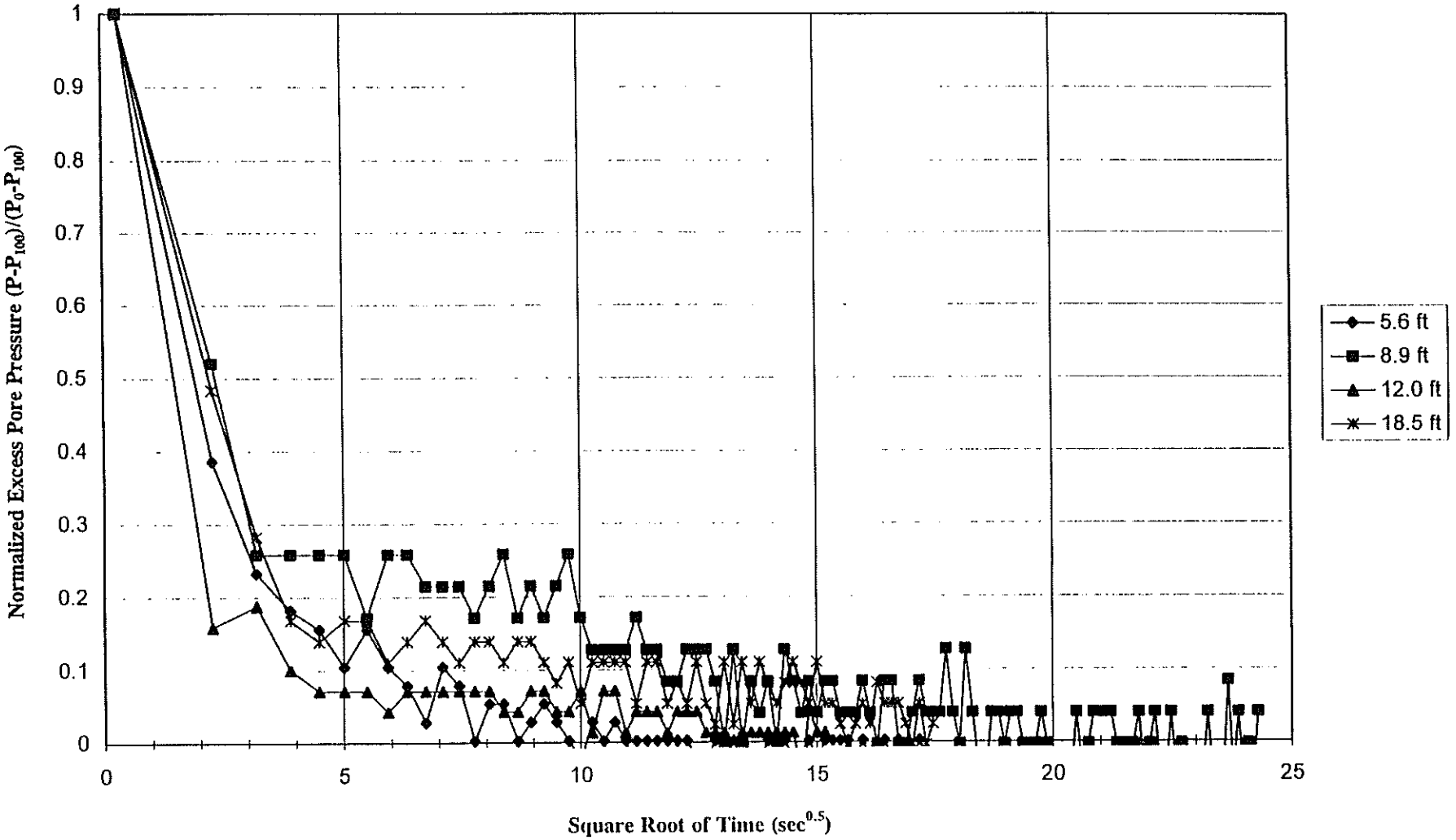
PROJECT NO. 973-2255 DATE 2/9/98 DRAWN BY: RTS

APPENDIX F

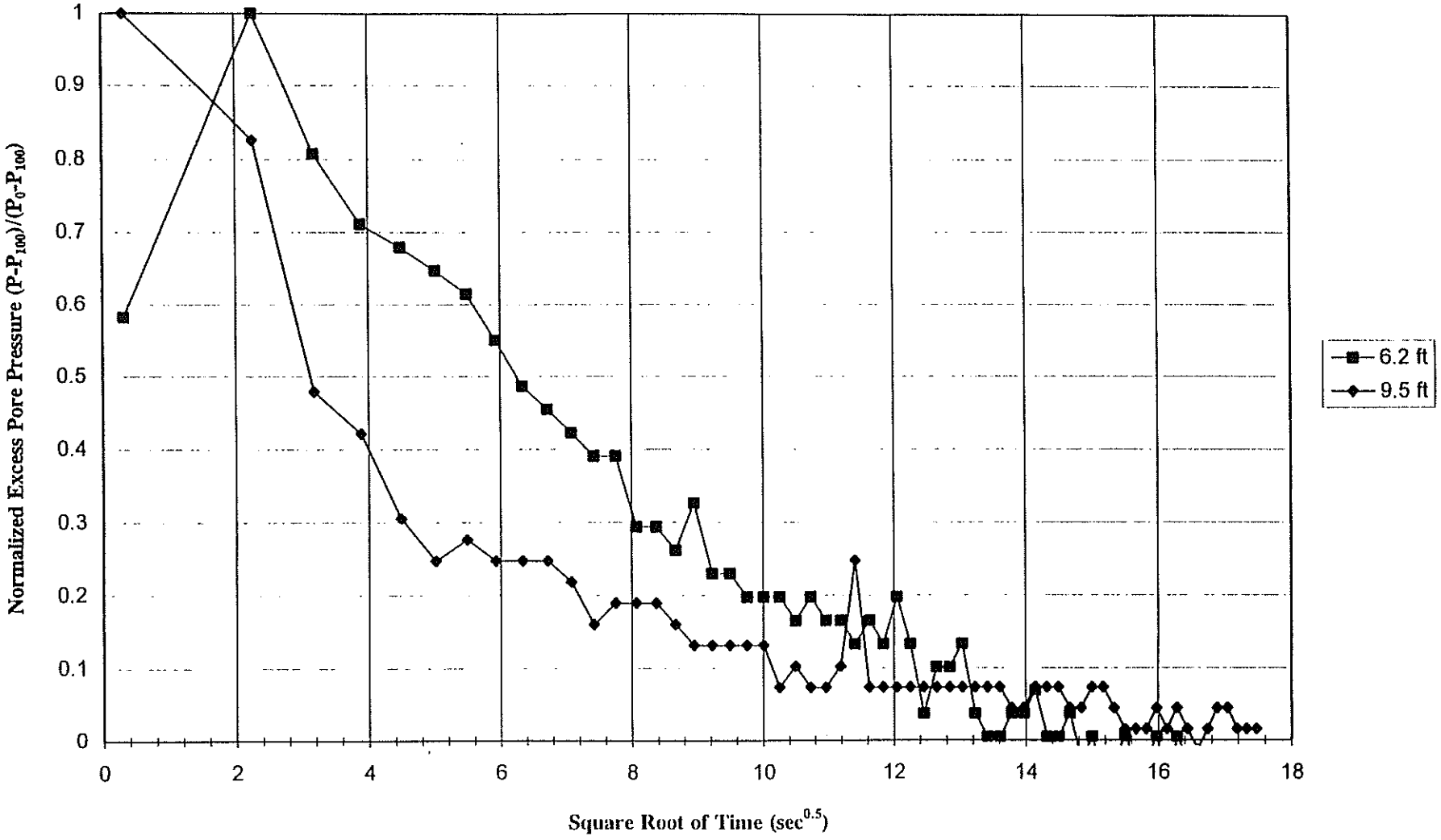
TYPICAL PORE PRESSURE DECAY DATA

CPT01

Normalized Excess Pore Pressure vs. Square Root of Time

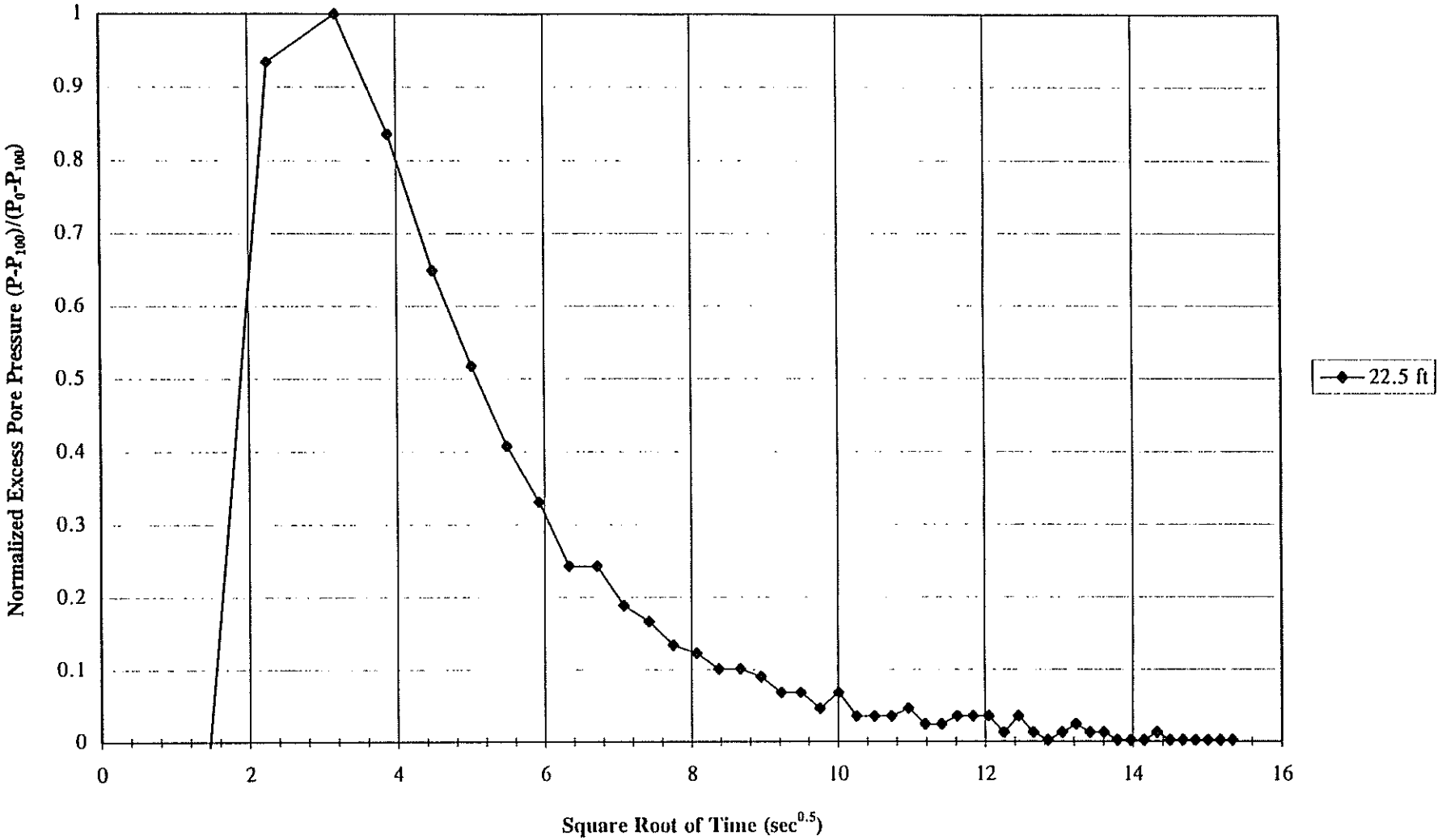


CPT05
Normalized Excess Pore Pressure vs. Square Root of Time



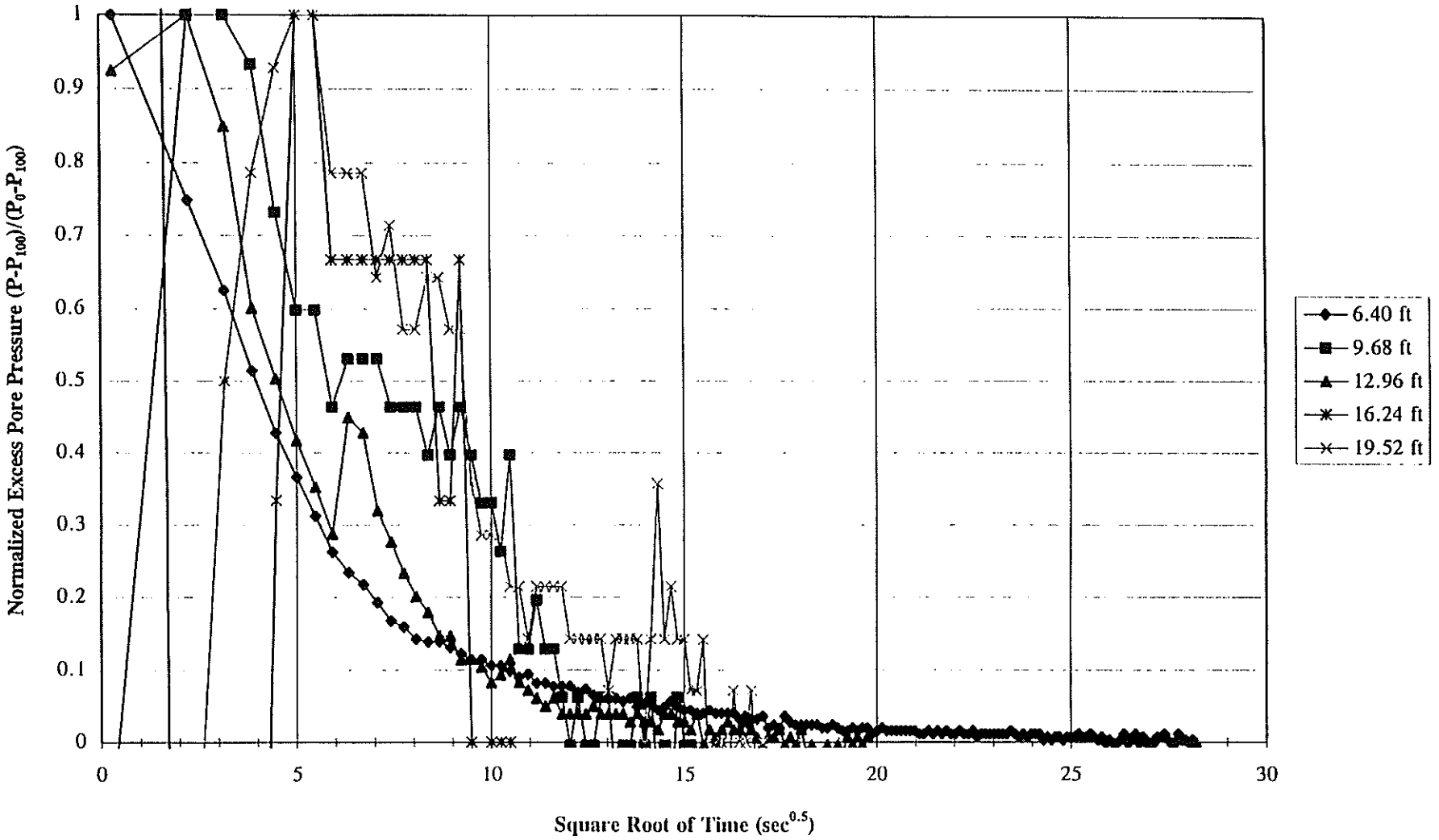
CPT06

Normalized Excess Pore Pressure vs. Square Root of Time



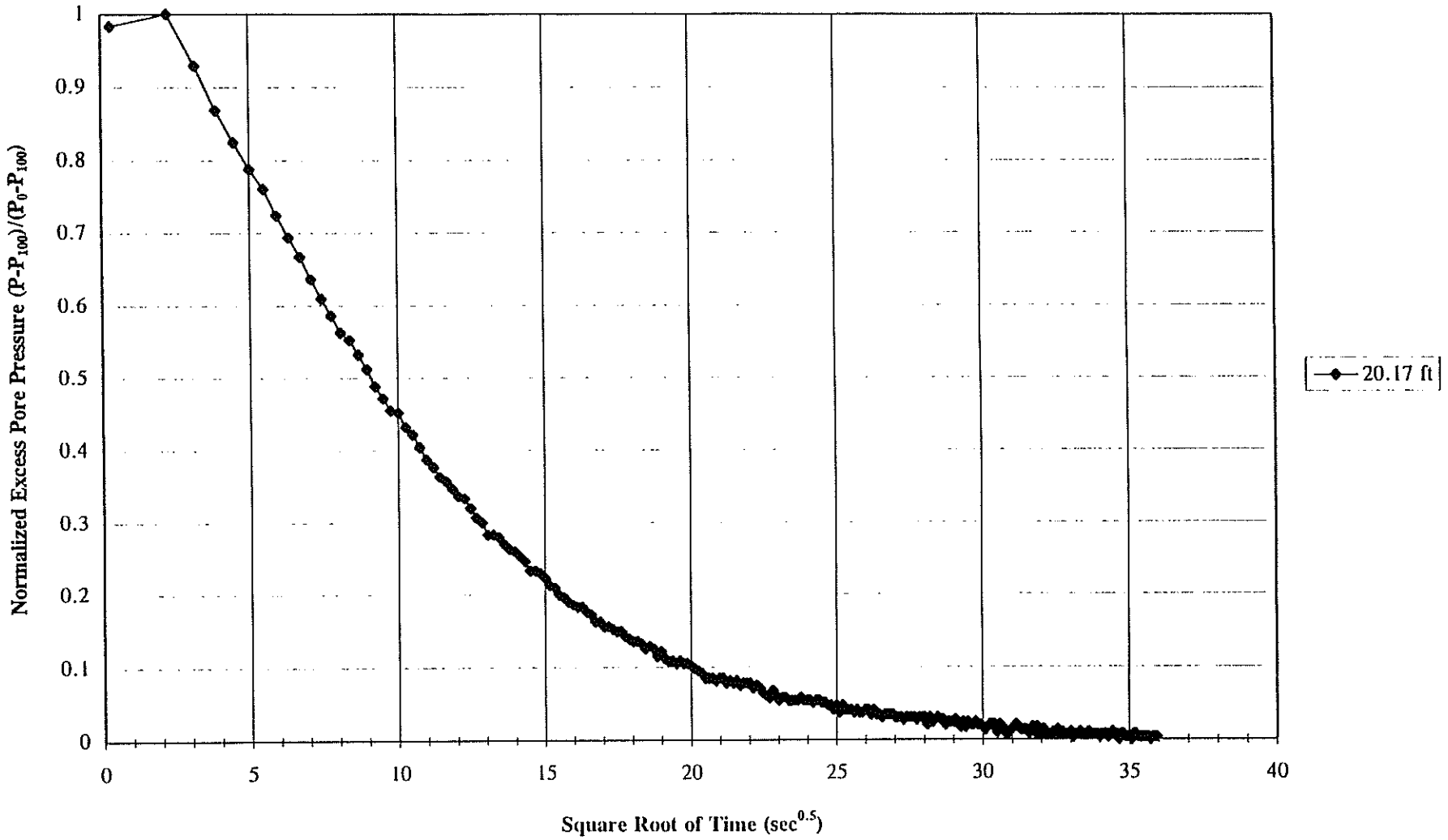
CPT07

Normalized Excess Pore Pressure vs. Square Root of Time



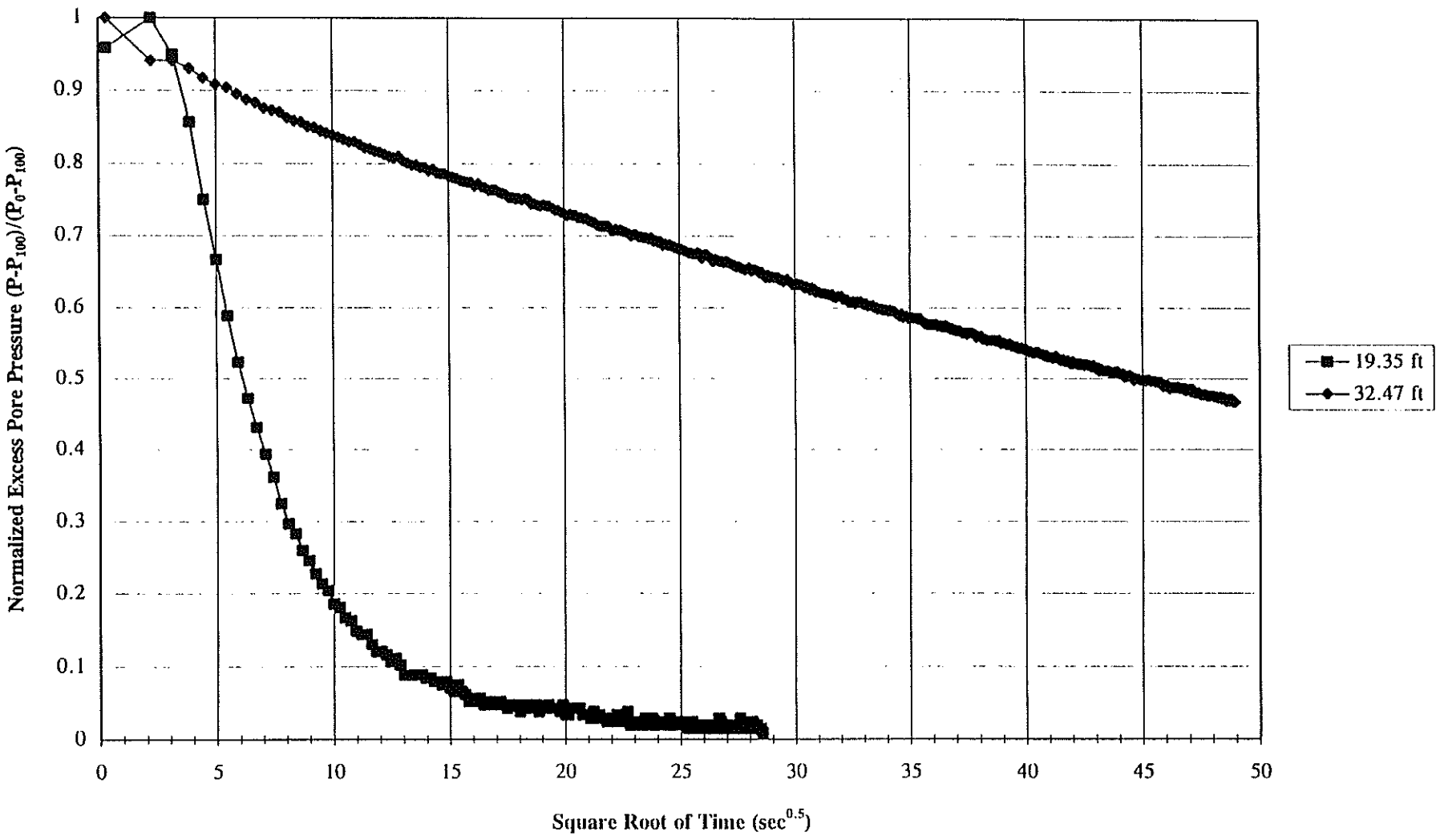
CPT08

Normalized Excess Pore Pressure vs. Square Root of Time



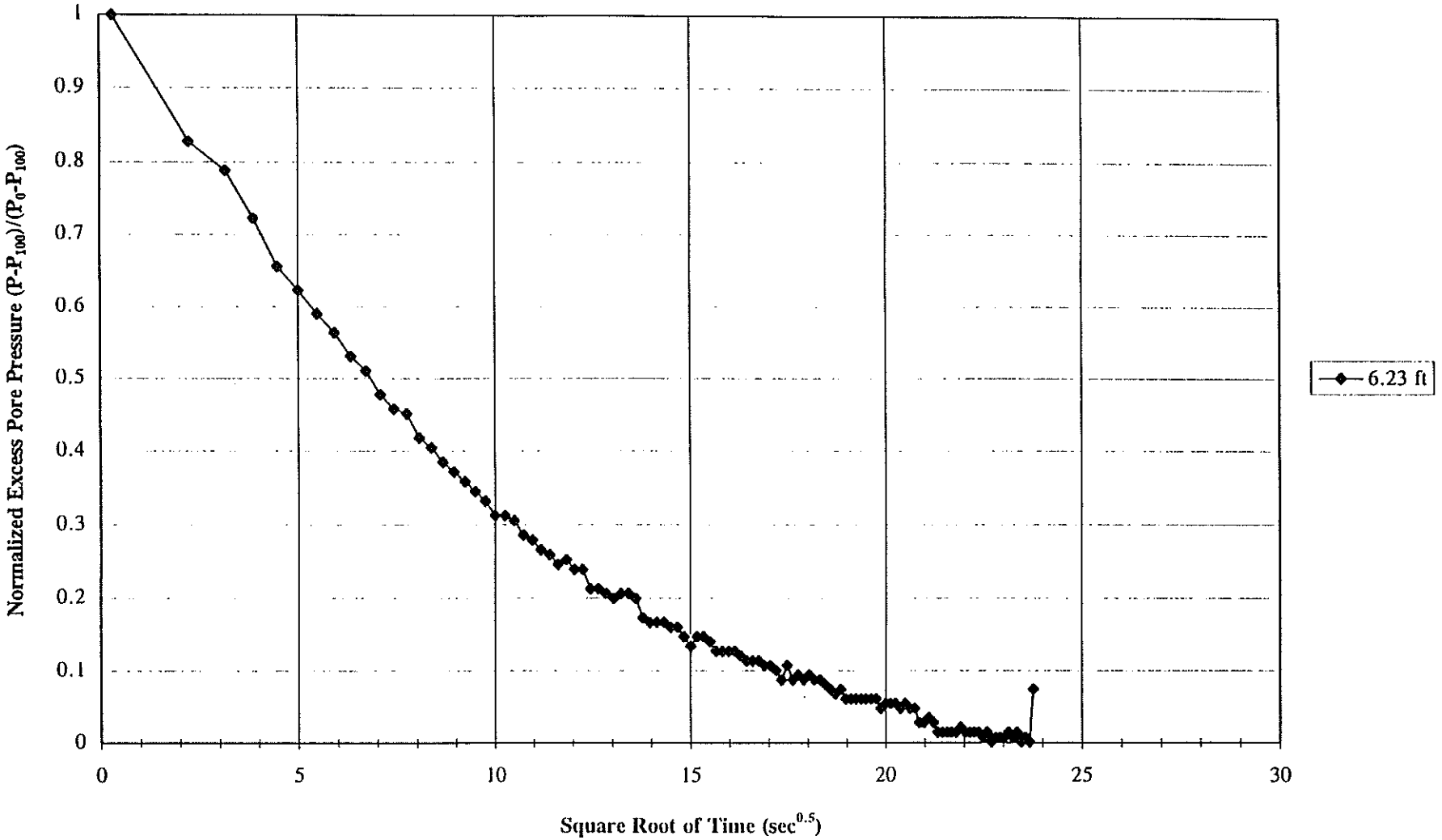
CPT10

Normalized Excess Pore Pressure vs. Square Root of Time



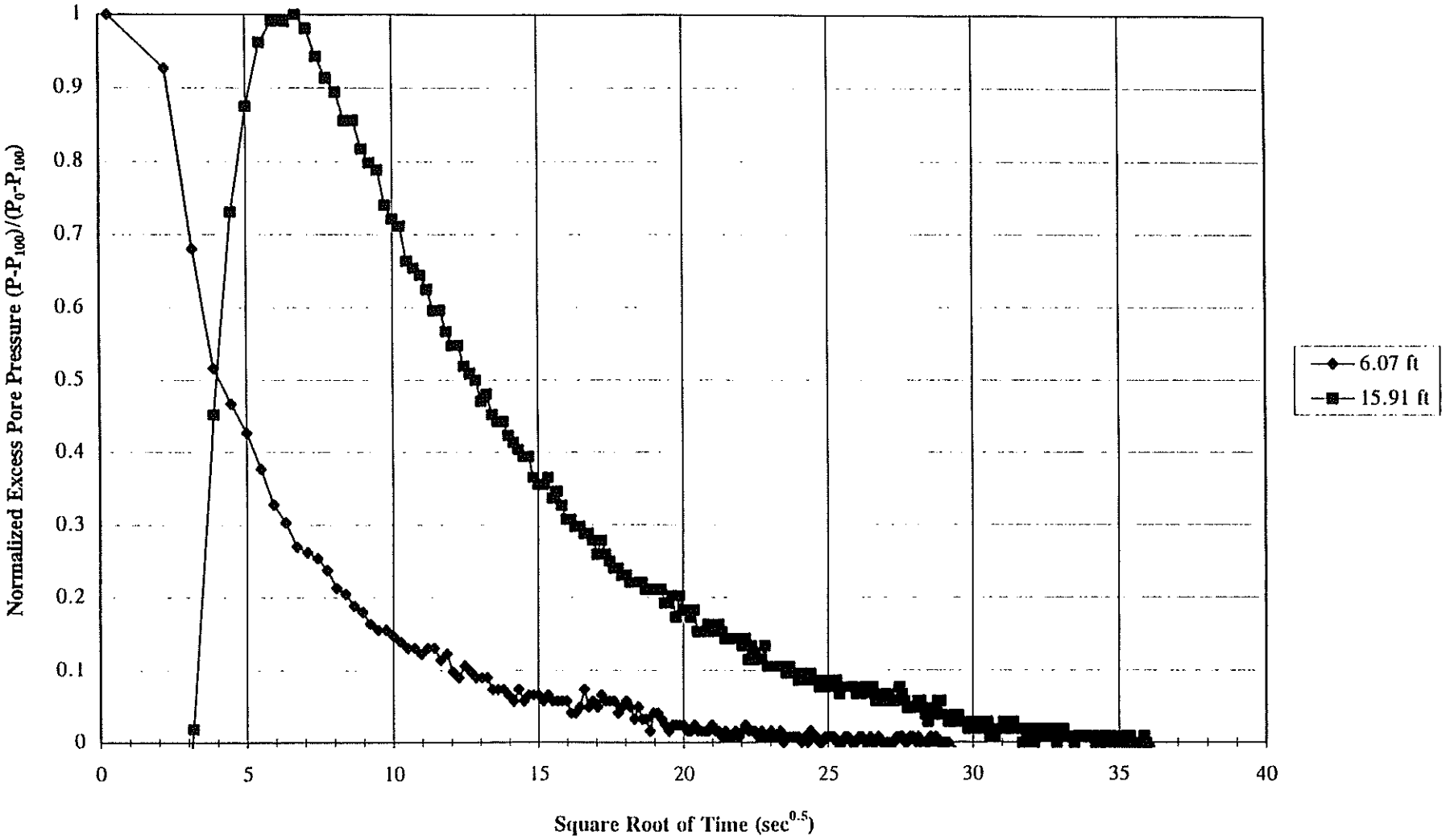
CPT11

Normalized Excess Pore Pressure vs. Square Root of Time



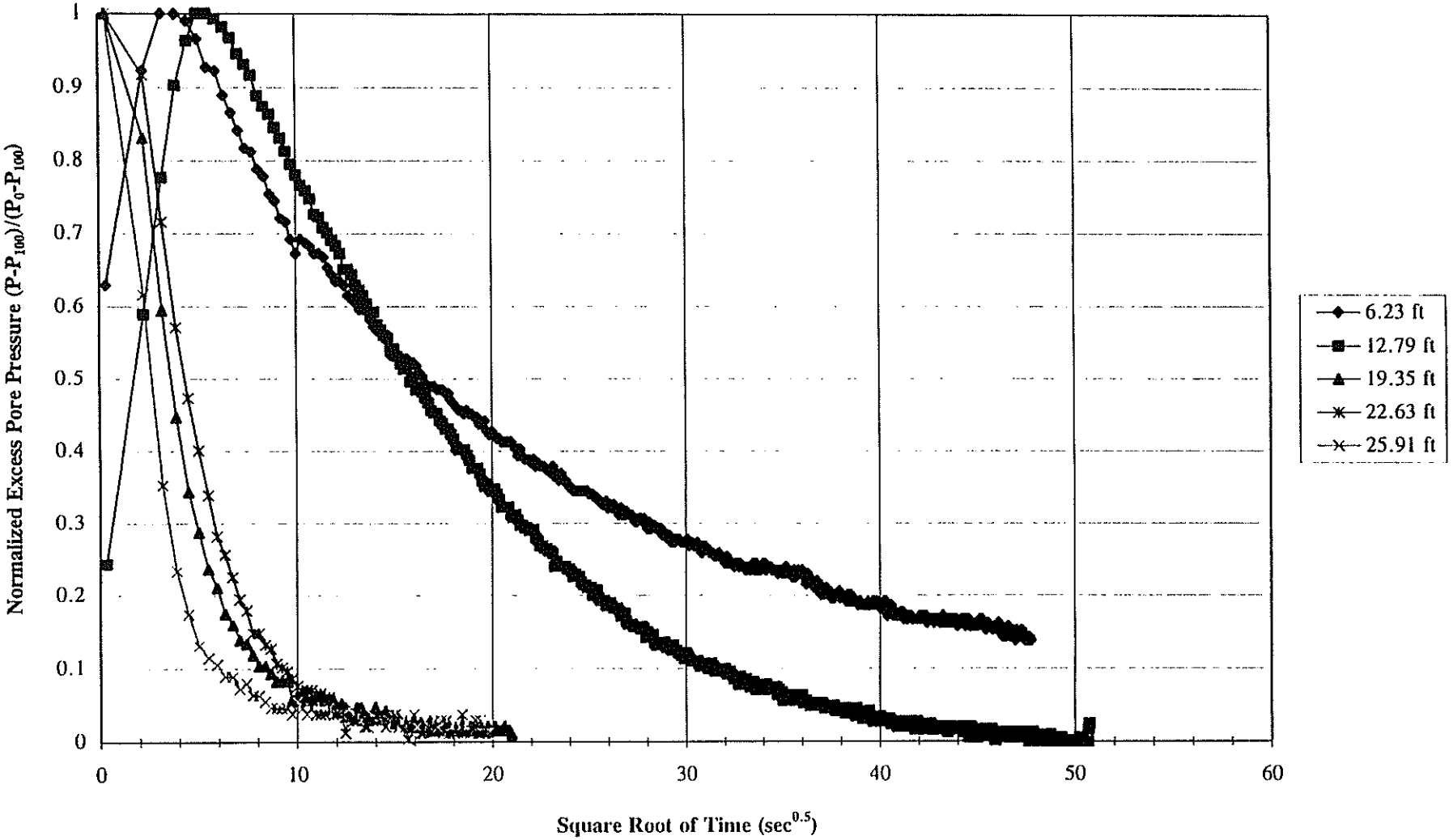
CPT12

Normalized Excess Pore Pressure vs. Square Root of Time

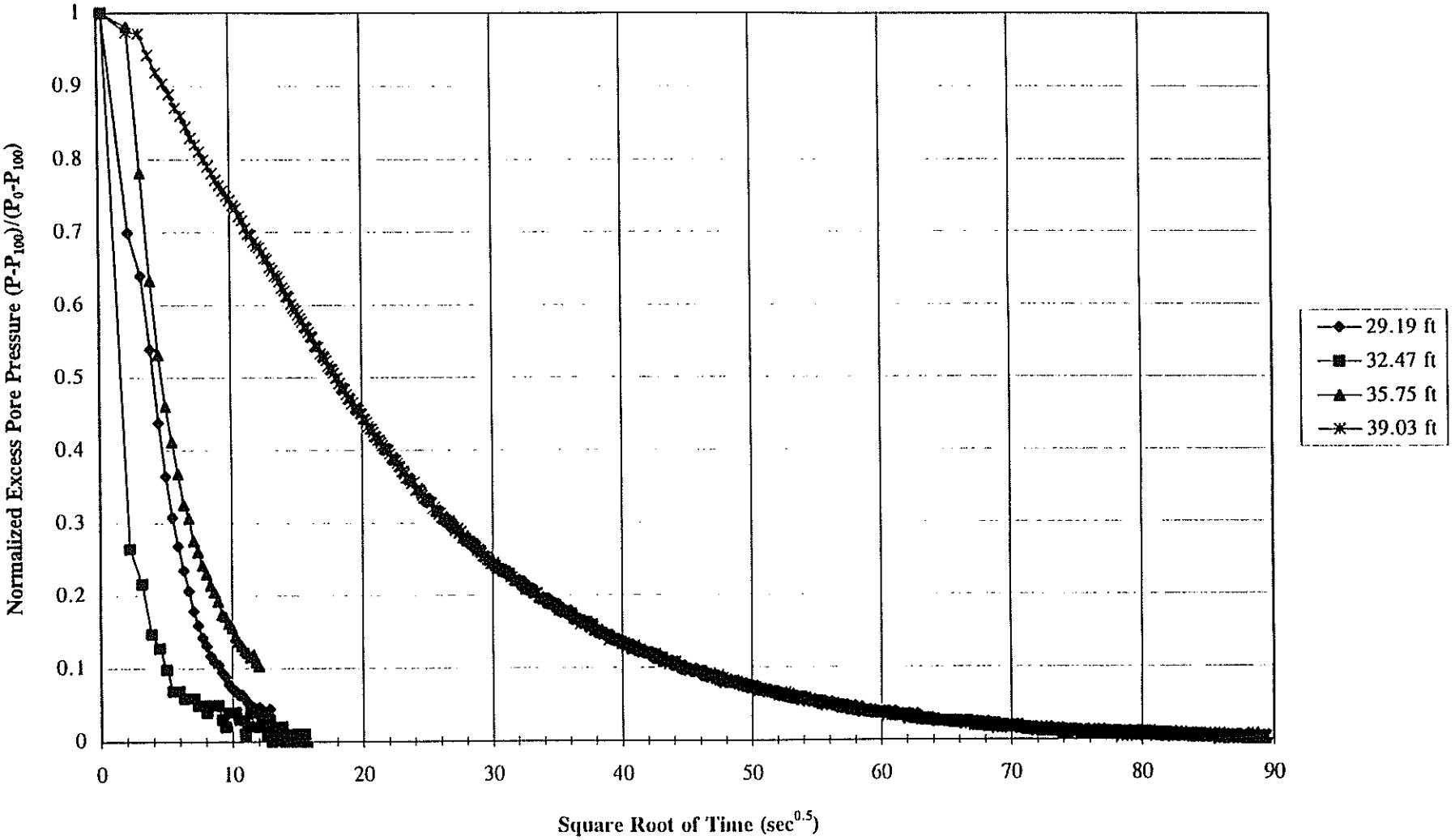


CPT15

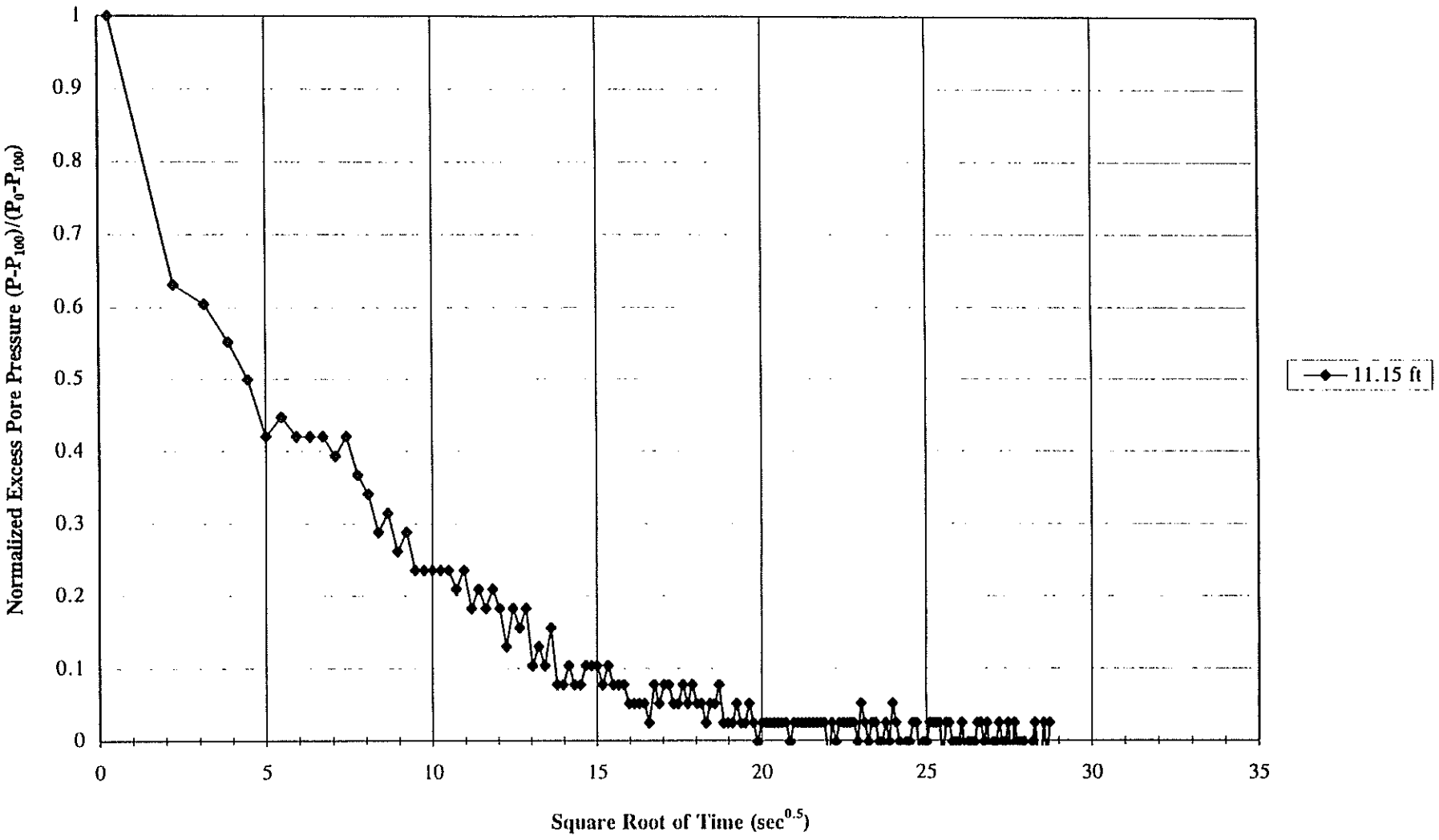
Normalized Excess Pore Pressure vs. Square Root of Time



CPT15
Normalized Excess Pore Pressure vs. Square Root of Time

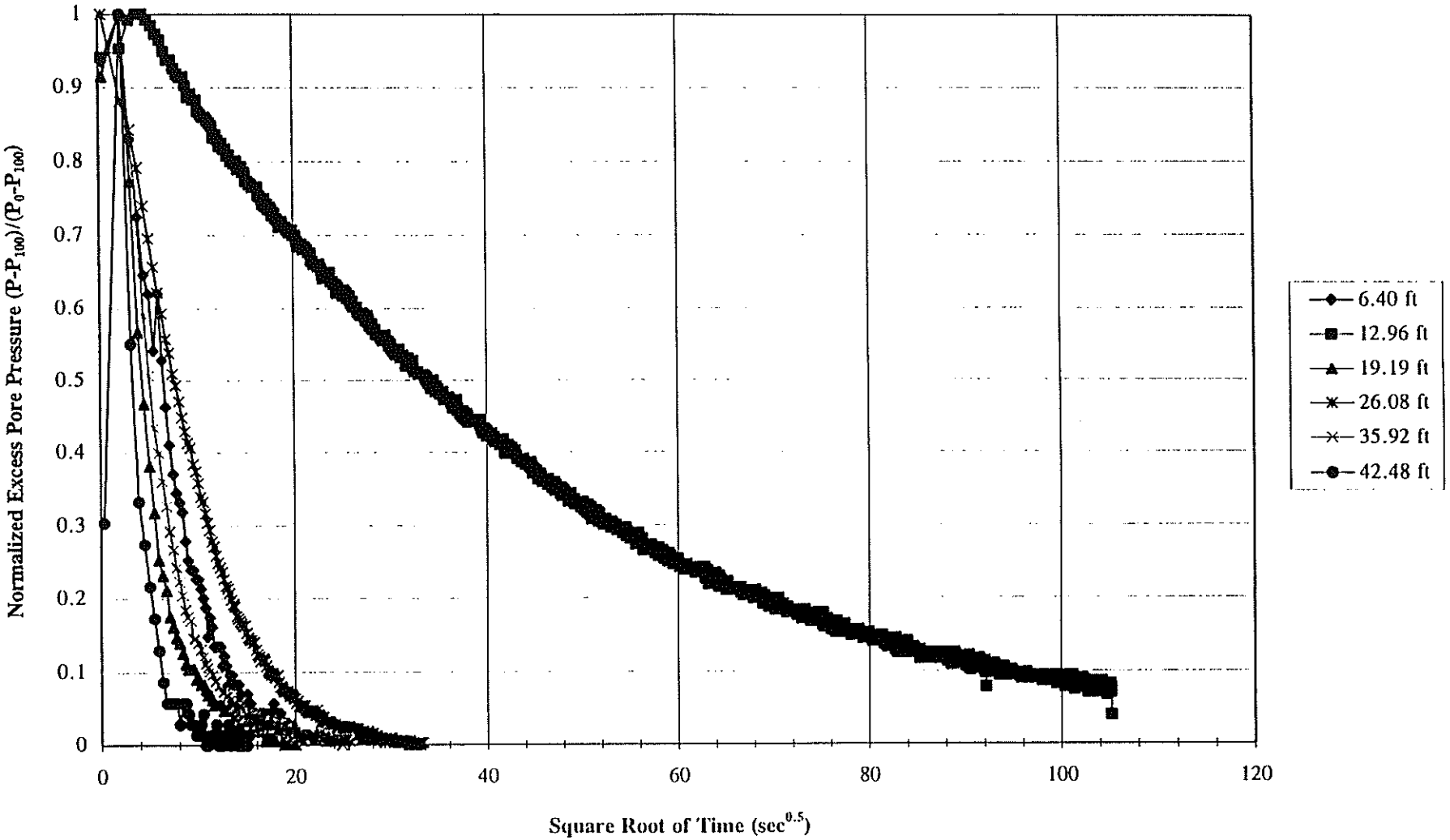


CPT16
Normalized Excess Pore Pressure vs. Square Root of Time

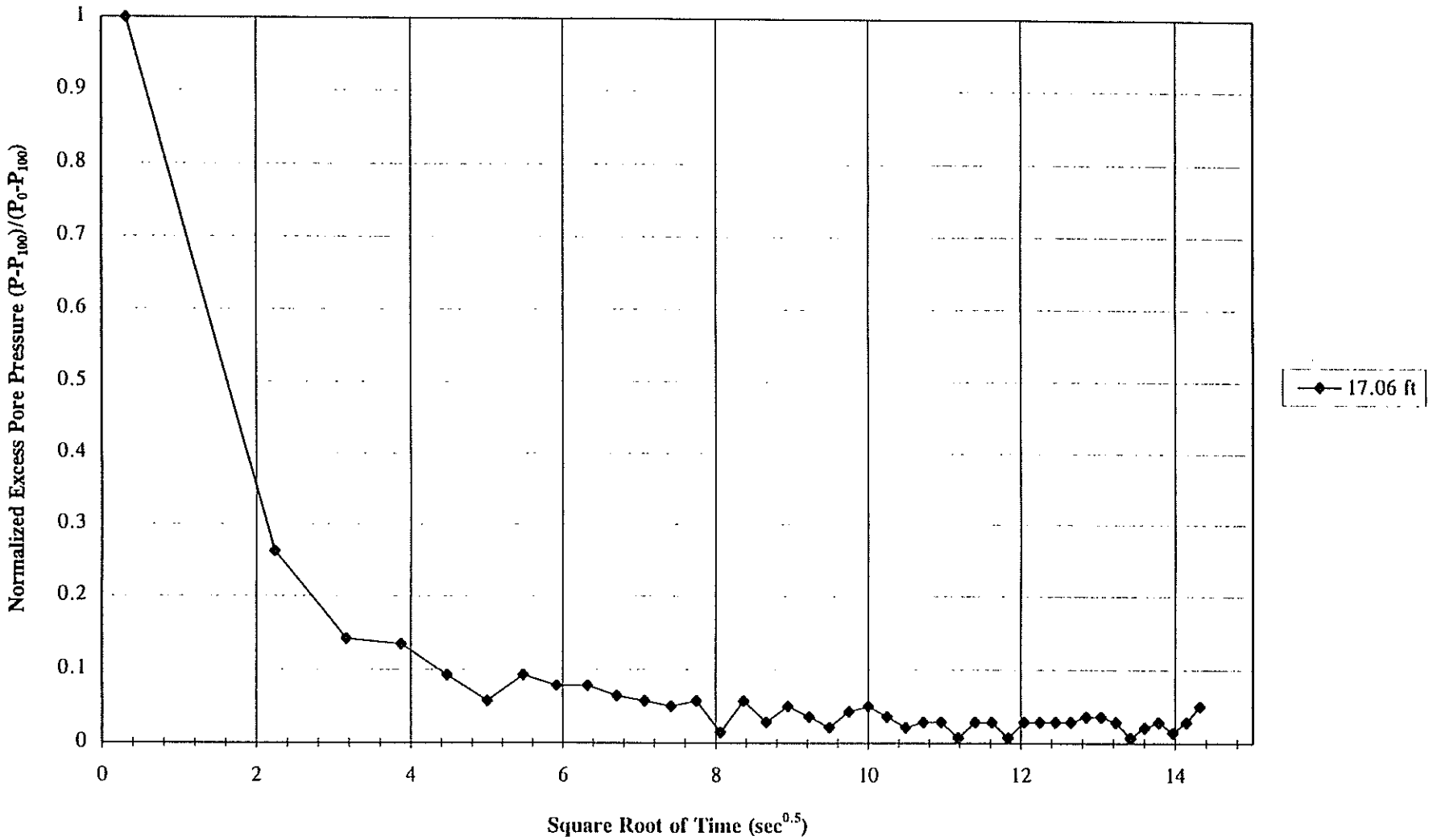


CPT18

Normalized Excess Pore Pressure vs. Square Root of Time

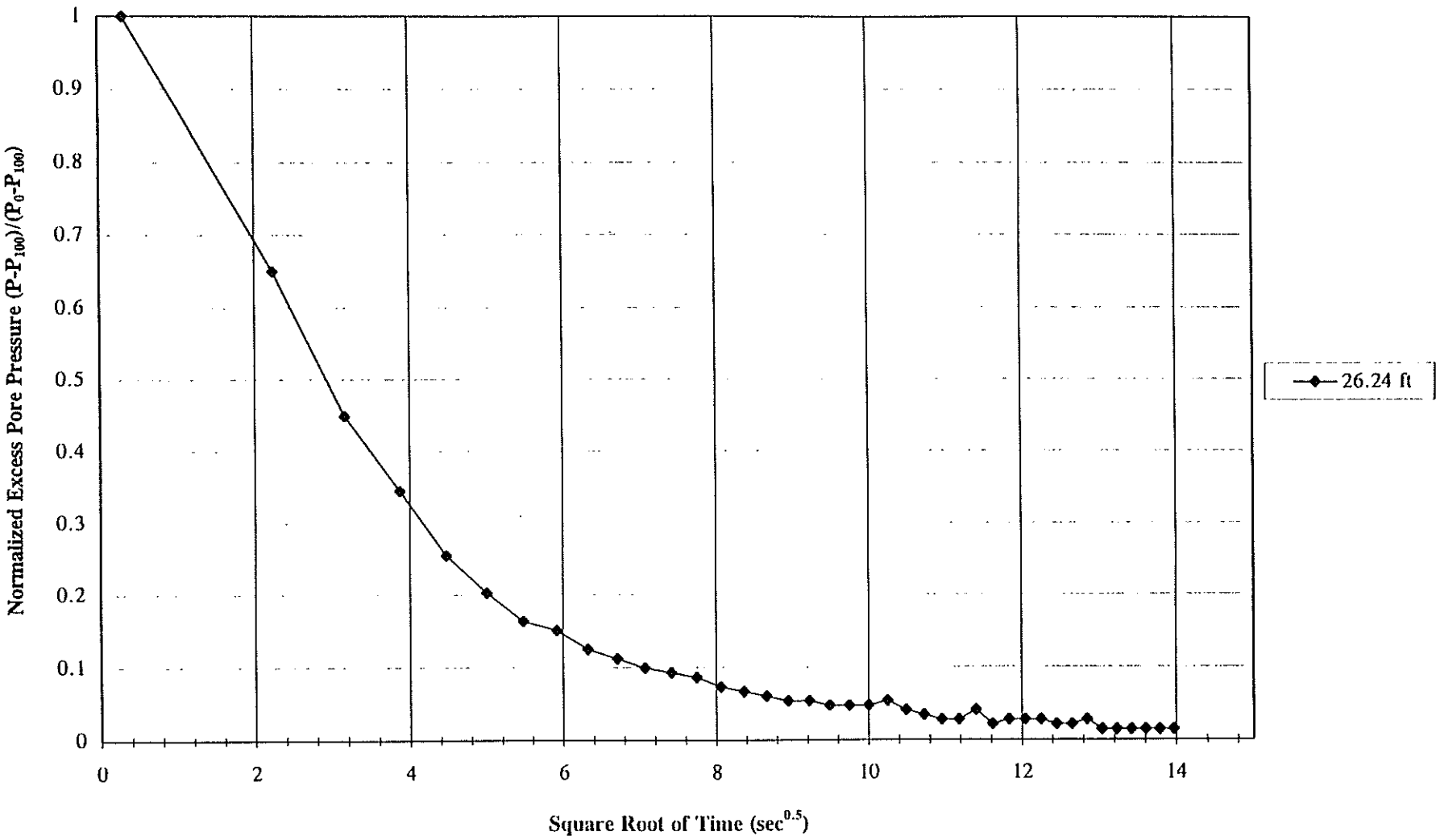


CPT20B
Normalized Excess Pore Pressure vs. Square Root of Time



CPT21

Normalized Excess Pore Pressure vs. Square Root of Time



APPENDIX G

STATIC PORE PRESSURE DATA

Location	Depth (ft)	Test Duration (sec)	Equilibrium Pore Pressure (psi)	t50 (sec)	T50	Ch (cm^2/sec)	Cv (cm^2/sec)	IC Number	Soil Type
CPT01	5.58	305	1.6	2.5	5.1	6.50	0.60	1.33	Clean Sand
CPT01	8.86	590	2.95	5.5	5.1	2.95	0.27	1.42	Clean Sand
CPT01	11.98	230	4.4	1	5.1	16.25	1.51	1.76	Silty Sand
CPT01	18.54	305	7.2	5	5.1	3.25	0.30	1.42	Clean Sand
CPT05	6.23	270	1.25	35	5.1	0.46	0.04	2.16	Silty Sand
CPT05	9.51	470	2.1	10	5.1	1.62	0.15	1.86	Silty Sand
CPT06	22.47	235	8.4	15	5.1	1.08	0.10	1.7	Silty Sand
CPT07	6.4	795	1.4	15	5.1	1.08	0.00	6.3	Sensitive Fines
CPT07	9.68	230	2.56	40	5.1	0.41	0.04	1.84	Silty Sand
CPT07	12.96	390	3.7	15	5.1	1.08	0.10	2.19	Silty Sand
CPT07	16.24	120	5.07	50	5.1	0.32	0.03	1.7	Silty Sand
CPT07	19.52	290	6.37	65	5.1	0.25	0.02	1.98	Silty Sand
CPT08	20.17	1290	6.8	80	5.1	0.20	0.00	2.78	Silty Clay
CPT10	19.35	815	6.8	30	5.1	0.54	0.00	2.74	Silty Clay
CPT10	32.47	2395		2100	5.1	0.01	0.00	6.11	Sensitive Fines
CPT11	6.23	560		50	5.1	0.32	0.00	4.09	Sensitive Fines
CPT12	6.07	855	1.52	18	5.1	0.90	0.08	1.12	Gravely Sand
CPT12	15.91	1295	5.42	135	5.1	0.12	0.01	2.4	Sandy Silt
CPT15	6.23	2280		270	5.1	0.06	0.00	4.12	Sensitive Fines
CPT15	12.79	2575	3.4	225	5.1	0.07	0.00	3.48	Sensitive Fines
CPT15	19.35	440	5.8	12	5.1	1.35	0.13	2.41	Sandy Silt
CPT15	22.63	185		19	5.1	0.86	0.08	2.57	Clayey Silt
CPT15	25.91	390	8.65	7	5.1	2.32	0.22	2.13	Silty Sand
CPT15	29.19	165		18	5.1	0.90	0.00	4.64	Sensitive Fines
CPT15	32.47	245	11.57	1.4	5.1	11.61	1.08	2.07	Silty Sand
CPT15	35.75	145		22	5.1	0.74	0.00	2.98	Clay
CPT15	39.03	7995	14.47	320	5.1	0.05	0.00	8.3	Sensitive Fines
CPT16	11.15	825	2.82	20	5.1	0.81	0.08	1.43	Clean Sand
CPT18	6.4	370	1.2	40	5.1	0.41	0.04	1.76	Silty Sand
CPT18	12.96	11065		1085	5.1	0.01	0.00	6.22	Sensitive Fines
CPT18	19.19	415	6.6	13	5.1	1.25	0.12	2.14	Silty Sand
CPT18	26.08	1105	9.5	60	5.1	0.27	0.00	3.88	Sensitive Fines
CPT18	35.92	655	13.7	23	5.1	0.71	0.07	2.32	Sandy Silt
CPT18	42.48	235	16.34	6	5.1	2.71	0.25	2.13	Silty Sand
CPT20B	17.06	205	10.4	1.5	5.1	10.83	1.01	2.36	Sandy Silt
CPT21	26.24	195	10	9	5.1	1.81	0.00	3.2	Clay

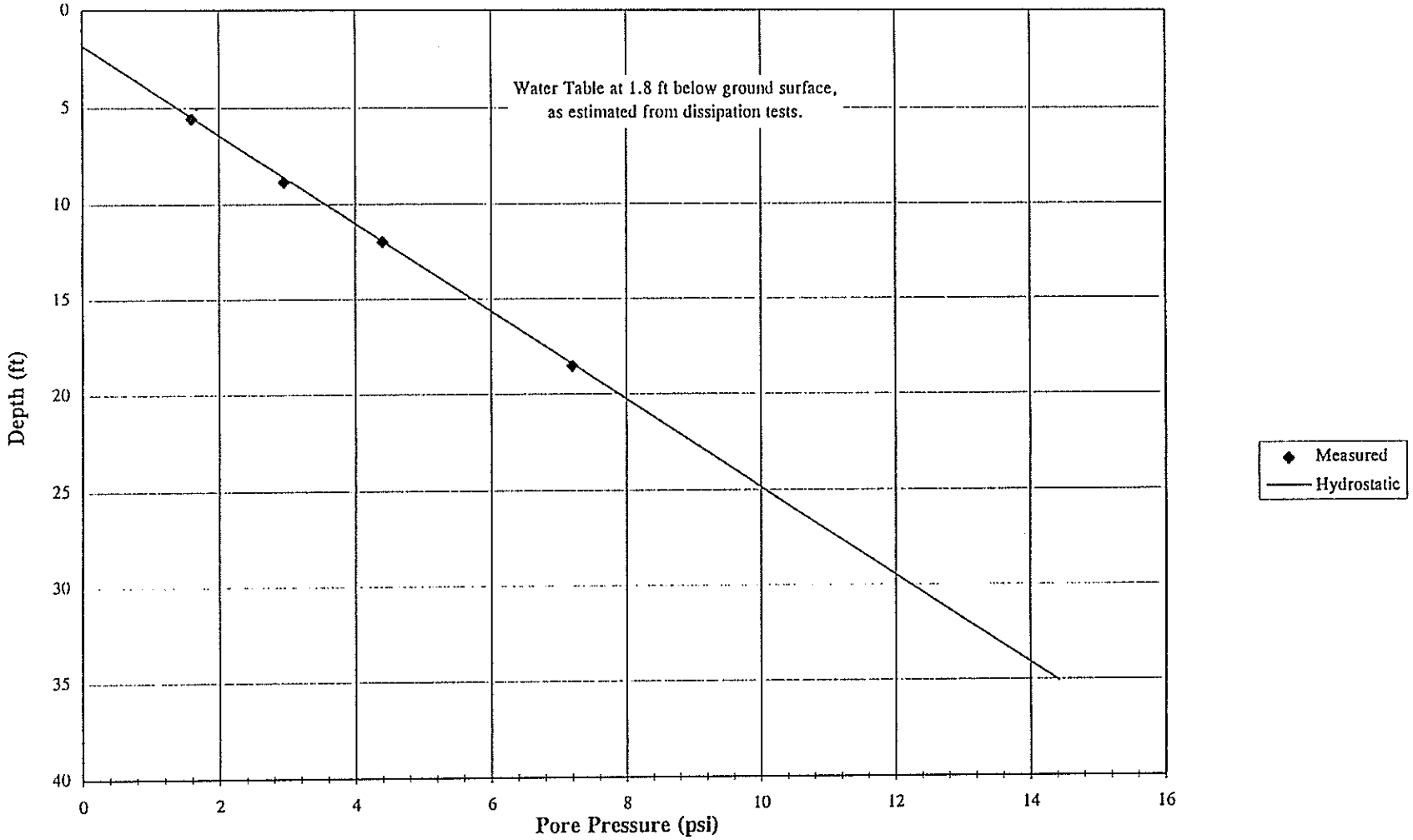
	Ch (cm^2/sec)		
	All Soil	IC<2.6	IC>2.6
Min	7.7E-03	1.2E-01	7.7E-03
Max	1.6E+01	1.6E+01	1.8E+00
Average	2.1E+00	3.0E+00	4.7E-01
Geometric Mean	6.6E-01	1.3E+00	1.9E-01

	Cv (cm^2/sec)		
	All Soil	IC<2.6	IC>2.6
Min	7.7E-07	1.1E-02	7.7E-07
Max	1.5E+00	1.5E+00	1.8E-04
Average	1.8E-01	2.8E-01	4.7E-05
Geometric Mean	5.2E-03	1.2E-01	1.9E-05

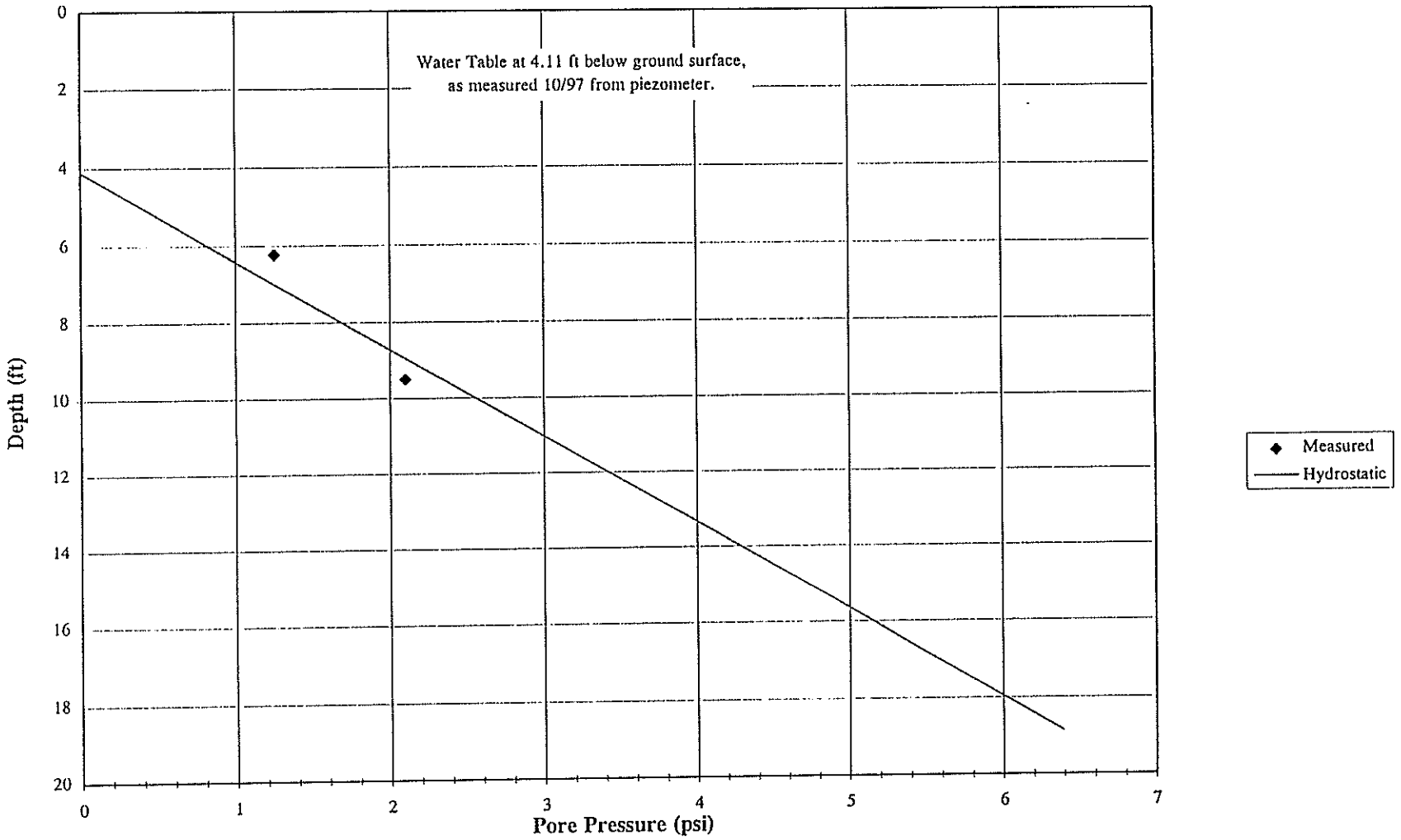
	kh (cm/sec)	
	IC<2.6	IC>2.6
Min	1.3E-03	8.5E-05
Max	1.8E-01	2.0E-02
Average	3.3E-02	5.1E-03
Geometric Mean	1.5E-02	2.0E-03

	kv (cm/sec)	
	IC<2.6	IC>2.6
Min	2.7E-04	1.9E-08
Max	3.6E-02	4.3E-06
Average	6.6E-03	1.1E-06
Geometric Mean	3.0E-03	4.5E-07

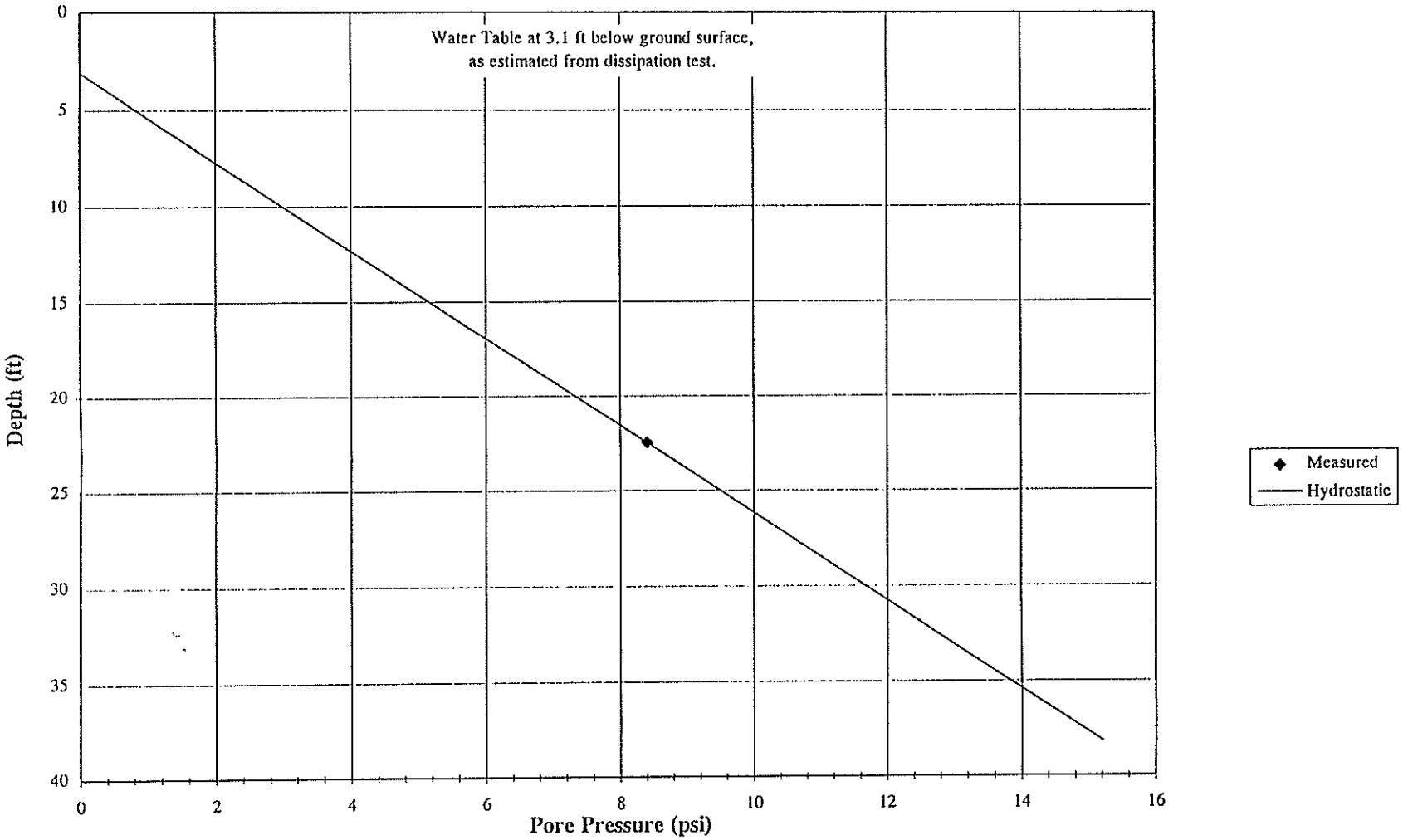
CPT01
Static Pore Pressure vs. Depth



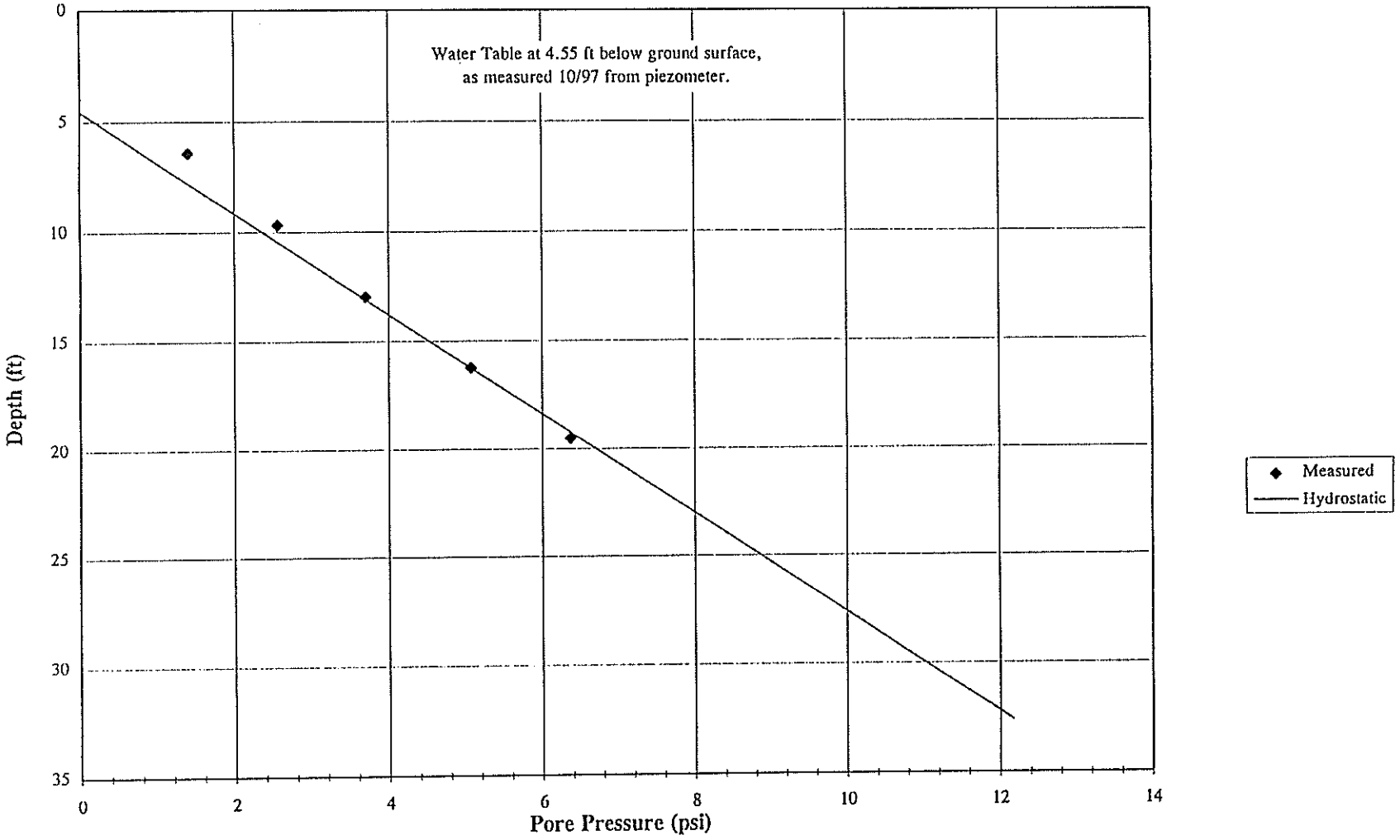
CPT05
Static Pore Pressure vs. Depth



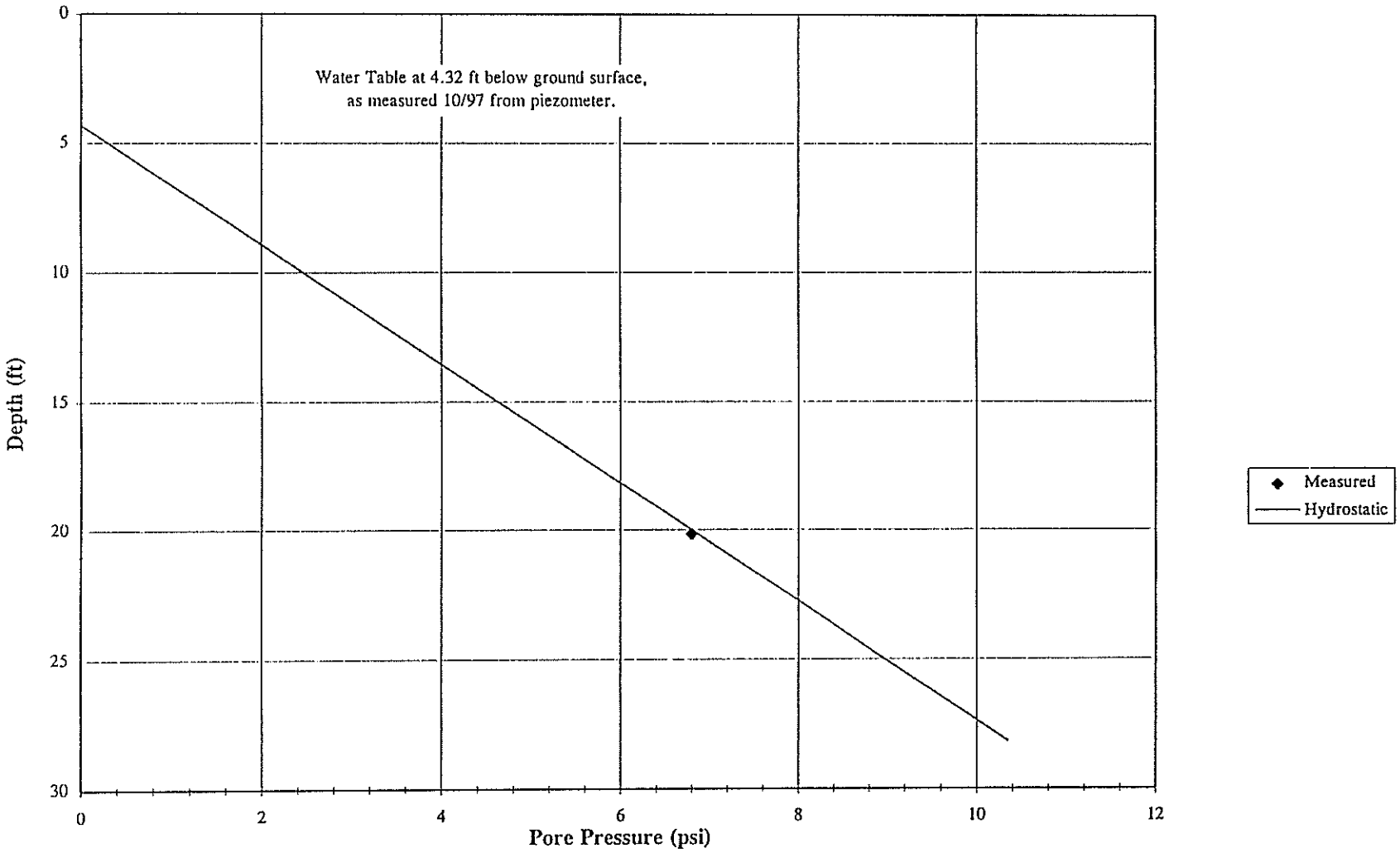
CPT06
Static Pore Pressure vs. Depth



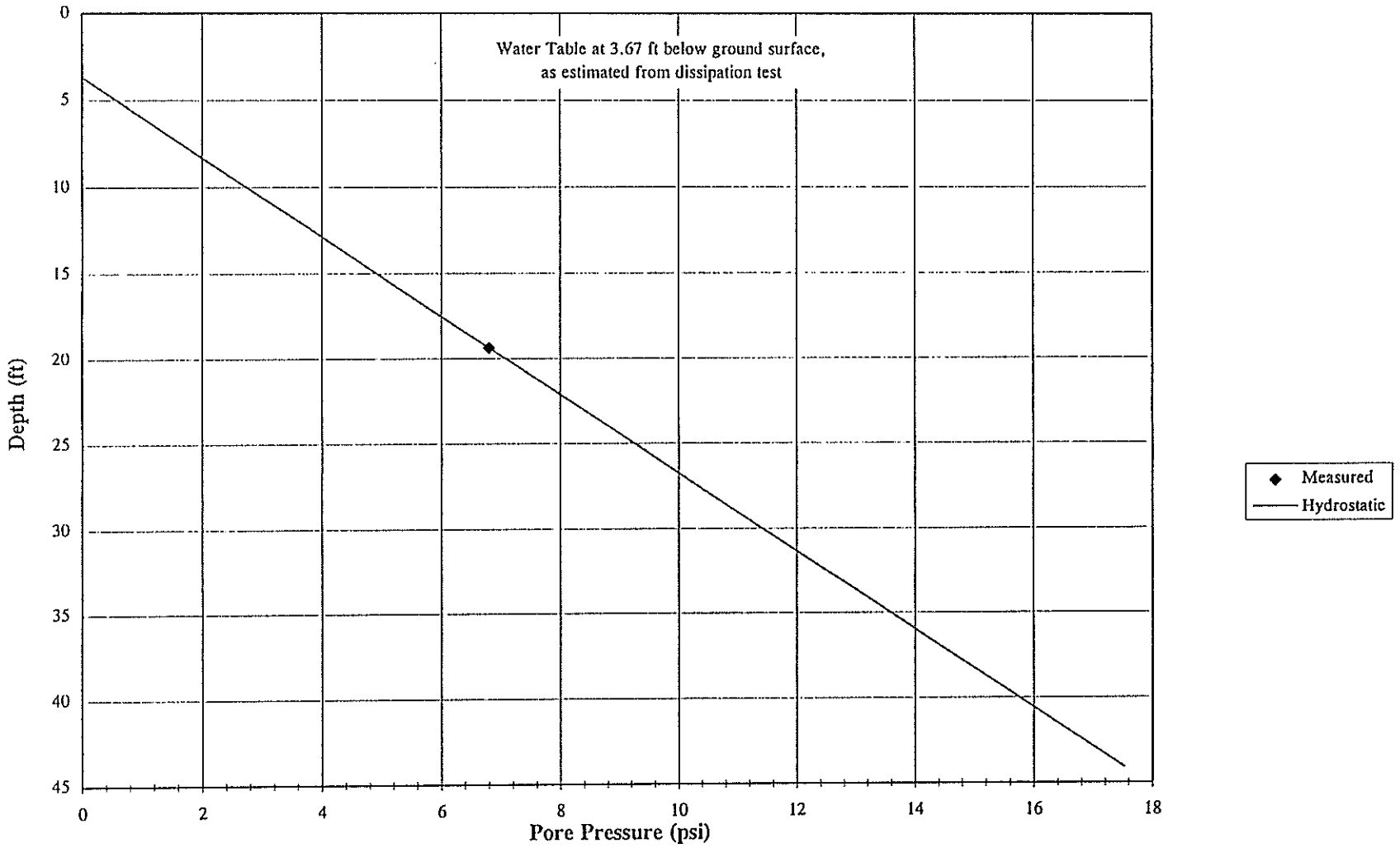
CPT07
Static Pore Pressure vs. Depth



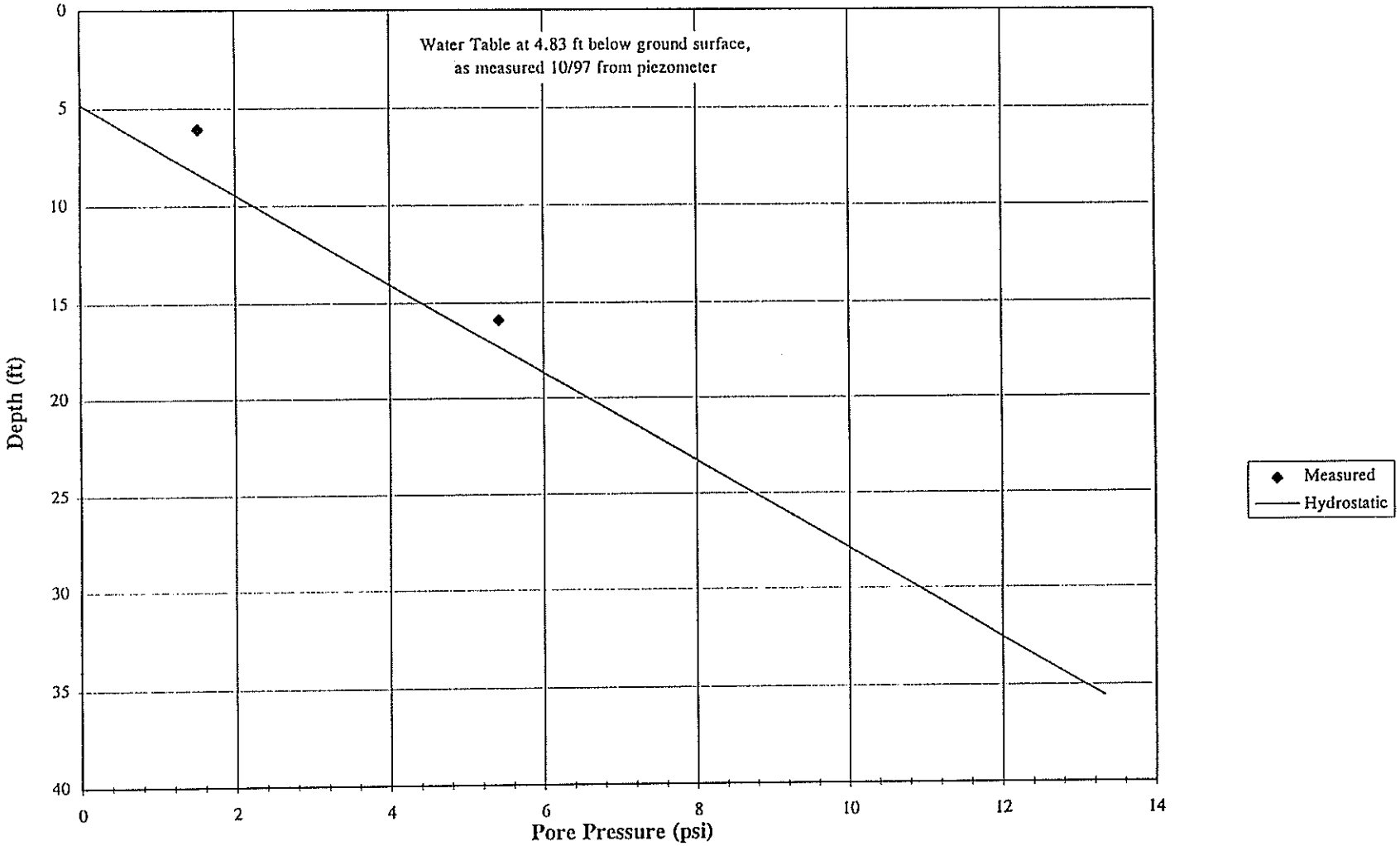
CPT08
Static Pore Pressure vs. Depth



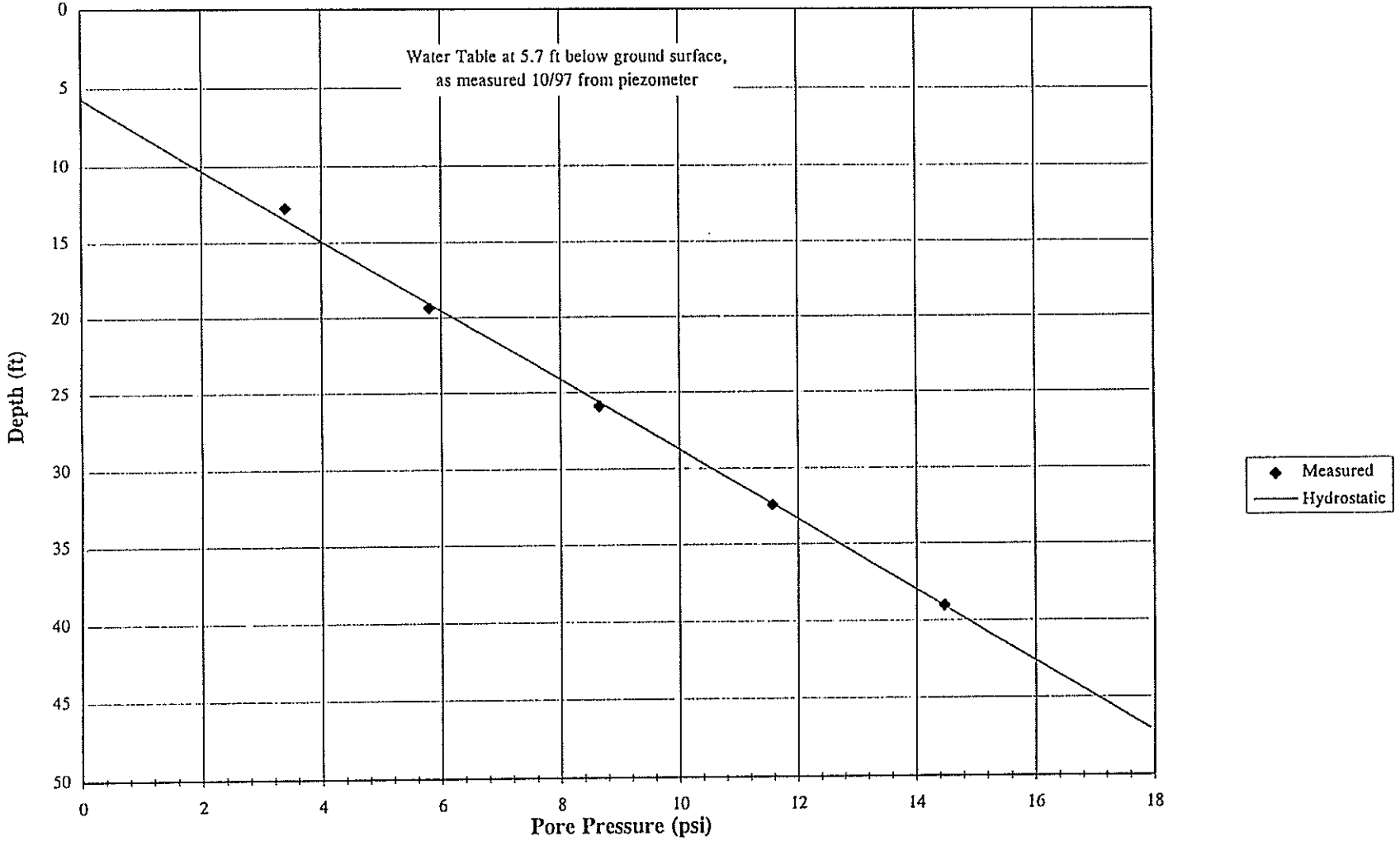
CPT10
Static Pore Pressure vs. Depth



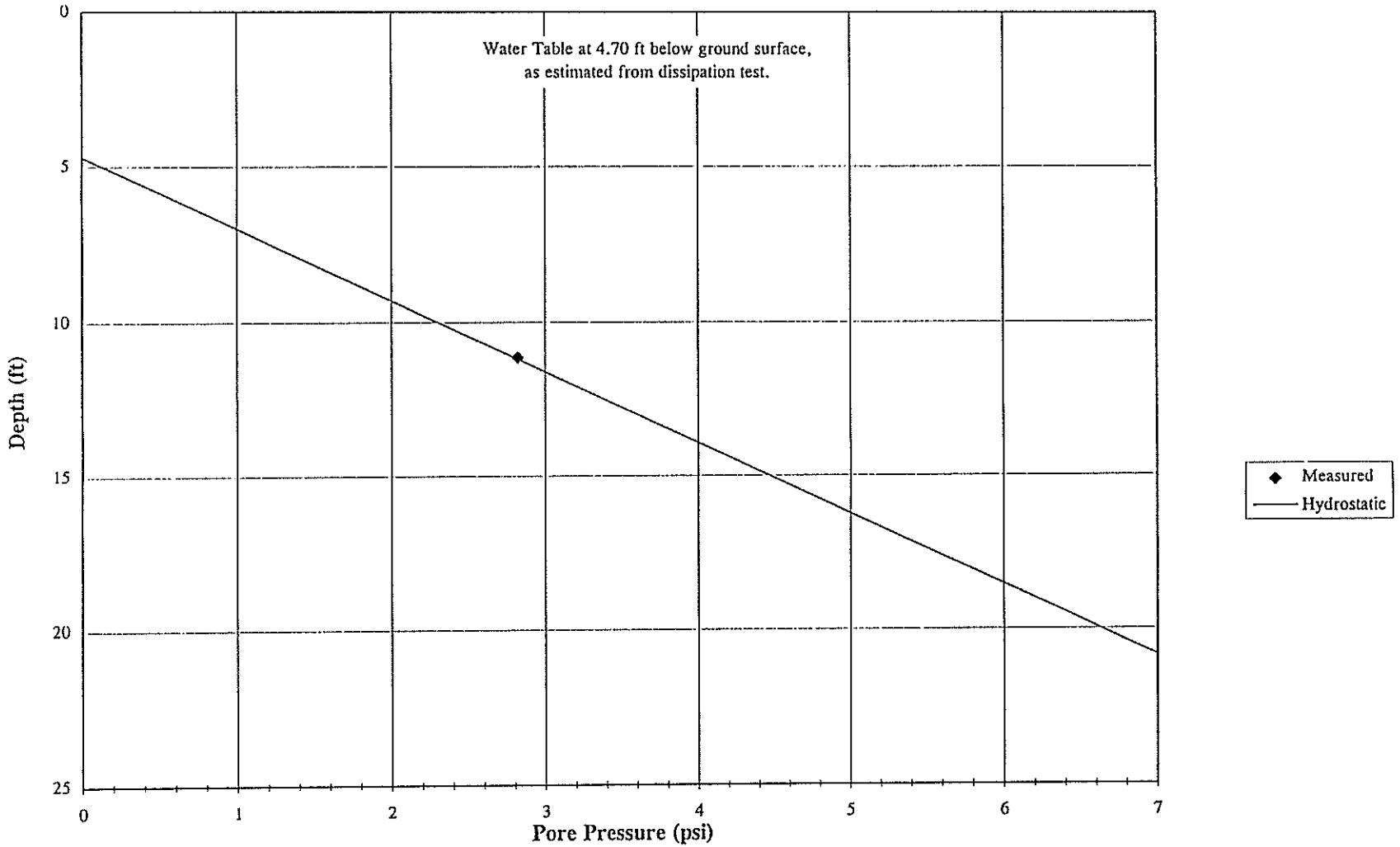
CPT12
Static Pore Pressure vs. Depth



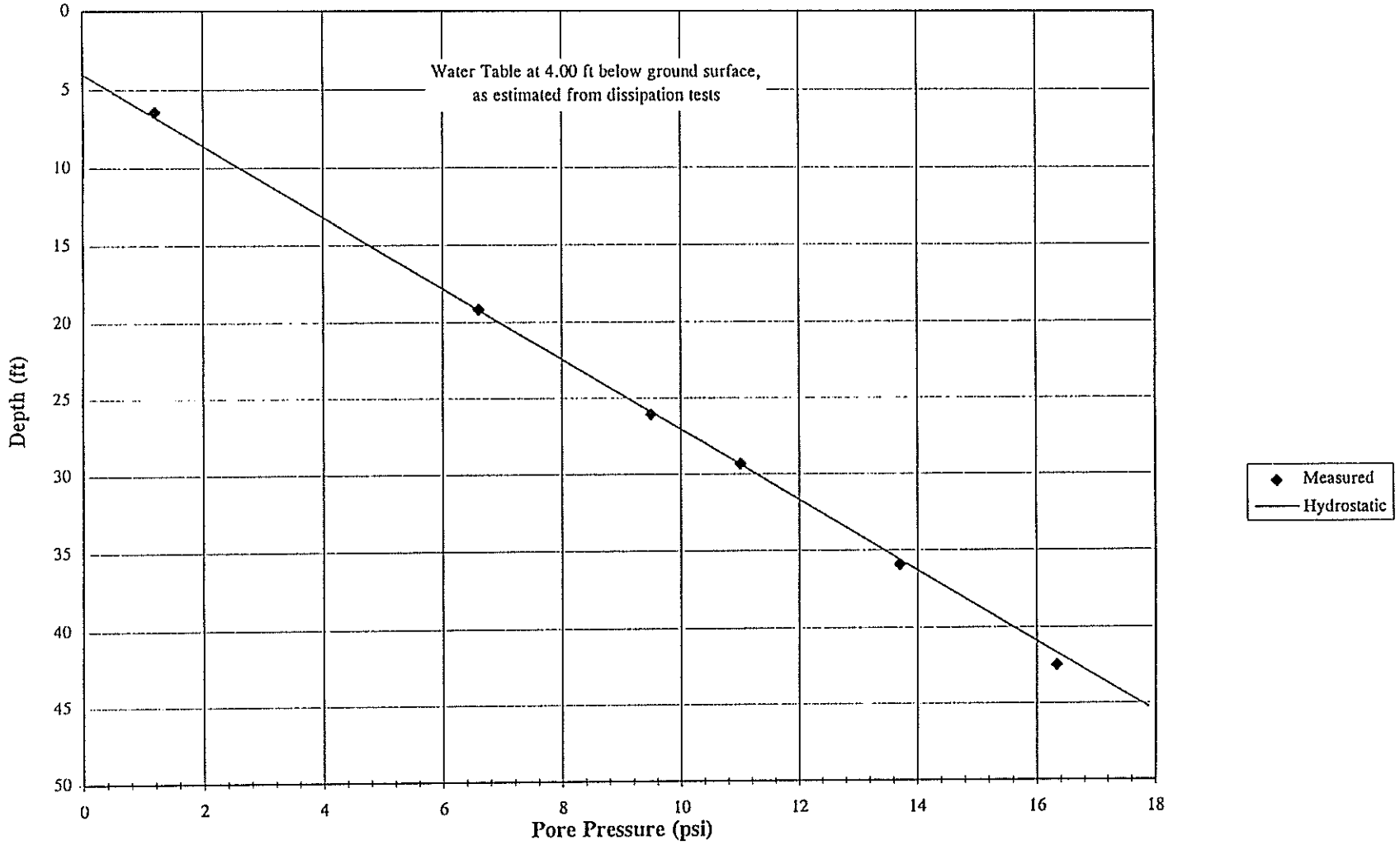
CPT15
Static Pore Pressure vs. Depth



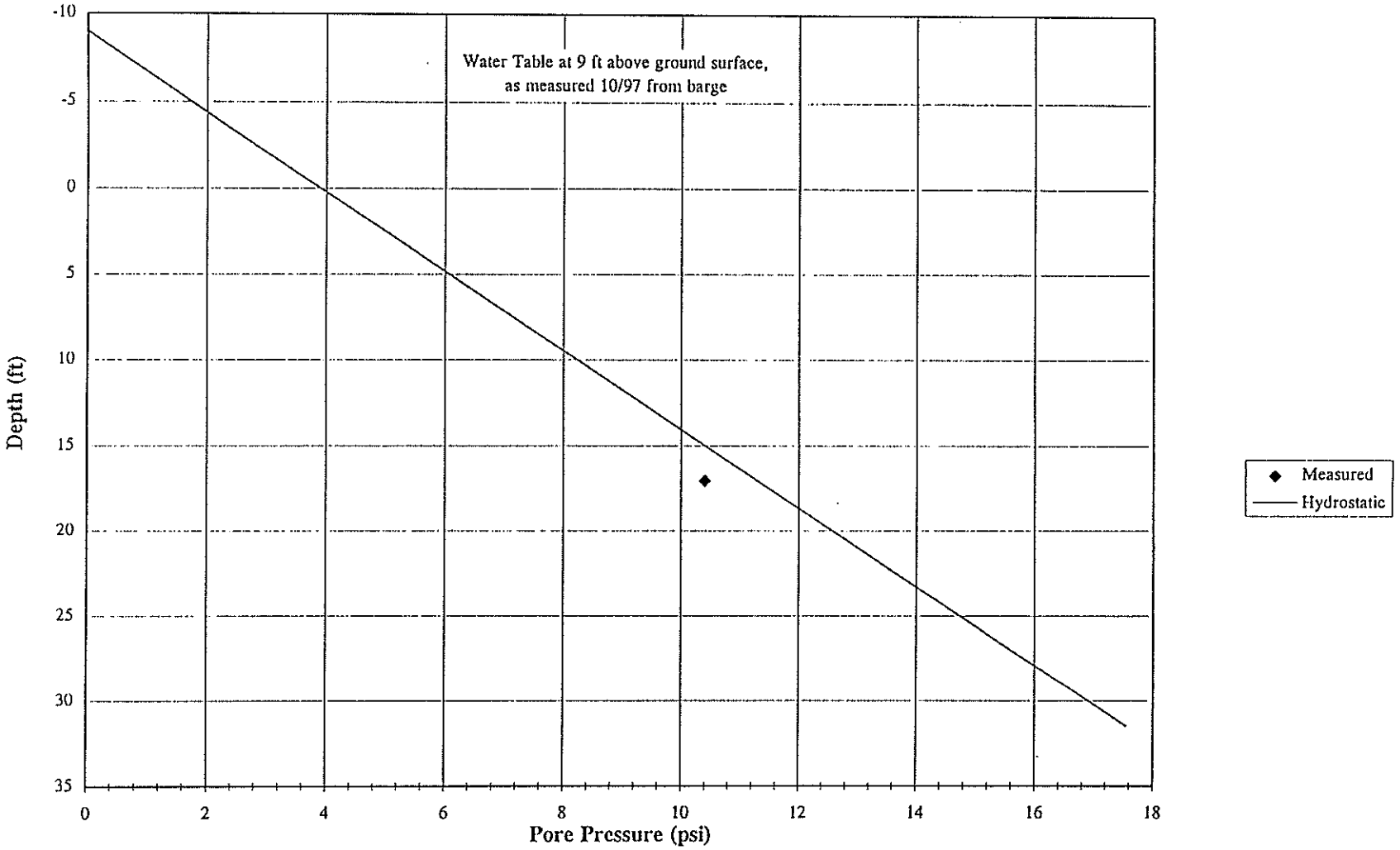
CPT16
Static Pore Pressure vs. Depth



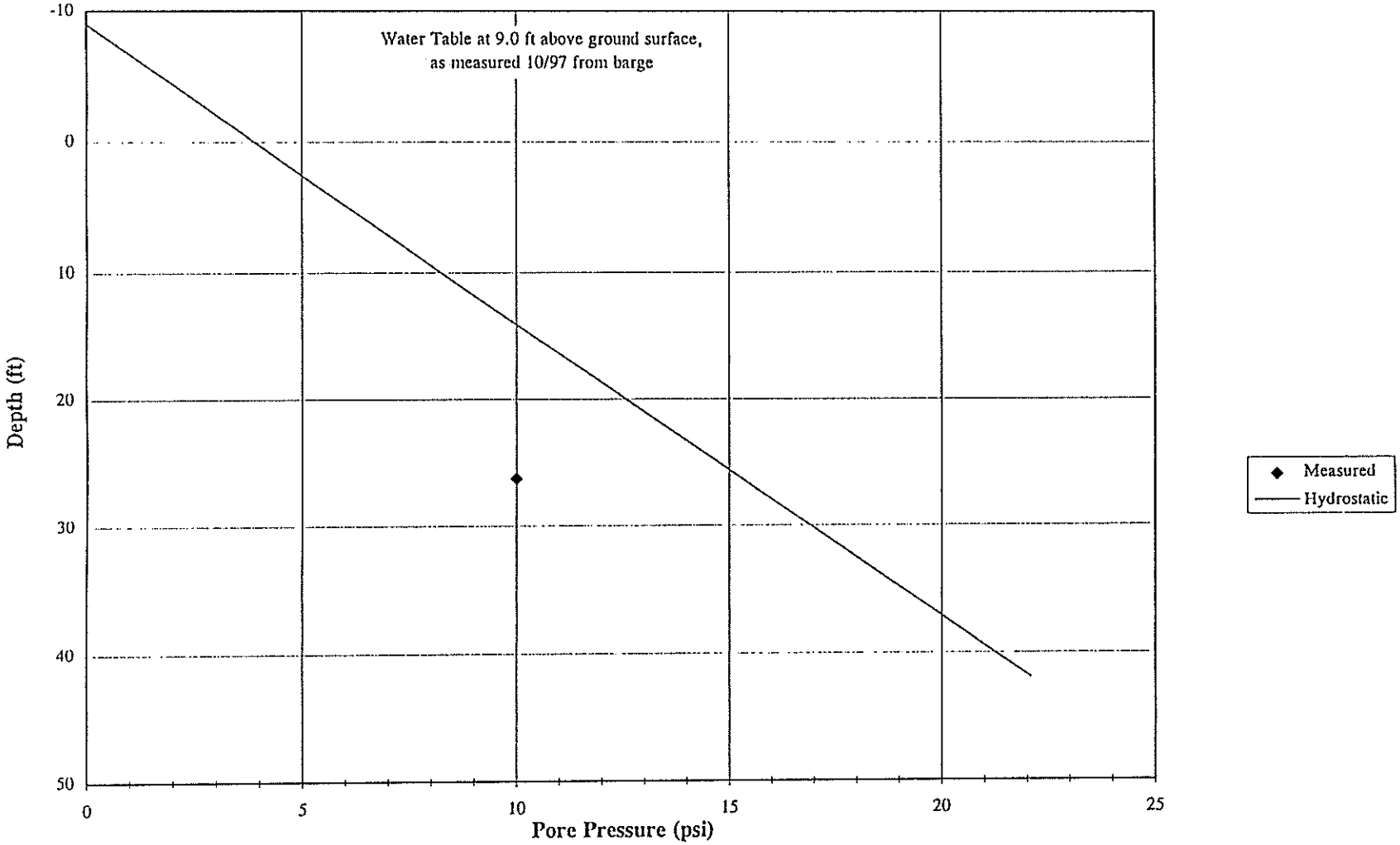
CPT18
Static Pore Pressure vs. Depth



CPT20B
Static Pore Pressure vs. Depth



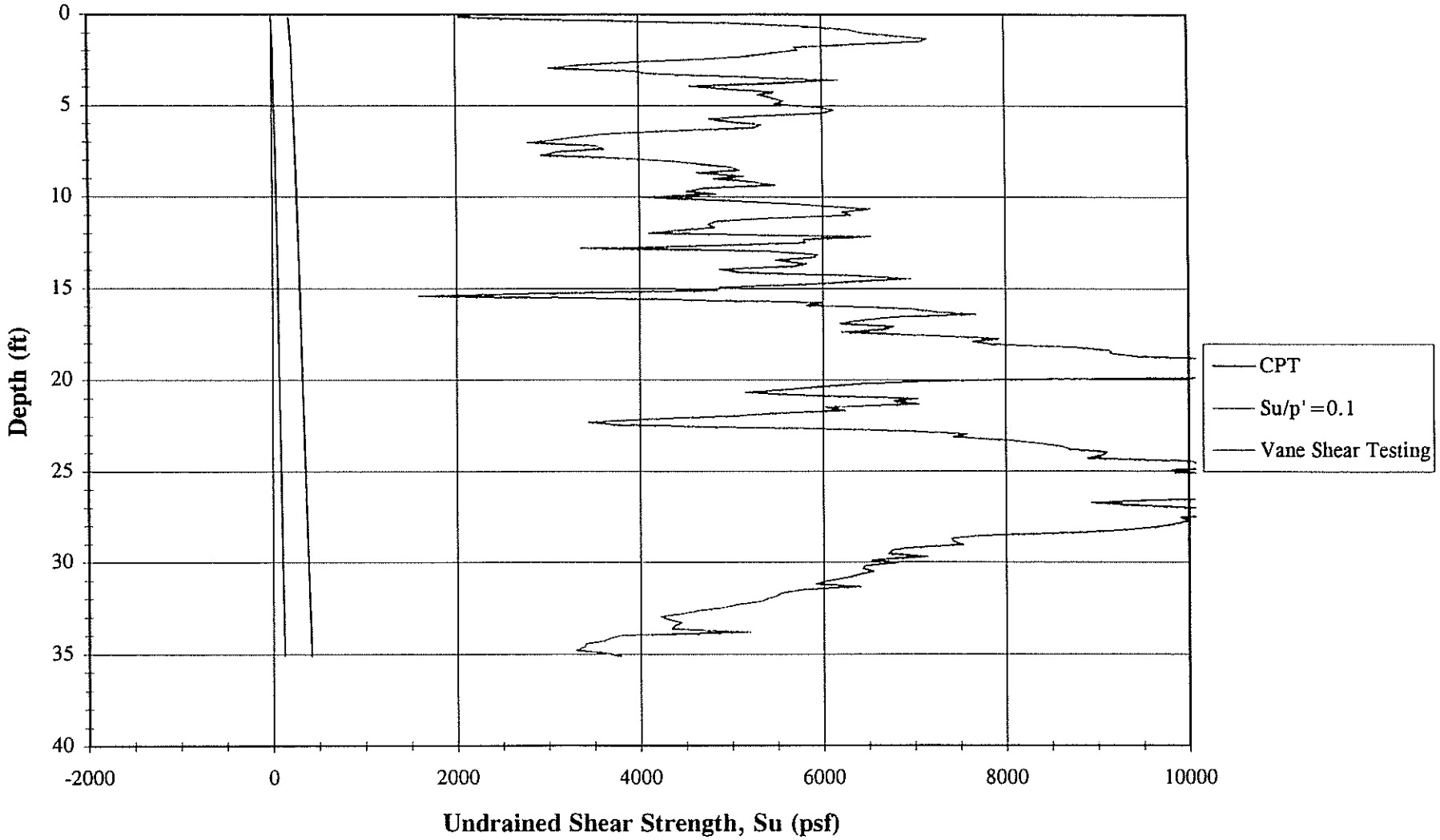
CPT21
Static Pore Pressure vs. Depth



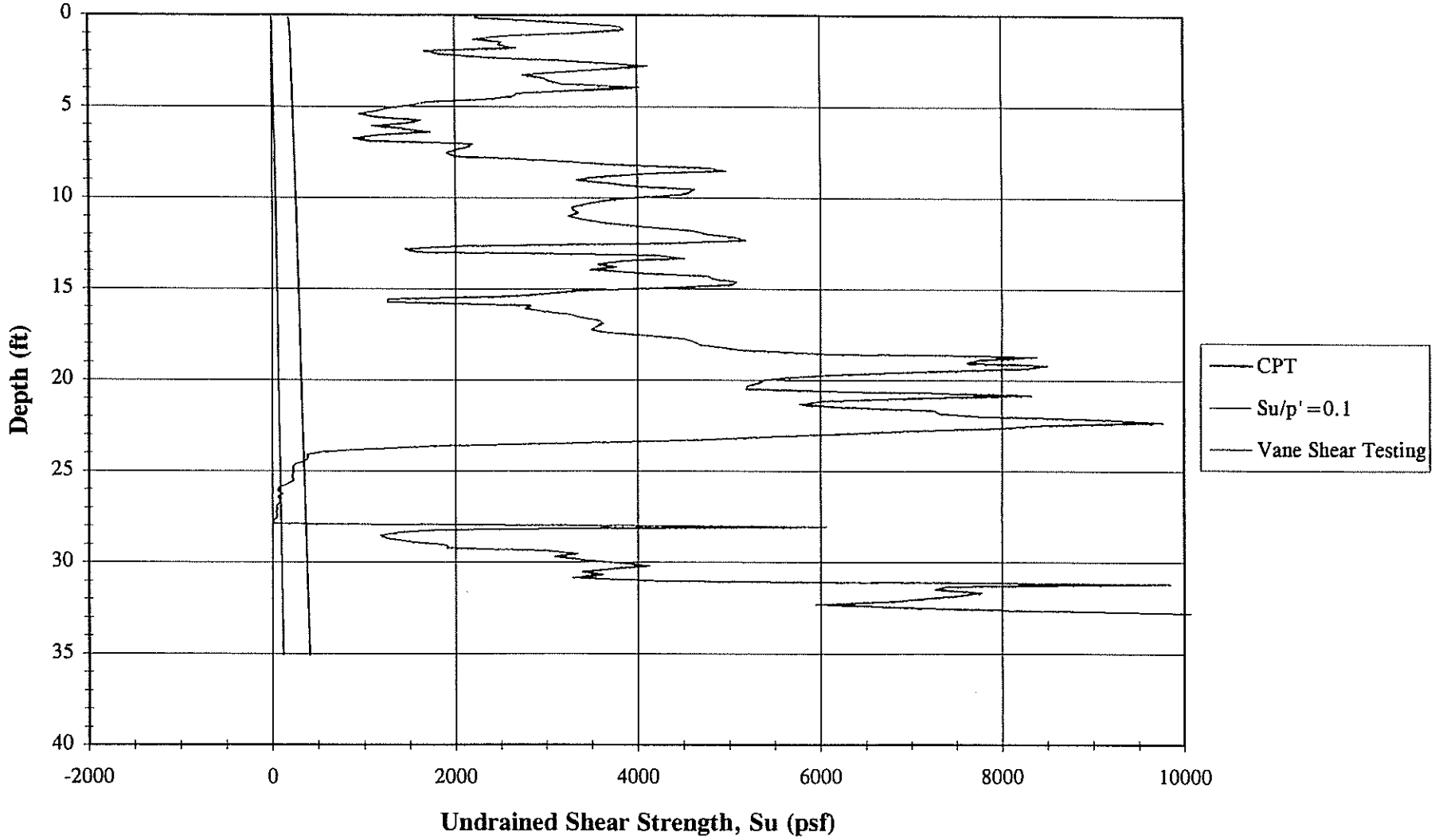
APPENDIX H

S_U VERSUS DEPTH DATA

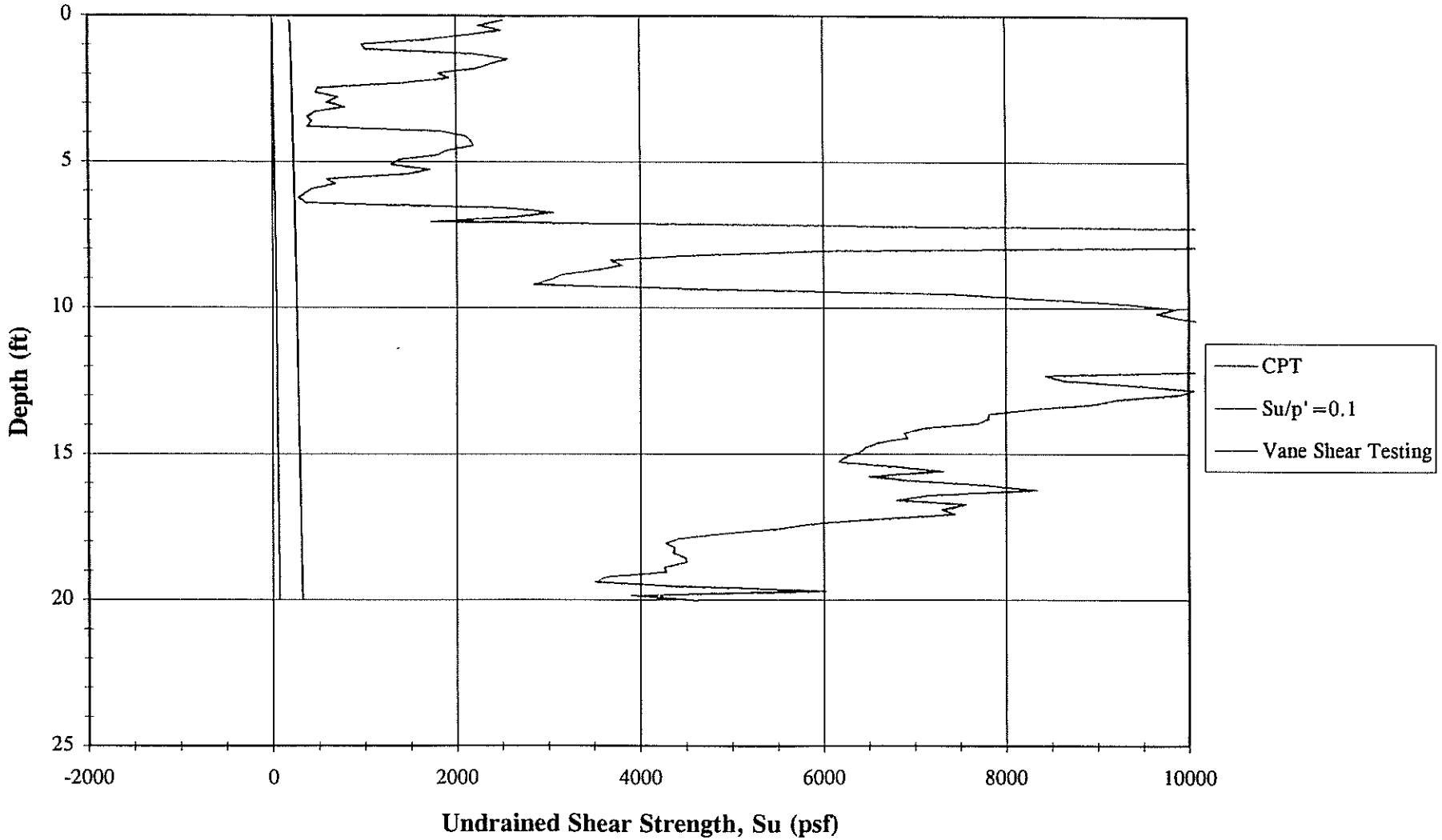
CPT01
Measured and Modeled Undrained Shear Strength



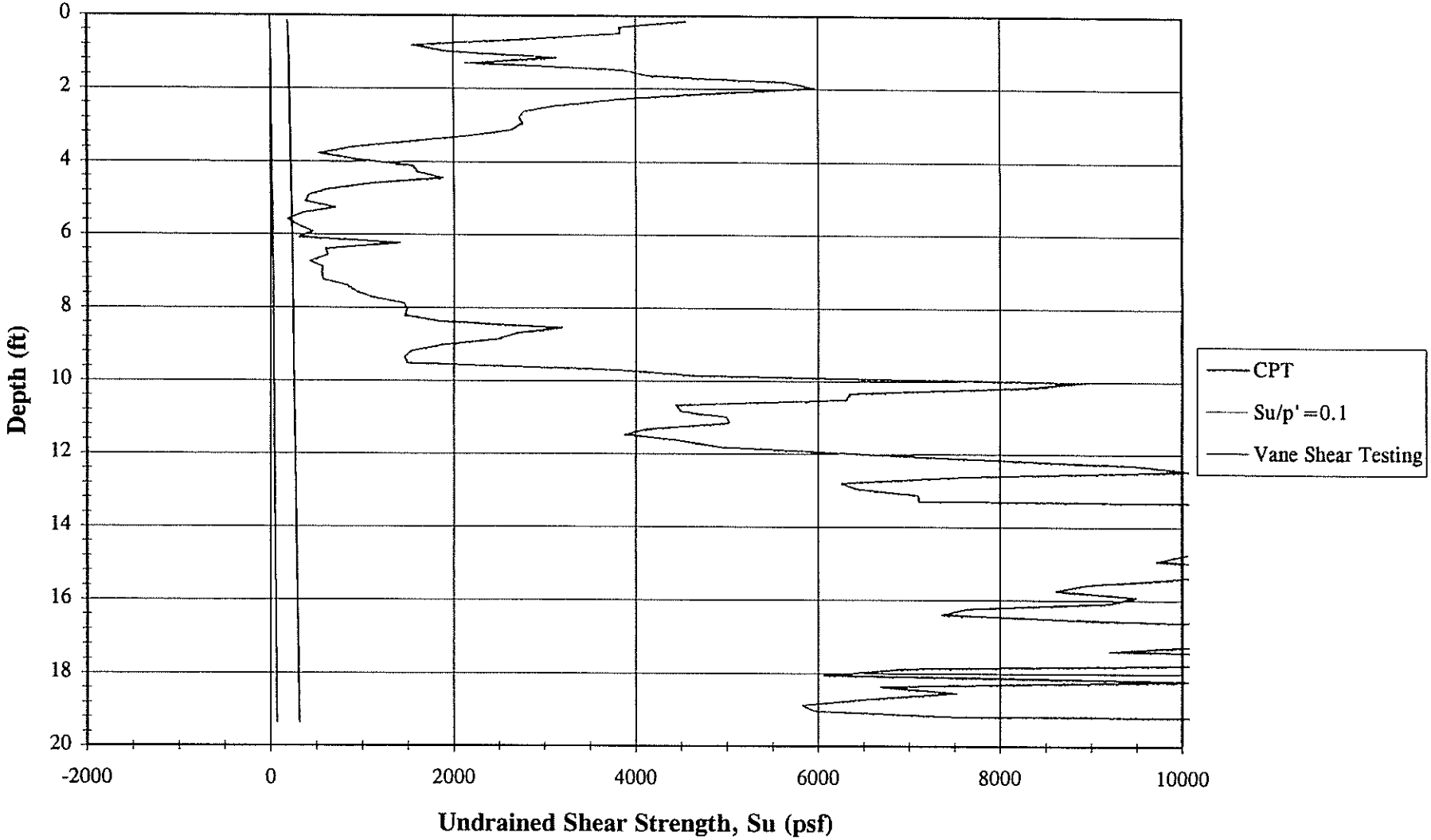
CPT02
Measured and Modeled Undrained Shear Strength



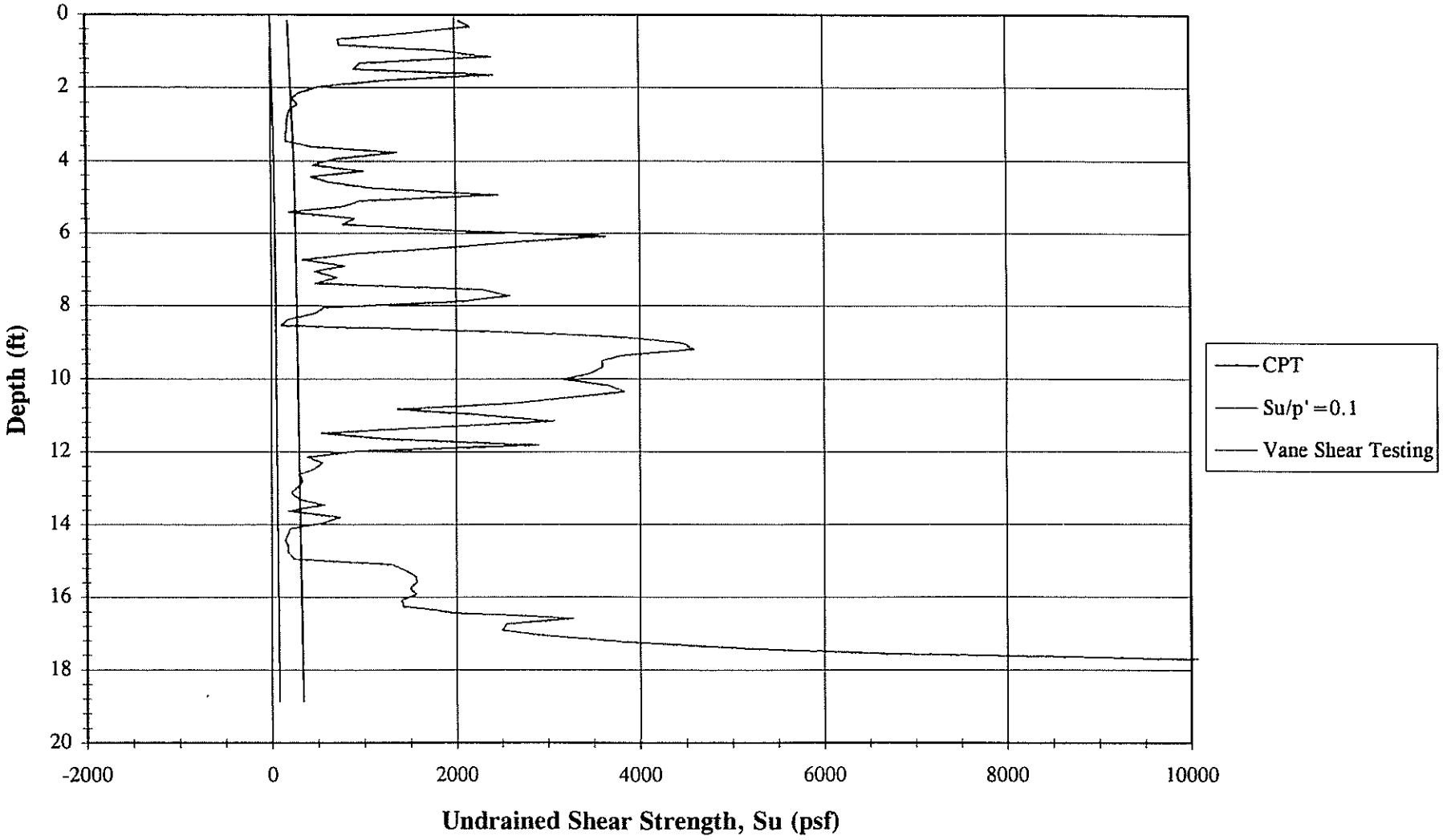
CPT03
Measured and Modeled Undrained Shear Strength



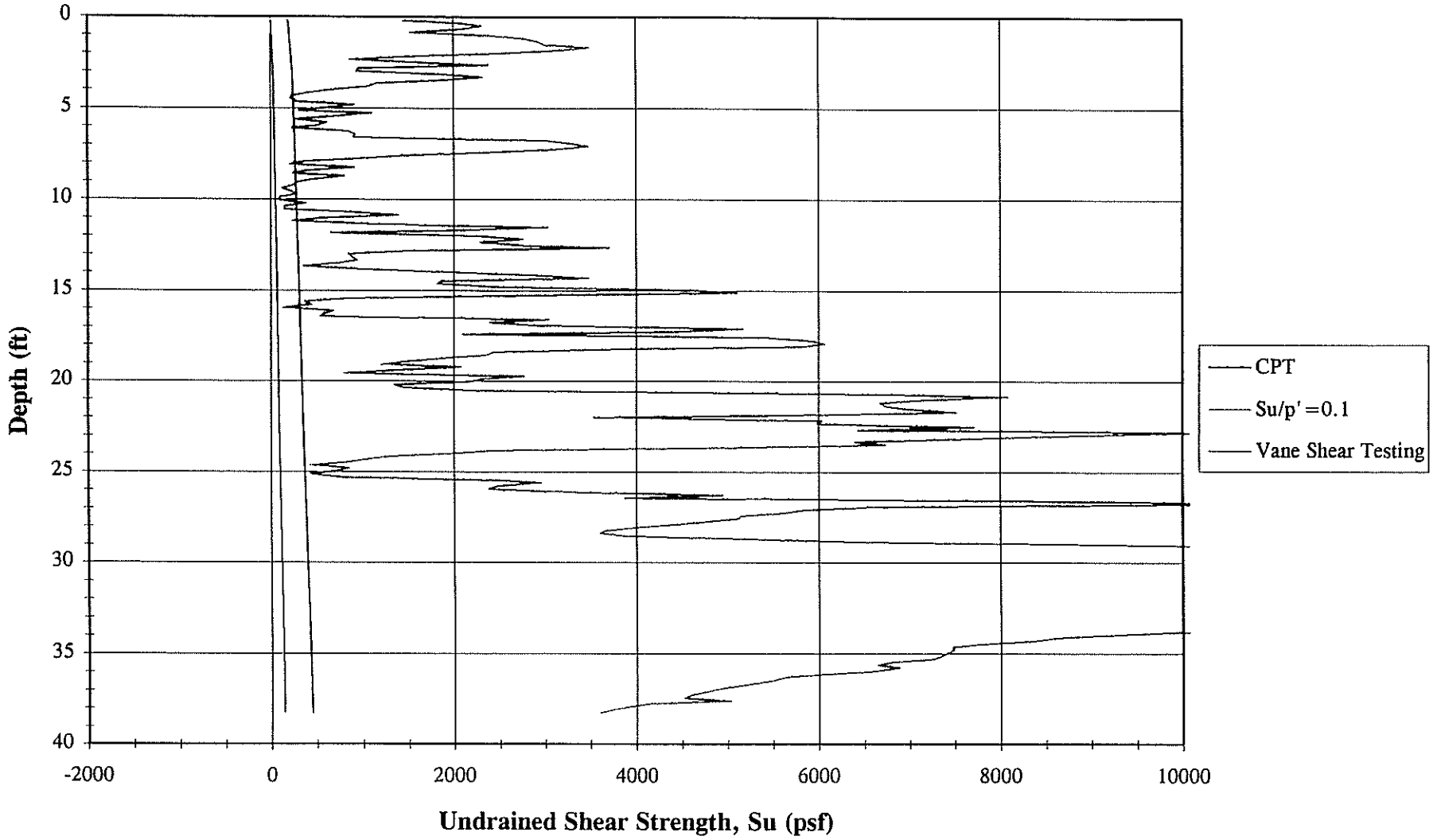
CPT04
Measured and Modeled Undrained Shear Strength



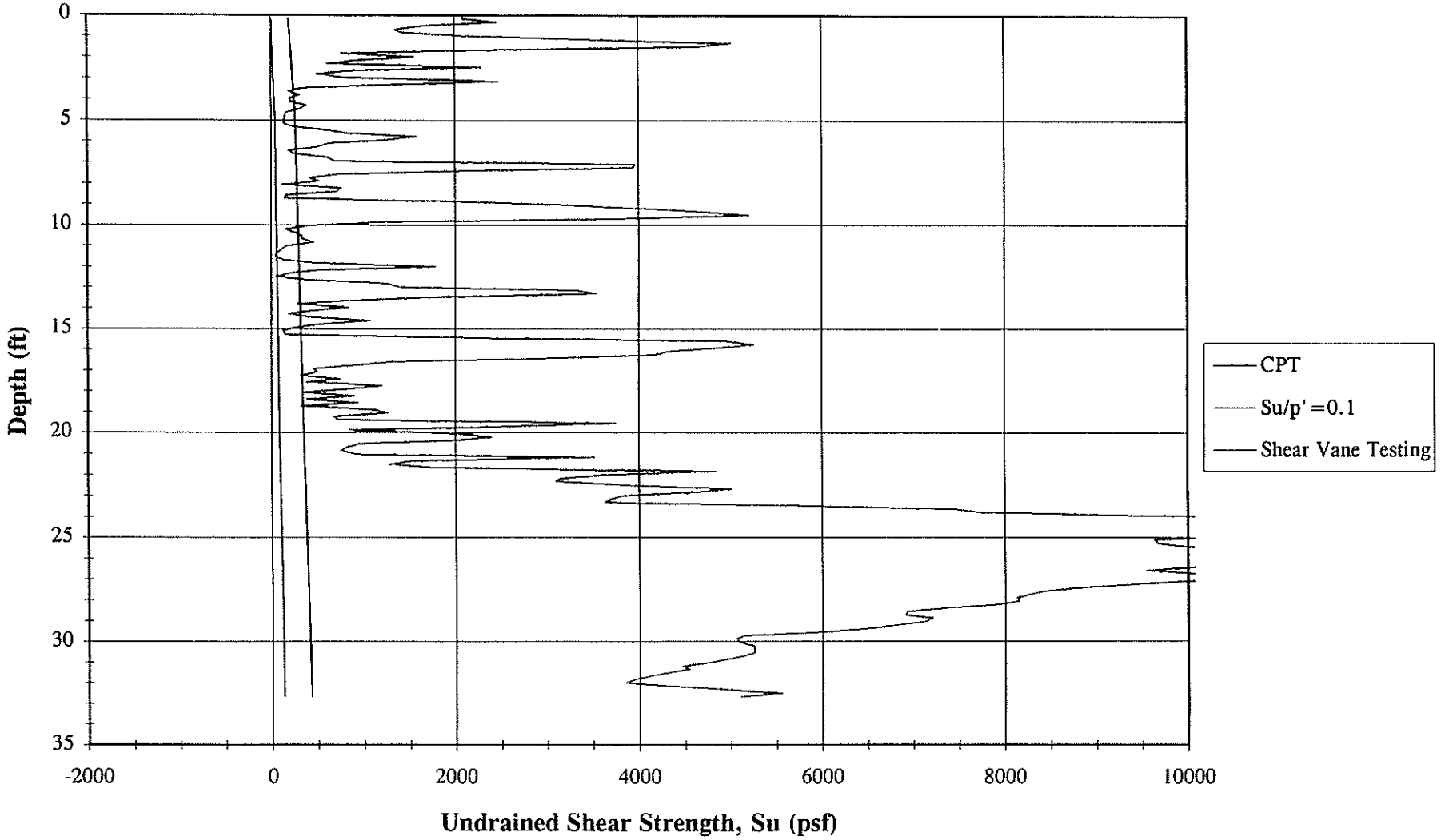
CPT05
Measured and Modeled Undrained Shear Strength



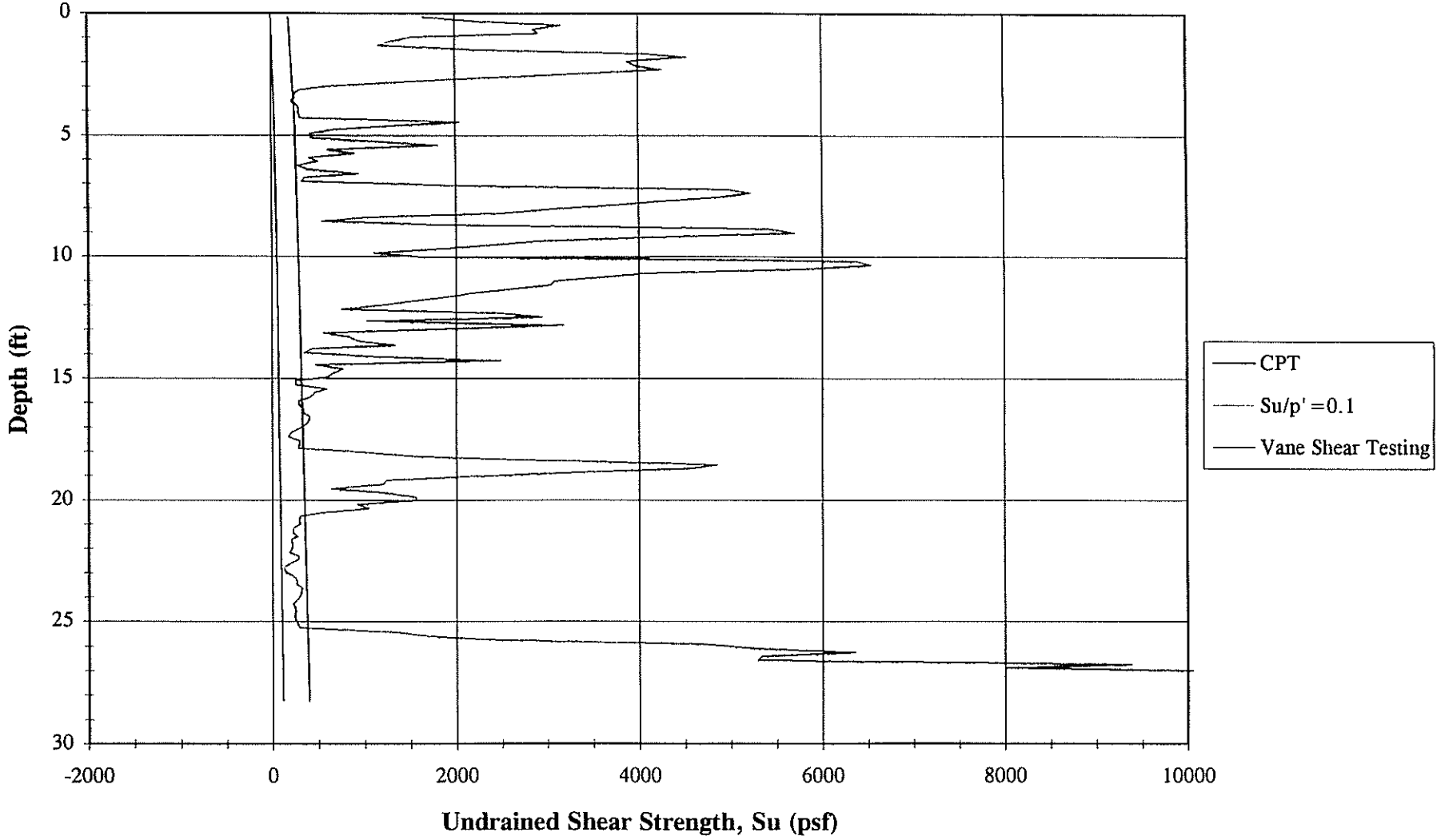
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Measured and Modeled Undrained Shear Strength



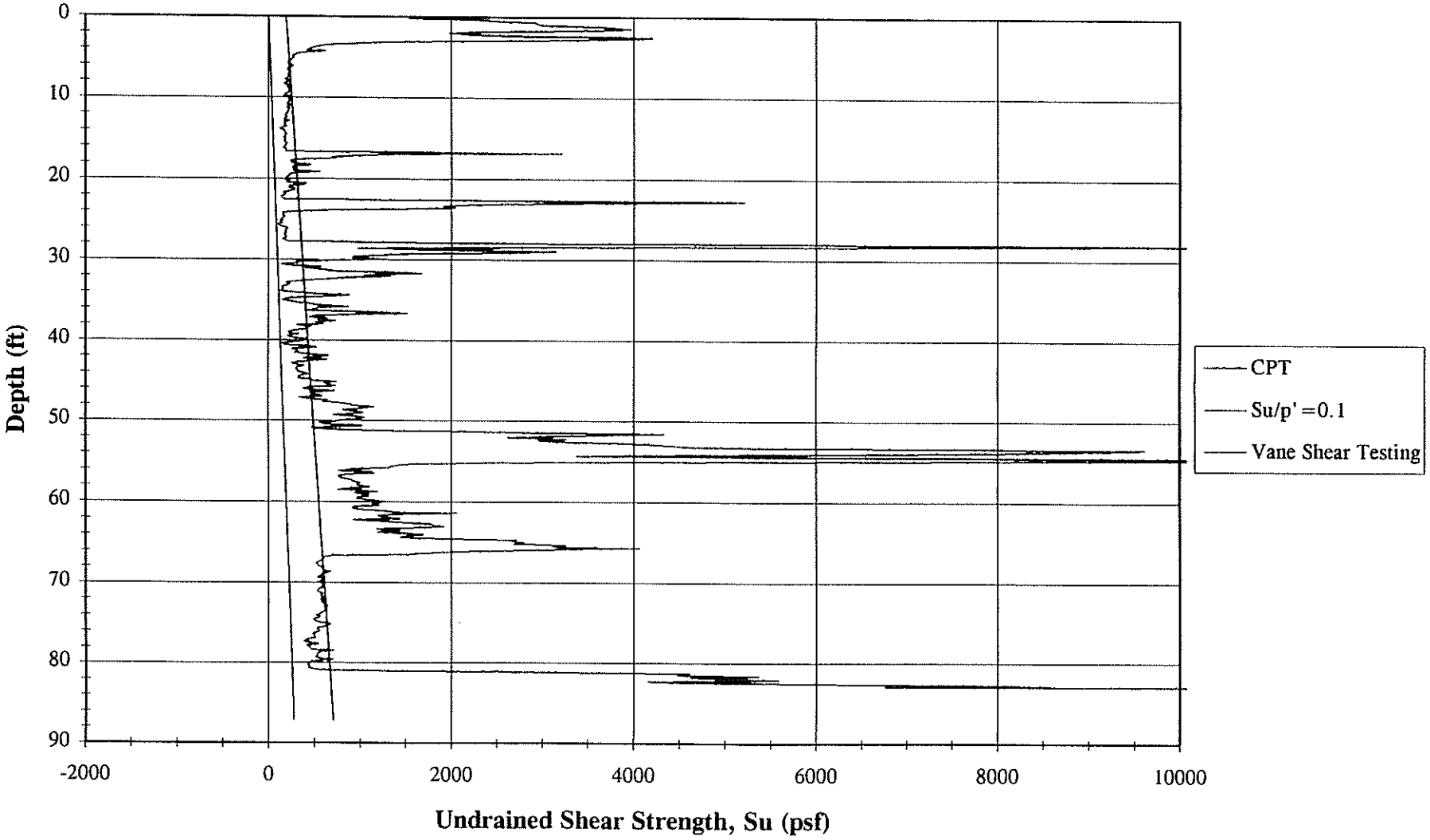
CPT07
Measured and Modeled Undrained Shear Strength



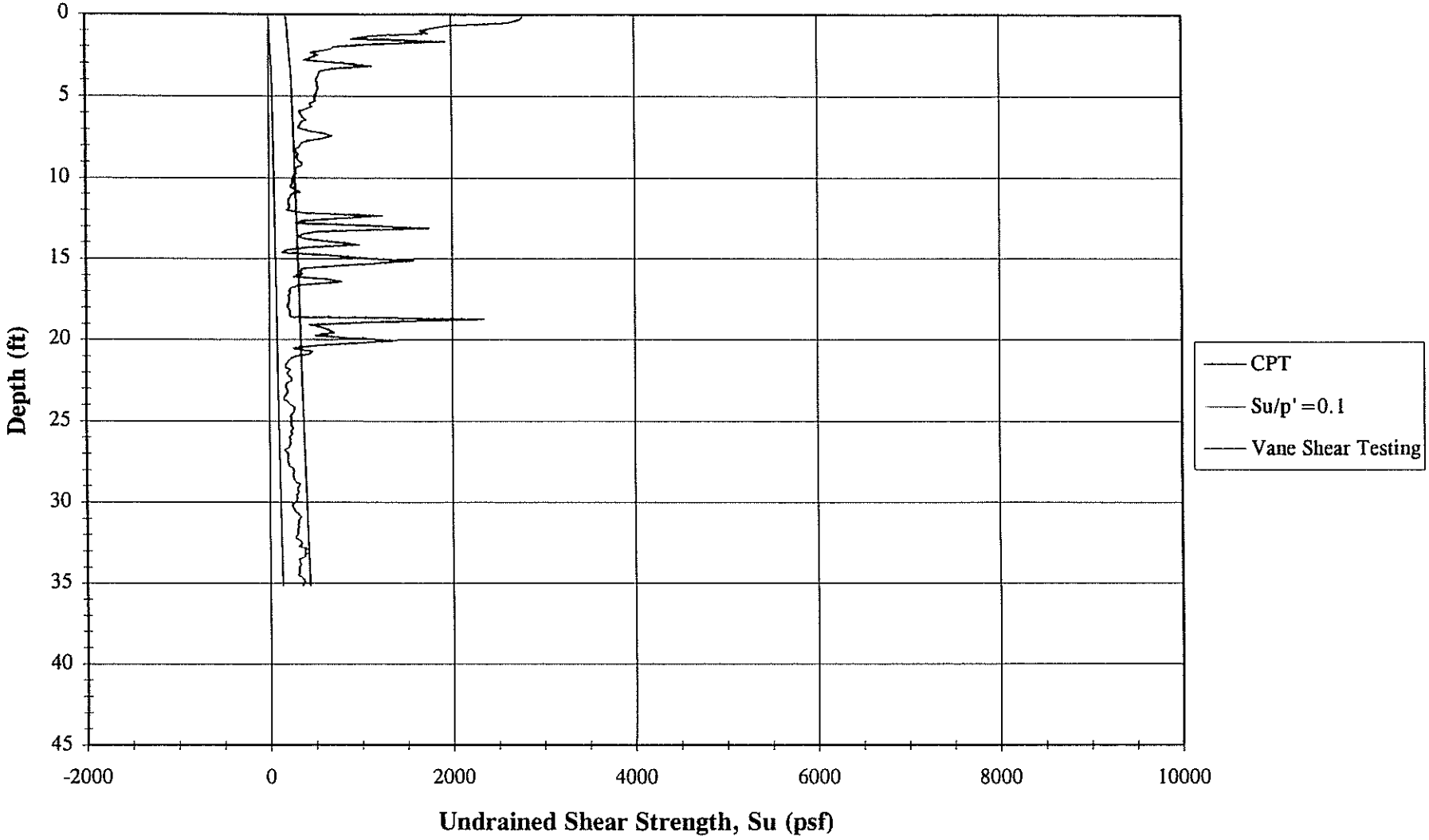
CPT08
Measured and Modeled Undrained Shear Strength



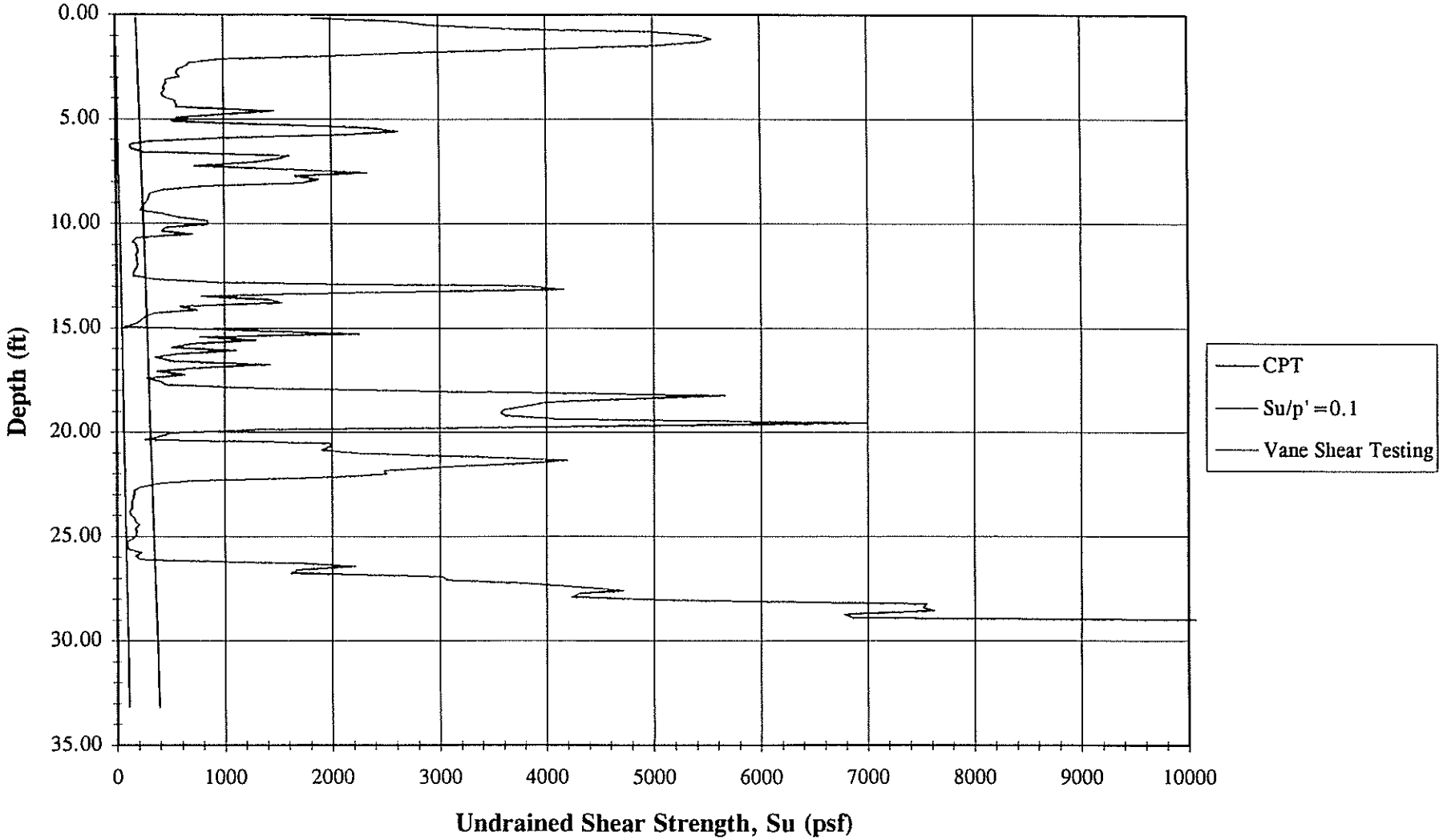
CPT09
Measured and Modeled Undrained Shear Strength



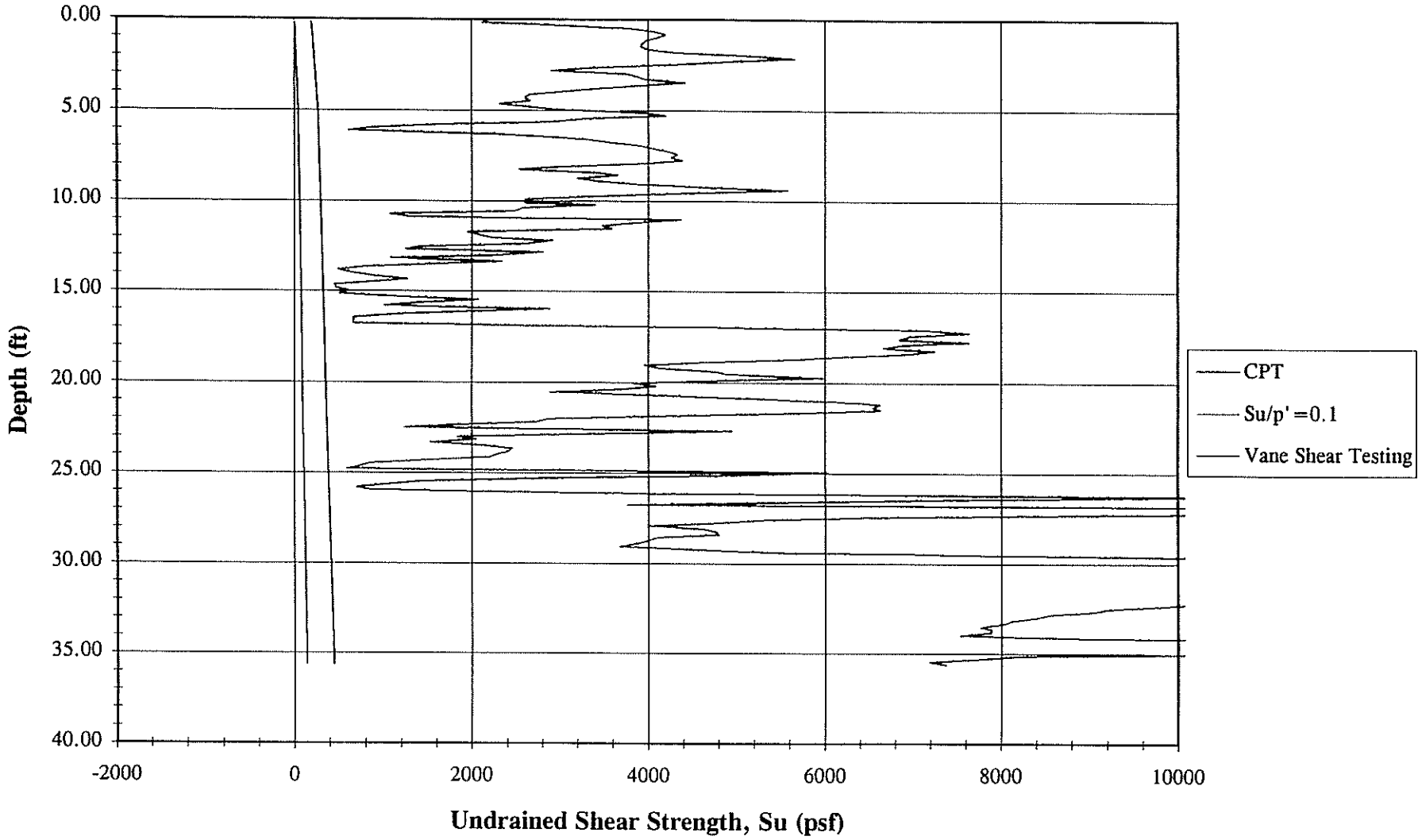
CPT10
Measured and Modeled Undrained Shear Strength



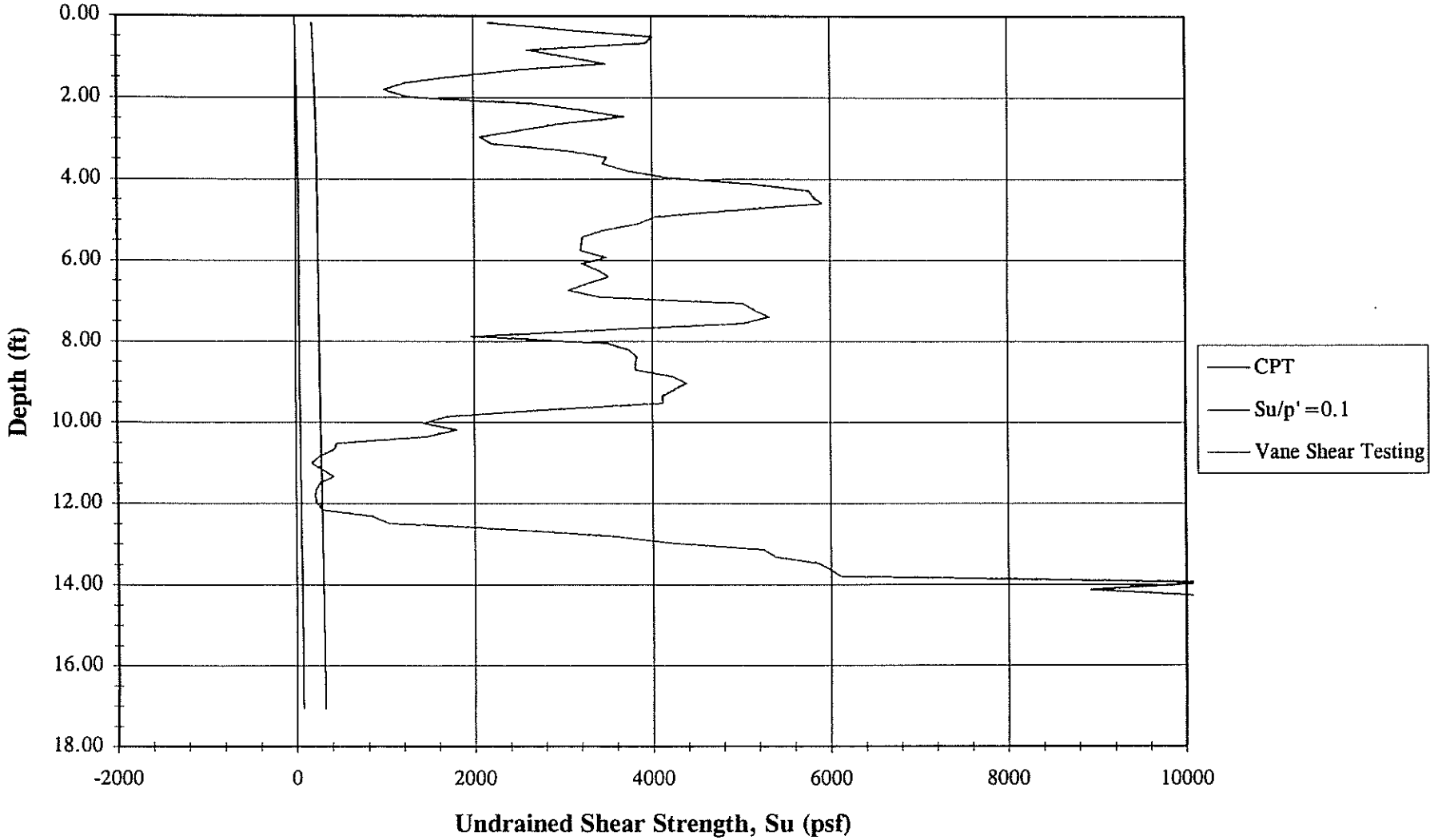
CPT11
Measured and Modeled Undrained Shear Strength



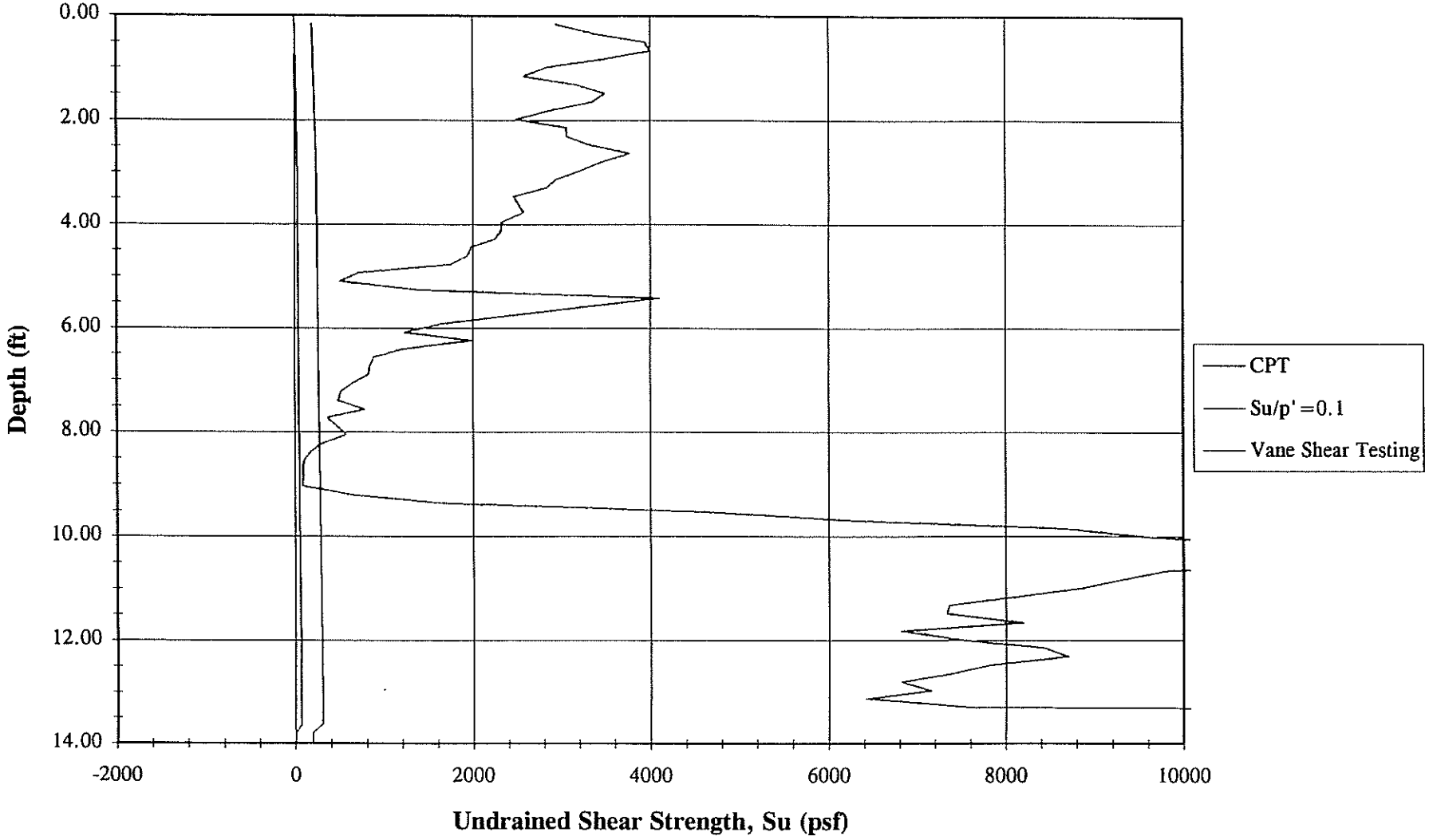
CPT12
Measured and Modeled Undrained Shear Strength



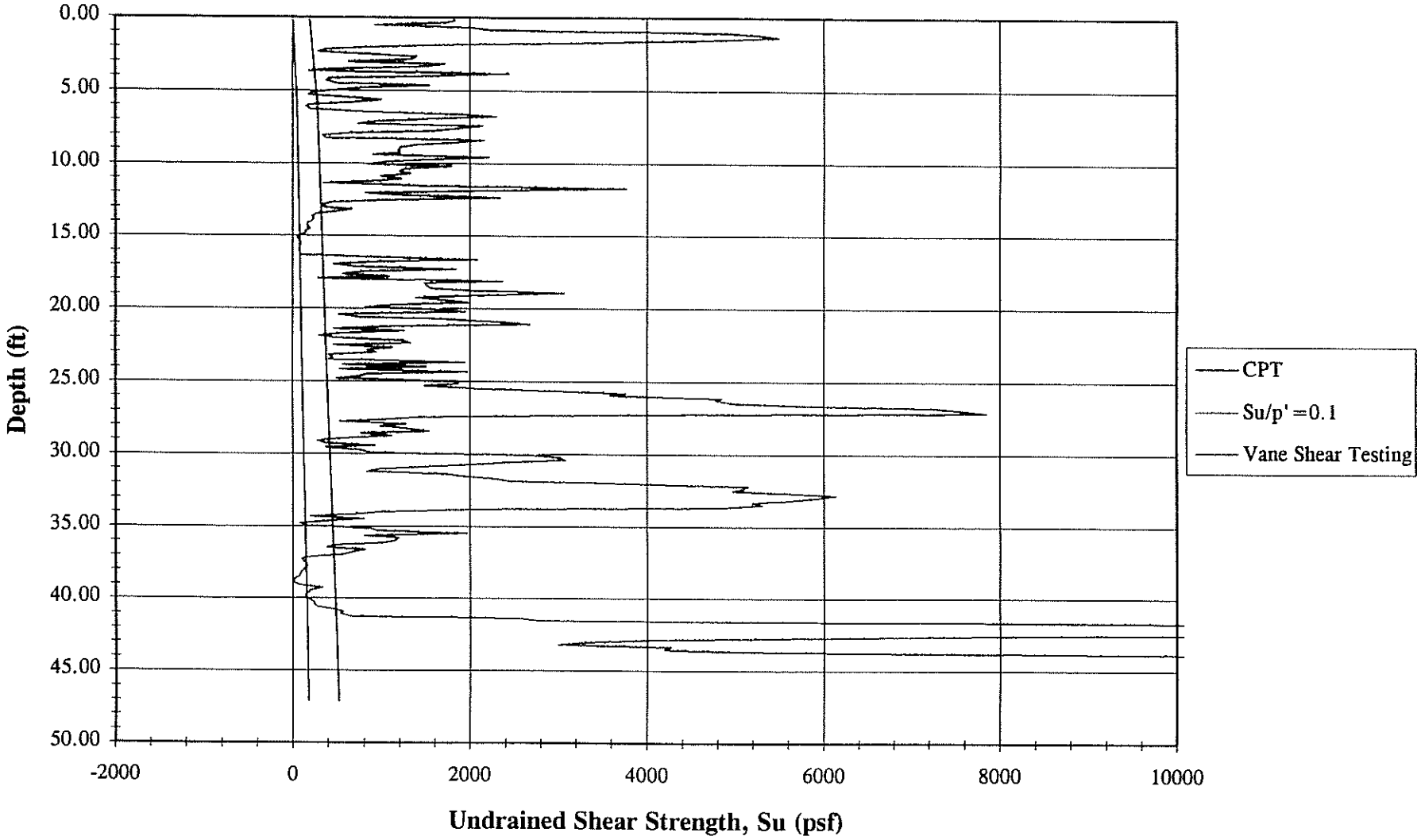
CPT13
Measured and Modeled Undrained Shear Strength



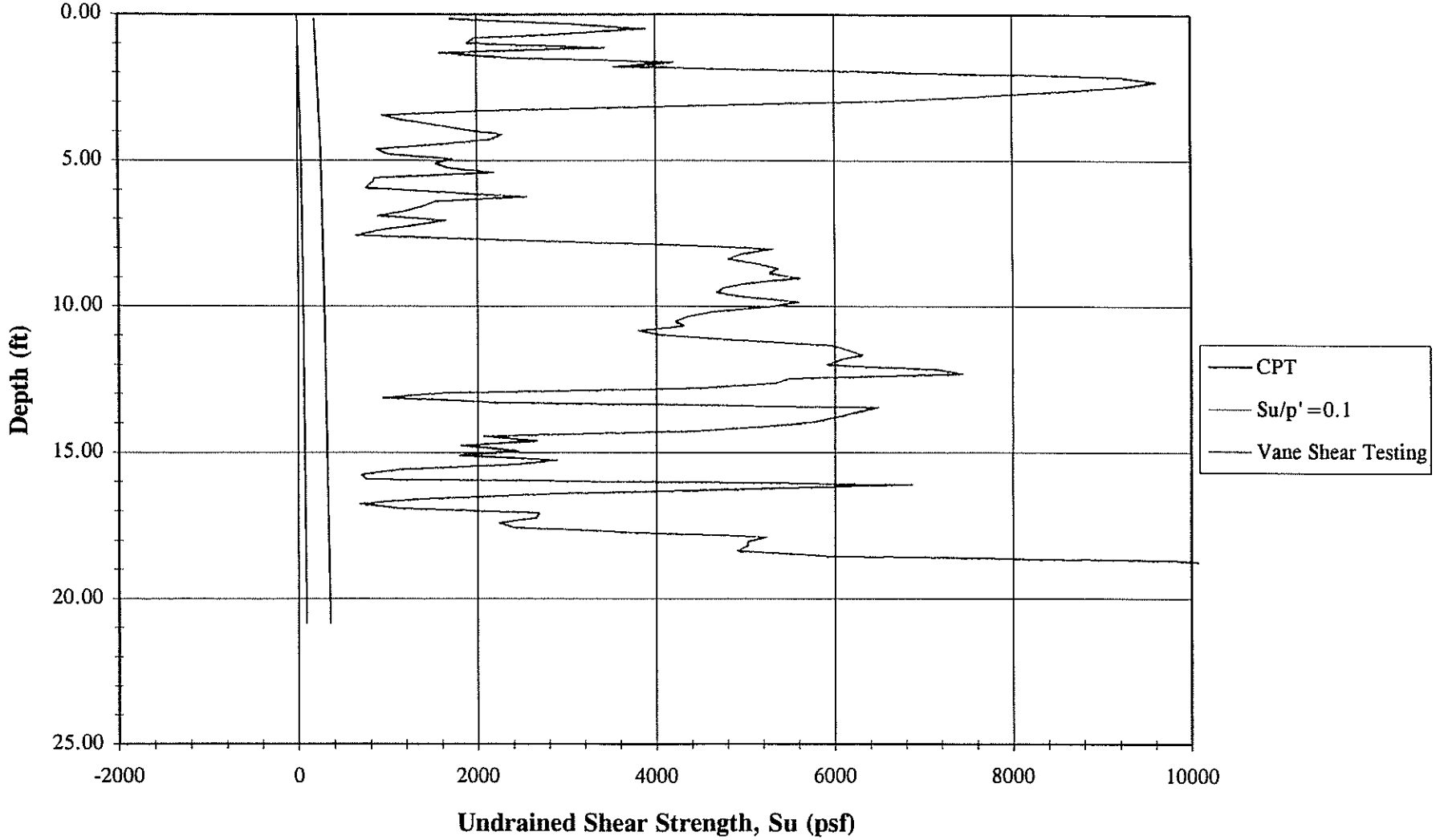
CPT14
Measured and Modeled Undrained Shear Strength



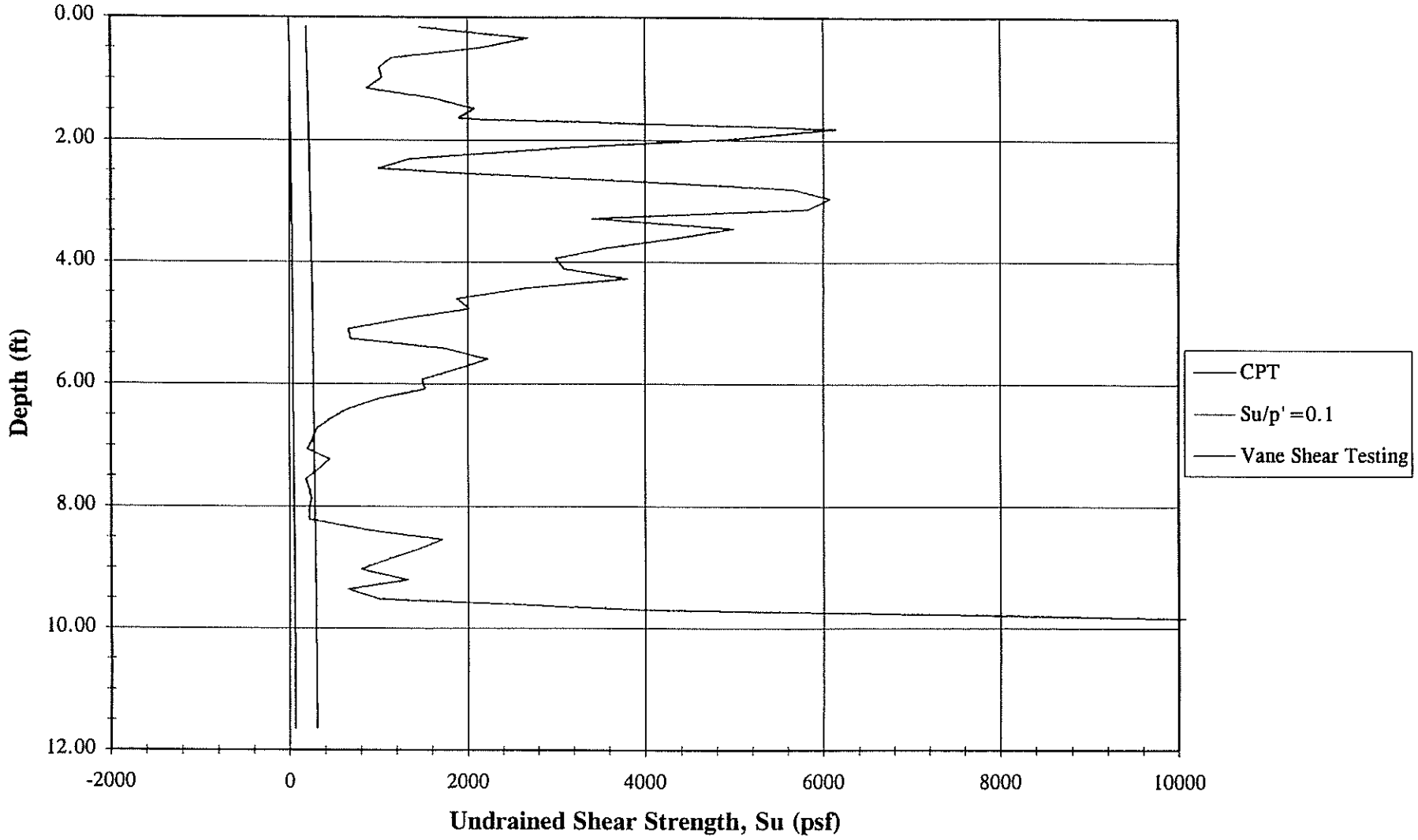
CPT15
Measured and Modeled Undrained Shear Strength



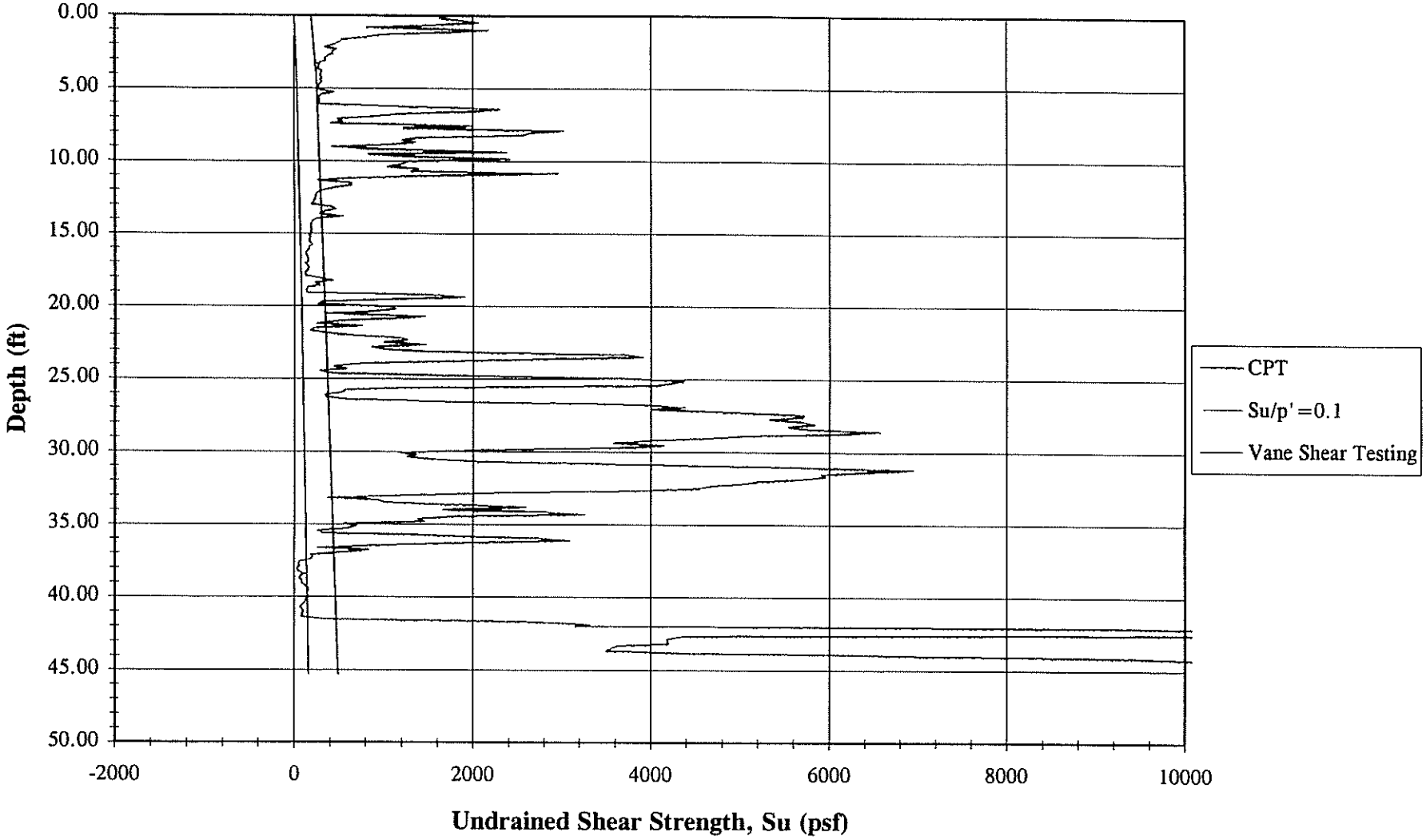
CPT16
Measured and Modeled Undrained Shear Strength



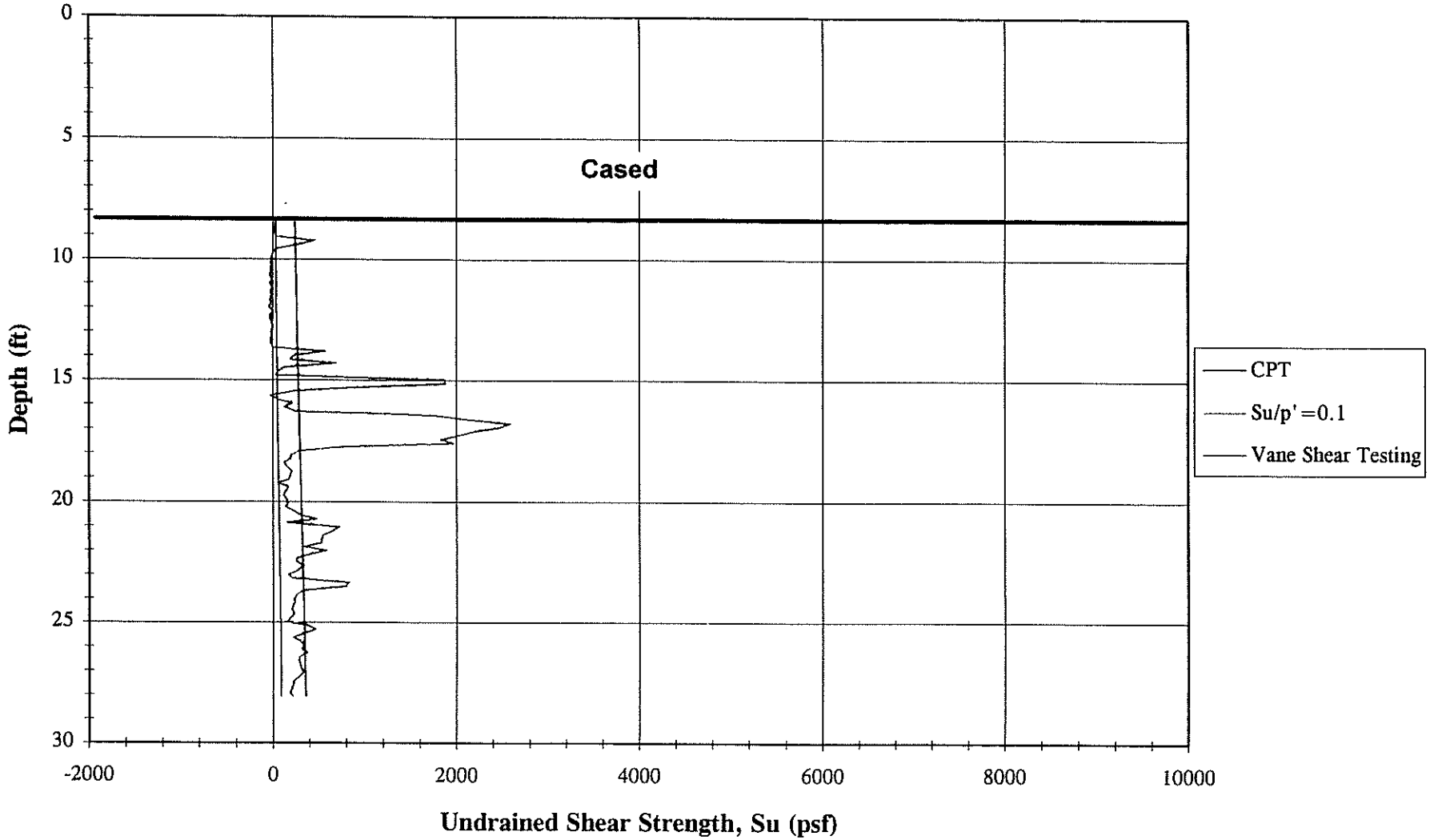
CPT17
Measured and Modeled Undrained Shear Strength



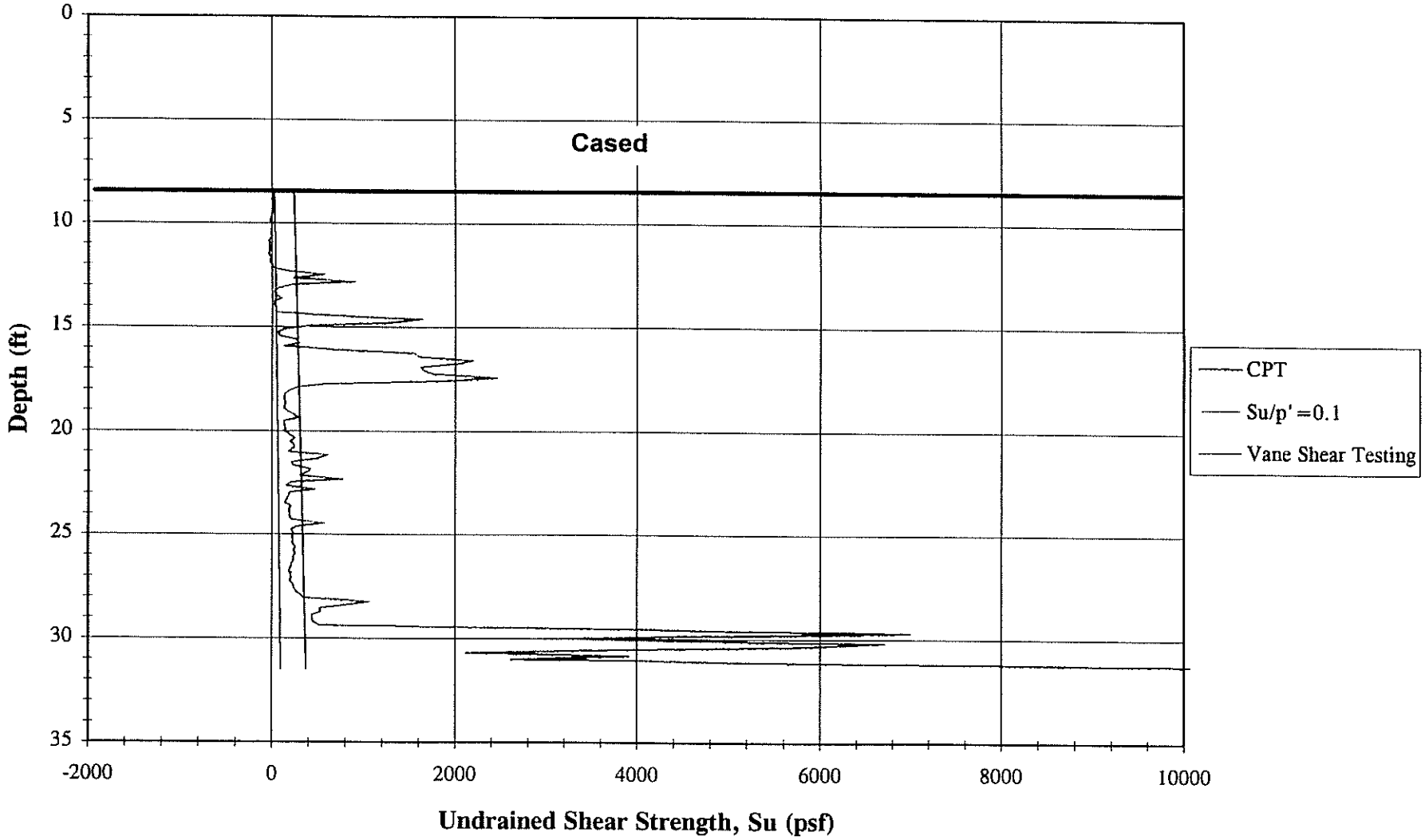
CPT18
Measured and Modeled Undrained Shear Strength



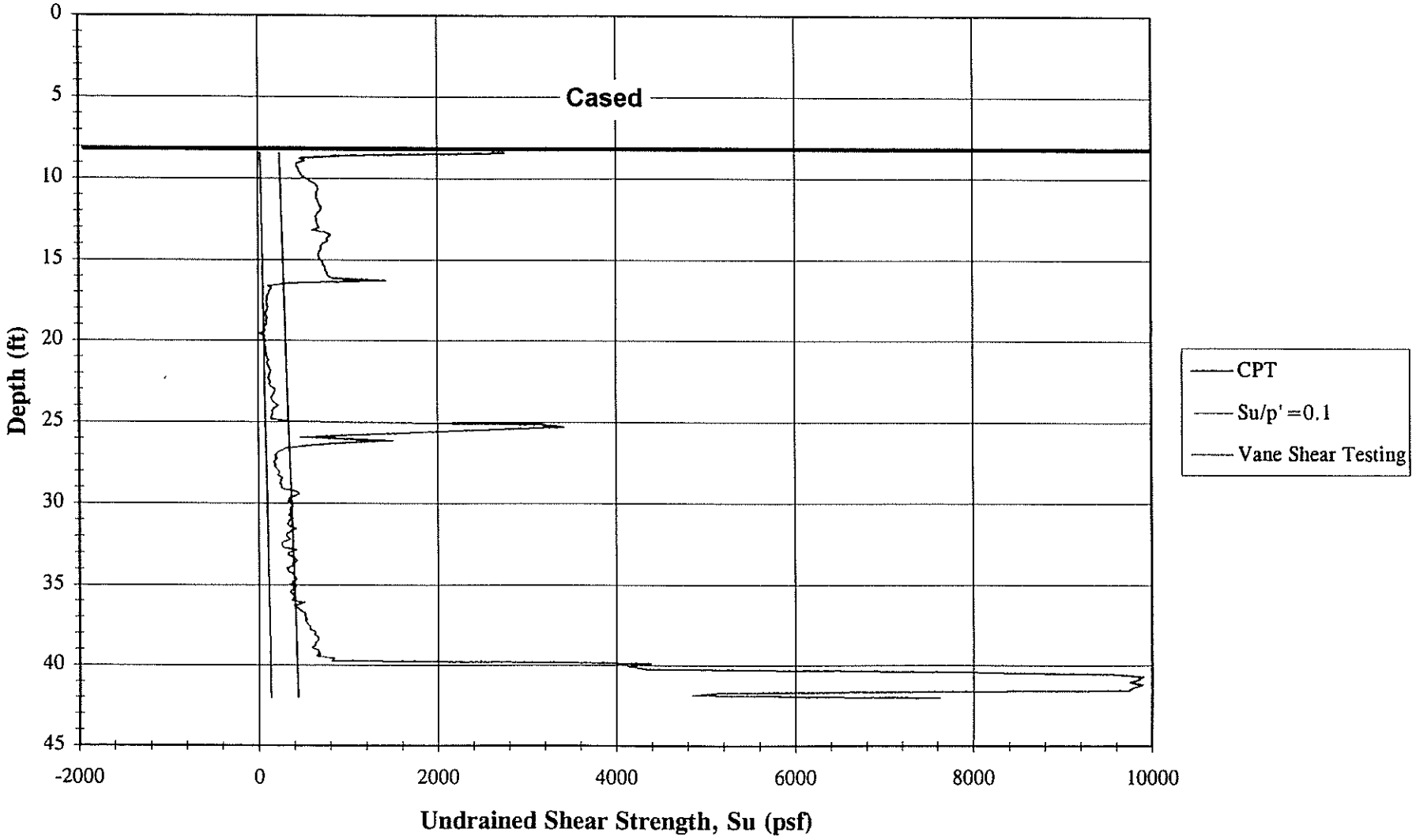
CPT20
Measured and Modeled Undrained Shear Strength



CPT20B
Measured and Modeled Undrained Shear Strength



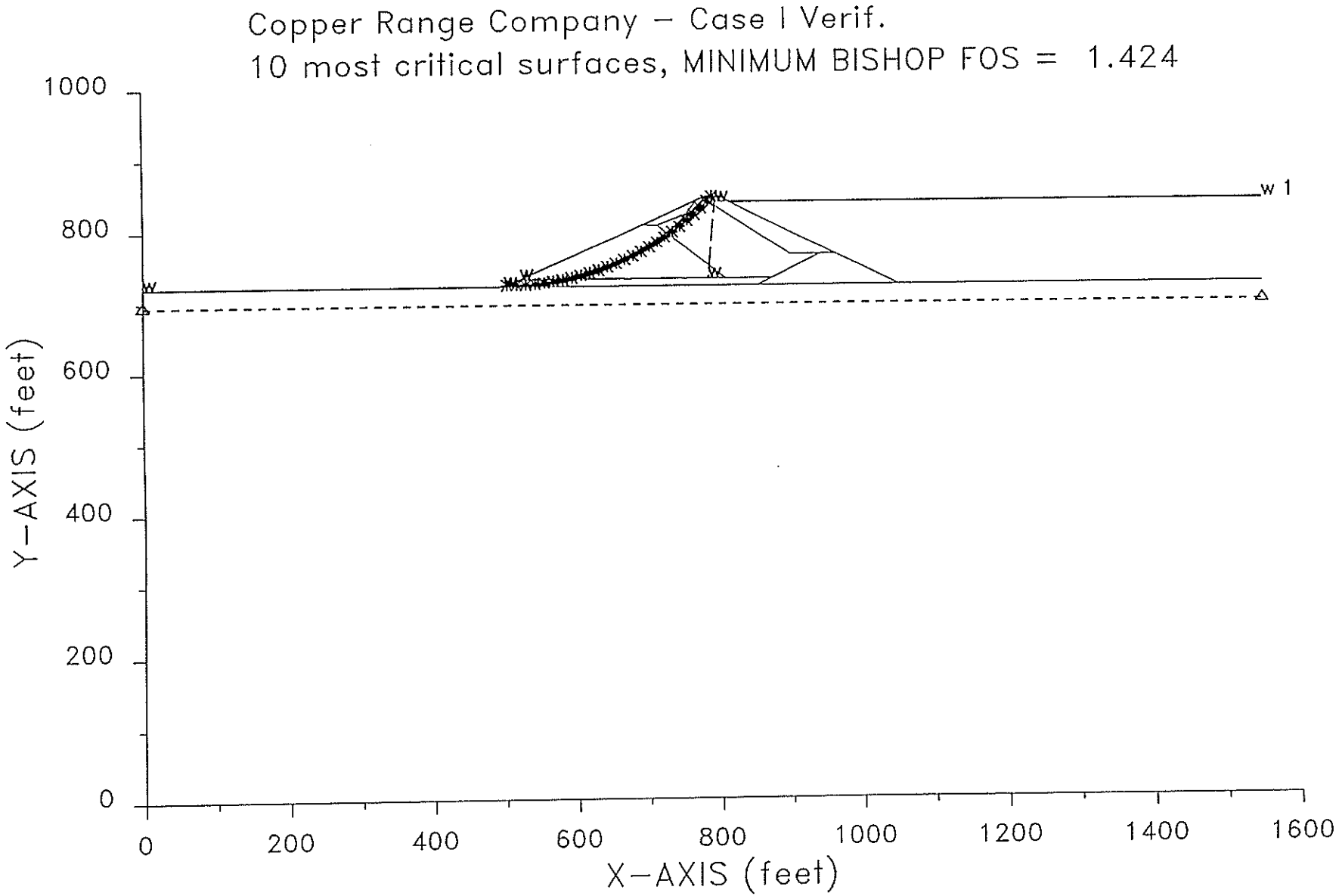
CPT21
Measured and Modeled Undrained Shear Strength



APPENDIX I

SLOPE STABILITY ANALYSIS OUTPUT

1C 12-21-97 12:22



XSTABL File: 1C 12-21-97 12:22

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*****************************************
*                                       *
*              X S T A B L              *
*                                       *
*        Slope Stability Analysis       *
*              using the                *
*        Method of Slices               *
*                                       *
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*        Moscow, ID 83843, U.S.A.       *
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*                                       *
*    Ver. 5.200          96 Ä 1264      *
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Problem Description : Copper Range Company - Case I Verif.

SEGMENT BOUNDARY COORDINATES

6 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	720.0	500.0	720.0	1
2	500.0	720.0	522.5	730.0	3
3	522.5	730.0	781.3	845.0	2
4	781.3	845.0	801.3	845.0	2
5	801.3	845.0	815.3	838.0	2
6	815.3	838.0	1551.3	838.0	4

15 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	815.3	838.0	963.3	764.0	2
2	963.3	764.0	1051.3	720.0	2
3	1051.3	720.0	1551.3	720.0	1
4	694.0	806.0	714.0	806.0	2
5	714.0	806.0	791.0	835.0	3
6	791.0	835.0	900.0	764.0	3
7	900.0	764.0	943.0	764.0	3
8	943.0	764.0	963.0	764.0	2
9	714.0	806.0	809.0	730.0	2
10	809.0	730.0	875.0	730.0	3
11	875.0	730.0	943.0	764.0	2
12	523.0	730.0	809.0	730.0	3
13	500.0	720.0	855.0	720.0	1
14	855.0	720.0	875.0	730.0	2
15	855.0	720.0	1051.0	720.0	1

ISOTROPIC Soil Parameters

4 Soil unit(s) specified

Soil No.	Unit Weight (pcf)	Moist (pcf)	Sat. Cohesion (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Water Constant (psf)	Surface No.
1	144.0	144.0	800.0	28.00	.000	.0	1
2	133.0	137.0	400.0	25.00	.000	.0	1
3	110.0	120.0	.0	32.00	.000	.0	1
4	77.0	77.0	.0	.00	.000	.0	1

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 6 coordinate points

PHREATIC SURFACE.

Point No.	x-water (ft)	y-water (ft)
1	.00	720.00
2	500.00	720.00
3	522.50	730.00
4	785.00	730.00
5	795.00	838.00
6	1551.30	838.00

BOUNDARIES THAT LIMIT SURFACE GENERATION HAVE BEEN SPECIFIED

LOWER limiting boundary of 1 segments:

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)
1	.0	694.0	1551.0	694.0

A critical failure surface searching method, using a random

technique for generating CIRCULAR surfaces has been specified.

900 trial surfaces will be generated and analyzed.

30 Surfaces initiate from each of 30 points equally spaced
along the ground surface between x = 503.0 ft
and x = 510.0 ft

Each surface terminates between x = 764.0 ft
and x = 807.0 ft

Unless further limitations were imposed, the minimum elevation
at which a surface extends is y = .0 ft

* * * * * DEFAULT SEGMENT LENGTH SELECTED BY XSTABL * * * * *

13.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

The first segment of each failure surface will be inclined
within the angular range defined by :

Lower angular limit := -45.0 degrees
Upper angular limit := (slope angle - 5.0) degrees

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface
is specified by 26 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	504.45	721.98
2	517.45	722.03
3	530.44	722.53
4	543.40	723.47
5	556.33	724.85
6	569.20	726.66
7	582.01	728.91
8	594.73	731.59
9	607.35	734.71
10	619.86	738.24
11	632.24	742.21
12	644.48	746.58
13	656.57	751.37
14	668.48	756.57
15	680.22	762.17
16	691.75	768.16
17	703.08	774.54
18	714.18	781.30
19	725.05	788.43
20	735.67	795.93
21	746.03	803.79
22	756.12	811.99
23	765.92	820.52
24	775.43	829.39
25	784.64	838.57
26	790.66	845.00

**** Simplified BISHOP FOS = 1.424 ****

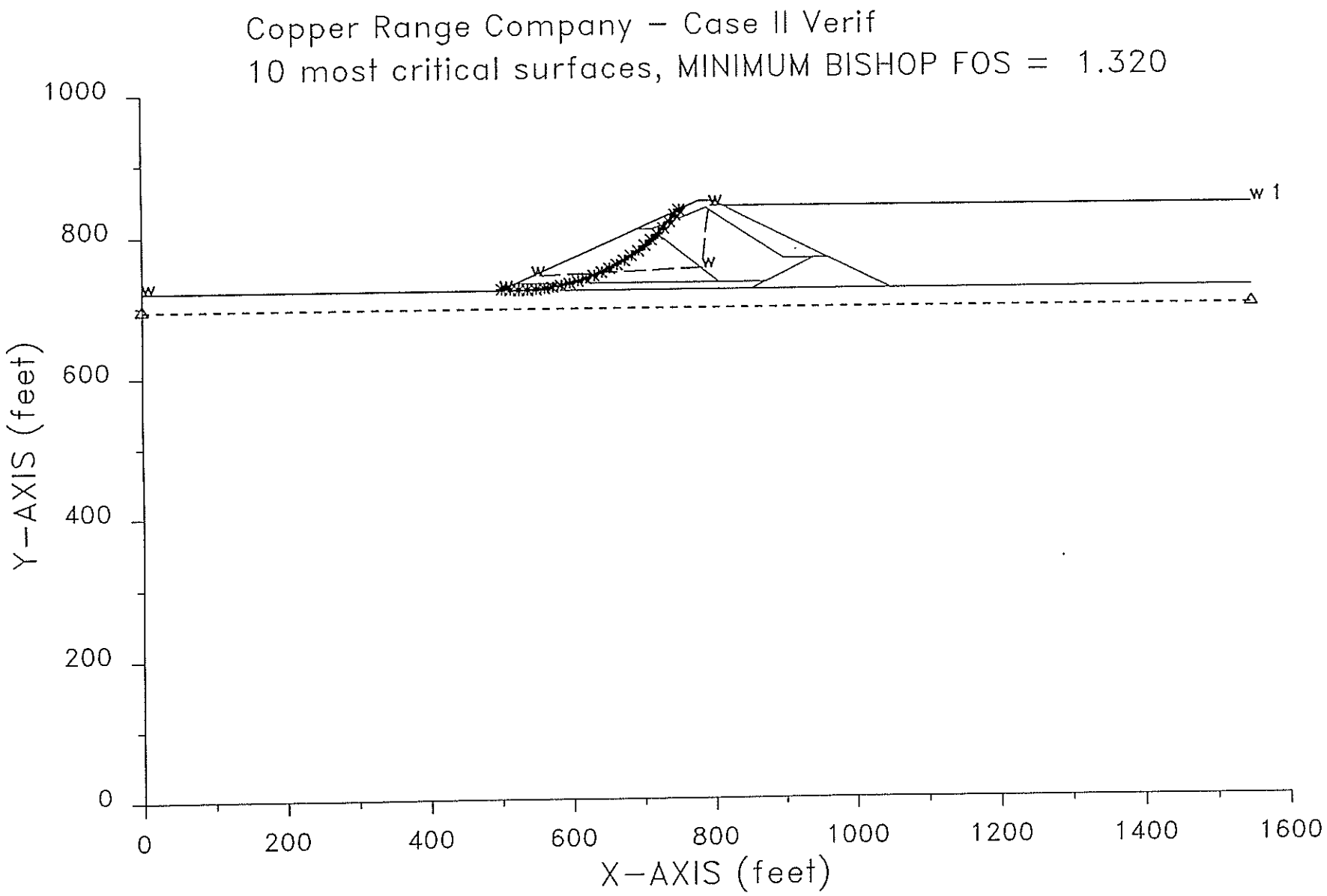
The following is a summary of the TEN most critical surfaces

Problem Description : Copper Range Company - Case I Verif.

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	1.424	509.26	1105.36	383.41	504.45	790.66	2.031E+08
2.	1.426	498.62	1108.65	387.34	503.00	782.34	1.814E+08
3.	1.426	515.69	1101.83	380.71	503.00	796.64	2.233E+08
4.	1.427	498.40	1119.42	397.59	504.21	786.07	1.910E+08
5.	1.427	509.42	1120.47	399.08	503.24	798.11	2.288E+08
6.	1.429	500.21	1140.22	418.37	504.21	796.64	2.243E+08
7.	1.429	496.76	1147.44	425.64	504.21	796.24	2.238E+08
8.	1.429	528.02	1044.02	323.16	503.97	782.54	1.794E+08
9.	1.430	503.22	1140.72	419.17	503.48	800.24	2.370E+08
10.	1.430	530.10	1019.27	299.03	503.24	768.97	1.557E+08

*** END OF FILE ***

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*****************************************
*                                       *
*              X S T A B L              *
*                                       *
*        Slope Stability Analysis       *
*              using the                *
*           Method of Slices            *
*                                       *
*        Copyright (C) 1992 Ä 96        *
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*                                       *
*  Ver. 5.200            96 Ä 1264      *
*****************************************
```

Problem Description : Copper Range Company - Case II Verif

SEGMENT BOUNDARY COORDINATES

6 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	720.0	500.0	720.0	1
2	500.0	720.0	522.5	730.0	3
3	522.5	730.0	781.3	845.0	2
4	781.3	845.0	801.3	845.0	2
5	801.3	845.0	815.3	838.0	2
6	815.3	838.0	1551.3	838.0	4

15 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	815.3	838.0	963.3	764.0	2
2	963.3	764.0	1051.3	720.0	2
3	1051.3	720.0	1551.3	720.0	1
4	694.0	806.0	714.0	806.0	2
5	714.0	806.0	791.0	835.0	3
6	791.0	835.0	900.0	764.0	3
7	900.0	764.0	943.0	764.0	3
8	943.0	764.0	963.0	764.0	2
9	714.0	806.0	809.0	730.0	2
10	809.0	730.0	875.0	730.0	3
11	875.0	730.0	943.0	764.0	2
12	523.0	730.0	809.0	730.0	3
13	500.0	720.0	855.0	720.0	1
14	855.0	720.0	875.0	730.0	2
15	855.0	720.0	1051.0	720.0	1

ISOTROPIC Soil Parameters

4 Soil unit(s) specified

Soil No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Water Constant (psf)	Surface No.
1	144.0	144.0	800.0	28.00	.000	.0	1
2	133.0	137.0	400.0	25.00	.000	.0	1
3	110.0	120.0	.0	32.00	.000	.0	1
4	77.0	77.0	.0	.00	.000	.0	1

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 6 coordinate points

PHREATIC SURFACE,

Point No.	x-water (ft)	y-water (ft)
1	.00	720.00
2	500.00	720.00
3	545.00	740.00
4	785.00	750.00
5	795.00	838.00
6	1551.30	838.00

BOUNDARIES THAT LIMIT SURFACE GENERATION HAVE BEEN SPECIFIED

LOWER limiting boundary of 1 segments:

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)
1	.0	694.0	1551.0	694.0

A critical failure surface searching method, using a random

technique for generating CIRCULAR surfaces has been specified.

900 trial surfaces will be generated and analyzed.

30 Surfaces initiate from each of 30 points equally spaced
along the ground surface between x = 503.0 ft
and x = 504.0 ft

Each surface terminates between x = 743.0 ft
and x = 767.0 ft

Unless further limitations were imposed, the minimum elevation
at which a surface extends is y = .0 ft

* * * * * DEFAULT SEGMENT LENGTH SELECTED BY XSTABL * * * * *

12.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

The first segment of each failure surface will be inclined
within the angular range defined by :

Lower angular limit := -45.0 degrees
Upper angular limit := (slope angle - 5.0) degrees

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface
is specified by 25 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	503.14	721.39
2	515.11	720.57
3	527.11	720.25
4	539.10	720.45
5	551.08	721.16
6	563.02	722.38
7	574.89	724.12
8	586.68	726.35
9	598.37	729.09
10	609.92	732.33
11	621.33	736.06
12	632.56	740.27
13	643.61	744.96
14	654.45	750.12
15	665.05	755.73
16	675.41	761.79
17	685.49	768.30
18	695.29	775.22
19	704.79	782.56
20	713.96	790.30
21	722.79	798.42
22	731.27	806.91
23	739.38	815.76
24	747.10	824.95
25	752.79	832.33

**** Simplified BISHOP FOS = 1.320 ****

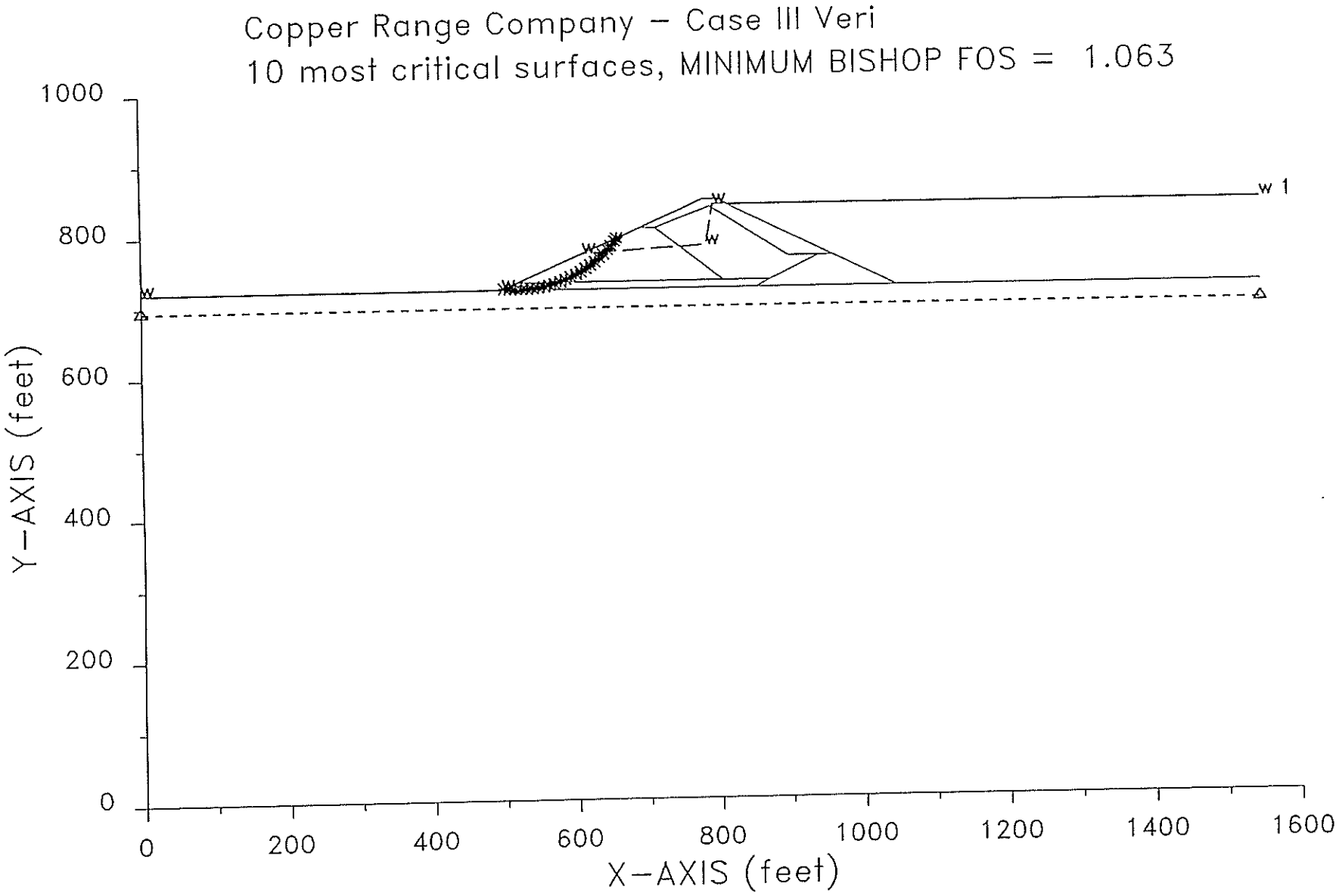
The following is a summary of the TEN most critical surfaces

Problem Description : Copper Range Company - Case II Verif

	FOS	Circle Center		Radius	Initial	Terminal	Resisting
	(BISHOP)	x-coord	y-coord		x-coord	x-coord	Moment
		(ft)	(ft)	(ft)	(ft)	(ft)	(ft-lb)
1.	1.320	528.47	1000.91	280.66	503.14	752.79	1.202E+08
2.	1.320	530.96	1006.54	286.48	503.17	761.09	1.321E+08
3.	1.320	531.54	986.31	266.34	503.31	746.93	1.120E+08
4.	1.320	531.94	994.98	274.96	503.38	754.03	1.215E+08
5.	1.320	525.85	1020.41	299.94	503.00	762.98	1.354E+08
6.	1.320	527.57	992.51	272.27	503.03	745.22	1.101E+08
7.	1.321	526.58	1021.52	301.08	503.07	765.01	1.383E+08
8.	1.321	524.62	1021.55	300.99	503.00	761.82	1.337E+08
9.	1.321	526.79	1001.30	280.87	503.21	750.15	1.167E+08
10.	1.321	529.31	1015.54	295.25	503.24	764.97	1.379E+08

* * * END OF FILE * * *

4D 12-21-97 12:40



XSTABL File: 4D 12-21-97 12:40

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*                                       *
*              X S T A B L              *
*                                       *
*         Slope Stability Analysis      *
*              using the                *
*           Method of Slices            *
*                                       *
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*  Ver. 5.200          96 Ä 1264        *
*****************************************
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Problem Description : Copper Range Company - Case III Veri

SEGMENT BOUNDARY COORDINATES

6 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	720.0	500.0	720.0	1
2	500.0	720.0	522.5	730.0	3
3	522.5	730.0	781.3	845.0	2
4	781.3	845.0	801.3	845.0	2
5	801.3	845.0	815.3	838.0	2
6	815.3	838.0	1551.3	838.0	4

15 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	815.3	838.0	963.3	764.0	2
2	963.3	764.0	1051.3	720.0	2
3	1051.3	720.0	1551.3	720.0	1
4	694.0	806.0	714.0	806.0	2
5	714.0	806.0	791.0	835.0	3
6	791.0	835.0	900.0	764.0	3
7	900.0	764.0	943.0	764.0	3
8	943.0	764.0	963.0	764.0	2
9	714.0	806.0	809.0	730.0	2
10	809.0	730.0	875.0	730.0	3
11	875.0	730.0	943.0	764.0	2
12	523.0	730.0	809.0	730.0	3
13	500.0	720.0	855.0	720.0	1
14	855.0	720.0	875.0	730.0	2
15	855.0	720.0	1051.0	720.0	1

ISOTROPIC Soil Parameters

4 Soil unit(s) specified

Soil No.	Unit Weight (pcf)	Moist (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Water Constant Surface No.
1	144.0	144.0	800.0	28.00	.000	.0 1
2	133.0	137.0	400.0	25.00	.000	.0 1
3	110.0	120.0	.0	32.00	.000	.0 1
4	77.0	77.0	.0	.00	.000	.0 1

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 6 coordinate points

PHREATIC SURFACE,

Point No.	x-water (ft)	y-water (ft)
1	.00	720.00
2	500.00	720.00
3	612.50	770.00
4	785.00	780.00
5	795.00	838.00
6	1551.30	838.00

BOUNDARIES THAT LIMIT SURFACE GENERATION HAVE BEEN SPECIFIED

LOWER limiting boundary of 1 segments:

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)
1	.0	694.0	1551.0	694.0

A critical failure surface searching method, using a random

technique for generating CIRCULAR surfaces has been specified.

900 trial surfaces will be generated and analyzed.

30 Surfaces initiate from each of 30 points equally spaced
along the ground surface between x = 503.0 ft
and x = 505.0 ft

Each surface terminates between x = 658.0 ft
and x = 678.0 ft

Unless further limitations were imposed, the minimum elevation
at which a surface extends is y = .0 ft

* * * * * DEFAULT SEGMENT LENGTH SELECTED BY XSTABL * * * * *

8.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

The first segment of each failure surface will be inclined
within the angular range defined by :

Lower angular limit := -45.0 degrees
Upper angular limit := (slope angle - 5.0) degrees

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface
is specified by 24 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	503.28	721.46
2	511.23	720.62
3	519.22	720.18
4	527.22	720.12
5	535.21	720.44
6	543.18	721.16
7	551.11	722.25
8	558.97	723.73
9	566.75	725.58
10	574.43	727.81
11	582.00	730.41
12	589.43	733.36
13	596.72	736.68
14	603.83	740.34
15	610.76	744.34
16	617.48	748.67
17	624.00	753.32
18	630.27	758.27
19	636.31	763.53
20	642.08	769.07
21	647.57	774.88
22	652.78	780.95
23	657.69	787.27
24	660.56	791.35

**** Simplified BISHOP FOS = 1.063 ****

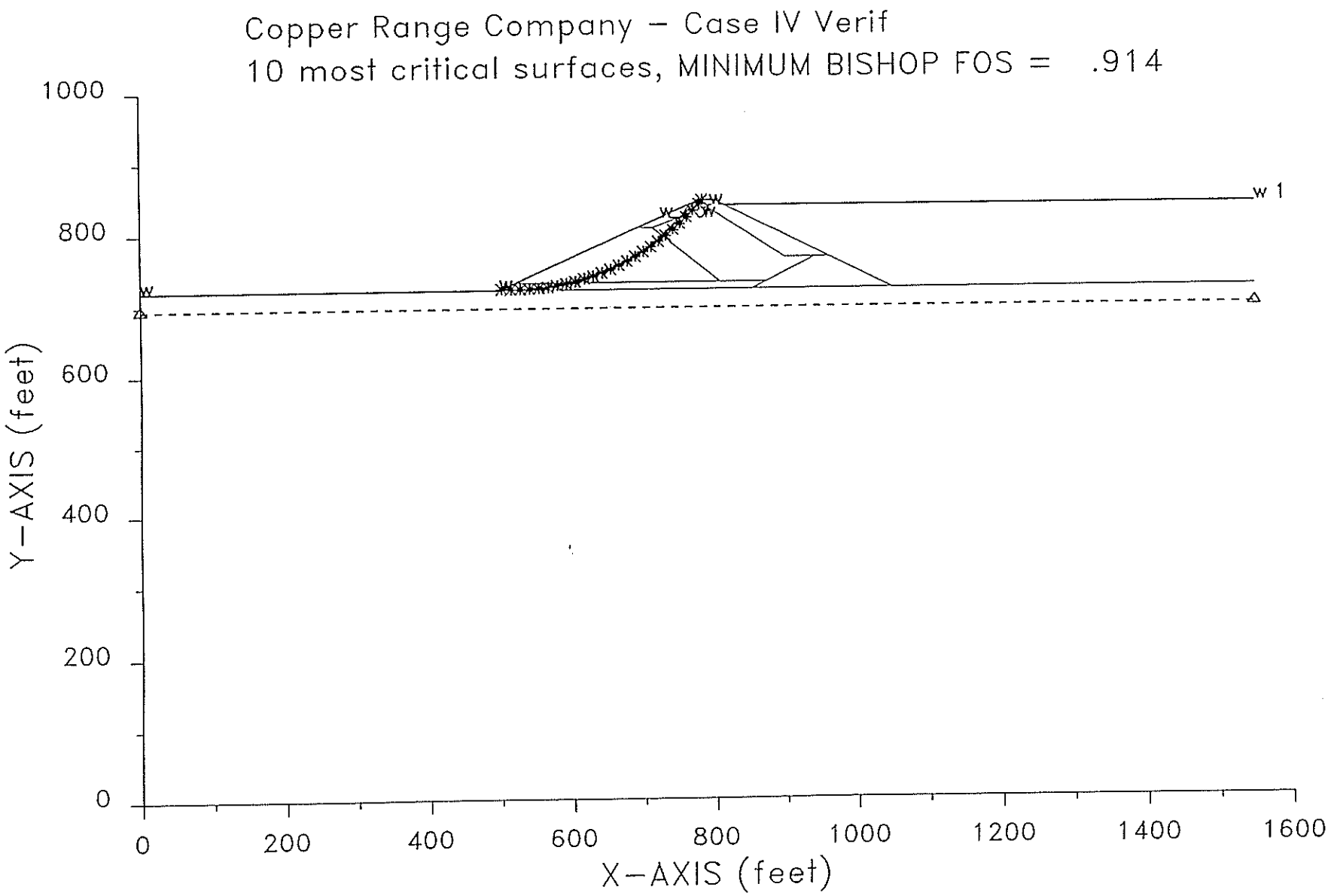
The following is a summary of the TEN most critical surfaces

Problem Description : Copper Range Company - Case III Veri

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	1.063	524.46	885.78	165.68	503.28	660.56	2.483E+07
2.	1.063	524.39	889.36	169.34	503.07	663.36	2.624E+07
3.	1.064	523.34	886.51	166.35	503.14	659.37	2.435E+07
4.	1.064	525.17	894.27	174.24	503.21	668.10	2.862E+07
5.	1.065	527.04	884.12	163.90	504.10	662.81	2.554E+07
6.	1.065	524.08	890.97	170.78	503.28	663.81	2.641E+07
7.	1.066	527.21	887.10	166.84	504.17	665.19	2.670E+07
8.	1.066	523.40	890.69	170.42	503.28	662.44	2.578E+07
9.	1.066	529.77	890.94	170.93	504.31	672.22	3.028E+07
10.	1.067	527.39	878.87	158.36	504.79	658.74	2.339E+07

* * * END OF FILE * * *

5D 12-21-97 12:47



XSTABL File: 5D 12-21-97 12:47

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*****************************************
*                XSTABL                 *
*                                       *
*        Slope Stability Analysis       *
*             using the                 *
*          Method of Slices             *
*                                       *
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*        Moscow, ID 83843, U.S.A.       *
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*                                       *
*  Ver. 5.200          96 Ä 1264        *
*****************************************
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Problem Description : Copper Range Company - Case IV Verif

SEGMENT BOUNDARY COORDINATES

6 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	720.0	500.0	720.0	1
2	500.0	720.0	522.5	730.0	3
3	522.5	730.0	781.3	845.0	2
4	781.3	845.0	801.3	845.0	2
5	801.3	845.0	815.3	838.0	2
6	815.3	838.0	1551.3	838.0	4

15 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	815.3	838.0	963.3	764.0	2
2	963.3	764.0	1051.3	720.0	2
3	1051.3	720.0	1551.3	720.0	1
4	694.0	806.0	714.0	806.0	2
5	714.0	806.0	791.0	835.0	3
6	791.0	835.0	900.0	764.0	3
7	900.0	764.0	943.0	764.0	3
8	943.0	764.0	963.0	764.0	2
9	714.0	806.0	809.0	730.0	2
10	809.0	730.0	875.0	730.0	3
11	875.0	730.0	943.0	764.0	2
12	523.0	730.0	809.0	730.0	3
13	500.0	720.0	855.0	720.0	1
14	855.0	720.0	875.0	730.0	2
15	855.0	720.0	1051.0	720.0	1

ISOTROPIC Soil Parameters

4 Soil unit(s) specified

Soil No.	Unit Weight (pcf)	Moist (pcf)	Sat. (psf)	Cohesion Intercept (deg)	Friction Angle	Pore Pressure Parameter Ru	Water Constant (psf)	Surface No.
1	144.0	144.0	800.0	28.00	.000	.0		1
2	133.0	137.0	400.0	25.00	.000	.0		1
3	110.0	120.0	.0	32.00	.000	.0		1
4	77.0	77.0	.0	.00	.000	.0		1

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 6 coordinate points

PHREATIC SURFACE,

Point No.	x-water (ft)	y-water (ft)
1	.00	720.00
2	500.00	720.00
3	725.00	820.00
4	785.00	820.00
5	795.00	838.00
6	1551.30	838.00

BOUNDARIES THAT LIMIT SURFACE GENERATION HAVE BEEN SPECIFIED

LOWER limiting boundary of 1 segments:

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)
1	.0	694.0	1551.0	694.0

A critical failure surface searching method, using a random

technique for generating CIRCULAR surfaces has been specified.

900 trial surfaces will be generated and analyzed.

30 Surfaces initiate from each of 30 points equally spaced
along the ground surface between x = 503.0 ft
and x = 504.0 ft

Each surface terminates between x = 765.0 ft
and x = 787.0 ft

Unless further limitations were imposed, the minimum elevation
at which a surface extends is y = .0 ft

* * * * * DEFAULT SEGMENT LENGTH SELECTED BY XSTABL * * * * *

13.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

The first segment of each failure surface will be inclined
within the angular range defined by :

Lower angular limit := -45.0 degrees
Upper angular limit := (slope angle - 5.0) degrees

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface
is specified by 26 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	503.07	721.36
2	516.06	720.83
3	529.06	720.79
4	542.05	721.26
5	555.01	722.24
6	567.93	723.71
7	580.78	725.68
8	593.54	728.15
9	606.20	731.11
10	618.74	734.56
11	631.13	738.49
12	643.36	742.90
13	655.41	747.77
14	667.26	753.11
15	678.90	758.91
16	690.30	765.15
17	701.46	771.83
18	712.34	778.93
19	722.95	786.45
20	733.25	794.37
21	743.24	802.69
22	752.90	811.39
23	762.22	820.46
24	771.18	829.87
25	779.77	839.63
26	784.14	845.00

**** Simplified BISHOP FOS = .914 ****

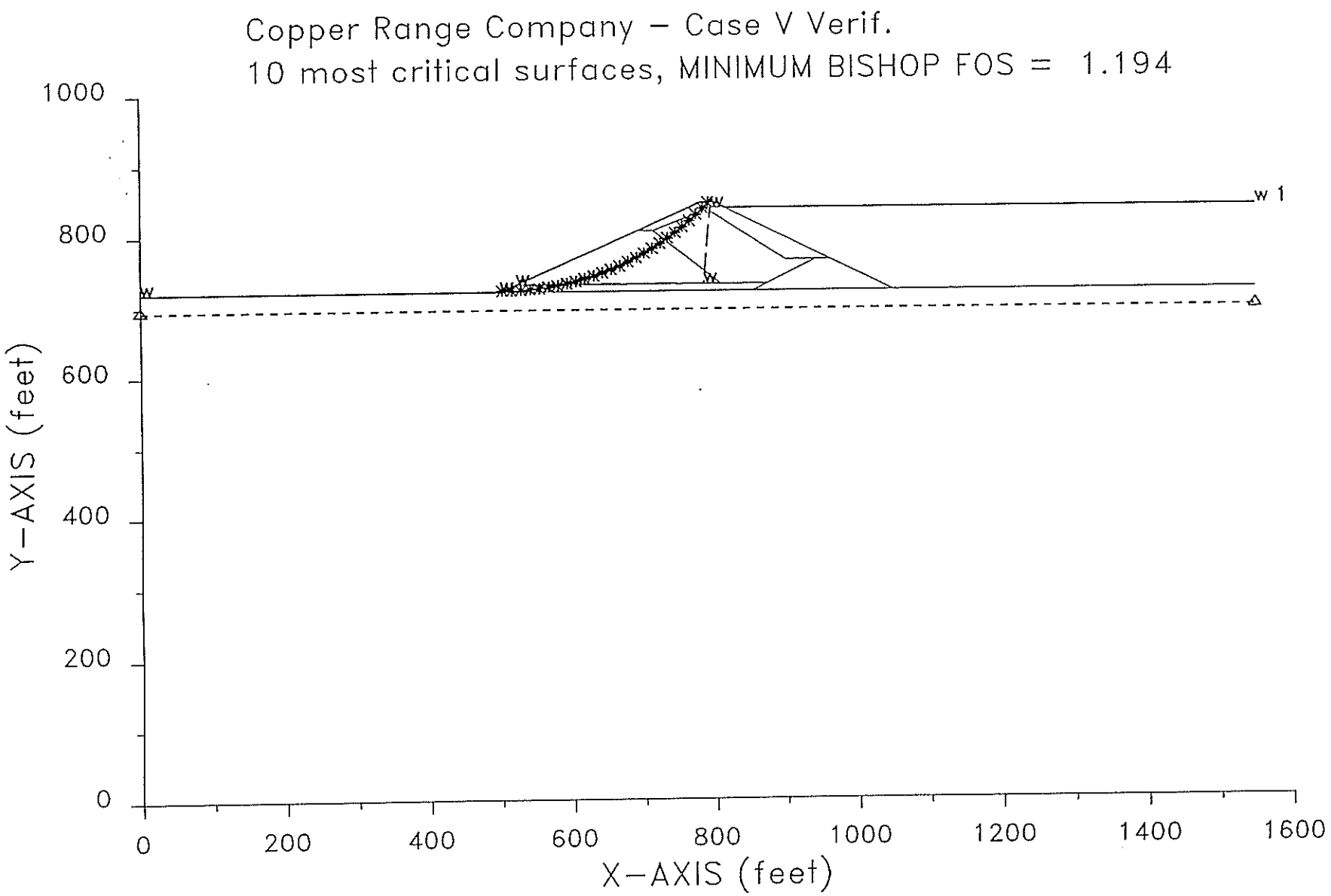
The following is a summary of the TEN most critical surfaces

Problem Description : Copper Range Company - Case IV Verif

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	.914	523.42	1056.56	335.82	503.07	784.14	1.227E+08
2.	.914	526.50	1048.12	327.63	503.00	783.51	1.215E+08
3.	.914	522.68	1063.13	342.31	503.10	785.71	1.262E+08
4.	.914	526.10	1049.90	329.32	503.10	783.88	1.220E+08
5.	.914	527.83	1046.70	326.31	503.00	784.28	1.229E+08
6.	.914	528.88	1026.67	306.32	503.21	772.47	1.067E+08
7.	.914	523.81	1057.33	336.46	503.34	784.75	1.235E+08
8.	.915	524.17	1050.79	330.10	503.07	782.13	1.190E+08
9.	.915	529.76	1017.34	297.20	503.03	767.26	1.010E+08
10.	.915	525.47	1037.18	316.45	503.38	774.43	1.088E+08

* * * END OF FILE * * *

2E 12-21-97 12:29



XSTABL File: 2E 12-21-97 12:29

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*                                       *
*              X S T A B L              *
*                                       *
*          Slope Stability Analysis     *
*               using the               *
*            Method of Slices           *
*                                       *
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*  Ver. 5.200            96 Ä 1264      *
*****************************************
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Problem Description : Copper Range Company - Case V Verif.

SEGMENT BOUNDARY COORDINATES

6 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	720.0	500.0	720.0	1
2	500.0	720.0	522.5	730.0	3
3	522.5	730.0	781.3	845.0	2
4	781.3	845.0	801.3	845.0	2
5	801.3	845.0	815.3	838.0	2
6	815.3	838.0	1551.3	838.0	4

15 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	815.3	838.0	963.3	764.0	2
2	963.3	764.0	1051.3	720.0	2
3	1051.3	720.0	1551.3	720.0	1
4	694.0	806.0	714.0	806.0	2
5	714.0	806.0	791.0	835.0	3
6	791.0	835.0	900.0	764.0	3
7	900.0	764.0	943.0	764.0	3
8	943.0	764.0	963.0	764.0	2
9	714.0	806.0	809.0	730.0	2
10	809.0	730.0	875.0	730.0	3
11	875.0	730.0	943.0	764.0	2
12	523.0	730.0	809.0	730.0	3
13	500.0	720.0	855.0	720.0	1
14	855.0	720.0	875.0	730.0	2
15	855.0	720.0	1051.0	720.0	1

ISOTROPIC Soil Parameters

4 Soil unit(s) specified

Soil Unit No.	Unit Weight (pcf)	Moist (pcf)	Sat. Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Water Constant (psf)	Surface No.
1	144.0	144.0	800.0	28.00	.000	.0	1
2	133.0	137.0	400.0	25.00	.000	.0	1
3	110.0	120.0	.0	32.00	.000	.0	1
4	77.0	77.0	.0	.00	.000	.0	1

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 6 coordinate points

PHREATIC SURFACE,

Point No.	x-water (ft)	y-water (ft)
1	.00	720.00
2	500.00	720.00
3	522.50	730.00
4	785.00	730.00
5	795.00	838.00
6	1551.30	838.00

A horizontal earthquake loading coefficient of .070 has been assigned

A vertical earthquake loading coefficient of .000 has been assigned

BOUNDARIES THAT LIMIT SURFACE GENERATION HAVE BEEN SPECIFIED

LOWER limiting boundary of 1 segments:

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)

1 .0 694.0 1551.0 694.0

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.

900 trial surfaces will be generated and analyzed.

30 Surfaces initiate from each of 30 points equally spaced along the ground surface between x = 503.0 ft and x = 504.0 ft

Each surface terminates between x = 788.0 ft and x = 796.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = .0 ft

* * * * * DEFAULT SEGMENT LENGTH SELECTED BY XSTABL * * * * *

13.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

The first segment of each failure surface will be inclined within the angular range defined by :

Lower angular limit := -45.0 degrees
Upper angular limit := (slope angle - 5.0) degrees

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface is specified by 26 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	503.17	721.41
2	516.17	721.47
3	529.16	721.96
4	542.13	722.89
5	555.06	724.25
6	567.93	726.05
7	580.74	728.28
8	593.47	730.94
9	606.09	734.03
10	618.61	737.53
11	631.00	741.46
12	643.26	745.80
13	655.36	750.56
14	667.29	755.71
15	679.04	761.27
16	690.60	767.21
17	701.96	773.55
18	713.09	780.26
19	724.00	787.34
20	734.65	794.78
21	745.06	802.58
22	755.19	810.72
23	765.04	819.20
24	774.61	828.01
25	783.87	837.13
26	791.34	845.00

**** Simplified BISHOP FOS = 1.194 ****

The following is a summary of the TEN most critical surfaces

Problem Description : Copper Range Company - Case V Verif.

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	1.194	508.03	1107.90	386.52	503.17	791.34	2.021E+08
2.	1.195	507.99	1110.38	388.98	503.21	792.36	2.052E+08
3.	1.195	509.22	1110.61	389.32	503.03	793.84	2.098E+08
4.	1.195	503.04	1126.16	404.79	503.07	794.24	2.120E+08
5.	1.196	511.79	1102.25	380.89	503.28	792.66	2.054E+08
6.	1.196	502.37	1126.93	405.51	503.21	793.81	2.106E+08
7.	1.196	499.34	1133.21	411.82	503.17	793.49	2.103E+08
8.	1.196	512.44	1103.69	382.42	503.10	794.07	2.099E+08
9.	1.196	515.58	1095.09	373.97	503.00	793.58	2.082E+08
10.	1.196	502.17	1128.05	406.58	503.31	794.03	2.112E+08

900 trial surfaces will be generated and analyzed.

30 Surfaces initiate from each of 30 points equally spaced
along the ground surface between x = 322.0 ft
and x = 342.0 ft

Each surface terminates between x = 256.0 ft
and x = 294.0 ft

Unless further limitations were imposed, the minimum elevation
at which a surface extends is y = .0 ft

* * * * * DEFAULT SEGMENT LENGTH SELECTED BY XSTABL * * * * *

2.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

The first segment of each failure surface will be inclined
within the angular range defined by :

Lower angular limit := -45.0 degrees
Upper angular limit := (slope angle - 5.0) degrees

****
-- WARNING -- WARNING -- WARNING -- WARNING -- (# 48)

****
Negative effective stresses were calculated at the base of a slice.
This warning is usually reported for cases where slices have low self
weight and a relatively high "c" shear strength parameter. In such
cases, this effect can only be eliminated by reducing the "c" value.

****

USER SELECTED option to maintain strength greater than zero

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface
is specified by 18 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	323.38	5172.11
2	321.42	5171.71
3	319.44	5171.44
4	317.44	5171.32
5	315.44	5171.33
6	313.45	5171.48
7	311.47	5171.77
8	309.51	5172.20
9	307.59	5172.76
10	305.72	5173.45
11	303.89	5174.27
12	302.13	5175.21
13	300.43	5176.27
14	298.82	5177.45
15	297.29	5178.74
16	295.85	5180.13
17	294.51	5181.61
18	293.46	5182.96

**** Simplified BISHOP FOS = 2.151 ****

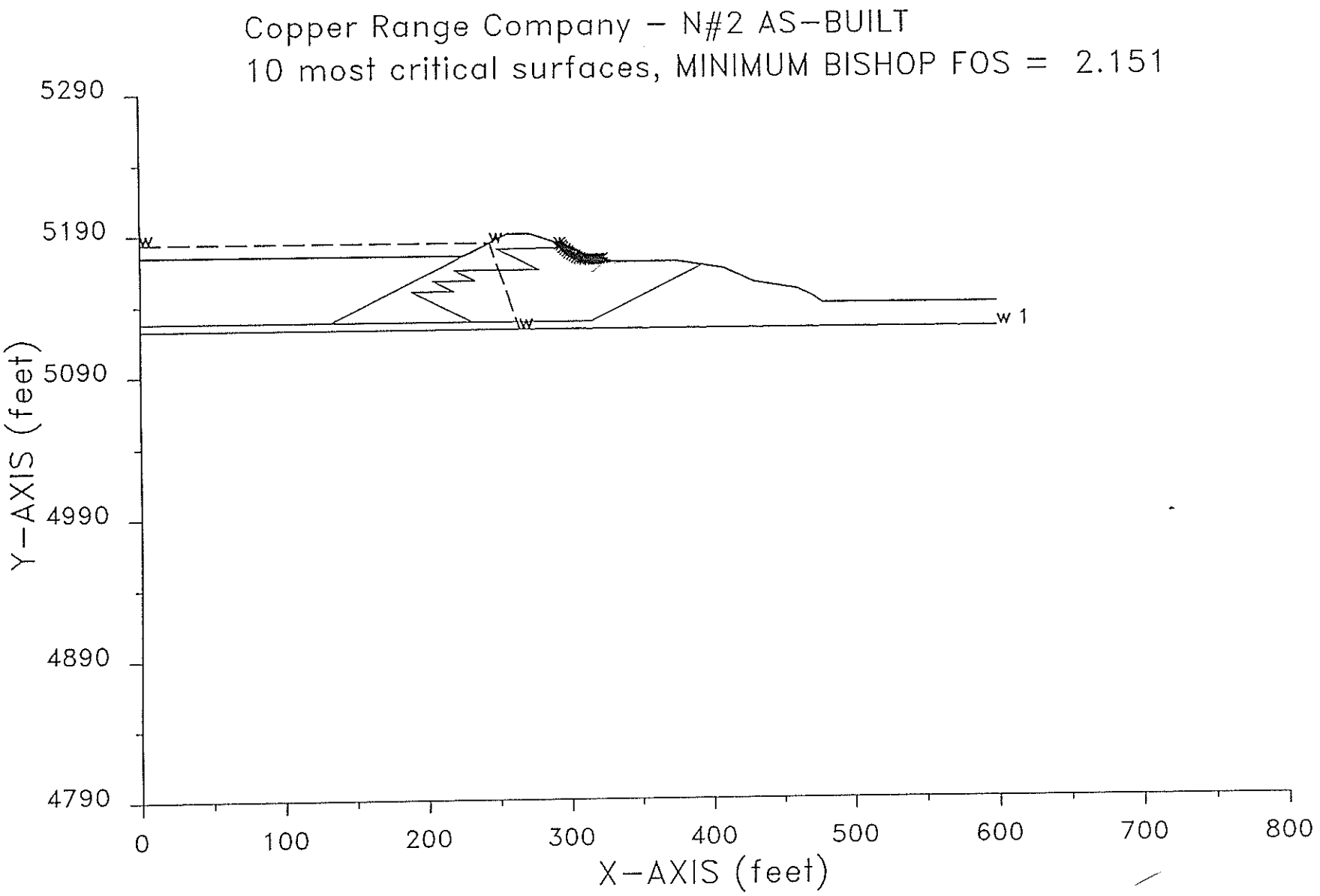
The following is a summary of the TEN most critical surfaces

Problem Description : Copper Range Company - N#2 AS-BUILT

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	2.151	316.64	5200.13	28.83	323.38	293.46	2.247E+05
2.	2.187	313.41	5193.22	22.47	322.00	293.45	2.103E+05
3.	2.197	318.03	5201.85	31.87	326.83	292.07	3.415E+05
4.	2.205	314.00	5200.91	29.92	322.69	289.12	3.457E+05
5.	2.224	316.09	5198.96	29.33	326.14	290.94	3.703E+05
6.	2.227	315.87	5194.42	24.77	325.45	293.98	2.630E+05
7.	2.228	312.66	5193.06	22.62	322.00	292.34	2.435E+05

*** END OF FILE ***

N2-CKB 4-03-98 14:22



XSTABL File: N2-CKB 4-03-98 14:22

****
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Problem Description : Copper Range Company - N#2 AS-BUILT

SEGMENT BOUNDARY COORDINATES

17 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	5174.6	225.9	5174.6	4
2	225.9	5174.6	243.9	5183.6	2
3	243.9	5183.6	256.7	5190.0	2
4	256.7	5190.0	271.7	5190.0	2
5	271.7	5190.0	302.6	5180.0	2
6	302.6	5180.0	312.1	5175.0	3
7	312.1	5175.0	331.6	5170.0	3
8	331.6	5170.0	352.4	5170.0	3
9	352.4	5170.0	376.1	5170.0	3
10	376.1	5170.0	393.9	5167.3	3
11	393.9	5167.3	408.4	5165.0	2
12	408.4	5165.0	419.0	5160.0	2
13	419.0	5160.0	429.9	5155.0	2
14	429.9	5155.0	460.2	5150.0	2
15	460.2	5150.0	471.0	5145.0	2
16	471.0	5145.0	478.2	5140.0	2
17	478.2	5140.0	600.0	5140.0	2

14 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	5128.0	132.7	5128.0	1
2	132.7	5128.0	225.9	5174.6	2
3	249.2	5179.5	302.6	5180.0	3
4	249.2	5179.5	279.2	5164.5	2
5	219.2	5164.5	279.2	5164.5	3
6	219.2	5164.5	234.2	5157.0	2
7	204.2	5157.0	234.2	5157.0	3
8	204.2	5157.0	219.2	5149.5	2
9	189.2	5149.5	219.2	5149.5	3
10	189.2	5149.5	232.2	5128.0	2
11	132.7	5128.0	232.2	5128.0	1
12	232.2	5128.0	315.4	5128.0	1
13	315.4	5128.0	393.9	5167.3	2
14	.0	5122.5	600.0	5122.5	5

ISOTROPIC Soil Parameters

5 Soil unit(s) specified

Soil Unit No.	Unit Weight (pcf)	Moist (pcf)	Sat. Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Water Constant (psf)	Surface No.
1	144.0	144.0	800.0	28.00	.000	.0	1
2	133.0	137.0	400.0	25.00	.000	.0	1
3	110.0	120.0	.0	32.00	.000	.0	1
4	77.0	77.0	.0	.00	.000	.0	1
5	125.0	125.0	5000.0	45.00	.000	.0	1

Beckstel's Str. Parameters

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 4 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)
1	.00	5183.60
2	243.90	5183.60
3	265.00	5122.50
4	600.00	5122.50

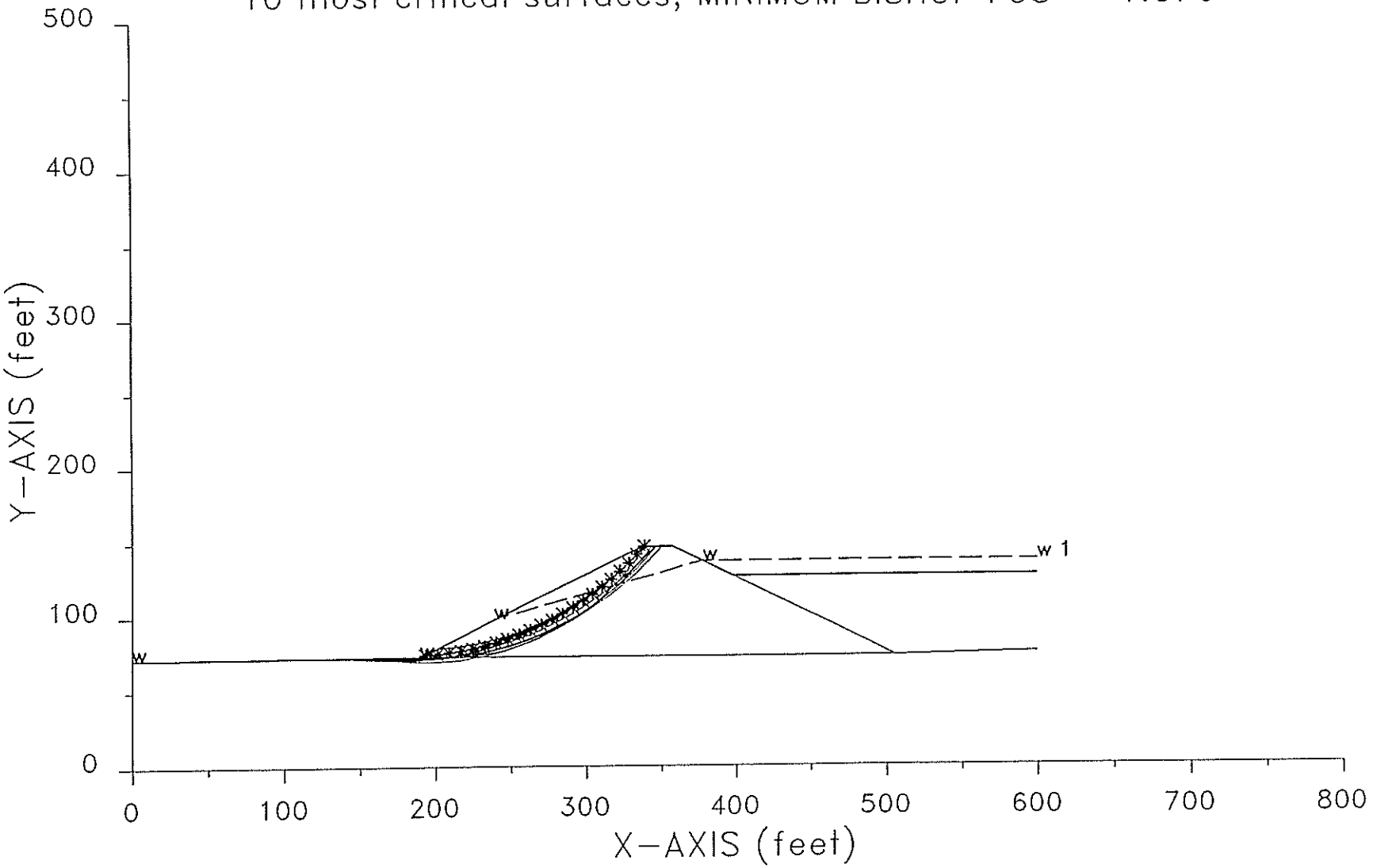
A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.

8.	2.228	318.85	5208.78	39.04	328.21	288.15	5.327E+05
9.	2.238	320.02	5207.34	38.39	330.28	289.27	5.498E+05
10.	2.244	323.69	5211.00	41.90	332.34	292.33	4.597E+05

*** END OF FILE ***

6B 12-22-97 9:13

Copper Range Co. – South Emb. Verif
10 most critical surfaces, MINIMUM BISHOP FOS = 1.076



XSTABL File: 6B 12-22-97 9:13

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Problem Description : Copper Range Co. - South Emb. Verif

SEGMENT BOUNDARY COORDINATES

---

5 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	72.0	190.0	72.9	1
2	190.0	72.9	338.0	146.9	2
3	338.0	146.9	358.0	146.9	2
4	358.0	146.9	398.0	126.9	2
5	398.0	126.9	600.0	126.9	3

3 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	398.0	126.9	506.0	72.9	2
2	190.0	72.9	506.0	72.9	1
3	506.0	72.9	600.0	75.0	1

ISOTROPIC Soil Parameters

---

4 Soil unit(s) specified

Soil Unit No.	Unit Weight (pcf)	Moist (pcf)	Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Water Constant (psf) No.
1	130.0	135.0	.0	35.00	.000	.0	1
2	130.0	135.0	.0	35.00	.000	.0	1
3	105.0	130.0	.0	35.00	.000	.0	1
4	115.0	130.0	.0	33.00	.000	.0	1

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 5 coordinate points

****

PHREATIC SURFACE,

****

Point No.	x-water (ft)	y-water (ft)
1	.00	72.00
2	190.00	72.90
3	239.30	97.60
4	378.00	136.90
5	600.00	136.90

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.

900 trial surfaces will be generated and analyzed.

30 Surfaces initiate from each of 30 points equally spaced along the ground surface between x = 128.0 ft and x = 214.0 ft

Each surface terminates between x = 339.0 ft and x = 366.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = .0 ft

* * * * * DEFAULT SEGMENT LENGTH SELECTED BY XSTABL * * * * *

8.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

The first segment of each failure surface will be inclined
within the angular range defined by :

Lower angular limit := -45.0 degrees
Upper angular limit := (slope angle - 5.0) degrees

Factors of safety have been calculated by the :

***** SIMPLIFIED BISHOP METHOD *****

The most critical circular failure surface
is specified by 22 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	193.24	74.52
2	201.22	75.08
3	209.17	75.95
4	217.09	77.14
5	224.95	78.63
6	232.74	80.43
7	240.46	82.53
8	248.09	84.94
9	255.62	87.64
10	263.04	90.64
11	270.33	93.92
12	277.49	97.49
13	284.51	101.33
14	291.37	105.45
15	298.06	109.83
16	304.58	114.47
17	310.90	119.37
18	317.04	124.50
19	322.96	129.88
20	328.67	135.48
21	334.16	141.30
22	339.04	146.90

**** Simplified BISHOP FOS = 1.076 ****

The following is a summary of the TEN most critical surfaces

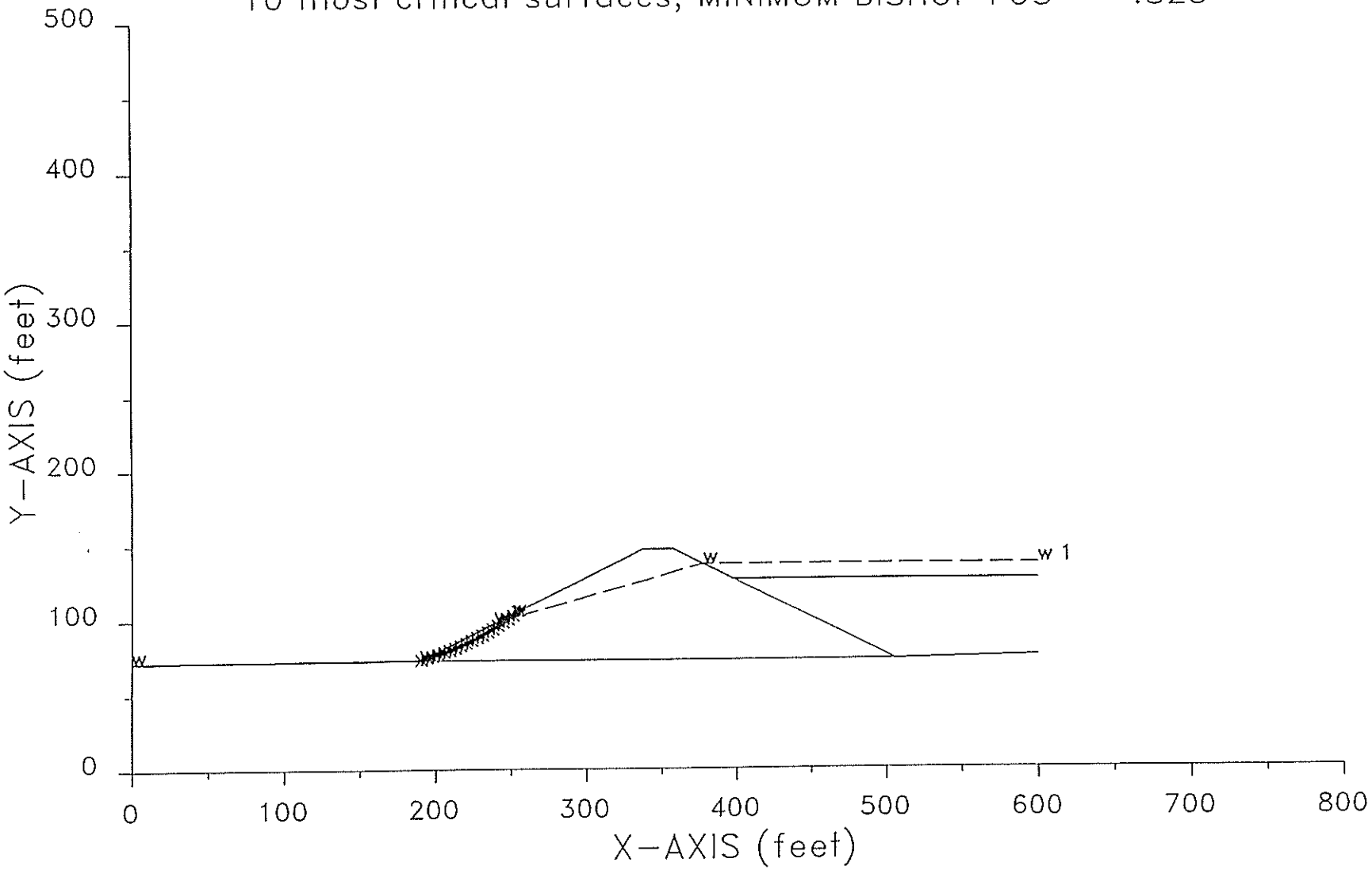
Problem Description : Copper Range Co. - South Emb. Verif

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	1.076	182.94	278.32	204.06	193.24	339.04	2.327E+07
2.	1.093	205.42	230.69	158.38	190.28	339.80	2.557E+07
3.	1.094	174.79	287.33	216.59	145.79	339.68	2.778E+07
4.	1.100	165.29	310.83	239.52	139.86	339.88	2.671E+07
5.	1.102	178.63	295.37	223.92	154.69	346.22	3.324E+07
6.	1.102	194.88	267.45	194.47	190.28	347.42	3.197E+07
7.	1.103	194.59	252.94	183.35	160.62	344.14	3.274E+07
8.	1.113	191.02	273.40	194.74	202.14	339.04	1.993E+07
9.	1.114	190.48	279.28	207.87	166.55	350.73	3.725E+07
10.	1.116	176.32	299.28	228.64	145.79	346.76	3.515E+07

*** END OF FILE ***

6G 12-22-97 9:18

Copper Range Co. – South Emb. Verif
10 most critical surfaces, MINIMUM BISHOP FOS = .823



XSTABL File: 6G 12-22-97 9:18

****

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* *

* Slope Stability Analysis *

* using the *

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****

Problem Description : Copper Range Co. - South Emb. Verif

SEGMENT BOUNDARY COORDINATES

---

5 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	72.0	190.0	72.9	1
2	190.0	72.9	338.0	146.9	2
3	338.0	146.9	358.0	146.9	2
4	358.0	146.9	398.0	126.9	2
5	398.0	126.9	600.0	126.9	3

3 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	398.0	126.9	506.0	72.9	2
2	190.0	72.9	506.0	72.9	1
3	506.0	72.9	600.0	75.0	1

ISOTROPIC Soil Parameters

---

4 Soil unit(s) specified

Soil No.	Unit Weight (pcf)	Moist (pcf)	Sat. (psf)	Cohesion Intercept (deg)	Friction Angle	Pore Pressure Parameter Ru	Water Constant (psf)	Surface No.
1	130.0	135.0	.0	35.00	.000	.0		1
2	130.0	135.0	.0	35.00	.000	.0		1
3	105.0	130.0	.0	35.00	.000	.0		1
4	115.0	130.0	.0	33.00	.000	.0		1

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 5 coordinate points

****

PHREATIC SURFACE,

****

Point No.	x-water (ft)	y-water (ft)
1	.00	72.00
2	190.00	72.90
3	239.30	97.60
4	378.00	136.90
5	600.00	136.90

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.

900 trial surfaces will be generated and analyzed.

30 Surfaces initiate from each of 30 points equally spaced along the ground surface between x = 191.0 ft and x = 197.0 ft

Each surface terminates between x = 256.0 ft and x = 258.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = .0 ft

* * * * * DEFAULT SEGMENT LENGTH SELECTED BY XSTABL * * * * *

4.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

The first segment of each failure surface will be inclined
within the angular range defined by :

Lower angular limit := -45.0 degrees
Upper angular limit := (slope angle - 5.0) degrees

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface
is specified by 20 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	191.00	73.40
2	194.85	74.47
3	198.68	75.62
4	202.49	76.86
5	206.26	78.19
6	210.01	79.59
7	213.72	81.08
8	217.40	82.66
9	221.04	84.31
10	224.64	86.04
11	228.21	87.86
12	231.73	89.75
13	235.21	91.72
14	238.65	93.77
15	242.04	95.89
16	245.38	98.09
17	248.67	100.36
18	251.91	102.71
19	255.10	105.13
20	256.20	106.00

**** Simplified BISHOP FOS = .823 ****

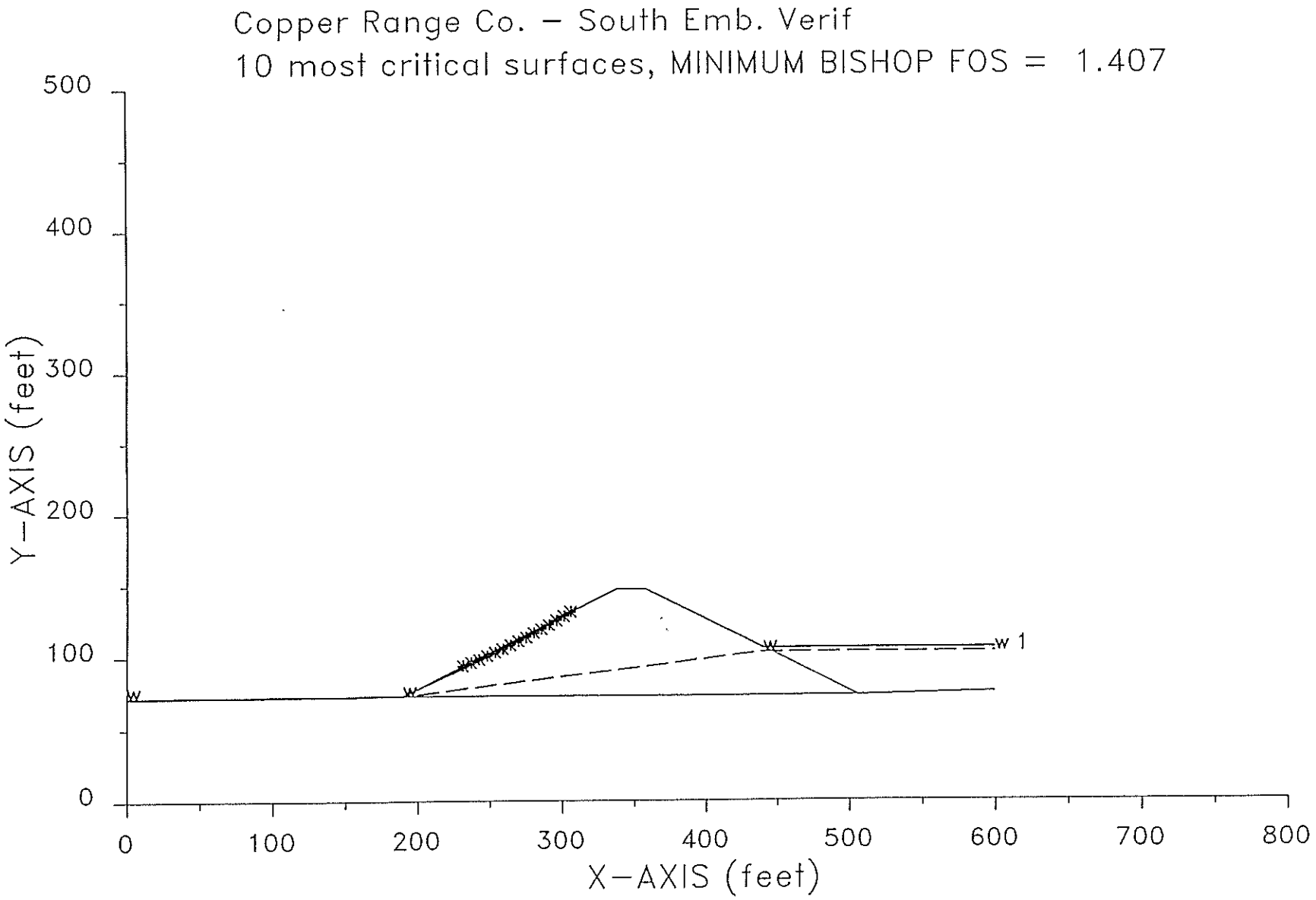
The following is a summary of the TEN most critical surfaces

Problem Description : Copper Range Co. - South Emb. Verif

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	.823	144.90	247.16	179.78	191.00	256.20	1.595E+06
2.	.824	143.88	249.56	182.30	191.21	256.29	1.588E+06
3.	.824	118.19	301.38	239.18	191.83	256.05	1.522E+06
4.	.824	150.54	236.26	167.71	191.41	256.11	1.560E+06
5.	.824	120.83	295.60	233.01	191.00	256.44	1.614E+06
6.	.825	152.48	232.27	163.47	191.00	256.42	1.617E+06
7.	.827	114.73	308.91	247.42	191.83	256.53	1.564E+06
8.	.827	144.26	249.93	182.52	191.41	256.97	1.630E+06
9.	.827	121.09	296.22	233.45	191.41	256.93	1.627E+06
10.	.827	118.35	301.94	239.67	191.83	256.74	1.580E+06

* * * END OF FILE * * *

7C 12-22-97 10:17



XSTABL File: 7C 12-22-97 10:17

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*****************************************
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Problem Description : Copper Range Co. - South Emb. Verif

SEGMENT BOUNDARY COORDINATES

---

5 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	72.0	190.0	72.9	1
2	190.0	72.9	338.0	146.9	2
3	338.0	146.9	358.0	146.9	2
4	358.0	146.9	440.0	105.9	2
5	440.0	105.9	600.0	105.9	3

3 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	440.0	105.9	506.0	72.9	2
2	190.0	72.9	506.0	72.9	1
3	506.0	72.9	600.0	75.0	1

ISOTROPIC Soil Parameters

---

4 Soil unit(s) specified

Soil No.	Unit Weight (pcf)	Moist (pcf)	Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Water Constant (psf)	Surface No.
1	130.0	135.0	.0	35.00	.000	.0	1	
2	130.0	135.0	.0	35.00	.000	.0	1	
3	105.0	130.0	.0	35.00	.000	.0	1	
4	115.0	130.0	.0	33.00	.000	.0	1	

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 4 coordinate points

****
PHREATIC SURFACE,
****

Point No.	x-water (ft)	y-water (ft)
1	.00	72.00
2	190.00	72.90
3	440.00	102.90
4	600.00	102.90

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.

900 trial surfaces will be generated and analyzed.

30 Surfaces initiate from each of 30 points equally spaced along the ground surface between x = 201.0 ft and x = 235.0 ft

Each surface terminates between x = 261.0 ft and x = 307.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = .0 ft

* * * * * DEFAULT SEGMENT LENGTH SELECTED BY XSTABL * * * * *

6.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

The first segment of each failure surface will be inclined
within the angular range defined by :

Lower angular limit := -45.0 degrees
Upper angular limit := (slope angle - 5.0) degrees

Factors of safety have been calculated by the :

***** SIMPLIFIED BISHOP METHOD *** **

The most critical circular failure surface
is specified by 15 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	231.48	93.64
2	237.06	95.84
3	242.61	98.12
4	248.13	100.48
5	253.62	102.91
6	259.07	105.41
7	264.49	107.98
8	269.87	110.63
9	275.22	113.36
10	280.53	116.15
11	285.80	119.02
12	291.03	121.95
13	296.23	124.96
14	301.38	128.04
15	306.09	130.95

**** Simplified BISHOP FOS = 1.407 ****

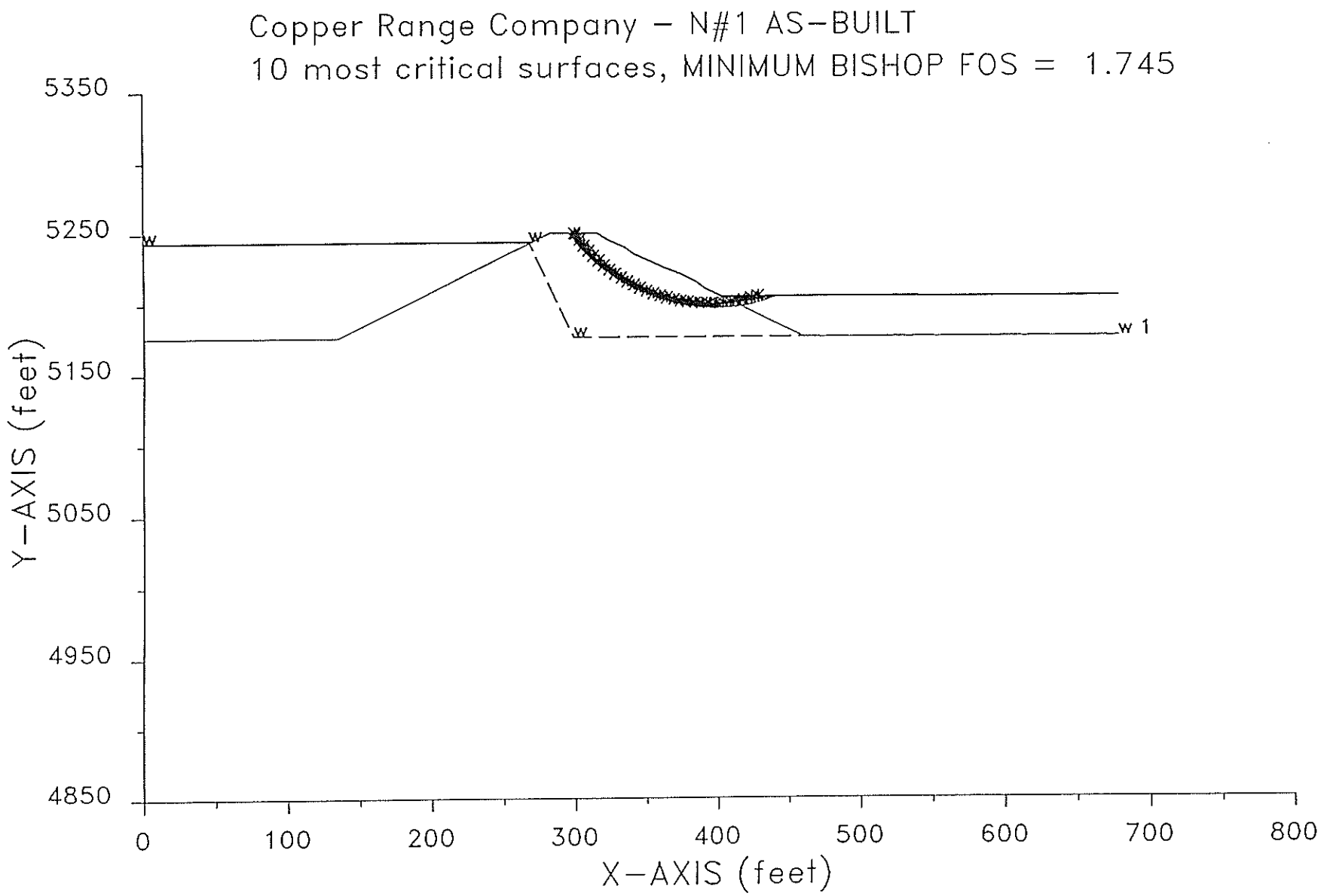
The following is a summary of the TEN most critical surfaces

Problem Description : Copper Range Co. - South Emb. Verif

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	1.407	71.76	506.39	442.57	231.48	306.09	3.939E+06
2.	1.407	-19.06	652.45	614.66	202.17	306.91	1.094E+07
3.	1.407	47.28	491.50	440.24	205.69	280.83	4.022E+06
4.	1.407	54.70	490.12	435.79	210.38	286.84	4.250E+06
5.	1.408	88.54	434.08	370.33	219.76	286.74	2.860E+06
6.	1.408	122.26	336.80	267.81	216.24	266.36	1.196E+06
7.	1.408	29.90	552.88	503.80	205.69	302.12	8.526E+06
8.	1.409	47.91	522.74	468.71	210.38	302.11	7.345E+06
9.	1.409	64.16	506.23	446.58	218.59	306.66	6.511E+06
10.	1.409	151.02	321.16	241.02	233.83	282.37	1.081E+06

*** END OF FILE ***

N1-CKC 4-03-98 14:22



XSTABL File: N1-CKC 4-03-98 14:22

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*****************************************
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Problem Description : Copper Range Company - N#1 AS-BUILT

SEGMENT BOUNDARY COORDINATES

13 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	5243.5	270.1	5243.5	4
2	270.1	5243.5	283.1	5250.0	2
3	283.1	5250.0	315.8	5250.0	2
4	315.8	5250.0	323.9	5245.0	2
5	323.9	5245.0	335.3	5240.0	2
6	335.3	5240.0	341.5	5235.0	2
7	341.5	5235.0	352.7	5230.0	2
8	352.7	5230.0	363.6	5225.0	2
9	363.6	5225.0	375.8	5220.0	2
10	375.8	5220.0	385.5	5215.0	2
11	385.5	5215.0	392.0	5210.0	2
12	392.0	5210.0	403.3	5205.0	2
13	403.3	5205.0	679.6	5204.5	4

4 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	5176.0	135.1	5176.0	1
2	135.1	5176.0	270.1	5243.5	2
3	403.3	5205.0	461.1	5176.0	2
4	461.1	5176.0	679.6	5176.0	1

ISOTROPIC Soil Parameters

5 Soil unit(s) specified

Soil No.	Unit Weight (pcf)	Moist (pcf)	Sat. (psf)	Cohesion Intercept (deg)	Friction Angle	Pore Pressure Parameter Ru	Water Constant (psf)	Surface No.
1	144.0	144.0	800.0	28.00	.000	.0	1	
2	133.0	137.0	400.0	25.00	.000	.0	1	
3	110.0	120.0	.0	32.00	.000	.0	1	
4	77.0	77.0	.0	.00	.000	.0	1	
5	125.0	125.0	5000.0	45.00	.000	.0	1	

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 4 coordinate points

PHREATIC SURFACE,

Point No.	x-water (ft)	y-water (ft)
1	.00	5243.50
2	268.10	5243.50
3	299.50	5176.00
4	679.60	5176.00

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.

900 trial surfaces will be generated and analyzed.

30 Surfaces initiate from each of 30 points equally spaced along the ground surface between x = 422.0 ft and x = 488.0 ft

Each surface terminates between x = 295.0 ft and x = 305.0 ft

Unless further limitations were imposed, the minimum elevation
at which a surface extends is y = .0 ft

* * * * * DEFAULT SEGMENT LENGTH SELECTED BY XSTABL * * * * *

5.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

The first segment of each failure surface will be inclined
within the angular range defined by :

Lower angular limit := -45.0 degrees
Upper angular limit := (slope angle - 5.0) degrees

****

-- WARNING -- WARNING -- WARNING -- WARNING -- (# 48)

****

Negative effective stresses were calculated at the base of a slice.
This warning is usually reported for cases where slices have low self
weight and a relatively high "c" shear strength parameter. In such
cases, this effect can only be eliminated by reducing the "c" value.

****

USER SELECTED option to maintain strength greater than zero

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface
is specified by 31 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	428.83	5204.95
2	424.02	5203.60
3	419.15	5202.45
4	414.24	5201.52
5	409.29	5200.80
6	404.31	5200.29
7	399.32	5200.00
8	394.32	5199.93
9	389.32	5200.07
10	384.34	5200.43
11	379.37	5201.01
12	374.43	5201.80
13	369.53	5202.80
14	364.68	5204.01
15	359.89	5205.43
16	355.16	5207.06
17	350.51	5208.89
18	345.94	5210.92
19	341.46	5213.15
20	337.09	5215.57
21	332.82	5218.17
22	328.67	5220.96
23	324.64	5223.93
24	320.75	5227.06
25	316.99	5230.37
26	313.39	5233.83
27	309.93	5237.44
28	306.64	5241.20
29	303.51	5245.10
30	300.55	5249.13
31	299.97	5250.00

**** Simplified BISHOP FOS = 1.745 ****

The following is a summary of the TEN most critical surfaces

Problem Description : Copper Range Company - N#1 AS-BUILT

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	1.745	395.11	5315.51	115.58	428.83	299.97	1.816E+07
2.	1.747	394.63	5318.00	118.10	428.83	298.15	1.913E+07
3.	1.750	395.11	5315.95	114.20	422.00	301.98	1.607E+07
4.	1.751	401.00	5331.54	131.26	435.66	298.20	1.998E+07
5.	1.751	393.41	5318.27	118.06	426.55	296.94	1.936E+07
6.	1.752	402.93	5334.71	135.03	440.21	297.78	2.094E+07
7.	1.752	398.81	5312.30	115.92	442.48	301.27	2.026E+07

8.	1.753	398.92	5323.41	126.24	442.48	
296.21	2.285E+07					
9.	1.753	401.43	5313.45	116.02	442.48	
304.24	1.828E+07					
10.	1.755	393.00	5316.33	117.72	431.10	
295.87	2.094E+07					

*** END OF FILE ***

APPENDIX B:
2025 Geotechnical Borings

SUBSURFACE BORING LOG

AET No: **P-0040820** Log of Boring No. **B-1B (p. 1 of 2)**

Project: **White Pine Mine; Carp Lake Township; Ontonagon County, Michigan**

DEPTH IN FEET	Surface Elevation _____ MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS WC	qp	LL	PL	%-#200
1	*Blind drill to 4.5 feet*	FILL									
2											
3											
4											
5	FILL, sandy lean clay, a little gravel, reddish brown (CL)		4	M	SS	15	13	<0.25			
6											
7	*Blind drill to 29.5 feet*										
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											
28											
29											

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS						
		DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
0-49.5'	**4.25" HSA**	**3/27/25**	**0753**	**51.5'**	**49.5'**	**51.5'**	**None**	**None**
BORING COMPLETED: **3/27/25**								
DR: **KS** LG: **SB** Rig: **57**								

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET_CORP P-0040820.GPJ AET+CPT+WELL.GDT 7/18/25

SUBSURFACE BORING LOG

AET No: **P-0040820** Log of Boring No. **B-1B (p. 2 of 2)**

Project: **White Pine Mine; Carp Lake Township; Ontonagon County, Michigan**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS WC	qp	LL	PL	%-#200
30	FILL, clayey sand, fine to medium grained, a little gravel, reddish brown (SC)		20	M	SS	24	10				
35	FILL, sandy lean clay, a little gravel, reddish brown (CL)		19	M	SS	24	12	2.25			
40	FILL, lean clay with sand, a little gravel, reddish brown (CL)		11	M	SS	15	14	3.75			
45			9	M	SS	24	15	1.25			
50			10	M	SS	24	13	1.25			
51	*End of boring at 51.5 feet*										

AET_CORP P-0040820.GPJ AET+CPT+WELL.GDT 7/18/25

SUBSURFACE BORING LOG

AET No: **P-0040820** Log of Boring No. **B-2 (p. 1 of 2)**

Project: **White Pine Mine; Carp Lake Township; Ontonagon County, Michigan**

DEPTH IN FEET	Surface Elevation _____ MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS WC	qp	LL	PL	%-#200
1–4	*Blind drill to 4.5 feet*	FILL									
5–8	FILL, sandy lean clay, a little gravel, reddish brown, with trace roots (CL)		14	M	SS	24	8	>4.5			
9–14	FILL, sandy lean clay, a little gravel, reddish brown (CL)		9	M	SS	24	13	3.5			
					TW	24					
15–18			12	M	SS	20	12	>4.5			
19–24	FILL, lean clay with sand, a little gravel, reddish brown, with trace roots (CL)		10	M	SS	24	13	3.25			
					TW	16					
25–29			5	M	SS	16	13	1.0			

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS						
		DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
0-58.3'	**4.25" HSA**	**3/28/25**	**1200**	**59.7'**	**58.3'**	**58.3'**	**None**	**None**
BORING COMPLETED:	**3/28/25**							
DR: **KS**	LG: **SB** Rig: **57**							

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET_CORP P-0040820.GPJ AET+CPT+WELL.GDT 7/18/25

SUBSURFACE BORING LOG

AET No: **P-0040820** Log of Boring No. **B-2 (p. 2 of 2)**

Project: **White Pine Mine; Carp Lake Township; Ontonagon County, Michigan**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS WC	qp	LL	PL	%-#200
30	FILL, lean clay with sand, a little gravel, reddish brown, with trace roots (CL) *(continued)*		12	M	SS	22	11	>4.5			
33					TW	23					
35	FILL, mix of lean clay with sand and sandy silt, reddish brown and light brown, with trace roots		14	M	SS	23	16	2.5			
38	FILL, lean clay with sand, a little gravel, reddish brown (CL)										
40			17	M	SS	21	10	>4.5			
44	FILL, lean clay with sand, a little gravel, reddish brown, with trace roots (CL)										
45			11	M	SS	23	16	3.75			
48					TW	0					
50			21	M	SS	24	15	2.25			
53					TW	24					
54	FILL, lean clay with sand, a little gravel, reddish brown and light brown, with lenses of silty sand (CL)		17	M	SS	24	12	>4.5			
59	Sandy SILT, a little gravel, reddish brown, moist, very dense, with laminations of lean clay with sand, with possible cobbles (ML)	TILL	130 /.3	M	SS	6	8				
	End of boring at 59.7 feet										

AET_CORP P-0040820.GPJ AET+CPT+WELL.GDT 7/18/25

SUBSURFACE BORING LOG

AET No: **P-0040820** Log of Boring No. **B-3 (p. 1 of 2)**

Project: **White Pine Mine; Carp Lake Township; Ontonagon County, Michigan**

DEPTH IN FEET	Surface Elevation _____ MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS WC	qp	LL	PL	%-#200
1	*Blind drill to 4.5 feet*	FILL									
2											
3											
4											
5	FILL, lean clay with sand, a little gravel, reddish brown (CL)		5	M	SS	16	12	1.5			
6											
7											
8											
9											
10			8	M	SS	22	16	1.75			
11											
12											
13					TW	20					
14											
15			9	M	SS	24	13	2.25			
16											
17											
18											
19											
20			14	M	SS	24	15	1.5			
21											
22											
23					TW	10					
24											
25			11	M	SS	20	15	3.0			
26											
27											
28											
29											

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS						
		DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
0-54.5'	**4.25" HSA**	**3/27/25**	**1407**	**55.0'**	**54.5'**	**54.5'**	**None**	**None**
BORING COMPLETED: **3/27/25**								
DR: **KS** LG: **SB** Rig: **57**								

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET_CORP P-0040820.GPJ AET+CPT+WELL.GDT 7/18/25

SUBSURFACE BORING LOG

AET No: **P-0040820** Log of Boring No. **B-3 (p. 2 of 2)**

Project: **White Pine Mine; Carp Lake Township; Ontonagon County, Michigan**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS WC	qp	LL	PL	%-#200
30	FILL, lean clay with sand, a little gravel, reddish brown (CL) *(continued)*		7	M	SS	21	15	2.5			
33					TW	17			31	15	
35	FILL, lean clay with sand, a little gravel, reddish brown and light brown (CL)		7	M	SS	22	18	2.0			
39	FILL, sandy lean clay, a little gravel, reddish brown (CL)		8	M	SS	17	16	2.25			
43					TW	19					
45	FILL, lean clay with sand, a little gravel, reddish brown (CL)		20	M	SS	17	14	>4.5			
50			17	M	SS	23	16	1.0			
52					TW	0					
55	FILL, lean clay with sand, a little gravel, reddish brown, with trace cinders (CL)		89/.5	M	SS	<1					
	End of boring at 55.0 feet										

AET_CORP P-0040820.GPJ AET+CPT+WELL.GDT 7/18/25

SUBSURFACE BORING LOG

AET No: **P-0040820** Log of Boring No. **B-4A (p. 1 of 3)**

Project: **White Pine Mine; Carp Lake Township; Ontonagon County, Michigan**

DEPTH IN FEET	Surface Elevation _____ MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS WC	qp	LL	PL	%-#200
1–4	*Blind drill to 4.5 feet*	FILL									
5–9	FILL, sandy lean clay, a little gravel, reddish brown, with lenses of silty sand (CL)		24	M	SS	23	9				
10–14	FILL, sand with silt, fine to medium grained, dark gray, moist (SP-SM)		16	M	SS	24					
					TW	8					
15–18			9	M	SS	24					
18–24	FILL, mix of sandy silt and lean clay, reddish brown		14	M	SS	24	11				
					TW	24					
25–29	FILL, silty sand, fine grained, dark gray, moist (SM)		17	M	SS	19					

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS						
		DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
0-69.5'	**4.25" HSA**	**4/1/25**	**1229**	**71.5'**	**69.5'**	**71.4'**	**None**	**70.9'**
		4/1/25	**1250**	**71.5'**	**69.5'**	**71.4'**	**None**	**70.9'**
BORING COMPLETED: **4/1/25**								
DR: **KS** LG: **SB** Rig: **57**								

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET_CORP P-0040820.GPJ AET+CPT+WELL.GDT 7/18/25

SUBSURFACE BORING LOG

AET No: **P-0040820** Log of Boring No. **B-4A (p. 2 of 3)**

Project: **White Pine Mine; Carp Lake Township; Ontonagon County, Michigan**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS WC	qp	LL	PL	%-#200
30	FILL, silty sand, fine grained, dark gray, moist (SM) *(continued)*		12	M	SS	19					
33					TW	23					
35			11	M	SS	22					
40			20	M	SS	18					
43					TW	21					
45			31	M	SS	24					
50			18	M	SS	18					
53					TW	20					
55			30	M	SS	18					
60			14	M	SS	19					
63					TW	14					
64											

AET_CORP P-0040820.GPJ AET+CPT+WELL.GDT 7/18/25

SUBSURFACE BORING LOG

AET No: **P-0040820** Log of Boring No. **B-4A (p. 3 of 3)**

Project: **White Pine Mine; Carp Lake Township; Ontonagon County, Michigan**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS WC	qp	LL	PL	%-#200
65	FILL, silty sand, fine to medium grained, a little gravel, reddish brown, moist (SM)	TILL	14	M	SS	12	12	2.75			
66	LEAN CLAY with sand, reddish brown, stiff, with lenses of fat clay and silt (CL)										
67											
68											
69											
70	CLAYEY SAND, fine to medium grained, reddish brown, moist, dense, with lenses of sandy lean clay (SC)		54	M▼W	SS	24	9				
71							9	>4.5			
	Sandy SILT, reddish brown, moist to waterbearing, very dense, with lenses of clayey sand (ML)										
	End of boring at 71.5 feet										

AET_CORP P-0040820.GPJ AET+CPT+WELL.GDT 7/18/25

SUBSURFACE BORING LOG

AET No: **P-0040820** Log of Boring No. **B-4B (p. 1 of 2)**

Project: **White Pine Mine; Carp Lake Township; Ontonagon County, Michigan**

DEPTH IN FEET	Surface Elevation _____ MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS WC	qp	LL	PL	%-#200
1–4	*Blind drill to 4.5 feet*	FILL		M							
5–9	FILL, lean clay with sand, a little gravel, reddish brown (CL)		5	M	SS	7	12	1.0			
					TW	18					
10–14	FILL, mix of sandy lean clay and sandy silt, reddish brown		12	M	SS	24	13	<0.25			
					TW	23					
15–19	FILL, sandy lean clay, reddish brown (CL)		16	M	SS	24	9	>4.5			
20–23			17	M	SS	20	9	>4.5			
					TW	20					
24–27	FILL, silty sand, fine to medium grained, reddish brown, moist, with trace pieces of wood (SM)		15	M	SS	24					
28–29	FILL, sandy lean clay, a little gravel, reddish brown (CL)										

DEPTH:	DRILLING METHOD
0-44.5'	**4.25" HSA**

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
3/31/25	**1431**	**46.5'**	**44.5'**	**44.5'**	**None**	**35.5'**

BORING COMPLETED: **4/1/25**

DR: **KS** LG: **SB** Rig: **57**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET_CORP P-0040820.GPJ AET+CPT+WELL.GDT 7/18/25

SUBSURFACE BORING LOG

AET No: **P-0040820** Log of Boring No. **B-4B (p. 2 of 2)**

Project: **White Pine Mine; Carp Lake Township; Ontonagon County, Michigan**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS WC	qp	LL	PL	%-#200
30	FILL, sandy lean clay, a little gravel, reddish brown (CL) *(continued)*		13	M	SS	24	11	3.0			
31											
32											
33					TW	17					
34											
35	FILL, mix of clayey sand and silty sand, fine to medium grained, reddish brown, moist						15				
36	FILL, silty sand, fine to medium grained, reddish brown, waterbearing (SM)		25	MW	SS	24				15	27
37											
38	FILL, sandy lean clay, a little gravel, reddish brown, with lenses of silty sand (CL)										
39											
40											
41			17	W	SS	22	10	3.0			
42											
43					TW	10					
44											
45											
46			39	W	SS	20	10				
	End of boring at 46.5 feet										

AET_CORP P-0040820.GPJ AET+CPT+WELL.GDT 7/18/25

SUBSURFACE BORING LOG

AET No: **P-0040820** Log of Boring No. **B-5A (p. 1 of 3)**

Project: **White Pine Mine; Carp Lake Township; Ontonagon County, Michigan**

DEPTH IN FEET	Surface Elevation _____ MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS WC	qp	LL	PL	%-#200
1–4	*Blind drill to 4.5 feet*	FILL									
5–8	FILL, sandy lean clay, a little gravel, reddish brown (CL)		17	M	SS	21	8				
9–12	FILL, silty sand, fine grained, dark gray, moist (SM)		32	M	SS	22					
					TW	7					
13–16			17	M	SS	20					
17–20	FILL, clayey sand, fine to medium grained, reddish brown, moist (SC)		13	M	SS	21	11	>4.5			
					TW	24					
21–24											
25–28	FILL, silty sand, fine grained, dark gray, moist (SM)		23	M	SS	18					
29	FILL, mix of sandy silt and clayey sand, reddish brown, moist										

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS						
		DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
0-72.0'	**4.25" HSA**	**4/7/25**	**1121**	**72.5'**	**72.0'**	**72.5'**	**None**	**72.1'**
BORING COMPLETED:	**4/8/25**							
DR: **KS**	LG: **SB** Rig: **57**							

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET_CORP P-0040820.GPJ AET+CPT+WELL.GDT 7/18/25

SUBSURFACE BORING LOG

AET No: **P-0040820** Log of Boring No. **B-5A (p. 2 of 3)**

Project: **White Pine Mine; Carp Lake Township; Ontonagon County, Michigan**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS WC	qp	LL	PL	%-#200
30	FILL, mix of sandy silt and clayey sand, reddish brown, moist *(continued)*		16	M	SS	21	11				
32					TW	10					
35	FILL, silty sand, fine grained, dark gray, moist (SM)		20	M	SS	19					
40			22	M	SS	21					
43					TW	18					
45			52	M	SS	21					
50			23	M	SS	21					
53					TW	20					
55			14	M	SS	20					
60			37	M	SS	20					
63					TW	24				NP	13
64											

AET_CORP P-0040820.GPJ AET+CPT+WELL.GDT 7/18/25

SUBSURFACE BORING LOG

AET No: **P-0040820** Log of Boring No. **B-5A (p. 3 of 3)**

Project: **White Pine Mine; Carp Lake Township; Ontonagon County, Michigan**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS WC	qp	LL	PL	%-#200
65	FILL, silty sand, fine grained, dark gray, moist (SM) *(continued)*		14	M	SS	21					
66	FILL, clayey sand, fine to medium grained, a little gravel, reddish brown, moist (SC)						14	4.25			
67											
68	LEAN CLAY with sand, reddish brown, hard (CL)	TILL									
69											
70											
71			37	M	SS	24	13	>4.5			
72				▼	TW	6					
	End of boring at 72.5 feet										

AET_CORP P-0040820.GPJ AET+CPT+WELL.GDT 7/18/25

SUBSURFACE BORING LOG

AET No: **P-0040820** Log of Boring No. **B-5B (p. 1 of 2)**

Project: **White Pine Mine; Carp Lake Township; Ontonagon County, Michigan**

DEPTH IN FEET	Surface Elevation _____ MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS WC	qp	LL	PL	%-#200
1–4	*Blind drill to 4.5 feet*	FILL									
5–9	FILL, silty sand, fine grained, dark gray, moist (SM)		9	M	SS	19					
10–14	FILL, mix of sandy silt and clayey sand, reddish brown, moist		20	M	SS	21					
					TW	23			21	14	
15–16	FILL, clayey sand, fine to medium grained, reddish brown, moist (SC)		15	M	SS	24	11				
17–22	FILL, silty sand, fine grained, dark gray, moist (SM)		26	M	SS	19	11				
23–29	FILL, sandy silt, a little gravel, reddish brown, moist (ML)										
	FILL, mix of sandy silt and sandy lean clay, reddish brown, moist				TW	20			26	17	
			31	M	SS	22	8				

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS						
		DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
0-49.5'	**4.25" HSA**	**4/2/25**	**0739**	**51.5'**	**49.5'**	**49.5'**	**None**	**None**
BORING COMPLETED: **4/2/25**								
DR: **KS** LG: **SB** Rig: **57**								

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET_CORP P-0040820.GPJ AET+CPT+WELL.GDT 7/18/25

SUBSURFACE BORING LOG

AET No: **P-0040820** Log of Boring No. **B-5B (p. 2 of 2)**

Project: **White Pine Mine; Carp Lake Township; Ontonagon County, Michigan**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS WC	qp	LL	PL	%-#200
30	FILL, silt with sand, a little gravel, reddish brown, moist (ML)		29	M	SS	21					
32					TW	2					
33	FILL, lean clay with sand, a little gravel, reddish brown, with lenses of sand (CL)										
35			18	M	SS	23	12				
38	FILL, silty sand, fine grained, dark gray, moist (SM)										
40			30	M	SS	19					
42											22
43					TW	19					
44	Sandy LEAN CLAY, reddish brown, stiff to hard, with lenses of silt (CL)	TILL							26	13	59
45			17	M	SS	24	11	>4.5			
50			38	M	SS	24	8	>4.5			
51	*End of boring at 51.5 feet*										

SUBSURFACE BORING LOG

AET No: **P-0040820** Log of Boring No. **B-6A (p. 1 of 2)**

Project: **White Pine Mine; Carp Lake Township; Ontonagon County, Michigan**

DEPTH IN FEET	Surface Elevation _____ MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS WC	qp	LL	PL	%-#200
1–4	*Blind drill to 4.5 feet*	FILL									
5–8	FILL, lean clay with sand, a little gravel, reddish brown (CL)		19	M	SS	20	10				
9–11	FILL, sandy silt, a little gravel, reddish brown, moist, with lenses of clayey sand (ML)		21	M	SS	21	8			NP	54
12–18	FILL, silty sand, fine grained, dark gray, moist (SM)		17	M	TW SS	1 14					
19–24	FILL, lean clay with sand, a little gravel, reddish brown, with lenses of silty sand (CL)		9	M	SS TW	19 2	12	1.75	24	15	70
25–28	FILL, silty sand, fine grained, dark gray, moist (SM)		8	M	SS	12					
29	FILL, lean clay with sand, reddish brown, with lenses of silty sand (CL)										

DEPTH:	DRILLING METHOD
0-56.5'	**4.25" HSA**

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
4/3/25	**1200**	**58.5'**	**56.5'**	**56.5'**	**None**	**None**

BORING COMPLETED: **4/3/25**

DR: **KS** LG: **SB** Rig: **57**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET_CORP P-0040820.GPJ AET+CPT+WELL.GDT 7/18/25

SUBSURFACE BORING LOG

AET No: **P-0040820** Log of Boring No. **B-6A (p. 2 of 2)**

Project: **White Pine Mine; Carp Lake Township; Ontonagon County, Michigan**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	qp	LL	PL	%-#200
30							15				
31	FILL, silty sand, fine grained, dark gray, moist (SM)		9	M	SS	17		<0.25			
32											
33					TW	21					
34											
35			15	M	SS	17					
36											
37											
38	FILL, sandy lean clay, reddish brown, with lenses of silty sand (CL)										
39											
40	FILL, silty sand, fine grained, dark gray, moist (SM)						12	2.25	22	15	66
41			28	M	SS	22					
42											
43					TW	20				NP	24
44											
45			19	M	SS	19					
46											
47											
48											
49											
50			22	M	SS	21					
51											
52											
53					TW	19				NP	26
54											
55											
56			26	M	SS	20					
57											
58			24	M	SS	19					
	End of boring at 58.5 feet										

AET_CORP P-0040820.GPJ AET+CPT+WELL.GDT 7/18/25

SUBSURFACE BORING LOG

AET No: **P-0040820** Log of Boring No. **B-6B (p. 1 of 2)**

Project: **White Pine Mine; Carp Lake Township; Ontonagon County, Michigan**

DEPTH IN FEET	Surface Elevation _____ MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS WC	qp	LL	PL	%-#200
1–4	*Blind drill to 4.5 feet*	FILL									
5–9	FILL, lean clay with sand, a little gravel, reddish brown (CL)		15	M	SS	21	12	4.0			
10–14	FILL, lean clay with sand, reddish brown, with lenses of silty sand (CL)		7	M	SS	22	16	1.75	27	14	71
					TW	6					
15–18	FILL, silt with sand, a little gravel, reddish brown, moist, with lenses of lean clay (ML)		26	M	SS	24	11	3.75	22	16	72
19–24	FILL, lean clay with sand, reddish brown, with lenses of silty sand (CL)		14	M	SS	21	12				
					TW	23					
25–28	FILL, sandy silt, reddish brown, moist (ML)		21	M	SS	17	13				
29	FILL, silty sand, fine grained, dark gray, moist (SM)										

DEPTH:	DRILLING METHOD
0-42.7'	**4.25" HSA**

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
4/2/25	**1324**	**42.7'**	**42.7'**	**42.7'**	**None**	**None**

BORING COMPLETED: **4/2/25**

DR: **KS** LG: **SB** Rig: **57**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET_CORP P-0040820.GPJ AET+CPT+WELL.GDT 7/18/25

SUBSURFACE BORING LOG

AET No: **P-0040820** Log of Boring No. **B-6B (p. 2 of 2)**

Project: **White Pine Mine; Carp Lake Township; Ontonagon County, Michigan**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS WC	qp	LL	PL	%-#200
30											
31	FILL, sandy lean clay, reddish brown, with lenses of silty sand (CL)		9	M	SS	16	12	2.0			
32											
33					TW	19					
34											
35	FILL, clayey sand, fine to medium grained, a little gravel, reddish brown, moist (SC)		12	M	SS	20	13				
36											
37											
38											
39	Gravelly SILTY SAND, fine to medium grained, dark reddish brown, moist, very dense, with lenses of sandy silt and apparent cobbles (SM)	TILL									
40			100 /.1	M	SS	6					
41											
42				M	TW	0					
	End of boring at 42.7 feet		100 /0	M	SS	0					

AET_CORP P-0040820.GPJ AET+CPT+WELL.GDT 7/18/25

SUBSURFACE BORING LOG

AET No: **P-0040820** Log of Boring No. **BH-PFS-1A (p. 1 of 3)**

Project: **White Pine Mine; Carp Lake Township; Ontonagon County, Michigan**

DEPTH IN FEET	Surface Elevation _____ MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS WC	qp	LL	PL	%-#200
1–4	*Blind drill to 4.5 feet*	FILL									
5–9	FILL, sandy lean clay, reddish brown, with trace roots (CL)		8	M	SS	4	12		24	13	
10–14	FILL, sandy lean clay, a little gravel, reddish brown (CL)		12	M	SS	24	9	2.0			
					TW						
15–17	FILL, mix of silty sand and sandy lean clay, reddish brown		21	M	SS	24	13	>4.5		NP	
18–29	FILL, sandy lean clay, a little gravel, reddish brown (CL)				TW	20					
			15	M	SS	20	10	3.75			
					TW	25					
			9	M	SS	23	15	<0.25			
	FILL, lean clay with sand, reddish brown (CL)										

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS						
		DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
0-84.5'	**4.25" HSA**	**3/26/25**	**1200**	**86.4'**	**84.5'**	**84.5'**	**None**	**None**
BORING COMPLETED:	**3/26/25**							
DR: **KS**	LG: **SB** Rig: **57**							

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET_CORP P-0040820.GPJ AET+CPT+WELL.GDT 7/18/25

SUBSURFACE BORING LOG

AET No: **P-0040820** Log of Boring No. **BH-PFS-1A (p. 2 of 3)**

Project: **White Pine Mine; Carp Lake Township; Ontonagon County, Michigan**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS WC	qp	LL	PL	%-#200
30	FILL, lean clay with sand, reddish brown (CL) *(continued)*		5	M	SS	24	16	1.75			
33					TW	18			24	14	
35	FILL, sandy lean clay, reddish brown (CL)		10	M	SS	21	11	2.75			
38	FILL, lean clay with sand, reddish brown, with trace roots (CL)										
40			13	M	SS	24	14	3.0			
43					TW	20					
45	FILL, sandy lean clay, a little gravel, reddish brown, with trace roots (CL)		14	M	SS	23	12	2.0			
50			15	M	SS	19	15	2.0			
53					TW	23					
55			18	M	SS	24	11	>4.5			
58	Sandy LEAN CLAY, a little gravel, reddish brown, stiff to very stiff (CL)	TILL									
60			18	M	SS	22	12	>4.5			
63					TW	20					
64											

AET_CORP P-0040820.GPJ AET+CPT+WELL.GDT 7/18/25

SUBSURFACE BORING LOG

AET No: **P-0040820** Log of Boring No. **BH-PFS-1A (p. 3 of 3)**

Project: **White Pine Mine; Carp Lake Township; Ontonagon County, Michigan**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS WC	qp	LL	PL	%-#200
65	Sandy LEAN CLAY, a little gravel, reddish brown, stiff to very stiff (CL) *(continued)*	TILL *(continued)*	11	M	SS	24		1.5			
66											
67											
68					TW	14					
69											
70			11	M	SS	24		1.75			
71											
72											
73											
74											
75											
76											
77											
78											
79											
80											
81											
82											
83											
84											
85			64	M	SS	17		>4.5			
86	*End of boring at 86.4 feet*										

APPENDIX C:
2025 Piezometer Completion Logs

7-98

State of Wisconsin
Department of Natural Resources

Route to: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 7-98

Facility/Project Name	Local Grid Location of Well ____ ft. ☐N. ☐S. ____ ft. ☐E. ☐W.	Well Name MW-6A
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☐ Lat. ° ' " Long. ° ' " or	Wis. Unique Well No. / DNR Well ID No.
Facility ID	St. Plane 46.80386 ft. N, 89.49669 ft. E/ S/C/N	Date Well Installed 04/03/2025 (m m d d y y y y)
Type of Well Well Code ____/____	Section Location of Waste/Source ____ 1/4 of ____ 1/4 of Sec. ____, T. ____ N, R. ____ ☐E ☑W	Well Installed By: Name (first, last) and Firm AET Drilling ZACH B/KYLES
Distance from Waste/Source N/A ft. / Enf. Stds. Apply ☐	Location of Well Relative to Waste/Source u ☐ Upgradient s ☑ Sidegradient d ☐ Downgradient n ☐ Not Known	Gov. Lot Number

A. Protective pipe, top elevation _____ ft. MSL
B. Well casing, top elevation _____ ft. MSL
C. Land surface elevation _____ ft. MSL
D. Surface seal, bottom _____ ft. MSL or 2.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☑
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis performed? ☐ Yes ☑ No

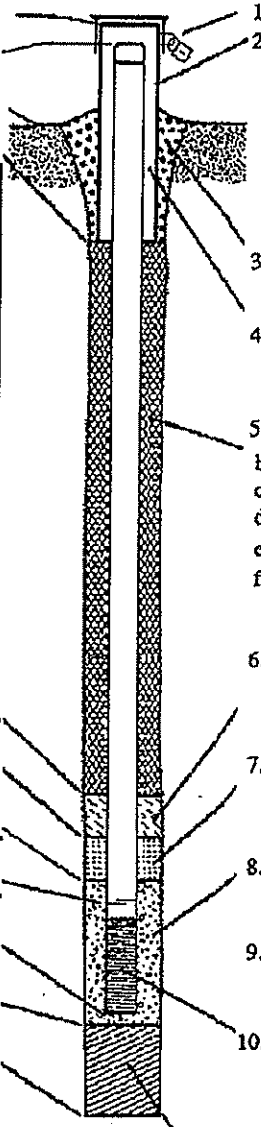
14. Drilling method used: Rotary ☐ 50
Hollow Stem Auger ☑ 41
Other ☐

15. Drilling fluid used: Water ☐ 02 Air ☐ 01
Drilling Mud ☐ 03 None ☑ 99

16. Drilling additives used? ☐ Yes ☑ No
Describe _____

17. Source of water (attach analysis, if required):
On-Site Private Well

E. Bentonite seal, top _____ ft. MSL or 2.0 ft.
F. Fine sand, top _____ ft. MSL or 41.0 ft.
G. Filter pack, top _____ ft. MSL or 43.0 ft.
H. Screen joint, top _____ ft. MSL or 45.0 ft.
I. Well bottom _____ ft. MSL or 55.0 ft.
J. Filter pack, bottom _____ ft. MSL or 55.0 ft.
K. Borehole, bottom _____ ft. MSL or 58.5 ft.
L. Borehole, diameter 6.0 in.
M. O.D. well casing 2.37 in.
N. I.D. well casing 2.07 in.



1. Cap and lock? ☑ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 7.0 ft.
c. Material: Steel ☒ 04 Other ☐
d. Additional protection? ☐ Yes ☒ No
If yes, describe: _____
3. Surface seal: Bentonite ☒ 30 Concrete ☐ 01 Other ☐
4. Material between well casing and protective pipe: None
Bentonite ☐ 30 Other ☐
5. Annular space seal: a. Granular/Chipped Bentonite ☐ 33
b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 35
c. ____ Lbs/gal mud weight . . . . . Bentonite slurry ☐ 31
d. 30 % Bentonite . . . . . Bentonite-cement grout ☐ 50
e. 7.0 Ft³ volume added for any of the above
f. How installed: Tremie ☑ 01 Tremie pumped ☒ 02 Gravity ☐ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐1/4 in. ☑3/8 in. ☐1/2 in. Bentonite chips ☑ 32
c. _____ Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
a. Red Flint No. 10
b. Volume added 0.4 ft³
8. Filter pack material: Manufacturer, product name & mesh size
a. Red Flint No. 40
b. Volume added 2.2 ft³
9. Well casing: Flush threaded PVC schedule 40 ☑ 23
Flush threaded PVC schedule 80 ☐ 24
Other ☐
10. Screen material: PVC
a. Screen type: Factory cut ☑ 11 Continuous slot ☐ 01 Other ☐
b. Manufacturer Johnson Screen Co
c. Slot size: 0.010 in.
d. Slotted length: 10.0 ft.
11. Backfill material (below filter pack): None ☐ 14 Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature _____ Firm TETRA TECH

Please complete both Forms 4400-113A and 4400-113B and return them to the appropriate DNR office and bureau. Completion of these reports is required by chs. 160, 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats., and ch. NR 141, Wis. Adm. Code. In accordance with chs. 281, 289, 291, 292, 293, 295, and 299, Wis. Stats., failure to file these forms may result in a forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on these forms is not intended to be used for any other purpose. NOTE: See the instructions for more information, including where the completed forms should be sent.

7-98

State of Wisconsin
Department of Natural Resources

Route to: Watershed/Wastewater ☐ Waste Management ☐ Remediation/Redevelopment ☐ Other ☐ _____

MONITORING WELL CONSTRUCTION

Form 4400-113A Rev. 7-98

Facility/Project Name	Local Grid Location of Well _____ ft. ☐N. ☐S. _____ ft. ☐E. ☐W.	Well Name MW-5A
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☐ Lat. ° ' " Long. ° ' " or	Wis. Unique Well No. / DNR Well ID No.
Facility ID	St. Plane _____ ft. N, _____ ft. W S/C/N	Date Well Installed m m / d d / y y y y
Type of Well Well Code ____/____	Section Location of Waste/Source ____ 1/4 of ____ 1/4 of Sec. ____, T. ____ N, R. ____ ☐E ☑W	Well Installed By: Name (first, last) and Firm AET Drilling Zach B. / Kyles
Distance from Waste/Source N/A ft. / Enf. Stds. Apply ☐	Location of Well Relative to Waste/Source u ☐ Upgradient s ☑ Sidegradient d ☐ Downgradient n ☐ Not Known	Gov. Lot Number

A. Protective pipe, top elevation _____ ft. MSL

B. Well casing, top elevation _____ ft. MSL

C. Land surface elevation _____ ft. MSL

D. Surface seal, bottom _____ ft. MSL or 2.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☑
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis performed? ☐ Yes ☑ No

14. Drilling method used: Rotary ☐ 50 / Hollow Stem Auger ☑ 41 / Other ☐ _____

15. Drilling fluid used: Water ☐ 02 / Air ☐ 01 / Drilling Mud ☐ 03 / None ☑ 99

16. Drilling additives used? ☐ Yes ☑ No

Describe _____

17. Source of water (attach analysis, if required):
On-Site Private Well

E. Bentonite seal, top _____ ft. MSL or 2.0 ft.

F. Fine sand, top _____ ft. MSL or 39.0 ft.

G. Filter pack, top _____ ft. MSL or 41.0 ft.

H. Screen joint, top _____ ft. MSL or 43.0 ft.

I. Well bottom _____ ft. MSL or 53.0 ft.

J. Filter pack, bottom _____ ft. MSL or 53.0 ft.

K. Borehole, bottom ~~72.5~~ ft MSL or 72.5 ft.

L. Borehole, diameter 6.0 in.

M. O.D. well casing 2.37 ~~2.50~~ in.

N. I.D. well casing 2.07 in.

1. Cap and lock? ☑ Yes ☐ No

2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 7.0 ft.
c. Material: Steel ☑ 04 / Other ☐ _____
d. Additional protection? ☐ Yes ☑ No
If yes, describe: _____

3. Surface seal: Bentonite ☑ 30 / Concrete ☐ 01 / Other ☐ _____

4. Material between well casing and protective pipe:
NONE
Bentonite ☐ 30 / Other ☑ _____

5. Annular space seal: a. Granular/Chipped Bentonite ☐ 33
b. _____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 35
c. _____ Lbs/gal mud weight . . . . . Bentonite slurry ☐ 31
d. 40 % Bentonite . . . . . Bentonite-cement grout ☑ 50
e. 7.0 Ft³ volume added for any of the above
f. How installed: Tremie ☐ 01 / Tremie pumped ☑ 02 / Gravity ☐ 08

6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐1/4 in. ☐3/8 in. ☐1/2 in. Bentonite chips ☑ 32
c. _____ Other ☐ _____

7. Fine sand material: Manufacturer, product name & mesh size
a. Red Flint No. 10
b. Volume added 0.4 ft³

8. Filter pack material: Manufacturer, product name & mesh size
a. Red Flint No. 40
b. Volume added 2.2 ft³

9. Well casing: Flush threaded PVC schedule 40 ☑ 23 / Flush threaded PVC schedule 80 ☐ 24 / Other ☐ _____

10. Screen material: PVC
a. Screen type: Factory cut ☑ 11 / Continuous slot ☐ 01 / Other ☐ _____
b. Manufacturer Johnson Screen Co
c. Slot size: 0.010 in.
d. Slotted length: 10.0 ft.

11. Backfill material (below filter pack): None ☐ 14 / Other ☐ _____

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature _____ Firm TETRA TECH

Please complete both Forms 4400-113A and 4400-113B and return them to the appropriate DNR office and bureau. Completion of these reports is required by chs. 160, 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats., and ch. NR 141, Wis. Adm. Code. In accordance with chs. 281, 289, 291, 292, 293, 295, and 299, Wis. Stats., failure to file these forms may result in a forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on these forms is not intended to be used for any other purpose. NOTE: See the instructions for more information, including where the completed forms should be sent.

7-98

State of Wisconsin
Department of Natural Resources

Route to: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐ _____

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 7-98

Facility/Project Name	Local Grid Location of Well ____ ft. ☐N ☐S ____ ft. ☐E ☐W	Well Name: MW-4B
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☐ Lat. ____ ° ____ ' ____ " Long. ____ ° ____ ' ____ " or	Wis. Unique Well No. / DNR Well ID No.
Facility ID	St. Plane 46.79908 ft. N, 89.55324 ft. ☒E S/C/N	Date Well Installed 03/31/2025 (m m d d y y y y)
Type of Well — Well Code ____ / ____	Section Location of Waste/Source: ____ 1/4 of ____ 1/4 of Sec. ____, T. ____ N, R. ____ ☐E ☐W	Well Installed By: Name (first, last) and Firm: AET Drilling — Zach Bilyeu
Distance from Waste/Source: N/A ft. / Enf. Stds. Apply ☐	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☒ Sidegradient d ☐ Downgradient n ☐ Not Known	Gov. Lot Number: ____

A. Protective pipe, top elevation _____ ft. MSL
B. Well casing, top elevation _____ ft. MSL
C. Land surface elevation _____ ft. MSL
D. Surface seal, bottom _____ ft. MSL or 2.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☒ ML ☐ MH ☐ CL ☒ CH ☐
Bedrock ☐

13. Sieve analysis performed? ☐ Yes ☒ No

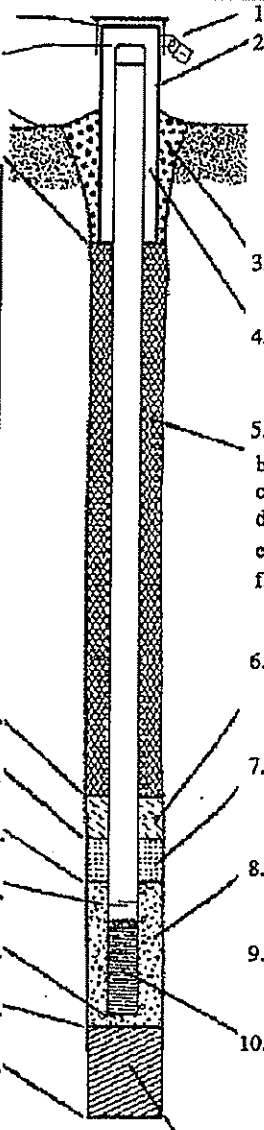
14. Drilling method used: Rotary ☐ 50; Hollow Stem Auger ☒ 41; Other ☐ _____

15. Drilling fluid used: Water ☐ 02; Air ☐ 01; Drilling Mud ☐ 03; None ☒ 99

16. Drilling additives used? ☐ Yes ☐ No
Describe N/A

17. Source of water (attach analysis, if required):
ON-SITE PRIVATE WELL

E. Bentonite seal, top _____ ft. MSL or 2.0 ft.
F. Fine sand, top _____ ft. MSL or 26.0 ft.
G. Filter pack, top _____ ft. MSL or 28.0 ft.
H. Screen joint, top _____ ft. MSL or 30.0 ft.
I. Well bottom _____ ft. MSL or 40.0 ft.
J. Filter pack, bottom _____ ft. MSL or 40.0 ft.
K. Borehole, bottom _____ ft. MSL or 46.5 ft.
L. Borehole, diameter 6.0 in.
M. O.D. well casing 2.37 in.
N. I.D. well casing 2.07 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 7.0 ft.
c. Material: Steel ☒ 04; Other ☐ _____
d. Additional protection? ☐ Yes ☒ No
If yes, describe: _____
3. Surface seal: Bentonite ☒ 30; Concrete ☐ 01; Other ☐ _____
4. Material between well casing and protective pipe: Bentonite ☐ 30; Other ☐ NONE
5. Annular space seal: a. Granular/Chipped Bentonite ☐ 33
b. _____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. _____ Lbs/gal mud weight ..... Bentonite slurry ☐ 31
d. 30 % Bentonite ..... Bentonite-cement grout ☒ 50
e. 4.3 Ft³ volume added for any of the above
f. How installed: Tremie ☐ 01; Tremie pumped ☒ 02; Gravity ☐ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒ 32
c. _____ Other ☐ _____
7. Fine sand material: Manufacturer, product name & mesh size
a. RED FLINT #10
b. Volume added 0.4 ft³
8. Filter pack material: Manufacturer, product name & mesh size
a. RED FLINT NO40
b. Volume added 2.2 ft³
9. Well casing: Flush threaded PVC schedule 40 ☒ 23; Flush threaded PVC schedule 80 ☐ 24; Other ☐ _____
10. Screen material: PVC
a. Screen type: Factory cut ☒ 11; Continuous slot ☐ 01; Other ☐ _____
b. Manufacturer Johnson Screen Co
c. Slot size: 0.040 in.
d. Slotted length: 10.0 ft.
11. Backfill material (below filter pack): None ☐ 14; Other ☐ _____

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature _____ Firm TETRA TECH

Please complete both Forms 4400-113A and 4400-113B and return them to the appropriate DNR office and bureau. Completion of these reports is required by chs. 160, 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats., and ch. NR 141, Wis. Adm. Code. In accordance with chs. 281, 289, 291, 292, 293, 295, and 299, Wis. Stats., failure to file these forms may result in a forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on these forms is not intended to be used for any other purpose. NOTE: See the instructions for more information, including where the completed forms should be sent.

7-98

State of Wisconsin
Department of Natural Resources

Route to: Watershed/Wastewater ☐ Waste Management ☐ Remediation/Redevelopment ☐ Other ☐ _____

MONITORING WELL CONSTRUCTION

Form 4400-113A Rev. 7-98

Facility/Project Name	Local Grid Location of Well ____ ft. ☐N ☐S ____ ft. ☐E ☐W	Well Name: BH-PFS-1A (MW-1A)
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☐ Lat. ____ ° ____ ' ____ " Long. ____ ° ____ ' ____ " or	Wis. Unique Well No. / DNR Well ID No.
Facility ID	St. Plane 46.78155 ft. N, 89.55623 ft. E. S/C/N	Date Well Installed: 03/26/2025 (m m d d y y y y)
Type of Well: Well Code ____/____	Section Location of Waste/Source: ____ 1/4 of ____ 1/4 of Sec. ____, T. ____ N, R. ____ ☐E ☐W	Well Installed By: Name (first, last) and Firm: AET Drilling — Zach B. / Kyle S
Distance from Waste/Source: N/A ft. / Enf. Stds. Apply ☐	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☑ Sidegradient d ☐ Downgradient n ☐ Not Known	Gov. Lot Number: ____

A. Protective pipe, top elevation _____ ft. MSL

B. Well casing, top elevation _____ ft. MSL

C. Land surface elevation _____ ft. MSL

D. Surface seal, bottom _____ ft. MSL or 2.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☒ CH ☐
Bedrock ☐

13. Sieve analysis performed? ☐ Yes ☒ No

14. Drilling method used: Rotary ☐ 50
Hollow Stem Auger ☒ 41
Other ☐ _____

15. Drilling fluid used: Water ☐ 02 Air ☐ 01
Drilling Mud ☐ 03 None ☒ 99

16. Drilling additives used? ☐ Yes ☒ No
Describe _____

17. Source of water (attach analysis, if required):
ON-Site Private Well

E. Bentonite seal, top _____ ft. MSL or 1.0 ft.

F. Fine sand, top _____ ft. MSL or 25.0 ft.

G. Filter pack, top _____ ft. MSL or 27.0 ft.

H. Screen joint, top _____ ft. MSL or 29.0 ft.

I. Well bottom _____ ft. MSL or 39.0 ft.

J. Filter pack, bottom _____ ft. MSL or 41.0 ft.

K. Borehole, bottom _____ ft. MSL or 984.5 ft.

L. Borehole, diameter 6.0 in.

M. O.D. well casing 2.39 in.

N. I.D. well casing 2.07 in.

1. Cap and lock? ☑ Yes ☐ No

2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 7.0 ft.
c. Material: Steel ☑ 04 Other ☐ _____
d. Additional protection? ☐ Yes ☑ No
If yes, describe: _____

3. Surface seal: Bentonite ☒ 30 Concrete ☐ 01 Other ☐ _____

4. Material between well casing and protective pipe:
Bentonite ☒ 30 Other ☐ _____

5. Annular space seal: a. Granular/Chipped Bentonite ☐ 33
b. _____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 35
c. _____ Lbs/gal mud weight . . . . . Bentonite slurry ☐ 31
d. 30 % Bentonite . . . . . Bentonite-cement grout ☒ 50
e. 4.3 Ft³ volume added for any of the above
f. How installed: Tremie ☐ 01 Tremie pumped ☒ 02 Gravity ☐ 08

6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐1/4 in. ☒3/8 in. ☐1/2 in. Bentonite chips ☒ 32
c. _____ Other ☐ _____

7. Fine sand material: Manufacturer, product name & mesh size
a. Red Flint #10
b. Volume added 0.4 ft³

8. Filter pack material: Manufacturer, product name & mesh size
a. Red Flint #40
b. Volume added 2.2 ft³

9. Well casing: Flush threaded PVC schedule 40 ☑ 23
Flush threaded PVC schedule 80 ☐ 24
Other ☐ _____

10. Screen material: PVC
a. Screen type: Factory cut ☑ 11 Continuous slot ☐ 01 Other ☐ _____
b. Manufacturer Johnson Screen Co.
c. Slot size: 0.010 in.
d. Slotted length: 10.0 ft.

11. Backfill material (below filter pack): None ☐ 14
Bent Chips / Sand Other ☐ _____

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature _____ Firm: TETRA TECH

Please complete both Forms 4400-113A and 4400-113B and return them to the appropriate DNR office and bureau. Completion of these reports is required by chs. 160, 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats., and ch. NR 141, Wis. Adm. Code. In accordance with chs. 281, 289, 291, 292, 293, 295, and 299, Wis. Stats., failure to file these forms may result in a forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on these forms is not intended to be used for any other purpose. NOTE: See the instructions for more information, including where the completed forms should be sent.

APPENDIX D:
2025 Geotechnical Laboratory Data

2025 Geotechnical Testing Results Summary

Boring	Sample Intervals (ft bgs)	Sample Type	Soil Description	USCS Soil Classification	Component of Embankment	Blow Counts (per 6-inches)				Sieve Analysis (Particle Size Distribution) (ASTM D422)				% Fines	Specific Gravity (ASTM D854)	Atterberg Limits (ASTM D4318)			Moisture (ASTM D2216), %w	Unit Dry Weight (ASTM D7263), pcf	Total Unit Weight (pcf)	Standard Proctor Compaction (ASTM D698) - Rock Corrected Results			Direct Shear		Consolidated Undrained w/pore pressure (ASTM 1550)				1-D Consolidation (ASTM D2435)		Hydraulic Conductivity (ASTM D2434/D5084), k (cm/sec)	Sample Preparation
										%Gravel	%Sand	%Silt	%Clay			LL	PL	PI				%W	MDD (pcf)	Total Unit Weight	Effective Cohesion (psf)	Effective Friction Angle (degrees)	Effective Cohesion (psf)	Effective Friction Angle (degrees)	Total Cohesion (psf)	Total Friction Angle (degrees)	Compression Index (C_c)	Recompression Index (C_r)		
BH-PFS-1A	4.5 - 6.5	Split Spoon	Fill, Sandy lean clay, reddish brown, with trace roots	CL	Embankment Fill	5	4	4	3	1.7	31.4	34.1	32.8	67		24	13	11	11														
	9.5 - 11.5	Slit Spoon	FILL, sandy lean clay, a little gravel, reddish brown (CL)	CL	Embankment Fill	4	4	8	13										9														
	12.0 - 14.0	Thin Wall	FILL, sandy lean clay, a little gravel, reddish brown (CL)	CL	Embankment Fill					2.5	26.8	39.4	31.3	71	2.70	23	14	9												0.041	0.005		Intact Sample
	14.5 - 16.5	Split Spoon	FILL, mix of silty sand and sandy lean clay, reddish brown	CL	Embankment Fill	6	10	11	11										13														
	17.0 - 19.0	Thin Wall	FILL, sandy lean clay, a little gravel, reddish brown	CL	Embankment Fill																												
	19.5 -21.5	Split Spoon	FILL, sandy lean clay, a little gravel, reddish brown	CL	Embankment Fill	3	6	9	11										10														
	22.0 - 24.0	Thin Wall	FILL, sandy lean clay, a little gravel, reddish brown	CL	Embankment Fill																												
	24.5 - 26.5	Split Spoon	FILL, sandy lean clay, a little gravel, reddish brown	CL	Embankment Fill	4	5	4	6										15														
	29.5 - 31.5	Split Spoon	FILL, lean clay with sand, reddish brown	CL	Embankment Fill	2	2	3	3										16														
	32.0 - 34.0	Thin Wall	FILL, lean clay with sand, reddish brown	CL	Embankment Fill					1.0	30.1	41.4	27.5	70.7	2.70	24	14	10	14.20	121.2	138.4						878.4	23.5	964.8	16.2				Intact Sample
															2.70				15.24	116.7	134.5											9.8E-07	
	34.5 - 36.5	Slit Spoon	FILL, sandy lean clay, reddish brown	CL	Embankment Fill	3	4	6	8										11														
	39.5 - 41.5	Split Spoon	FILL, lean clay with sand, reddish brown, with trace roots	CL	Embankment Fill	3	5	8	8										14														
	42.0 -44.0	Thin Wall	FILL, lean clay with sand, reddish brown, with trace roots	CL	Embankment Fill																												
	45.2 - 46.2	Split Spoon	FILL, sandy lean clay, a little gravel, reddish brown, with trace roots	CL	Embankment Fill	4	8	9	9										12														
	49.5 - 51.5	Split Spoon	FILL, sandy lean clay, a little gravel, reddish brown, with trace roots	CL	Embankment Fill	4	6	9	11										15														
	52.0 - 54.0	Thin Wall	FILL, sandy lean clay, a little gravel, reddish brown, with trace roots	CL	Embankment Fill																												
	54.5 - 56.5	Split Spoon	FILL, sandy lean clay, a little gravel, reddish brown, with trace roots	CL	Embankment Fill	1	7	11	14										11														
	59.5 - 61.5	Split Spoon	Sandy LEAN CLAY, a little gravel, reddish brown, stiff to very stiff	CL	Embankment Fill	4	8	10	14										12														
	62.0 - 64.0	Thin Wall	Sandy LEAN CLAY, a little gravel, reddish brown, stiff to very stiff	CL	Foundation Soil																												
	64.5 - 66.5	Split Spoon	Sandy LEAN CLAY, a little gravel, reddish brown, stiff to very stiff	CL	Foundation Soil	4	5	6	8																								
	67.0 - 69.0	Thin Wall	Sandy LEAN CLAY, a little gravel, reddish brown, stiff to very stiff	CL	Foundation Soil					5.0	29.8	35.6	29.6	65	2.70	22	13	9	11.55	126.08	140.6						Refer to Test Report						1.99E-07	Intact Sample
	69.5 - 71.5	Split Spoon	Sandy LEAN CLAY, a little gravel, reddish brown, stiff to very stiff	CL	Foundation Soil	1	4	7	9																								
	84.5 - 86.5	Split Spoon	Sandy LEAN CLAY, a little gravel, reddish brown, stiff to very stiff	CL	Foundation Soil	16	25	39	50/4"																								
BH-PFS-1B	4.5 - 6.5	Split Spoon	FILL, sandy lean clay, a little gravel, reddish brown	CL	Embankment/Access Ramp Fill	2	2	2	3										13														
	29.5 - 31.5	Split Spoon	FILL, clayey sand, fine to medium grained, a little gravel, reddish brown	SC	Embankment/Access Ramp Fill	6	10	10	13										10														
	34.5 -36.5	Split Spoon	FILL, sandy lean clay, a little gravel, reddish brown	CL	Foundation Soil	3	8	11	15										12														
	39.5 -41.5	Split Spoon	FILL, sandy lean clay, a little gravel, reddish brown	CL	Foundation Soil	1	5	6	8										14														
	44.5 - 46.5	Split Spoon	FILL, sandy lean clay, a little gravel, reddish brown	CL	Foundation Soil	3	4	5	7										15														
	49.5 -51.5	Split Spoon	FILL, sandy lean clay, a little gravel, reddish brown	CL	Foundation Soil	3	4	6	7										13														
BH-PFS-2	4.5 - 6.5	Split Spoon	FILL, sandy lean clay, a little gravel, reddish brown, with trace roots	CL	Embankment Fill	4	7	7	8										8														
	9.5- 11.5	Split Spoon	FILL, sandy lean clay, a little gravel, reddish brown	CL	Embankment Fill	2	4	5	7										13														
	12.0 - 14.0	Thin Wall	FILL, sandy lean clay, a little gravel, reddish brown	CL	Embankment Fill					2.0	27.4	38.2	32.4	71	2.74	24	14	11	17.9	113.7	134.1										0.12	0.02		Intact Sample
	14.5 - 16.5	Slit Spoon	FILL, sandy lean clay, a little gravel, reddish brown	CL	Embankment Fill	3	6	6	7										12														
	19.5 - 21.5	Slit Spoon	FILL, sandy lean clay, a little gravel, reddish brown, with trace roots	CL	Embankment Fill	4	4	6	7										13														
	22.0 - 24.0	Thin Wall	FILL, sandy lean clay, a little gravel, reddish brown, with trace roots	CL	Embankment Fill					0.4	25.5	40.7	33.4	74		25	15	10																
	24.5 - 26.5	Split Spoon	FILL, sandy lean clay, a little gravel, reddish brown, with trace roots	CL	Embankment Fill	2	2	3	5										13														
	29.5 - 31.5	Split Spoon	FILL, sandy lean clay, a little gravel, reddish brown, with trace roots	CL	Embankment Fill	3	6	6	9										11														
	32.0 - 34.0	Thin Wall	FILL, sandy lean clay, a little gravel, reddish brown, with trace roots	CL	Embankment Fill																												
	34.5 - 36.5	Split Spoon	FILL, sandy lean clay, a little gravel, reddish brown, with trace roots	CL	Embankment Fill	3	6	8	11										16														
	39.5 - 41.5	Split Spoon	FILL, sandy lean clay, a little gravel, reddish brown	CL	Embankment Fill	4	8	9	11										10														
	44.5 - 46.5	Split Spoon	FILL, sandy lean clay, a little gravel, reddish brown, with trace roots	CL	Embankment Fill	2	5	6	7										16														
	47.0 - 49.0	Thin Wall	FILL, sandy lean clay, a little gravel, reddish brown, with trace roots	CL	Embankment Fill																												
	49.5 - 51.5	Split Spoon	FILL, sandy lean clay, a little gravel, reddish brown, with trace roots	CL	Embankment Fill/Foundation Transition	4	10	11	11										15														
	52.0 - 54.0	Thin Wall	FILL, sandy lean clay, a little gravel, reddish brown, with trace roots	CL	Foundation Soil					0.7	26.2	38.7	34.4	73		24	14	10	11.4	127.4	141.9						14.4	32.5	1238.4	28.4				Intact Sample
																			12	126.4	141.2											1.37E-05	

2025 Geotechnical Testing Results Summary

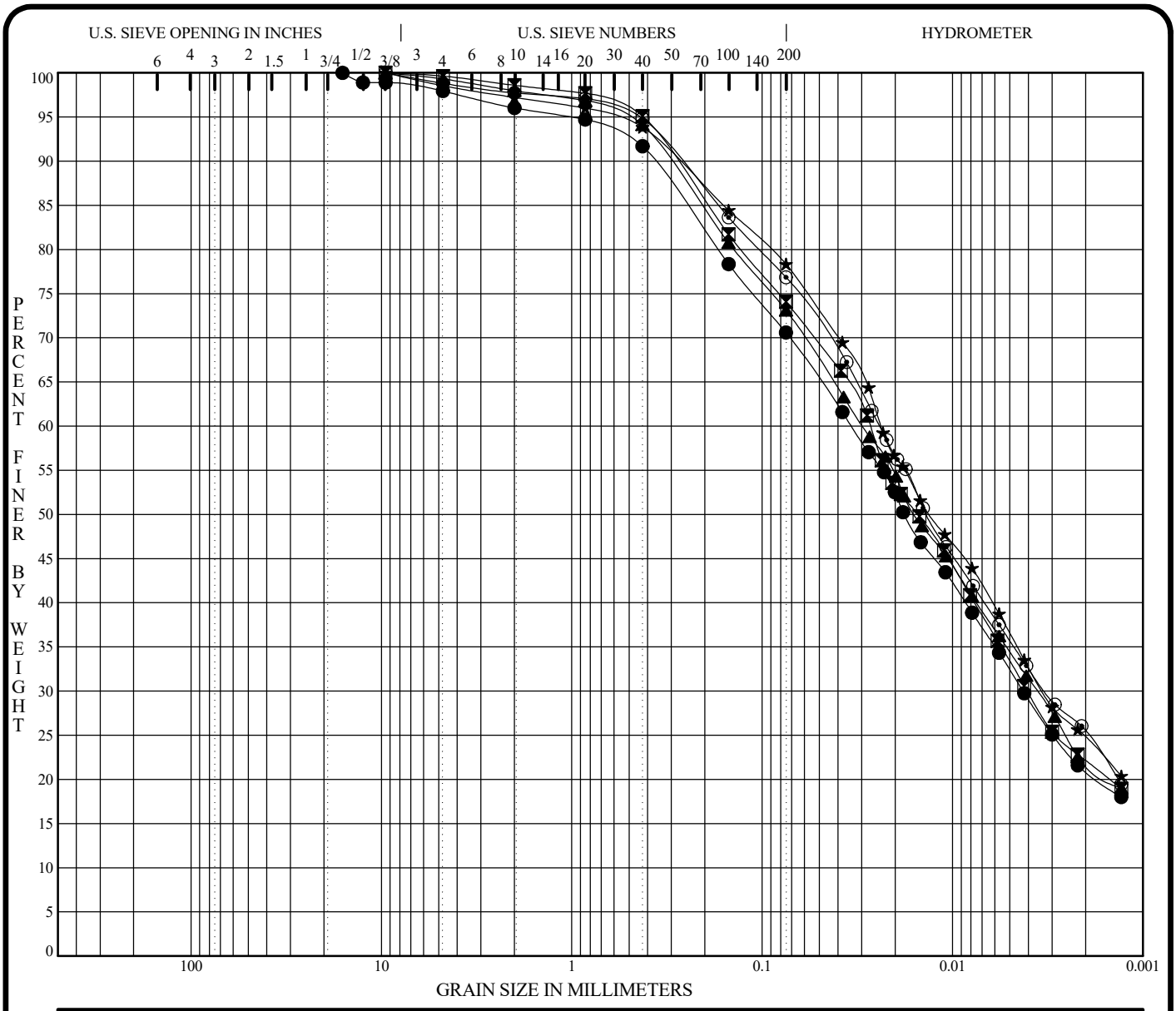
Boring	Sample Intervals (ft bgs)	Sample Type	Soil Description	USCS Soil Classification	Component of Embankment	Blow Counts (per 6-inches)				Sieve Analysis (Particle Size Distribution) (ASTM D422)				% Fines	Specific Gravity (ASTM D854)	Atterberg Limits (ASTM D4318)			Moisture (ASTM D2216), %w	Unit Dry Weight (ASTM D7263), pcf	Total Unit Weight (pcf)	Standard Proctor Compaction (ASTM D698) - Rock Corrected Results			Direct Shear		Consolidated Undrained w/pore pressure (ASTM 1550)				1-D Consolidation (ASTM D2435)		Hydraulic Conductivity (ASTM D2434/D5084), k (cm/sec)	Sample Preparation
										%Gravel	%Sand	%Silt	%Clay			LL	PL	PI				%W	MDD (pcf)	Total Unit Weight	Effective Cohesion (psf)	Effective Friction Angle (degrees)	Effective Cohesion (psf)	Effective Friction Angle (degrees)	Total Cohesion (psf)	Total Friction Angle (degrees)	Compression Index (C_c)	Recompression Index (C_r)		
	54.5 - 56.5	Split Spoon	FILL, lean clay with sand, a little gravel, reddish brown and light brown, with lenses of silty sand	CL	Foundation Soil	4	7	10	13										12															
	58.5 - 59.7	Split Spoon	Sandy SILT, a little gravel, reddish brown, moist, very dense, with laminations of lean clay with sand, with possible cobbles	ML	Bedrock/Till	6	7	30	100/4"										8															
	4.5 - 6.5	Slit Spoon	FILL, lean clay with sand, a little gravel, reddish brown	CL	Embankment Fill	2	3	2	4										12															
	9.5- 11.5	Slit Spoon	FILL, lean clay with sand, a little gravel, reddish brown	CL	Embankment Fill	3	4	4	5										16															
	12.0 - 14.0	Thin Wall	FILL, lean clay with sand, a little gravel, reddish brown	CL	Embankment Fill					1.5	20.2	41.8	36.5	73.1	2.72	26	15	11	12.9	122.0	137.7							140.0	34.4	0.0	29.2				Intact Sample
																			14.2	120.3	137.4									0.06	0.01		
	14.5 - 16.5	Slit Spoon	FILL, lean clay with sand, a little gravel, reddish brown	CL	Embankment Fill	2	4	5	7										13															
	19.5 - 21.5	Slit Spoon	FILL, lean clay with sand, a little gravel, reddish brown	CL	Embankment Fill	4	7	7	9										15															
	22.0 - 24.0	Thin Wall	FILL, lean clay with sand, a little gravel, reddish brown	CL	Embankment Fill																													
	24.5 - 26.5	Split Spoon	FILL, lean clay with sand, a little gravel, reddish brown	CL	Embankment Fill	3	5	6	5										15															
	29.5 - 31.5	Split Spoon	FILL, lean clay with sand, a little gravel, reddish brown	CL	Embankment Fill	2	3	4	6										15															
BH-PFS-3	32.0 - 34.0	Thin Wall	FILL, lean clay with sand, a little gravel, reddish brown	CL	Embankment Fill					1.2	22.0	41.2	35.7	73.1		31	15	16	17.49	110.58	129.92						518.4	25.5							Intact Sample
															2.70				18.13	113.46	134.03											2.24E-08	
	34.5 - 36.5	Split Spoon	FILL, lean clay with sand, a little gravel, reddish brown and light brown	CL	Embankment Fill	2	3	4	6										18															
	39.5 - 41.5	Split Spoon	FILL, sandy lean clay, a little gravel, reddish brown	CL	Embankment Fill	2	3	5	5										16															
	42.0 - 44.0	Thin Wall	FILL, sandy lean clay, a little gravel, reddish brown	CL	Embankment Fill																													
	44.5 - 46.5	Split Spoon	FILL, lean clay with sand, a little gravel, reddish brown	CL	Embankment Fill	3	6	14	39										14															
	49.5 - 51.5	Split Spoon	FILL, lean clay with sand, a little gravel, reddish brown	CL	Foundation Soil	25	8	9	14										16															
	52.0 - 52.5	Thin Wall	FILL, lean clay with sand, a little gravel, reddish brown	CL	Foundation Soil																													
	54.5 - 55.0	Split Spoon	FILL, lean clay with sand, a little gravel, reddish brown	CL	Foundation Soil	89/6"																												
	4.5 - 6.5	Slit Spoon	FILL, sandy lean clay, a little gravel, reddish brown, with lenses of silty sand	CL	Embankment Fill	8	11	13	13										9															
	9.5 - 11.5	Slit Spoon	FILL, sand with silt, fine to medium grained, dark gray, moist	SP-SM	Cyclone Sand	9	8	8	9																									
	12.0 - 12.5	Thin Wall	FILL, sand with silt, fine to medium grained, dark gray, moist	SP-SM	Cyclone Sand																													
	14.5 - 16.5	Slit Spoon	FILL, sand with silt, fine to medium grained, dark gray, moist	SP-SM	Cyclone Sand	3	4	5	4	0.0	79.9	16.1	4.0	20.1			NP																		
	19.5 - 21.5	Slit Spoon	FILL, mix of sandy silt and lean clay, reddish brow	CL-SM	Cyclone Sand	4	6	8	12										11															
	22.0 - 24.0	Thin Wall	FILL, mix of sandy silt and lean clay, reddish brow	CL-SM	Cyclone Sand					0.0	73.8	21.8	4.4	26.2	2.64		NP		5.7	96.7	102.2											0.12	0.01		Remolded to 90% of Maximum Dry Density
	24.5 - 26.5	Slit Spoon	FILL, silty sand, fine grained, dark gray, moist	SM	Cyclone Sand	3	8	9	12																									
	29.5 - 31.5	Slit Spoon	FILL, silty sand, fine grained, dark gray, moist	SM	Cyclone Sand	3	6	6	12																									
BH-PFS-4A	32.0 - 34.0	Thin Wall	FILL, silty sand, fine grained, dark gray, moist	SM	Cyclone Sand					0.0	73.4	31.1	3.5	34.6			NP		6.2	95.6	101.5							1540.0	30.0	3740.0	16.5			1.2E-03	Remolded to 90% of Maximum Dry Density
	34.5 - 36.5	Slit Spoon	FILL, silty sand, fine grained, dark gray, moist	SM	Cyclone Sand	2	6	5	9																									
	39.5 - 40.5	Slit Spoon	FILL, silty sand, fine grained, dark gray, moist	SM	Cyclone Sand	3	8	12	14																									
	42.0 - 44.0	Thin Wall	FILL, silty sand, fine grained, dark gray, moist	SM	Cyclone Sand																													
	44.5 - 46.5	Split Spoon	FILL, silty sand, fine grained, dark gray, moist	SM	Cyclone Sand	9	15	16	14																									
	49.5 - 51.5	Split Spoon	FILL, silty sand, fine grained, dark gray, moist	SM	Cyclone Sand	4	8	10	13																									
	52.0 - 54.0	Thin Wall	FILL, silty sand, fine grained, dark gray, moist	SM	Cyclone Sand																													
	54.5 - 56.5	Split Spoon	FILL, silty sand, fine grained, dark gray, moist	SM	Cyclone Sand	8	14	16	17																									
	59.5 - 61.5	Split Spoon	FILL, silty sand, fine grained, dark gray, moist	SM	Cyclone Sand	6	7	7	8																									
	62.0 - 63.5	Thin Wall	FILL, silty sand, fine grained, dark gray, moist	SM	Cyclone Sand																													
	64.5 - 65.5	Split Spoon	FILL, silty sand, fine to medium grained, a little gravel, reddish brown, moist	SM	Foundation Soil	7	7																											
	65.5 - 66.5	Split Spoon	LEAN CLAY with sand, reddish brown, stiff, with lenses of fat clay and silt	CL	Foundation Soil			7	10										12															
	69.5 - 70.5	Split Spoon	CLAYEY SAND, fine to medium grained, reddish brown, moist, dense, with lenses of sandy lean clay	SC	Foundation Soil	4	17												9															
	70.5 - 71.5	Split Spoon	Sandy SILT, reddish brown, moist to water bearing, very dense, with lenses of clayey sand	ML	Foundation Soil			37	28										9															
	4.5 - 6.5	Slit Spoon	FILL, lean clay with sand, a little gravel, reddish brown	CL	Embankment Fill	2	2	3	2										12															
	7.0 - 9.0	Thin Wall	FILL, lean clay with sand, a little gravel, reddish brown	CL	Embankment Fill																													
	9.5 - 11.5	Slit Spoon	FILL, mix of sandy lean clay and sandy silt, reddish brown	CL-SM	Embankment Fill	3	5	7	9										13															
	12.0 - 14.0	Thin Wall	FILL, mix of sandy lean clay and sandy silt, reddish brown	CL-SM	Embankment Fill					2.1	23.6	47.1	27.1	74.2	2.69	25	14	11	10.9	126.4	140.2							120.0	34.0	240.0	29.5				Intact Sample
															2.72				12.0	121.7	136.3									0.06	0.01		
																			11.1	127.2	141.3											2.2E-08	
	14.5 16.5	Slit Spoon	FILL, sandy lean clay, reddish brown	CL	Embankment Fill	5	7	9	8										9															
	19.5 - 21.5	Slit Spoon	FILL, sandy lean clay, reddish brown	CL	Embankment Fill	4	7	10	9										9															
	22.0 - 24.0	Thin Wall	FILL, sandy lean clay, reddish brown	CL	Embankment Fill																													
PFS-BH-4B	24.5 - 26.5	Slit Spoon	FILL, silty sand, fine to medium grained, reddish brown, moist, with trace pieces of wood	SM	Embankment Fill	3	6	9	12																									
	29.5 - 31.5	Slit Spoon	FILL, sandy lean clay, a little gravel, reddish brown	CL	Embankment Fill	3	6	7	7										11															
	32.0 - 34.0	Thin Wall	FILL, sandy lean clay, a little gravel, reddish brown	CL	Embankment Fill																													
	34.5 - 35.5	Split Spoon	FILL, mix of clayey sand and silty sand, fine to medium grained, reddish brown, moist	SM	Cyclone Sand	3	11												15															
	35.5 - 36.5	Split Spoon	FILL, silty sand, fine to medium grained, reddish brown, water bearing	SM	Cyclone Sand			14	15	1.5	71.5	27.0		27.0			15																		
	39.5 - 41.5	Split Spoon	FILL, sandy lean clay, a little gravel, reddish brown, with lenses of silty sand	CL	Foundation Soil	2	7	10	20										10															
	42.0 - 44.0	Thin Wall	Sandy LEAN CLAY, reddish brown, stiff to hard, with lenses of silt	CL	Foundation Soil					1.8	33.5	37.9	26.8	64.7		17	13	4																		
	44.5 - 46.5	Slit Spoon	FILL, sandy lean clay, a little gravel, reddish brown, with lenses of silty sand	CL	Foundation Soil	11	17	22	36										10															
	4.5 - 6.5	Slit Spoon	FILL, sandy lean clay, a little gravel, reddish brown	CL	Embankment Fill	9	9	8	12										8															

2025 Geotechnical Testing Results Summary

Boring	Sample Intervals (ft bgs)	Sample Type	Soil Description	USCS Soil Classification	Component of Embankment	Blow Counts (per 6-inches)				Sieve Analysis (Particle Size Distribution) (ASTM D422)				% Fines	Specific Gravity (ASTM D854)	Atterberg Limits (ASTM D4318)			Moisture (ASTM D2216), %w	Unit Dry Weight (ASTM D7263), pcf	Total Unit Weight (pcf)	Standard Proctor Compaction (ASTM D698) - Rock Corrected Results			Direct Shear		Consolidated Undrained w/pore pressure (ASTM 1550)				1-D Consolidation (ASTM D2435)		Hydraulic Conductivity (ASTM D2434/D5084), k (cm/sec)	Sample Preparation
										%Gravel	%Sand	%Silt	%Clay			LL	PL	PI				%W	MDD (pcf)	Total Unit Weight	Effective Cohesion (psf)	Effective Friction Angle (degrees)	Effective Cohesion (psf)	Effective Friction Angle (degrees)	Total Cohesion (psf)	Total Friction Angle (degrees)	Compression Index (C_c)	Recompression Index (C_r)		
PFS-BH-5A	9.5 - 11.5	Slit Spoon	FILL, sandy lean clay, a little gravel, reddish brown	SM	Embankment Fill	12	15	17	17																								
	12.0 - 13.0	Thin Wall	FILL, sandy lean clay, a little gravel, reddish brown	SM	Embankment Fill																												
	14.5 - 16.5	Slit Spoon	FILL, sandy lean clay, a little gravel, reddish brown	SM	Embankment Fill	4	8	9	9																								
	19.5 - 21.5	Slit Spoon	Sandy Lean Clay, Red	CL	Embankment Fill	3	5	8	9										11														
	22.0 - 24.0	Thin Wall	Sandy Lean Clay, Red	CL	Embankment Fill														12.19	123.5	138.5				576.0	29.8							Intact Sample
	24.5 - 26.5	Split Spoon	FILL, silty sand, fine grained, dark gray, moist	SM	Cyclone Sand	3	11	12	10																								
	29.5 - 31.5	Split Spoon	FILL, mix of sandy silt and clayey sand, reddish brown, moist	SC-SM	Embankment Fill	3	8	8	9										11														
	32.0 - 33.0	Thin Wall	FILL, mix of sandy silt and clayey sand, reddish brown, moist	SC-SM	Embankment Fill																												
	34.5 - 36.5	Split Spoon	FILL, silty sand, fine grained, dark gray, moist	SM	Cyclone Sand	3	9	11	11																								
	39.5 - 41.5	Split Spoon	FILL, silty sand, fine grained, dark gray, moist	SM	Cyclone Sand	5	11	11	12																								
	42.0 - 44.0	Thin Wall	Sandy Lean Clay, Red	CL	Embankment Fill					0.9	27.3	71.8		71.8	2.7	32	14	18	12.1 13.8	126.7 123.2	142.0 140.2				1123.2	24.6							1.15E-07	Intact Sample
	44.5 - 46.5	Split Spoon	FILL, silty sand, fine grained, dark gray, moist	SM	Cyclone Sand	7	25	27	20																								
	49.5 - 51.5	Split Spoon	FILL, silty sand, fine grained, dark gray, moist	SM	Cyclone Sand	8	11	12	24																								
	52.0 - 54.0	Thin Wall	FILL, silty sand, fine grained, dark gray, moist	SM	Cyclone Sand																												
	54.5 - 56.5	Split Spoon	FILL, silty sand, fine grained, dark gray, moist	SM	Cyclone Sand	6	8	6	9																								
	59.5 - 61.5	Split Spoon	FILL, silty sand, fine grained, dark gray, moist	SM	Cyclone Sand	10	16	21	23																								
	62.0 - 64.0	Thin Wall	FILL, silty sand, fine grained, dark gray, moist	SM	Cyclone Sand					0.0	86.9	13.1		13.1			NP																
	64.5 - 65.5	Split Spoon	FILL, silty sand, fine grained, dark gray, moist	SM	Cyclone Sand	7	7																										
	65.5 - 66.5	Split Spoon	FILL, clayey sand, fine to medium grained, a little gravel, reddish brown, moist	SC	Foundation Soil			7	7										14														
	69.5 - 71.5	Split Spoon	LEAN CLAY with sand, reddish brown, hard, Till	CL	Foundation Soil	6	15	21	28										13														
	72.0 - 72.5	Thin Wall	LEAN CLAY with sand, reddish brown, hard. Till	CL	Foundation Soil																												
PFS-BH-5B	4.5 - 6.5	Split Spoon	FILL, silty sand, fine grained, dark gray, moist	SM	Embankment Fill	4	4	5	4																								
	9.5 - 11.5	Split Spoon	FILL, mix of sandy silt and clayey sand, reddish brown, moist	SM-SC	Embankment Fill	7	10	10	9																								
	12.0 - 14.0	Thin Wall	FILL, mix of sandy silt and clayey sand, reddish brown, moist	SM-SC	Embankment Fill					5.6	29.2	37.6	27.5	65.1		21	14	7																
	14.5 - 15.5	Split Spoon	FILL, clayey sand, fine to medium grained, reddish brown, moist	SC	Embankment Fill	4	6	9	14										11														
	15.5 - 16.5	Split Spoon	FILL, silty sand, fine grained, dark gray, moist	SM	Embankment Fill			9	14																								
	19.5 - 21.5	Split Spoon	FILL, sandy silt, a little gravel, reddish brown, moist	ML	Embankment Fill	11	12	14	14										11														
	22.0 - 24.0	Thin Wall	FILL, mix of sandy silt and sandy lean clay, reddish brown, moist	SM-CL	Embankment Fill					3.4	42.4	39.2	15.1	54.3		26	17	9																
	24.5 - 26.5	Slit Spoon	FILL, mix of sandy silt and sandy lean clay, reddish brown, moist	SM-CL	Embankment Fill	6	17	14	19										8														
	29.5 - 31.5	Split Spoon	FILL, silt with sand, a little gravel, reddish brown, moist	ML	Embankment Fill	4	15	14	14																								
	32.0 - 32.2	Thin Wall	FILL, silt with sand, a little gravel, reddish brown, moist	ML	Embankment Fill																												
	34.5 - 36.5	Slit Spoon	FILL, lean clay with sand, a little gravel, reddish brown, with lenses of sand	CL	Embankment Fill	7	8	10	11										12														
	39.5 - 41.5	Split Spoon	FILL, silty sand, fine grained, dark gray, moist	SM	Cyclone Sand	3	14	16	19																								
	42.0 - 43.0	Thin Wall	FILL, silty sand, fine grained, dark gray, moist	SM	Cyclone Sand					0.0	77.8	22.2		22.2																				
	43.0 - 44.0	Thin Wall	Sandy LEAN CLAY, reddish brown, stiff to hard, with lenses of silt	CL	Foundation Soil					2.1	38.7	59.3		59.3		26	13	13																
	44.5 - 46.5	Split Spoon	Sandy LEAN CLAY, reddish brown, stiff to hard, with lenses of silt	CL	Foundation Soil	2	6	11	13										11														
	49.5 - 51.5	Split Spoon	Sandy LEAN CLAY, reddish brown, stiff to hard, with lenses of silt	CL	Foundation Soil	5	11	27	30										8														
PFS-BH-6A	4.5 - 6.5	Split Spoon	FILL, lean clay with sand, a little gravel, reddish brown	CL	Embankment Fill	9	10	9	8										10														
	9.5 - 10.5	Split Spoon	FILL, sandy silt, a little gravel, reddish brown, moist, with lenses of clayey sand	ML	Embankment Fill	6	10			7.2	39.2	53.5		53.5			NP		8														
	10.5 - 11.5	Split Spoon	FILL, silty sand, fine grained, dark gray, moist	SM	Cyclone Sand			11	16																								
	12.0 - 12.2	Thin Wall	FILL, silty sand, fine grained, dark gray, moist	SM	Cyclone Sand																												
	14.5 - 16.5	Split Spoon	FILL, silty sand, fine grained, dark gray, moist	SM	Cyclone Sand	5	9	8	4																								
	19.5 - 21.5	Split Spoon	FILL, lean clay with sand, a little gravel, reddish brown, with lenses of silty sand	CL	Embankment Fill	2	3	6	8	3.2	26.3	70.5		70.5		24	15	9	12															
	22.0 - 23.0	Thin Wall	FILL, lean clay with sand, a little gravel, reddish brown, with lenses of silty sand	CL	Embankment Fill																												
	24.5 - 26.5	Split Spoon	FILL, silty sand, fine grained, dark gray, moist	SM	Cyclone Sand	2	3	5	7																								
	29.5 - 30.0	Split Spoon	FILL, lean clay with sand, reddish brown, with lense	CL	Embankment Fill	2	3												15														
	30.0 - 31.5	Split Spoon	FILL, silty sand, fine grained, dark gray, moist	SM	Cyclone Sand			6	11																								
	32.0 - 34.0	Thin Wall	FILL, silty sand, fine grained, dark gray, moist	SM	Cyclone Sand					0.1	72.9	27.0		27.0	2.7 2.64		NP		6.2 5.9	96.8 96.4	102.8 102.1				302.0	36.1						0.11	0.01		Remolded to 90% of Maximum Dry
	34.5 - 36.5	Split Spoon	FILL, silty sand, fine grained, dark gray, moist	SM	Cyclone Sand	3	7	8	9																								
	39.5 - 40.5	Split Spoon	FILL, sandy lean clay, reddish brown, with lenses of silty sand	CL	Embankment Fill	5	13			0.7	33.1	66.2		66.2		22	15	7	12															
	40.5 - 41.5	Split Spoon	FILL, silty sand, fine grained, dark gray, moist	SM	Cyclone Sand			15	15																								
	42.0 - 44.0	Thin Wall	FILL, silty sand, fine grained, dark gray, moist	SM	Cyclone Sand					0.0	75.7	24.3		24.3			NP																
	44.5 - 46.5	Split Spoon	FILL, silty sand, fine grained, dark gray, moist	SM	Cyclone Sand	10	10	9	15																								
	49.5 - 51.5	Split Spoon	FILL, silty sand, fine grained, dark gray, moist	SM	Cyclone Sand	7	9	13	18																								
	52.0 - 54.0	Thin Wall	FILL, silty sand, fine grained, dark gray, moist	SM	Cyclone Sand					0.0	73.8	26.2		26.2			NP																
	54.5 - 56.5	Split Spoon	FILL, silty sand, fine grained, dark gray, moist	SM	Cyclone Sand	6	12	14	17																								
	56.5 - 58.5	Split Spoon	FILL, silty sand, fine grained, dark gray, moist	SM	Cyclone Sand	6	7	17	20																								
PFS-BH-6B	4.5 - 6.5	Split Spoon	FILL, lean clay with sand, a little gravel, reddish brown	CL	Embankment Fill	3	6	9	9										12														
	9.5 - 11.5	Split Spoon	FILL, lean clay with sand, reddish brown, with lenses of silty sand	CL	Embankment Fill	3	4	3	6	0.0	29.0	71.0		71.0		27	14	13	16															
	12.0 - 12.5	Thin Wall	FILL, lean clay with sand, reddish brown, with lenses of silty sand	CL	Embankment Fill																												
	14.5 - 16.5	Split Spoon	FILL, silt with sand, a little gravel, reddish brown, m	ML	Embankment Fill	3	12	12	17	4.5	23.4	72.1		72.1		22	16	6	11															
	19.5 - 21.5	Split Spoon	FILL, lean clay with sand, reddish brown, with lenses of silty sand	CL	Embankment Fill	3	7	7	9										12														
	22.0 - 24.0	Thin Wall	FILL, lean clay with sand, reddish brown, with lenses of silty sand	CL	Embankment Fill					0.4	20.8	78.8		78.8	 2.73	27	14	13	14.5 12.0	115.1 124.6	131.8 139.6				788.0	31.8						0.07	0.01	6.2E-07	Intact Sample
	24.5 - 26.5	Split Spoon	FILL, sandy silt, reddish brown, moist	ML	Embankment Fill	5	9	12	12										13														
	29.5 - 30.5	Split Spoon	FILL, silty sand, fine grained, dark gray, moist	SM	Cyclone Sand	5	5																										
	30.5 - 31.5	Split Spoon	FILL, sandy lean clay, reddish brown, with lenses of silty sand	CL	Foundation Soil			4	8										12														
	32.0 - 34.0	Thin Wall	FILL, sandy lean clay, reddish brown, with lenses of silty sand	CL	Foundation Soil																												
	34.5 - 36.5	Split Spoon	FILL, clayey sand, fine to medium grained, a little gravel, reddish brown, moist	SC	Foundation Soil	4	5	7	9										13														

2025 Geotechnical Testing Results Summary

Boring	Sample Intervals (ft bgs)	Sample Type	Soil Description	USCS Soil Classification	Component of Embankment	Blow Counts (per 6-inches)				Sieve Analysis (Particle Size Distribution) (ASTM D422)				% Fines	Specific Gravity (ASTM D854)	Atterberg Limits (ASTM D4318)			Moisture (ASTM D2216), %w	Unit Dry Weight (ASTM D7263), pcf	Total Unit Weight (pcf)	Standard Proctor Compaction (ASTM D698) - Rock Corrected Results			Direct Shear		Consolidated Undrained w/pore pressure (ASTM 1550)				1-D Consolidation (ASTM D2435)		Hydraulic Conductivity (ASTM D2434/D5084), k (cm/sec)	Sample Preparation
										%Gravel	%Sand	%Silt	%Clay			LL	PL	PI				%W	MDD (pcf)	Total Unit Weight	Effective Cohesion (psf)	Effective Friction Angle (degrees)	Effective Cohesion (psf)	Effective Friction Angle (degrees)	Total Cohesion (psf)	Total Friction Angle (degrees)	Compression Index (C_c)	Recompression Index (C_r)		
	39.5 - 40.0	Split Spoon	Gravelly SILTY SAND, fine to medium grained, dark reddish brown, moist, very dense, with lenses of sandy silt and apparent cobbles	SM	Bedrock	100/2"																											
	40.0 -42.7	Split Spoon	Gravelly SILTY SAND, fine to medium grained, dark reddish brown, moist, very dense, with lenses of sandy silt and apparent cobbles	SM	Bedrock	100/0"																											
Clay Stockpile #1	From South Pond Embankment	Grab Sample	Lean Clay with Sand	CL						0.7	29.2	40.1	30.1	70.2	2.75	24	14	10				11.6	123.9	138.3	204.0	32.5							2.7E-05	Remolded to 95% of Maximum Dry Density
Clay Stockpile #2	From South Pond Embankment	Grab Sample	Lean Clay with Sand	CL						1.8	28.7	37.8	31.8	69.6		25	13	12															
Clay Stockpile #3	From South Pond Embankment	Grab Sample	Lean Clay with Sand	CL						1.4	29.2	37.5	31.8	69.3		26	14	12															
Clay Stockpile #4	From South Pond Embankment	Grab Sample	Lean Clay with Sand	CL						1.0	28.2	38.7	32.1	70.8		26	14	12															
Tailings #1	From North Pond 1	Grab Sample	Sand with silt, fine grained	SP-SM						0.0	89.1	10.9		10.9			NP					14.3	107.5	122.9	210.0	37.5							3.5E-03	Remolded to 95% of Maximum Dry Density
Tailings #2	From North Pond 1	Grab Sample	Silty sand, fine to coarse grained	SPM						1.1	64.3	34.6		34.6			NP					11.1	126.2	140.2	224.0	40.7					0.025	0.007		Remolded to 95% of Maximum Dry Density
50:50 Mix Clay Stockpile and Tailings #1		Grab Sample	Silty Clayey Sand	SC-SM						1.7	59.4	38.9		38.9	2.81	18.0	14.0	4.0				12.0	122.5	137.2	288.0	33.8							4.40E-05	Remolded to 95% of Maximum Dry Density
50:50 Mix Clay Stockpile and Tailings #1		Grab Sample	Sandy Lean Clay	CL						1.7	46.2	52.1		52.1	2.81	24.0	16.0	8.0				10.8	127.0	140.7	332.0	35.7							5.80E-06	Remolded to 95% of Maximum Dry Density



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
●	B-2	13.0'	Lean clay with sand (CL)		25	14	11		
⧓	B-2	23.0'	Lean clay with sand (CL)		25	15	10		
▲	B-2	53.0'	Lean clay with sand (CL)		24	14	10		
★	B-3	13.0'	Lean clay with sand (CL)		26	15	11		
⊙	B-3	33.0'	Lean clay with sand (CL)		31	15	16		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-2	13.0'	16.00	0.03	0.004		2.0	27.4	38.2	32.4
⧓	B-2	23.0'	9.50	0.03	0.004		0.4	25.5	40.7	33.4
▲	B-2	53.0'	9.50	0.03	0.004		0.7	26.2	38.7	34.4
★	B-3	13.0'	9.50	0.02	0.003		1.5	20.2	41.8	36.5
⊙	B-3	33.0'	9.50	0.02	0.003		1.2	22.0	41.2	35.7

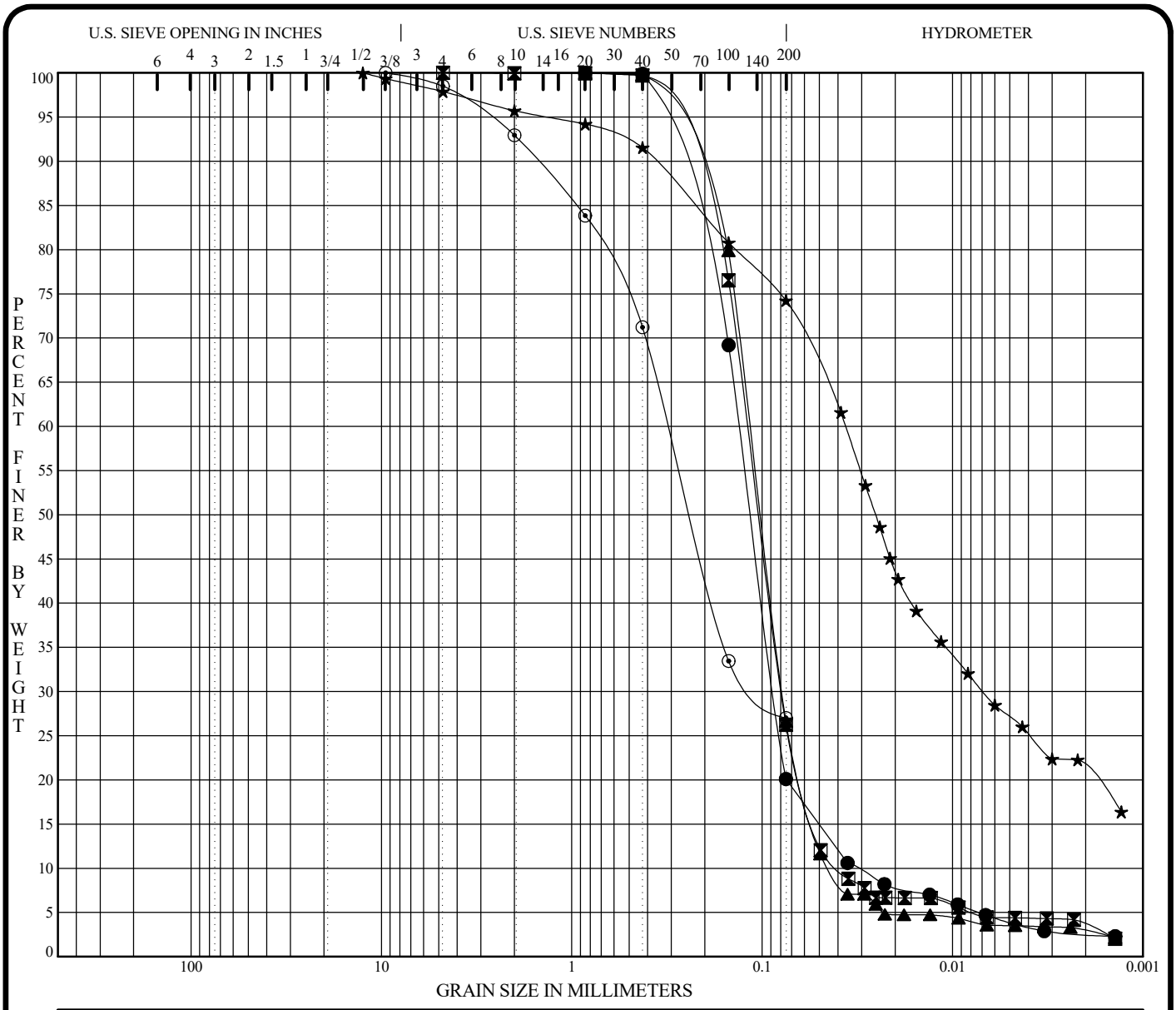
PROJECT **White Pine Mine; Carp Lake Township; Ontonagon County, Michigan**

AET JOB NO. **P-0040820**

DATE **3/27/25**

American Engineering Testing, Inc.
550 Cleveland Avenue North
St. Paul, MN 55114
Telephone: (651) 659-9001
Fax: (651) 659-1347

GRADATION CURVES



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
●	B-4A	15.5'	Silty sand, fine grained (SM)			NP		1.77	4.1
⧓	B-4A	23.0'	Mix of silty sand and lean clay			NP		1.31	3.0
▲	B-4A	33.0'	Silty sand, fine grained (SM)			NP		1.20	2.6
★	B-4B	13.0'	Mix of lean clay with sand and sandy silt		25	14	11		
⊙	B-4B	36.0'	Silty sand, fine to medium grained (SM)			15			

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-4A	15.5'	0.85	0.13	0.086	0.0318	0.0	79.9	16.1	4.0
⧓	B-4A	23.0'	4.75	0.12	0.079	0.0399	0.0	73.8	21.8	4.4
▲	B-4A	33.0'	0.85	0.12	0.078	0.0441	0.0	73.4	23.1	3.5
★	B-4B	13.0'	12.50	0.04	0.007		2.1	23.6	47.1	27.1
⊙	B-4B	36.0'	9.50	0.31	0.103		1.5	71.5	27.0	

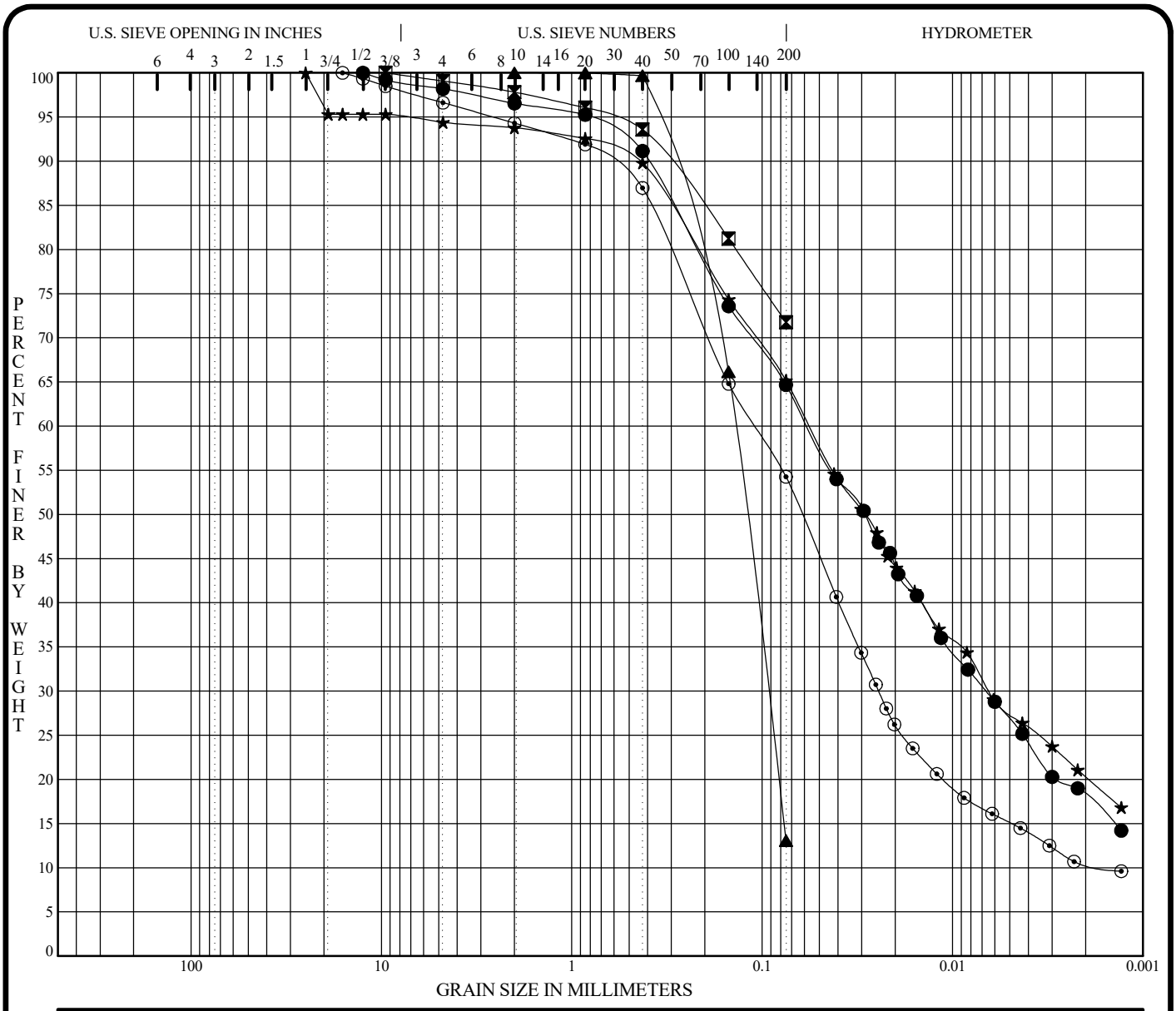
PROJECT **White Pine Mine; Carp Lake Township; Ontonagon County, Michigan**

AET JOB NO. **P-0040820**

DATE **4/1/25**

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GRADATION CURVES



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
●	B-4B	42.4'	Sandy silty clay (CL-ML)		17	13	4		
⧓	B-5A	43.0'	Lean clay with sand (CL)		32	14	18		
▲	B-5A	63.0'	Silty sand, fine grained (SM)			NP			
★	B-5B	13.0'	Mix of sandy silt and clayey sand		21	14	7		
⊙	B-5B	23.0'	Mix of sandy silt and sandy lean clay		26	17	9	3.42	68.4

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-4B	42.4'	12.50	0.06	0.007		1.8	33.5	37.9	26.8
⧓	B-5A	43.0'	9.50				0.9	27.3	71.8	
▲	B-5A	63.0'	2.00	0.14	0.094		0.0	86.9	13.1	
★	B-5B	13.0'	25.00	0.06	0.006		5.6	29.2	37.6	27.5
⊙	B-5B	23.0'	16.00	0.11	0.024	0.0016	3.4	42.4	39.2	15.1

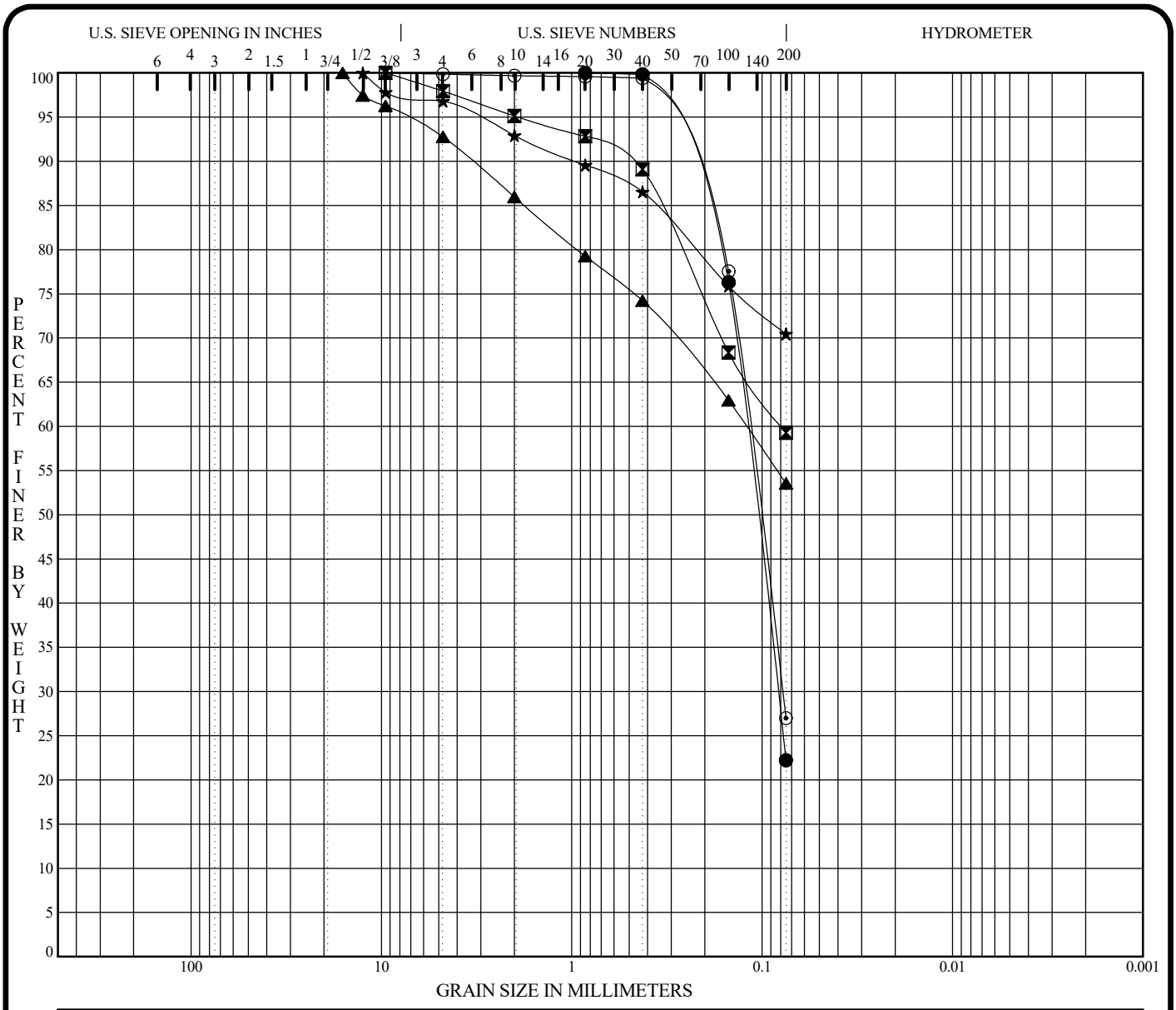
PROJECT **White Pine Mine; Carp Lake Township; Ontonagon County, Michigan**

AET JOB NO. **P-0040820**

DATE **4/2/25**

American Engineering Testing, Inc.
550 Cleveland Avenue North
St. Paul, MN 55114
Telephone: (651) 659-9001
Fax: (651) 659-1347

GRADATION CURVES



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
●	B-5B	42.5'	Silty sand, fine grained (SM)						
⧓	B-5B	43.5'	Sandy lean clay (CL)		26	13	13		
▲	B-6A	10.3'	Sandy silt, a little gravel (ML)			NP			
★	B-6A	20.5'	Lean clay with sand, a little gravel (CL)	12	24	15	9		
⊙	B-6A	33.0'	Silty sand, fine grained (SM)			NP			

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-5B	42.5'	0.85	0.12	0.083		0.0	77.8	22.2	
⧓	B-5B	43.5'	9.50	0.08			2.1	38.7	59.3	
▲	B-6A	10.3'	16.00	0.12			7.2	39.2	53.5	
★	B-6A	20.5'	12.50				3.2	26.3	70.5	
⊙	B-6A	33.0'	9.50	0.12	0.078		0.1	72.9	27.0	

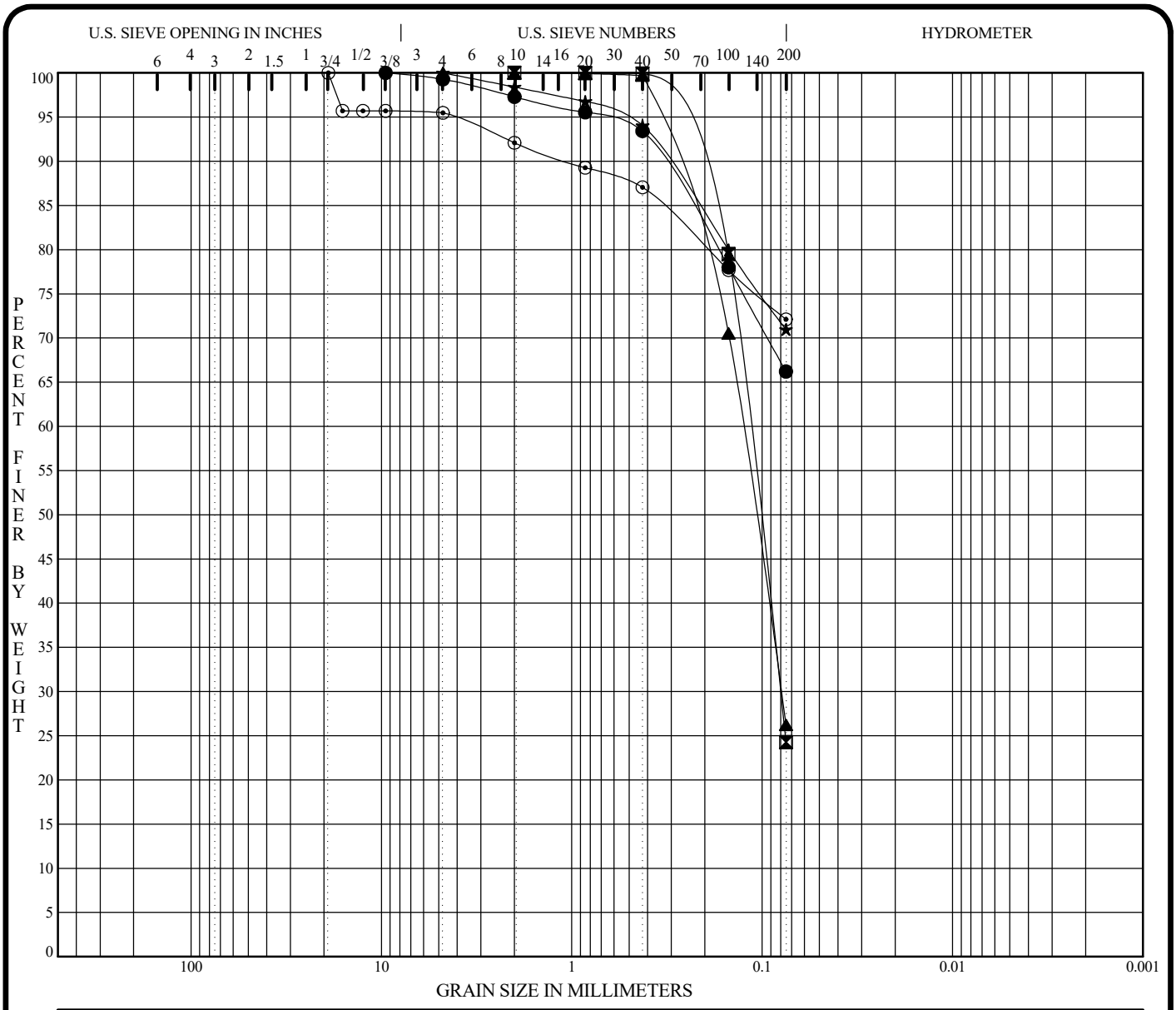
PROJECT **White Pine Mine; Carp Lake Township; Ontonagon County, Michigan**

AET JOB NO. **P-0040820**

DATE **4/3/25**

American Engineering Testing, Inc.
550 Cleveland Avenue North
St. Paul, MN 55114
Telephone: (651) 659-9001
Fax: (651) 659-1347

GRADATION CURVES



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
●	B-6A	39.8'	Sandy lean clay (CL)	12	22	15	7		
⧓	B-6A	43.0'	Silty sand, fine grained (SM)			NP			
▲	B-6A	53.0'	Silty sand, fine grained (SM)			NP			
★	B-6B	10.5'	Lean clay with sand (CL)	16	27	14	13		
⊙	B-6B	15.5'	Silt w/ sand, a little gravel, w/ lenses of lean clay (ML)	11	22	16	6		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-6A	39.8'	9.50				0.7	33.1	66.2	
⧓	B-6A	43.0'	2.00	0.12	0.081		0.0	75.7	24.3	
▲	B-6A	53.0'	4.75	0.13	0.080		0.0	73.8	26.2	
★	B-6B	10.5'	4.75				0.0	29.0	71.0	
⊙	B-6B	15.5'	19.00				4.5	23.4	72.1	

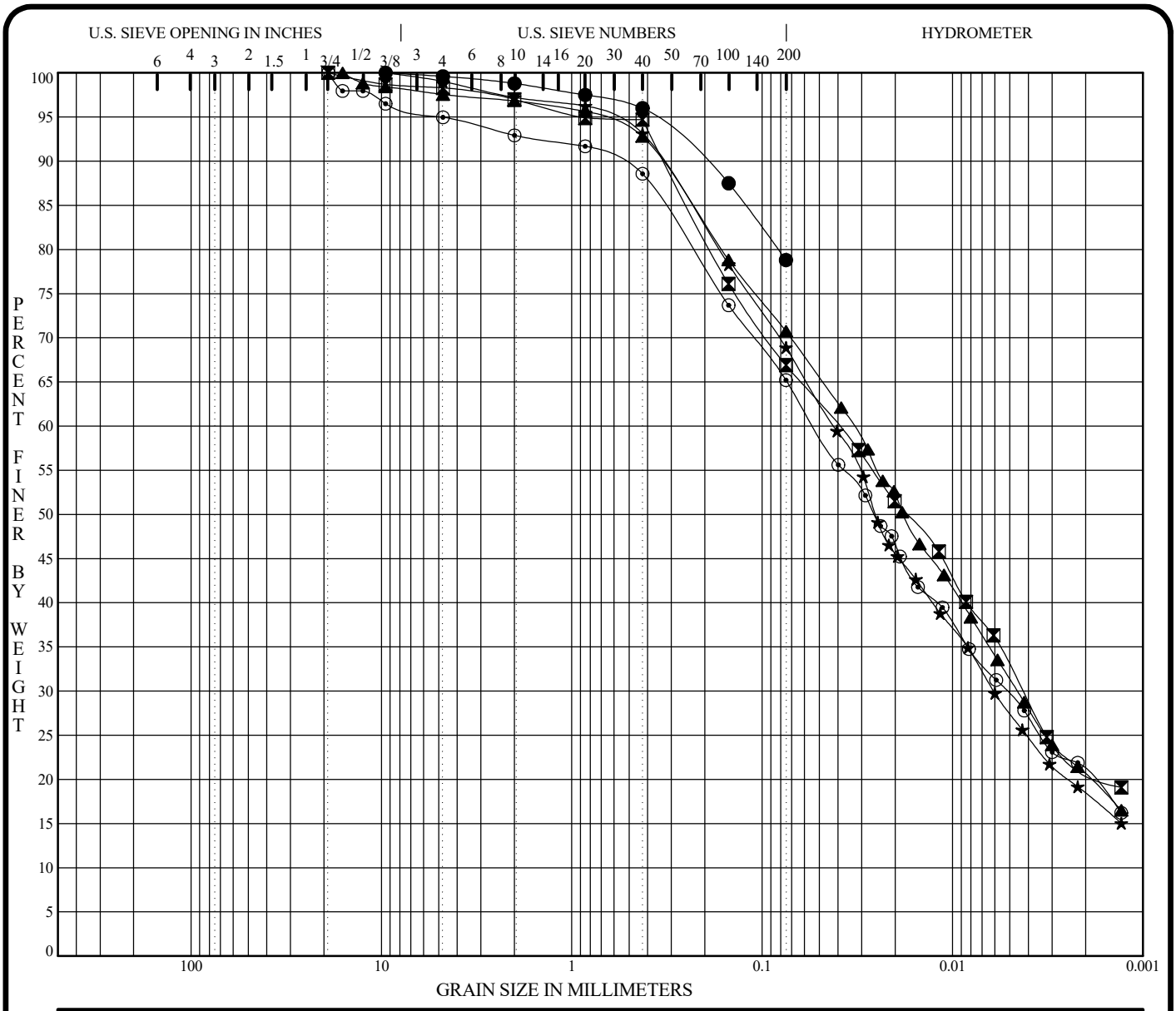
PROJECT **White Pine Mine; Carp Lake Township; Ontonagon County, Michigan**

AET JOB NO. **P-0040820**

DATE **4/2/25**

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550 Cleveland Avenue North
St. Paul, MN 55114
Telephone: (651) 659-9001
Fax: (651) 659-1347

GRADATION CURVES



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
●	B-6B	23.0'	Lean clay with sand (CL)		27	14	13		
⊠	BH-PFS-1A	5.5'	Sandy lean clay (CL)	12	24	13	11		
▲	BH-PFS-1A	13.0'	Lean clay with sand, a little gravel (CL)		23	14	9		
★	BH-PFS-1A	33.0'	Sandy lean clay (CL)		24	14	10		
⊙	BH-PFS-1A	68.0'	Sandy lean clay, a little gravel (CL)		22	13	9		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-6B	23.0'	9.50				0.4	20.8	78.8	
⊠	BH-PFS-1A	5.5'	19.00	0.04	0.004		1.7	31.4	34.1	32.8
▲	BH-PFS-1A	13.0'	16.00	0.03	0.005		2.5	26.8	39.4	31.3
★	BH-PFS-1A	33.0'	9.50	0.04	0.006		1.0	30.1	41.4	27.5
⊙	BH-PFS-1A	68.0'	19.00	0.05	0.005		5.0	29.8	35.6	29.6

PROJECT **White Pine Mine; Carp Lake Township; Ontonagon County, Michigan**

AET JOB NO. **P-0040820**

DATE **3/26/25**

American Engineering Testing, Inc.
550 Cleveland Avenue North
St. Paul, MN 55114
Telephone: (651) 659-9001
Fax: (651) 659-1347

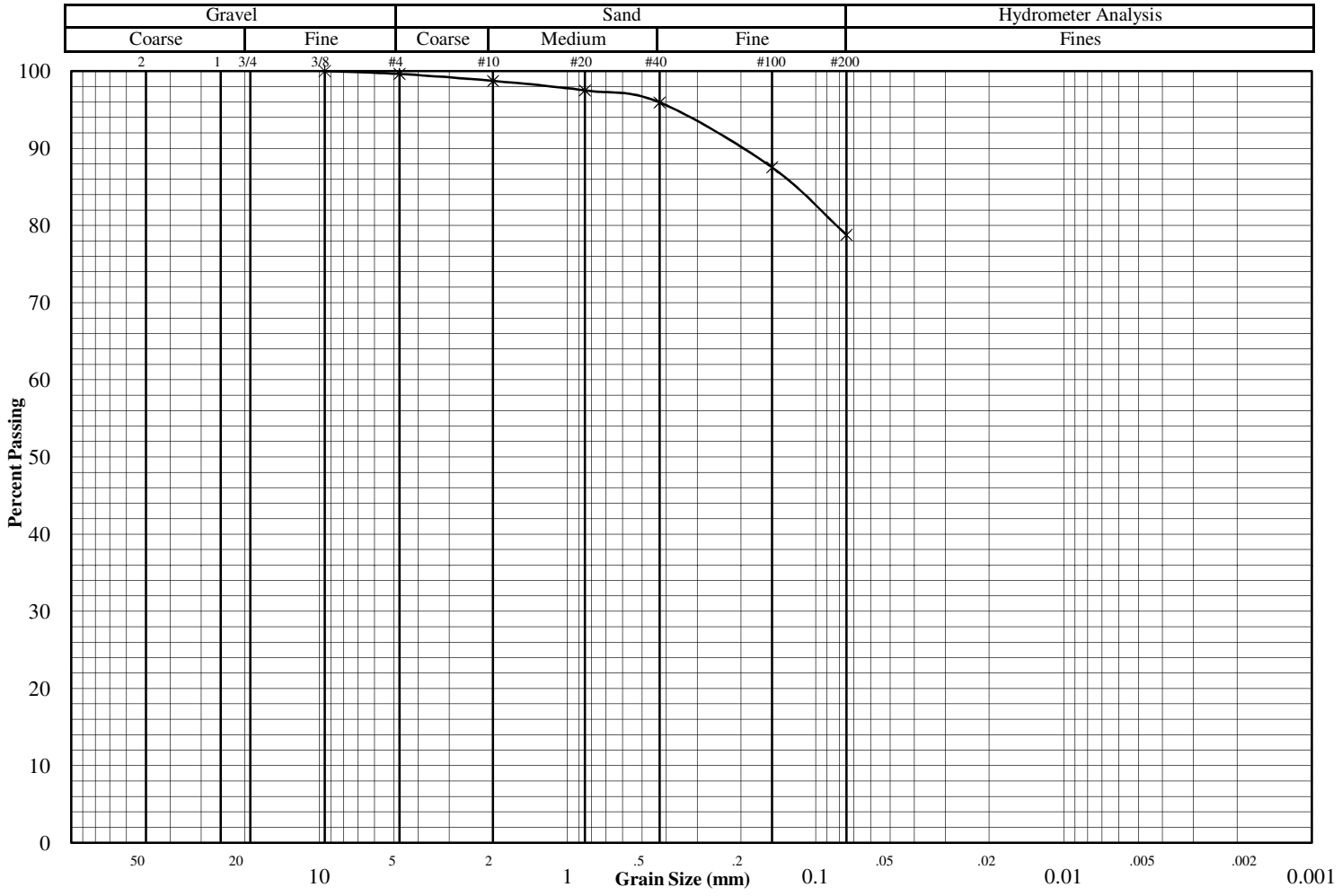
GRADATION CURVES

Grain Size Distribution ASTM D422-16

Job No. : **15997**

Project:	White Pine Mine - #0040820	Test Date:	8/13/25
Reported To:	American Engineering Testing, Inc.	Report Date:	8/20/25

	Location / Boring No.	Sample No.	Depth (ft)	Sample Type	Soil Classification
*	PFS-6B		22-24	TWT	Lean Clay w/sand and lenses of silt (CL)
●					
◇					



Additional Results	*	●	◇
Liquid Limit	27		
Plastic Limit	14		
Plasticity Index ASTM:D4318	13		
Water Content ASTM:D2216			
Dry Density (pcf) ASTM:D7263			
Specific Gravity ASTM:D854			
Porosity			
Organic Content ASTM:D2974			
pH ASTM:D4972 Method B			

Percent Passing

	*	●	◇
Mass (g)	172.8		
2"			
1.5"			
1"			
3/4"			
3/8"	100.0		
#4	99.6		
#10	98.8		
#20	97.5		
#40	96.0		
#100	87.5		
#200	78.8		

	*	●	◇
D_{60}			
D_{30}			
D_{10}			
C_U			
C_C			

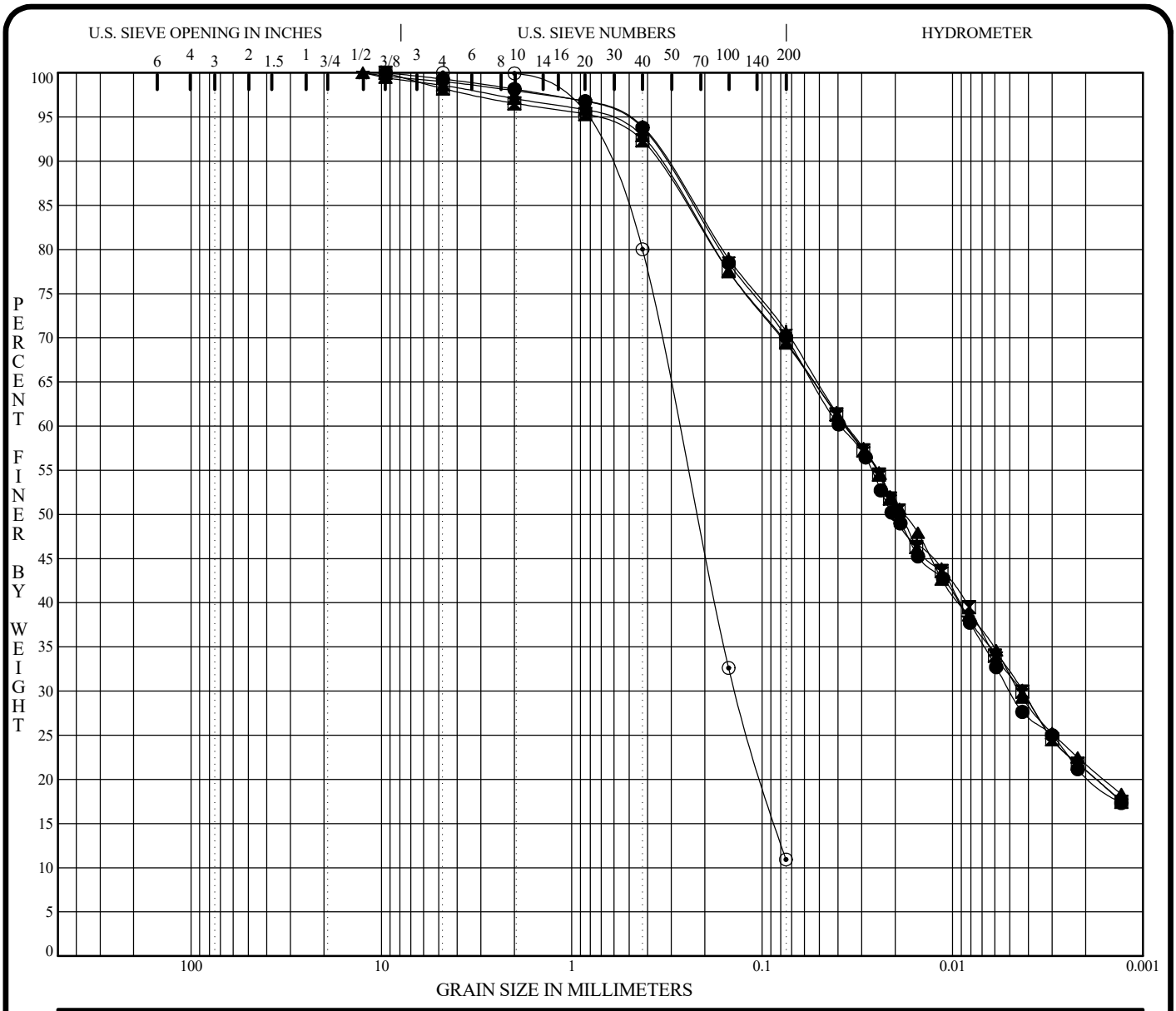
Remarks:

(* = assumed)

9530 James Ave South

SOIL ENGINEERING TESTING, INC.

Bloomington, MN 55431



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
●	**Clay #1**	**1.0'**	**Lean clay with sand (CL)**		**24**	**14**	**10**		
⧓	**Clay #2**	**1.0'**	**Sandy lean clay (CL)**		**25**	**13**	**12**		
▲	**Clay #3**	**1.0'**	**Lean clay with sand (CL)**		**26**	**14**	**12**		
★	**Clay #4**	**1.0'**	**Lean clay with sand (CL)**		**26**	**14**	**12**		
⊙	**Tailings #1**	**1.0'**	**Sand with silt, fine grained (SP-SM)**			**NP**		**0.95**	**3.8**

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**Clay #1**	**1.0'**	**9.50**	**0.04**	**0.005**		**0.7**	**29.2**	**40.1**	**30.1**
⧓	**Clay #2**	**1.0'**	**9.50**	**0.04**	**0.004**		**1.8**	**28.7**	**37.8**	**31.8**
▲	**Clay #3**	**1.0'**	**12.50**	**0.04**	**0.004**		**1.4**	**29.2**	**37.5**	**31.8**
★	**Clay #4**	**1.0'**	**12.50**	**0.04**	**0.004**		**1.0**	**28.2**	**38.7**	**32.1**
⊙	**Tailings #1**	**1.0'**	**4.75**	**0.27**	**0.138**		**0.0**	**89.1**	**10.9**	

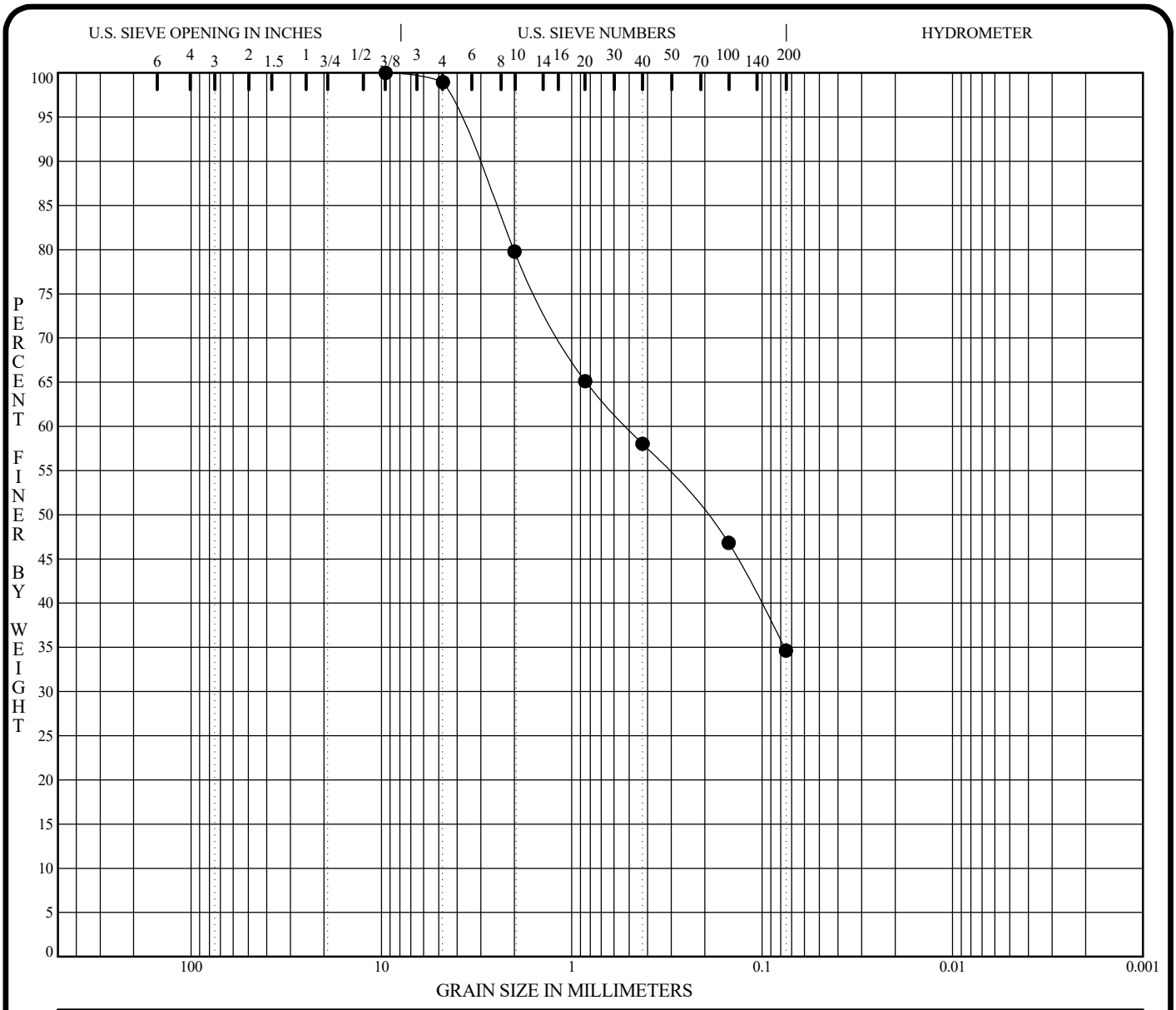
PROJECT **White Pine Mine; Carp Lake Township; Ontonagon County, Michigan**

AET JOB NO. **P-0040820**

DATE

American Engineering Testing, Inc.
550 Cleveland Avenue North
St. Paul, MN 55114
Telephone: (651) 659-9001
Fax: (651) 659-1347

GRADATION CURVES



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
● **Tailings #2**	**1.0'**	**Silty sand, fine to coarse grained (SM)**			**NP**			

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● **Tailings #2**	**1.0'**	**9.50**	**0.52**			**1.1**	**64.3**	**34.6**	

PROJECT **White Pine Mine; Carp Lake Township; Ontonagon County, Michigan**

AET JOB NO. **P-0040820**

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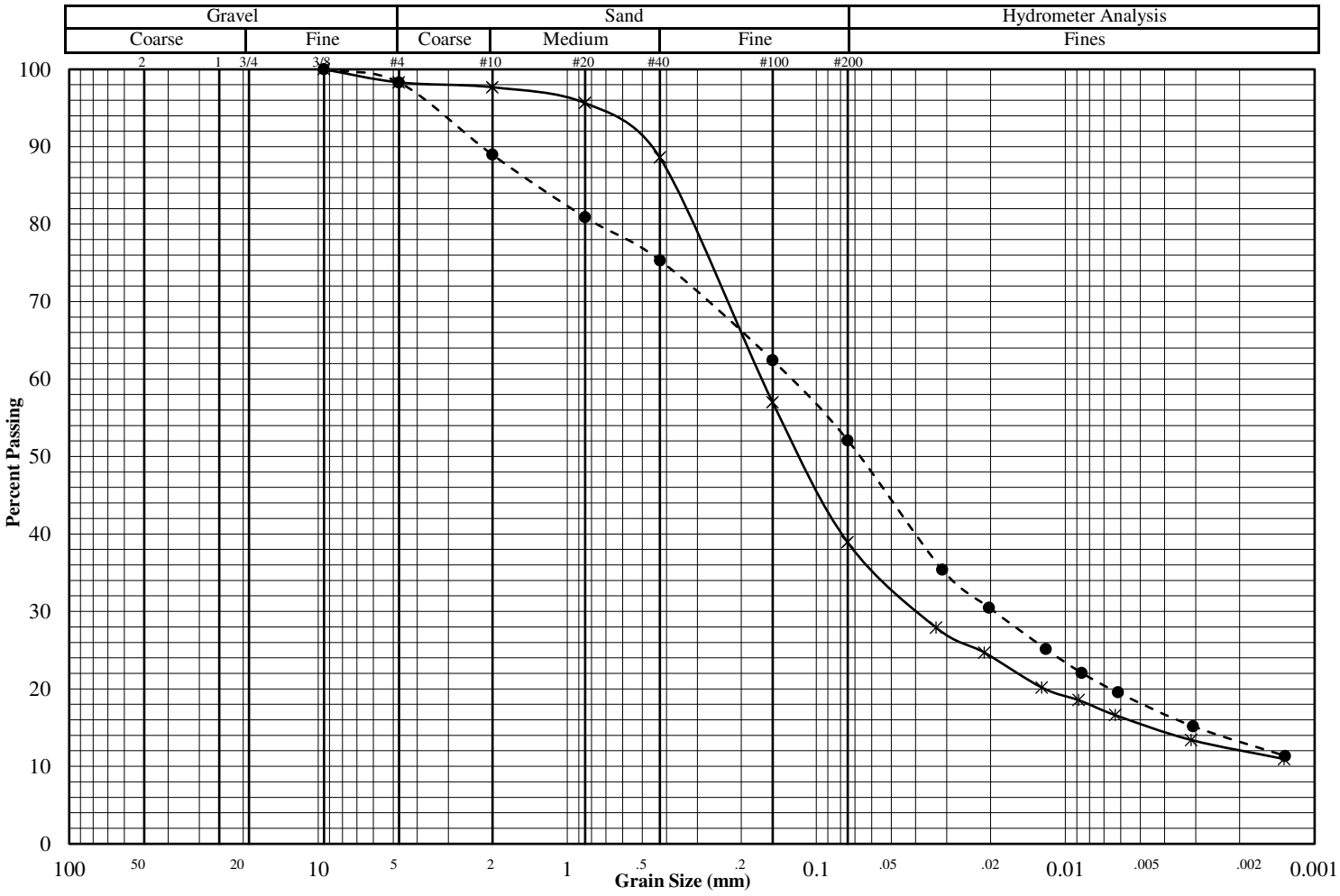
GRADATION CURVES

Grain Size Distribution ASTM D422-16

Job No. : **15997-A**

Project:	White Pine Mine - #0040820	Test Date:	10/10/25
Reported To:	American Engineering Testing, Inc.	Report Date:	10/17/25

	Location / Boring No.	Depth (ft)	Sample Type	Soil Classification
*	50:50 Stockpile #1 & Tailings #1		Bulk	Silty Clayey Sand (SC-SM)
●	50:50 Stockpile #1 & Tailings #2		Bulk	Sandy Lean Clay w/a trace of glass pieces (CL)
◇				



Additional Results	*	●	◇
Liquid Limit	18	24	
Plastic Limit	14	16	
Plasticity Index ASTM:D4318	4	8	
Water Content ASTM:D2216			
Dry Density (pcf) ASTM:D7263			
Specific Gravity ASTM:D854	2.81*	2.81*	
Porosity			
Organic Content ASTM:D2974			
pH ASTM:D4972 Method B			

(* = assumed)

Percent Passing

	*	●	◇
Mass (g)	498.1	198.7	
2"			
1.5"			
1"			
3/4"			
3/8"	100.0	100.0	
#4	98.3	98.3	
#10	97.7	89.0	
#20	95.7	80.9	
#40	88.6	75.3	
#100	57.0	62.4	
#200	38.9	52.1	

	*	●	◇
D_{60}			
D_{30}			
D_{10}			
C_U			
C_C			

Remarks:

9530 James Ave South

SOIL ENGINEERING TESTING, INC.

Bloomington, MN 55431

Grain Size Distribution ASTM D422-16

Job No. : **15997-A**

Project:	White Pine Mine - #0040820	Test Date:	10/10/25
Reported To:	American Engineering Testing, Inc.	Report Date:	10/17/25

	Location / Boring No.	Depth (ft)	Sample Type	Soil Classification
Spec 1	50:50 Stockpile #1 & Tailings #1		Bulk	Silty Clayey Sand (SC-SM)
Spec 2	50:50 Stockpile #1 & Tailings #2		Bulk	Sandy Lean Clay w/a trace of glass pieces (CL)
Spec 3				

Sieve Data

Specimen 1		Specimen 2		Specimen 3	
Sieve	% Passing	Sieve	% Passing	Sieve	% Passing
2"		2"		2"	
1.5"		1.5"		1.5"	
1"		1"		1"	
3/4"		3/4"		3/4"	
3/8"	100.0	3/8"	100.0	3/8"	
#4	98.3	#4	98.3	#4	
#10	97.7	#10	89.0	#10	
#20	95.7	#20	80.9	#20	
#40	88.6	#40	75.3	#40	
#100	57.0	#100	62.4	#100	
#200	38.9	#200	52.1	#200	

Hydrometer Data

Specimen 1		Specimen 2		Specimen 3	
Diameter (mm)	% Passing	Diameter	% Passing	Diameter	% Passing
0.033	27.9	0.031	35.4		
0.021	24.7	0.020	30.5		
0.012	20.2	0.012	25.2		
0.009	18.6	0.009	22.1		
0.006	16.6	0.006	19.6		
0.003	13.4	0.003	15.2		
0.001	10.9	0.001	11.4		

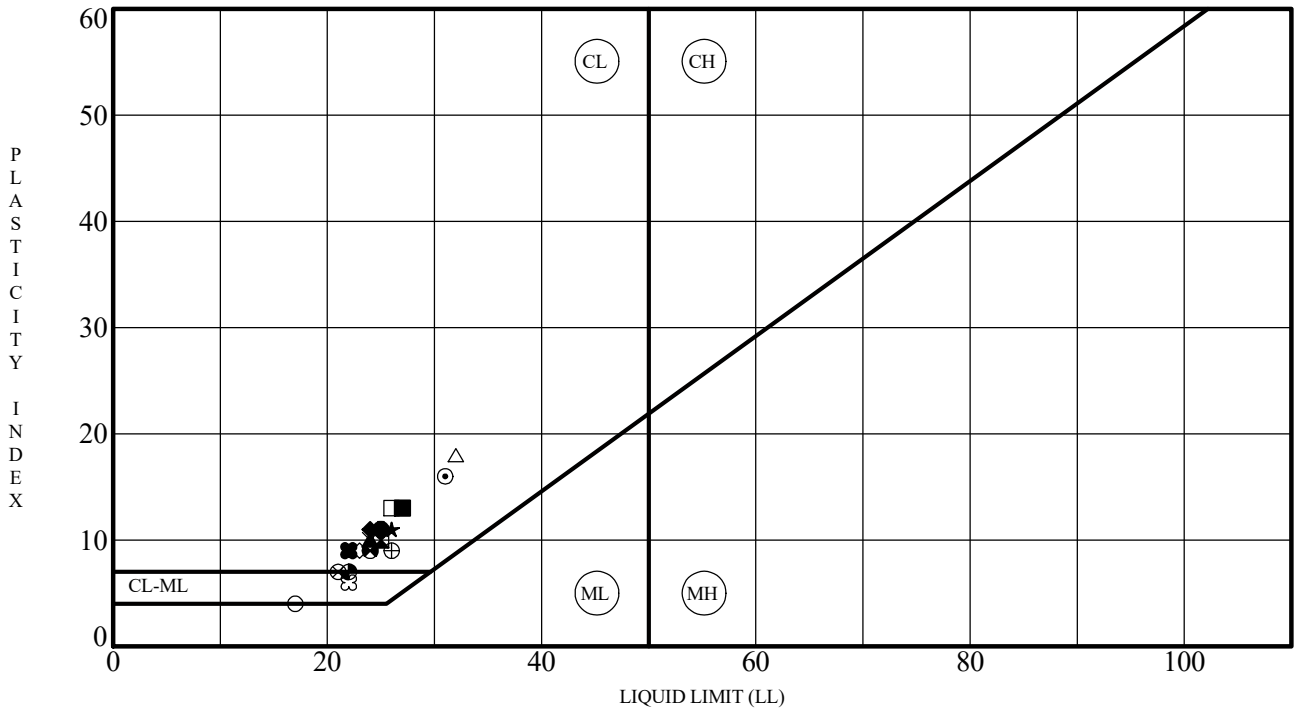
Remarks

Specimen 1	Specimen 2	Specimen 3

9530 James Ave South

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Specimen Identification			LL	PL	PI	Fines	Classification
●	B-2	13.0'	25	14	11	70.6	Lean clay with sand (CL)
⊠	B-2	23.0'	25	15	10	74.1	Lean clay with sand (CL)
▲	B-2	53.0'	24	14	10	73.1	Lean clay with sand (CL)
★	B-3	13.0'	26	15	11	78.3	Lean clay with sand (CL)
⊙	B-3	33.0'	31	15	16	76.9	Lean clay with sand (CL)
✿	B-4B	13.0'	25	14	11	74.2	Mix of lean clay with sand and sandy silt
○	B-4B	42.4'	17	13	4	64.7	Sandy silty clay (CL-ML)
△	B-5A	43.0'	32	14	18	71.8	Lean clay with sand (CL)
⊗	B-5B	13.0'	21	14	7	65.2	Mix of sandy silt and clayey sand
⊕	B-5B	23.0'	26	17	9	54.3	Mix of sandy silt and sandy lean clay
□	B-5B	43.5'	26	13	13	59.3	Sandy lean clay (CL)
⊛	B-6A	20.5'	24	15	9	70.5	Lean clay with sand, a little gravel (CL)
◕	B-6A	39.8'	22	15	7	66.2	Sandy lean clay (CL)
☆	B-6B	10.5'	27	14	13	71.0	Lean clay with sand (CL)
⊠	B-6B	15.5'	22	16	6	72.1	Silt w/ sand, a little gravel, w/ lenses of lean clay (ML)
■	B-6B	23.0'	27	14	13	78.8	Lean clay with sand (CL)
◆	BH-PFS-1A	5.5'	24	13	11	66.9	Sandy lean clay (CL)
◇	BH-PFS-1A	13.0'	23	14	9	70.7	Lean clay with sand, a little gravel (CL)
×	BH-PFS-1A	33.0'	24	14	10	68.9	Sandy lean clay (CL)
■	BH-PFS-1A	68.0'	22	13	9	65.2	Sandy lean clay, a little gravel (CL)

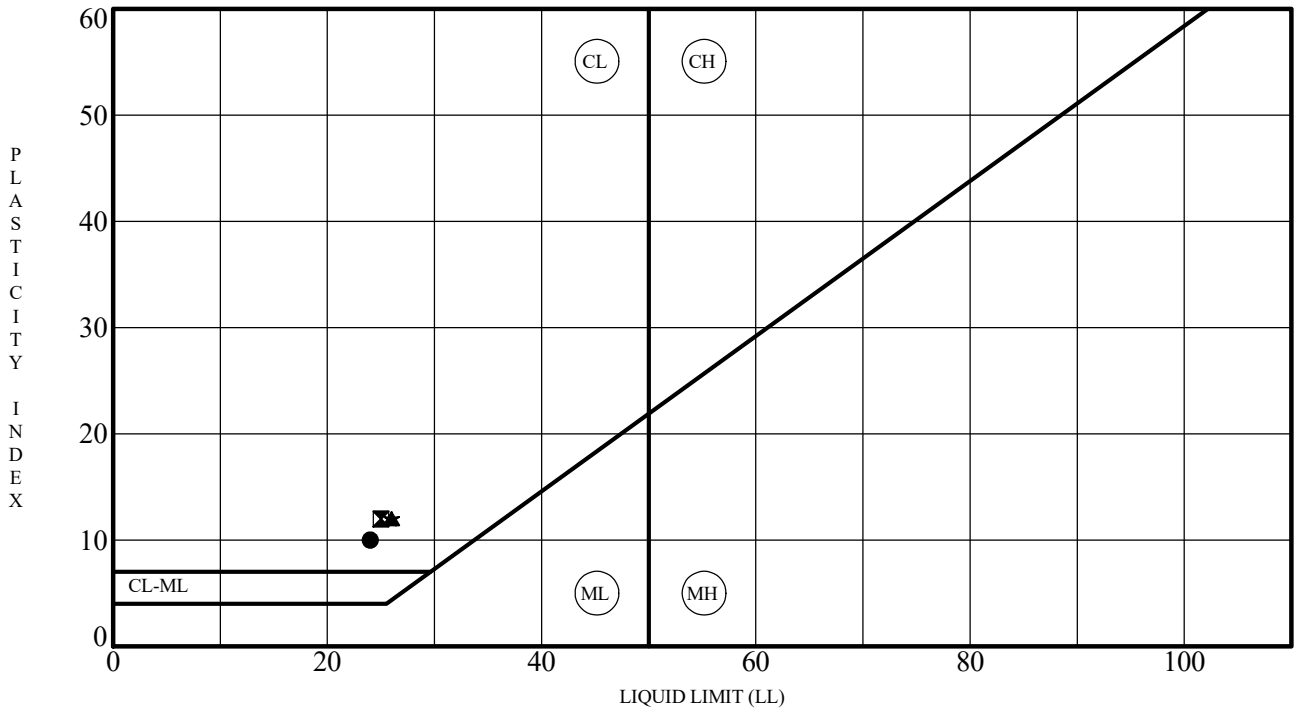
PROJECT **White Pine Mine; Carp Lake Township; Ontonagon County, Michigan**

AET JOB NO. **P-0040820**

DATE **3/26/25**

American Engineering Testing, Inc.
550 Cleveland Avenue North
St. Paul, MN 55114
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ATTERBERG LIMITS RESULTS



	Specimen Identification		LL	PL	PI	Fines	Classification
●	**Clay #1**	**1.0'**	**24**	**14**	**10**	**70.1**	**Lean clay with sand (CL)**
⊠	**Clay #2**	**1.0'**	**25**	**13**	**12**	**69.5**	**Sandy lean clay (CL)**
▲	**Clay #3**	**1.0'**	**26**	**14**	**12**	**69.4**	**Lean clay with sand (CL)**
★	**Clay #4**	**1.0'**	**26**	**14**	**12**	**70.8**	**Lean clay with sand (CL)**

PROJECT **White Pine Mine; Carp Lake Township; Ontonagon County, Michigan**

AET JOB NO. **P-0040820**

DATE

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ATTERBERG LIMITS RESULTS

Hydraulic Conductivity Test Data ASTM D2434

Project: White Pine Mine - #0040820 Date: 8/20/2025

Client: American Engineering Testing, Inc. Job No.: 15997

Boring No.: PFS-4A Depth (ft): 32-34

Sample No.: Type: Bag/Bulk

Location:

Soil Type: Sand with silt, fine grained, dark brown (SP-SM)

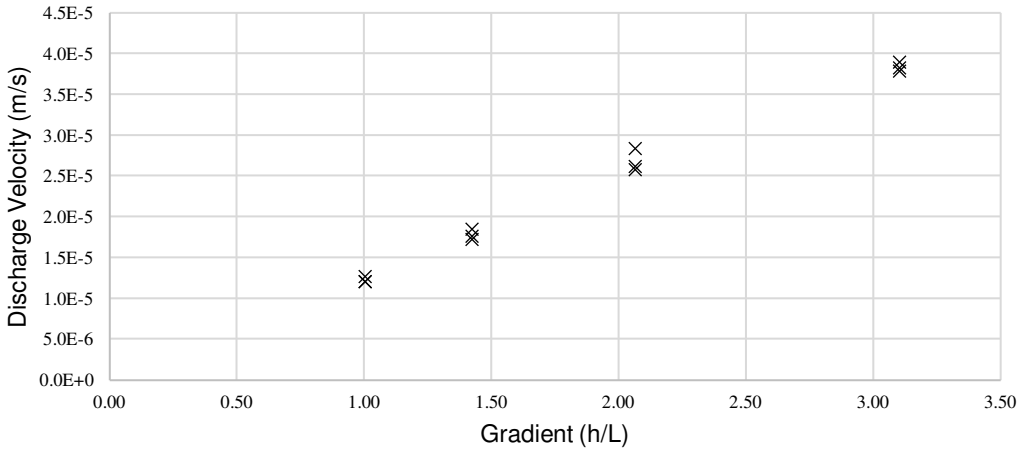
Ht (in) 5.27 Dia. (in): 3.00

W.C.(%): 5.8 Yd (pcf): 94.1

Compaction: Specimen compacted to as close as possible to 90% of standard proctor density at the as received moisture content.

K @ 20°C (cm/sec): 1.2×10^{-3}

K @ 20°C (ft/min): 2.3×10^{-3}



Boring No.: Depth (ft):

Sample No.: Type:

Location:

Soil Type:

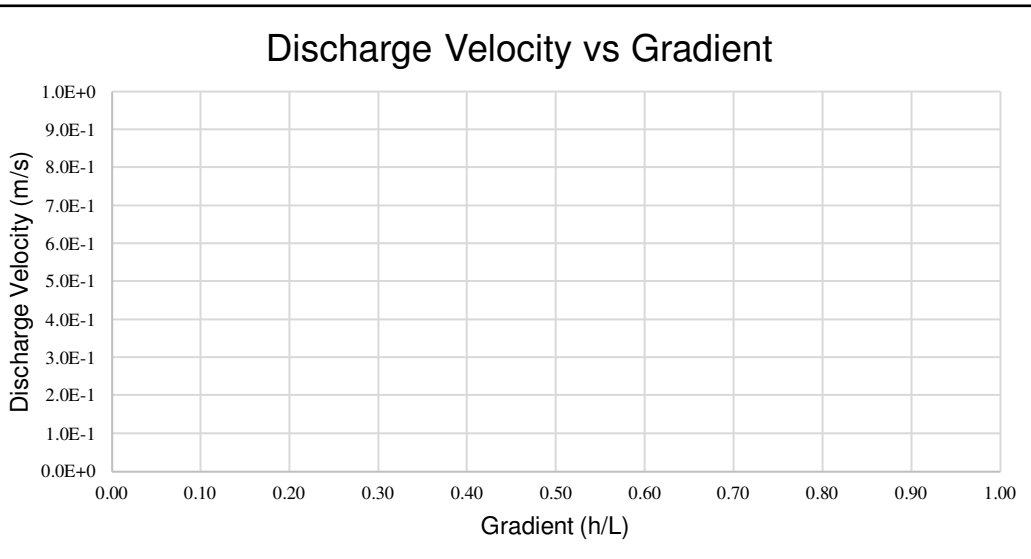
Ht (in) Dia. (in):

W.C.(%): Yd (pcf):

Compaction:

K @ 20°C (cm/sec):

K @ 20°C (ft/min):



Boring No.: Depth (ft):

Sample No.: Type:

Location:

Soil Type:

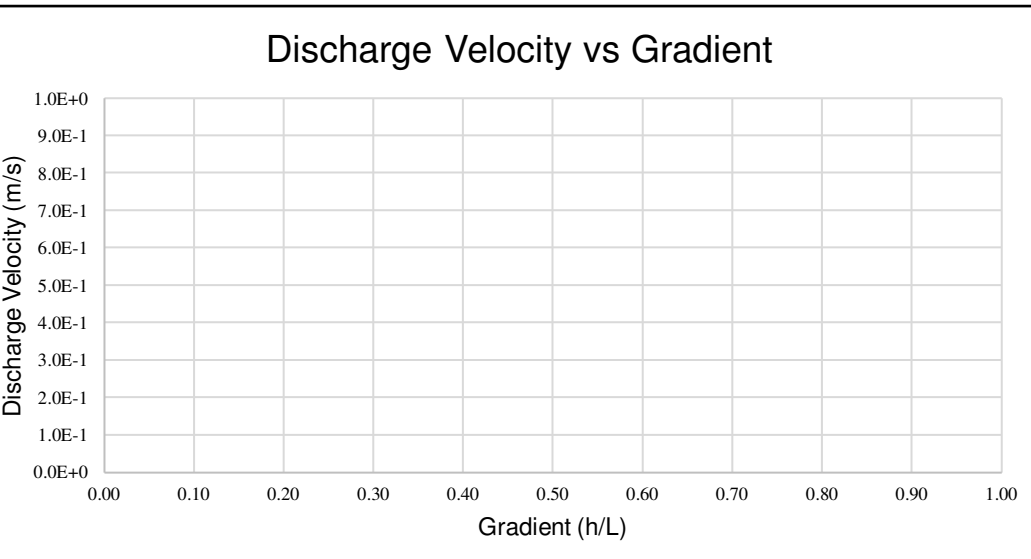
Ht (in) Dia. (in):

W.C.(%): Yd (pcf):

Compaction:

K @ 20°C (cm/sec):

K @ 20°C (ft/min):



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SOIL ENGINEERING TESTING, INC.

Bloomington, MN 55431

Hydraulic Conductivity Test Data ASTM D5084

Project: White Pine Mine - #0040820 Date: 8/21/2025

Client: American Engineering Testing, Inc. Job No.: 15997

Boring No.:	PFS-4B	PFS-6B					
Sample No.:							
Depth (ft):	12-14	22-24					
Location:							
Sample Type:	TWT	TWT					
Soil Classification:	Sandy Lean Clay w/a little gravel (CL)	Lean Clay w/sand and lenses of silt (CL)					
Atterberg Limits Liquid Limit:							
Plastic Limit:							
Plasticity Index:							
Permeability Test	Intact Flex Wall	Intact Flex Wall					
Before Test Conditions Saturation %:							
Porosity:							
Height (in):	2.50	2.70					
Diameter (in):	2.86	2.86					
Dry Density (pcf):	127.2	115.1					
Water Content:	11.1%	14.5%					
Test Conditions Test Type:	Falling Head	Falling Head					
Max Head (ft):	5.0	5.0					
Confining press. (Effective-psi):	2.0	2.0					
Trial Numbers:	8-12	9-13					
Water Temp °C:	23.0	23.0					
Compaction:							
Saturation %:	97.2%	95.8%					
Coefficient of Permeability							
K @ 20 °C (cm/sec)	**2.2×10^{-8}**	**6.2×10^{-7}**					
K @ 20 °C (ft/min)	**4.3×10^{-8}**	**1.2×10^{-6}**					
Notes:							

9530 James Ave South

SOIL ENGINEERING TESTING, INC.

Bloomington, MN 55431

AET, Inc
American Engineering Testing
550 Cleveland Ave. North
St. Paul, MN 55114
651-659-9001

Hydraulic Conductivity / Permeability

ASTM D 5084

AET Project No.: P-0040820 Project Name: White Pine Mine

Project Location: Ontonagon County, MI Project Manager: B. Mattson

Date Submitted: By: AET Date Tested: 5/6/2025 Tested By: B. Pomroy

Sample Description: Clay, red (CL) (Contained a root passing horizontally across the specimen)

Boring Number: BH-PFS-1A Sample No.: BH-PFS-1A, 32' - 34' Depth: 32' - 34'

Initial Sample		Final Sample			
Sample Wt: (g)	582.98	Sample Wt: (g)	590.83	Specific Gravity:	2.700
Length: (in)	2.594	Length: (in)	2.598	Assumed/Tested:	Assumed
Diameter: (in)	2.847	Diameter: (in)	2.840		
Area: (in^2)	6.367	Area: (in^2)	6.336	Permeant Liquid:	Deaired Tap Water
Volume: (cf)	0.0096	Volume: (cf)	0.0095	Cell Pressure: (psi)	80
MC: (%)	15.24	MC: (%)	16.79	Consolidation Stress: (psi)	4.4
Dry Unit Wt: (pcf)	116.71	Dry Unit Wt: (pcf)	117.10	Burette Area: (cm)	1.00
Saturation: (%)	92.73	Saturation: (%)	103.31		

Average Hydraulic Conductivity at 20 oC: 9.84E-07 cm/sec

2.79E-03 ft/day

Reviewed By:

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St. Paul, MN 55114
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Hydraulic Conductivity / Permeability

ASTM D 5084

AET Project No.: P-0040820 Project Name: White Pine Mine

Project Location: White Pine, MI Project Manager: B. Mattson

Date Submitted: By: AET Date Tested: 8/20/2025 Tested By: BAP

Sample Description: Sandy Lean Clay, red (CL). Contains one 0.66" x 0.45" x 0.37" rock

Boring Number: 1A Sample No.: BH-PFS-1A, 67' - 69' Depth: 67' - 69'

Initial Sample		Final Sample			
Sample Wt: (g)	865.81	Sample Wt: (g)	871.50	Specific Gravity:	2.700
Length: (in)	3.733	Length: (in)	3.733	Assumed/Tested:	Assumed
Diameter: (in)	2.829	Diameter: (in)	2.837		
Area: (in^2)	6.284	Area: (in^2)	6.323	Permeant Liquid:	Deaired Tap Water
Volume: (cf)	0.0136	Volume: (cf)	0.0137	Cell Pressure: (psi)	80
MC: (%)	11.55	MC: (%)	12.28	Consolidation Stress: (psi)	4.0
Dry Unit Wt: (pcf)	126.08	Dry Unit Wt: (pcf)	125.29	Burette Area: (cm)	1.00
Saturation: (%)	92.72	Saturation: (%)	96.19		

Average Hydraulic Conductivity at 20 oC: 1.99E-07 cm/sec

5.63E-04 ft/day

Reviewed By: _____

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Hydraulic Conductivity / Permeability

ASTM D 5084

AET Project No.: P-0040820 Project Name: White Pine Mine

Project Location: White Pine, MI Project Manager: B. Mattson

Date Submitted: By: AET Date Tested: 9/12/2025 Tested By: B. Pomroy

Sample Description: Clay, red (CL) Vertical silt seam discovered after test

Boring Number: 2 Sample No.: BH-PFS-2, 52' - 54' Depth: 52' - 54'

Initial Sample		Final Sample			
Sample Wt: (g)	957.98	Sample Wt: (g)	968.97	Specific Gravity:	2.700
Length: (in)	4.030	Length: (in)	4.020	Assumed/Tested:	Assumed
Diameter: (in)	2.855	Diameter: (in)	2.871		
Area: (in^2)	6.403	Area: (in^2)	6.475	Permeant Liquid:	Deaired Tap Water
Volume: (cf)	0.0149	Volume: (cf)	0.0151	Cell Pressure: (psi)	80
MC: (%)	11.69	MC: (%)	12.97	Consolidation Stress: (psi)	4.0
Dry Unit Wt: (pcf)	126.64	Dry Unit Wt: (pcf)	125.54	Burette Area: (cm)	1.00
Saturation: (%)	95.54	Saturation: (%)	102.41		

Average Hydraulic Conductivity at 20 oC: 1.37E-05 cm/sec

3.89E-02 ft/day

Reviewed By: _____

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Hydraulic Conductivity / Permeability

ASTM D 5084

AET Project No.: P-0040820 Project Name: White Pine Mine

Project Location: Ontonagon County, MI Project Manager: B. Mattson

Date Submitted: By: AET Date Tested: 7/3/2025 Tested By: B. Pomroy

Sample Description: Clay, red (CL)

Boring Number: BH-PFS-3 Sample No.: BH-PFS-3 Depth: 32' - 34'

Initial Sample		Final Sample			
Sample Wt: (g)	1080.71	Sample Wt: (g)	1086.05	Specific Gravity:	2.700
Length: (in)	4.805	Length: (in)	4.804	Assumed/Tested:	Assumed
Diameter: (in)	2.853	Diameter: (in)	2.859		
Area: (in^2)	6.394	Area: (in^2)	6.420	Permeant Liquid:	Deaired Tap Water
Volume: (cf)	0.0178	Volume: (cf)	0.0178	Cell Pressure: (psi)	80.5
MC: (%)	18.13	MC: (%)	18.71	Consolidation Stress: (psi)	3.5
Dry Unit Wt: (pcf)	113.46	Dry Unit Wt: (pcf)	113.04	Burette Area: (cm)	1.00
Saturation: (%)	100.93	Saturation: (%)	103.01		

Average Hydraulic Conductivity at 20 oC: 2.24E-08 cm/sec

6.34E-05 ft/day

Reviewed By: _____

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651-659-9001

Hydraulic Conductivity / Permeability

ASTM D 5084

AET Project No.: P-0040820 Project Name: White Pine Mine

Project Location: White Pine, MI Project Manager: B. Mattson

Date Submitted: By: AET Date Tested: 10/5/2025 Tested By: B. Pomroy

Sample Description: Sandy Lean Clay, red (CL). Contained horizontal laminations of cyclone sand

Boring Number: BH-PFS-5A Sample No.: BH-PFS-5A(42-44ft) Depth: 42' - 44'

Initial Sample		Final Sample			
Sample Wt: (g)	1188.36	Sample Wt: (g)	1199.71	Specific Gravity:	2.700
Length: (in)	5.099	Length: (in)	5.097	Assumed/Tested:	Assumed
Diameter: (in)	2.840	Diameter: (in)	2.857		
Area: (in^2)	6.335	Area: (in^2)	6.412	Permeant Liquid:	Deaired Tap Water
Volume: (cf)	0.0187	Volume: (cf)	0.0189	Cell Pressure: (psi)	80
MC: (%)	13.81	MC: (%)	14.90	Consolidation Stress: (psi)	4.0
Dry Unit Wt: (pcf)	123.17	Dry Unit Wt: (pcf)	121.74	Burette Area: (cm)	1.00
Saturation: (%)	101.35	Saturation: (%)	104.77		

Average Hydraulic Conductivity at 20 oC: 1.15E-07 cm/sec

3.27E-04 ft/day

Reviewed By: _____

Hydraulic Conductivity Test Data ASTM D2434

Project: White Pine Mine - #0040820 Date: 10/17/2025

Client: American Engineering Testing, Inc. Job No.: 15997-A

Boring No.: Depth (ft):

Sample No.: Tailings #1 Type: Bulk

Location:

Soil Type: Sand w/silt, fine grained, dark brown (SP-SM)

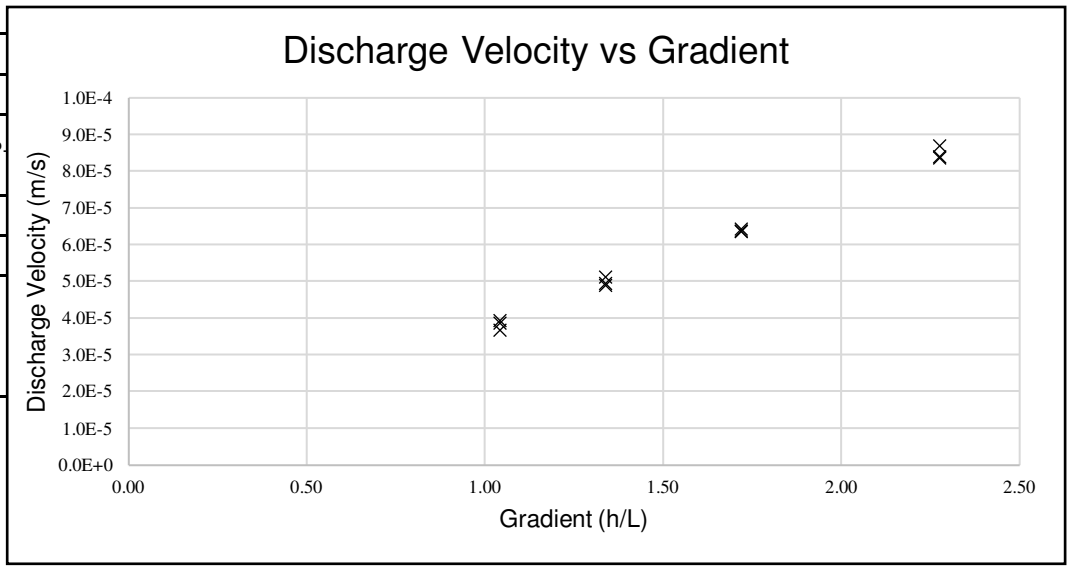
Ht (in) 5.30 Dia. (in): 3.00

W.C.(%): 14.3 Yd (pcf): 96.7

Compaction: Specimen reconstituted as close to 95% of maximum standard proctor density as possible at the optimum moisture content

K @ 20°C (cm/sec): 3.5×10^{-3}

K @ 20°C (ft/min): 7.0×10^{-3}



Boring No.: Depth (ft):

Sample No.: Type:

Location:

Soil Type:

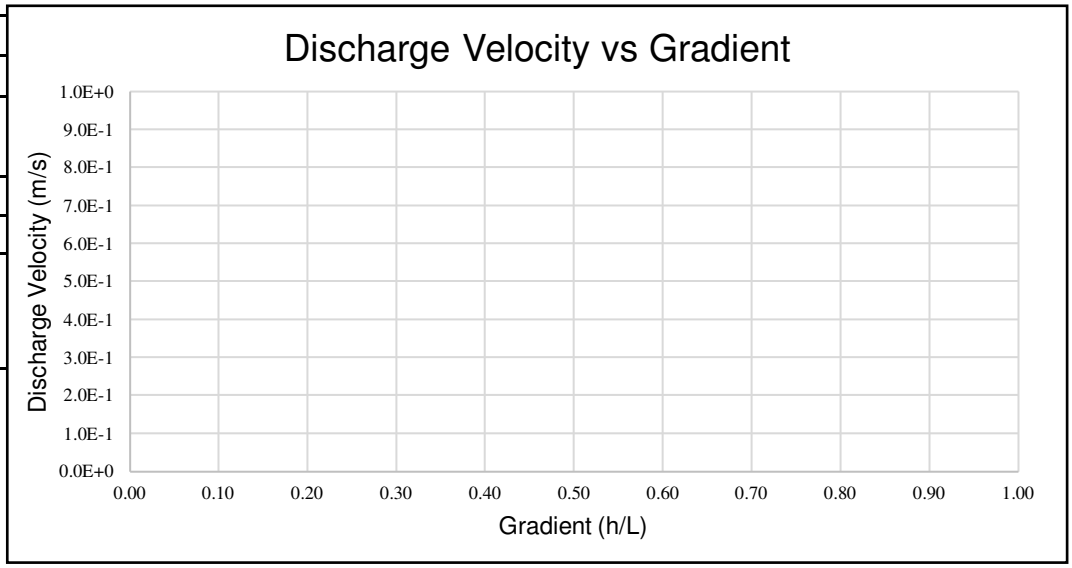
Ht (in) Dia. (in):

W.C.(%): Yd (pcf):

Compaction:

K @ 20°C (cm/sec):

K @ 20°C (ft/min):



Boring No.: Depth (ft):

Sample No.: Type:

Location:

Soil Type:

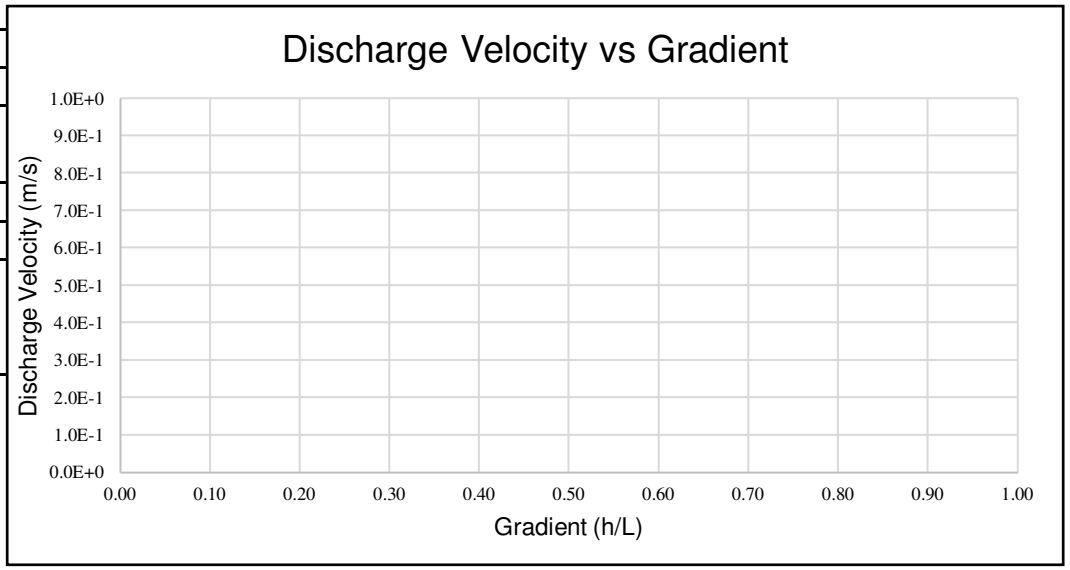
Ht (in) Dia. (in):

W.C.(%): Yd (pcf):

Compaction:

K @ 20°C (cm/sec):

K @ 20°C (ft/min):



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Hydraulic Conductivity Test Data ASTM D5084

Project: White Pine Mine - #0040820 Date: 10/27/2025

Client: American Engineering Testing, Inc. Job No.: 15997-A

Boring No.:								
Sample No.:		Clay Stockpile #1	50:50 Stockpile #1 & Tailings #1	50:50 Stockpile #1 & Tailings #2				
Depth (ft):								
Location:								
Sample Type:		Bulk	Bulk	Bulk				
Soil Classification:		Lean Clay w/sand (CL)	Silty Clayey Sand (SC-SM)	Sandy Lean Clay w/a trace of glass pieces (CL)				
Atterberg Limits	Liquid Limit:							
	Plastic Limit:							
	Plasticity Index:							
Permeability Test		Reconsituted Flex Wall	Reconsituted Flex Wall	Reconsituted Flex Wall				
Before Test Conditions	Saturation %:							
	Porosity:							
	Height (in):	3.00	3.00	3.00				
	Diameter (in):	2.86	2.86	2.86				
	Dry Density (pcf):	117.8	116.3	119.7				
	Water Content:	11.7%	12.0%	10.6%				
Test Conditions	Test Type:	Falling Head	Falling Head	Falling Head				
	Max Head (ft):	5.0	5.0	5.0				
	Confining press. (Effective-psi):	2.0	2.0	2.0				
	Trial Numbers:	8-12	10-14	11-15				
	Water Temp °C:	23.0	23.0	23.0				
	Compaction:	95.1%	95.0%	94.2%				
	Saturation %:	96.8%	96.6%	97.1%				
Coefficient of Permeability								
K @ 20 °C (cm/sec)		**2.7×10^{-7}**	**4.4×10^{-5}**	**5.8×10^{-6}**				
K @ 20 °C (ft/min)		**5.3×10^{-7}**	**8.7×10^{-5}**	**1.1×10^{-5}**				
Notes:		Samples reconstituted to approximately 95% of maximum standard proctor density near the optimum moisture content.						

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ET OIL ENGINEERING TESTING, INC.

Bloomington, MN 55431

Direct Shear Test

ASTM D3080

Job No.: 15997

Project/Client: **White Pine Mine - #0040820 / American Engineering Testing, Inc.**

Boring No.: **BH-PFS-6A** Sample No. Depth: **32'-34'**

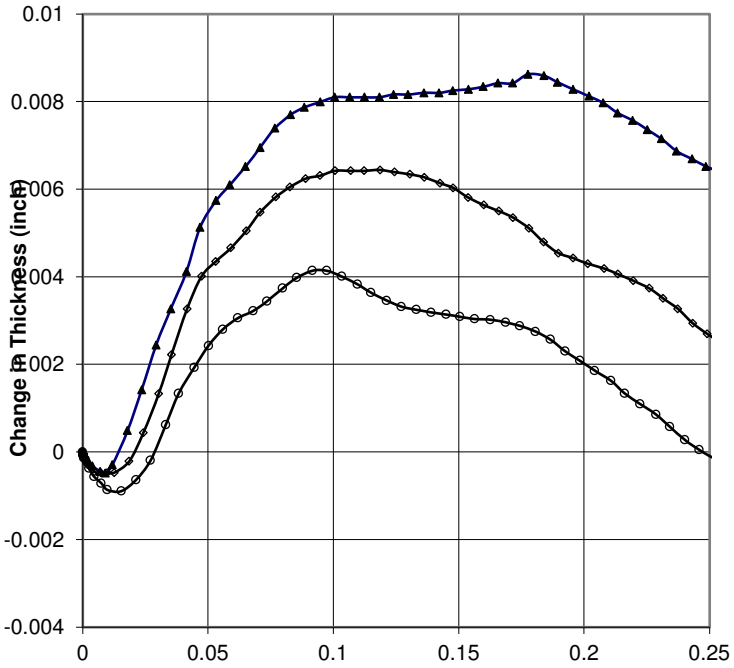
Location: Sample Type: **TWT**

Soil Type: **Sand with Silt (SP-SM)**

Test Date:	**8/15/2025**
Date Reported:	**8/20/2025**
Shear Rate	
0.003 (in/min)	
Liquid Limit:	
Plastic Limit:	
Plasticity Index:	
Specific Gravity (*):	**2.68**

Remarks: Specimens compacted to given density and moisture content (90% of provided maximum proctor density) using -#4 material; Inundated after applying normal load. Consolidated and sheared to given displacements at constant rate of 0.003 inches/minute.

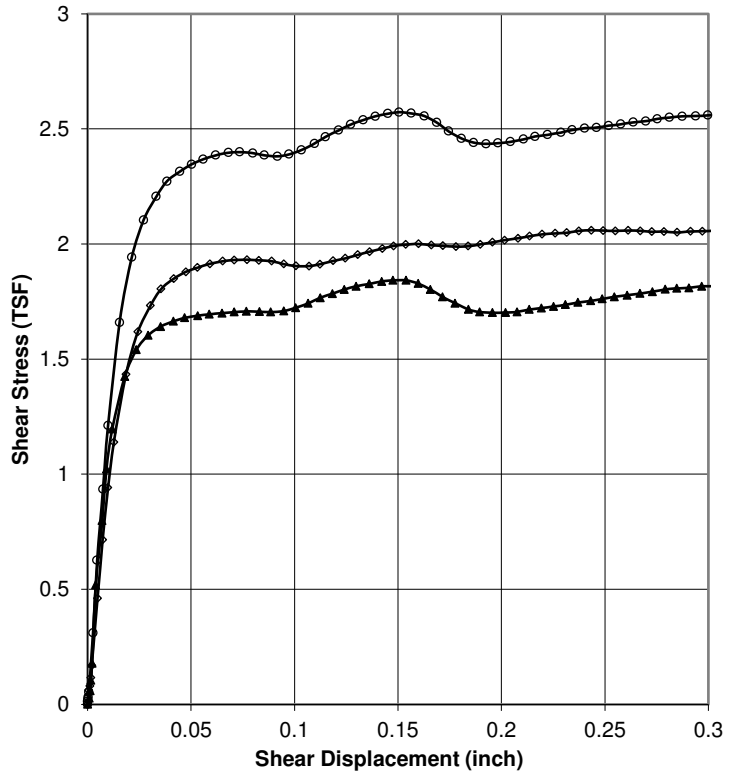
(*) = Assumed Specific Gravity

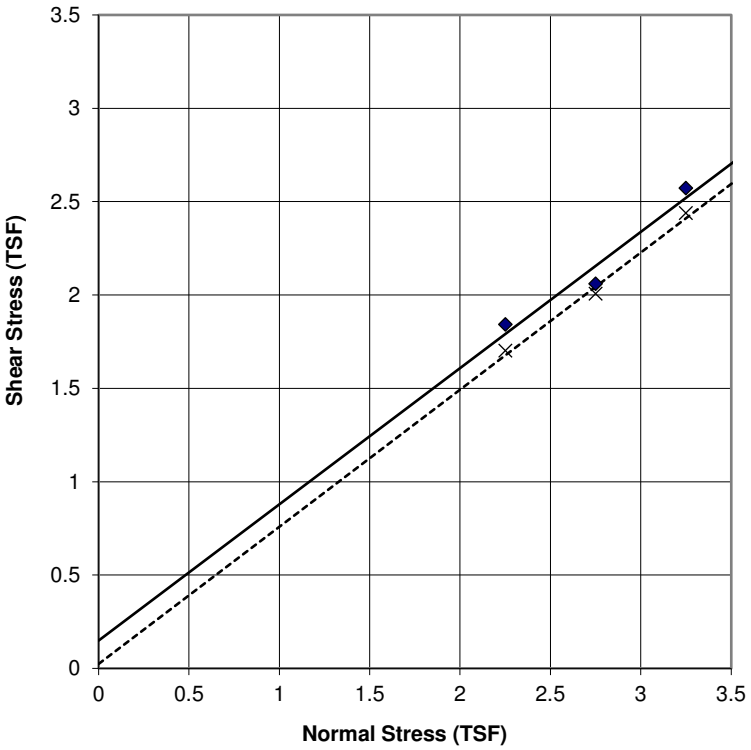


Failure Criterion:				
Max Stress	A	B	C	D
Initial	▲	◇	○	X
Diameter (In.)	2.50	2.50	2.50	
Thickness (In.)	0.95	0.95	0.95	
Water Content (%)	6.2	6.2	6.2	
Dry Density (pcf)	96.8	96.8	96.8	
Before Shear				
Thickness (In.)	0.94	0.93	0.93	
Water Content (%)	26.2	26.0	26.0	
Dry Density (pcf)	98.3	98.5	98.6	
Normal Stress	2.25	2.75	3.25	
Shear Stress	1.84	2.06	2.57	

"These tests are for informational purposes only and must be reviewed by a qualified professional engineer to verify that the test parameters shown are appropriate for any particular design."

Peak Conditions		At Given Shear Disp. Of:	0.2
Friction Angle:	ϕ= **36.1 deg.**	Friction Angle:	ϕ= **36.3 deg.**
Apparent Cohesion	**0.151 TSF**	Apparent Cohesion	**0.024 TSF**





9530 James Ave South

SOIL ENGINEERING TESTING, INC.

Bloomington, MN 55431

Direct Shear Test

ASTM D3080

Job No.: 15997

Project/Client: **White Pine Mine - #0040820 / American Engineering Testing, Inc.**

Boring No.: **BH-PFS-6B** Sample No. Depth: **22'-24'**

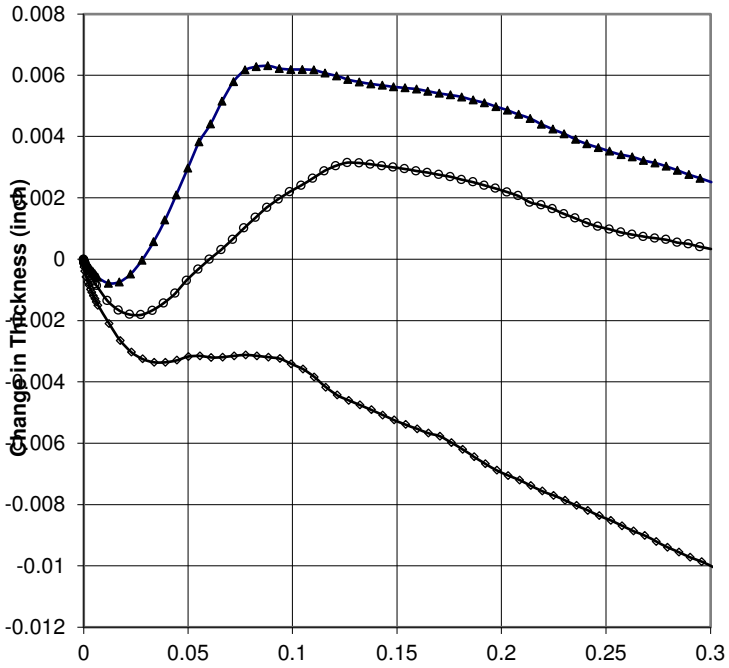
Location: Sample Type: **TWT**

Soil Type: **Lean Clay with lenses of Silt (CL)**

Test Date:	**8/15/2025**
Date Reported:	**8/20/2025**
Shear Rate	
0.0008 (in/min)	
Liquid Limit:	
Plastic Limit:	
Plasticity Index:	
Specific Gravity (*):	**2.68**

Remarks: Specimens trimmed to given sizes; Inundated after applying normal load. Consolidated and sheared to given displacements at constant rate of 0.0008 inches/minute.

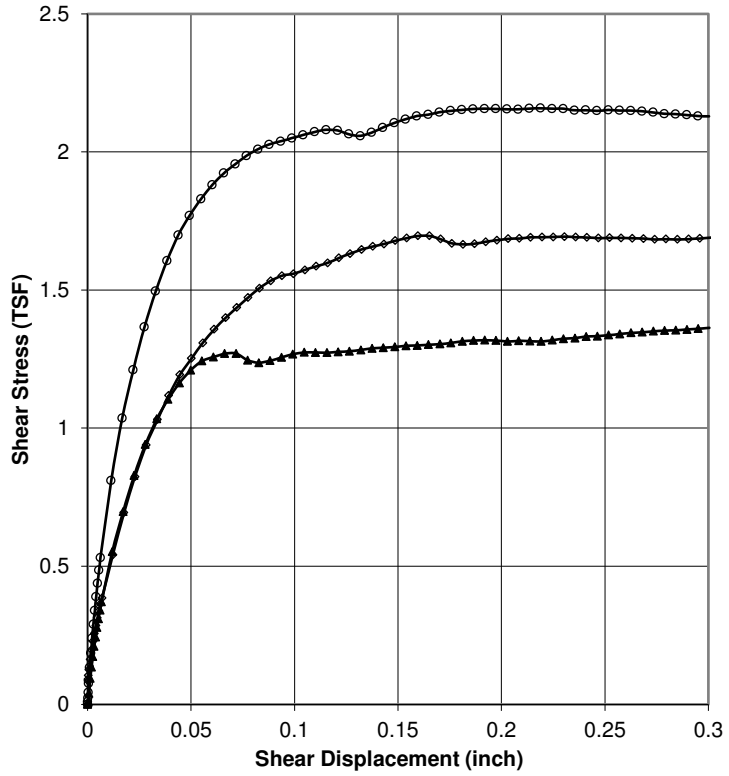
(*) = Assumed Specific Gravity

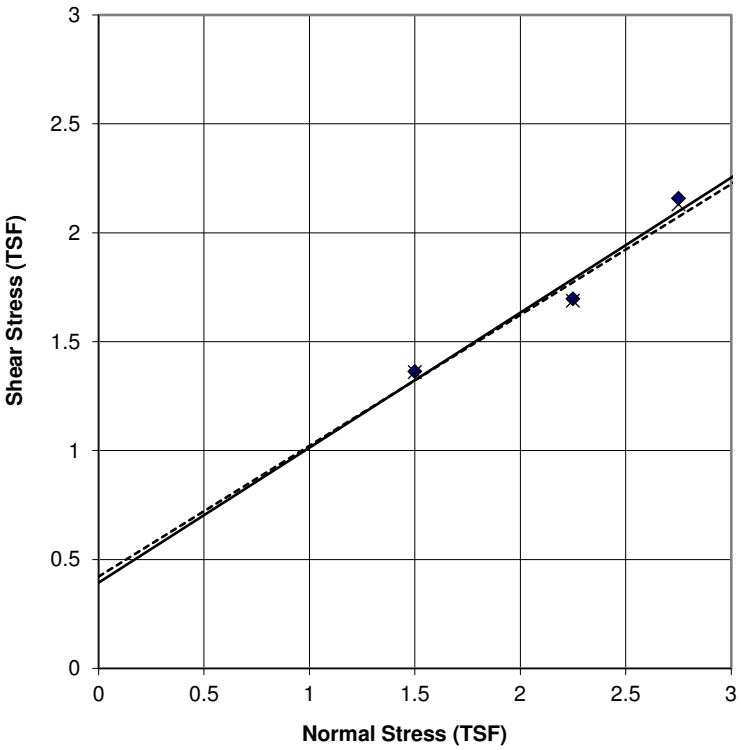


Failure Criterion:				
Max Stress	A	B	C	D
Initial	▲	◇	○	X
Diameter (In.)	2.50	2.50	2.50	
Thickness (In.)	0.97	0.97	0.97	
Water Content (%)	15.0	14.9	15.2	
Dry Density (pcf)	113.5	110.1	114.5	
Before Shear				
Thickness (In.)	0.94	0.94	0.94	
Water Content (%)	16.5	17.6	15.7	
Dry Density (pcf)	116.1	113.6	117.8	
Normal Stress	1.50	2.25	2.75	
Shear Stress	1.36	1.70	2.16	

"These tests are for informational purposes only and must be reviewed by a qualified professional engineer to verify that the test parameters shown are appropriate for any particular design."

Peak Conditions		At Given Shear Disp. Of:	0.3
Friction Angle:	ϕ= **31.8 deg.**	Friction Angle:	ϕ= **31.0 deg.**
Apparent Cohesion	**0.394 TSF**	Apparent Cohesion	**0.422 TSF**





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Direct Shear Test (AASHTO T236)

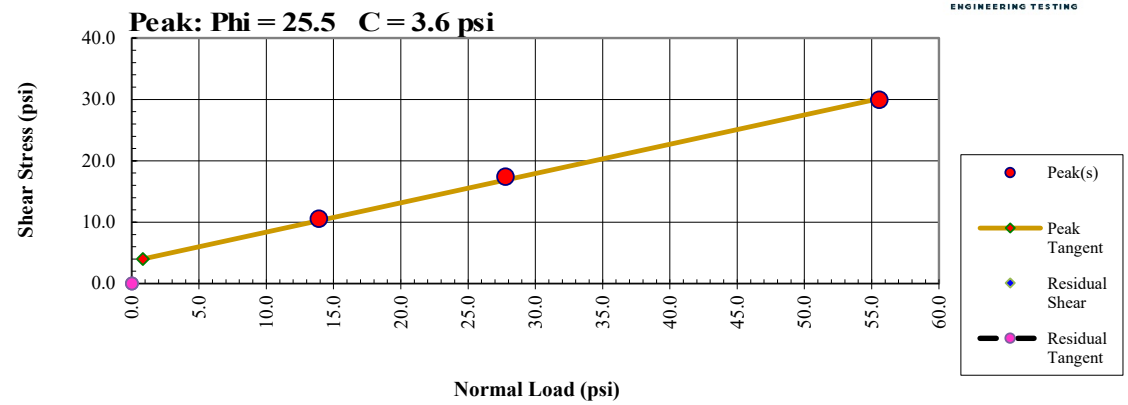
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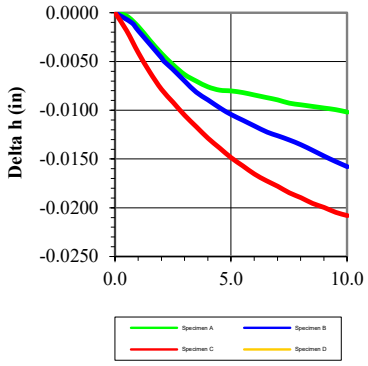
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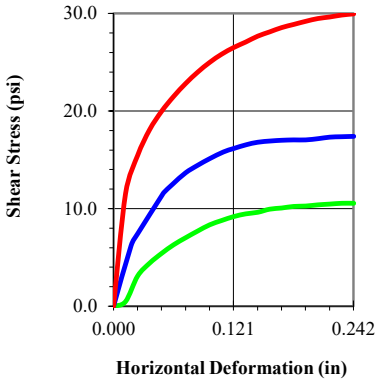
4/26/2025

Date

Tested By: Greg Burgess







Initial	Specimen A	B	C	D
Moisture (%)	17.49	16.17	18.22	
Density (pcf)	110.58	109.48	107.59	
Void Ratio	0.524	0.540	0.567	
Saturation (%)	90.07	80.92	86.81	
Diameter (in)	2.419	2.419	2.419	
Height (in)	1.000	1.000	1.000	

Final	A	B	C	D
Moisture (%)	19.10	19.81	18.66	
Density (pcf)	114.30	110.69	110.12	
Void Ratio	0.475	0.523	0.531	
Saturation (%)	100.00	100.00	100.00	
Diameter (in)	2.419	2.419	2.419	
Height (in)	0.960	0.939	0.914	
Normal Stress (psi)	13.9	27.8	55.6	
Peak Stress (psi)	10.5	17.4	30.0	
Residual Stress (psi)	N/A	N/A	N/A	
Strain (%)	10.017	10.017	10.017	
Rate (in/min)	0.00318	0.00402	0.00162	

Project Date	
Date	4/25/2025

Project:	White Pine Mine	N/A	N/A	N/A	N/A
Location:	White Pine, MI				
Project Number:	P-0040820				
Boring Number	BH-PFS-3				
Sample Number:	BH-PFS-3, 32' - 34'				
Depth:	32' - 34'				
Sample Type:	Undisturbed	Failure Photographs			
Description:	Clay, red (CL)				
Test Type:	Direct Shear				
Remarks:					

American Engineering Testing

Direct Shear Test (AASHTO T236)

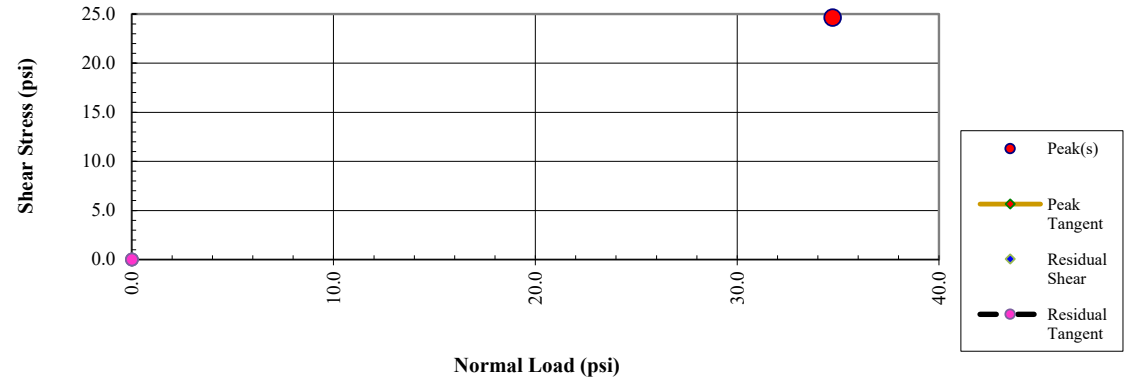
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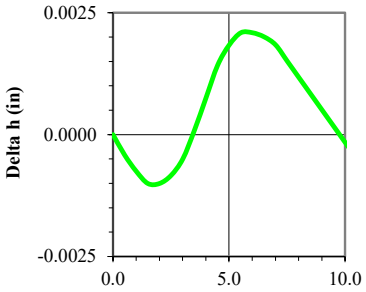
Checked By: Benjamin Pomroy

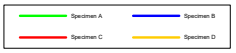
5/16/2025

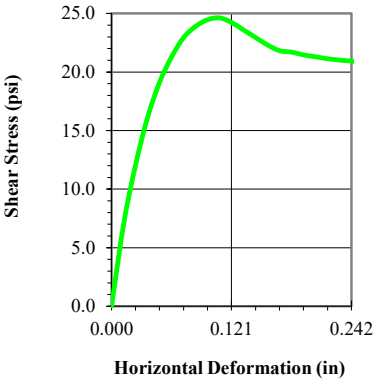
Date

Tested By: Benjamin Pomroy









Initial	Specimen A	B	C	D
Moisture (%)	6.24			
Density (pcf)	128.22			
Void Ratio	0.315			
Saturation (%)	53.54			
Diameter (in)	2.419			
Height (in)	1.000			

Final	A	B	C	D
Moisture (%)	14.13			
Density (pcf)	125.03			
Void Ratio	0.348			
Saturation (%)	100.00			
Diameter (in)	2.419			
Height (in)	0.954			
Normal Stress (psi)	34.7			
Peak Stress (psi)	24.6			
Residual Stress (psi)	20.9			
Strain (%)	4.508			
Rate (in/min)	0.00353			

Project Date	
Date	5/16/25

Project:	White Pine Mine	N/A	N/A	N/A	N/A
Location:	White Pine, MI				
Project Number:	P-0040820				
Boring Number	BH-PFS-4B				
Sample Number:	BH-PFS-4B, 42'-44'				
Depth:	42' - 43.8'				
Sample Type:	Undisturbed	Failure Photographs			
Description:	Clay with Sand, red (CL)				
Test Type:	Direct Shear				
Remarks:					

American Engineering Testing

Direct Shear Test (AASHTO T236)

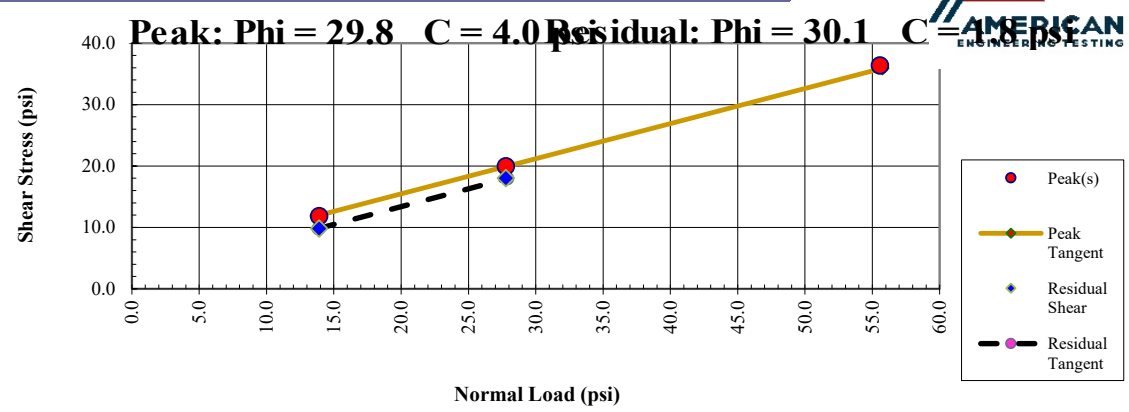
Date: 10/15/2025

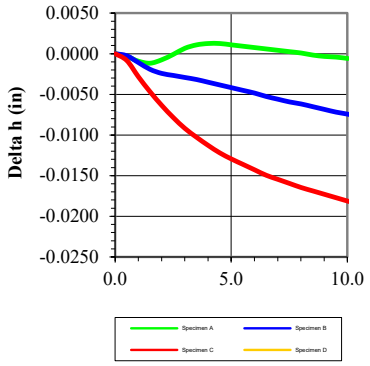
Checked By: Benjamin Pomroy

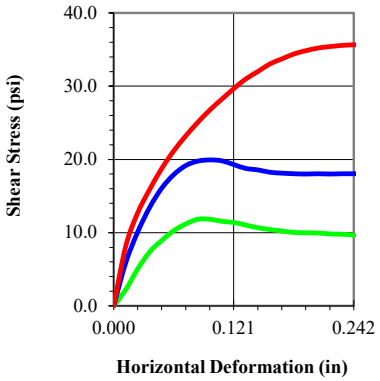
9/9/2025

Date

Tested By: Benjamin Pomroy







Initial	Specimen A	B	C	D
Moisture (%)	12.19	11.73	12.48	
Density (pcf)	123.47	123.17	121.92	
Void Ratio	0.365	0.368	0.382	
Saturation (%)	90.14	85.94	88.10	
Diameter (in)	2.419	2.419	2.419	
Height (in)	1.000	1.000	0.996	

Final	A	B	C	D
Moisture (%)	15.39	15.78	14.60	
Density (pcf)	124.82	123.78	123.03	
Void Ratio	0.350	0.362	0.370	
Saturation (%)	100.00	100.00	100.00	
Diameter (in)	2.419	2.419	2.419	
Height (in)	0.981	0.965	0.946	
Normal Stress (psi)	13.9	27.8	55.6	
Peak Stress (psi)	11.8	19.9	36.4	
Residual Stress (psi)	9.8	18.0	N/A	
Strain (%)	4.007	4.007	10.017	
Rate (in/min)	0.00337	0.0031	0.00216	

Project Date	
Date	9/8/25

Project:	White Pine Mine	N/A	N/A	N/A	N/A
Location:	White Pine, MI				
Project Number:	P-0040820				
Boring Number	BH-PFS-5A				
Sample Number:	BH-PFS-5A, 22'-24'				
Depth:	22' - 24'				
Sample Type:	Undisturbed	Failure Photographs			
Description:	Sandy Lean Clay, red (CL)				
Test Type:	Direct Shear				
Remarks:					

American Engineering Testing

Direct Shear Test (AASHTO T236)

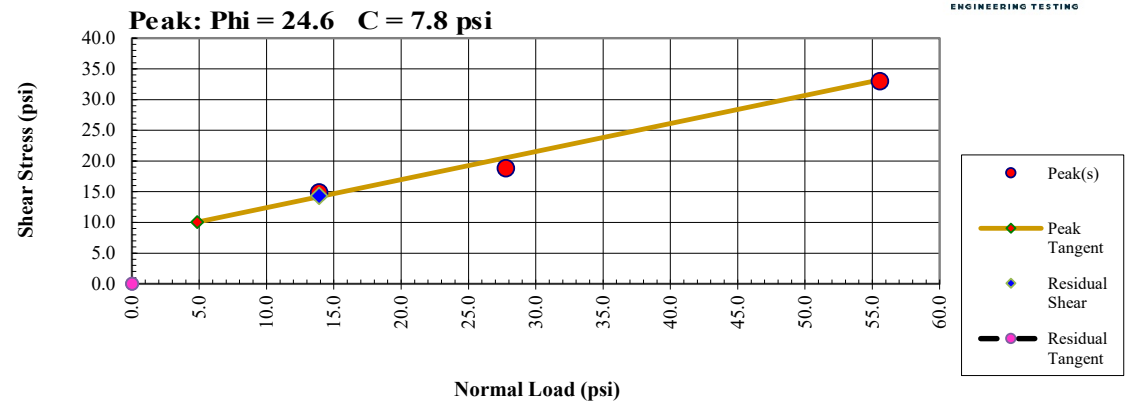
Date: 10/15/2025

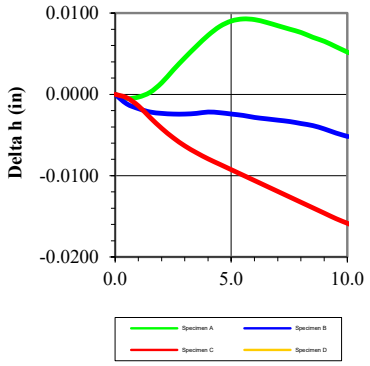
Checked By: Benjamin Pomroy

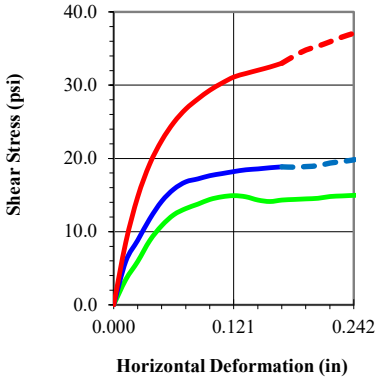
9/4/2025

Date

Tested By: Benjamin Pomroy







Initial	Specimen A	B	C	D
Moisture (%)	12.07	12.65	14.47	
Density (pcf)	126.26	123.59	116.88	
Void Ratio	0.335	0.364	0.442	
Saturation (%)	97.31	93.87	88.37	
Diameter (in)	2.419	2.419	2.419	
Height (in)	0.999	1.003	0.998	

Final	A	B	C	D
Moisture (%)	15.66	16.59	20.39	
Density (pcf)	127.43	125.90	118.05	
Void Ratio	0.323	0.339	0.428	
Saturation (%)	100.00	100.00	100.00	
Diameter (in)	2.419	2.419	2.419	
Height (in)	0.992	0.974	0.948	
Normal Stress (psi)	13.9	27.8	55.6	
Peak Stress (psi)	14.9	18.8	33.0	
Residual Stress (psi)	14.3	N/A	N/A	
Strain (%)	4.508	6.511	6.511	
Rate (in/min)	0.00361	0.00146	0.00355	

Project Date	
Date	8/26/25

Project:	White Pine Mine	N/A	N/A	N/A	N/A
Location:	White Pine, MI				
Project Number:	P-0040820				
Boring Number	BH-PFS-5A				
Sample Number:	BH-PFS-5A, 42'-44'				
Depth:	42' - 44'				
Sample Type:	Undisturbed	Failure Photographs			
Description:	Sandy Lean Clay, red (CL)				
Test Type:	Direct Shear				
Remarks:	Top cap tilting caused shear stress to continue rising after the "peak". Peak stress was determined from data prior to the cap tilting for "B" and "C".				

Direct Shear Test

ASTM D3080

Job No.: 15997-A

Project/Client: **White Pine Mine - #0040820 / American Engineering Testing, Inc.**

Sample No.: **Clay Stockpile #1** Depth:

Location: Sample Type: **Bulk**

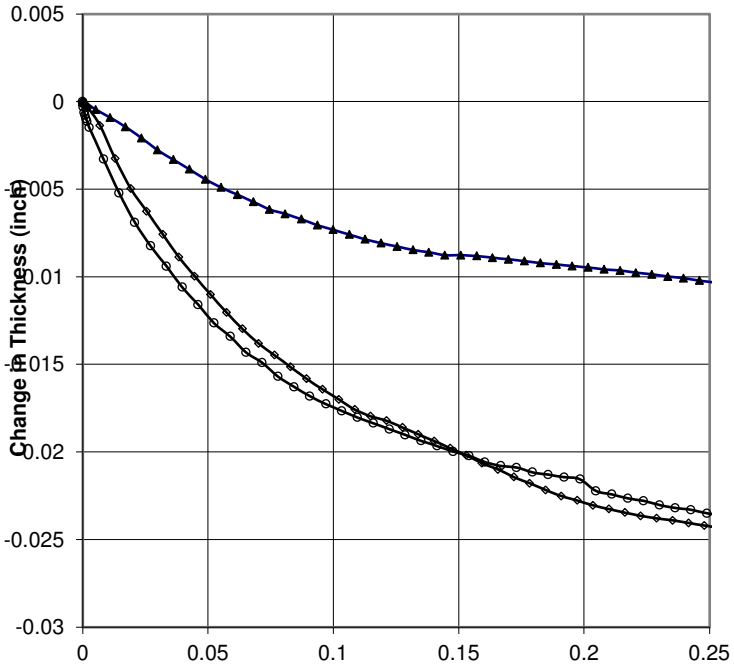
Soil Type: **Lean Clay with Sand (CL)**

Test Date:	**10/14/2025**
Date Reported:	**10/27/2025**
Shear Rate	
0.0005 (in/min)	

Remarks: Specimens compacted to 95% of maximum standard proctor density near optimum moisture content using -#4 material; Inundated after applying normal load. Consolidated and sheared to given displacements at constant rate of 0.0005 inches/minute.

Liquid Limit:	
Plastic Limit:	
Plasticity Index:	
Specific Gravity (*):	**2.68**

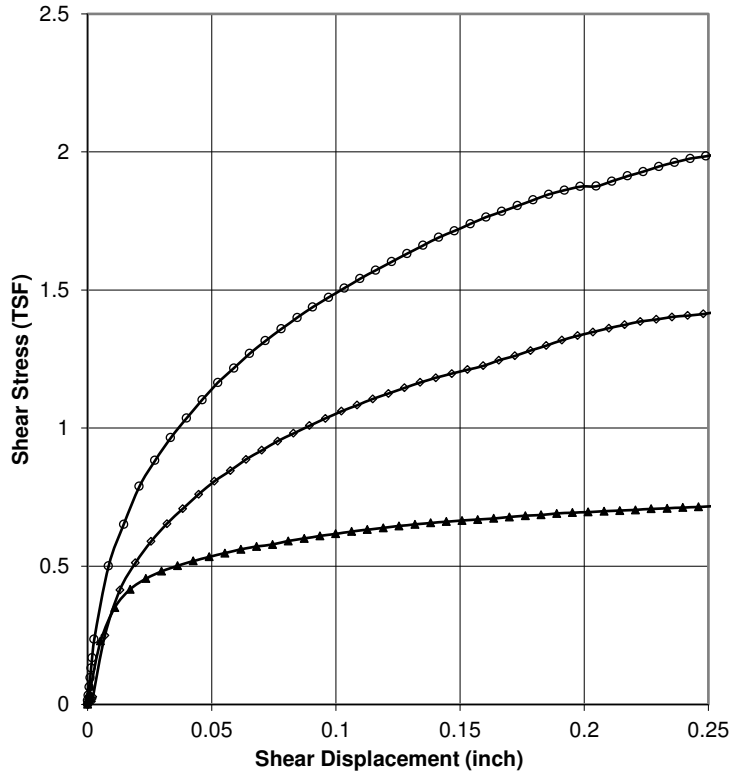
(*) = Assumed Specific Gravity

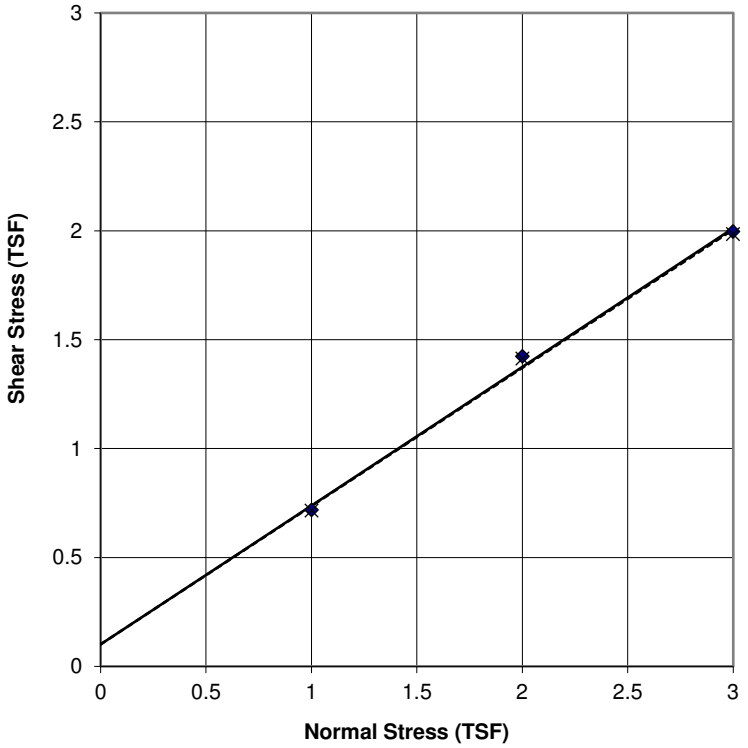


Failure Criterion:				
Max Stress	A	B	C	D
Initial	▲	◇	○	X
Diameter (In.)	2.50	2.50	2.50	
Thickness (In.)	0.95	0.95	0.95	
Water Content (%)	11.6	11.6	11.6	
Dry Density (pcf)	117.7	117.7	117.7	
Before Shear				
Thickness (In.)	0.94	0.92	0.91	
Water Content (%)	15.0	14.2	13.7	
Dry Density (pcf)	119.2	121.2	122.5	
Normal Stress	1.00	2.00	3.00	
Shear Stress	0.72	1.42	2.00	

"These tests are for informational purposes only and must be reviewed by a qualified professional engineer to verify that the test parameters shown are appropriate for any particular design."

Peak Conditions		At Given Shear Disp. Of: 0.25	
Friction Angle:	**ϕ= 32.5 deg.**	Friction Angle:	**ϕ= 32.4 deg.**
Apparent Cohesion	**0.102 TSF**	Apparent Cohesion	**0.102 TSF**





9530 James Ave South

SOIL ENGINEERING TESTING, INC.

Bloomington, MN 55431

Direct Shear Test

ASTM D3080

Job No.: 15997-A

Project/Client: **White Pine Mine - #0040820 / American Engineering Testing, Inc.**

Sample No.: **Tailings #1** Depth:

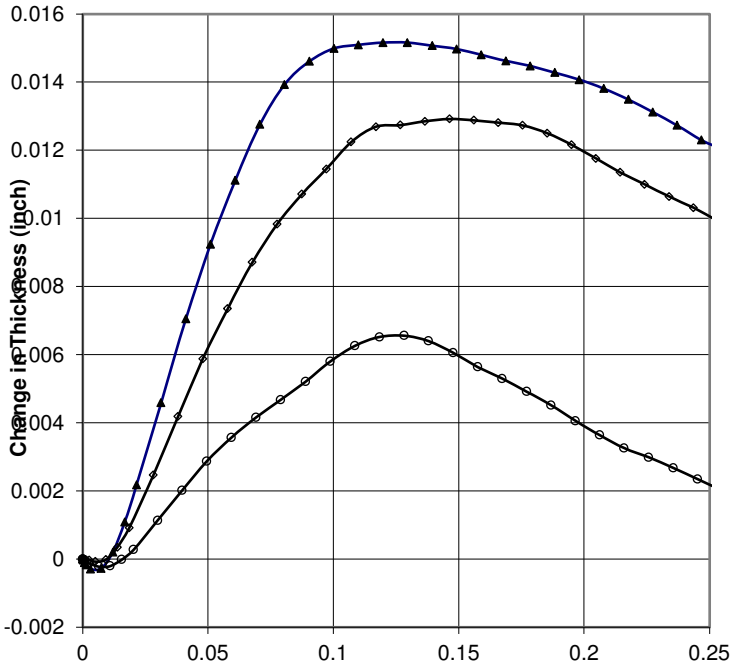
Location: Sample Type: **Bulk**

Soil Type: **Sand with Silt, fine grained, dark brown (SP-SM)**

Test Date:	**10/14/2025**
Date Reported:	**10/27/2025**
Shear Rate	
0.003 (in/min)	
Liquid Limit:	
Plastic Limit:	
Plasticity Index:	
Specific Gravity (*):	**2.68**

Remarks: Specimens compacted to 95% of maximum standard proctor density near optimum moisture content using -#4 material; Inundated after applying normal load. Consolidated and sheared to given displacements at constant rate of 0.003 inches/minute.

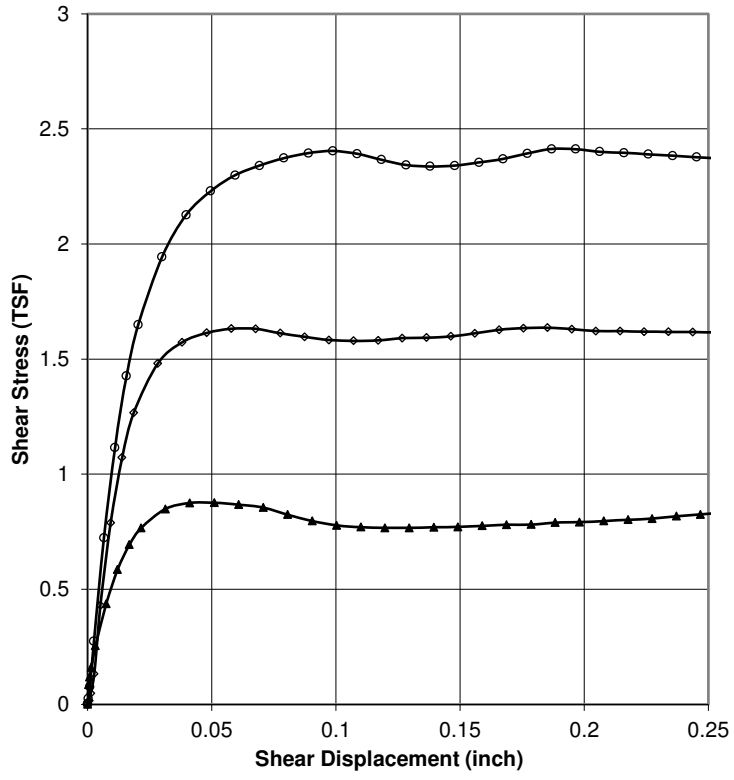
(*) = Assumed Specific Gravity

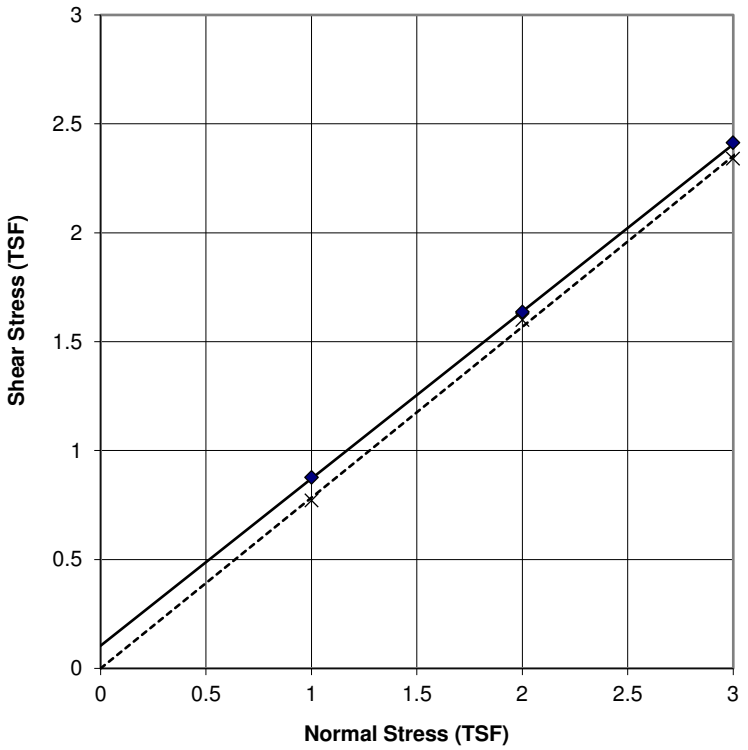


Failure Criterion:				
Max Stress	A	B	C	D
Initial	▲	◇	○	X
Diameter (In.)	2.50	2.50	2.50	
Thickness (In.)	0.95	0.95	0.95	
Water Content (%)	14.3	14.3	14.3	
Dry Density (pcf)	102.1	102.1	102.1	
Before Shear				
Thickness (In.)	0.94	0.94	0.93	
Water Content (%)	23.1	22.8	22.7	
Dry Density (pcf)	103.4	103.8	104.0	
Normal Stress	1.00	2.00	3.00	
Shear Stress	0.88	1.64	2.41	

"These tests are for informational purposes only and must be reviewed by a qualified professional engineer to verify that the test parameters shown are appropriate for any particular design."

Peak Conditions		At Given Shear Disp. Of:	0.15
Friction Angle:	ϕ= **37.5 deg.**	Friction Angle:	ϕ= **38.1 deg.**
Apparent Cohesion	**0.105 TSF**	Apparent Cohesion	**0.001 TSF**





9530 James Ave South

SOIL ENGINEERING TESTING, INC.

Bloomington, MN 55431

Direct Shear Test

ASTM D3080

Job No.: 15997-A

Project/Client: **White Pine Mine - #0040820 / American Engineering Testing, Inc.**

Sample No.: **Talings #2** Depth:

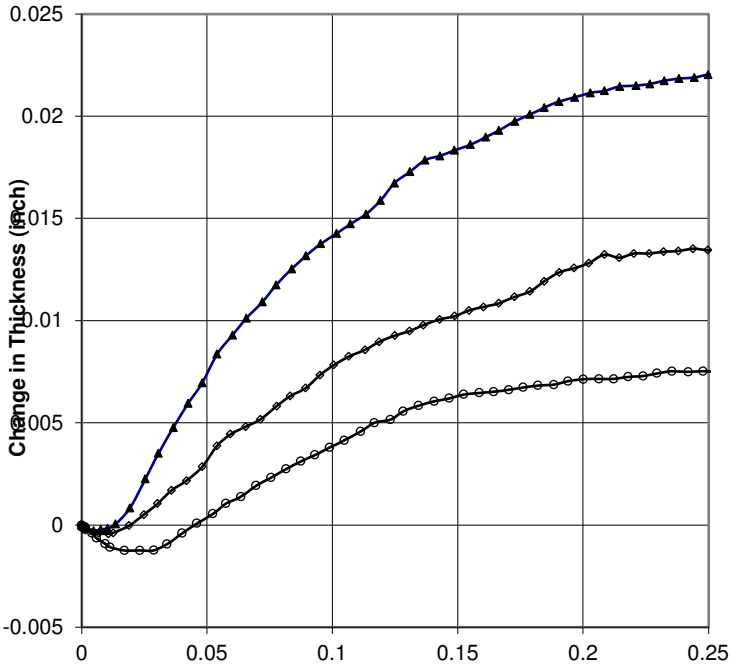
Location: Sample Type: **Bulk**

Soil Type: **Silty Sand, dark brown (SM)**

Test Date:	**10/14/2025**
Date Reported:	**10/27/2025**
Shear Rate	
0.003 (in/min)	
Liquid Limit:	
Plastic Limit:	
Plasticity Index:	
Specific Gravity (*):	**2.68**

Remarks: Specimens compacted to 95% of maximum standard proctor density near optimum moisture content using -#4 material; Inundated after applying normal load. Consolidated and sheared to given displacements at constant rate of 0.003 inches/minute.

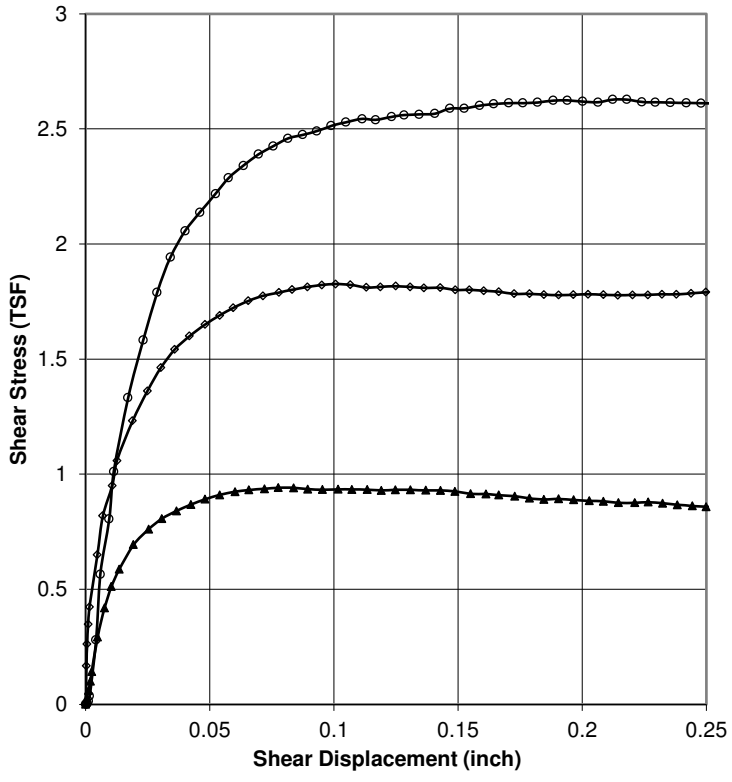
(*) = Assumed Specific Gravity

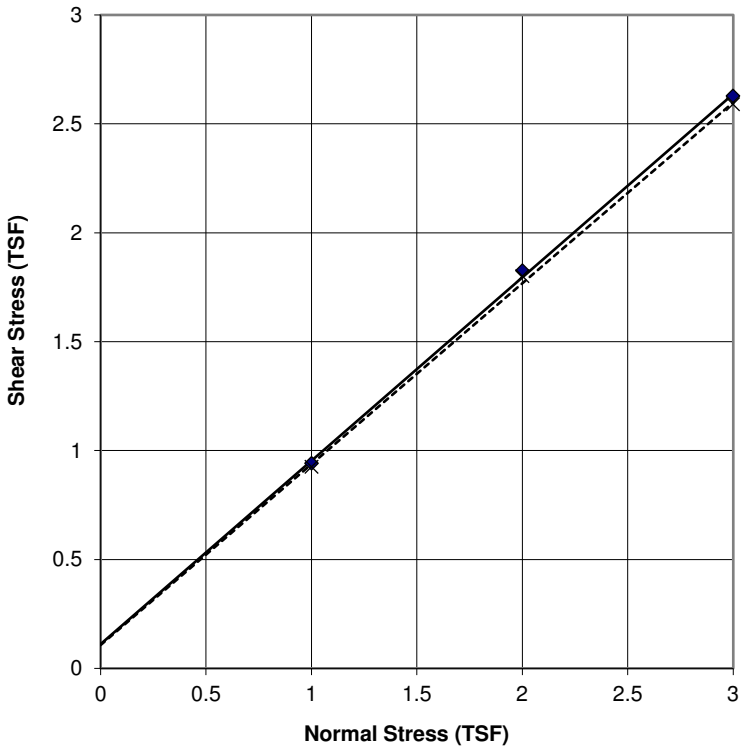


Failure Criterion:				
Max Stress	A	B	C	D
Initial	▲	◇	○	X
Diameter (In.)	2.50	2.50	2.50	
Thickness (In.)	0.95	0.95	0.95	
Water Content (%)	11.1	11.1	11.1	
Dry Density (pcf)	119.9	119.9	119.9	
Before Shear				
Thickness (In.)	0.94	0.93	0.93	
Water Content (%)	14.1	13.9	13.6	
Dry Density (pcf)	121.4	122.0	122.5	
Normal Stress	1.00	2.00	3.00	
Shear Stress	0.94	1.83	2.63	

"These tests are for informational purposes only and must be reviewed by a qualified professional engineer to verify that the test parameters shown are appropriate for any particular design."

Peak Conditions		At Given Shear Disp. Of: 0.15	
Friction Angle:	ϕ= **40.1 deg.**	Friction Angle:	ϕ= **39.7 deg.**
Apparent Cohesion	**0.112 TSF**	Apparent Cohesion	**0.108 TSF**





9530 James Ave South

SOIL ENGINEERING TESTING, INC.

Bloomington, MN 55431

Direct Shear Test

ASTM D3080

Job No.: 15997-A

Project/Client: **White Pine Mine - #0040820 / American Engineering Testing, Inc.**

Sample **50:50 Claystockpile #1 and Tailings #1** Depth:

Location: Sample Type: **Bulk**

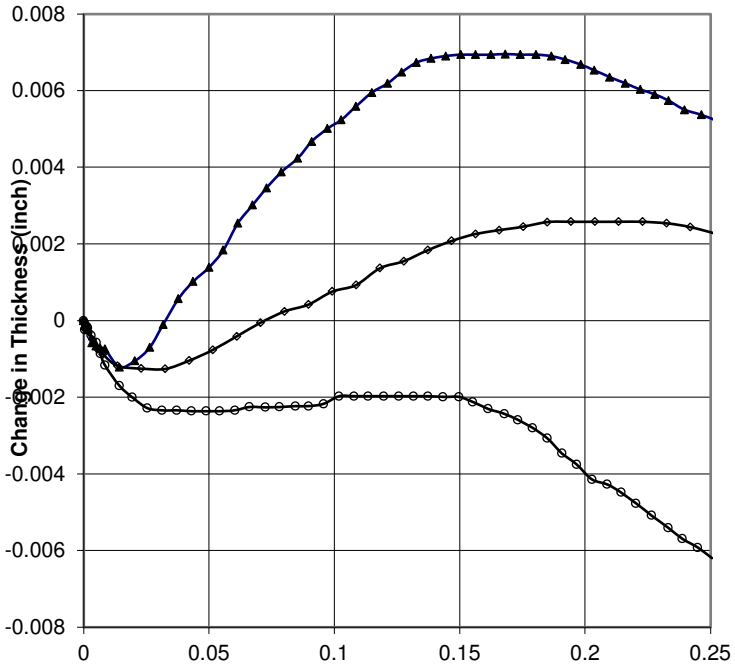
Soil Type: **Silty Clayey Sand (SC-SM)**

Test Date:	**10/25/2025**
Date Reported:	**11/3/2025**
Shear Rate	
0.001 (in/min)	

Remarks: Specimens compacted to 95% of maximum standard proctor density near optimum moisture content using -#4 material; Inundated after applying normal load. Consolidated and sheared to given displacements at constant rate of 0.001 inches/minute.

Liquid Limit:	**18**
Plastic Limit:	**14**
Plasticity Index:	**4**
Specific Gravity (*):	**2.68**

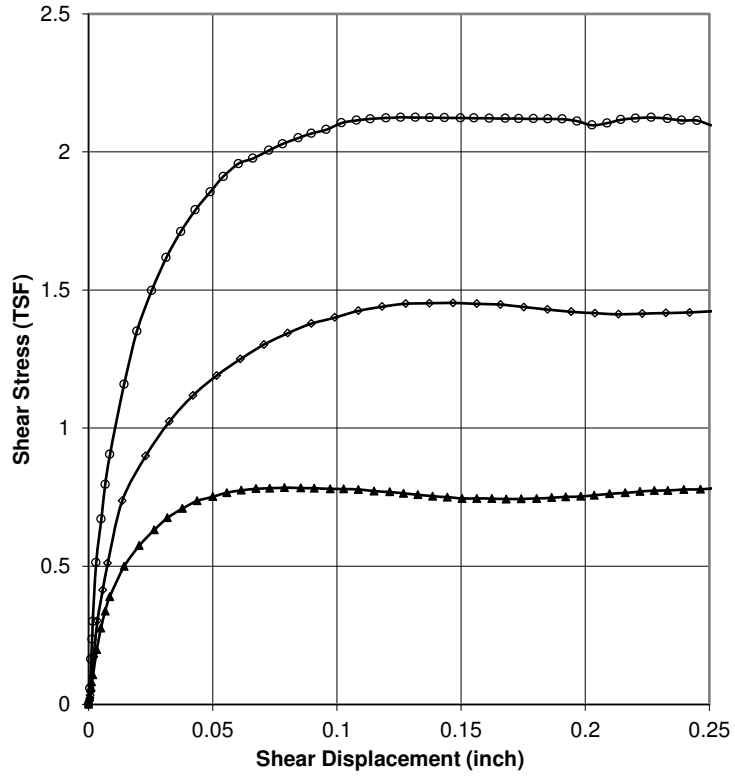
(*) = Assumed Specific Gravity

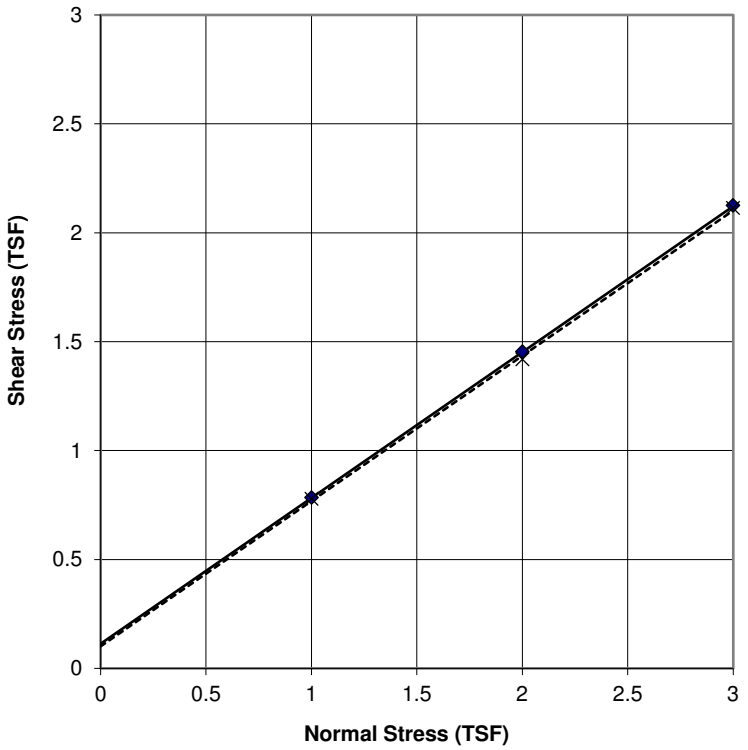


Failure Criterion:				
Max Stress	A	B	C	D
Initial	▲	◇	○	X
Diameter (In.)	2.50	2.50	2.50	
Thickness (In.)	0.95	0.95	0.95	
Water Content (%)	12.0	12.0	12.0	
Dry Density (pcf)	116.4	116.4	116.4	
Before Shear				
Thickness (In.)	0.94	0.93	0.92	
Water Content (%)	15.5	15.3	14.6	
Dry Density (pcf)	118.2	118.5	120.2	
Normal Stress	1.00	2.00	3.00	
Shear Stress	0.78	1.45	2.13	

"These tests are for informational purposes only and must be reviewed by a qualified professional engineer to verify that the test parameters shown are appropriate for any particular design."

Peak Conditions		At Given Shear Disp. Of:	0.25
Friction Angle:	ϕ= **33.8 deg.**	Friction Angle:	ϕ= **33.7 deg.**
Apparent Cohesion	**0.114 TSF**	Apparent Cohesion	**0.102 TSF**





9530 James Ave South

SOIL ENGINEERING TESTING, INC.

Bloomington, MN 55431

Direct Shear Test

ASTM D3080

Job No.: 15997-A

Project/Client: **White Pine Mine - #0040820 / American Engineering Testing, Inc.**

Boring No.: **'50:50 Claystockpile #1 and Tailings #2** Depth:

Location: Sample Type: **Bulk**

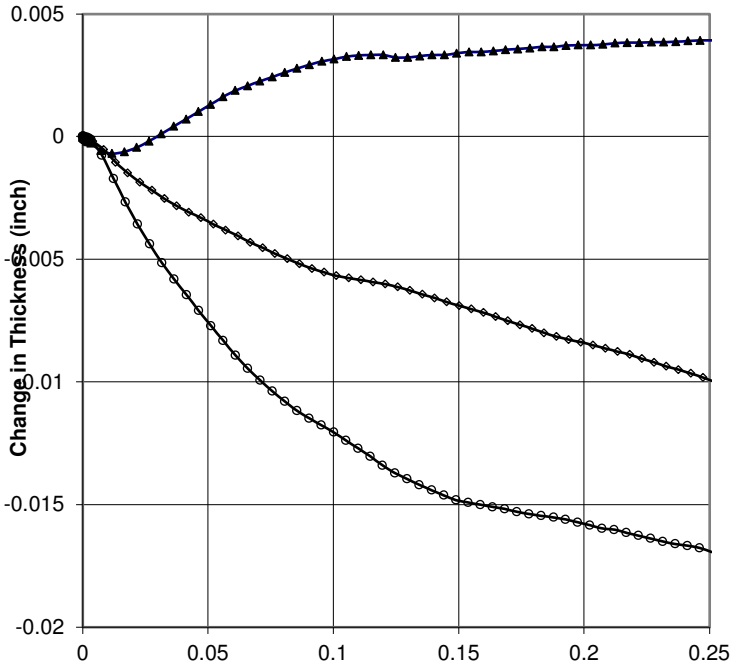
Soil Type: **Sandy Lean Clay with a trace of glass pieces (CL)**

Test Date:	**10/23/2025**
Date Reported:	**11/3/2025**
Shear Rate	
0.001 (in/min)	

Remarks: Specimens compacted to 95% of maximum standard proctor density near optimum moisture content using -#4 material; Inundated after applying normal load. Consolidated and sheared to given displacements at constant rate of 0.001 inches/minute.Consolidated and sheared to given displacements at constant rate of 0.005 inches/minute.

(*) = Assumed Specific Gravity

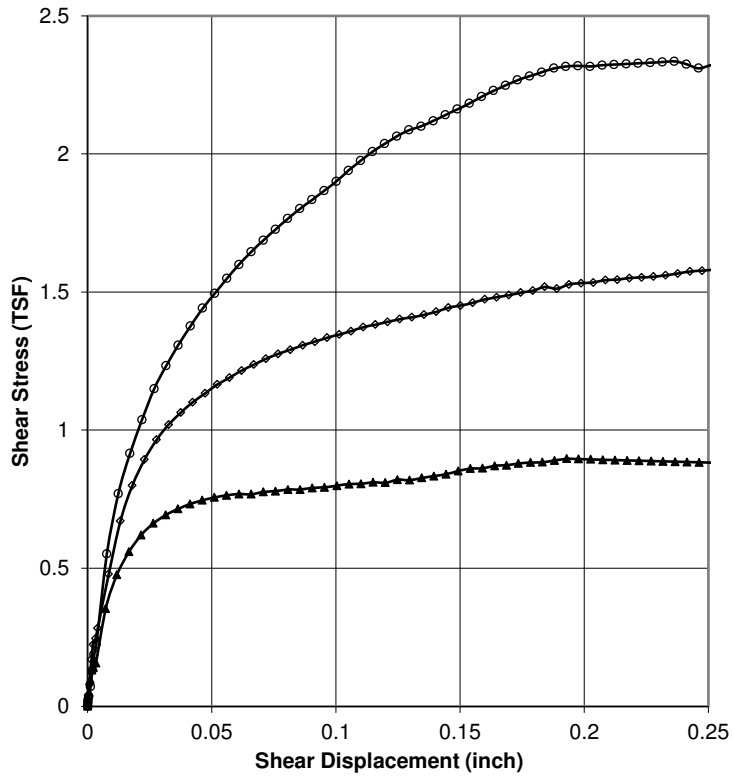
Liquid Limit:	**24**
Plastic Limit:	**16**
Plasticity Index:	**8**
Specific Gravity (*):	**2.68**

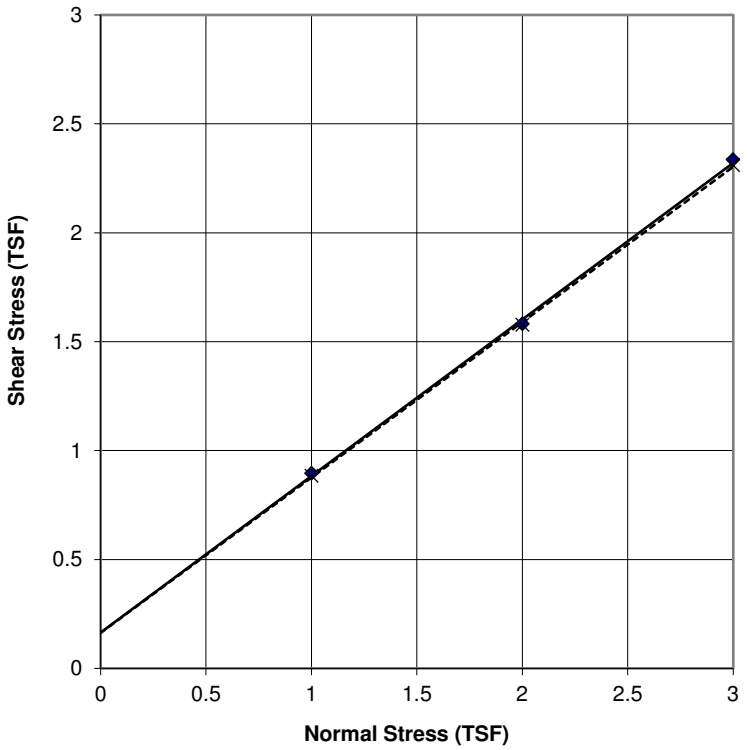


Failure Criterion:				
Max Stress	A	B	C	D
Initial	▲	◇	○	X
Diameter (In.)	2.50	2.50	2.50	
Thickness (In.)	0.95	0.95	0.95	
Water Content (%)	10.8	10.8	10.8	
Dry Density (pcf)	120.6	120.6	120.6	
Before Shear				
Thickness (In.)	0.94	0.93	0.92	
Water Content (%)	13.7	13.4	13.0	
Dry Density (pcf)	122.3	123.0	124.1	
Normal Stress	1.00	2.00	3.00	
Shear Stress	0.90	1.58	2.34	

"These tests are for informational purposes only and must be reviewed by a qualified professional engineer to verify that the test parameters shown are appropriate for any particular design."

Peak Conditions		At Given Shear Disp. Of: 0.25	
Friction Angle:	**ϕ= 35.7 deg.**	Friction Angle:	**ϕ= 35.5 deg.**
Apparent Cohesion	**0.166 TSF**	Apparent Cohesion	**0.164 TSF**





9530 James Ave South

SOIL ENGINEERING TESTING, INC.

Bloomington, MN 55431

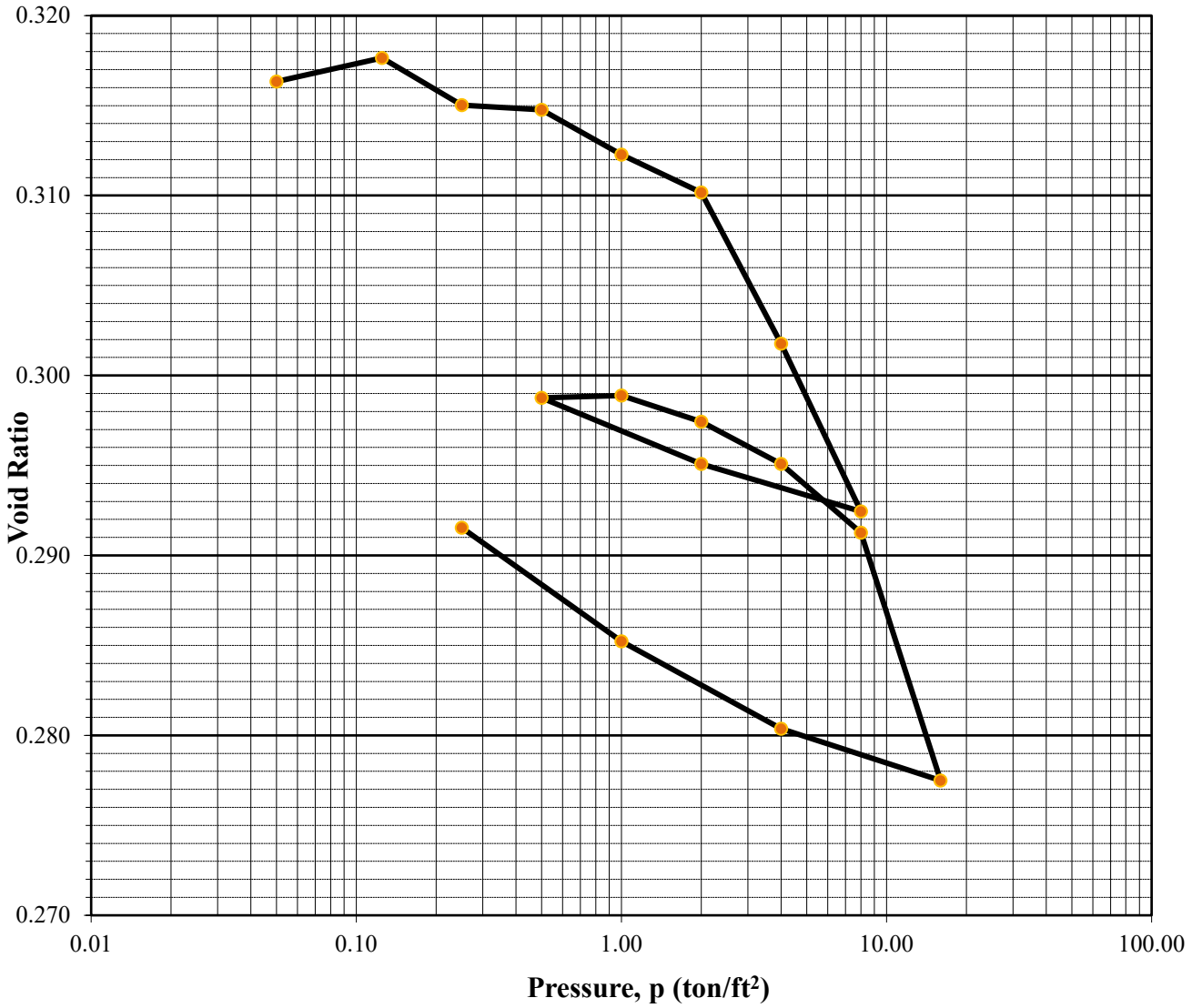
AMERICAN ENGINEERING TESTING

Consolidation Test Results: Void Ratio vs. Pressure

Project: White Pine Mine
White Pine, MI

AET No.: P-0040820

Date: 10/16/2025



	Before	After			
Water Content (%):	10.73	11.09	**Liquid Limit (%):**	23	**Test Date:** 7/29/2025
Dry Density (pcf):	127.99	129.91	**Plastic Limit (%):**	14	
Saturation (%):	91.39	100.64	**Plasticity Index (%):**	9	
Void Ratio:	0.3146	0.2915	**Specific Gravity:**	2.70	Assumed

Sample Description: Sandy Lean Clay, red (CL)

Boring Number: BH-PFS-1A **Depth:** 12' - 14'

Remarks: Test conducted in general accordance with ASTM D2435

Soil Parameters:
Preconsolidation Pressure (Pc): 2.8 tsf
Compression Index (Cc): 0.041
Recompression Index (Cr): 0.005

Tested By: Benjamin Pomroy

Reviewed By:

AMERICAN ENGINEERING TESTING

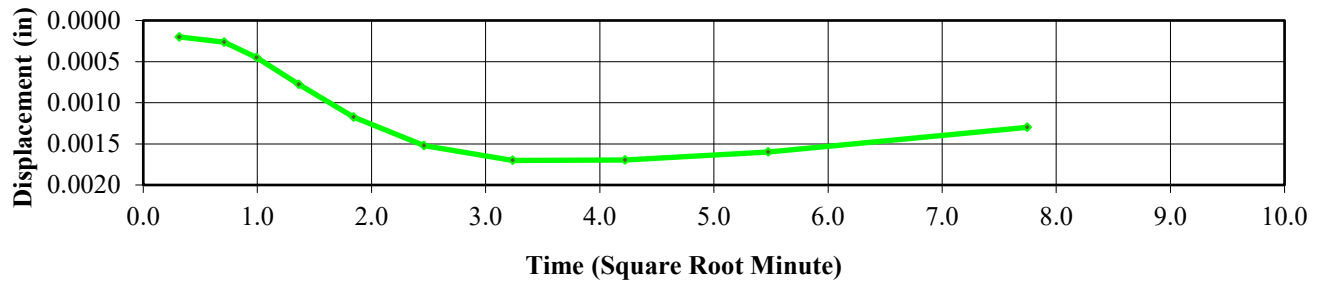
Consolidation Test Results: Square Root Time vs. Displacement

Project: White Pine Mine
White Pine, MI

AET #: P-0040820

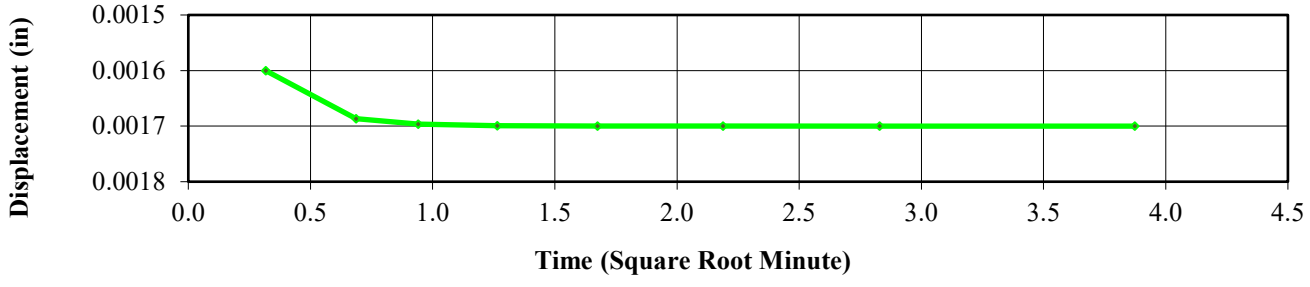
Date: 10/16/2025

Load: 0.05 tsf



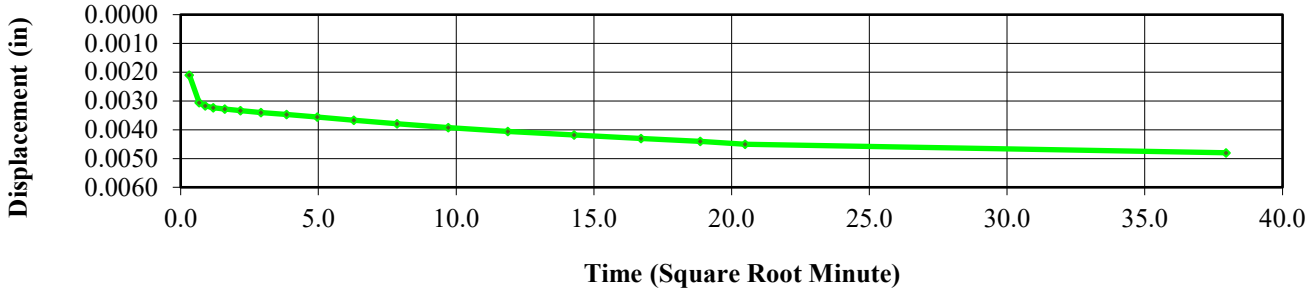
Cv= N/A (ft2/year)

Load: 0.125 tsf



Cv= N/A (ft2/year)

Load: 0.25 tsf



Cv= 133.974 (ft2/year)

Sample Description:	Sandy Lean Clay, red (CL)	
Boring Number:	BH-PFS-1A	**Depth:** 12' - 14'
Remarks:	Test conducted in general accordance with ASTM D2435	
Tested By: Benjamin Pomroy		**Reviewed By:**

AMERICAN ENGINEERING TESTING

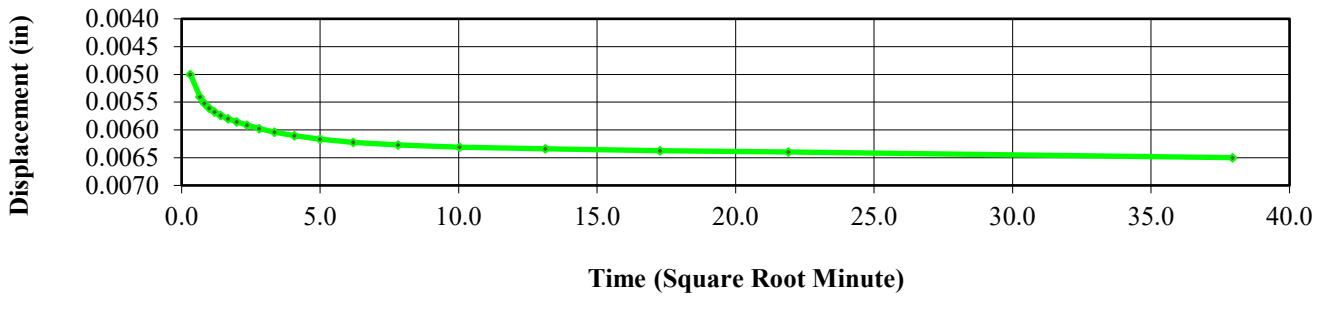
Consolidation Test Results: Square Root Time vs. Displacement

Project:
White Pine Mine
White Pine, MI

AET #: P-0040820

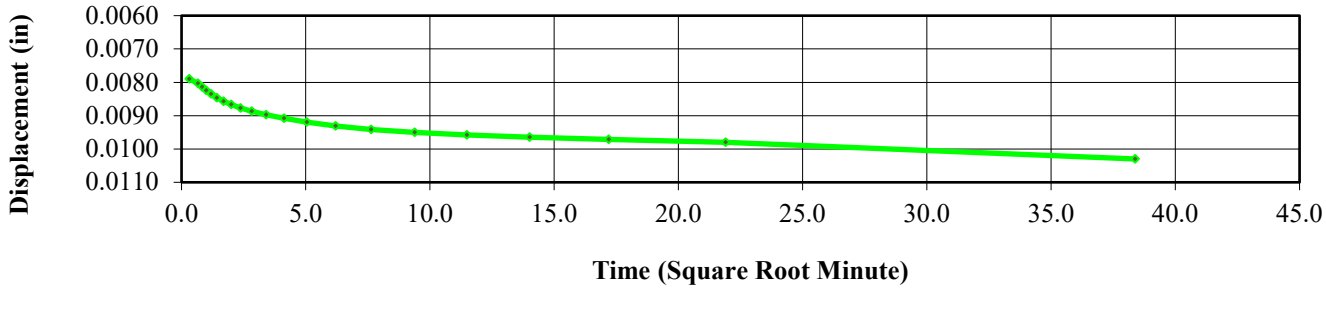
Date: 10/16/2025

Load: 0.5 tsf



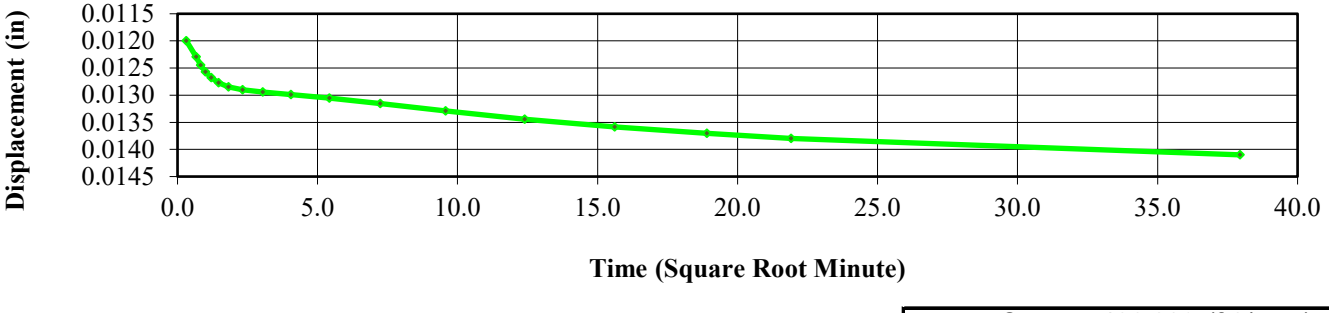
Cv= 294.376 (ft2/year)

Load: 1 tsf



Cv= 165.116 (ft2/year)

Load: 2 tsf



Cv= 426.209 (ft2/year)

Sample Description:	Sandy Lean Clay, red (CL)	
Boring Number:	BH-PFS-1A	**Depth:** 12' - 14'
Remarks:	Test conducted in general accordance with ASTM D2435	

Tested By: Benjamin Pomroy

Reviewed By:

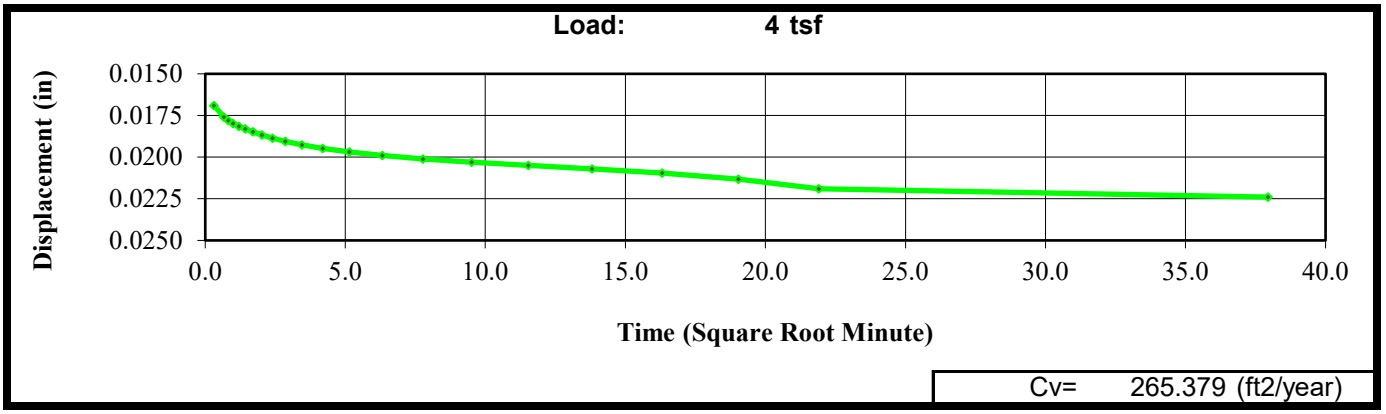
AMERICAN ENGINEERING TESTING

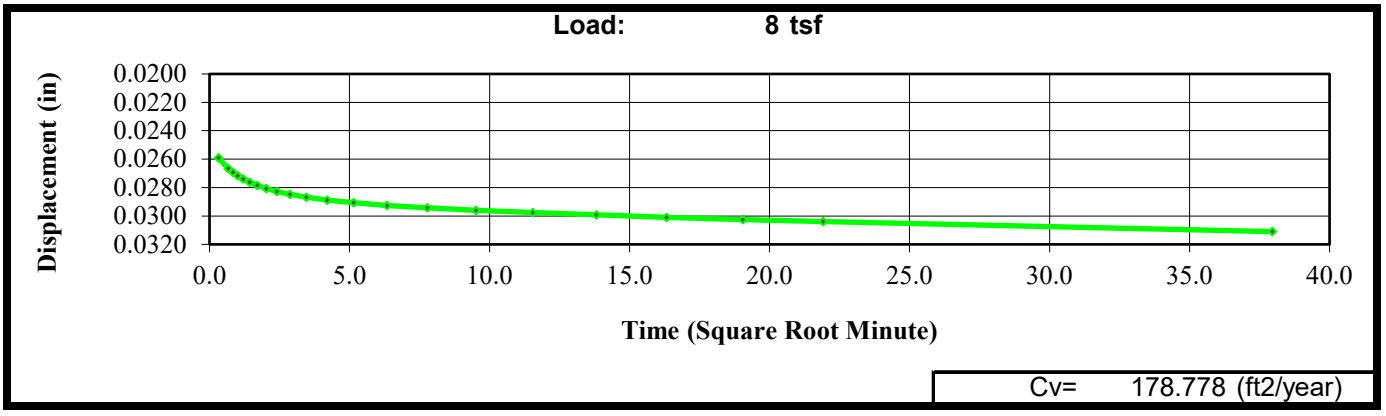
Consolidation Test Results: Square Root Time vs. Displacement

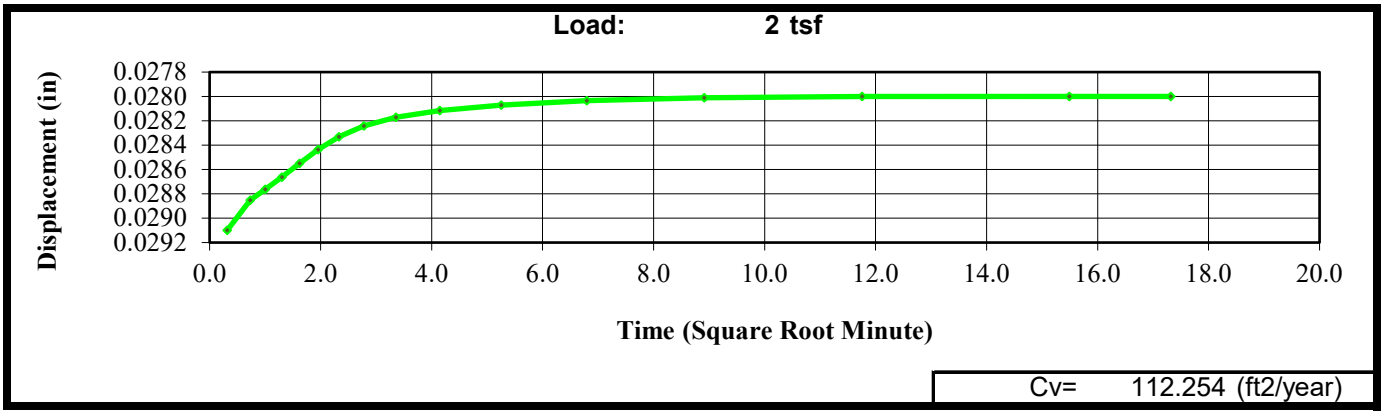
Project:
White Pine Mine
White Pine, MI

AET #: P-0040820

Date: 10/16/2025







Sample Description:	Sandy Lean Clay, red (CL)		
Boring Number:	BH-PFS-1A	**Depth:**	12' - 14'
Remarks:	Test conducted in general accordance with ASTM D2435		
Tested By:	Benjamin Pomroy	**Reviewed By:**	

AMERICAN ENGINEERING TESTING

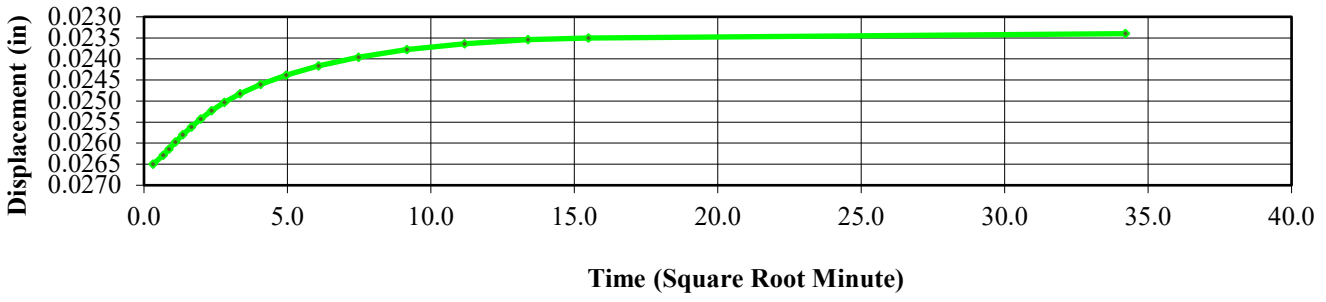
Consolidation Test Results: Square Root Time vs. Displacement

Project: White Pine Mine
White Pine, MI

AET #: P-0040820

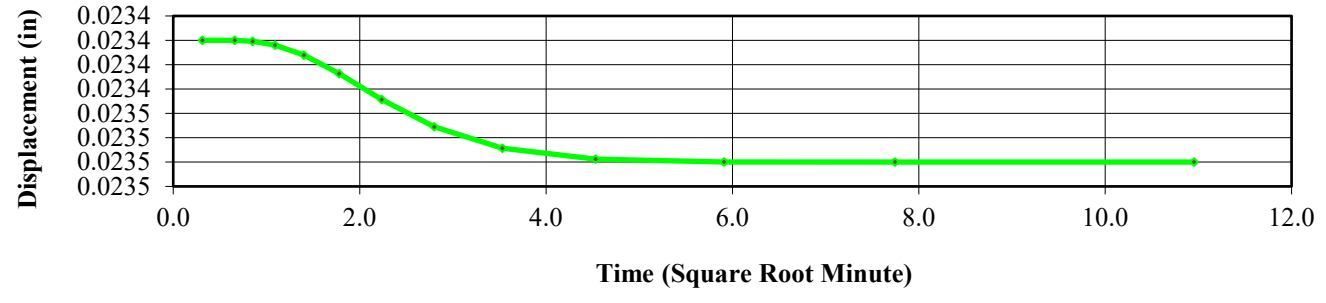
Date: 10/16/2025

Load: 0.5 tsf



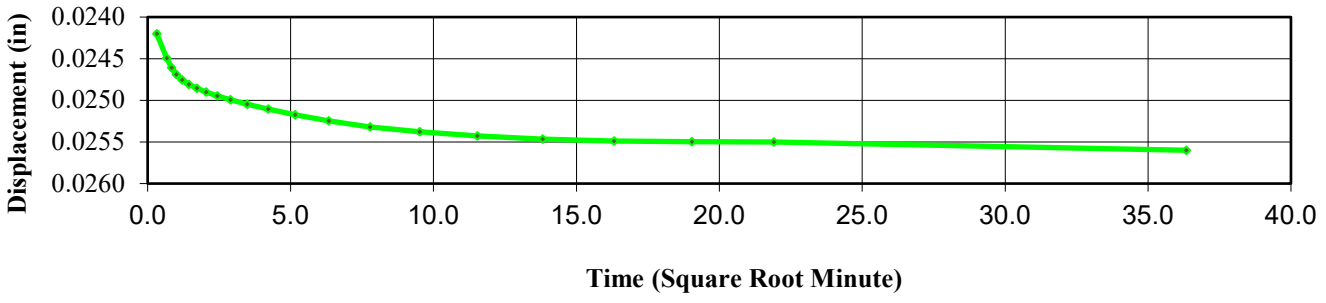
Cv= 75.915 (ft2/year)

Load: 1 tsf



Cv= N/A (ft2/year)

Load: 2 tsf



Cv= 484.005 (ft2/year)

Sample Description:	Sandy Lean Clay, red (CL)
Boring Number: BH-PFS-1A	**Depth:** 12' - 14'
Remarks:	Test conducted in general accordance with ASTM D2435

Tested By: Benjamin Pomroy

Reviewed By:

AMERICAN ENGINEERING TESTING

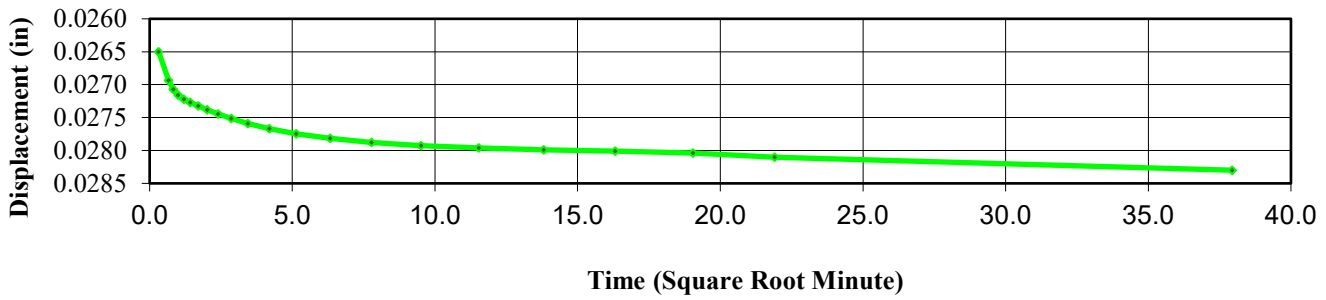
Consolidation Test Results: Square Root Time vs. Displacement

Project:
White Pine Mine
White Pine, MI

AET #: P-0040820

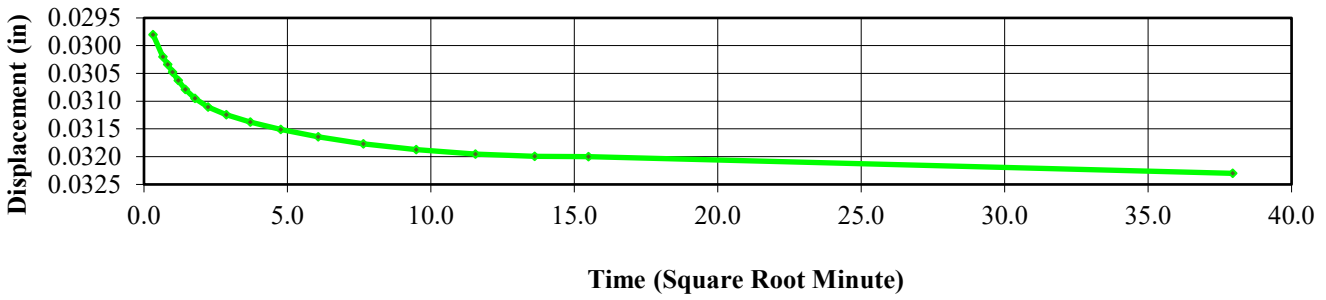
Date: 10/16/2025

Load: 4 tsf



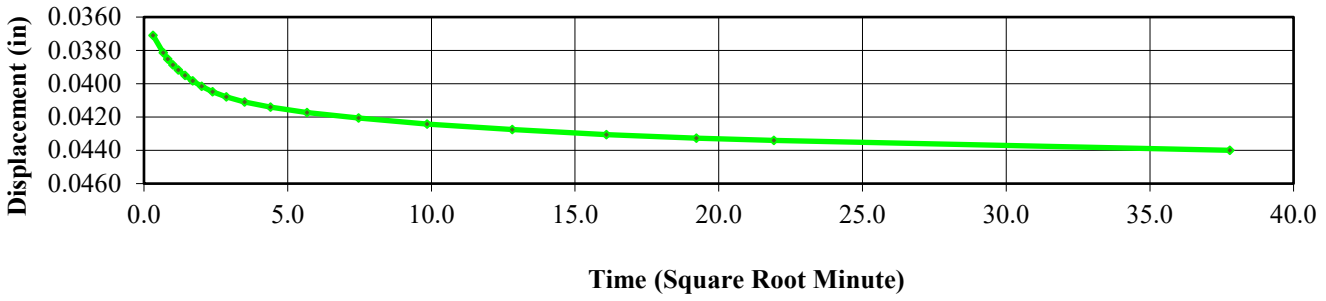
Cv= 832.181 (ft2/year)

Load: 8 tsf



Cv= 164.583 (ft2/year)

Load: 16 tsf



Cv= 103.369 (ft2/year)

Sample Description:	Sandy Lean Clay, red (CL)	
Boring Number:	BH-PFS-1A	**Depth:** 12' - 14'
Remarks:	Test conducted in general accordance with ASTM D2435	

Tested By: Benjamin Pomroy

Reviewed By:

AMERICAN ENGINEERING TESTING

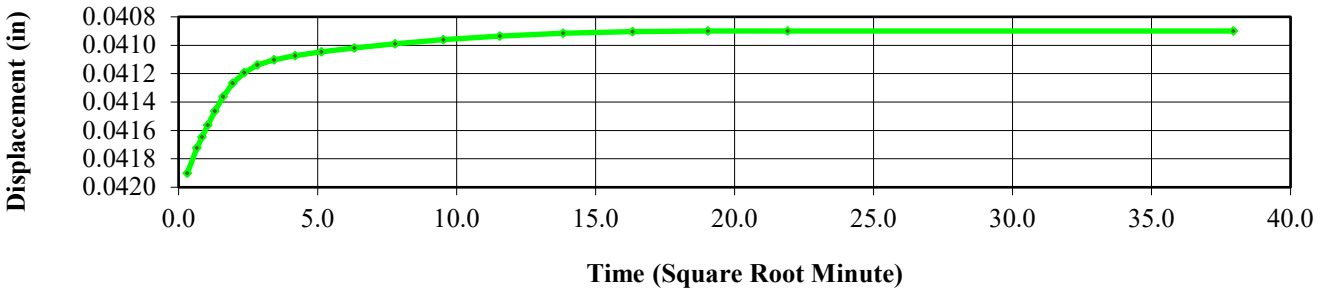
Consolidation Test Results: Square Root Time vs. Displacement

Project: White Pine Mine
White Pine, MI

AET #: P-0040820

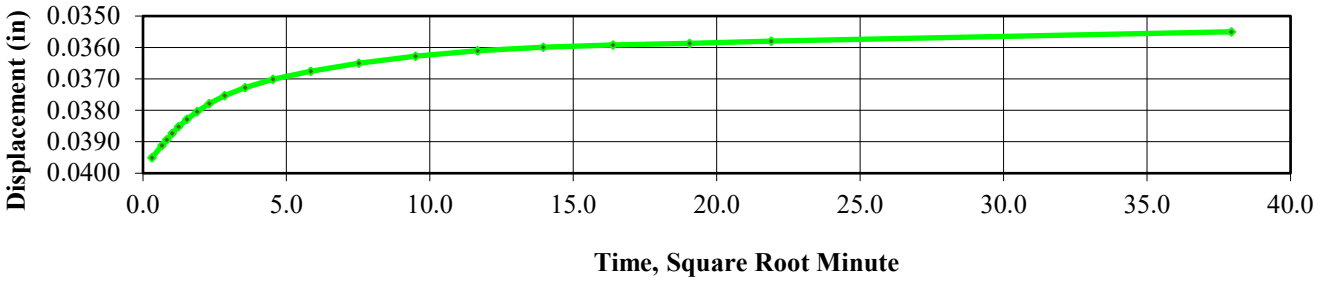
Date: 10/16/2025

Load: 4 tsf



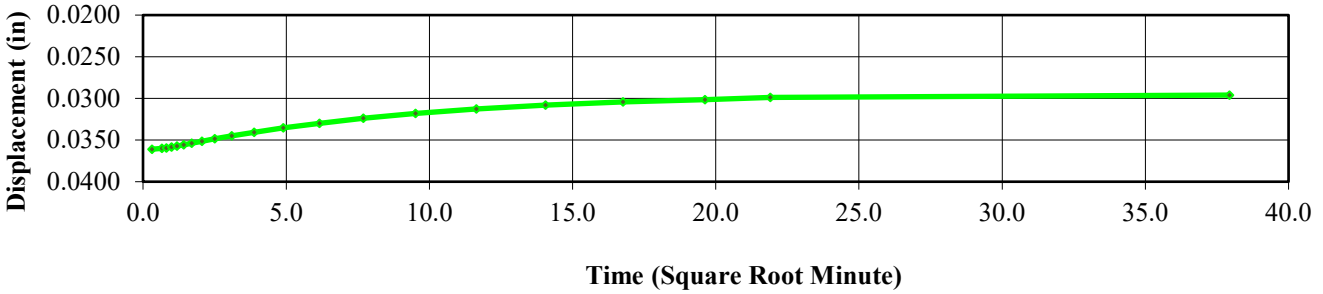
Cv= 145.102 (ft2/year)

Load: 1 tsf



Cv= 123.471 (ft2/year)

Load: 0.25 tsf



Cv= 9.904 (ft2/year)

Sample Description:	Sandy Lean Clay, red (CL)	
Boring Number:	BH-PFS-1A	**Depth:** 12' - 14'
Remarks:	Test conducted in general accordance with ASTM D2435	

Tested By: Benjamin Pomroy

Reviewed By:

AMERICAN ENGINEERING TESTING

Consolidation Test Results: Summary

Project: White Pine Mine
White Pine, MI

AET No.: P-0040820

Date: 10/16/2025

Client No.:

Sample No.: BH-PFS-1A, 12'-14'
Boring No.: BH-PFS-1A
Depth: 12' - 14'
Sample Type: Undisturbed

Sample Description: Sandy Lean Clay, red (CL)
Remarks:

Test No.:
Test Date:

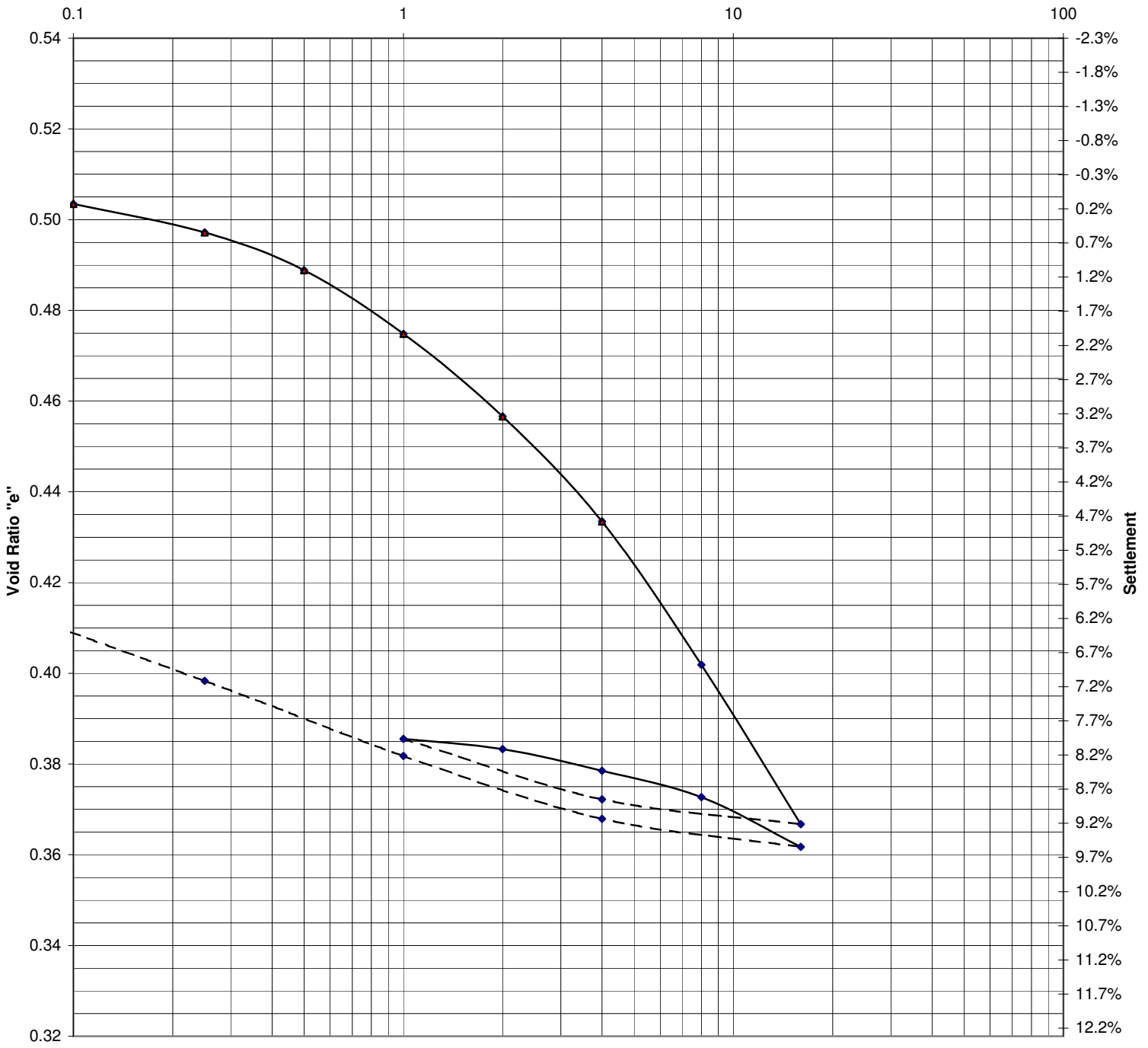
Index	Load Sequence (tsf)	Cummulative Change in Height (in)	Specimen Height (in)	Height of Void (in)	Vertical Strain (%)	Void Ratio	t90 Fitting Time (min)	t50 Fitting Time (min)	t90 Cv (ft2/year)	t50 Cv (ft2/year)
0	0.000	0.0000	1.0017	0.2397	0.00	0.3146	N/A	N/A	N/A	N/A
1	0.050	-0.0013	1.0030	0.2410	-0.13	0.3163	N/A	N/A	N/A	N/A
2	0.125	-0.0023	1.0040	0.2420	-0.23	0.3176	N/A	N/A	N/A	N/A
3	0.250	-0.0003	1.0020	0.2400	-0.03	0.3150	5.799	* 3.2216	133.974	56.023
4	0.500	-0.0001	1.0018	0.2398	-0.01	0.3148	2.638	0.365	294.376	493.997
5	1.000	0.0018	0.9999	0.2379	0.18	0.3123	4.686	2.627	165.116	68.405
6	2.000	0.0034	0.9983	0.2363	0.34	0.3102	1.809	* 1.0052	426.209	178.225
7	4.000	0.0098	0.9919	0.2299	0.98	0.3018	2.869	2.189	265.379	80.790
8	8.000	0.0169	0.9848	0.2228	1.69	0.2925	4.198	0.869	178.778	200.532
9	2.000	0.0149	0.9868	0.2248	1.49	0.2951	6.713	2.504	112.254	69.916
10	0.500	0.0121	0.9896	0.2276	1.21	0.2988	9.982	5.894	75.915	29.868
11	1.000	0.0120	0.9897	0.2277	1.20	0.2989	N/A	N/A	N/A	N/A
12	2.000	0.0131	0.9886	0.2266	1.31	0.2974	1.563	0.515	484.005	341.322
13	4.000	0.0149	0.9868	0.2248	1.49	0.2951	0.906	0.414	832.181	422.921
14	8.000	0.0178	0.9839	0.2219	1.78	0.2913	4.551	1.194	164.583	145.808
15	16.000	0.0283	0.9734	0.2114	2.83	0.2775	7.093	0.974	103.369	174.817
16	4.000	0.0261	0.9756	0.2136	2.61	0.2804	5.076	1.136	145.102	150.620
17	1.000	0.0224	0.9793	0.2173	2.24	0.2852	* 6.0103	3.339	123.471	51.631
18	0.250	0.0176	0.9841	0.2221	1.76	0.2915	75.663	26.976	9.904	6.454

Predicted value indicated with *

Tested By: Benjamin Pomroy

Reviewed By:

Void Ratio and % Settlement vs. Log of Pressure



Project: White Pine Mine - #0040820 / American Engineering Testing, Inc.				Date: 8/28/25
Sample #:	Boring #: PFS-2	Depth ft: 12-14		Job #: 15997
Soil Type: Sandy Lean Clay w/a little gravel (CL)				
Initial W/C (%): 17.9	Dry Density (pcf): 113.7	LL:	PL:	PI: Gs: 2.74 (Assumed)
Organic Content (%):	Initial Height (in.): 0.660	Diameter (in.): 2.500	e_o= 0.505	
Preconsolidation Pressure (Pc): 1.9 tsf	Compression Index (Cc): 0.12	Recompression Index (Cr): 0.02		

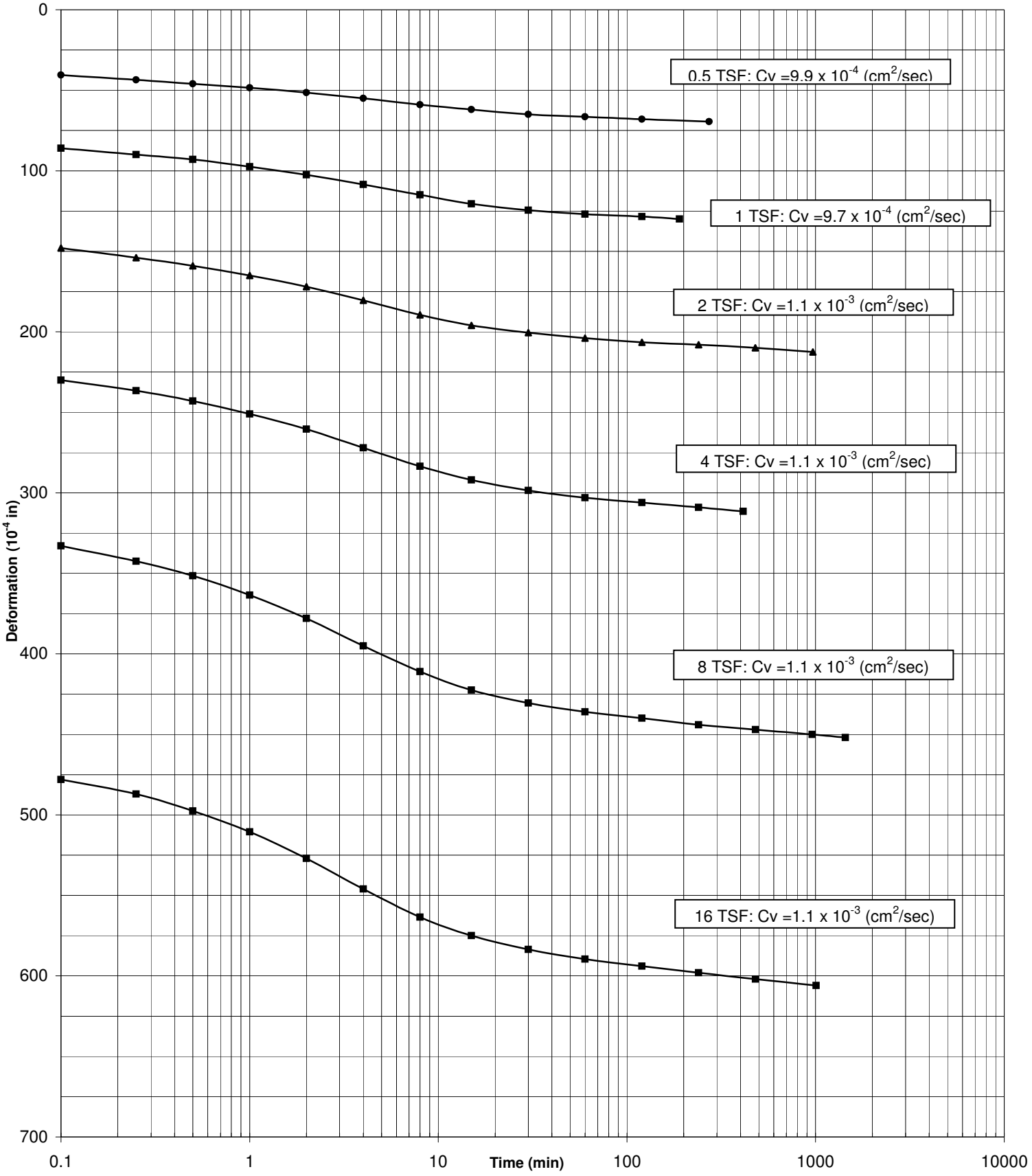
Remarks: Testing performed in general accordance with ASTM:D2435
Distilled water used for sample inundation.

9530 James Avenue South

SOIL ENGINEERING TESTING, INC.

Bloomington, Minnesota 55431

Consolidation Log of Time Curves



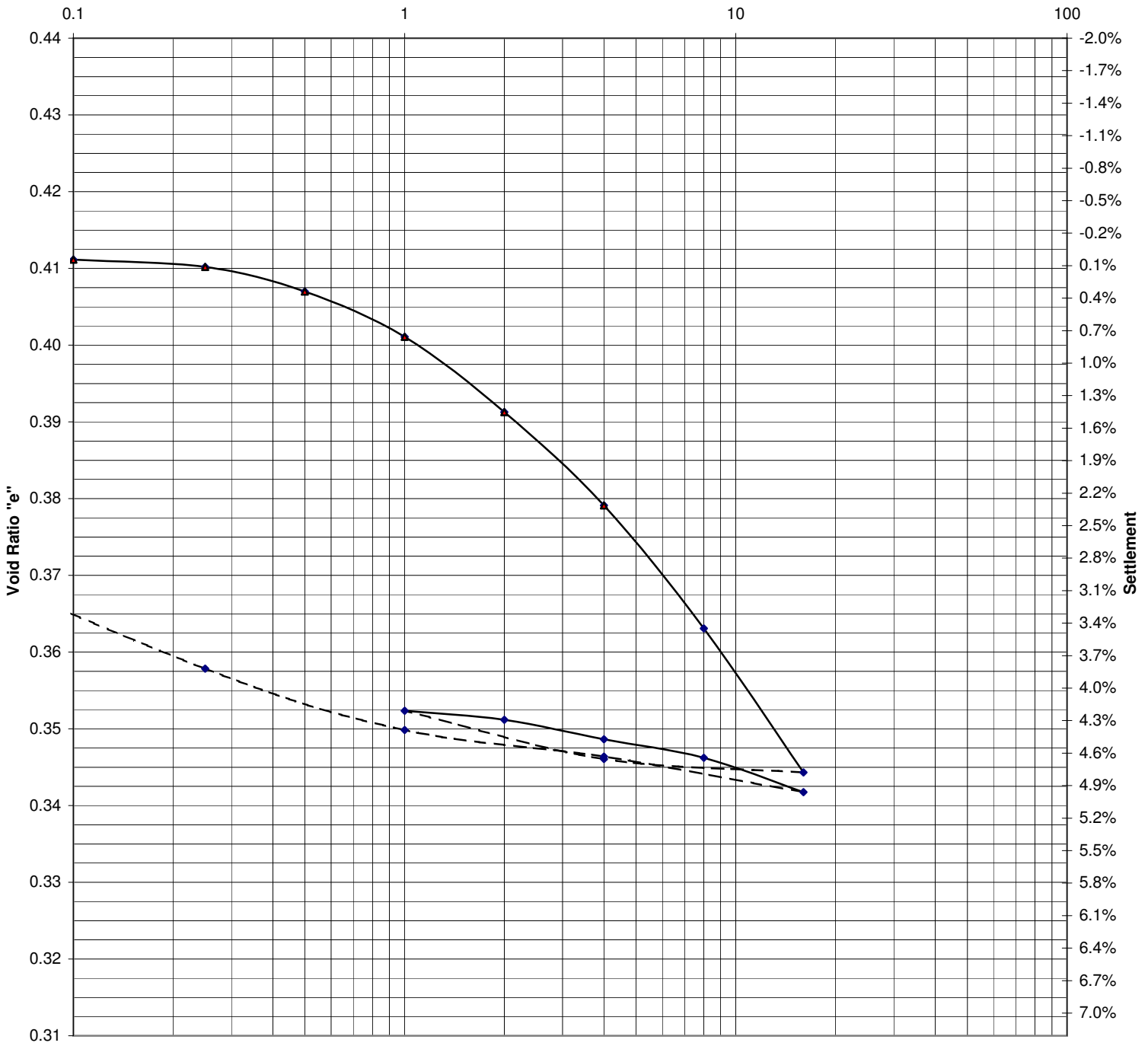
Project: White Pine Mine - #0040820 / American Engineering Testing, Inc.			Date: 8/28/25
Sample #:	Boring #: PFS-2	Depth ft: 12-14	Job #: 15997

9530 James Avenue South

SOIL ENGINEERING TESTING, INC.

Bloomington, Minnesota 55431

Void Ratio and % Settlement vs. Log of Pressure



Project: White Pine Mine - #0040820 / American Engineering Testing, Inc.			Date: 9/2/25
Sample #:	Boring #: PFS-3	Depth ft: 12-14	Job #: 15997
Soil Type: Sandy Lean Clay w/a trace of gravel (CL)			
Initial W/C (%): 14.2	Dry Density (pcf): 120.3	LL: PL: PI:	Gs: 2.72 (Assumed)
Organic Content (%):	Initial Height (in.): 0.899	Diameter (in.): 2.502	e_o= 0.412
Preconsolidation Pressure (Pc): 2.3 tsf	Compression Index (Cc): 0.06	Recompression Index (Cr): 0.01	

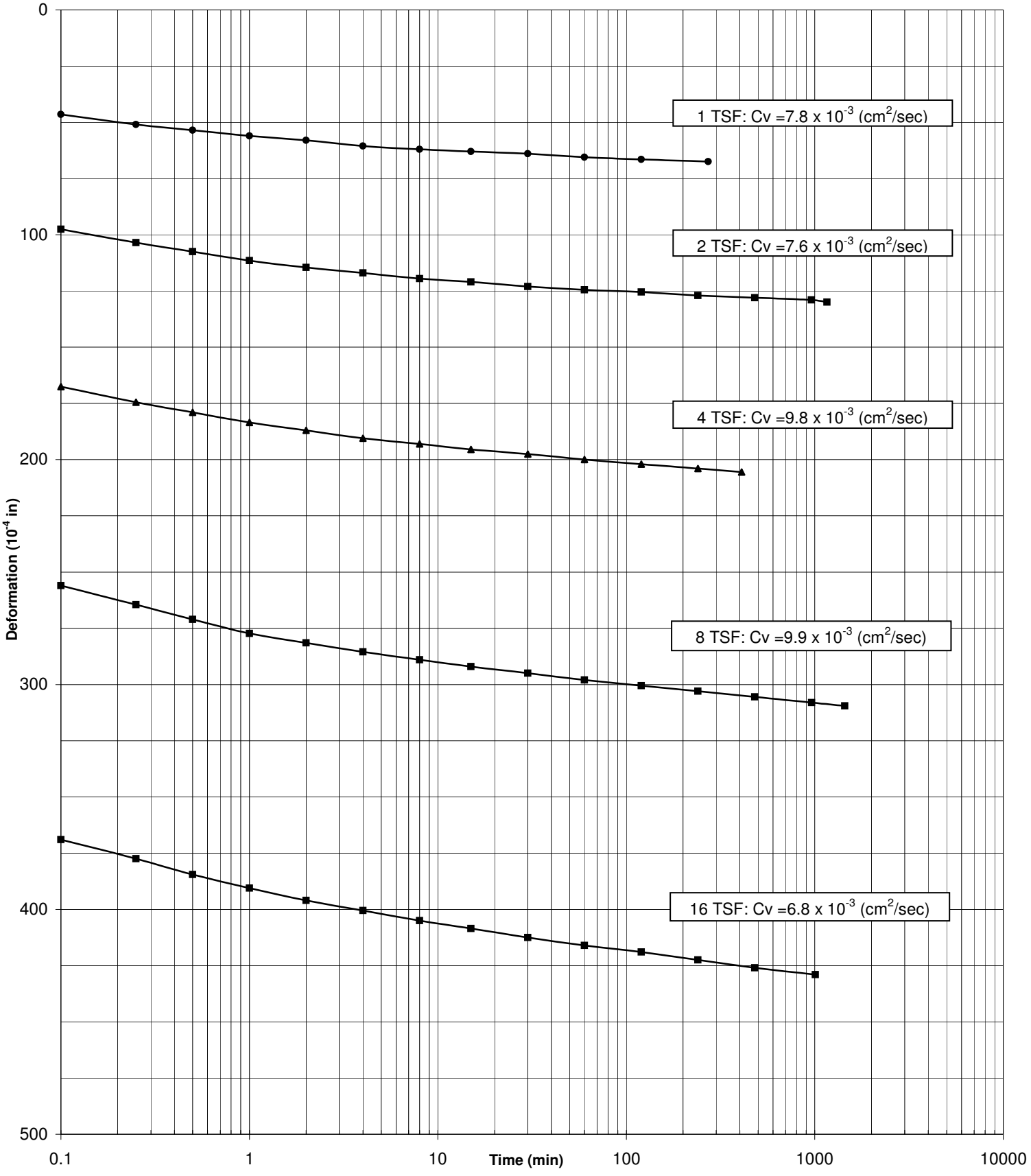
Remarks: Testing performed in general accordance with ASTM:D2435
Distilled water used for sample inundation.

9530 James Avenue South

SOIL ENGINEERING TESTING, INC.

Bloomington, Minnesota 55431

Consolidation Log of Time Curves



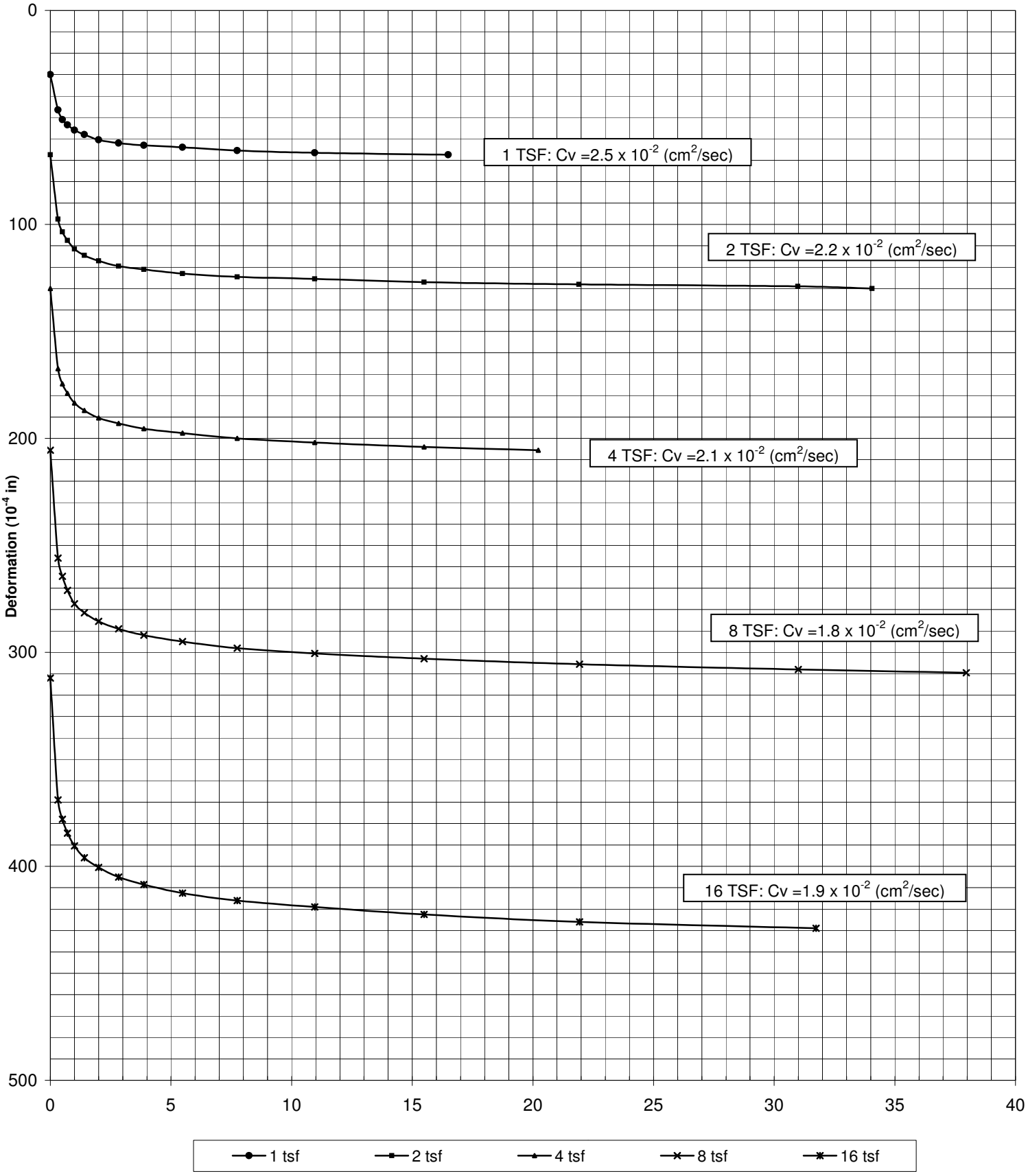
Project: White Pine Mine - #0040820 / American Engineering Testing, Inc.			Date: 9/2/25
Sample #:	Boring #: PFS-3	Depth ft: 12-14	Job #: 15997

9530 James Avenue South

SOIL ENGINEERING TESTING, INC.

Bloomington, Minnesota 55431

Square Root of Time Curves



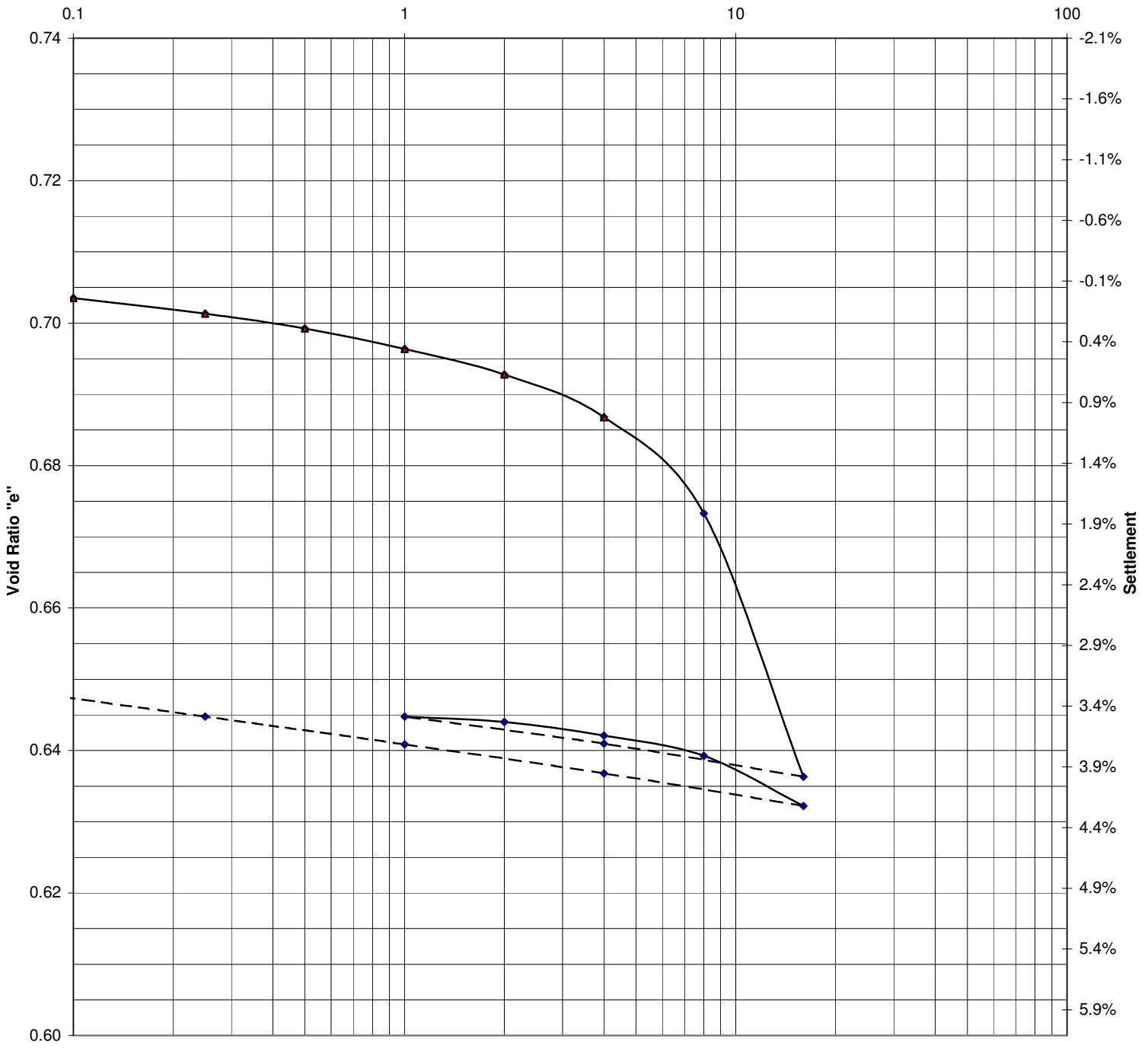
Project: White Pine Mine - #0040820 / American Engineering Testing, Inc.			Date: 9/2/25
Sample #:	Boring #: PFS-3	Depth ft: 12-14	Job #: 15997

9530 James Avenue South

SOIL ENGINEERING TESTING, INC.

Bloomington, Minnesota 55431

Void Ratio and % Settlement vs. Log of Pressure



Project: White Pine Mine - #0040820 / American Engineering Testing, Inc.				Date: 8/22/25
Sample #:	Boring #: PFS-4A	Depth ft: 22-24		Job #: 15997
Soil Type: Sand w/silt, fine grained (SP-SM)				
Initial W/C (%): 5.7	Dry Density (pcf): 96.7	LL:	PL: PI:	Gs: 2.64 (Assumed)
Organic Content (%):	Initial Height (in.): 0.897	Diameter (in.): 2.506	e_o= 0.705	
Preconsolidation Pressure (Pc): 6.5 tsf	Compression Index (Cc): 0.12	Recompression Index (Cr): 0.01		

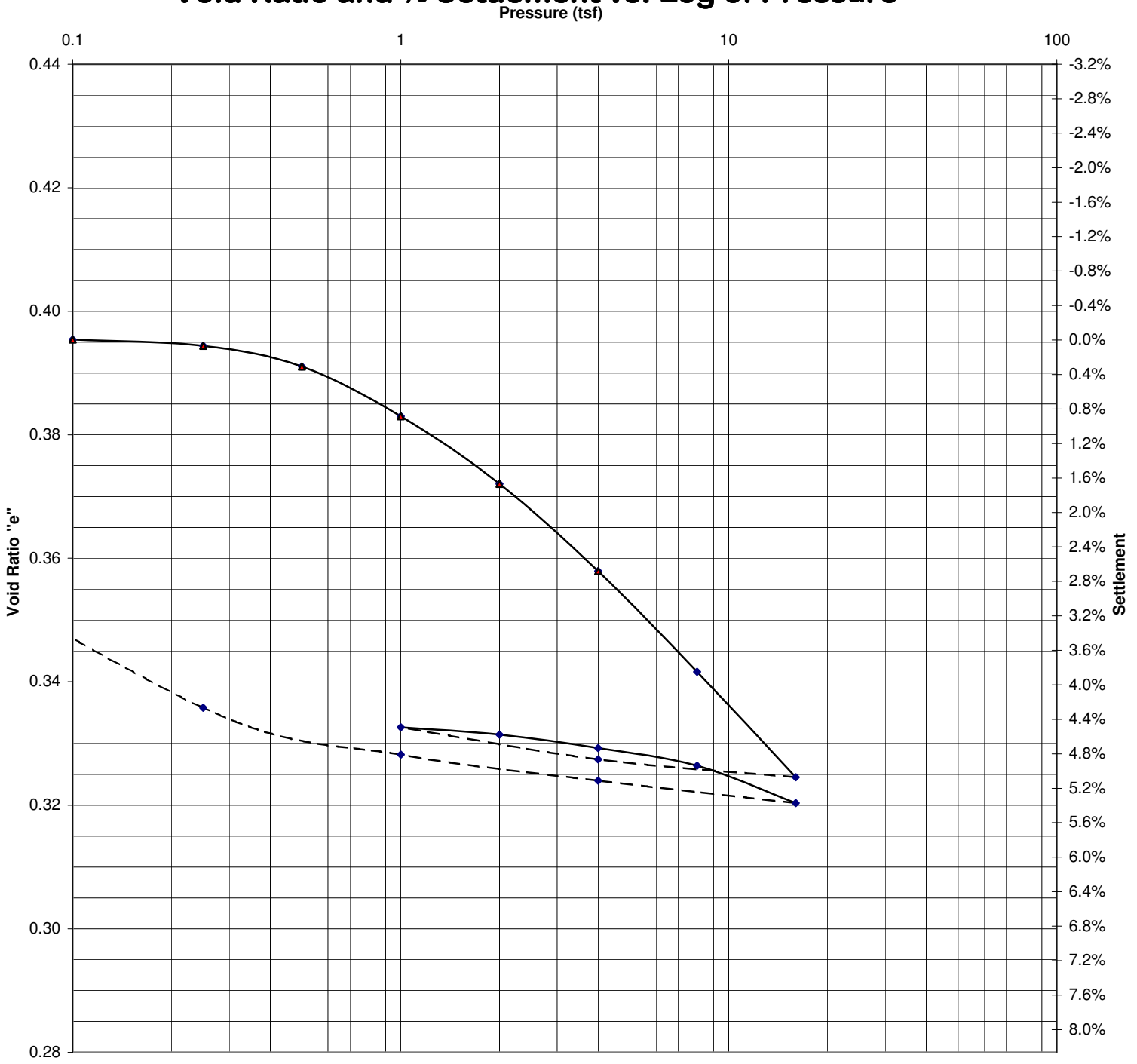
Remarks: Testing performed in general accordance with ASTM:D2435
Distilled water used for sample inundation.
Specimen compacted to an estimated 90% of maximum standard proctor density.

9530 James Avenue South

SOIL ENGINEERING TESTING, INC.

Bloomington, Minnesota 55431

Void Ratio and % Settlement vs. Log of Pressure



Project: White Pine Mine - #0040820 / American Engineering Testing, Inc.				Date: 9/2/25
Sample #:	Boring #: PFS-4B	Depth ft: 12-14		Job #: 15997
Soil Type: Silty Clay w/sand and a little gravel (CL-ML)				
Initial W/C (%): 12.0	Dry Density (pcf): 121.7	LL:	PL: PI:	Gs: 2.72 (Assumed)
Organic Content (%):	Initial Height (in.): 0.899	Diameter (in.): 2.501	e_o= 0.396	
Preconsolidation Pressure (Pc): 1.5 tsf	Compression Index (Cc): 0.06	Recompression Index (Cr): 0.01		

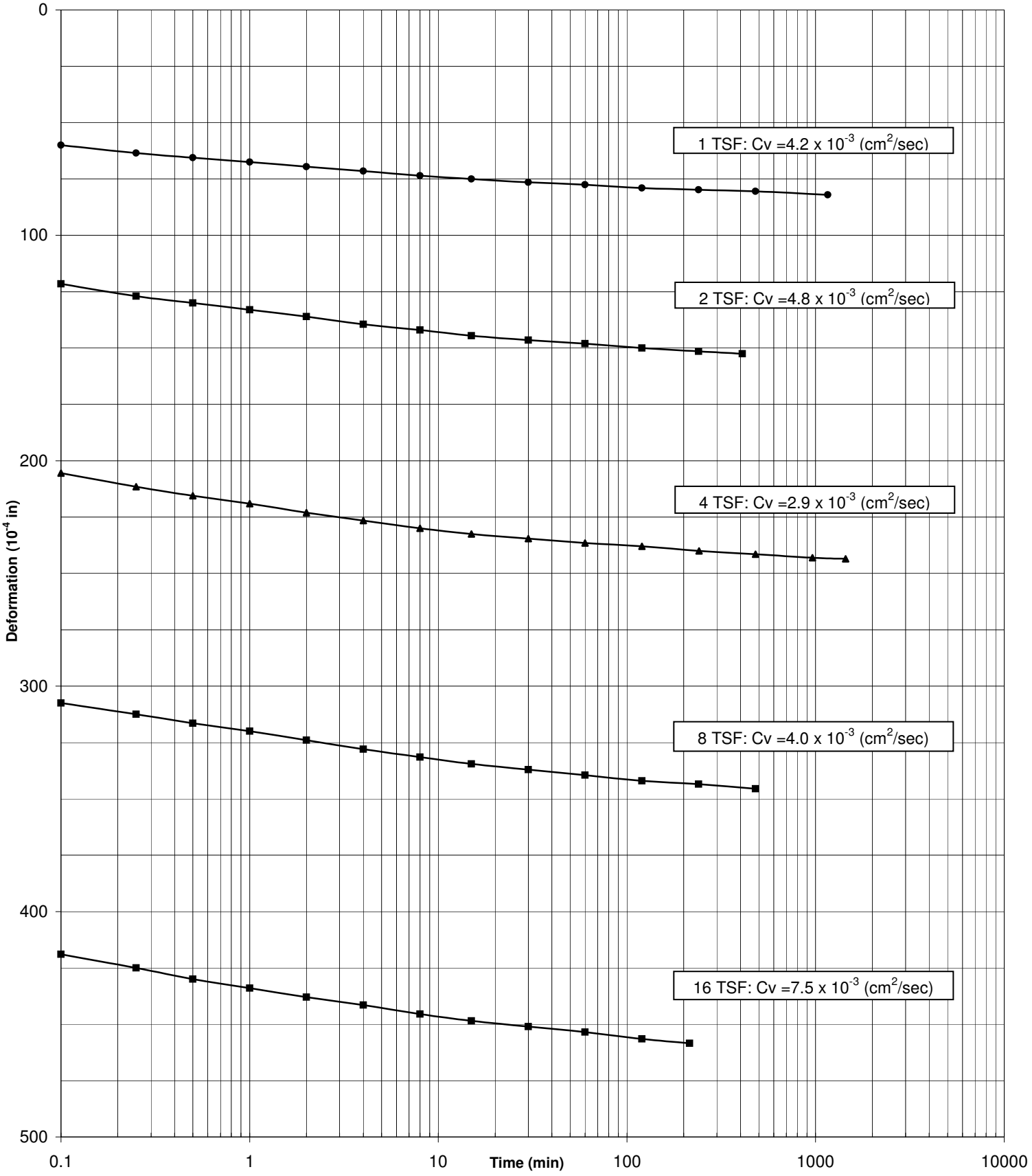
Remarks: Testing performed in general accordance with ASTM:D2435
Distilled water used for sample inundation.

9530 James Avenue South

SOIL ENGINEERING TESTING, INC.

Bloomington, Minnesota 55431

Consolidation Log of Time Curves



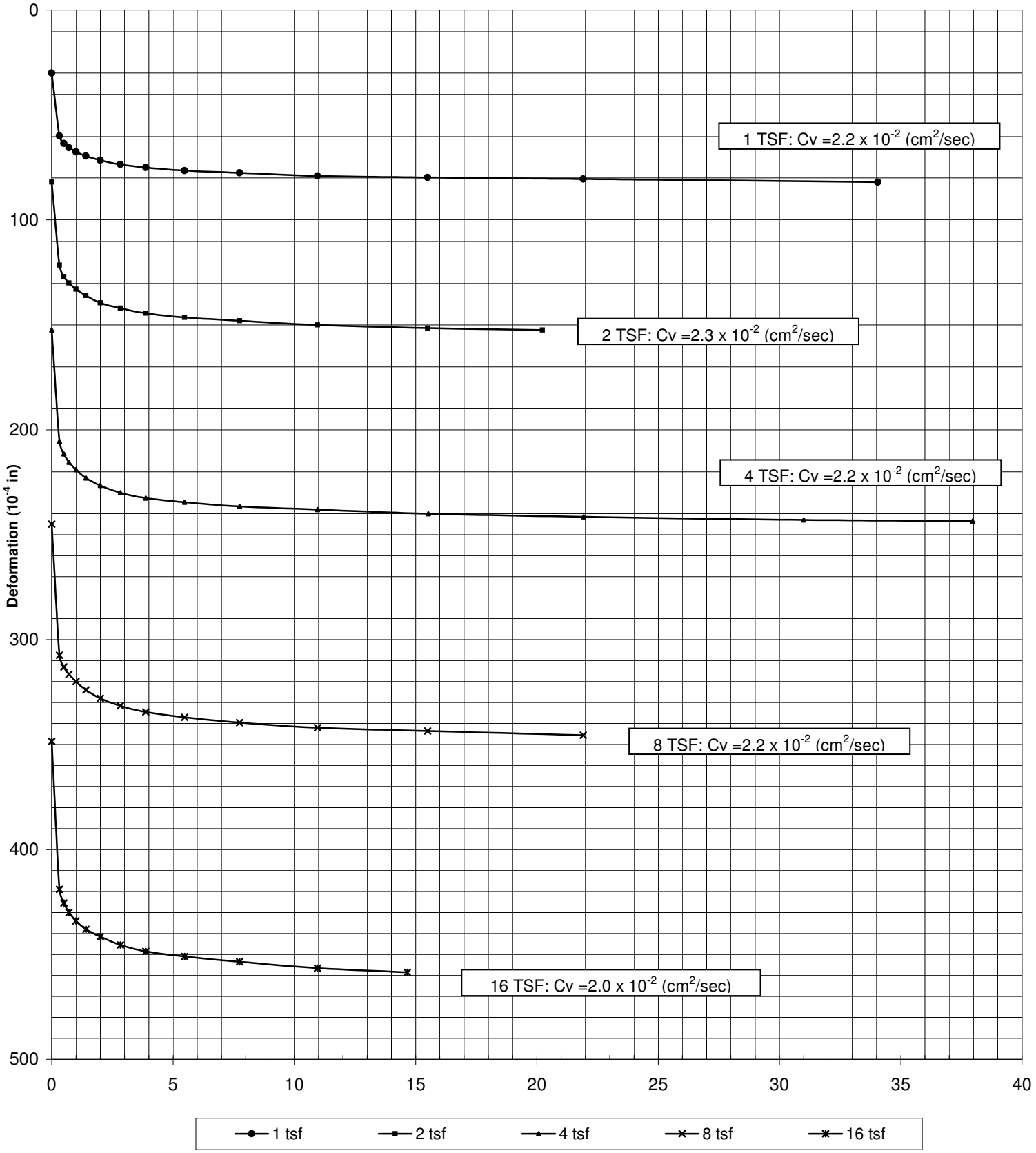
Project: White Pine Mine - #0040820 / American Engineering Testing, Inc.			Date: 9/2/25
Sample #:	Boring #: PFS-4B	Depth ft: 12-14	Job #: 15997

9530 James Avenue South

SOIL ENGINEERING TESTING, INC.

Bloomington, Minnesota 55431

Square Root of Time Curves



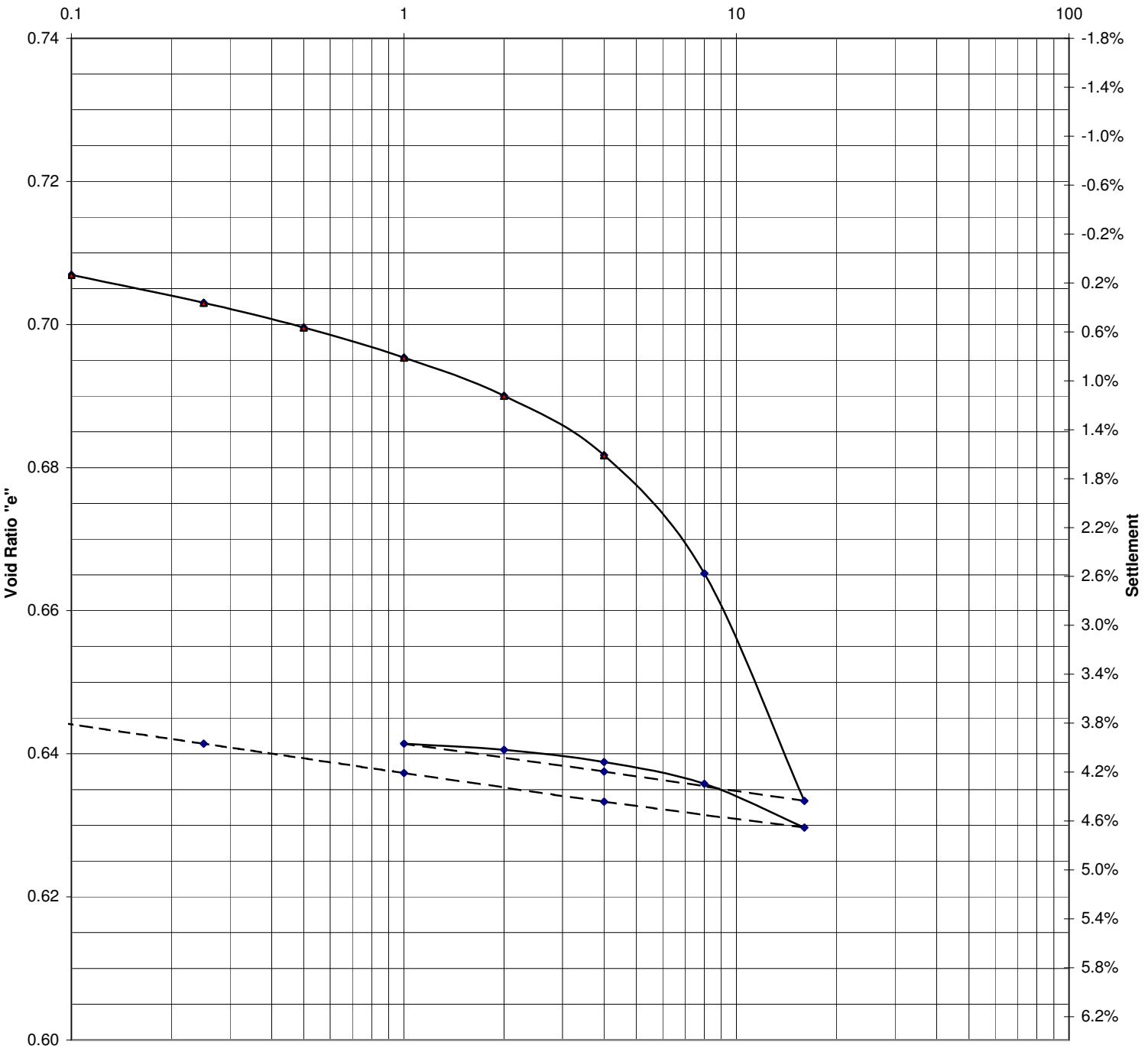
Project: White Pine Mine - #0040820 / American Engineering Testing, Inc.			Date: 9/2/25
Sample #:	Boring #: PFS-4B	Depth ft: 12-14	Job #: 15997

9530 James Avenue South

SOIL ENGINEERING TESTING, INC.

Bloomington, Minnesota 55431

Void Ratio and % Settlement vs. Log of Pressure



Project: White Pine Mine - #0040820 / American Engineering Testing, Inc.				Date: 8/28/25
Sample #:	Boring #: PFS-6A	Depth ft: 32-34		Job #: 15997
Soil Type: Sand w/silt, fine grained (SP-SM)				
Initial W/C (%): 5.9	Dry Density (pcf): 96.4	LL:	PL:	PI: Gs: 2.64 (Assumed)
Organic Content (%):	Initial Height (in.): 0.895	Diameter (in.): 2.506	e_o= 0.709	
Preconsolidation Pressure (Pc): 5.5 tsf	Compression Index (Cc): 0.11	Recompression Index (Cr): 0.01		

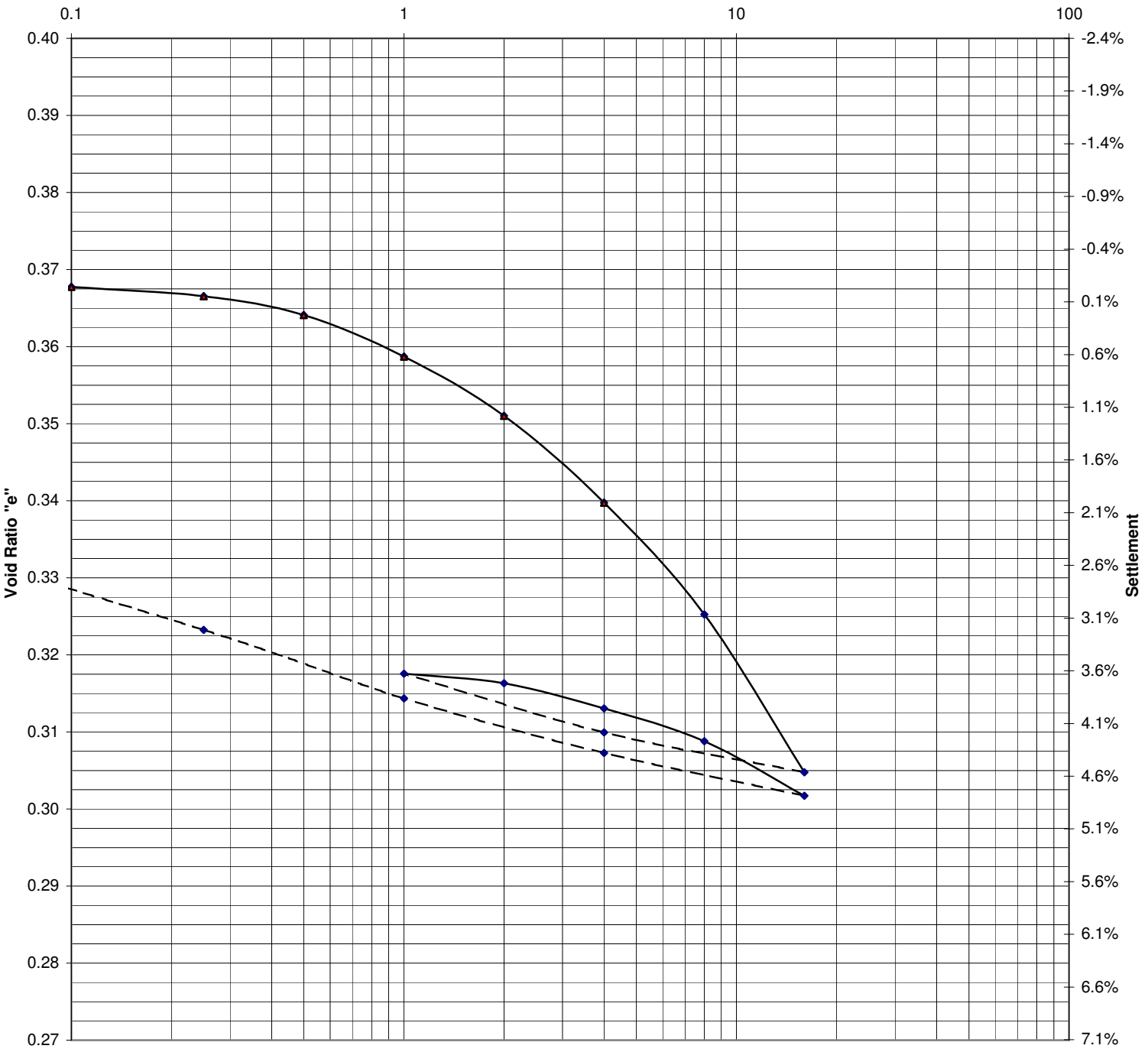
Remarks: Testing performed in general accordance with ASTM:D2435.
Distilled water used for sample inundation.
Specimen compacted to an estimated 90% of maximum standard proctor density.

9530 James Avenue South

SOIL ENGINEERING TESTING, INC.

Bloomington, Minnesota 55431

Void Ratio and % Settlement vs. Log of Pressure



Project: White Pine Mine - #0040820 / American Engineering Testing, Inc.				Date: 8/29/25
Sample #:	Boring #: PFS-6B	Depth ft: 22-24		Job #: 15997
Soil Type: Lean Clay w/sand and some lenses of silt (CL)				
Initial W/C (%): 12.0	Dry Density (pcf): 124.6	LL: 27	PL: 14	PI: 13	Gs: 2.73 (Assumed)
Organic Content (%):	Initial Height (in.): 0.899	Diameter (in.): 2.501	e_o= 0.368	
Preconsolidation Pressure (Pc): 3.3 tsf	Compression Index (Cc): 0.07	Recompression Index (Cr): 0.01		

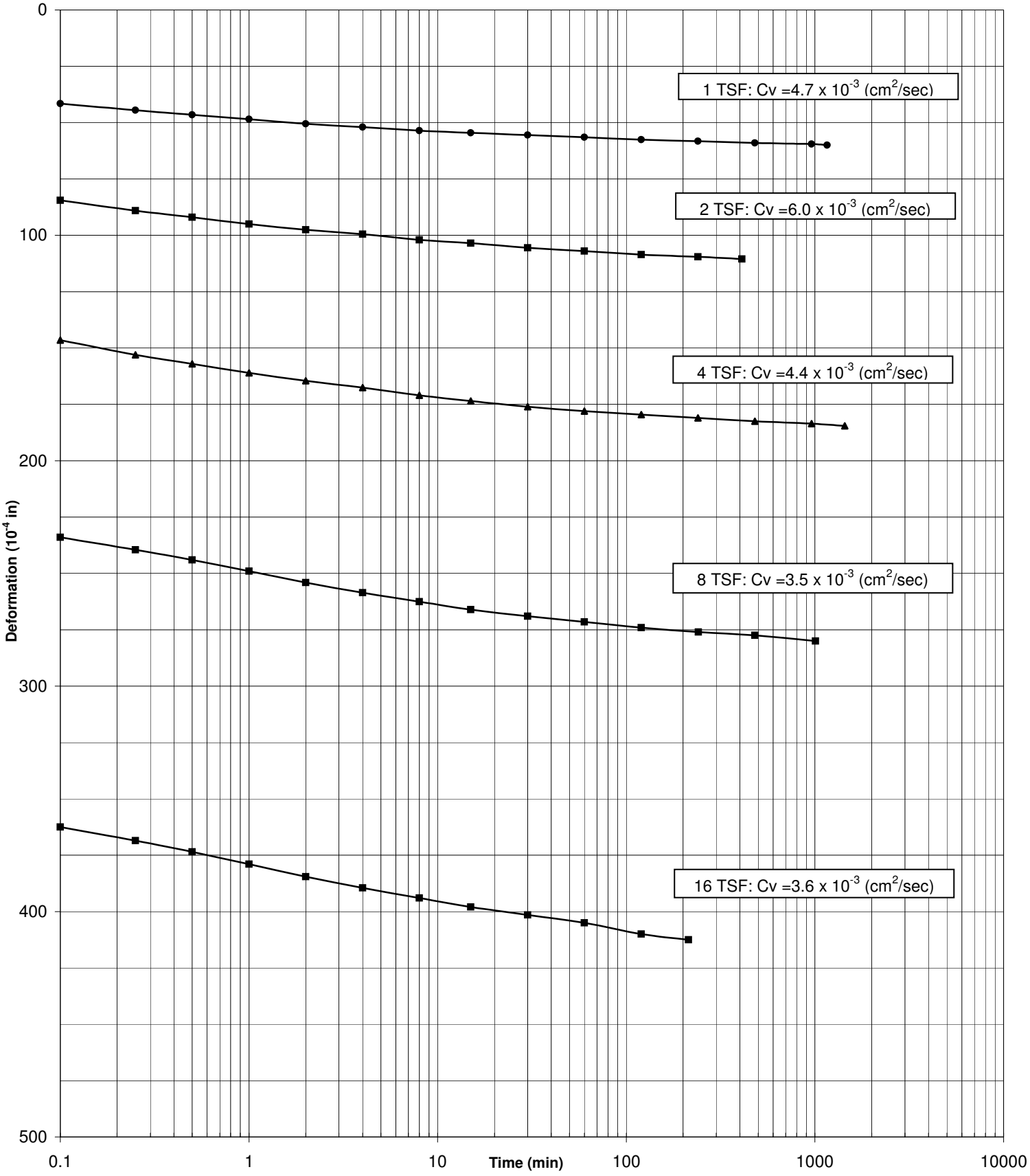
Remarks: Testing performed in general accordance with ASTM:D2435
Distilled water used for sample inundation.

9530 James Avenue South

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Bloomington, Minnesota 55431

Consolidation Log of Time Curves



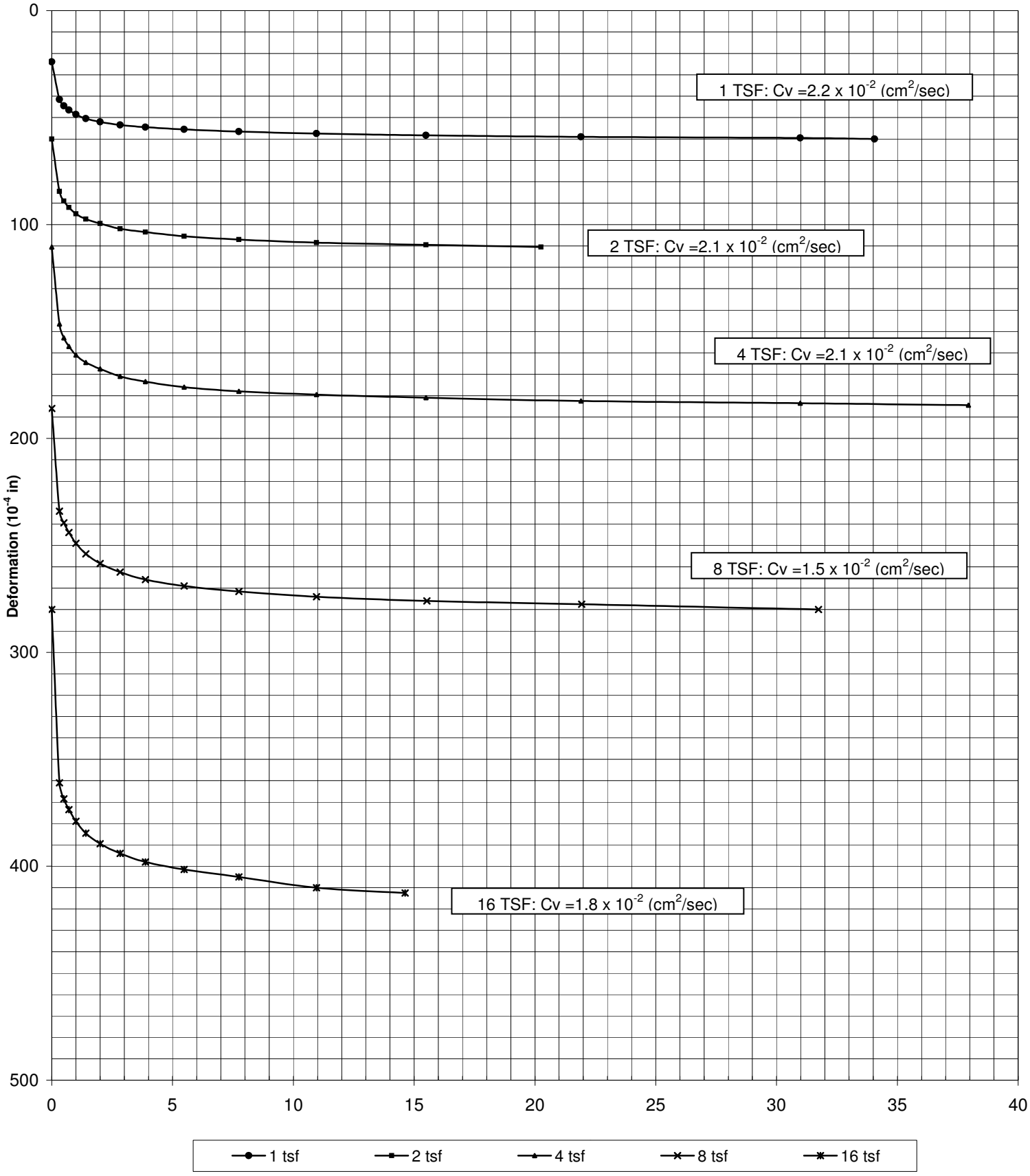
Project: White Pine Mine - #0040820 / American Engineering Testing, Inc.			Date: 8/29/25
Sample #:	Boring #: PFS-6B	Depth ft: 22-24	Job #: 15997

9530 James Avenue South

SOIL ENGINEERING TESTING, INC.

Bloomington, Minnesota 55431

Square Root of Time Curves



Project: White Pine Mine - #0040820 / American Engineering Testing, Inc.			Date: 8/29/25
Sample #:	Boring #: PFS-6B	Depth ft: 22-24	Job #: 15997

9530 James Avenue South

SOIL ENGINEERING TESTING, INC.

Bloomington, Minnesota 55431

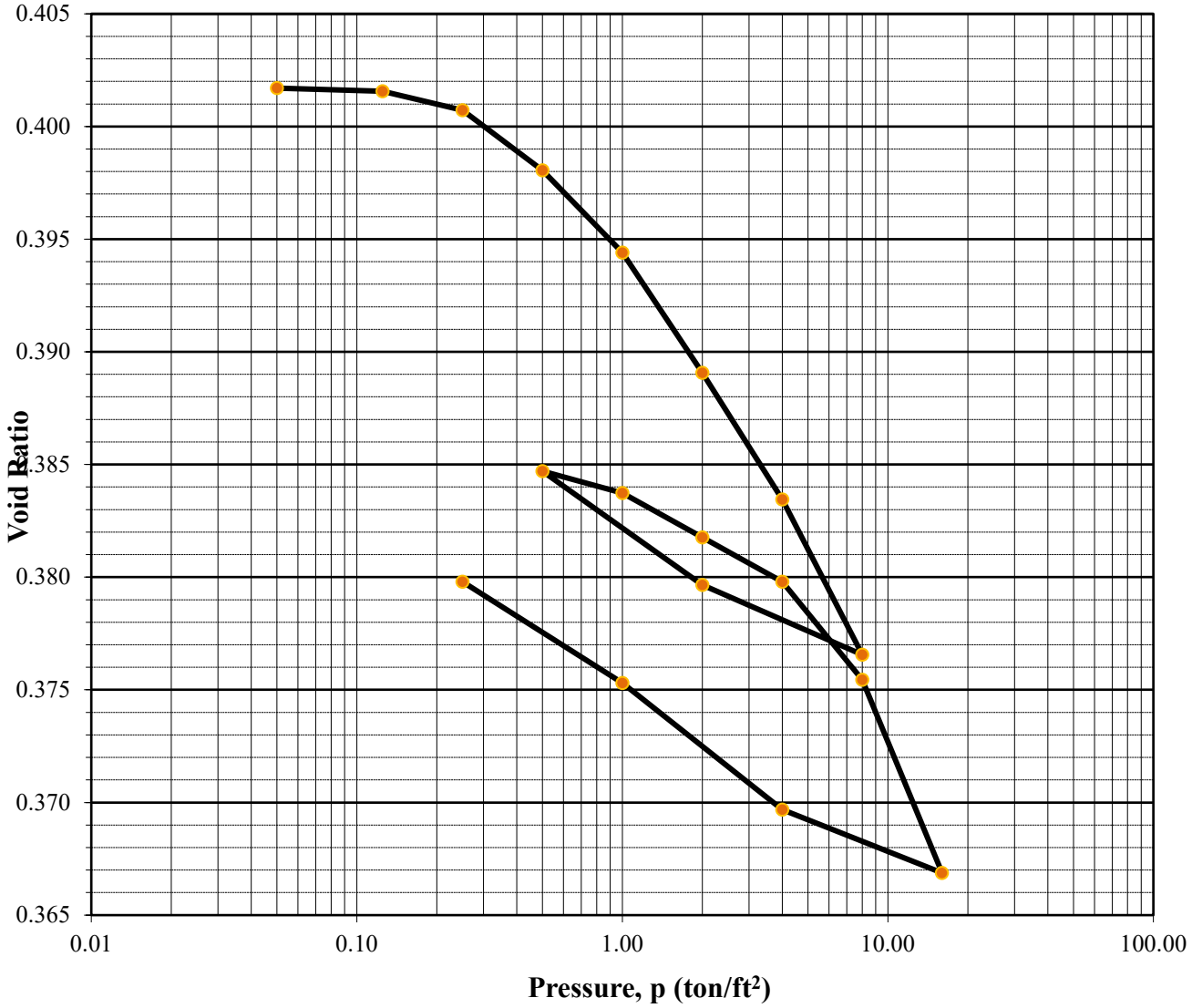
AMERICAN ENGINEERING TESTING

Consolidation Test Results: Void Ratio vs. Pressure

Project: White Pine, MI

AET No.: P-0040820

Date: 10/16/2025



	Before	After			
Water Content (%):	10.03	14.12	**Liquid Limit (%):**	NP	**Test Date:** 7/25/2025
Dry Density (pcf):	119.81	121.94	**Plastic Limit (%):**	NP	
Saturation (%):	66.56	99.73	**Plasticity Index (%):**	NP	
Void Ratio:	0.4044	0.3798	**Specific Gravity:**	2.70	Assumed

Sample Description: Silty Sand, gray-brown (SM)

Boring Number: Tailings #2 **Depth:**

Remarks: Test conducted in general accordance with ASTM D2435

Soil Parameters:

Preconsolidation Pressure (Pc): 1.0 tsf

Compression Index (Cc): 0.025

Recompression Index (Cr): 0.007

Tested By: Benjamin Pomroy

Reviewed By:

AMERICAN ENGINEERING TESTING

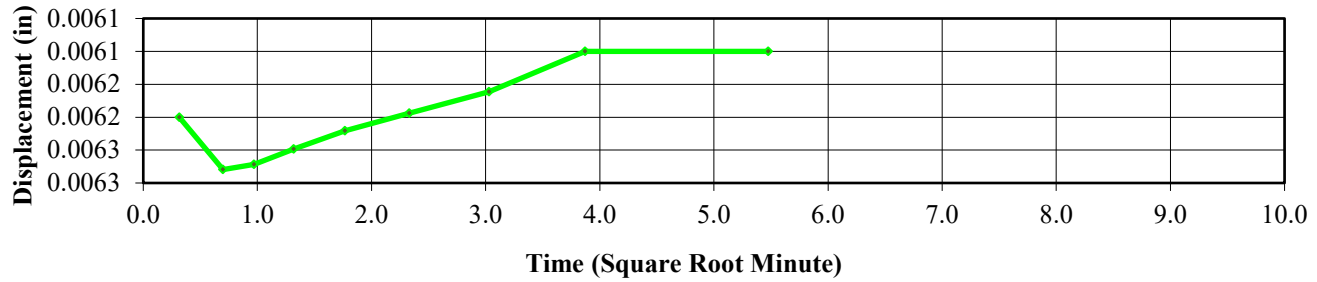
Consolidation Test Results: Square Root Time vs. Displacement

Project: White Pine, MI

AET #: P-0040820

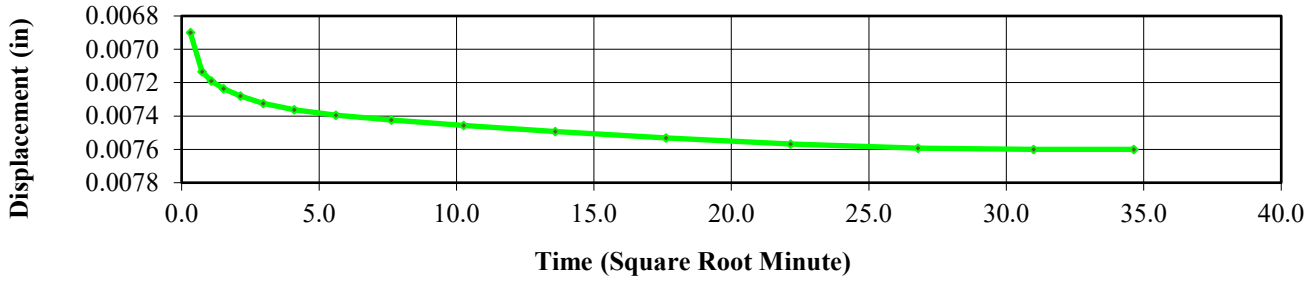
Date: 10/16/2025

Load: 0.05 tsf



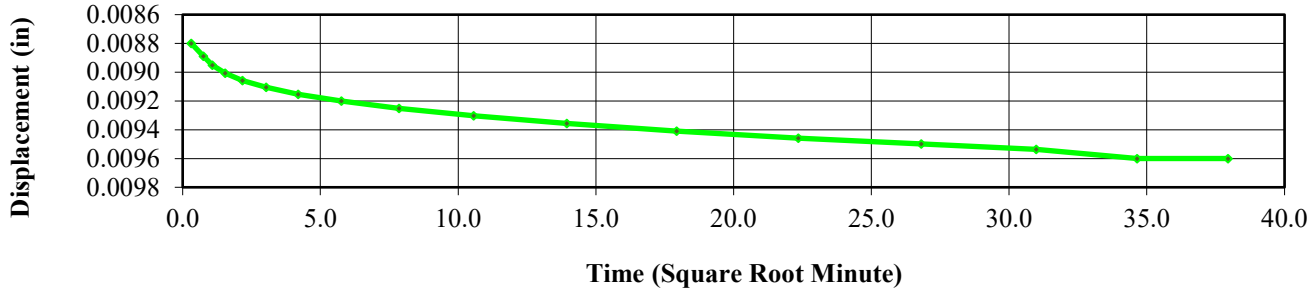
Cv= N/A (ft2/year)

Load: 0.125 tsf



Cv= 53.378 (ft2/year)

Load: 0.25 tsf



Cv= 49.865 (ft2/year)

Sample Description:	Silty Sand, gray-brown (SM)	
Boring Number:	Tailings #2	**Depth:**
Remarks:	Test conducted in general accordance with ASTM D2435	

Tested By: Benjamin Pomroy

Reviewed By:

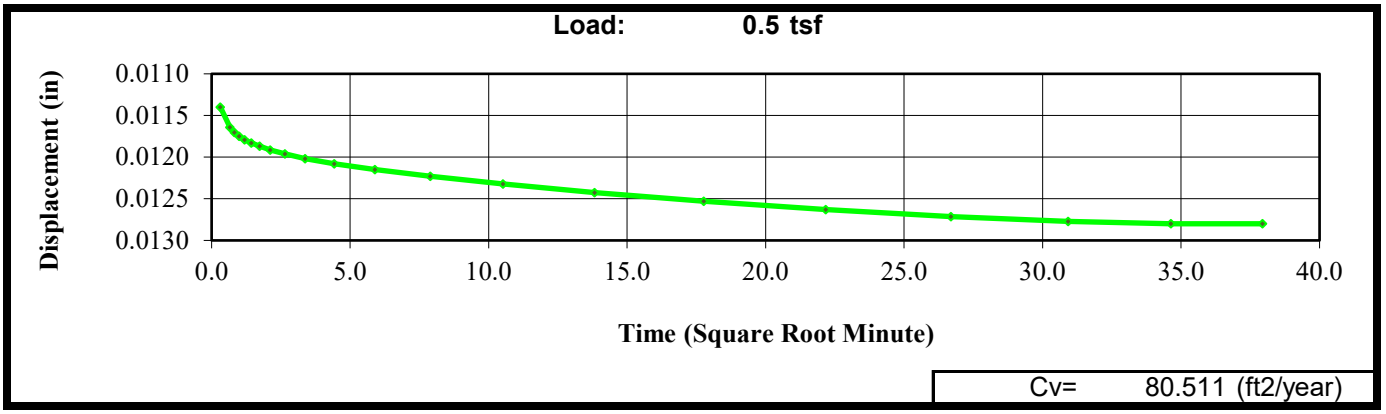
AMERICAN ENGINEERING TESTING

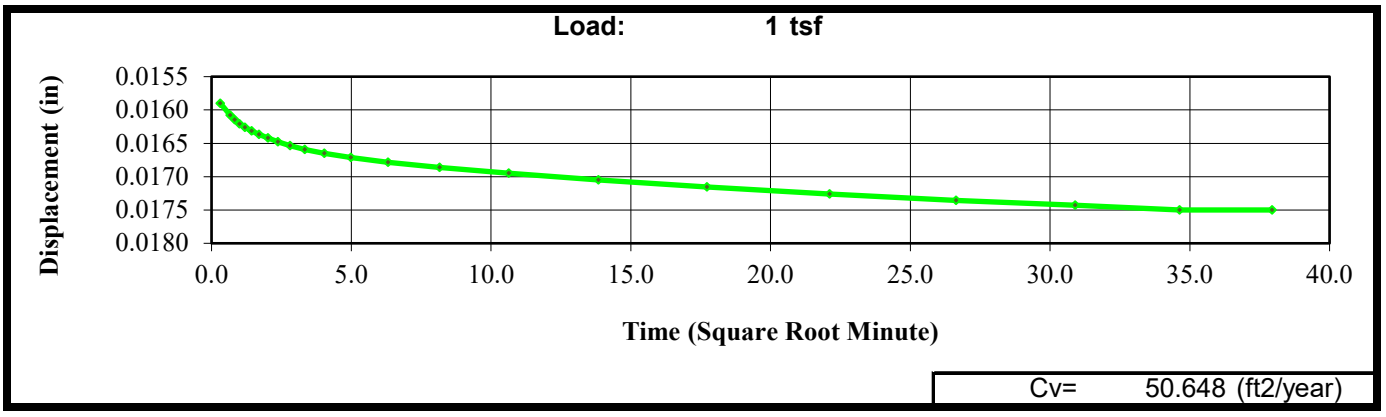
Consolidation Test Results: Square Root Time vs. Displacement

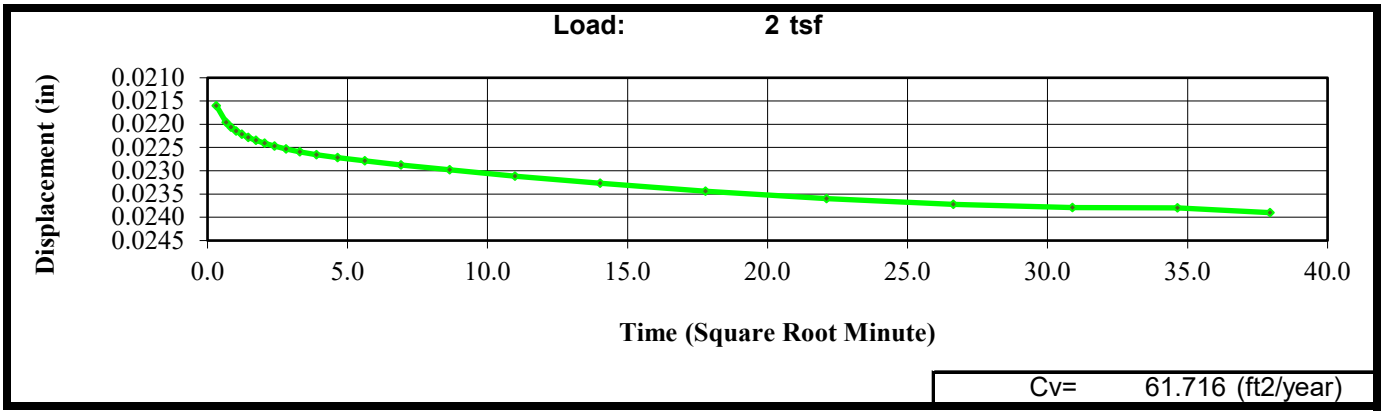
Project: White Pine, MI

AET #: P-0040820

Date: 10/16/2025







Sample Description:	Silty Sand, gray-brown (SM)		
Boring Number:	Tailings #2	**Depth:**	
Remarks:	Test conducted in general accordance with ASTM D2435		
Tested By: Benjamin Pomroy		**Reviewed By:**	

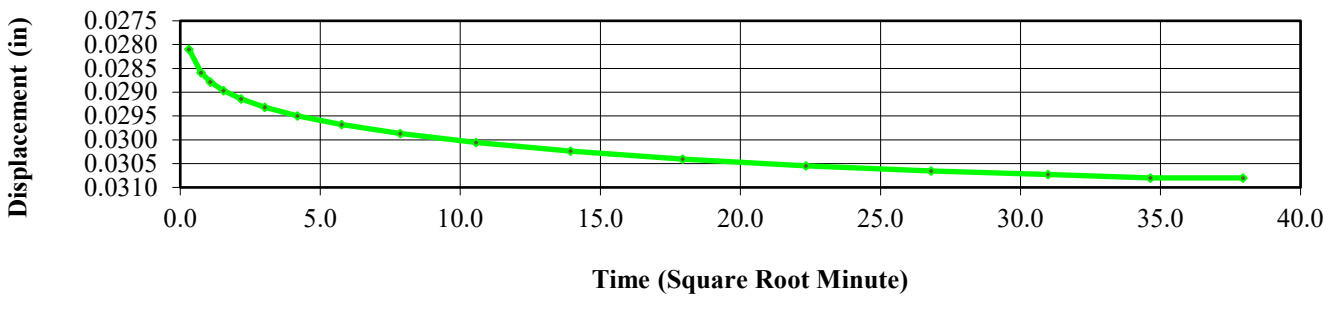
AMERICAN ENGINEERING TESTING

Consolidation Test Results: Square Root Time vs. Displacement

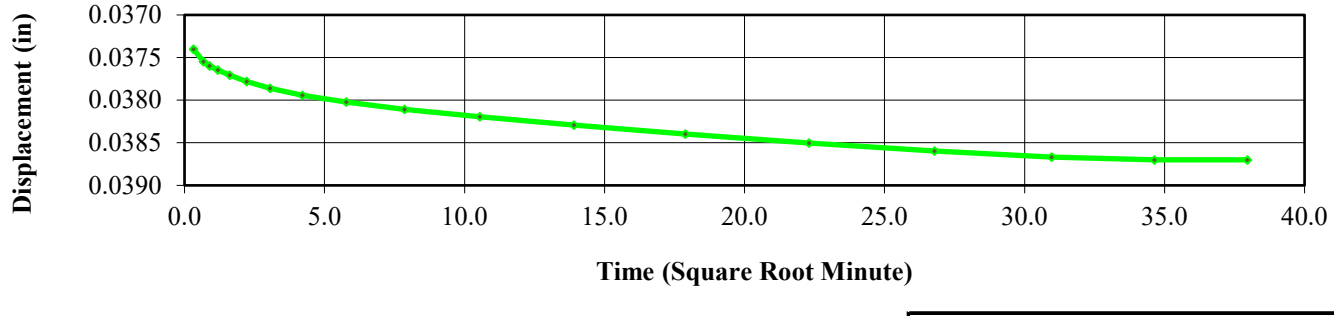
Project: White Pine, MI

AET #: P-0040820

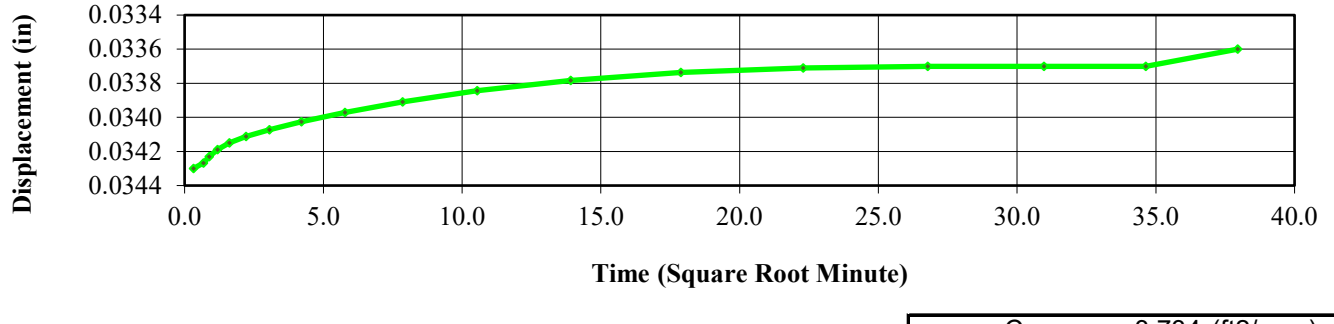
Date: 10/16/2025



Cv= 55.989 (ft2/year)



Cv= 46.658 (ft2/year)



Cv= 3.734 (ft2/year)

Sample Description:	Silty Sand, gray-brown (SM)		
Boring Number:	Tailings #2	**Depth:**	
Remarks:	Test conducted in general accordance with ASTM D2435		
Tested By: Benjamin Pomroy		**Reviewed By:**	

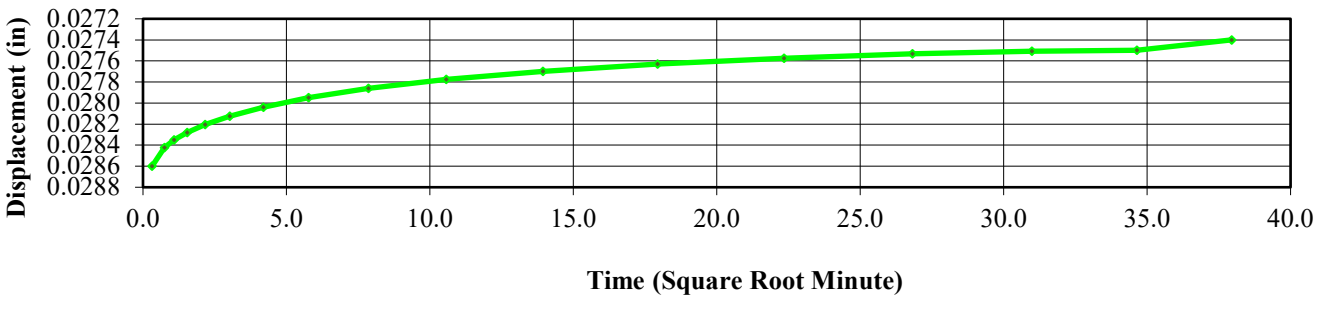
AMERICAN ENGINEERING TESTING

Consolidation Test Results: Square Root Time vs. Displacement

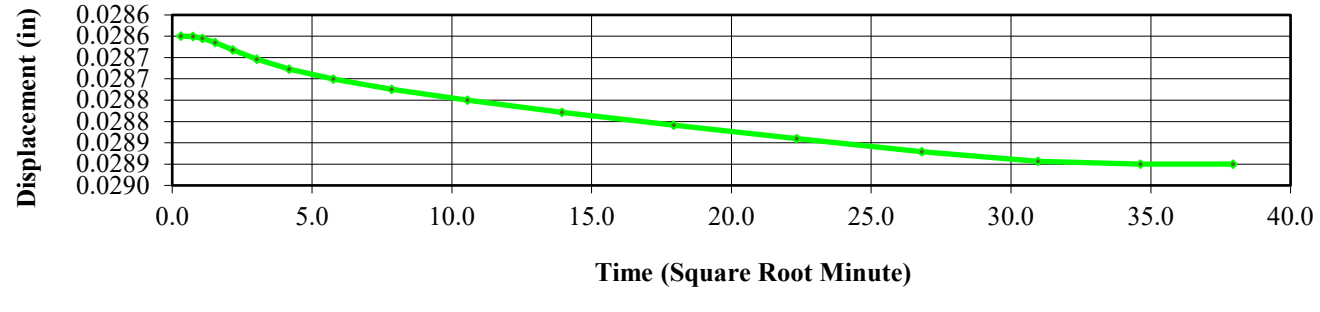
Project: White Pine, MI

AET #: P-0040820

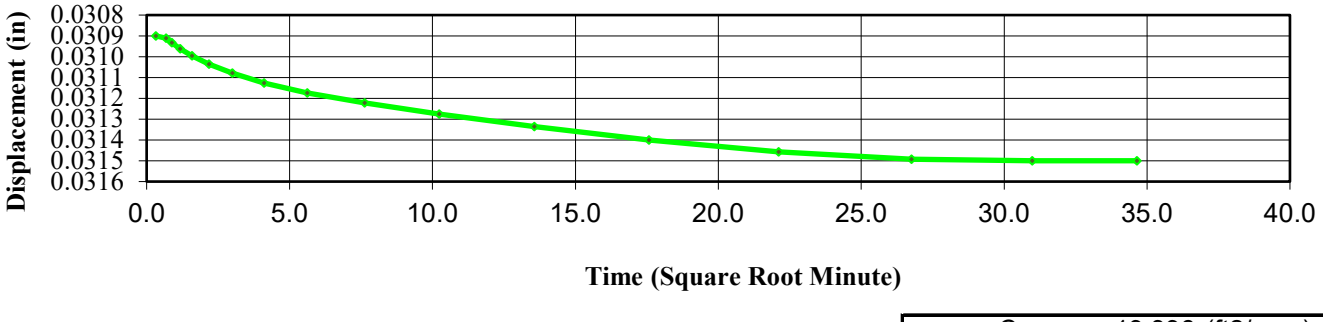
Date: 10/16/2025



Cv= 24.292 (ft2/year)



Cv= N/A (ft2/year)



Cv= 19.396 (ft2/year)

Sample Description:	Silty Sand, gray-brown (SM)		
Boring Number:	Tailings #2	**Depth:**	
Remarks:	Test conducted in general accordance with ASTM D2435		
Tested By: Benjamin Pomroy		**Reviewed By:**	

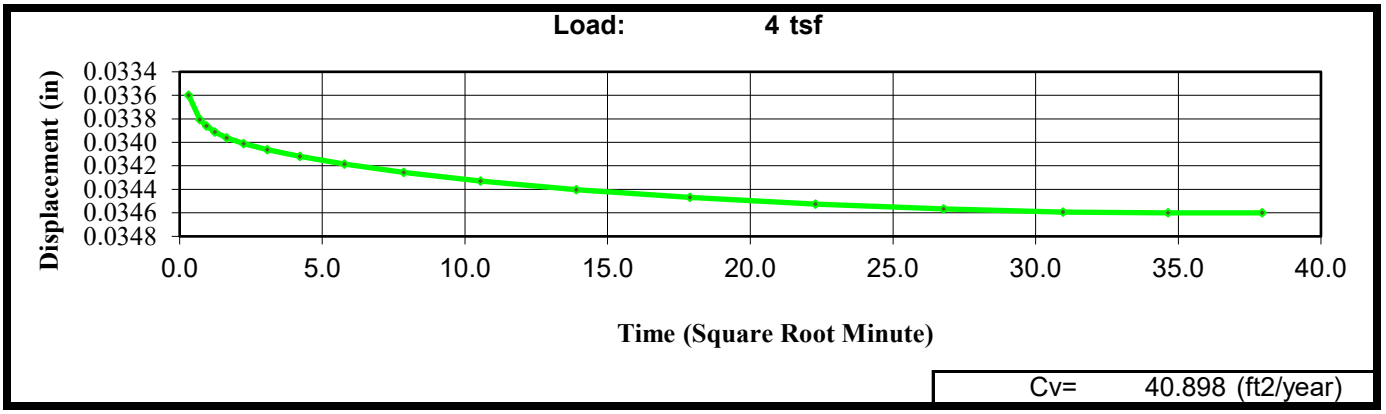
AMERICAN ENGINEERING TESTING

Consolidation Test Results: Square Root Time vs. Displacement

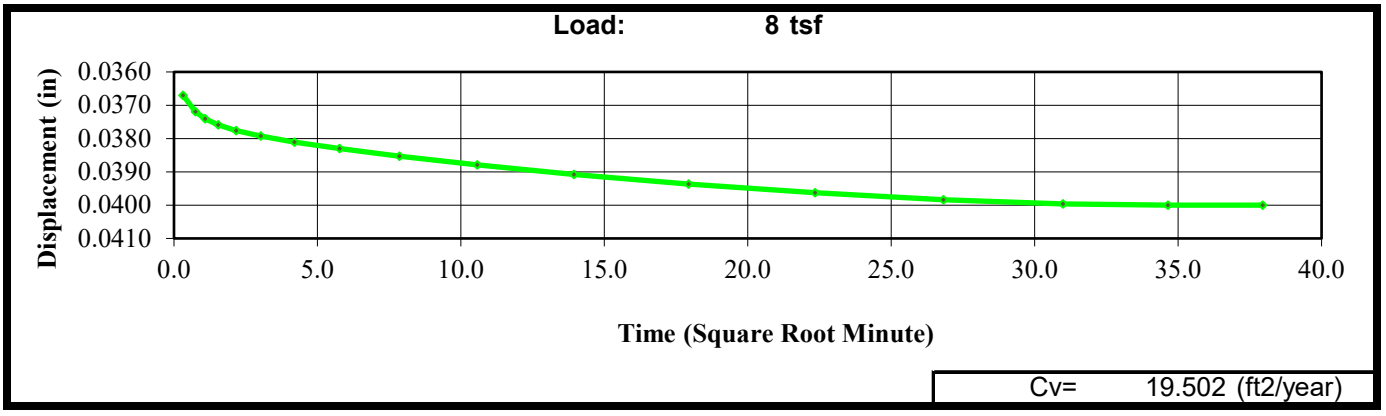
Project: White Pine, MI

AET #: P-0040820

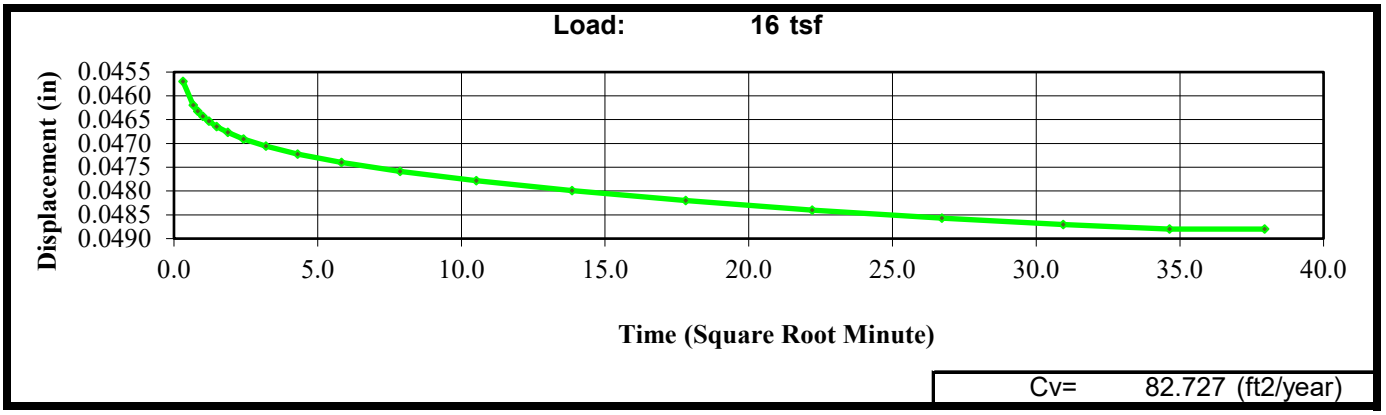
Date: 10/16/2025



Cv= 40.898 (ft2/year)



Cv= 19.502 (ft2/year)



Cv= 82.727 (ft2/year)

Sample Description:	Silty Sand, gray-brown (SM)		
Boring Number:	Tailings #2	**Depth:**	
Remarks:	Test conducted in general accordance with ASTM D2435		
Tested By: Benjamin Pomroy		**Reviewed By:**	

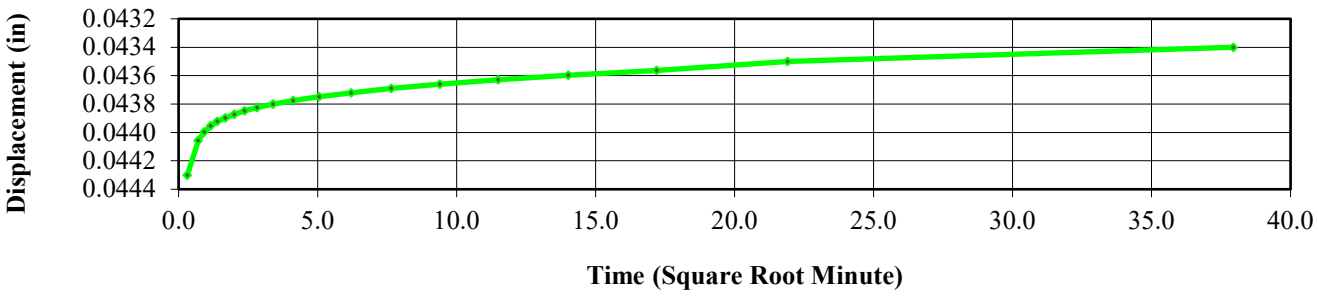
AMERICAN ENGINEERING TESTING

Consolidation Test Results: Square Root Time vs. Displacement

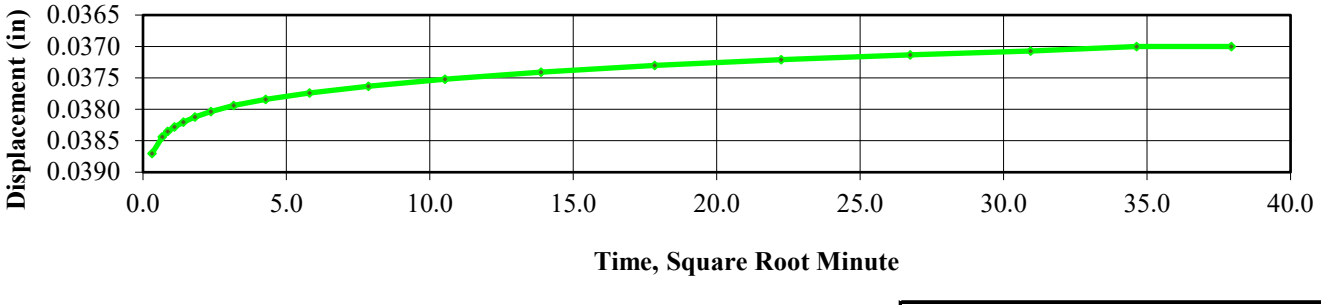
Project: White Pine, MI

AET #: P-0040820

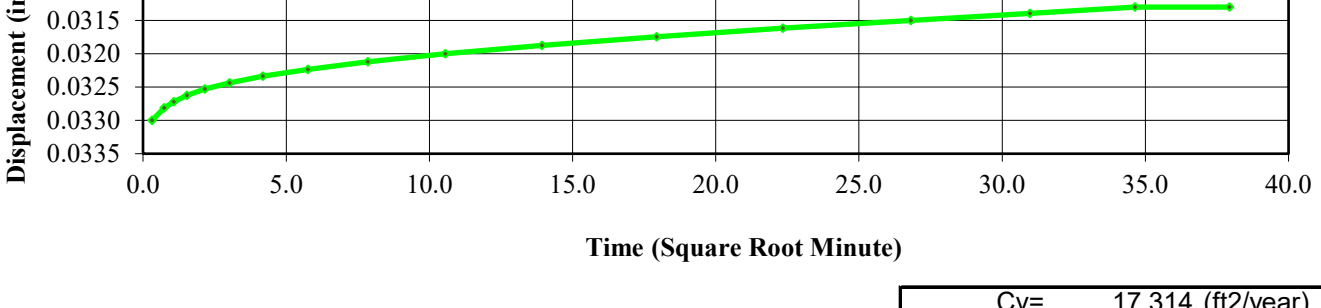
Date: 10/16/2025



Cv= 76.137 (ft2/year)



Cv= 110.810 (ft2/year)



Cv= 17.314 (ft2/year)

Sample Description:	Silty Sand, gray-brown (SM)		
Boring Number:	Tailings #2	**Depth:**	
Remarks:	Test conducted in general accordance with ASTM D2435		
Tested By: Benjamin Pomroy		**Reviewed By:**	

AMERICAN ENGINEERING TESTING

Consolidation Test Results: Summary

Project: White Pine, MI

AET No.: P-0040820

Date: 10/16/2025

Client No.:

Sample No.: Tailings #2
Boring No.: Tailings #2
Depth:
Sample Type: Undisturbed

Sample Description: Silty Sand, gray-brown (SM)
Remarks:

Test No.:
Test Date:

Index	Load Sequence (tsf)	Cummulative Change in Height (in)	Specimen Height (in)	Height of Void (in)	Vertical Strain (%)	Void Ratio	t90 Fitting Time (min)	t50 Fitting Time (min)	t90 Cv (ft2/year)	t50 Cv (ft2/year)
0	0.000	0.0000	1.0000	0.2879	0.00	0.4044	N/A	N/A	N/A	N/A
1	0.050	0.0019	0.9981	0.2860	0.19	0.4017	N/A	N/A	N/A	N/A
2	0.125	0.0020	0.9980	0.2859	0.20	0.4016	14.439	* 8.0214	53.378	22.321
3	0.250	0.0026	0.9974	0.2853	0.26	0.4007	15.437	* 8.5762	49.865	20.852
4	0.500	0.0045	0.9955	0.2834	0.45	0.3981	9.525	* 5.2915	80.511	33.667
5	1.000	0.0071	0.9929	0.2808	0.71	0.3944	15.062	* 8.3677	50.648	21.179
6	2.000	0.0109	0.9891	0.2770	1.09	0.3891	12.266	13.648	61.716	12.886
7	4.000	0.0149	0.9851	0.2730	1.49	0.3834	13.412	8.365	55.989	20.853
8	8.000	0.0198	0.9802	0.2681	1.98	0.3766	15.934	7.321	46.658	23.591
9	2.000	0.0176	0.9824	0.2703	1.76	0.3797	200.024	9.454	3.734	18.351
10	0.500	0.0140	0.9860	0.2739	1.40	0.3847	30.969	* 17.2047	24.292	10.158
11	1.000	0.0147	0.9853	0.2732	1.47	0.3837	N/A	N/A	N/A	N/A
12	2.000	0.0161	0.9839	0.2718	1.61	0.3818	38.621	* 21.4560	19.396	8.111
13	4.000	0.0175	0.9825	0.2704	1.75	0.3798	18.264	6.827	40.898	25.418
14	8.000	0.0206	0.9794	0.2673	2.06	0.3754	38.061	9.759	19.502	17.669
15	16.000	0.0267	0.9733	0.2612	2.67	0.3669	8.861	* 4.9227	82.727	34.593
16	4.000	0.0247	0.9753	0.2632	2.47	0.3697	9.667	* 5.3708	76.137	31.837
17	1.000	0.0207	0.9793	0.2672	2.07	0.3753	6.697	* 3.7206	110.810	46.336
18	0.250	0.0175	0.9825	0.2704	1.75	0.3798	43.142	* 23.9675	17.314	7.240

Predicted value indicated with *

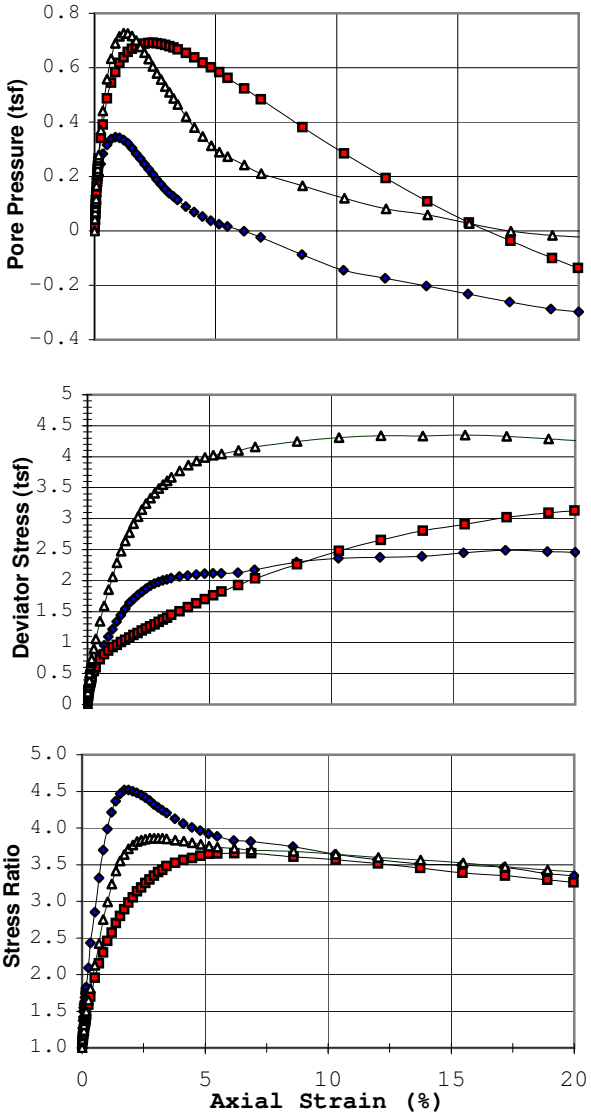
Tested By: Benjamin Pomroy

Reviewed By:

TRIAXIAL TEST ASTM: D 4767

Job No. **15997**
Date: **8/18/25**

Project: **White Pine Mine - #0040820 / American Engineering Testing, Inc.**
Boring #: **PFS-3** Sample #: Type: **3T** Depth (ft): **12-14**
Soil Type: **Sandy Lean Clay w/a little gravel (CL)**



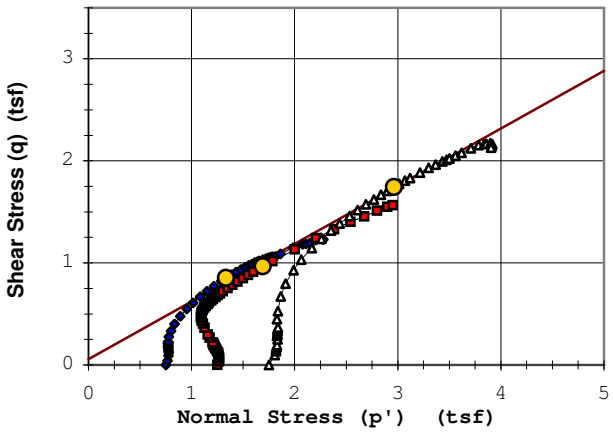


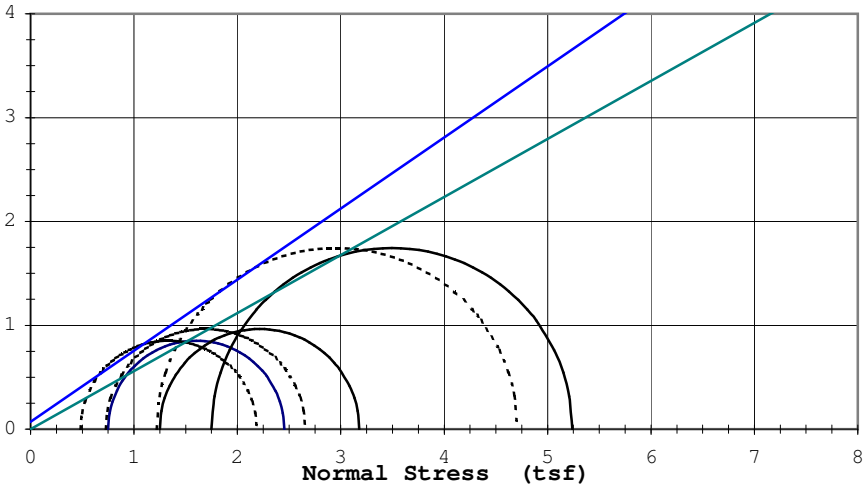
Failure Criterion:	**Max. Stress Ratio**
Angle of internal friction, **ϕ' =**	**34.4 °**
Apparent Cohesion, **c' =**	**0.07 (tsf)**
Test Date: 8/13/25	Liquid Limit:
Test Type: CU w/pp	Plastic Limit:
Strain Rate (in/min): 0.00073	Plasticity Index:
Strain Rate (%/min): 0.025	Spec. Gravity (Assumed): 2.69

Initial Conditions	A	B	C	D	E
Diameter (in)	1.44	1.44	1.44		
Height (in)	2.93	2.93	2.92		
Water Content (%)	12.9	12.7	14.2		
Dry Density (pcf)	123.0	121.1	118.9		
Void Ratio	0.36	0.39	0.41		
After Consolidation					
Diameter (in)	1.41	1.42	1.41		
Height (in)	2.92	2.91	2.91		
Water Content (%)	11.6	12.9	13.2		
Dry Density (pcf)	128.1	124.8	124.0		
Void Ratio	0.31	0.35	0.35		
Back Pressure (tsf)	4.0	7.3	4.0		
Minor Principal Stress (tsf)	0.75	1.25	1.75		
Max. Deviator Stress (tsf)	2.49	3.13	4.35		
Ultimate Deviator Stress (tsf)	2.46	3.13	4.26		
Deviator Stress at Failure (tsf)	1.70	1.93	3.49		
Max. Pore Pressure Buildup (tsf)	0.34	0.69	0.73		
Pore Pressure Parameter "B"	0.95	0.95	0.95		
Pct. Axial Strain at Failure	1.9	6.2	2.9		

"These test results are for informational purposes only and must be reviewed by a qualified professional engineer to verify that the test parameters shown are appropriate for any particular design"

Remarks: Specimens trimmed to given conditions; Saturated, backpressured until "B" response was 0.95 to 1.00; Consolidated; All Drainage valves closed and immediately sheared.
A correction for membrane stiffness was applied to the deviator stress.





Rupture Envelope at Failure			
α = 29.5 °	a = 0.1 (tsf)		

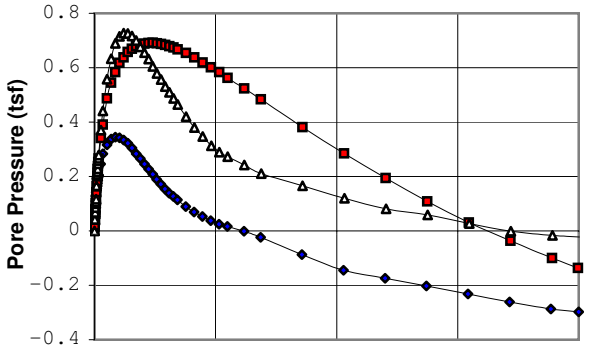
----------	Effective ϕ':	34.4 °	c'=	0.07 (tsf)
_____	Total ϕ:	29.2 °	c=	0.00 (tsf)

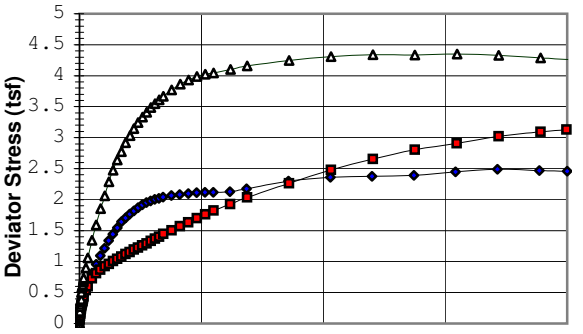
9530 James Avenue South — Bloomington, Minnesota 55431

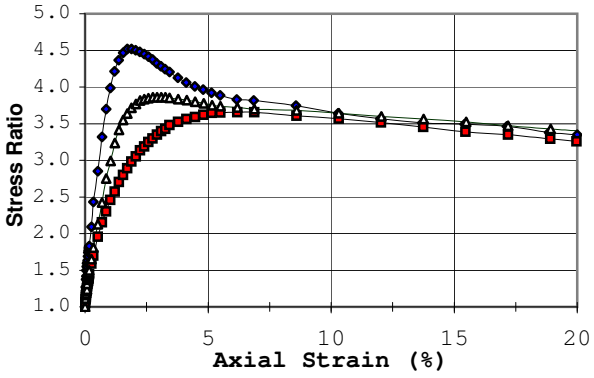
TRIAXIAL TEST ASTM: D 4767

Job No. **15997**
Date: **8/18/25**

Project: **White Pine Mine - #0040820 / American Engineering Testing, Inc.**
Boring #: **PFS-3** Sample #: Type: **3T** Depth (ft): **12-14**
Soil Type: **Sandy Lean Clay w/a little gravel (CL)**









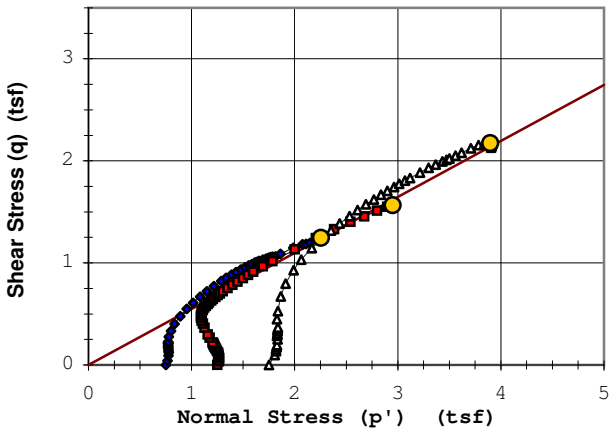
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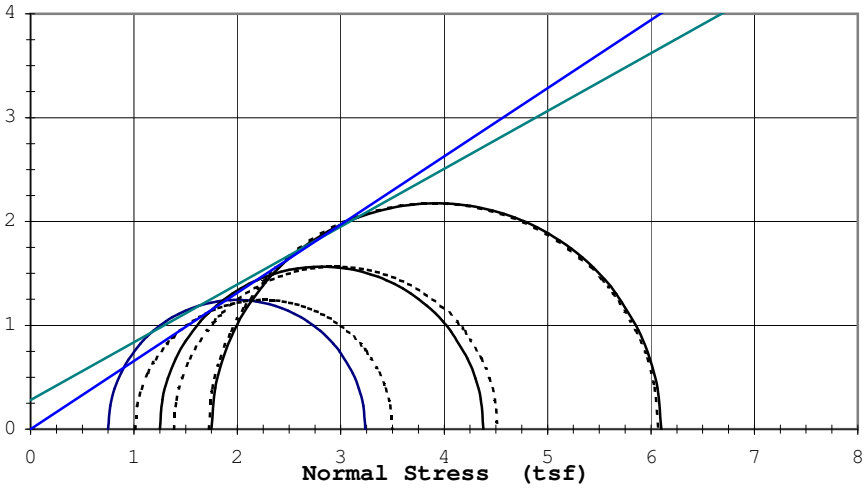
X

Failure Criterion:	Max. Deviator Stress				
Angle of internal friction, ϕ' =	33.3 °				
Apparent Cohesion, c' =	0.00 (tsf)				
Test Date: 8/13/25	Liquid Limit:				
Test Type: CU w/pp	Plastic Limit:				
Strain Rate (in/min): 0.00073	Plasticity Index:				
Strain Rate (%/min): 0.025	Spec. Gravity (Assumed):	2.69			
Initial Conditions	**A**	**B**	**C**	**D**	**E**
Diameter (in)	1.44	1.44	1.44		
Height (in)	2.93	2.93	2.92		
Water Content (%)	12.9	12.7	14.2		
Dry Density (pcf)	123.0	121.1	118.9		
Void Ratio	0.36	0.39	0.41		
After Consolidation					
Diameter (in)	1.41	1.42	1.41		
Height (in)	2.92	2.91	2.91		
Water Content (%)	11.6	12.9	13.2		
Dry Density (pcf)	128.1	124.8	124.0		
Void Ratio	0.31	0.35	0.35		
Back Pressure (tsf)	4.0	7.3	4.0		
Minor Principal Stress (tsf)	0.75	1.25	1.75		
Max. Deviator Stress (tsf)	2.49	3.13	4.35		
Ultimate Deviator Stress (tsf)	2.46	3.13	4.26		
Deviator Stress at Failure (tsf)	2.49	3.13	4.35		
Max. Pore Pressure Buildup (tsf)	0.34	0.69	0.73		
Pore Pressure Parameter "B"	0.95	0.95	0.95		
Pct. Axial Strain at Failure	17.1	20.0	15.5		

"These test results are for informational purposes only and must be reviewed by a qualified professional engineer to verify that the test parameters shown are appropriate for any particular design"

Remarks: Specimens trimmed to given conditions; Saturated, backpressured until "B" response was 0.95 to 1.00; Consolidated; All Drainage valves closed and immediately sheared.
A correction for membrane stiffness was applied to the deviator stress.





Rupture Envelope at Failure
α = 28.8 ° a = 0.0 (tsf)

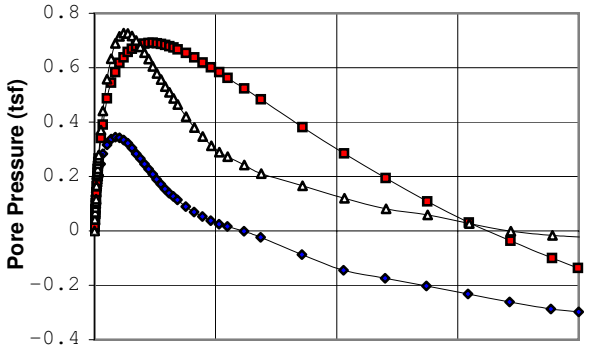
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_____	Total ϕ:	29.1 °	c= 0.28 (tsf)

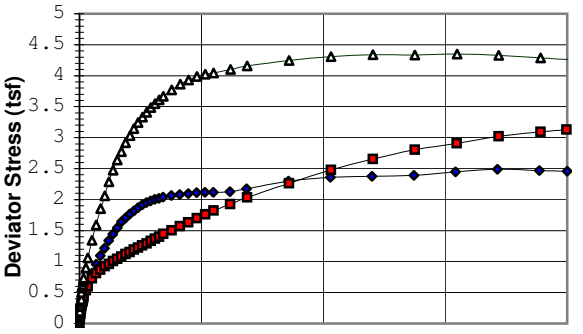
9530 James Avenue South
OIL ENGINEERING TESTING, INC.
Bloomington, Minnesota 55431

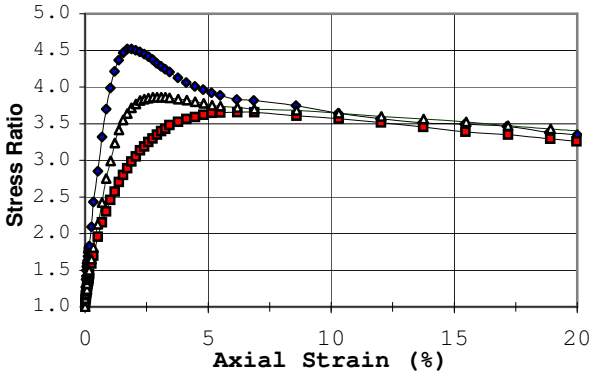
TRIAXIAL TEST ASTM: D 4767

Job No. **15997**
Date: **8/18/25**

Project: **White Pine Mine - #0040820 / American Engineering Testing, Inc.**
Boring #: **PFS-3** Sample #: Type: **3T** Depth (ft): **12-14**
Soil Type: **Sandy Lean Clay w/a little gravel (CL)**













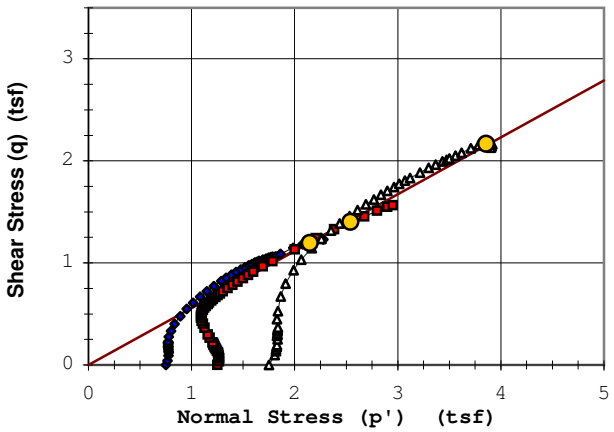
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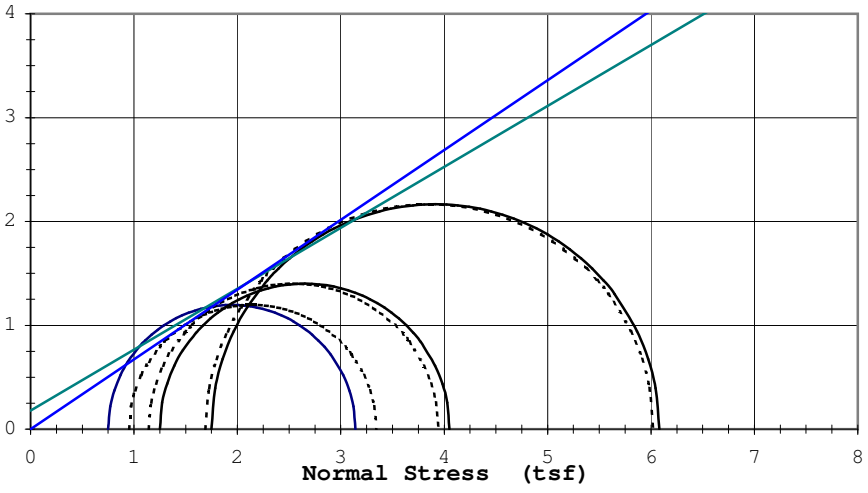
X

Failure Criterion:	Given Strain of: 15%				
Angle of internal friction, ϕ' =	33.9 °				
Apparent Cohesion, c' =	0.00 (tsf)				
Test Date: 8/13/25	Liquid Limit:				
Test Type: CU w/pp	Plastic Limit:				
Strain Rate (in/min): 0.00073	Plasticity Index:				
Strain Rate (%/min): 0.025	Spec. Gravity (Assumed):	2.69			
Initial Conditions	**A**	**B**	**C**	**D**	**E**
Diameter (in)	1.44	1.44	1.44		
Height (in)	2.93	2.93	2.92		
Water Content (%)	12.9	12.7	14.2		
Dry Density (pcf)	123.0	121.1	118.9		
Void Ratio	0.36	0.39	0.41		
After Consolidation					
Diameter (in)	1.41	1.42	1.41		
Height (in)	2.92	2.91	2.91		
Water Content (%)	11.6	12.9	13.2		
Dry Density (pcf)	128.1	124.8	124.0		
Void Ratio	0.31	0.35	0.35		
Back Pressure (tsf)	4.0	7.3	4.0		
Minor Principal Stress (tsf)	0.75	1.25	1.75		
Max. Deviator Stress (tsf)	2.49	3.13	4.35		
Ultimate Deviator Stress (tsf)	2.46	3.13	4.26		
Deviator Stress at Failure (tsf)	2.39	2.80	4.33		
Max. Pore Pressure Buildup (tsf)	0.34	0.69	0.73		
Pore Pressure Parameter "B"	0.95	0.95	0.95		
Pct. Axial Strain at Failure	15.0	15.0	15.0		

"These test results are for informational purposes only and must be reviewed by a qualified professional engineer to verify that the test parameters shown are appropriate for any particular design"

Remarks: Specimens trimmed to given conditions; Saturated, backpressured until "B" response was 0.95 to 1.00; Consolidated; All Drainage valves closed and immediately sheared.
A correction for membrane stiffness was applied to the deviator stress.





Rupture Envelope at Failure
α = 29.2 ° a = 0.0 (tsf)

---------- Effective ϕ': 33.9 ° c'= 0.00 (tsf)
_____ Total ϕ: 30.4 ° c= 0.18 (tsf)

9530 James Avenue South
OIL ENGINEERING TESTING, INC.
Bloomington, Minnesota 55431

Triaxial Data

Job: **15997**

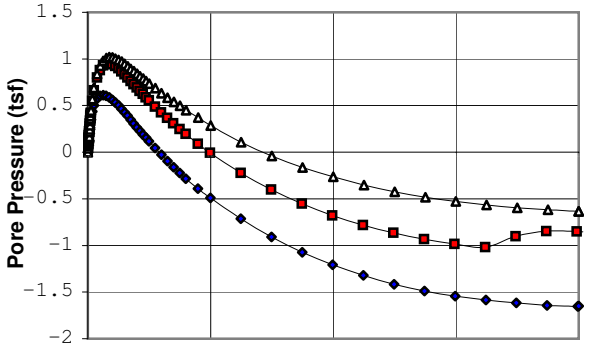
Boring: PFS-3 Sample: Depth: 12-14 Date: 8/18/25

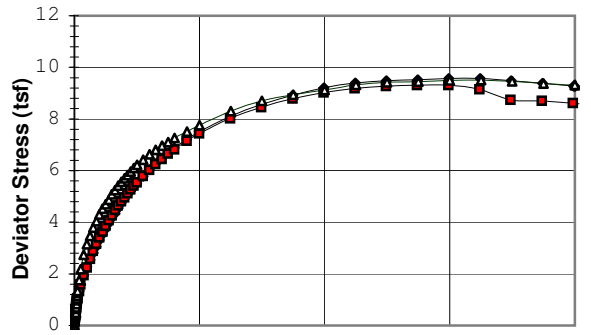
0.75 tsf			1.25 tsf			1.75 tsf			Sample 4			Sample 5		
Strain (%)	Deviator Stress (tsf)	Pore Pressure (tsf)	Strain (%)	Deviator Stress (tsf)	Pore Pressure (tsf)	Strain (%)	Deviator Stress (tsf)	Pore Pressure (tsf)	Strain (%)	Deviator Stress (tsf)	Pore Pressure (tsf)	Strain (%)	Deviator Stress (tsf)	Pore Pressure (tsf)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						
0.01	0.08	0.02	0.01	0.07	0.02	0.01	0.20	0.04						
0.02	0.18	0.07	0.02	0.12	0.04	0.02	0.27	0.07						
0.03	0.24	0.09	0.03	0.16	0.06	0.04	0.31	0.09						
0.05	0.27	0.11	0.04	0.18	0.08	0.05	0.35	0.10						
0.06	0.31	0.13	0.06	0.22	0.10	0.06	0.36	0.11						
0.07	0.33	0.14	0.07	0.24	0.11	0.07	0.39	0.12						
0.08	0.35	0.15	0.08	0.28	0.14	0.08	0.50	0.17						
0.09	0.36	0.16	0.09	0.31	0.16	0.09	0.57	0.21						
0.10	0.37	0.16	0.10	0.33	0.18	0.11	0.59	0.21						
0.12	0.40	0.18	0.12	0.35	0.20	0.12	0.60	0.22						
0.13	0.42	0.19	0.13	0.37	0.21	0.13	0.62	0.23						
0.14	0.43	0.19	0.14	0.39	0.23	0.14	0.66	0.25						
0.15	0.44	0.20	0.15	0.40	0.24	0.15	0.68	0.26						
0.16	0.45	0.20	0.16	0.42	0.25	0.16	0.70	0.27						
0.17	0.45	0.20	0.17	0.44	0.27	0.18	0.73	0.28						
0.26	0.55	0.25	0.26	0.54	0.34	0.26	0.90	0.37						
0.34	0.67	0.28	0.34	0.60	0.39	0.34	1.06	0.44						
0.51	0.80	0.32	0.52	0.73	0.49	0.52	1.34	0.56						
0.69	0.96	0.34	0.69	0.81	0.55	0.69	1.59	0.63						
0.86	1.09	0.34	0.86	0.87	0.58	0.86	1.86	0.69						
1.03	1.22	0.34	1.03	0.92	0.62	1.04	2.06	0.72						
1.20	1.34	0.33	1.20	0.96	0.64	1.21	2.29	0.73						
1.37	1.44	0.32	1.37	1.01	0.66	1.38	2.47	0.73						
1.54	1.54	0.30	1.55	1.05	0.67	1.55	2.64	0.72						
1.71	1.64	0.28	1.72	1.08	0.68	1.72	2.77	0.70						
1.89	1.70	0.27	1.89	1.12	0.69	1.89	2.92	0.68						
2.06	1.77	0.25	2.06	1.15	0.69	2.07	3.03	0.66						
2.23	1.82	0.23	2.23	1.19	0.69	2.24	3.15	0.63						
2.40	1.87	0.21	2.41	1.22	0.69	2.41	3.24	0.60						
2.57	1.91	0.19	2.58	1.26	0.69	2.58	3.33	0.58						
2.74	1.95	0.17	2.75	1.29	0.69	2.75	3.41	0.56						
2.91	1.98	0.15	2.92	1.33	0.68	2.93	3.49	0.53						
3.09	2.01	0.14	3.09	1.37	0.68	3.10	3.55	0.51						
3.26	2.02	0.13	3.27	1.40	0.67	3.27	3.61	0.49						
3.43	2.04	0.11	3.44	1.44	0.67	3.44	3.67	0.46						
3.77	2.06	0.09	3.78	1.51	0.65	3.78	3.77	0.42						
4.11	2.08	0.07	4.12	1.57	0.64	4.13	3.86	0.38						
4.46	2.10	0.05	4.47	1.63	0.62	4.47	3.93	0.35						
4.80	2.11	0.04	4.81	1.70	0.60	4.82	3.99	0.31						
5.14	2.12	0.03	5.16	1.76	0.58	5.16	4.02	0.29						
5.48	2.12	0.02	5.50	1.82	0.56	5.50	4.05	0.27						
6.17	2.13	0.00	6.19	1.93	0.52	6.19	4.10	0.24						
6.86	2.18	-0.02	6.87	2.03	0.48	6.88	4.16	0.21						
8.57	2.30	-0.09	8.59	2.26	0.38	8.60	4.25	0.17						
10.28	2.36	-0.14	10.31	2.48	0.28	10.32	4.31	0.12						
12.00	2.37	-0.17	12.03	2.66	0.19	12.04	4.34	0.08						
13.71	2.39	-0.20	13.75	2.80	0.11	13.76	4.33	0.06						
15.43	2.45	-0.23	15.47	2.91	0.03	15.48	4.35	0.03						
17.14	2.49	-0.26	17.19	3.02	-0.04	17.20	4.33	0.00						
18.85	2.47	-0.29	18.90	3.10	-0.10	18.92	4.29	-0.02						
20.00	2.46	-0.30	19.97	3.13	-0.14	20.03	4.26	-0.02						

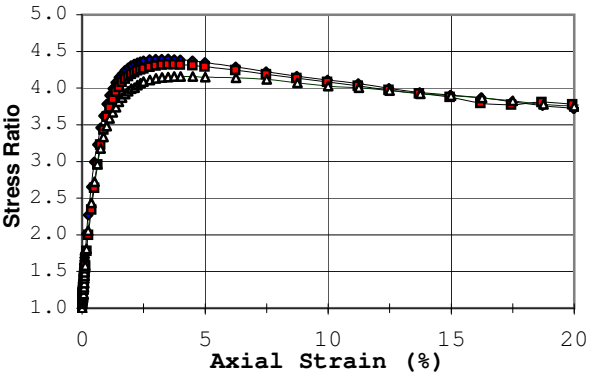
TRIAXIAL TEST ASTM: D 4767

Job No. **15997**
Date: **8/20/25**

Project: **White Pine Mine - #0040820 / American Engineering Testing, Inc.**
Boring #: **PFS-4A** Sample #: Type: **Bulk** Depth (ft): **32-34**
Soil Type: **Sand w/silt (SP-SM)**













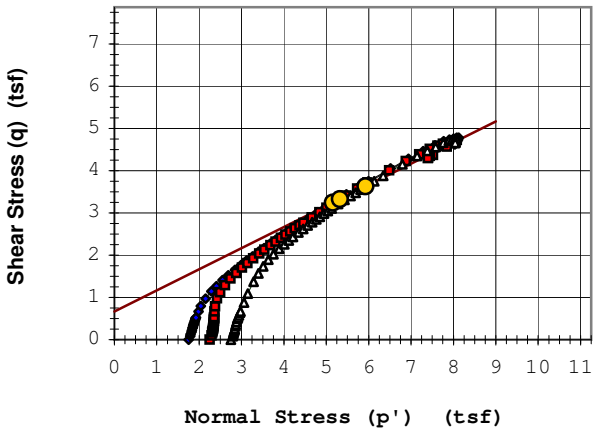
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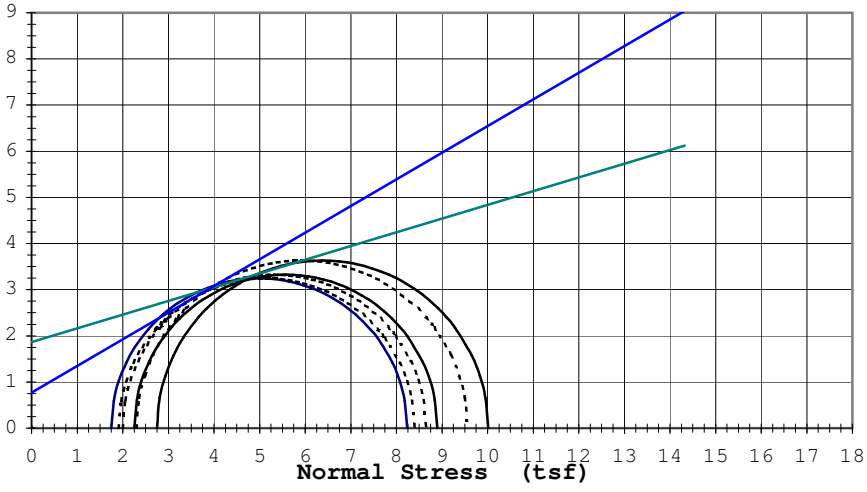
X

Failure Criterion:	Max. Stress Ratio				
Angle of internal friction, ϕ' =	30.0 °				
Apparent Cohesion, c' =	0.77 (tsf)				
Test Date: 8/14/25	Liquid Limit:				
Test Type: CU w/pp	Plastic Limit:				
Strain Rate (in/min): 0.001002	Plasticity Index:				
Strain Rate (%/min): 0.025	Spec. Gravity (Assumed):	2.66			
Initial Conditions	**A**	**B**	**C**	**D**	**E**
Diameter (in)	2.05	2.05	2.05		
Height (in)	4.04	4.05	4.03		
Water Content (%)	6.2	6.4	6.2		
Dry Density (pcf)	95.6	95.2	95.7		
Void Ratio	0.74	0.74	0.74		
After Consolidation					
Diameter (in)	2.03	2.03	2.02		
Height (in)	4.01	4.02	4.00		
Water Content (%)	26.2	26.3	25.8		
Dry Density (pcf)	97.8	97.7	98.5		
Void Ratio	0.70	0.70	0.69		
Back Pressure (tsf)	9.4	9.1	9.3		
Minor Principal Stress (tsf)	1.75	2.25	2.75		
Max. Deviator Stress (tsf)	9.57	9.31	9.51		
Ultimate Deviator Stress (tsf)	9.26	8.60	9.32		
Deviator Stress at Failure (tsf)	6.49	6.65	7.26		
Max. Pore Pressure Buildup (tsf)	0.61	0.95	1.02		
Pore Pressure Parameter "B"	0.95	0.95	0.95		
Pct. Axial Strain at Failure	3.5	3.7	4.0		

"These test results are for informational purposes only and must be reviewed by a qualified professional engineer to verify that the test parameters shown are appropriate for any particular design"

Remarks: Specimens compacted to given conditions (90% of provided maximum proctor density); Saturated, backpressured until "B" response was 0.95 to 1.00; Consolidated; All Drainage valves closed and immediately sheared.
A correction for membrane stiffness was applied to the deviator stress.
Only Max Stress Ratio reported due to all specimens having the relatively similar peak deviator stresses.





Rupture Envelope at Failure
α = 26.6 ° a = 0.7 (tsf)

----------	Effective ϕ':	30.0 °	c'= 0.77 (tsf)
_____	Total ϕ:	16.5 °	c= 1.87 (tsf)

9530 James Avenue South
OIL ENGINEERING TESTING, INC.
Bloomington, Minnesota 55431

Triaxial Data

Job: **15997**

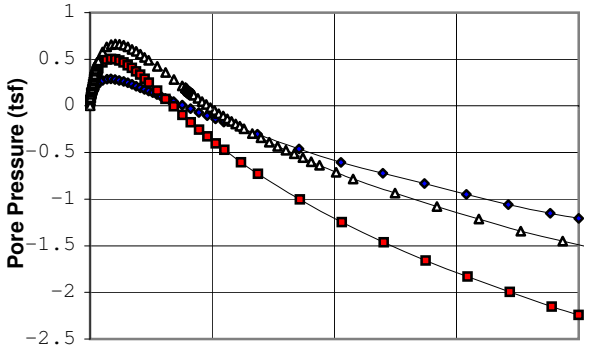
Boring: PFS-4A Sample: Depth: 32-34 Date: 8/20/25

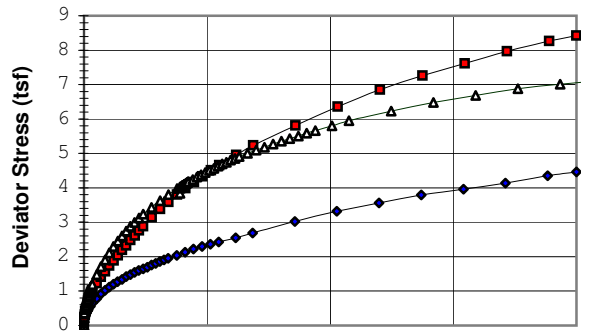
1.75 tsf			2.25 tsf			2.75 tsf			Sample 4			Sample 5		
Strain (%)	Deviator Stress (tsf)	Pore Pressure (tsf)	Strain (%)	Deviator Stress (tsf)	Pore Pressure (tsf)	Strain (%)	Deviator Stress (tsf)	Pore Pressure (tsf)	Strain (%)	Deviator Stress (tsf)	Pore Pressure (tsf)	Strain (%)	Deviator Stress (tsf)	Pore Pressure (tsf)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						
0.01	0.17	0.04	0.01	0.20	0.06	0.01	0.17	0.04						
0.02	0.26	0.08	0.02	0.34	0.11	0.02	0.24	0.07						
0.02	0.37	0.12	0.02	0.40	0.13	0.03	0.30	0.09						
0.03	0.44	0.14	0.03	0.46	0.15	0.03	0.37	0.11						
0.04	0.54	0.18	0.04	0.52	0.18	0.04	0.42	0.13						
0.05	0.58	0.19	0.05	0.56	0.20	0.05	0.46	0.15						
0.06	0.65	0.22	0.06	0.62	0.22	0.06	0.50	0.17						
0.07	0.69	0.23	0.07	0.67	0.24	0.07	0.64	0.22						
0.07	0.74	0.25	0.07	0.74	0.28	0.08	0.71	0.24						
0.08	0.80	0.27	0.08	0.81	0.31	0.08	0.83	0.29						
0.09	0.88	0.29	0.09	0.88	0.34	0.09	0.98	0.34						
0.10	0.93	0.31	0.10	0.94	0.37	0.10	1.05	0.36						
0.11	0.98	0.33	0.11	0.99	0.39	0.11	1.15	0.39						
0.12	1.02	0.34	0.12	1.04	0.41	0.12	1.27	0.43						
0.12	1.05	0.35	0.12	1.06	0.42	0.13	1.34	0.45						
0.19	1.34	0.43	0.19	1.33	0.55	0.19	1.76	0.57						
0.25	1.59	0.50	0.25	1.58	0.66	0.25	2.18	0.69						
0.37	1.95	0.57	0.37	1.95	0.80	0.37	2.74	0.84						
0.50	2.28	0.60	0.50	2.25	0.88	0.50	3.14	0.93						
0.62	2.54	0.61	0.62	2.58	0.93	0.63	3.48	0.98						
0.75	2.82	0.60	0.75	2.89	0.95	0.75	3.79	1.01						
0.87	3.05	0.59	0.87	3.16	0.95	0.88	4.04	1.02						
1.00	3.31	0.56	1.00	3.41	0.94	1.00	4.31	1.02						
1.12	3.54	0.53	1.12	3.63	0.92	1.12	4.52	1.00						
1.25	3.74	0.50	1.25	3.85	0.90	1.25	4.70	0.99						
1.37	3.95	0.47	1.37	4.08	0.87	1.38	4.87	0.97						
1.50	4.16	0.43	1.49	4.26	0.84	1.50	5.08	0.95						
1.62	4.34	0.39	1.62	4.47	0.80	1.63	5.25	0.92						
1.75	4.55	0.35	1.74	4.65	0.76	1.75	5.42	0.89						
1.87	4.73	0.31	1.87	4.82	0.73	1.87	5.57	0.87						
2.00	4.91	0.27	1.99	4.96	0.69	2.00	5.71	0.84						
2.12	5.07	0.23	2.12	5.12	0.66	2.13	5.82	0.81						
2.24	5.22	0.19	2.24	5.27	0.62	2.25	5.97	0.79						
2.37	5.36	0.15	2.37	5.41	0.59	2.38	6.10	0.76						
2.49	5.50	0.12	2.49	5.54	0.56	2.50	6.22	0.73						
2.74	5.78	0.04	2.74	5.79	0.49	2.75	6.42	0.69						
2.99	6.03	-0.03	2.99	6.03	0.43	3.00	6.63	0.63						
3.24	6.27	-0.10	3.24	6.25	0.37	3.25	6.81	0.59						
3.49	6.49	-0.16	3.49	6.45	0.31	3.50	6.96	0.54						
3.74	6.69	-0.22	3.74	6.65	0.25	3.75	7.11	0.50						
3.99	6.88	-0.28	3.98	6.82	0.20	4.00	7.26	0.45						
4.49	7.22	-0.39	4.48	7.15	0.09	4.50	7.51	0.37						
4.99	7.51	-0.49	4.98	7.44	-0.01	5.00	7.76	0.29						
6.24	8.11	-0.71	6.23	8.02	-0.22	6.25	8.30	0.11						
7.48	8.57	-0.91	7.47	8.45	-0.40	7.50	8.70	-0.04						
8.73	8.93	-1.07	8.72	8.78	-0.55	8.75	8.94	-0.16						
9.98	9.21	-1.21	9.96	9.03	-0.68	10.00	9.12	-0.26						
11.22	9.40	-1.32	11.21	9.18	-0.78	11.25	9.32	-0.35						
12.47	9.48	-1.42	12.45	9.27	-0.87	12.50	9.42	-0.43						
13.72	9.53	-1.49	13.70	9.31	-0.93	13.75	9.45	-0.48						
14.97	9.57	-1.54	14.94	9.31	-0.98	15.00	9.49	-0.53						
16.21	9.57	-1.59	16.19	9.14	-1.02	16.25	9.51	-0.57						
17.46	9.48	-1.62	17.43	8.74	-0.90	17.50	9.46	-0.60						
18.71	9.38	-1.64	18.68	8.70	-0.85									
19.95	9.27	-1.65	19.92	8.62	-0.85									
20.00	9.26	-1.65	20.16	8.60	-0.85									

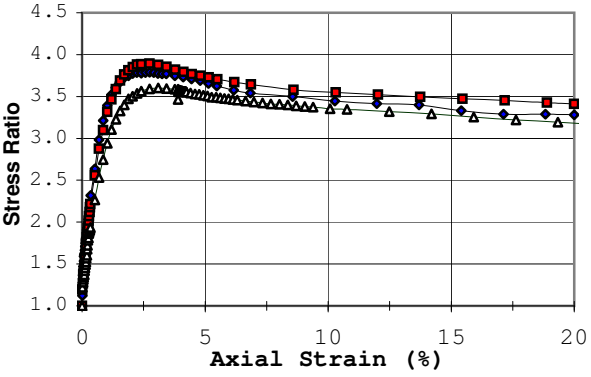
TRIAXIAL TEST ASTM: D 4767

Job No. **15997**
Date: **8/18/25**

Project: **White Pine Mine - #0040820 / American Engineering Testing, Inc.**
Boring #: **PFS-4B** Sample #: Type: **3T** Depth (ft): **12-14**
Soil Type: **Sandy Lean Clay w/a little gravel (CL)**













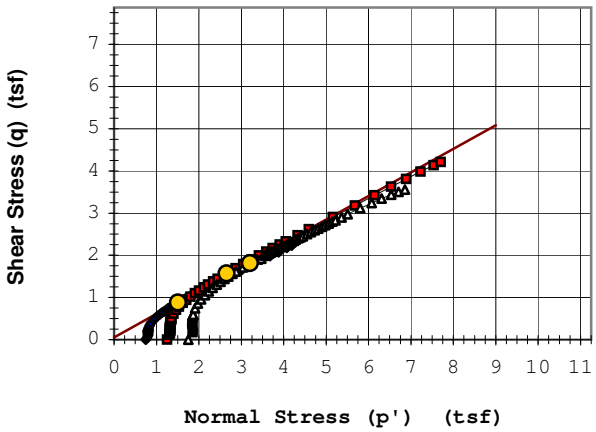
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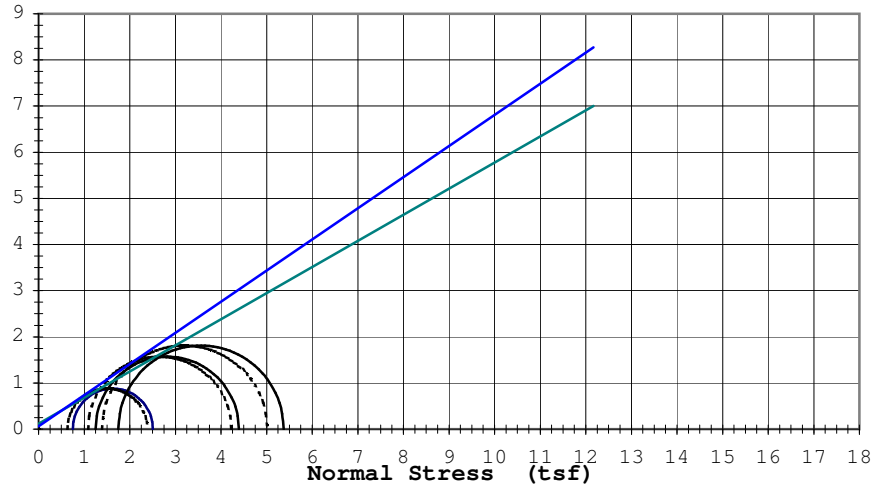
X

Failure Criterion:	Max. Stress Ratio				
Angle of internal friction, ϕ' =	34.0 °				
Apparent Cohesion, c' =	0.06 (tsf)				
Test Date: 8/13/25	Liquid Limit:				
Test Type: CU w/pp	Plastic Limit:				
Strain Rate (in/min): 0.00073	Plasticity Index:				
Strain Rate (%/min): 0.025	Spec. Gravity (Assumed):	2.69			
Initial Conditions	**A**	**B**	**C**	**D**	**E**
Diameter (in)	1.44	1.44	1.44		
Height (in)	2.93	2.93	2.93		
Water Content (%)	10.9	11.3	11.2		
Dry Density (pcf)	126.4	124.3	128.0		
Void Ratio	0.33	0.35	0.31		
After Consolidation					
Diameter (in)	1.43	1.42	1.41		
Height (in)	2.92	2.91	2.91		
Water Content (%)	11.5	11.7	9.6		
Dry Density (pcf)	128.1	127.6	133.3		
Void Ratio	0.31	0.32	0.26		
Back Pressure (tsf)	5.5	4.0	4.0		
Minor Principal Stress (tsf)	0.75	1.25	1.75		
Max. Deviator Stress (tsf)	4.47	8.42	7.12		
Ultimate Deviator Stress (tsf)	4.47	8.42	7.12		
Deviator Stress at Failure (tsf)	1.76	3.14	3.62		
Max. Pore Pressure Buildup (tsf)	0.29	0.50	0.66		
Pore Pressure Parameter "B"	0.95	0.95	0.95		
Pct. Axial Strain at Failure	2.7	2.7	3.1		

"These test results are for informational purposes only and must be reviewed by a qualified professional engineer to verify that the test parameters shown are appropriate for any particular design"

Remarks: Specimens trimmed to given conditions; Saturated, backpressured until "B" response was 0.95 to 1.00; Consolidated; All Drainage valves closed and immediately sheared.
A correction for membrane stiffness was applied to the deviator stress.
Specimen B was less cohesive than A and C. Specimen B was not used in determining friction angles.





Rupture Envelope at Failure
α = 29.2 ° a = 0.0 (tsf)

----------	Effective ϕ':	34.0 °	c'=	0.06 (tsf)
_____	Total ϕ:	29.5 °	c=	0.12 (tsf)

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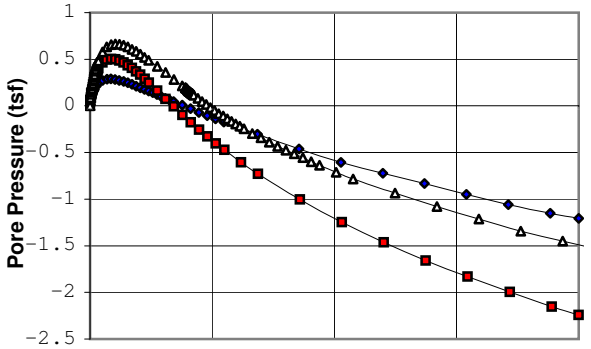
OIL ENGINEERING TESTING, INC.

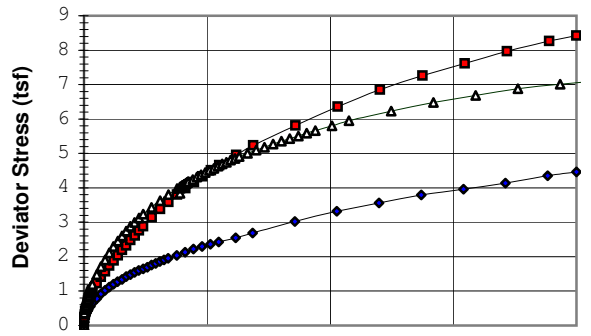
Bloomington, Minnesota 55431

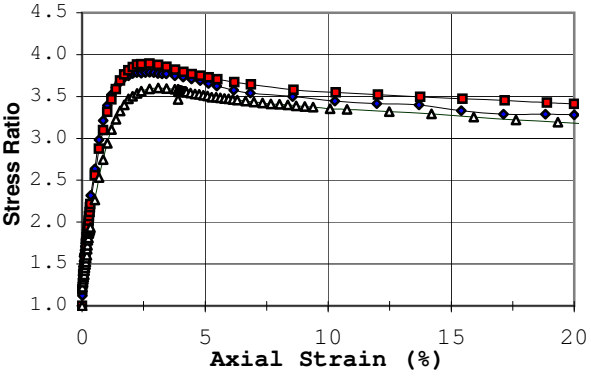
TRIAXIAL TEST ASTM: D 4767

Job No. **15997**
Date: **8/18/25**

Project: **White Pine Mine - #0040820 / American Engineering Testing, Inc.**
Boring #: **PFS-4B** Sample #: Type: **3T** Depth (ft): **12-14**
Soil Type: **Sandy Lean Clay w/a little gravel (CL)**













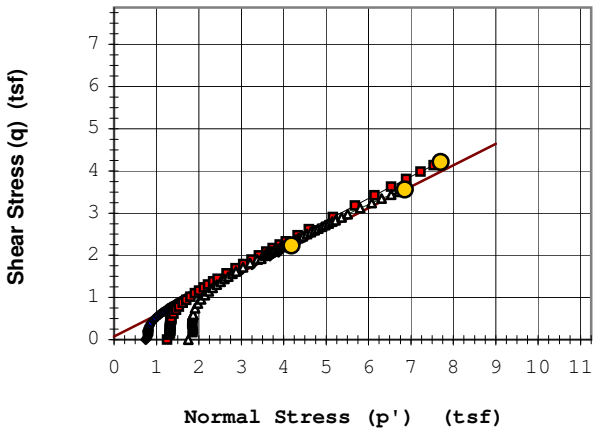
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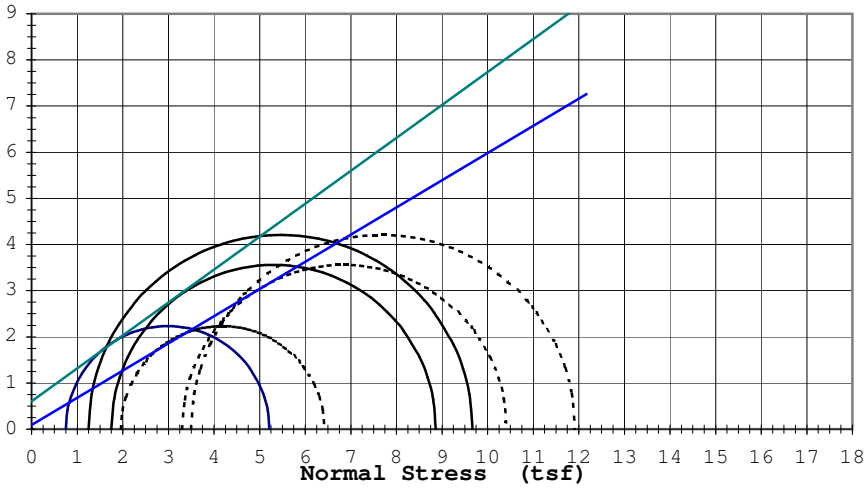
X

Failure Criterion:	Max. Deviator Stress				
Angle of internal friction, ϕ' =	30.5 °				
Apparent Cohesion, c' =	0.09 (tsf)				
Test Date: 8/13/25	Liquid Limit:				
Test Type: CU w/pp	Plastic Limit:				
Strain Rate (in/min): 0.00073	Plasticity Index:				
Strain Rate (%/min): 0.025	Spec. Gravity (Assumed):	2.69			
Initial Conditions	**A**	**B**	**C**	**D**	**E**
Diameter (in)	1.44	1.44	1.44		
Height (in)	2.93	2.93	2.93		
Water Content (%)	10.9	11.3	11.2		
Dry Density (pcf)	126.4	124.3	128.0		
Void Ratio	0.33	0.35	0.31		
After Consolidation					
Diameter (in)	1.43	1.42	1.41		
Height (in)	2.92	2.91	2.91		
Water Content (%)	11.5	11.7	9.6		
Dry Density (pcf)	128.1	127.6	133.3		
Void Ratio	0.31	0.32	0.26		
Back Pressure (tsf)	5.5	4.0	4.0		
Minor Principal Stress (tsf)	0.75	1.25	1.75		
Max. Deviator Stress (tsf)	4.47	8.42	7.12		
Ultimate Deviator Stress (tsf)	4.47	8.42	7.12		
Deviator Stress at Failure (tsf)	4.47	8.42	7.12		
Max. Pore Pressure Buildup (tsf)	0.29	0.50	0.66		
Pore Pressure Parameter "B"	0.95	0.95	0.95		
Pct. Axial Strain at Failure	20.0	20.0	21.1		

"These test results are for informational purposes only and must be reviewed by a qualified professional engineer to verify that the test parameters shown are appropriate for any particular design"

Remarks: Specimens trimmed to given conditions; Saturated, backpressured until "B" response was 0.95 to 1.00; Consolidated; All Drainage valves closed and immediately sheared.
A correction for membrane stiffness was applied to the deviator stress.
Specimen B was less cohesive than A and C. Specimen B was not used in determining friction angles.





Rupture Envelope at Failure
α = 26.9 ° a = 0.1 (tsf)

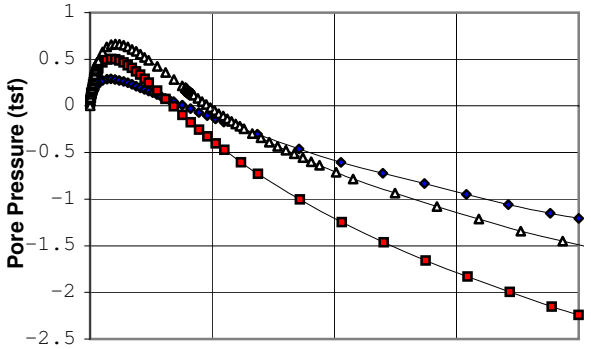
----------	Effective ϕ':	30.5 °	c'=	0.09 (tsf)
_____	Total ϕ:	35.5 °	c=	0.60 (tsf)

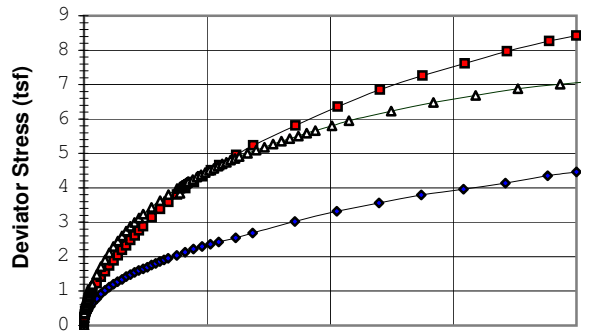
9530 James Avenue South
OIL ENGINEERING TESTING, INC.
Bloomington, Minnesota 55431

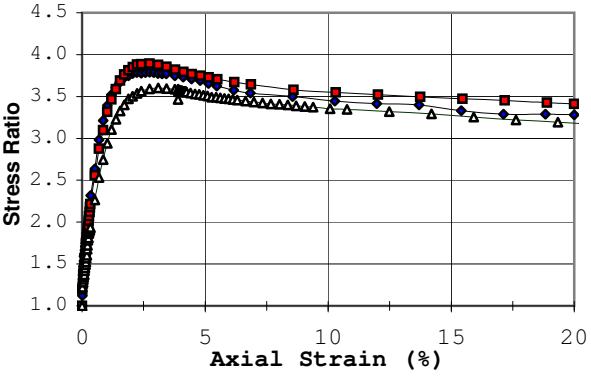
TRIAXIAL TEST ASTM: D 4767

Job No. **15997**
Date: **8/18/25**

Project: **White Pine Mine - #0040820 / American Engineering Testing, Inc.**
Boring #: **PFS-4B** Sample #: Type: **3T** Depth (ft): **12-14**
Soil Type: **Sandy Lean Clay w/a little gravel (CL)**













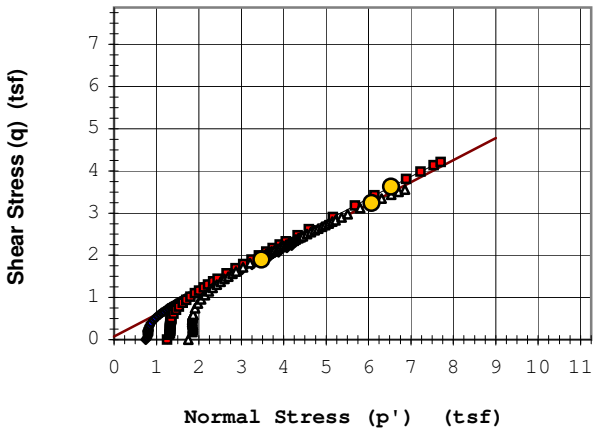
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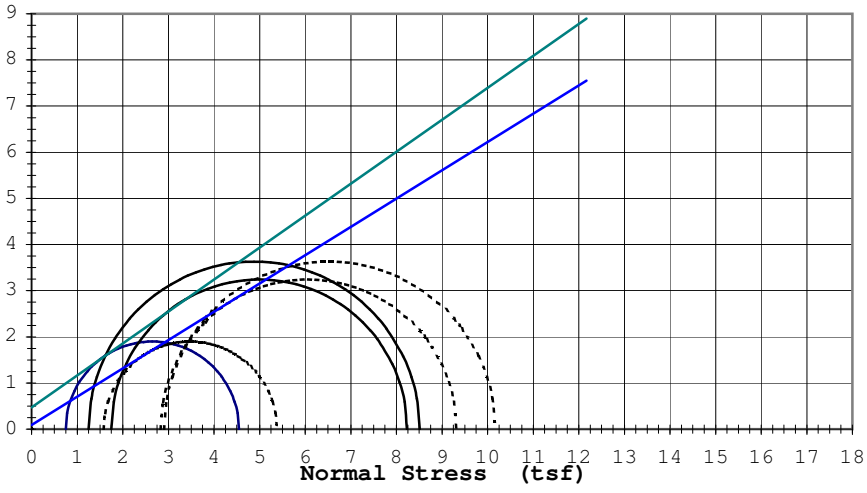
X

Failure Criterion:	Given Strain of: 15%				
Angle of internal friction, ϕ' =	31.5 °				
Apparent Cohesion, c' =	0.09 (tsf)				
Test Date: 8/13/25	Liquid Limit:				
Test Type: CU w/pp	Plastic Limit:				
Strain Rate (in/min): 0.00073	Plasticity Index:				
Strain Rate (%/min): 0.025	Spec. Gravity (Assumed):	2.69			
Initial Conditions	**A**	**B**	**C**	**D**	**E**
Diameter (in)	1.44	1.44	1.44		
Height (in)	2.93	2.93	2.93		
Water Content (%)	10.9	11.3	11.2		
Dry Density (pcf)	126.4	124.3	128.0		
Void Ratio	0.33	0.35	0.31		
After Consolidation					
Diameter (in)	1.43	1.42	1.41		
Height (in)	2.92	2.91	2.91		
Water Content (%)	11.5	11.7	9.6		
Dry Density (pcf)	128.1	127.6	133.3		
Void Ratio	0.31	0.32	0.26		
Back Pressure (tsf)	5.5	4.0	4.0		
Minor Principal Stress (tsf)	0.75	1.25	1.75		
Max. Deviator Stress (tsf)	4.47	8.42	7.12		
Ultimate Deviator Stress (tsf)	4.47	8.42	7.12		
Deviator Stress at Failure (tsf)	3.80	7.26	6.48		
Max. Pore Pressure Buildup (tsf)	0.29	0.50	0.66		
Pore Pressure Parameter "B"	0.95	0.95	0.95		
Pct. Axial Strain at Failure	15.0	15.0	15.0		

"These test results are for informational purposes only and must be reviewed by a qualified professional engineer to verify that the test parameters shown are appropriate for any particular design"

Remarks: Specimens trimmed to given conditions; Saturated, backpressured until "B" response was 0.95 to 1.00; Consolidated; All Drainage valves closed and immediately sheared.
A correction for membrane stiffness was applied to the deviator stress.
Specimen B was less cohesive than A and C. Specimen B was not used in determining friction angles.





Rupture Envelope at Failure
α = 27.6 ° a = 0.1 (tsf)

---------- Effective ϕ': 31.5 ° c'= 0.09 (tsf)
_____ Total ϕ: 34.7 ° c= 0.47 (tsf)

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OIL ENGINEERING TESTING, INC.
Bloomington, Minnesota 55431

Triaxial Data

Job: **15997**

Boring: PFS-4B Sample: Depth: 12-14 Date: 8/18/25

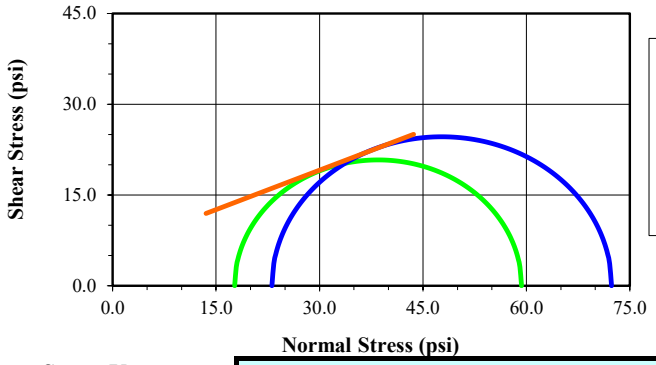
0.75 tsf			1.25 tsf			1.75 tsf			Sample 4			Sample 5		
Strain (%)	Deviator Stress (tsf)	Pore Pressure (tsf)	Strain (%)	Deviator Stress (tsf)	Pore Pressure (tsf)	Strain (%)	Deviator Stress (tsf)	Pore Pressure (tsf)	Strain (%)	Deviator Stress (tsf)	Pore Pressure (tsf)	Strain (%)	Deviator Stress (tsf)	Pore Pressure (tsf)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						
0.01	0.09	0.01	0.02	0.23	0.06	0.02	0.37	0.09						
0.02	0.19	0.05	0.03	0.31	0.09	0.03	0.46	0.13						
0.04	0.25	0.07	0.05	0.41	0.13	0.05	0.51	0.15						
0.05	0.28	0.09	0.07	0.43	0.14	0.07	0.54	0.17						
0.06	0.30	0.10	0.09	0.48	0.16	0.09	0.58	0.19						
0.07	0.34	0.12	0.10	0.50	0.18	0.10	0.65	0.22						
0.08	0.37	0.13	0.12	0.54	0.20	0.12	0.68	0.24						
0.09	0.38	0.14	0.14	0.60	0.23	0.14	0.73	0.27						
0.11	0.38	0.14	0.15	0.65	0.25	0.15	0.77	0.29						
0.12	0.40	0.15	0.17	0.71	0.28	0.17	0.82	0.31						
0.13	0.42	0.16	0.19	0.77	0.30	0.19	0.86	0.33						
0.14	0.44	0.17	0.21	0.79	0.32	0.21	0.93	0.37						
0.15	0.45	0.17	0.22	0.82	0.32	0.22	0.98	0.39						
0.16	0.46	0.17	0.24	0.85	0.33	0.24	1.04	0.42						
0.17	0.47	0.18	0.26	0.86	0.34	0.26	1.07	0.44						
0.26	0.55	0.21	0.27	0.91	0.36	0.27	1.12	0.46						
0.35	0.66	0.25	0.29	0.94	0.37	0.29	1.14	0.46						
0.52	0.78	0.27	0.31	0.97	0.39	0.31	1.15	0.47						
0.69	0.92	0.29	0.33	1.00	0.40	0.33	1.17	0.48						
0.86	1.02	0.29	0.34	1.02	0.41	0.34	1.19	0.48						
1.03	1.12	0.28	0.52	1.23	0.46	0.51	1.48	0.58						
1.20	1.20	0.27	0.69	1.42	0.50	0.69	1.71	0.63						
1.37	1.27	0.26	0.86	1.57	0.50	0.86	1.91	0.66						
1.54	1.34	0.25	1.03	1.74	0.50	1.03	2.11	0.66						
1.71	1.42	0.23	1.20	1.89	0.48	1.20	2.29	0.66						
1.89	1.48	0.21	1.37	2.03	0.46	1.37	2.45	0.65						
2.06	1.54	0.19	1.55	2.19	0.43	1.54	2.61	0.63						
2.23	1.59	0.18	1.72	2.33	0.41	1.72	2.74	0.61						
2.40	1.65	0.16	1.89	2.48	0.37	1.89	2.88	0.58						
2.57	1.70	0.14	2.06	2.61	0.33	2.06	2.99	0.55						
2.74	1.76	0.12	2.23	2.76	0.29	2.23	3.12	0.52						
2.91	1.81	0.10	2.41	2.88	0.25	2.40	3.23	0.49						
3.08	1.86	0.08	2.75	3.14	0.16	2.75	3.43	0.42						
3.25	1.90	0.06	3.09	3.38	0.08	3.09	3.62	0.36						
3.42	1.95	0.05	3.44	3.58	-0.01	3.43	3.81	0.28						
3.77	2.04	0.01	3.78	3.80	-0.10	3.78	3.97	0.21						
4.11	2.13	-0.03	4.12	3.98	-0.18	4.12	4.12	0.14						
4.45	2.22	-0.07	4.47	4.17	-0.26	4.41	4.24	0.08						
4.79	2.30	-0.10	4.81	4.33	-0.33	4.76	4.38	0.02						
5.13	2.36	-0.14	5.15	4.51	-0.40	5.10	4.51	-0.05						
5.48	2.42	-0.17	5.50	4.66	-0.47	5.61	4.69	-0.14						
6.17	2.55	-0.24	6.18	4.95	-0.61	6.30	4.90	-0.25						
6.85	2.68	-0.31	6.87	5.23	-0.73	6.99	5.09	-0.34						
8.56	3.02	-0.46	8.59	5.82	-1.00	8.70	5.51	-0.56						
10.27	3.32	-0.61	10.31	6.36	-1.25	9.39	5.67	-0.64						
11.98	3.56	-0.72	12.03	6.85	-1.46	10.08	5.80	-0.71						
13.69	3.80	-0.83	13.74	7.26	-1.66	10.76	5.95	-0.78						
15.41	3.96	-0.95	15.46	7.62	-1.83	12.48	6.23	-0.94						
17.12	4.14	-1.06	17.18	7.96	-2.00	14.20	6.48	-1.08						
18.83	4.35	-1.15	18.90	8.26	-2.15	15.91	6.69	-1.21						
20.00	4.47	-1.21	20.00	8.42	-2.24	17.63	6.88	-1.35						
						19.34	7.01	-1.45						
						21.06	7.12	-1.55						

American Engineering Testing

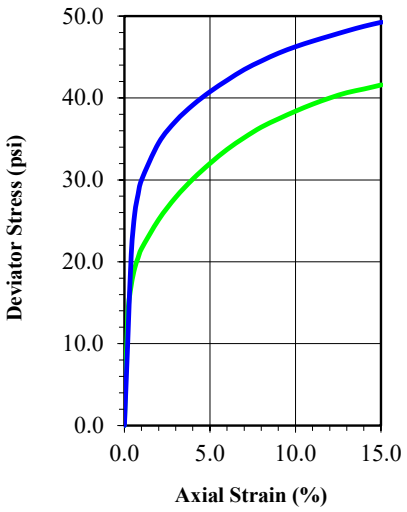
Consolidated Undrained Triaxial Test (ASTM D4767)

Date: 7/16/2025
Checked By: Benjamin Pomroy
Date: 5/2/2025
Tested By: Benjamin Pomroy

Effective Stress at Maximum Deviator Stress Criterion



Deviator Stress Vs. Axial Strain

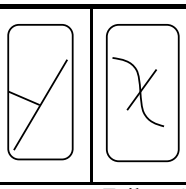


Initial	Specimen A	B	C	D
Water Content (%)	14.2	14.8		
Dry Density (pcf)	121.2	118.5		
Saturation (%)	98.61	95.50		
Void Ratio	0.388	0.419		
Diameter (in)	2.857	2.864		
Height (in)	5.565	5.554		
Specific Gravity	2.70	2.70		
Liquid Limit	N/A	N/A		
Plastic Limit	N/A	N/A		
After Consolidation	**A**	**B**	**C**	**D**
B-Value	0.96	0.96		
Water Content (%)	13.3	13.5		
Dry Density (pcf)	127.26	125.21		
Saturation (%)	100.00	100.00		
Void Ratio	0.322	0.343		
Effective Stress (psi)	31.3	41.7		
Back Press. (psi)	32.0	44.3		
Rate of Strain	0.001823	0.001826		

Maximium Deviator Stress Criterion	
C (psi)	6.7
C' (psi)	6.1
Ø (deg)	16.2
Ø' (deg)	23.5

After Shear	A	B	C	D
σ'1 at Failure (psi)	59.30	72.35		
σ'3 at Failure (psi)	17.70	23.10		

Project:	White Pine Mine
Location:	White Pine, MI
Project Number:	P-0040820
Boring Number:	BH-PFS-1A
Sample Number:	BH-PFS-1A, 32' - 34'
Depth:	32' - 34'
Sample Type:	Undisturbed
Description:	Clay, red (CL)
Test Type	Consolidated Undrained
Remarks	



N/A N/A

Failure Sketches

American Engineering Testing

Consolidated Undrained Triaxial Test (ASTM D4767)

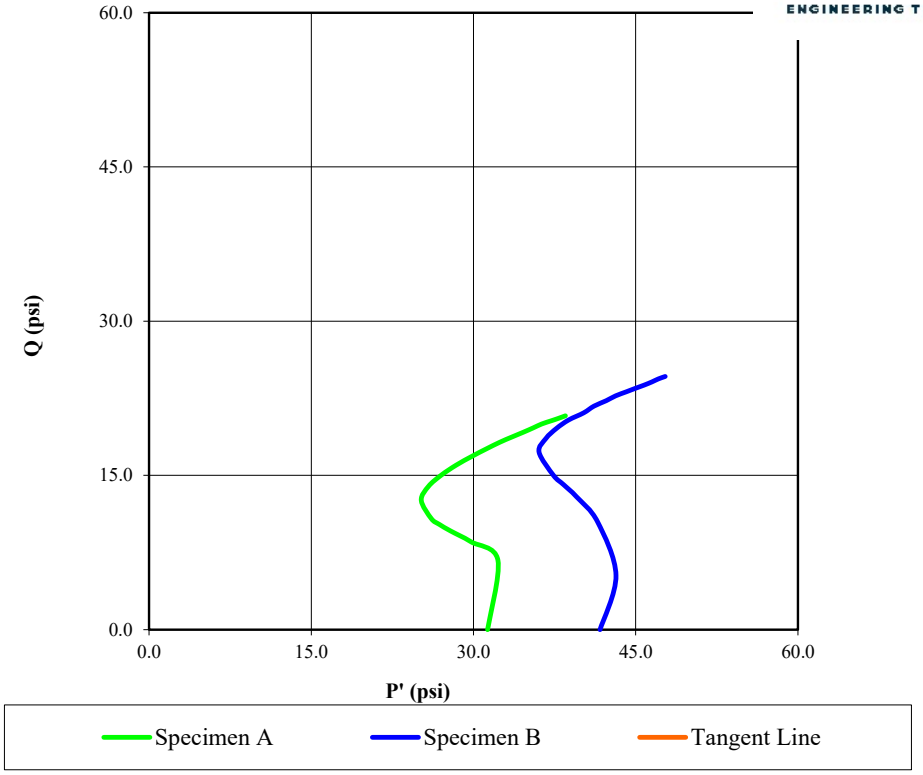
Date: 7/16/2025

Checked By: Benjamin Pomroy

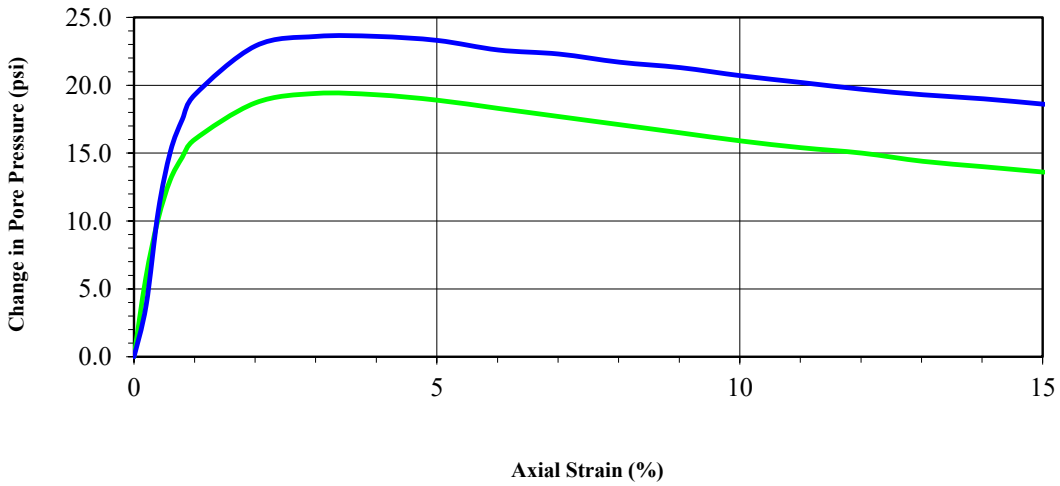
Date: 5/2/2025

Tested By: Benjamin Pomroy

Stress Paths (Effective)



Change in Pore Pressure vs. Axial Strain

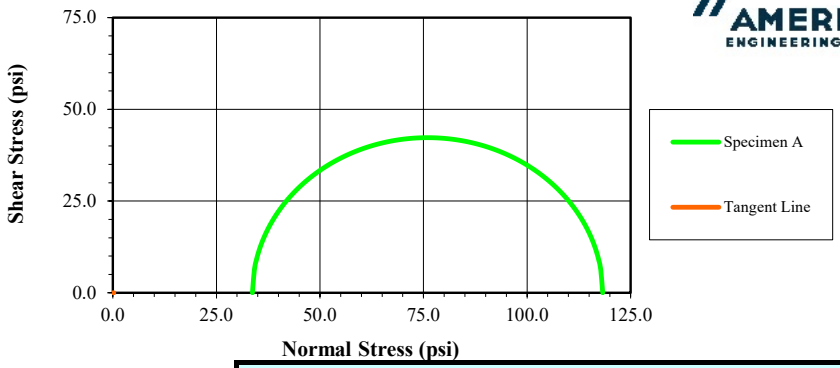


American Engineering Testing

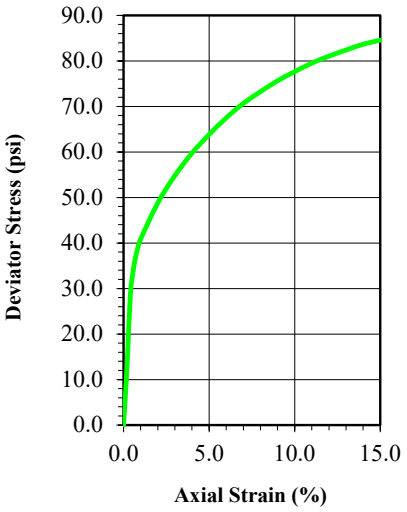
Consolidated Undrained Triaxial Test (ASTM D4767)

Date: 10/15/2025
Checked By: Benjamin Pomroy
Date: 8/25/2025
Tested By: Benjamin Pomroy

Effective Stress at Maximum Deviator Stress Criterion



Deviator Stress Vs. Axial Strain



Initial	Specimen A	B	C	D
Water Content (%)	11.5			
Dry Density (pcf)	129.7			
Saturation (%)	104.86			
Void Ratio	0.297			
Diameter (in)	2.806			
Height (in)	5.703			
Specific Gravity	2.70			
Liquid Limit	22			
Plastic Limit	13			
After Consolidation	**A**	**B**	**C**	**D**
B-Value	0.96			
Water Content (%)	11.1			
Dry Density (pcf)	134.06			
Saturation (%)	100.00			
Void Ratio	0.255			
Effective Stress (psi)	59.1			
Back Press. (psi)	26.5			
Rate of Strain	0.001878			

Maximium Deviator Stress Criterion		After Shear	A	B	C	D
C (psi)	N/A	σ'1 at Failure (psi)	118.26			
C' (psi)	N/A	σ'3 at Failure (psi)	33.70			
Ø (deg)	N/A					
Ø' (deg)	N/A					

Project:	White Pine Mine
Location:	White Pine, MI
Project Number:	P-0040820
Boring Number:	BH-PFS-1A
Sample Number:	BH-PFS-1A, 67'-69'
Depth:	67' - 69'
Sample Type:	Undisturbed
Description:	Sandy Lean Clay, red (CL)
Test Type	Consolidated Undrained
Remarks	1/2" rock discovered within sample after test completion.

A	B	C	D
N/A	N/A	N/A	N/A

Failure Photographs

American Engineering Testing

Consolidated Undrained Triaxial Test (ASTM D4767)

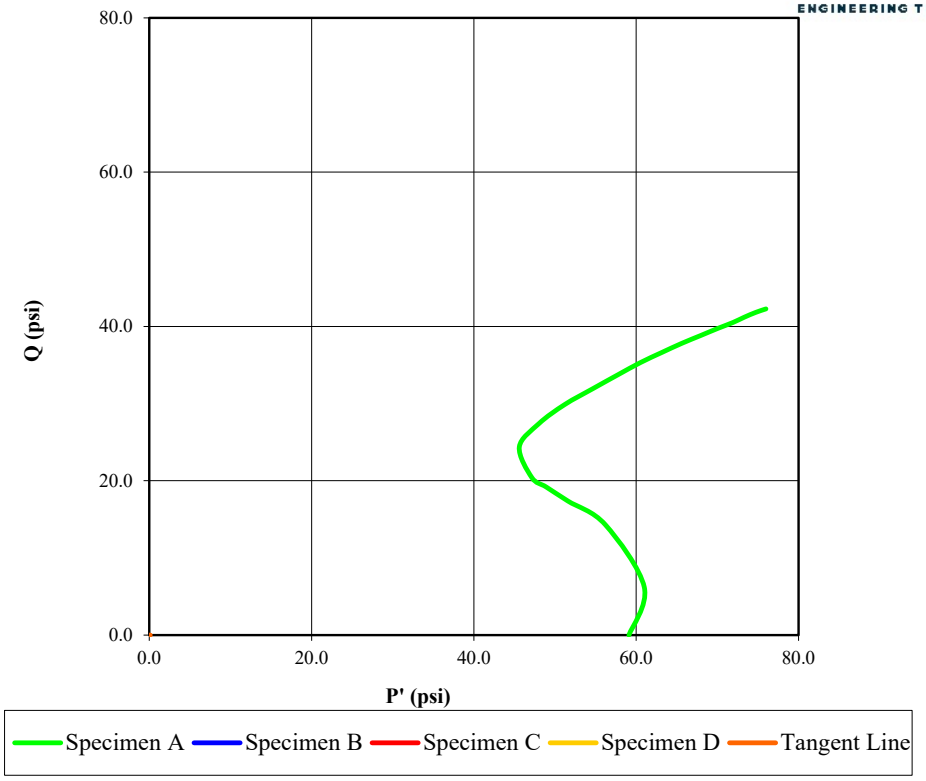
Date: 10/15/2025

Checked By: Benjamin Pomroy

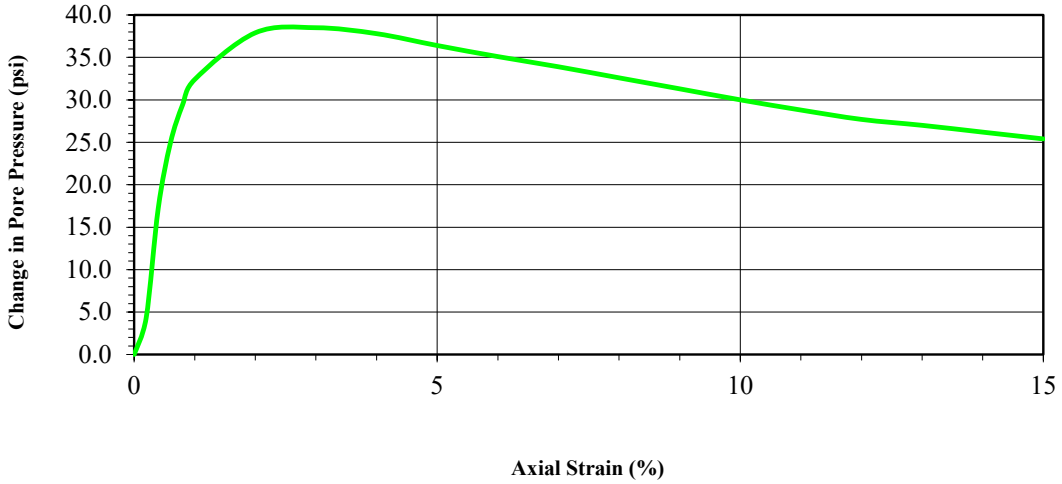
Date: 8/25/2025

Tested By: Benjamin Pomroy

Stress Paths (Effective)

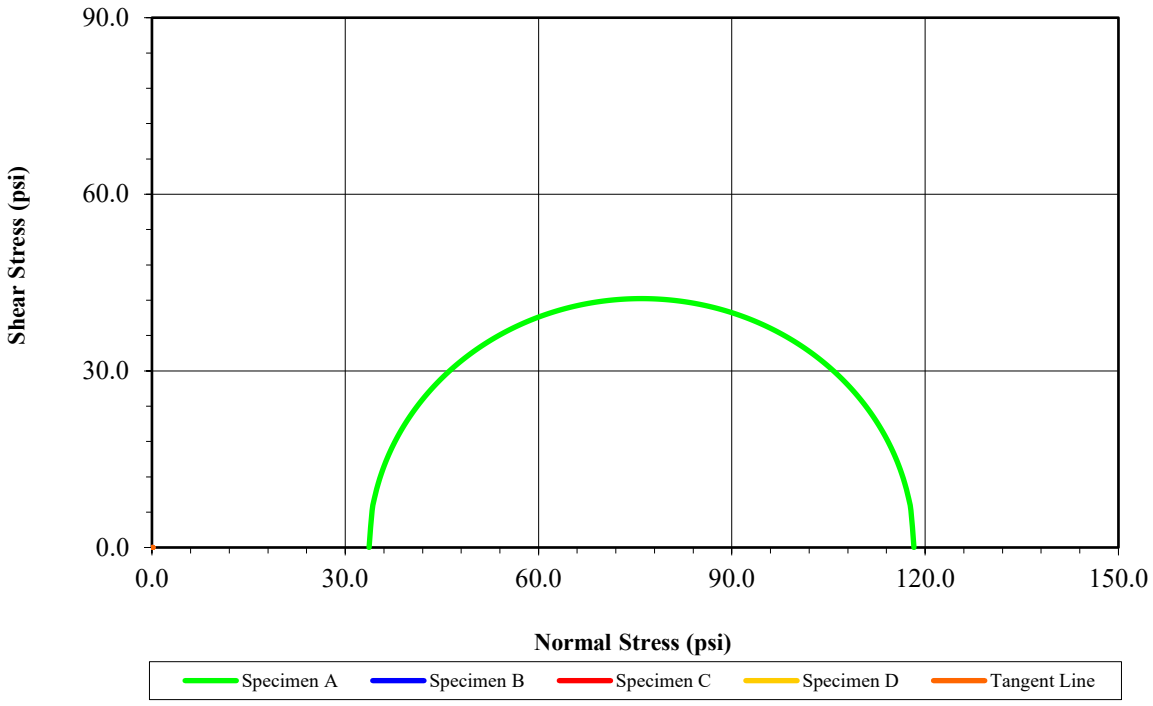


Change in Pore Pressure vs. Axial Strain

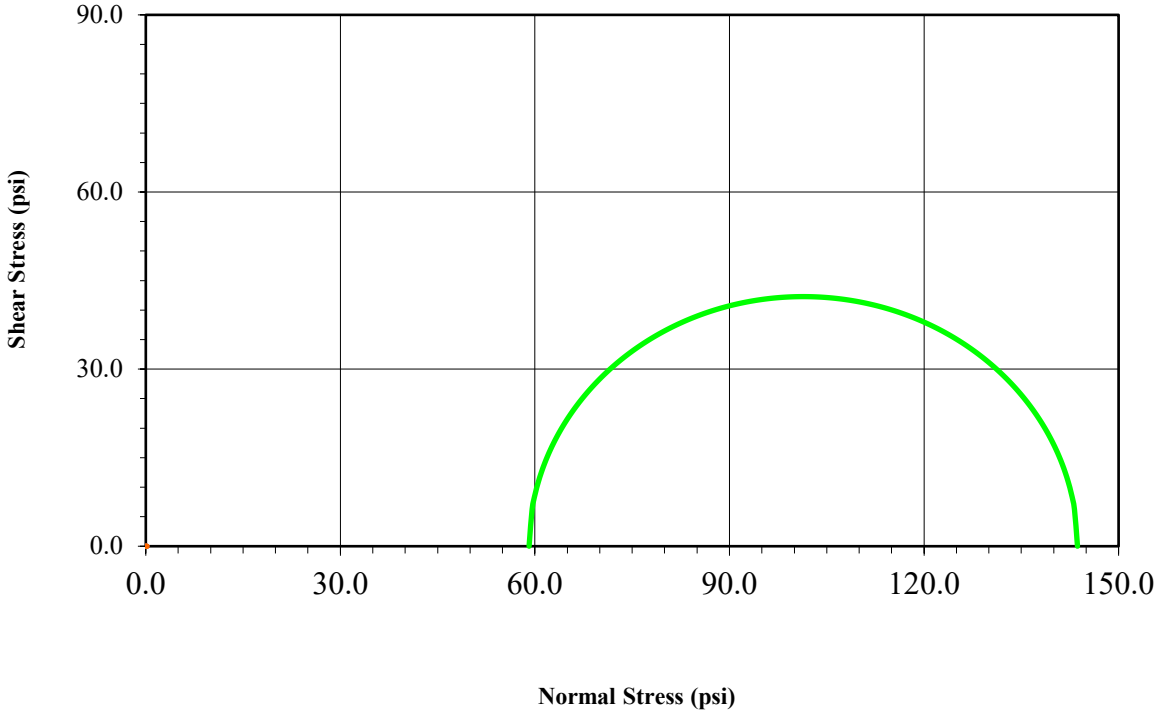


Mohr Stress Circles at Maximum Deviator Stress Criterion

Effective Stress

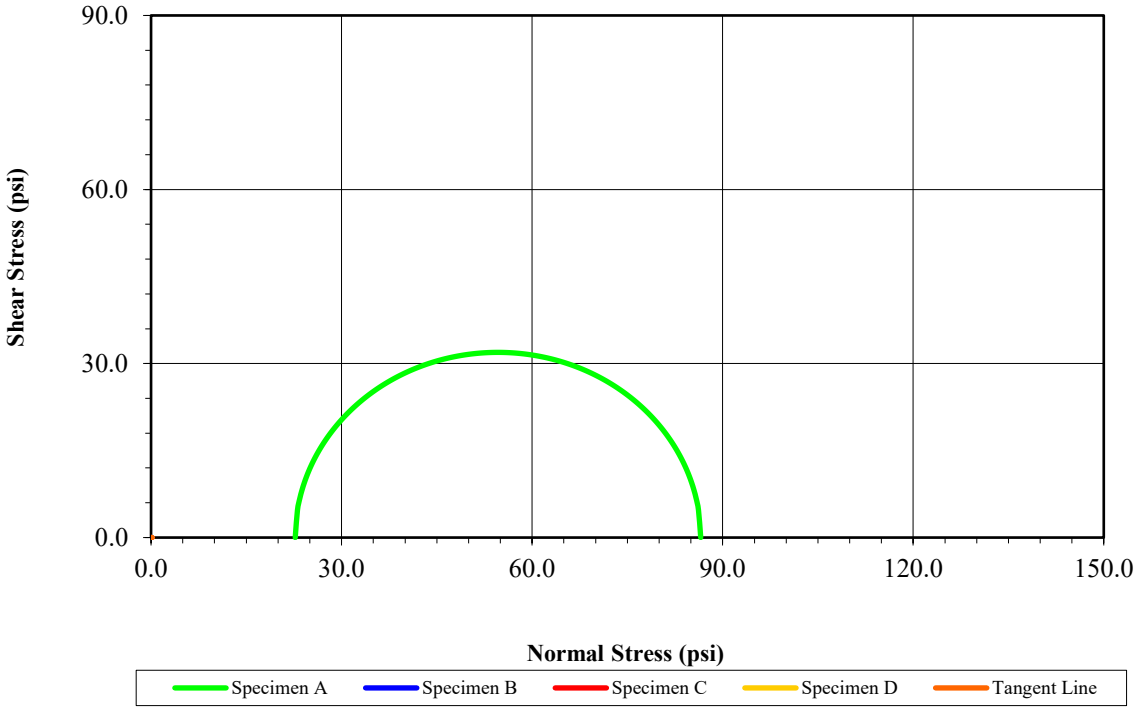


Total Stress

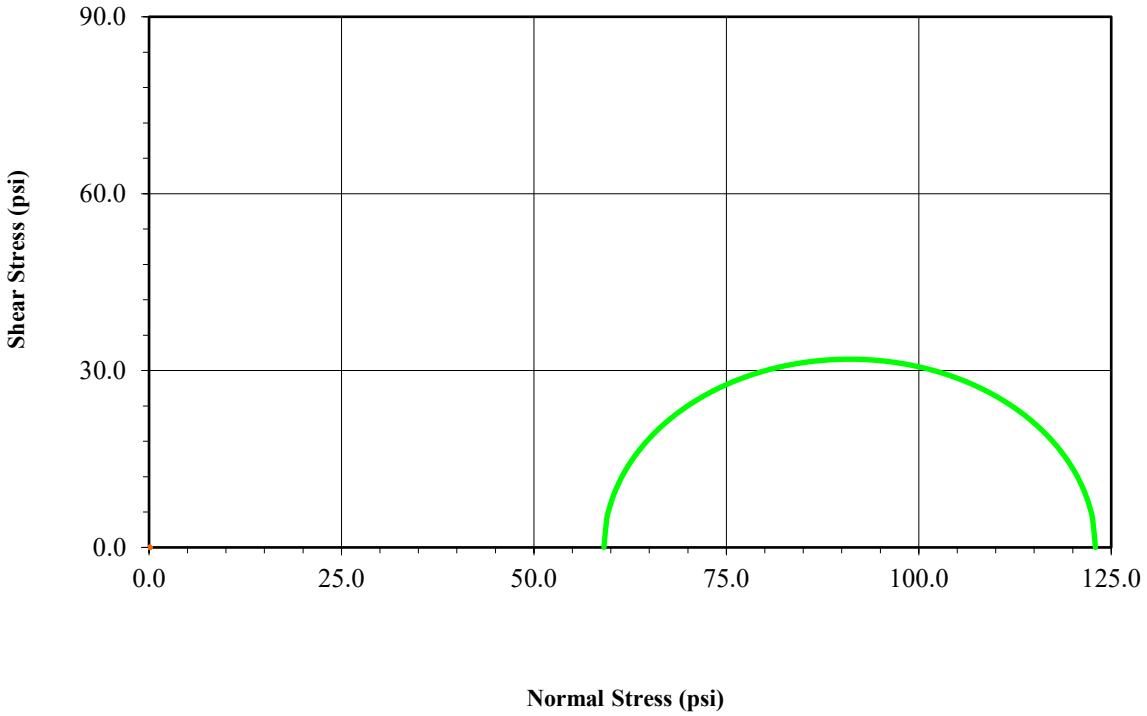


Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

Effective Stress



Total Stress



American Engineering Testing

Consolidated Undrained Triaxial Test (ASTM D4767)

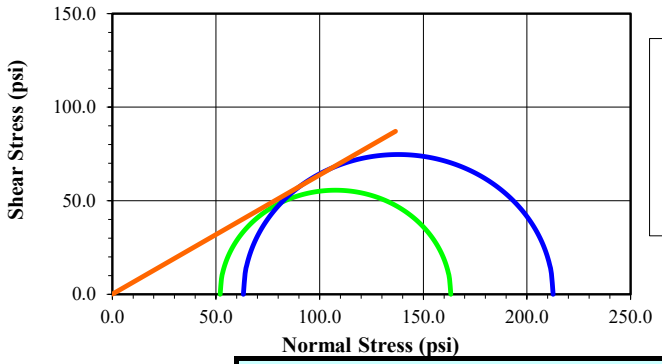
Date: 10/15/2025

Checked By: Benjamin Pomroy

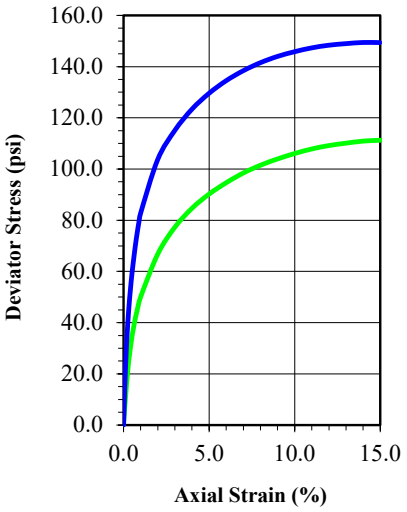
Date : 10/11/2025

Tested By: Benjamin Pomroy

Effective Stress at Maximum Deviator Stress Criterion



Deviator Stress Vs. Axial Strain



Initial	Specimen A	B	C	D
Water Content (%)	11.4	11.4		
Dry Density (pcf)	127.4	128.0		
Saturation (%)	96.42	97.51		
Void Ratio	0.320	0.314		
Diameter (in)	2.879	2.871		
Height (in)	5.435	5.562		
Specific Gravity	2.70	2.70		
Liquid Limit	24	24		
Plastic Limit	14	14		
After Consolidation	**A**	**B**	**C**	**D**
B-Value	1.00	0.98		
Water Content (%)	11.8	11.5		
Dry Density (pcf)	129.41	131.15		
Saturation (%)	106.45	109.48		
Void Ratio	0.300	0.283		
Effective Stress (psi)	45.2	66.0		
Back Press. (psi)	42.4	10.3		
Rate of Strain	0.00214	0.00637		

Maximium Deviator Stress Criterion	
C (psi)	8.6
C' (psi)	0.1
Ø (deg)	28.4
Ø' (deg)	32.5

After Shear	A	B	C	D
σ'1 at Failure (psi)	163.26	212.62		
σ'3 at Failure (psi)	52.00	63.20		

Project:	White Pine Mine
Location:	White Pine, MN
Project Number:	P-0040820
Boring Number:	BH-PFS-2
Sample Number:	BH-PFS-2, 52' - 54'
Depth:	52' - 54'
Sample Type:	Undisturbed
Description:	Lean Clay with Sand, red (CL)
Test Type	Consolidated Undrained
Remarks	

A	B	C	D
N/A	N/A	N/A	N/A

Failure Photographs

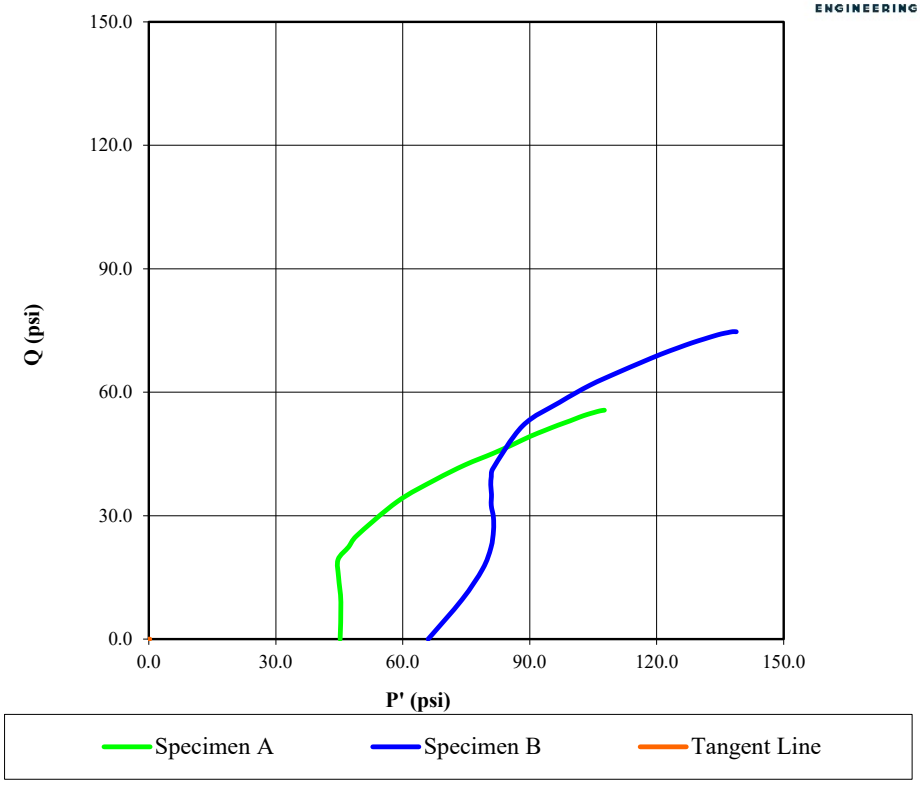
American Engineering Testing

Consolidated Undrained Triaxial Test (ASTM D4767)

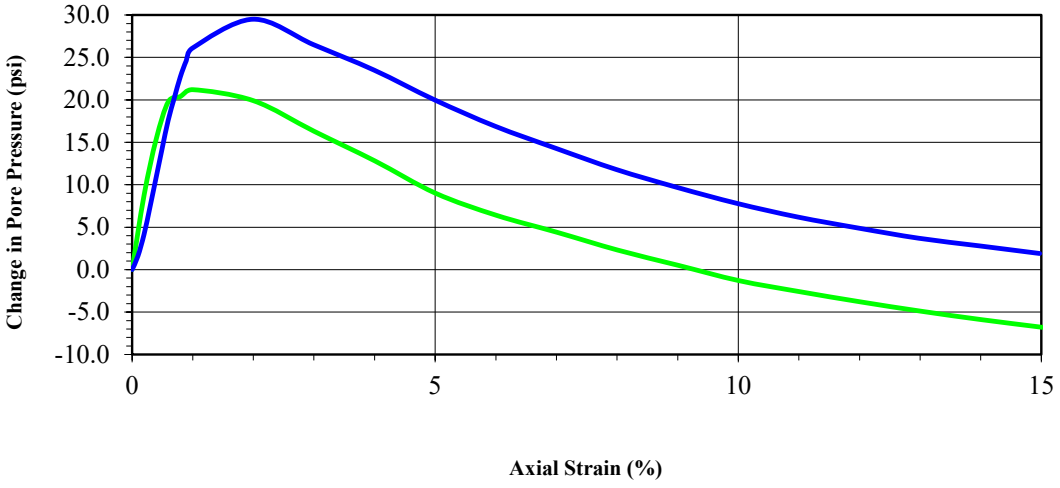
Tested By: Benjamin Pomroy Date : 10/11/2025

Checked By: Benjamin Pomroy Date: 10/15/2025

Stress Paths (Effective)

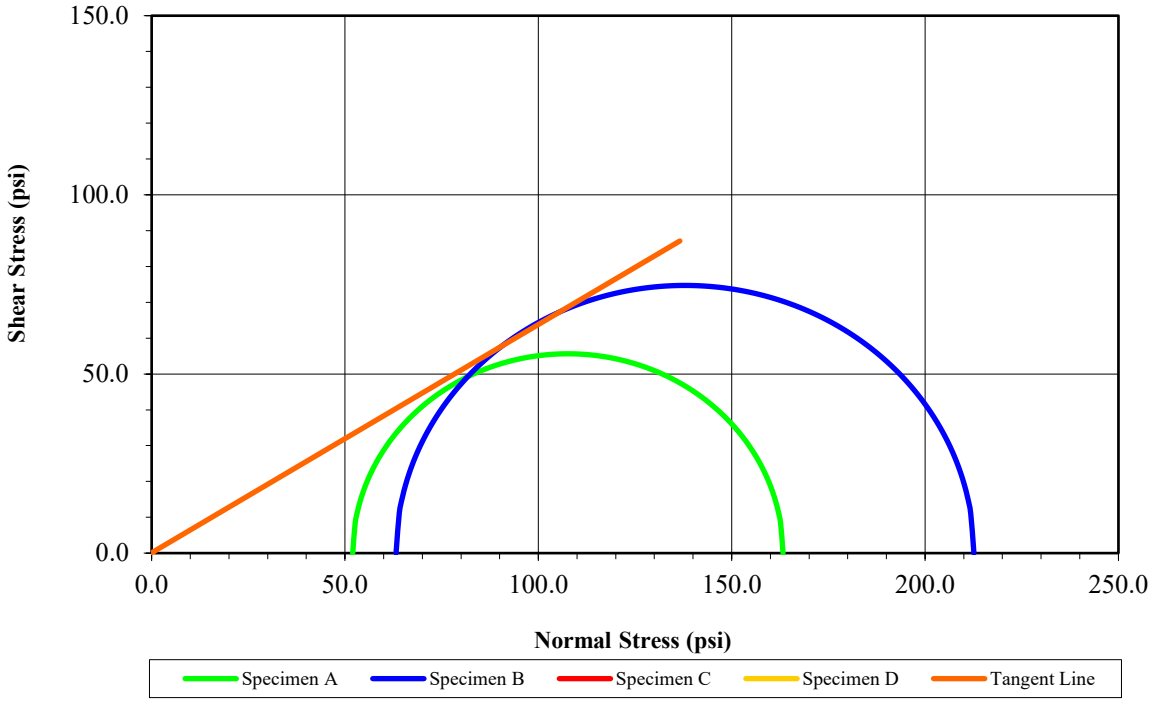


Change in Pore Pressure vs. Axial Strain

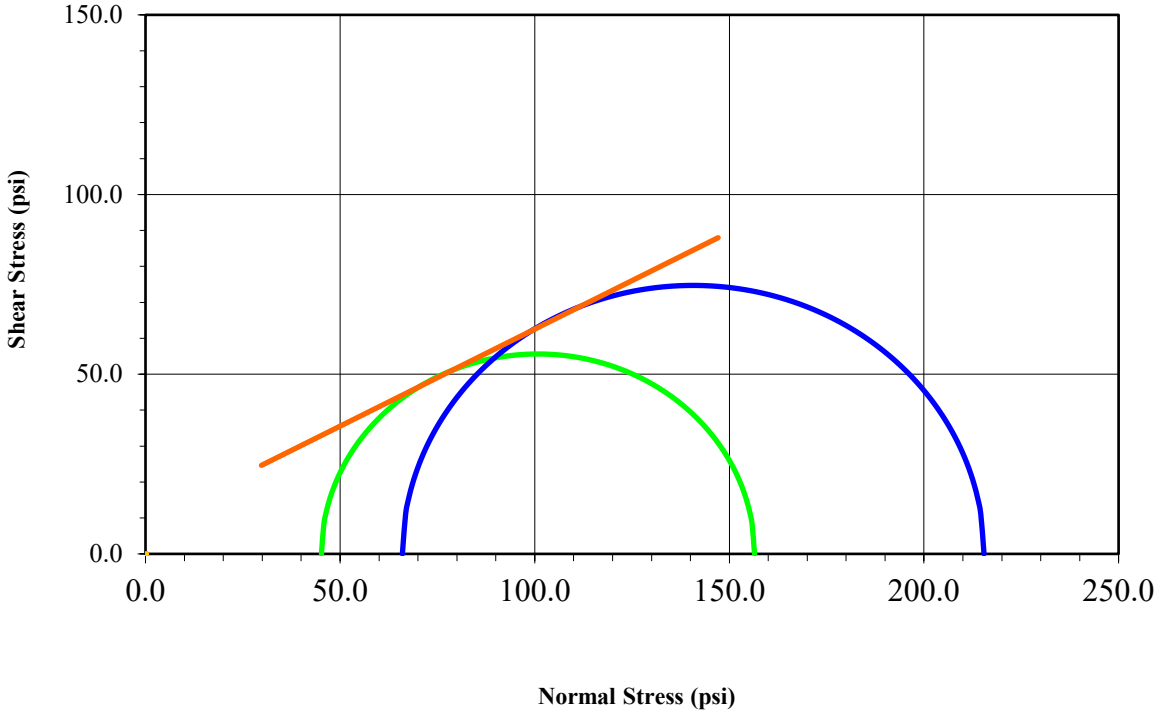


Mohr Stress Circles at Maximum Deviator Stress Criterion

Effective Stress
(C' = 0.1 Ø' = 32.5)

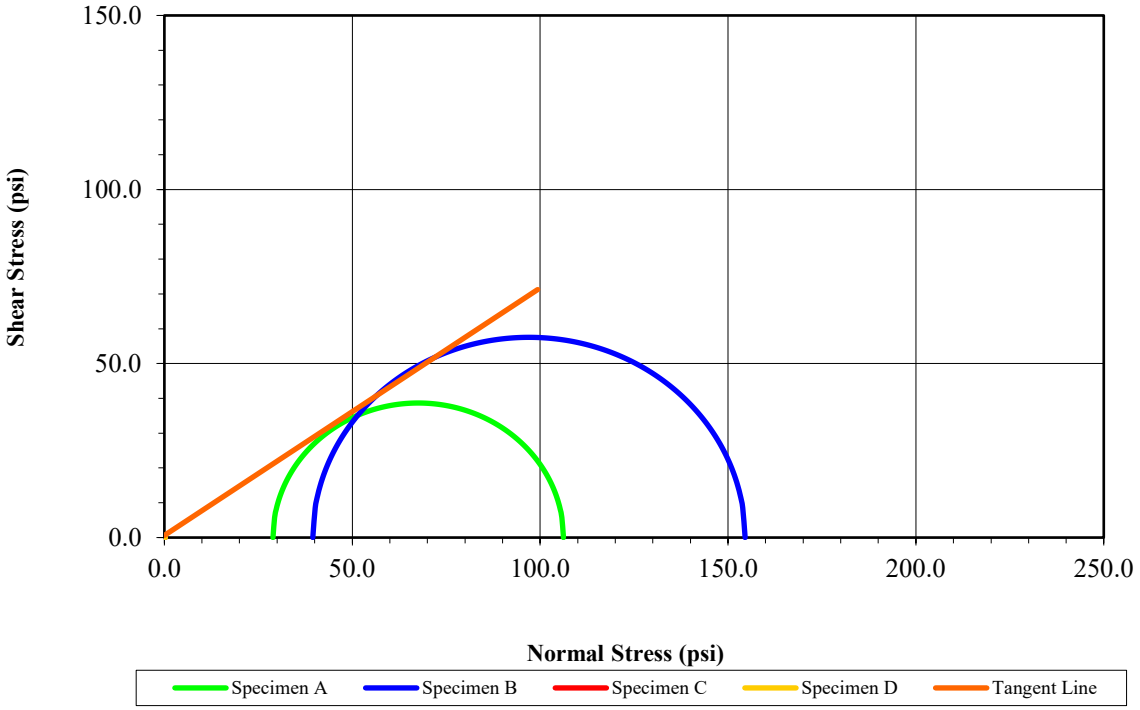


Total Stress
(C = 8.6 Ø = 28.4)

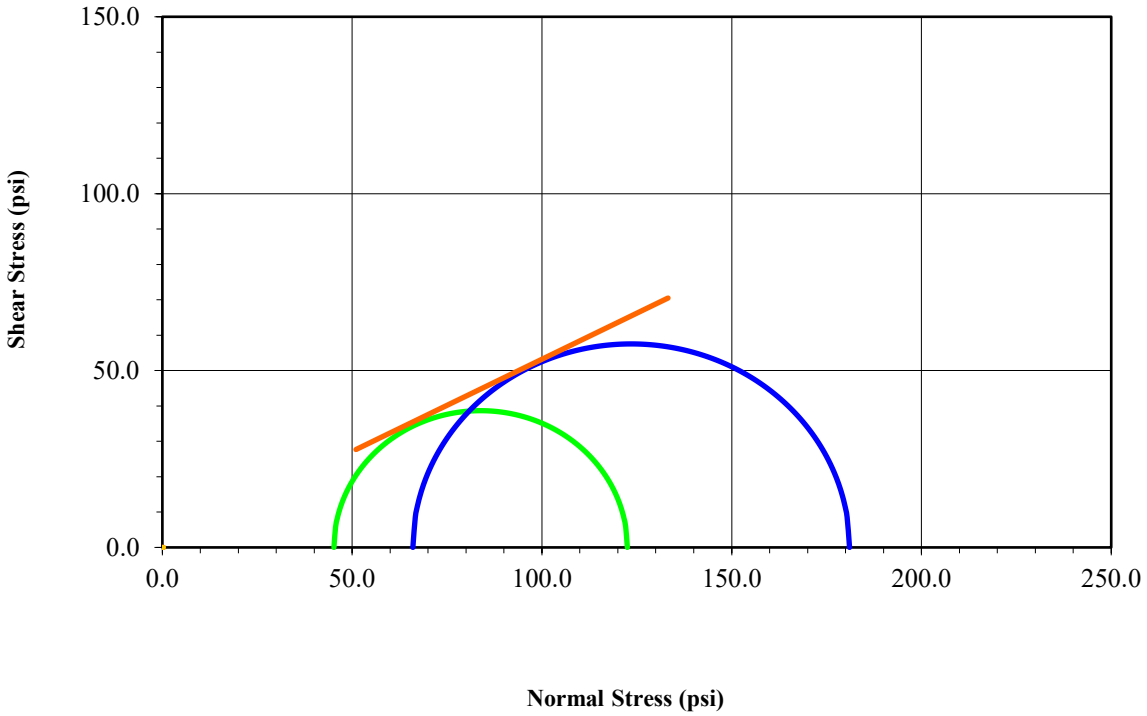


Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

Effective Stress
(C' = 0.6 Ø' = 35.4)



Total Stress
(C = 1.1 Ø = 27.5)



Moisture Density Curve ASTM: D698, Method A

Project: **White Pine Mine - #0040820** Date: **10/14/25**

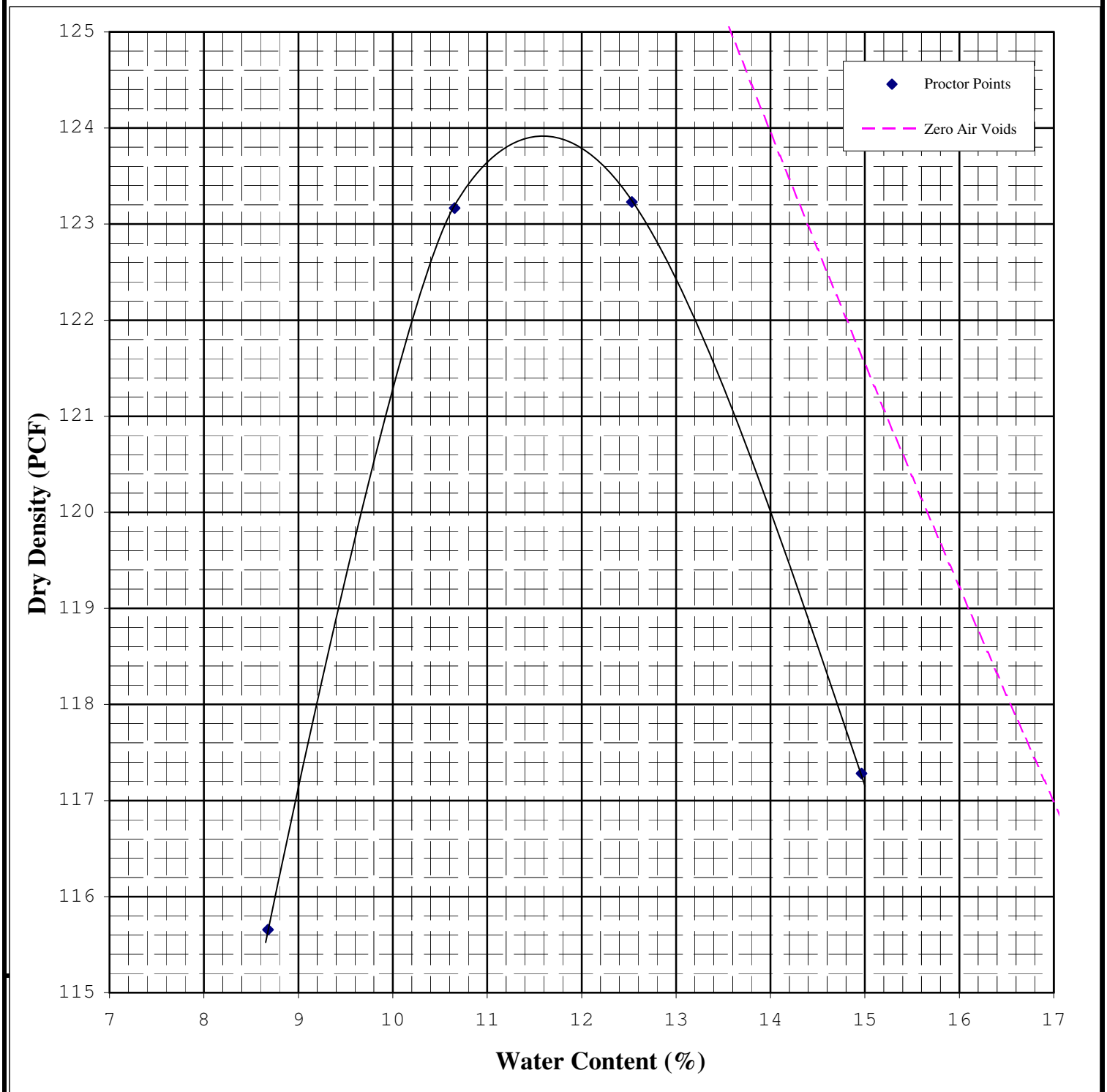
Client: **American Engineering Testing, Inc.** Job No. **15997-A**

Sample: **Clay Stockpile #1** Depth(ft): Location:

Soil Type: **Lean Clay w/sand (CL)**

As Received W.C. (%): **11.7** LL: PL: PI: Specific Gravity: **2.75** *Assumed

Maximum Dry Density (pcf): **123.9** Opt. Water Content (%): **11.6**



9530 James Ave South

SOIL ENGINEERING TESTING, INC.

Bloomington, MN 55431

American Engineering Testing, Inc.
Wausau
4203 Schofield Ave
Schofield, WI 54476
(715) 359-3534
www.teamAET.com

Proctor Report

Report No: PTR:AET-228760-S1

Client: Tetra Tech - Salt Lake City, UT **CC:**

Project: White Pine Mine; White Pine, MI

White Pine MI

Job No: P-0040820

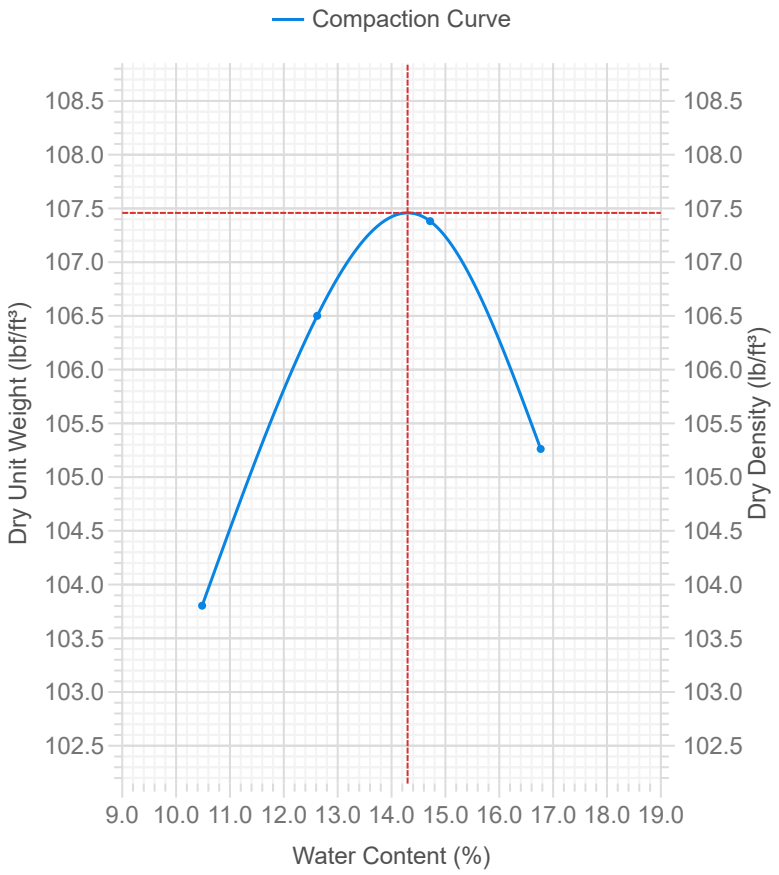
Draft Report - Subject to change pending final review

Date of Issue: 7/22/2025

Sample Details

Sample ID: AET-228760-S1
Date Sampled: 7/21/2025
Material: Sand with silt, fine grained, dk brown (SP-SM)
Location: Tailings #1, Jar #542
Sampled By: 20-St. Paul

Dry Unit Weight - Water Content Relationship



Test Results

ASTM D698

Std. Maximum Dry Unit Weight (lbf/ft³):	**107.5**
Std. Optimum Water Content (%):	**14.3**
Test Portion As-received Water Content (%):	0
Retained on 3/4″ Sieve (%):	0
Passing 3/4″ Sieve (%):	100
Cumulative Retained on 3/8″ Sieve (%):	0
Retained on 3/8″ Sieve (%):	0
Passing 3/8″ Sieve (%):	100
Cumulative Retained on No.4 Sieve (%):	0
Retained on No.4 Sieve (%):	0
Passing No.4 Sieve (%):	100
Method:	A
Preparation Method:	Dry
Rammer Type:	Automatic
Determined By:	Estimated
Tested By:	Abdisalam Ayanle
Date Tested:	7/22/2025

Comments

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American Engineering Testing, Inc.
Wausau
4203 Schofield Ave
Schofield, WI 54476
(715) 359-3534
www.teamAET.com

Proctor Report

Report No: PTR:AET-228760-S2

Client: Tetra Tech - Salt Lake City, UT **CC:**

Project: White Pine Mine; White Pine, MI

White Pine MI

Job No: P-0040820

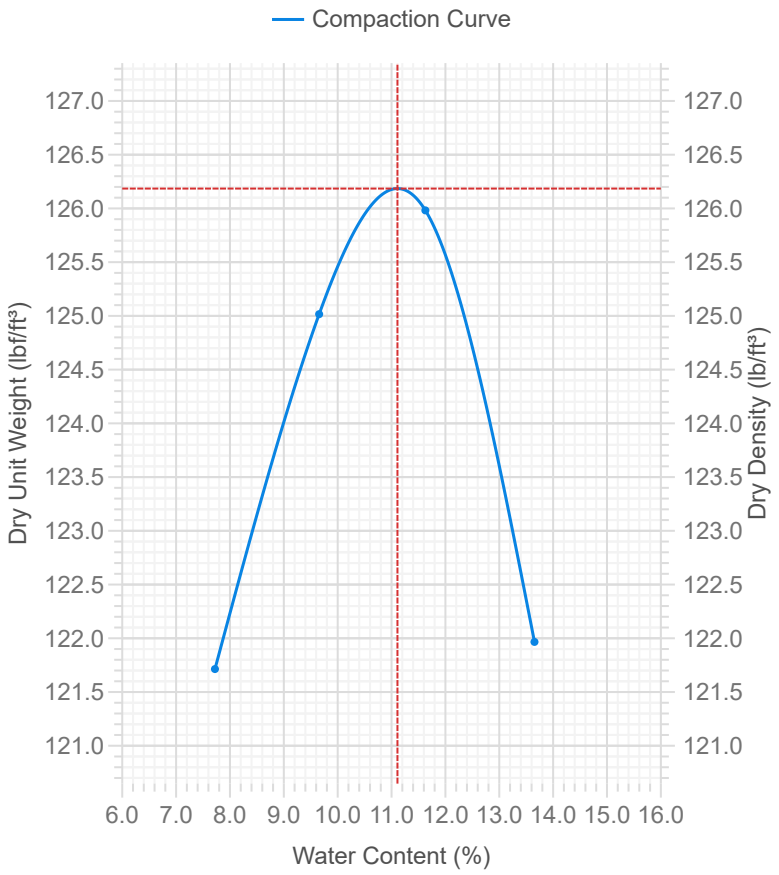
Draft Report - Subject to change pending final review

Date of Issue: 7/23/2025

Sample Details

Sample ID: AET-228760-S2
Date Sampled: 7/22/2025
Material: Silty Sand, dark brown (SM)
Location: Tailings #2, Jar #545 (Broken glass pieces)
Sampled By: 20-St. Paul

Dry Unit Weight - Water Content Relationship



Test Results

ASTM D698

Std. Maximum Dry Unit Weight (lbf/ft³):	**126.2**
Std. Optimum Water Content (%):	**11.1**
Test Portion As-received Water Content (%):	0
Retained on 3/4″ Sieve (%):	0
Passing 3/4″ Sieve (%):	100
Cumulative Retained on 3/8″ Sieve (%):	0
Retained on 3/8″ Sieve (%):	0
Passing 3/8″ Sieve (%):	100
Cumulative Retained on No.4 Sieve (%):	1
Retained on No.4 Sieve (%):	0
Passing No.4 Sieve (%):	99
Method:	A
Preparation Method:	Dry
Rammer Type:	Automatic
Determined By:	Estimated
Tested By:	Abdisalam Ayanle
Date Tested:	7/23/2025

Comments

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Moisture Density Curve ASTM: D698, Method B

Project: **White Pine Mine - #0040820** Date: **10/17/25**

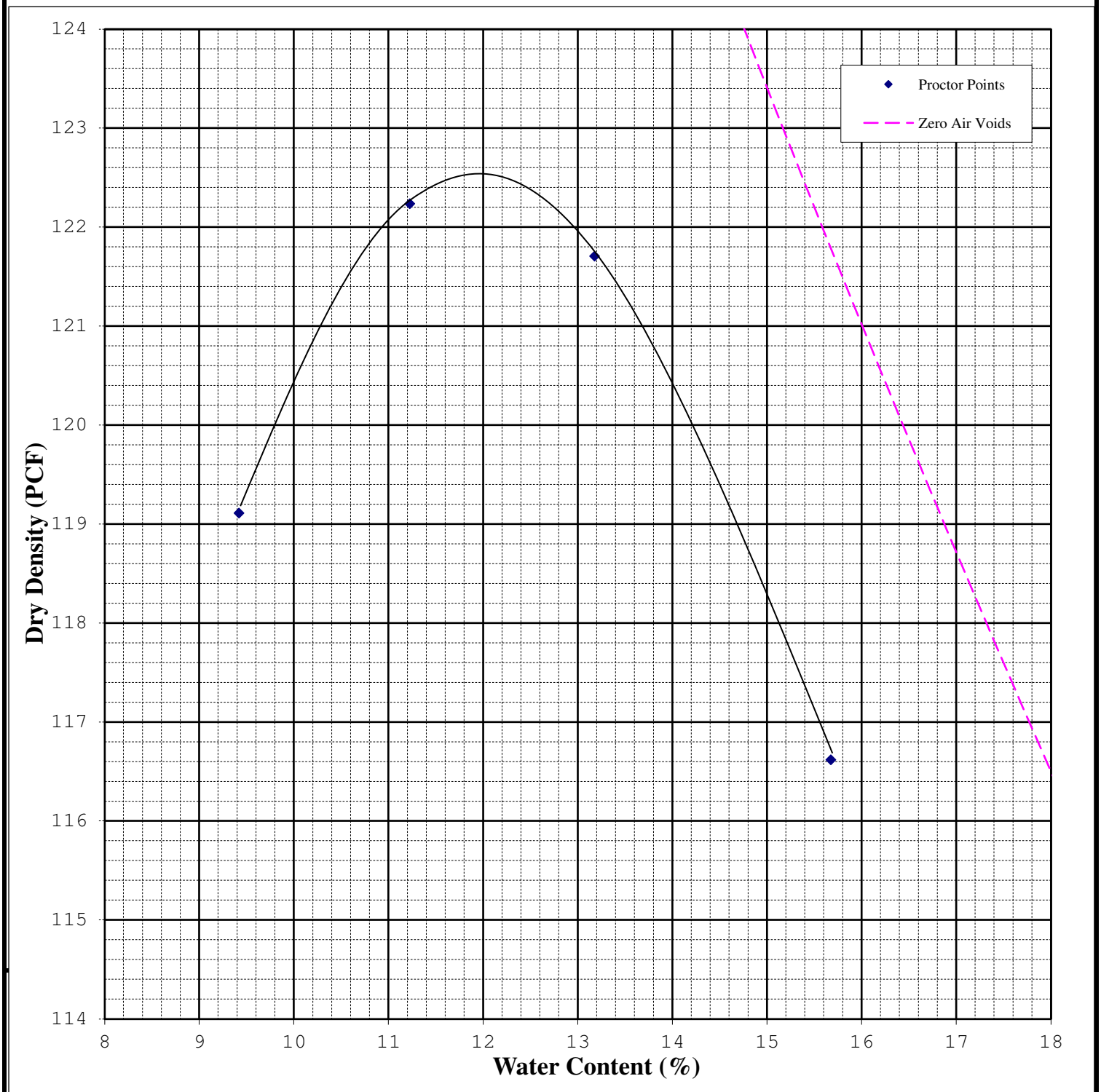
Client: **American Engineering Testing, Inc.** Job No. **15997-A**

Boring No. **50:50 Stockpile #1 & Tailings #1** Location:

Soil Type: **Silty Clayey Sand (SC-SM)**

As Received W.C. (%): **10.0** LL: **18** PL: **14** PI: **4** Specific Gravity: **2.81** *Assumed

Maximum Dry Density (pcf): **122.5** Opt. Water Content (%): **12.0**



9530 James Ave South

SOIL ENGINEERING TESTING, INC.

Bloomington, MN 55431

Moisture Density Curve ASTM: D698, Method A

Project: **White Pine Mine - #0040820** Date: **10/17/25**

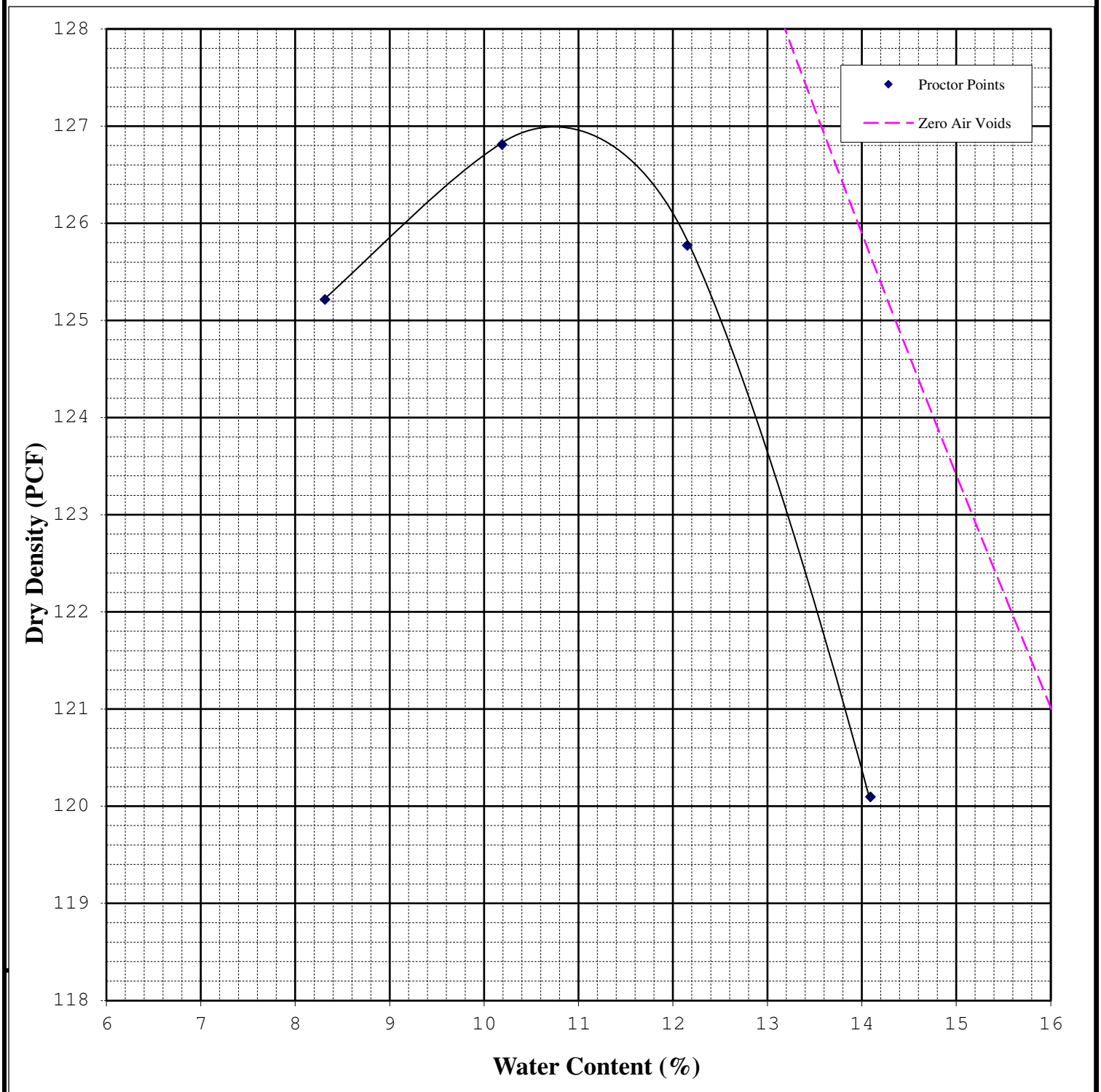
Client: **American Engineering Testing, Inc.** Job No. **15997-A**

Boring No. **50:50 Clay Stockpile #1 & Tailings #2** Location:

Soil Type: **Sandy Lean Clay w/a trace of glass pieces (CL)**

As Received W.C. (%): **9.7** LL: **24** PL: **16** PI: **8** Specific Gravity: **2.81** *Assumed

Maximum Dry Density (pcf): **127.0** Opt. Water Content (%): **10.8**



9530 James Ave South

SOIL ENGINEERING TESTING, INC.

Bloomington, MN 55431

SET-R18a

APPENDIX E:
Topographic Survey Cross-Sections

N

0 375' 750' 1500'

SCALE: 1" = 750'

TETRA TECH

www.tetratech.com

MARK	DATE	DESCRIPTION	BY
A	08/22/24	FOR INFORMATION ONLY	RNW

PLAN VIEW

PROJ:

DESN:

DRWN: R. WOOLSEY

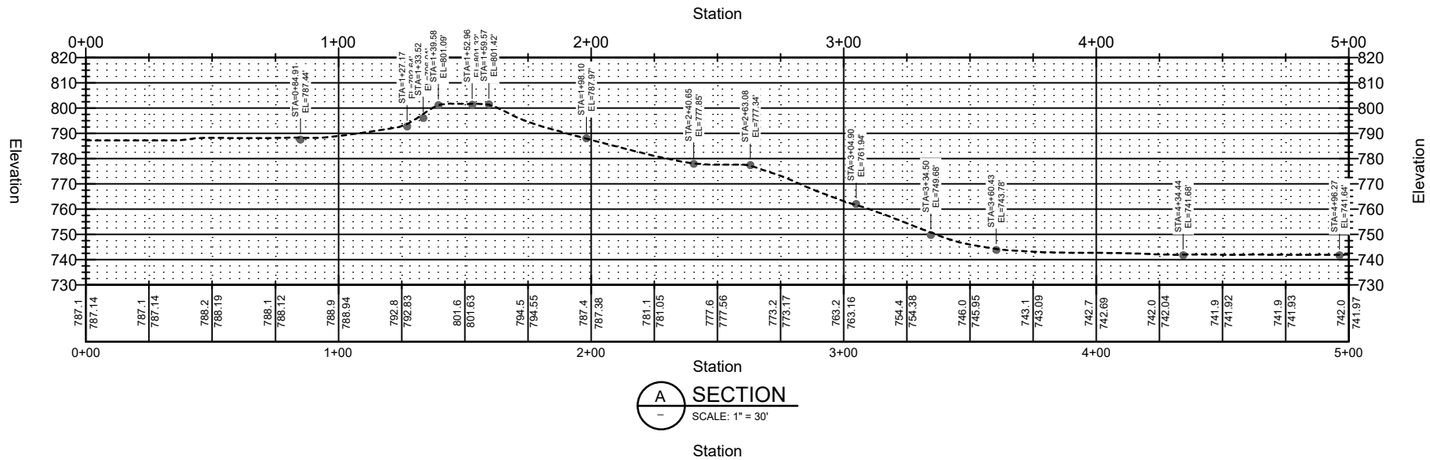
CHKD:

FIG-01

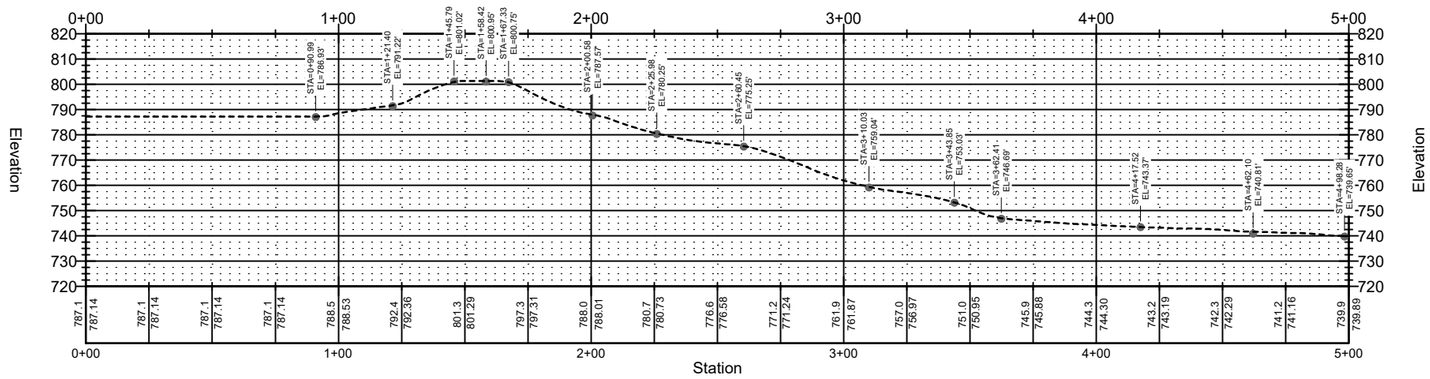
Copyright Tetra Tech

Bar Measures 1 inch, otherwise drawing not to scale

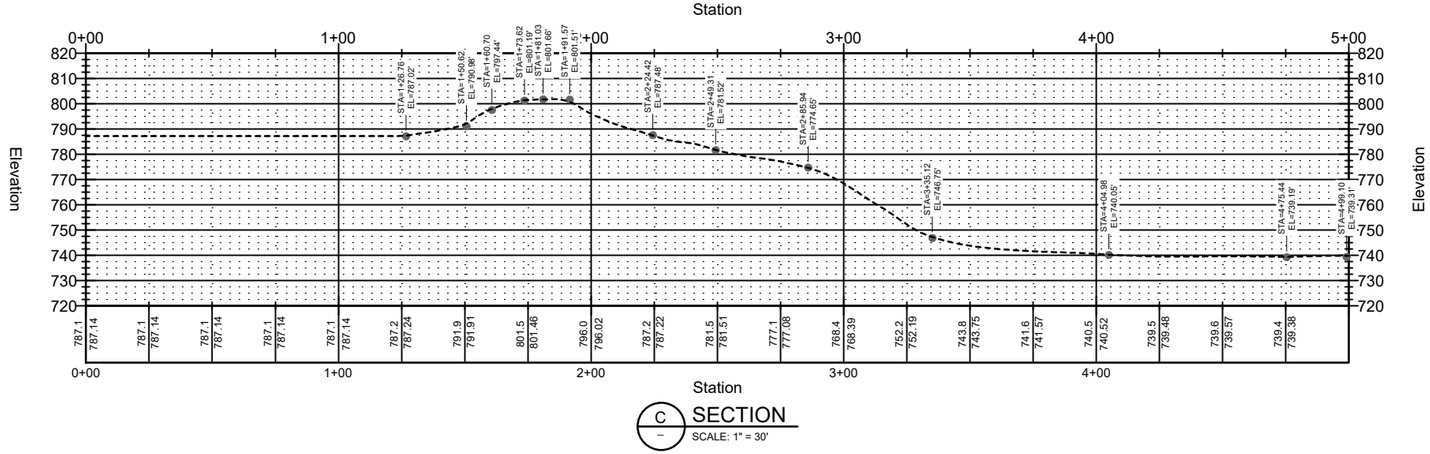
8/22/2024 2:08:20 PM - C:\USERS\ROGER.WOOLSEY\ONEDRIVE - TETRA TECH, INC\DESKTOP\RICHARD\WHITE PINES EG.DWG - WOOLSEY, ROGER



A SECTION
SCALE: 1" = 30'



B SECTION
SCALE: 1" = 30'



C SECTION
SCALE: 1" = 30'

TETRA TECH
www.tetratech.com

MARK	DATE	DESCRIPTION	BY
A	08/22/24	FOR INFORMATION ONLY	RNW

SECTIONS 1

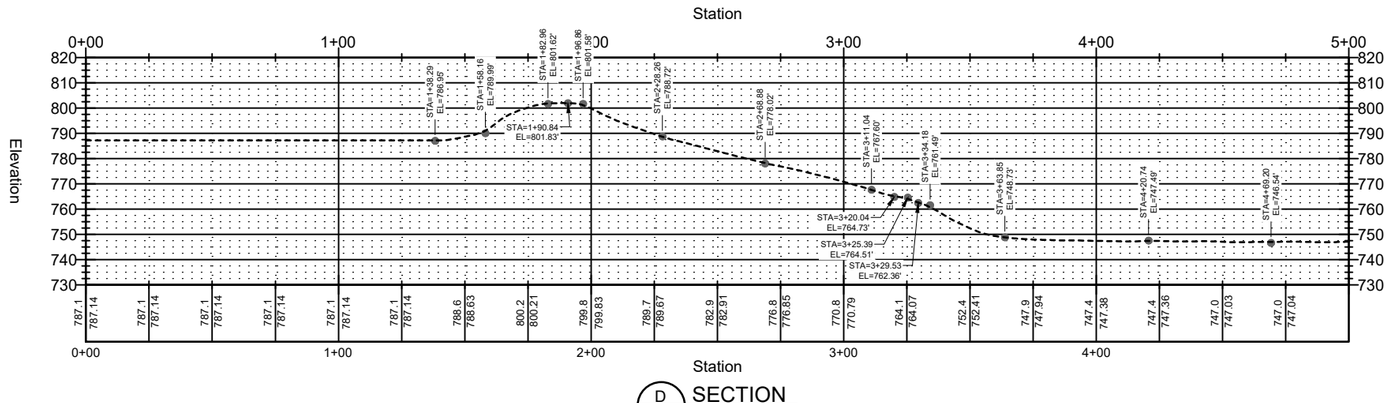
PROJ:
DESN:
DRWN: R. WOOLSEY
CHKD:

FIG-02

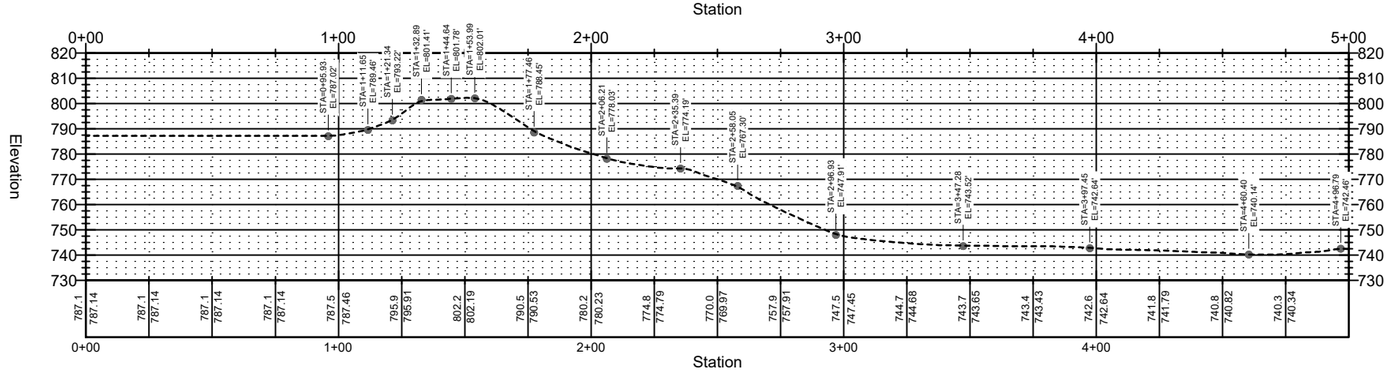
Copyright: Tetra Tech

Bar Measures 1 inch, otherwise drawing not to scale

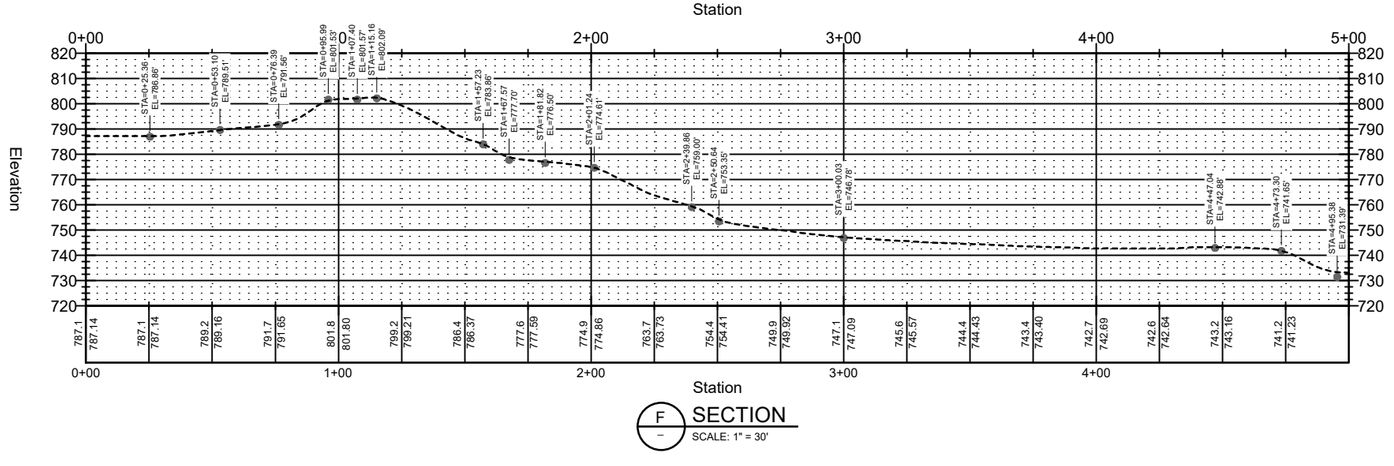
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D SECTION
SCALE: 1" = 30'



E SECTION
SCALE: 1" = 30'



F SECTION
SCALE: 1" = 30'

TETRA TECH
www.tetratech.com

MARK	DATE	DESCRIPTION	BY
A	08/22/24	FOR INFORMATION ONLY	RNW

SECTIONS 2

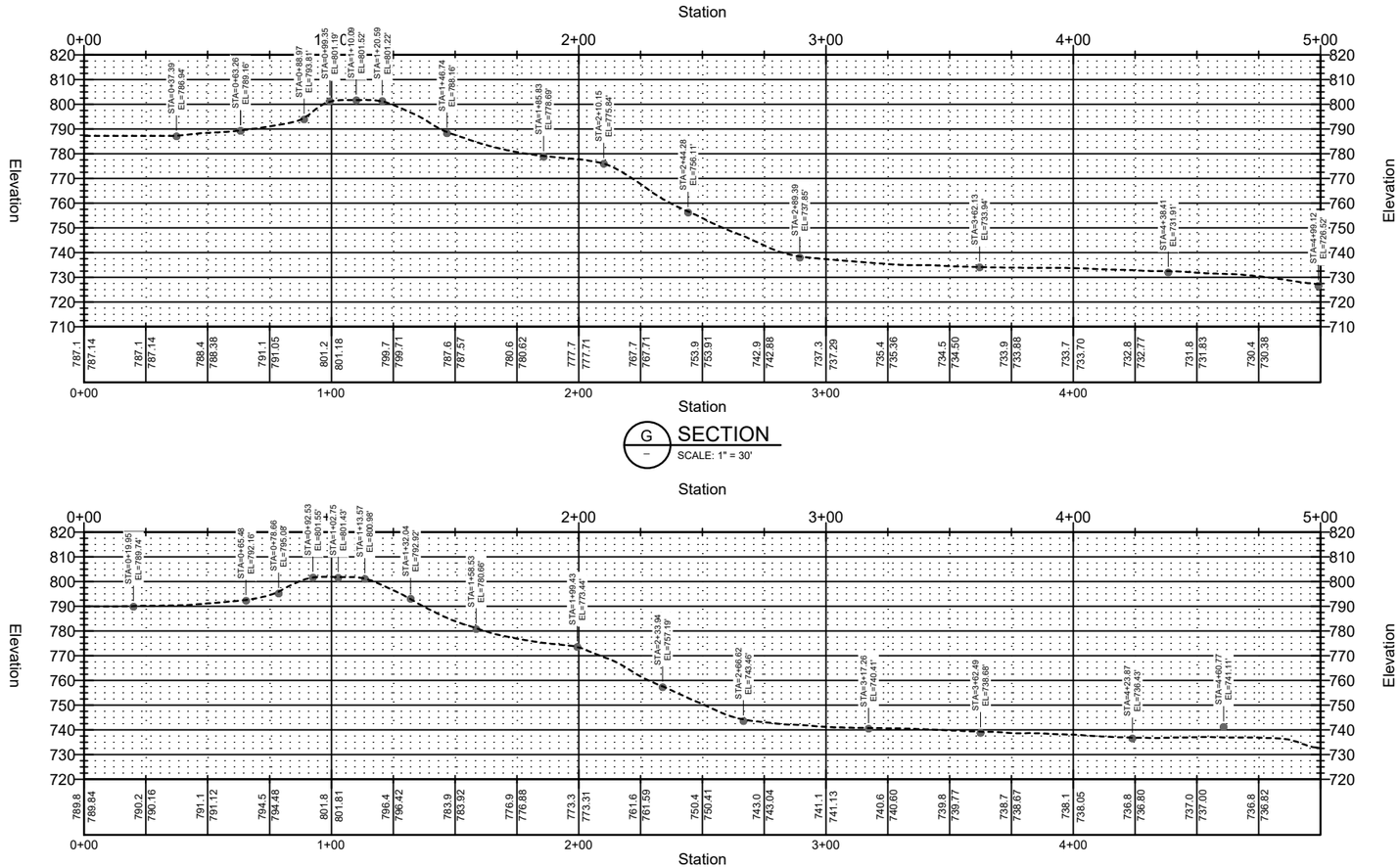
PROJ:
DESN:
DRWN: R. WOOLSEY
CHKD:

FIG-03

Copyright: Tetra Tech

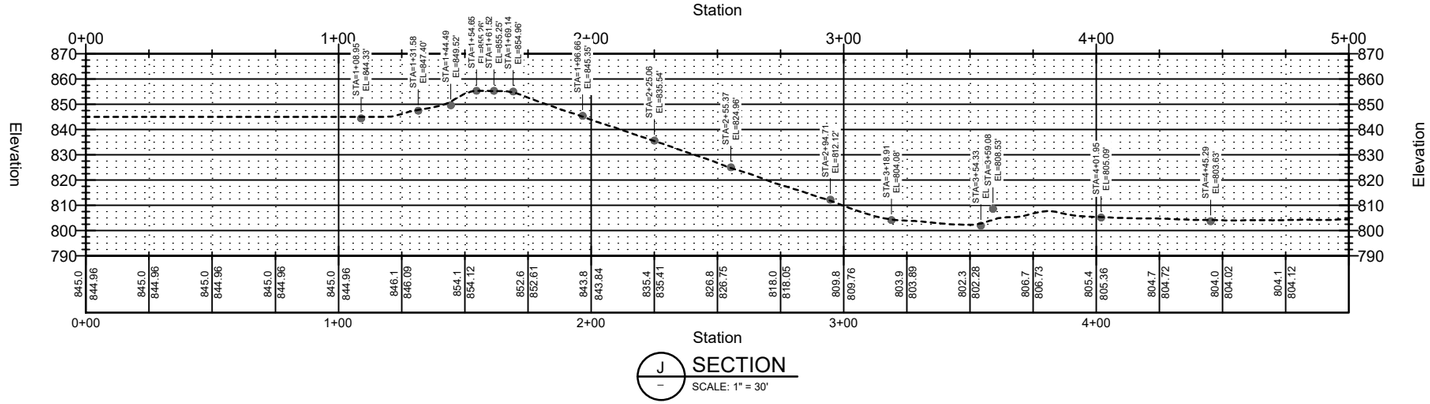
Bar Measures 1 inch, otherwise drawing not to scale

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G
–
SECTION
SCALE: 1" = 30'

H
–
SECTION
SCALE: 1" = 30'



J
–
SECTION
SCALE: 1" = 30'

MARK	DATE	DESCRIPTION	BY
A	08/22/24	FOR INFORMATION ONLY	RNW

SECTIONS 3

PROJ:
DESN:
DRWN: R. WOOLSEY
CHKD:

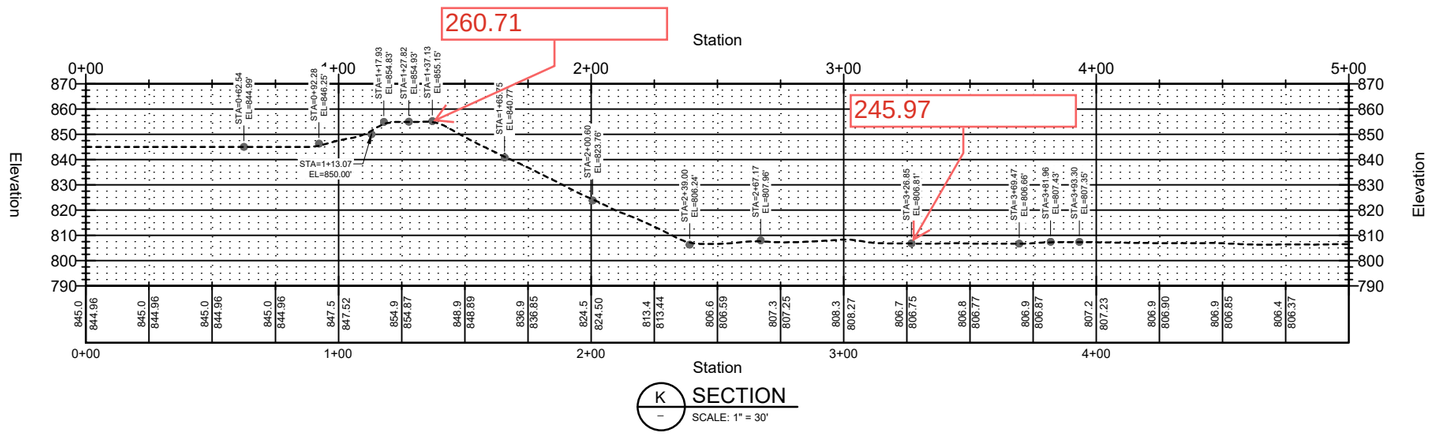
FIG-04

TETRA TECH
www.tetratech.com

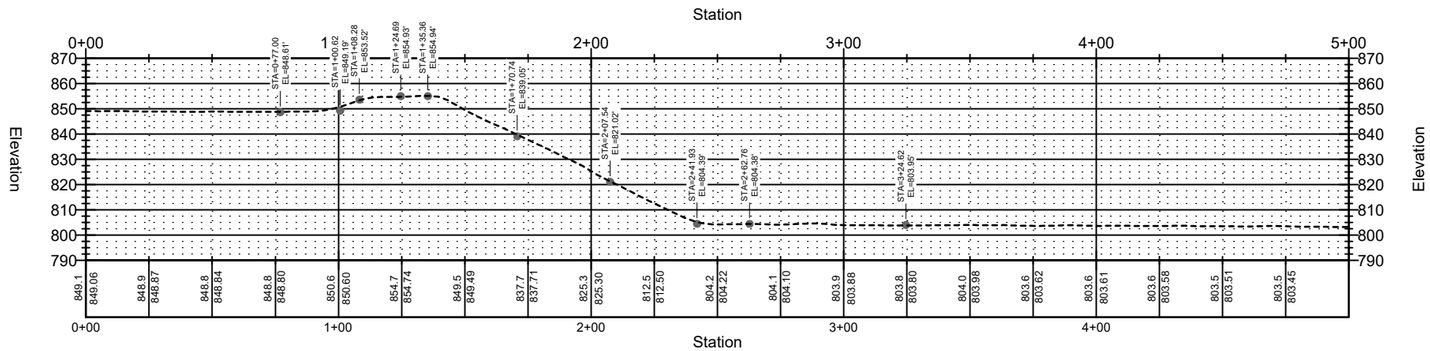
Copyright Tetra Tech

Bar Measures 1 inch, otherwise drawing not to scale

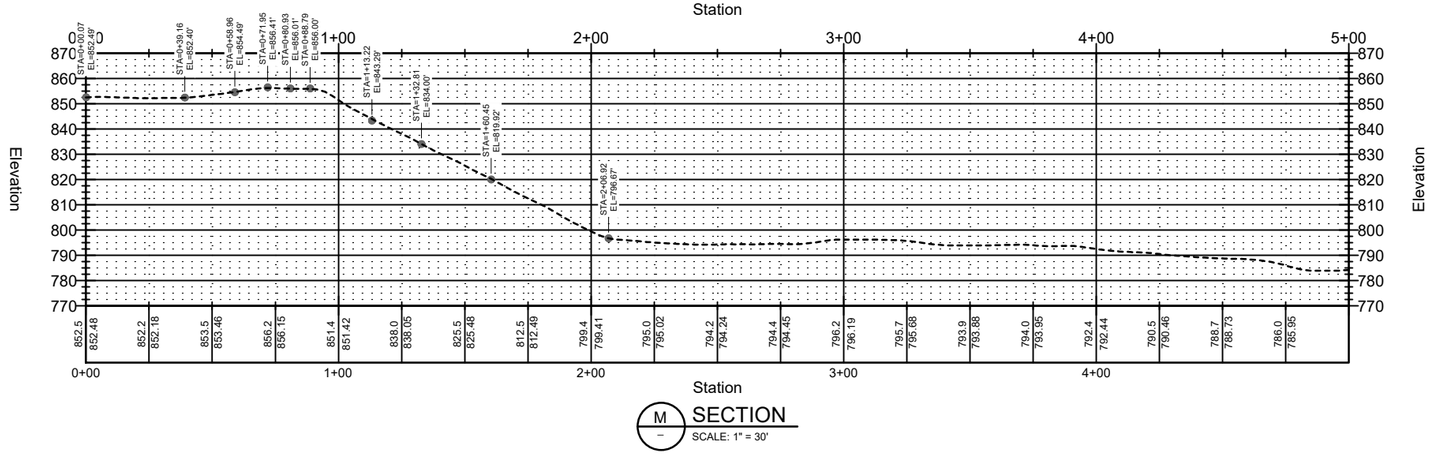
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K SECTION
SCALE: 1" = 30'



L SECTION
SCALE: 1" = 30'



M SECTION
SCALE: 1" = 30'

MARK	DATE	DESCRIPTION	BY
A	08/22/24	FOR INFORMATION ONLY	RNW

SECTIONS 4

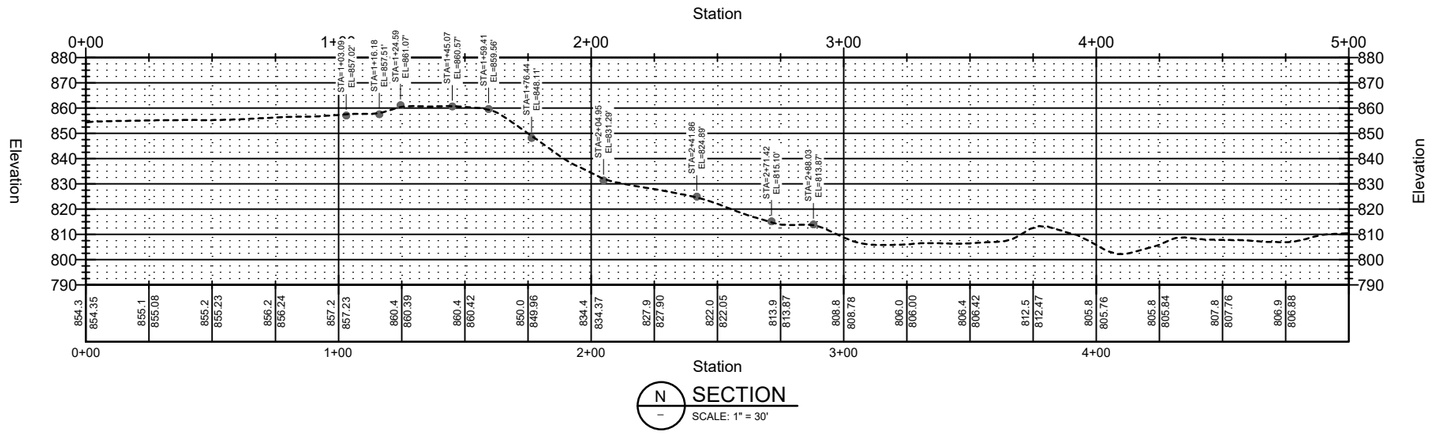
PROJ:
DESN:
DRWN: R. WOOLSEY
CHKD:

FIG-05

Copyright: Tetra Tech

Bar Measures 1 inch, otherwise drawing not to scale

8/22/2024 2:59:59 PM - C:\USERS\ROGER.WOOLSEY\ONEDRIVE - TETRA TECH, INC\DESKTOP\RICHARD\WHITE PINES EG.DWG - WOOLSEY, ROGER



N

SECTION

SCALE: 1" = 30'

MARK	DATE	DESCRIPTION	BY
A	08/22/24	FOR INFORMATION ONLY	RNW

SECTIONS 5

PROJ:

DESN:

DRWN: R. WOOLSEY

CHKD:

FIG-06

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Bar Measures 1 inch, otherwise drawing not to scale

8/22/2024 3:01:20 PM - C:\USERS\ROGER.WOOLSEY\ONEDRIVE - TETRA TECH, INC\DESKTOP\RICHARD\WHITE PINES EG.DWG - WOOLSEY, ROGER

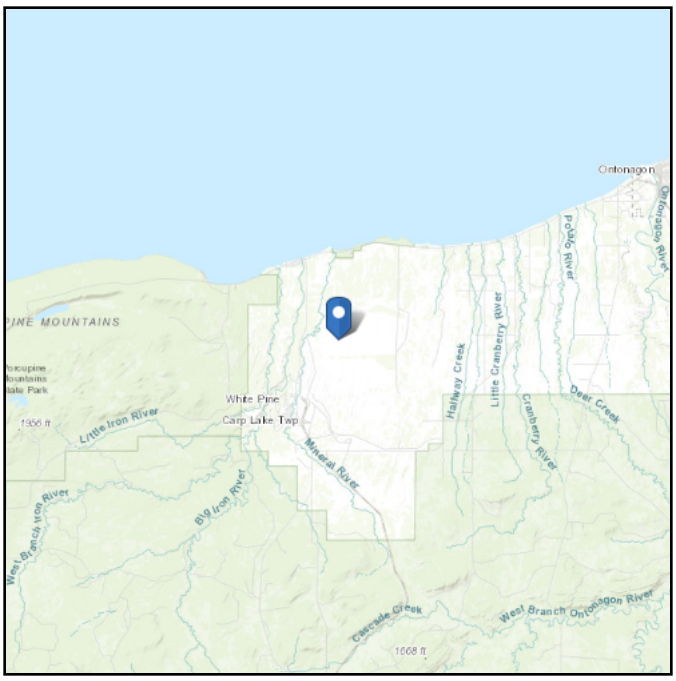
APPENDIX F:
USGS Seismic Hazard Tool Report

ASCE Hazards Report

Address:
No Address at This Location

Standard:	ASCE/SEI 7-22	**Latitude:**	46.790949
Risk Category:	III	**Longitude:**	-89.544431
Soil Class:	D - Stiff Soil	**Elevation:**	797.2635939802819 ft (NAVD 88)





Seismic

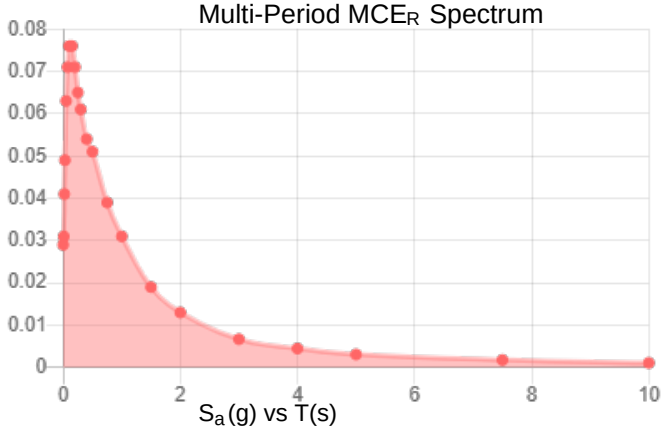
Site Soil Class: D - Stiff Soil

Results:

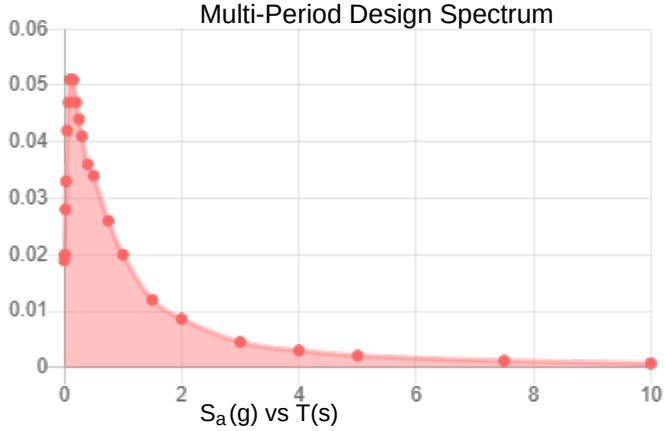
PGA_M :	0.024	T_L :	4
S_{MS} :	0.064	S_S :	0.048
S_{M1} :	0.031	S_1 :	0.014
S_{DS} :	0.043	V_{S30} :	260
S_{D1} :	0.02		

Seismic Design Category: A

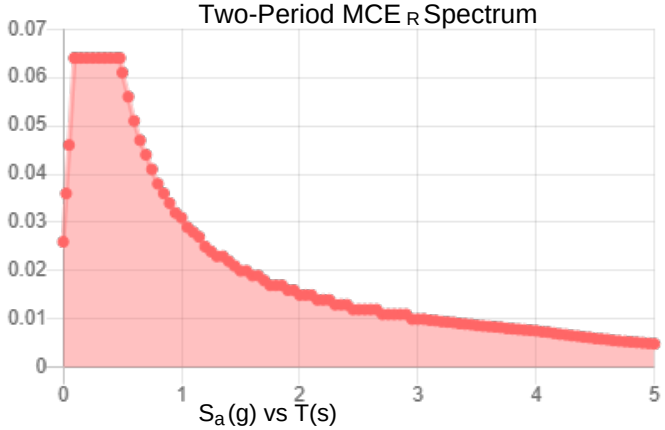
Multi-Period MCE_R Spectrum



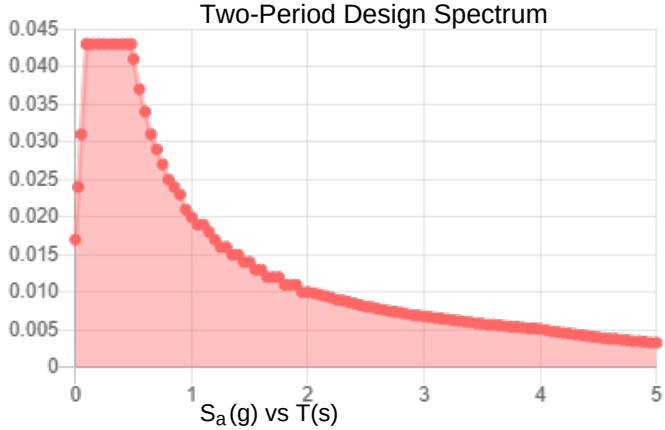
Multi-Period Design Spectrum



Two-Period MCE_R Spectrum



Two-Period Design Spectrum



MCE_R Vertical Response Spectrum

Vertical ground motion data has not yet been made available by USGS.

Design Vertical Response Spectrum

Vertical ground motion data has not yet been made available by USGS.

Data Accessed: **Fri Feb 06 2026**

Date Source:
USGS Seismic Design Maps based on ASCE/SEI 7-22 and ASCE/SEI 7-22 Table 1.5-2. Additional data for site-specific ground motion procedures in accordance with ASCE/SEI 7-22 Ch. 21 are available from USGS.

The ASCE Hazard Tool is provided for your convenience, for informational purposes only, and is provided “as is” and without warranties of any kind. The location data included herein has been obtained from information developed, produced, and maintained by third party providers; or has been extrapolated from maps incorporated in the ASCE standard. While ASCE has made every effort to use data obtained from reliable sources or methodologies, ASCE does not make any representations or warranties as to the accuracy, completeness, reliability, currency, or quality of any data provided herein. Any third-party links provided by this Tool should not be construed as an endorsement, affiliation, relationship, or sponsorship of such third-party content by or from ASCE.

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Appendix G
Thickened Tailings Geotechnical Testing Reports

ADVANCED TERRA TESTING
833 PARFET ST UNIT A
LAKEWOOD, CO
303-232-8308 www.terratesting.com

Wednesday, January 21, 2026

Project Number:	2592-115
Company:	Tetra Tech
Address:	4750 West 2100 South, Suite 400
City:	Salt Lake City
State:	Utah

RE: Soil Testing
White Pine North Tailings
117-372636-25001.01.4

Dear Chad Tomlinson,

With this letter you will find a report on Soil samples assigned on 12/11/2025.

Testing was performed in accordance with standardized test methods, accepted industry practices as well as specific instructions received from you, our client. Advanced Terra Testing accepts no responsibility and makes no claims to the use or purpose of the material being tested. Furthermore, the results herein are based solely on the material received and tested. Please note that all material will be disposed of after thirty days unless other arrangements are made.

We respectfully request that sample reports be considered proprietary information and are not to be reproduced, except in full and only with prior written approval of Advanced Terra Testing. We are pleased to have been given the opportunity to perform high quality laboratory testing for your project. We sincerely hope the results herein provide you with all the information required. If you have questions or need anything further, please reach out and we will be happy to assist you.

Respectfully,

Brandon Ferro

ADVANCED TERRA TESTING

Moisture and Density
ASTM D 2216 and ASTM D 7263 Method B

CLIENT	Tetra Tech	JOB NO.	2592-115
PROJECT	White Pine North Tailings	LOCATION	White Pine Michigan
PROJECT NO.	117-372636-25001.0		

BORING NO.	--	--
DEPTH	--	--
SAMPLE NO.	Whole Tails Slurry @ ~64%m	Whole Tails Slurry @ ~64%m
DATE SAMPLED	--	--
DATE TESTED	12/29/25	12/29/25
TECHNICIAN	BDF	BDF
DESCRIPTION	--	Blended
Mass of Wet Soil and Pan (g):	761.67	173.51
Mass of Dry Soil and Pan (g):	570.54	121.19
Mass of Pan (g):	225.53	25.68
Moisture (%):	**55.4**	**54.8**
Diameter (in):	2.41	
Height (in):	3.54	
Mass of Wet Soil and Ring (g):	1056.19	
Mass of Ring (g):	512.72	
Wet Density (lbs/ft³):	**128.1**	
Dry Density (lbs/ft³):	**82.4**	
Wet Density (kg/m³):	**2052**	
Dry Density (kg/m³):	**1320**	

BORING NO.	
DEPTH	
SAMPLE NO.	
DATE SAMPLED	
DATE TESTED	
TECHNICIAN	
DESCRIPTION	
Mass of Wet Soil and Pan (g):	
Mass of Dry Soil and Pan (g):	
Mass of Pan (g):	
Moisture (%):	
Diameter (in):	
Height (in):	
Mass of Wet Soil and Ring (g):	
Mass of Ring (g):	
Wet Density (lbs/ft³):	
Dry Density (lbs/ft³):	
Wet Density (kg/m³):	
Dry Density (kg/m³):	
NOTES	

Data entry by:	BDF	Date:	12/30/25
Checked by:	MH	Date:	12/31/25
File name:	2592115__Moisture and Density ASTM D7236_0.xlsm		

ADVANCED TERRA TESTING

One-Dimensional Consolidation

ASTM D 2435

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry @ ~64% M
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	SAMPLED BY	--
DATE TESTED	01/03/26	DESCRIPTION	Remolded Specimen
TECHNICIAN	BDF		

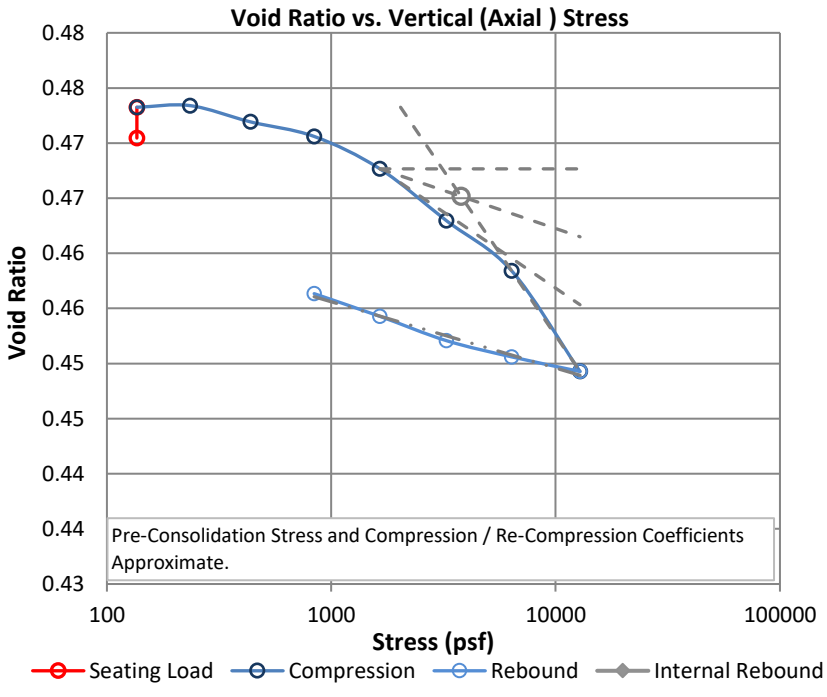
Sample Conditions

Before Test Mass of Wet Soil and Ring (g):	199.45	Initial Wet Density (pcf):	129.4
After Test Mass of Wet Soil and Ring (g):	204.03	Initial Dry Density (pcf):	112.5
Mass of Dry Soil, Ring, and Pan (g):	228.05	Initial Wet Density (kg/m³):	2073
Diameter (in):	2.41	Initial Dry Density (kg/m³):	1802
Initial Height (in):	1.00	Initial Moisture (%):	15.0
Mass of Ring (g):	44.51	Final Wet Density (pcf):	134.5
Mass of Pan (g):	48.82	Final Dry Density (pcf):	113.6
Assumed Specific Gravity:	2.65	Final Wet Density (kg/m³):	2155
Initial Saturation (%):	84.7	Final Dry Density (kg/m³):	1820
Final Saturation (%):	100.0	Final Moisture (%):	18.4

Consolidation Data

Coefficient of Compression:	0.030	Pre-Consolidation Stress (psf):	3790
Coefficient of Re-Compression:	0.006	Pre-Consolidation Stress (kPa):	182

Load (psf)	Void Ratio	Deformation (in)	Strain (%)
136	0.470	0.0000	0.00
Inundation	0.473	-0.0019	-0.19
235	0.473	-0.0020	-0.20
436	0.472	-0.0010	-0.10
839	0.471	-0.0001	-0.01
1648	0.468	0.0019	0.19
3263	0.463	0.0051	0.51
6376	0.458	0.0082	0.82
12847	0.449	0.0144	1.44
Rebound			
12847	0.449	0.0144	1.44
6376	0.451	0.0135	1.35
3263	0.452	0.0125	1.25
1648	0.454	0.0110	1.10
839	0.456	0.0096	0.96
Internal			



NOTES:

Data entry by:	AC	Date:	01/16/26
Checked by:	BDF	Date:	01/21/26
File name:	2592115__Consol ASTM D2435_0.xlsm		Page 1 of 3

ADVANCED TERRA TESTING

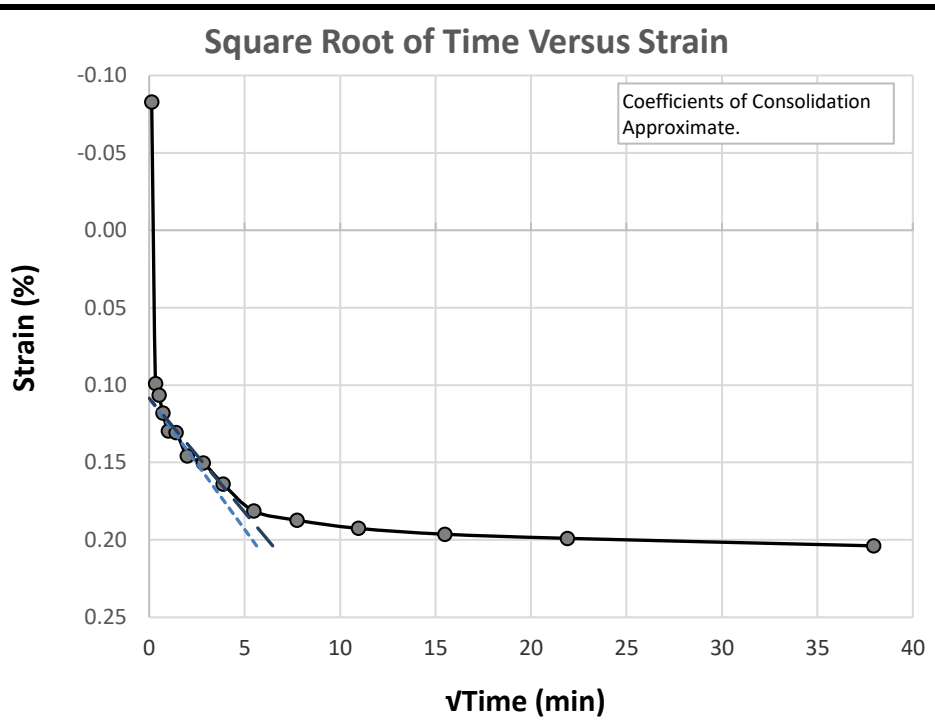
One-Dimensional Consolidation

ASTM D 2435

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry @ ~64% M
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	SAMPLED BY	--
DATE TESTED	01/03/26	DESCRIPTION	Remolded Specimen
TECHNICIAN	BDF		

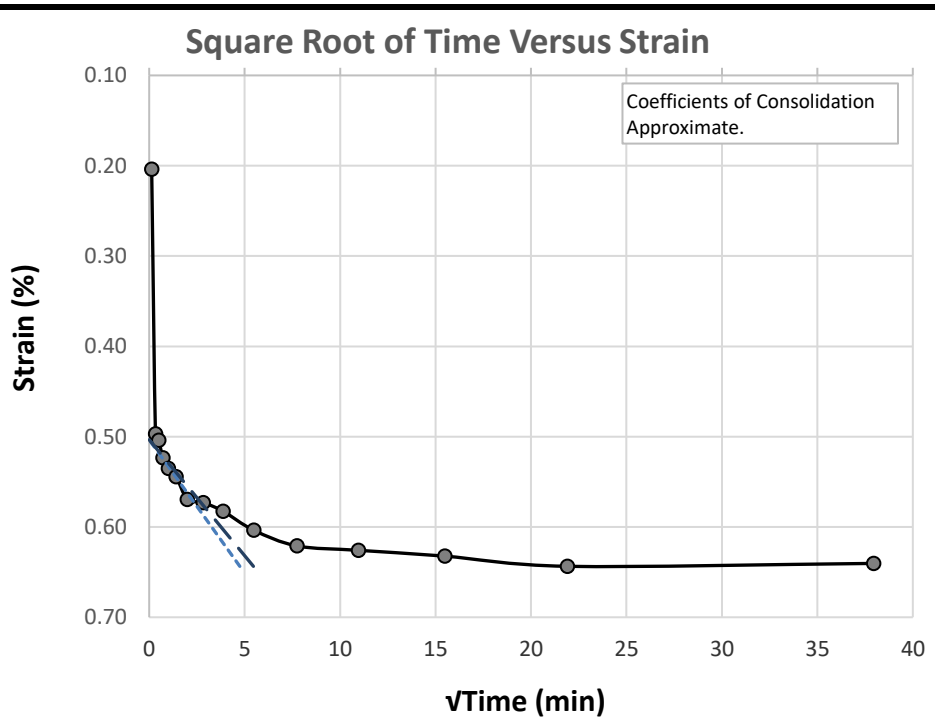
Coefficient of Consolidation (cm^2/s)	T90 (min)	Load (psf)
0.0027	8.568	1648

Elapsed Time (min)	Deformation (in)	Strain (%)
0	-0.0019	-0.08
0.1	-0.0037	0.10
0.27	-0.0038	0.11
0.5	-0.0039	0.12
1	-0.0040	0.13
2	-0.0040	0.13
4	-0.0042	0.15
8	-0.0042	0.15
15	-0.0043	0.16
30	-0.0045	0.18
60	-0.0046	0.19
120	-0.0046	0.19
240	-0.0047	0.20
480	-0.0047	0.20
1440	-0.0047	0.20



Coefficient of Consolidation (cm^2/s)	T90 (min)	Load (psf)
0.0031	7.204	3263

Elapsed Time (min)	Deformation (in)	Strain (%)
0	-0.0047	0.20
0.1	-0.0077	0.50
0.25	-0.0077	0.50
0.5	-0.0079	0.52
1	-0.0081	0.54
2	-0.0081	0.54
4	-0.0084	0.57
8	-0.0084	0.57
15	-0.0085	0.58
30	-0.0087	0.60
60	-0.0089	0.62
120	-0.0090	0.63
240	-0.0090	0.63
480	-0.0091	0.64
1440	-0.0091	0.64



Data Files 2592-115_wholetails_1648PSF_01-06.txt, 2592-115_WHOLETAILS_3263PSF_01-07.txt

File name: 2592115__Consol ASTM D2435_0.xlsm

ADVANCED TERRA TESTING

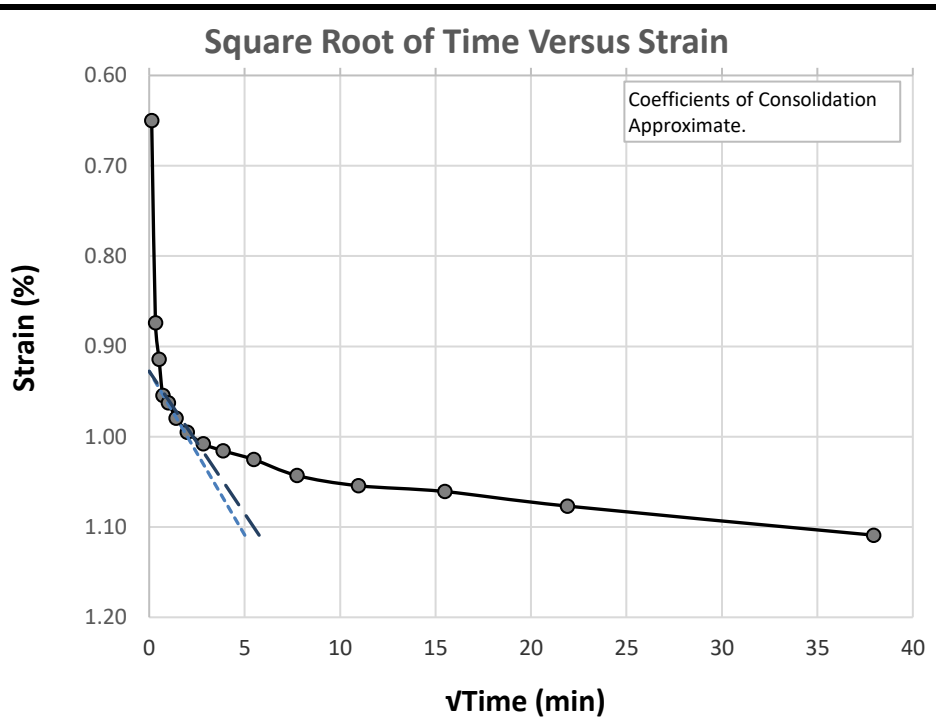
One-Dimensional Consolidation

ASTM D 2435

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry @ ~64% M
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	SAMPLED BY	--
DATE TESTED	01/03/26	DESCRIPTION	Remolded Specimen
TECHNICIAN	BDF		

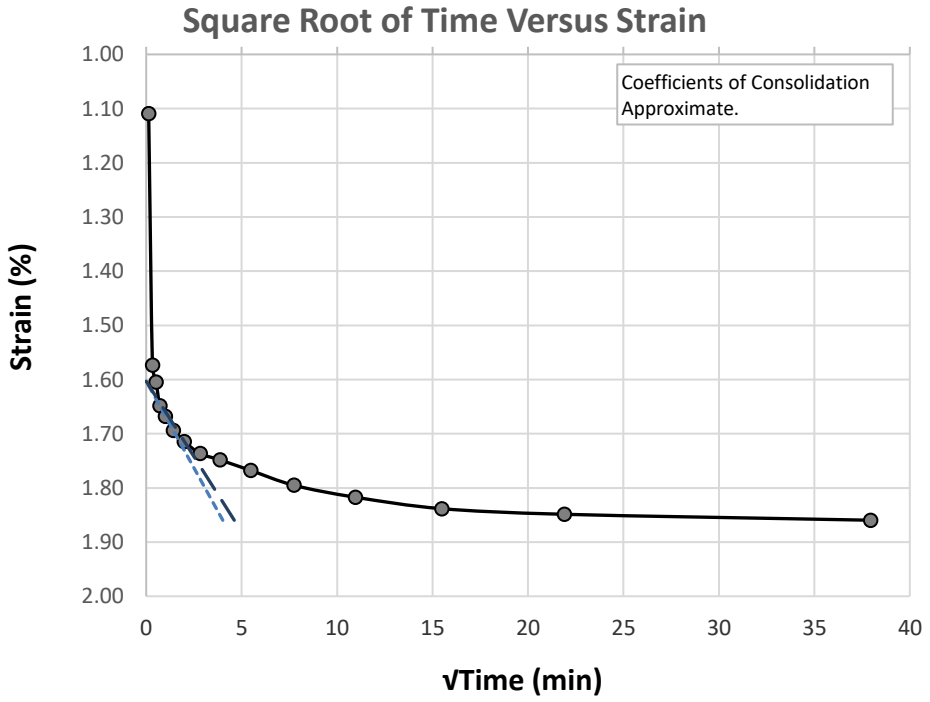
Coefficient of Consolidation (cm^2/s)	T90 (min)	Load (psf)
0.0043	5.183	6376

Elapsed Time (min)	Deformation (in)	Strain (%)
0	-0.0092	0.65
0.1	-0.0114	0.87
0.27	-0.0118	0.91
0.5	-0.0122	0.95
1	-0.0123	0.96
2	-0.0125	0.98
4	-0.0127	1.00
8	-0.0128	1.01
15	-0.0129	1.02
30	-0.0130	1.03
60	-0.0131	1.04
120	-0.0132	1.05
240	-0.0133	1.06
480	-0.0135	1.08
1440	-0.0138	1.11



Coefficient of Consolidation (cm^2/s)	T90 (min)	Load (psf)
0.0054	4.045	12847

Elapsed Time (min)	Deformation (in)	Strain (%)
0	-0.0138	1.11
0.1	-0.0184	1.57
0.27	-0.0187	1.60
0.5	-0.0192	1.65
1	-0.0194	1.67
2	-0.0196	1.69
4	-0.0198	1.71
8	-0.0201	1.74
15	-0.0202	1.75
30	-0.0204	1.77
60	-0.0207	1.80
120	-0.0209	1.82
240	-0.0211	1.84
480	-0.0212	1.85
1440	-0.0213	1.86



Data Files 2592-115_WHOLETAILS_6376PSF_01-08.txt, 2592-115_wholetails_12847PSF_01-09.txt

File name: 2592115__Consol ASTM D2435_0.xlsm

ADVANCED TERRA TESTING
833 PARFET ST UNIT A
LAKEWOOD, CO
303-232-8308 www.terratesting.com

Friday, February 27, 2026

Project Number:	2592-115
Company:	Tetra Tech
Address:	4750 West 2100 South, Suite 400
City:	Salt Lake City
State:	Utah

RE: Soil Testing
White Pine North Tailings
117-372636-25001.01.4

Dear Chad Tomlinson,

With this letter you will find a report on Soil samples assigned on 12/11/2025.

Testing was performed in accordance with standardized test methods, accepted industry practices as well as specific instructions received from you, our client. Advanced Terra Testing accepts no responsibility and makes no claims to the use or purpose of the material being tested. Furthermore, the results herein are based solely on the material received and tested. Please note that all material will be disposed of after thirty days unless other arrangements are made.

We respectfully request that sample reports be considered proprietary information and are not to be reproduced, except in full and only with prior written approval of Advanced Terra Testing. We are pleased to have been given the opportunity to perform high quality laboratory testing for your project. We sincerely hope the results herein provide you with all the information required. If you have questions or need anything further, please reach out and we will be happy to assist you.

Respectfully,

Brandon Ferro

ADVANCED TERRA TESTING

Unconfined Compressive Strength

ASTM D2166

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	DESCRIPTION	Remold
DATE TESTED	02/20/26		
TECHNICIAN	JL		

Test Parameters

Strain Rate (in/min):	0.038
Strain Rate (cm/min):	0.097

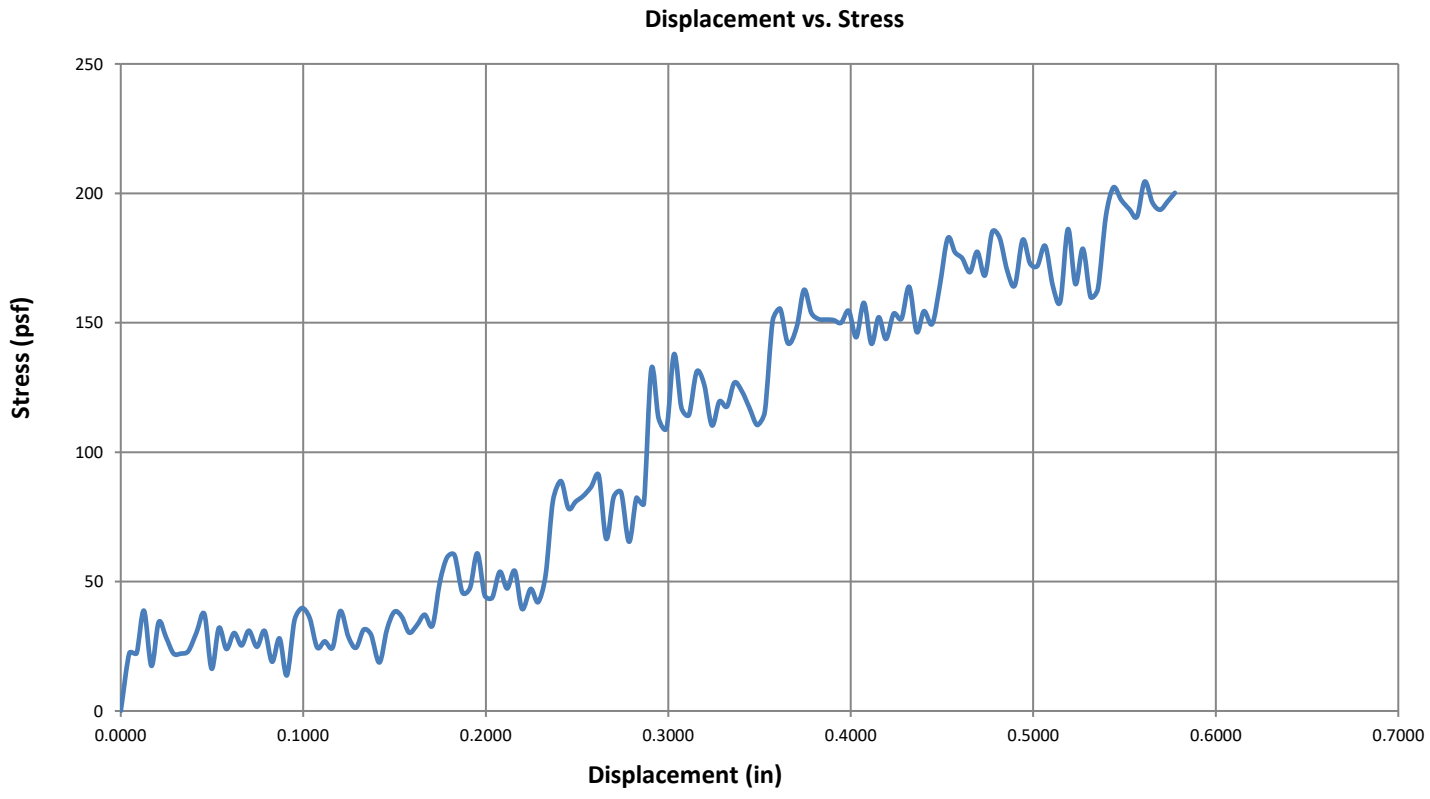
Raw Data Files: 2592-115_WTS_UCS.

Moisture & Density Data

Mass of Wet Soil and Pan (g):	483.32	Initial Wet Density (pcf):	115.6
Mass of Dry Soil and Pan (g):	420.74	Initial Dry Density (pcf):	94.6
Mass of Pan (g):	139.43	Initial Wet Density (kg/m³):	1852
Mass of Wet Soil (g):	343.89	Initial Dry Density (kg/m³):	1515
Initial Diameter (in):	1.942	Initial Moisture (%):	22.2
Initial Height (in):	3.826		

Test Results

Peak Stress (psf):	205	Axial Strain at Peak Stress (%):	14.7
Peak Stress (kPa):	10	Height to Diameter Ratio:	2.0:1



NOTES:	Sample height decreased during extrusion, and the sample slumped under its own weight.

Data entry by:	JL	Date:	02/26/26
Checked by:	AC	Date:	02/27/26
File name:	2592115__UCS ASTM D2166_0.xlsm		

ADVANCED TERRA TESTING

Unconfined Compressive Strength
ASTM D2166
(Before Picture)

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	DESCRIPTION	Remold
DATE TESTED	02/20/26		
TECHNICIAN	JL		



NOTES	Sample height decreased during extrusion, and the sample slumped under its own weight.

Picture File:	2592-115_WTS_UCS_before.JPG
File name:	2592115__UCS ASTM D2166_0.xlsm

ADVANCED TERRA TESTING

Unconfined Compressive Strength
ASTM D2166
(After Picture)

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	DESCRIPTION	Remold
DATE TESTED	02/20/26		
TECHNICIAN	JL		



NOTES	Sample height decreased during extrusion, and the sample slumped under its own weight.

Picture File: 2592-115_WTS_UCS_after.JPG
File name: 2592115__UCS ASTM D2166_0.xlsm

Unconfined Compressive Strength
ASTM D2166

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	DESCRIPTION	Remold
DATE TESTED	02/20/26		
TECHNICIAN	JL		

Displacement (in)	Displacement (cm)	Strain (%)	Average Cross Sectional Area (in²)	Load (lbs)	Load (N)	Stress (psf)	Stress (kPa)
0.0000	0.000	0.00	2.96	0.0	0	0	0
0.0047	0.012	0.12	2.97	0.5	2	22	1
0.0087	0.022	0.23	2.97	0.5	2	22	1
0.0127	0.032	0.33	2.97	0.8	4	39	2
0.0168	0.043	0.44	2.98	0.4	2	17	1
0.0208	0.053	0.54	2.98	0.7	3	34	2
0.0248	0.063	0.65	2.98	0.6	3	28	1
0.0289	0.073	0.76	2.98	0.5	2	22	1
0.0329	0.084	0.86	2.99	0.5	2	22	1
0.0370	0.094	0.97	2.99	0.5	2	23	1
0.0415	0.105	1.08	2.99	0.6	3	30	1
0.0458	0.116	1.20	3.00	0.8	3	37	2
0.0498	0.126	1.30	3.00	0.3	2	16	1
0.0538	0.137	1.41	3.00	0.7	3	32	2
0.0579	0.147	1.51	3.01	0.5	2	24	1
0.0621	0.158	1.62	3.01	0.6	3	30	1
0.0662	0.168	1.73	3.01	0.5	2	25	1
0.0702	0.178	1.83	3.02	0.7	3	31	1
0.0746	0.189	1.95	3.02	0.5	2	25	1
0.0788	0.200	2.06	3.02	0.7	3	31	1
0.0829	0.211	2.17	3.03	0.4	2	19	1
0.0870	0.221	2.27	3.03	0.6	3	28	1
0.0910	0.231	2.38	3.03	0.3	1	14	1
0.0952	0.242	2.49	3.04	0.7	3	35	2
0.0993	0.252	2.60	3.04	0.8	4	40	2
0.1035	0.263	2.71	3.04	0.8	3	36	2
0.1076	0.273	2.81	3.05	0.5	2	25	1
0.1118	0.284	2.92	3.05	0.6	3	27	1
0.1161	0.295	3.03	3.05	0.5	2	25	1
0.1203	0.306	3.14	3.06	0.8	4	39	2
0.1247	0.317	3.26	3.06	0.6	3	29	1
0.1289	0.327	3.37	3.07	0.5	2	24	1
0.1331	0.338	3.48	3.07	0.7	3	31	2
0.1371	0.348	3.58	3.07	0.6	3	30	1
0.1417	0.360	3.70	3.08	0.4	2	19	1
0.1458	0.370	3.81	3.08	0.7	3	31	2
0.1499	0.381	3.92	3.08	0.8	4	38	2
0.1540	0.391	4.03	3.09	0.8	3	36	2
0.1580	0.401	4.13	3.09	0.7	3	30	1
0.1622	0.412	4.24	3.09	0.7	3	33	2
0.1665	0.423	4.35	3.10	0.8	4	37	2
0.1708	0.434	4.46	3.10	0.7	3	33	2
0.1748	0.444	4.57	3.10	1.1	5	50	2

Unconfined Compressive Strength
ASTM D2166

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	DESCRIPTION	Remold
DATE TESTED	02/20/26		
TECHNICIAN	JL		

Displacement (in)	Displacement (cm)	Strain (%)	Average Cross Sectional Area (in²)	Load (lbs)	Load (N)	Stress (psf)	Stress (kPa)
0.1788	0.454	4.67	3.11	1.3	6	59	3
0.1829	0.465	4.78	3.11	1.3	6	60	3
0.1872	0.475	4.89	3.11	1.0	4	46	2
0.1914	0.486	5.00	3.12	1.0	5	48	2
0.1954	0.496	5.11	3.12	1.3	6	61	3
0.1994	0.506	5.21	3.12	1.0	4	45	2
0.2035	0.517	5.32	3.13	1.0	4	44	2
0.2077	0.528	5.43	3.13	1.2	5	54	3
0.2117	0.538	5.53	3.14	1.0	5	47	2
0.2159	0.548	5.64	3.14	1.2	5	54	3
0.2199	0.559	5.75	3.14	0.9	4	39	2
0.2246	0.570	5.87	3.15	1.0	5	47	2
0.2287	0.581	5.98	3.15	0.9	4	42	2
0.2328	0.591	6.08	3.15	1.2	5	53	3
0.2368	0.601	6.19	3.16	1.8	8	81	4
0.2412	0.613	6.30	3.16	2.0	9	89	4
0.2453	0.623	6.41	3.16	1.7	8	78	4
0.2493	0.633	6.52	3.17	1.8	8	81	4
0.2534	0.644	6.62	3.17	1.8	8	83	4
0.2578	0.655	6.74	3.18	1.9	8	87	4
0.2619	0.665	6.85	3.18	2.0	9	91	4
0.2660	0.676	6.95	3.18	1.5	7	66	3
0.2701	0.686	7.06	3.19	1.8	8	83	4
0.2742	0.696	7.17	3.19	1.9	8	84	4
0.2785	0.707	7.28	3.19	1.5	6	65	3
0.2826	0.718	7.39	3.20	1.8	8	82	4
0.2866	0.728	7.49	3.20	1.8	8	80	4
0.2907	0.738	7.60	3.21	2.9	13	132	6
0.2947	0.749	7.70	3.21	2.5	11	113	5
0.2991	0.760	7.82	3.21	2.4	11	109	5
0.3032	0.770	7.92	3.22	3.1	14	138	7
0.3072	0.780	8.03	3.22	2.6	12	117	6
0.3113	0.791	8.14	3.22	2.6	11	114	5
0.3156	0.802	8.25	3.23	2.9	13	131	6
0.3197	0.812	8.36	3.23	2.8	13	126	6
0.3239	0.823	8.47	3.24	2.5	11	110	5
0.3280	0.833	8.57	3.24	2.7	12	120	6
0.3322	0.844	8.68	3.24	2.7	12	118	6
0.3362	0.854	8.79	3.25	2.9	13	127	6
0.3403	0.864	8.89	3.25	2.8	12	124	6
0.3444	0.875	9.00	3.26	2.7	12	117	6
0.3488	0.886	9.12	3.26	2.5	11	110	5
0.3529	0.896	9.22	3.26	2.6	12	116	6

Unconfined Compressive Strength
ASTM D2166

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	DESCRIPTION	Remold
DATE TESTED	02/20/26		
TECHNICIAN	JL		

Displacement (in)	Displacement (cm)	Strain (%)	Average Cross Sectional Area (in²)	Load (lbs)	Load (N)	Stress (psf)	Stress (kPa)
0.3572	0.907	9.34	3.27	3.4	15	151	7
0.3613	0.918	9.44	3.27	3.5	16	155	7
0.3656	0.929	9.56	3.27	3.2	14	142	7
0.3704	0.941	9.68	3.28	3.4	15	148	7
0.3744	0.951	9.79	3.28	3.7	17	163	8
0.3784	0.961	9.89	3.29	3.5	16	154	7
0.3825	0.972	10.00	3.29	3.5	15	151	7
0.3865	0.982	10.10	3.29	3.5	15	151	7
0.3905	0.992	10.21	3.30	3.5	15	151	7
0.3947	1.003	10.32	3.30	3.4	15	150	7
0.3989	1.013	10.43	3.31	3.6	16	155	7
0.4030	1.024	10.53	3.31	3.3	15	144	7
0.4072	1.034	10.64	3.31	3.6	16	158	8
0.4113	1.045	10.75	3.32	3.3	15	142	7
0.4153	1.055	10.85	3.32	3.5	16	152	7
0.4193	1.065	10.96	3.33	3.3	15	144	7
0.4235	1.076	11.07	3.33	3.6	16	153	7
0.4278	1.087	11.18	3.33	3.5	16	152	7
0.4320	1.097	11.29	3.34	3.8	17	164	8
0.4361	1.108	11.40	3.34	3.4	15	146	7
0.4401	1.118	11.50	3.35	3.6	16	154	7
0.4446	1.129	11.62	3.35	3.5	15	150	7
0.4487	1.140	11.73	3.36	3.8	17	164	8
0.4531	1.151	11.84	3.36	4.3	19	183	9
0.4571	1.161	11.95	3.36	4.1	18	177	8
0.4611	1.171	12.05	3.37	4.1	18	175	8
0.4653	1.182	12.16	3.37	4.0	18	170	8
0.4693	1.192	12.27	3.38	4.2	19	177	8
0.4735	1.203	12.38	3.38	4.0	18	168	8
0.4775	1.213	12.48	3.38	4.4	19	185	9
0.4816	1.223	12.59	3.39	4.3	19	183	9
0.4857	1.234	12.69	3.39	4.0	18	170	8
0.4899	1.244	12.80	3.40	3.9	17	164	8
0.4942	1.255	12.92	3.40	4.3	19	182	9
0.4982	1.265	13.02	3.41	4.1	18	173	8
0.5022	1.276	13.13	3.41	4.1	18	172	8
0.5065	1.287	13.24	3.41	4.3	19	180	9
0.5107	1.297	13.35	3.42	3.9	17	164	8
0.5148	1.308	13.46	3.42	3.8	17	158	8
0.5190	1.318	13.57	3.43	4.4	20	186	9
0.5231	1.329	13.67	3.43	3.9	17	165	8
0.5272	1.339	13.78	3.44	4.3	19	179	9
0.5314	1.350	13.89	3.44	3.8	17	160	8

Unconfined Compressive Strength
ASTM D2166

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	DESCRIPTION	Remold
DATE TESTED	02/20/26		
TECHNICIAN	JL		

Displacement (in)	Displacement (cm)	Strain (%)	Average Cross Sectional Area (in²)	Load (lbs)	Load (N)	Stress (psf)	Stress (kPa)
0.5354	1.360	13.99	3.44	3.9	17	163	8
0.5398	1.371	14.11	3.45	4.6	20	191	9
0.5439	1.382	14.22	3.45	4.9	22	202	10
0.5482	1.392	14.33	3.46	4.7	21	197	9
0.5527	1.404	14.45	3.46	4.7	21	194	9
0.5569	1.415	14.56	3.47	4.6	20	191	9
0.5610	1.425	14.66	3.47	4.9	22	205	10
0.5653	1.436	14.78	3.48	4.7	21	196	9
0.5695	1.447	14.88	3.48	4.7	21	194	9
0.5735	1.457	14.99	3.48	4.8	21	197	9
0.5776	1.467	15.10	3.49	4.9	22	200	10

ADVANCED TERRA TESTING
833 PARFET ST UNIT A
LAKEWOOD, CO
303-232-8308 www.terratesting.com

Friday, February 27, 2026

Project Number:	2592-115
Company:	Tetra Tech
Address:	4750 West 2100 South, Suite 400
City:	Salt Lake City
State:	Utah

RE: Soil Testing
White Pine North Tailings
117-372636-25001.01.4

Dear Chad Tomlinson,

With this letter you will find a report on Soil samples assigned on 12/11/2025.

Testing was performed in accordance with standardized test methods, accepted industry practices as well as specific instructions received from you, our client. Advanced Terra Testing accepts no responsibility and makes no claims to the use or purpose of the material being tested. Furthermore, the results herein are based solely on the material received and tested. Please note that all material will be disposed of after thirty days unless other arrangements are made.

We respectfully request that sample reports be considered proprietary information and are not to be reproduced, except in full and only with prior written approval of Advanced Terra Testing. We are pleased to have been given the opportunity to perform high quality laboratory testing for your project. We sincerely hope the results herein provide you with all the information required. If you have questions or need anything further, please reach out and we will be happy to assist you.

Respectfully,

Brandon Ferro

ADVANCED TERRA TESTING

Staged Permeability

ASTM D5084 Method D

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	SAMPLED BY	--
DATE TESTED	02/13/26	DESCRIPTION	Remold
TECHNICIAN	JL		

Stage 1

Before Test Mass of Wet Soil (g):	397.78	Initial Wet Density (pcf):	112.0
After Test Mass of Wet Soil (g):	386.83	Initial Dry Density (pcf):	90.9
Mass of Dry Soil and Pan (g):	501.00	Initial Wet Density (kg/m³):	1794
Mass of Pan (g):	177.94	Initial Dry Density (kg/m³):	1457
Diameter (in):	2.446	Initial Moisture (%):	23.1
Initial Sample Height (in):	2.880	Final Wet Density (pcf):	114.5
After Consolidation Height (in):	2.729	Final Dry Density (pcf):	96.8
Assumed Specific Gravity:	2.65	Final Wet Density (kg/m³):	1833
		Final Dry Density (kg/m³):	1551
Back Pressure (psi):	58.0	Final Moisture (%):	18.2
Cell Pressure (psi):	61.1		
Initial Effective Stress (psi):	3.1		
Initial Effective Stress (kPa):	21.4		

Permeability Data

Pump Setting	Percentage of Pump Setting	Rate of Flow (cc/s)	Pump Pressure (psi)	Head Loss (cm)	Gradient - i	Effective Stress (psi) - σ_3	Effective Stress (kPa) - σ_3	Temperature (°C)	Temperature Correction	Corrected Hydraulic Conductivity (cm/s) - k
--	--	8.33E-05	0.470	33.09	4.77	2.87	19.8	20.1	0.998	5.80E-07
--	--	8.33E-05	0.480	33.80	4.87	2.86	19.7	20.3	0.993	5.65E-07
--	--	8.33E-05	0.500	35.20	5.08	2.85	19.7	20.5	0.988	5.40E-07
--	--	8.33E-05	0.489	34.43	4.97	2.86	19.7	20.6	0.986	5.51E-07

Test Results

Average Corrected Hydraulic Conductivity (cm/s): 5.59E-07

NOTES:	Sample slumped during setup. Sample dimensions may have changed during the application of the membrane.

Data entry by:	JL	Date:	03/02/26
Checked by:	AC	Date:	03/03/26
File name:	2592115__Staged TxPbp ASTM D5084_0.xlsm		Page 1 of 1

ADVANCED TERRA TESTING

Staged Permeability

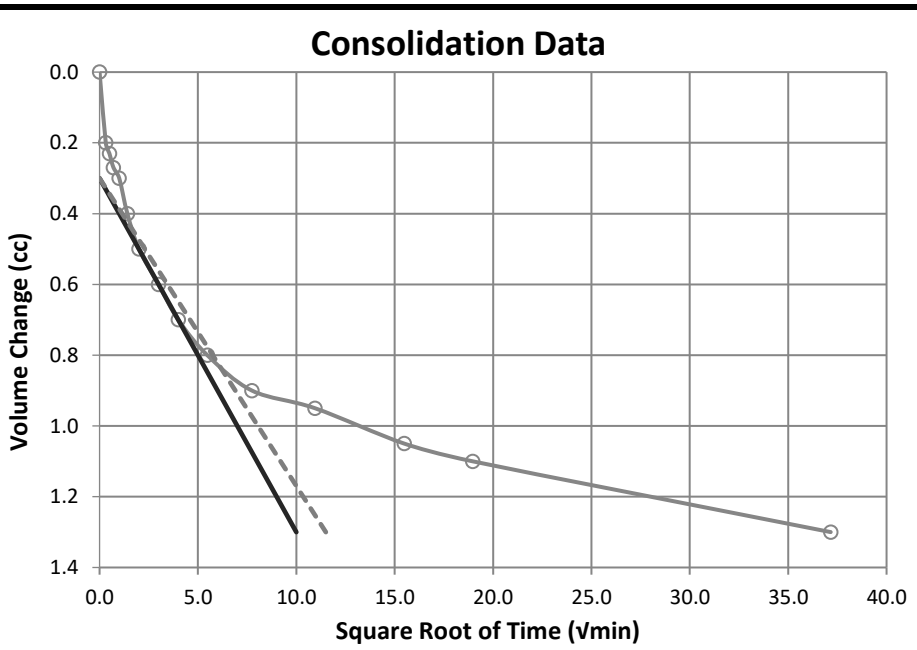
ASTM D5084 Method D

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	SAMPLED BY	--
DATE TESTED	02/13/26	DESCRIPTION	Remold
TECHNICIAN	JL		

Consolidation - Stage 1

Initial Saturation (%):	74.8	Initial Volume of Sample (cc):	221.8
Final Saturation (%):	68.1	Final Volume of Sample (cc):	208.3
Cell Pressure (psi):	61.1	Volume Change After Consolidation (cc):	23.1
Back Pressure (psi):	58.0	Initial Dial Reading (in):	0.00000
Effective Stress (psi):	3.1	Final Dial Reading (in):	0.15055
Effective Stress (kPa):	21.4	Height Change (in):	0.15055
Cell Expansion Correction (cc):	9.61	Initial Area (cm²):	30.32
Cell ID:	12P	Final Area (cm²):	30.04
T50 (min):	11.22		

Elapsed Time (min)	Square Root of Time (√min)	Burette Reading (cc)	Volume Change (cc)
0	0.00	0.20	0.00
0.1	0.32	0.40	0.20
0.25	0.50	0.43	0.23
0.5	0.71	0.47	0.27
1	1.00	0.50	0.30
2	1.41	0.60	0.40
4	2.00	0.70	0.50
9	3.00	0.80	0.60
16	4.00	0.90	0.70
30	5.48	1.00	0.80
60	7.75	1.10	0.90
120	10.95	1.15	0.95
240	15.49	1.25	1.05
360	18.97	1.30	1.10
1381	37.16	1.50	1.30



Saturation

Cell Pressure (psi)		Pore Pressure (psi)		Burette Reading (cc)		Back Pressure (psi)	Volume Change (cc)	Effective Stress (psi)	Δu (psi)	B
Initial	Final	Initial	Final	Initial	Final					
40.0	50.0	39.0	48.2	24.20	24.90	9.2	0.70	30.8	9.2	0.92
50.0	60.0	48.9	58.3	24.90	25.60	9.4	0.70	40.6	9.4	0.94
60.0	70.0	58.8	68.5	25.60	25.70	9.7	0.10	50.3	9.7	0.97

File name: 2592115__Staged TxPbp ASTM D5084_0.xlsm

ADVANCED TERRA TESTING

Staged Permeability

ASTM D5084 Method D

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	SAMPLED BY	--
DATE TESTED	02/13/26	DESCRIPTION	Remold
TECHNICIAN	JL		

Stage 2

		Initial Wet Density (pcf):	114.5
		Initial Dry Density (pcf):	96.8
		Initial Wet Density (kg/m³):	1833
		Initial Dry Density (kg/m³):	1551
Diameter (in):	2.435	Initial Moisture (%):	18.2
Initial Sample Height (in):	2.729	Final Wet Density (pcf):	116.9
After Consolidation Height (in):	2.721	Final Dry Density (pcf):	98.2
Assumed Specific Gravity:	2.65	Final Wet Density (kg/m³):	1872
		Final Dry Density (kg/m³):	1572
Back Pressure (psi):	58.0	Final Moisture (%):	19.1
Cell Pressure (psi):	67.4		
Initial Effective Stress (psi):	9.4		
Initial Effective Stress (kPa):	64.8		

Permeability Data

Pump Setting	Percentage of Pump Setting	Rate of Flow (cc/s)	Pump Pressure (psi)	Head Loss (cm)	Gradient - i	Effective Stress (psi) - σ_3	Effective Stress (kPa) - σ_3	Temperature (°C)	Temperature Correction	Corrected Hydraulic Conductivity (cm/s) - k
--	--	8.33E-05	0.679	47.81	6.92	9.06	62.5	21.0	0.976	3.96E-07
--	--	8.33E-05	0.694	48.86	7.07	9.05	62.4	21.1	0.974	3.86E-07
--	--	8.33E-05	0.704	49.57	7.17	9.05	62.4	21.1	0.974	3.81E-07
--	--	8.33E-05	0.698	49.15	7.11	9.05	62.4	21.2	0.972	3.83E-07

Test Results

Average Corrected Hydraulic Conductivity (cm/s): 3.86E-07

NOTES:	Sample slumped during setup. Sample dimensions may have changed during the application of the membrane.

File name: 2592115__Staged TxPbp ASTM D5084_0.xlsm

ADVANCED TERRA TESTING

Staged Permeability

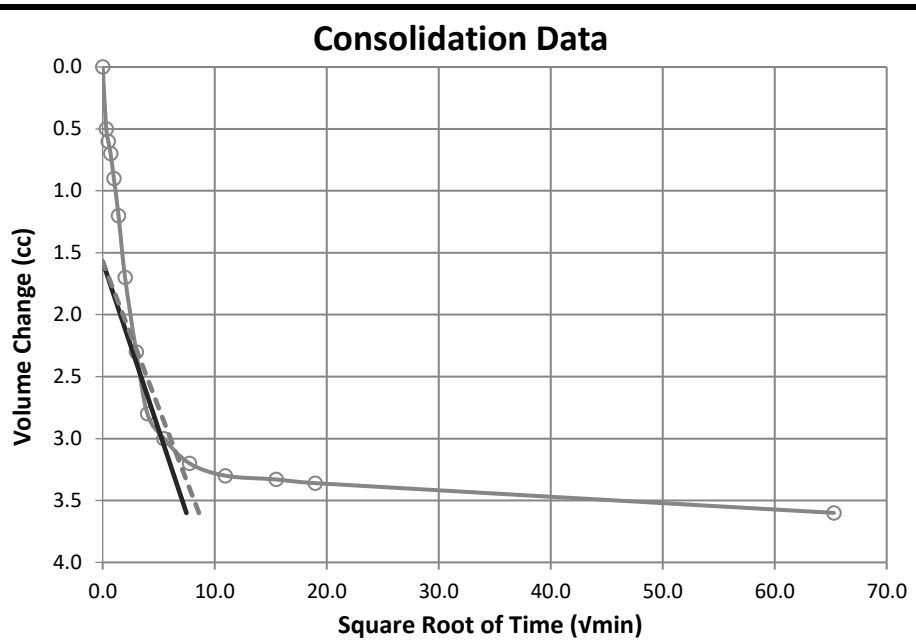
ASTM D5084 Method D

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	SAMPLED BY	--
DATE TESTED	02/13/26	DESCRIPTION	Remold
TECHNICIAN	JL		

Consolidation - Stage 2

Initial Saturation (%):	68.1	Initial Volume of Sample (cc):	208.3
Final Saturation (%):	73.7	Final Volume of Sample (cc):	205.5
Cell Pressure (psi):	67.4	Volume Change After Consolidation (cc):	3.6
Back Pressure (psi):	58.0	Initial Dial Reading (in):	0.00000
Effective Stress (psi):	9.4	Final Dial Reading (in):	0.00805
Effective Stress (kPa):	64.8	Height Change (in):	0.00805
Cell Expansion Correction (cc):	10.41	Initial Area (cm²):	30.04
Cell ID:	12P	Final Area (cm²):	29.73
T50 (min):	12.63		

Elapsed Time (min)	Square Root of Time (√min)	Burette Reading (cc)	Volume Change (cc)
0	0.00	3.40	0.00
0.1	0.32	3.90	0.50
0.25	0.50	4.00	0.60
0.5	0.71	4.10	0.70
1	1.00	4.30	0.90
2	1.41	4.60	1.20
4	2.00	5.10	1.70
9	3.00	5.70	2.30
16	4.00	6.20	2.80
30	5.48	6.40	3.00
60	7.75	6.60	3.20
120	10.95	6.70	3.30
240	15.49	6.73	3.33
360	18.97	6.76	3.36
4263	65.29	7.00	3.60



File name: 2592115__Staged TxPbp ASTM D5084_0.xlsm

ADVANCED TERRA TESTING

Staged Permeability

ASTM D5084 Method D

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	SAMPLED BY	--
DATE TESTED	02/13/26	DESCRIPTION	Remold
TECHNICIAN	JL		

Stage 3

		Initial Wet Density (pcf):	116.9
		Initial Dry Density (pcf):	98.2
		Initial Wet Density (kg/m³):	1871.9
		Initial Dry Density (kg/m³):	1572.2
Diameter (in):	2.422	Initial Moisture (%):	19.1
Initial Sample Height (in):	2.721	Final Wet Density (pcf):	118.0
After Consolidation Height (in):	2.711	Final Dry Density (pcf):	98.8
Assumed Specific Gravity:	2.65	Final Wet Density (kg/m³):	1890.2
		Final Dry Density (kg/m³):	1582.3
Back Pressure (psi):	58.0	Final Moisture (%):	19.5
Cell Pressure (psi):	73.6		
Initial Effective Stress (psi):	15.6		
Initial Effective Stress (kPa):	107.6		

Permeability Data

Pump Setting	Percentage of Pump Setting	Rate of Flow (cc/s)	Pump Pressure (psi)	Head Loss (cm)	Gradient - i	Effective Stress (psi) - σ_3	Effective Stress (kPa) - σ_3	Temperature (°C)	Temperature Correction	Corrected Hydraulic Conductivity (cm/s) - k
--	--	8.33E-05	0.818	57.59	8.36	15.19	104.7	20.5	0.988	3.32E-07
--	--	8.33E-05	0.827	58.23	8.46	15.19	104.7	20.6	0.986	3.28E-07
--	--	8.33E-05	0.860	60.55	8.79	15.17	104.6	20.7	0.983	3.14E-07
--	--	8.33E-05	0.850	59.85	8.69	15.18	104.6	20.8	0.981	3.17E-07

Test Results

Average Corrected Hydraulic Conductivity (cm/s): 3.23E-07

NOTES:	Sample slumped during setup. Sample dimensions may have changed during the application of the membrane.

File name: 2592115__Staged TxPbp ASTM D5084_0.xlsm

ADVANCED TERRA TESTING

Staged Permeability

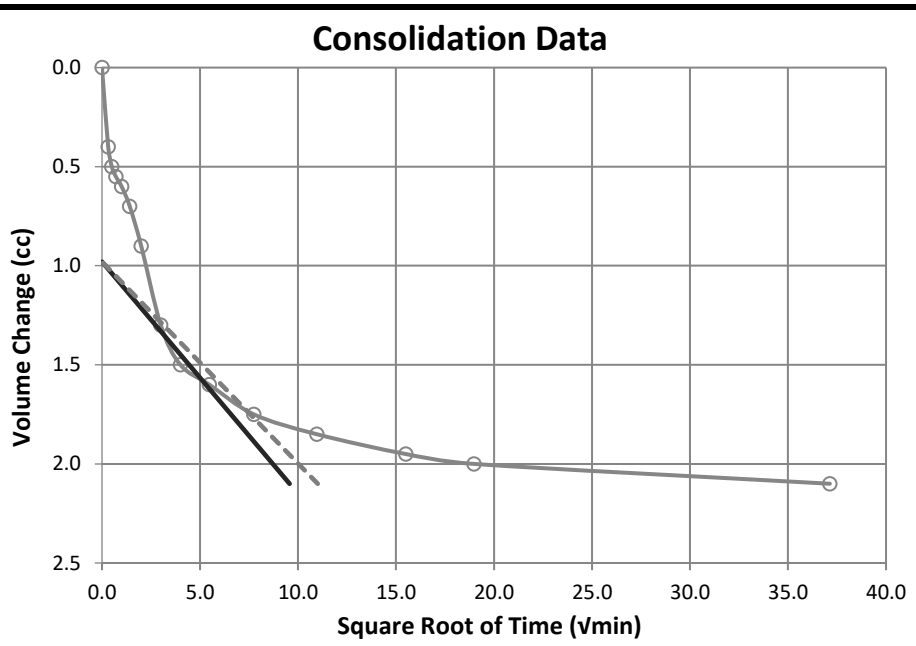
ASTM D5084 Method D

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	SAMPLED BY	--
DATE TESTED	02/13/26	DESCRIPTION	Remold
TECHNICIAN	JL		

Consolidation - Stage 3

Initial Saturation (%):	73.7	Initial Volume of Sample (cc):	205.5
Final Saturation (%):	76.4	Final Volume of Sample (cc):	204.2
Cell Pressure (psi):	73.6	Volume Change After Consolidation (cc):	2.1
Back Pressure (psi):	58.0	Initial Dial Reading (in):	0.00000
Effective Stress (psi):	15.6	Final Dial Reading (in):	0.01025
Effective Stress (kPa):	107.6	Height Change (in):	0.01025
Cell Expansion Correction (cc):	11.21	Initial Area (cm²):	29.73
Cell ID:	12P	Final Area (cm²):	29.65
T50 (min):	16.15		

Elapsed Time (min)	Square Root of Time (√min)	Burette Reading (cc)	Volume Change (cc)
0	0.00	7.40	0.00
0.1	0.32	7.80	0.40
0.25	0.50	7.90	0.50
0.5	0.71	7.95	0.55
1	1.00	8.00	0.60
2	1.41	8.10	0.70
4	2.00	8.30	0.90
9	3.00	8.70	1.30
16	4.00	8.90	1.50
30	5.48	9.00	1.60
60	7.75	9.15	1.75
120	10.95	9.25	1.85
240	15.49	9.35	1.95
360	18.97	9.40	2.00
1379	37.13	9.50	2.10



File name: 2592115__Staged TxPbp ASTM D5084_0.xlsm

ADVANCED TERRA TESTING

Staged Permeability

ASTM D5084 Method D

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	SAMPLED BY	--
DATE TESTED	02/13/26	DESCRIPTION	Remold
TECHNICIAN	JL		

Stage 4

		Initial Wet Density (pcf):	118.0
		Initial Dry Density (pcf):	98.8
		Initial Wet Density (kg/m³):	1890.2
		Initial Dry Density (kg/m³):	1582.3
Diameter (in):	2.419	Initial Moisture (%):	19.5
Initial Sample Height (in):	2.711	Final Wet Density (pcf):	118.8
After Consolidation Height (in):	2.703	Final Dry Density (pcf):	99.2
Assumed Specific Gravity:	2.65	Final Wet Density (kg/m³):	1902.9
		Final Dry Density (kg/m³):	1589.2
Back Pressure (psi):	58.0	Final Moisture (%):	19.7
Cell Pressure (psi):	79.9		
Initial Effective Stress (psi):	21.9		
Initial Effective Stress (kPa):	151.0		

Permeability Data

Pump Setting	Percentage of Pump Setting	Rate of Flow (cc/s)	Pump Pressure (psi)	Head Loss (cm)	Gradient - i	Effective Stress (psi) - σ_3	Effective Stress (kPa) - σ_3	Temperature (°C)	Temperature Correction	Corrected Hydraulic Conductivity (cm/s) - k
--	--	8.33E-05	0.882	62.10	9.04	15.16	104.5	20.0	1.000	3.11E-07
--	--	8.33E-05	0.871	61.33	8.93	15.16	104.6	20.0	1.000	3.15E-07
--	--	8.33E-05	0.926	65.20	9.50	15.14	104.4	20.0	1.000	2.96E-07
--	--	8.33E-05	0.912	64.21	9.35	15.14	104.4	20.2	0.995	3.00E-07

Test Results

Average Corrected Hydraulic Conductivity (cm/s): 3.06E-07

NOTES:	Sample slumped during setup. Sample dimensions may have changed during the application of the membrane.

File name: 2592115__Staged TxPbp ASTM D5084_0.xlsm

ADVANCED TERRA TESTING

Staged Permeability

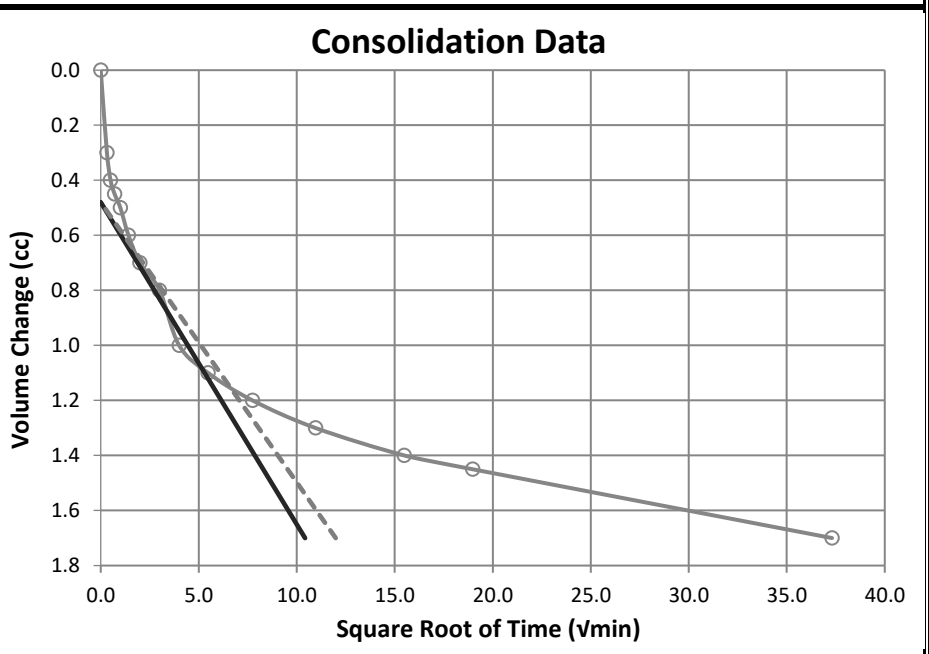
ASTM D5084 Method D

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	SAMPLED BY	--
DATE TESTED	02/13/26	DESCRIPTION	Remold
TECHNICIAN	JL		

Consolidation - Stage 4

Initial Saturation (%):	76.4	Initial Volume of Sample (cc):	204.2
Final Saturation (%):	78.4	Final Volume of Sample (cc):	203.3
Cell Pressure (psi):	79.9	Volume Change After Consolidation (cc):	1.7
Back Pressure (psi):	58.0	Initial Dial Reading (in):	0.00000
Effective Stress (psi):	21.9	Final Dial Reading (in):	0.00810
Effective Stress (kPa):	151.0	Height Change (in):	0.00810
Cell Expansion Correction (cc):	12.02	Initial Area (cm²):	29.65
Cell ID:	12P	After Consolidation Area (cm²):	29.61
T50 (min):	13.29		

Elapsed Time (min)	Square Root of Time (√min)	Burette Reading (cc)	Volume Change (cc)
0	0.00	9.90	0.00
0.1	0.32	10.20	0.30
0.25	0.50	10.30	0.40
0.5	0.71	10.35	0.45
1	1.00	10.40	0.50
2	1.41	10.50	0.60
4	2.00	10.60	0.70
9	3.00	10.70	0.80
16	4.00	10.90	1.00
30	5.48	11.00	1.10
60	7.75	11.10	1.20
120	10.95	11.20	1.30
240	15.49	11.30	1.40
360	18.97	11.35	1.45
1392	37.31	11.60	1.70



File name: 2592115__Staged TxPbp ASTM D5084_0.xlsm

ADVANCED TERRA TESTING

Direct Shear

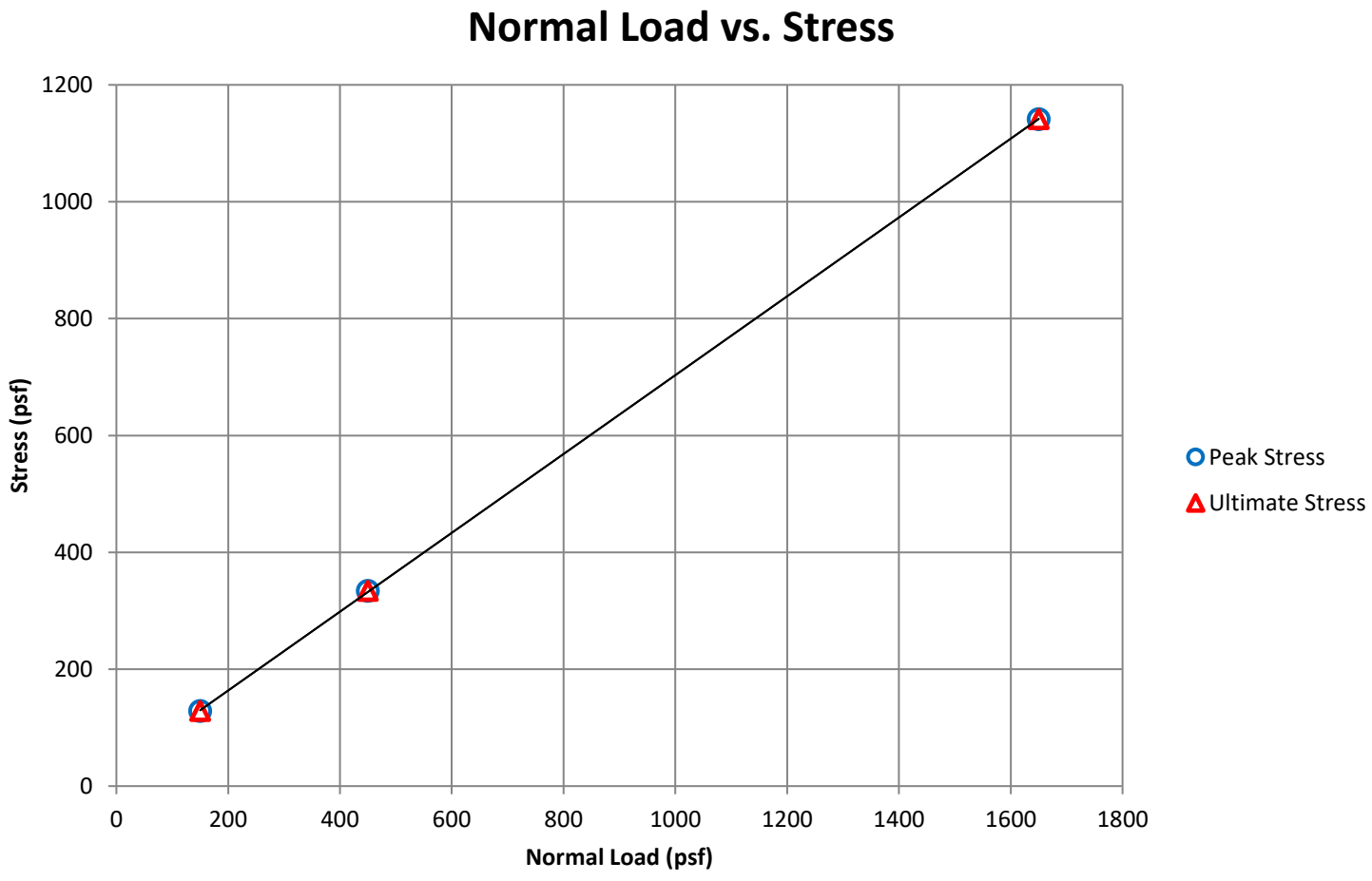
ASTM D 3080

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	DESCRIPTION	Remolded Specimens
DATE TESTED	03/02/26		
TECHNICIAN	AC		

Direct Shear Results

Point:	A	B	C
Normal Load (psf):	1650	450	150
Normal Load (kPa):	79.0	21.5	7.2
Peak Strength (psf):	1141	334	128
Ultimate Strength (psf):	1141	334	128
Peak Strength (kPa):	54.6	16.0	6.1
Ultimate Strength (kPa):	54.6	16.0	6.1

Peak Strength		Ultimate Strength	
Friction Angle:	34.0	Friction Angle:	34.0
Cohesion (psf):	29	Cohesion (psf):	29
Cohesion (kPa):	1.4	Cohesion (kPa):	1.4



Data entry by:	AC	Date: 03/03/26
Checked by:	BDF	Date: 03/03/26
File name:	2592115__Direct Shear ASTM D3080_0.xlsm	Page 1 of 2

ADVANCED TERRA TESTING

Direct Shear

ASTM D 3080

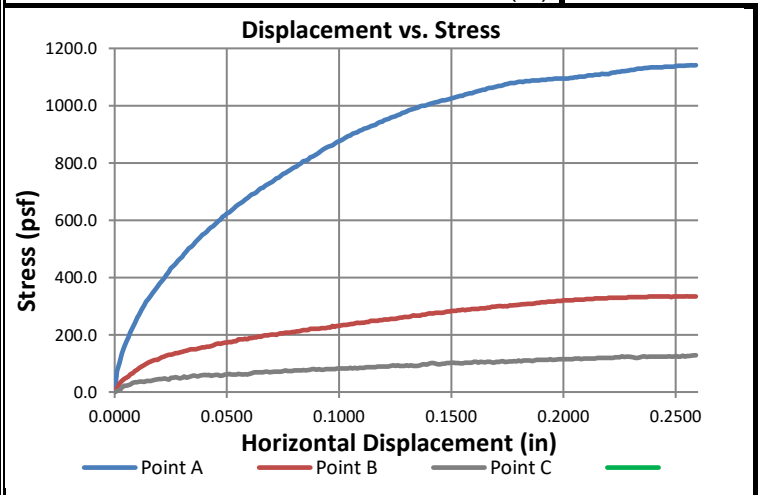
CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	DESCRIPTION	Remolded Specimens
DATE TESTED	03/02/26		
TECHNICIAN	AC		

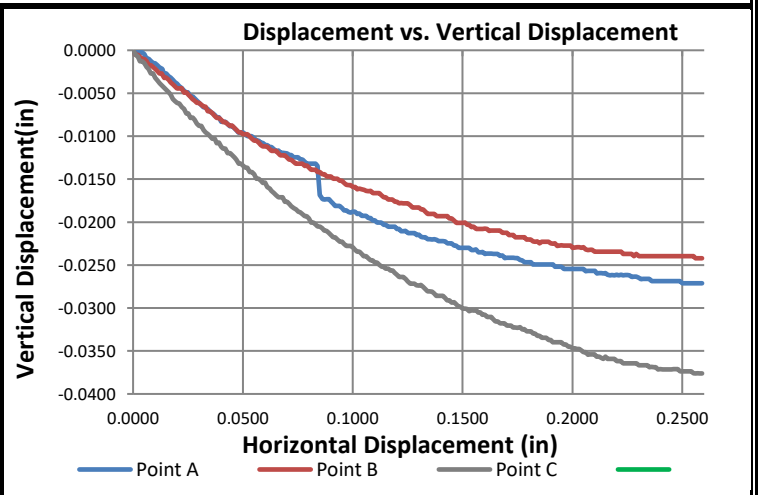
Test Parameters

Displacement Rate (in/min): 0.0077 Displacement Rate (cm/min): 0.019558

Raw Data Files: 2592-115_wholetailsslurry_DS_A_03-03.txt, 2592-115_wholetailsslurry_DS_B_03-03.txt, 2592-115_wholetailsslurry_DS_C_03-03.txt,

Before Test Mass of Wet Soil and Ring (g):	176.83	178.64	175.25
After Test Mass of Wet Soil and Pan (g):	131.21	132.51	135.08
Mass of Ring (g):	44.50	46.44	42.97
Mass of Wet Soil and Pan (g):	41.95	64.35	39.95
Mass of Dry Soil and Pan (g):	34.90	53.21	33.25
Mass of Pan (g):	3.13	3.11	3.13
Diameter (in):	2.41	2.41	2.41
Initial Height (in):	1.00	1.00	1.00
Height Change (in):	0.1299	0.05795	0.01265
Area (in²):	4.56	4.56	4.56
Initial Wet Density (pcf):	110.5	110.4	110.5
Initial Dry Density (pcf):	90.4	90.3	90.4
Initial Wet Density (kg/m³):	1770	1769	1770
Initial Dry Density (kg/m³):	1449	1447	1448
Initial Moisture (%):	22.2	22.2	22.2
Final Wet Density (pcf):	125.9	117.5	114.3
Final Dry Density (pcf):	103.9	95.9	91.5
Final Wet Density (kg/m³):	2017	1882	1830
Final Dry Density (kg/m³):	1665	1536	1466
Final Moisture (%):	21.2	22.5	24.8





NOTES:

File name: 2592115__Direct Shear ASTM D3080_0.xlsm

Direct Shear Data
ASTM D3080

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01	DATE SAMPLED	--
LOCATION	White Pine Michigan	DESCRIPTION	Remolded Specimens
DATE TESTED	03/02/26		
TECHNICIAN	AC		

Point A			Point B			Point C		
Displacement (in)	Stress (psf)	Vertical Displacment (in)	Displacement (in)	Stress (psf)	Vertical Displacment (in)	Displacement (in)	Stress (psf)	Vertical Displacment (in)
0.0000	0.0	0.0000	0.0000	0.0	0.0000	0.0000	0.0	0.0000
0.0011	73.2	0.0000	0.0012	14.8	-0.0005	0.0012	3.7	-0.0005
0.0022	102.9	0.0000	0.0022	29.3	-0.0005	0.0023	6.1	-0.0008
0.0032	133.2	-0.0003	0.0031	38.4	-0.0008	0.0032	15.4	-0.0013
0.0042	156.4	-0.0002	0.0042	45.1	-0.0010	0.0042	21.9	-0.0013
0.0051	174.5	-0.0005	0.0051	50.0	-0.0010	0.0052	22.1	-0.0015
0.0061	191.4	-0.0010	0.0061	54.7	-0.0013	0.0061	24.4	-0.0020
0.0071	209.7	-0.0010	0.0071	61.6	-0.0017	0.0070	26.8	-0.0022
0.0081	225.6	-0.0012	0.0080	65.8	-0.0017	0.0080	31.7	-0.0027
0.0090	241.4	-0.0015	0.0091	73.2	-0.0019	0.0091	33.7	-0.0027
0.0100	259.0	-0.0015	0.0100	77.7	-0.0022	0.0101	33.7	-0.0032
0.0110	271.9	-0.0017	0.0111	84.6	-0.0024	0.0110	36.6	-0.0035
0.0121	288.2	-0.0020	0.0120	89.2	-0.0027	0.0122	36.0	-0.0039
0.0132	304.4	-0.0022	0.0130	93.9	-0.0027	0.0132	35.7	-0.0041
0.0140	315.8	-0.0027	0.0141	98.8	-0.0032	0.0142	38.1	-0.0044
0.0150	325.1	-0.0027	0.0151	103.0	-0.0032	0.0151	38.6	-0.0046
0.0162	336.5	-0.0030	0.0161	107.3	-0.0034	0.0161	38.1	-0.0049
0.0171	348.7	-0.0032	0.0171	110.0	-0.0037	0.0171	40.5	-0.0052
0.0181	357.9	-0.0034	0.0181	112.2	-0.0039	0.0181	42.7	-0.0057
0.0191	366.9	-0.0037	0.0191	112.2	-0.0042	0.0190	43.9	-0.0059
0.0201	378.1	-0.0039	0.0200	117.1	-0.0044	0.0200	45.1	-0.0061
0.0210	387.7	-0.0042	0.0210	121.3	-0.0044	0.0210	45.3	-0.0062
0.0222	399.0	-0.0044	0.0220	123.9	-0.0044	0.0222	47.6	-0.0066
0.0230	408.3	-0.0047	0.0232	128.3	-0.0049	0.0232	45.3	-0.0068
0.0241	419.9	-0.0049	0.0242	130.8	-0.0049	0.0242	42.8	-0.0073
0.0250	431.6	-0.0049	0.0252	130.6	-0.0052	0.0251	50.0	-0.0073
0.0261	440.3	-0.0054	0.0262	133.1	-0.0054	0.0261	50.0	-0.0079
0.0271	447.5	-0.0054	0.0271	135.3	-0.0057	0.0271	52.3	-0.0078
0.0281	457.3	-0.0056	0.0281	135.3	-0.0059	0.0281	50.0	-0.0081
0.0291	465.0	-0.0059	0.0290	137.8	-0.0061	0.0290	47.6	-0.0085
0.0300	470.7	-0.0061	0.0300	140.2	-0.0061	0.0301	50.0	-0.0088
0.0310	482.4	-0.0064	0.0310	142.7	-0.0063	0.0310	54.0	-0.0088
0.0320	491.4	-0.0066	0.0322	144.6	-0.0066	0.0320	50.0	-0.0093
0.0330	501.1	-0.0066	0.0330	147.1	-0.0066	0.0330	52.4	-0.0095
0.0342	507.5	-0.0069	0.0340	149.2	-0.0071	0.0342	54.9	-0.0098
0.0352	514.6	-0.0071	0.0350	149.7	-0.0071	0.0352	57.2	-0.0100
0.0361	524.3	-0.0073	0.0361	149.7	-0.0073	0.0360	56.9	-0.0103
0.0371	532.9	-0.0075	0.0371	151.5	-0.0076	0.0371	54.7	-0.0103
0.0381	540.2	-0.0078	0.0381	153.8	-0.0079	0.0381	57.3	-0.0108
0.0391	549.0	-0.0078	0.0391	156.1	-0.0079	0.0391	59.1	-0.0108
0.0400	553.6	-0.0083	0.0401	156.1	-0.0081	0.0401	59.6	-0.0112
0.0410	560.9	-0.0083	0.0410	158.5	-0.0084	0.0410	59.3	-0.0115
0.0421	569.9	-0.0083	0.0420	158.5	-0.0083	0.0420	59.6	-0.0115

Direct Shear Data
ASTM D3080

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01	DATE SAMPLED	--
LOCATION	White Pine Michigan	DESCRIPTION	Remolded Specimens
DATE TESTED	03/02/26		
TECHNICIAN	AC		

Point A			Point B			Point C		
Displacement (in)	Stress (psf)	Vertical Displacment (in)	Displacement (in)	Stress (psf)	Vertical Displacment (in)	Displacement (in)	Stress (psf)	Vertical Displacment (in)
0.0430	574.6	-0.0086	0.0431	161.0	-0.0086	0.0430	57.0	-0.0120
0.0440	579.2	-0.0088	0.0442	163.4	-0.0088	0.0442	58.8	-0.0120
0.0451	588.5	-0.0088	0.0450	167.5	-0.0088	0.0451	59.4	-0.0122
0.0462	597.6	-0.0091	0.0461	169.9	-0.0090	0.0462	59.4	-0.0125
0.0471	602.4	-0.0093	0.0471	168.3	-0.0093	0.0470	56.7	-0.0127
0.0480	612.1	-0.0096	0.0481	170.3	-0.0095	0.0481	57.2	-0.0132
0.0491	616.4	-0.0095	0.0491	172.4	-0.0095	0.0491	61.1	-0.0132
0.0500	622.9	-0.0095	0.0501	172.5	-0.0098	0.0500	61.3	-0.0134
0.0511	627.8	-0.0098	0.0510	174.5	-0.0098	0.0511	63.6	-0.0136
0.0520	632.8	-0.0100	0.0520	174.4	-0.0098	0.0520	61.3	-0.0137
0.0530	640.5	-0.0100	0.0530	176.8	-0.0100	0.0531	61.4	-0.0142
0.0540	648.8	-0.0100	0.0540	177.0	-0.0103	0.0542	61.1	-0.0142
0.0552	655.7	-0.0103	0.0551	184.1	-0.0105	0.0551	63.6	-0.0144
0.0562	660.0	-0.0105	0.0562	184.1	-0.0105	0.0561	61.6	-0.0149
0.0571	664.5	-0.0105	0.0572	184.0	-0.0107	0.0571	61.4	-0.0149
0.0582	671.9	-0.0108	0.0581	186.6	-0.0110	0.0581	62.2	-0.0152
0.0591	676.7	-0.0108	0.0591	184.1	-0.0112	0.0591	61.0	-0.0154
0.0600	683.0	-0.0110	0.0600	188.8	-0.0112	0.0601	63.7	-0.0154
0.0611	690.1	-0.0110	0.0611	188.4	-0.0112	0.0611	65.8	-0.0159
0.0620	692.6	-0.0113	0.0620	191.0	-0.0115	0.0622	68.3	-0.0161
0.0630	697.2	-0.0113	0.0630	190.5	-0.0117	0.0630	68.4	-0.0164
0.0641	704.2	-0.0115	0.0640	193.9	-0.0117	0.0642	68.3	-0.0166
0.0651	710.9	-0.0117	0.0652	193.1	-0.0117	0.0652	68.3	-0.0169
0.0661	713.3	-0.0117	0.0660	195.7	-0.0120	0.0661	68.3	-0.0171
0.0670	720.3	-0.0119	0.0671	198.0	-0.0122	0.0671	70.7	-0.0171
0.0681	724.7	-0.0119	0.0681	197.7	-0.0122	0.0680	70.6	-0.0171
0.0691	729.3	-0.0120	0.0691	200.0	-0.0122	0.0691	68.3	-0.0176
0.0701	734.0	-0.0120	0.0701	200.1	-0.0125	0.0701	70.4	-0.0176
0.0710	738.9	-0.0122	0.0711	200.3	-0.0127	0.0711	70.7	-0.0179
0.0721	745.9	-0.0122	0.0720	200.0	-0.0127	0.0720	70.7	-0.0181
0.0730	748.2	-0.0124	0.0731	202.4	-0.0130	0.0732	70.7	-0.0184
0.0740	754.8	-0.0124	0.0741	204.8	-0.0132	0.0742	70.7	-0.0185
0.0750	762.1	-0.0124	0.0752	204.8	-0.0132	0.0752	73.2	-0.0188
0.0762	764.5	-0.0127	0.0760	207.3	-0.0132	0.0762	75.4	-0.0188
0.0772	770.9	-0.0127	0.0771	207.3	-0.0132	0.0770	72.9	-0.0191
0.0781	775.5	-0.0130	0.0782	207.3	-0.0135	0.0781	72.9	-0.0193
0.0792	780.4	-0.0132	0.0791	209.7	-0.0134	0.0790	73.2	-0.0193
0.0801	785.3	-0.0132	0.0801	209.7	-0.0137	0.0800	75.4	-0.0196
0.0811	787.5	-0.0132	0.0810	212.0	-0.0139	0.0811	75.1	-0.0201
0.0820	794.2	-0.0132	0.0820	212.0	-0.0139	0.0820	75.1	-0.0200
0.0830	798.7	-0.0132	0.0830	214.3	-0.0139	0.0832	75.3	-0.0203
0.0840	805.8	-0.0135	0.0840	216.7	-0.0142	0.0840	77.1	-0.0205
0.0850	807.8	-0.0169	0.0850	216.1	-0.0142	0.0852	75.3	-0.0205

Direct Shear Data
ASTM D3080

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01	DATE SAMPLED	--
LOCATION	White Pine Michigan	DESCRIPTION	Remolded Specimens
DATE TESTED	03/02/26		
TECHNICIAN	AC		

Point A			Point B			Point C		
Displacement (in)	Stress (psf)	Vertical Displacment (in)	Displacement (in)	Stress (psf)	Vertical Displacment (in)	Displacement (in)	Stress (psf)	Vertical Displacment (in)
0.0862	812.2	-0.0174	0.0862	216.3	-0.0144	0.0862	76.7	-0.0207
0.0871	819.5	-0.0174	0.0872	221.0	-0.0144	0.0870	78.0	-0.0210
0.0882	821.8	-0.0174	0.0881	220.7	-0.0147	0.0881	80.3	-0.0210
0.0892	826.6	-0.0173	0.0891	220.7	-0.0147	0.0890	79.9	-0.0212
0.0901	831.3	-0.0176	0.0901	220.7	-0.0147	0.0901	77.6	-0.0215
0.0911	836.2	-0.0178	0.0911	220.9	-0.0149	0.0911	80.3	-0.0218
0.0920	842.6	-0.0181	0.0921	223.1	-0.0149	0.0920	77.3	-0.0218
0.0931	847.3	-0.0181	0.0931	223.1	-0.0149	0.0930	78.0	-0.0220
0.0940	852.0	-0.0181	0.0940	223.1	-0.0152	0.0942	79.7	-0.0223
0.0951	856.7	-0.0184	0.0952	225.6	-0.0152	0.0951	80.2	-0.0223
0.0960	859.2	-0.0186	0.0962	225.6	-0.0155	0.0961	80.2	-0.0225
0.0970	860.9	-0.0186	0.0971	230.3	-0.0156	0.0971	80.2	-0.0228
0.0981	868.3	-0.0188	0.0980	228.0	-0.0157	0.0981	79.7	-0.0228
0.0991	873.0	-0.0189	0.0990	230.3	-0.0157	0.0991	82.0	-0.0228
0.1000	875.5	-0.0188	0.1001	230.5	-0.0159	0.1001	82.0	-0.0230
0.1011	879.4	-0.0188	0.1011	232.9	-0.0159	0.1010	82.5	-0.0232
0.1021	884.2	-0.0191	0.1020	234.7	-0.0162	0.1020	81.8	-0.0234
0.1030	888.9	-0.0190	0.1031	234.7	-0.0161	0.1030	82.2	-0.0235
0.1040	893.8	-0.0193	0.1040	234.9	-0.0162	0.1040	81.7	-0.0237
0.1050	895.9	-0.0193	0.1052	237.0	-0.0162	0.1050	84.7	-0.0239
0.1062	902.6	-0.0193	0.1061	237.3	-0.0164	0.1060	82.2	-0.0239
0.1071	904.9	-0.0195	0.1072	239.6	-0.0164	0.1071	84.3	-0.0242
0.1082	907.2	-0.0195	0.1082	241.7	-0.0164	0.1081	81.8	-0.0245
0.1091	912.1	-0.0198	0.1091	241.4	-0.0166	0.1091	84.3	-0.0245
0.1101	914.5	-0.0198	0.1101	241.6	-0.0166	0.1101	84.9	-0.0247
0.1110	919.1	-0.0200	0.1111	241.6	-0.0166	0.1111	84.6	-0.0247
0.1121	921.5	-0.0200	0.1121	244.0	-0.0166	0.1120	86.6	-0.0250
0.1130	923.5	-0.0200	0.1130	244.0	-0.0169	0.1133	86.9	-0.0252
0.1140	927.9	-0.0203	0.1141	248.7	-0.0171	0.1140	86.6	-0.0252
0.1150	930.5	-0.0203	0.1150	248.7	-0.0171	0.1150	86.7	-0.0254
0.1161	932.9	-0.0206	0.1162	248.7	-0.0174	0.1162	86.9	-0.0254
0.1172	937.7	-0.0206	0.1172	248.7	-0.0174	0.1172	89.0	-0.0256
0.1182	942.5	-0.0206	0.1181	251.2	-0.0174	0.1181	89.0	-0.0256
0.1192	944.2	-0.0206	0.1191	251.2	-0.0176	0.1191	89.2	-0.0259
0.1201	948.9	-0.0208	0.1200	253.5	-0.0176	0.1201	89.0	-0.0261
0.1211	951.1	-0.0208	0.1211	253.6	-0.0178	0.1211	89.0	-0.0264
0.1220	953.5	-0.0211	0.1220	253.3	-0.0178	0.1220	89.2	-0.0264
0.1231	958.4	-0.0211	0.1230	255.9	-0.0178	0.1230	91.5	-0.0264
0.1240	960.8	-0.0210	0.1240	255.5	-0.0178	0.1242	93.9	-0.0267
0.1252	963.1	-0.0213	0.1250	255.5	-0.0178	0.1251	91.5	-0.0269
0.1262	967.4	-0.0213	0.1262	257.6	-0.0180	0.1262	93.9	-0.0272
0.1272	969.7	-0.0213	0.1272	259.9	-0.0183	0.1270	91.5	-0.0272
0.1282	974.6	-0.0213	0.1282	259.7	-0.0183	0.1281	91.5	-0.0272

Direct Shear Data
ASTM D3080

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01	DATE SAMPLED	--
LOCATION	White Pine Michigan	DESCRIPTION	Remolded Specimens
DATE TESTED	03/02/26		
TECHNICIAN	AC		

Point A			Point B			Point C		
Displacement (in)	Stress (psf)	Vertical Displacment (in)	Displacement (in)	Stress (psf)	Vertical Displacment (in)	Displacement (in)	Stress (psf)	Vertical Displacment (in)
0.1291	976.7	-0.0215	0.1291	262.3	-0.0183	0.1290	91.5	-0.0274
0.1301	979.3	-0.0215	0.1301	262.5	-0.0183	0.1301	93.9	-0.0274
0.1311	984.0	-0.0217	0.1311	262.2	-0.0185	0.1310	91.5	-0.0273
0.1321	986.4	-0.0218	0.1320	264.9	-0.0185	0.1320	93.9	-0.0276
0.1330	988.6	-0.0218	0.1331	267.3	-0.0188	0.1331	91.5	-0.0278
0.1340	990.9	-0.0220	0.1341	267.0	-0.0191	0.1340	91.5	-0.0281
0.1350	992.7	-0.0220	0.1350	267.0	-0.0191	0.1350	91.5	-0.0281
0.1361	997.4	-0.0220	0.1360	267.0	-0.0191	0.1362	93.9	-0.0281
0.1371	999.9	-0.0220	0.1371	269.5	-0.0191	0.1372	96.3	-0.0283
0.1382	999.9	-0.0220	0.1382	269.5	-0.0193	0.1381	96.3	-0.0286
0.1391	1002.3	-0.0222	0.1391	271.9	-0.0193	0.1391	96.2	-0.0286
0.1401	1004.7	-0.0222	0.1401	274.2	-0.0193	0.1401	98.8	-0.0286
0.1411	1007.0	-0.0222	0.1411	274.4	-0.0193	0.1410	101.1	-0.0286
0.1421	1009.3	-0.0222	0.1421	274.4	-0.0193	0.1421	100.9	-0.0288
0.1430	1011.6	-0.0225	0.1431	276.8	-0.0193	0.1430	98.5	-0.0291
0.1440	1013.6	-0.0225	0.1440	276.3	-0.0196	0.1440	96.3	-0.0291
0.1450	1016.0	-0.0225	0.1450	276.5	-0.0196	0.1450	96.3	-0.0294
0.1462	1018.5	-0.0227	0.1462	276.8	-0.0198	0.1462	98.6	-0.0293
0.1470	1018.5	-0.0227	0.1472	278.5	-0.0201	0.1471	98.8	-0.0296
0.1482	1020.6	-0.0230	0.1481	281.1	-0.0201	0.1481	100.7	-0.0298
0.1492	1023.0	-0.0230	0.1491	281.7	-0.0201	0.1490	100.9	-0.0298
0.1501	1025.5	-0.0230	0.1501	283.6	-0.0201	0.1501	102.9	-0.0301
0.1511	1027.9	-0.0230	0.1511	283.3	-0.0201	0.1511	102.7	-0.0301
0.1521	1030.0	-0.0230	0.1521	283.5	-0.0203	0.1520	100.7	-0.0301
0.1531	1032.5	-0.0230	0.1530	285.8	-0.0203	0.1530	100.9	-0.0304
0.1540	1034.5	-0.0232	0.1540	285.3	-0.0206	0.1540	100.4	-0.0303
0.1550	1034.8	-0.0232	0.1550	287.8	-0.0205	0.1550	100.6	-0.0303
0.1560	1039.2	-0.0232	0.1562	285.6	-0.0208	0.1562	102.7	-0.0303
0.1572	1041.5	-0.0235	0.1572	288.1	-0.0208	0.1571	102.7	-0.0305
0.1582	1043.8	-0.0235	0.1582	287.8	-0.0208	0.1582	102.7	-0.0305
0.1592	1043.8	-0.0235	0.1592	290.2	-0.0208	0.1590	102.4	-0.0308
0.1601	1046.0	-0.0237	0.1601	290.2	-0.0207	0.1601	105.3	-0.0308
0.1611	1048.6	-0.0237	0.1611	290.2	-0.0208	0.1611	105.2	-0.0310
0.1621	1051.1	-0.0237	0.1620	290.2	-0.0210	0.1620	102.9	-0.0310
0.1631	1053.2	-0.0237	0.1631	292.5	-0.0210	0.1631	105.2	-0.0310
0.1641	1055.9	-0.0237	0.1640	292.6	-0.0210	0.1640	105.0	-0.0313
0.1650	1055.6	-0.0237	0.1652	292.6	-0.0210	0.1650	103.9	-0.0315
0.1660	1060.1	-0.0237	0.1660	295.1	-0.0210	0.1660	105.2	-0.0315
0.1670	1062.2	-0.0239	0.1670	295.1	-0.0210	0.1672	105.2	-0.0318
0.1682	1062.3	-0.0239	0.1682	297.5	-0.0212	0.1681	103.0	-0.0318
0.1692	1064.6	-0.0242	0.1691	297.5	-0.0212	0.1691	102.7	-0.0318
0.1702	1066.9	-0.0242	0.1701	299.3	-0.0212	0.1702	105.2	-0.0321
0.1711	1069.2	-0.0242	0.1711	299.8	-0.0215	0.1711	104.9	-0.0321

Direct Shear Data
ASTM D3080

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01	DATE SAMPLED	--
LOCATION	White Pine Michigan	DESCRIPTION	Remolded Specimens
DATE TESTED	03/02/26		
TECHNICIAN	AC		

Point A			Point B			Point C		
Displacement (in)	Stress (psf)	Vertical Displacment (in)	Displacement (in)	Stress (psf)	Vertical Displacment (in)	Displacement (in)	Stress (psf)	Vertical Displacment (in)
0.1720	1069.4	-0.0242	0.1720	300.0	-0.0215	0.1721	107.3	-0.0320
0.1730	1071.6	-0.0242	0.1731	299.5	-0.0215	0.1730	107.5	-0.0323
0.1740	1074.1	-0.0242	0.1741	300.0	-0.0218	0.1740	105.0	-0.0323
0.1751	1076.1	-0.0242	0.1750	299.3	-0.0218	0.1750	105.8	-0.0323
0.1762	1078.5	-0.0244	0.1760	302.1	-0.0218	0.1762	107.3	-0.0322
0.1770	1078.8	-0.0244	0.1770	301.9	-0.0218	0.1771	106.8	-0.0325
0.1782	1079.0	-0.0247	0.1782	303.9	-0.0218	0.1781	107.6	-0.0324
0.1792	1081.1	-0.0247	0.1791	303.9	-0.0220	0.1792	107.3	-0.0327
0.1801	1082.9	-0.0247	0.1800	304.2	-0.0220	0.1801	109.7	-0.0327
0.1811	1082.9	-0.0247	0.1810	306.1	-0.0220	0.1811	107.3	-0.0327
0.1820	1082.8	-0.0249	0.1821	306.4	-0.0223	0.1821	109.7	-0.0330
0.1831	1085.5	-0.0249	0.1831	306.5	-0.0223	0.1830	109.7	-0.0330
0.1841	1085.2	-0.0249	0.1840	308.5	-0.0222	0.1841	109.7	-0.0332
0.1850	1085.2	-0.0249	0.1850	308.5	-0.0225	0.1850	109.7	-0.0332
0.1860	1087.6	-0.0249	0.1860	308.5	-0.0223	0.1861	107.6	-0.0335
0.1870	1087.6	-0.0249	0.1870	308.8	-0.0223	0.1870	109.7	-0.0335
0.1882	1087.6	-0.0249	0.1881	310.9	-0.0223	0.1882	112.2	-0.0335
0.1891	1087.6	-0.0249	0.1892	310.9	-0.0223	0.1892	112.2	-0.0337
0.1901	1090.1	-0.0249	0.1902	313.4	-0.0225	0.1901	112.2	-0.0337
0.1912	1090.1	-0.0249	0.1911	313.4	-0.0225	0.1910	112.2	-0.0340
0.1921	1090.1	-0.0252	0.1921	313.4	-0.0225	0.1921	112.2	-0.0340
0.1931	1092.5	-0.0252	0.1931	315.8	-0.0228	0.1931	112.2	-0.0340
0.1940	1092.5	-0.0252	0.1941	315.8	-0.0227	0.1941	114.6	-0.0340
0.1950	1092.5	-0.0252	0.1950	315.8	-0.0227	0.1950	112.2	-0.0340
0.1961	1094.8	-0.0254	0.1960	315.8	-0.0227	0.1960	112.2	-0.0342
0.1970	1094.8	-0.0254	0.1970	318.2	-0.0227	0.1970	113.7	-0.0342
0.1982	1095.0	-0.0254	0.1981	318.2	-0.0227	0.1982	114.5	-0.0345
0.1990	1095.0	-0.0254	0.1992	318.2	-0.0227	0.1991	114.6	-0.0345
0.2000	1095.0	-0.0254	0.2000	320.7	-0.0230	0.2001	114.6	-0.0347
0.2011	1095.0	-0.0254	0.2012	320.7	-0.0230	0.2011	114.6	-0.0347
0.2021	1095.0	-0.0254	0.2021	320.7	-0.0229	0.2021	114.8	-0.0347
0.2031	1097.4	-0.0254	0.2031	320.7	-0.0229	0.2031	114.6	-0.0347
0.2041	1097.4	-0.0254	0.2041	320.7	-0.0230	0.2041	114.6	-0.0349
0.2051	1099.2	-0.0254	0.2050	322.8	-0.0229	0.2050	117.1	-0.0352
0.2061	1099.5	-0.0257	0.2060	322.5	-0.0232	0.2060	117.1	-0.0352
0.2070	1101.7	-0.0257	0.2070	322.7	-0.0233	0.2070	117.1	-0.0354
0.2080	1101.7	-0.0257	0.2082	322.7	-0.0232	0.2080	114.6	-0.0354
0.2092	1101.5	-0.0257	0.2090	323.0	-0.0232	0.2090	117.1	-0.0354
0.2102	1103.8	-0.0257	0.2102	324.8	-0.0234	0.2101	117.1	-0.0354
0.2111	1106.1	-0.0260	0.2111	325.0	-0.0235	0.2110	117.1	-0.0357
0.2122	1105.9	-0.0259	0.2120	325.0	-0.0234	0.2121	117.4	-0.0357
0.2131	1106.2	-0.0259	0.2131	324.5	-0.0235	0.2131	117.1	-0.0358
0.2141	1108.4	-0.0260	0.2140	327.4	-0.0235	0.2141	117.1	-0.0359

Direct Shear Data
ASTM D3080

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01	DATE SAMPLED	--
LOCATION	White Pine Michigan	DESCRIPTION	Remolded Specimens
DATE TESTED	03/02/26		
TECHNICIAN	AC		

Point A			Point B			Point C		
Displacement (in)	Stress (psf)	Vertical Displacment (in)	Displacement (in)	Stress (psf)	Vertical Displacment (in)	Displacement (in)	Stress (psf)	Vertical Displacment (in)
0.2151	1108.4	-0.0259	0.2150	326.9	-0.0234	0.2150	119.3	-0.0357
0.2160	1108.4	-0.0261	0.2161	326.8	-0.0234	0.2160	119.5	-0.0359
0.2170	1111.0	-0.0262	0.2170	326.8	-0.0235	0.2170	119.5	-0.0359
0.2180	1110.8	-0.0262	0.2180	326.9	-0.0235	0.2180	119.5	-0.0359
0.2191	1110.8	-0.0262	0.2192	326.8	-0.0234	0.2192	119.3	-0.0359
0.2202	1110.8	-0.0261	0.2202	329.2	-0.0234	0.2202	119.2	-0.0362
0.2210	1113.3	-0.0262	0.2212	329.2	-0.0234	0.2211	119.3	-0.0362
0.2222	1115.4	-0.0261	0.2222	329.4	-0.0235	0.2221	119.3	-0.0362
0.2231	1115.7	-0.0262	0.2231	329.4	-0.0237	0.2231	121.5	-0.0364
0.2241	1118.1	-0.0262	0.2241	329.5	-0.0237	0.2241	121.6	-0.0364
0.2251	1118.1	-0.0262	0.2251	329.7	-0.0237	0.2250	121.8	-0.0364
0.2261	1120.1	-0.0262	0.2260	329.4	-0.0237	0.2260	124.4	-0.0364
0.2270	1120.4	-0.0264	0.2270	329.2	-0.0237	0.2270	121.9	-0.0364
0.2281	1121.8	-0.0264	0.2280	329.4	-0.0239	0.2282	123.9	-0.0364
0.2290	1122.4	-0.0264	0.2290	331.7	-0.0237	0.2292	123.9	-0.0364
0.2300	1124.8	-0.0264	0.2302	331.7	-0.0239	0.2302	121.9	-0.0367
0.2312	1124.5	-0.0266	0.2312	331.7	-0.0239	0.2311	121.8	-0.0367
0.2322	1126.8	-0.0266	0.2320	332.0	-0.0239	0.2321	119.3	-0.0367
0.2331	1129.1	-0.0266	0.2330	331.7	-0.0239	0.2331	119.5	-0.0366
0.2341	1129.1	-0.0266	0.2341	331.7	-0.0239	0.2341	121.5	-0.0367
0.2351	1129.1	-0.0266	0.2350	331.7	-0.0239	0.2350	123.5	-0.0369
0.2361	1131.5	-0.0269	0.2361	331.7	-0.0239	0.2361	124.2	-0.0369
0.2370	1131.5	-0.0269	0.2370	331.7	-0.0239	0.2370	122.7	-0.0369
0.2380	1132.8	-0.0269	0.2382	334.1	-0.0239	0.2380	123.5	-0.0369
0.2390	1134.0	-0.0269	0.2390	334.1	-0.0239	0.2390	123.8	-0.0371
0.2402	1134.1	-0.0269	0.2401	334.1	-0.0239	0.2400	124.1	-0.0371
0.2413	1134.0	-0.0269	0.2412	334.1	-0.0239	0.2412	124.1	-0.0371
0.2422	1134.0	-0.0269	0.2421	334.1	-0.0239	0.2421	123.8	-0.0371
0.2431	1134.0	-0.0269	0.2430	334.1	-0.0239	0.2431	123.8	-0.0371
0.2441	1134.0	-0.0269	0.2441	334.1	-0.0239	0.2441	124.1	-0.0371
0.2451	1136.4	-0.0269	0.2451	334.1	-0.0239	0.2451	123.6	-0.0371
0.2460	1136.4	-0.0269	0.2461	334.1	-0.0239	0.2461	123.8	-0.0371
0.2470	1136.4	-0.0269	0.2470	334.1	-0.0239	0.2470	124.2	-0.0371
0.2480	1136.4	-0.0269	0.2480	331.8	-0.0239	0.2480	123.9	-0.0371
0.2490	1136.4	-0.0269	0.2490	334.1	-0.0239	0.2490	123.5	-0.0374
0.2500	1138.7	-0.0271	0.2500	334.1	-0.0239	0.2501	125.9	-0.0374
0.2512	1138.9	-0.0271	0.2512	334.1	-0.0239	0.2510	123.6	-0.0374
0.2522	1138.9	-0.0271	0.2522	334.1	-0.0239	0.2522	124.1	-0.0374
0.2532	1138.9	-0.0271	0.2532	334.1	-0.0239	0.2531	126.7	-0.0374
0.2540	1138.9	-0.0271	0.2541	334.1	-0.0239	0.2541	123.9	-0.0374
0.2551	1141.0	-0.0271	0.2551	334.3	-0.0239	0.2551	125.9	-0.0376
0.2561	1140.8	-0.0271	0.2560	334.1	-0.0242	0.2560	126.4	-0.0376
0.2571	1141.3	-0.0271	0.2570	334.1	-0.0242	0.2571	126.7	-0.0376

Direct Shear Data
ASTM D3080

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01	DATE SAMPLED	--
LOCATION	White Pine Michigan	DESCRIPTION	Remolded Specimens
DATE TESTED	03/02/26		
TECHNICIAN	AC		

Point A			Point B			Point C		
Displacement (in)	Stress (psf)	Vertical Displacment (in)	Displacement (in)	Stress (psf)	Vertical Displacment (in)	Displacement (in)	Stress (psf)	Vertical Displacment (in)
0.2581	1140.8	-0.0271	0.2580	334.1	-0.0242	0.2580	128.2	-0.0376
0.2590	1141.3	-0.0271	0.2590	334.1	-0.0242	0.2590	128.3	-0.0376

ADVANCED TERRA TESTING

DS Shear Rate

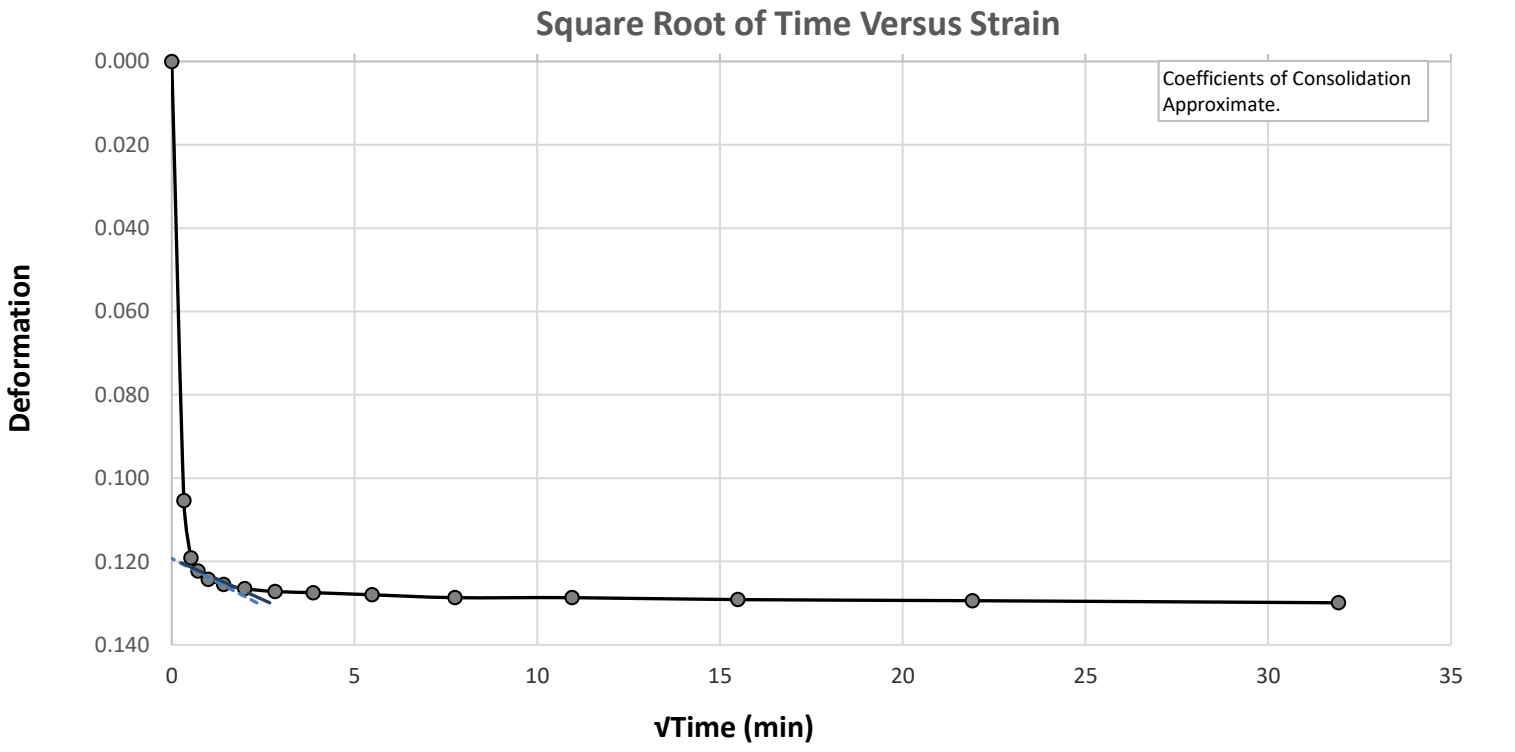
ASTM D 2435

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	DESCRIPTION	Remolded Specimens
DATE TESTED	03/02/26		
TECHNICIAN	AC	STANDARD	ASTM D3080

Coefficient of Consolidation (cm^2/s)	Shear Rate (in/min)	Load (psf)
0.00785	0.0077	--
T50 (min)	T90 (min)	Distance to Failure (in):
0.894	2.90	0.26

NOTES:

Elapsed Time (min)	Elapsed Time $\sqrt{min}$	Dial Reading (in)	Deformation (in)	Strain (%)
0	0.00	0.0000	0.0000	0.0
0.11	0.33	0.1054	0.1054	10.5
0.28	0.53	0.1192	0.1192	11.9
0.52	0.72	0.1223	0.1223	12.2
1	1.00	0.1243	0.1243	12.4
2	1.41	0.1255	0.1255	12.6
4	2.00	0.1265	0.1265	12.7
8	2.83	0.1272	0.1272	12.7
15	3.87	0.1275	0.1275	12.7
30	5.48	0.1280	0.1280	12.8
60	7.75	0.1287	0.1287	12.9
120	10.95	0.1287	0.1287	12.9
240	15.49	0.1291	0.1291	12.9
480	21.91	0.1294	0.1294	12.9
1019	31.92	0.1299	0.1299	13.0

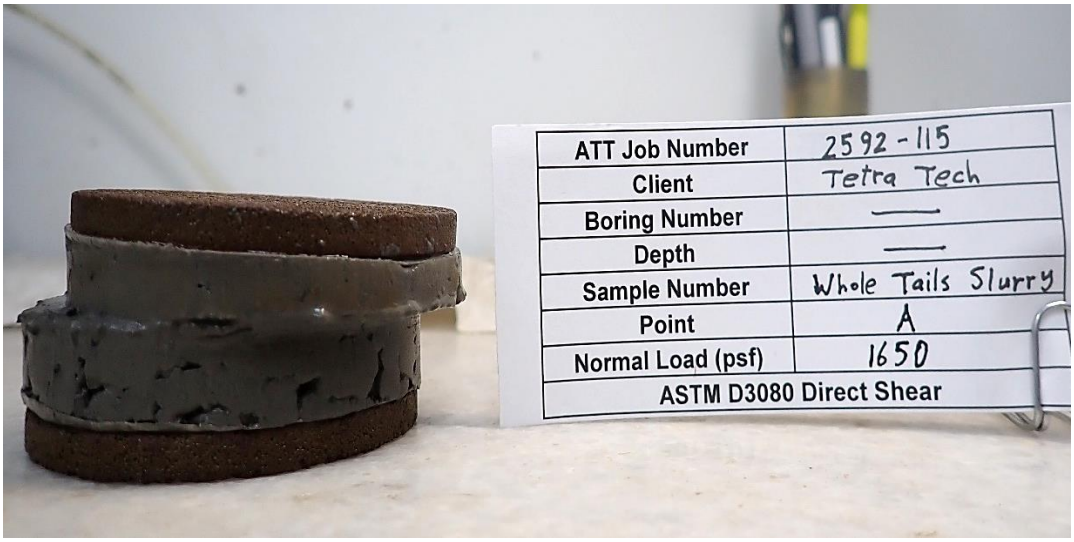


Data entry by:	AC	Date: 03/03/26
Checked by:	BDF	Date: 03/03/26

ADVANCED TERRA TESTING

Direct Shear
ASTM D3080
(Point A Picture 1)

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	DESCRIPTION	Remolded Specimens
DATE TESTED	03/02/26		
TECHNICIAN	AC		



NOTES

Picture File: P3034371.JPG
File name: 2592115__Direct Shear ASTM D3080_0.xlsm

ADVANCED TERRA TESTING

Direct Shear
ASTM D3080
(Point A Picture 2)

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	DESCRIPTION	Remolded Specimens
DATE TESTED	03/02/26		
TECHNICIAN	AC		



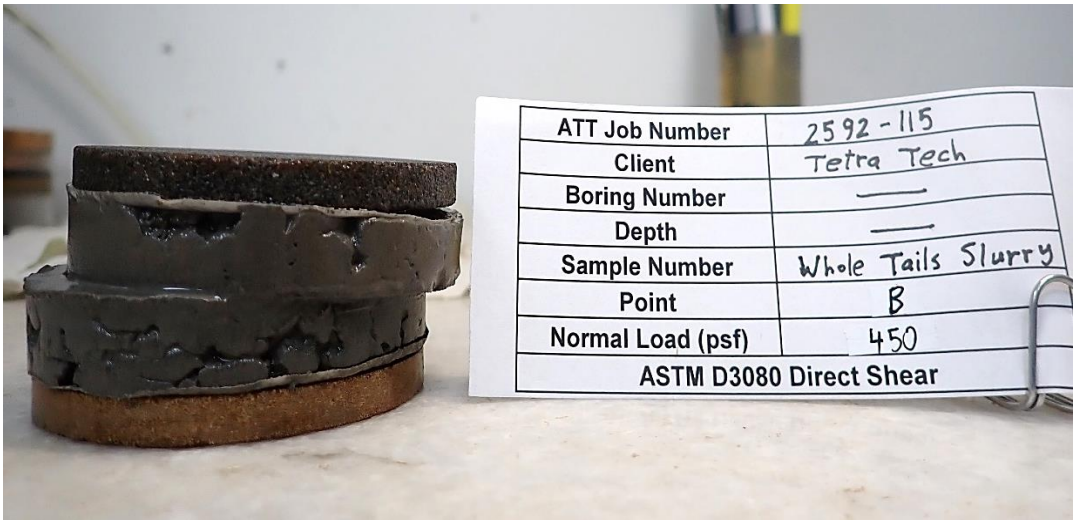
NOTES

Picture File: P3034372.JPG
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ADVANCED TERRA TESTING

Direct Shear
ASTM D3080
(Point B Picture 1)

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	DESCRIPTION	Remolded Specimens
DATE TESTED	03/02/26		
TECHNICIAN	AC		



NOTES

Picture File: P3034375.JPG
File name: 2592115__Direct Shear ASTM D3080_0.xlsm

ADVANCED TERRA TESTING

Direct Shear
ASTM D3080
(Point B Picture 2)

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	DESCRIPTION	Remolded Specimens
DATE TESTED	03/02/26		
TECHNICIAN	AC		



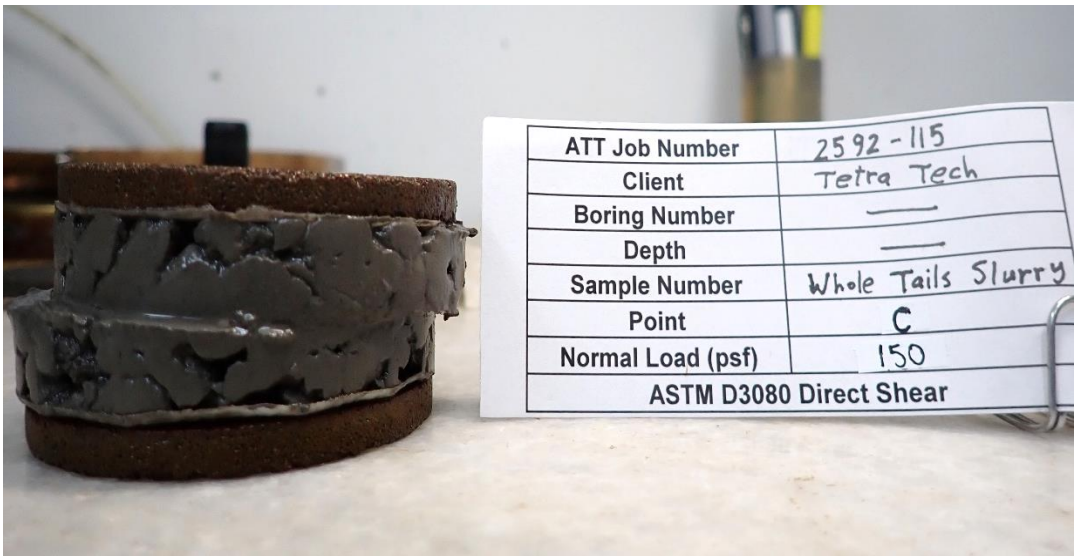
NOTES

Picture File: P3034376.JPG
File name: 2592115__Direct Shear ASTM D3080_0.xlsm

ADVANCED TERRA TESTING

Direct Shear
ASTM D3080
(Point C Picture 1)

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	DESCRIPTION	Remolded Specimens
DATE TESTED	03/02/26		
TECHNICIAN	AC		



NOTES

Picture File: P3034379.JPG
File name: 2592115__Direct Shear ASTM D3080_0.xlsm

ADVANCED TERRA TESTING

Direct Shear
ASTM D3080
(Point C Picture 2)

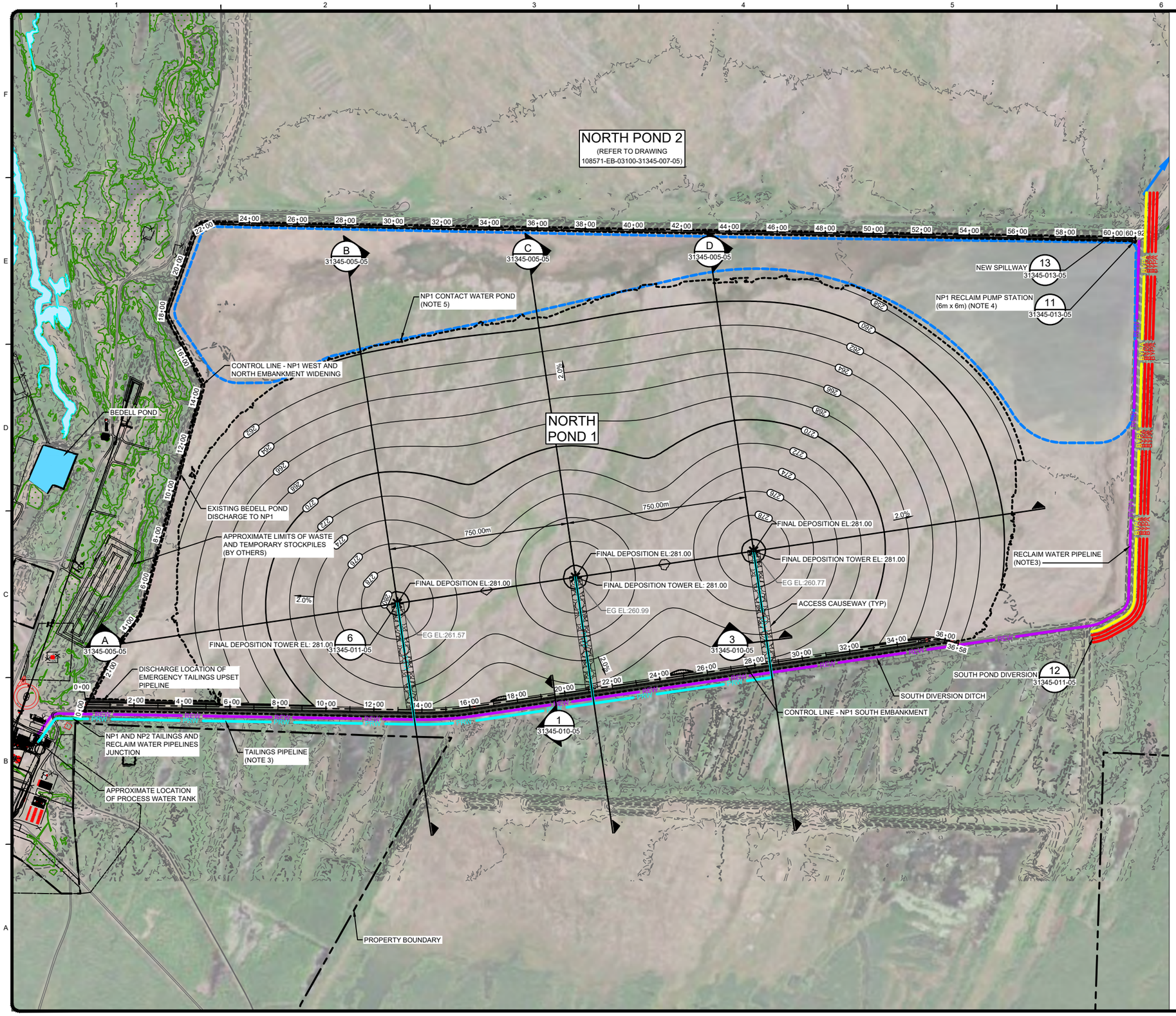
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JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	DESCRIPTION	Remolded Specimens
DATE TESTED	03/02/26		
TECHNICIAN	AC		



NOTES

Picture File: P3034381.JPG
File name: 2592115__Direct Shear ASTM D3080_0.xlsm

APPENDIX H:
Deposition Designs



0 80m 160m 240m 320m 400m 800m

SCALE: 1mm = 8m

NOTES

1. PROJECT COORDINATE SYSTEM IS UTM-WGS 1984 DATUM, ZONE 16 NORTH, METER; CENT. MERIDIAN 87D W.
2. DRAWING UNITS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
3. PIPELINES SHOWN ARE INDICATIVE. PIPELINE SHALL BE INSTALLED IN EMBANKMENTS UNLESS NOTED OTHERWISE. REFER TO DRAWING 108571-EB-03100-31345-009-05 FOR PIPING SCHEDULE AND ROUTING.
4. RECLAIM PUMP STATION SHALL BE LOCATED ON NEW CREST PAD IN NORTHEAST CORNER OF NP1.
5. NP1 CONTACT WATER POND INCLUDES NORTHERN AREA OF NP1 ABSENT OF DEPOSITION OF TAILINGS.

LEGEND

- EXISTING CONTOURS (2m MINOR, 10m MAJOR)
- DESIGN CONTOURS (2m MINOR, 10m MAJOR)
- BYPA — SOUTH POND DIVERSION PIPELINE
- REW — RECLAIM WATER PIPELINE
- PRW — TAILINGS PIPELINE
- PRW — FORMER MINE DEWATERING PIPELINE
- PROPERTY BOUNDARY
- CONTACT WATER POND
- APPROXIMATE LIMITS OF DISTURBANCE
- DEPOSITION TOWER

NP1 TAILINGS DEPOSITION (2.0% SLOPE)		
CUT/FILL	VOLUME (m³)	VOLUME (M TONS)
FILL	42,584,581	61,747,642

NP1 TAILINGS DEPOSITION (2.0% SLOPE)	
3d SURFACE AREA (m²)	SPIGOTS (EA)
4,984,445	3

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MARK	DATE	DESCRIPTION	BY
A	02/27/26	ISSUED FOR REVIEW	RNW
B	03/16/26	ISSUED FOR REVIEW	RNW

WHITE PINE NORTH
TAILINGS MANAGEMENT
PRE-FEASIBILITY STUDY

TAILINGS DISPOSAL FACILITY
NP1 TAILINGS DEPOSITION
PLAN VIEW (YR1 - YR11 & YR25)

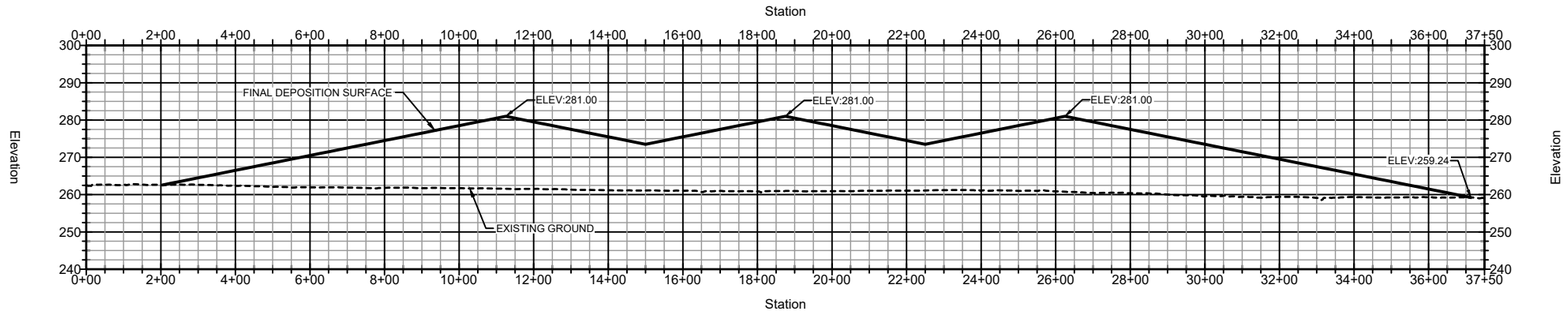
PROJ:	117-372636-25001
DESN:	C. TOMLINSON
DRWN:	R. WOOLSEY
CHKD:	C. TOMLINSON

108571-EB-03100-31345-004-05

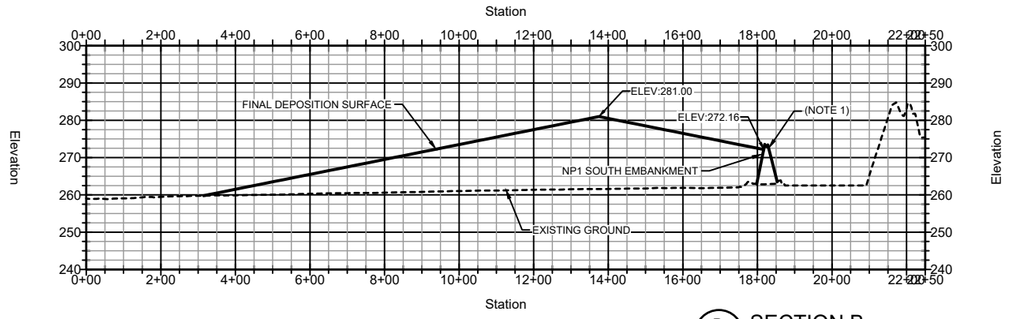
Copyright: Tetra Tech

Bar Measures 1 inch, otherwise drawing not to scale

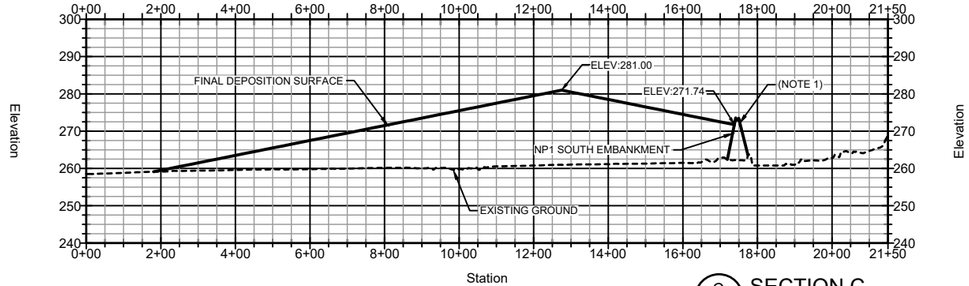
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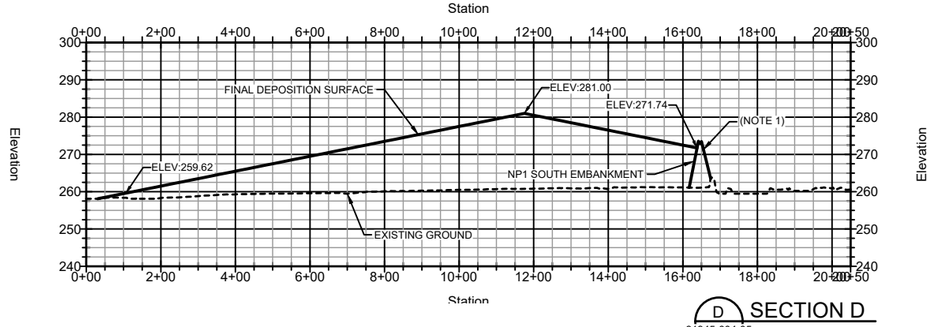
A SECTION A
31345-004-05 SCALE: 1:8



B SECTION B
31345-004-05 SCALE: 1:8



C SECTION C
31345-004-05 SCALE: 1:8



D SECTION D
31345-004-05 SCALE: 1:8

NOTES

1. WATER ACCUMULATED AGAINST SOUTH EMBANKMENT SHALL BE MANAGED WITH TEMPORARY PUMPING SYSTEMS AND CONSTRUCTION OF TEMPORARY CONVEYANCE CHANNELS.

0 80m 160 240 320 400m 800
SCALE: 1mm = 8m

Bar Measures 1 inch, otherwise drawing not to scale

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MARK	DATE	DESCRIPTION	BY
A	02/27/26	ISSUED FOR REVIEW	RNW
B	03/16/26	ISSUED FOR REVIEW	RNW

WHITE PINE NORTH
TAILINGS MANAGEMENT
PRE-FEASIBILITY STUDY

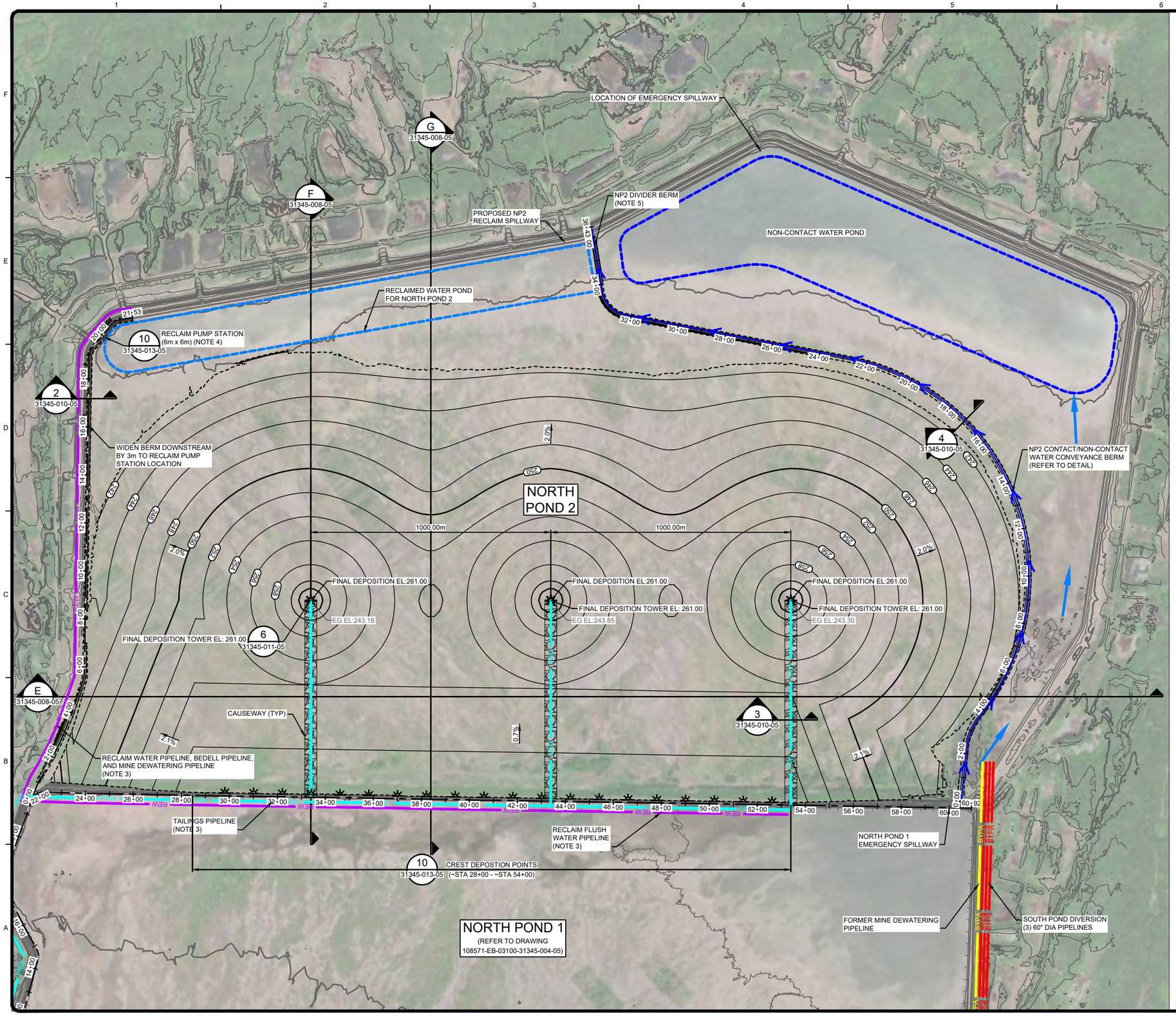
TAILINGS DISPOSAL FACILITY
NP1 TAILINGS DEPOSITION
SECTIONS

PROJ:	117-372636-25001
DESN:	C. TOMLINSON
DRWN:	R. WOOLSEY
CHKD:	C. TOMLINSON

108571-EB-03100-31345-005-05

Copyright: Tetra Tech

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0 80m 160m 240m 320m 400m 800m

SCALE: 1mm = 8m

NOTES

1. PROJECT COORDINATE SYSTEM IS UTM-WGS 1984 DATUM, ZONE 16 NORTH, METER; CENT. MERIDIAN 87D W.
2. DRAWING UNITS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
3. PIPELINES SHOWN ARE INDICATIVE. PIPELINE SHALL BE INSTALLED ON EMBANKMENTS UNLESS NOTED OTHERWISE. REFER TO DRAWING 108571-EB-03100-31345-009-05 FOR PIPING SCHEDULE AND ROUTING.
4. RECLAIM PUMP SYSTEM SHALL BE LOCATED ON NEW CREST PAD LOCATED IN NORTHWEST CORNER OF NP2.
5. NON-CONTACT AND CONTACT WATER PONDS FORMED BY EXISTING PONDED AREAS. THE TWO PONDS SHALL BE SEPARATED BY CONSTRUCTION OF A SEPARATION BERM.

LEGEND

- EXISTING CONTOURS (2m MINOR, 10m MAJOR)
- DESIGN CONTOURS (2m MINOR, 10m MAJOR)
- BYPA — SOUTH POND DIVERSION PIPELINE
- REW — RECLAIM WATER PIPELINE
- PRW — TAILINGS PIPELINE
- PRW — FORMER MINE DEWATERING PIPELINE
- PROPERTY BOUNDARY
- CONTACT WATER POND
- NON-CONTACT WATER POND
- APPROXIMATE LIMITS OF DISTURBANCE
- WATER CONVEYANCE BERM
- DEPOSITION TOWER
- PERIMETER DISCHARGE SPIGOT

POND 2 THICKENED TAILINGS DEPOSITION (2.0% SLOPE)(CENTRAL)		
CUT/FILL	VOLUME (m³)	VOLUME (M TONS)
FILL	38,223,221	55,423,670

POND 2 THICKENED TAILINGS DEPOSITION (2.0% SLOPE)(EMBANKMENT)		
CUT/FILL	VOLUME (m³)	VOLUME (M TONS)
FILL	10,818,384	15,686,657

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MARK	DATE	DESCRIPTION	BY
A	02/27/26	ISSUED FOR REVIEW	RNW
B	03/16/26	ISSUED FOR REVIEW	RNW

WHITE PINE NORTH
TAILINGS MANAGEMENT
PRE-FEASIBILITY STUDY

TAILINGS DISPOSAL FACILITY NP2 TAILINGS DEPOSITION PLAN VIEW (YR11 - YR24)

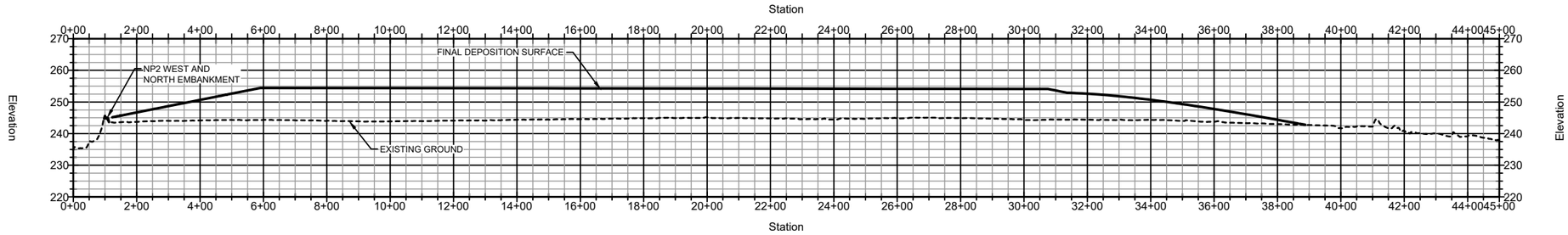
PROJ:	117-372636-25001
DESN:	C. TOMLINSON
DRWN:	R. WOOLSEY
CHKD:	C. TOMLINSON

108571-EB-03100-31345-007-05

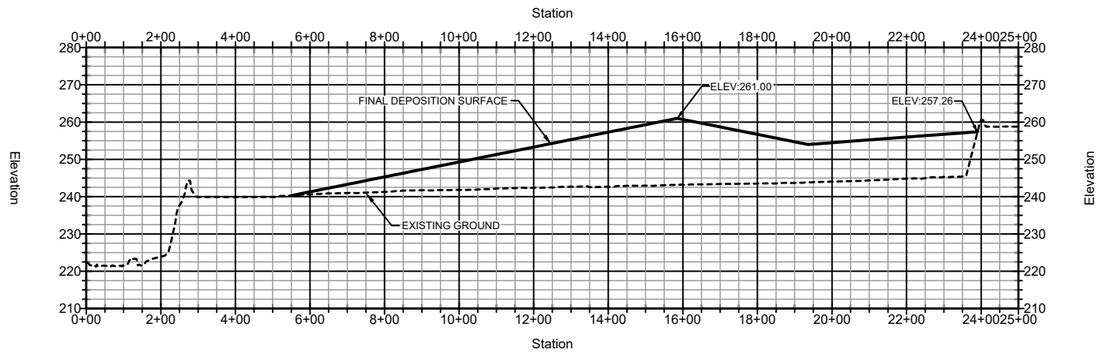
Copyright: Tetra Tech

Bar Measures 1 inch, otherwise drawing not to scale

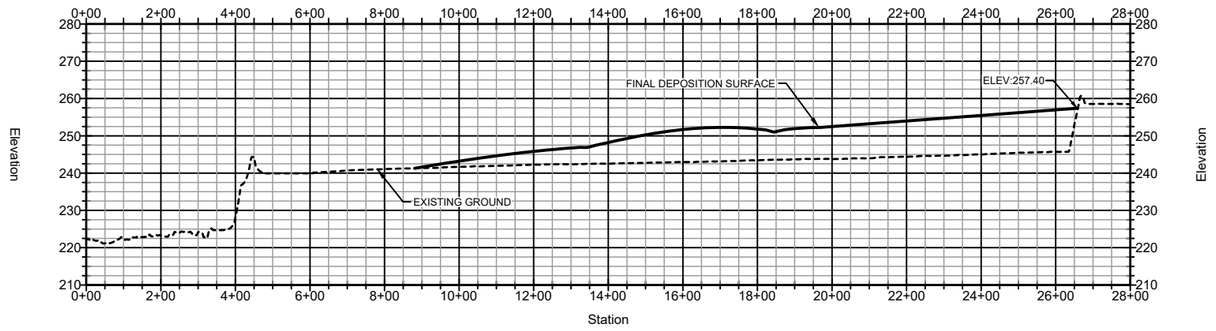
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E SECTION E
31345-007-05 SCALE: 1:8



F SECTION F
31345-007-05 SCALE: 1:8



G SECTION G
31345-007-05 SCALE: 1:8

0 80m 160m 240m 320m 400m 800m
SCALE: 1mm = 8m

Bar Measures 1 inch, otherwise drawing not to scale

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MARK	DATE	DESCRIPTION	BY
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B	03/16/26	ISSUED FOR REVIEW	RNW

WHITE PINE NORTH
TAILINGS MANAGEMENT
PRE-FEASIBILITY STUDY

TAILINGS DISPOSAL FACILITY NP2 TAILINGS DEPOSITION SECTIONS

PROJ:	117-372636-25001
DESN:	C. TOMLINSON
DRWN:	R. WOOLSEY
CHKD:	C. TOMLINSON

108571-EB-03100-31345-008-05

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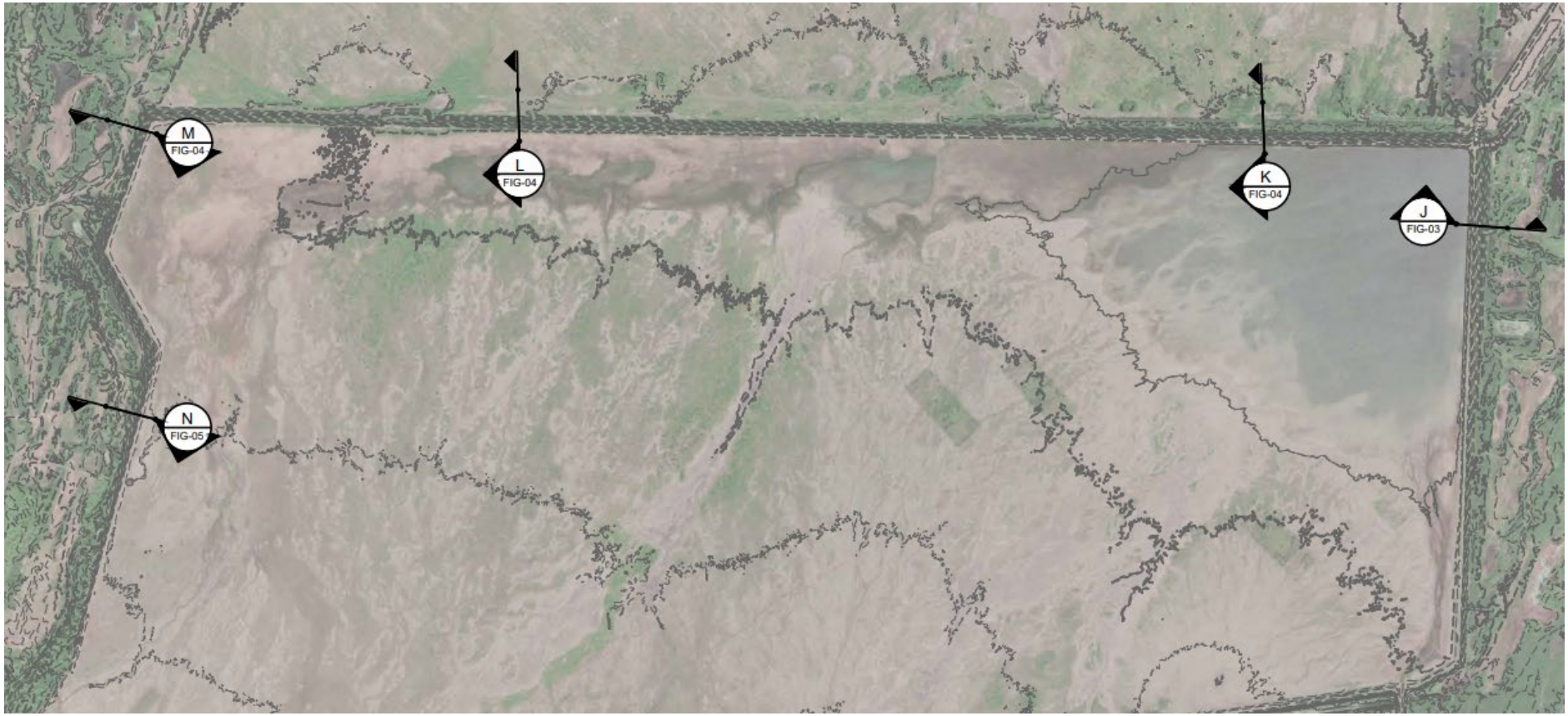
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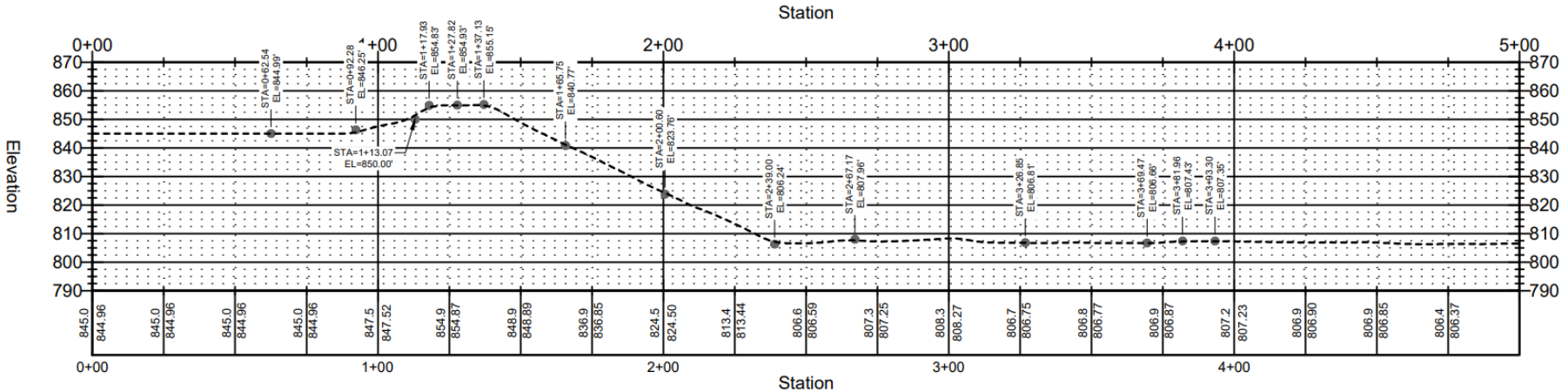
APPENDIX I:
Existing Conditions Seepage and Stability Results

North Pond 1
Existing Condition
Seepage and Stability Assessment

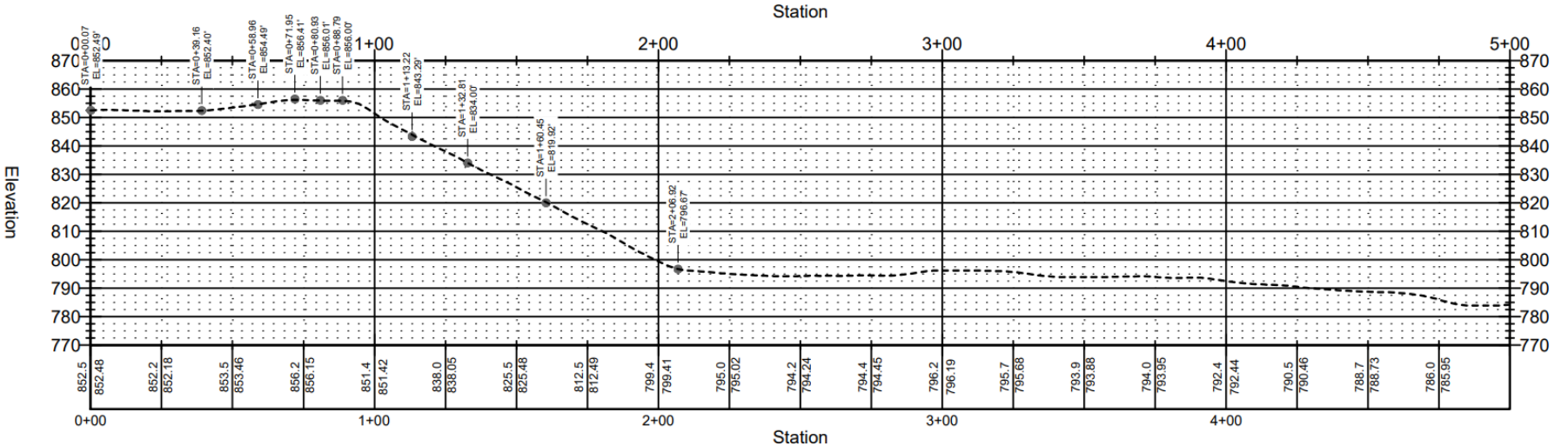
Project No: 117-372636-25001

January 2026


M
FIG-04
L
FIG-04
K
FIG-04
J
FIG-03
N
FIG-05



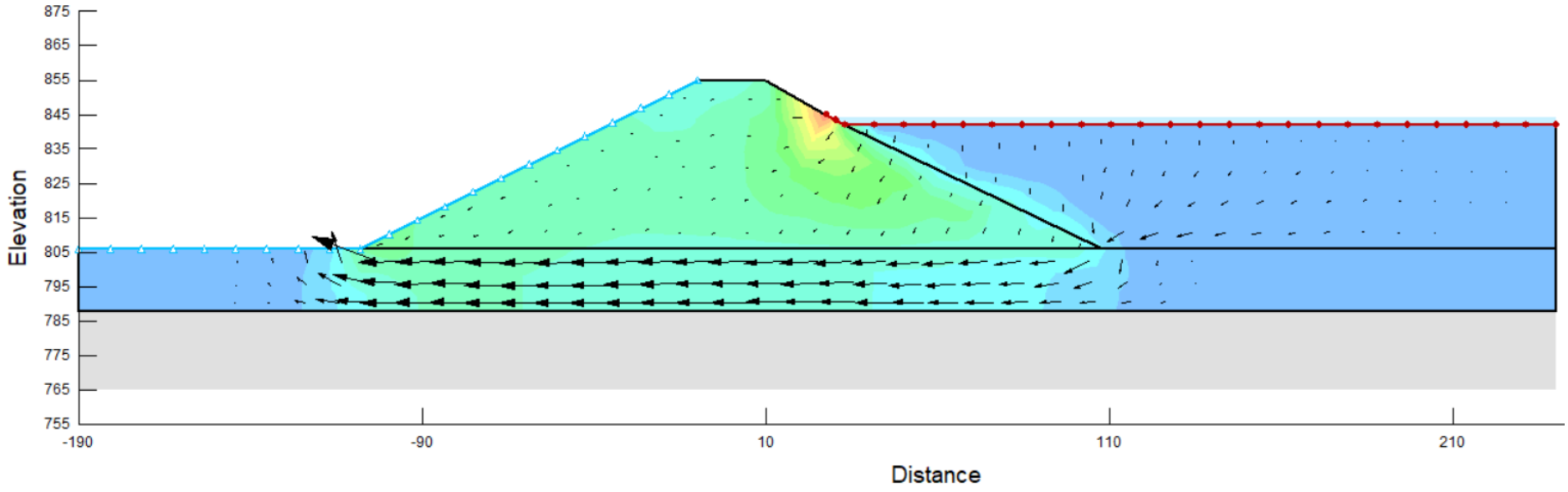
K SECTION
SCALE: 1" = 30'



M SECTION
SCALE: 1" = 30'

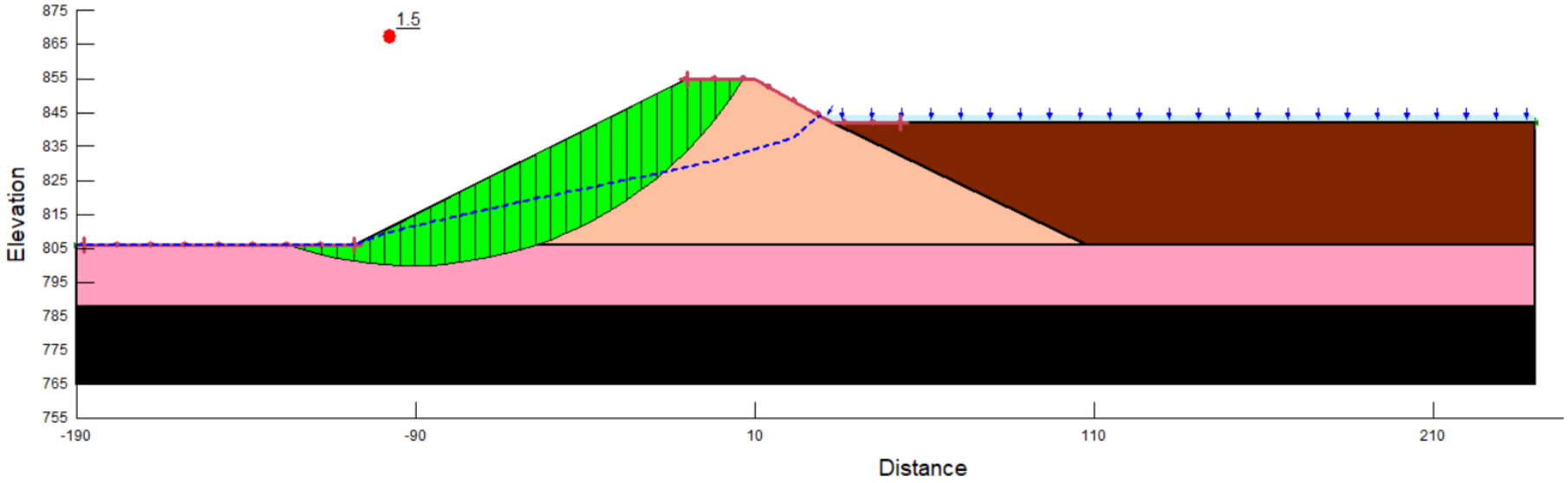
Normal Pool
Water Surface Elevation 845 ft amsl

Color	Name	Hydraulic Material Model	Sat Kx (ft/sec)	Ky'/Kx' Ratio	Rotation (°)	Volumetric Water Content	Compressibility (/psf)
	Bedrock	(none)					
	Compacted Clay Embankment (Drained)	Saturated Only	1.65e-08	1	0	0.31	0
	In-situ Foundation (Drained)	Saturated Only	2.28e-07	1	0	0.31	0
	Tailings (Drained)	Saturated Only	0.000492	0.2	0	0.55	0



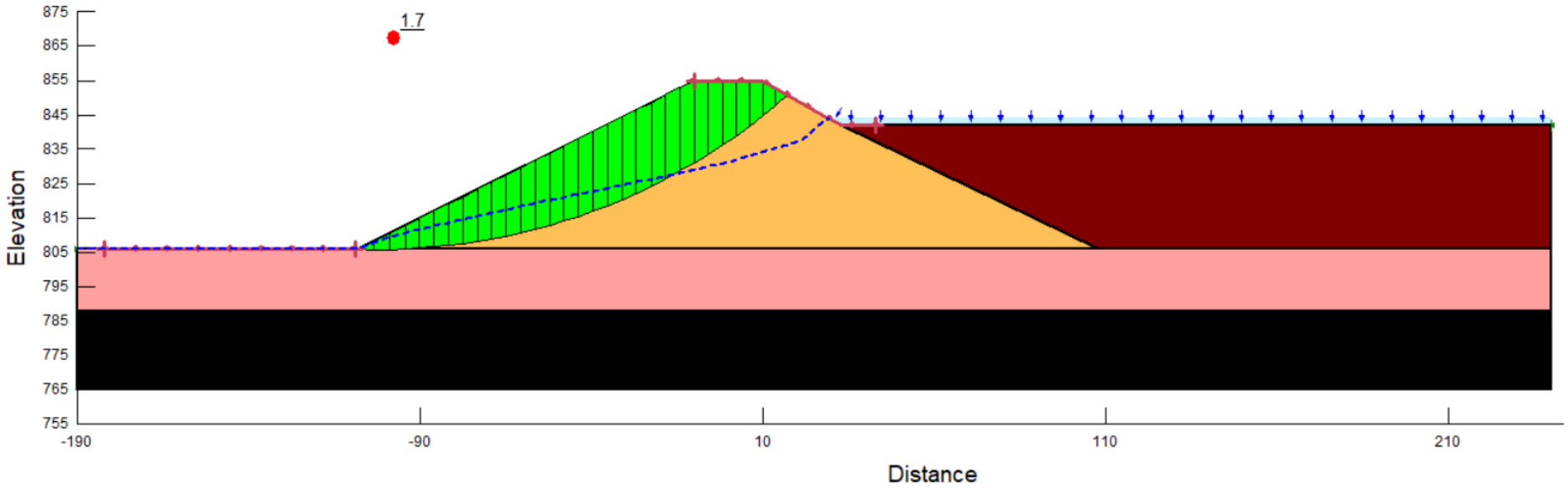
GeoStudio Modeling of NP1 Embankment Cross-Section K
Normal Pool Steady State Seepage Model

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Phi-B (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted Clay Embankment (Drained)	Mohr-Coulomb	135	513	27	0
	In-situ Foundation (Drained)	Mohr-Coulomb	141	14	32	0
	Tailings (Drained)	Mohr-Coulomb	105	0	35	0



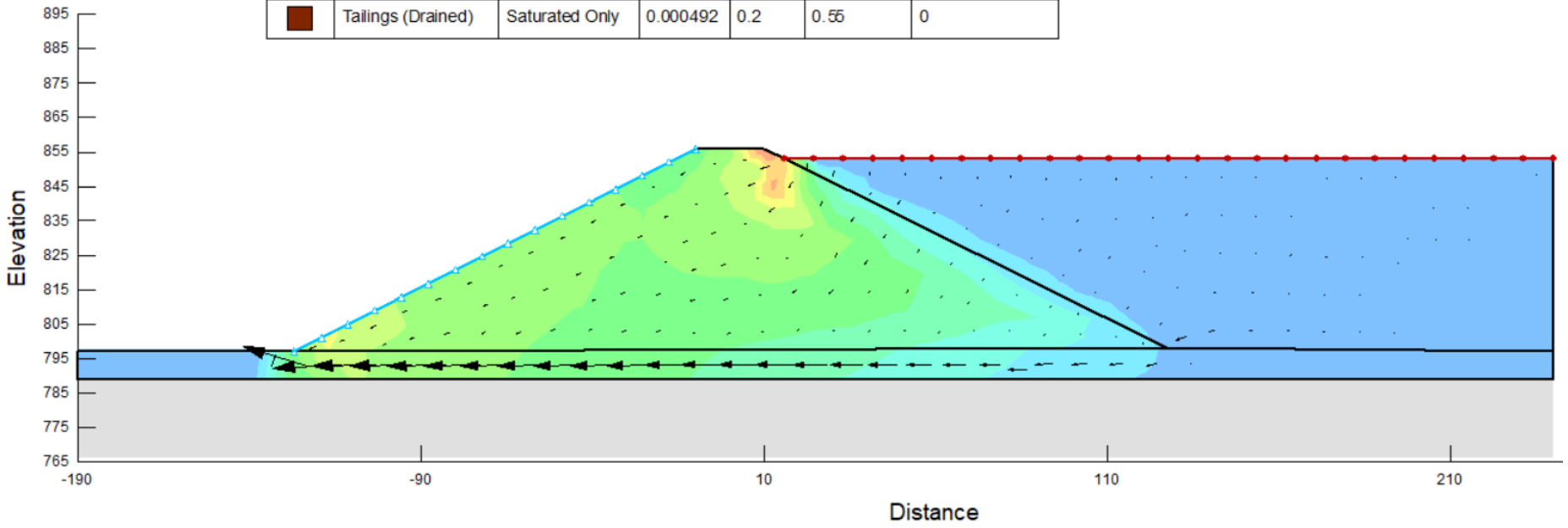
GeoStudio Modeling of NP1 Embankment Cross-Section K
Normal Pool Steady State Seepage, Static Loading, Slope Stability Model

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Phi-B (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted Clay Embankment (Undrained MC)	Mohr-Coulomb	135	482	23	0
	In-Situ Foundation (Undrained MC)	Mohr-Coulomb	141	1,238	28	0
	Tailings (Undrained)	Mohr-Coulomb	105	0	30	0



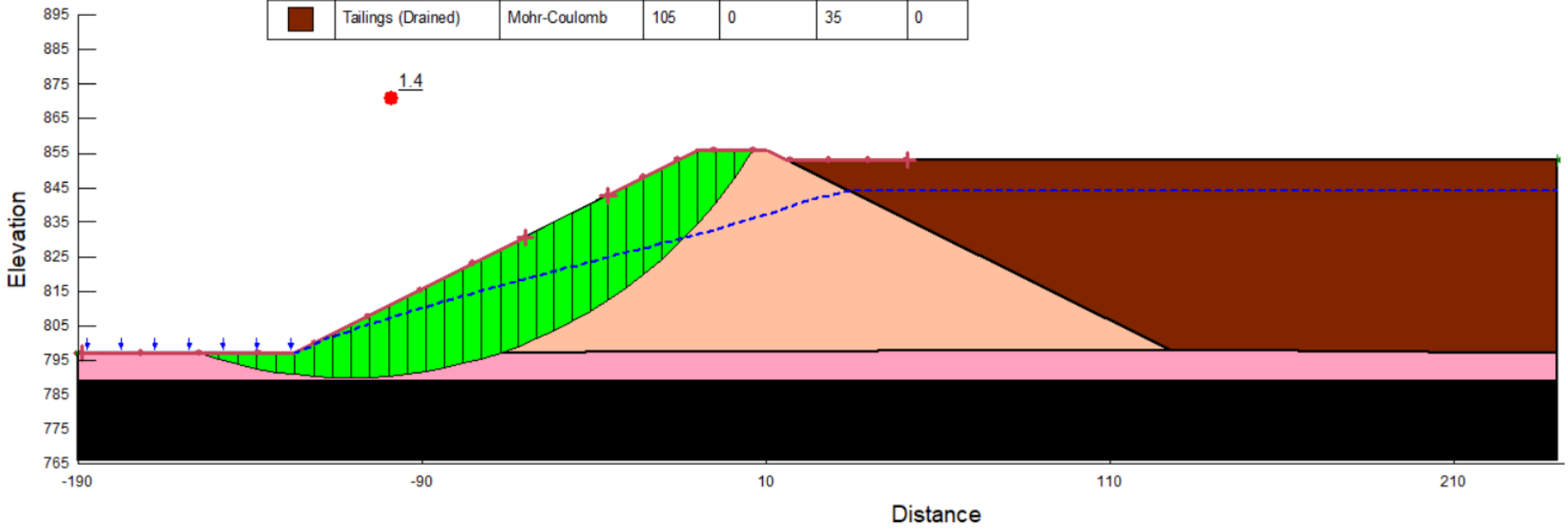
GeoStudio Modeling of NP1 Embankment Cross-Section K
Normal Pool Steady State Seepage, Pseudo Static Loading, Slope Stability Model

Color	Name	Hydraulic Material Model	Sat Kx (ft/sec)	Ky'/Kx' Ratio	Volumetric Water Content	Compressibility (/psf)
	Bedrock	(none)				
	Compacted Clay Embankment (Drained)	Saturated Only	1.65e-08	1	0.31	0
	In-situ Foundation (Drained)	Saturated Only	2.28e-07	1	0.31	0
	Tailings (Drained)	Saturated Only	0.000492	0.2	0.55	0



GeoStudio Modeling of NP1 Embankment Cross-Section M
Normal Pool Steady State Seepage Model

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Phi-B (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted Clay Embankment (Drained)	Mohr-Coulomb	135	513	27	0
	In-situ Foundation (Drained)	Mohr-Coulomb	141	14	32	0
	Tailings (Drained)	Mohr-Coulomb	105	0	35	0

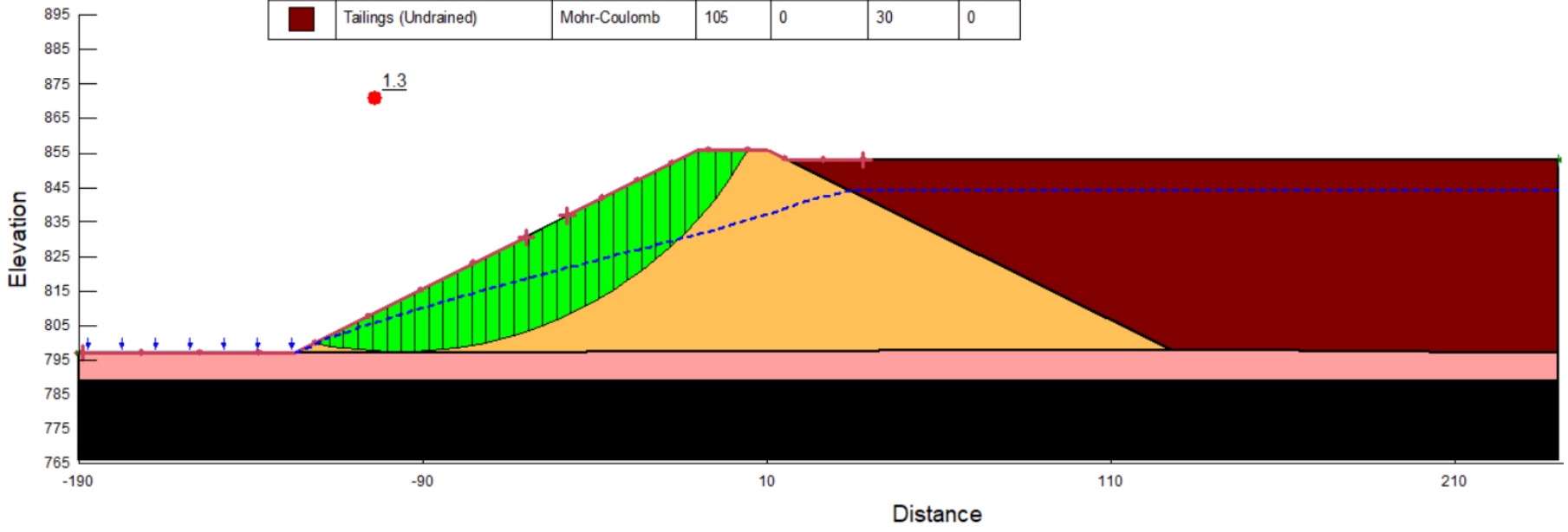


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GeoStudio Modeling of NP1 Embankment Cross-Section M
Normal Pool Steady State Seepage, Static Loading, Slope Stability Model

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Phi-B (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted Clay Embankment (Undrained MC)	Mohr-Coulomb	135	482	23	0
	In-Situ Foundation (Undrained MC)	Mohr-Coulomb	141	1,238	28	0
	Tailings (Undrained)	Mohr-Coulomb	105	0	30	0

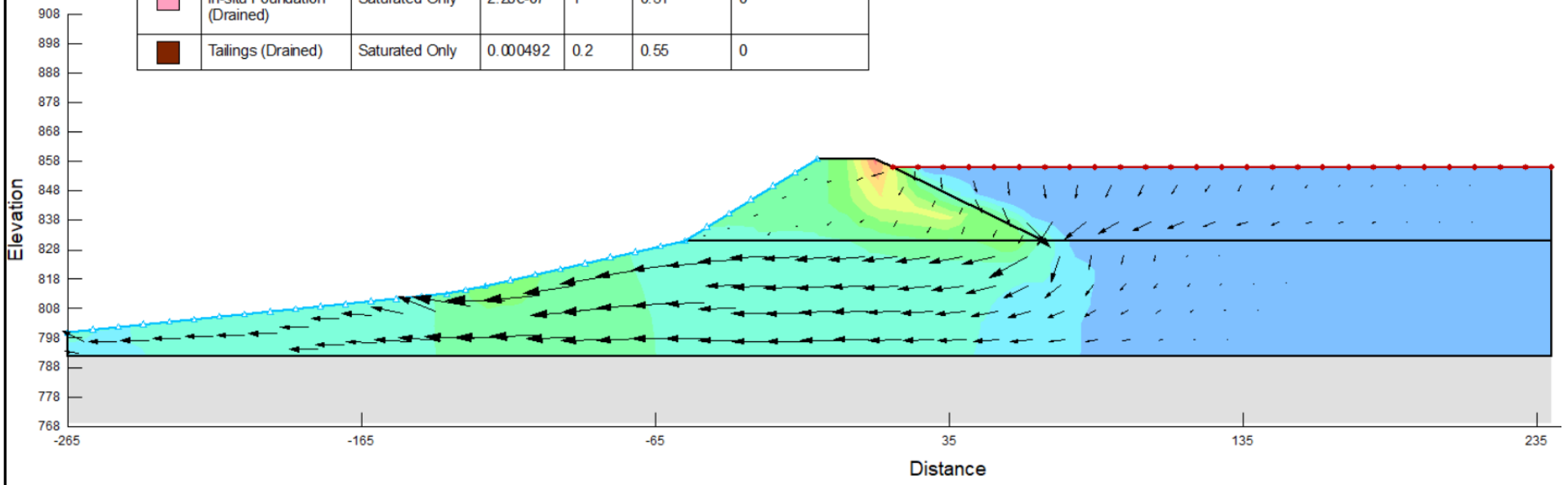


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GeoStudio Modeling of NP1 Embankment Cross-Section M
Normal Pool Steady State Seepage, Pseudo Static Loading, Slope Stability Model

Color	Name	Hydraulic Material Model	Sat Kx (ft/sec)	Ky'/Kx' Ratio	Volumetric Water Content	Compressibility (/psf)
	Bedrock	(none)				
	Compacted Clay Embankment (Drained)	Saturated Only	1.65e-08	1	0.31	0
	In-situ Foundation (Drained)	Saturated Only	2.28e-07	1	0.31	0
	Tailings (Drained)	Saturated Only	0.000492	0.2	0.55	0

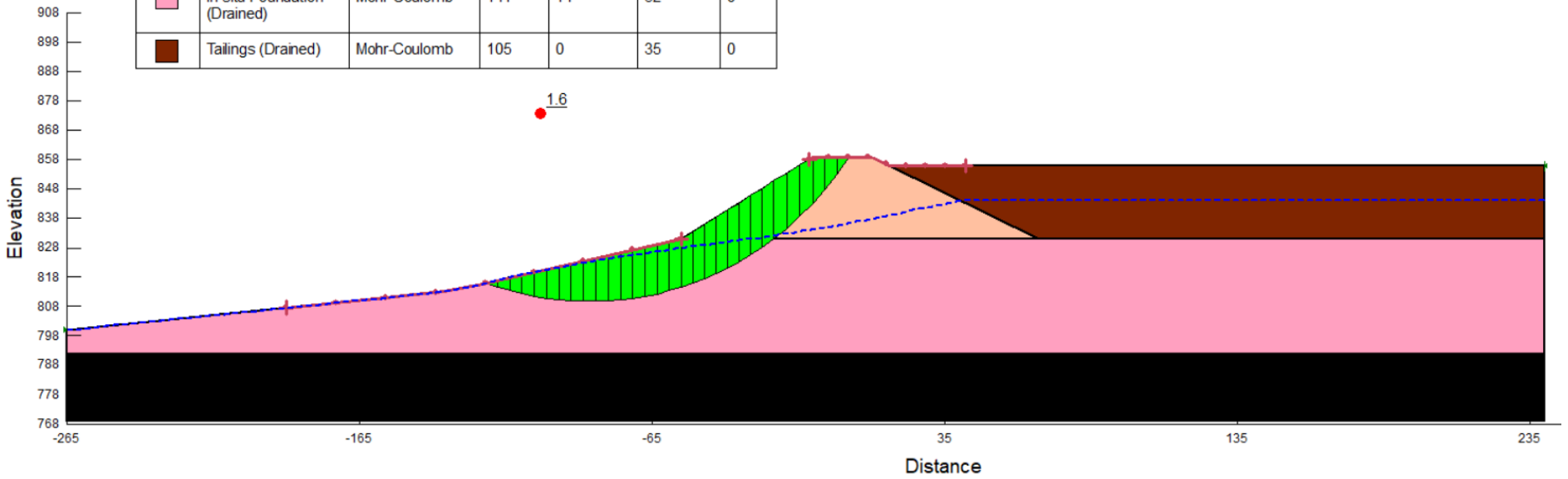


Project No: 117-372636-25001

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GeoStudio Modeling of NP1 Embankment Cross-Section N
Normal Pool Steady State Seepage Model

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Phi-B (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted Clay Embankment (Drained)	Mohr-Coulomb	135	513	27	0
	In-situ Foundation (Drained)	Mohr-Coulomb	141	14	32	0
	Tailings (Drained)	Mohr-Coulomb	105	0	35	0

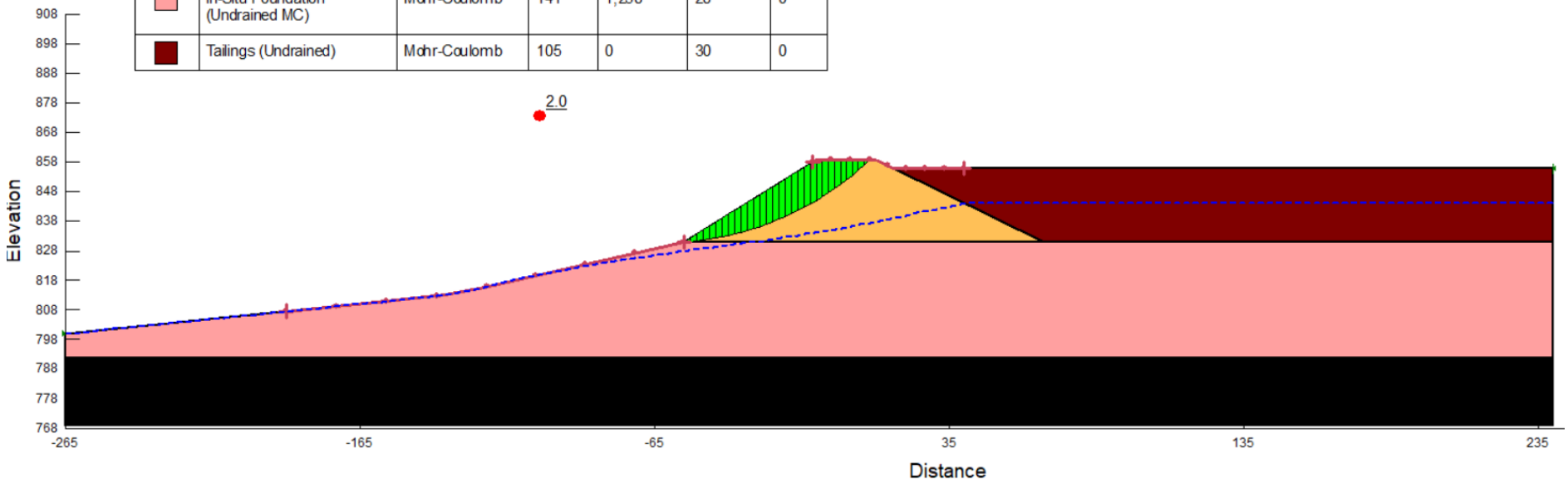


Project No: 117-372636-25001

January 2026

GeoStudio Modeling of NP1 Embankment Cross-Section N
Normal Pool Steady State Seepage, Static Loading, Slope Stability Model

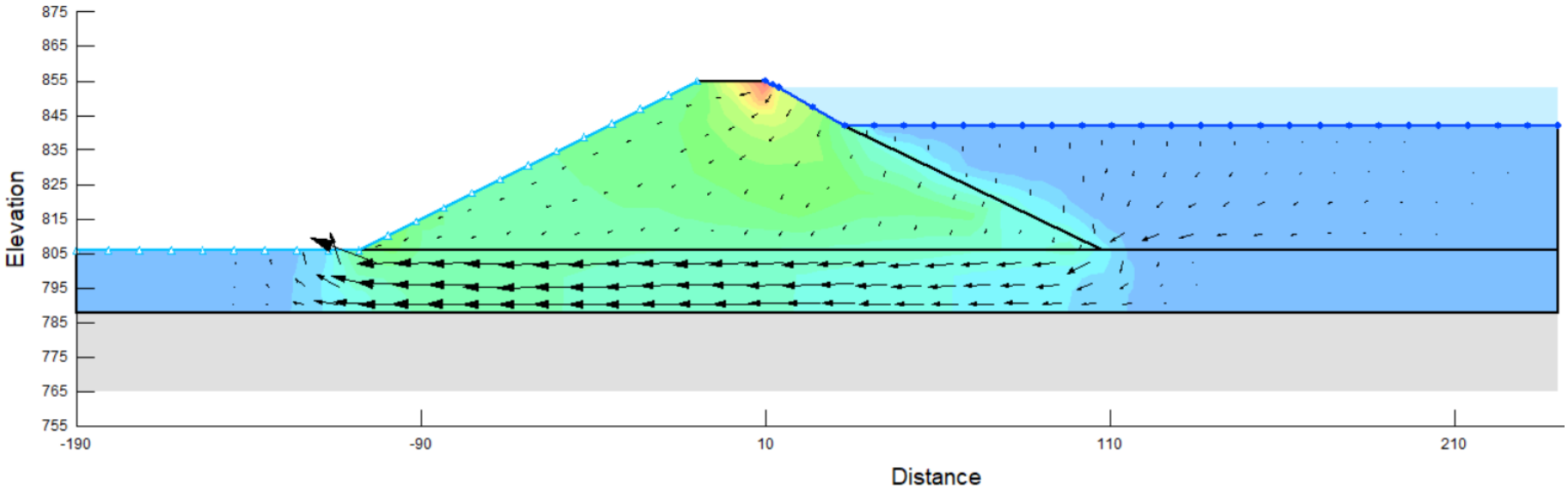
Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Phi-B (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted Clay Embankment (Undrained MC)	Mohr-Coulomb	135	482	23	0
	In-Situ Foundation (Undrained MC)	Mohr-Coulomb	141	1,238	28	0
	Tailings (Undrained)	Mohr-Coulomb	105	0	30	0



GeoStudio Modeling of NP1 Embankment Cross-Section N
Normal Pool Steady State Seepage, Pseudo Static Loading, Slope Stability Model

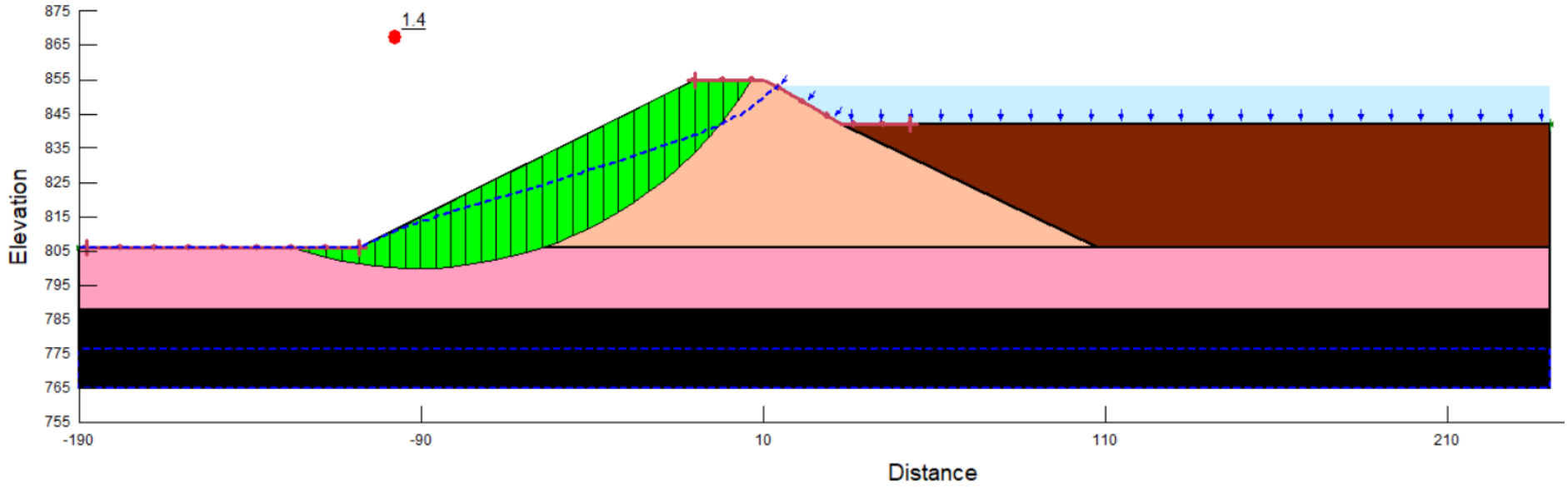
Flood Pool
Water Surface Elevation 852.90 ft amsl

Color	Name	Hydraulic Material Model	Sat Kx (ft/sec)	Ky'/Kx' Ratio	Rotation (°)	Volumetric Water Content	Compressibility (/psf)
	Bedrock	(none)					
	Compacted Clay Embankment (Drained)	Saturated Only	1.65e-08	1	0	0.31	0
	In-situ Foundation (Drained)	Saturated Only	2.28e-07	1	0	0.31	0
	Tailings (Drained)	Saturated Only	0.000492	0.2	0	0.55	0



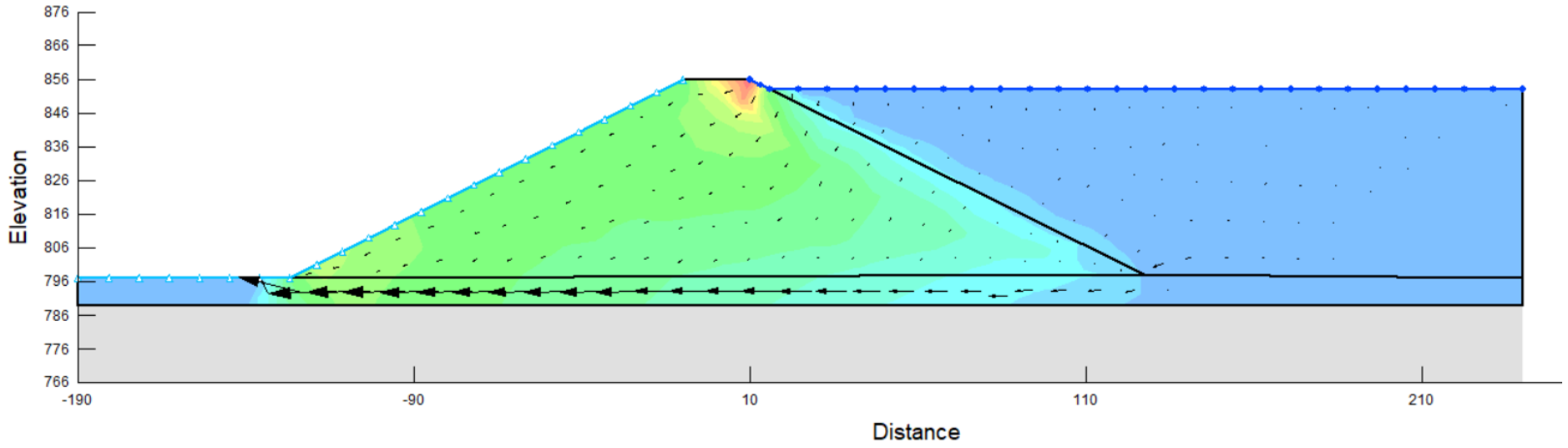
GeoStudio Modeling of NP1 Embankment Cross-Section K
Flood Pool Steady State Seepage Model

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Phi-B (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted Clay Embankment (Drained)	Mohr-Coulomb	135	513	27	0
	In-situ Foundation (Drained)	Mohr-Coulomb	141	14	32	0
	Tailings (Drained)	Mohr-Coulomb	105	0	35	0



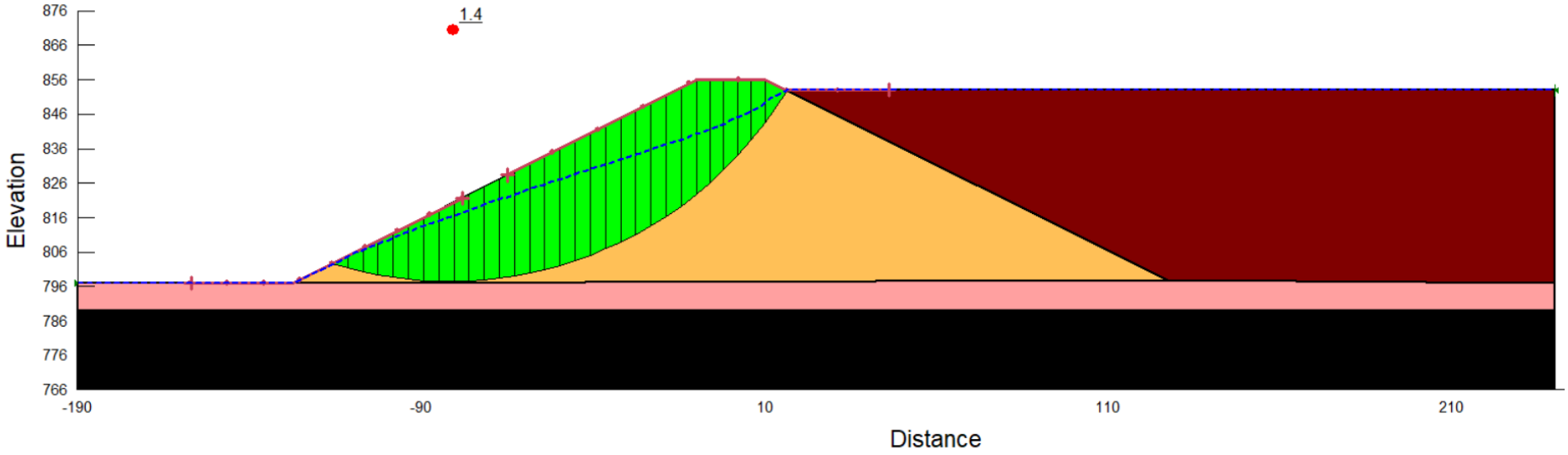
GeoStudio Modeling of NP1 Embankment Cross-Section K
Flood Pool Steady State Seepage, Static Loading, Slope Stability Model

Color	Name	Hydraulic Material Model	Sat Kx (ft/sec)	Ky'/Kx' Ratio	Volumetric Water Content	Compressibility (/psf)
	Bedrock	(none)				
	Compacted Clay Embankment (Drained)	Saturated Only	1.65e-08	1	0.31	0
	In-situ Foundation (Drained)	Saturated Only	2.28e-07	1	0.31	0
	Tailings (Drained)	Saturated Only	0.000492	0.2	0.55	0



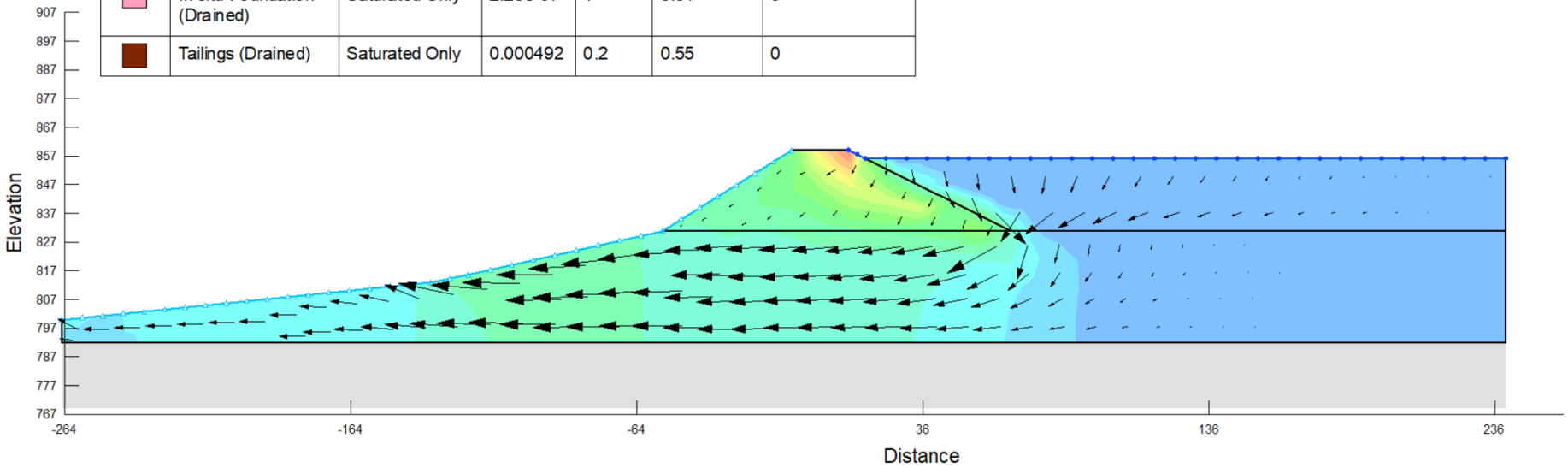
GeoStudio Modeling of NP1 Embankment Cross-Section M
Flood Pool Steady State Seepage Model

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Phi-B (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted Clay Embankment (Undrained MC)	Mohr-Coulomb	135	482	23	0
	In-Situ Foundation (Undrained MC)	Mohr-Coulomb	141	1,238	28	0
	Tailings (Undrained)	Mohr-Coulomb	105	0	30	0



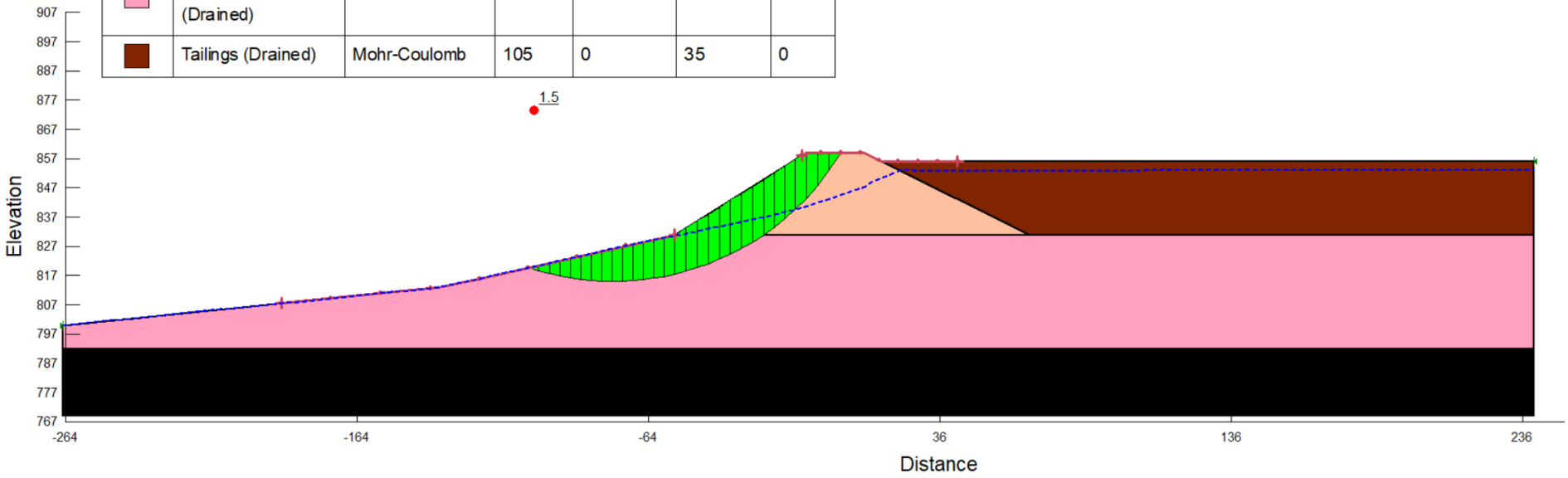
GeoStudio Modeling of NP1 Embankment Cross-Section M
Flood Pool Steady State Seepage, Static Loading, Slope Stability Model

Color	Name	Hydraulic Material Model	Sat Kx (ft/sec)	Ky'/Kx' Ratio	Volumetric Water Content	Compressibility (/psf)
	Bedrock	(none)				
	Compacted Clay Embankment (Drained)	Saturated Only	1.65e-08	1	0.31	0
	In-situ Foundation (Drained)	Saturated Only	2.28e-07	1	0.31	0
	Tailings (Drained)	Saturated Only	0.000492	0.2	0.55	0



GeoStudio Modeling of NP1 Embankment Cross-Section N
Flood Pool Steady State Seepage Model

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Phi-B (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted Clay Embankment (Drained)	Mohr-Coulomb	135	513	27	0
	In-situ Foundation (Drained)	Mohr-Coulomb	141	14	32	0
	Tailings (Drained)	Mohr-Coulomb	105	0	35	0

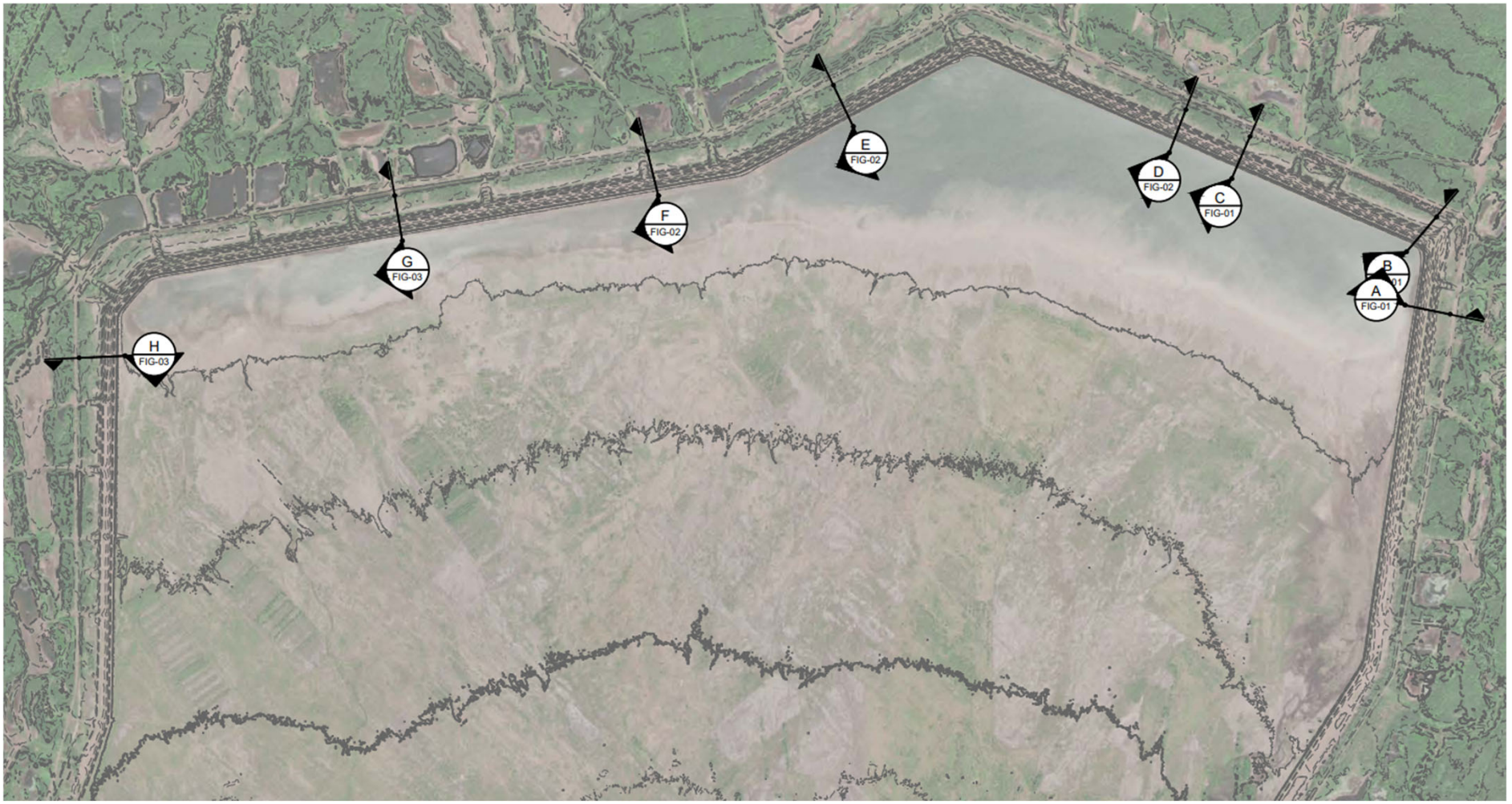


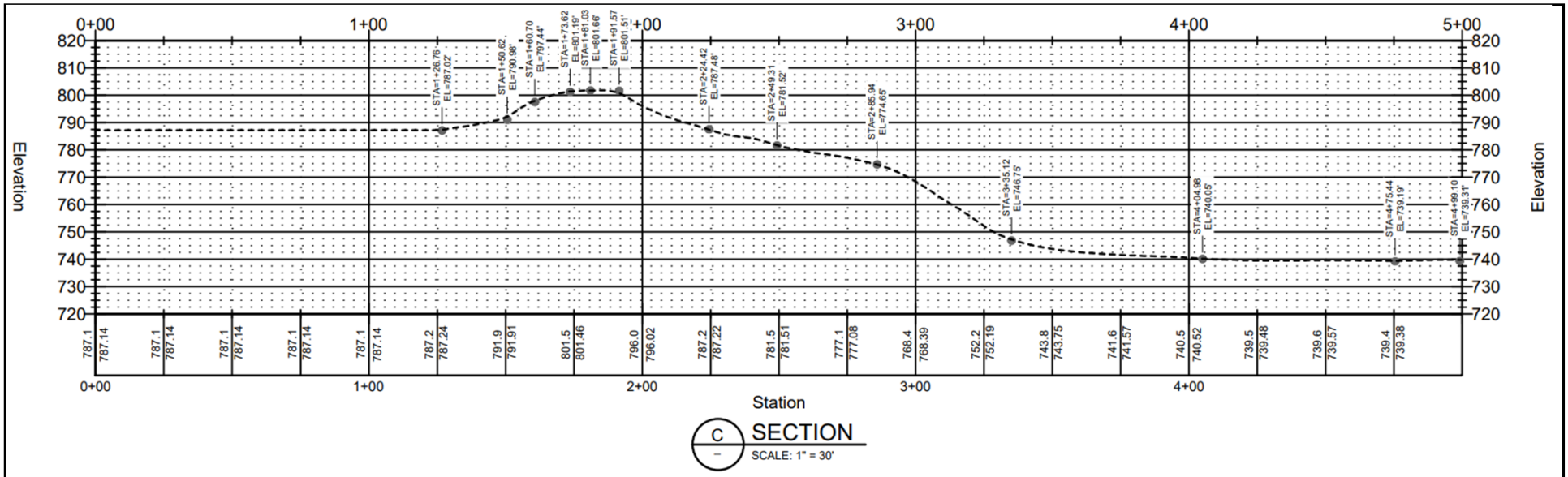
GeoStudio Modeling of NP1 Embankment Cross-Section N
Flood Pool Steady State Seepage, Static Loading, Slope Stability Model

North Pond 2
Existing Conditions
Seepage and Stability Assessment

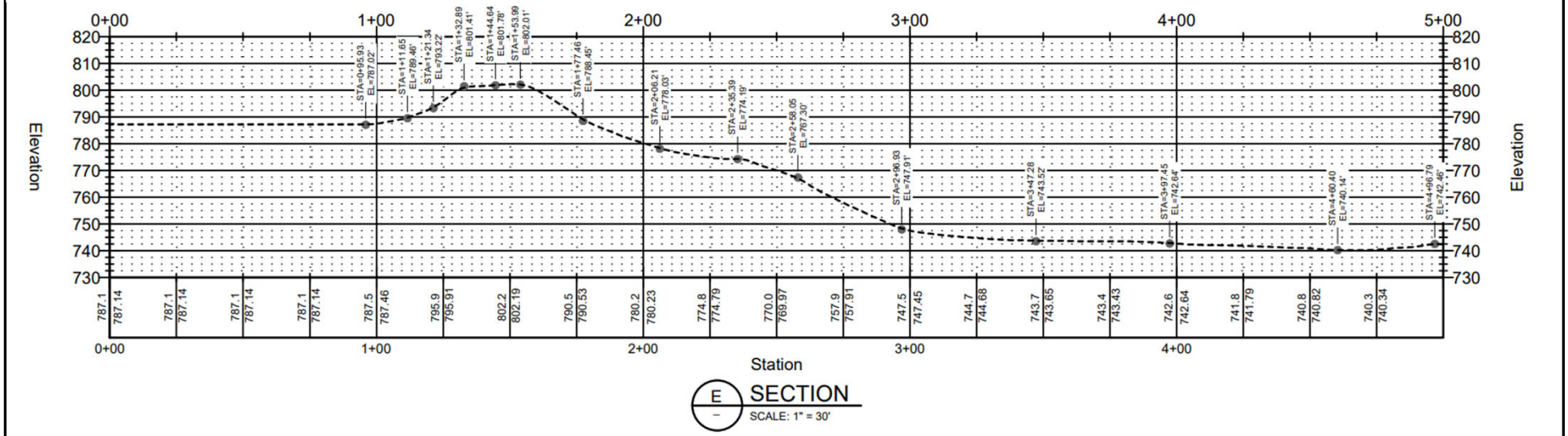
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H
FIG-03
G
FIG-03
F
FIG-02
E
FIG-02
D
FIG-02
C
FIG-01
B
A
FIG-01



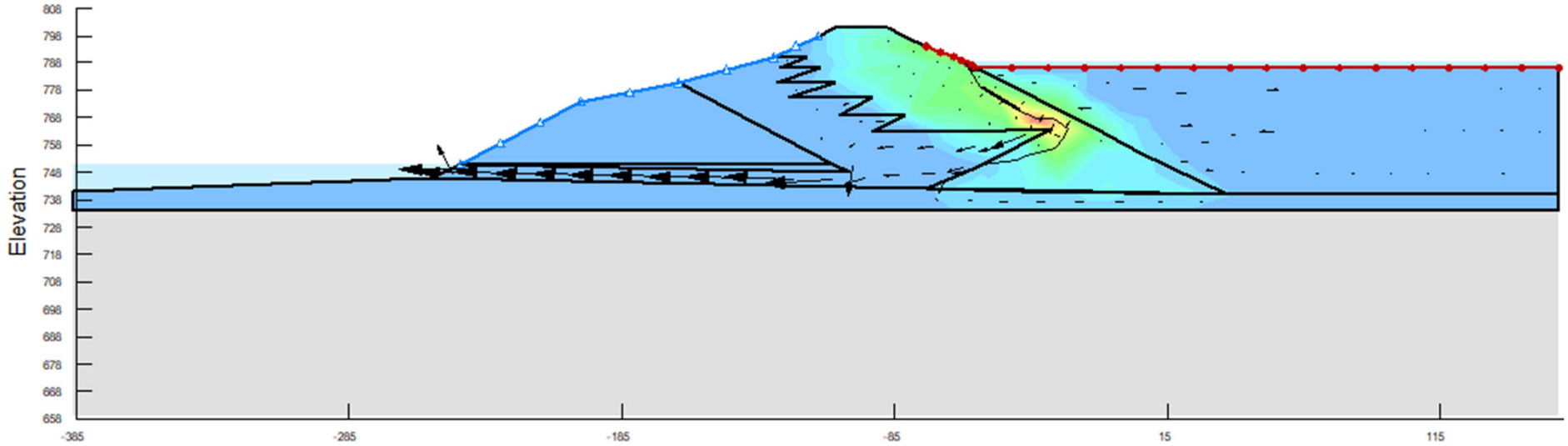
C SECTION
SCALE: 1" = 30'



E SECTION
SCALE: 1" = 30'

Normal Pool
Water Surface Elevation 788 ft amsl

Color	Name	Hydraulic Material Model	Sat Kx (ft/sec)	Ky/Kx Ratio	Rotation (°)	Volumetric Water Content	Compressibility (/psf)
	Bedrock	(none)					
	Clay Embankment (Low Perm)	Saturated Only	1.65e-08	1	0	0.28	0
	Compacted Clay Embankment (Drained)	Saturated Only	1.65e-08	1	0	0.31	0
	Cycloned Sands	Saturated Only	3.94e-05	1	0	0.42	0
	In-Situ Foundation (Drained)	Saturated Only	2.28e-07	1	0	0.31	0
	Tailings (Drained)	Saturated Only	0.000492	0.0002	0	0.55	0

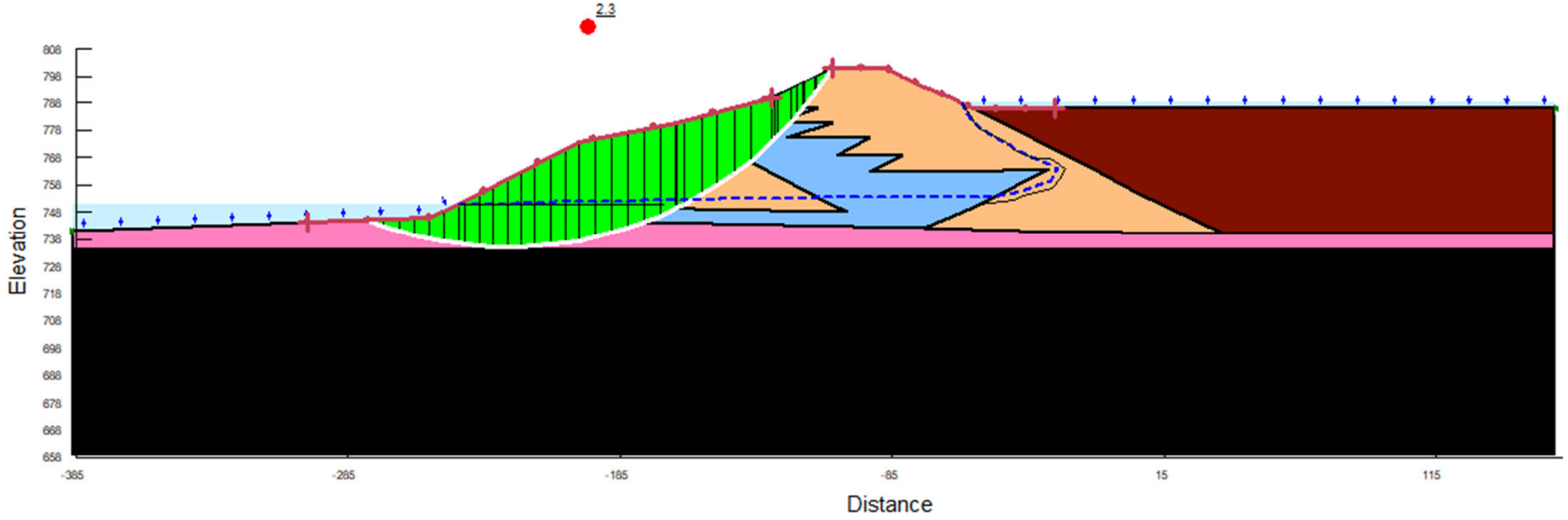


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GeoStudio Modeling of NP2 Embankment Cross-Section C
Normal Pool Steady State Seepage Model

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Phi-B (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted Clay Embankment (Drained)	Mohr-Coulomb	135	513	27	0
	Cycloned Sands	Mohr-Coulomb	102	302	36	0
	In-Situ Foundation (Drained)	Mohr-Coulomb	141	14	32	0
	Tailings (Drained)	Mohr-Coulomb	105	0	35	0

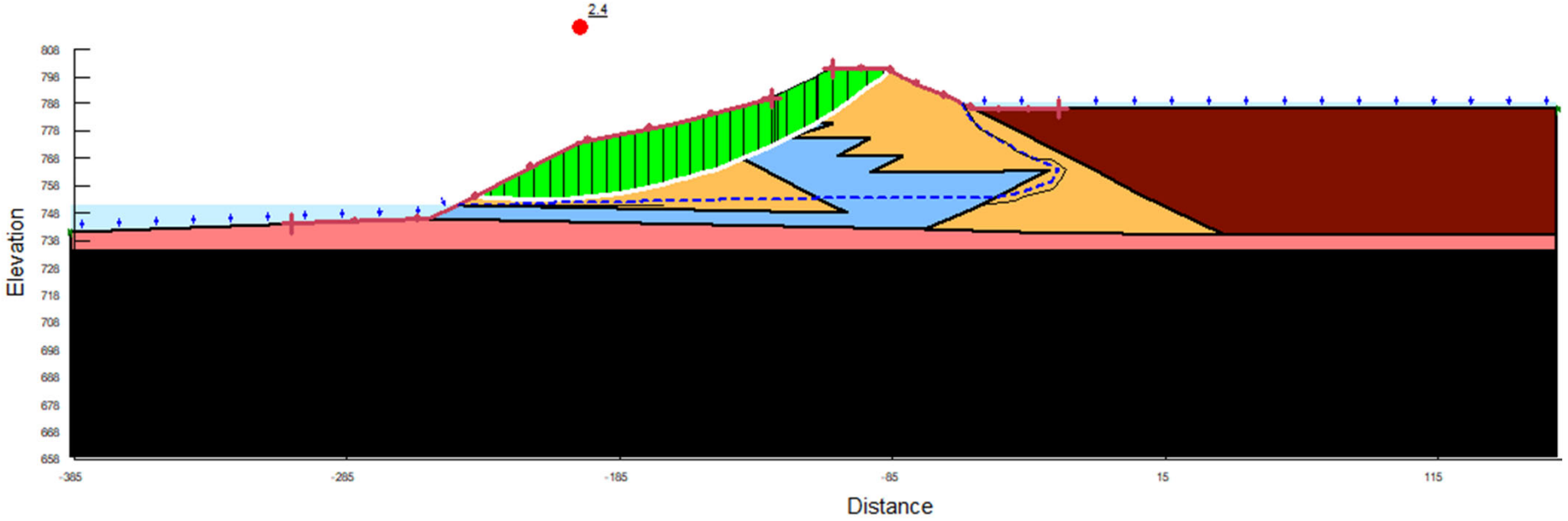


Project No: 117-372636-25001

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GeoStudio Modeling of NP2 Embankment Cross-Section C
Normal Pool Steady State Seepage, Static Loading, Slope Stability Model

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Phi-B (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted Clay Embankment (Undrained)	Mohr-Coulomb	135	482	23	0
	Cycloned Sands	Mohr-Coulomb	102	302	36	0
	In-Situ Foundation (Undrained)	Mohr-Coulomb	141	1,238	28	0
	Tailings (Drained)	Mohr-Coulomb	105	0	35	0

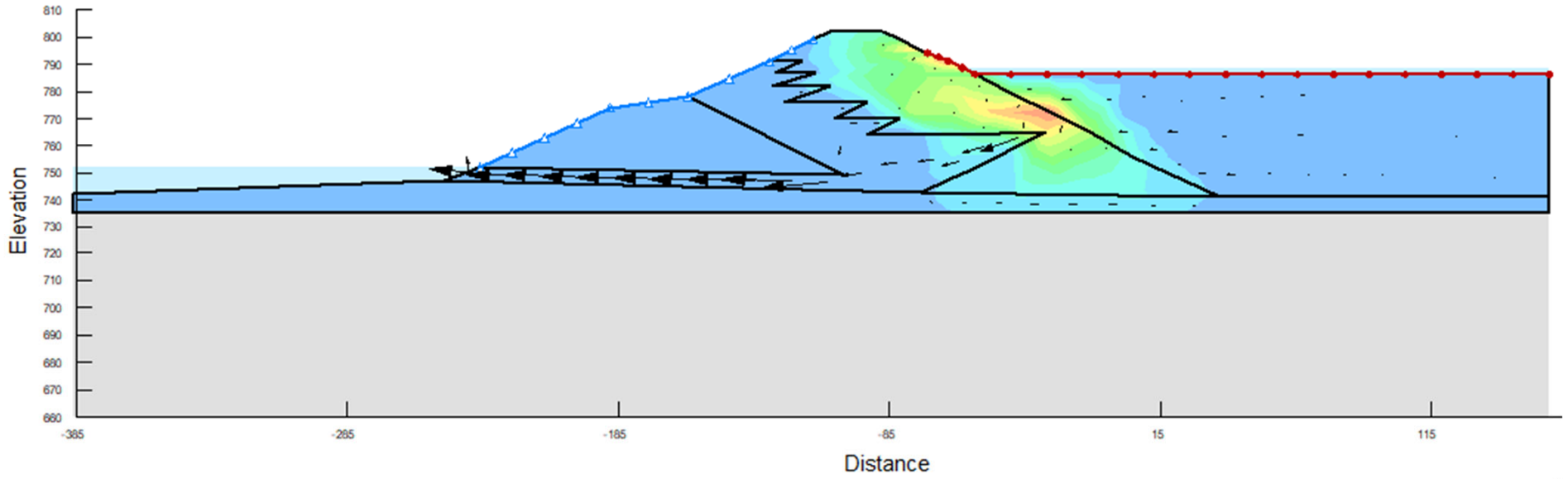


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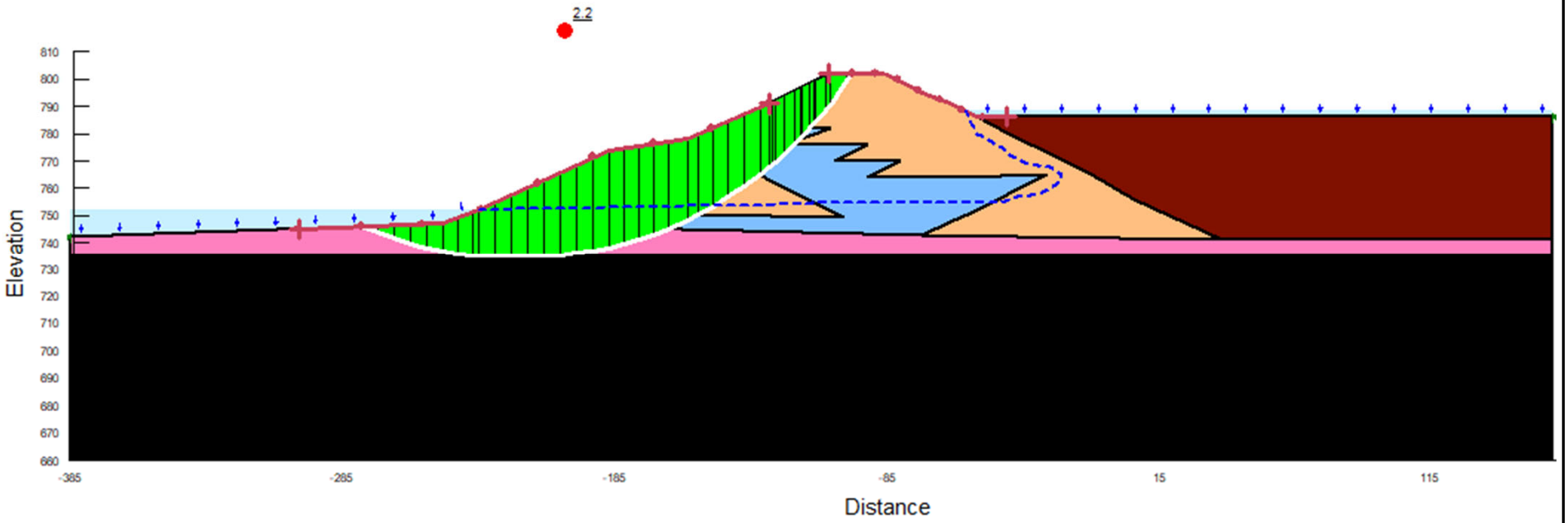
GeoStudio Modeling of NP2 Embankment Cross-Section C
Normal Pool Steady State Seepage, Pseudo Static Loading, Slope Stability Model

Color	Name	Hydraulic Material Model	Sat Kx (ft/sec)	Ky/Kx' Ratio	Rotation (°)	Volumetric Water Content	Compressibility (psf)
	Bedrock	(none)					
	Compacted Clay Embankment (Drained)	Saturated Only	1.6e-08	1	0	0.31	0
	Cycloned Sands	Saturated Only	3.9e-05	1	0	0.42	0
	In-Situ Foundation (Drained)	Saturated Only	2.2e-07	1	0	0.31	0
	Tailings (Drained)	Saturated Only	0.000492	0.0002	0	0.55	0



GeoStudio Modeling of NP2 Embankment Cross-Section E
Normal Pool Steady State Seepage Model

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Phi-B (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted Clay Embankment (Drained)	Mohr-Coulomb	135	513	27	0
	Cycloned Sands	Mohr-Coulomb	102	302	36	0
	In-Situ Foundation (Drained)	Mohr-Coulomb	141	14	32	0
	Tailings (Drained)	Mohr-Coulomb	105	0	35	0

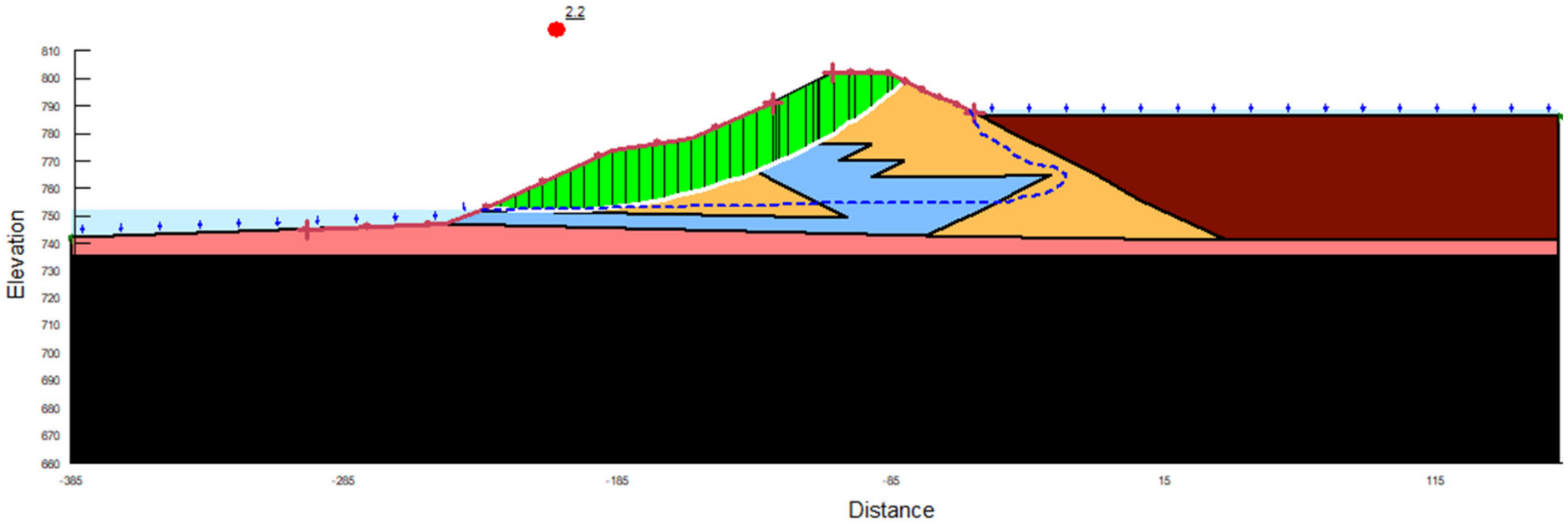


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GeoStudio Modeling of NP2 Embankment Cross-Section E
Normal Pool Steady State Seepage, Static Loading, Slope Stability Model

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Phi-B (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted Clay Embankment (Undrained)	Mohr-Coulomb	135	482	23	0
	Cycloned Sands	Mohr-Coulomb	102	302	36	0
	In-Situ Foundation (Undrained)	Mohr-Coulomb	141	1,238	28	0
	Tailings (Drained)	Mohr-Coulomb	105	0	35	0



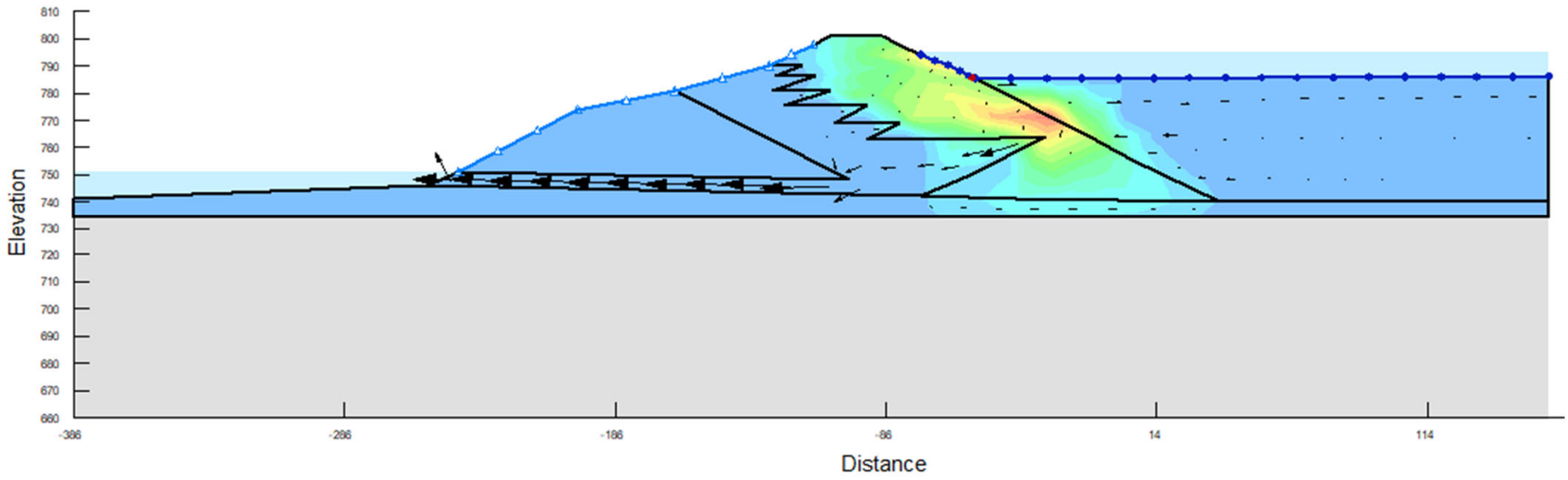
Project No: 117-372636-25001

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GeoStudio Modeling of NP2 Embankment Cross-Section E
Normal Pool Steady State Seepage, Pseudo Static Loading, Slope Stability Model

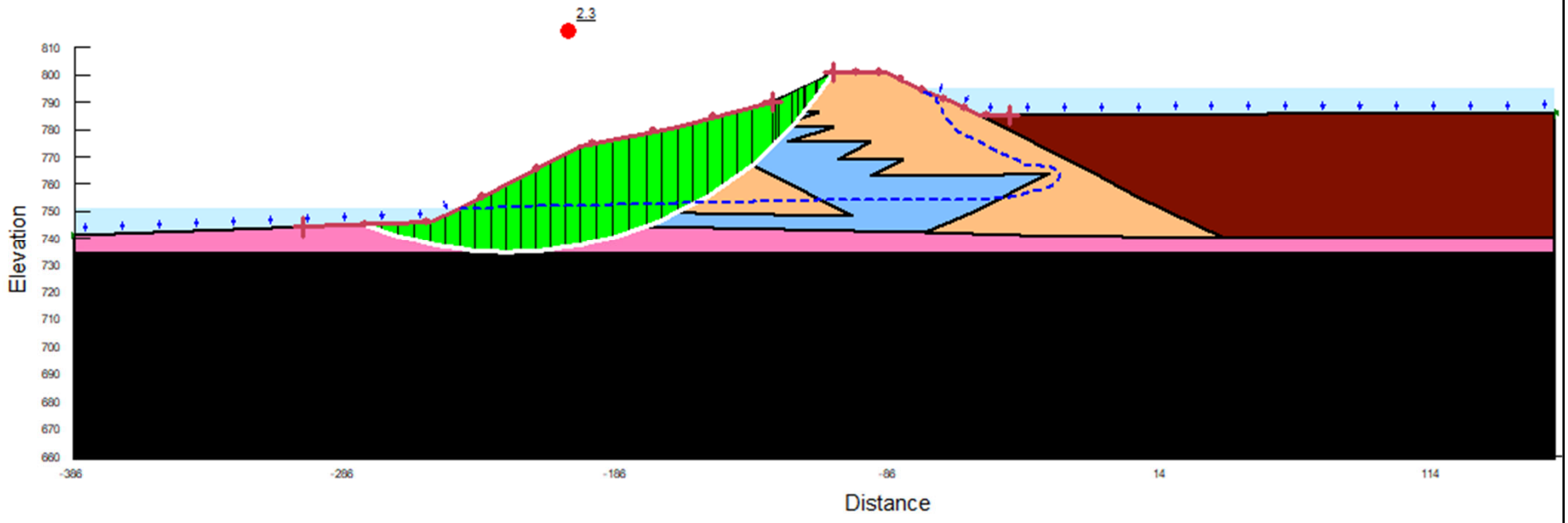
Flood Pool
Water Surface Elevation 795 ft amsl

Color	Name	Hydraulic Material Model	Sat Kx (ft/sec)	Ky/Kx Ratio	Rotation (°)	Volumetric Water Content	Compressibility (/psf)
	Bedrock	(none)					
	Compacted Clay Embankment (Drained)	Saturated Only	1.65e-08	1	0	0.3	0
	Cycloned Sands	Saturated Only	3.94e-05	1	0	0.42	0
	In-Situ Foundation (Drained)	Saturated Only	2.28e-07	1	0	0.3	0
	Tailings (Drained)	Saturated Only	0.000492	0.0002	0	0.55	0



GeoStudio Modeling of NP2 Embankment Cross-Section C
Flood Pool Steady State Seepage Model

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Phi-B (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted Clay Embankment (Drained)	Mohr-Coulomb	135	513	27	0
	Cycloned Sands	Mohr-Coulomb	102	302	36	0
	In-Situ Foundation (Drained)	Mohr-Coulomb	141	14	32	0
	Tailings (Drained)	Mohr-Coulomb	105	0	35	0

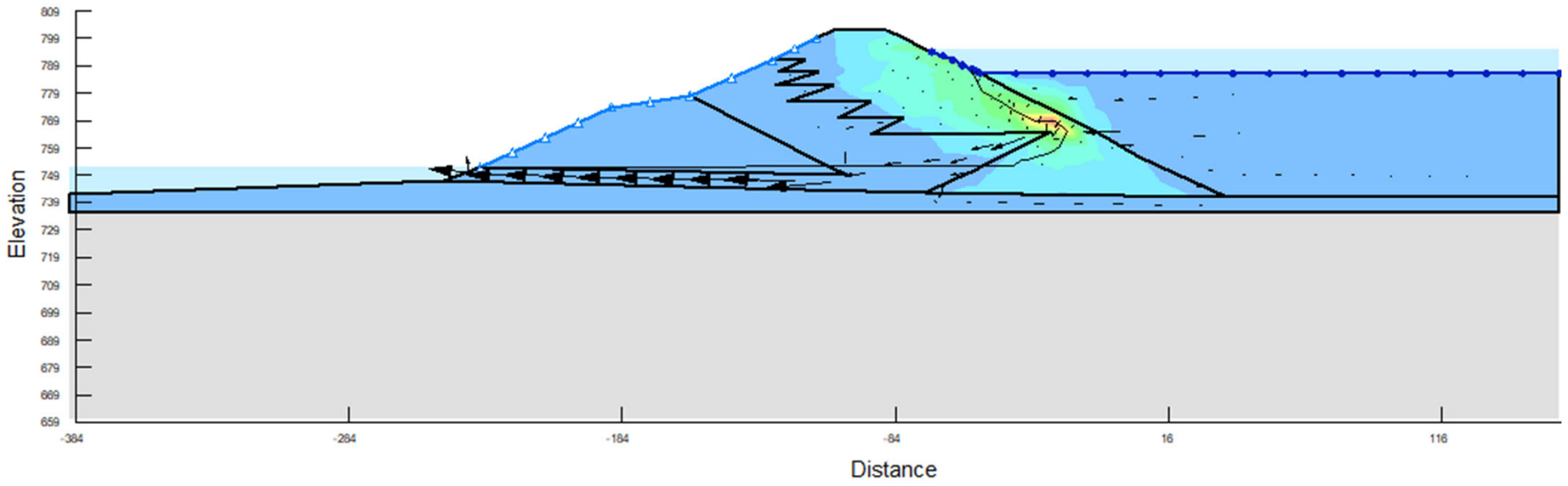


Project No: 117-372636-25001

March 2026

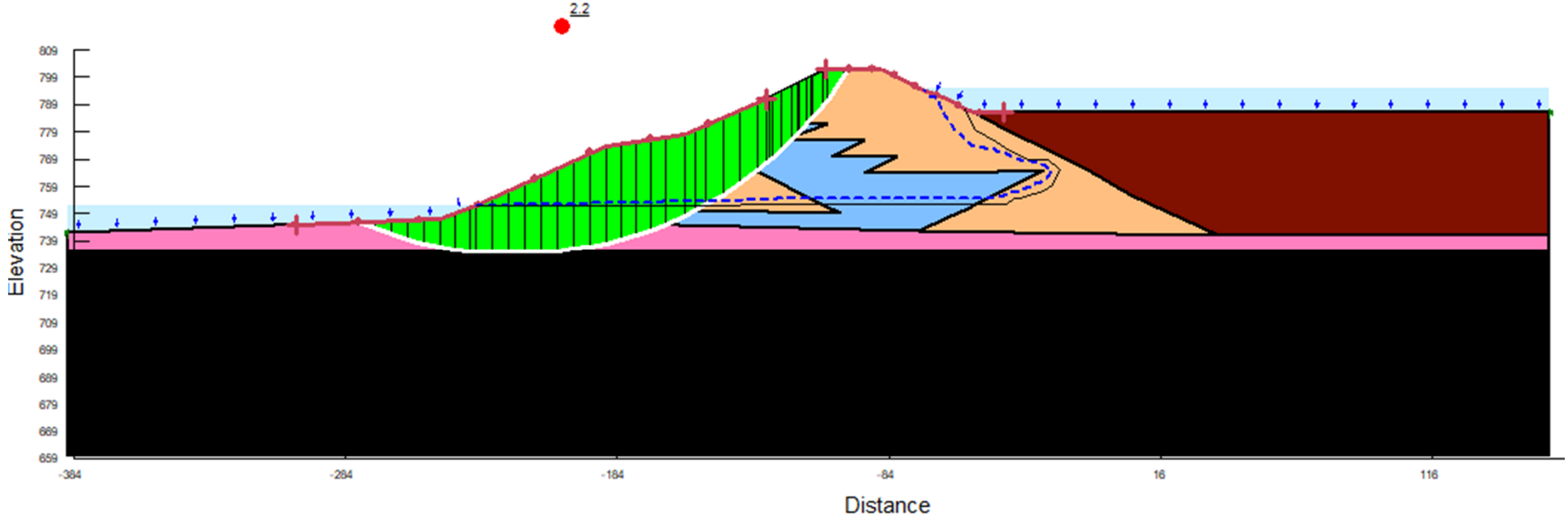
GeoStudio Modeling of NP2 Embankment Cross-Section C
Flood Pool Steady State Seepage, Static Loading, Slope Stability Model

Color	Name	Hydraulic Material Model	Sat Kx (ft/sec)	Ky/Kx Ratio	Rotation (°)	Volumetric Water Content	Compressibility (psf)
	Bedrock	(none)					
	Clay Embankment (Low Perm)	Saturated Only	1.65e-08	1	0	0.28	0
	Compacted Clay Embankment (Drained)	Saturated Only	1.65e-08	1	0	0.31	0
	Cycloned Sands	Saturated Only	3.94e-05	1	0	0.42	0
	In-Situ Foundation (Drained)	Saturated Only	2.26e-07	1	0	0.31	0
	Tailings (Drained)	Saturated Only	0.000492	0.0002	0	0.55	0



GeoStudio Modeling of NP2 Embankment Cross-Section E
Flood Pool Steady State Seepage Model

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Phi-B (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted Clay Embankment (Drained)	Mohr-Coulomb	135	513	27	0
	Cyclone Sands	Mohr-Coulomb	102	302	36	0
	In-Situ Foundation (Drained)	Mohr-Coulomb	141	14	32	0
	Tailings (Drained)	Mohr-Coulomb	105	0	35	0



Project No: 117-372636-25001

March 2026

GeoStudio Modeling of NP2 Embankment Cross-Section E
Flood Pool Steady State Seepage, Static Loading, Slope Stability Model

APPENDIX J:
Future Conditions Seepage and Stability Results

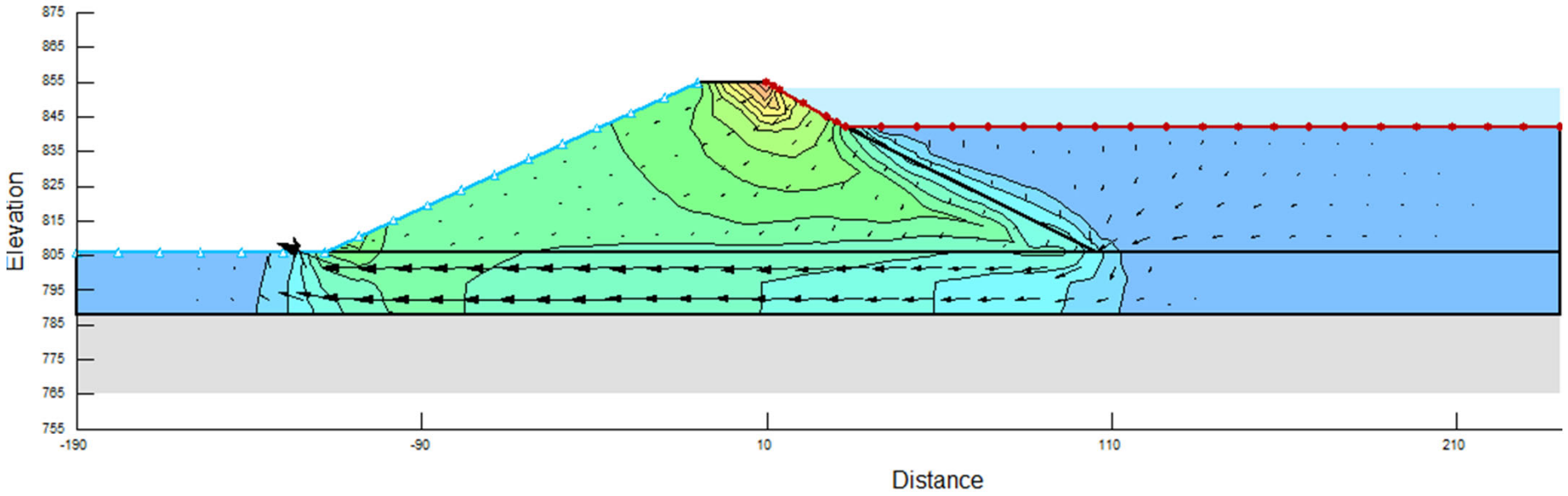
North Pond 1
Future Condition
Seepage and Stability Assessment

Project No: 117-372636-25001

March 2026

Normal Pool
Water Surface Elevation 853 ft amsl

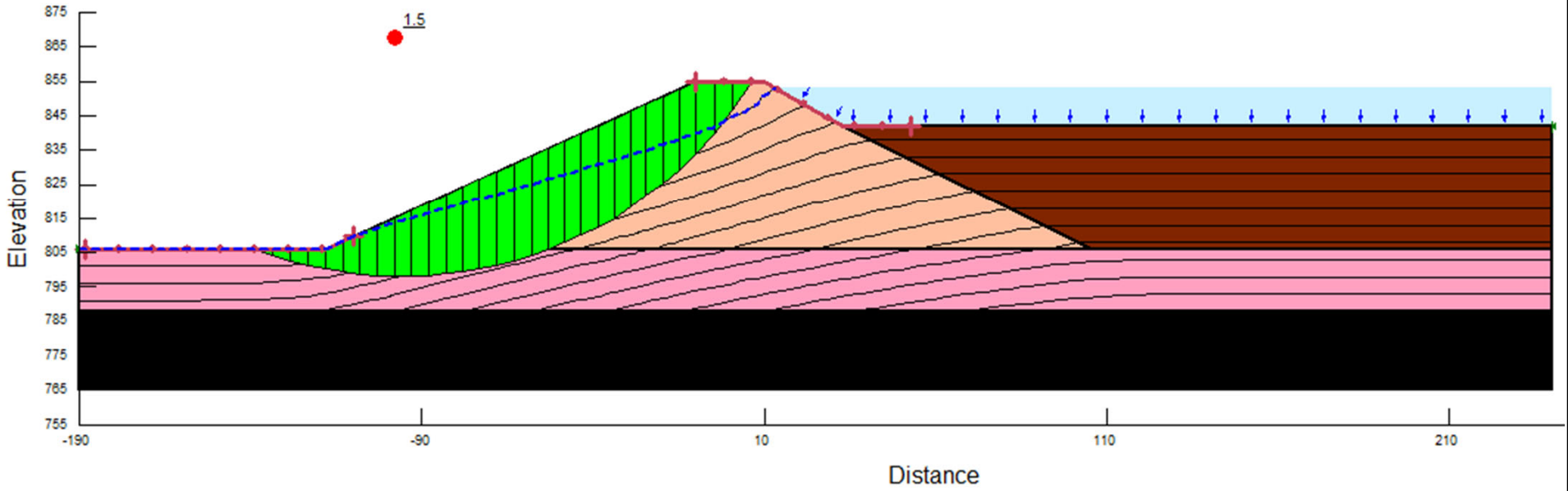
Color	Name	Hydraulic Material Model	Sat Kx (ft/sec)	Ky'/Kx' Ratio	Rotation (°)	Volumetric Water Content	Compressibility (/psf)
	Bedrock	(none)					
	Compacted Clay Embankment (Drained)	Saturated Only	1.65e-08	1	0	0.31	0
	In-situ Foundation (Drained)	Saturated Only	2.28e-07	1	0	0.31	0
	Tailings (Drained)	Saturated Only	0.000492	0.2	0	0.55	0



GeoStudio Modeling of NP1 Embankment Cross-Section K
Normal Pool Steady State Seepage Model

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Phi-B (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted Clay Embankment (Drained)	Mohr-Coulomb	135	513	27	0
	In-situ Foundation (Drained)	Mohr-Coulomb	141	14	32	0
	Tailings (Drained)	Mohr-Coulomb	105	0		

3.86543, 5.15693 in

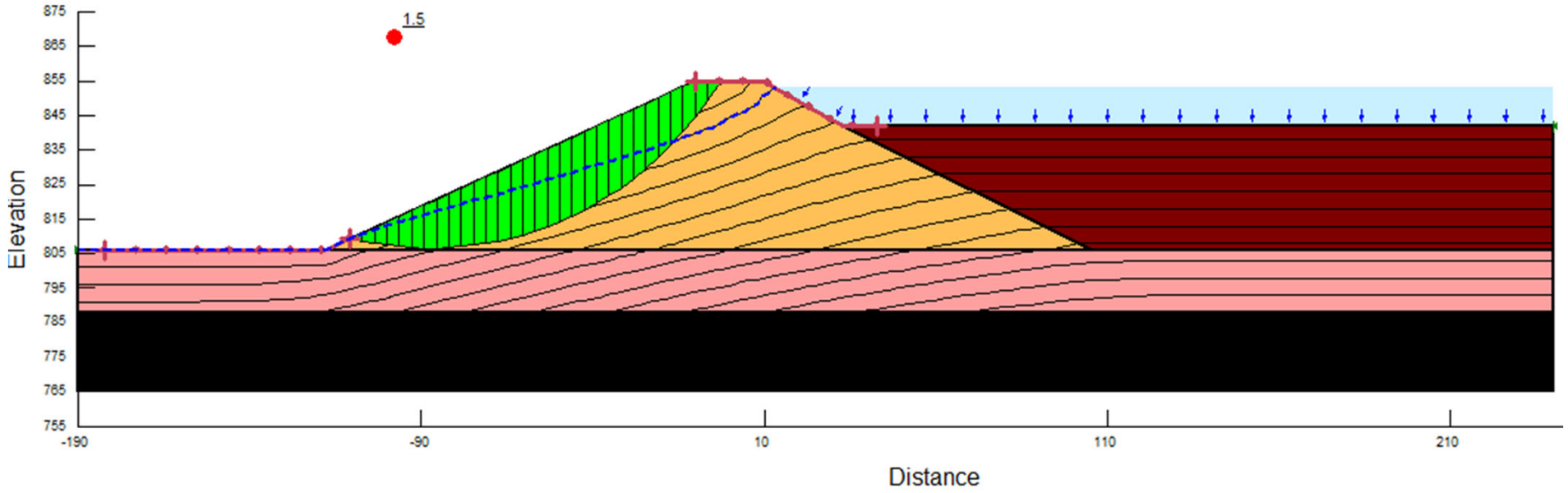


Project No: 117-372636-25001

March 2026

GeoStudio Modeling of NP1 Embankment Cross-Section K
Normal Pool Steady State Seepage, Static Loading, Slope Stability Model

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Phi-B (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted Clay Embankment (Undrained MC)	Mohr-Coulomb	135	482		
	In-Situ Foundation (Undrained MC)	Mohr-Coulomb	141	1,238	28	0
	Tailings (Undrained)	Mohr-Coulomb	105	0	30	0

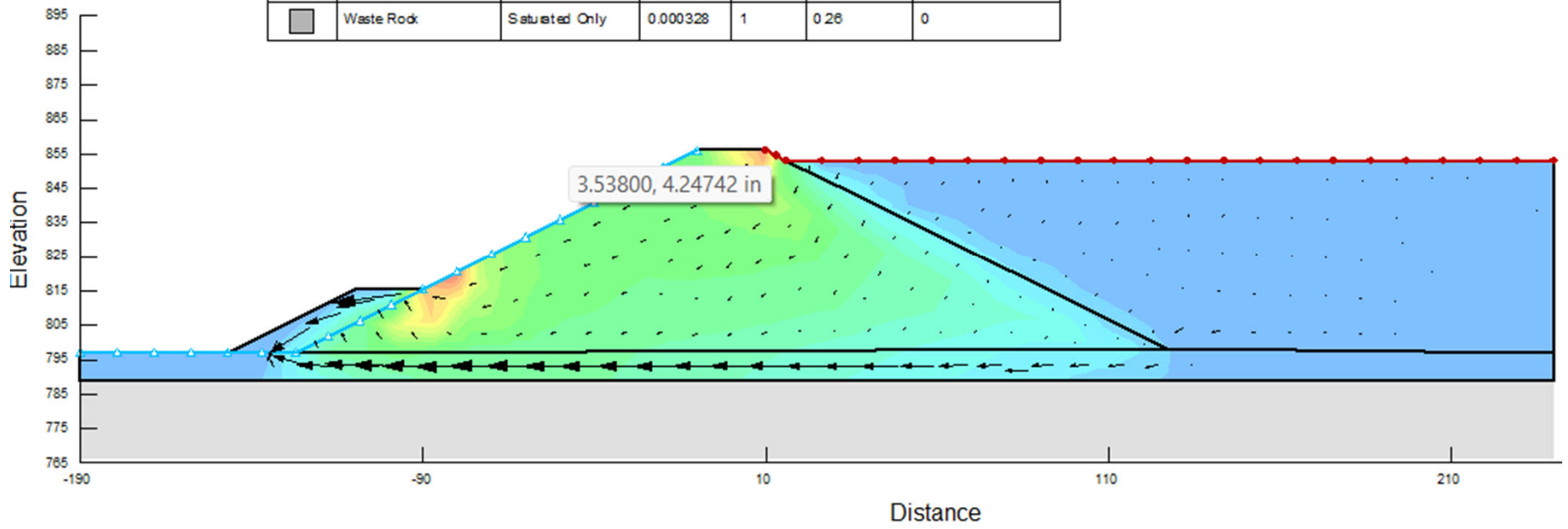


Project No: 117-372636-25001

March 2026

GeoStudio Modeling of NP1 Embankment Cross-Section K
Normal Pool Steady State Seepage, Pseudo Static Loading, Slope Stability Model

Color	Name	Hydraulic Material Model	Sat Kx (ft/sec)	Ky/Kx' Ratio	Volumetric Water Content	Compressibility (/psf)
	Bedrock	(none)				
	Compacted Clay Embankment (Drained)	Saturated Only	1.65e-08	1	0.31	0
	In-situ Foundation (Drained)	Saturated Only	2.28e-07	1	0.31	0
	Tailings (Drained)	Saturated Only	0.000492	0.2	0.55	0
	Waste Rock	Saturated Only	0.000328	1	0.26	0

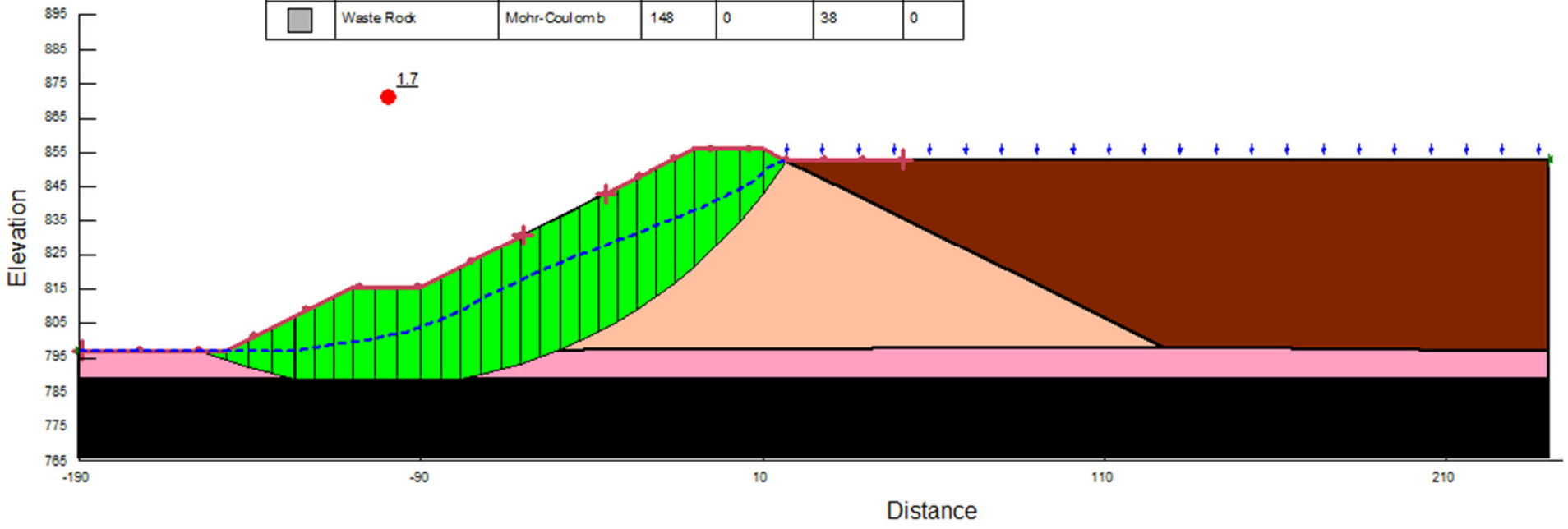


Project No: 117-372636-25001

March 2026

GeoStudio Modeling of NP1 Embankment Cross-Section M With Buttress
Normal Pool Steady State Seepage Model

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Phi-B (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted Clay Embankment (Drained)	Mohr-Coulomb	135	513	27	0
	In-situ Foundation (Drained)	Mohr-Coulomb	141	14	32	0
	Tailings (Drained)	Mohr-Coulomb	105	0	35	0
	Waste Rock	Mohr-Coulomb	148	0	38	0

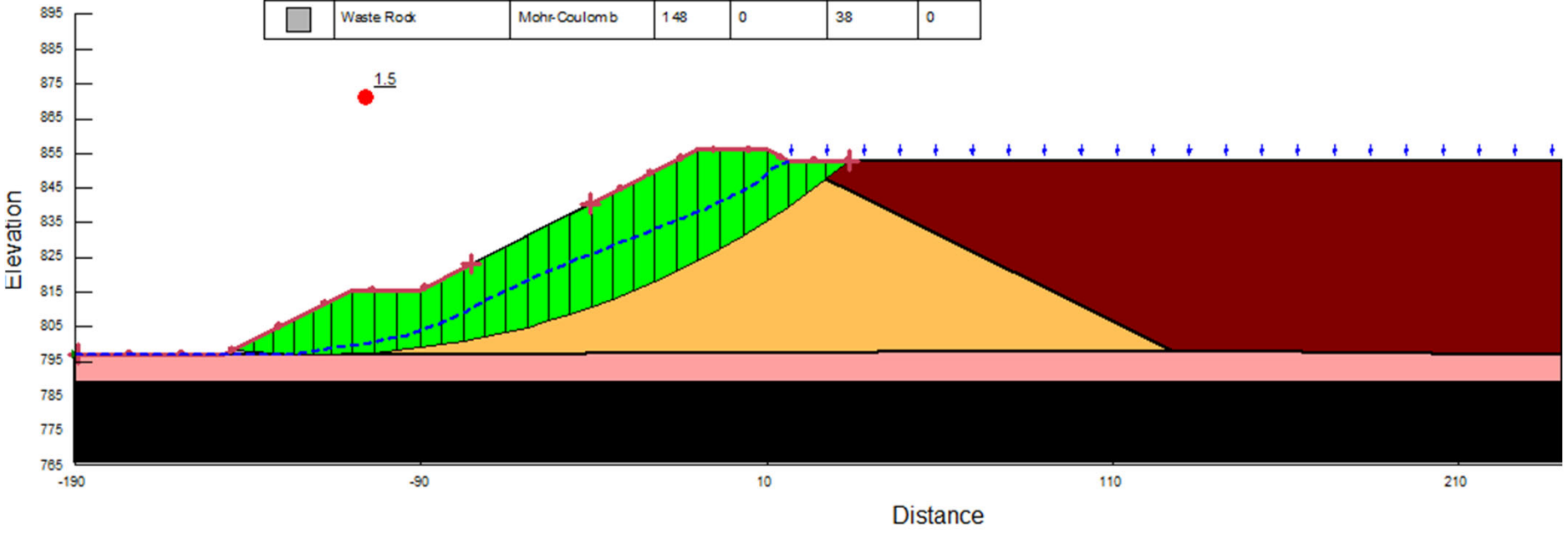


Project No: 117-372636-25001

March 2026

GeoStudio Modeling of NP1 Embankment Cross-Section M with Buttress
Normal Pool Steady State Seepage, Static Loading, Slope Stability Model

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Phi-B (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted Clay Embankment (Undrained MC)	Mohr-Coulomb	135	482	23	0
	In-Situ Foundation (Undrained MC)	Mohr-Coulomb	141	1238	28	0
	Tailings (Undrained)	Mohr-Coulomb	105	0	30	0
	Waste Rock	Mohr-Coulomb	148	0	38	0

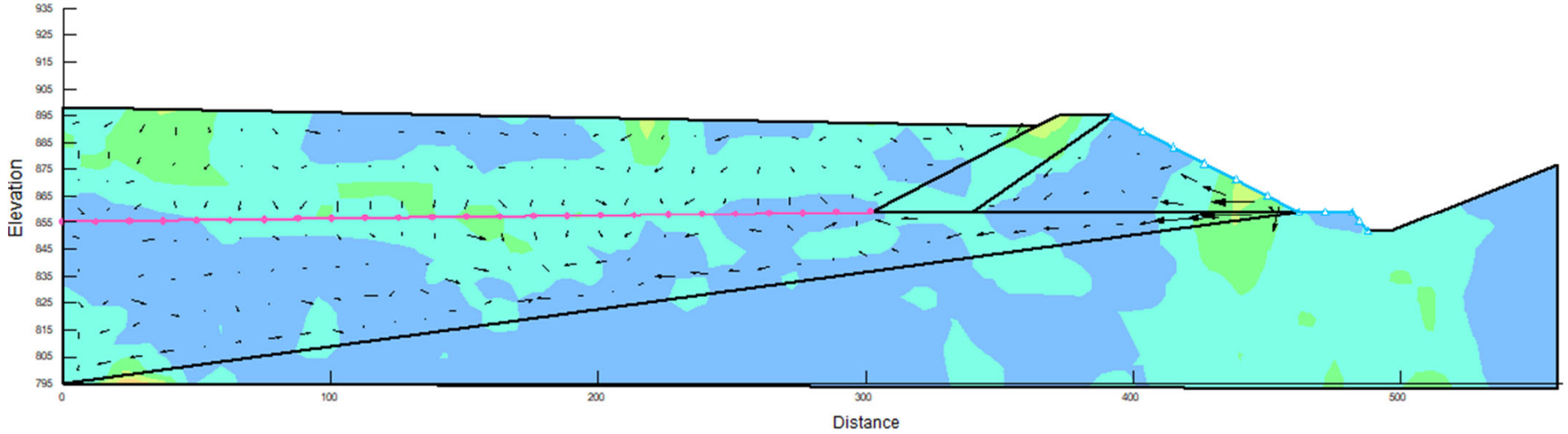


Project No: 117-372636-25001

March 2026

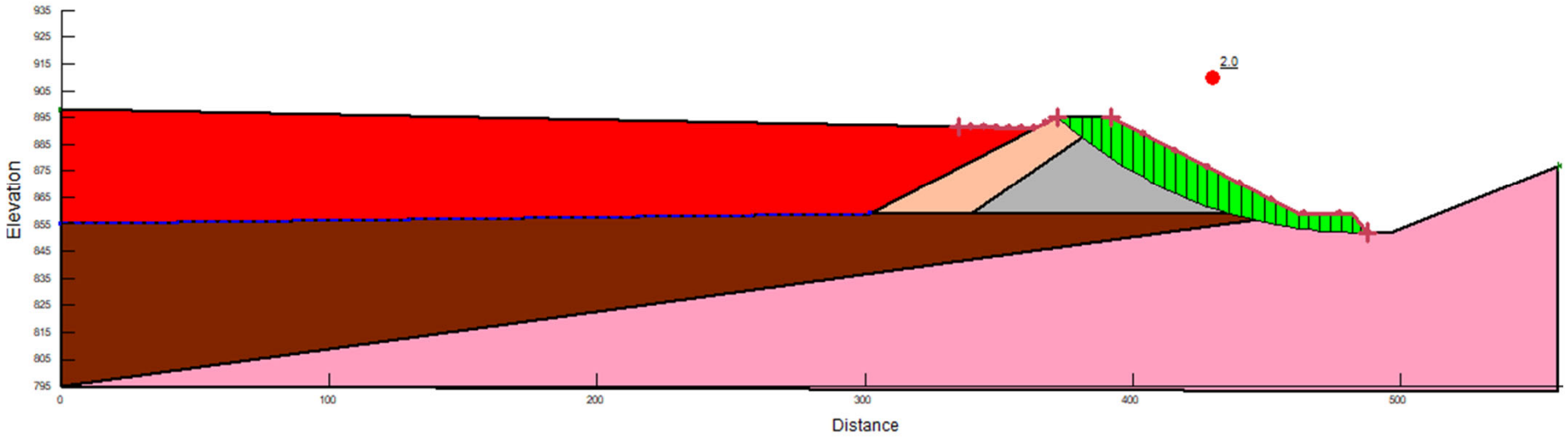
GeoStudio Modeling of NP1 Embankment Cross-Section M With Buttress
Normal Pool Steady State Seepage, Pseudo Static Loading, Slope Stability Model

Color	Name	Hydraulic Material Model	Sat Kx (ft/sec)	Ky/Kx' Ratio	Rotation (°)	Volumetric Water Content	Compressibility (/psf)
	Clay Stockpile (Drained)	Saturated Only	8.86e-07	1	0	0.28	0
	In-situ Foundation (Drained)	Saturated Only	2.28e-07	1	0	0.31	0
	Tailings (Drained)	Saturated Only	0.000492	0.2	0	0.55	0
	Thickened Tailings (Drained)	Saturated Only	0.00041	0.2	0	0.46	0
	Waste Rock	Saturated Only	0.000328	1	0	0.26	0



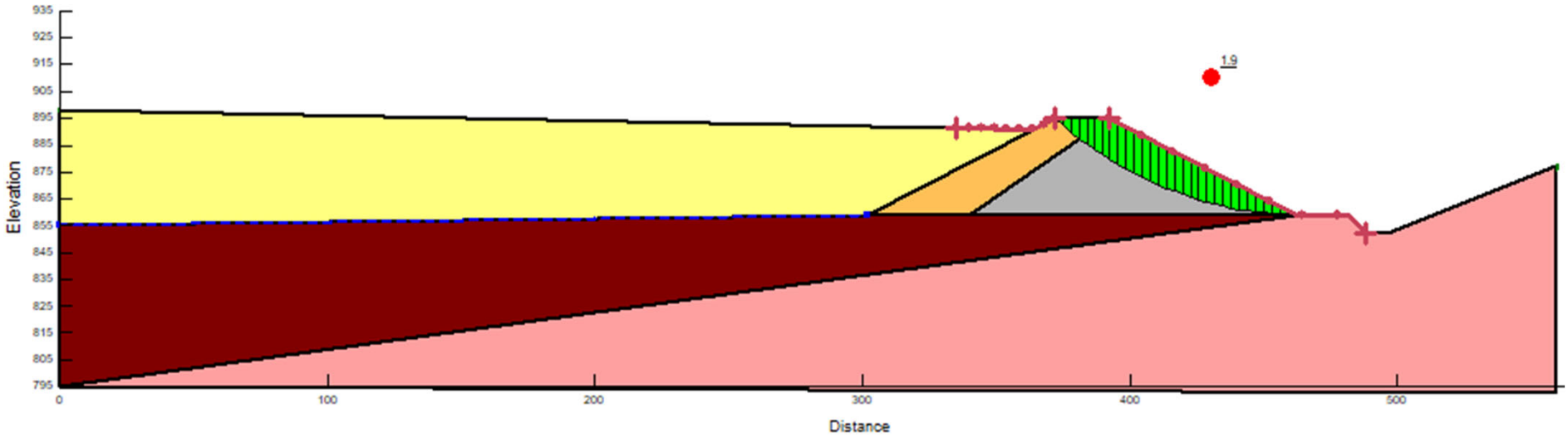
GeoStudio Modeling of NP1 South Containment Embankment
Normal Pool Steady State Seepage Model

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Phi-B (°)	Piezometric Surface
	Compacted Clay Embankment (Drained)	Mohr-Coulomb	135	513	27	0	1
	In-situ Foundation (Drained)	Mohr-Coulomb	141	14	32	0	1
	Tailings (Drained)	Mohr-Coulomb	105	0	35	0	1
	Thickened Tailings (Drained)	Mohr-Coulomb	107	0	35	0	1
	Waste Rock	Mohr-Coulomb	148	0	38	0	1



GeoStudio Modeling of NP1 South Containment Embankment Normal Pool Steady State Seepage, Static Loading, Slope Stability Model

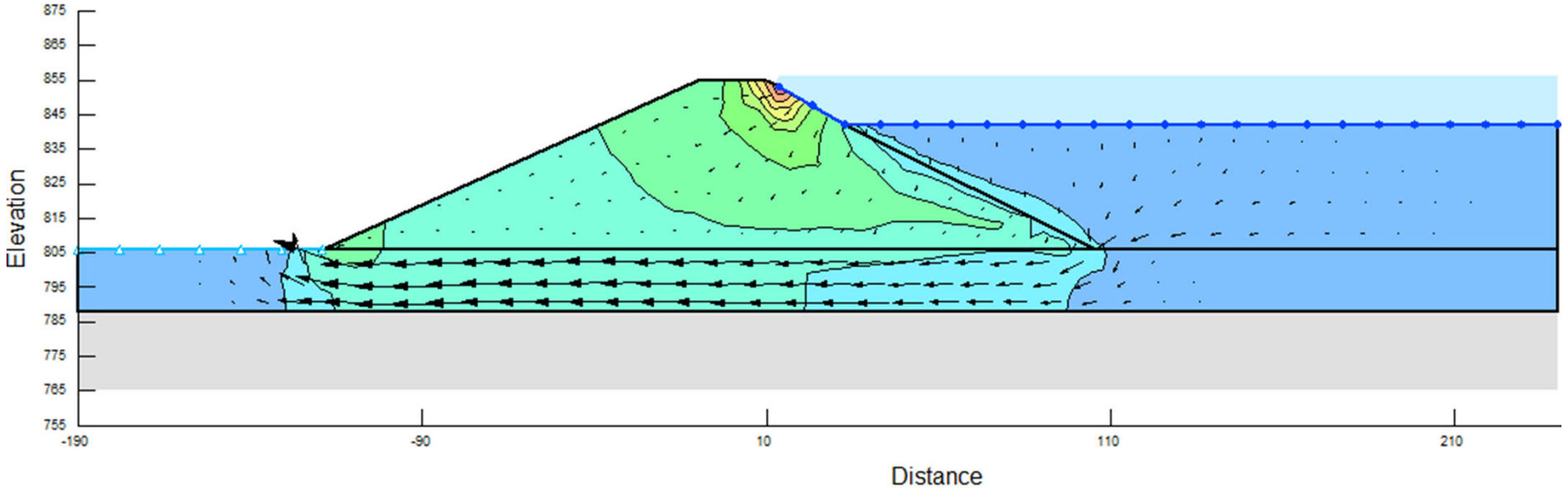
Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Phi-B (°)	Piezometric Surface
	Compacted Clay Embankment (Undrained MC)	Mohr-Coulomb	135	482	23	0	1
	In Situ Foundation (Undrained MC)	Mohr-Coulomb	141	1,238	28	0	1
	Tailings (Undrained)	Mohr-Coulomb	105	0	30	0	1
	Thickened Tailings (Undrained)	Mohr-Coulomb	107	0	30	0	1
	Waste Rock	Mohr-Coulomb	148	0	38	0	1



GeoStudio Modeling of NP1 South Containment Embankment Normal Pool Steady State Seepage, Pseudo Static Loading, Slope Stability Model

Flood Pool
Water Surface Elevation 856 ft amsl

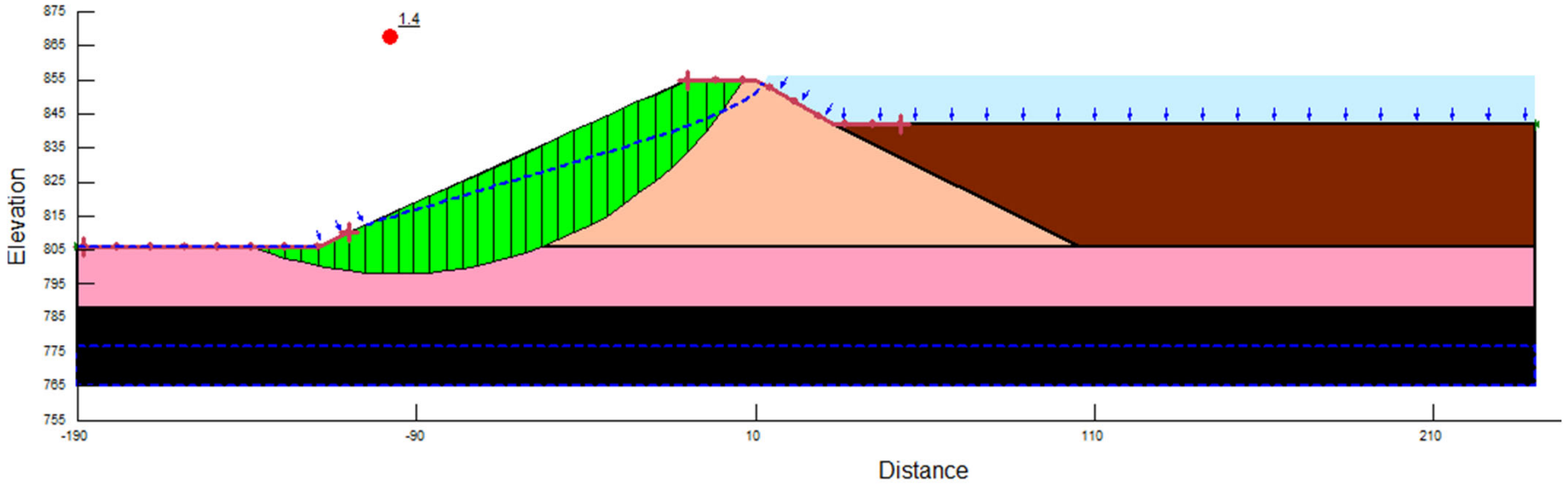
Color	Name	Hydraulic Material Model	Sat Kx (ft/sec)	Ky'/Kx' Ratio	Rotation (°)	Volumetric Water Content	Compressibility (/psf)
	Bedrock	(none)					
	Compacted Clay Embankment (Drained)	Saturated Only	1.65e-08	1	0	0.31	0
	In-situ Foundation (Drained)	Saturated Only	2.28e-07	1	0	0.31	0
	Tailings (Drained)	Saturated Only	0.000492	0.2	0	0.55	0



GeoStudio Modeling of North No. 1 Embankment Cross-Section K
Flood Pool Steady State Seepage Model

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Phi-B (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted Clay Embankment (Dra	Mohr-Coulomb	135	513	27	0
	In-situ Foundation (Drained)	Mohr-Coulomb	141	14	32	0
	Tailings (Drained)	Mohr-Coulomb	105	0	35	0

1.53708, 5.74357 in

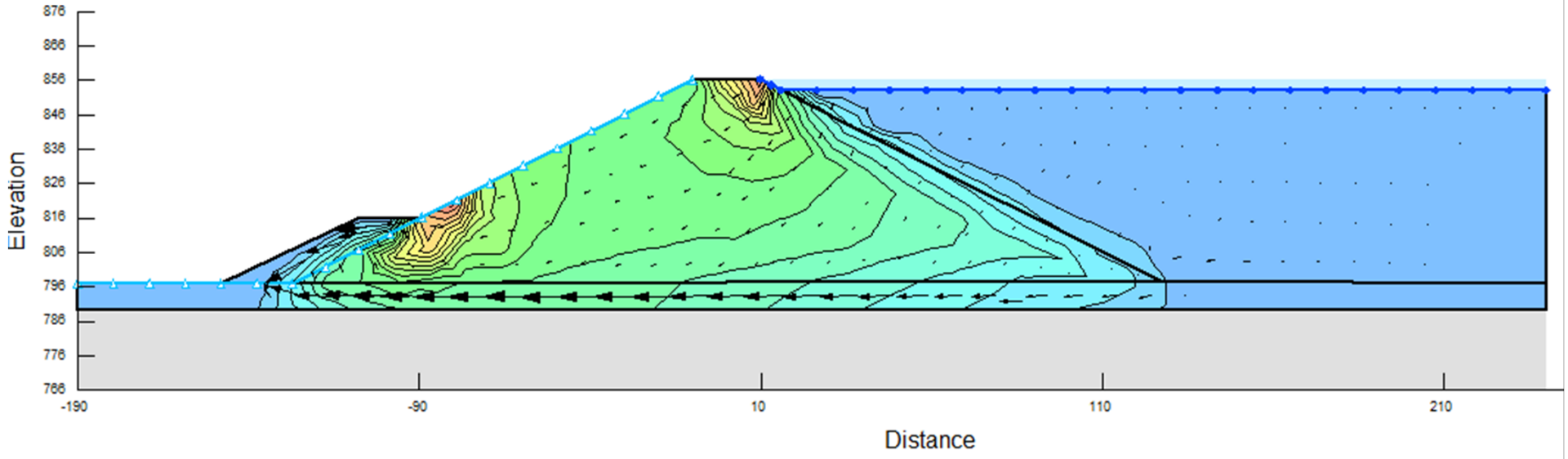


Project No: 117-372636-25001

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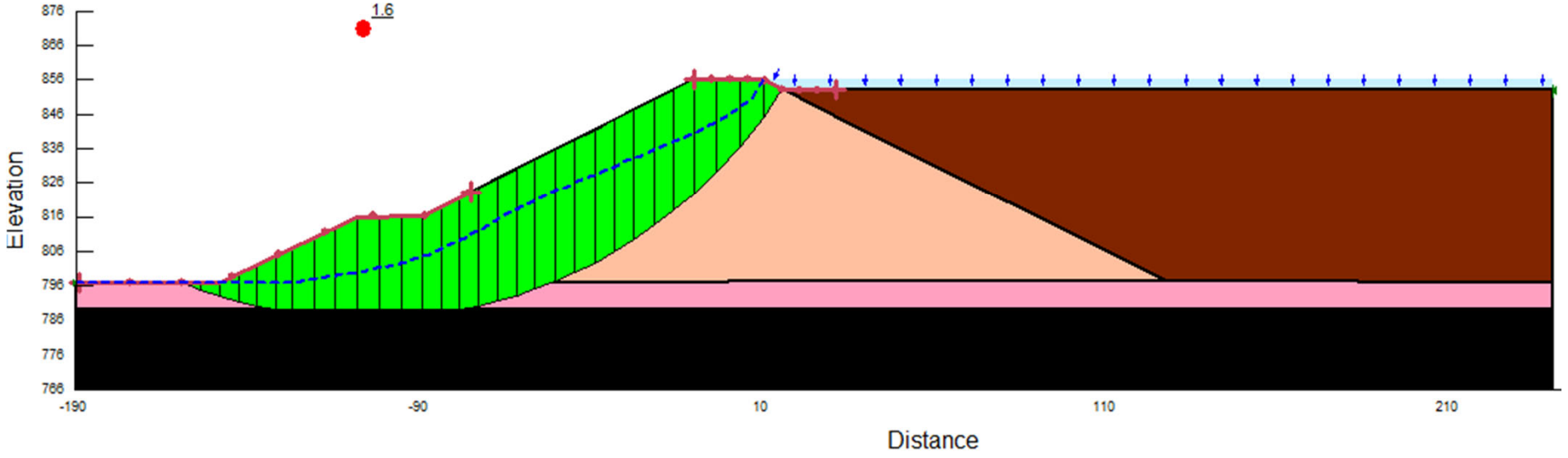
GeoStudio Modeling of NP1 Embankment Cross-Section K
Flood Pool Steady State Seepage, Static Loading, Slope Stability Model

Color	Name	Hydraulic Material Model	Sat Kx (ft/sec)	Ky/Kx' Ratio	Volumetric Water Content	Compressibility (/psf)
	Bedrock	(none)				
	Compacted Clay Embankment (Drained)	Saturated Only	1.65e-08	1	0.31	0
	In-situ Foundation (Drained)	Saturated Only	2.28e-07	1	0.31	0
	Tailings (Drained)	Saturated Only	0.000492	0.2	0.55	0
	Waste Rock	Saturated Only	0.000328	1	0.26	0



GeoStudio Modeling of North No. 1 Embankment Cross-Section M Buttressed Flood Pool Steady State Seepage Model

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Phi-B (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted Clay Embankment (Drained)	Mohr-Coulomb	135	513	27	0
	In-situ Foundation (Drained)	Mohr-Coulomb	141	14	32	0
	Tailings (Drained)	Mohr-Coulomb	105	0	35	0
	Waste Rock	Mohr-Coulomb	148	0	38	0



GeoStudio Modeling of NP1 Embankment Cross-Section M Buttressed Flood Pool Steady State Seepage, Static Loading, Slope Stability Model

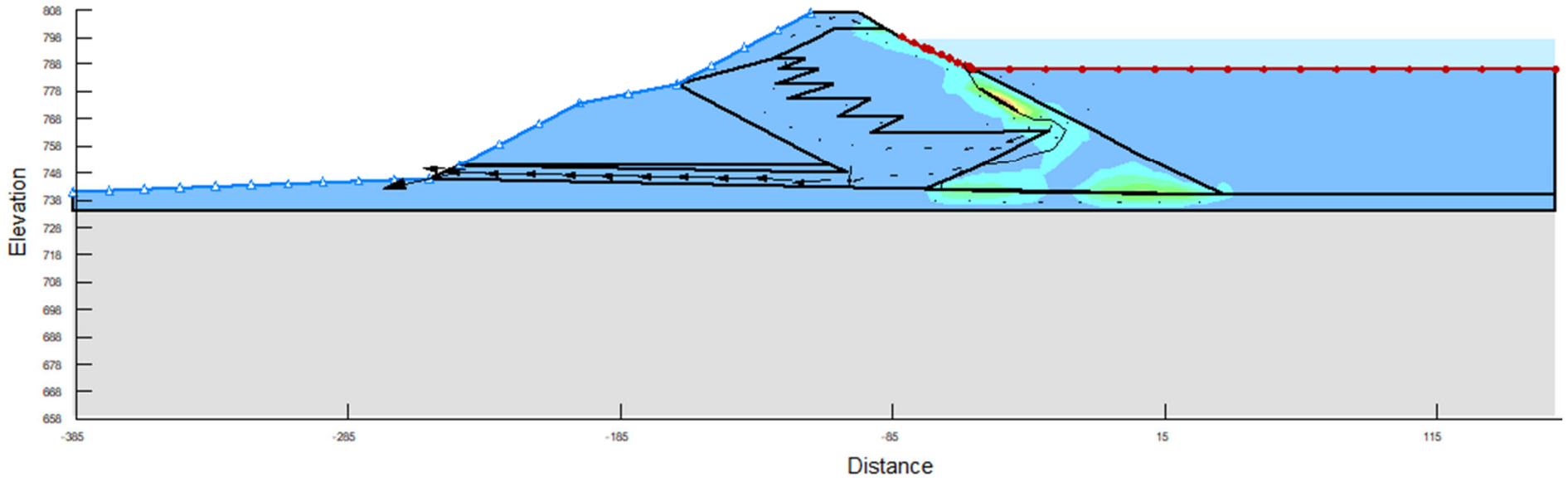
North Pond 2
Future Conditions
Seepage and Stability Assessment

Project No: 117-372636-25001

March 2026

Normal Pool
Water Surface Elevation 797 ft amsl

Color	Name	Hydraulic Material Model	Sat Kx (ft/sec)	Ky'/Kx' Ratio	Rotation (°)	Volumetric Water Content	Compressibility (/psf)
	Bedrock	(none)					
	Clay Embankment (Low Perm)	Saturated Only	5.25e-10	1	0	0.28	0
	Compacted Clay Embankment (Drained)	Saturated Only	1.65e-08	1	0	0.31	0
	Cycloned Sands	Saturated Only	3.94e-05	1	0	0.42	0
	In-Situ Foundation (Drained)	Saturated Only	2.28e-07	1	0	0.31	0
	South Pond Borrow	Saturated Only	8.86e-07	1	0	0.28	0
	Tailings (Drained)	Saturated Only	0.000492	0.2	0	0.55	0

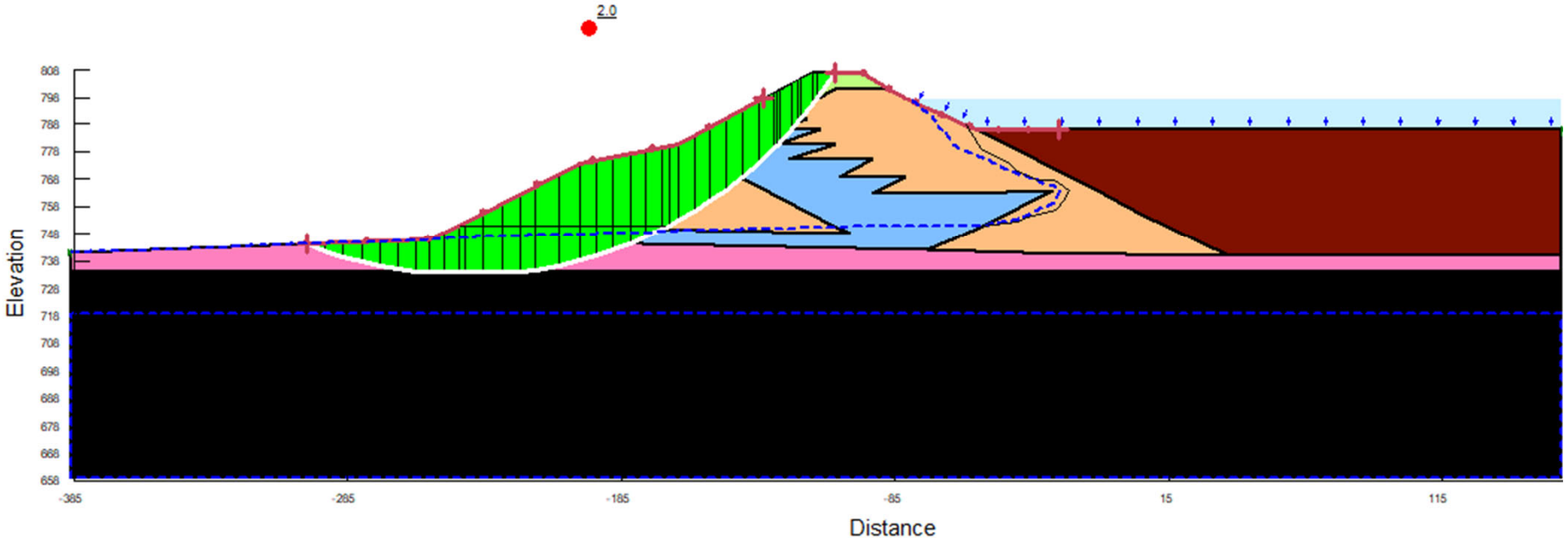


Project No: 117-372636-25001

March 2026

GeoStudio Modeling of NP2 Embankment Cross-Section C
Normal Pool Steady State Seepage Model

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Phi-B (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted Clay Embankment (Drained)	Mohr-Coulomb	135	513	27	0
	Cycloned Sands	Mohr-Coulomb	102	302	36	0
	In-Situ Foundation (Drained)	Mohr-Coulomb	141	14	32	0
	South Pond Borrow	Mohr-Coulomb	138	204	32	0
	Tailings (Drained)	Mohr-Coulomb	105	0	35	0

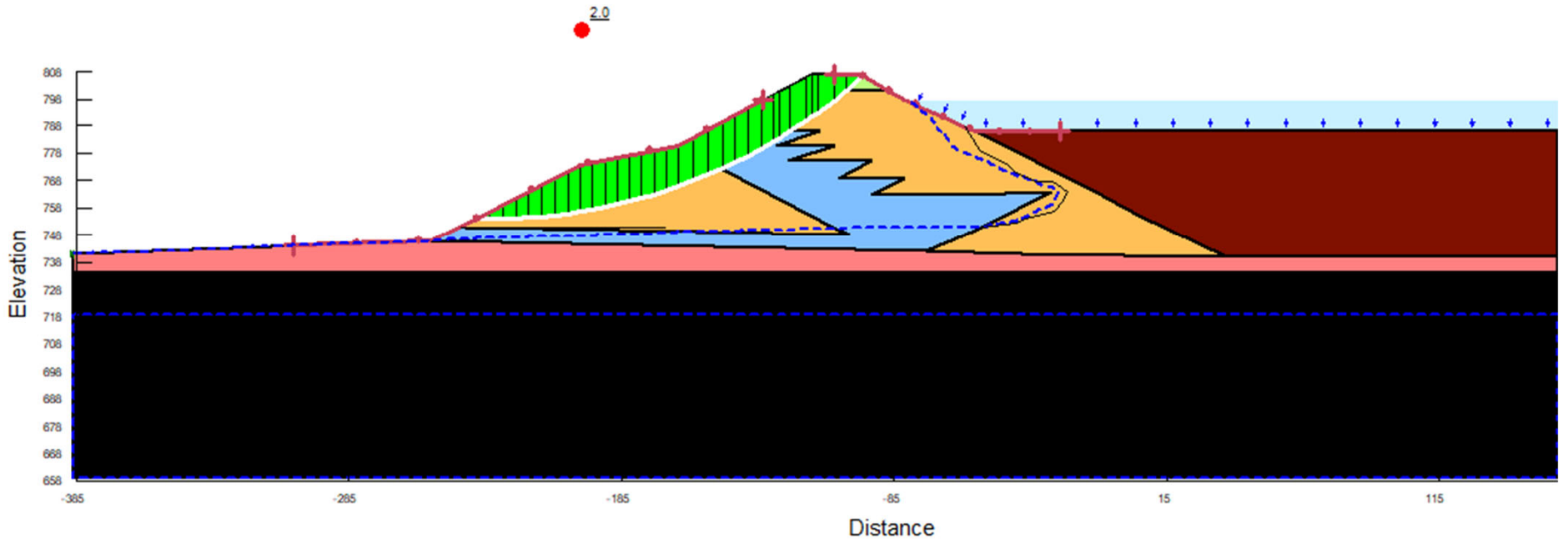


Project No: 117-372636-25001

March 2026

GeoStudio Modeling of NP2 Embankment Cross-Section C
Normal Pool Steady State Seepage, Static Loading, Slope Stability Model

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Phi-B (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted Clay Embankment (Undrained)	Mohr-Coulomb	135	482	23	0
	Cycloned Sands	Mohr-Coulomb	102	302	36	0
	In-Situ Foundation (Undrained)	Mohr-Coulomb	141	1,238	28	0
	South Pond Borrow	Mohr-Coulomb	138	204	32	0
	Tailings (Drained)	Mohr-Coulomb	105	0	35	0



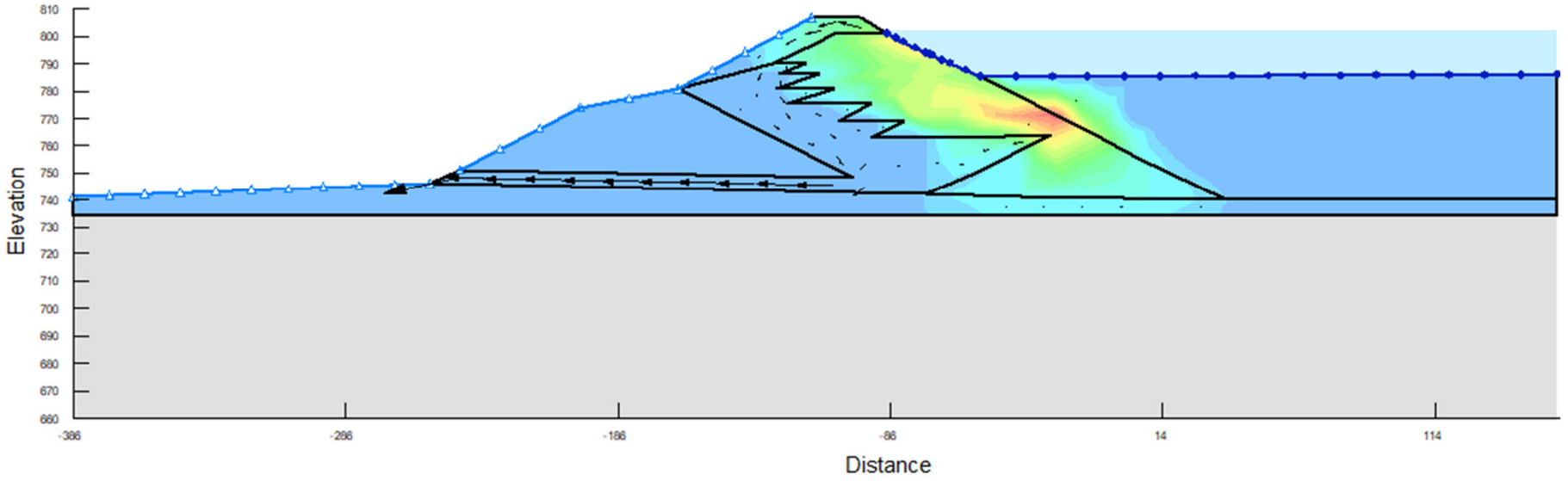
Project No: 117-372636-25001

March 2026

GeoStudio Modeling of NP2 Embankment Cross-Section C
Normal Pool Steady State Seepage, Pseudo Static Loading, Slope Stability Model

Flood Pool
Water Surface Elevation 802 ft amsl

Color	Name	Hydraulic Material Model	Sat Kx (ft/sec)	Ky/Kx' Ratio	Rotation (°)	Volumetric Water Content	Compressibility (psf)
	Bedrock	(none)					
	Compacted Clay Embankment (Drained)	Saturated Only	1.65e-08	1	0	0.31	0
	Cycloned Sands	Saturated Only	3.94e-05	1	0	0.42	0
	In-Situ Foundation (Drained)	Saturated Only	2.26e-07	1	0	0.31	0
	South Pond Borrow	Saturated Only	8.86e-07	1	0	0.26	0
	Tailings (Drained)	Saturated Only	0.000492	0.2	0	0.55	0

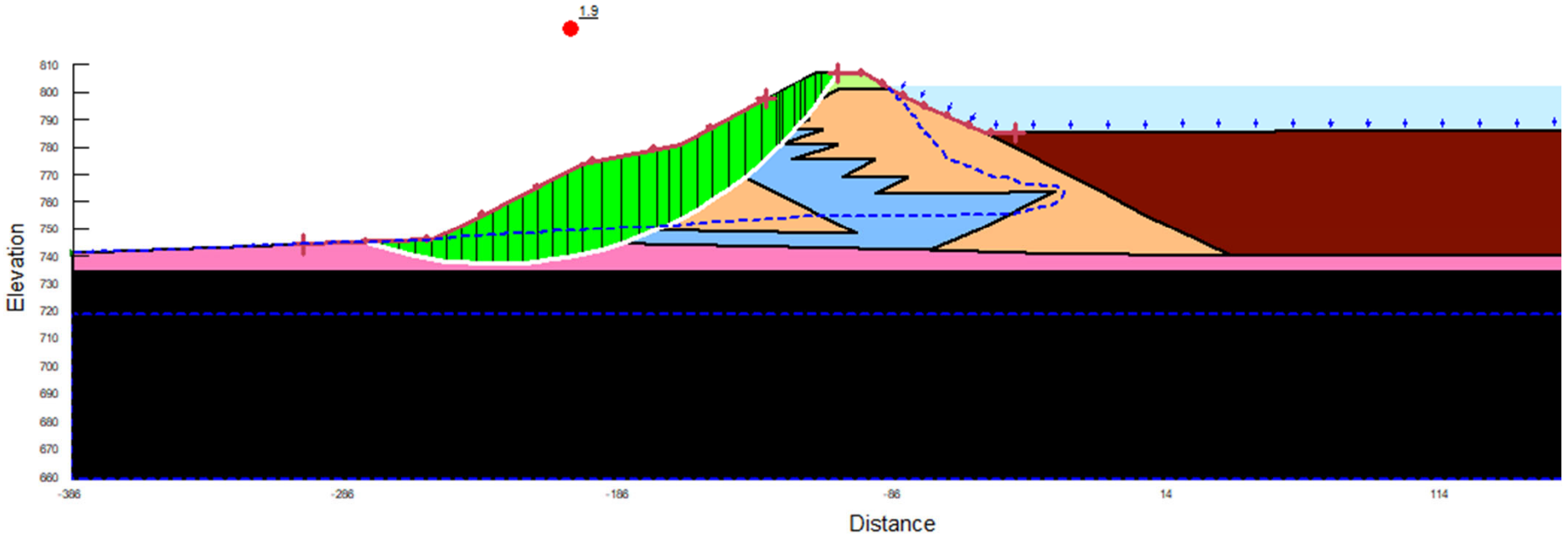


Project No: 117-372636-25001

March 2026

GeoStudio Modeling of NP2 Embankment Cross-Section C
Flood Pool Steady State Seepage Model

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Rhi-B (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted Clay Embankment (Drained)	Mohr-Coulomb	135	513	27	0
	Cycloned Sands	Mohr-Coulomb	102	302	36	0
	In-Situ Foundation (Drained)	Mohr-Coulomb	141	14	32	0
	South Pond Borrow	Mohr-Coulomb	138	204	32	0
	Tailings (Drained)	Mohr-Coulomb	105	0	35	0



GeoStudio Modeling of NP2 Embankment Cross-Section C
Flood Pool Steady State Seepage, Static Loading, Slope Stability Model

APPENDIX K:
Seepage Assessment Calculations

Embankment Seepage Calculations

White Pine Mine LLC
North No. 1 Seepage Analysis

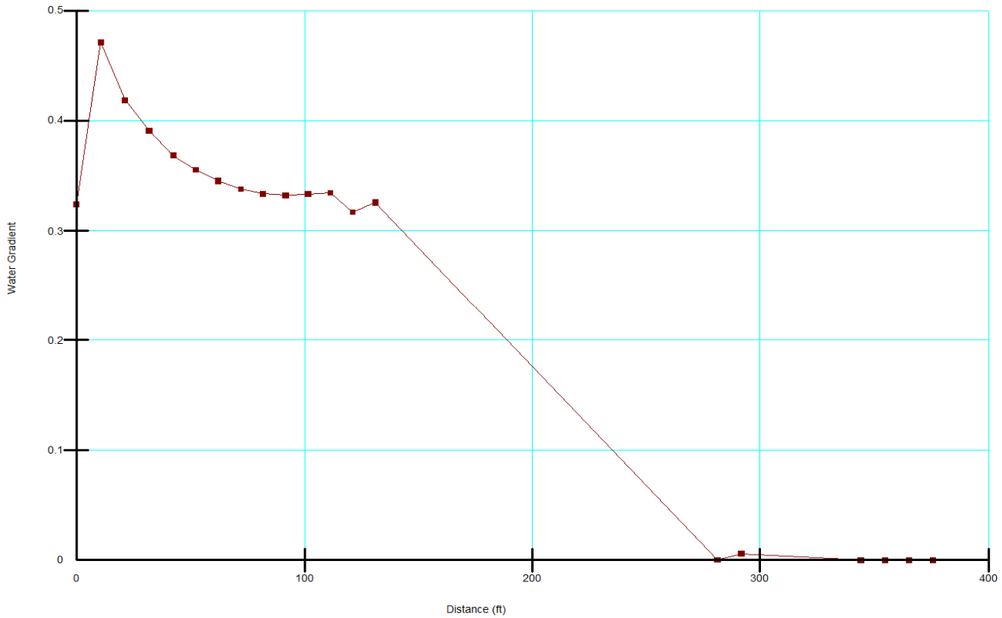
117-372636-25001
9-Mar-26

density of water, ρw 62.4 pcf

Maximum Section

Gs	2.71	Average of all specific gravity test results
e	0.45	calculated using ρd = 116.85 pcf based moisture density relationships assuming 90% of MDD
ρsat	136.2	pcf, calculated using Gs, ρw, and e
ρsub	73.8	pcf, calculated using ρs and ρw
i_{cr}	1.18	calculated using γbuyoant and γw
maximum y-gradient from model	0.46	from chart, placed to right

FS	**2.6**



1. Calculate void ratio (*e*) using dry density (ρd), specific gravity (Gs), and density of water (ρw)

$$\rho d = \left(\frac{Gs * \rho w}{1 + e}\right)$$

Rearrange to

$$e = \left(\frac{Gs * \rho w}{\rho d}\right) - 1$$

2. Calculate saturated density (ρs), using Gs, e, and ρw

$$\rho s = \left(\frac{Gs + e}{1 + e}\right) * \rho w$$

3. Calculate buoyant density (ρb) using ρs and ρw

$$\rho b = \rho s - \rho_w$$

4. Calculate critical hydraulic gradient (i_{cr}) using ρb and ρw

$$icr = \frac{\rho b}{\rho w}$$

5. Calculate factor of safety (FS) using i_{cr} and maximum y-gradient or xy-gradient output from GeoStudio model

$$FS = \frac{icr}{ygradient}$$

White Pine Mine LLC
North No. 2 Seepage Analysis

117-372636-25001
9-Mar-26

density of water, ρw 62.4 pcf

Maximum Section

Gs	2.71	Average of all specific gravity test results
e	0.37	calculated using ρd = 123
ρsat	140.0	pcf, calculated using Gs, ρw, and e
ρsub	77.6	pcf, calculated using ρs and ρw
i_{cr}	1.24	calculated using γbuyoant and γw
maximum x-gradient from model	0.51	from chart, placed to right

FS	**2.44**

1. Calculate void ratio (e) using dry density (ρ_d), specific gravity (Gs), and density of water (ρ_w)

$$\rho d = \left(\frac{Gs * \rho w}{1+e}\right)$$

Rearrange to

$$e = \left(\frac{Gs * \rho w}{\rho d}\right) - 1$$

2. Calculate saturated density (ρ_s), using Gs, e, and ρ_w

$$\rho s = \left(\frac{Gs + e}{1+e}\right) * \rho w$$

3. Calculate buoyant density (ρ_b) using ρ_s and ρ_w

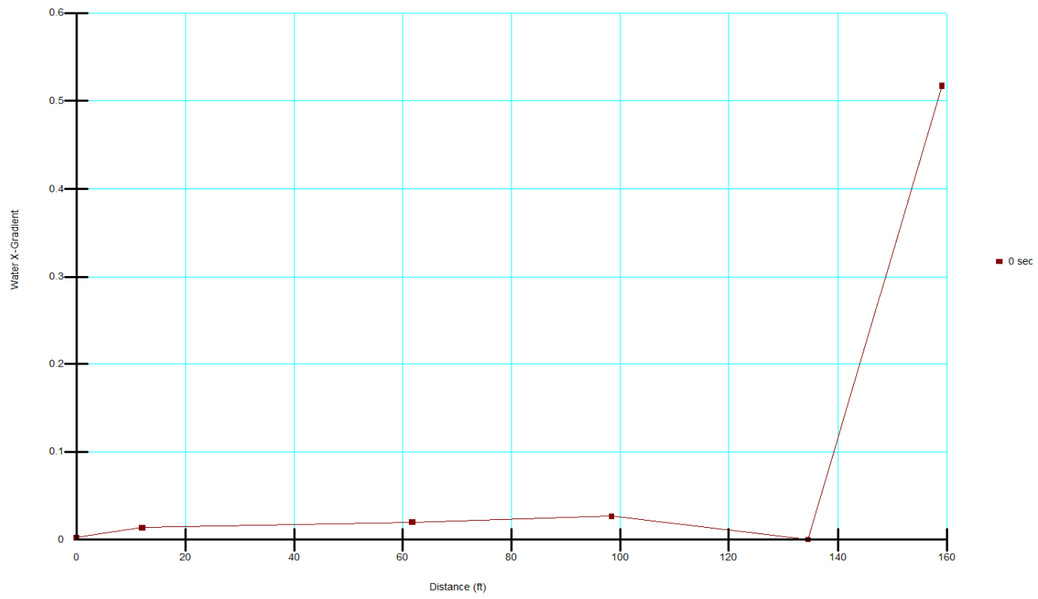
$$\rho b = \rho s - \rho_w$$

4. Calculate critical hydraulic gradient (i_{cr}) using ρ_b and ρ_w

$$icr = \frac{\rho b}{\rho w}$$

5. Calculate factor of safety (FS) using i_{cr} and maximum y-gradient or xy-gradient output from GeoStudio model

$$FS = \frac{icr}{ygradient}$$



Appendix L
Mine Subsidence Impact Assessment

TETRA TECH

Memo

To:	For File
From:	Chad Tomlinson and Guy Roemer
Date:	7/27/2026
Subject:	Evaluation of White Pine North Mine Subsidence on Tailings Storage Facility, Groundwater Wells, and Neighboring Surface Structures

Introduction

White Pine Copper, LLC (WPC) has engaged WSP to evaluate the potential extent of bedrock subsidence due to the White Pine North (WPN) mine workings. Based on a review of WSP's WPN Bedrock Deflection Assessment (WSP, 2026), subsidence at the top of the bedrock was modeled to be a maximum of ~6 to 7 mm (0.28 inches). The subsidence contouring based on WSP's modeling overlaid onto a site map of the mine and adjacent properties are presented in **Figure 1.** As shown in **Figure 1**, the mine infrastructure, including the tailings disposal facilities (TDFs) is outside of the modeled area of maximum subsidence.

WPC has requested that Tetra Tech evaluate the potential impacts from this subsidence on surface and near surface onsite (mine) and adjacent offsite infrastructure. A more conservative 2 cm (0.78 in) of subsidence was used in this analysis to assess the potential impacts to surface infrastructure including:

- TDFs.
- Neighboring offsite foundations.
- Groundwater wells.

Due to the de minimis estimated subsidence at the top of the bedrock (directly below the overburden), additional modeling was not conducted by Tetra Tech to predict how the estimated bedrock subsidence will propagate to the surface due to the limitations regarding accuracy of analytical methods and models. Although some attenuation of subsidence is expected, this evaluation assumes the full subsidence of 2 cm will propagate to the surface. To put the estimated surface subsidence into context, typical tolerances set forth by the United States Department of Agriculture (USDA) for earthworks allow for gradual changes of plus or minus 9.1 cm (3.6 inches) from plan and grade for finished fill slopes and plus 3 cm (1.2 inches) for top of fills for dams, dikes, and levees (USDA, 2025). These industry accepted tolerances are greater than the predicted subsidence 2 cm (0.78 inches).

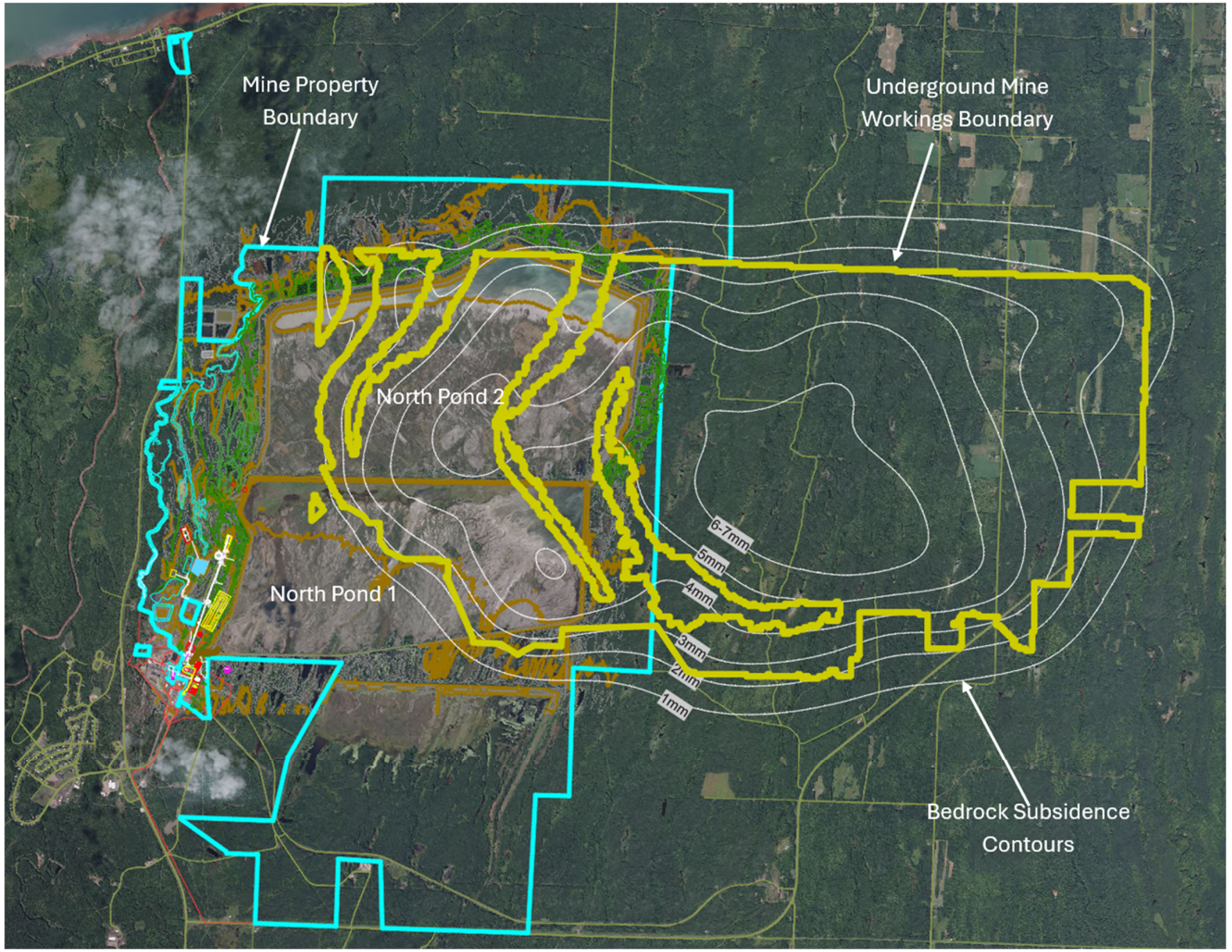


Figure 1: Site Map of Predict Subsidence Contours

Potential Impacts on Tailings Disposal Facilities

The impact/damage to the TDFs embankments caused by surface displacement can be viewed as analogous to the damage caused to an embankment as a result of embankment deformation caused by a seismic event. Based on embankment height of the TDFs ranging from 25 to 50 feet, the maximum predicted 2 cm (0.78 in) of surface displacement would equate to a relative crest settlement (based predicted subsidence divided by total embankment height) of between 0.26% to 0.13%. **Figure 2** below describes relative crest settlement between this range as between damage class 1 and 2, "Minor to Moderate" with a maximum longitudinal crack width between 10 to 80 mm (approximately 0.39 to 3.15 inches) and relative crest settlement of between 0.03 and 0.5 percent . Therefore, there is a minimal risk to the TDFs due to mine subsidence.

Damage Class		Maximum Longitudinal Crack Width (1) mm	Maximum Relative Crest Settlement (2) %
Number	Description		
0	No or Slight	< 10 mm	<0.03
1	Minor	10 - 30	0.03 - 0.2
2	Moderate	30 - 80	0.2 - 0.5
3	Major	80 - 150	0.5 - 1.5
4	Severe	150 - 500	1.5 - 5

(1) Maximum crack width is taken as the maximum width, in millimetres, of any longitudinal cracking that occurs.
(2) Maximum relative crest settlement is expressed as a percentage of the structural dam height.

Figure 2: Cracking and Settlement by Damage Class (Table 5.36 from Pells and Fell, 2003)

Potential Impacts on Surface Infrastructure

Differential settlement is the uneven settlement of a building's foundation, while uniform settlement is defined as settlement that occurs evenly over the foundation of a structure. Differential settlement and the associated angle distortion across a structure, opposed to the total settlement, is the primary concern when evaluating the potential settlement impact on a structure. In the case of the White Pine North Mine, if settlement, as a result of subsidence, were to occur to offsite structures, it is highly likely that it would occur uniformly across the structure; and therefore, would not result in appreciable differential settlement and therefore would not increase the stress conditions in the building. Although uniform settlement is expected to occur, the WSP WPN Bedrock Deflection Assessment (WSP, 2026), included modeling of horizontal strain (i.e. lateral stretching or compression) and angular distortion (i.e. twisting or tilting) at the bedrock surface. Based on the modeling results, WSP reported that very minimal horizontal strain and angular distortion are forecasted at the bedrock surface (< 1e-5 m).

Although the degree of settlement (both total and differential) that a structure can accommodate is dependent on foundation type and building materials used in the construction, the settlement criteria based on soil type in **Table 1** have been commonly referenced.

Table 1 – Recommendations of Permissible Settlement

Settlement (mm)	Sand		Clay
Maximum differential settlement	20[1/]	25[2/]	40[2/]
Maximum Settlement (isolated foundation)	25[1/]	40[2/]	65[2/]
Maximum Settlement (raft foundation)	50[1/]	40-65[2/]	65-100[2/]
Notes: [1/] Terzaghi and Peck (1948) [2/] Skempton and MacDonald (1956)			

Based on geotechnical investigations completed at the mine site, the overburden (soil) that neighboring structures would be constructed over are likely clayey sand. Based on the values provided in **Table 1**, the estimated subsidence (assumed to be the measured settlement at the surface) of 2 cm (0.78 in) is half the recommended maximum differential settlement and three times less than the maximum settlement assuming clay soil. Therefore, it is expected that the estimated subsidence will not result in damage to offsite structures.

Subsidence Monitoring

As part of the operations of the Tailings Disposal Facilities, WPC will develop an Operation, Maintenance, and Surveillance (OMS) Manual and an associated Trigger Action Response Plan (TARP). As part of the OMS Manual, settlement monuments will be installed on the embankments and on native ground and surveyed to monitor for settlement. The TARP will set trigger action levels and if the monitoring of the settlement monuments indicates that settlement is approaching the action level, the TARP will require additional actions, including increasing the frequency of settlement monument monitoring, inspection of the TDF embankments, and other engineered actions, as needed, to maintain the integrity of the tailings disposal facility.

Potential Impacts on Groundwater Wells

An estimated 2 cm (0.78 in) of subsidence at the base of the overburden is not expected to materially affect the structural integrity or performance of wells completed 6 to 18 meters (20 to 60 feet) below ground surface. At this magnitude, subsurface deformation would be anticipated to occur primarily as broadly uniform settlement of the soil column, resulting in minor vertical translation of the well casing and surrounding formation without inducing significant differential strain, bending, or shear stresses. Published geomechanical evaluations of subsidence effects indicate that well integrity impacts such as casing deformation, buckling, or shear failure occur under conditions of substantially greater displacement and/or pronounced differential movement that generate localized stress concentrations (Bruno, 1992).

Based on these considerations, the predicted subsidence magnitude is unlikely to cause material impacts to domestic wells or shallow monitoring wells. Any resulting change in top-of-casing or ground-surface elevation would be minor and would not be expected to compromise annular seals, screened intervals, hydraulic connectivity, groundwater level interpretation, or domestic well operation.

References

- Bruno, M.S. 1992. *Subsidence-Induced Well Failure*. SPE Drilling & Completion, Society of Petroleum Engineers.
- Pells and Fell, 2003. Damage and Cracking of Embankment Dams by Earthquakes and the Implications for Internal Erosion and Piping. International Congress on Large Dam. January 2003.
- Skempton and MacDonald.. 1956. Allowable Settlement of Buildings. Proceedings of the Institution of Civil Engineers. Vol. 5 (6), Pages 727-768
- Terzaghi and Peck. 1948. Soil Mechanics in Engineering Practice. Wiley, New York.
- USDA. 2025. Title 210 - National Engineering Handbook Appendix E – Construction Tolerances. Amended March 2025.
- WSP, 2026. Technical Memorandum: White Pine North Project - Bedrock Deflection Assessment, July 2, 2026

Appendix E
Tailings Management Design Drawings

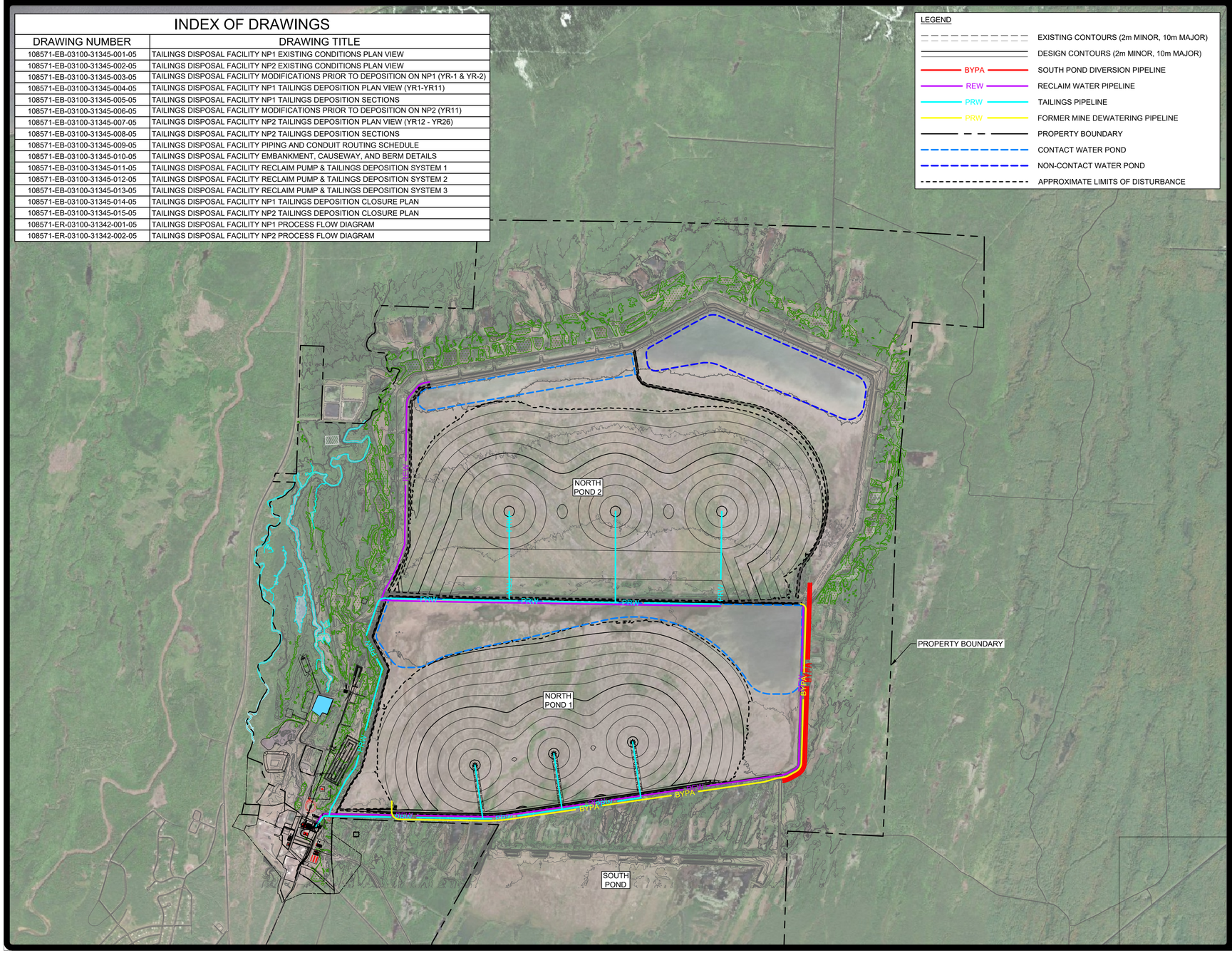
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TAILINGS MANAGEMENT
PRE-FEASIBILITY STUDY DESIGN DRAWINGS

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INDEX OF DRAWINGS

DRAWING NUMBER	DRAWING TITLE
108571-EB-03100-31345-001-05	TAILINGS DISPOSAL FACILITY NP1 EXISTING CONDITIONS PLAN VIEW
108571-EB-03100-31345-002-05	TAILINGS DISPOSAL FACILITY NP2 EXISTING CONDITIONS PLAN VIEW
108571-EB-03100-31345-003-05	TAILINGS DISPOSAL FACILITY MODIFICATIONS PRIOR TO DEPOSITION ON NP1 (YR-1 & YR-2)
108571-EB-03100-31345-004-05	TAILINGS DISPOSAL FACILITY NP1 TAILINGS DEPOSITION PLAN VIEW (YR1-YR11)
108571-EB-03100-31345-005-05	TAILINGS DISPOSAL FACILITY NP1 TAILINGS DEPOSITION SECTIONS
108571-EB-03100-31345-006-05	TAILINGS DISPOSAL FACILITY MODIFICATIONS PRIOR TO DEPOSITION ON NP2 (YR11)
108571-EB-03100-31345-007-05	TAILINGS DISPOSAL FACILITY NP2 TAILINGS DEPOSITION PLAN VIEW (YR12 - YR26)
108571-EB-03100-31345-008-05	TAILINGS DISPOSAL FACILITY NP2 TAILINGS DEPOSITION SECTIONS
108571-EB-03100-31345-009-05	TAILINGS DISPOSAL FACILITY PIPING AND CONDUIT ROUTING SCHEDULE
108571-EB-03100-31345-010-05	TAILINGS DISPOSAL FACILITY EMBANKMENT, CAUSEWAY, AND BERM DETAILS
108571-EB-03100-31345-011-05	TAILINGS DISPOSAL FACILITY RECLAIM PUMP & TAILINGS DEPOSITION SYSTEM 1
108571-EB-03100-31345-012-05	TAILINGS DISPOSAL FACILITY RECLAIM PUMP & TAILINGS DEPOSITION SYSTEM 2
108571-EB-03100-31345-013-05	TAILINGS DISPOSAL FACILITY RECLAIM PUMP & TAILINGS DEPOSITION SYSTEM 3
108571-EB-03100-31345-014-05	TAILINGS DISPOSAL FACILITY NP1 TAILINGS DEPOSITION CLOSURE PLAN
108571-EB-03100-31345-015-05	TAILINGS DISPOSAL FACILITY NP2 TAILINGS DEPOSITION CLOSURE PLAN
108571-ER-03100-31342-001-05	TAILINGS DISPOSAL FACILITY NP1 PROCESS FLOW DIAGRAM
108571-ER-03100-31342-002-05	TAILINGS DISPOSAL FACILITY NP2 PROCESS FLOW DIAGRAM



PROJECT LOCATION:
WHITE PINE, MI

CLIENT INFORMATION:
WHITE PINE COPPER

Tt PROJECT No.:
117-372636-25001

CLIENT PROJECT No.:

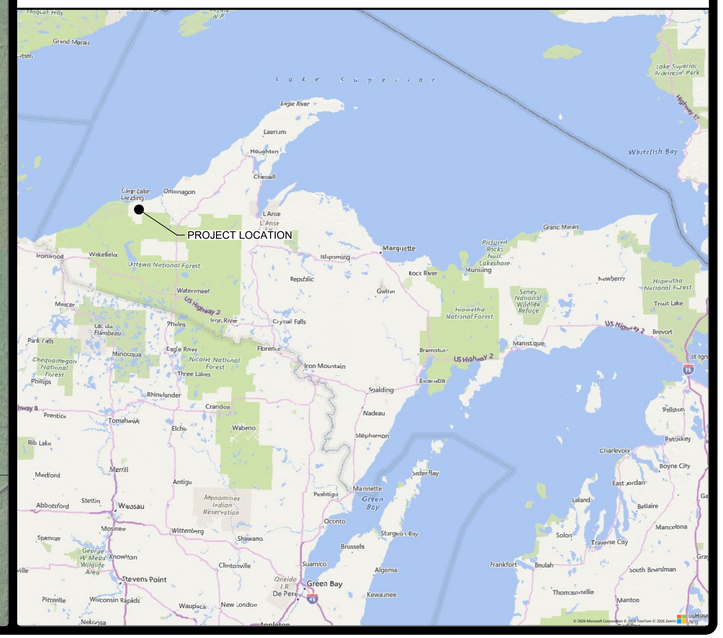
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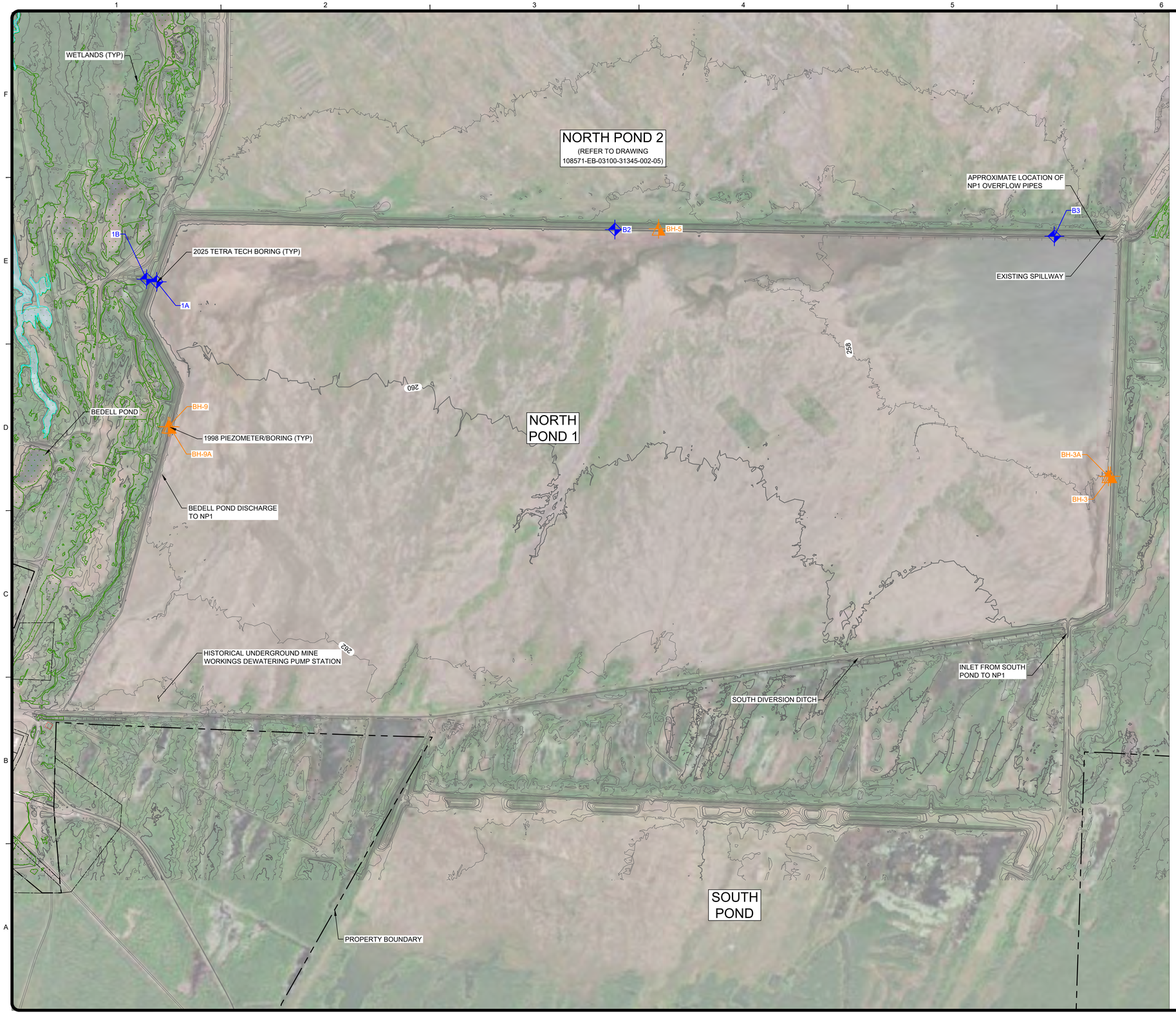
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License No. 6201314878
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REV C - 04/06/26 - ISSUED FOR STUDY
REV D - 08/17/26 - ISSUED FOR PERMITTING

VICINITY MAP:





N

0 80m 160m 240m 320m 400m 800m

SCALE: 1mm = 8m

NOTES

1. PROJECT COORDINATE SYSTEM IS UTM-WGS 1984 DATUM, ZONE 16 NORTH, METER; CENT. MERIDIAN 87D W.
2. DRAWING UNITS ARE IN METERS UNLESS OTHERWISE SPECIFIED.

LEGEND

- EXISTING CONTOURS (2m MINOR, 10m MAJOR)
- PROPERTY BOUNDARY
- 2025 TETRA TECH BORING
- 1998 PIEZOMETER/BORING

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WHITE PINE NORTH

TAILINGS MANAGEMENT
PRE-FEASIBILITY STUDY

TAILINGS DISPOSAL FACILITY
NP1 EXISTING CONDITIONS
PLAN VIEW

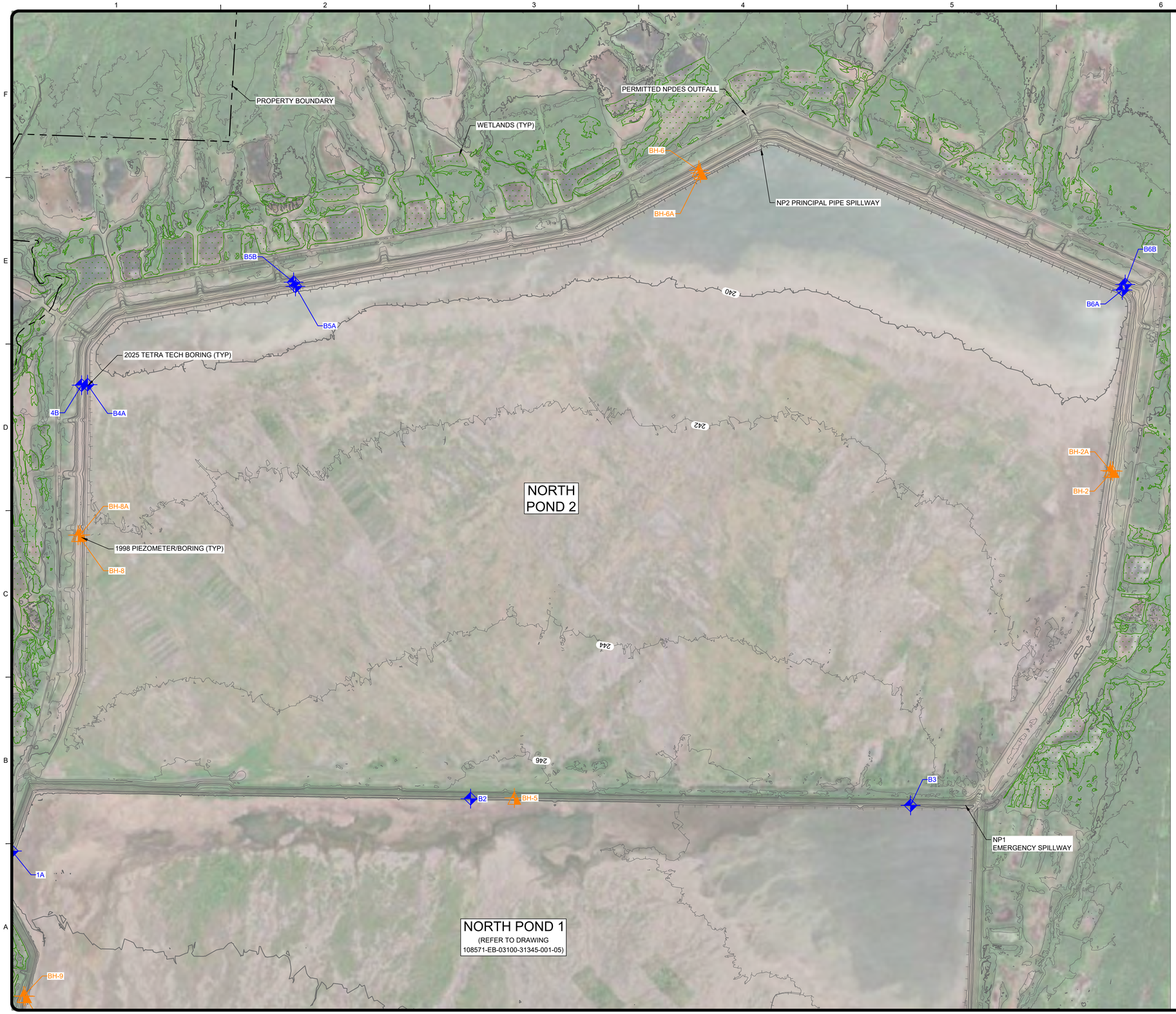
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DESN:	C. TOMLINSON
DRWN:	R. WOOLSEY
CHKD:	C. TOMLINSON

108571-EB-03100-31345-001-05

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0 80m 160m 240m 320m 400m 800m

SCALE: 1mm = 8m

NOTES

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WHITE PINE NORTH
TAILINGS MANAGEMENT
PRE-FEASIBILITY STUDY

TAILINGS DISPOSAL FACILITY
NP2 EXISTING CONDITIONS
PLAN VIEW

PROJ:	117-372636-25001
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NORTH POND 2
(REFER TO DRAWING
108571-EB-03100-31345-006-05)

NORTH
POND 1

NP1 EMBANKMENT BUTTRESS
(STA 17+00 TO STA 19+00 AND
STA 20+50 TO 22+00)

DISCHARGE LOCATION FOR BEDELL
POND AND MINE DEWATERING

CONTROL LINE - NP1 WEST AND
NORTH EMBANKMENT WIDENING

BEDELL POND

EXISTING BEDELL POND
DISCHARGE TO NP1

APPROXIMATE LIMITS OF
TEMPORARY ORE STOCKPILES
(BY OTHERS)

DISCHARGE LOCATION OF
EMERGENCY TAILINGS UPSET
PIPELINE

NP1 AND NP2 TAILINGS AND
RECLAIM WATER PIPELINES
JUNCTION

TAILINGS PIPELINE
(NOTE 3)

APPROXIMATE LOCATION
OF PROCESS WATER TANK

PROPERTY BOUNDARY

NEW SPILLWAY
13
31345-013-05

DEMO EXISTING SPILLWAY
AND CONSTRUCT NEW
RECLAIM WATER SPILLWAY

NP1 RECLAIM
PUMP STATION (6m x 6m)
11
31345-011-05

SOUTH POND DIVERSION PIPELINE
(3) 60" DIA PIPELINES

FORMER MINE
DEWATERING PIPELINE

RECLAIM WATER PIPELINE
(NOTE 3)

INITIAL DEPOSITION TOWER EL:265.77

EG EL:260.77

INITIAL DEPOSITION TOWER EL:265.99

EG EL:260.99

INITIAL DEPOSITION TOWER EL: 266.57
6
31345-011-05

EG EL:261.57

ACCESS CAUSEWAY (TYP)

3
108571-EB-03100-31345-010-05

SOUTH POND DIVERSION
(NOTE 5)
12
31345-011-05

SOUTH DIVERSION DITCH

CONTROL LINE - NP1 SOUTH BERM

1
31345-010-05

750.00m

750.00m

2
31345-010-05

2
31345-010-05

2
31345-010-05

2
31345-010-05

0 80m 160m 240m 320m 400m 800m

SCALE: 1mm = 8m

NOTES

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2. DRAWING UNITS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
3. RECLAIM WATER AND TAILINGS PIPELINES SHOWN ARE INDICATIVE. PIPELINE SHALL BE INSTALLED ON EMBANKMENTS UNLESS NOTED OTHERWISE.
4. REFER TO DRAWING 108571-EB-03100-31345-009-05 FOR PIPING SCHEDULE AND ROUTING.
5. SOUTH POND DIVERSION PIPELINE SHALL BE TERMINATED INSIDE THE SOUTHEAST CORNER OF NP2.

LEGEND

- EXISTING CONTOURS (2m MINOR, 10m MAJOR)
- DESIGN CONTOURS (2m MINOR, 10m MAJOR)
- BYPA — SOUTH POND DIVERSION PIPELINE
- REW — RECLAIM WATER PIPELINE
- PRW — TAILINGS PIPELINE
- PRW — FORMER MINE DEWATERING PIPELINE
- EMERGENCY TAILINGS UPSET DISCHARGE PIPELINE
- PROPERTY BOUNDARY
- DEPOSITION TOWER
- APPROXIMATE LIMITS OF DISTURBANCE

NP1 SOUTH BERM

CUT/FILL	VOLUME (m³)	CREST ELEV (m)
FILL	1,199,405	267.00

NP1 WEST AND NORTH EMBANKMENT WIDENING

CUT/FILL	VOLUME (m³)	CREST ELEV (m)
FILL	42,010	260.66

NP1 INITIAL CAUSEWAY

CUT/FILL	VOLUME (m³)	CREST ELEV (m)
FILL	278,220	VARIES

NP1 EMBANKMENT BUTTRESS

CUT/FILL	VOLUME (m³)	CREST ELEV (m)
FILL	16,040	VARIES

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WHITE PINE NORTH
TAILINGS MANAGEMENT
PRE-FEASIBILITY STUDY

TAILINGS DISPOSAL FACILITY MODIFICATIONS PRIOR TO DEPOSITION ON NP1 (YR-1 & YR-2)

PROJ:	117-372636-25001
DESN:	C. TOMLINSON
DRWN:	R. WOOLSEY
CHKD:	C. TOMLINSON

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NORTH POND 2
(REFER TO DRAWING
108571-EB-03100-31345-007-05)

NORTH POND 1

NP1 CONTACT WATER POND
(NOTE 5)

NP1 RECLAIM PUMP STATION
(6m x 6m) (NOTE 4)

NEW SPILLWAY

CONTROL LINE - NP1 WEST AND
NORTH BERM WIDENING

BEDELL POND

EXISTING BEDELL POND
DISCHARGE TO NP1

APPROXIMATE LIMITS OF WASTE
AND TEMPORARY STOCKPILES
(BY OTHERS)

DISCHARGE LOCATION OF
EMERGENCY TAILINGS UPSET
PIPELINE

NP1 AND NP2 TAILINGS AND
RECLAIM WATER PIPELINES
JUNCTION

TAILINGS PIPELINE
(NOTE 3)

APPROXIMATE LOCATION
OF PROCESS WATER TANK

PROPERTY BOUNDARY

FINAL DEPOSITION EL:281.00

FINAL DEPOSITION TOWER EL: 281.00

EG EL:260.99

EG EL:260.77

EG EL:261.57

ACCESS CAUSEWAY (TYP)

RECLAIM WATER PIPELINE
(NOTE3)

SOUTH POND DIVERSION

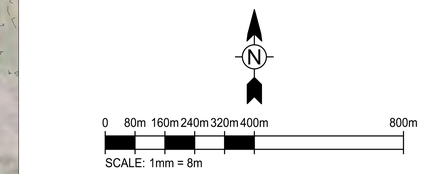
SOUTH DIVERSION DITCH

CONTROL LINE - NP1 SOUTH BERM

750.00m

2.0%

A 31345-005-05
B 31345-005-05
C 31345-005-05
D 31345-005-05
1 31345-010-05
3 31345-010-05
6 31345-011-05
11 31345-013-05
12 31345-011-05
13 31345-013-05



NOTES

1. PROJECT COORDINATE SYSTEM IS UTM-WGS 1984 DATUM, ZONE 16 NORTH, METER; CENT. MERIDIAN 87D W.
2. DRAWING UNITS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
3. PIPELINES SHOWN ARE INDICATIVE. PIPELINE SHALL BE INSTALLED IN BERMS UNLESS NOTED OTHERWISE. REFER TO DRAWING 108571-EB-03100-31345-009-05 FOR PIPING SCHEDULE AND ROUTING.
4. RECLAIM PUMP STATION SHALL BE LOCATED ON NEW CREST PAD IN NORTHEAST CORNER OF NP1.
5. NP1 CONTACT WATER POND INCLUDES NORTHERN AREA OF NP1 ABSENT OF DEPOSITION OF TAILINGS.

LEGEND

- EXISTING CONTOURS (2m MINOR, 10m MAJOR)
- DESIGN CONTOURS (2m MINOR, 10m MAJOR)
- BYPA — SOUTH POND DIVERSION PIPELINE
- REW — RECLAIM WATER PIPELINE
- PRW — TAILINGS PIPELINE
- PRW — FORMER MINE DEWATERING PIPELINE
- EMERGENCY TAILINGS UPSET DISCHARGE PIPELINE
- PROPERTY BOUNDARY
- CONTACT WATER POND
- APPROXIMATE LIMITS OF DISTURBANCE
- DEPOSITION TOWER

NP1 TAILINGS DEPOSITION (2.0% SLOPE)

CUT/FILL	VOLUME* (m^3)	DRY MASS** (M TONS)
FILL	42,584,581	62,173,488

*DEPOSITION VOLUME IS SUBTRACTIVE OF CAUSEWAY FILL VOLUME.
**DRY MASS BASED ON A CONSOLIDATED DRY DENSITY OF 1.46 T/m^3.

NP1 TAILINGS DEPOSITION (2.0% SLOPE)

3d SURFACE AREA (m^2)	SPIGOTS (EA)
4,984,445	3

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D	08/17/26	ISSUED FOR PERMITTING	

WHITE PINE NORTH
TAILINGS MANAGEMENT
PRE-FEASIBILITY STUDY

TAILINGS DISPOSAL FACILITY
NP1 TAILINGS DEPOSITION
PLAN VIEW (YR1 - YR11)

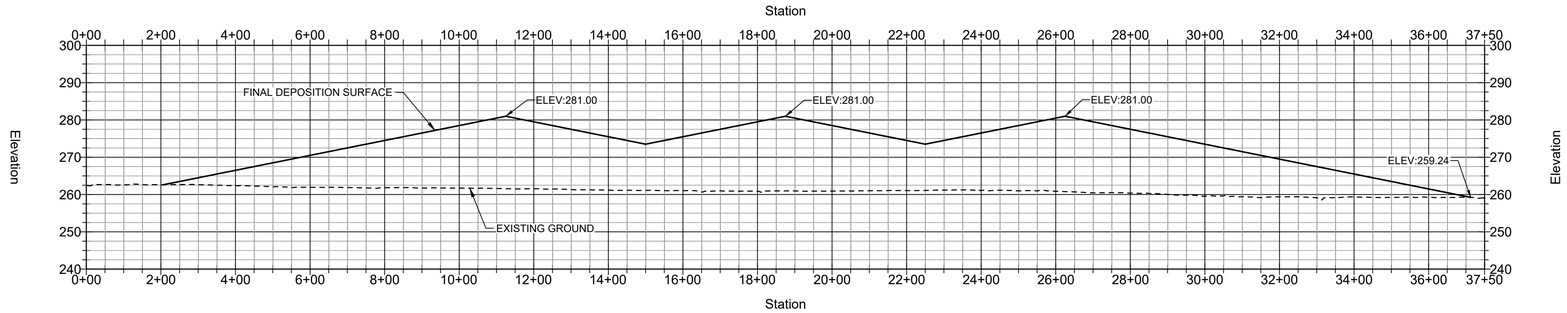
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DRWN:	R. WOOLSEY
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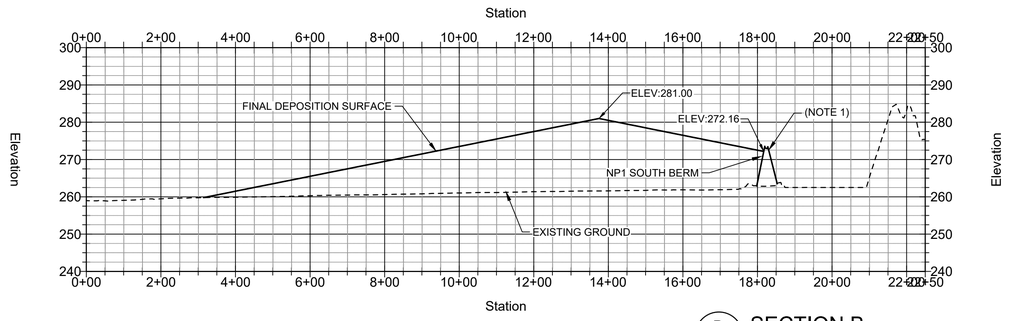
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Bar Measures 1 inch, otherwise drawing not to scale

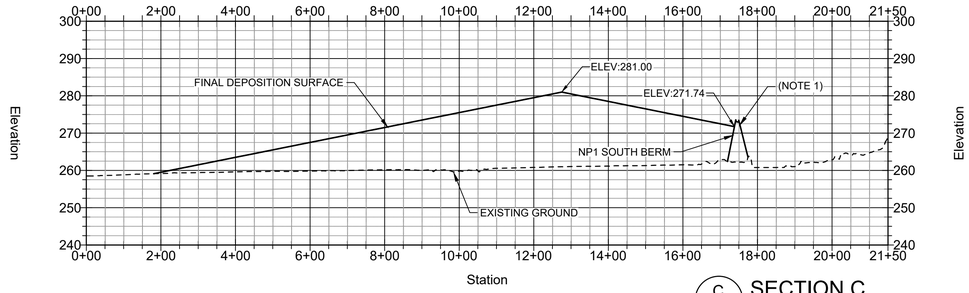
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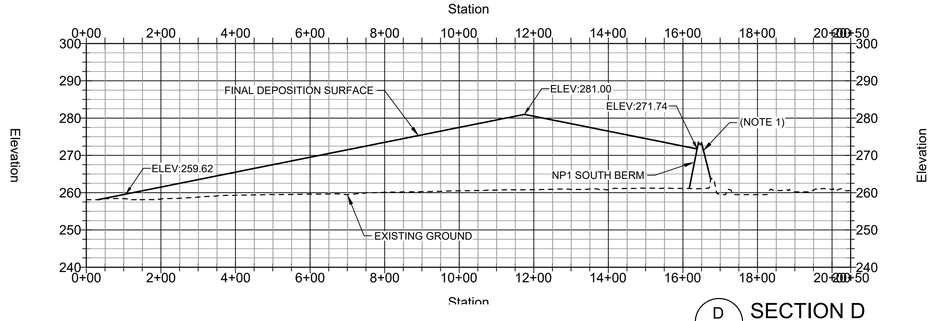
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31345-004-05 SCALE: 1:8



B SECTION B
31345-004-05 SCALE: 1:8



C SECTION C
31345-004-05 SCALE: 1:8



D SECTION D
31345-004-05 SCALE: 1:8

NOTES

1. WATER ACCUMULATED AGAINST SOUTH BERM SHALL BE MANAGED WITH TEMPORARY PUMPING SYSTEMS AND CONSTRUCTION OF TEMPORARY CONVEYANCE CHANNELS.

0 80m 160 240 320 400m 800
SCALE: 1mm = 8m

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WHITE PINE NORTH
TAILINGS MANAGEMENT
PRE-FEASIBILITY STUDY

TAILINGS DISPOSAL FACILITY
NP1 TAILINGS DEPOSITION
SECTIONS

PROJ:	117-372636-25001
DESN:	C. TOMLINSON
DRWN:	R. WOOLSEY
CHKD:	C. TOMLINSON

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APPROXIMATE LOCATION OF EMERGENCY SPILLWAY

PROPOSED NP2 RECLAIM SPILLWAY

NP2 DIVIDER BERM (NOTE 5)

NON-CONTACT WATER POND

RECLAIMED WATER POND FOR NORTH POND 2

11 31345-013-05 RECLAIM PUMP STATION (6m x 6m) (NOTE 4)

2 31345-010-05

RECLAIM FLUSH WATER, BEDELL PIPELINE, AND MINE DEWATERING PIPELINE (NOTE 3)

4 31345-010-05

NP2 CONTACT/NON-CONTACT WATER CONVEYANCE BERM (REFER TO DETAIL)

NORTH POND 2

1000.00m 1000.00m

6 31345-011-05 INITIAL DEPOSITION TOWER EL: 248.18

EG EL:243.18

INITIAL DEPOSITION TOWER EL: 248.85

EG EL:243.85

INITIAL DEPOSITION TOWER EL: 248.30

EG EL:243.30

CAUSEWAY (TYP)

3 31345-010-05

BEGIN WIDENING BERM DOWNSTREAM BY 3m TO RECLAIM PUMP STATION LOCATION

TAILINGS PIPELINE (NOTE 3)

RECLAIM FLUSH WATER PIPELINE (NOTE 3)

NORTH POND 1 EMERGENCY SPILLWAY

10 31345-013-05 CREST DEPOSTION POINTS (~STA 28+00 - ~STA 54+00)

FORMER MINE DEWATERING PIPELINE

SOUTH POND DIVERSION (3) 60" DIA PIPELINES

NORTH POND 1
(REFER TO DRAWING 108571-EB-03100-31345-004-05)

N

0 80m 160m 240m 320m 400m 800m

SCALE: 1mm = 8m

NOTES

1. PROJECT COORDINATE SYSTEM IS UTM-WGS 1984 DATUM, ZONE 16 NORTH, METER; CENT. MERIDIAN 87D W.
2. DRAWING UNITS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
3. PIPELINES SHOWN ARE INDICATIVE. PIPELINE SHALL BE INSTALLED ON EMBANKMENTS UNLESS NOTED OTHERWISE. REFER TO DRAWING 108571-EB-03100-31345-009-05 FOR PIPING SCHEDULE AND ROUTING.
4. RECLAIM PUMP SYSTEM SHALL BE LOCATED ON NEW CREST PAD LOCATED IN NORTHWEST CORNER OF NP2.
5. NON-CONTACT AND CONTACT WATER PONDS FORMED BY EXISTING PONDED AREAS. THE TWO PONDS SHALL BE SEPARATED BY CONSTRUCTION OF A SEPARATION BERM.

LEGEND

- EXISTING CONTOURS (2m MINOR, 10m MAJOR)
- DESIGN CONTOURS (2m MINOR, 10m MAJOR)
- BYPA — SOUTH POND DIVERSION PIPELINE
- REW — RECLAIM WATER PIPELINE
- PRW — TAILINGS PIPELINE
- PRW — FORMER MINE DEWATERING PIPELINE
- PROPERTY BOUNDARY
- CONTACT WATER POND
- NON-CONTACT WATER POND
- APPROXIMATE LIMITS OF DISTURBANCE
- WATER CONVEYANCE BERM
- DEPOSITION TOWER
- PERIMETER DISCHARGE SPIGOT

NP2 WEST EMBANKMENT

CUT/FILL	VOLUME (m³)	CREST ELEV (m)
FILL	25,235	244.13

NP2 CONTACT/NON-CONTACT CONVEYANCE BERM

CUT/FILL	VOLUME (m³)	CREST ELEV (m)
FILL	78,350	VARIES
CUT	16,680	VARIES

NP2 INITIAL CAUSEWAYS

CUT/FILL	VOLUME (m³)	CREST ELEV (m)
FILL	858,805	VARIES

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WHITE PINE NORTH

TAILINGS MANAGEMENT
PRE-FEASIBILITY STUDY

TAILINGS DISPOSAL FACILITY MODIFICATIONS PRIOR TO DEPOSITION ON NP2 (YR11)

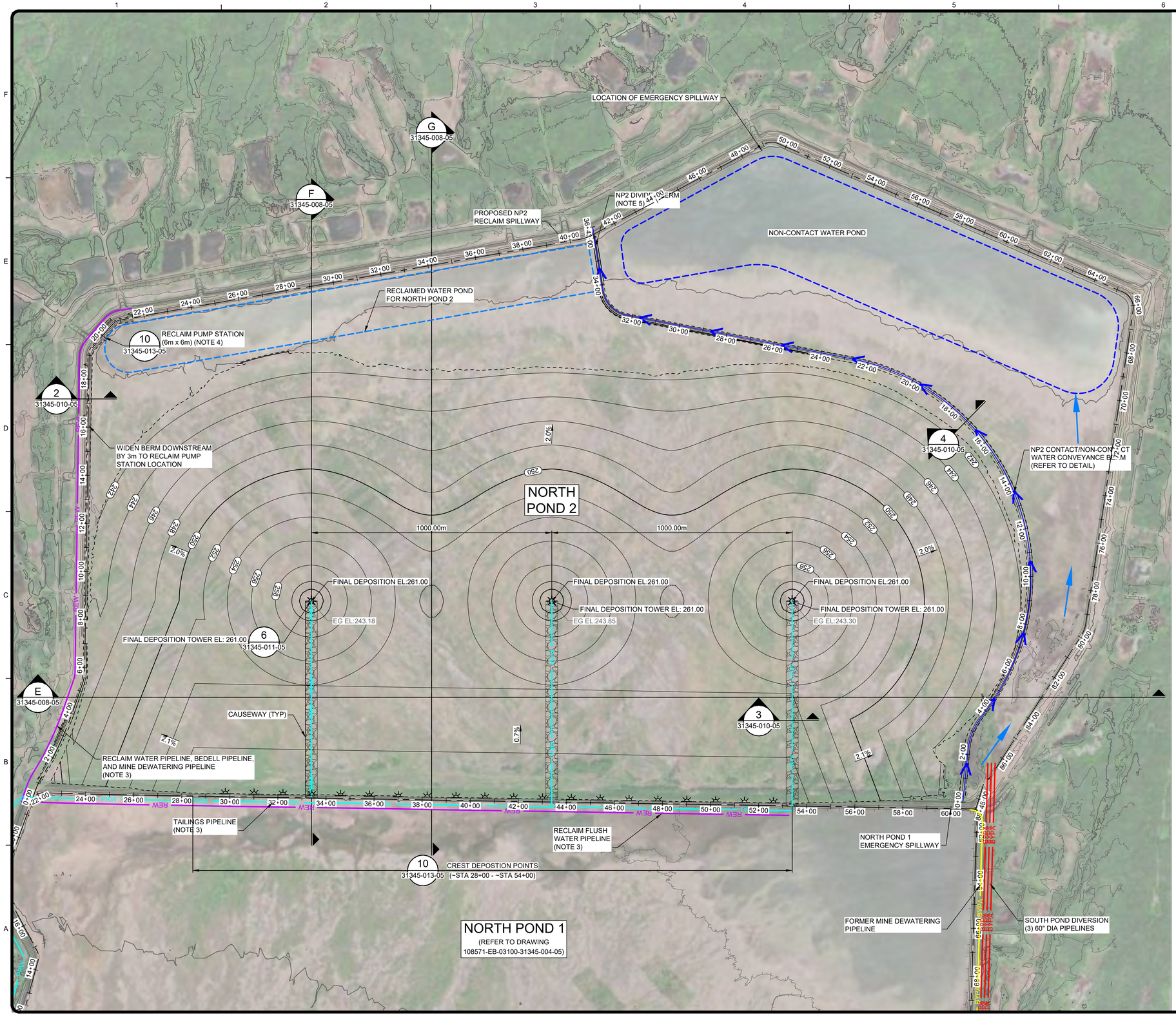
PROJ:	117-372636-25001
DESN:	C. TOMLINSON
DRWN:	R. WOOLSEY
CHKD:	C. TOMLINSON

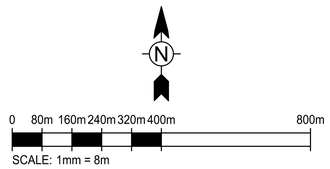
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NOTES

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4. RECLAIM PUMP SYSTEM SHALL BE LOCATED ON NEW CREST PAD LOCATED IN NORTHWEST CORNER OF NP2.
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LEGEND

- EXISTING CONTOURS (2m MINOR, 10m MAJOR)
- DESIGN CONTOURS (2m MINOR, 10m MAJOR)
- BYPA — SOUTH POND DIVERSION PIPELINE
- REW — RECLAIM WATER PIPELINE
- PRW — TAILINGS PIPELINE
- PRW — FORMER MINE DEWATERING PIPELINE
- PROPERTY BOUNDARY
- CONTACT WATER POND
- NON-CONTACT WATER POND
- APPROXIMATE LIMITS OF DISTURBANCE
- WATER CONVEYANCE BERM
- DEPOSITION TOWER
- PERIMETER DISCHARGE SPIGOT

POND 2 THICKENED TAILINGS DEPOSITION (2.0% SLOPE)(CENTRAL)

CUT/FILL	VOLUME* (m³)	DRY MASS** (M TONS)
FILL	38,223,221	55,805,903

*DEPOSITION VOLUME IS SUBTRACTIVE OF CAUSEWAY FILL VOLUME.
**DRY MASS BASED ON A CONSOLIDATED DRY DENSITY OF 1.46 T/m³.

POND 2 THICKENED TAILINGS DEPOSITION (2.0% SLOPE)(EMBANKMENT)

CUT/FILL	VOLUME (m³)	VOLUME (M TONS)
FILL	10,816,385	15,791,922

**DRY MASS BASED ON A CONSOLIDATED DRY DENSITY OF 1.46 T/m³.

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WHITE PINE NORTH
TAILINGS MANAGEMENT
PRE-FEASIBILITY STUDY

TAILINGS DISPOSAL FACILITY NP2 TAILINGS DEPOSITION PLAN VIEW (YR12 - YR26)

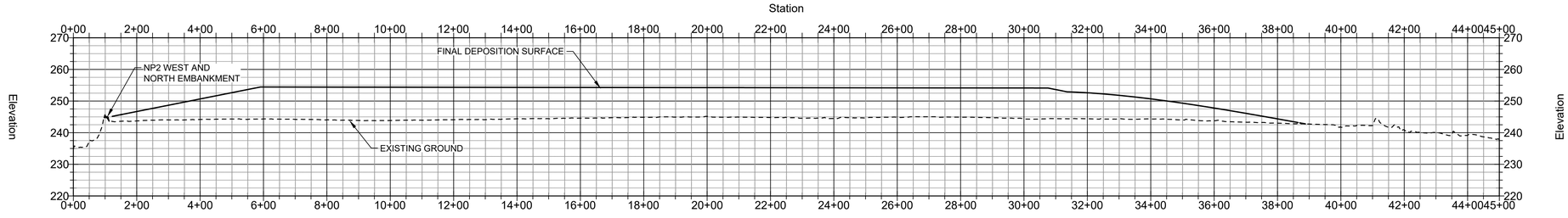
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DESN:	C. TOMLINSON
DRWN:	R. WOOLSEY
CHKD:	C. TOMLINSON

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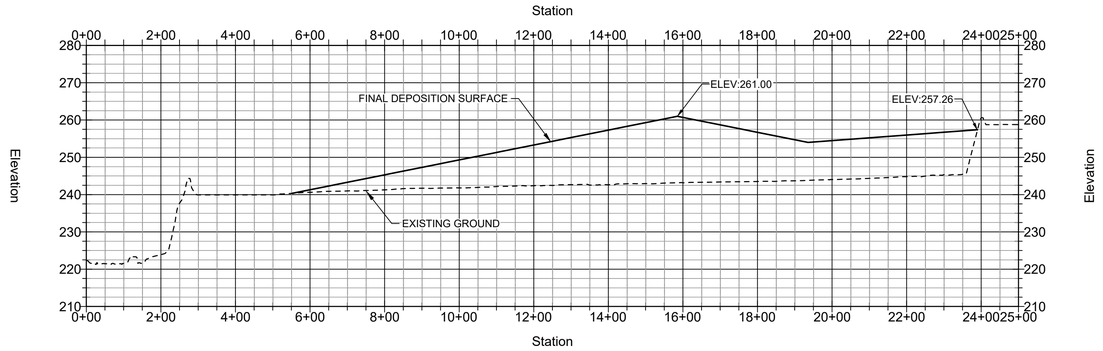
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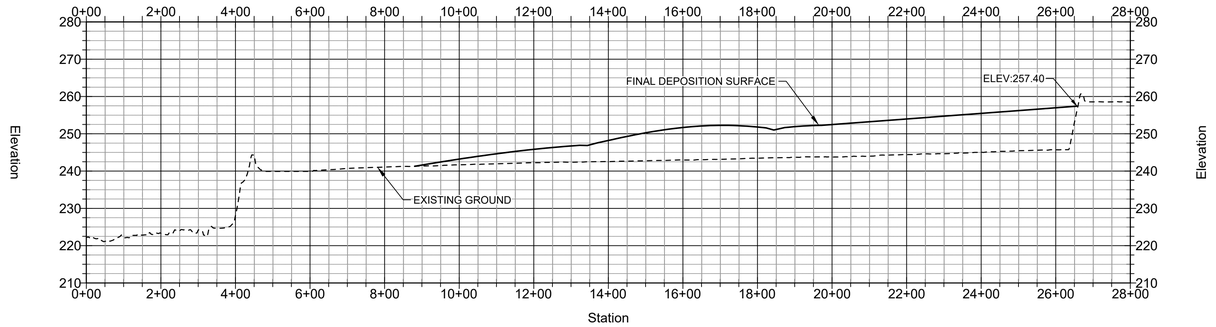
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E SECTION E
31345-007-05 SCALE: 1:8



F SECTION F
31345-007-05 SCALE: 1:8



G SECTION G
31345-007-05 SCALE: 1:8

0 80m 160m 240m 320m 400m 800m
SCALE: 1mm = 8m

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WHITE PINE NORTH
TAILINGS MANAGEMENT
PRE-FEASIBILITY STUDY

TAILINGS DISPOSAL FACILITY NP2 TAILINGS DEPOSITION SECTIONS

PROJ:	117-372636-25001
DESN:	C. TOMLINSON
DRWN:	R. WOOLSEY
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PIPELINE LENGTHS

PIPE TYPE	SIZE	PIPE SPECIFICATION	QUANTITY (m)		BATTERY LIMITS	COMMENTS
			NP1	NP2		
TAILINGS STEEL PIPELINE	10-INCH	10 INCH HDPE LINED CARBON STEEL, SCH. STD, ASTM A53 GRADE B, ERW, 0.28 INCH (7.1mm) LINER, CLASS 900	569	-	FROM THICKENED TAILINGS PUMPS TO NP1 AND NP2 TAILINGS LINE JUNCTION IN SOUTHWEST CORNER OF NP1.	BASED ON PATERSON & COOKE'S HYDRAULIC DESIGN FOR TAILINGS PIPELINE CONVEYANCE. NOMINAL PRESSURE RATING OF 2246 PSI (SCH 80)
TAILINGS STEEL PIPELINE	10-INCH	10 INCH HDPE LINED CARBON STEEL, SCH. STD, ASTM A53 GRADE B, ERW, 0.28 INCH (7.1mm) LINER, CLASS 600	929	3,320	FROM NP1 AND NP2 TAILINGS PIPELINE JUNCTION IN SOUTHWEST CORNER OF NP1 TO TRANSITION TO CLASS 300 FLANGES.	BASED ON PATERSON & COOKE'S HYDRAULIC DESIGN FOR TAILINGS PIPELINE CONVEYANCE. NOMINAL PRESSURE RATING OF 1499 PSI (SCH 60)
TAILINGS STEEL PIPELINE	10-INCH	10 INCH HDPE LINED CARBON STEEL, SCH. STD, ASTM A53 GRADE B, ERW, 0.28 INCH (7.1mm) LINER, CLASS 300	2,032	2,006	FROM CALL 300 FLANGES RATED TAILINGS PIPELINE TO DEPOSITION TOWERS.	BASED ON PATERSON & COOKE'S HYDRAULIC DESIGN FOR TAILINGS PIPELINE CONVEYANCE. NOMINAL PRESSURE RATING OF 749 PSI (SCH 20).
TAILINGS HDPE PIPELINE	12-INCH	12 INCH HDPE SDR 9, ASTM F714, PE4710	1,335	2,409	TRANSITION FROM 10-INCH SCH STD STEEL NP1 AND NP2 TAILINGS PIPELINE TO DEPOSITION TOWERS.	BASED ON PATERSON & COOKE'S HYDRAULIC DESIGN FOR TAILINGS PIPELINE CONVEYANCE. NOMINAL PRESSURE RATING OF 2246 PSI
RECLAIM WATER PIPELINE TO PROCESS TANK	16-INCH	HDPE CLASS 130 DR17, CLASS, E4710	6,571	4,251	NP1 QUANTITIES FROM NP1 RECLAIM PUMP TO PROCESS WATER TANK. NP2 QUANTITIES FROM NP2 RECLAIM PUMP TO NP1 AND NP2 RECLAIM PIPELINE JUNCTION LOCATED IN SOUTHWEST CONER OF NP1.	SIZED BASED ON A FLOW RATE OF 3500 GPM. RESULTS IN MAX PRESSURE OF 87 PSI TO STAY ON PUMP CURVE OF RECLAIM PUMP. INCLUDES ADDITIONAL PIPING TO RECLAIM TOWER CAUSEWAYS FOR FLUSHING.
RECLAIM WATER PIPELINE TO WATER TREATMENT PLANT	16-INCH	HDPE CLASS 130 DR17, CLASS, E4711	1,251	-	FROM "T" LOCATED AT ROAD TO WATER TREATMENT PLANT NORTHWEST OF PROCESS PLANT AREA.	SIZED BASED ON A FLOW RATE OF 3500 GPM. RESULTS IN MAX PRESSURE OF 87 PSI TO STAY ON PUMP CURVE OF RECLAIM PUMP. INCLUDES ADDITIONAL PIPING TO RECLAIM TOWER CAUSEWAYS FOR FLUSHING.
RECLAIM FLUSH WATER PIPELINE TO DEPOSITION CONES	12-INCH	HDPE CLASS 130 DR17, CLASS, E4712	-	3,157	FROM NORTHWEST CORNER OF NP1 CREST TO NP2 DEPOSITION TOWER ACCESS CAUSEWAYS.	SIZED BASED ON A FLOW RATE OF 3500 GPM. RESULTS IN MAX PRESSURE OF 87 PSI TO STAY ON PUMP CURVE OF RECLAIM PUMP. INCUDES ADDITIONAL PIPING TO RECLAIM TOWER CAUSEWAYS FOR FLUSHING.
FORMER MINE DEWATERING PIPELINE	16-INCH	HDPE CLASS 130 DR17, CLASS, E4711	5,881	-	FROM FORMER MINE DEWATERING PUMP SYSTEM SHED TO SOUTHEAST CORNER OF NP2.	ASSUMED DIAMETER TO LIMIT PRESSURE LOSS IN PIPE FOR EXISTING PUMP
SOUTH POND DIVERSION PIPELINE	(3) 60-INCH	(3) 60-INCH CORRUGATED HDPE TYPE S, BELL AND SPIGOT	-	5,982	FROM SP RUNOFF DITCH AT SOUTHEAST CORNER OF NP1 TO SOUTHEAST CORNER OF NP2.	
TAILINGS EMERGENCY UPSET DISCHARGE PIPELINE STEEL	10-INCH	10 INCH HDPE LINED CARBON STEEL, SCH. STD, ASTM A53 GRADE B, ERW, 0.28 INCH (7.1mm) LINER, CLASS 300	1,000	-	FROM TAILINGS PUMPS TO TRANSITION TO HDPE.	
TAILINGS EMERGENCY UPSET DISCHARGE PIPELINE HDPE	12-INCH	12 INCH HDPE SDR 9, ASTM F714, PE4710	2,000	-	FROM TRANSITION FROM STEEL TO HDPE TO SOUTHWEST CORNER OF NP1	

NP2 CREST DEPOSITON PIPE STEEL FITTINGS AND FLANGES

LENGTH OF CREST DEPOSITION (m)	DEPOSITION POINT SPACING (m)	LENGTH OF CLASS 600	NUMBER OF CLASS 600 FLANGES	LENGTH OF CLASS 300	NUMBER OF CLASS 600 FLANGES	NUMBER OF 10" SCH STD STEEL TEES	NUMBER OF 12" GATE VALVES
2,453	40	550	6	1,903	20	16	16

NP2 CREST DEPOSITION 12" SDR PIPE LENGTH AND FITTINGS

LENGTH OF CREST DEPOSITION (m)	DEPOSITION POINT SPACING (m)	LENGTH OF 12" SDR PIPE	NUMBER OF 12" TEES
2,453	40	2,600	78

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WHITE PINE NORTH
TAILINGS MANAGEMENT
PRE-FEASIBILITY STUDY

TAILINGS DISPOSAL FACILITY PIPING AND ROUTING SCHEDULE

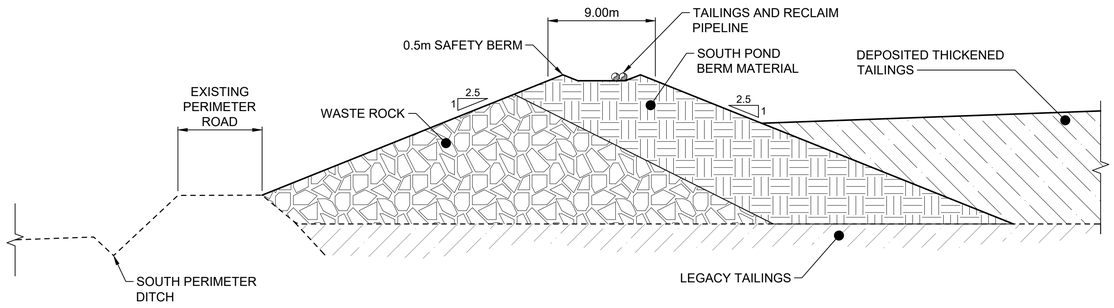
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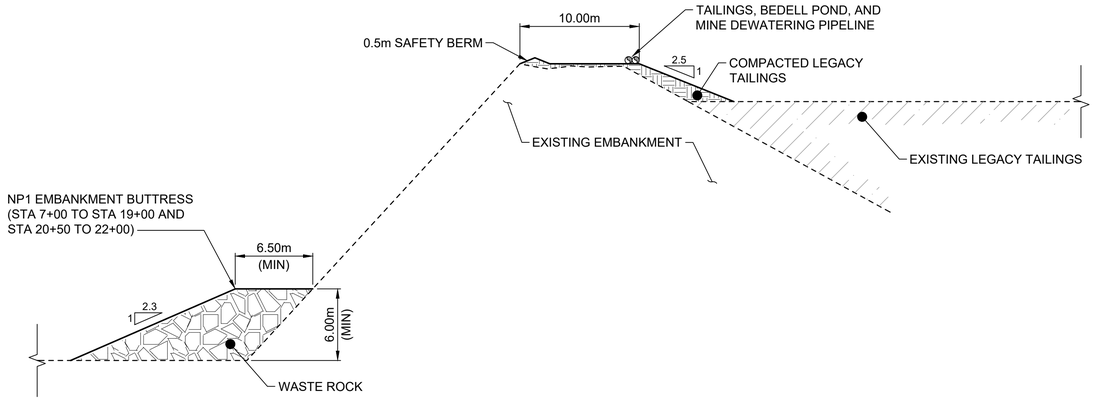
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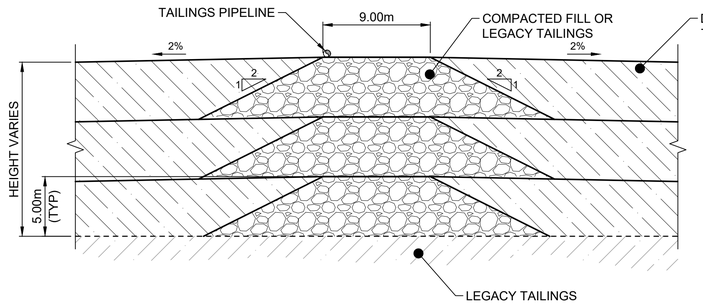
NP1 SOUTH BERM DETAIL

1 — 31345-004-05 SCALE: NTS



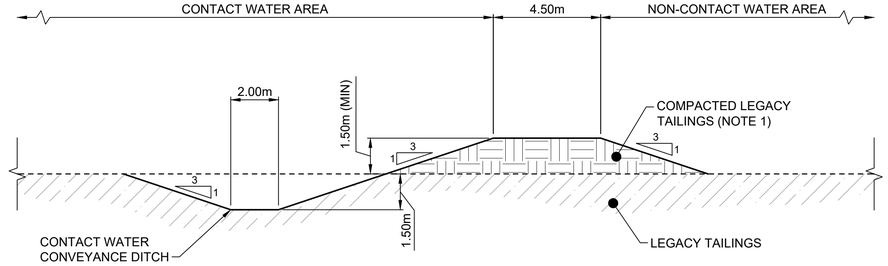
NP1 WEST AND NORTH EXISTING EMBANKMENT WIDENING DETAIL

2 — 31345-004-05 SCALE: NTS



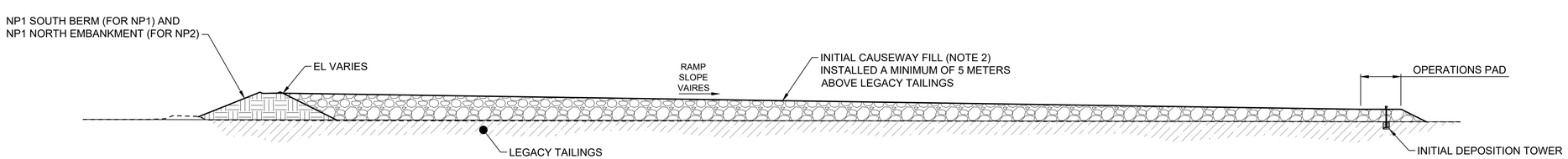
TYPICAL DEPOSITION TOWER ACCESS CAUSEWAY DETAIL

3 — 31345-004-05, 31345-007-05 SCALE: NTS



NP2 CONTACT/NON-CONTACT WATER SEPERATION BERM

4 — 31345-006-05 SCALE: NTS



TYPICAL DEPOSITION TOWER ACCESS CAUSEWAY PROFILE

5 — 31345-004-05, 31345-007-05 SCALE: NTS

NOTES

1. FILL FOR BERM TO BE OBTAINED FROM EXCAVATING LEGACY TAILINGS FROM EAST AND WEST SIDE OF BERM.
2. INITIAL CAUSEWAY FILL LIFT TO BE OBTAINED FROM LEGACY TAILINGS. REMAINING CAUSEWAY FILL TO BE OBTAINED FROM SOUTH POND SOIL.

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WHITE PINE NORTH
TAILINGS MANAGEMENT PRE-FEASIBILITY STUDY

TAILINGS DISPOSAL FACILITY EMBANKMENT, CAUSEWAY, AND BERM DETAILS

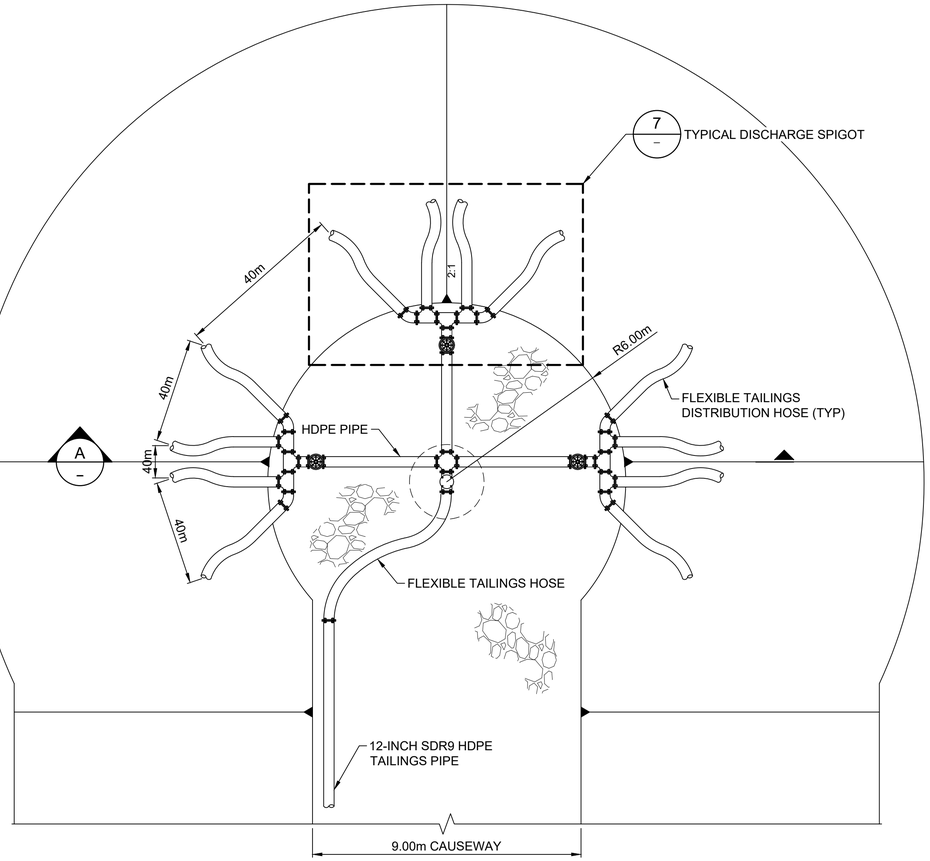
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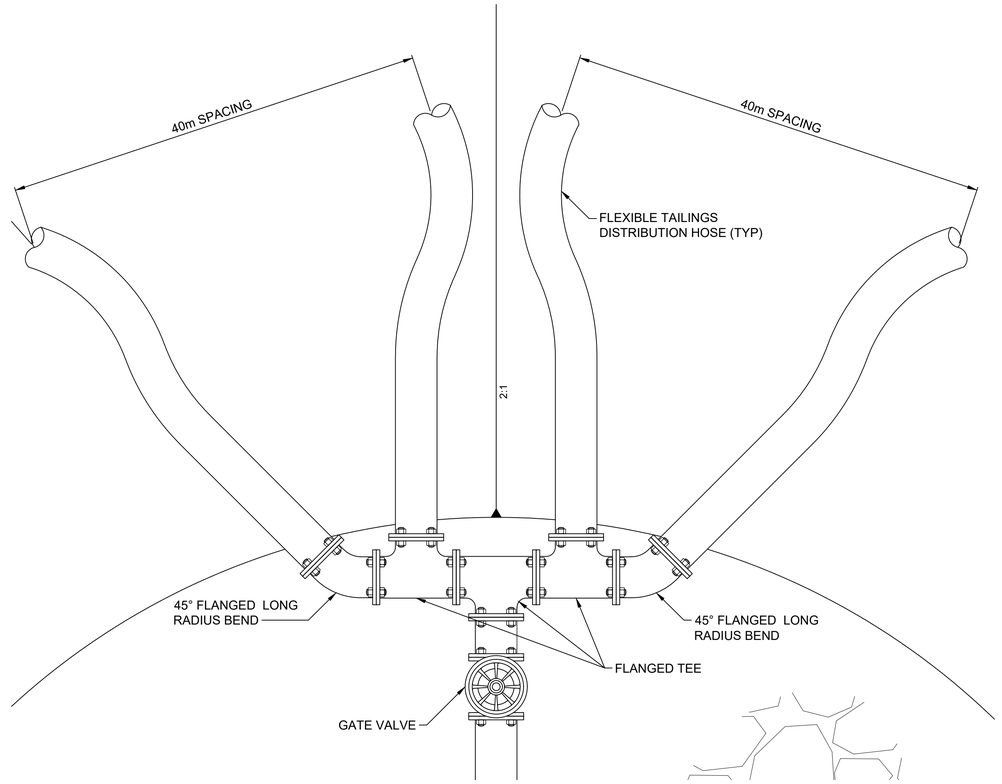
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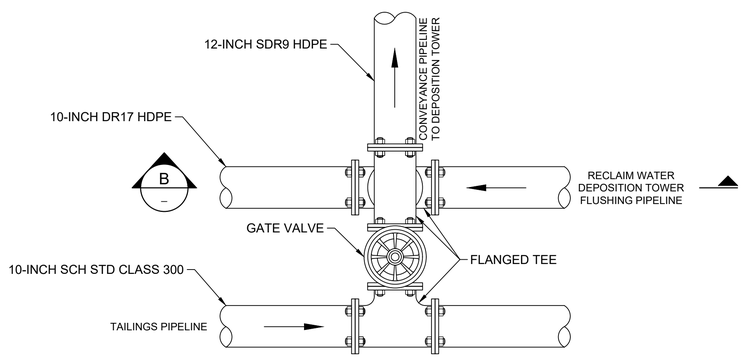
TYPICAL DEPOSITION TOWER PLAN VIEW

6 — 31345-004-05, 31345-007-05 — SCALE: NTS



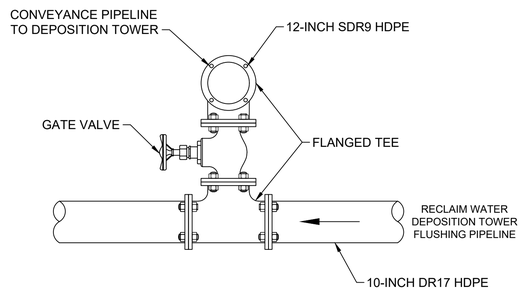
TYPICAL DISCHARGE SPIGOT DETAIL

7 — SCALE: NTS



TAILINGS AND RECLAIM PIPELINE VALVING AT DEPOSITION TOWER CAUSEWAY DETAIL

8 — SCALE: NTS



TAILINGS PIPELINE VALVING AT DEPOSITION TOWER CAUSEWAY SECTION

B — SCALE: NTS

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D	08/17/26	ISSUED FOR PERMITTING	

WHITE PINE NORTH
TAILINGS MANAGEMENT
PRE-FEASIBILITY STUDY

TAILINGS DISPOSAL FACILITY RECLAIM PUMP & TAILINGS DEPOSITION SYSTEM 1

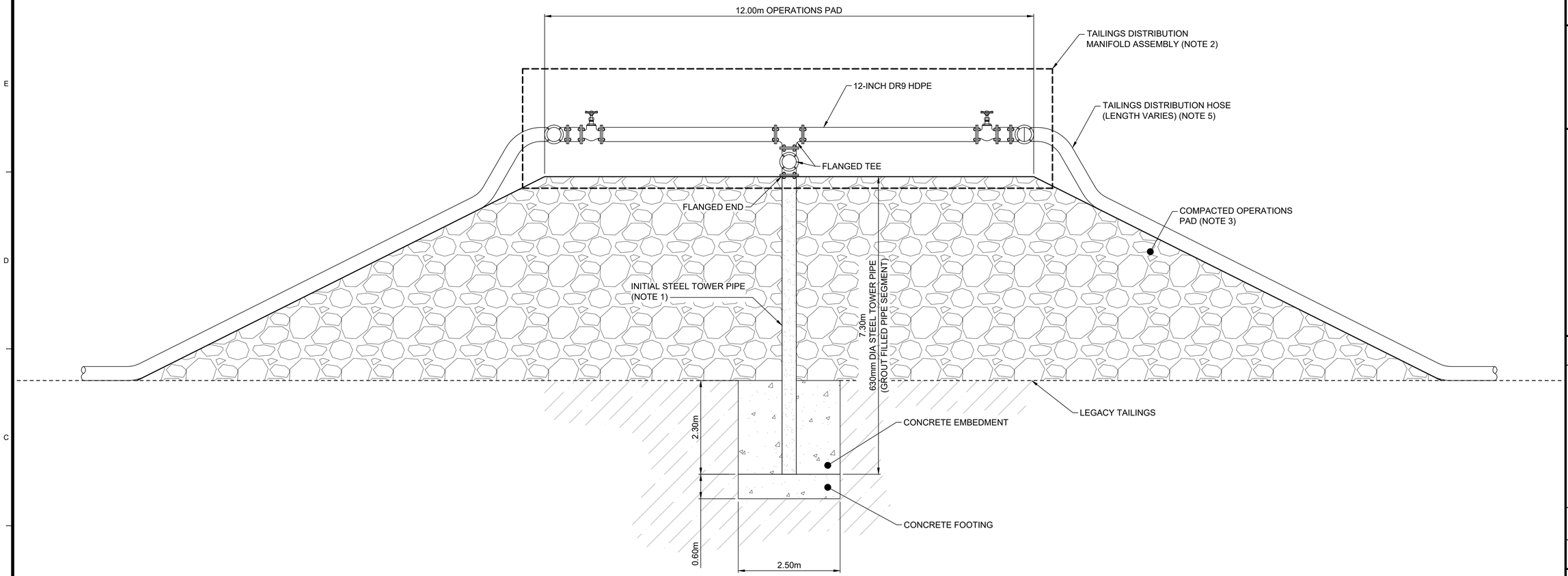
PROJ:	117-372636-25001
DESN:	C. TOMLINSON
DRWN:	R. WOOLSEY
CHKD:	C. TOMLINSON

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A
31345-011-05

TYPICAL DECANT TOWER INITIAL CONSTRUCTION DETAIL (NOTE 4)

SCALE: NTS

NOTES

1. ADDITIONAL TOWER PIPING TO BE RAISED BY NOMINALLY 5 METERS USING FLANGED CONNECTIONS.
2. TAILINGS DISTRIBUTION MANIFOLD ASSEMBLY TO BE DISASSEMBLED AND RAISED WHEN TOWER IS EXTENDED.
3. REFER TO DETAIL 3 FOR CAUSEWAY/ACCESS PAD RAISING.
4. DETAIL SHOWS TYPICAL ARRANGEMENT OF DEPOSITION TOWER APPLICABLE TO BOTH NP1 AND NP2.
5. TAILINGS DISTRIBUTION HOSE SHALL BE RAISED AND MOVED AS NECESSARY TO ESTABLISH UNIFORM BEACH SLOPE.

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WHITE PINE NORTH
TAILINGS MANAGEMENT
PRE-FEASIBILITY STUDY

TAILINGS DISPOSAL FACILITY RECLAIM PUMP & TAILINGS DEPOSITION SYSTEM 2

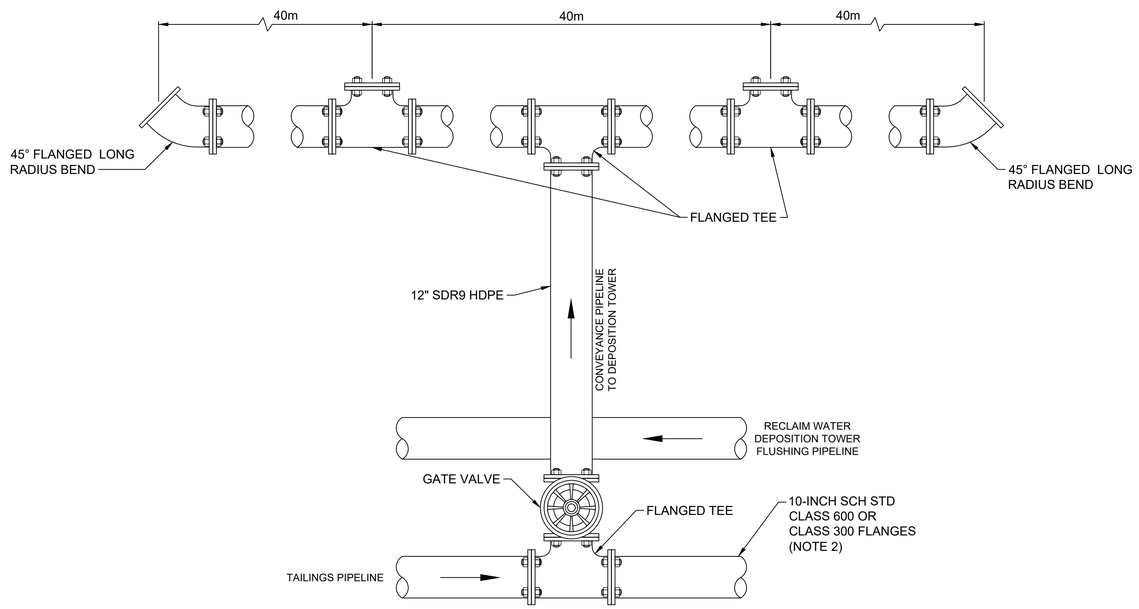
PROJ:	117-372636-25001
DESN:	C. TOMLINSON
DRWN:	R. WOOLSEY
CHKD:	C. TOMLINSON

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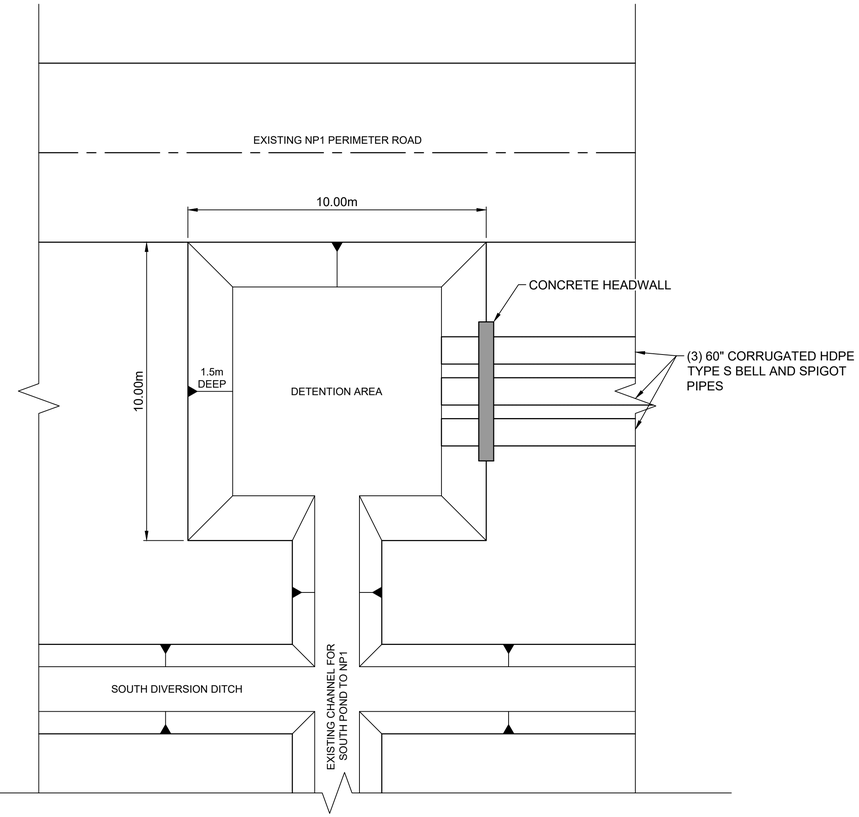
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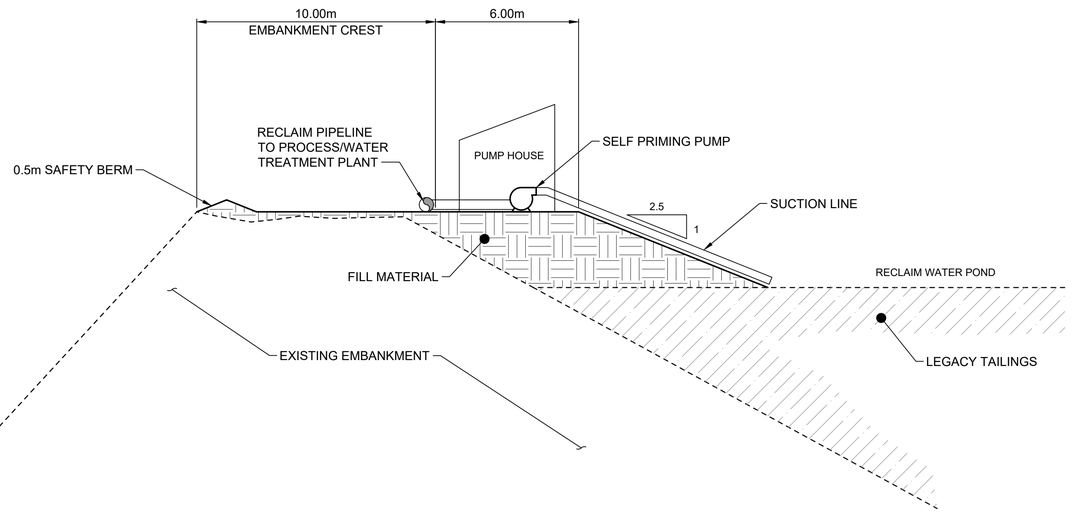
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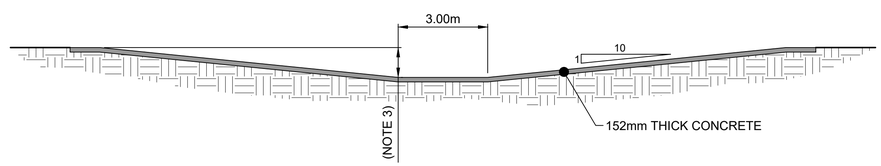
10 NP2 CREST DISCHARGE SPIGOT DETAIL
31345-007-05 SCALE: NTS



12 SOUTH POND DIVERSION SYSTEM DETAIL
31345-003-05 SCALE: NTS
31345-004-05



11 TYPICAL RECLAIM PUMP SYSTEM DETAIL
31345-004-05 SCALE: NTS
31345-007-05



13 RECLAIM WATER COMPARTMENT SPILLWAY
31345-003-05 SCALE: NTS
31345-006-05

NOTES

1. CREST DEPOSITION MANIFOLDS TO BE SPACED 154 FEET.
2. CLASS 600 FLANGES FROM STA 28+00 TO 33+50. CLASS 300 FLANGES FROM 33+50 TO 54+00.
3. NP1 AND NP2 RECLAIM SPILLWAY HEIGHTS 0.92m AND 1.52m, RESPECTIVELY.

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WHITE PINE NORTH
TAILINGS MANAGEMENT
PRE-FEASIBILITY STUDY

TAILINGS DISPOSAL FACILITY RECLAIM PUMP & TAILINGS DEPOSITION SYSTEM 3

PROJ:	117-372636-25001
DESN:	C. TOMLINSON
DRWN:	R. WOOLSEY
CHKD:	C. TOMLINSON

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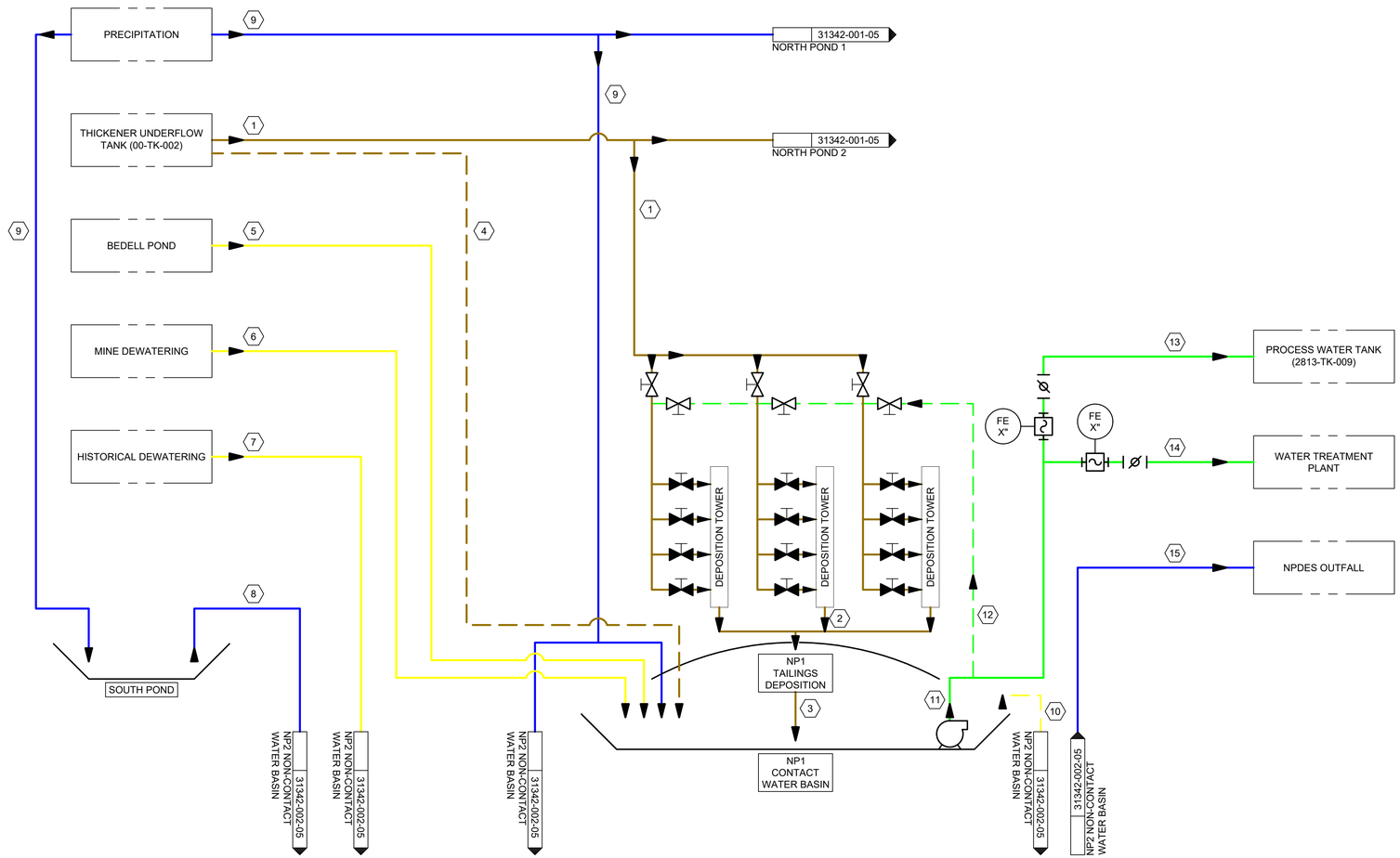
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LEGEND

- MANUALLY ACTUATED GATE VALVE (NO)
- MANUALLY ACTUATED GATE VALVE (NC)
- ACTUATED GATE VALVE (NO)
- FLOW CONTROL BUTTERFLY VALVE
- ULTRASONIC FLOW METER
- RECLAIM PUMP
- FE 3" — INSTRUMENT TYPE / INSTRUMENT SIZE
- UNTHICKEND TAILINGS
- CONTACT WATER
- NON-CONTACT WATER
- RECLAIM WATER
- THICKENED TAILINGS

NOTES:

1. DASHED LINES ARE INTERMITTENT OR UPSET FLOWS.
2. ONLY ONE TAILINGS DISCHARGE TOWER WILL BE OPERATED AT ANY ONE TIME.



STREAM		INPUTS									OUTPUTS					
		01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
DESCRIPTION		THICKENER UNDERFLOW	NP1 DEPOSITED TAILINGS	DEPOSITED TAILINGS BLEED WATER	EMERGENCY TAILINGS BYPASS	BEDELL POND	MINE DEWATERING	HISTORICAL MINE DEWATERING	SOUTH POND RUNOFF WATER	PRECIPITATION	NP1 CONTACT EMERGENCY OVERFLOW	RECLAIM WATER	DEPOSITION TOWER FLUSH WATER	RECLAIM WATER TO PROCESS WATER TANK (2813-TK-009)	RECLAIM WATER TO WATER TREATMENT PLANT	NPDES PERMITTED OUTFALL
PARAMETER	UNITS															
SOLID DENSITY	KG/M3	2768.00	2768.00	2768.00	2768.00	2650.00	2650.00	2650.00	2650.00	2650.00	2650.00	2650.00	2650.00	2650.00	2650.00	2650.00
LIQUID DENSITY	KG/M3	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00
SOLID MASS FLW RATE	MET. T/H	653.00	653.00	0.00	653.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LIQUID MASS FLOW RATE	MET. T/H	435.00	435.00	151.02	435.00	17.42	192.07	124.12	181.68	215.01	INTERMITTENT EMERGENCY FLOW	830.36	INTERMITTENT FLOW	411.41	418.95	INTERMITTENT FLOW
LIQUID VOLUMETRIC FLOW RATE	M3/H	436.00	436.00	150.87	434.57	17.40	191.88	124.00	181.50	214.79		829.53		411.00	418.53	
MIXTURE VOLUMETRIC FLOW RATE	M3/H	672.00	672.00	150.72	672.00	17.40	191.88	124.00	181.50	214.79		882.00		411.00	471.00	
MIXTURE DENSITY	KG/M3	1620.00	1620.00	999.00	1620.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00
MIXTURE SOLIDS VOLUME CONCENTRATION	%V	35.10	35.10	0.00	35.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MIXTURE SOLIDS MASS CONCETRATION	%M	62.00	62.00	0.00	62.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

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WHITE PINE NORTH
TAILINGS MANAGEMENT
PRE-FEASIBILITY STUDY

TAILINGS DISPOSAL FACILITY NP1 PROCESS FLOW DIAGRAM

PROJ:	117-372636-25001
DESN:	C. TOMLINSON
DRWN:	R. WOOLSEY
CHKD:	C. TOMLINSON

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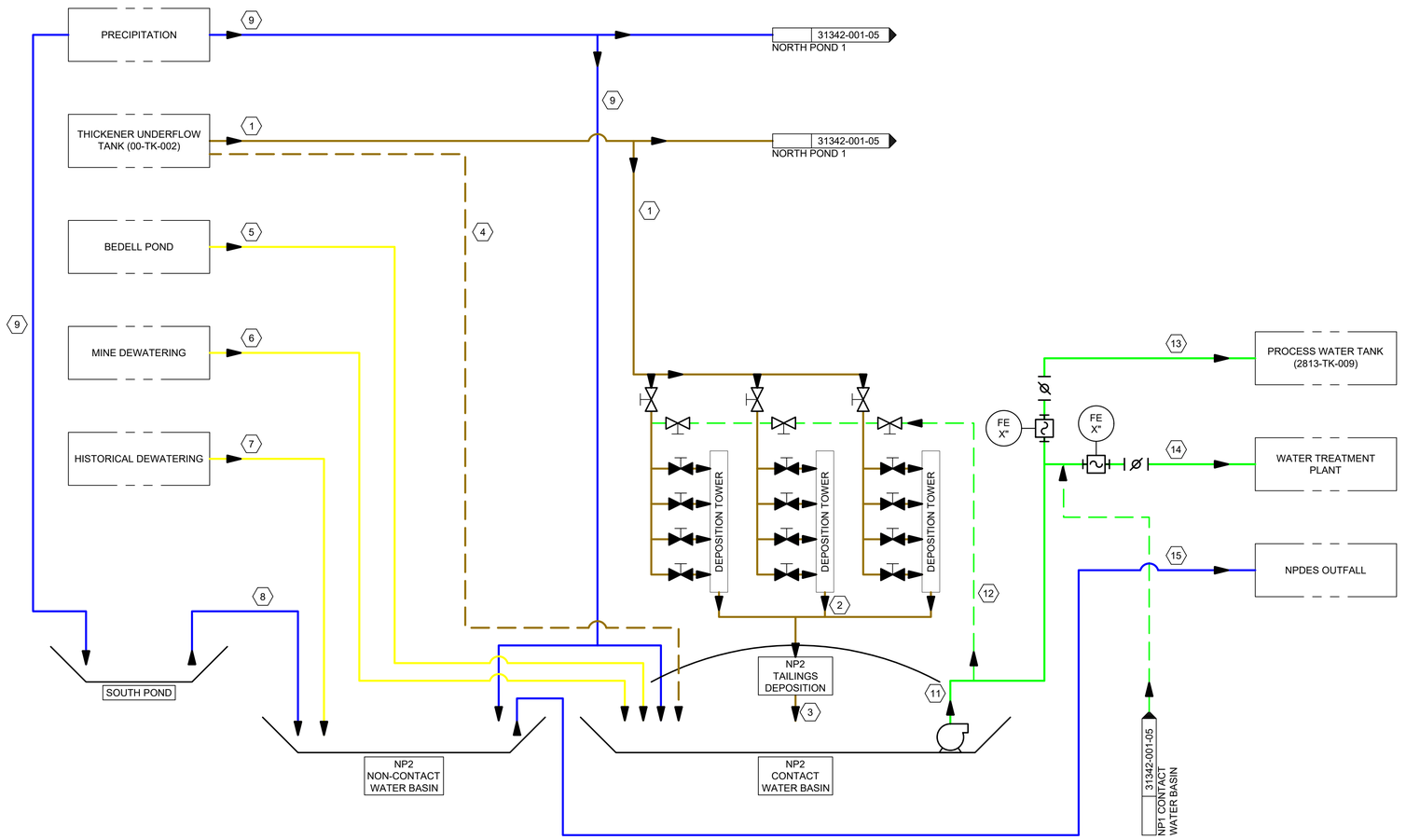
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LEGEND

- MANUALLY ACTUATED GATE VALVE (NO)
- MANUALLY ACTUATED GATE VALVE (NC)
- ACTUATED GATE VALVE (NO)
- FLOW CONTROL BUTTERFLY VALVE
- ULTRASONIC FLOW METER
- RECLAIM PUMP
- FE 3" — INSTRUMENT TYPE / INSTRUMENT SIZE
- UNTHICKEND TAILINGS
- CONTACT WATER
- NON-CONTACT WATER
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- THICKENED TAILINGS

NOTES:

1. DASHED LINES ARE INTERMITTENT OR UPSET FLOWS.
2. ONLY ONE TAILINGS DISCHARGE TOWER WILL BE OPERATED AT ANY ONE TIME.



STREAM		INPUTS									OUTPUTS					
		01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
DESCRIPTION		THICKENER UNDERFLOW	NP1 DEPOSITED TAILINGS	DEPOSITED TAILINGS BLEED WATER	EMERGENCY TAILINGS BYPASS	BEDELL POND	MINE DEWATERING	HISTORICAL MINE DEWATERING	SOUTH POND RUNOFF WATER	PRECIPITATION	NP1 CONTACT EMERGENCY OVERFLOW	RECLAIM WATER	DEPOSITION TOWER FLUSH WATER	RECLAIM WATER TO PROCESS WATER TANK (2813-TK-009)	RECLAIM WATER TO WATER TREATMENT PLANT	NPDES PERMITTED OUTFALL
PARAMETER	UNITS															
SOLID DENSITY	KG/M3	2768.00	2768.00	2768.00	2768.00	2650.00	2650.00	2650.00	2650.00	2650.00	2650.00	2650.00	2650.00	2650.00	2650.00	2650.00
LIQUID DENSITY	KG/M3	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00
SOLID MASS FLW RATE	MET. T/H	653.00	653.00	0.00	653.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LIQUID MASS FLOW RATE	MET. T/H	435.00	435.00	151.02	435.00	17.42	192.07	124.12	181.68	215.01	INTERMITTENT EMERGENCY FLOW	830.36	INTERMITTENT FLOW	411.41	418.95	INTERMITTENT FLOW
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MIXTURE VOLUMETRIC FLOW RATE	M3/H	672.00	672.00	150.72	672.00	17.40	191.88	124.00	181.50	214.79		882.00		411.00	471.00	
MIXTURE DENSITY	KG/M3	1620.00	1620.00	999.00	1620.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00	999.00
MIXTURE SOLIDS VOLUME CONCENTRATION	%V	35.10	35.10	0.00	35.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MIXTURE SOLIDS MASS CONCETRATION	%M	62.00	62.00	0.00	62.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

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WHITE PINE NORTH
TAILINGS MANAGEMENT
PRE-FEASIBILITY STUDY

TAILINGS DISPOSAL FACILITY NP2 PROCESS FLOW DIAGRAM

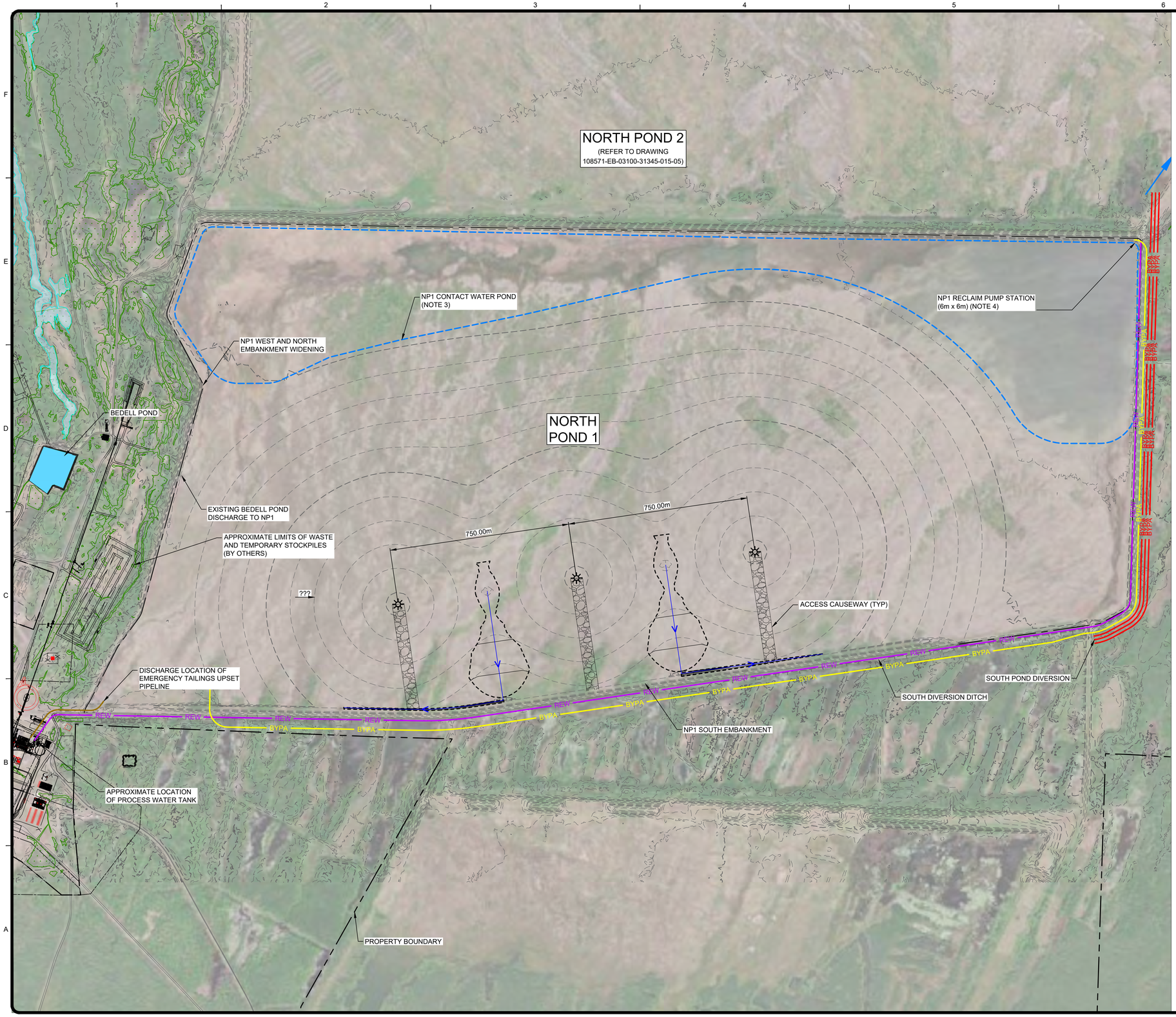
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DRWN:	R. WOOLSEY
CHKD:	C. TOMLINSON

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0 80m 160m 240m 320m 400m 800m

SCALE: 1mm = 8m

NOTES

1. PROJECT COORDINATE SYSTEM IS UTM-WGS 1984 DATUM, ZONE 16 NORTH, METER; CENT. MERIDIAN 87D W.
2. DRAWING UNITS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
3. NP1 CONTACT WATER POND INCLUDES NORTHERN AREA OF NP1 ABSENT OF DEPOSITION OF TAILINGS.

LEGEND

- EXISTING CONTOURS (2m MINOR, 10m MAJOR)
- DESIGN CONTOURS (2m MINOR, 10m MAJOR)
- BYPA — SOUTH POND DIVERSION PIPELINE
- REW — RECLAIM WATER PIPELINE
- PRW — FORMER MINE DEWATERING PIPELINE
- EMERGENCY TAILINGS UPSET DISCHARGE PIPELINE
- PROPERTY BOUNDARY
- CONTACT WATER POND
- APPROXIMATE LIMITS OF DISTURBANCE
- CLOSURE DRAINAGE
- DEPOSITION TOWER

NP1 CLOSURE GRADING

CUT/FILL	VOLUME (m³)
FILL	45,020
CUT	7,085

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WHITE PINE NORTH

TAILINGS MANAGEMENT
PRE-FEASIBILITY STUDY

TAILINGS DISPOSAL FACILITY
NP1 TAILINGS DEPOSITION
CLOSURE PLAN

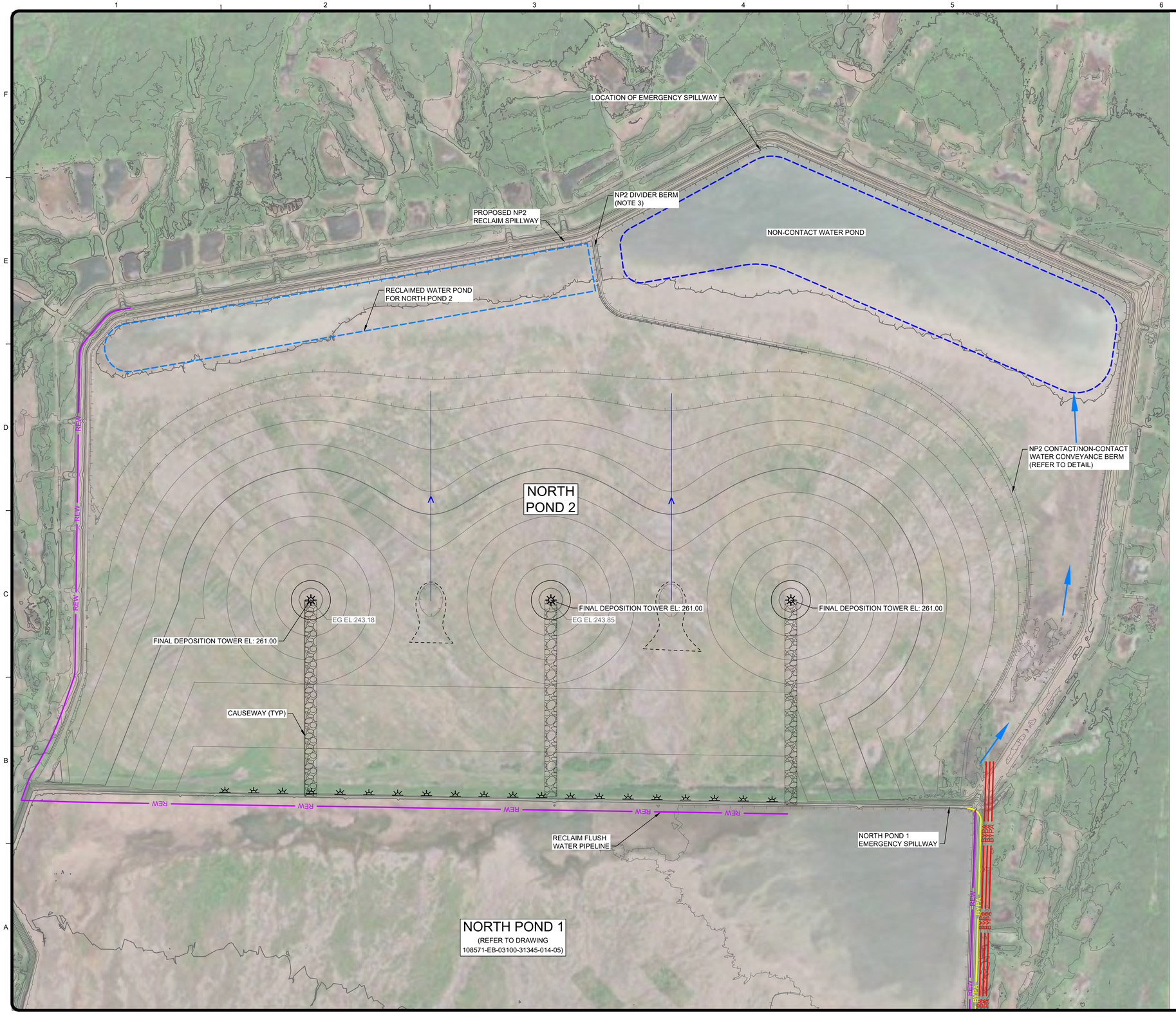
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0 80m 160m 240m 320m 400m 800m

SCALE: 1mm = 8m

NOTES

1. PROJECT COORDINATE SYSTEM IS UTM-WGS 1984 DATUM, ZONE 16 NORTH, METER; CENT. MERIDIAN 87D W.
2. DRAWING UNITS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
3. NON-CONTACT AND CONTACT WATER PONDS FORMED BY EXISTING PONDED AREAS. THE TWO PONDS SHALL BE SEPARATED BY CONSTRUCTION OF A SEPARATION BERM.

LEGEND

- EXISTING CONTOURS (2m MINOR, 10m MAJOR)
- DESIGN CONTOURS (2m MINOR, 10m MAJOR)
- BYPA — SOUTH POND DIVERSION PIPELINE
- REW — RECLAIM WATER PIPELINE
- PRW — FORMER MINE DEWATERING PIPELINE
- PROPERTY BOUNDARY
- CONTACT WATER POND
- NON-CONTACT WATER POND
- APPROXIMATE LIMITS OF DISTURBANCE
- CLOSURE DRAINAGE
- DEPOSITION TOWER
- PERIMETER DISCHARGE SPIGOT

NP2 CLOSURE GRADING

CUT/FILL	VOLUME (m³)
FILL	15,370
CUT	-

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WHITE PINE NORTH

TAILINGS MANAGEMENT
PRE-FEASIBILITY STUDY

TAILINGS DISPOSAL FACILITY
NP2 TAILINGS DEPOSITION
CLOSURE PLAN

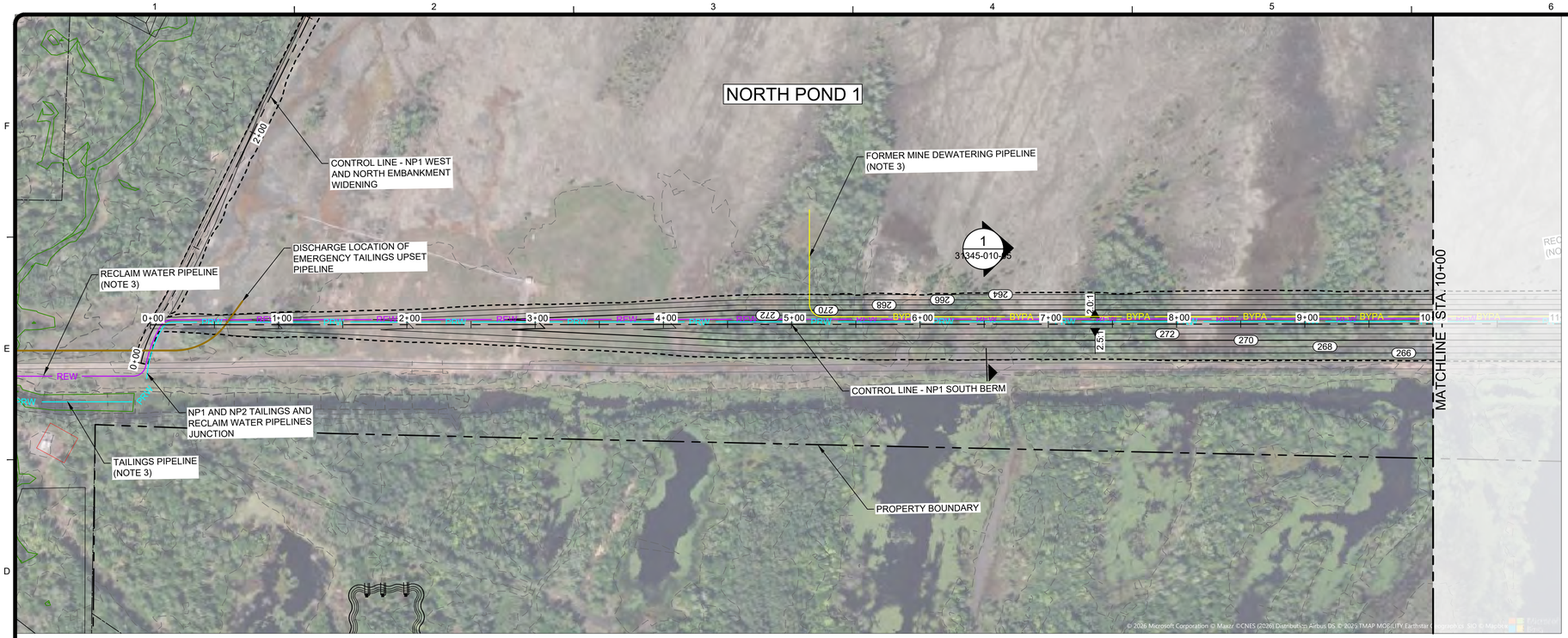
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DESN:	C. TOMLINSON
DRWN:	R. WOOLSEY
CHKD:	C. TOMLINSON

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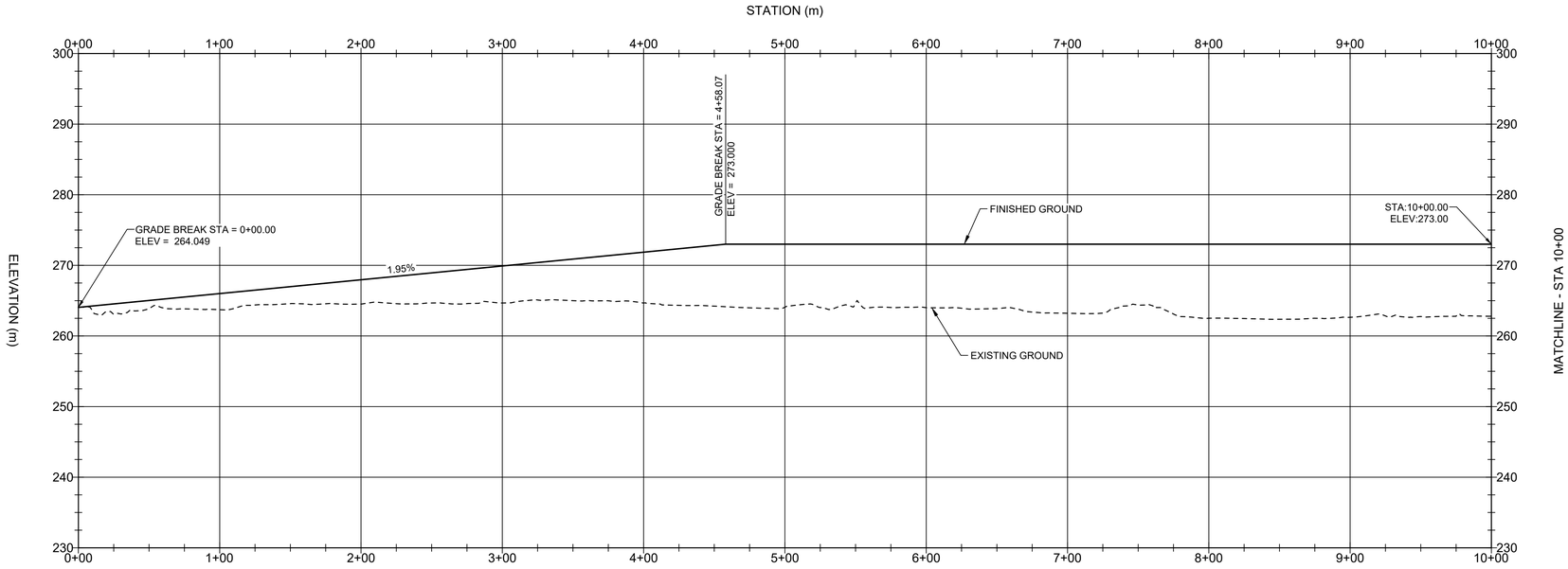
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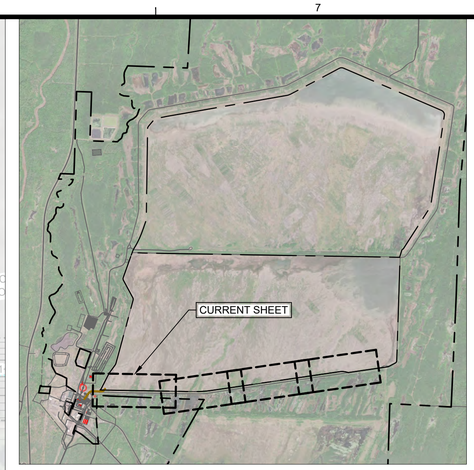
NP1 SOUTH BERM PLAN
STA 0+00 THRU STA 10+00

SCALE: NTS



NP1 SOUTH BERM PROFILE
STA 0+00 THRU STA 10+00

SCALE: NTS



KEY MAP

SCALE: NTS

LEGEND

- EXISTING CONTOURS (2m MINOR, 10m MAJOR)
- DESIGN CONTOURS (2m MINOR, 10m MAJOR)
- BYPA — SOUTH POND DIVERSION PIPELINE
- REW — RECLAIM WATER PIPELINE
- PRW — TAILINGS PIPELINE
- PRW — FORMER MINE DEWATERING PIPELINE
- EMERGENCY TAILINGS UPSET DISCHARGE PIPELINE
- PROPERTY BOUNDARY
- APPROXIMATE LIMITS OF DISTURBANCE

NOTES

1. PROJECT COORDINATE SYSTEM IS UTM-WGS 1984 DATUM, ZONE 16 NORTH, METER; CENT. MERIDIAN 87D W.
2. DRAWING UNITS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
3. RECLAIM WATER AND TAILINGS PIPELINES SHOWN ARE INDICATIVE. PIPELINE SHALL BE INSTALLED ON EMBANKMENTS UNLESS NOTED OTHERWISE.
4. REFER TO DRAWING 108571-EB-03100-31345-009-05 FOR PIPING SCHEDULE AND ROUTING.
5. SOUTH POND DIVERSION PIPELINE SHALL BE TERMINATED INSIDE THE SOUTHEAST CORNER OF NP2.

N

0 20m 40m 60m 80m 100m 200m
HORZ SCALE: 1mm = 2m

0 4m 8m 12m 16m 20m 40m
VERT SCALE: 1mm = 0.4m

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B	03/27/26	ISSUED FOR REVIEW	RNW
C	04/06/26	ISSUED FOR STUDY	RNW
D	08/17/26	ISSUED FOR PERMITTING	RNW

WHITE PINE NORTH
TAILINGS MANAGEMENT
PRE-FEASIBILITY STUDY

TAILINGS DISPOSAL FACILITY
NP1 SOUTH BERM P&P
STA 0+00 THRU STA 10+00

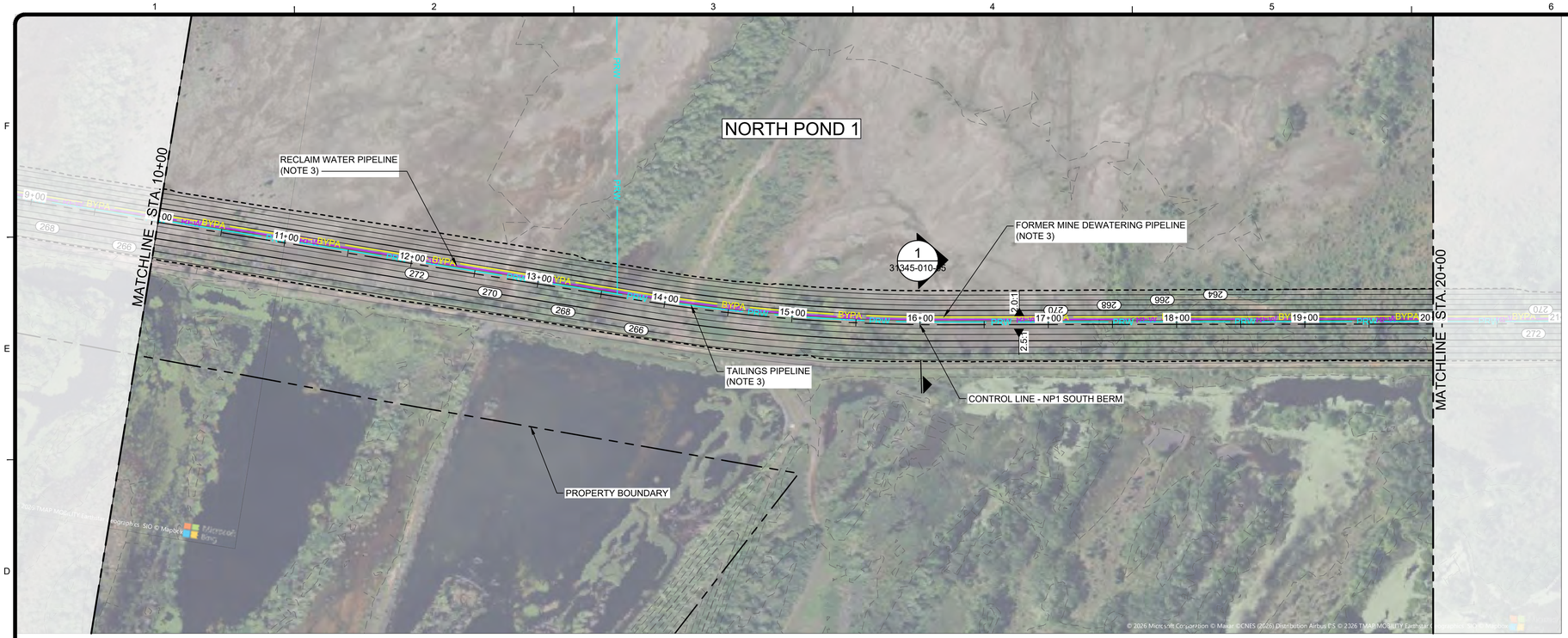
PROJ:	117-372636-25001
DESN:	C. TOMLINSON
DRWN:	R. WOOLSEY
CHKD:	C. TOMLINSON

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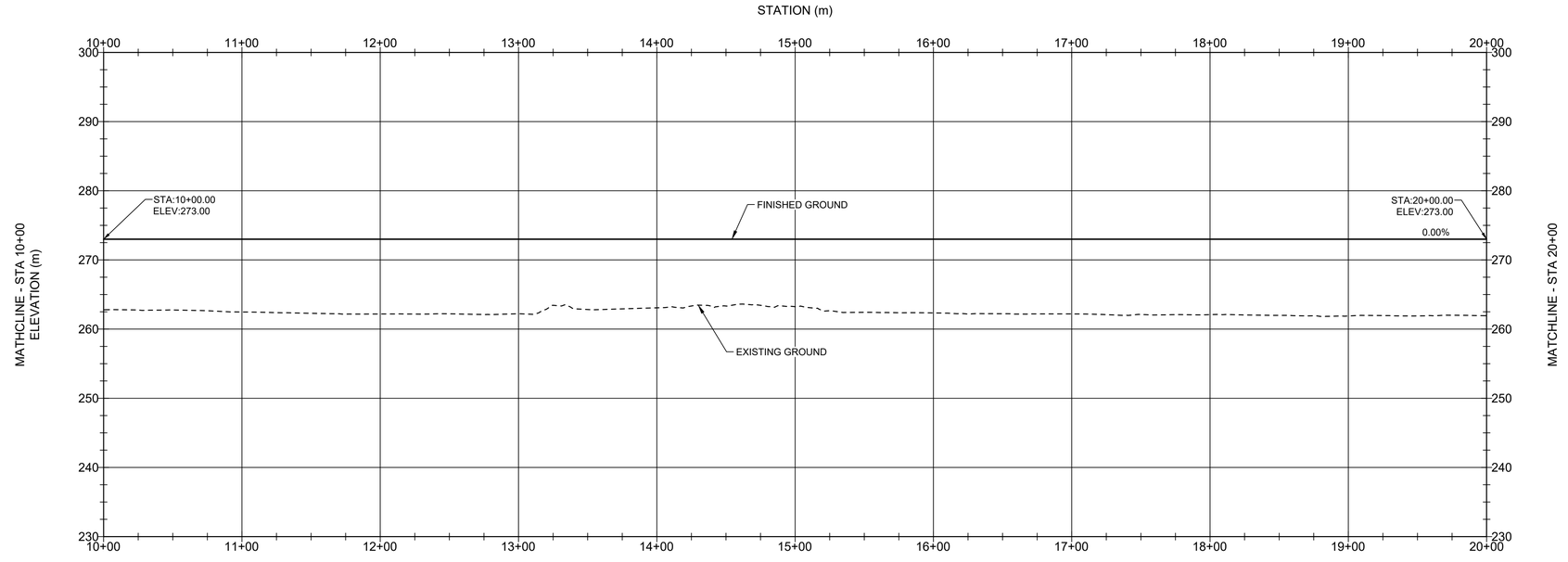
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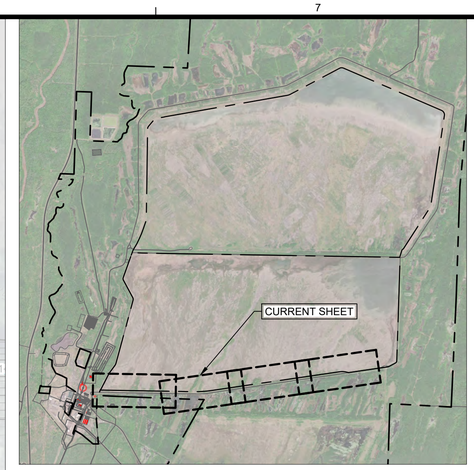
NP1 SOUTH BERM PLAN
STA 10+00 THRU STA 20+00

SCALE: NTS



NP1 SOUTH BERM PROFILE
STA 10+00 THRU STA 20+00

SCALE: NTS



KEY MAP

SCALE: NTS

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- APPROXIMATE LIMITS OF DISTURBANCE

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0 4m 8m 12m 16m 20m 40m
VERT SCALE: 1mm = 0.4m

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D	08/17/26	ISSUED FOR PERMITTING	

WHITE PINE NORTH
TAILINGS MANAGEMENT
PRE-FEASIBILITY STUDY

TAILINGS DISPOSAL FACILITY
NP1 SOUTH BERM P&P
STA 10+00 THRU STA 20+00

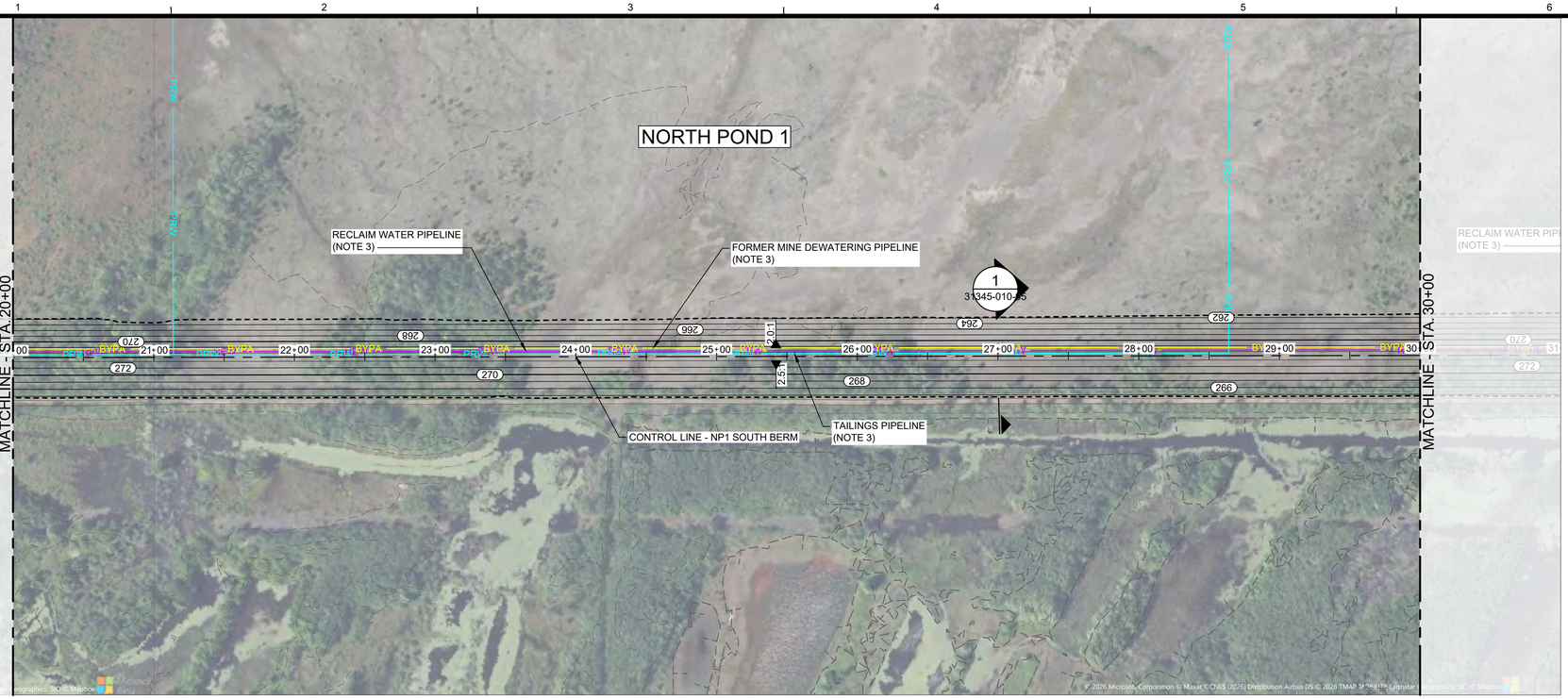
PROJ:	117-372636-25001
DESN:	C. TOMLINSON
DRWN:	R. WOOLSEY
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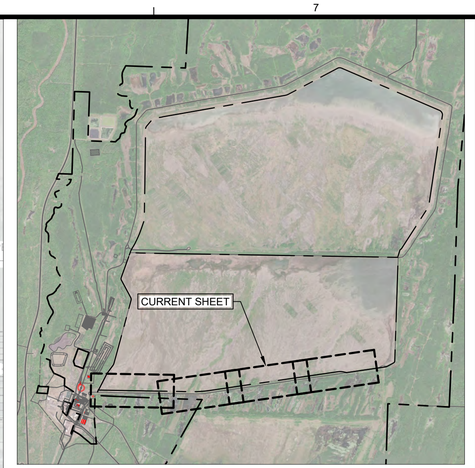
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KEY MAP

SCALE: NTS

LEGEND

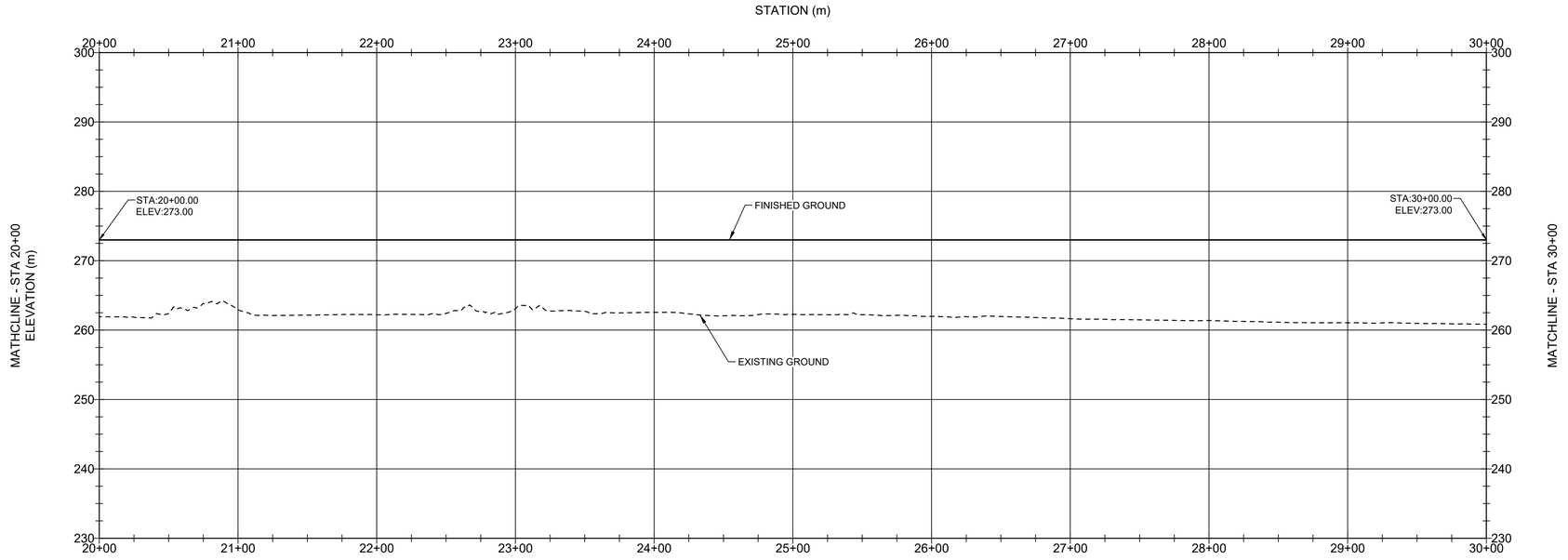
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NP1 SOUTH BERM PLAN
STA 20+00 THRU STA 30+00

SCALE: NTS



NP1 SOUTH BERM PROFILE
STA 20+00 THRU STA 30+00

SCALE: NTS

0 20m 40m 60m 80m 100m 200m

HORZ SCALE: 1mm = 2m

0 4m 8m 12m 16m 20m 40m

VERT SCALE: 1mm = 0.4m

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WHITE PINE NORTH
TAILINGS MANAGEMENT
PRE-FEASIBILITY STUDY

TAILINGS DISPOSAL FACILITY
NP1 SOUTH BERM P&P
STA 20+00 THRU STA 30+00

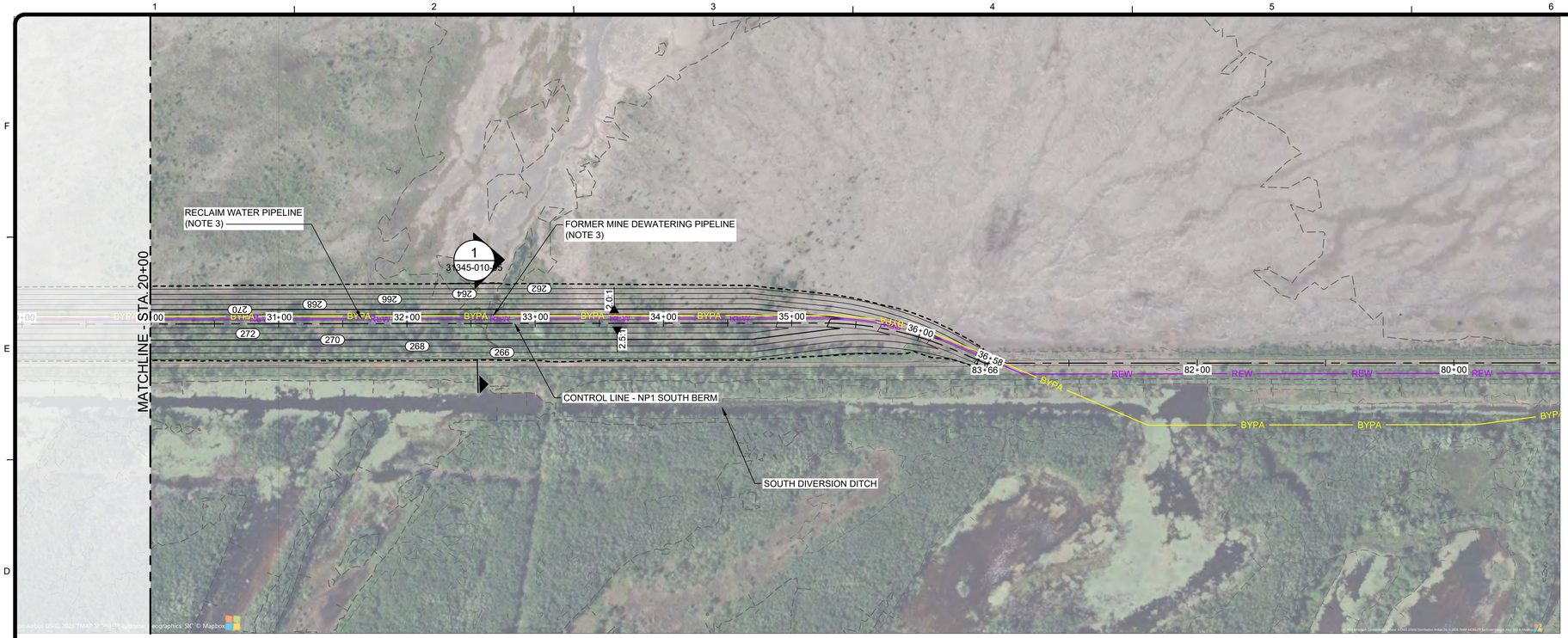
PROJ:	117-372636-25001
DESN:	C. TOMLINSON
DRWN:	R. WOOLSEY
CHKD:	C. TOMLINSON

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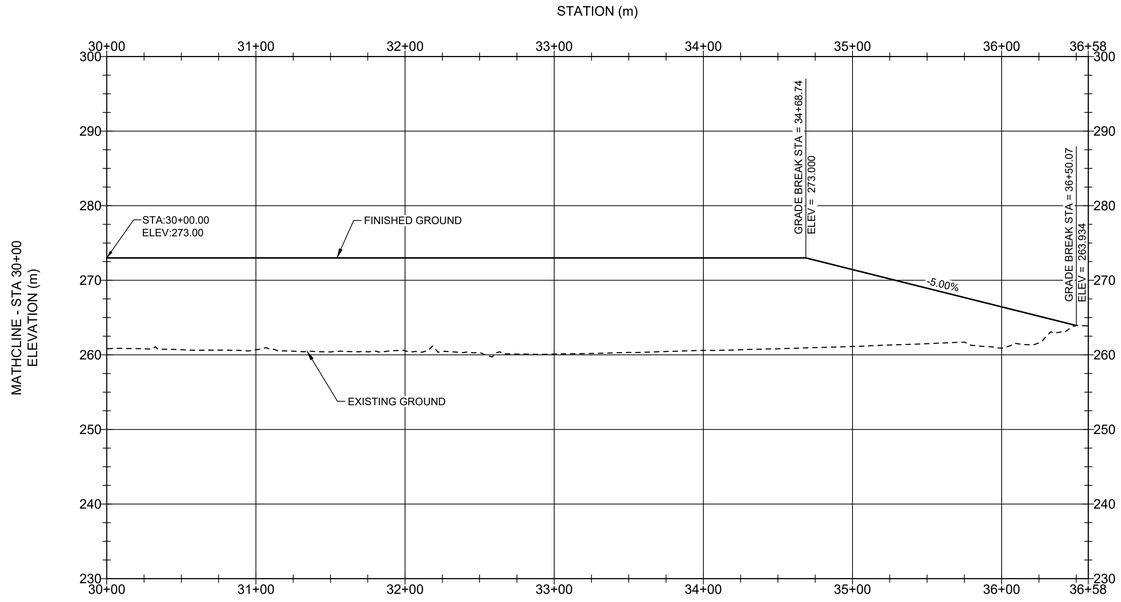
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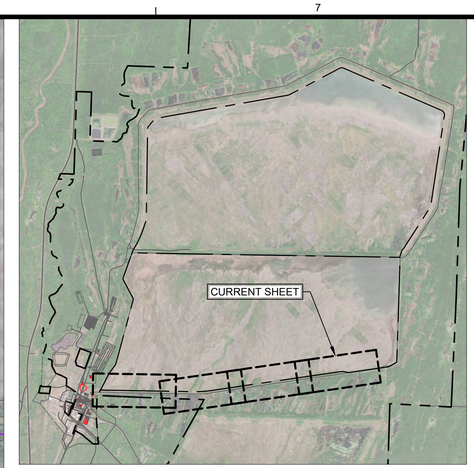
NP1 SOUTH BERM PLAN
STA 30+00 THRU STA 36+58

SCALE: NTS



NP1 SOUTH BERM PROFILE
STA 30+00 THRU STA 36+58

SCALE: NTS



KEY MAP

SCALE: NTS

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0 20m 40m 60m 80m 100m 200m
HORZ SCALE: 1mm = 2m

0 4m 8m 12m 16m 20m 40m
VERT SCALE: 1mm = 0.4m

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WHITE PINE NORTH
TAILINGS MANAGEMENT
PRE-FEASIBILITY STUDY

TAILINGS DISPOSAL FACILITY
NP1 SOUTH BERM P&P
STA 30+00 THRU 36+58

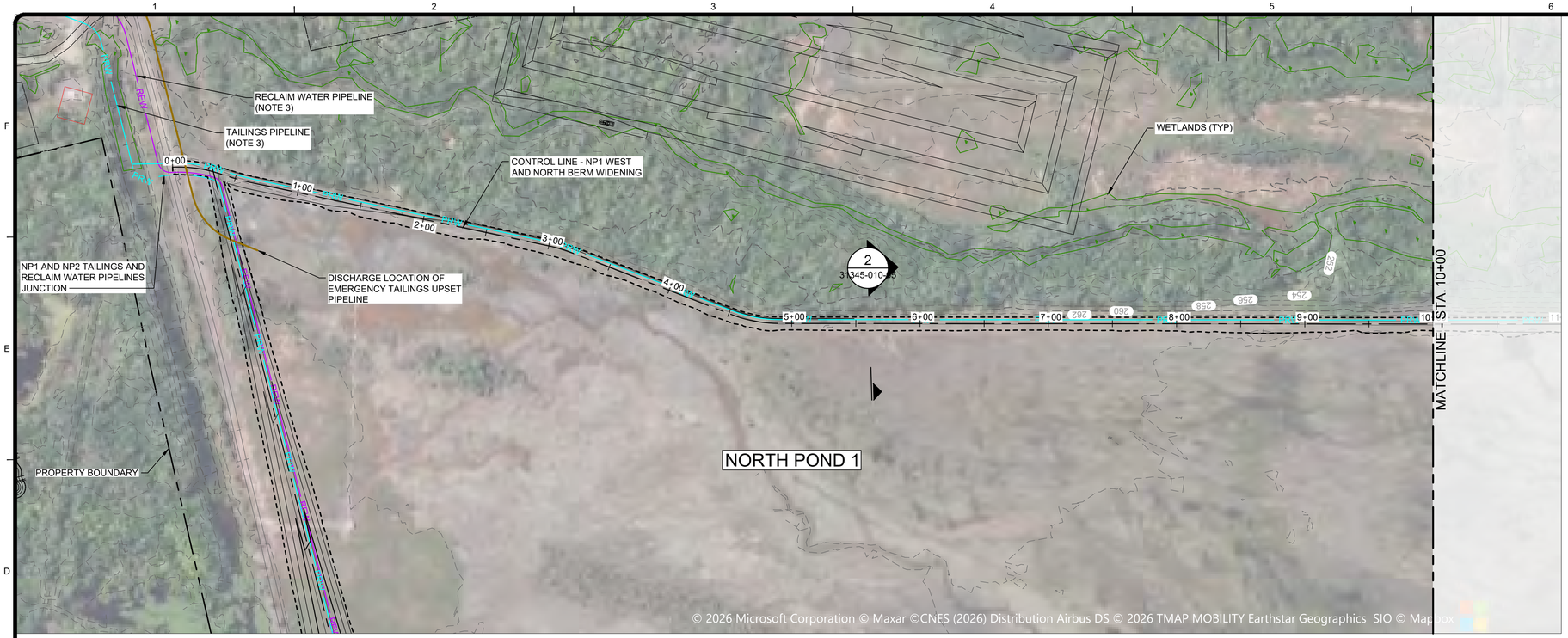
PROJ:	117-372636-25001
DESN:	C. TOMLINSON
DRWN:	R. WOOLSEY
CHKD:	C. TOMLINSON

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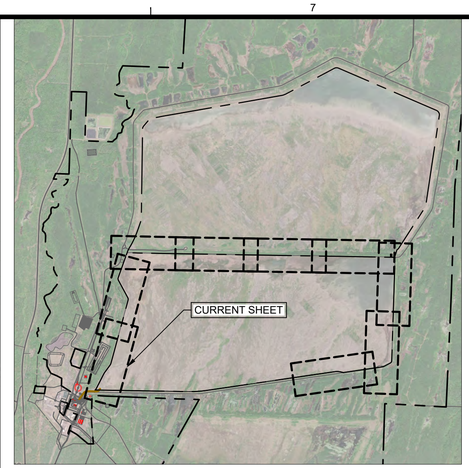
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NP1 WEST & NORTH BERM PLAN
STA 0+00 THRU STA 10+00

SCALE: NTS



KEY MAP

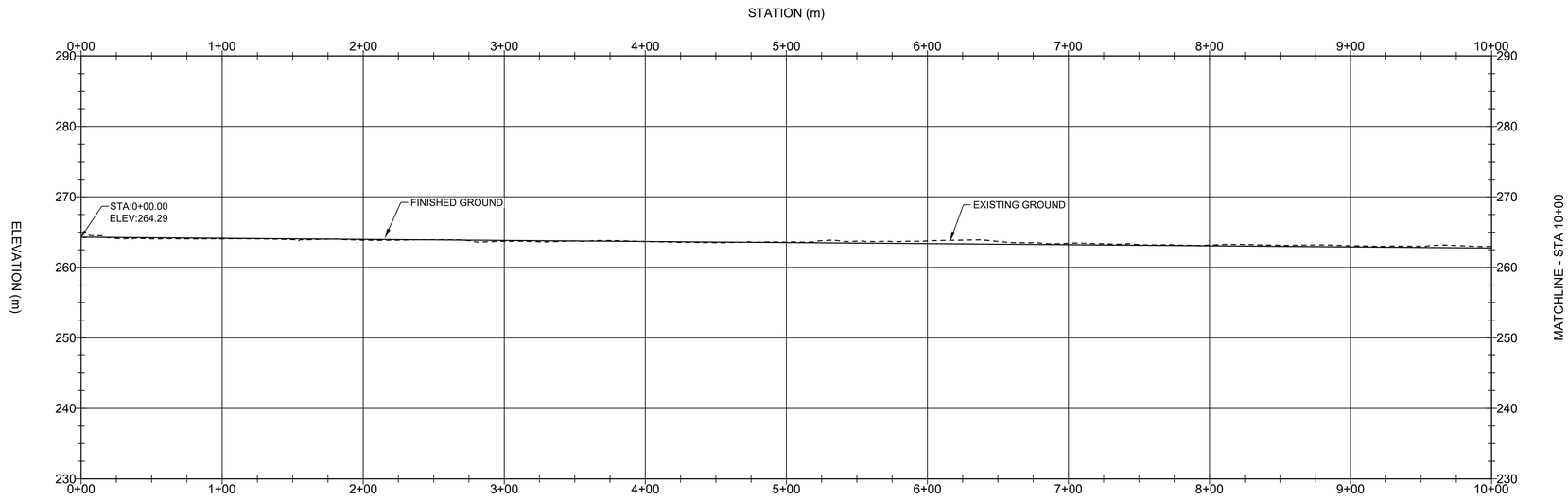
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NP1 WEST & NORTH BERM PROFILE
STA 0+00 THRU STA 10+00

SCALE: NTS

0 20m 40m 60m 80m 100m 200m
HORZ SCALE: 1mm = 2m

0 4m 8m 12m 16m 20m 40m
VERT SCALE: 1mm = 0.4m

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WHITE PINE NORTH
TAILINGS MANAGEMENT
PRE-FEASIBILITY STUDY

TAILINGS DISPOSAL FACILITY
WEST & NORTH BERM P&P
STA 0+00 THRU STA 10+00

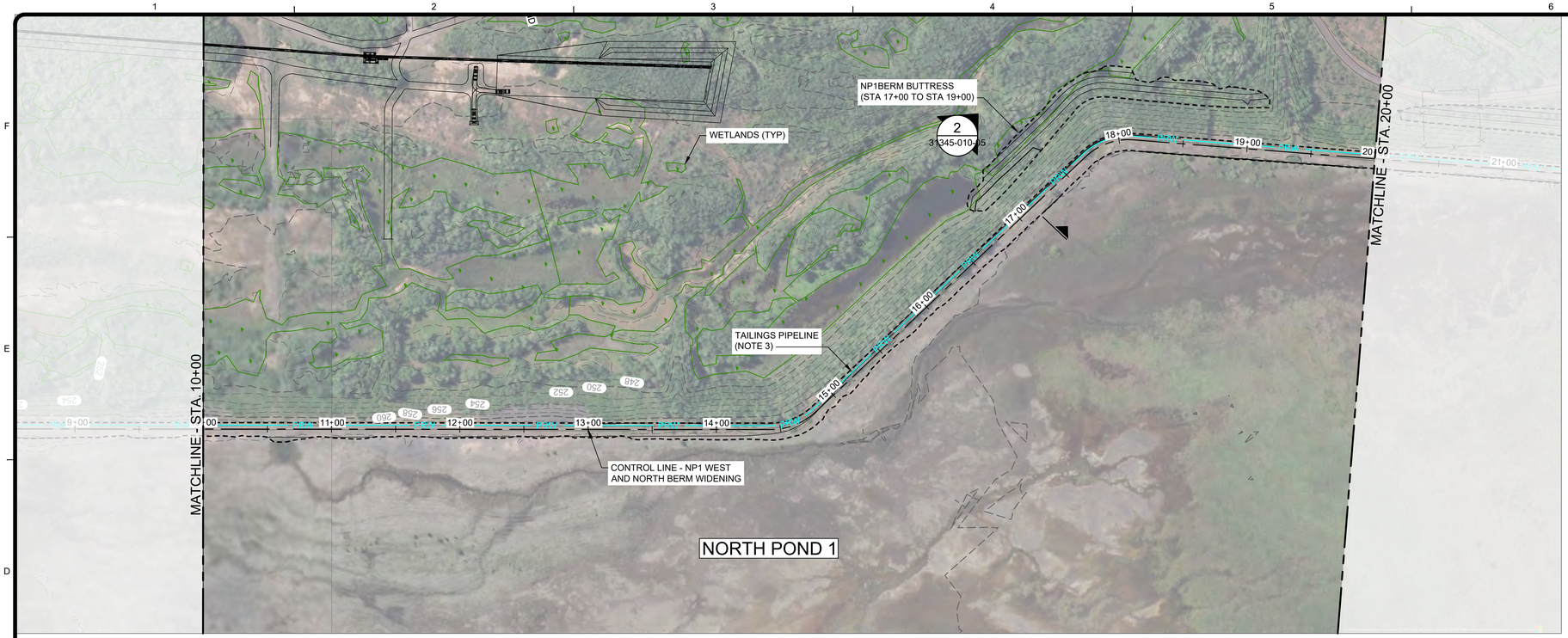
PROJ:	117-372636-25001
DESN:	C. TOMLINSON
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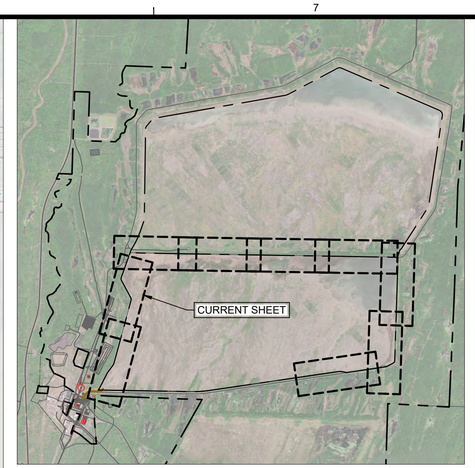
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NP1 WEST & NORTH BERM PLAN
STA 10+00 THRU STA 20+00

SCALE: NTS



KEY MAP

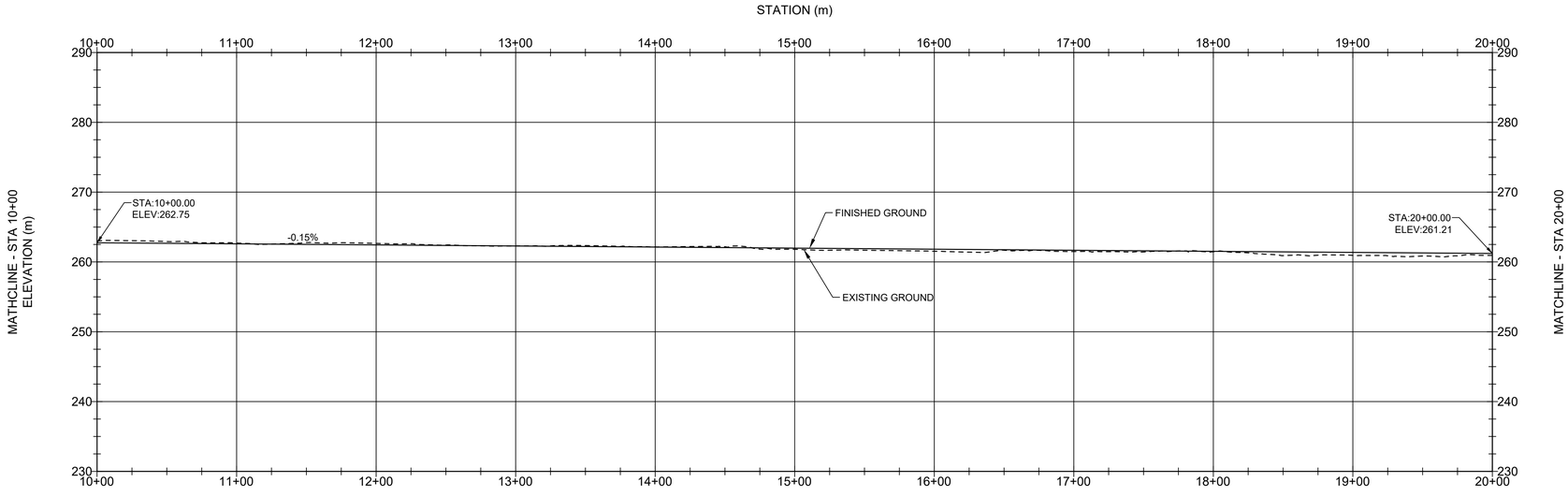
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STA 10+00 THRU STA 20+00

SCALE: NTS

0 20m 40m 60m 80m 100m 200m

HORZ SCALE: 1mm = 2m

0 4m 8m 12m 16m 20m 40m

VERT SCALE: 1mm = 0.4m

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WHITE PINE NORTH

TAILINGS MANAGEMENT
PRE-FEASIBILITY STUDY

TAILINGS DISPOSAL FACILITY
WEST & NORTH BERM P&P
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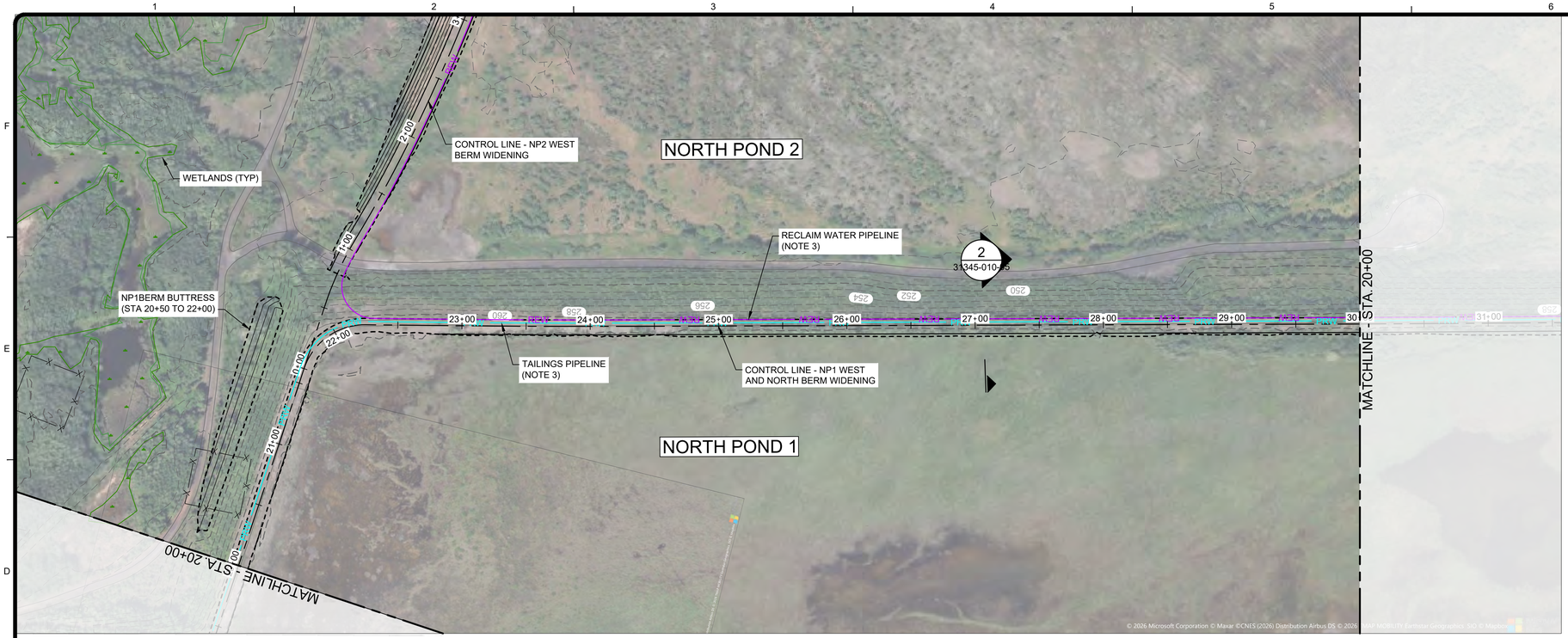
PROJ:	117-372636-25001
DESN:	C. TOMLINSON
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CHKD:	C. TOMLINSON

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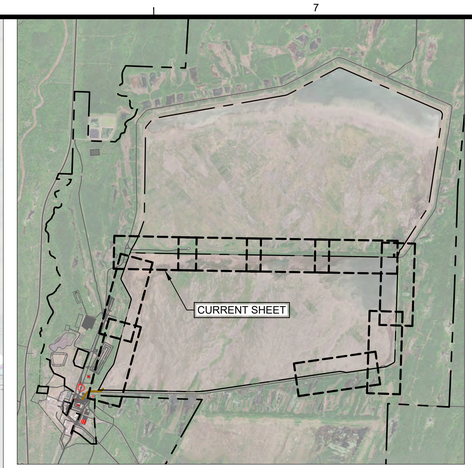
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NP1 WEST & NORTH BERM PLAN
STA 20+00 THRU STA 30+00

SCALE: NTS



KEY MAP

SCALE: NTS

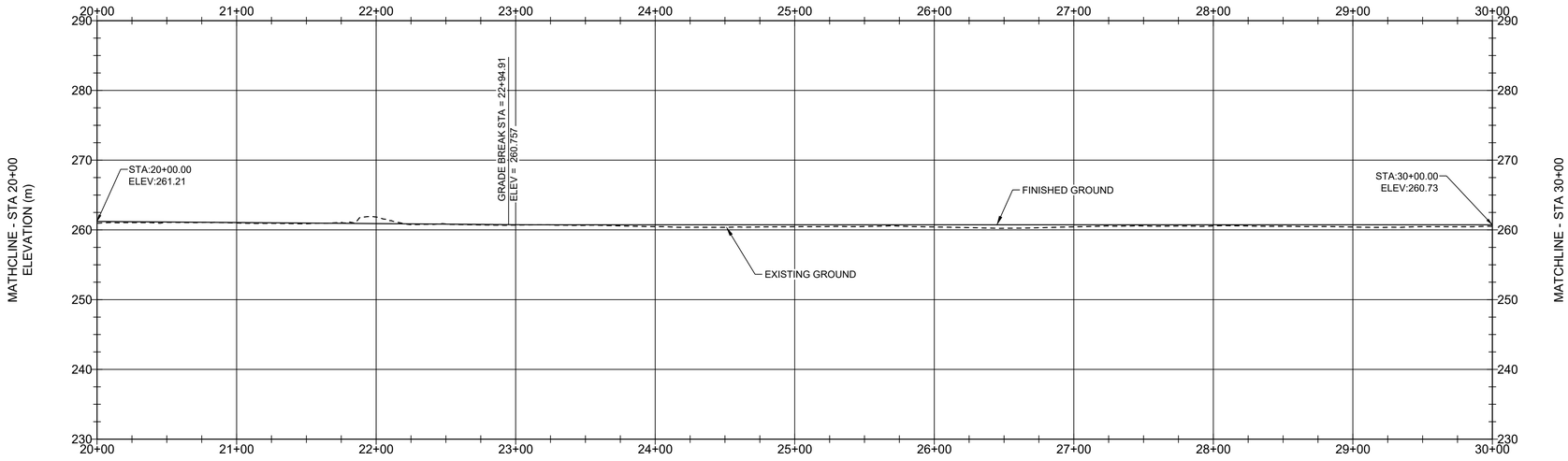
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4. REFER TO DRAWING 108571-EB-03100-31345-009-05 FOR PIPING SCHEDULE AND ROUTING.
5. SOUTH POND DIVERSION PIPELINE SHALL BE TERMINATED INSIDE THE SOUTHEAST CORNER OF NP2.

STATION (m)



NP1 WEST & NORTH BERM PROFILE
STA 20+00 THRU STA 30+00

SCALE: NTS

HORZ SCALE: 1mm = 2m (0, 20m, 40m, 60m, 80m, 100m, 200m)

VERT SCALE: 1mm = 0.4m (0, 4m, 8m, 12m, 16m, 20m, 40m)

Bar Measures 1 inch, otherwise drawing not to scale

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C	04/06/26	ISSUED FOR STUDY	RNW
D	08/17/26	ISSUED FOR PERMITTING	

WHITE PINE NORTH
TAILINGS MANAGEMENT
PRE-FEASIBILITY STUDY

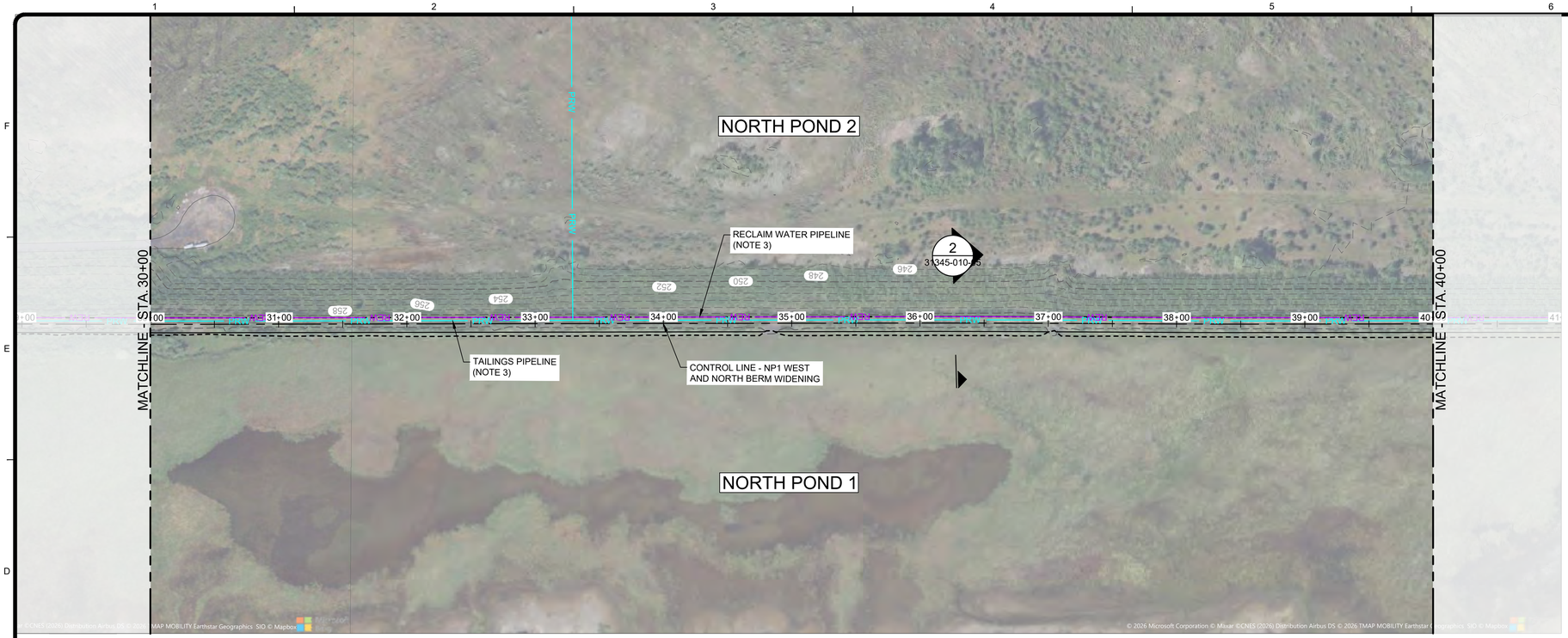
TAILINGS DISPOSAL FACILITY
WEST & NORTH BERM P&P
STA 20+00 THRU STA 30+00

PROJ:	117-372636-25001
DESN:	C. TOMLINSON
DRWN:	R. WOOLSEY
CHKD:	C. TOMLINSON

108571-EB-03100-31345-020-05

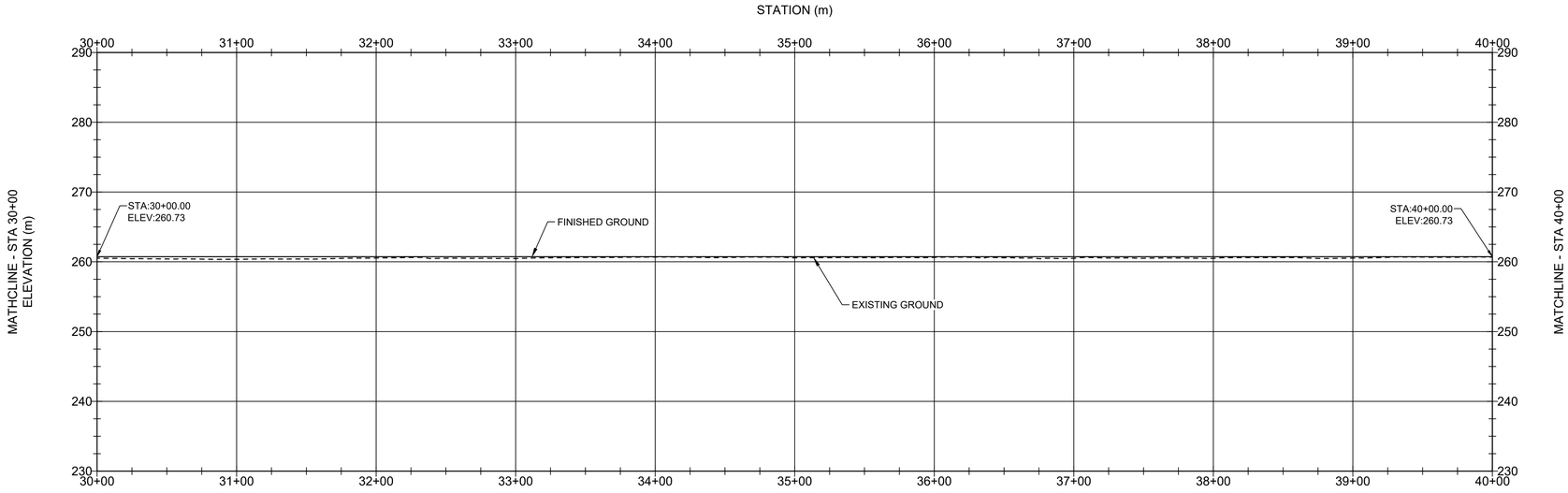
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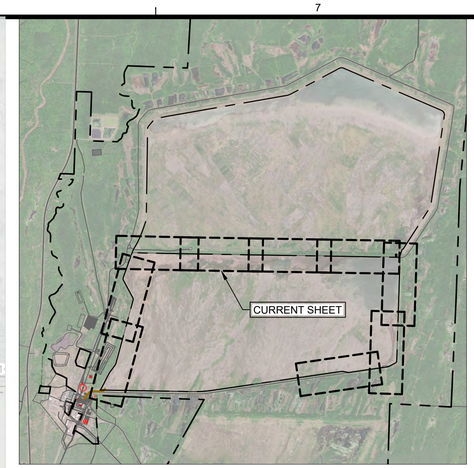
NP1 WEST & NORTH BERM PLAN
STA 30+00 THRU STA 40+00

SCALE: NTS



NP1 WEST & NORTH BERM PROFILE
STA 30+00 THRU STA 40+00

SCALE: NTS



KEY MAP

SCALE: NTS

LEGEND

- EXISTING CONTOURS (2m MINOR, 10m MAJOR)
- DESIGN CONTOURS (2m MINOR, 10m MAJOR)
- BYPA — SOUTH POND DIVERSION PIPELINE
- REW — RECLAIM WATER PIPELINE
- PRW — TAILINGS PIPELINE
- PRW — FORMER MINE DEWATERING PIPELINE
- EMERGENCY TAILINGS UPSET DISCHARGE PIPELINE
- PROPERTY BOUNDARY
- APPROXIMATE LIMITS OF DISTURBANCE

NOTES

1. PROJECT COORDINATE SYSTEM IS UTM-WGS 1984 DATUM, ZONE 16 NORTH, METER; CENT. MERIDIAN 87D W.
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4. REFER TO DRAWING 108571-EB-03100-31345-009-05 FOR PIPING SCHEDULE AND ROUTING.
5. SOUTH POND DIVERSION PIPELINE SHALL BE TERMINATED INSIDE THE SOUTHEAST CORNER OF NP2.

N

0 20m 40m 60m 80m 100m 200m
HORZ SCALE: 1mm = 2m

0 4m 8m 12m 16m 20m 40m
VERT SCALE: 1mm = 0.4m

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WHITE PINE NORTH
TAILINGS MANAGEMENT
PRE-FEASIBILITY STUDY

TAILINGS DISPOSAL FACILITY
WEST & NORTH BERM P&P
STA 30+00 THRU STA 40+00

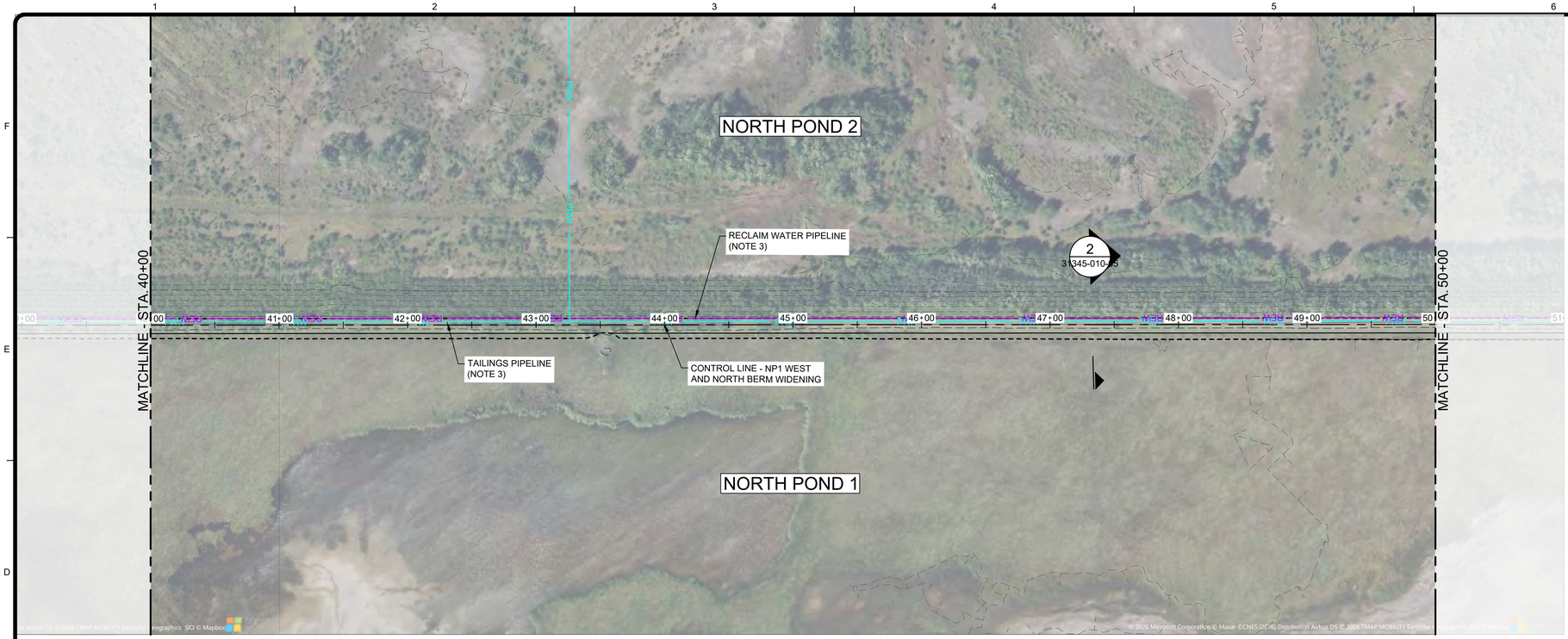
PROJ:	117-372636-25001
DESN:	C. TOMLINSON
DRWN:	R. WOOLSEY
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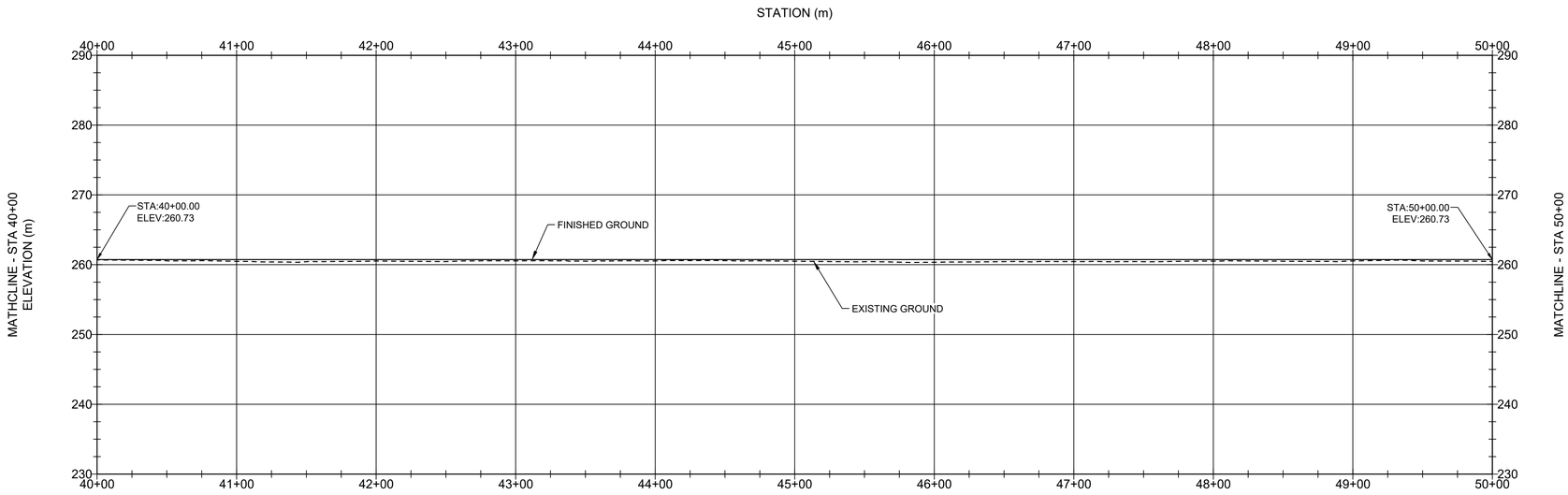
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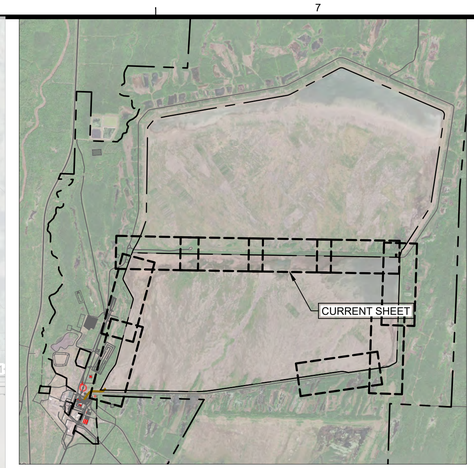
NP1 WEST & NORTH BERM PLAN
STA 40+00 THRU STA 50+00

SCALE: NTS



NP1 WEST & NORTH BERM PROFILE
STA 40+00 THRU STA 50+00

SCALE: NTS



KEY MAP

SCALE: NTS

LEGEND

- EXISTING CONTOURS (2m MINOR, 10m MAJOR)
- DESIGN CONTOURS (2m MINOR, 10m MAJOR)
- BYPA — SOUTH POND DIVERSION PIPELINE
- REW — RECLAIM WATER PIPELINE
- PRW — TAILINGS PIPELINE
- PRW — FORMER MINE DEWATERING PIPELINE
- EMERGENCY TAILINGS UPSET DISCHARGE PIPELINE
- PROPERTY BOUNDARY
- APPROXIMATE LIMITS OF DISTURBANCE

NOTES

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0 20m 40m 60m 80m 100m 200m

HORZ SCALE: 1mm = 2m

0 4m 8m 12m 16m 20m 40m

VERT SCALE: 1mm = 0.4m

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WHITE PINE NORTH
TAILINGS MANAGEMENT
PRE-FEASIBILITY STUDY

TAILINGS DISPOSAL FACILITY
WEST & NORTH BERM P&P
STA 40+00 THRU STA 50+00

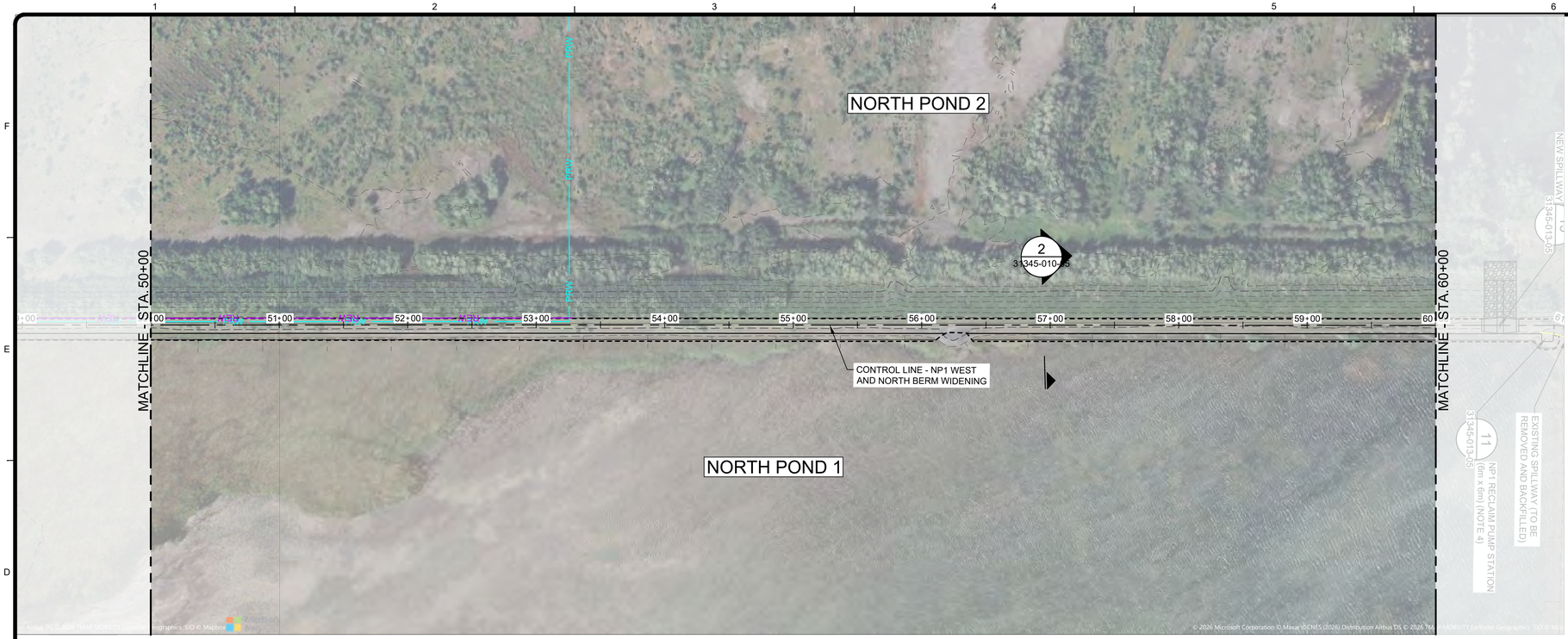
PROJ:	117-372636-25001
DESN:	C. TOMLINSON
DRWN:	R. WOOLSEY
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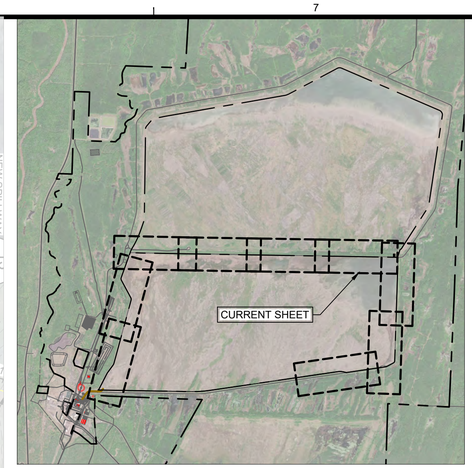
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NP1 WEST & NORTH BERM PLAN
STA 50+00 THRU STA 60+00

SCALE: NTS



KEY MAP

SCALE: NTS

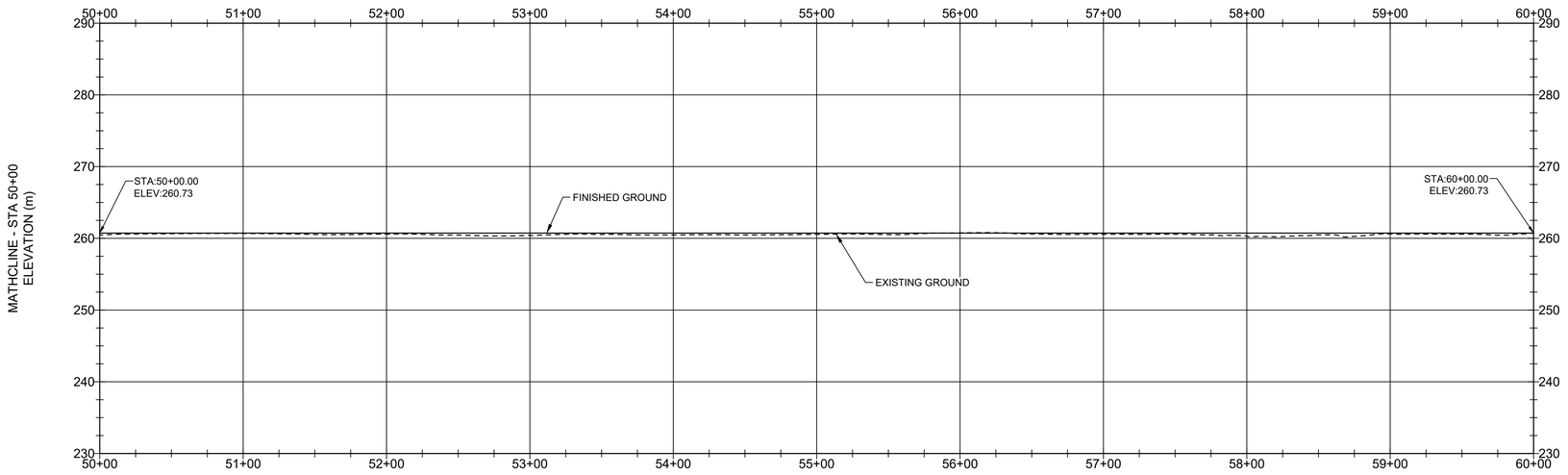
LEGEND

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- DESIGN CONTOURS (2m MINOR, 10m MAJOR)
- BYPA — SOUTH POND DIVERSION PIPELINE
- REW — RECLAIM WATER PIPELINE
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- PRW — FORMER MINE DEWATERING PIPELINE
- EMERGENCY TAILINGS UPSET DISCHARGE PIPELINE
- PROPERTY BOUNDARY
- APPROXIMATE LIMITS OF DISTURBANCE

NOTES

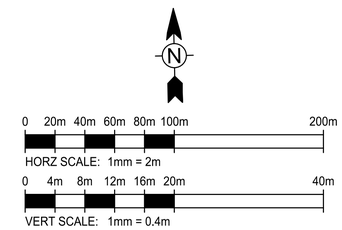
1. PROJECT COORDINATE SYSTEM IS UTM-WGS 1984 DATUM, ZONE 16 NORTH, METER; CENT. MERIDIAN 87D W.
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STATION (m)



NP1 WEST & NORTH BERM PROFILE
STA 50+00 THRU STA 60+00

SCALE: NTS



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D	08/17/26	ISSUED FOR PERMITTING	

WHITE PINE NORTH
TAILINGS MANAGEMENT
PRE-FEASIBILITY STUDY

TAILINGS DISPOSAL FACILITY
WEST & NORTH BERM P&P
STA 50+00 THRU STA 60+00

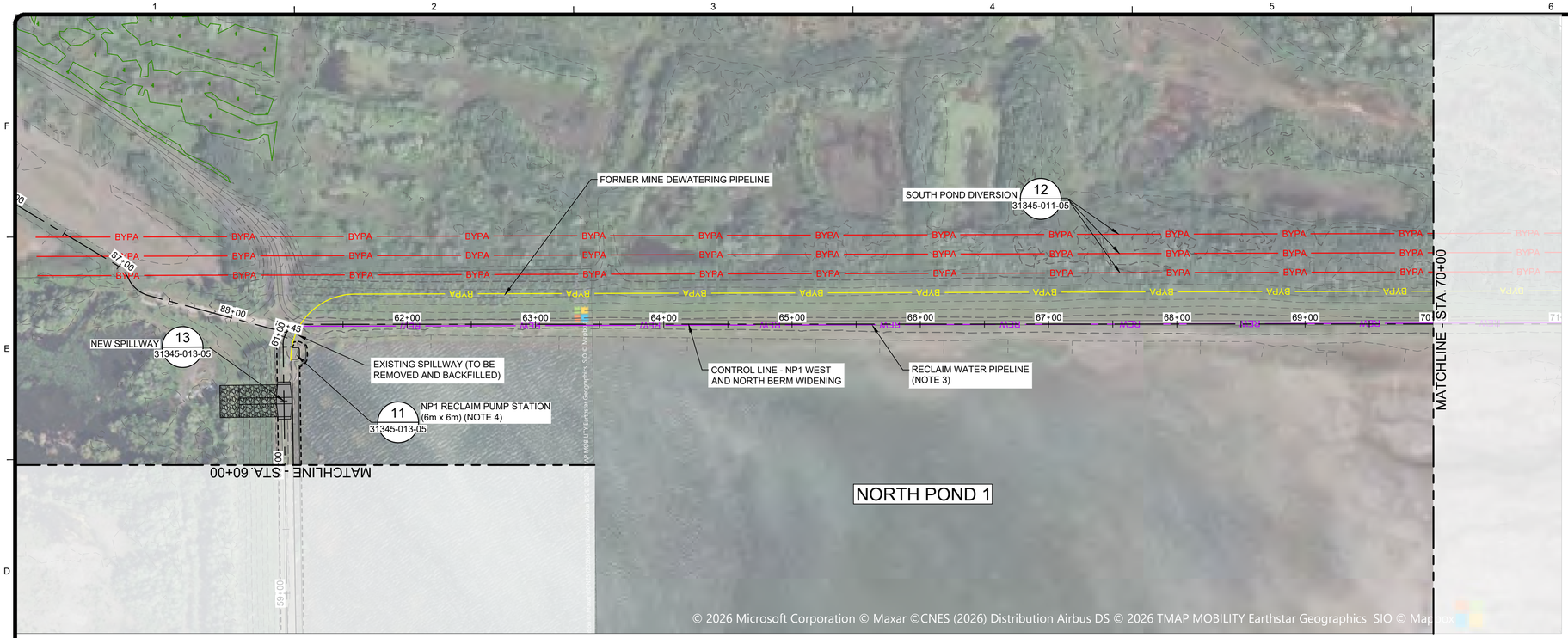
PROJ:	117-372636-25001
DESN:	C. TOMLINSON
DRWN:	R. WOOLSEY
CHKD:	C. TOMLINSON

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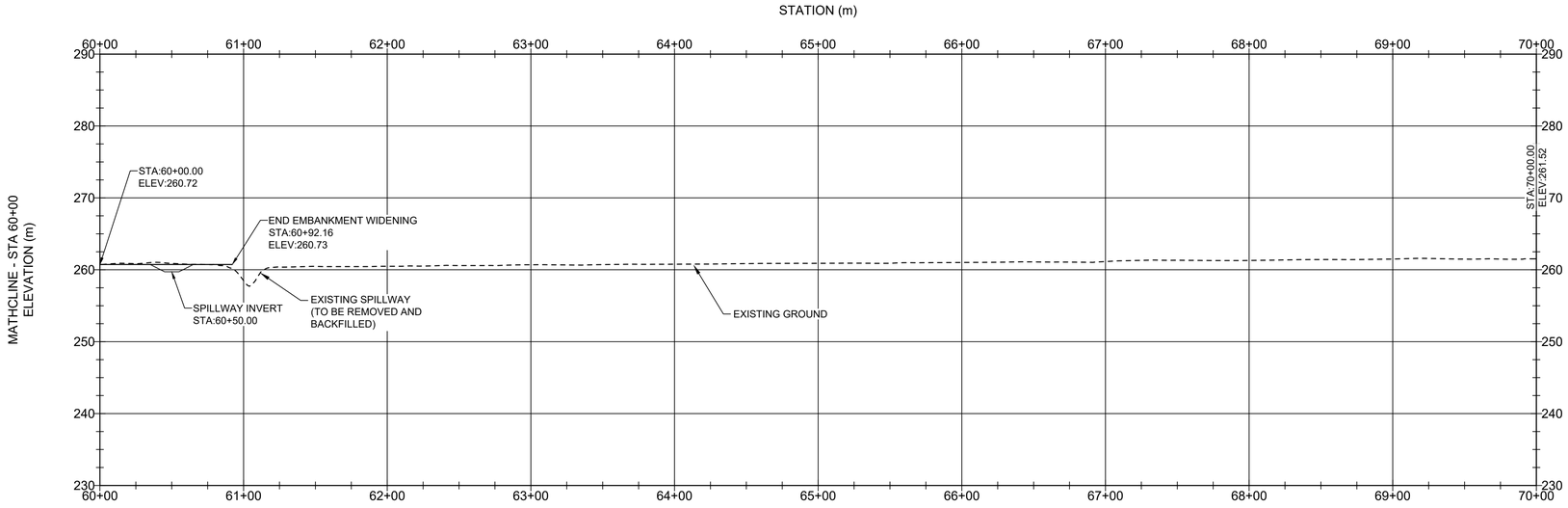
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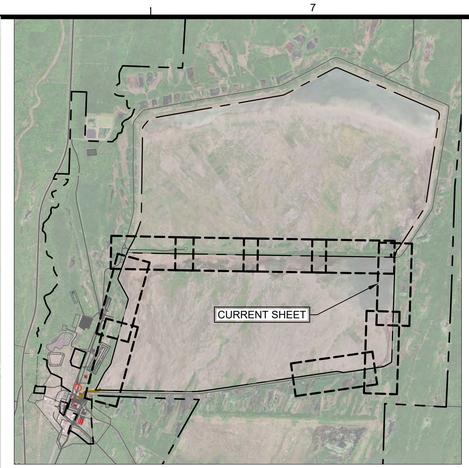
NP1 WEST & NORTH BERM PLAN
STA 60+00 THRU STA 70+00

SCALE: NTS



NP1 WEST & NORTH BERM PROFILE
STA 60+00 THRU STA 70+00

SCALE: NTS



KEY MAP

SCALE: NTS

LEGEND

- EXISTING CONTOURS (2m MINOR, 10m MAJOR)
- DESIGN CONTOURS (2m MINOR, 10m MAJOR)
- BYPA — SOUTH POND DIVERSION PIPELINE
- REW — RECLAIM WATER PIPELINE
- PRW — TAILINGS PIPELINE
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- EMERGENCY TAILINGS UPSET DISCHARGE PIPELINE
- PROPERTY BOUNDARY
- APPROXIMATE LIMITS OF DISTURBANCE

NOTES

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5. SOUTH POND DIVERSION PIPELINE SHALL BE TERMINATED INSIDE THE SOUTHEAST CORNER OF NP2.

0 20m 40m 60m 80m 100m 200m

HORZ SCALE: 1mm = 2m

0 4m 8m 12m 16m 20m 40m

VERT SCALE: 1mm = 0.4m

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D	08/17/26	ISSUED FOR PERMITTING	

WHITE PINE NORTH
TAILINGS MANAGEMENT
PRE-FEASIBILITY STUDY

TAILINGS DISPOSAL FACILITY
WEST & NORTH BERM P&P
STA 60+00 THRU STA 70+00

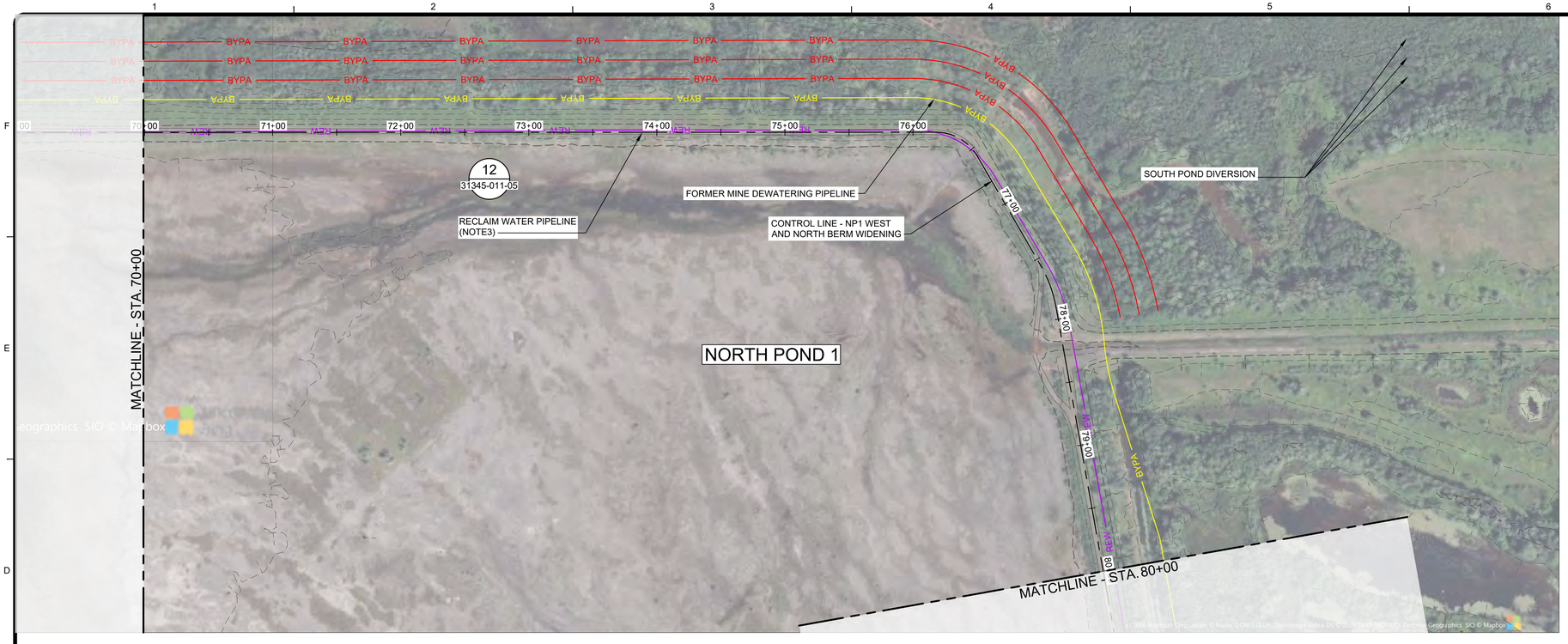
PROJ:	117-372636-25001
DESN:	C. TOMLINSON
DRWN:	R. WOOLSEY
CHKD:	C. TOMLINSON

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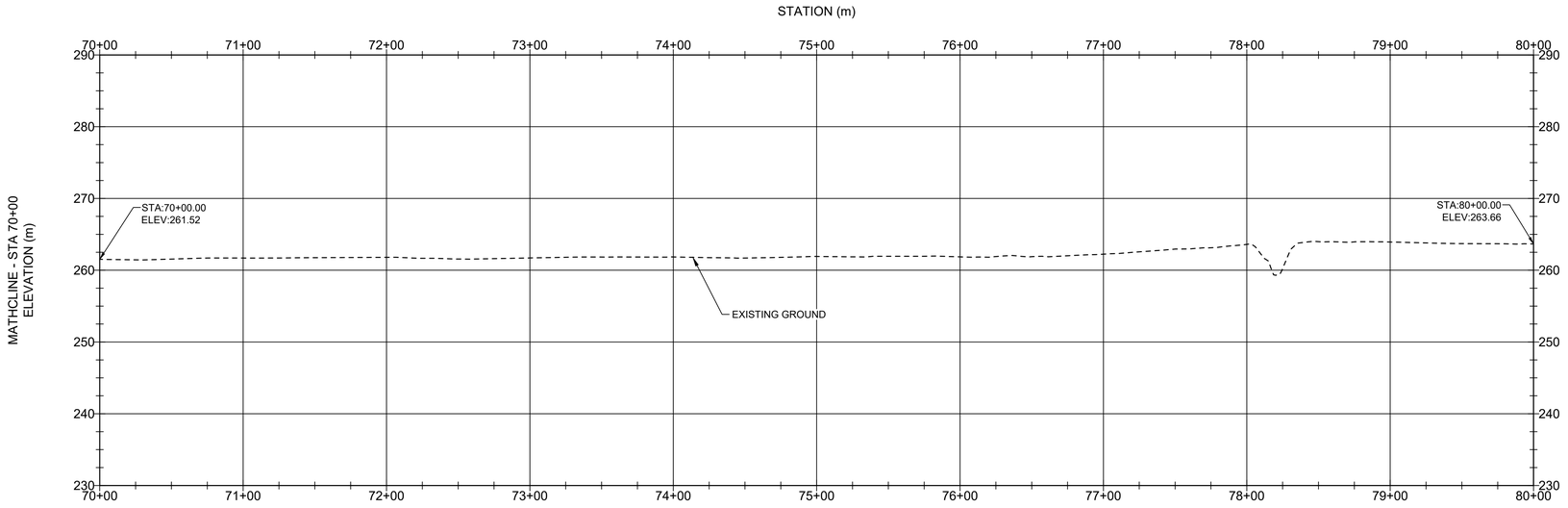
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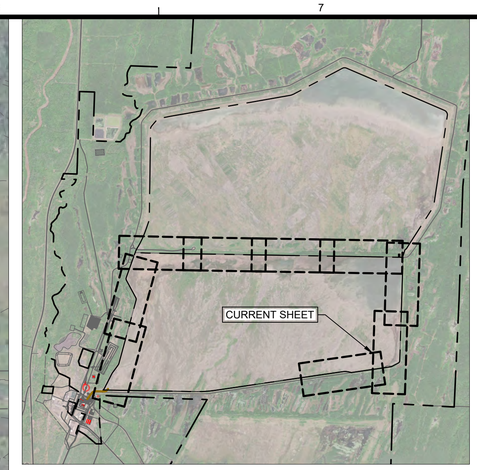
NP1 WEST & NORTH BERM PLAN
STA 70+00 THRU STA 80+00

SCALE: NTS



NP1 WEST & NORTH BERM PROFILE
STA 70+00 THRU STA 80+00

SCALE: NTS



KEY MAP

SCALE: NTS

LEGEND

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- DESIGN CONTOURS (2m MINOR, 10m MAJOR)
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0 20m 40m 60m 80m 100m 200m
HORZ SCALE: 1mm = 2m

0 4m 8m 12m 16m 20m 40m
VERT SCALE: 1mm = 0.4m

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D	08/17/26	ISSUED FOR PERMITTING	

WHITE PINE NORTH
TAILINGS MANAGEMENT
PRE-FEASIBILITY STUDY

TAILINGS DISPOSAL FACILITY
WEST & NORTH BERM P&P
STA 70+00 THRU STA 80+00

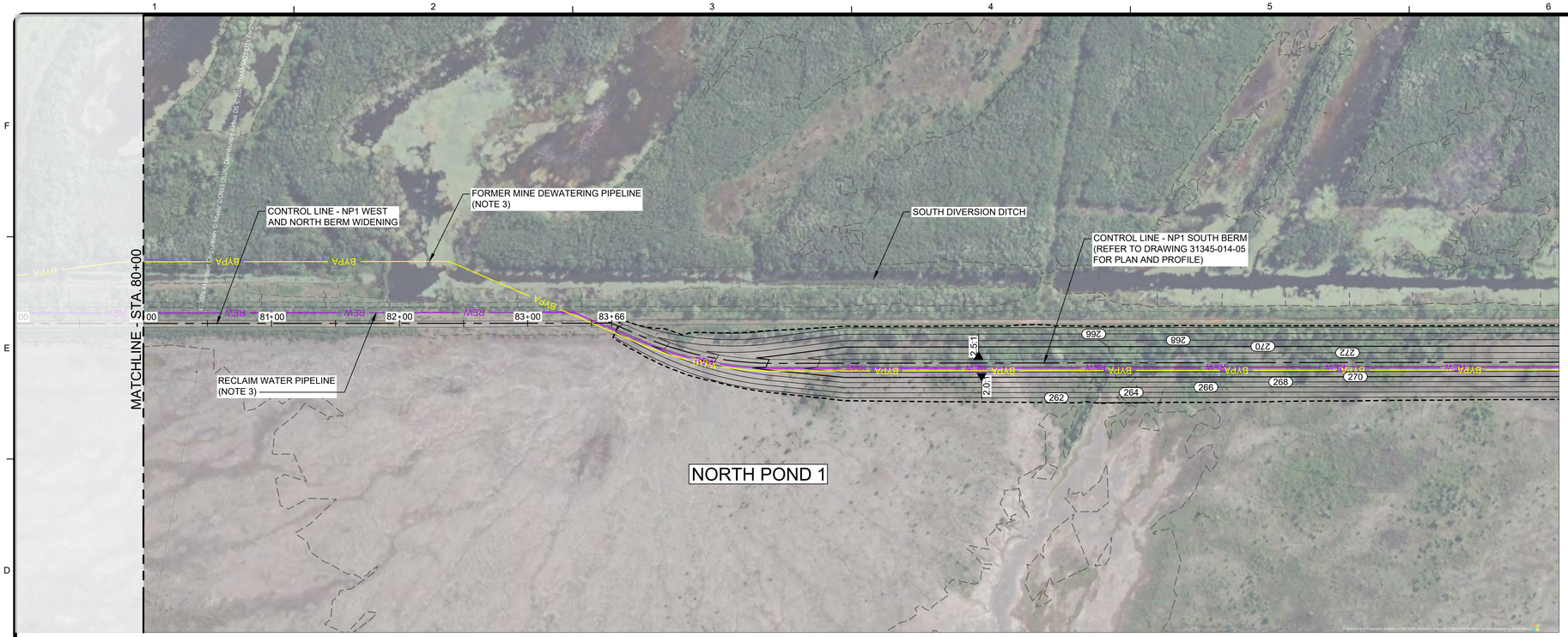
PROJ:	117-372636-25001
DESN:	C. TOMLINSON
DRWN:	R. WOOLSEY
CHKD:	C. TOMLINSON

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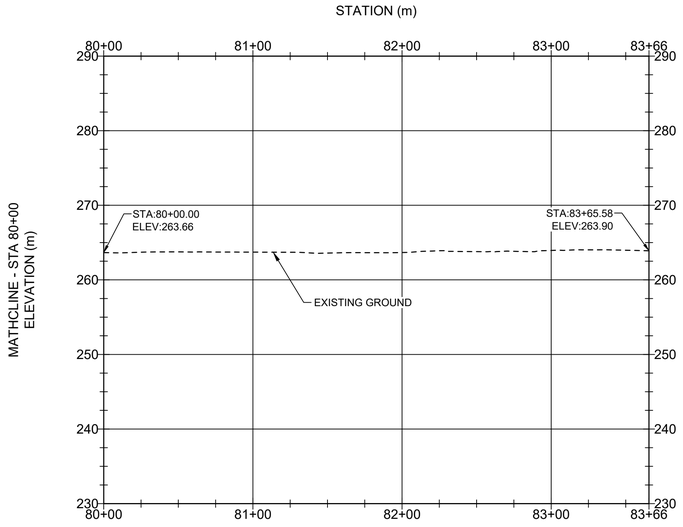
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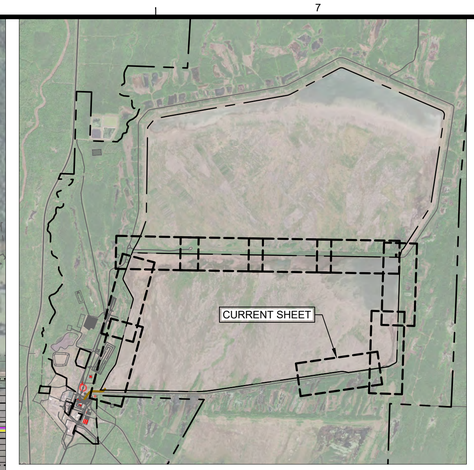
NP1 WEST & NORTH BERM PLAN
STA 80+00 THRU STA 83+66

SCALE: NTS



NP1 WEST & NORTH BERM PROFILE
STA 80+00 THRU STA 83+66

SCALE: NTS



KEY MAP

SCALE: NTS

LEGEND

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- DESIGN CONTOURS (2m MINOR, 10m MAJOR)
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0 20m 40m 60m 80m 100m 200m
HORZ SCALE: 1mm = 2m

0 4m 8m 12m 16m 20m 40m
VERT SCALE: 1mm = 0.4m

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WHITE PINE NORTH
TAILINGS MANAGEMENT
PRE-FEASIBILITY STUDY

TAILINGS DISPOSAL FACILITY
WEST & NORTH BERM P&P
STA 80+00 THRU STA 83+66

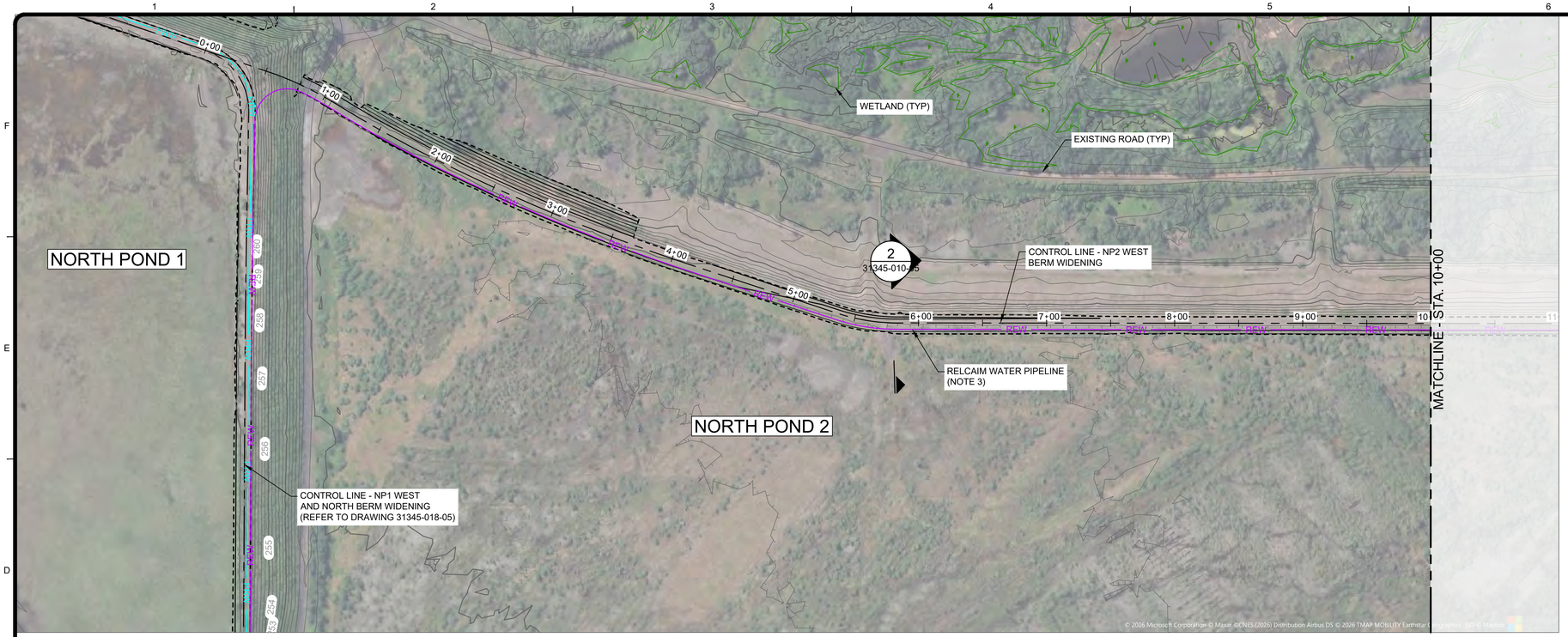
PROJ:	117-372636-25001
DESN:	C. TOMLINSON
DRWN:	R. WOOLSEY
CHKD:	C. TOMLINSON

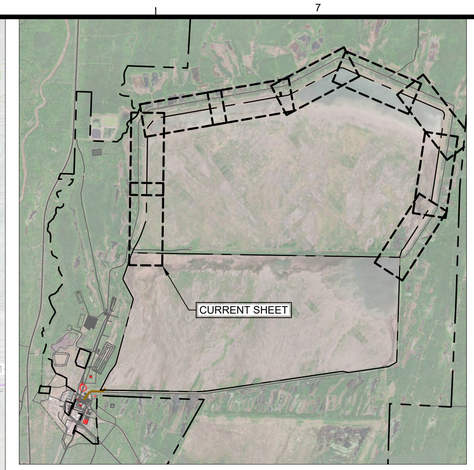
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Bar Measures 1 inch, otherwise drawing not to scale

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KEY MAP

SCALE: NTS

LEGEND

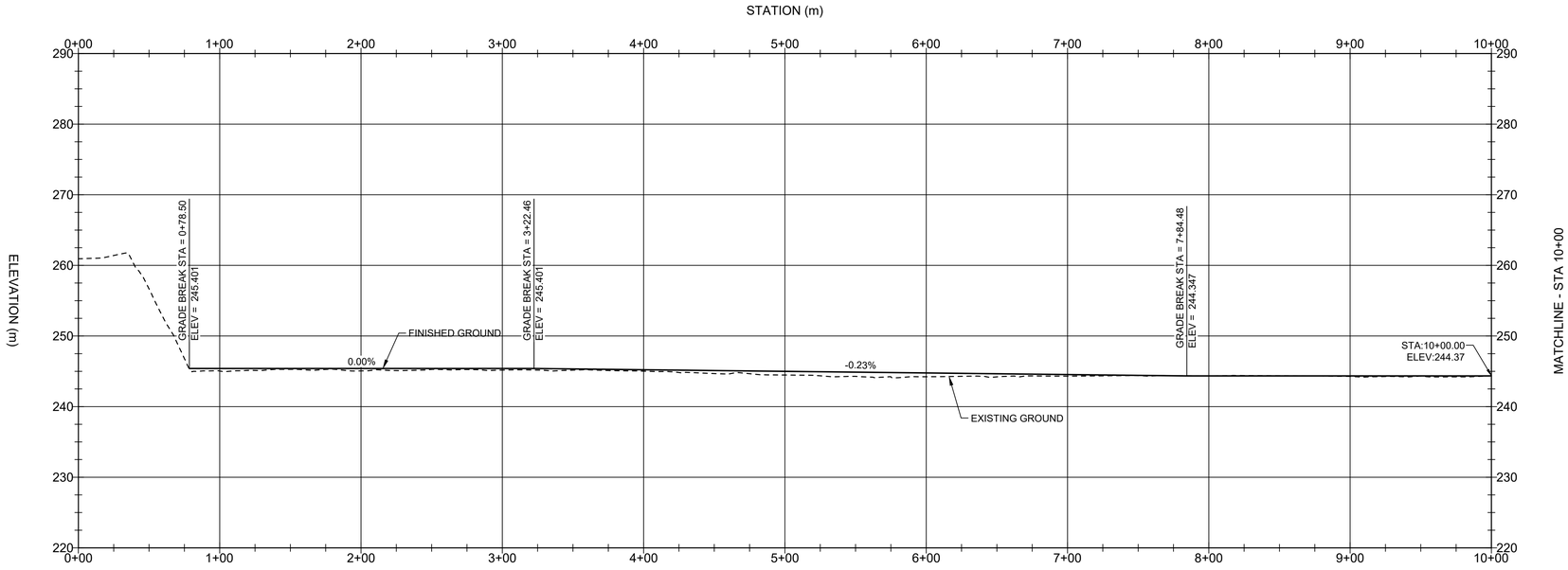
- EXISTING CONTOURS (2m MINOR, 10m MAJOR)
- DESIGN CONTOURS (2m MINOR, 10m MAJOR)
- BYPA — SOUTH POND DIVERSION PIPELINE
- REW — RECLAIM WATER PIPELINE
- PRW — TAILINGS PIPELINE
- PRW — FORMER MINE DEWATERING PIPELINE
- EMERGENCY TAILINGS UPSET DISCHARGE PIPELINE
- PROPERTY BOUNDARY
- APPROXIMATE LIMITS OF DISTURBANCE

NOTES

1. PROJECT COORDINATE SYSTEM IS UTM-WGS 1984 DATUM, ZONE 16 NORTH, METER; CENT. MERIDIAN 87D W.
2. DRAWING UNITS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
3. RECLAIM WATER AND TAILINGS PIPELINES SHOWN ARE INDICATIVE. PIPELINE SHALL BE INSTALLED ON BERMS UNLESS NOTED OTHERWISE.
4. REFER TO DRAWING 108571-EB-03100-31345-009-05 FOR PIPING SCHEDULE AND ROUTING.
5. SOUTH POND DIVERSION PIPELINE SHALL BE TERMINATED INSIDE THE SOUTHEAST CORNER OF NP2.

NP2 WEST BERM PLAN
STA 0+00 THRU STA 10+00

SCALE: NTS



NP2 WEST BERM PROFILE
STA 0+00 THRU STA 10+00

SCALE: NTS

0 20m 40m 60m 80m 100m 200m

HORZ SCALE: 1mm = 2m

0 4m 8m 12m 16m 20m 40m

VERT SCALE: 1mm = 0.4m

MARK	DATE	DESCRIPTION	BY
A	02/27/26	ISSUED FOR REVIEW	RNW
B	03/27/26	ISSUED FOR REVIEW	RNW
C	04/06/26	ISSUED FOR STUDY	RNW
D	08/17/26	ISSUED FOR PERMITTING	RNW

FOR PERMITTING
NOT FOR CONSTRUCTION

WHITE PINE NORTH

TAILINGS MANAGEMENT
PRE-FEASIBILITY STUDY

TAILINGS DISPOSAL FACILITY
NP2 WEST BERM P&P
STA 0+00 THRU STA 10+00

PROJ:	117-372636-25001
DESN:	C. TOMLINSON
DRWN:	R. WOOLSEY
CHKD:	C. TOMLINSON

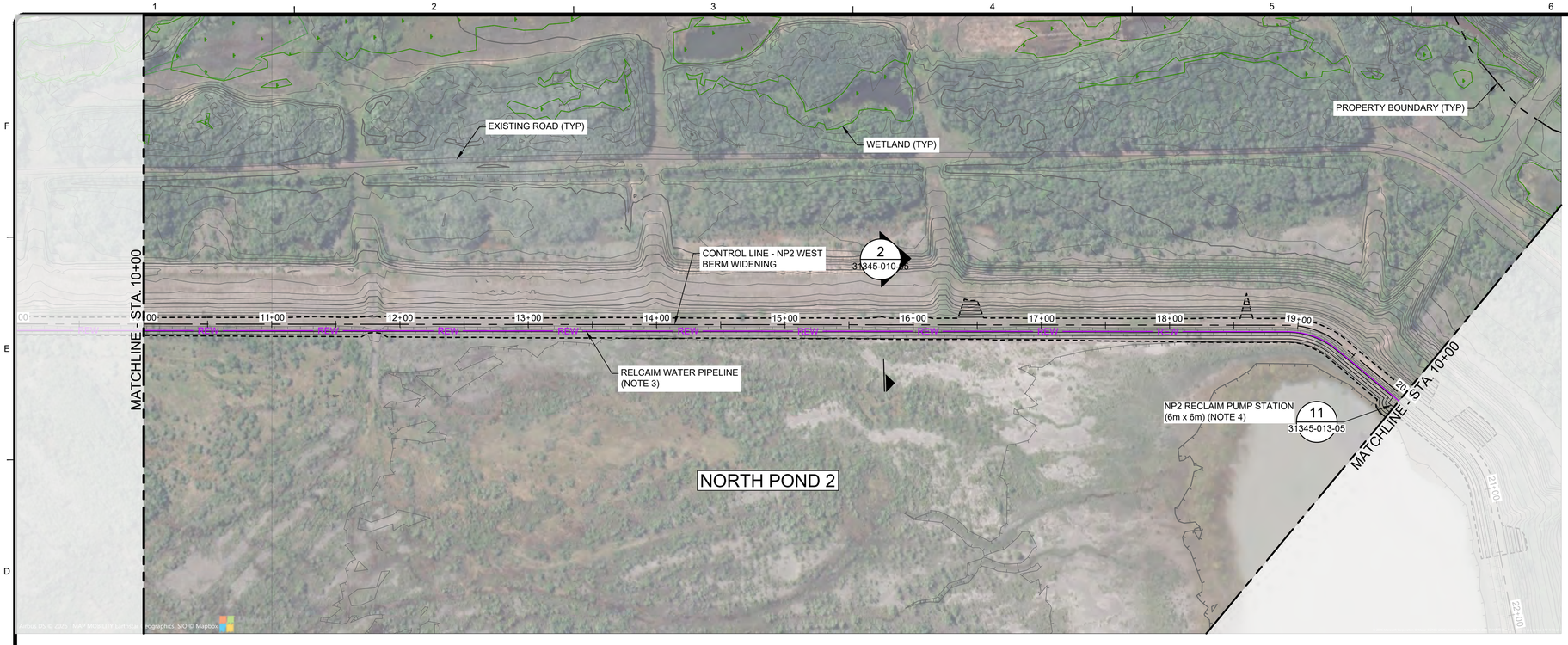
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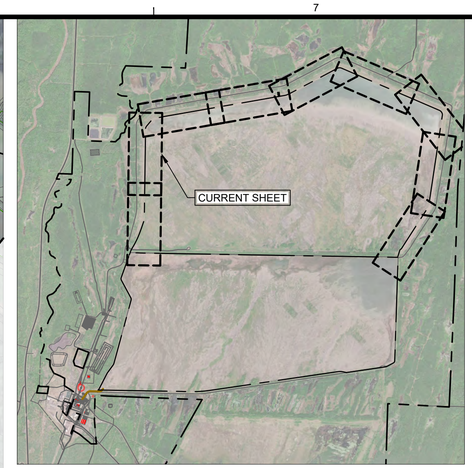
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NP2 WEST BERM PLAN
STA 10+00 THRU STA 21+53
SCALE: NTS



KEY MAP
SCALE: NTS

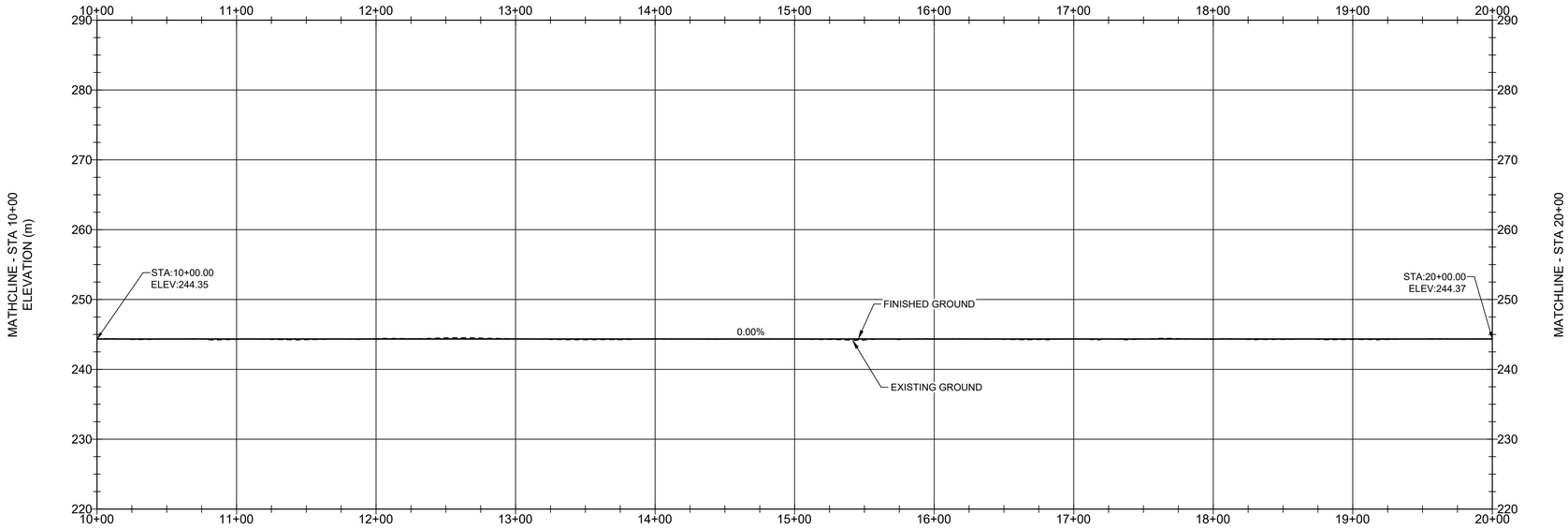
LEGEND

- EXISTING CONTOURS (2m MINOR, 10m MAJOR)
- DESIGN CONTOURS (2m MINOR, 10m MAJOR)
- BYPA — SOUTH POND DIVERSION PIPELINE
- REW — RECLAIM WATER PIPELINE
- PRW — TAILINGS PIPELINE
- PRW — FORMER MINE DEWATERING PIPELINE
- EMERGENCY TAILINGS UPSET DISCHARGE PIPELINE
- PROPERTY BOUNDARY
- APPROXIMATE LIMITS OF DISTURBANCE

NOTES

1. PROJECT COORDINATE SYSTEM IS UTM-WGS 1984 DATUM, ZONE 16 NORTH, METER; CENT. MERIDIAN 87D W.
2. DRAWING UNITS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
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4. REFER TO DRAWING 108571-EB-03100-31345-009-05 FOR PIPING SCHEDULE AND ROUTING.
5. SOUTH POND DIVERSION PIPELINE SHALL BE TERMINATED INSIDE THE SOUTHEAST CORNER OF NP2.

STATION (m)



NP2 WEST BERM PROFILE
STA 10+00 THRU STA 20+00
SCALE: NTS

0 20m 40m 60m 80m 100m 200m
HORZ SCALE: 1mm = 2m

0 4m 8m 12m 16m 20m 40m
VERT SCALE: 1mm = 0.4m

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B	03/27/26	ISSUED FOR REVIEW	RNW
C	04/06/26	ISSUED FOR STUDY	RNW
D	08/17/26	ISSUED FOR PERMITTING	

WHITE PINE NORTH
TAILINGS MANAGEMENT
PRE-FEASIBILITY STUDY

TAILINGS DISPOSAL FACILITY
NP2 WEST BERM P&P
STA 10+00 THRU STA 20+00

PROJ:	117-372636-25001
DESN:	C. TOMLINSON
DRWN:	R. WOOLSEY
CHKD:	C. TOMLINSON

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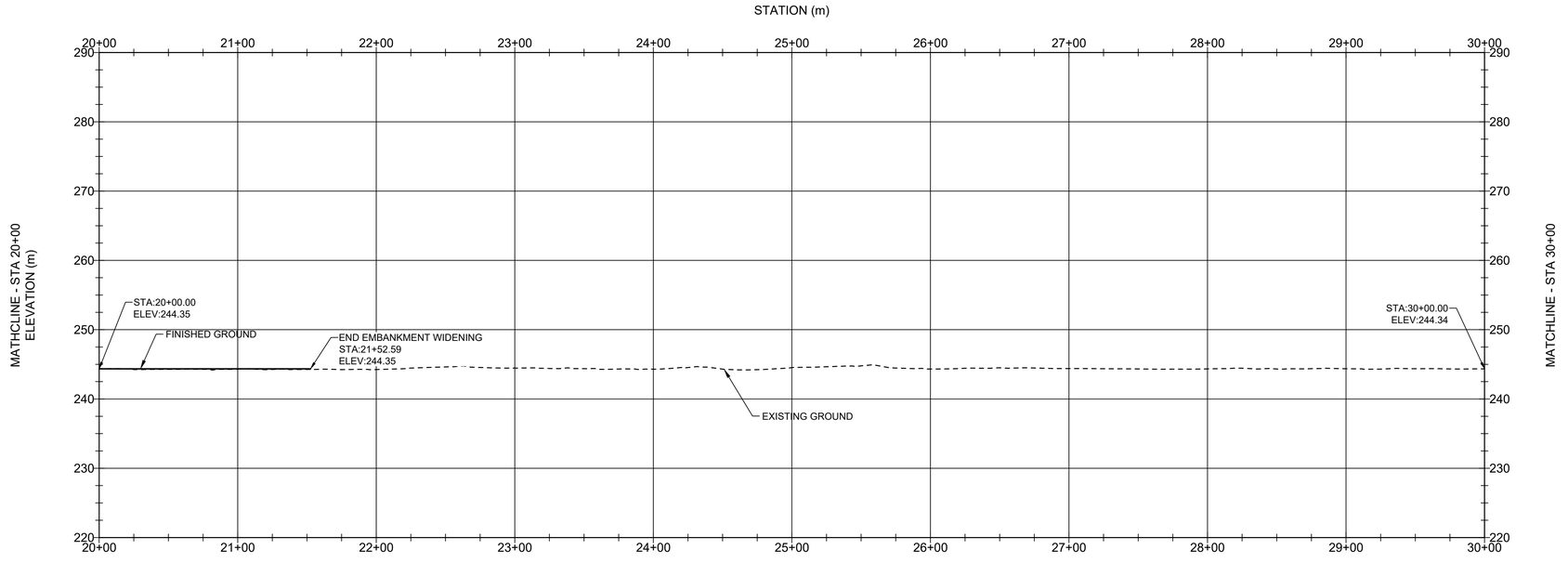
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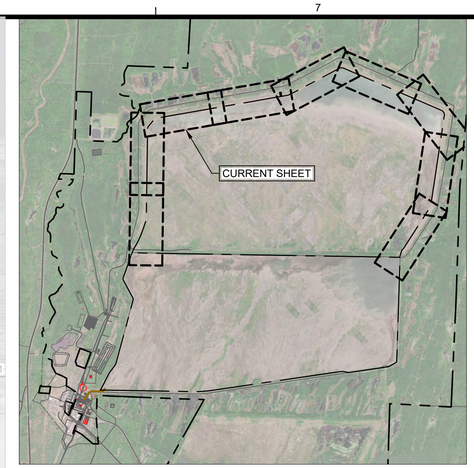
NP2 WEST BERM PLAN
STA 20+00 THRU STA 30+00

SCALE: NTS



NP2 WEST BERM PROFILE
STA 20+00 THRU STA 30+00

SCALE: NTS



KEY MAP

SCALE: NTS

LEGEND

- EXISTING CONTOURS (2m MINOR, 10m MAJOR)
- DESIGN CONTOURS (2m MINOR, 10m MAJOR)
- BYPA — SOUTH POND DIVERSION PIPELINE
- REW — RECLAIM WATER PIPELINE
- PRW — TAILINGS PIPELINE
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- PROPERTY BOUNDARY
- APPROXIMATE LIMITS OF DISTURBANCE

NOTES

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4. REFER TO DRAWING 108571-EB-03100-31345-009-05 FOR PIPING SCHEDULE AND ROUTING.
5. SOUTH POND DIVERSION PIPELINE SHALL BE TERMINATED INSIDE THE SOUTHEAST CORNER OF NP2.

0 20m 40m 60m 80m 100m 200m
HORZ SCALE: 1mm = 2m

0 4m 8m 12m 16m 20m 40m
VERT SCALE: 1mm = 0.4m

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B	03/27/26	ISSUED FOR REVIEW	RNW
C	04/06/26	ISSUED FOR STUDY	RNW
D	08/17/26	ISSUED FOR PERMITTING	

WHITE PINE NORTH
TAILINGS MANAGEMENT
PRE-FEASIBILITY STUDY

TAILINGS DISPOSAL FACILITY
NP2 WEST BERM P&P
STA 20+00 THRU STA 30+00

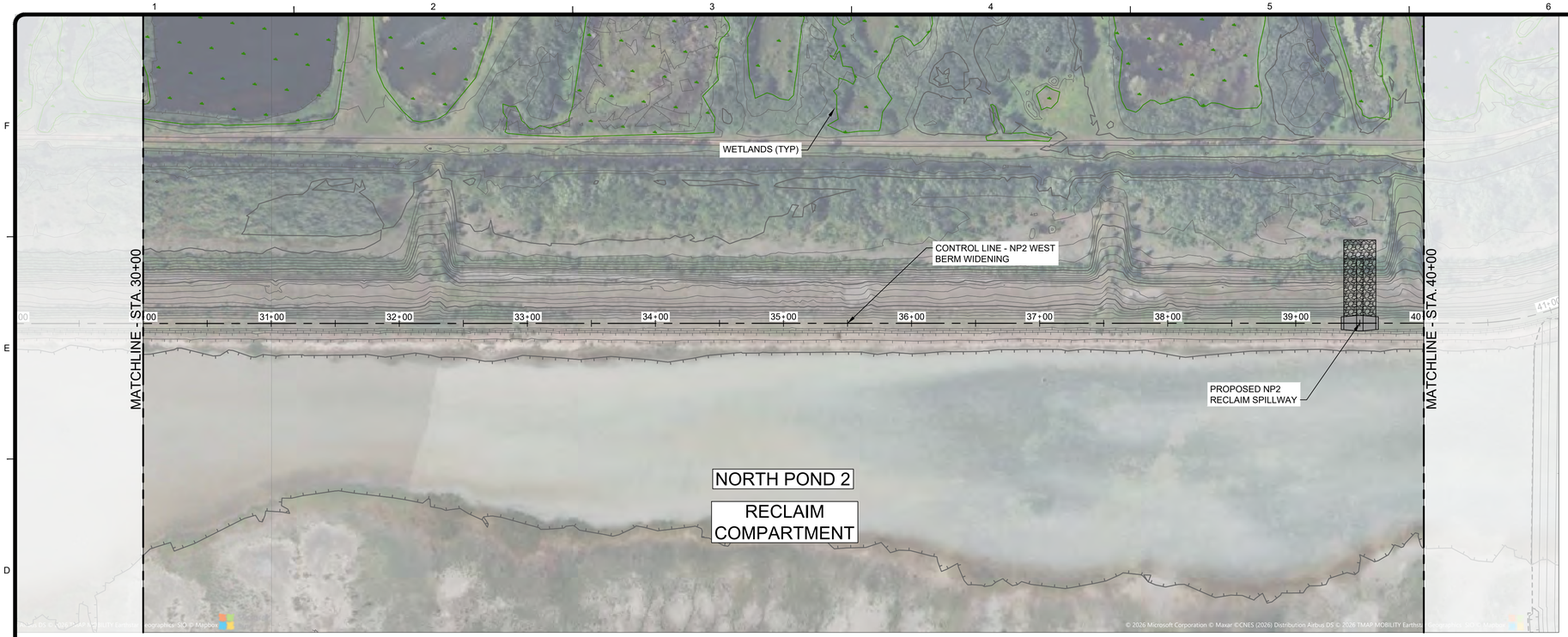
PROJ:	117-372636-25001
DESN:	C. TOMLINSON
DRWN:	R. WOOLSEY
CHKD:	C. TOMLINSON

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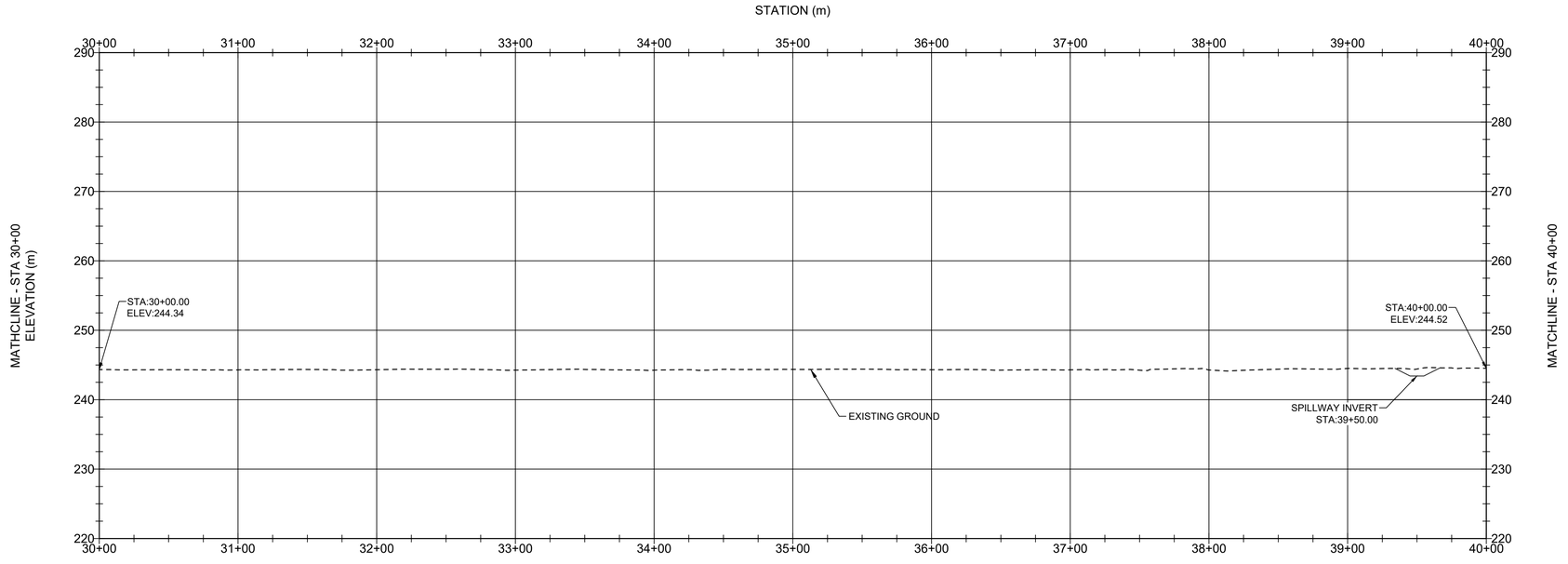
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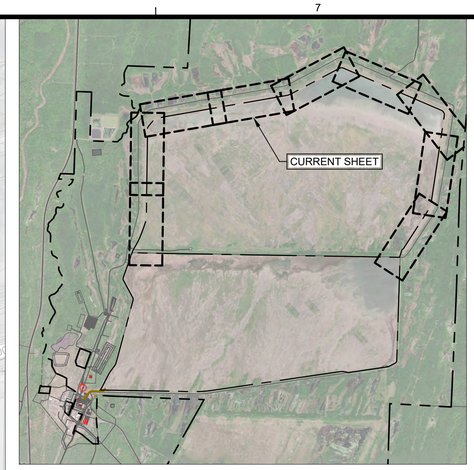
NP2 WEST BERM PLAN
STA 30+00 THRU STA 40+00

SCALE: NTS



NP2 WEST BERM PROFILE
STA 30+00 THRU STA 40+00

SCALE: NTS



KEY MAP

SCALE: NTS

LEGEND

- EXISTING CONTOURS (2m MINOR, 10m MAJOR)
- DESIGN CONTOURS (2m MINOR, 10m MAJOR)
- BYPA — SOUTH POND DIVERSION PIPELINE
- REW — RECLAIM WATER PIPELINE
- PRW — TAILINGS PIPELINE
- PRW — FORMER MINE DEWATERING PIPELINE
- EMERGENCY TAILINGS UPSET DISCHARGE PIPELINE
- PROPERTY BOUNDARY
- APPROXIMATE LIMITS OF DISTURBANCE

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4. REFER TO DRAWING 108571-EB-03100-31345-009-05 FOR PIPING SCHEDULE AND ROUTING.
5. SOUTH POND DIVERSION PIPELINE SHALL BE TERMINATED INSIDE THE SOUTHEAST CORNER OF NP2.



0 20m 40m 60m 80m 100m 200m
HORZ SCALE: 1mm = 2m

0 4m 8m 12m 16m 20m 40m
VERT SCALE: 1mm = 0.4m

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B	03/27/26	ISSUED FOR REVIEW	RNW
C	04/06/26	ISSUED FOR STUDY	RNW
D	08/17/26	ISSUED FOR PERMITTING	

WHITE PINE NORTH
TAILINGS MANAGEMENT
PRE-FEASIBILITY STUDY

TAILINGS DISPOSAL FACILITY
NP2 WEST BERM P&P
STA 30+00 THRU STA 40+00

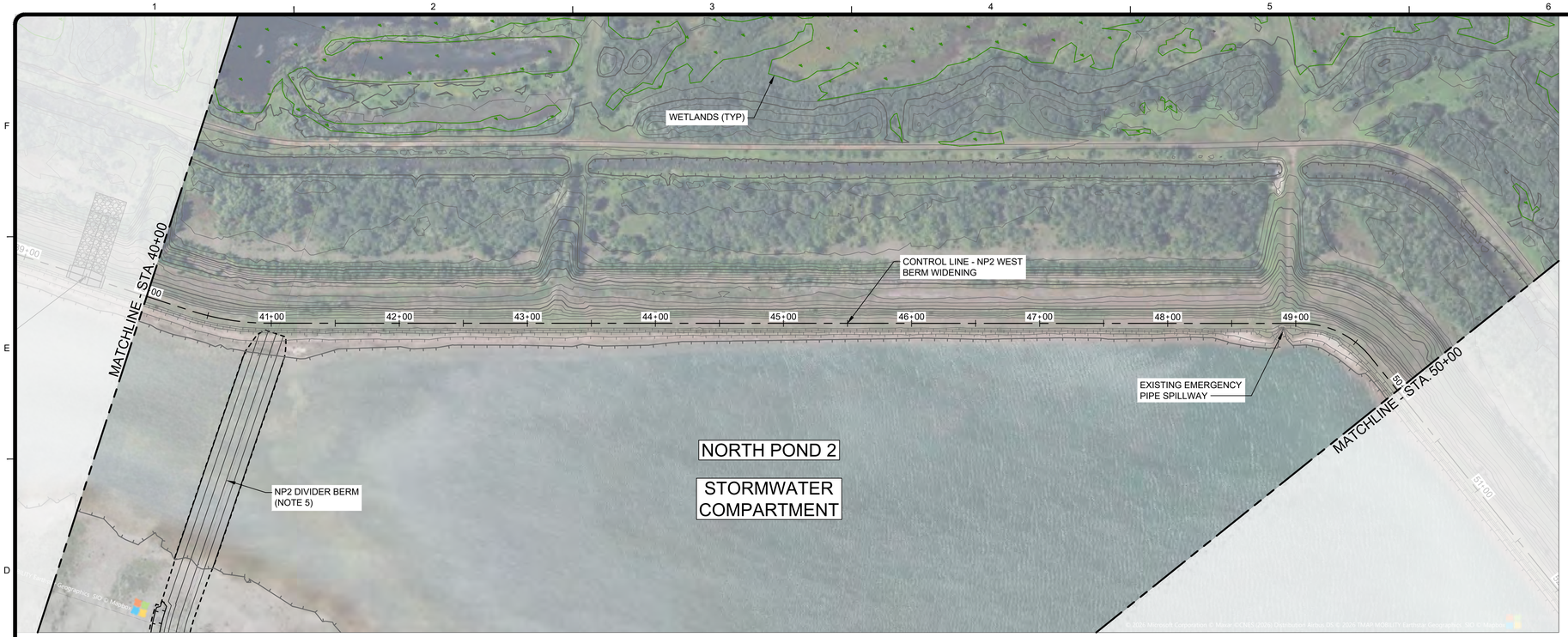
PROJ:	117-372636-25001
DESN:	C. TOMLINSON
DRWN:	R. WOOLSEY
CHKD:	C. TOMLINSON

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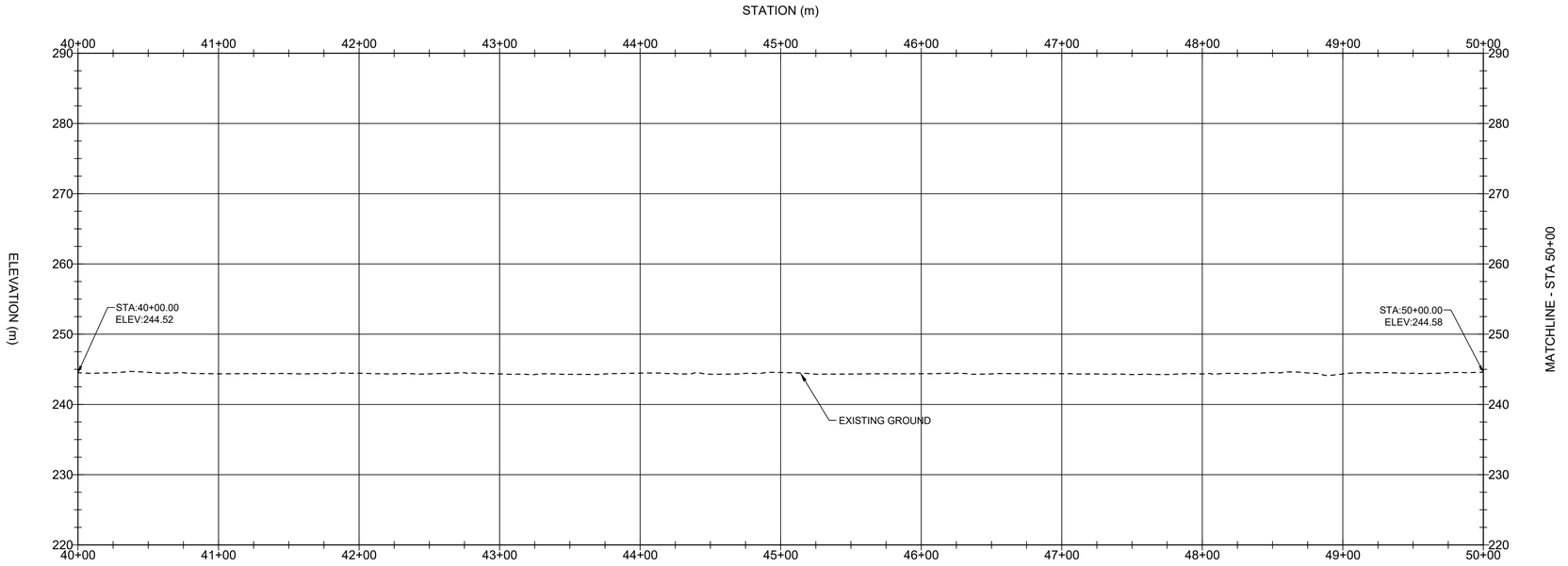
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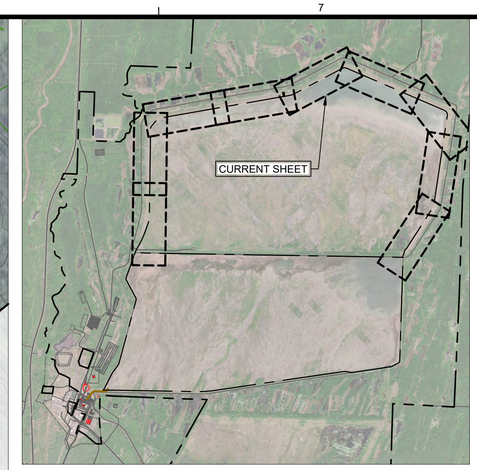
NP2 WEST BERM PLAN
STA 40+00 THRU STA 50+00

SCALE: NTS



NP2 WEST BERM PROFILE
STA 40+00 THRU STA 50+00

SCALE: NTS



KEY MAP

SCALE: NTS

LEGEND

- EXISTING CONTOURS (2m MINOR, 10m MAJOR)
- DESIGN CONTOURS (2m MINOR, 10m MAJOR)
- BYPA — SOUTH POND DIVERSION PIPELINE
- REW — RECLAIM WATER PIPELINE
- PRW — TAILINGS PIPELINE
- PRW — FORMER MINE DEWATERING PIPELINE
- EMERGENCY TAILINGS UPSET DISCHARGE PIPELINE
- PROPERTY BOUNDARY
- APPROXIMATE LIMITS OF DISTURBANCE

NOTES

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4. REFER TO DRAWING 108571-EB-03100-31345-009-05 FOR PIPING SCHEDULE AND ROUTING.
5. SOUTH POND DIVERSION PIPELINE SHALL BE TERMINATED INSIDE THE SOUTHEAST CORNER OF NP2.
6. NON-CONTACT AND CONTACT WATER PONDS FORMED BY EXISTING PONDED AREAS. THE TWO PONDS SHALL BE SEPARATED BY CONSTRUCTION OF A SEPARATION BERM.

0 20m 40m 60m 80m 100m 200m
HORZ SCALE: 1mm = 2m

0 4m 8m 12m 16m 20m 40m
VERT SCALE: 1mm = 0.4m

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B	03/27/26	ISSUED FOR REVIEW	RNW
C	04/06/26	ISSUED FOR STUDY	RNW
D	08/17/26	ISSUED FOR PERMITTING	

WHITE PINE NORTH
TAILINGS MANAGEMENT
PRE-FEASIBILITY STUDY

TAILINGS DISPOSAL FACILITY
NP2 WEST BERM P&P
STA 40+00 THRU STA 50+00

PROJ:	117-372636-25001
DESN:	C. TOMLINSON
DRWN:	R. WOOLSEY
CHKD:	C. TOMLINSON

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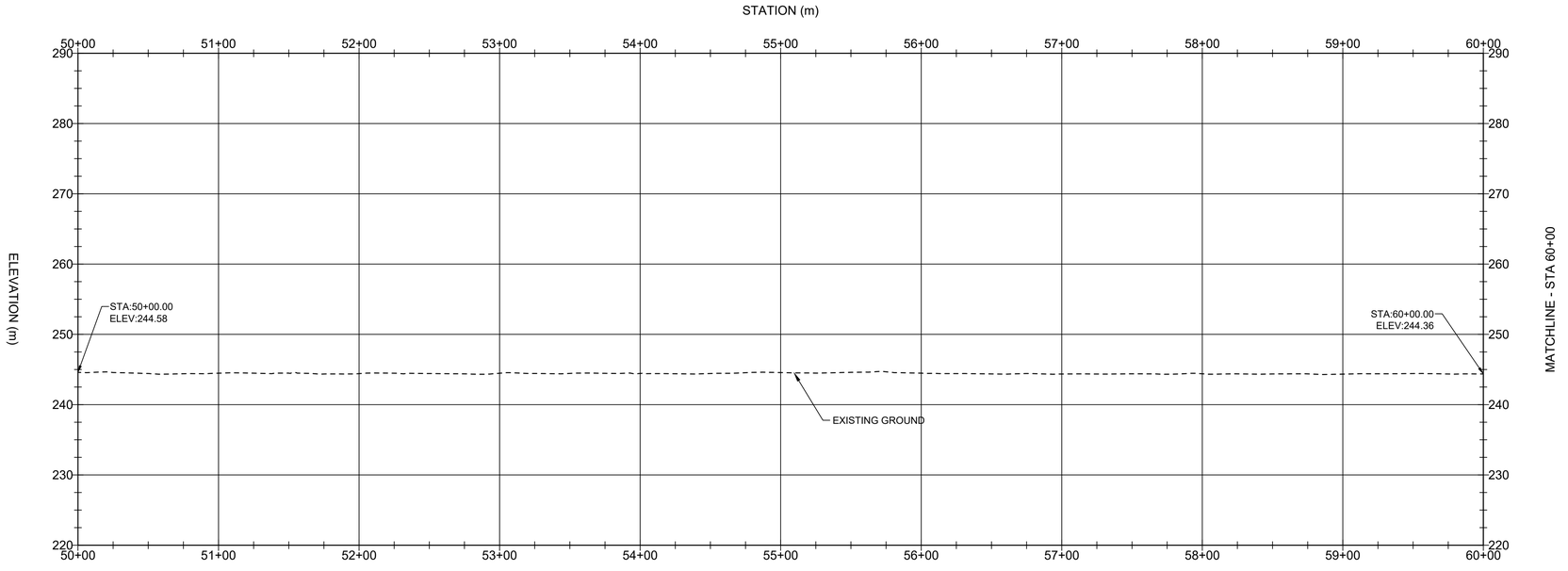
Bar Measures 1 inch, otherwise drawing not to scale

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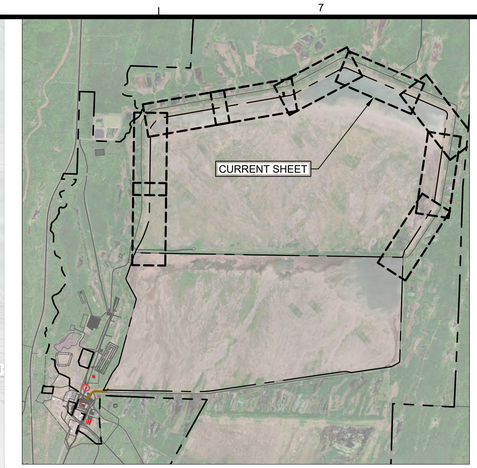
NP2 WEST BERM PLAN
STA 50+00 THRU STA 60+00

SCALE: NTS



NP2 WEST BERM PROFILE
STA 50+00 THRU STA 60+00

SCALE: NTS



KEY MAP

SCALE: NTS

LEGEND

- EXISTING CONTOURS (2m MINOR, 10m MAJOR)
- DESIGN CONTOURS (2m MINOR, 10m MAJOR)
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0 20m 40m 60m 80m 100m 200m
HORZ SCALE: 1mm = 2m

0 4m 8m 12m 16m 20m 40m
VERT SCALE: 1mm = 0.4m

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B	03/27/26	ISSUED FOR REVIEW	RNW
C	04/06/26	ISSUED FOR STUDY	RNW
D	08/17/26	ISSUED FOR PERMITTING	

WHITE PINE NORTH
TAILINGS MANAGEMENT
PRE-FEASIBILITY STUDY

TAILINGS DISPOSAL FACILITY
NP2 WEST BERM P&P
STA 50+00 THRU STA 60+00

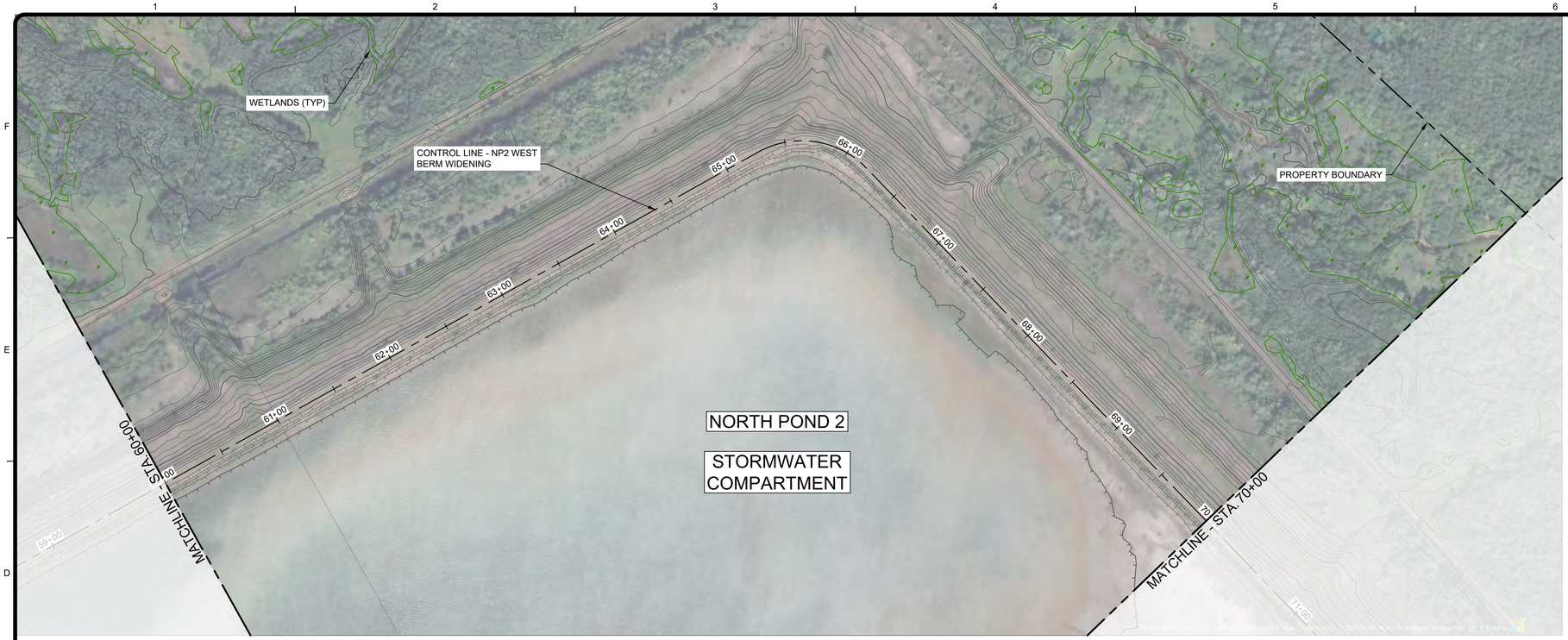
PROJ:	117-372636-25001
DESN:	C. TOMLINSON
DRWN:	R. WOOLSEY
CHKD:	C. TOMLINSON

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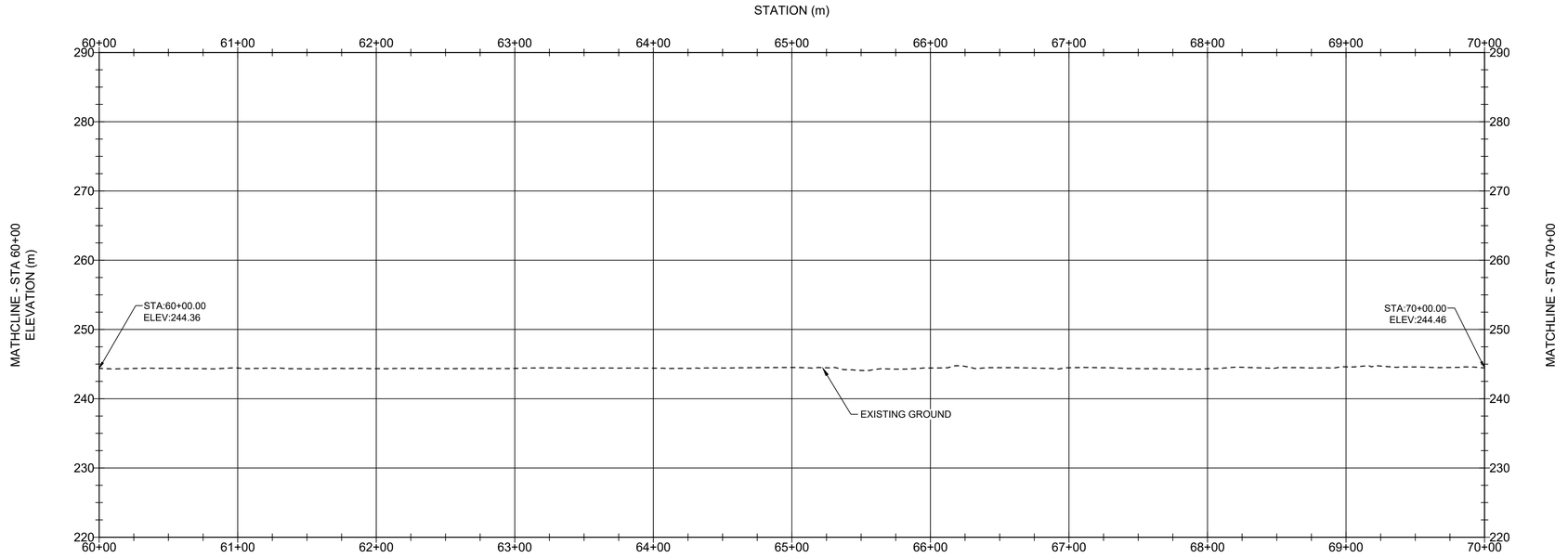
Bar Measures 1 inch, otherwise drawing not to scale

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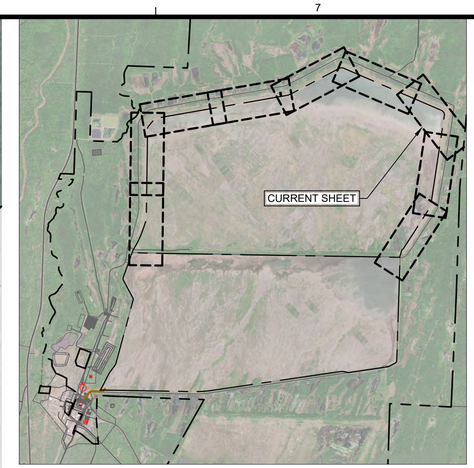
NP2 WEST BERM PLAN
STA 60+00 THRU STA 70+00

SCALE: NTS



NP2 WEST BERM PROFILE
STA 60+00 THRU STA 70+00

SCALE: NTS



KEY MAP

SCALE: NTS

LEGEND

- EXISTING CONTOURS (2m MINOR, 10m MAJOR)
- DESIGN CONTOURS (2m MINOR, 10m MAJOR)
- BYPA — SOUTH POND DIVERSION PIPELINE
- REW — RECLAIM WATER PIPELINE
- PRW — TAILINGS PIPELINE
- PRW — FORMER MINE DEWATERING PIPELINE
- EMERGENCY TAILINGS UPSET DISCHARGE PIPELINE
- PROPERTY BOUNDARY
- APPROXIMATE LIMITS OF DISTURBANCE

NOTES

1. PROJECT COORDINATE SYSTEM IS UTM-WGS 1984 DATUM, ZONE 16 NORTH, METER; CENT. MERIDIAN 87D W.
2. DRAWING UNITS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
3. RECLAIM WATER AND TAILINGS PIPELINES SHOWN ARE INDICATIVE. PIPELINE SHALL BE INSTALLED ON BERMS UNLESS NOTED OTHERWISE.
4. REFER TO DRAWING 108571-EB-03100-31345-009-05 FOR PIPING SCHEDULE AND ROUTING.
5. SOUTH POND DIVERSION PIPELINE SHALL BE TERMINATED INSIDE THE SOUTHEAST CORNER OF NP2.

0 20m 40m 60m 80m 100m 200m

HORZ SCALE: 1mm = 2m

0 4m 8m 12m 16m 20m 40m

VERT SCALE: 1mm = 0.4m

TETRA TECH
www.tetratech.com
4750 West 2100 South, Suite 400
Salt Lake City, UT 84120
Phone: (801) 736-7451 Fax (801) 364-2021

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NOT FOR CONSTRUCTION

MARK	DATE	DESCRIPTION	BY
A	02/27/26	ISSUED FOR REVIEW	RNW
B	03/27/26	ISSUED FOR REVIEW	RNW
C	04/06/26	ISSUED FOR STUDY	RNW
D	08/17/26	ISSUED FOR PERMITTING	

WHITE PINE NORTH
TAILINGS MANAGEMENT
PRE-FEASIBILITY STUDY

TAILINGS DISPOSAL FACILITY
NP2 WEST BERM P&P
STA 60+00 THRU STA 70+00

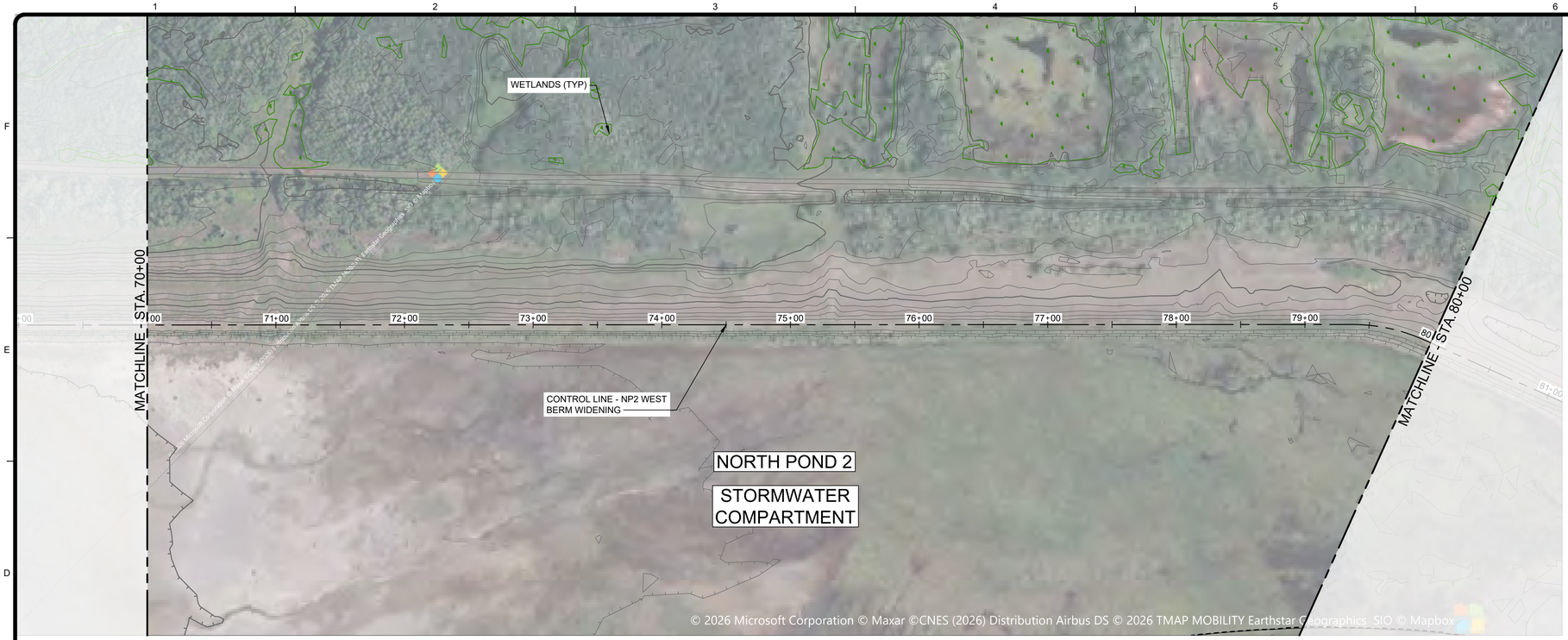
PROJ:	117-372636-25001
DESN:	C. TOMLINSON
DRWN:	R. WOOLSEY
CHKD:	C. TOMLINSON

108571-EB-03100-31345-033-05

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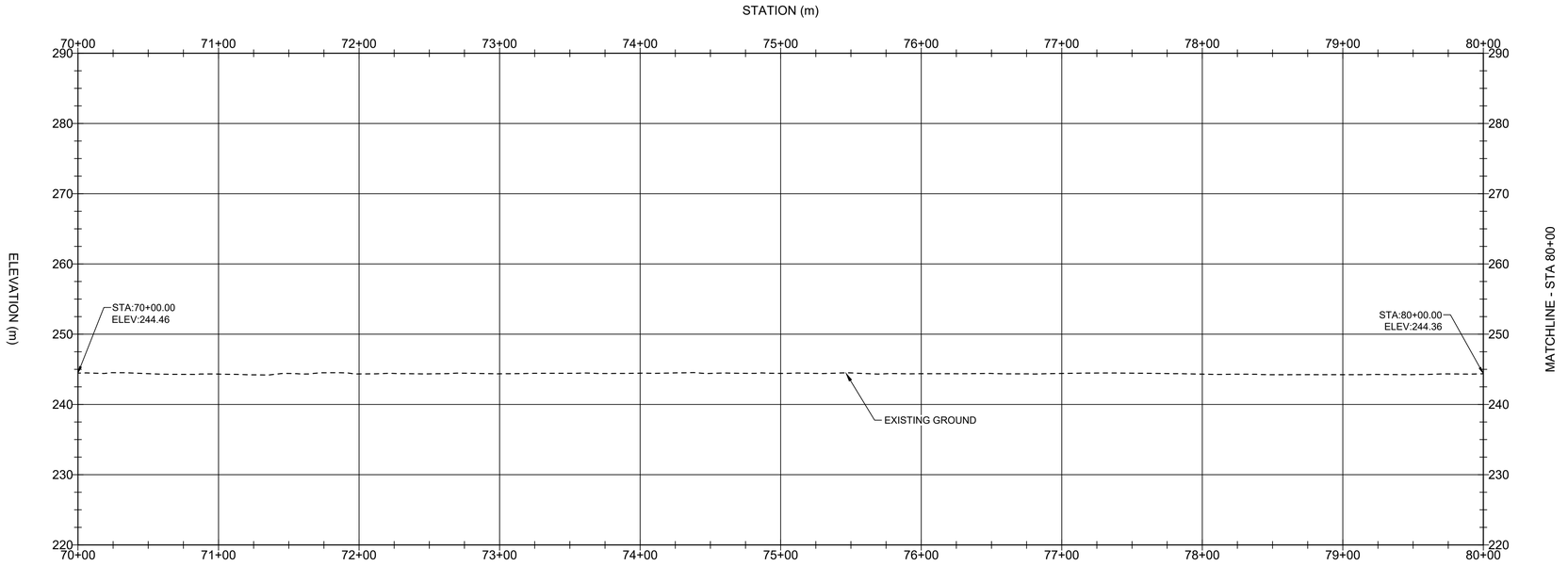
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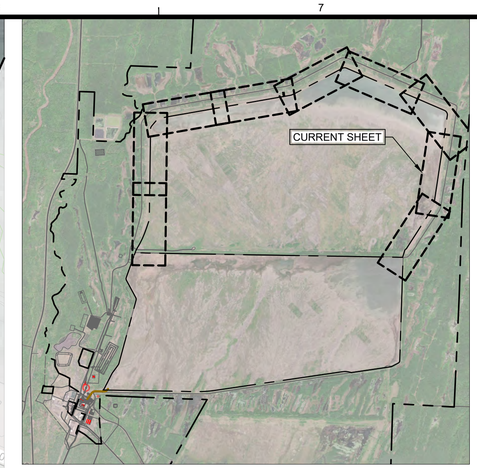
NP2 WEST BERM PLAN
STA 70+00 THRU STA 80+00

SCALE: NTS



NP2 WEST BERM PROFILE
STA 70+00 THRU STA 80+00

SCALE: NTS



KEY MAP

SCALE: NTS

LEGEND

- EXISTING CONTOURS (2m MINOR, 10m MAJOR)
- DESIGN CONTOURS (2m MINOR, 10m MAJOR)
- BYPA — SOUTH POND DIVERSION PIPELINE
- REW — RECLAIM WATER PIPELINE
- PRW — TAILINGS PIPELINE
- PRW — FORMER MINE DEWATERING PIPELINE
- EMERGENCY TAILINGS UPSET DISCHARGE PIPELINE
- PROPERTY BOUNDARY
- APPROXIMATE LIMITS OF DISTURBANCE

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0 20m 40m 60m 80m 100m 200m
HORZ SCALE: 1mm = 2m

0 4m 8m 12m 16m 20m 40m
VERT SCALE: 1mm = 0.4m

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WHITE PINE NORTH
TAILINGS MANAGEMENT
PRE-FEASIBILITY STUDY

TAILINGS DISPOSAL FACILITY
NP2 WEST BERM P&P
STA 70+00 THRU STA 80+00

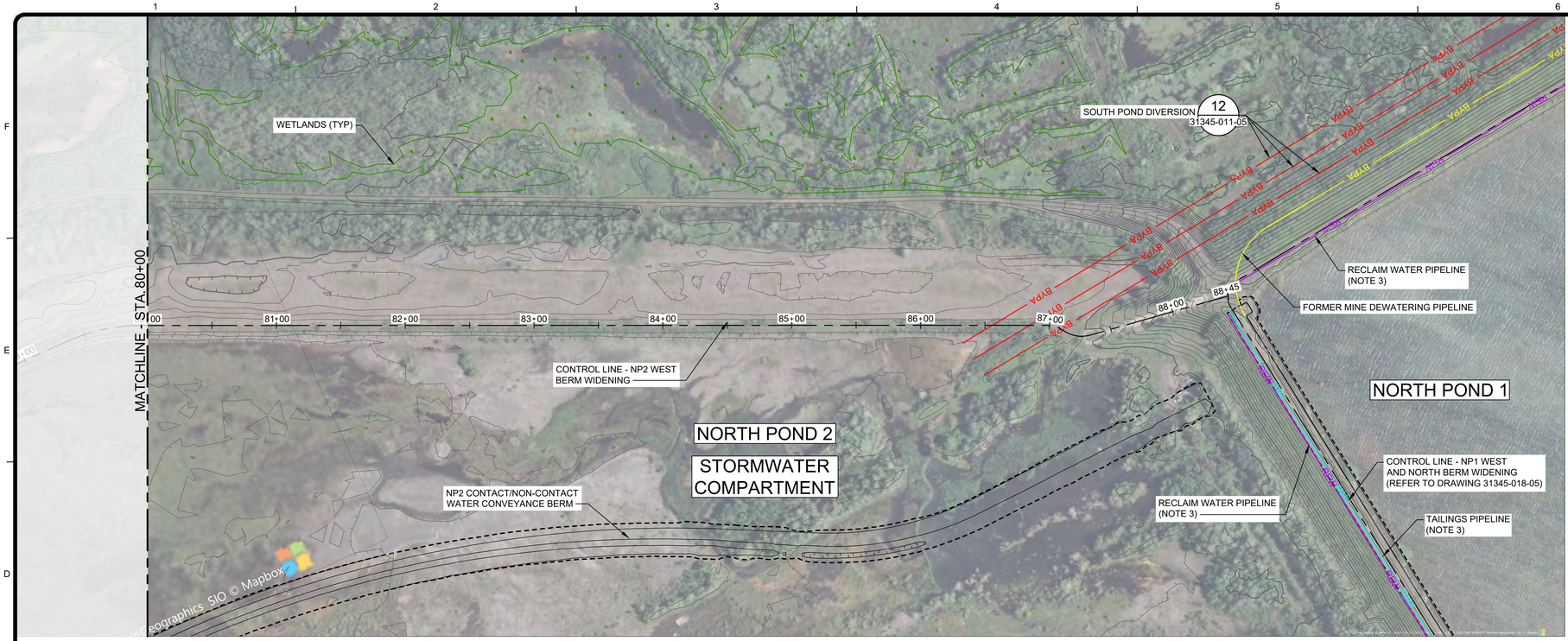
PROJ:	117-372636-25001
DESN:	C. TOMLINSON
DRWN:	R. WOOLSEY
CHKD:	C. TOMLINSON

108571-EB-03100-31345-034-05

Copyright: Tetra Tech

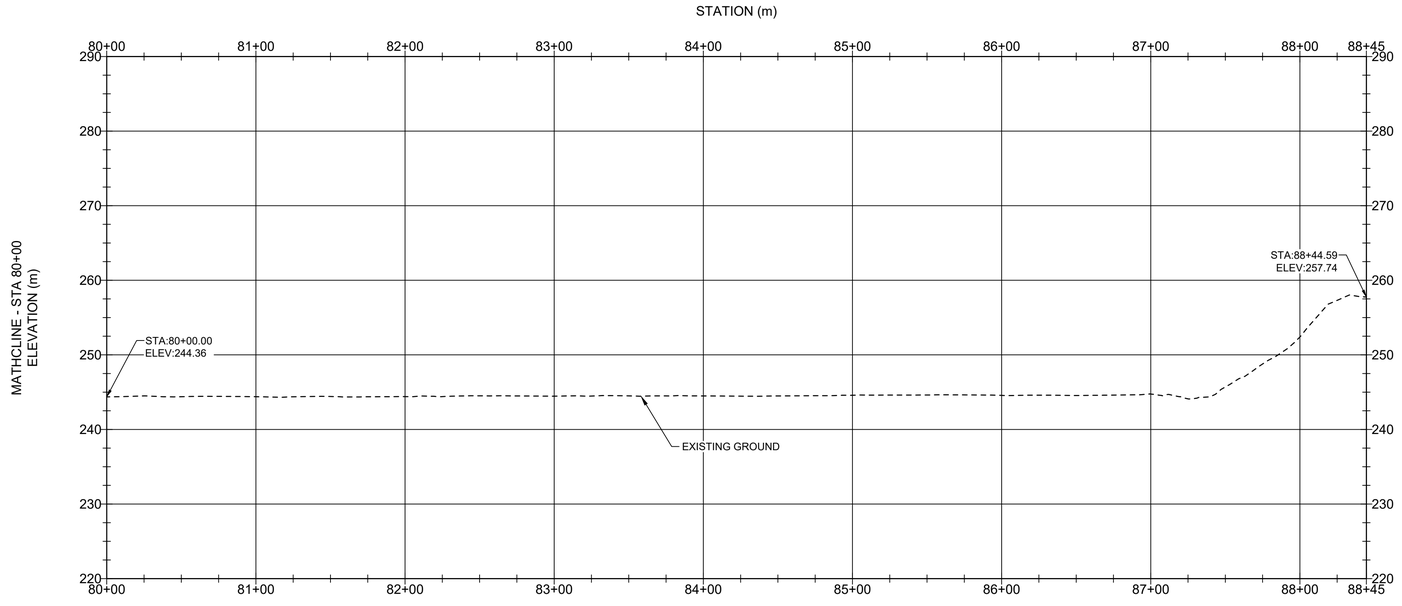
Bar Measures 1 inch, otherwise drawing not to scale

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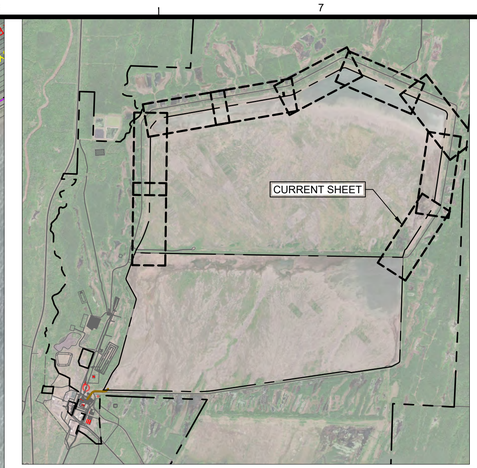
NP2 WEST BERM PLAN
STA 80+00 THRU STA 88+45

SCALE: NTS



NP2 WEST BERM PROFILE
STA 80+00 THRU STA 88+45

SCALE: NTS



KEY MAP

SCALE: NTS

LEGEND

- EXISTING CONTOURS (2m MINOR, 10m MAJOR)
- DESIGN CONTOURS (2m MINOR, 10m MAJOR)
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VERT SCALE: 1mm = 0.4m

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WHITE PINE NORTH
TAILINGS MANAGEMENT
PRE-FEASIBILITY STUDY

TAILINGS DISPOSAL FACILITY
NP2 WEST BERM P&P
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PROJ:	117-372636-25001
DESN:	C. TOMLINSON
DRWN:	R. WOOLSEY
CHKD:	C. TOMLINSON

108571-EB-03100-31345-035-05

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Bar Measures 1 inch, otherwise drawing not to scale

8/17/2026 10:28:52 AM - C:\USERS\ROGER.WOOLSEY\DC\ACCDOCS\TETRA TECH INC\372636-WPCOPPER\PROJECT FILES\25001-NORTH\PFS\CIVIL\SHEETFILES\NP2 WEST EMB P&P.DWG - WOOLSEY, ROGER

Appendix F
Tailings Geotechnical Testing

ADVANCED TERRA TESTING
833 PARFET ST UNIT A
LAKEWOOD, CO
303-232-8308 www.terratesting.com

Wednesday, January 21, 2026

Project Number:	2592-115
Company:	Tetra Tech
Address:	4750 West 2100 South, Suite 400
City:	Salt Lake City
State:	Utah

RE: Soil Testing
White Pine North Tailings
117-372636-25001.01.4

Dear Chad Tomlinson,

With this letter you will find a report on Soil samples assigned on 12/11/2025.

Testing was performed in accordance with standardized test methods, accepted industry practices as well as specific instructions received from you, our client. Advanced Terra Testing accepts no responsibility and makes no claims to the use or purpose of the material being tested. Furthermore, the results herein are based solely on the material received and tested. Please note that all material will be disposed of after thirty days unless other arrangements are made.

We respectfully request that sample reports be considered proprietary information and are not to be reproduced, except in full and only with prior written approval of Advanced Terra Testing. We are pleased to have been given the opportunity to perform high quality laboratory testing for your project. We sincerely hope the results herein provide you with all the information required. If you have questions or need anything further, please reach out and we will be happy to assist you.

Respectfully,

Brandon Ferro

ADVANCED TERRA TESTING

Moisture and Density
ASTM D 2216 and ASTM D 7263 Method B

CLIENT	Tetra Tech	JOB NO.	2592-115
PROJECT	White Pine North Tailings	LOCATION	White Pine Michigan
PROJECT NO.	117-372636-25001.0		

BORING NO.	--	--
DEPTH	--	--
SAMPLE NO.	Whole Tails Slurry @ ~64%m	Whole Tails Slurry @ ~64%m
DATE SAMPLED	--	--
DATE TESTED	12/29/25	12/29/25
TECHNICIAN	BDF	BDF
DESCRIPTION	--	Blended
Mass of Wet Soil and Pan (g):	761.67	173.51
Mass of Dry Soil and Pan (g):	570.54	121.19
Mass of Pan (g):	225.53	25.68
Moisture (%):	**55.4**	**54.8**
Diameter (in):	2.41	
Height (in):	3.54	
Mass of Wet Soil and Ring (g):	1056.19	
Mass of Ring (g):	512.72	
Wet Density (lbs/ft³):	**128.1**	
Dry Density (lbs/ft³):	**82.4**	
Wet Density (kg/m³):	**2052**	
Dry Density (kg/m³):	**1320**	

BORING NO.	
DEPTH	
SAMPLE NO.	
DATE SAMPLED	
DATE TESTED	
TECHNICIAN	
DESCRIPTION	
Mass of Wet Soil and Pan (g):	
Mass of Dry Soil and Pan (g):	
Mass of Pan (g):	
Moisture (%):	
Diameter (in):	
Height (in):	
Mass of Wet Soil and Ring (g):	
Mass of Ring (g):	
Wet Density (lbs/ft³):	
Dry Density (lbs/ft³):	
Wet Density (kg/m³):	
Dry Density (kg/m³):	
NOTES	

Data entry by:	BDF	Date:	12/30/25
Checked by:	MH	Date:	12/31/25
File name:	2592115__Moisture and Density ASTM D7236_0.xlsm		

ADVANCED TERRA TESTING

One-Dimensional Consolidation

ASTM D 2435

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry @ ~64% M
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	SAMPLED BY	--
DATE TESTED	01/03/26	DESCRIPTION	Remolded Specimen
TECHNICIAN	BDF		

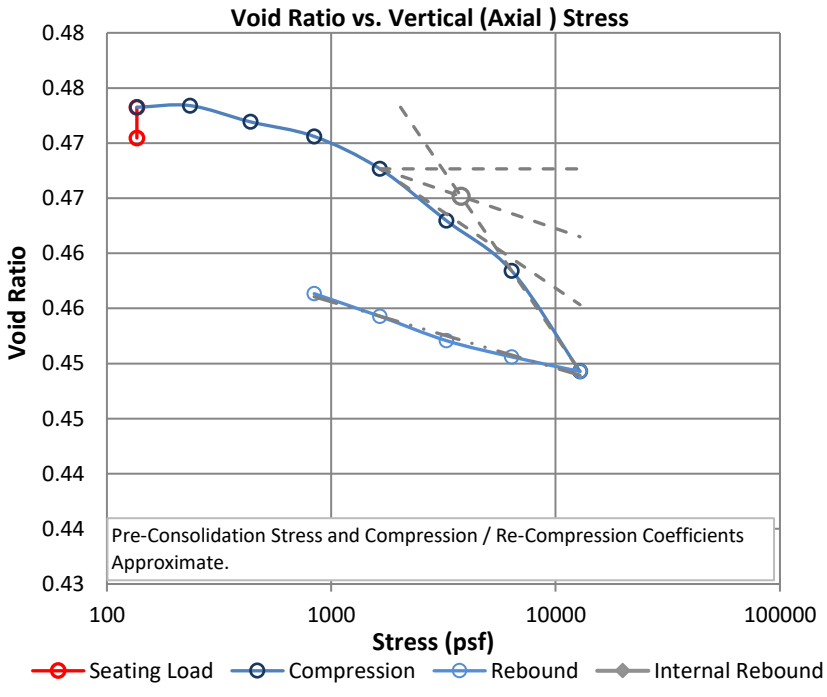
Sample Conditions

Before Test Mass of Wet Soil and Ring (g):	199.45	Initial Wet Density (pcf):	129.4
After Test Mass of Wet Soil and Ring (g):	204.03	Initial Dry Density (pcf):	112.5
Mass of Dry Soil, Ring, and Pan (g):	228.05	Initial Wet Density (kg/m³):	2073
Diameter (in):	2.41	Initial Dry Density (kg/m³):	1802
Initial Height (in):	1.00	Initial Moisture (%):	15.0
Mass of Ring (g):	44.51	Final Wet Density (pcf):	134.5
Mass of Pan (g):	48.82	Final Dry Density (pcf):	113.6
Assumed Specific Gravity:	2.65	Final Wet Density (kg/m³):	2155
Initial Saturation (%):	84.7	Final Dry Density (kg/m³):	1820
Final Saturation (%):	100.0	Final Moisture (%):	18.4

Consolidation Data

Coefficient of Compression:	0.030	Pre-Consolidation Stress (psf):	3790
Coefficient of Re-Compression:	0.006	Pre-Consolidation Stress (kPa):	182

Load (psf)	Void Ratio	Deformation (in)	Strain (%)
136	0.470	0.0000	0.00
Inundation	0.473	-0.0019	-0.19
235	0.473	-0.0020	-0.20
436	0.472	-0.0010	-0.10
839	0.471	-0.0001	-0.01
1648	0.468	0.0019	0.19
3263	0.463	0.0051	0.51
6376	0.458	0.0082	0.82
12847	0.449	0.0144	1.44
Rebound			
12847	0.449	0.0144	1.44
6376	0.451	0.0135	1.35
3263	0.452	0.0125	1.25
1648	0.454	0.0110	1.10
839	0.456	0.0096	0.96
Internal			



NOTES:

Data entry by:	AC	Date:	01/16/26
Checked by:	BDF	Date:	01/21/26
File name:	2592115__Consol ASTM D2435_0.xlsm		Page 1 of 3

ADVANCED TERRA TESTING

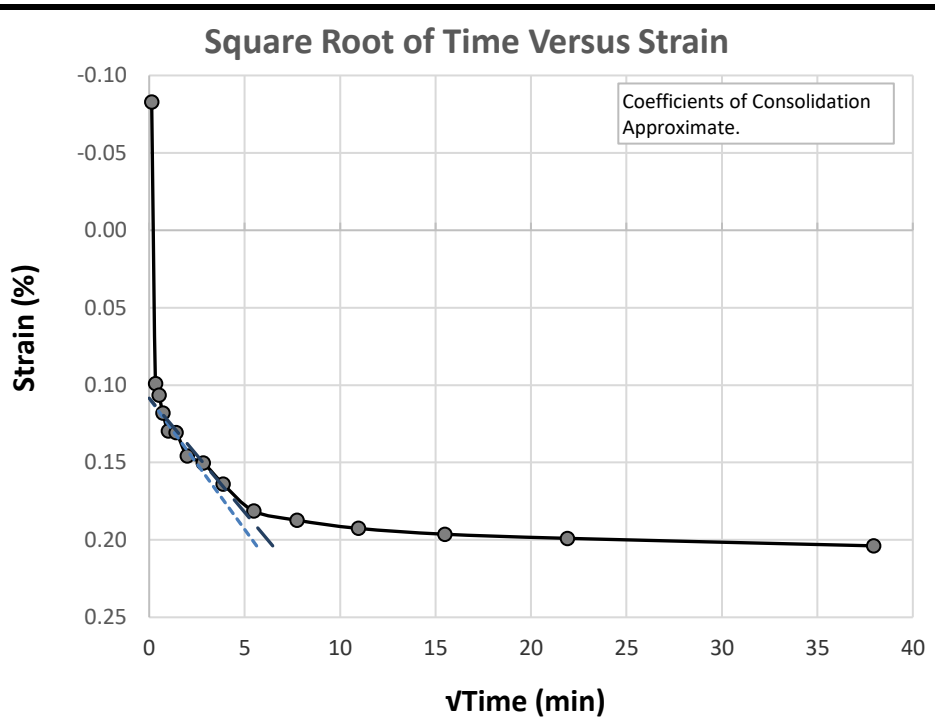
One-Dimensional Consolidation

ASTM D 2435

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry @ ~64% M
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	SAMPLED BY	--
DATE TESTED	01/03/26	DESCRIPTION	Remolded Specimen
TECHNICIAN	BDF		

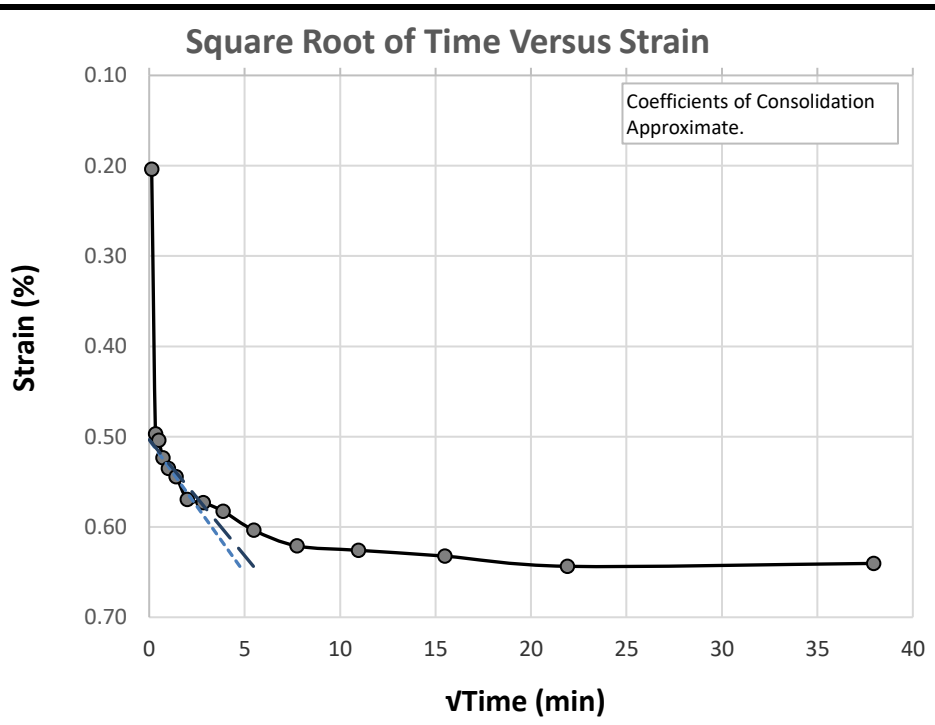
Coefficient of Consolidation (cm^2/s)	T90 (min)	Load (psf)
0.0027	8.568	1648

Elapsed Time (min)	Deformation (in)	Strain (%)
0	-0.0019	-0.08
0.1	-0.0037	0.10
0.27	-0.0038	0.11
0.5	-0.0039	0.12
1	-0.0040	0.13
2	-0.0040	0.13
4	-0.0042	0.15
8	-0.0042	0.15
15	-0.0043	0.16
30	-0.0045	0.18
60	-0.0046	0.19
120	-0.0046	0.19
240	-0.0047	0.20
480	-0.0047	0.20
1440	-0.0047	0.20



Coefficient of Consolidation (cm^2/s)	T90 (min)	Load (psf)
0.0031	7.204	3263

Elapsed Time (min)	Deformation (in)	Strain (%)
0	-0.0047	0.20
0.1	-0.0077	0.50
0.25	-0.0077	0.50
0.5	-0.0079	0.52
1	-0.0081	0.54
2	-0.0081	0.54
4	-0.0084	0.57
8	-0.0084	0.57
15	-0.0085	0.58
30	-0.0087	0.60
60	-0.0089	0.62
120	-0.0090	0.63
240	-0.0090	0.63
480	-0.0091	0.64
1440	-0.0091	0.64



Data Files 2592-115_wholetails_1648PSF_01-06.txt, 2592-115_WHOLETAILS_3263PSF_01-07.txt

File name: 2592115__Consol ASTM D2435_0.xlsm

ADVANCED TERRA TESTING

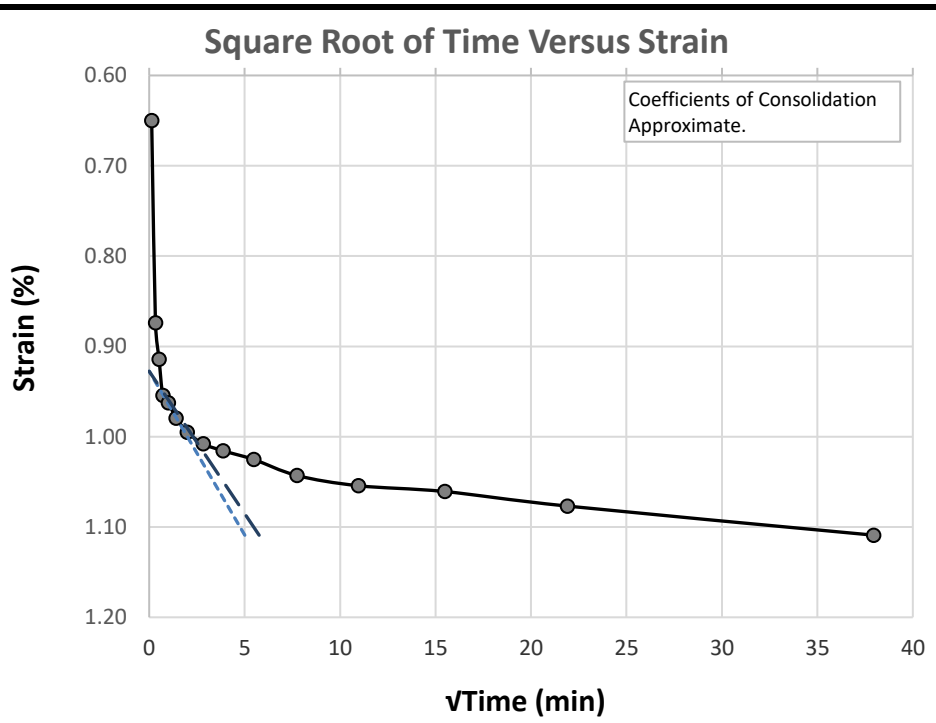
One-Dimensional Consolidation

ASTM D 2435

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry @ ~64% M
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	SAMPLED BY	--
DATE TESTED	01/03/26	DESCRIPTION	Remolded Specimen
TECHNICIAN	BDF		

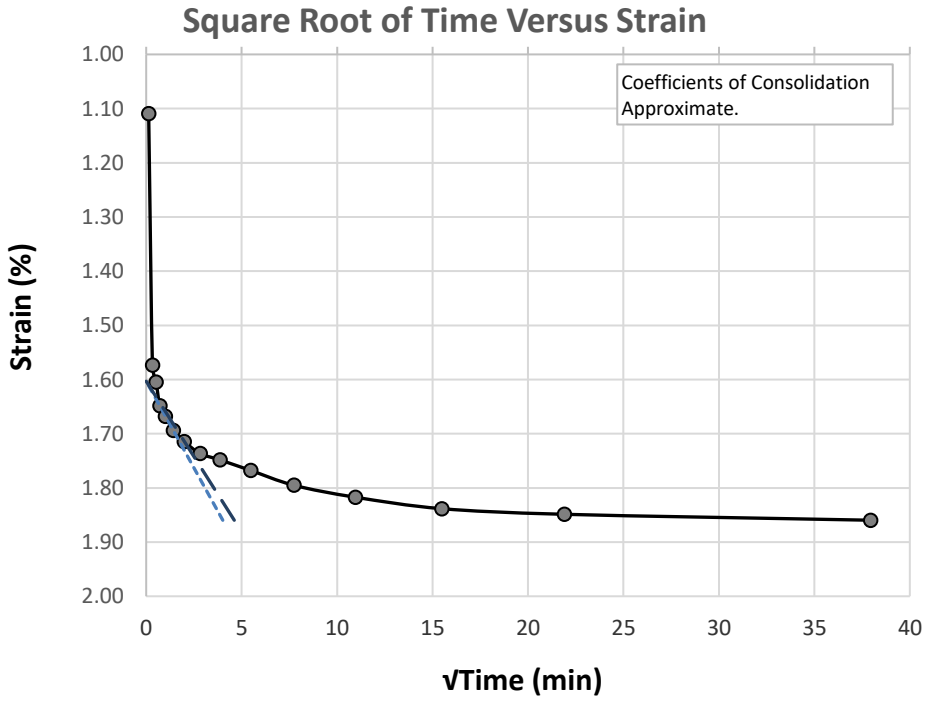
Coefficient of Consolidation (cm^2/s)	T90 (min)	Load (psf)
0.0043	5.183	6376

Elapsed Time (min)	Deformation (in)	Strain (%)
0	-0.0092	0.65
0.1	-0.0114	0.87
0.27	-0.0118	0.91
0.5	-0.0122	0.95
1	-0.0123	0.96
2	-0.0125	0.98
4	-0.0127	1.00
8	-0.0128	1.01
15	-0.0129	1.02
30	-0.0130	1.03
60	-0.0131	1.04
120	-0.0132	1.05
240	-0.0133	1.06
480	-0.0135	1.08
1440	-0.0138	1.11



Coefficient of Consolidation (cm^2/s)	T90 (min)	Load (psf)
0.0054	4.045	12847

Elapsed Time (min)	Deformation (in)	Strain (%)
0	-0.0138	1.11
0.1	-0.0184	1.57
0.27	-0.0187	1.60
0.5	-0.0192	1.65
1	-0.0194	1.67
2	-0.0196	1.69
4	-0.0198	1.71
8	-0.0201	1.74
15	-0.0202	1.75
30	-0.0204	1.77
60	-0.0207	1.80
120	-0.0209	1.82
240	-0.0211	1.84
480	-0.0212	1.85
1440	-0.0213	1.86



Data Files 2592-115_WHOLETAILS_6376PSF_01-08.txt, 2592-115_wholetails_12847PSF_01-09.txt

File name: 2592115__Consol ASTM D2435_0.xlsm

ADVANCED TERRA TESTING
833 PARFET ST UNIT A
LAKEWOOD, CO
303-232-8308 www.terratesting.com

Friday, February 27, 2026

Project Number:	2592-115
Company:	Tetra Tech
Address:	4750 West 2100 South, Suite 400
City:	Salt Lake City
State:	Utah

RE: Soil Testing
White Pine North Tailings
117-372636-25001.01.4

Dear Chad Tomlinson,

With this letter you will find a report on Soil samples assigned on 12/11/2025.

Testing was performed in accordance with standardized test methods, accepted industry practices as well as specific instructions received from you, our client. Advanced Terra Testing accepts no responsibility and makes no claims to the use or purpose of the material being tested. Furthermore, the results herein are based solely on the material received and tested. Please note that all material will be disposed of after thirty days unless other arrangements are made.

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Respectfully,

Brandon Ferro

ADVANCED TERRA TESTING

Unconfined Compressive Strength

ASTM D2166

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	DESCRIPTION	Remold
DATE TESTED	02/20/26		
TECHNICIAN	JL		

Test Parameters

Strain Rate (in/min):	0.038
Strain Rate (cm/min):	0.097

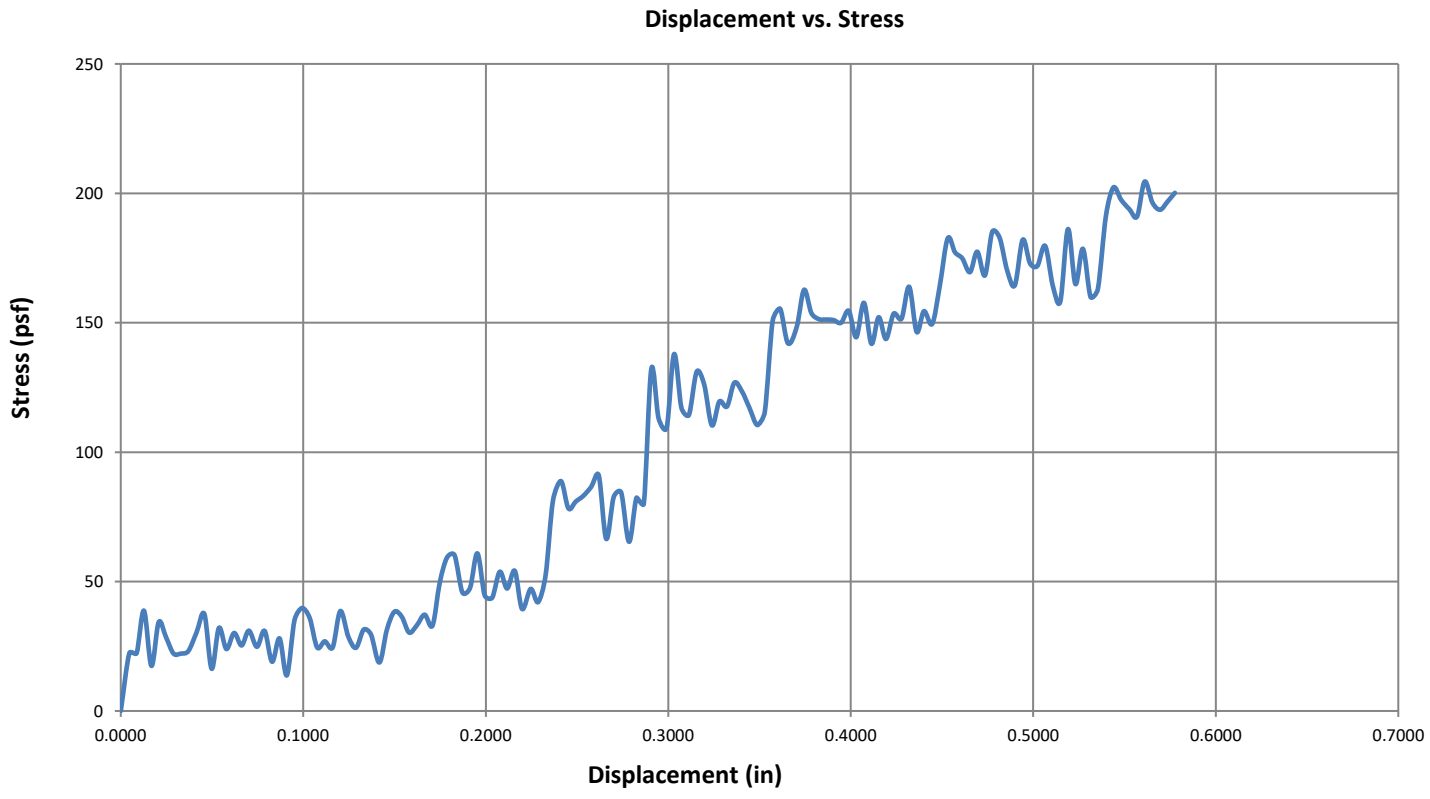
Raw Data Files: 2592-115_WTS_UCS.

Moisture & Density Data

Mass of Wet Soil and Pan (g):	483.32	Initial Wet Density (pcf):	115.6
Mass of Dry Soil and Pan (g):	420.74	Initial Dry Density (pcf):	94.6
Mass of Pan (g):	139.43	Initial Wet Density (kg/m³):	1852
Mass of Wet Soil (g):	343.89	Initial Dry Density (kg/m³):	1515
Initial Diameter (in):	1.942	Initial Moisture (%):	22.2
Initial Height (in):	3.826		

Test Results

Peak Stress (psf):	205	Axial Strain at Peak Stress (%):	14.7
Peak Stress (kPa):	10	Height to Diameter Ratio:	2.0:1



NOTES:	Sample height decreased during extrusion, and the sample slumped under its own weight.

Data entry by:	JL	Date:	02/26/26
Checked by:	AC	Date:	02/27/26
File name:	2592115__UCS ASTM D2166_0.xlsm		

ADVANCED TERRA TESTING

Unconfined Compressive Strength
ASTM D2166
(Before Picture)

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	DESCRIPTION	Remold
DATE TESTED	02/20/26		
TECHNICIAN	JL		



NOTES	Sample height decreased during extrusion, and the sample slumped under its own weight.

Picture File:	2592-115_WTS_UCS_before.JPG
File name:	2592115__UCS ASTM D2166_0.xlsm

ADVANCED TERRA TESTING

Unconfined Compressive Strength
ASTM D2166
(After Picture)

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	DESCRIPTION	Remold
DATE TESTED	02/20/26		
TECHNICIAN	JL		



NOTES	Sample height decreased during extrusion, and the sample slumped under its own weight.

Picture File: 2592-115_WTS_UCS_after.JPG
File name: 2592115__UCS ASTM D2166_0.xlsm

Unconfined Compressive Strength
ASTM D2166

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	DESCRIPTION	Remold
DATE TESTED	02/20/26		
TECHNICIAN	JL		

Displacement (in)	Displacement (cm)	Strain (%)	Average Cross Sectional Area (in²)	Load (lbs)	Load (N)	Stress (psf)	Stress (kPa)
0.0000	0.000	0.00	2.96	0.0	0	0	0
0.0047	0.012	0.12	2.97	0.5	2	22	1
0.0087	0.022	0.23	2.97	0.5	2	22	1
0.0127	0.032	0.33	2.97	0.8	4	39	2
0.0168	0.043	0.44	2.98	0.4	2	17	1
0.0208	0.053	0.54	2.98	0.7	3	34	2
0.0248	0.063	0.65	2.98	0.6	3	28	1
0.0289	0.073	0.76	2.98	0.5	2	22	1
0.0329	0.084	0.86	2.99	0.5	2	22	1
0.0370	0.094	0.97	2.99	0.5	2	23	1
0.0415	0.105	1.08	2.99	0.6	3	30	1
0.0458	0.116	1.20	3.00	0.8	3	37	2
0.0498	0.126	1.30	3.00	0.3	2	16	1
0.0538	0.137	1.41	3.00	0.7	3	32	2
0.0579	0.147	1.51	3.01	0.5	2	24	1
0.0621	0.158	1.62	3.01	0.6	3	30	1
0.0662	0.168	1.73	3.01	0.5	2	25	1
0.0702	0.178	1.83	3.02	0.7	3	31	1
0.0746	0.189	1.95	3.02	0.5	2	25	1
0.0788	0.200	2.06	3.02	0.7	3	31	1
0.0829	0.211	2.17	3.03	0.4	2	19	1
0.0870	0.221	2.27	3.03	0.6	3	28	1
0.0910	0.231	2.38	3.03	0.3	1	14	1
0.0952	0.242	2.49	3.04	0.7	3	35	2
0.0993	0.252	2.60	3.04	0.8	4	40	2
0.1035	0.263	2.71	3.04	0.8	3	36	2
0.1076	0.273	2.81	3.05	0.5	2	25	1
0.1118	0.284	2.92	3.05	0.6	3	27	1
0.1161	0.295	3.03	3.05	0.5	2	25	1
0.1203	0.306	3.14	3.06	0.8	4	39	2
0.1247	0.317	3.26	3.06	0.6	3	29	1
0.1289	0.327	3.37	3.07	0.5	2	24	1
0.1331	0.338	3.48	3.07	0.7	3	31	2
0.1371	0.348	3.58	3.07	0.6	3	30	1
0.1417	0.360	3.70	3.08	0.4	2	19	1
0.1458	0.370	3.81	3.08	0.7	3	31	2
0.1499	0.381	3.92	3.08	0.8	4	38	2
0.1540	0.391	4.03	3.09	0.8	3	36	2
0.1580	0.401	4.13	3.09	0.7	3	30	1
0.1622	0.412	4.24	3.09	0.7	3	33	2
0.1665	0.423	4.35	3.10	0.8	4	37	2
0.1708	0.434	4.46	3.10	0.7	3	33	2
0.1748	0.444	4.57	3.10	1.1	5	50	2

Unconfined Compressive Strength
ASTM D2166

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	DESCRIPTION	Remold
DATE TESTED	02/20/26		
TECHNICIAN	JL		

Displacement (in)	Displacement (cm)	Strain (%)	Average Cross Sectional Area (in²)	Load (lbs)	Load (N)	Stress (psf)	Stress (kPa)
0.1788	0.454	4.67	3.11	1.3	6	59	3
0.1829	0.465	4.78	3.11	1.3	6	60	3
0.1872	0.475	4.89	3.11	1.0	4	46	2
0.1914	0.486	5.00	3.12	1.0	5	48	2
0.1954	0.496	5.11	3.12	1.3	6	61	3
0.1994	0.506	5.21	3.12	1.0	4	45	2
0.2035	0.517	5.32	3.13	1.0	4	44	2
0.2077	0.528	5.43	3.13	1.2	5	54	3
0.2117	0.538	5.53	3.14	1.0	5	47	2
0.2159	0.548	5.64	3.14	1.2	5	54	3
0.2199	0.559	5.75	3.14	0.9	4	39	2
0.2246	0.570	5.87	3.15	1.0	5	47	2
0.2287	0.581	5.98	3.15	0.9	4	42	2
0.2328	0.591	6.08	3.15	1.2	5	53	3
0.2368	0.601	6.19	3.16	1.8	8	81	4
0.2412	0.613	6.30	3.16	2.0	9	89	4
0.2453	0.623	6.41	3.16	1.7	8	78	4
0.2493	0.633	6.52	3.17	1.8	8	81	4
0.2534	0.644	6.62	3.17	1.8	8	83	4
0.2578	0.655	6.74	3.18	1.9	8	87	4
0.2619	0.665	6.85	3.18	2.0	9	91	4
0.2660	0.676	6.95	3.18	1.5	7	66	3
0.2701	0.686	7.06	3.19	1.8	8	83	4
0.2742	0.696	7.17	3.19	1.9	8	84	4
0.2785	0.707	7.28	3.19	1.5	6	65	3
0.2826	0.718	7.39	3.20	1.8	8	82	4
0.2866	0.728	7.49	3.20	1.8	8	80	4
0.2907	0.738	7.60	3.21	2.9	13	132	6
0.2947	0.749	7.70	3.21	2.5	11	113	5
0.2991	0.760	7.82	3.21	2.4	11	109	5
0.3032	0.770	7.92	3.22	3.1	14	138	7
0.3072	0.780	8.03	3.22	2.6	12	117	6
0.3113	0.791	8.14	3.22	2.6	11	114	5
0.3156	0.802	8.25	3.23	2.9	13	131	6
0.3197	0.812	8.36	3.23	2.8	13	126	6
0.3239	0.823	8.47	3.24	2.5	11	110	5
0.3280	0.833	8.57	3.24	2.7	12	120	6
0.3322	0.844	8.68	3.24	2.7	12	118	6
0.3362	0.854	8.79	3.25	2.9	13	127	6
0.3403	0.864	8.89	3.25	2.8	12	124	6
0.3444	0.875	9.00	3.26	2.7	12	117	6
0.3488	0.886	9.12	3.26	2.5	11	110	5
0.3529	0.896	9.22	3.26	2.6	12	116	6

Unconfined Compressive Strength
ASTM D2166

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JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	DESCRIPTION	Remold
DATE TESTED	02/20/26		
TECHNICIAN	JL		

Displacement (in)	Displacement (cm)	Strain (%)	Average Cross Sectional Area (in²)	Load (lbs)	Load (N)	Stress (psf)	Stress (kPa)
0.3572	0.907	9.34	3.27	3.4	15	151	7
0.3613	0.918	9.44	3.27	3.5	16	155	7
0.3656	0.929	9.56	3.27	3.2	14	142	7
0.3704	0.941	9.68	3.28	3.4	15	148	7
0.3744	0.951	9.79	3.28	3.7	17	163	8
0.3784	0.961	9.89	3.29	3.5	16	154	7
0.3825	0.972	10.00	3.29	3.5	15	151	7
0.3865	0.982	10.10	3.29	3.5	15	151	7
0.3905	0.992	10.21	3.30	3.5	15	151	7
0.3947	1.003	10.32	3.30	3.4	15	150	7
0.3989	1.013	10.43	3.31	3.6	16	155	7
0.4030	1.024	10.53	3.31	3.3	15	144	7
0.4072	1.034	10.64	3.31	3.6	16	158	8
0.4113	1.045	10.75	3.32	3.3	15	142	7
0.4153	1.055	10.85	3.32	3.5	16	152	7
0.4193	1.065	10.96	3.33	3.3	15	144	7
0.4235	1.076	11.07	3.33	3.6	16	153	7
0.4278	1.087	11.18	3.33	3.5	16	152	7
0.4320	1.097	11.29	3.34	3.8	17	164	8
0.4361	1.108	11.40	3.34	3.4	15	146	7
0.4401	1.118	11.50	3.35	3.6	16	154	7
0.4446	1.129	11.62	3.35	3.5	15	150	7
0.4487	1.140	11.73	3.36	3.8	17	164	8
0.4531	1.151	11.84	3.36	4.3	19	183	9
0.4571	1.161	11.95	3.36	4.1	18	177	8
0.4611	1.171	12.05	3.37	4.1	18	175	8
0.4653	1.182	12.16	3.37	4.0	18	170	8
0.4693	1.192	12.27	3.38	4.2	19	177	8
0.4735	1.203	12.38	3.38	4.0	18	168	8
0.4775	1.213	12.48	3.38	4.4	19	185	9
0.4816	1.223	12.59	3.39	4.3	19	183	9
0.4857	1.234	12.69	3.39	4.0	18	170	8
0.4899	1.244	12.80	3.40	3.9	17	164	8
0.4942	1.255	12.92	3.40	4.3	19	182	9
0.4982	1.265	13.02	3.41	4.1	18	173	8
0.5022	1.276	13.13	3.41	4.1	18	172	8
0.5065	1.287	13.24	3.41	4.3	19	180	9
0.5107	1.297	13.35	3.42	3.9	17	164	8
0.5148	1.308	13.46	3.42	3.8	17	158	8
0.5190	1.318	13.57	3.43	4.4	20	186	9
0.5231	1.329	13.67	3.43	3.9	17	165	8
0.5272	1.339	13.78	3.44	4.3	19	179	9
0.5314	1.350	13.89	3.44	3.8	17	160	8

Unconfined Compressive Strength
ASTM D2166

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	DESCRIPTION	Remold
DATE TESTED	02/20/26		
TECHNICIAN	JL		

Displacement (in)	Displacement (cm)	Strain (%)	Average Cross Sectional Area (in²)	Load (lbs)	Load (N)	Stress (psf)	Stress (kPa)
0.5354	1.360	13.99	3.44	3.9	17	163	8
0.5398	1.371	14.11	3.45	4.6	20	191	9
0.5439	1.382	14.22	3.45	4.9	22	202	10
0.5482	1.392	14.33	3.46	4.7	21	197	9
0.5527	1.404	14.45	3.46	4.7	21	194	9
0.5569	1.415	14.56	3.47	4.6	20	191	9
0.5610	1.425	14.66	3.47	4.9	22	205	10
0.5653	1.436	14.78	3.48	4.7	21	196	9
0.5695	1.447	14.88	3.48	4.7	21	194	9
0.5735	1.457	14.99	3.48	4.8	21	197	9
0.5776	1.467	15.10	3.49	4.9	22	200	10

ADVANCED TERRA TESTING
833 PARFET ST UNIT A
LAKEWOOD, CO
303-232-8308 www.terratesting.com

Friday, February 27, 2026

Project Number:	2592-115
Company:	Tetra Tech
Address:	4750 West 2100 South, Suite 400
City:	Salt Lake City
State:	Utah

RE: Soil Testing
White Pine North Tailings
117-372636-25001.01.4

Dear Chad Tomlinson,

With this letter you will find a report on Soil samples assigned on 12/11/2025.

Testing was performed in accordance with standardized test methods, accepted industry practices as well as specific instructions received from you, our client. Advanced Terra Testing accepts no responsibility and makes no claims to the use or purpose of the material being tested. Furthermore, the results herein are based solely on the material received and tested. Please note that all material will be disposed of after thirty days unless other arrangements are made.

We respectfully request that sample reports be considered proprietary information and are not to be reproduced, except in full and only with prior written approval of Advanced Terra Testing. We are pleased to have been given the opportunity to perform high quality laboratory testing for your project. We sincerely hope the results herein provide you with all the information required. If you have questions or need anything further, please reach out and we will be happy to assist you.

Respectfully,

Brandon Ferro

ADVANCED TERRA TESTING

Staged Permeability

ASTM D5084 Method D

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	SAMPLED BY	--
DATE TESTED	02/13/26	DESCRIPTION	Remold
TECHNICIAN	JL		

Stage 1

Before Test Mass of Wet Soil (g):	397.78	Initial Wet Density (pcf):	112.0
After Test Mass of Wet Soil (g):	386.83	Initial Dry Density (pcf):	90.9
Mass of Dry Soil and Pan (g):	501.00	Initial Wet Density (kg/m³):	1794
Mass of Pan (g):	177.94	Initial Dry Density (kg/m³):	1457
Diameter (in):	2.446	Initial Moisture (%):	23.1
Initial Sample Height (in):	2.880	Final Wet Density (pcf):	114.5
After Consolidation Height (in):	2.729	Final Dry Density (pcf):	96.8
Assumed Specific Gravity:	2.65	Final Wet Density (kg/m³):	1833
		Final Dry Density (kg/m³):	1551
Back Pressure (psi):	58.0	Final Moisture (%):	18.2
Cell Pressure (psi):	61.1		
Initial Effective Stress (psi):	3.1		
Initial Effective Stress (kPa):	21.4		

Permeability Data

Pump Setting	Percentage of Pump Setting	Rate of Flow (cc/s)	Pump Pressure (psi)	Head Loss (cm)	Gradient - i	Effective Stress (psi) - σ_3	Effective Stress (kPa) - σ_3	Temperature (°C)	Temperature Correction	Corrected Hydraulic Conductivity (cm/s) - k
--	--	8.33E-05	0.470	33.09	4.77	2.87	19.8	20.1	0.998	5.80E-07
--	--	8.33E-05	0.480	33.80	4.87	2.86	19.7	20.3	0.993	5.65E-07
--	--	8.33E-05	0.500	35.20	5.08	2.85	19.7	20.5	0.988	5.40E-07
--	--	8.33E-05	0.489	34.43	4.97	2.86	19.7	20.6	0.986	5.51E-07

Test Results

Average Corrected Hydraulic Conductivity (cm/s): 5.59E-07

NOTES:	Sample slumped during setup. Sample dimensions may have changed during the application of the membrane.

Data entry by:	JL	Date:	03/02/26
Checked by:	AC	Date:	03/03/26
File name:	2592115__Staged TxPbp ASTM D5084_0.xlsm		Page 1 of 1

ADVANCED TERRA TESTING

Staged Permeability

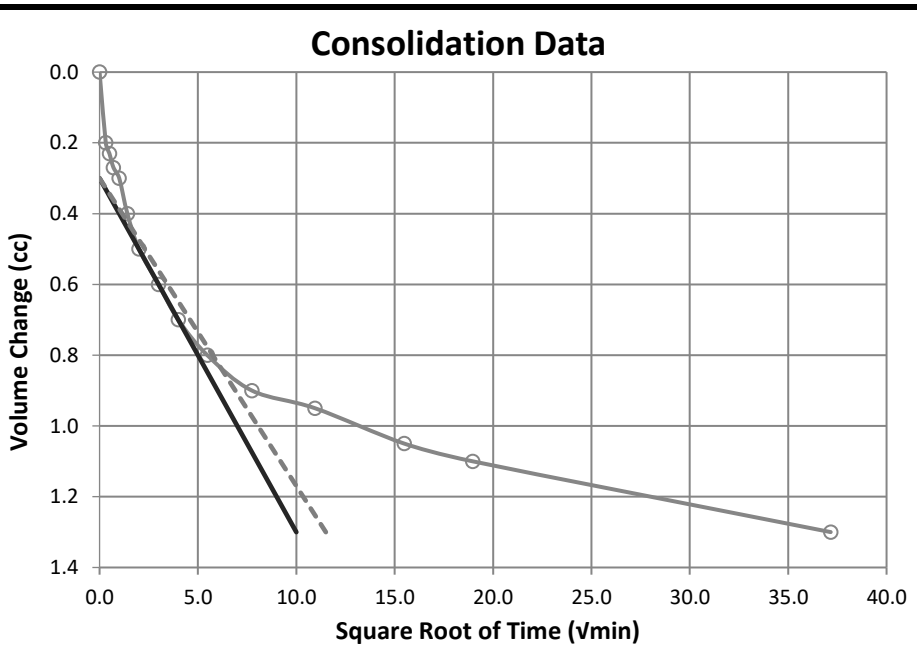
ASTM D5084 Method D

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	SAMPLED BY	--
DATE TESTED	02/13/26	DESCRIPTION	Remold
TECHNICIAN	JL		

Consolidation - Stage 1

Initial Saturation (%):	74.8	Initial Volume of Sample (cc):	221.8
Final Saturation (%):	68.1	Final Volume of Sample (cc):	208.3
Cell Pressure (psi):	61.1	Volume Change After Consolidation (cc):	23.1
Back Pressure (psi):	58.0	Initial Dial Reading (in):	0.00000
Effective Stress (psi):	3.1	Final Dial Reading (in):	0.15055
Effective Stress (kPa):	21.4	Height Change (in):	0.15055
Cell Expansion Correction (cc):	9.61	Initial Area (cm²):	30.32
Cell ID:	12P	Final Area (cm²):	30.04
T50 (min):	11.22		

Elapsed Time (min)	Square Root of Time (√min)	Burette Reading (cc)	Volume Change (cc)
0	0.00	0.20	0.00
0.1	0.32	0.40	0.20
0.25	0.50	0.43	0.23
0.5	0.71	0.47	0.27
1	1.00	0.50	0.30
2	1.41	0.60	0.40
4	2.00	0.70	0.50
9	3.00	0.80	0.60
16	4.00	0.90	0.70
30	5.48	1.00	0.80
60	7.75	1.10	0.90
120	10.95	1.15	0.95
240	15.49	1.25	1.05
360	18.97	1.30	1.10
1381	37.16	1.50	1.30



Saturation

Cell Pressure (psi)		Pore Pressure (psi)		Burette Reading (cc)		Back Pressure (psi)	Volume Change (cc)	Effective Stress (psi)	Δu (psi)	B
Initial	Final	Initial	Final	Initial	Final					
40.0	50.0	39.0	48.2	24.20	24.90	9.2	0.70	30.8	9.2	0.92
50.0	60.0	48.9	58.3	24.90	25.60	9.4	0.70	40.6	9.4	0.94
60.0	70.0	58.8	68.5	25.60	25.70	9.7	0.10	50.3	9.7	0.97

File name: 2592115__Staged TxPbp ASTM D5084_0.xlsm

ADVANCED TERRA TESTING

Staged Permeability

ASTM D5084 Method D

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	SAMPLED BY	--
DATE TESTED	02/13/26	DESCRIPTION	Remold
TECHNICIAN	JL		

Stage 2

		Initial Wet Density (pcf):	114.5
		Initial Dry Density (pcf):	96.8
		Initial Wet Density (kg/m³):	1833
		Initial Dry Density (kg/m³):	1551
Diameter (in):	2.435	Initial Moisture (%):	18.2
Initial Sample Height (in):	2.729	Final Wet Density (pcf):	116.9
After Consolidation Height (in):	2.721	Final Dry Density (pcf):	98.2
Assumed Specific Gravity:	2.65	Final Wet Density (kg/m³):	1872
		Final Dry Density (kg/m³):	1572
Back Pressure (psi):	58.0	Final Moisture (%):	19.1
Cell Pressure (psi):	67.4		
Initial Effective Stress (psi):	9.4		
Initial Effective Stress (kPa):	64.8		

Permeability Data

Pump Setting	Percentage of Pump Setting	Rate of Flow (cc/s)	Pump Pressure (psi)	Head Loss (cm)	Gradient - i	Effective Stress (psi) - σ_3	Effective Stress (kPa) - σ_3	Temperature (°C)	Temperature Correction	Corrected Hydraulic Conductivity (cm/s) - k
--	--	8.33E-05	0.679	47.81	6.92	9.06	62.5	21.0	0.976	3.96E-07
--	--	8.33E-05	0.694	48.86	7.07	9.05	62.4	21.1	0.974	3.86E-07
--	--	8.33E-05	0.704	49.57	7.17	9.05	62.4	21.1	0.974	3.81E-07
--	--	8.33E-05	0.698	49.15	7.11	9.05	62.4	21.2	0.972	3.83E-07

Test Results

Average Corrected Hydraulic Conductivity (cm/s): 3.86E-07

NOTES:	Sample slumped during setup. Sample dimensions may have changed during the application of the membrane.

File name: 2592115__Staged TxPbp ASTM D5084_0.xlsm

ADVANCED TERRA TESTING

Staged Permeability

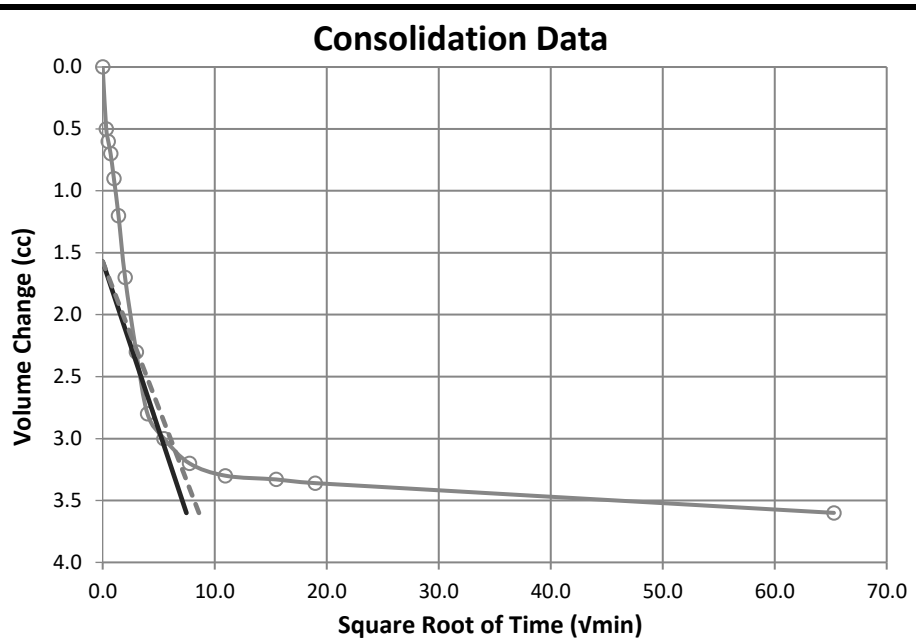
ASTM D5084 Method D

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	SAMPLED BY	--
DATE TESTED	02/13/26	DESCRIPTION	Remold
TECHNICIAN	JL		

Consolidation - Stage 2

Initial Saturation (%):	68.1	Initial Volume of Sample (cc):	208.3
Final Saturation (%):	73.7	Final Volume of Sample (cc):	205.5
Cell Pressure (psi):	67.4	Volume Change After Consolidation (cc):	3.6
Back Pressure (psi):	58.0	Initial Dial Reading (in):	0.00000
Effective Stress (psi):	9.4	Final Dial Reading (in):	0.00805
Effective Stress (kPa):	64.8	Height Change (in):	0.00805
Cell Expansion Correction (cc):	10.41	Initial Area (cm²):	30.04
Cell ID:	12P	Final Area (cm²):	29.73
T50 (min):	12.63		

Elapsed Time (min)	Square Root of Time (√min)	Burette Reading (cc)	Volume Change (cc)
0	0.00	3.40	0.00
0.1	0.32	3.90	0.50
0.25	0.50	4.00	0.60
0.5	0.71	4.10	0.70
1	1.00	4.30	0.90
2	1.41	4.60	1.20
4	2.00	5.10	1.70
9	3.00	5.70	2.30
16	4.00	6.20	2.80
30	5.48	6.40	3.00
60	7.75	6.60	3.20
120	10.95	6.70	3.30
240	15.49	6.73	3.33
360	18.97	6.76	3.36
4263	65.29	7.00	3.60



File name: 2592115__Staged TxPbp ASTM D5084_0.xlsm

ADVANCED TERRA TESTING

Staged Permeability

ASTM D5084 Method D

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	SAMPLED BY	--
DATE TESTED	02/13/26	DESCRIPTION	Remold
TECHNICIAN	JL		

Stage 3

		Initial Wet Density (pcf):	116.9
		Initial Dry Density (pcf):	98.2
		Initial Wet Density (kg/m³):	1871.9
		Initial Dry Density (kg/m³):	1572.2
Diameter (in):	2.422	Initial Moisture (%):	19.1
Initial Sample Height (in):	2.721	Final Wet Density (pcf):	118.0
After Consolidation Height (in):	2.711	Final Dry Density (pcf):	98.8
Assumed Specific Gravity:	2.65	Final Wet Density (kg/m³):	1890.2
		Final Dry Density (kg/m³):	1582.3
Back Pressure (psi):	58.0	Final Moisture (%):	19.5
Cell Pressure (psi):	73.6		
Initial Effective Stress (psi):	15.6		
Initial Effective Stress (kPa):	107.6		

Permeability Data

Pump Setting	Percentage of Pump Setting	Rate of Flow (cc/s)	Pump Pressure (psi)	Head Loss (cm)	Gradient - i	Effective Stress (psi) - σ_3	Effective Stress (kPa) - σ_3	Temperature (°C)	Temperature Correction	Corrected Hydraulic Conductivity (cm/s) - k
--	--	8.33E-05	0.818	57.59	8.36	15.19	104.7	20.5	0.988	3.32E-07
--	--	8.33E-05	0.827	58.23	8.46	15.19	104.7	20.6	0.986	3.28E-07
--	--	8.33E-05	0.860	60.55	8.79	15.17	104.6	20.7	0.983	3.14E-07
--	--	8.33E-05	0.850	59.85	8.69	15.18	104.6	20.8	0.981	3.17E-07

Test Results

Average Corrected Hydraulic Conductivity (cm/s): 3.23E-07

NOTES:	Sample slumped during setup. Sample dimensions may have changed during the application of the membrane.

File name: 2592115__Staged TxPbp ASTM D5084_0.xlsm

ADVANCED TERRA TESTING

Staged Permeability

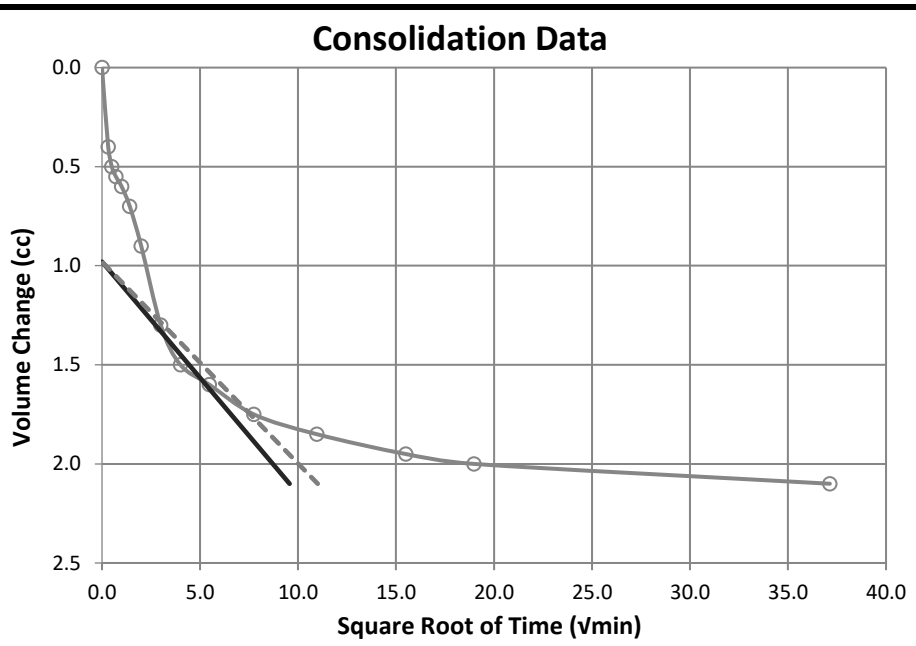
ASTM D5084 Method D

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	SAMPLED BY	--
DATE TESTED	02/13/26	DESCRIPTION	Remold
TECHNICIAN	JL		

Consolidation - Stage 3

Initial Saturation (%):	73.7	Initial Volume of Sample (cc):	205.5
Final Saturation (%):	76.4	Final Volume of Sample (cc):	204.2
Cell Pressure (psi):	73.6	Volume Change After Consolidation (cc):	2.1
Back Pressure (psi):	58.0	Initial Dial Reading (in):	0.00000
Effective Stress (psi):	15.6	Final Dial Reading (in):	0.01025
Effective Stress (kPa):	107.6	Height Change (in):	0.01025
Cell Expansion Correction (cc):	11.21	Initial Area (cm²):	29.73
Cell ID:	12P	Final Area (cm²):	29.65
T50 (min):	16.15		

Elapsed Time (min)	Square Root of Time (√min)	Burette Reading (cc)	Volume Change (cc)
0	0.00	7.40	0.00
0.1	0.32	7.80	0.40
0.25	0.50	7.90	0.50
0.5	0.71	7.95	0.55
1	1.00	8.00	0.60
2	1.41	8.10	0.70
4	2.00	8.30	0.90
9	3.00	8.70	1.30
16	4.00	8.90	1.50
30	5.48	9.00	1.60
60	7.75	9.15	1.75
120	10.95	9.25	1.85
240	15.49	9.35	1.95
360	18.97	9.40	2.00
1379	37.13	9.50	2.10



File name: 2592115__Staged TxPbp ASTM D5084_0.xlsm

ADVANCED TERRA TESTING

Staged Permeability

ASTM D5084 Method D

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	SAMPLED BY	--
DATE TESTED	02/13/26	DESCRIPTION	Remold
TECHNICIAN	JL		

Stage 4

		Initial Wet Density (pcf):	118.0
		Initial Dry Density (pcf):	98.8
		Initial Wet Density (kg/m³):	1890.2
		Initial Dry Density (kg/m³):	1582.3
Diameter (in):	2.419	Initial Moisture (%):	19.5
Initial Sample Height (in):	2.711	Final Wet Density (pcf):	118.8
After Consolidation Height (in):	2.703	Final Dry Density (pcf):	99.2
Assumed Specific Gravity:	2.65	Final Wet Density (kg/m³):	1902.9
		Final Dry Density (kg/m³):	1589.2
Back Pressure (psi):	58.0	Final Moisture (%):	19.7
Cell Pressure (psi):	79.9		
Initial Effective Stress (psi):	21.9		
Initial Effective Stress (kPa):	151.0		

Permeability Data

Pump Setting	Percentage of Pump Setting	Rate of Flow (cc/s)	Pump Pressure (psi)	Head Loss (cm)	Gradient - i	Effective Stress (psi) - σ_3	Effective Stress (kPa) - σ_3	Temperature (°C)	Temperature Correction	Corrected Hydraulic Conductivity (cm/s) - k
--	--	8.33E-05	0.882	62.10	9.04	15.16	104.5	20.0	1.000	3.11E-07
--	--	8.33E-05	0.871	61.33	8.93	15.16	104.6	20.0	1.000	3.15E-07
--	--	8.33E-05	0.926	65.20	9.50	15.14	104.4	20.0	1.000	2.96E-07
--	--	8.33E-05	0.912	64.21	9.35	15.14	104.4	20.2	0.995	3.00E-07

Test Results

Average Corrected Hydraulic Conductivity (cm/s): 3.06E-07

NOTES:	Sample slumped during setup. Sample dimensions may have changed during the application of the membrane.

File name: 2592115__Staged TxPbp ASTM D5084_0.xlsm

ADVANCED TERRA TESTING

Staged Permeability

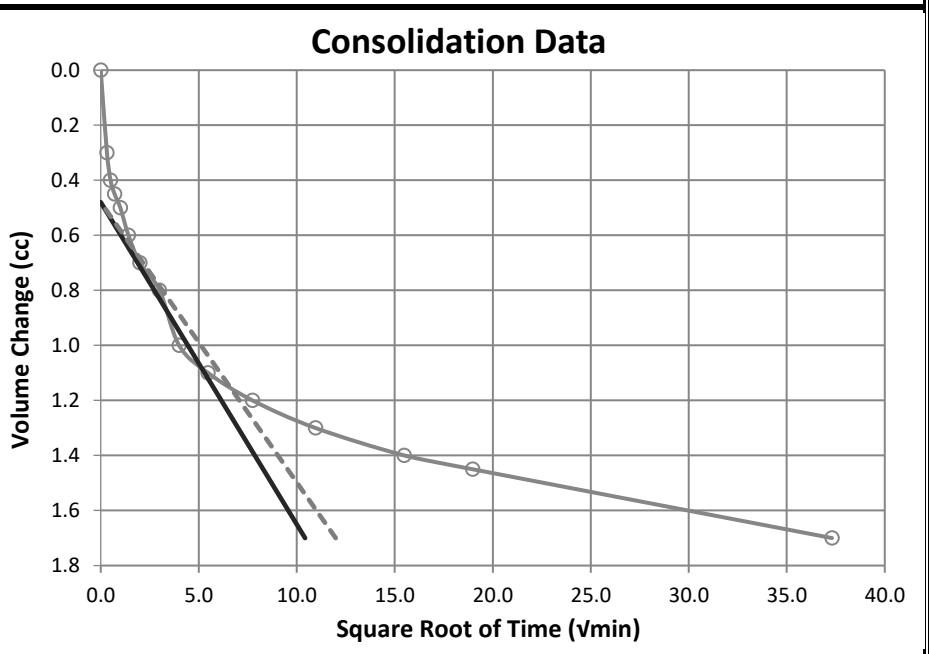
ASTM D5084 Method D

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	SAMPLED BY	--
DATE TESTED	02/13/26	DESCRIPTION	Remold
TECHNICIAN	JL		

Consolidation - Stage 4

Initial Saturation (%):	76.4	Initial Volume of Sample (cc):	204.2
Final Saturation (%):	78.4	Final Volume of Sample (cc):	203.3
Cell Pressure (psi):	79.9	Volume Change After Consolidation (cc):	1.7
Back Pressure (psi):	58.0	Initial Dial Reading (in):	0.00000
Effective Stress (psi):	21.9	Final Dial Reading (in):	0.00810
Effective Stress (kPa):	151.0	Height Change (in):	0.00810
Cell Expansion Correction (cc):	12.02	Initial Area (cm²):	29.65
Cell ID:	12P	After Consolidation Area (cm²):	29.61
T50 (min):	13.29		

Elapsed Time (min)	Square Root of Time (√min)	Burette Reading (cc)	Volume Change (cc)
0	0.00	9.90	0.00
0.1	0.32	10.20	0.30
0.25	0.50	10.30	0.40
0.5	0.71	10.35	0.45
1	1.00	10.40	0.50
2	1.41	10.50	0.60
4	2.00	10.60	0.70
9	3.00	10.70	0.80
16	4.00	10.90	1.00
30	5.48	11.00	1.10
60	7.75	11.10	1.20
120	10.95	11.20	1.30
240	15.49	11.30	1.40
360	18.97	11.35	1.45
1392	37.31	11.60	1.70



File name: 2592115__Staged TxPbp ASTM D5084_0.xlsm

ADVANCED TERRA TESTING

Direct Shear

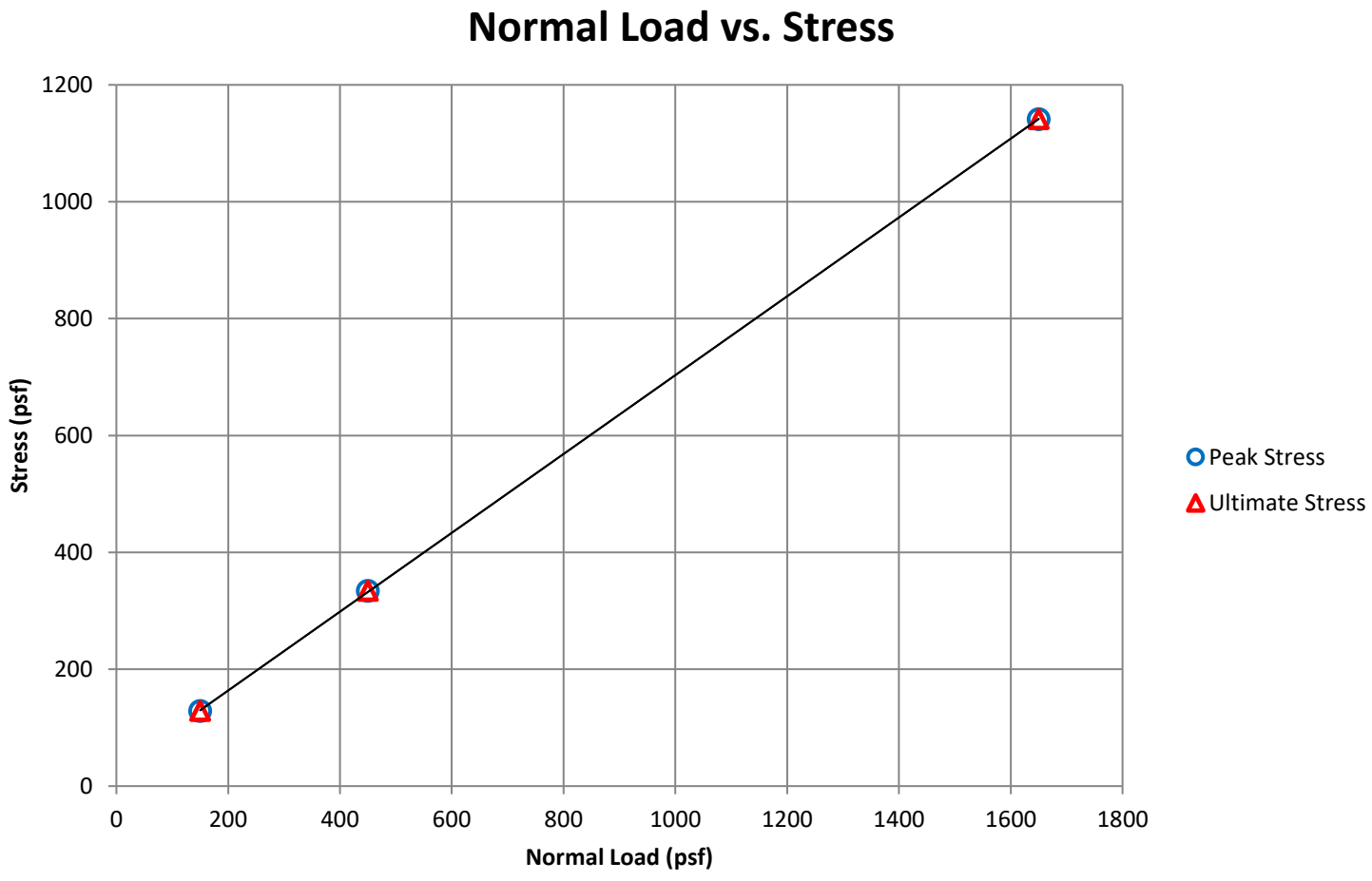
ASTM D 3080

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	DESCRIPTION	Remolded Specimens
DATE TESTED	03/02/26		
TECHNICIAN	AC		

Direct Shear Results

Point:	A	B	C
Normal Load (psf):	1650	450	150
Normal Load (kPa):	79.0	21.5	7.2
Peak Strength (psf):	1141	334	128
Ultimate Strength (psf):	1141	334	128
Peak Strength (kPa):	54.6	16.0	6.1
Ultimate Strength (kPa):	54.6	16.0	6.1

Peak Strength		Ultimate Strength	
Friction Angle:	34.0	Friction Angle:	34.0
Cohesion (psf):	29	Cohesion (psf):	29
Cohesion (kPa):	1.4	Cohesion (kPa):	1.4



Data entry by:	AC	Date: 03/03/26
Checked by:	BDF	Date: 03/03/26
File name:	2592115__Direct Shear ASTM D3080_0.xlsm	Page 1 of 2

ADVANCED TERRA TESTING

Direct Shear

ASTM D 3080

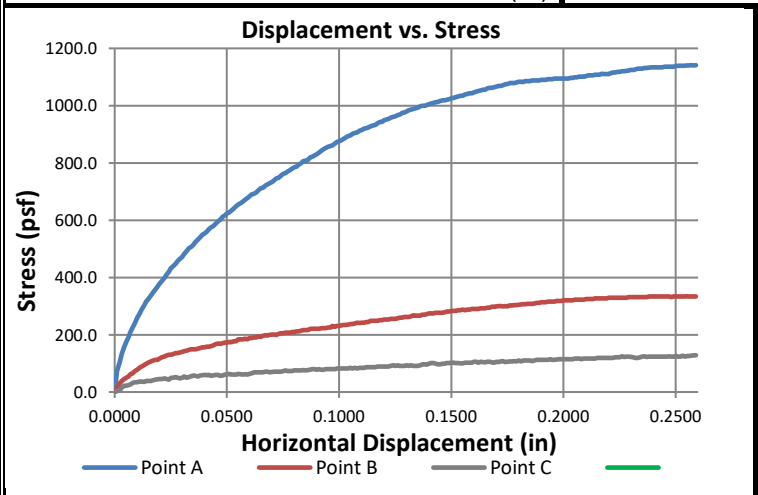
CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	DESCRIPTION	Remolded Specimens
DATE TESTED	03/02/26		
TECHNICIAN	AC		

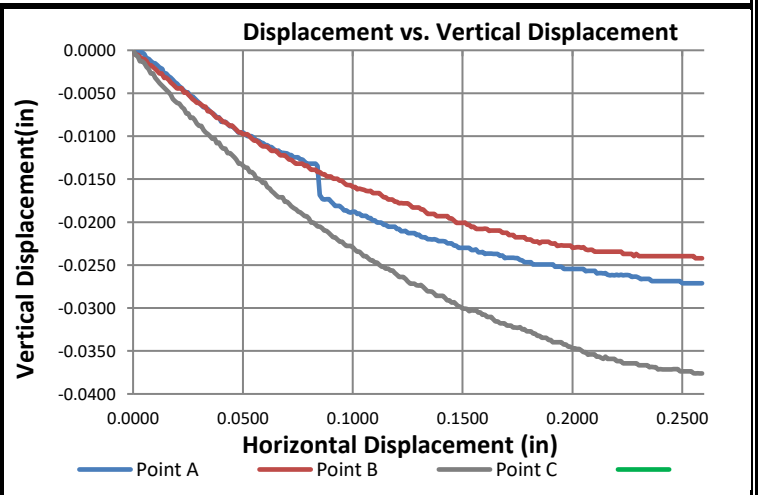
Test Parameters

Displacement Rate (in/min): 0.0077 Displacement Rate (cm/min): 0.019558

Raw Data Files: 2592-115_wholetailsslurry_DS_A_03-03.txt, 2592-115_wholetailsslurry_DS_B_03-03.txt, 2592-115_wholetailsslurry_DS_C_03-03.txt,

Before Test Mass of Wet Soil and Ring (g):	176.83	178.64	175.25
After Test Mass of Wet Soil and Pan (g):	131.21	132.51	135.08
Mass of Ring (g):	44.50	46.44	42.97
Mass of Wet Soil and Pan (g):	41.95	64.35	39.95
Mass of Dry Soil and Pan (g):	34.90	53.21	33.25
Mass of Pan (g):	3.13	3.11	3.13
Diameter (in):	2.41	2.41	2.41
Initial Height (in):	1.00	1.00	1.00
Height Change (in):	0.1299	0.05795	0.01265
Area (in²):	4.56	4.56	4.56
Initial Wet Density (pcf):	110.5	110.4	110.5
Initial Dry Density (pcf):	90.4	90.3	90.4
Initial Wet Density (kg/m³):	1770	1769	1770
Initial Dry Density (kg/m³):	1449	1447	1448
Initial Moisture (%):	22.2	22.2	22.2
Final Wet Density (pcf):	125.9	117.5	114.3
Final Dry Density (pcf):	103.9	95.9	91.5
Final Wet Density (kg/m³):	2017	1882	1830
Final Dry Density (kg/m³):	1665	1536	1466
Final Moisture (%):	21.2	22.5	24.8





NOTES:

File name: 2592115__Direct Shear ASTM D3080_0.xlsm

Direct Shear Data
ASTM D3080

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01	DATE SAMPLED	--
LOCATION	White Pine Michigan	DESCRIPTION	Remolded Specimens
DATE TESTED	03/02/26		
TECHNICIAN	AC		

Point A			Point B			Point C		
Displacement (in)	Stress (psf)	Vertical Displacment (in)	Displacement (in)	Stress (psf)	Vertical Displacment (in)	Displacement (in)	Stress (psf)	Vertical Displacment (in)
0.0000	0.0	0.0000	0.0000	0.0	0.0000	0.0000	0.0	0.0000
0.0011	73.2	0.0000	0.0012	14.8	-0.0005	0.0012	3.7	-0.0005
0.0022	102.9	0.0000	0.0022	29.3	-0.0005	0.0023	6.1	-0.0008
0.0032	133.2	-0.0003	0.0031	38.4	-0.0008	0.0032	15.4	-0.0013
0.0042	156.4	-0.0002	0.0042	45.1	-0.0010	0.0042	21.9	-0.0013
0.0051	174.5	-0.0005	0.0051	50.0	-0.0010	0.0052	22.1	-0.0015
0.0061	191.4	-0.0010	0.0061	54.7	-0.0013	0.0061	24.4	-0.0020
0.0071	209.7	-0.0010	0.0071	61.6	-0.0017	0.0070	26.8	-0.0022
0.0081	225.6	-0.0012	0.0080	65.8	-0.0017	0.0080	31.7	-0.0027
0.0090	241.4	-0.0015	0.0091	73.2	-0.0019	0.0091	33.7	-0.0027
0.0100	259.0	-0.0015	0.0100	77.7	-0.0022	0.0101	33.7	-0.0032
0.0110	271.9	-0.0017	0.0111	84.6	-0.0024	0.0110	36.6	-0.0035
0.0121	288.2	-0.0020	0.0120	89.2	-0.0027	0.0122	36.0	-0.0039
0.0132	304.4	-0.0022	0.0130	93.9	-0.0027	0.0132	35.7	-0.0041
0.0140	315.8	-0.0027	0.0141	98.8	-0.0032	0.0142	38.1	-0.0044
0.0150	325.1	-0.0027	0.0151	103.0	-0.0032	0.0151	38.6	-0.0046
0.0162	336.5	-0.0030	0.0161	107.3	-0.0034	0.0161	38.1	-0.0049
0.0171	348.7	-0.0032	0.0171	110.0	-0.0037	0.0171	40.5	-0.0052
0.0181	357.9	-0.0034	0.0181	112.2	-0.0039	0.0181	42.7	-0.0057
0.0191	366.9	-0.0037	0.0191	112.2	-0.0042	0.0190	43.9	-0.0059
0.0201	378.1	-0.0039	0.0200	117.1	-0.0044	0.0200	45.1	-0.0061
0.0210	387.7	-0.0042	0.0210	121.3	-0.0044	0.0210	45.3	-0.0062
0.0222	399.0	-0.0044	0.0220	123.9	-0.0044	0.0222	47.6	-0.0066
0.0230	408.3	-0.0047	0.0232	128.3	-0.0049	0.0232	45.3	-0.0068
0.0241	419.9	-0.0049	0.0242	130.8	-0.0049	0.0242	42.8	-0.0073
0.0250	431.6	-0.0049	0.0252	130.6	-0.0052	0.0251	50.0	-0.0073
0.0261	440.3	-0.0054	0.0262	133.1	-0.0054	0.0261	50.0	-0.0079
0.0271	447.5	-0.0054	0.0271	135.3	-0.0057	0.0271	52.3	-0.0078
0.0281	457.3	-0.0056	0.0281	135.3	-0.0059	0.0281	50.0	-0.0081
0.0291	465.0	-0.0059	0.0290	137.8	-0.0061	0.0290	47.6	-0.0085
0.0300	470.7	-0.0061	0.0300	140.2	-0.0061	0.0301	50.0	-0.0088
0.0310	482.4	-0.0064	0.0310	142.7	-0.0063	0.0310	54.0	-0.0088
0.0320	491.4	-0.0066	0.0322	144.6	-0.0066	0.0320	50.0	-0.0093
0.0330	501.1	-0.0066	0.0330	147.1	-0.0066	0.0330	52.4	-0.0095
0.0342	507.5	-0.0069	0.0340	149.2	-0.0071	0.0342	54.9	-0.0098
0.0352	514.6	-0.0071	0.0350	149.7	-0.0071	0.0352	57.2	-0.0100
0.0361	524.3	-0.0073	0.0361	149.7	-0.0073	0.0360	56.9	-0.0103
0.0371	532.9	-0.0075	0.0371	151.5	-0.0076	0.0371	54.7	-0.0103
0.0381	540.2	-0.0078	0.0381	153.8	-0.0079	0.0381	57.3	-0.0108
0.0391	549.0	-0.0078	0.0391	156.1	-0.0079	0.0391	59.1	-0.0108
0.0400	553.6	-0.0083	0.0401	156.1	-0.0081	0.0401	59.6	-0.0112
0.0410	560.9	-0.0083	0.0410	158.5	-0.0084	0.0410	59.3	-0.0115
0.0421	569.9	-0.0083	0.0420	158.5	-0.0083	0.0420	59.6	-0.0115

Direct Shear Data
ASTM D3080

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01	DATE SAMPLED	--
LOCATION	White Pine Michigan	DESCRIPTION	Remolded Specimens
DATE TESTED	03/02/26		
TECHNICIAN	AC		

Point A			Point B			Point C		
Displacement (in)	Stress (psf)	Vertical Displacment (in)	Displacement (in)	Stress (psf)	Vertical Displacment (in)	Displacement (in)	Stress (psf)	Vertical Displacment (in)
0.0430	574.6	-0.0086	0.0431	161.0	-0.0086	0.0430	57.0	-0.0120
0.0440	579.2	-0.0088	0.0442	163.4	-0.0088	0.0442	58.8	-0.0120
0.0451	588.5	-0.0088	0.0450	167.5	-0.0088	0.0451	59.4	-0.0122
0.0462	597.6	-0.0091	0.0461	169.9	-0.0090	0.0462	59.4	-0.0125
0.0471	602.4	-0.0093	0.0471	168.3	-0.0093	0.0470	56.7	-0.0127
0.0480	612.1	-0.0096	0.0481	170.3	-0.0095	0.0481	57.2	-0.0132
0.0491	616.4	-0.0095	0.0491	172.4	-0.0095	0.0491	61.1	-0.0132
0.0500	622.9	-0.0095	0.0501	172.5	-0.0098	0.0500	61.3	-0.0134
0.0511	627.8	-0.0098	0.0510	174.5	-0.0098	0.0511	63.6	-0.0136
0.0520	632.8	-0.0100	0.0520	174.4	-0.0098	0.0520	61.3	-0.0137
0.0530	640.5	-0.0100	0.0530	176.8	-0.0100	0.0531	61.4	-0.0142
0.0540	648.8	-0.0100	0.0540	177.0	-0.0103	0.0542	61.1	-0.0142
0.0552	655.7	-0.0103	0.0551	184.1	-0.0105	0.0551	63.6	-0.0144
0.0562	660.0	-0.0105	0.0562	184.1	-0.0105	0.0561	61.6	-0.0149
0.0571	664.5	-0.0105	0.0572	184.0	-0.0107	0.0571	61.4	-0.0149
0.0582	671.9	-0.0108	0.0581	186.6	-0.0110	0.0581	62.2	-0.0152
0.0591	676.7	-0.0108	0.0591	184.1	-0.0112	0.0591	61.0	-0.0154
0.0600	683.0	-0.0110	0.0600	188.8	-0.0112	0.0601	63.7	-0.0154
0.0611	690.1	-0.0110	0.0611	188.4	-0.0112	0.0611	65.8	-0.0159
0.0620	692.6	-0.0113	0.0620	191.0	-0.0115	0.0622	68.3	-0.0161
0.0630	697.2	-0.0113	0.0630	190.5	-0.0117	0.0630	68.4	-0.0164
0.0641	704.2	-0.0115	0.0640	193.9	-0.0117	0.0642	68.3	-0.0166
0.0651	710.9	-0.0117	0.0652	193.1	-0.0117	0.0652	68.3	-0.0169
0.0661	713.3	-0.0117	0.0660	195.7	-0.0120	0.0661	68.3	-0.0171
0.0670	720.3	-0.0119	0.0671	198.0	-0.0122	0.0671	70.7	-0.0171
0.0681	724.7	-0.0119	0.0681	197.7	-0.0122	0.0680	70.6	-0.0171
0.0691	729.3	-0.0120	0.0691	200.0	-0.0122	0.0691	68.3	-0.0176
0.0701	734.0	-0.0120	0.0701	200.1	-0.0125	0.0701	70.4	-0.0176
0.0710	738.9	-0.0122	0.0711	200.3	-0.0127	0.0711	70.7	-0.0179
0.0721	745.9	-0.0122	0.0720	200.0	-0.0127	0.0720	70.7	-0.0181
0.0730	748.2	-0.0124	0.0731	202.4	-0.0130	0.0732	70.7	-0.0184
0.0740	754.8	-0.0124	0.0741	204.8	-0.0132	0.0742	70.7	-0.0185
0.0750	762.1	-0.0124	0.0752	204.8	-0.0132	0.0752	73.2	-0.0188
0.0762	764.5	-0.0127	0.0760	207.3	-0.0132	0.0762	75.4	-0.0188
0.0772	770.9	-0.0127	0.0771	207.3	-0.0132	0.0770	72.9	-0.0191
0.0781	775.5	-0.0130	0.0782	207.3	-0.0135	0.0781	72.9	-0.0193
0.0792	780.4	-0.0132	0.0791	209.7	-0.0134	0.0790	73.2	-0.0193
0.0801	785.3	-0.0132	0.0801	209.7	-0.0137	0.0800	75.4	-0.0196
0.0811	787.5	-0.0132	0.0810	212.0	-0.0139	0.0811	75.1	-0.0201
0.0820	794.2	-0.0132	0.0820	212.0	-0.0139	0.0820	75.1	-0.0200
0.0830	798.7	-0.0132	0.0830	214.3	-0.0139	0.0832	75.3	-0.0203
0.0840	805.8	-0.0135	0.0840	216.7	-0.0142	0.0840	77.1	-0.0205
0.0850	807.8	-0.0169	0.0850	216.1	-0.0142	0.0852	75.3	-0.0205

Direct Shear Data
ASTM D3080

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01	DATE SAMPLED	--
LOCATION	White Pine Michigan	DESCRIPTION	Remolded Specimens
DATE TESTED	03/02/26		
TECHNICIAN	AC		

Point A			Point B			Point C		
Displacement (in)	Stress (psf)	Vertical Displacment (in)	Displacement (in)	Stress (psf)	Vertical Displacment (in)	Displacement (in)	Stress (psf)	Vertical Displacment (in)
0.0862	812.2	-0.0174	0.0862	216.3	-0.0144	0.0862	76.7	-0.0207
0.0871	819.5	-0.0174	0.0872	221.0	-0.0144	0.0870	78.0	-0.0210
0.0882	821.8	-0.0174	0.0881	220.7	-0.0147	0.0881	80.3	-0.0210
0.0892	826.6	-0.0173	0.0891	220.7	-0.0147	0.0890	79.9	-0.0212
0.0901	831.3	-0.0176	0.0901	220.7	-0.0147	0.0901	77.6	-0.0215
0.0911	836.2	-0.0178	0.0911	220.9	-0.0149	0.0911	80.3	-0.0218
0.0920	842.6	-0.0181	0.0921	223.1	-0.0149	0.0920	77.3	-0.0218
0.0931	847.3	-0.0181	0.0931	223.1	-0.0149	0.0930	78.0	-0.0220
0.0940	852.0	-0.0181	0.0940	223.1	-0.0152	0.0942	79.7	-0.0223
0.0951	856.7	-0.0184	0.0952	225.6	-0.0152	0.0951	80.2	-0.0223
0.0960	859.2	-0.0186	0.0962	225.6	-0.0155	0.0961	80.2	-0.0225
0.0970	860.9	-0.0186	0.0971	230.3	-0.0156	0.0971	80.2	-0.0228
0.0981	868.3	-0.0188	0.0980	228.0	-0.0157	0.0981	79.7	-0.0228
0.0991	873.0	-0.0189	0.0990	230.3	-0.0157	0.0991	82.0	-0.0228
0.1000	875.5	-0.0188	0.1001	230.5	-0.0159	0.1001	82.0	-0.0230
0.1011	879.4	-0.0188	0.1011	232.9	-0.0159	0.1010	82.5	-0.0232
0.1021	884.2	-0.0191	0.1020	234.7	-0.0162	0.1020	81.8	-0.0234
0.1030	888.9	-0.0190	0.1031	234.7	-0.0161	0.1030	82.2	-0.0235
0.1040	893.8	-0.0193	0.1040	234.9	-0.0162	0.1040	81.7	-0.0237
0.1050	895.9	-0.0193	0.1052	237.0	-0.0162	0.1050	84.7	-0.0239
0.1062	902.6	-0.0193	0.1061	237.3	-0.0164	0.1060	82.2	-0.0239
0.1071	904.9	-0.0195	0.1072	239.6	-0.0164	0.1071	84.3	-0.0242
0.1082	907.2	-0.0195	0.1082	241.7	-0.0164	0.1081	81.8	-0.0245
0.1091	912.1	-0.0198	0.1091	241.4	-0.0166	0.1091	84.3	-0.0245
0.1101	914.5	-0.0198	0.1101	241.6	-0.0166	0.1101	84.9	-0.0247
0.1110	919.1	-0.0200	0.1111	241.6	-0.0166	0.1111	84.6	-0.0247
0.1121	921.5	-0.0200	0.1121	244.0	-0.0166	0.1120	86.6	-0.0250
0.1130	923.5	-0.0200	0.1130	244.0	-0.0169	0.1133	86.9	-0.0252
0.1140	927.9	-0.0203	0.1141	248.7	-0.0171	0.1140	86.6	-0.0252
0.1150	930.5	-0.0203	0.1150	248.7	-0.0171	0.1150	86.7	-0.0254
0.1161	932.9	-0.0206	0.1162	248.7	-0.0174	0.1162	86.9	-0.0254
0.1172	937.7	-0.0206	0.1172	248.7	-0.0174	0.1172	89.0	-0.0256
0.1182	942.5	-0.0206	0.1181	251.2	-0.0174	0.1181	89.0	-0.0256
0.1192	944.2	-0.0206	0.1191	251.2	-0.0176	0.1191	89.2	-0.0259
0.1201	948.9	-0.0208	0.1200	253.5	-0.0176	0.1201	89.0	-0.0261
0.1211	951.1	-0.0208	0.1211	253.6	-0.0178	0.1211	89.0	-0.0264
0.1220	953.5	-0.0211	0.1220	253.3	-0.0178	0.1220	89.2	-0.0264
0.1231	958.4	-0.0211	0.1230	255.9	-0.0178	0.1230	91.5	-0.0264
0.1240	960.8	-0.0210	0.1240	255.5	-0.0178	0.1242	93.9	-0.0267
0.1252	963.1	-0.0213	0.1250	255.5	-0.0178	0.1251	91.5	-0.0269
0.1262	967.4	-0.0213	0.1262	257.6	-0.0180	0.1262	93.9	-0.0272
0.1272	969.7	-0.0213	0.1272	259.9	-0.0183	0.1270	91.5	-0.0272
0.1282	974.6	-0.0213	0.1282	259.7	-0.0183	0.1281	91.5	-0.0272

Direct Shear Data
ASTM D3080

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01	DATE SAMPLED	--
LOCATION	White Pine Michigan	DESCRIPTION	Remolded Specimens
DATE TESTED	03/02/26		
TECHNICIAN	AC		

Point A			Point B			Point C		
Displacement (in)	Stress (psf)	Vertical Displacment (in)	Displacement (in)	Stress (psf)	Vertical Displacment (in)	Displacement (in)	Stress (psf)	Vertical Displacment (in)
0.1291	976.7	-0.0215	0.1291	262.3	-0.0183	0.1290	91.5	-0.0274
0.1301	979.3	-0.0215	0.1301	262.5	-0.0183	0.1301	93.9	-0.0274
0.1311	984.0	-0.0217	0.1311	262.2	-0.0185	0.1310	91.5	-0.0273
0.1321	986.4	-0.0218	0.1320	264.9	-0.0185	0.1320	93.9	-0.0276
0.1330	988.6	-0.0218	0.1331	267.3	-0.0188	0.1331	91.5	-0.0278
0.1340	990.9	-0.0220	0.1341	267.0	-0.0191	0.1340	91.5	-0.0281
0.1350	992.7	-0.0220	0.1350	267.0	-0.0191	0.1350	91.5	-0.0281
0.1361	997.4	-0.0220	0.1360	267.0	-0.0191	0.1362	93.9	-0.0281
0.1371	999.9	-0.0220	0.1371	269.5	-0.0191	0.1372	96.3	-0.0283
0.1382	999.9	-0.0220	0.1382	269.5	-0.0193	0.1381	96.3	-0.0286
0.1391	1002.3	-0.0222	0.1391	271.9	-0.0193	0.1391	96.2	-0.0286
0.1401	1004.7	-0.0222	0.1401	274.2	-0.0193	0.1401	98.8	-0.0286
0.1411	1007.0	-0.0222	0.1411	274.4	-0.0193	0.1410	101.1	-0.0286
0.1421	1009.3	-0.0222	0.1421	274.4	-0.0193	0.1421	100.9	-0.0288
0.1430	1011.6	-0.0225	0.1431	276.8	-0.0193	0.1430	98.5	-0.0291
0.1440	1013.6	-0.0225	0.1440	276.3	-0.0196	0.1440	96.3	-0.0291
0.1450	1016.0	-0.0225	0.1450	276.5	-0.0196	0.1450	96.3	-0.0294
0.1462	1018.5	-0.0227	0.1462	276.8	-0.0198	0.1462	98.6	-0.0293
0.1470	1018.5	-0.0227	0.1472	278.5	-0.0201	0.1471	98.8	-0.0296
0.1482	1020.6	-0.0230	0.1481	281.1	-0.0201	0.1481	100.7	-0.0298
0.1492	1023.0	-0.0230	0.1491	281.7	-0.0201	0.1490	100.9	-0.0298
0.1501	1025.5	-0.0230	0.1501	283.6	-0.0201	0.1501	102.9	-0.0301
0.1511	1027.9	-0.0230	0.1511	283.3	-0.0201	0.1511	102.7	-0.0301
0.1521	1030.0	-0.0230	0.1521	283.5	-0.0203	0.1520	100.7	-0.0301
0.1531	1032.5	-0.0230	0.1530	285.8	-0.0203	0.1530	100.9	-0.0304
0.1540	1034.5	-0.0232	0.1540	285.3	-0.0206	0.1540	100.4	-0.0303
0.1550	1034.8	-0.0232	0.1550	287.8	-0.0205	0.1550	100.6	-0.0303
0.1560	1039.2	-0.0232	0.1562	285.6	-0.0208	0.1562	102.7	-0.0303
0.1572	1041.5	-0.0235	0.1572	288.1	-0.0208	0.1571	102.7	-0.0305
0.1582	1043.8	-0.0235	0.1582	287.8	-0.0208	0.1582	102.7	-0.0305
0.1592	1043.8	-0.0235	0.1592	290.2	-0.0208	0.1590	102.4	-0.0308
0.1601	1046.0	-0.0237	0.1601	290.2	-0.0207	0.1601	105.3	-0.0308
0.1611	1048.6	-0.0237	0.1611	290.2	-0.0208	0.1611	105.2	-0.0310
0.1621	1051.1	-0.0237	0.1620	290.2	-0.0210	0.1620	102.9	-0.0310
0.1631	1053.2	-0.0237	0.1631	292.5	-0.0210	0.1631	105.2	-0.0310
0.1641	1055.9	-0.0237	0.1640	292.6	-0.0210	0.1640	105.0	-0.0313
0.1650	1055.6	-0.0237	0.1652	292.6	-0.0210	0.1650	103.9	-0.0315
0.1660	1060.1	-0.0237	0.1660	295.1	-0.0210	0.1660	105.2	-0.0315
0.1670	1062.2	-0.0239	0.1670	295.1	-0.0210	0.1672	105.2	-0.0318
0.1682	1062.3	-0.0239	0.1682	297.5	-0.0212	0.1681	103.0	-0.0318
0.1692	1064.6	-0.0242	0.1691	297.5	-0.0212	0.1691	102.7	-0.0318
0.1702	1066.9	-0.0242	0.1701	299.3	-0.0212	0.1702	105.2	-0.0321
0.1711	1069.2	-0.0242	0.1711	299.8	-0.0215	0.1711	104.9	-0.0321

Direct Shear Data
ASTM D3080

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01	DATE SAMPLED	--
LOCATION	White Pine Michigan	DESCRIPTION	Remolded Specimens
DATE TESTED	03/02/26		
TECHNICIAN	AC		

Point A			Point B			Point C		
Displacement (in)	Stress (psf)	Vertical Displacment (in)	Displacement (in)	Stress (psf)	Vertical Displacment (in)	Displacement (in)	Stress (psf)	Vertical Displacment (in)
0.1720	1069.4	-0.0242	0.1720	300.0	-0.0215	0.1721	107.3	-0.0320
0.1730	1071.6	-0.0242	0.1731	299.5	-0.0215	0.1730	107.5	-0.0323
0.1740	1074.1	-0.0242	0.1741	300.0	-0.0218	0.1740	105.0	-0.0323
0.1751	1076.1	-0.0242	0.1750	299.3	-0.0218	0.1750	105.8	-0.0323
0.1762	1078.5	-0.0244	0.1760	302.1	-0.0218	0.1762	107.3	-0.0322
0.1770	1078.8	-0.0244	0.1770	301.9	-0.0218	0.1771	106.8	-0.0325
0.1782	1079.0	-0.0247	0.1782	303.9	-0.0218	0.1781	107.6	-0.0324
0.1792	1081.1	-0.0247	0.1791	303.9	-0.0220	0.1792	107.3	-0.0327
0.1801	1082.9	-0.0247	0.1800	304.2	-0.0220	0.1801	109.7	-0.0327
0.1811	1082.9	-0.0247	0.1810	306.1	-0.0220	0.1811	107.3	-0.0327
0.1820	1082.8	-0.0249	0.1821	306.4	-0.0223	0.1821	109.7	-0.0330
0.1831	1085.5	-0.0249	0.1831	306.5	-0.0223	0.1830	109.7	-0.0330
0.1841	1085.2	-0.0249	0.1840	308.5	-0.0222	0.1841	109.7	-0.0332
0.1850	1085.2	-0.0249	0.1850	308.5	-0.0225	0.1850	109.7	-0.0332
0.1860	1087.6	-0.0249	0.1860	308.5	-0.0223	0.1861	107.6	-0.0335
0.1870	1087.6	-0.0249	0.1870	308.8	-0.0223	0.1870	109.7	-0.0335
0.1882	1087.6	-0.0249	0.1881	310.9	-0.0223	0.1882	112.2	-0.0335
0.1891	1087.6	-0.0249	0.1892	310.9	-0.0223	0.1892	112.2	-0.0337
0.1901	1090.1	-0.0249	0.1902	313.4	-0.0225	0.1901	112.2	-0.0337
0.1912	1090.1	-0.0249	0.1911	313.4	-0.0225	0.1910	112.2	-0.0340
0.1921	1090.1	-0.0252	0.1921	313.4	-0.0225	0.1921	112.2	-0.0340
0.1931	1092.5	-0.0252	0.1931	315.8	-0.0228	0.1931	112.2	-0.0340
0.1940	1092.5	-0.0252	0.1941	315.8	-0.0227	0.1941	114.6	-0.0340
0.1950	1092.5	-0.0252	0.1950	315.8	-0.0227	0.1950	112.2	-0.0340
0.1961	1094.8	-0.0254	0.1960	315.8	-0.0227	0.1960	112.2	-0.0342
0.1970	1094.8	-0.0254	0.1970	318.2	-0.0227	0.1970	113.7	-0.0342
0.1982	1095.0	-0.0254	0.1981	318.2	-0.0227	0.1982	114.5	-0.0345
0.1990	1095.0	-0.0254	0.1992	318.2	-0.0227	0.1991	114.6	-0.0345
0.2000	1095.0	-0.0254	0.2000	320.7	-0.0230	0.2001	114.6	-0.0347
0.2011	1095.0	-0.0254	0.2012	320.7	-0.0230	0.2011	114.6	-0.0347
0.2021	1095.0	-0.0254	0.2021	320.7	-0.0229	0.2021	114.8	-0.0347
0.2031	1097.4	-0.0254	0.2031	320.7	-0.0229	0.2031	114.6	-0.0347
0.2041	1097.4	-0.0254	0.2041	320.7	-0.0230	0.2041	114.6	-0.0349
0.2051	1099.2	-0.0254	0.2050	322.8	-0.0229	0.2050	117.1	-0.0352
0.2061	1099.5	-0.0257	0.2060	322.5	-0.0232	0.2060	117.1	-0.0352
0.2070	1101.7	-0.0257	0.2070	322.7	-0.0233	0.2070	117.1	-0.0354
0.2080	1101.7	-0.0257	0.2082	322.7	-0.0232	0.2080	114.6	-0.0354
0.2092	1101.5	-0.0257	0.2090	323.0	-0.0232	0.2090	117.1	-0.0354
0.2102	1103.8	-0.0257	0.2102	324.8	-0.0234	0.2101	117.1	-0.0354
0.2111	1106.1	-0.0260	0.2111	325.0	-0.0235	0.2110	117.1	-0.0357
0.2122	1105.9	-0.0259	0.2120	325.0	-0.0234	0.2121	117.4	-0.0357
0.2131	1106.2	-0.0259	0.2131	324.5	-0.0235	0.2131	117.1	-0.0358
0.2141	1108.4	-0.0260	0.2140	327.4	-0.0235	0.2141	117.1	-0.0359

Direct Shear Data
ASTM D3080

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01	DATE SAMPLED	--
LOCATION	White Pine Michigan	DESCRIPTION	Remolded Specimens
DATE TESTED	03/02/26		
TECHNICIAN	AC		

Point A			Point B			Point C		
Displacement (in)	Stress (psf)	Vertical Displacment (in)	Displacement (in)	Stress (psf)	Vertical Displacment (in)	Displacement (in)	Stress (psf)	Vertical Displacment (in)
0.2151	1108.4	-0.0259	0.2150	326.9	-0.0234	0.2150	119.3	-0.0357
0.2160	1108.4	-0.0261	0.2161	326.8	-0.0234	0.2160	119.5	-0.0359
0.2170	1111.0	-0.0262	0.2170	326.8	-0.0235	0.2170	119.5	-0.0359
0.2180	1110.8	-0.0262	0.2180	326.9	-0.0235	0.2180	119.5	-0.0359
0.2191	1110.8	-0.0262	0.2192	326.8	-0.0234	0.2192	119.3	-0.0359
0.2202	1110.8	-0.0261	0.2202	329.2	-0.0234	0.2202	119.2	-0.0362
0.2210	1113.3	-0.0262	0.2212	329.2	-0.0234	0.2211	119.3	-0.0362
0.2222	1115.4	-0.0261	0.2222	329.4	-0.0235	0.2221	119.3	-0.0362
0.2231	1115.7	-0.0262	0.2231	329.4	-0.0237	0.2231	121.5	-0.0364
0.2241	1118.1	-0.0262	0.2241	329.5	-0.0237	0.2241	121.6	-0.0364
0.2251	1118.1	-0.0262	0.2251	329.7	-0.0237	0.2250	121.8	-0.0364
0.2261	1120.1	-0.0262	0.2260	329.4	-0.0237	0.2260	124.4	-0.0364
0.2270	1120.4	-0.0264	0.2270	329.2	-0.0237	0.2270	121.9	-0.0364
0.2281	1121.8	-0.0264	0.2280	329.4	-0.0239	0.2282	123.9	-0.0364
0.2290	1122.4	-0.0264	0.2290	331.7	-0.0237	0.2292	123.9	-0.0364
0.2300	1124.8	-0.0264	0.2302	331.7	-0.0239	0.2302	121.9	-0.0367
0.2312	1124.5	-0.0266	0.2312	331.7	-0.0239	0.2311	121.8	-0.0367
0.2322	1126.8	-0.0266	0.2320	332.0	-0.0239	0.2321	119.3	-0.0367
0.2331	1129.1	-0.0266	0.2330	331.7	-0.0239	0.2331	119.5	-0.0366
0.2341	1129.1	-0.0266	0.2341	331.7	-0.0239	0.2341	121.5	-0.0367
0.2351	1129.1	-0.0266	0.2350	331.7	-0.0239	0.2350	123.5	-0.0369
0.2361	1131.5	-0.0269	0.2361	331.7	-0.0239	0.2361	124.2	-0.0369
0.2370	1131.5	-0.0269	0.2370	331.7	-0.0239	0.2370	122.7	-0.0369
0.2380	1132.8	-0.0269	0.2382	334.1	-0.0239	0.2380	123.5	-0.0369
0.2390	1134.0	-0.0269	0.2390	334.1	-0.0239	0.2390	123.8	-0.0371
0.2402	1134.1	-0.0269	0.2401	334.1	-0.0239	0.2400	124.1	-0.0371
0.2413	1134.0	-0.0269	0.2412	334.1	-0.0239	0.2412	124.1	-0.0371
0.2422	1134.0	-0.0269	0.2421	334.1	-0.0239	0.2421	123.8	-0.0371
0.2431	1134.0	-0.0269	0.2430	334.1	-0.0239	0.2431	123.8	-0.0371
0.2441	1134.0	-0.0269	0.2441	334.1	-0.0239	0.2441	124.1	-0.0371
0.2451	1136.4	-0.0269	0.2451	334.1	-0.0239	0.2451	123.6	-0.0371
0.2460	1136.4	-0.0269	0.2461	334.1	-0.0239	0.2461	123.8	-0.0371
0.2470	1136.4	-0.0269	0.2470	334.1	-0.0239	0.2470	124.2	-0.0371
0.2480	1136.4	-0.0269	0.2480	331.8	-0.0239	0.2480	123.9	-0.0371
0.2490	1136.4	-0.0269	0.2490	334.1	-0.0239	0.2490	123.5	-0.0374
0.2500	1138.7	-0.0271	0.2500	334.1	-0.0239	0.2501	125.9	-0.0374
0.2512	1138.9	-0.0271	0.2512	334.1	-0.0239	0.2510	123.6	-0.0374
0.2522	1138.9	-0.0271	0.2522	334.1	-0.0239	0.2522	124.1	-0.0374
0.2532	1138.9	-0.0271	0.2532	334.1	-0.0239	0.2531	126.7	-0.0374
0.2540	1138.9	-0.0271	0.2541	334.1	-0.0239	0.2541	123.9	-0.0374
0.2551	1141.0	-0.0271	0.2551	334.3	-0.0239	0.2551	125.9	-0.0376
0.2561	1140.8	-0.0271	0.2560	334.1	-0.0242	0.2560	126.4	-0.0376
0.2571	1141.3	-0.0271	0.2570	334.1	-0.0242	0.2571	126.7	-0.0376

Direct Shear Data
ASTM D3080

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01	DATE SAMPLED	--
LOCATION	White Pine Michigan	DESCRIPTION	Remolded Specimens
DATE TESTED	03/02/26		
TECHNICIAN	AC		

Point A			Point B			Point C		
Displacement (in)	Stress (psf)	Vertical Displacment (in)	Displacement (in)	Stress (psf)	Vertical Displacment (in)	Displacement (in)	Stress (psf)	Vertical Displacment (in)
0.2581	1140.8	-0.0271	0.2580	334.1	-0.0242	0.2580	128.2	-0.0376
0.2590	1141.3	-0.0271	0.2590	334.1	-0.0242	0.2590	128.3	-0.0376

ADVANCED TERRA TESTING

DS Shear Rate

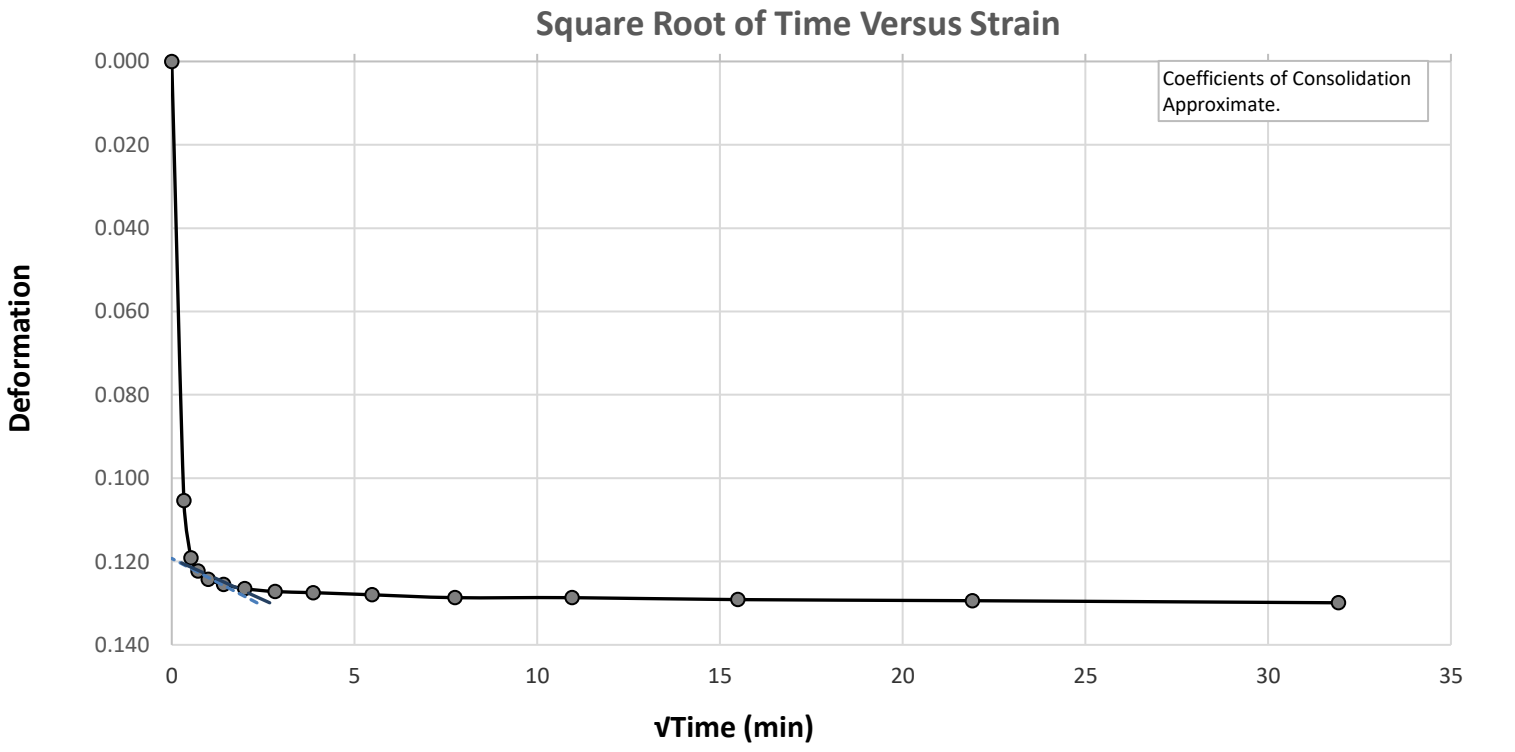
ASTM D 2435

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	DESCRIPTION	Remolded Specimens
DATE TESTED	03/02/26		
TECHNICIAN	AC	STANDARD	ASTM D3080

Coefficient of Consolidation (cm^2/s)	Shear Rate (in/min)	Load (psf)
0.00785	0.0077	--
T50 (min)	T90 (min)	Distance to Failure (in):
0.894	2.90	0.26

NOTES:

Elapsed Time (min)	Elapsed Time $\sqrt{min}$	Dial Reading (in)	Deformation (in)	Strain (%)
0	0.00	0.0000	0.0000	0.0
0.11	0.33	0.1054	0.1054	10.5
0.28	0.53	0.1192	0.1192	11.9
0.52	0.72	0.1223	0.1223	12.2
1	1.00	0.1243	0.1243	12.4
2	1.41	0.1255	0.1255	12.6
4	2.00	0.1265	0.1265	12.7
8	2.83	0.1272	0.1272	12.7
15	3.87	0.1275	0.1275	12.7
30	5.48	0.1280	0.1280	12.8
60	7.75	0.1287	0.1287	12.9
120	10.95	0.1287	0.1287	12.9
240	15.49	0.1291	0.1291	12.9
480	21.91	0.1294	0.1294	12.9
1019	31.92	0.1299	0.1299	13.0

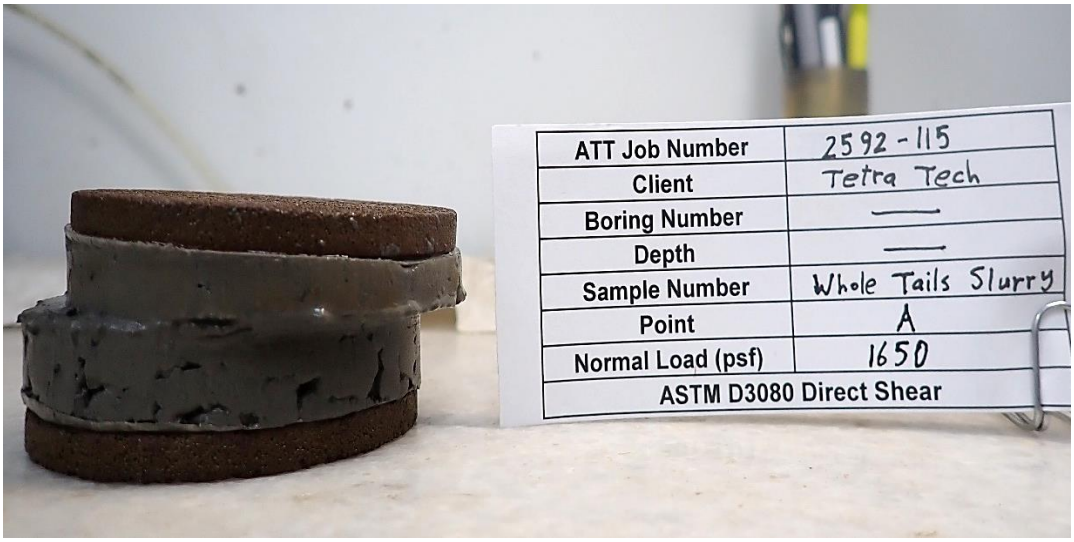


Data entry by:	AC	Date: 03/03/26
Checked by:	BDF	Date: 03/03/26

ADVANCED TERRA TESTING

Direct Shear
ASTM D3080
(Point A Picture 1)

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	DESCRIPTION	Remolded Specimens
DATE TESTED	03/02/26		
TECHNICIAN	AC		



NOTES

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File name: 2592115__Direct Shear ASTM D3080_0.xlsm

ADVANCED TERRA TESTING

Direct Shear
ASTM D3080
(Point A Picture 2)

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	DESCRIPTION	Remolded Specimens
DATE TESTED	03/02/26		
TECHNICIAN	AC		



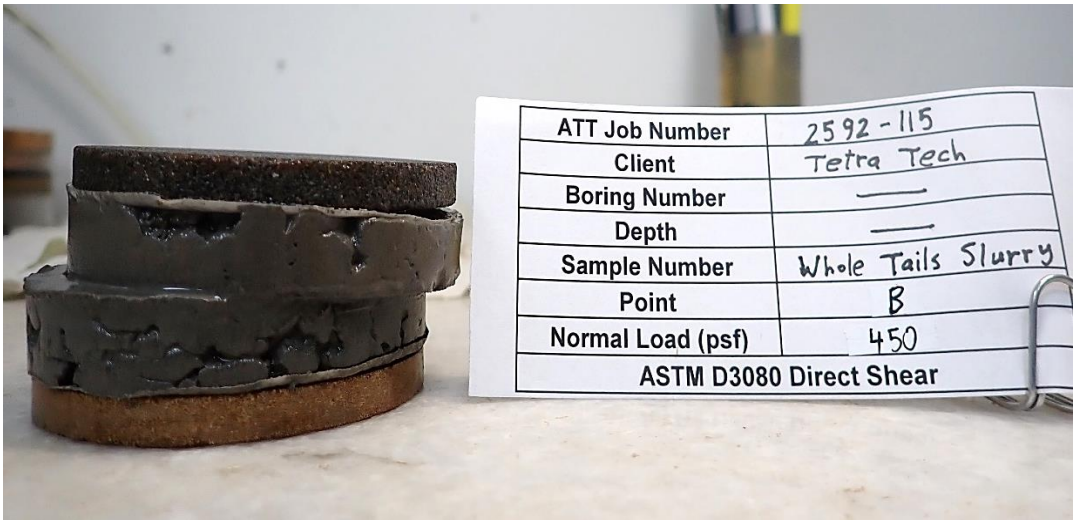
NOTES

Picture File: P3034372.JPG
File name: 2592115__Direct Shear ASTM D3080_0.xlsm

ADVANCED TERRA TESTING

Direct Shear
ASTM D3080
(Point B Picture 1)

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	DESCRIPTION	Remolded Specimens
DATE TESTED	03/02/26		
TECHNICIAN	AC		



NOTES

Picture File: P3034375.JPG
File name: 2592115__Direct Shear ASTM D3080_0.xlsm

ADVANCED TERRA TESTING

Direct Shear
ASTM D3080
(Point B Picture 2)

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	DESCRIPTION	Remolded Specimens
DATE TESTED	03/02/26		
TECHNICIAN	AC		



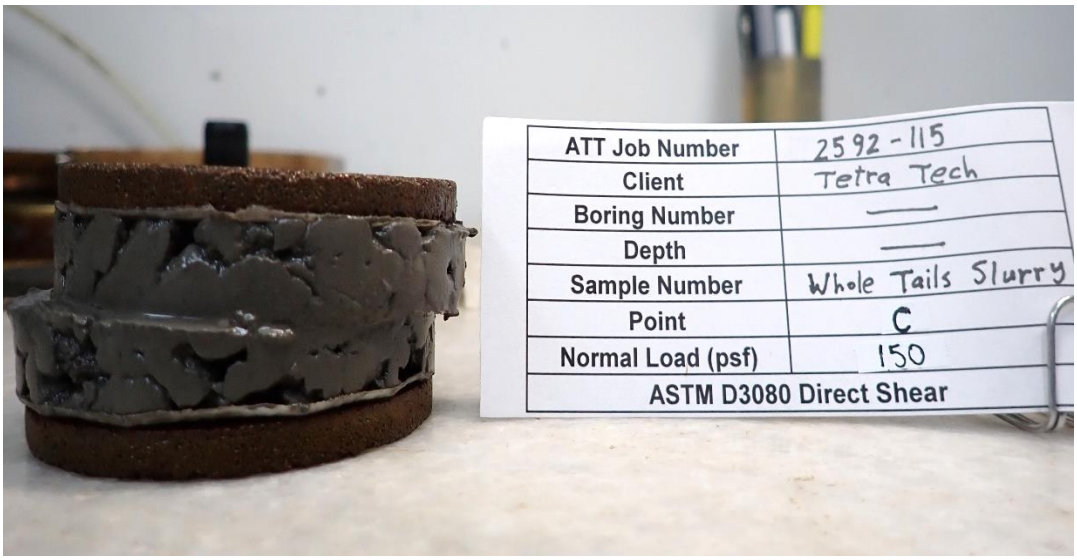
NOTES

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ADVANCED TERRA TESTING

Direct Shear
ASTM D3080
(Point C Picture 1)

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	DESCRIPTION	Remolded Specimens
DATE TESTED	03/02/26		
TECHNICIAN	AC		



NOTES

Picture File: P3034379.JPG
File name: 2592115__Direct Shear ASTM D3080_0.xlsm

ADVANCED TERRA TESTING

Direct Shear
ASTM D3080
(Point C Picture 2)

CLIENT	Tetra Tech	BORING NO.	--
JOB NO.	2592-115	DEPTH	--
PROJECT	White Pine North Tailings	SAMPLE NO.	Whole Tails Slurry
PROJECT NO.	117-372636-25001.01.4	DATE SAMPLED	--
LOCATION	White Pine Michigan	DESCRIPTION	Remolded Specimens
DATE TESTED	03/02/26		
TECHNICIAN	AC		



NOTES

Picture File: P3034381.JPG
File name: 2592115__Direct Shear ASTM D3080_0.xlsm

Appendix G
Surface Water Management Memorandum

TETRA TECH

Memo

To:	Chad Wolahan, Amanada Zeidler
Cc:	Steve Donahue
From:	Chad Tomlinson
Date:	8/7/2026
Subject:	Water Management Philosophy of Operating and Design Storm Conditions

PROJECT BACKGROUND

One of the major future operating challenges for the Tailings Disposal Facilities (TDFs) will be achieving a water balance of inflows with outflows from the TDFs, including stormwater inputs. Water currently generated from the site (herein referred to as legacy water) is routed through North Pond 1(NP1) and 2 (NP2) and discharged via an existing National Pollutant Discharge Elimination System (NPDES) permit to Outfall 001.

Legacy Water Management – Current Condition

A block flow diagram showing the various inputs into the legacy TDF system is presented in **Figure 1**. As shown in **Figure 1**, the TDFs operate in series, with the South Pond (SP) discharging to NP1, and all water in NP1 discharging to NP2 via overflow pipes and seasonally through an overflow spillway. Water accumulating in NP2 is discharged through a 96-inch pipe spillway to the environment via the permitted Perch Creek Outfall 001. Flow readings for Outfall 001 from 2018 to 2024 are shown in **Figure 2**. As shown, the average peak annual discharges occur in April and May, giving strong argument to the fact that the current water balance of the TDF system is dominated by natural precipitation falling as both rain and snow, as well as snowmelt. Based on their respective areas, SP, NP1, and NP2 are expected to contribute 24%, 33.4% and 42.6% of the flow to Perch Creek Outfall 001 during peak flow, neglecting the Bedell Pond and Old Mine Dewatering System. This would result in an average peak flow of 6.7 million gallons per day (MGD) from SP, 9.32 MGD from NP1, and 11.88 MGD from NP2.

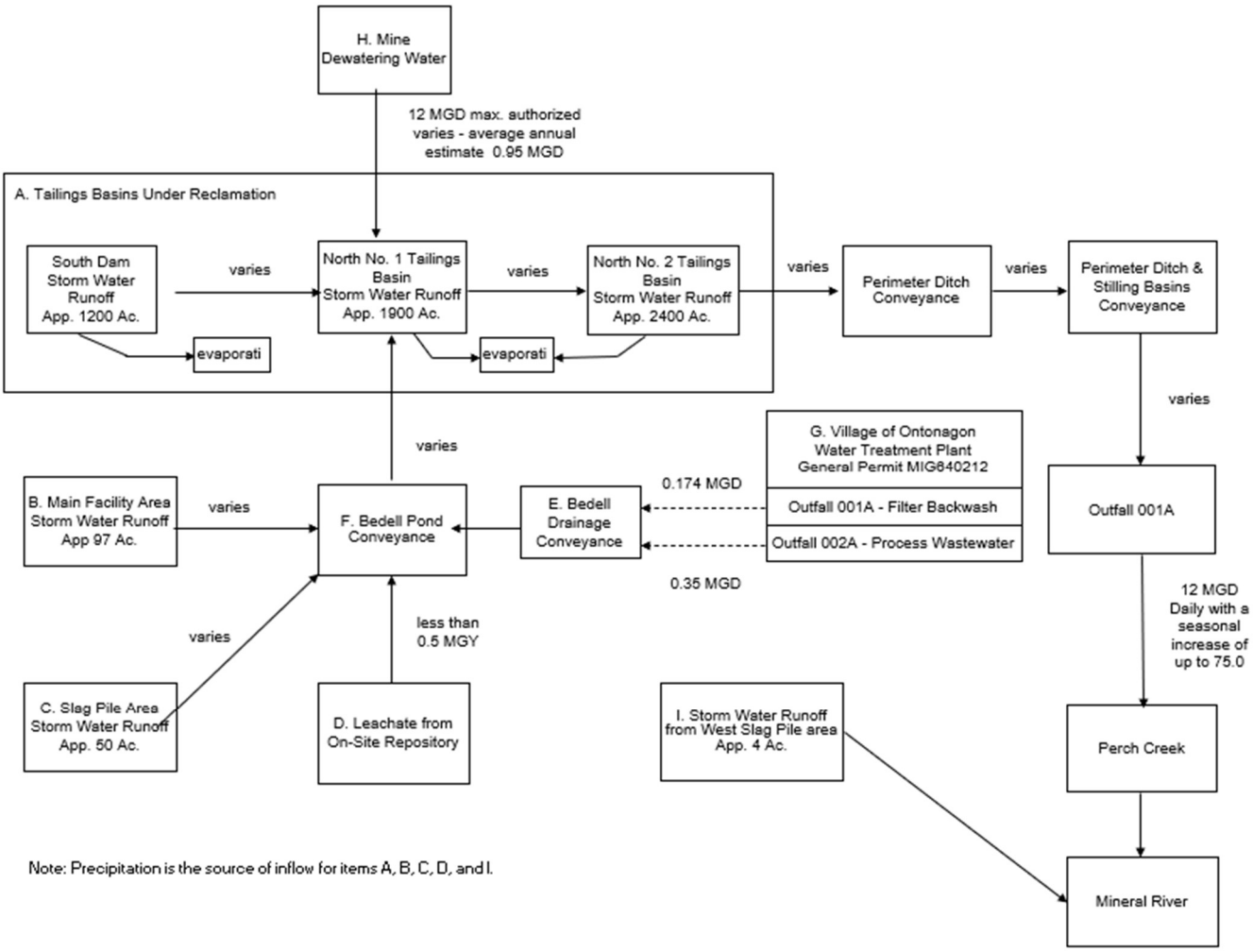


Figure 1 – Legacy Tailings Water Management Process Flow Diagram for Current Conditions

2018-2024 Outfall 001 Daily Discharge Flow Rate Summary

Month	Minimum	Maximum	Mean	Median
January	1.41	13.50	4.08	3.17
February	1.07	17.24	3.49	2.63
March	1.19	91.44	9.25	4.33
April	1.54	87.46	27.89	17.18
May	0.75	65.08	14.62	5.75
June	0.08	23.72	4.00	2.21
July	0.02	19.43	2.91	1.65
August	0.02	11.52	1.30	0.33
September	0.00	12.83	1.13	0.28
October	0.00	55.48	4.92	0.67
November	0.00	47.65	6.84	5.84
December	0.60	19.73	5.58	4.50

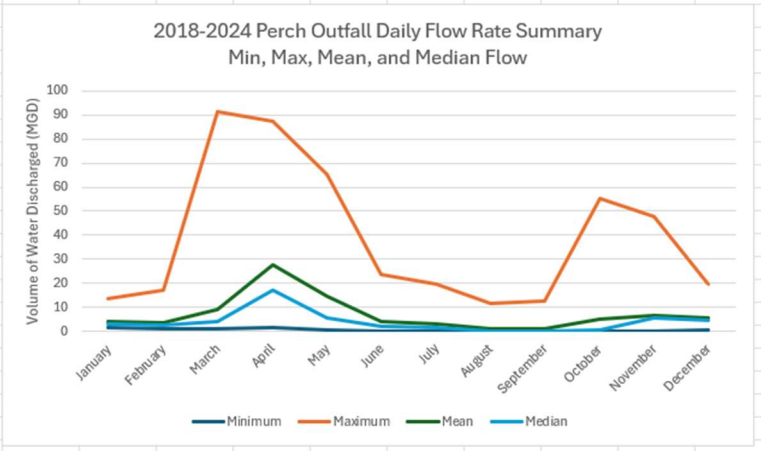


Figure 2 – Perch Creek Outfall 001 Discharge Data

Future Water Management

The water entering the TDFs will be characterized as non-contact or contact water. Non-contact water refers to all legacy water associated with historical/legacy operations, including stormwater coming into contact with legacy tailings. Contact water refers to water anticipated to be generated from the new mining operations, including stormwater falling on the future tailing deposition areas. A summary of the non-contact and contact water anticipated to be discharged to the TDFs during future operations is presented in **Table 1**. Groundwater resulting from dewatering the new underground mine workings is not included in this assessment.

Table 1 – Summary of Contact and Non-Contact Waters

Water Source	Water Type
Former Mine Dewatering	Non-Contact
South Pond Runoff	Non-Contact
Runoff from Legacy Tailings	Non-Contact
Bedell Pond Discharge	Contact
Future Tailings Discharge (Bleed Water)	Contact
New Mine Dewatering	Contact
Runoff from Future Tailings Deposition Area	Contact

The future site-wide water management philosophy considers the entire footprint of NP1 as a contact water basin and as such will not receive any non-contact water. All non-contact water will be directed to and discharged from NP2, through the existing Perch Creek NPDES Outfall.

Once deposition of tailings begins in NP2, it will be divided into separate non-contact and contact water areas to allow these waters to be managed separately. Excavation of trenches and construction of berms and establishment

of separate stormwater (non-contact) and reclaim (contact) basins within NP2 will prevent comingling of non-contact and contact waters.

Under future operations, non-contact water will continue to be discharged to the existing permitted Perch Creek Outfall 001 while contact water will be pumped back to the process plant as make-up water or pumped to a future water treatment plant for treatment prior to discharge under a new NPDES permit.

Water Management Philosophy for Low Probability Storm Events

In addition to managing process related streams and "typical" annual precipitation, it is desired to develop a management strategy for NP1 and NP2 to minimize discharge of contact related stormwater even under the low probability storm events. Consideration of these low probability events will be required to prevent failure of the embankment due to overtopping. This will require that surplus water be pumped to a water treatment plant to maintain NP1 and NP2 at established water elevations to provide buffer storage capacity in each pond to contain the runoff volume from low probability design storm events. Maintaining these buffer storage water elevations will rely on pumping that can be vulnerable due to pump failure or loss of electrical power. Although contingencies are in place to mitigate the pump vulnerabilities, spillways will be included in the design to ensure that the ponds will be able to pass the low probability storm events in the event of a pumping system failure to prevent overtopping of NP1 and NP2.

Assumed Hazard Classification and Design Storm Events

Michigan's Department of Environment, Great Lakes, and Energy (EGLE) Dam Safety Department assigns the hazard classifications. The hazard classification will dictate the design storm event that needs to be considered for establishing adequate freeboard and the size of the spillways. NP2 is currently classified as a Significant Hazard Potential and NP1 is classified as a Low Hazard Potential. Because of the increased tailing deposition in each of the basins, it was assumed that NP1 and NP2 could be perceived as significant and high hazard dams, respectively. As such and in accordance with Section 324.31516 of the Natural Resources and Environmental Protection Act (Act 451 of 1994), a dam classified as a Significant Hazard Potential must be designed to meet the 200-yr flood or flood of record and High Hazard Potential dams must meet half the probable maximum flood (PMF). For the Significant Hazard Potential dam (NP1) WPC chose to use a more conservative 1,000 yr flood to align with GISTM standards. Consistent with the regulation, half the PMF was used as the design storm event for the High Hazard Potential dam (NP2).

FREEBOARD AND ASSOCIATED WATER ELEVATIONS

To increase the available storage capacity in each pond without resulting in discharge through the spillways, the freeboard in NP1 and reclaim compartment of NP2 will be reduced. For the purpose of this analysis, freeboard is measured from the invert elevation of the spillway to the crest of the dam. Currently NP1 and NP2 operate with a 7.4-foot (1.83 m) and 14-foot (4.26 m) freeboards, respectively. The freeboard for NP1 and NP2 will be reduced to 3 ft (0.91 m) and 5 ft (1.52 m), respectively. A summary of pertinent elevations related to the existing and proposed freeboard for NP1 and NP2 are presented in **Tables 2** and **3**, respectively. Unless otherwise specified, elevations are referenced to the Mine Datum. To convert from the Mine Datum to feet Above Mean Sea Level (AMSL), AMSL = Mine Datum - 4,396.44 feet.

Table 2 – Summary of NP1 Existing and Proposed Freeboard Elevations

Pertinent Elevation	Elevation (ft)	Elevation (ft)	Elevation (m)
	Mine Datum	AMSL	AMSL
Existing Conditions			
Crest Elevation	5,251.40	854.96	260.66
Spillway Elevation	5,244.00	847.56	258.40
Freeboard	7.40	7.40	2.26
Proposed Conditions			
Crest Elevation	5,251.40	854.96	260.66
Spillway Elevation	5,248.40	851.96	259.74
Freeboard	3.00	3.00	0.91

Table 3 - Summary of NP2 Existing and Proposed Freeboard Elevations

Pertinent Elevation	Elevation (ft)	Elevation (ft)	Elevation (m)
	Mine Datum	AMSL	AMSL
Existing Conditions			
Crest Elevation	5,197.19	800.75	244.13
Spillway Elevation	5,184.04	787.60	240.12
Freeboard	13.15	13.15	4.01
Proposed Conditions			
Crest Elevation	5,197.19	800.75	244.13
Spillway Elevation	5,192.19	795.75	242.61
Freeboard	5.00	5.00	1.52

Stage-Storage relationships were developed based on deposition design for the thickened tailings. Based on the water management philosophy, NP1 will be treated as a contact water pond and therefore will have a single combined reclaim water pond as opposed to individual reclaim and stormwater storage compartments. Once deposition begins, NP2 will be divided into contact (i.e. reclaim) and non-contact water (i.e. stormwater) areas and therefore, separate reclaim and stormwater compartments are included in the design. A summary of the available buffer storage capacity, volume of storage below invert elevation of spillway, for NP1 and NP2 based on available topographic survey information, the current deposition designs, and existing and proposed freeboard elevations are presented in **Table 4**. Note the available topography only allows for storage to be calculated based on the surface water elevation at the time of the survey. Therefore, there is likely more storage available than calculated.

As shown in **Table 4**, the invert elevations of the proposed new spillways in NP1 and NP2 and associated reduction in freeboard will significantly increase available storage capacity prior to initiating discharge to the environment. This will allow for more flexibility in pumping rates while providing buffer storage to contain low probability storm events, assuming that established maximum normal operating elevations are maintained.

Table 4 - Summary of Existing and Proposed Freeboard Elevations

Condition	Freeboard		Spillway Invert Elevation (			Storage Capacity	
	Feet	Meters	Mine Datum (ft)	AMSL (ft)	AMSL (m)	Reclaim Area (acre-ft)	Stormwater Area (acre-ft)
NP1							
Existing	7.40	2.26	5,244.00	847.56	258.4	396.41	
Proposed	3.00	0.91	5,248.40	851.96	259.7	2669.58	
NP2							
Existing	13.15	4.01	5,184.04	787.60	240.12	1,104.07	
Proposed	5.00[1/] 13.15[2/]	1.52[1/] 4.01[2/]	5,192.19[1/] 5184.04[2/]	795.75[1/] 787.60[2/]	242.61[1/] 240.12[2/]	2,157.81	849.93

Notes:
[1/] Proposed spillway value for NP2 reclaim compartment.
[2/] Spillway values for NP2 Stormwater Compartment.

CURRENT CONDITIONS HYDROLOGY ANALYSIS

This section summarizes the methodology used to perform the hydrologic analysis and presents spillway system components used in the hydrologic model. Spillways referenced below are described in Table 5 below. Seven (7) scenarios were analyzed to confirm the capacity of the ponds to safely store water from various precipitation events without breaching the dam crests. The analyzed scenarios are described below:

- Probable Maximum Precipitation (PMP) with all pipe spillways and North Pond 1 emergency spillway operational.
- PMP with pipe spillways blocked and inoperable; North Pond 1 emergency spillway operational.
- Half-PMP with all pipe spillways and North Pond 1 emergency spillway operational.
- Half-PMP with pipe spillways blocked and inoperable; North Pond 1 emergency spillway operational.
- Snowmelt + 100-year storm event with all pipe spillways and North Pond 1 emergency spillway operational.
- Snowmelt + 100-year storm event with pipe spillways blocked and inoperable; North Pond 1 emergency spillway operational.
- 200-year 24-hr storm event with all pipe spillways and North Pond 1 emergency spillway operational.

Site Layout

The South Pond lies south of North Pond 1 and is separated by a swath of land historically used as a material borrow source. North Pond 1 is an impoundment situated between the South Pond and North Pond 2. NP1 and NP2 are separated by a shared embankment with NP2 located north of NP1. The South Pond rests at an elevation higher than North Pond 1 and 2 with NP2 sitting at the lowest elevation of the three ponds.

The South Pond discharges water through a trapezoidal open-channel spillway cut through the eastern embankment into a channel which routes water directly into the NP1 from the south. The area separating the South Pond and NP1 does not contribute flow into this channel but rather flow is diverted under the channel and circumvents NP1 to the east and west. For this analysis, it was estimated that the South Pond spillway invert is at grade with the existing ground surface and thus there is no storage capacity in the South Pond.

North Pond 1 receives inflow from the South Pond in the southeast corner and releases water through outlet structures located in the northeast corner of NP1. North Pond 1 outlet structures consist of two pipe outlets, a 24-in pipe and a 36-in pipe, in addition to a 10-ft wide trapezoidal emergency spillway with an invert elevation approximately 1.75 ft above the 24-in pipe invert. The crest of NP1 varies in elevation from approximately 5,260 ft along the west embankment to approximately 5251 ft near the outlet structures in the northeast (This crest elevation is based on recent surveys of specific locations near the permanent pool on the north and east embankments, however a complete survey has not been conducted to verify the minimum crest elevation). North Pond 1 has a permanent pool at an approximate elevation of 5,241 ft. Discharge from the NP1 outlet structures is conveyed directly into NP2.

North Pond 2 has a crest elevation ranging from approximately 5,197.4 ft to 5,198.5 ft with a crest elevation of 5,197.44 ft at the pipe spillway. North Pond 2 discharges impounded water via a 42-in pipe spillway with a 96-in diameter inlet.

A recent survey completed in August 2024 provided updated elevations for points of interest such as dam crest elevations at the outlet structures, instrumentation elevations, and inverts for pipe and emergency spillways and inverts for spillway sills. Recent survey data did not provide a comprehensive survey of the project site. All elevations presented in this report are in local mine elevations and coordinate system unless stated otherwise. The local elevations presented in the memorandum are 4,396.44 ft above the USGS mean sea level (El. Ft, AMSL, NGVD 1929 datum = Local Elevation – 4,396.44). For this analysis, the following key elevation points utilized in the hydrologic model based on recent survey data are presented in **Table 5**.

Table 5: Elevations of Select Structures

Elevation Point ID	Elevation (ft)
North Pond 1 Crest	5,251.00
North Pond 1 24" Pipe Spillway Invert	5,241.56
North Pond 2 36" Pipe Spillway Invert	5,240.86
North Pond 1 Emergency Spillway Concrete Sill Invert (crest)	5,243.31
North Pond 2 Crest	5,197.40
North Pond 2 96" Pipe Inlet Invert	5,182.59
North Pond 2 Spillway Sill Invert	5,183.73

Elevations obtained from "White Pine Tailings Survey 8-15-24.csv"

Rainfall

Precipitation data for the analyzed storm events were obtained from *White Pine Mine Tailings Dams (North Ponds # 1 and #2) Dam Breach Analyses* (Tetra Tech, 2026). No additional analyses were conducted to quantify precipitation data as the referenced data is assumed to still apply to the project site. Total point precipitations for the selected storm recurrence intervals are summarized in **Table 6**.

Table 6: Recurrence Interval Point Precipitation

Recurrence Interval (years)	Precipitation Depth (in)
200	6.9
Half-PMP	11.0
Snowmelt + 100-year	15.8
PMP	22.0

Drainage Area Delineation and Storage Capacity

Limited survey and topographic data for the project site was available at the start of this hydrologic analysis. Supplemental topography at 1 meter grid intervals and dated 2019 was obtained using Global Mapper®, a geographic information systems (GIS) software. The obtained topographic data was used to delineate the three tailings dams to quantify contributing drainage areas. For this analysis it was assumed no external contributing stormwater run-off entered any tailings facility. Drainage areas are presented below in

Table 7.

Table 7: Tailings Dam Drainage Areas

Drainage Area ID	Area (ac)
South Pond	1,429
North Pond 1	1,994
North Pond 2	2,539
TOTAL	5,962

Contour intervals from the supplementary topographic data were at approximately one meter. The tailings impoundment contours from the obtained supplementary topographic data were used to create stage-storage curves for North Ponds 1 and 2. The South Pond is assumed to have no capacity to impound water. Where stage data was missing, areas and volumes were interpolated to estimate storage capacity at that stage. Refer to **Table 8** and **Table 9** below for a summary of stage-storage capacities. **Attachment 1** provides two figures depicting a graphical representation of stage-storage capacities for North Ponds 1 and 2.

Table 8: North Pond 1 Stage-Storage Capacity

Elevation (ft)	Area (ac)	Incremental Volume (ac-ft)	Cumulative Volume (ac-ft)
5,238	0	0	0
5,241	82	123	123
5,242.90	260	324	447
5,246.18	605	1,419	1,866
5,249.46	1,073	2,753	4,619
5,251.44[1]	1,331	2,384	7,003

[1] *Value for stage capacity were interpolated*

Table 9: North Pond 2 Stage-Storage Capacity

Elevation (ft)	Area (ac)	Incremental Volume (ac-ft)	Cumulative Volume (ac-ft)
5,183.84	375	0	0
5,187.12	610	1,616	1,616
5,190.40	1,069	2,754	4,370
5,193.68	1,626	4,421	8,791
5,196.96	2,003	5,953	14,744
5,197.44[1]	2,045	965	15709

[1] *Value for stage capacity were interpolated*

Land Cover Description and Curve Numbers

Classifying land cover descriptions for the tailings facilities assists in assigning Curve Numbers and subsequently estimating run-off when using the Natural Resources Conservation Service (NRCS) Curve Number Method. Assigned Curve Numbers for this analysis reflect the average antecedent moisture condition (AMC II) for all storm events except for the Snowmelt + 100-year event where it is anticipated that the soil will become saturated and thus reflect AMC III.

Land cover description, soil classification, and assigned Curve Numbers for the three impoundments were referenced from a previous study completed by MFG Inc. (MFG, 2002) and assumed to still apply to the project site

as it is unlikely that site conditions have significantly changed. For the three impoundments, the characteristics and Curve Numbers presented in **Table 10** have been applied.

Table 10: Land Cover and Curve Numbers

Pond ID	Land Cover Description	Soil Classification	AMC II Curve Number	AMC III Curve Number
South Pond	Wooded; grass mixture	Sandy clay loam	71	85
North Pond 1	Native vegetation	Silty loam	67	83
North Pond 2	Native vegetation	Silty clay	74	87

Current Conditions Hydrological Model Results

Tetra Tech utilized the Army Corps of Engineers' HEC-HMS software to model simulated hypothetical storm events. Using a Soil Conservation Service (SCS) Type-II rainfall distribution, runoff volumes and peak flow rates were calculated and used to determine whether North Ponds 1 and 2 have adequate capacity to store water during each hypothetical storm event. Key results from the completed model are presented in **Table 11** and **Table 12**.

Table 11: HEC-HMS Hydrologic Model Results Summary – North Pond 1

Storm Event Scenario	Max Water Surface Elevation (ft)	Inflow Volume (ac-ft)	Discharge Volume (ac-ft)	Peak Storage (ac-ft)	Total Peak Discharge (cfs)
200-yr 24-hr	5,244.1	969.6	231.0	984.8	67.3
½ PMF	5,246.0	1,980.9	714.5	1,804.5	218.7
½ PMF No Pipe Outlets	5,246.2	1,980.9	459.4	1,901.9	136.7
Snowmelt + 100-yr	5,248.2	3,904.8	1,366.1	3,582.5	356.3
Snowmelt + 100-yr No Pipe Outlets	5,248.4	3,904.8	1,011.7	3,696.9	267.0
PMF	5,249.0	4,943.4	1,947.3	4,253.2	541.2
PMF No Pipe Outlets	5,249.3	4,943.4	1,427.1	4,449.8	399.0

Table 12: HEC-HMS Hydrologic Model Results Summary – North Pond 2

Storm Event Scenario	Max Water Surface Elevation (ft)	Inflow Volume (ac-ft)	Discharge Volume (ac-ft)	Peak Storage (ac-ft)	Total Peak Discharge (cfs)
200-yr 24-hr	5,185.7	1,054.5	167.2	887.2	39.0
½ PMF	5187.6	2,303.5	326.8	1,976.6	79.3
½ PMF No Pipe Outlets	5,187.6	2,057.2	0.0	2,057.5	0.0
Snowmelt + 100-yr	5,189.7	4,310.6	570.3	3,740.1	135.9
Snowmelt + 100-yr No Pipe Outlets	5,189.9	3,966.6	0.0	3,966.6	0.0
PMF	5,190.9	5,710.4	655.8	5,054.6	156.2
PMF No Pipe Outlets	5,191.0	5,214.0	0.0	5,214.0	0.0

The results provided in Tables 11 and 12 indicate the following:

- NP1 can convey the PMF assuming no pipe outlets based on the NP1 crest elevation of 5251.44 ft and a maximum flood water surface elevation of 5,249.3 ft.

- NP2 can retain the PMF assuming no pipe outlets based on the NP1 crest elevation of 5197.44 ft and a maximum flood water surface elevation of 5,191.0 ft.

SURFACE WATER MANAGEMENT MODIFICATIONS

To support future management of surface water entering and exiting the TDFs, the following modifications were designed as shown in Figure 1:

- Constructing a new berm to separate North Pond 2 into 2 basins, which are identified as the NP2 Stormwater Basin (non-contact water) and NP2 Reclaim Basin (contact water) in **Figure 3**.
- Raising the North Pond 1 spillway to provide additional storage and sizing it to pass the 1,000-year event
- Adding a spillway to the new berm to pass the Half Probable Maximum Flood (PMF) flow from the NP2 Reclaim Basin to the NP2 Stormwater basin.
- Adding a bypass pipe to re-route stormwater flows up to the 100-year event from the South Pond stormwater ditch into the NP2 Stormwater Basin. Under current conditions, water flows from the SP along the stormwater ditch into NP1.

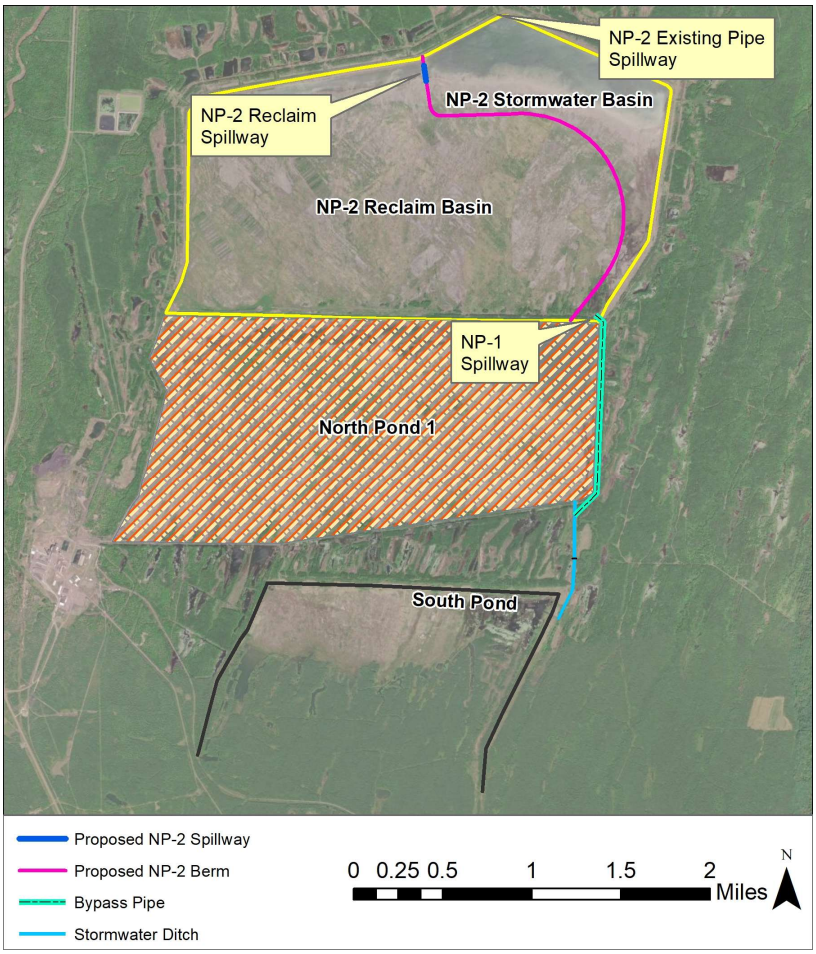


Figure 3 – Tailings Disposal Facility Surface Water Management Modifications

HYDROLOGICAL MODELING FOR STORMWATER MODIFICATIONS

A HEC-HMS (USACE, 2024a) hydrologic model of the existing conditions was developed for the Tailing Disposal Facility Trade-off Study Report (Tetra Tech, 2025). This HEC-HMS model was updated to incorporate the stormwater modifications planned for the project. In the HEC-HMS model, NP2 was separated into two basins, with 79% of the area assigned to the Reclaim basin and the remaining 21% assigned to the Stormwater basin. The associated drainage area was split for each basin and scaled to the same percentages. Under the existing configuration, there are spillways on NP1 and NP2 which provide 7.4 ft and 13.2-ft of freeboard, respectively, measured from the invert elevation of the spillway to the crest of the dam. The existing NP1 emergency spillway is a ten-foot-wide broad crested weir, and the NP2 principal outlet is a 96-inch circular pipe. The existing spillways were shifted in elevation as shown in **Table 2** and **Table 3**.

The spillway sizing was evaluated after the model configuration was updated. Initial water surface elevations were adjusted to be equal to the spillway invert elevations in the SP, NP1, and both NP2 Reclaim and Stormwater basins.

In the HEC-HMS model, the downstream link from the SP channel was changed from NP1 to connect to the NP2 Stormwater basin. The bypass pipe is intended to convey flows up to the 100-year event while flows greater than the 100-yr event will overtop the stormwater ditch. Accordingly, a diversion was added to the HEC-HMS model to route flows above the 100-yr flow away from the system so that for events greater than the 100-yr, only flows up to the 100-yr event were routed to the NP2 Stormwater basin.

South Pond Stormwater Ditch and Bypass Piping

The capacity of the stormwater ditch was unknown, so a HEC-RAS model (USACE, 2024b) of the ditch was developed using a Digital Terrain Model (DTM) derived from LiDAR acquired from the US Geological Survey's 3DEP program (USGS, 2021). It is unknown if the ditch contained water at the time the LiDAR was collected. If water was present at the time, the DTM may underestimate the capacity of the channel, however, the LiDAR provided the best-available source for characterizing the channel geometry. The HEC-HMS model was run for the 100-yr rainfall event, which predicted a maximum flow of 525 cfs from the South Pond. The output hydrograph from HEC-HMS was applied as an inflow boundary condition to the HEC-RAS model which predicted that the ditch does not have sufficient capacity to convey the 100-yr peak flow, with overtopping along the ditch exceeding one foot in some locations.

The channel geometry was modified to evaluate whether the ditch could be excavated to convey the 100-yr peak flow and to provide a headwater depth for culvert calculations. While this effort showed that the ditch could mostly convey 525 cfs, it required significant modification and did not prevent all overtopping at all locations along the ditch, with several discrete locations indicating some overtopping by 3-4 inches along the ditch. The most restrictive section along the ditch, after modifying to increase capacity, overtopped at 460 cfs. This ditch geometry should be further evaluated as the design progresses. Prior to modifying the ditch to increase capacity, the most restrictive section showed a capacity of only 225 cfs, however, as mentioned previously the modeled capacity may appear to be more restricted than in reality due to the limitations of the lidar data used to define the channel geometry. A survey of the ditch would provide the most accurate representation of the current channel geometry.

Based on the HEC-RAS model, the predicted headwater elevation is 5,252.9 ft about 300 feet upstream of the existing junction with the stormwater ditch and NP1, the predicted tailwater elevation is 5,191.34 ft, and the pipe length is about 6,000 feet. The pipes were sized using Bentley CulvertMaster software. Calculation sheets are shown in Attachment 1. Using smooth HDPE, 3x60-inch pipes, resulted in a peak flow of 520 cfs. With the overtopping identified with the existing ditch geometry, the peak capacity of 520 cfs is likely sufficient. However,

to ensure that the 525 cfs can be entirely conveyed, 3x66-inch CMP pipes are predicted to have a peak capacity of 542 cfs. Culvert capacity calculations are provided in **Attachment 2**.

Riprap aprons were designed for the culvert outlets based upon HEC-14 Hydraulic Design of Energy Dissipators for Culverts and Channels manual (FHWA, 2006). If 60-inch HDPE pipes are selected, the riprap should have a median diameter of 10 inches, an apron depth of 1.9 ft and an apron length of 25 ft. For a 66-inch CMP pipe, the riprap should have a median diameter of 7 inches, with an apron depth of 1.8 ft and an apron length of 22 ft. Riprap apron calculations are provided in **Attachment 3**.

As a significant amount of flow may overtop the ditch under higher storm event conditions, riprap was sized to be placed on the landward side of the ditch embankment according to the approach described in Simplified Design Guidelines for Riprap Subjected to Overtopping Flow (Frizell et al,1998). The PMF flow in the ditch is 3,296 cfs. Subtracting the 100-yr flow of 525 cfs and splitting the overflow over both sides of the ditch equates to 1,386 cfs over approximately 3,000 ft along the ditch, and the side slopes of the ditch embankment are approximately 3H:1V. With these parameters, riprap with a median diameter of 6 inches placed at a depth of 12 inches will provide protection against the PMF overtopping the ditch. Calculations for embankment protections are provided in **Attachment 4**.

North Pond 1 Spillway Sizing

The existing spillway width of 10 feet was used as the initial starting point for the updated design but was adjusted to the proposed invert elevation of 5,248.40 ft. The HEC-HMS model predicted that the existing spillway width of 10 feet was sufficient to pass all the way up to a half PMF. To address accessibility on the spillway, the side slopes were adjusted to 10H:1V, and a spillway rating curve with a base width of 10 ft and side slopes of 10H:1V was developed using a weir coefficient of 2.7 for a broad crested weir from the Handbook of Hydraulics (Brater & King, 1996). The resulting rating curve was input into the updated HEC-HMS model and is shown in **Attachment 5**. The resulting peak reservoir elevation and spillway flow and volume for the 100-yr, 1,000-yr, and Half PMF are shown in **Table 13**.

Table 13. Summary of Hydraulics for Updated NP-1 Spillway

Storm Event	Peak Stage	Depth Over Invert	Peak Flow	Spillway Discharge Volume
	Ft, Mine Datum	feet	cfs	Acre-Ft
100-yr	5,248.40	0.00	0.0	0
1000-yr	5,248.77	0.37	11.0	19.6
Half PMF	5,249.02	0.62	30.8	65.4

The predicted peak stage and flow values were input into SpillwayPro (USBR, 2019) to estimate downstream velocities and depths with slope of 2H:1V. The predicted depths along the spillway chute ranged from 0.2 ft to 0.5 ft, and the velocities ranged from 6.7 ft/s to 18.4 ft/s at the base of the spillway.

The methods described in Simplified Design Guidelines for Riprap Subjected to Overtopping Flow (Frizell et al,1998) were used to estimate the size and depth of riprap to be placed on the chute to protect against scour for the 1,000-yr event. With a flow of 11 cfs, chute width of 10 ft, and a slope of 2H:1V, 9-inch median diameter riprap at a depth of 18 inches will provide protection against scour. Calculations are provided in **Attachment 6**.

North Pond 2 Spillway Sizing

For the NP2 spillway, a spillway width of 10 feet was used as the initial starting point for the updated design for the NP2 Reclaim basin and was adjusted to the proposed invert elevation of 5,192.19 ft. Model runs of HEC-HMS showed that the proposed spillway width of 10 feet is sufficient to pass the Half PMF of 73 cfs given that the flow depth over the invert of the spillway is only 0.94 ft compared to the proposed freeboard for the NP2 Reclaim Basin Spillway of 5 ft. To address accessibility on the spillway, the side slopes were adjusted to 10H:1V, and a spillway rating curve with a base width of 10 ft and side slopes of 10H:1V was developed using a weir coefficient of 2.7 for a broad crested weir from the Handbook of Hydraulics (Brater & King, 1996). The resulting rating curve was input into the updated HEC-HMS model and is shown in **Attachment 7**. The resulting peak reservoir elevation and spillway flow and volume for the 100-yr, 1,000-yr, and Half PMF are shown in **Table 14** and **Table 15**.

Table 14. Summary of Hydraulics for Updated NP2 Reclaim Basin Spillway

Storm Event	Peak Stage	Depth Over Invert	Peak Flow	Spillway Discharge Volume
	Ft, Mine Datum	feet	cfs	Acre-Ft
100-yr	5,192.56	0.37	11.1	40
1000-yr	5,192.93	0.74	46.3	157.9
Half-PMF	5,193.13	0.94	72.6	251

Table 15. Summary of Hydraulics for Updated NP2 Stormwater Basin Spillway

Storm Event	Peak Stage	Depth Over Invert	Peak Flow	Spillway Discharge Volume
	Ft, Mine Datum	feet	cfs	Acre-Ft
100-yr	5,189.93	5.89	129.5	596.6
1000-yr	5,191.37	7.33	160.1	701.9
Half-PMF	5,192.21	8.17	173.2	745.7

The resulting peak stage and flows for the NP2 reclaim spillway were input into SpillwayPro (USBR, 2019) to estimate the exit velocities and depths with slope of 2H:1V. The predicted depths along the spillway chute ranged from 0.3 ft to 0.9 ft, and the velocity ranged from 7.7 ft/s up to 22.5 ft/s at the base of the spillway.

The riprap for the NP-2 Reclaim basin spillway was designed using the same riprap design guidelines applied to the NP-1 spillway. With the flow of 72.6 cfs, chute width of 10 ft, and a slope of 2H:1V, 30-inch median diameter riprap at a depth of 60 inches will provide protection against scour. Calculations are provided in **Attachment 8**.

Summary of Results

The predicted reservoir elevations for the NP2 Reclaim Basin, and the NP2 Stormwater basin for the 100-yr, 1,000-yr, and Half PMF events are summarized in

Table 16, Table 17, Table 18, respectively. The peak spillway flows for the NP1 and NP2 Reclaim basins are shown in **Table 19**.

Table 16. Peak Reservoir Elevations for NP1

Storm Event	Peak Stage		
	Ft, Mine Datum	Feet, AMSL	m, AMSL
100-yr	5,248.40	851.96	259.68
1,000-yr	5,248.77	852.33	259.79
Half PMF	5,249.02	852.58	259.87

Table 17. Peak Reservoir Elevations for NP2 Reclaim Basin

Storm Event	Peak Stage		
	Ft, Mine Datum	Feet, AMSL	m, AMSL
100-yr	5,192.56	796.12	242.66
1,000-yr	5,192.93	796.49	242.77
Half PMF	5,193.13	796.69	242.83

Table 18. Peak Reservoir Elevations for NP2 Stormwater Basin

Storm Event	Peak Stage		
	Ft, Mine Datum	Feet, AMSL	m, AMSL
100-yr	5,189.93	793.49	241.86
1000-yr	5,191.37	794.93	242.30
Half PMF	5,192.21	795.77	242.55

Table 19. Peak Spillway Flows and Volumes for NP1 and NP2

Storm Event	Peak Spillway Inflow (cfs)			Spillway Discharge Volumes (acre-ft)		
	NP1	NP2 Reclaim Compartment	NP2 Stormwater Compartment	NP1	NP2 Reclaim Compartment	NP2 Stormwater Compartment
100-yr	NA	6.5	129.5	0	40	596.6
1000-yr	11.0	17.9	160.1	19.6	157.9	701.9
Half PMF	30.8	24.2	173.2	65.4	251	745.7

FLOOD OR LOW FLOW DISCHARGE REQUEST

A flood or low flow discharge requests for NP1 and NP2 was made to EGLE, Water Resource Division. The written responses state the following:

- For NP1

  "Tributary to Mineral River at White Pine Mine North Tailings Pond No. 1, Dam ID 702, Section 28, T51N, R41W, Carp Lake Township, Ontonagon County, has a drainage area of 5.1 square miles. The design discharge for this dam is the 0.5% annual chance (200-year) flood discharge. The 0.5% and 0.2% chance peak flood discharges are estimated to be 2100 cubic feet per second (cfs) and 2600 cfs, respectively. The 0.5% and 0.2% chance flood volumes are estimated to be 1300 acre-feet (ac-ft) and 1600 ac-ft, respectively. (Watershed No. 56L Presque Isle (Lake).

- For NP2

  "Tributary to Mineral River at White Pine Mine North Tailings Pond No. 2, Dam ID 269, Section 16, T51N, R41W, Carp Lake Township, Ontonagon County, has a drainage area of 8.8 square miles. The design discharge for this dam is the 0.5% annual chance (200-year) flood discharge. The 0.5% and 0.2% chance peak flood discharges are estimated to be 2600 cubic feet per second (cfs) and 3300 cfs, respectively. The 0.5% and 0.2% chance flood volumes are estimated to be 2000 acre-feet (ac-ft) and 2500 ac-ft, respectively. (Watershed No. 56L Presque Isle (Lake).

The future spillways for NP1 and NP2 were designed to a 1000-yr (0.1% chance peak flood) and half the PMP event, respectively. Spillway discharge flows from NP1 will discharge to NP2, which will be combined with NP2 and SP stormwater flows and will cumulatively discharge through NP2's two spillways. The estimated spillway discharge flows and volumes from NP1 and NP2 as summarized in **Table 19**.

The hydraulic modeling accounted for attenuation and flood routing through the TDF discharge system. Based on the values presented in **Table 19**, the TDFs discharge system will have a cumulative discharge flow and volume of 197.4 cfs and 996.7 acre-ft, respectively, which are both less than the discharge flows and volumes stipulated in the discharge requests.

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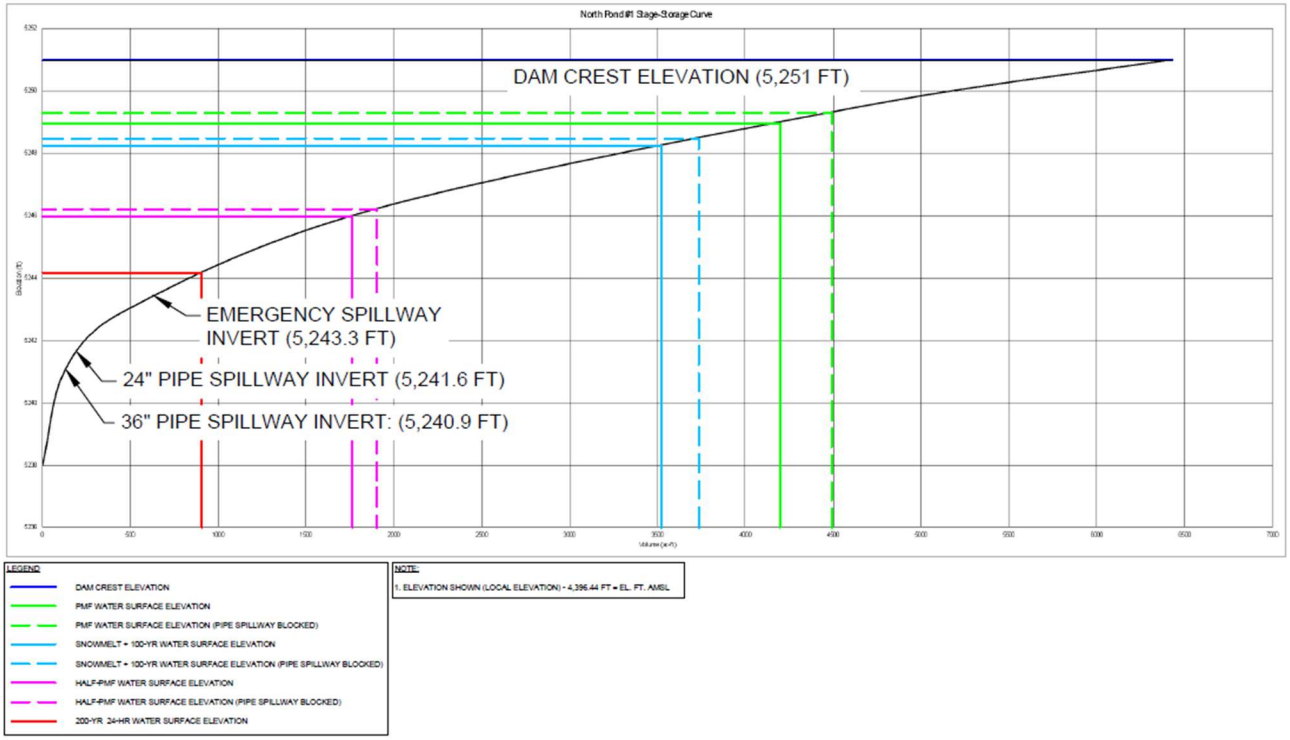
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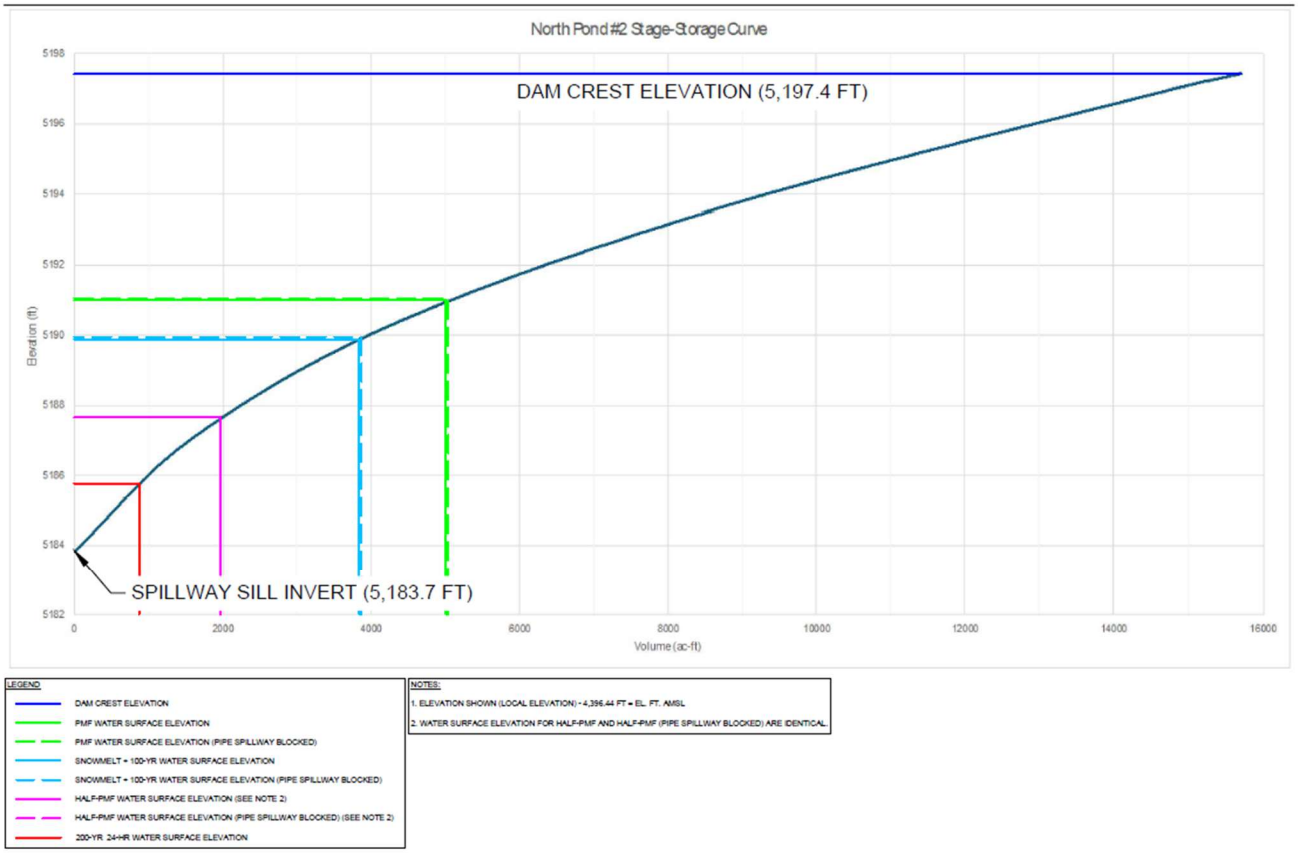
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Attachment 1 – Current Conditions Stage Storage Curves




North Pond #2 Stage-Storage Curve
DAM CREST ELEVATION (5,197.4 FT)
SPILLWAY SILL INVERT (5,183.7 FT)
Elevation (ft)
Volume (ac-ft)
5198
5196
5194
5192
5190
5188
5186
5184
5182
0
2000
4000
6000
8000
10000
12000
14000
16000
LEGEND
DAM CREST ELEVATION
PMF WATER SURFACE ELEVATION
PMF WATER SURFACE ELEVATION (PIPE SPILLWAY BLOCKED)
SNOWMELT + 100-YR WATER SURFACE ELEVATION
SNOWMELT + 100-YR WATER SURFACE ELEVATION (PIPE SPILLWAY BLOCKED)
HALF-PMF WATER SURFACE ELEVATION (SEE NOTE 2)
HALF-PMF WATER SURFACE ELEVATION (PIPE SPILLWAY BLOCKED) (SEE NOTE 2)
200-YR 24-HR WATER SURFACE ELEVATION
NOTES:
1. ELEVATION SHOWN (LOCAL ELEVATION) - 4,396.44 FT = EL. FT. AMSL
2. WATER SURFACE ELEVATION FOR HALF-PMF AND HALF-PMF (PIPE SPILLWAY BLOCKED) ARE IDENTICAL.

Attachment 2 – CulvertMaster Calculations

Culvert Calculator Report
WhitePine_100yrDitch

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	856.41	ft	Headwater Depth/Height	1.20	
Computed Headwater Elev	856.41	ft	Discharge	520.06	cfs
Inlet Control HW Elev.	856.41	ft	Tailwater Elevation	794.93	ft
Outlet Control HW Elev.	856.40	ft	Control Type	Inlet Control	

Grades					
Upstream Invert	850.41	ft	Downstream Invert	794.93	ft
Length	6,000.00	ft	Constructed Slope	0.009247	ft/ft

Hydraulic Profile					
Profile	S2		Depth, Downstream	2.90	ft
Slope Type	Steep		Normal Depth	2.90	ft
Flow Regime	Supercritical		Critical Depth	3.77	ft
Velocity Downstream	14.65	ft/s	Critical Slope	0.004474	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.012	
Section Material	HDPE (Smooth Interior)		Span	5.00	ft
Section Size	60 inch		Rise	5.00	ft
Number Sections	3				

Outlet Control Properties					
Outlet Control HW Elev.	856.40	ft	Upstream Velocity Head	1.85	ft
Ke	0.20		Entrance Loss	0.37	ft

Inlet Control Properties					
Inlet Control HW Elev.	856.41	ft	Flow Control	Transition	
Inlet Type	Beveled ring, 33.7° bevels		Area Full	58.9	ft²
K	0.00180		HDS 5 Chart	3	
M	2.50000		HDS 5 Scale	B	
C	0.02430		Equation Form	1	
Y	0.83000				

Attachment 1.a. CulvertMaster results for 3x 60-inch HDPE pipes

Culvert Calculator Report
WhitePine_100yrDitch

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	856.41	ft	Headwater Depth/Height	1.09	
Computed Headwater Eleva	856.41	ft	Discharge	542.26	cfs
Inlet Control HW Elev.	856.03	ft	Tailwater Elevation	794.93	ft
Outlet Control HW Elev.	856.41	ft	Control Type	Outlet Control	

Grades					
Upstream Invert	850.41	ft	Downstream Invert	794.93	ft
Length	6,000.00	ft	Constructed Slope	0.009247	ft/ft

Hydraulic Profile					
Profile	M2		Depth, Downstream	3.76	ft
Slope Type	Mild		Normal Depth	4.69	ft
Flow Regime	Subcritical		Critical Depth	3.76	ft
Velocity Downstream	10.44	ft/s	Critical Slope	0.014980	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	5.50	ft
Section Size	66 inch		Rise	5.50	ft
Number Sections	3				

Outlet Control Properties					
Outlet Control HW Elev.	856.41	ft	Upstream Velocity Head	1.09	ft
Ke	0.20		Entrance Loss	0.22	ft

Inlet Control Properties					
Inlet Control HW Elev.	856.03	ft	Flow Control	Unsubmerged	
Inlet Type	Beveled ring, 33.7° (1.5:1) bevels		Area Full	71.3	ft²
K	0.00180		HDS 5 Chart	3	
M	2.50000		HDS 5 Scale	B	
C	0.02430		Equation Form	1	
Y	0.83000				

Attachment 1.b. CulvertMaster results for 3x 60-inch HDPE pipes

Attachment 3 – Culvert Rip Rap Apron Calcs

Parameters	3*60 in HDPE		3*66 in CMP	
D=	60	in	66	in
D=	5	ft	5.5	ft
S=	1	%	1	%
Q=	173.35	cfs (x3)	180.75	cfs (x3)
TW=	2.9	ft	3.76	ft
g=	32.2	ft/s^2	32.2	ft/s^2
D_{50}=	0.77	ft	0.55	ft
D_{50}=	9.24	in	6.64	in
Apron Length=	25	ft	22	ft
Apron Depth =	1.85	ft	1.77	ft

Several relationships have been proposed for riprap sizing for culvert aprons and several of these are discussed in greater detail in Appendix D. The independent variables in these relationships include one or more of the following variables: outlet velocity, rock specific gravity, pipe dimension (e.g. diameter), outlet Froude number, and tailwater. The following equation (Fletcher and Grace, 1972) is recommended for circular culverts:

$$D_{50} = 0.2\,D\left(\frac{Q}{\sqrt{g}D^{2.5}}\right)^{4/3}\left(\frac{D}{TW}\right) \qquad (10.4)$$

where,

- D_{50} = riprap size, m (ft)
- Q = design discharge, m^3/s (ft^3/s)
- D = culvert diameter (circular), m (ft)
- TW = tailwater depth, m (ft)
- g = acceleration due to gravity, 9.81 m/s^2 (32.2 ft/s^2)
- S = slope m/m (ft/ft)

Tailwater depth for Equation 10.4 should be limited to between 0.4D and 1.0D. If tailwater is unknown, use 0.4D.

Whenever the flow is supercritical in the culvert, the culvert diameter is adjusted as follows:

$$D' = \frac{D + y_n}{2} \qquad (10.5)$$

where,

- D' = adjusted culvert rise, m (ft)
- y_n = normal (supercritical) depth in the culvert, m (ft)

Table 10.1. Example Riprap Classes and Apron Dimensions

Class	D_{50} (mm)	D50 (in)	Apron Length[1] (ft)	Apron Depth (in)
1	125	5	4D	$3.5D_{50}$
2	150	6	4D	$3.3D_{50}$
3	250	10	5D	$2.4D_{50}$
4	350	14	6D	$2.2D_{50}$
5	500	20	7D	$2.0D_{50}$
6	550	22	8D	$2.0D_{50}$

[1]D is the culvert rise

Attachment 4 – Embankment protection calculations for backside of stormwater ditch assuming overtopping on both sides of the ditch.

Parameters	Parameter Description	PMP	
Q	Flow	1386	cfs
W	Width	3000	ft
Q	Flow	39.26	m^3/s
W	Width	914.4	m
q	Unit Discharge	0.04	m^2/s
$D_{50}*Cu^{0.25}$		0.53	
Cu	Coefficient of Uniformity	2	
ϕ	Angle of Repose of materia	42	°
ϕ	Angle of Repose of materia	0.733	RAD
D_{50}	Median Riprap Diameter	0.15	m
D_{50}	Median Riprap Diameter	0.49	ft
D_{50}	Median Riprap Diameter	**5.91**	**in**
S	Embankment slope	0.33	ft/ft
g	Gravitation	9.81	m/s^2
v_i	Interstital Velocity	0.34	m/s
n_p	Porosity	0.45	
v_{ave}	Average Velocity	0.15	m/s
y	Average Depth	0.28	m
$2*D_{50}$	Design Riprap Depth	0.30	m
Iterate size of D_{50} until $y>2*D_{50}$			

Attachment 5 – NP1 Spillway Rating Curve

NP-1 Stage (ft, Mine Datum)	Discharge (cfs)
5,248.4	0.0
5,248.6	3.3
5,248.8	12.3
5,249.0	27.6
5,249.4	81.0
5,249.6	120.7
5,249.8	170.0
5,250.0	229.5
5,250.2	299.9
5,250.4	381.8
5,250.9	640.4
5,251.4	982.1
5,251.9	1,414.3
5,252.4	1,944.0
5,252.9	2,577.4
5,253.4	3,320.6
5,253.9	4,179.2

Attachment 6 – NP1 Spillway Rip Rap Sizing Calculations

Parameters	Parameter Description	**1000-yr**	
Q	Flow	11	cfs
W	Width	10	ft
Q	Flow	0.31	m^3/s
W	Width	3.048	m
q	Unit Discharge	0.10	m^2/s
$D_{50}*Cu^{0.25}$		0.23	
Cu	Coefficient of Uniformity	2	
ϕ	Angle of Repose of material	42	°
ϕ	Angle of Repose of material	0.733	RAD
D_{50}	Median Riprap Diameter	0.22	m
D_{50}	Median Riprap Diameter	0.72	ft
D_{50}	Median Riprap Diameter	**8.66**	**in**
S	Embankment slope	0.5	ft/ft
g	Gravitation	9.81	m/s^2
v_i	Interstital Velocity	0.52	m/s
n_p	Porosity	0.45	
v_{ave}	Average Velocity	0.24	m/s
y	Average Depth	0.43	m
$2*D_{50}$	Design Riprap Depth	0.44	m
Iterate size of D_{50} until $y>2*D_{50}$			

Attachment 7 – NP2 Spillway Rating Curve

NP-2 Stage (ft, Mine Datum)	Discharge (cfs)
5,192.2	0.0
5,192.4	3.3
5,192.6	12.3
5,192.8	27.6
5,193.2	81.0
5,193.4	120.7
5,193.6	170.0
5,193.8	229.5
5,194.0	299.9
5,194.2	381.8
5,194.7	640.4
5,195.2	982.1
5,195.7	1,414.3
5,196.2	1,944.0
5,196.7	2,577.4
5,197.2	3,320.6
5,197.7	4,179.2

Attachment 8 – NP2 Spillway Rip Rap Sizing Calculations

Parameters	Parameter Description	**Half PMP**	
Q	Flow	72.6	cfs
W	Width	10	ft
Q	Flow	2.06	m^3/s
W	Width	3.048	m
q	Unit Discharge	0.67	m^2/s
$D_{50}*Cu^{0.25}$		0.53	
Cu	Coefficient of Uniformity	2	
ϕ	Angle of Repose of material	42	°
ϕ	Angle of Repose of material	0.733	RAD
D_{50}	Median Riprap Diameter	0.77	m
D_{50}	Median Riprap Diameter	2.53	ft
D_{50}	Median Riprap Diameter	**30.31**	**in**
S	Embankment slope	0.5	ft/ft
g	Gravitation	9.81	m/s^2
v_i	Interstital Velocity	0.98	m/s
n_p	Porosity	0.45	
v_{ave}	Average Velocity	0.44	m/s
y	Average Depth	1.53	m
$2*D_{50}$	Design Riprap Depth	1.54	m
Iterate size of D_{50} until $y>2*D_{50}$			

Appendix H Discharge Requests

From: EGLE-wrd-qreq
To: Amanda Zeidler
Subject: RE: Flood or Low Flow Discharge Request
Date: Friday, July 17, 2026 9:51:02 AM

We have processed the flood discharge request submitted on June 10, 2026, Process No. 20260417, as follows:

Tributary to Mineral River at White Pine Mine North Tailings Pond No. 1, Dam ID 702, Section 28, T51N, R41W, Carp Lake Township, Ontonagon County, has a drainage area of 5.1 square miles. The design discharge for this dam is the 0.5% annual chance (200-year) flood discharge. The 0.5% and 0.2% chance peak flood discharges are estimated to be 2100 cubic feet per second (cfs) and 2600 cfs, respectively. The 0.5% and 0.2% chance flood volumes are estimated to be 1300 acre-feet (ac-ft) and 1600 ac-ft, respectively. (Watershed No. 56L Presque Isle (Lake)).

Please include a copy of this letter with your inspection report or any subsequent permit application. Flood discharge estimates provided in this response expire one year after the date of this email. If you have questions concerning these flood discharge estimates, please contact Ms. Susan Greiner, Water Resources Division, Hydrologic Studies and Floodplain Management Unit, at 517-927-3838 or GreinerS@michigan.gov. If you have questions concerning the hydraulics or the requirements for the dam safety inspection report, please contact Mr. Michael Size, Water Resources Division, Dam Safety Unit, at 989-619-4295 or SizeM@michigan.gov.

From: EGLE-Automated <EGLE-Automated@michigan.gov>
Sent: Wednesday, June 10, 2026 10:00 AM
To: EGLE-wrd-qreq <EGLE-wrd-qreq@michigan.gov>
Subject: Flood or Low Flow Discharge Request

Requestor: Amanda Zeidler
Company: White Pine Copper LLC
Address: P.O. Box 338
City/State: White Pine, MI
ZIP Code: 49971
Phone: 9062046500
Date: 06/10/2026

Flood Discharge Request Type: Dam
Other Description (if request type "Other" selected):
Dam Hazard Potential (if request type "Dam" selected): Significant
Dam ID (if request type "Dam" selected): 702
Low Flow Project Description:
Contact Person:
Watercourse: Not applicable, this is a tailings dam. White Pine Mine, North Pond No.1 Tailings Dam

Local Name: Not applicable, this is a tailings dam. North Pond No.1 Tailings Dam
County: Ontonagon
City/Township: Carp Lake
Section: 32
Town: 51N
Range: 41W
Location: White Pine Mine Tailings Dam, North Pond No.1, Dam ID No. 00702 The tailings dam covers parcels within Carp Lake Township T51N, R41W Sections 28, 29, 30, 31, 32, 33 Request is related to an application to alter an existing dam. The current dam classification is low hazard potential. We are requesting flood discharge information for a Significant hazard potential assuming the classification may change upon submittal of the application.
Email: azeidler@whitepinecu.com

CAUTION: This email originated from outside our Server.

From: EGLE-wrd-qreq
To: Amanda Zeidler
Subject: RE: Flood or Low Flow Discharge Request
Date: Friday, July 17, 2026 9:48:04 AM

We have processed the flood discharge request submitted on June 10, 2026, Process No. 20260416, as follows:

Tributary to Mineral River at White Pine Mine North Tailings Pond No. 2, Dam ID 269, Section 16, T51N, R41W, Carp Lake Township, Ontonagon County, has a drainage area of 8.8 square miles. The design discharge for this dam is the 0.5% annual chance (200-year) flood discharge. The 0.5% and 0.2% chance peak flood discharges are estimated to be 2600 cubic feet per second (cfs) and 3300 cfs, respectively. The 0.5% and 0.2% chance flood volumes are estimated to be 2000 acre-feet (ac-ft) and 2500 ac-ft, respectively. (Watershed No. 56L Presque Isle (Lake)).

Please include a copy of this letter with your inspection report or any subsequent permit application. Flood discharge estimates provided in this response expire one year after the date of this email. If you have questions concerning these flood discharge estimates, please contact Ms. Susan Greiner, Water Resources Division, Hydrologic Studies and Floodplain Management Unit, at 517-927-3838 or GreinerS@michigan.gov. If you have questions concerning the hydraulics or the requirements for the dam safety inspection report, please contact Mr. Michael Size, Water Resources Division, Dam Safety Unit, at 989-619-4295 or SizeM@michigan.gov.

From: EGLE-Automated <EGLE-Automated@michigan.gov>
Sent: Wednesday, June 10, 2026 9:50 AM
To: EGLE-wrd-qreq <EGLE-wrd-qreq@michigan.gov>
Subject: Flood or Low Flow Discharge Request

Requestor: Amanda Zeidler
Company: White Pine Copper LLC
Address: P.O. Box 338
City/State: White Pine, MI
ZIP Code: 49971
Phone: 9062046500
Date: 06/10/2026

Flood Discharge Request Type: Dam
Other Description (if request type "Other" selected):
Dam Hazard Potential (if request type "Dam" selected): High
Dam ID (if request type "Dam" selected): 269
Low Flow Project Description:
Contact Person:
Watercourse: Not applicable, this is a tailings dam. White Pine Mine, North Pond No. 2 Tailings Dam

Local Name: Not applicable, this is a tailings dam. North Pond No. 2 Tailings Dam
County: Ontonagon
City/Township: Carp Lake
Section: 21
Town: 51N
Range: 41W
Location: White Pine Mine Tailings Dam, North Pond No. 2, Dam ID No. 00269 The tailings dam covers parcels within Carp Lake Township T51N, R41W Sections 19, 20, 21, 22, 27, 28, 29, 30 Request is related to application to alter an existing dam. The current dam classification is significant hazard potential. We are requesting flood discharge information for a High hazard potential dam assuming the classification may change upon submittal of the application.
Email: azeidler@whitepinecu.com

CAUTION: This email originated from outside our Server.